PUBLIC SWITCHED TELEPHONE NETWORK (PSTN)

Volume II

INTRODUCTION

On the basement of the United Automatic Telecommunication System (UATS) fundamental tenets "The Public Switching Telephone Network" was developped and its principles were edited in two volumes.

In Volume 1 were given the recommendation on the basic system problems.

In Volume 2 were given the temporary electrical norms on the public automatic switching telephone network (PSTN) telephone channels.

In 1982 the Ministry of Communications of USSR edited the "Public Switching Telephone Networks Set of Rules" (PSTN SR), volume 1 (M. "Radio & svyaz", 1982), approved by the interministerial committce at the Ministry of Communication of USSR on the 26-th of October 1979.

The individual edition of norms on the electrical and telephonometrical parameters of the switching equipment telephone channels, lines and speech paths was provided by this document.

This "The Future Norms on PSTN Telephone Channels" (PSTN SR Volume 2) are developped with considertion of CCITT, CCIR recommendations, the UATS primary networks documents (Standard, norms) and the materials on the future UATS development.

These norms act as the operational ones for the telephone channels and as the setting norms for PSTN future network individual sections.

The SR spread to the analog telephone channels at the FD, TD, FD-TD transmission systems implementation in local network.

This PSTN SR, Volume 2 should be used by research, development, planning organizations, by operational groups at the eqipment development, the telephone network design and planning and by the different organizations to interface their private networks with PSTN.

1. The perspective norms on electrical parameters of the PSTN channels

Table 1.1. The norms on general characteristics

Parameter name	Norms on analog telephone channels		Note
	FD transmission system	TD transmission system	
1	2	3	4
1.1.1. The signal power incoming on the input of the telephone channel, brought to the UATS VF channel zero relative level			All power values brought here charaicterize the telephony signals at the channel activity ratio equal 0,25.
1.1.1.1. The power telephony signals parameters (subscribers voice signals and switching equipment signals). and switching equipment signals). At any type of call set-up and any transmission route the power values must be no more than: average for long-time power mcWt0 (dBm0)	32 (minus 15)	32 (minus 15)	By the channel activity ratio is meant the relative holding time of an active voice signals into single transmission route
maximum power average for an hour mcWt0(dBm0)	64 (minus 11,9)	64 (minus 11,9)	
maximum power average for a minute mcWt0 (dBmO)	500 (minus 3)	500 (minus 3)	
maximum equivalent power mcWt0 (dBm0)	1250 (plus 0,9)	1250 (plus 0,9)	

I

Table 1.1 (cont.)

1	2	3	4
1.1.1.2. The power subscribers voice signals parameters The subscribers voice signals power value at the activity ratio 0,25 must be no more than: average for long-time power mcWt0 (dBmO)	22 (minus 16)	22 (minus 16)	
The direct subscribers voice signals power (the nearest subscribers signals on the hybrid output in the transmitting path) in the active periods must be no more than: average value (by lots of subscribers) mcWt0 (dBm0)	88 (minus 10,6)	88 (minus 10,6)	
Maximum power with the exeeding probability no more than 10^{-3} of a great number power values, averaged for a talk, mcWt0 (dBm0)	500 (minus 3)	500 (minus 3)	

Table 1.1 (cont.)

1	2	3	4
A sine signal power level at frequency1000 Hz on the subscriber line input from the telephone set side, relevant to the active subscriber voice signal average power level is 88 mcWt0, (dBm0)	minus 6	minus 6	
1.1.1.3. The power telephonists voice signals parameters. The telephonists voice signal average for long-time power value at the acfivity ratio no more than 0,03 must not exceed, mcWt0 (dBm0) The average power value in active periods of time must not exceed, mcWt0 (dBm0)	2,7(minus 25,7) 88 (minus 10,6)	2,7(minus 25,7) 88 (minus 10,6)	
1.1.1.4. The energy switching equipment (line, control and acoustic signals) parameters. The line, control and acoustic signals average for long-time value at any mode type of call set-up and in any route must not exceed, mcWt0 (dBm0) what is relevant to energy for an hour value, no more, mcWt0 (dBm0) The power of bursts of individual signals types must be no more, mcWt0 (dBm0) for the control signals for the line and acoustic signals	10 (minus 20) 3600 368 (minus 4,3) 135(minus 8,7)	10 (minus 20) 3600 368 (minus 4,3) 135(minus 8,7)	separate normalization is to be defined

Table 1.1 (cont.)

1	2	3	4
1.1.1.5. The avarage for long-time power the maximum power average for an hour and the maximum power average for a minute of data transmission. The average for long-time power, the maximum power average for an hour and the maximum power average for a minute of the data transmission must not exceed mcWt0 (dBm0)	32 (minus 15)	32 (minus 15)	
1.1.1.6. The facsmile telegraphing average for long-time power, the maximum power for an hour and the maximum power average for a minute. The facsimile telegraphing average for long-time power, the maximum power average for an hour and the maximum power average for a minute value must not be more mcWt0 (dBm0)		32 (minus 15)	

Table 1.1 (cont.)

1	2	3	4
1.1.2. The operating frequency band of four-wire telephone channel sections. The operating frequency band of four-wire telephone channel section must be, Hz	300-3400	300-3400	
1.1.3. The input impedance. The telephone channel four-wire sections input impedance nominal value in 300-3400 Hz freq. band should be equal, Ohm. The reflection ratio concerning the telephone channel four-wire section nominal in frequency band of 300-3400 Hz, must be no more, %. The balance return loss of the telephone channel four-wire section must be no less, dB.	600 10 43	600 10 43	The reflection ratio and the balance return loss ratio is to be defined.
1.1.4.The nominal relative levels. The nominal relative transmission levels in the in the telephone channels in the VF four-wire channels switching points at frequency 1000 Hz must be: transmission, dB Ohm, reception, dB Ohm	minus 13 plus 4	minus 13 plus 4	The voice-frequency channel transmission into a secondary network or the damaged channel replacement by a valid one is realized in the switching points.

Table 1.1 (cont.)

1	2	3	4
The nominal relative transmission levels in the telephone channels four-wire automatic switching points at frequency of 1000 Hz must be equal:			
switching nodes and the local and intra-zonal circuits exchanges and switching exchanges			
toll network,			
transmission	minus 3,5	0,0	
dB Ohm			
reception			
automatic switching nodes of toll network	minus 3,5	0,0	
transmission, dB Om	minus 3,5	0,0	
reception, dB Om	minus 4,0	0,0	
1.1.5. Overall loss			
The overall loss nominal value of four-wire telephone channel in VF channels switching points at frequency of 1000 Hz must be, dB n-is ASN number.	minus 17	minus 17	
The overall loss nominal value of four-wire telephone channel in switching points at frequency of 1000 Hz must be no more:			
on local and zonal telephone channels, dB	0,0	0,0	
on toll, telephone channels, dB	0 + 0,5p	0,0	
The overall loss naminal value setting error must be no more, dB	0,5	0,5	

Table 1.1 (cont.)

1	2	3	4
1.1.6. Stability The mean value of crosstalk attenuation between the reception path and transmission path (path a-t-B) in frequency band of 300-3400 Hz at any telephone channels termination plans should be more, than dB.	10 + n	10 + n	n - number of four-wire i channeis
The value of the a-t-B path crosstalk attenuation mean square, deviation from its average value in frequency band of 300-3400 Hz at any telephone channels termination plans should be more, dB	6,25 + 4 n	6,25 + 4 n	
The minimum value of a-t-B path crosstalk attenuation in frequency band of 0-4000 Hz should be, dB	6 + n	6 + n	
Mean value of the hybrid balance loss in frequency band of 300-3400Hz at any communication channels termination plans should be more, dB	6	6	
The hybrid balance loss minimum value infrequency band of 300-3400 Hz at any telephone channels termination plans should be more, dB	1 + 10 ^ (-7)		
A part of connections, having stability no more: 0 dB 3 dB	1 + 10 ^ (-6)		

Table 1.1 (cont.)

1	2	3	4
1.1.7. Echo The mean value of crosstalk attenuation between the reception path and the transmission path (a-t-B) from the echo-signal point of view on the telephone networks of all types should be more, than dB	15 + n	15 + n	n - number of four-wire channels
The value of the a-t-B path crosstalk attenuation mean square deviation from its mean value from the echo-signal point of view should be more, dB	9 + 4 n	9 + 4 n	
The hybrid balance loss mean value from point of view of echo-signal should be more, dB	11	11	
The value of the balance loss mean square deviation from its average value from the echo-signal point of view should be no more, dB	3	3	

Table 1.2. Local speech paths (LSP)

Parameter name	Norms on analog speech paths at use of				
	Physical trunks	FD	TD	FD-TD	Note
1	2	3	4	5	6
1.2.1. The Structure The UTN and RTN local speech path (LSP) corresponds The voice-frequency speech path of the local primary network, formed to fit it's nominal circuit (fig.1.2.3 and 1.2.4) of four ordinary voice-frequency paths and having the maximum, extension, km is included in LSP of maximum extension.	fig.1.2.1 1.2.2.	fig.1.2.1 1.2.2.	fig.1.2.1 1.2.2.	fig.1.2.1 1.2.2.	fig.1.2.1 1.2.2.
The LSP switching sections number must be no more than. Urban telephone network	3*	3*	3*	3*	*5 switching sections at presence of two remote switching modules
Rural telephone network	4	4	4	4	
1.2.2. The channels electrical parameters					
1.2.2.1. The 1000 and 800 Hz frequency LSP accumulated loss mean square deviation. The LSP maximum accumulated loss must be no more, dB	25.0	25.0	25.0	25.0	
on frequency of 1000 Hz	19.5	30.0*	29.0*	26.5*	*The norms on paths at TS and physical trunk use.
on frequency of 800 Hz	17.5	23.0 28.0*	23.0 27.0*	23.0 24.5	
The accumulated loss maximum values distribution and the level diagrams for standard LSP circuits on frequencies of 1000 and 800 Hz	fig.1.2.8	fig1.2.11 1.2.12. 1.2.6 1.2.7 1.2.9 i* 1.2.10Щ	fig1.2.14 1.2.17. 1.2.18 1.2.21Щ*	fig1.2.24 1.2.18 1.2.20i 1.2.22i* 1.2.23i 1.2.25Щ	*The standard paths at TS and the physical trunks use
The LSP accumulated loss mean square deviation (at four voice-frequency channels availability) in time from its average value at 1000 frequency value should be no more than, dB	-	2.8	-	0.7	
1.2.2.2. The frequency variation the transmitted signal frequency variation in LSP at four voice-frequency channels use should be no more, Hz					
as a rule	-	1.6	-	1.6	
with a probability of 0.99	-	2.4	-	2.4	
with a probability of 0.999	-	3.1	-	3.1	

Table 1.2 (cont.)

1	2	3	4	5	6
1.2.2.3. The stepwise phase variation in time. The transmitted signal step wise phase variation in LSP in time at the voice-frequency channel, 200 km, of length (at 3 voice-frequency relaying) in consequence of the transmitting system generator equipment switching should appear no more than once during an hour.		0.8	is to be defined		
1.2.2.4. The accumulated loss gain-level variation. The LSP accumulated loss frequency distortions maximum values at the voice-frequency channel maximum length (3 voice-frequency relaying) and at the physical trunks maximum lengths should be no more than, dB	Table 1.2.1	Table 1.2.2	Table 1.2.3	Table 1.2.2	
1.2.2.5. Absolute group delay. The absolute group delay deviation gain-level variation. The absolute group delay maximum value in LSP should be no more, than ms	Is to be defined				
The absolute group delay deviation at the four voice frequency channels availabi lity from value, measured at frequency of 1900 Hz should be no more than.		Table 1.2.4	Table 1.2.5	Is to be defin ed	
1.2.2.6. The gain-level variation. It is required of the LSP gain-level variation that the channel accumulated loss, measured in operating frequency band for 97% of cases should remain constant at the level variation on it's input from the nominal value to plus 3.5 dBmO with a precision, dB	-	1.0	Is to be defined		* Is to be precised
The LSP overload threshold value with the availability of the four voice-frequency channels	-	Is to be defined			

Table 1.2 (cont.)

1	2	3	4	5	6
1.2.2.7. The noise					
The maximum power average for an four of psophometrical noise on the telephone set terminals at reception with any LSP type, should be no more than Wt (dBm, mV)	500 (minus 63 0.5)	1000 (minus 60 0.75)	250 (minus 66 0.4)	500 (minus 63 0.5)	
The unweighted noise maximum power average for an hour on the telephone set terminals at reception with any LSP type, during any hour in frequency band of 300-3400 Hz should be no more than pWt(dBm, mV)	2000 (minus 57 1.0)	4000 (minus 54 1.5)	1000 (minus 60 0.8)	2000 (minus 57 1.0)	The unweighted and psophomet ric ration is to be precised
1.2.2.8. The selective noises. The selective noises each type level in LSP, composed of voise-frequency chanels of FD systems should be no more than dBmO	Is to be defined				
- from power supply at any frequency (50, 100, 150, 200, 250 Hz)	-				
Summary value from carrier frequency balances on frequency 4000 Hz	-				
4000 Hz; R=1,2,3,4	-				
- from various call frequencies in VF channels band for each 700, 900, 1100, 1200, 1300, 1500, 1600, 1700, 2600	-				
- out of voice frequency channel band for each frequency of 3850, 3825 Hz.	-				
Each of selective noises level (but for the selective noises, from sampling rate) in LSP with voice-frequency channels availability should be no more than dBmO	-				
The sampling rate selective noises level in LSP at voice frequency channels availability should be no more dBmO	-				
1.2.2.9. The distinct cross talk protektion transient influences resistance).					
The distinct crosstalk protection on near end between two any LSP in operating frequency band should be no lessthan, dB	52.0	42.0	47.0	43.0	

Table 1.2 (cont.)

1	2	3	4	5	6
The distinct transient influences protection on the near end between four-wire LSP CO-CO sections in operating band should be no less than, dB	58.0	76 for 50% of combina-tions 68 for 100% of combina-tions 62 for 75% of combi-nations 59% for 100% of combina-tions			* - in the individual coding use case **- in the group coding use case
The distinct transient influ ences protection between forward and inverse transmission direction of LSP (CO-CO) four- wire section in the operating frequency band should be no less than, dB	-	46.0	- 59.0	49.0*** (59.0)	*** - for the case, when the channel is echo-protected
1.2.2.10. The level transient disapperances and the impulse noise effect summary relative time.					
The impulse noises (exceeding minus 15dBmO, more than 500mkc duration threshold) and the signal level transient disappearances (the descent more than by 18dB, more than 500 mkc duration) effect summary relative time in LSP for an hour periods of time should be no more than. The transient level disappe arance more than of 300 mc duration is considered a failure.	-	Is to be defined			
1.2.2.11. The impulse noises. The impulse noises effect relative time (at presence of four voice-frequency channels exceeding minus 15 dBmO threshold,more than of 500 mkc duration) for an hour periods of time should be no more than	Is to be defined				
1.2.2.12. The transient level disappearances. The signal level tansient disappearances effect relative time in LSP (descent more than by 18 dB, more than 500 mkc duration) for an hour-periods of time should be no more than	Is to be defined				

Table 1.2 (cont.)

1	2	3	4	5	6
1.2.2.13. Stray modulation products protection. The signal protection in LSP at four voice-frequency channels availability from a stray modulation products by the supply noises at any frequency, differing by ±50 Hz, ±100 Hz (up to 400 Hz frequency) from the useful signal by frequency should be no less, dB	-	47.0	57.0	48.0	The switching equipment is not taken into account.
1.2.2.14. The phase jitter. The phase jitter range with frequency of 20-300 Hz in LSP at availability of the four voice frequency channels should be no more than (~).	-	Is to be defined			
1.2.2.15. Non-linear distortions. Non-linear distortion ratio in LSP at '- four channels availability should not exeed, %					
summary	-	2.5	Is to be defined		
by 3-d harmonic	-	1.8	Is to be defined		
by combination 2f1-f2	-	2.9 *	Is to be defined		*-with account of five analogi CO
1.2.2.16. The fault ratio. The fault ratio in LSP with four voice-frequency channels available at the binary signals transmission at 1200 Baud rate in 0.3-3.4 kHz spectrum should not exceed	0.9^10(-4)	0.75^10(-4)	0.7^10(-4)	0.7^10(-4)	
1.2.2.17. The summary distortions, following the signal (including the quantization distortions). The signal resistance from the following noises unweighted power on LSP section, formed with voice frequency four channels use should be no less than (dB) at the - noise input signal level variation (dBmO)					
minus 3	-	-	20.0 *	Is to be defined	* - only at LSP available
minus 6	-	-	28.0		
minus 27	-	-	27.0		
minus 34	-	-	26.0		
minus 40	-	-	22.0		
minus 55	-	-	7.0		

Table 1.2 (cont.)

1	2	3	4	5	6
The signal protection from the following noises psophometrical power on LSP section, formed with voice frequency four channels use should be no less (dB) at the noise input signal level variation (dBmO)					
0	-	-	27.0 *	Is to be defined	* - only at LSP available
minus 30	-	-	27.0		
minus 40	-	-	21.0		
minus 45	-	-	16.0		
1.2.2.18. The noises from out of-band signals on channel input.					
Any product level on LSP output of the voice-frequency channels switching points at the sine signal incoming on its input with 4.6-72 kHz frequency and the nominal transmission level should be less than this level by the value, more, dB	-	-	25.0	Is to be defined	
1.2.2.19. Out-of-band noises on the channel output.					
The level of any product on LSP output in the voice-frequency channel switching points, measured out of the operating frequency band, at the sine signal with the relative zero level and with the frequency in the efficiently transmitted frequency band bounds, applying to its input should be less than, dB0	-	-	minus 25.0	Is to be defined	
1.2.2.20. The third degree combinational product level.					
Any third degree combinational product level on the channel output at the simultane ous sine signal income on its input with any frequency in 300-3400 Hz frequency band and minus 9dBmO level and the signal with 50 Hz frequency and minus 23 dBmO level should be less, dB	-	-	Minus 49.0	Is to be defined	The measurements are produced only on channel termination equipment sets
1.2.2.21. Any noise maximum level.					
Any noise in LSP, caused by the simultaneous active the signalling channels condition, maximum level should be no less, dB	-	-	Is to be defined		

Table 1.2.1. The LSP accumulated loss frequency distortions maximum values (without voice-frequency channel) at the largest physical circuits sections lengths

Frequency (Hz)	300	400	600	800	1000	2400	3000	3400
LSP accumulated loss maximum values, dB	12.0	13.8	15.7	17.5	19.5	29.5	32.7	34.8
Maximum values attenuations deviation from its value at frequency of 1000 Hz gain/frequency deviation	-7.3	-5.7	-3.8	-2.0	0	10.0	13.2	15.3

Notes: 1. The subscriber cable lines in LSP with 0.5 mm the threads diameter.

2. The values are given in accordance with fig.1.2.8.

Table 1.2.2. The LSP accumulated loss frequency distortion maximum values for tree transits via voice-frequency channels of FD transmission systems of FD-TD transmission systems and with the maximum subscriber lines lengths.

Frequency (Hz)	300	400	600	1000	2400	3000	3400
The accumulated loss maximum value higher limit, dB	28.8	25.4	24.3	25.0	35.4	41.8	49.2
The accumulated loss deviati on from its value at 1000 Hz gain/frequency variation	3.8	0.4	0.7	0	10.4	16.8	24.2
The accumulated loss maximum value lower limit	43.8	15.2	17.6	25.0	29.8	32.2	34.2
The accumulated loss maximum value deviations from its value at frequency of 1000 Hz lower limit, dB	-11.2	-9.8	-7.4	0	4.8	7.2	9.2

Notes: 1. The subscriber cable lines in LSP with 0.5 mm the threads diameter.

2. The values are given in accordance with fig. 1.2.12.

Table 1.2.3. The LSP accumulated loss frequency deistortion maximum values for three transits via voice frequency channels of TD transmission systems and with the maximum subscriber lines length.

Frequency (Hz)	300	400	600	1000	2400	3000	3400
The accumulated loss maximum value higher limit, dB	22.1	21.3	23.3	25.0	35.5	39.9	43.3
The accumulated loss maximum value deviations from its value at 1000 Hz frequency gain/frequency variation, dB	-2.9	-3.1	-1.7	0	10.5	14.9	18.3
The accumulated loss maximum value lower limit, dB	15.2	16.7	19.0	25.0	31.2	33.6	35.6
The accumulated loss maximum value deviations from its value at at 1000 Hz frequency lower limit, dB	-9.8	-8.3	-6.0	0	6.2	8.6	10.6

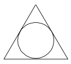
Notes: 1. The subscriber cable lines in LSP with 0.5 mm the threads diameter.
2. The values are given in accordance with fig. 1.2.16.

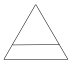
Table 1.2.4. The signal group delay value deviation from its value at frequency of 1900 Hz with '€ Џ of local network (with three voice-frequency transits)

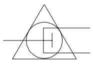
Frequency (Hz)		0.3	0.4	0.5	0.6	0.8	1.0	1.4	1.6	2.2	2.4	2.8	3.0	3.3	3.4
Group delay deviations, mc	LSP	27.5	19.0	12.7	9.5	5.5	3.9	1.75	1.4	1.4	1.75	4.05	6.15	11.0	27.5
	voice frequency four channels (without CO ta ring into account	26.5	18.0	11.7	8.5	5.0	3.4	1,25	0.9	0.9	1.25	3.55	5.65	10.0	26.5

Table 1.2.5. The signal group delay value deviation from its value at frequency of 1.9 kHz in LSP with '€Џ trunk primary network (with three voice-frequency transit) use

Frequency, kHz		0.3	0.4	0.5	0.6	0.8	1.0	1.4	1.6	2.2	2.4	2.8	3.0	3.3	3.4
The group delay deviation,	LSP	14.6	10.6	7.0	5.4	2.9	2.1	2.1	0.9	0.9	1.1	2.3	3.5	8.6	15.0
mc	voice-frequency four channels (withouti CO ta ring into account)	13.6	9.6	6.0	4.4	2.4	1.6	0.6	0.4	0.4	0.6	1.8	3.0	7.6	14.0

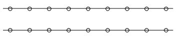

– Exchanges and nodes of telephone switching


– Network node (NN), ASN


– Exchanges and nodes of telephone switching, containing hybrid for transition from 2-wire to 4-wire path

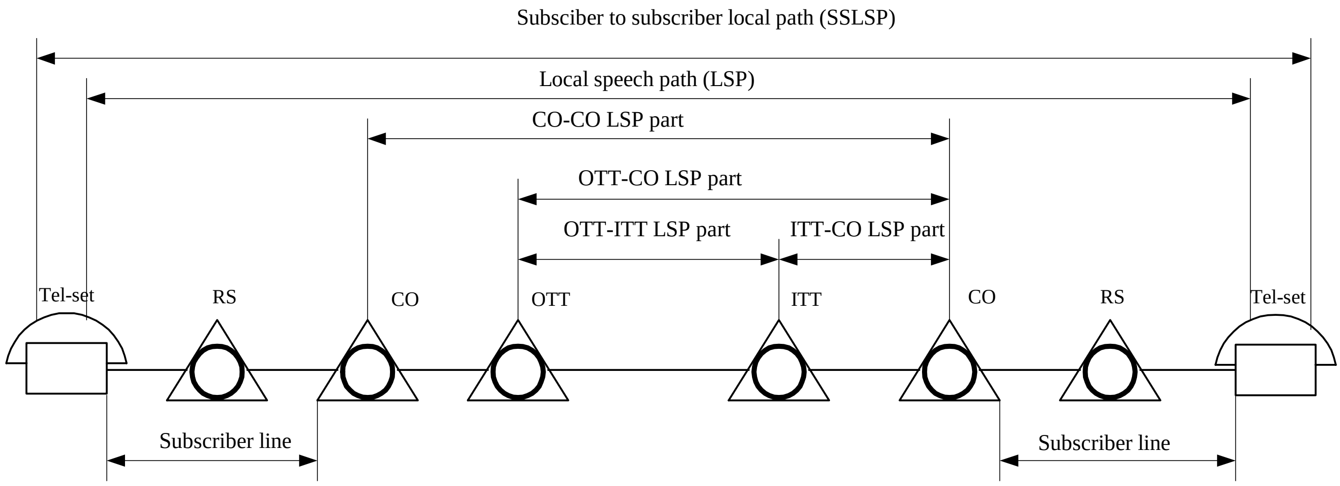
– Physical 2-wire line at nominal trunk circuits

– Analog channel of FD transmission system


– Analog channel of TD transmission system


– Digital-analog and analog-digital convertor of TD transmission systems

Structure of subscriber to subscriber local speech path of UTN (SSLSP UTN)



Note: RS - remote switch that is not optional

Fig. 1.2.1.

Structure of subscriber to subscriber local speech path of UTN (SSLSP PTN)

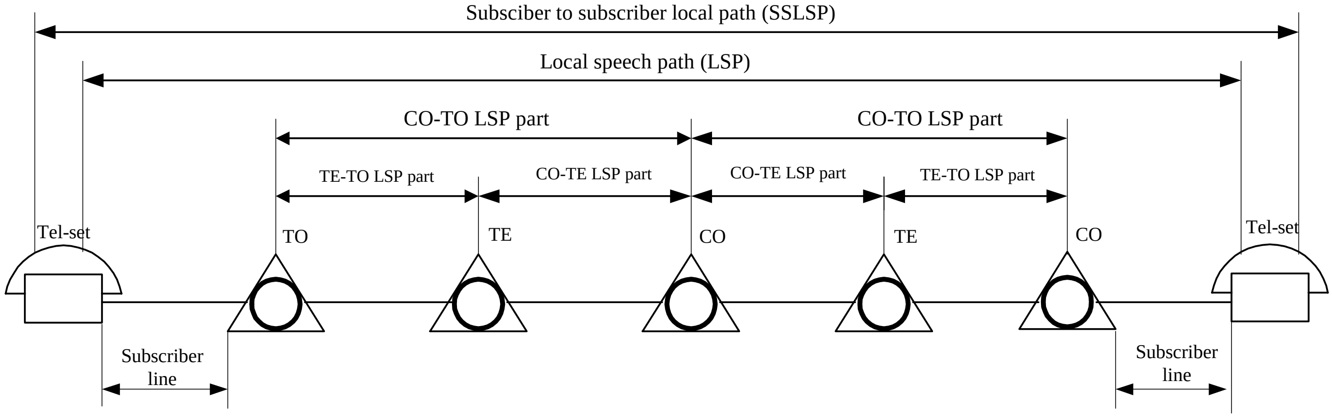


Fig. 1.2.2

Long-term nominal diagram of UTN LSP

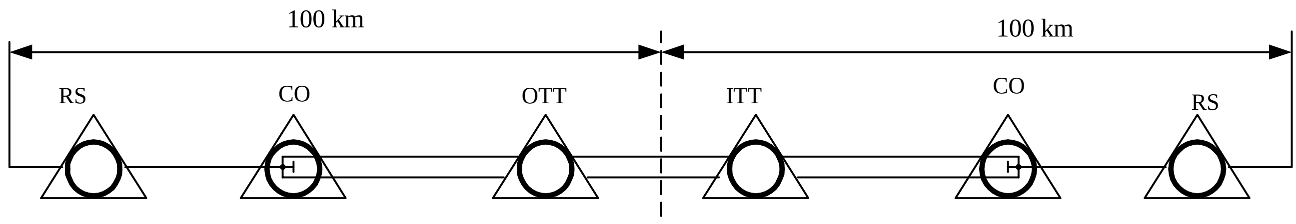


Fig. 1.2.3.

Long-term nominal diagram of RTN LSP

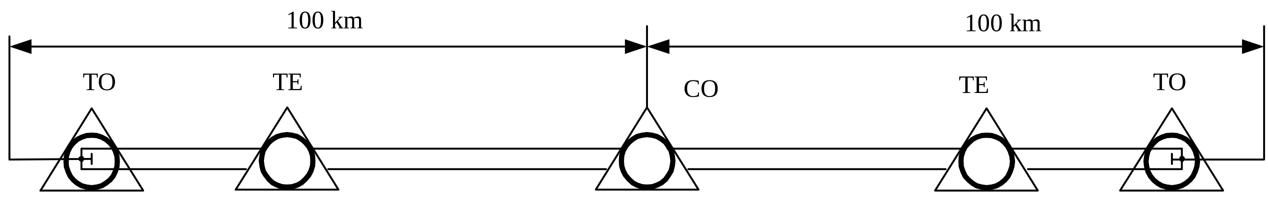


Fig. 1.2.4.

Long-term nominal diagram of CTN LSP (RTN and UTN)

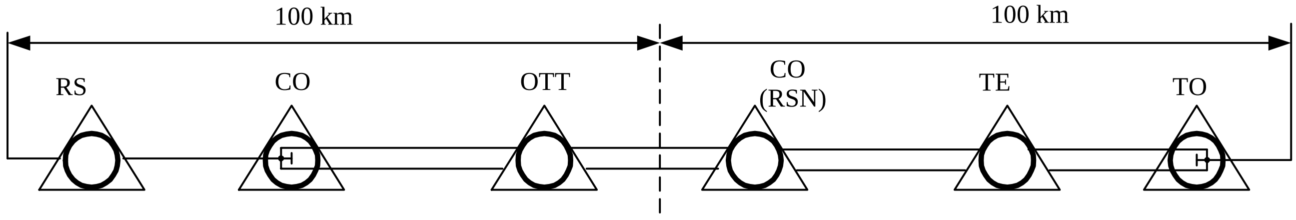
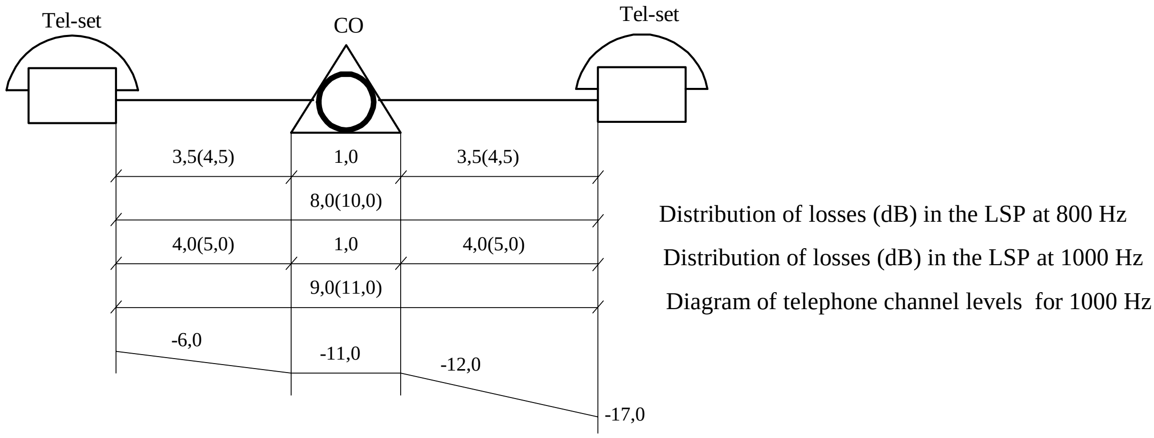


Fig. 1.2.4a.

Diagram of typical SSLSP of non-districtive UTN



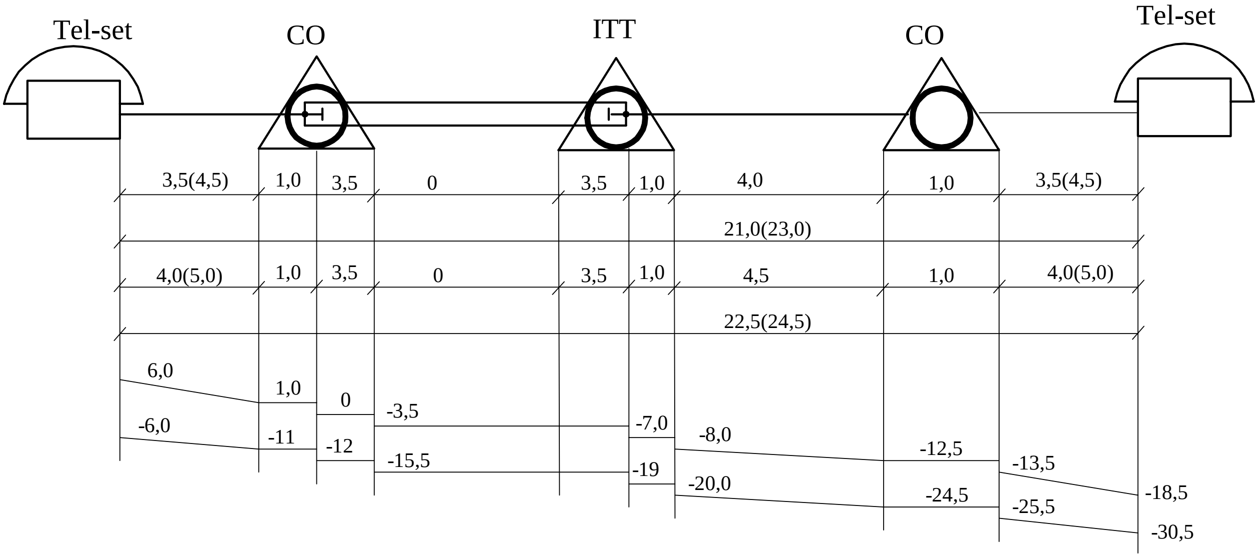
Note: Subscriber line attenuation at 800 and 1000 Hz for cables with the diameter of wires:

From fig. 1.2.5 to fig. 1.2.25
(except 1.2.8-1.2.10; 1.2.12;
1.2.15-1.2.17; 1.2.24; 1.2.25 figures)

diameter of wires (mm)	0,32	0,4	0,5	0,64	0,7
losses at 800 Hz (dB)	3,5	4,0	4,5	4,5	4,5
losses at 1000 Hz (dB)	4,0	4,5	5,0	5,0	5,0

Fig. 1.2.5.

Diagram of typical SSLSP of districtive UTN with ITT and with using the FD transmission systems



Distribution of losses (dB) in the LSP at 800 Hz

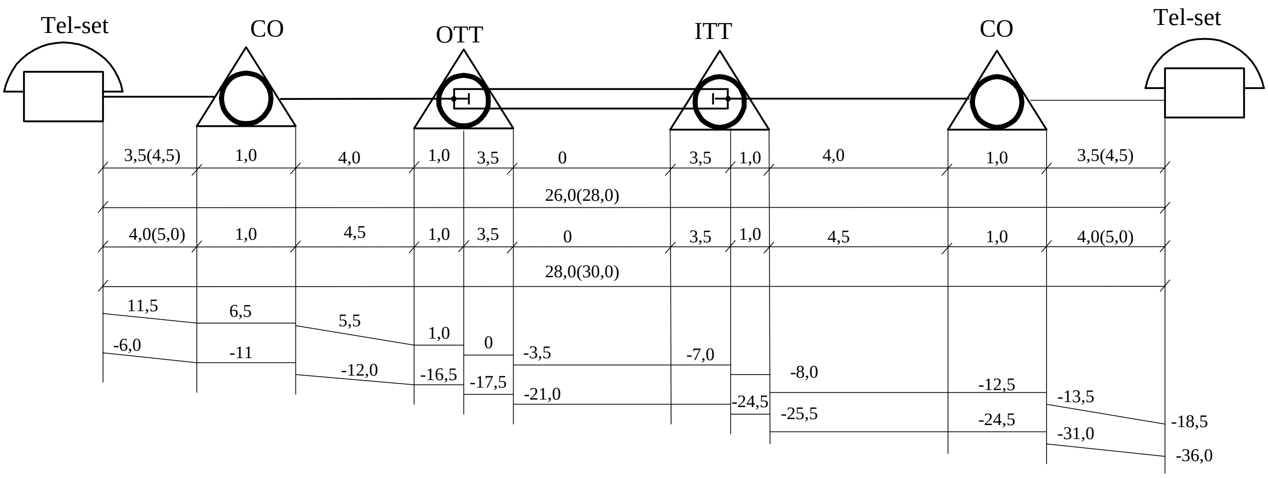
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig. 1.2.6

Diagram of typical SSLSP of districtive UTN with ITT and
with using the FD transmission systems



Distribution of losses (dB) in the LSP at 800 Hz

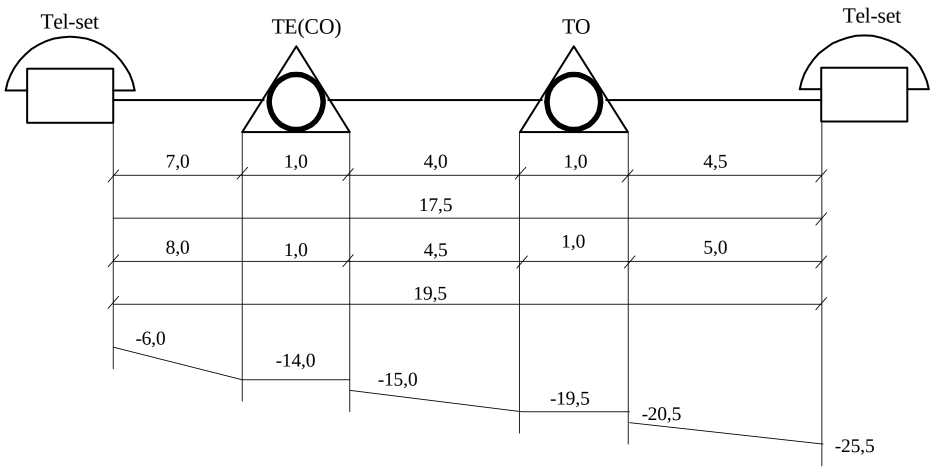
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel levels of local primaty network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig. 1.2.7

Diagram of typical RTN SSLSP for one-stage radial design



Note: Subsciber line attenuation is given for the cable with 0,5 mm, 0,64 и 0,7 mm wires diameter for the 1.2.8-1.2.10; 1.2.12; 1.2.15-1.2.17; 1.2.24 and 1.2.25 figures

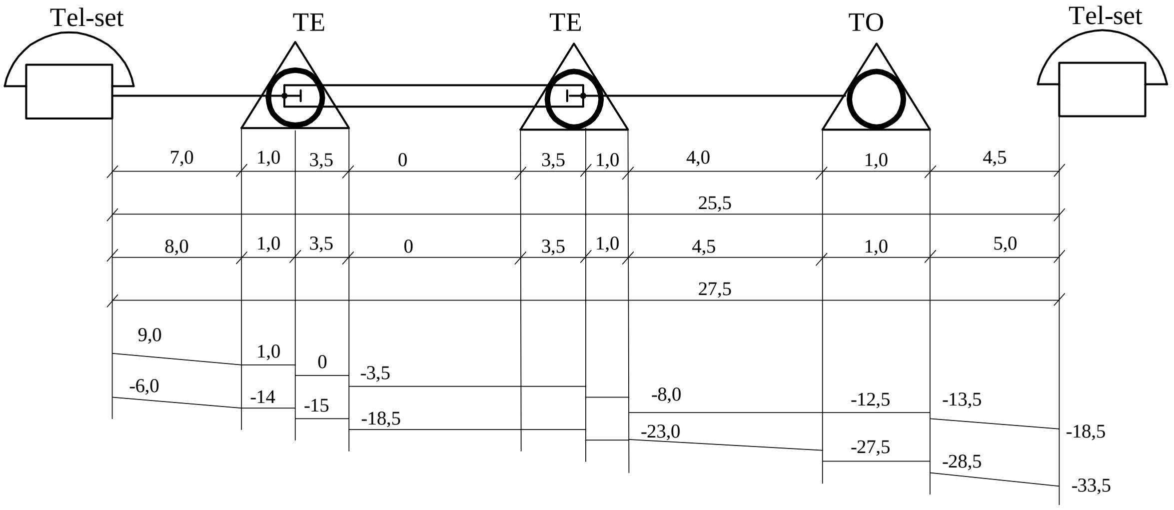
Distribution of losses (dB) in the LSP at 800 Hz

Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig. 1.2.8

Diagram of typical RTN SSLSP for two-stage
radial-node design
when the FD transmission systems using



Distribution of losses (dB) in the LSP at 800 Hz

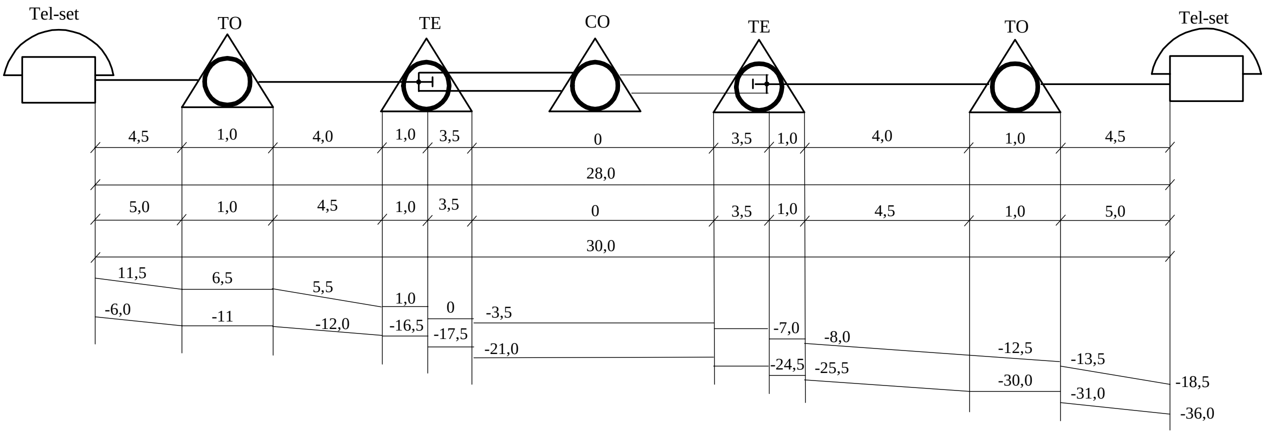
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig. 1.2.9

Diagram of typical RTN SSLSP for two-stage radial-node design
when the FD transmission systems using



Distribution of losses (dB) in the LSP at 800 Hz

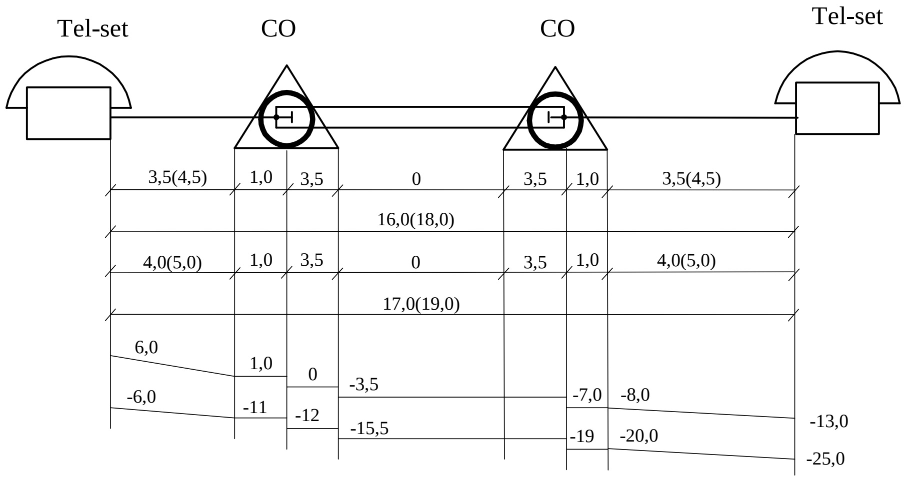
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel
levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig. 1.2.10

Diagram of typical SSLSP of districtive UTN without nodes
when using the FD transmission systems



Note. At the CO-CO parts it is allowed to un physical trunks with no more than 7,0 dB losses at 1000 Hz

Distribution of losses (dB) in the LSP at 800 Hz

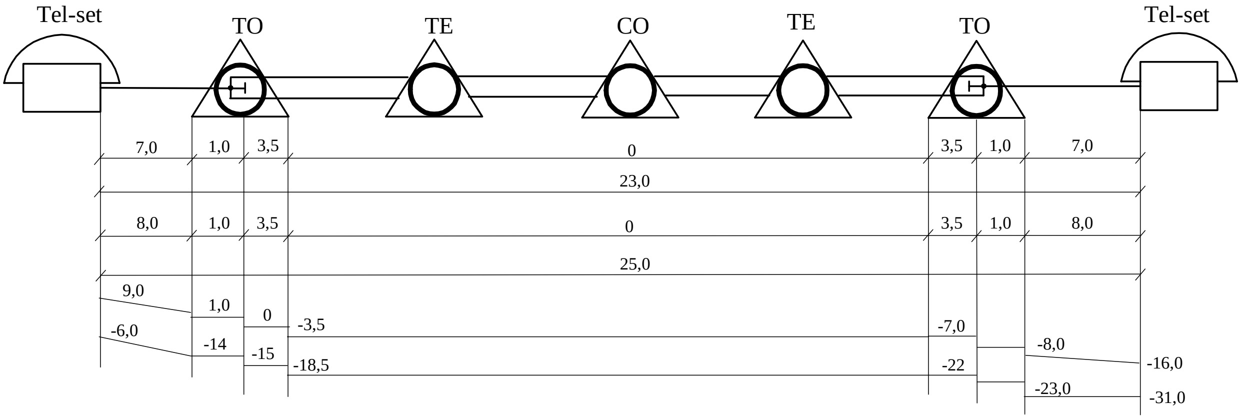
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig. 1.2.11

Diagram of typical RTN SSLSP for two-stage radial-node design
when the FD transmission systems using



Distribution of losses (dB) in the LSP at 800 Hz

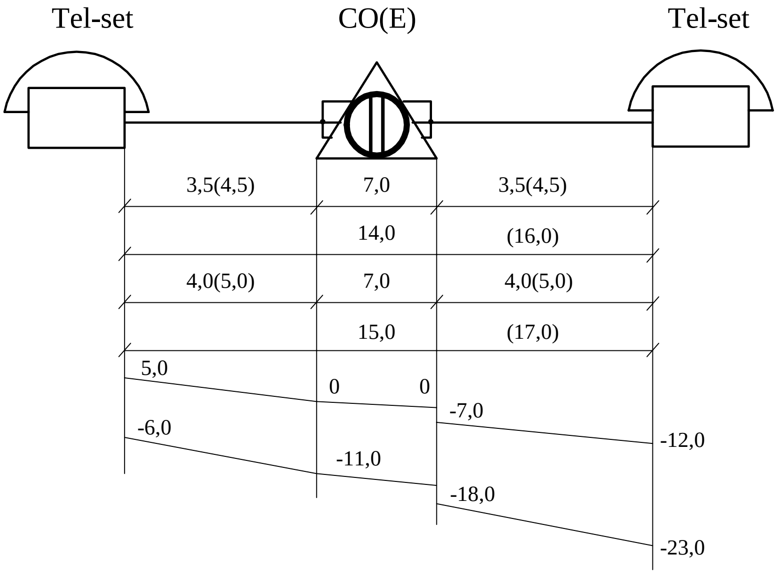
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel
levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig.1.2.12

Diagram of typical SSLSP of non districtive UTN when the electronic CO (CO(E))



Distribution of losses (dB) in the LSP at 800 Hz

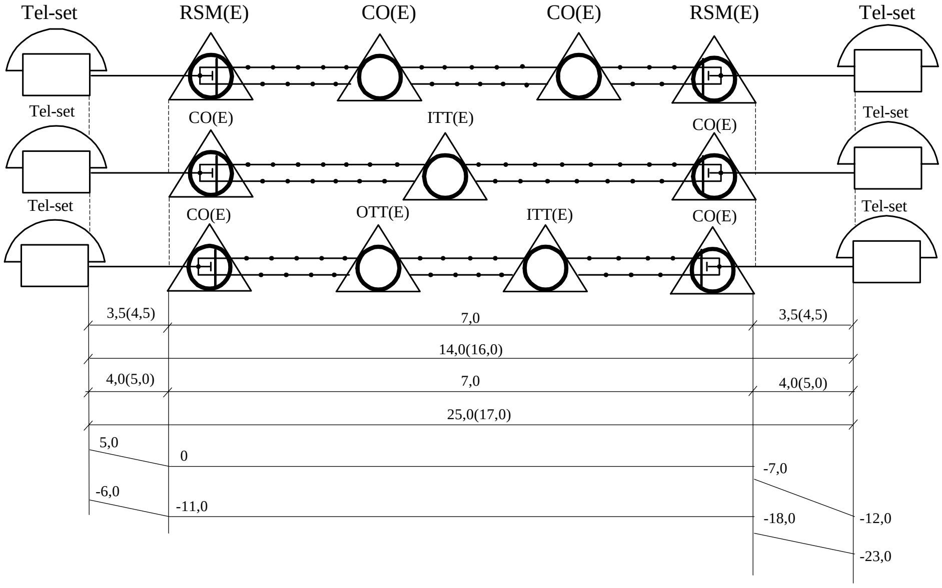
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig.1.2.13

Diagram of typical SSLSP for districtive UTN when using the TD transmission systems



Distribution of losses (dB) in the LSP at 800 Hz

Distribution of losses (dB) in the LSP at 1000 Hz

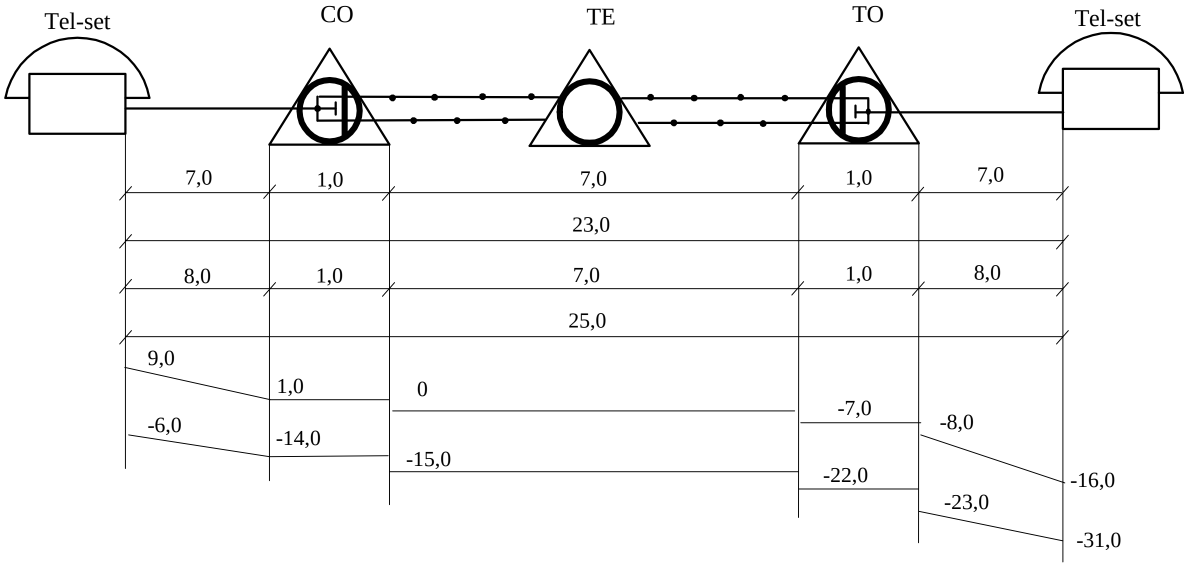
Diagram of voice frequency channel levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig.1.2.14

Diagram of typical SSLSP of RTN for two-stage radial-node

disign when using the TD transmission systems



Distribution of losses (dB) in the LSP at 800 Hz

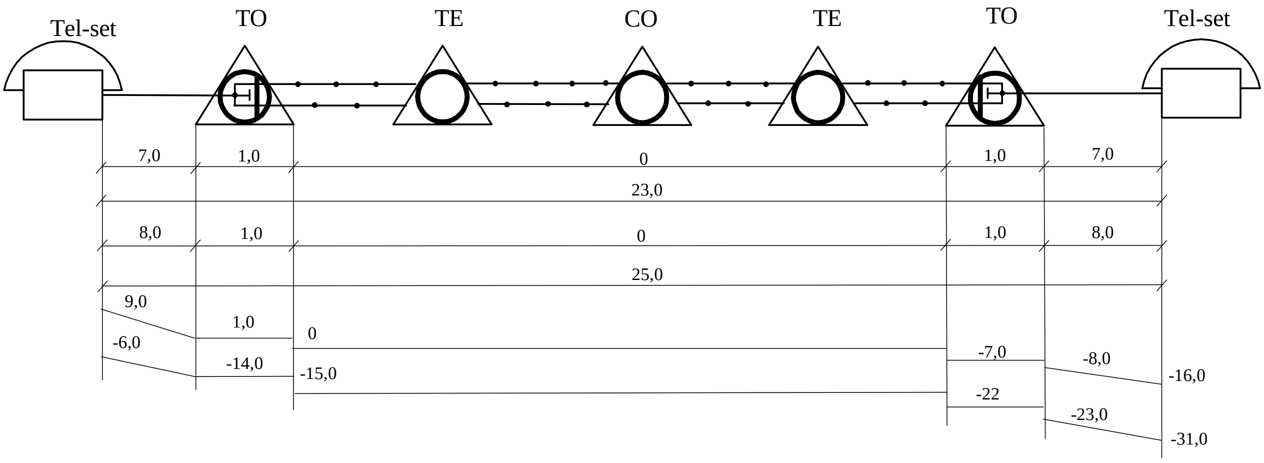
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig.1.2.15

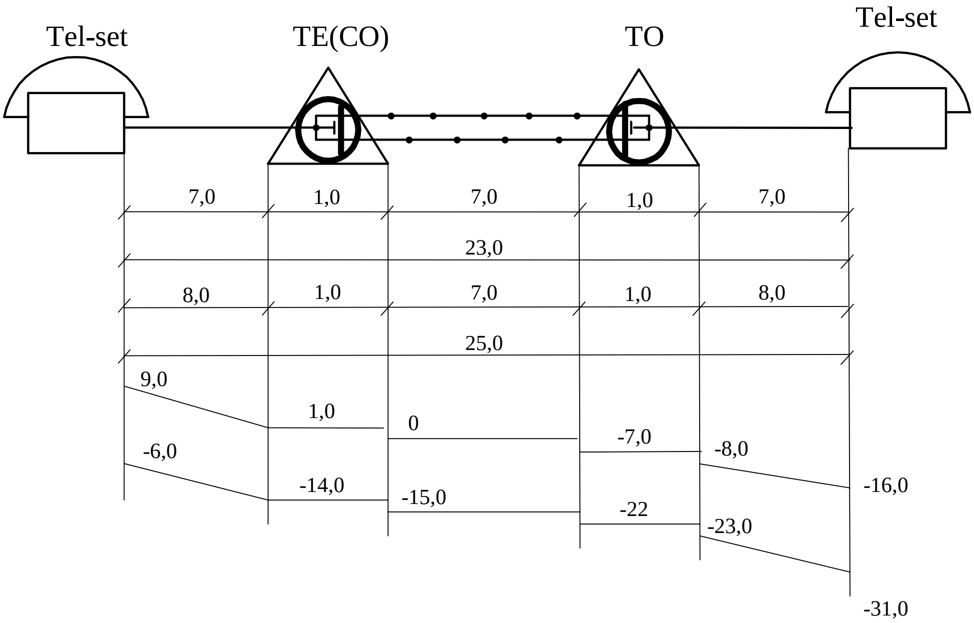
Diagram of typical SSLSP of RTN for two-stage radial-node disign when using the TD transmission systems



Distribution of losses (dB) in the LSP at 800 Hz
Distribution of losses (dB) in the LSP at 1000 Hz
Diagram of voice frequency channel levels of local primary network for 1000 Hz
Diagram of telephone channel levels for 1000 Hz

Fig.1.2.16

Diagram of typical SSLSP for one-stage construction with the un of TD transmission systems



Distribution of losses (dB) in the LSP at 800 Hz

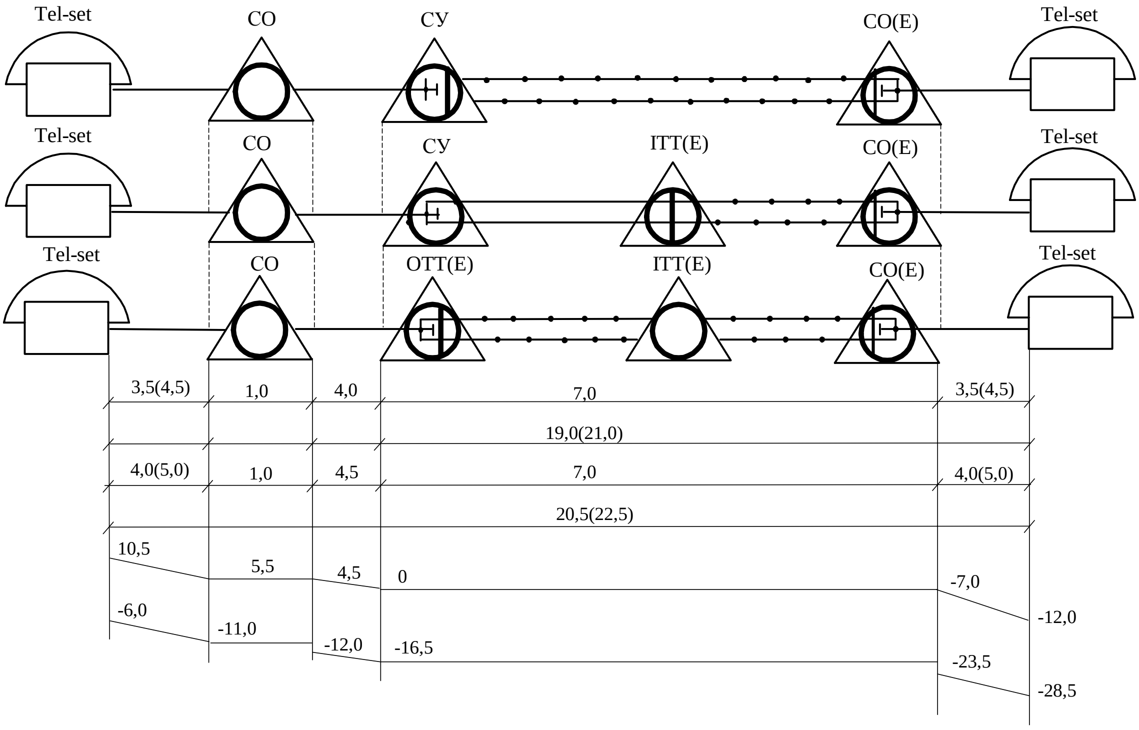
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig.1.2.17

Diagram of typical SSLSP for districtive network when using the
FD and TD transmission systems



Distribution of losses (dB) in the LSP at 800 Hz

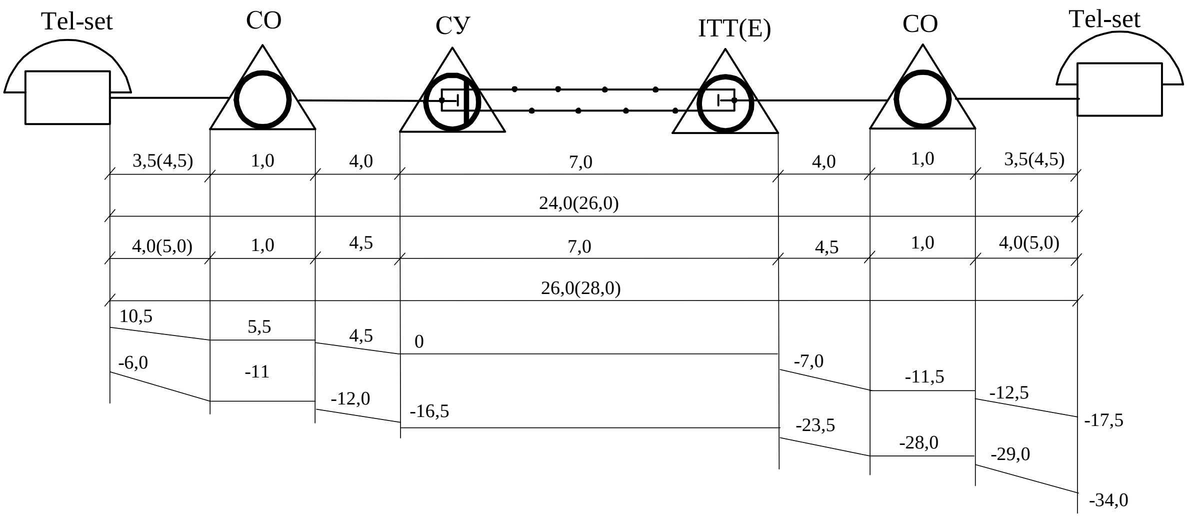
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel
levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig.1.2.18

Diagram of typical SSLSP of UTN for districtive network when using the TD transmission systems



Distribution of losses (dB) in the LSP at 800 Hz

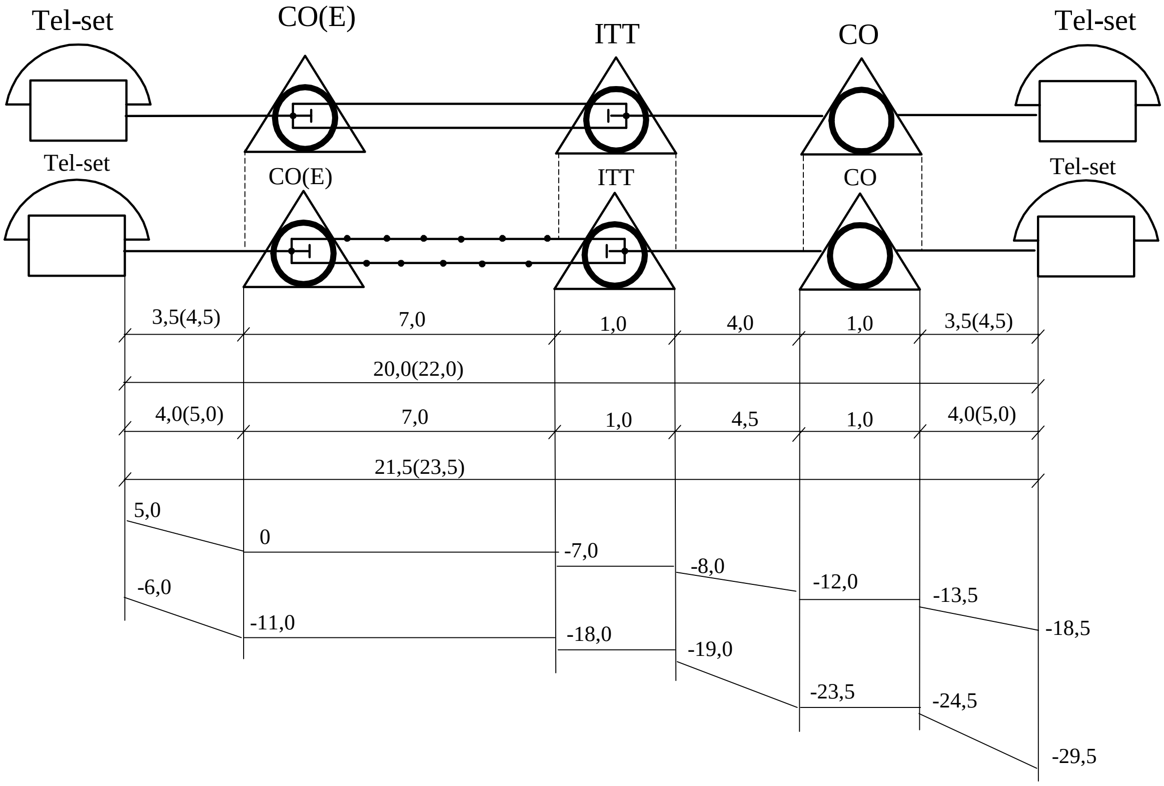
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig.1.2.19

Diagram of typical SSLSP of UTN for districtive network when using the TD and FD transmission systems



Distribution of losses (dB) in the LSP at 800 Hz

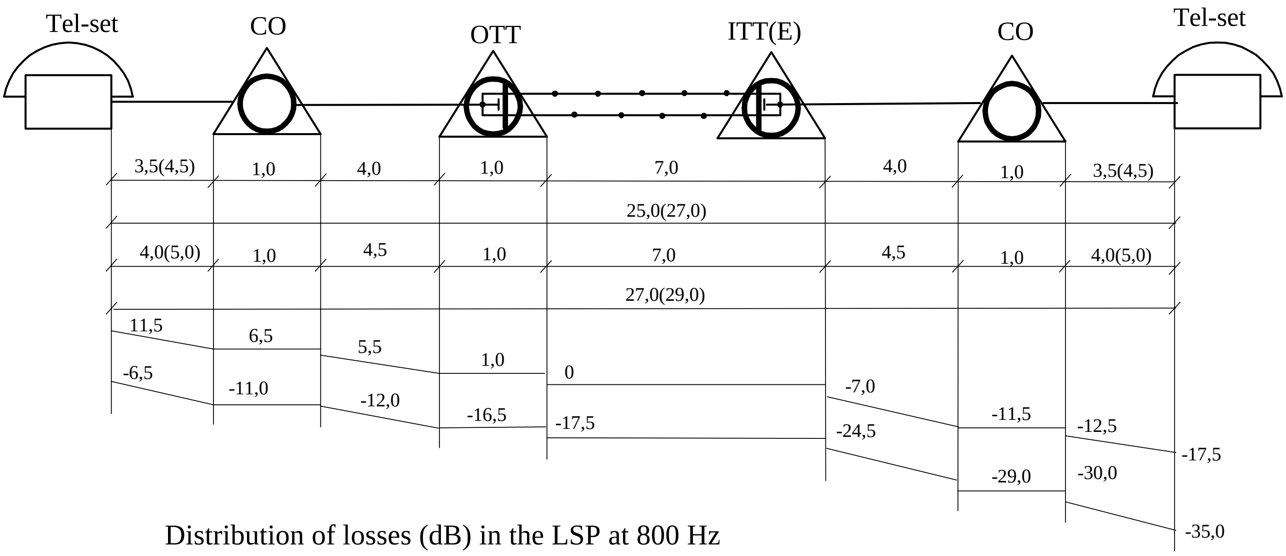
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig.1.2.20

Diagram of typical SSLSP of UTN for districtive network when using the TD transmission systems



Distribution of losses (dB) in the LSP at 800 Hz

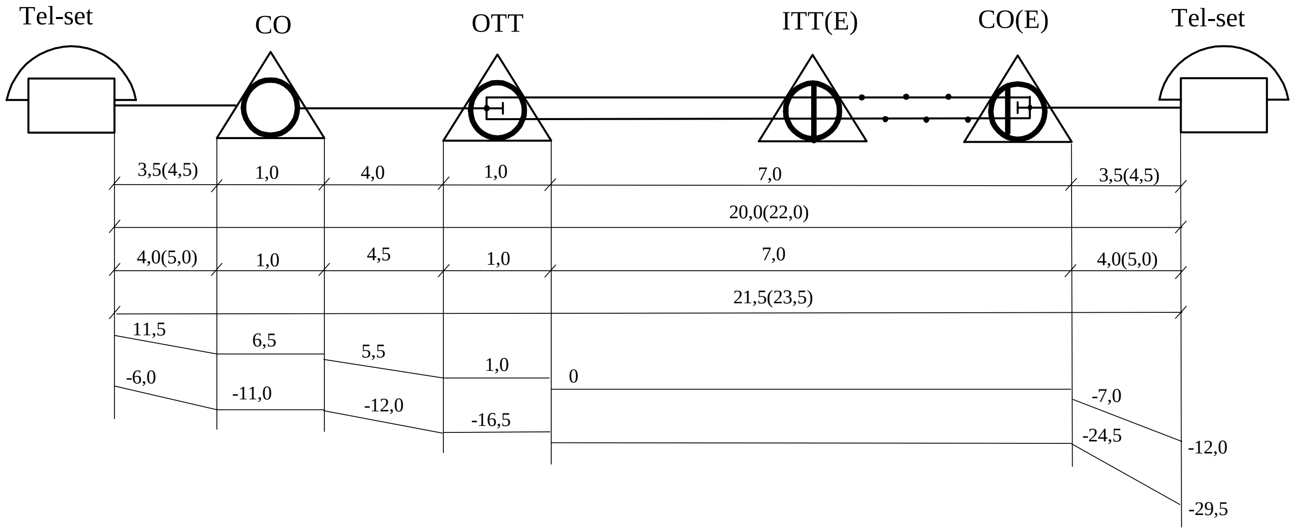
Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig.1.2.21

Diagram of typical SSLSP of UTN for districtive network when using the TD and FD transmission systems



Distribution of losses (dB) in the LSP at 800 Hz

Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig.1.2.22

Diagram of typical SSLSP of UTN for districtive network
when using the TD and FD transmission systems

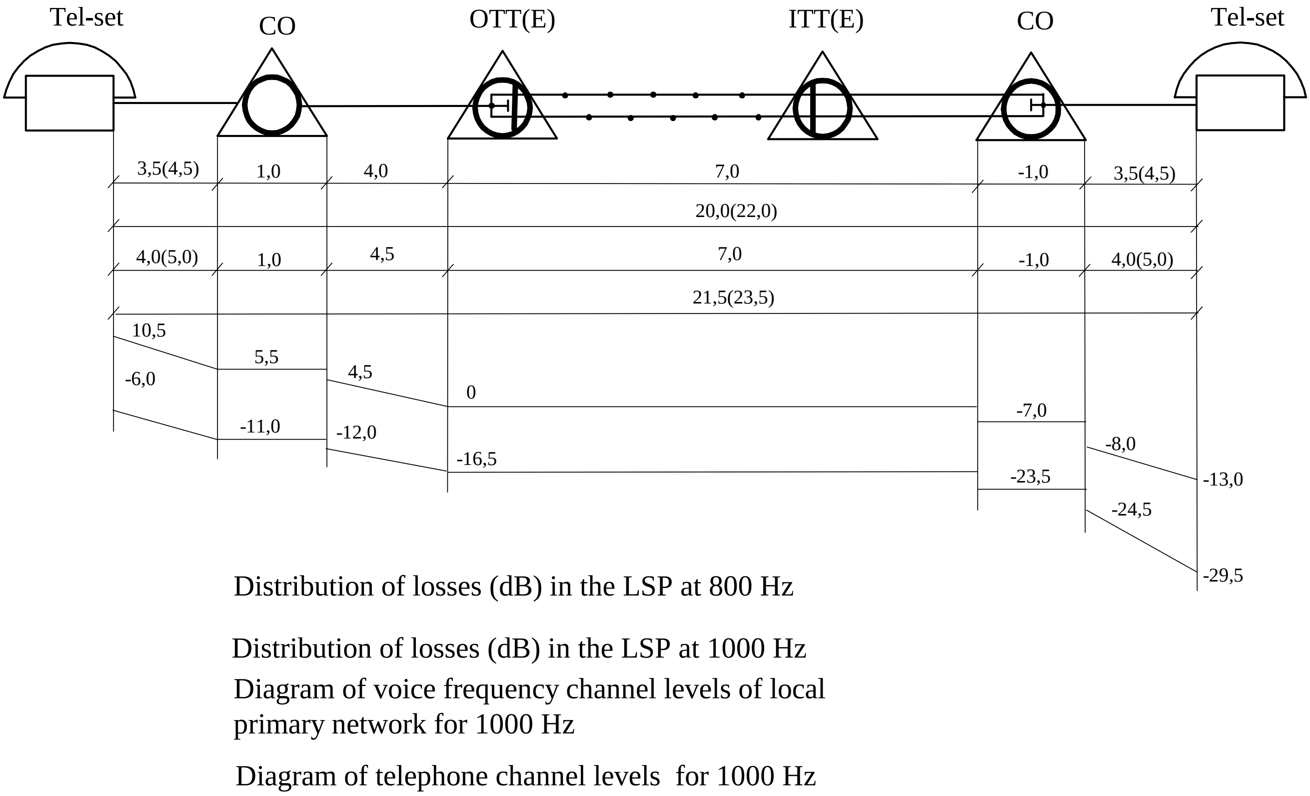
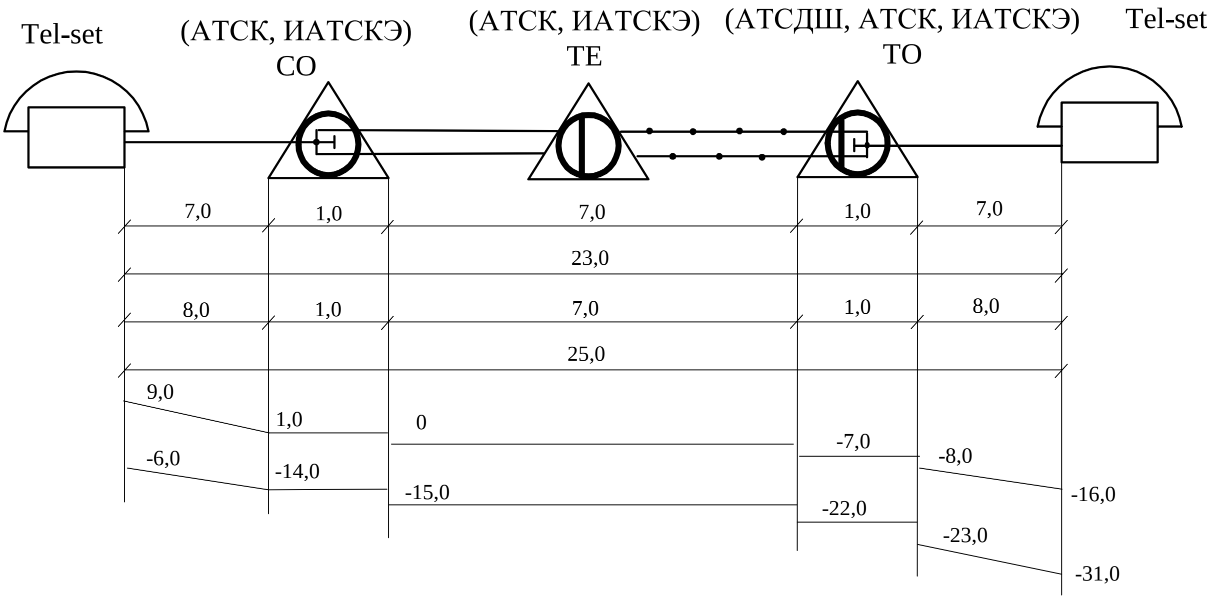


Fig.1.2.23

Diagram of typical SSLSP of UTN for districtive network when using the TD and FD transmission systems



Distribution of losses (dB) in the LSP at 800 Hz

Distribution of losses (dB) in the LSP at 1000 Hz

Diagram of voice frequency channel levels of local primary network for 1000 Hz

Diagram of telephone channel levels for 1000 Hz

Fig.1.2.24

Diagram of typical SSLSP for two-stage rodial-node design when using the TD and FD transmission systems

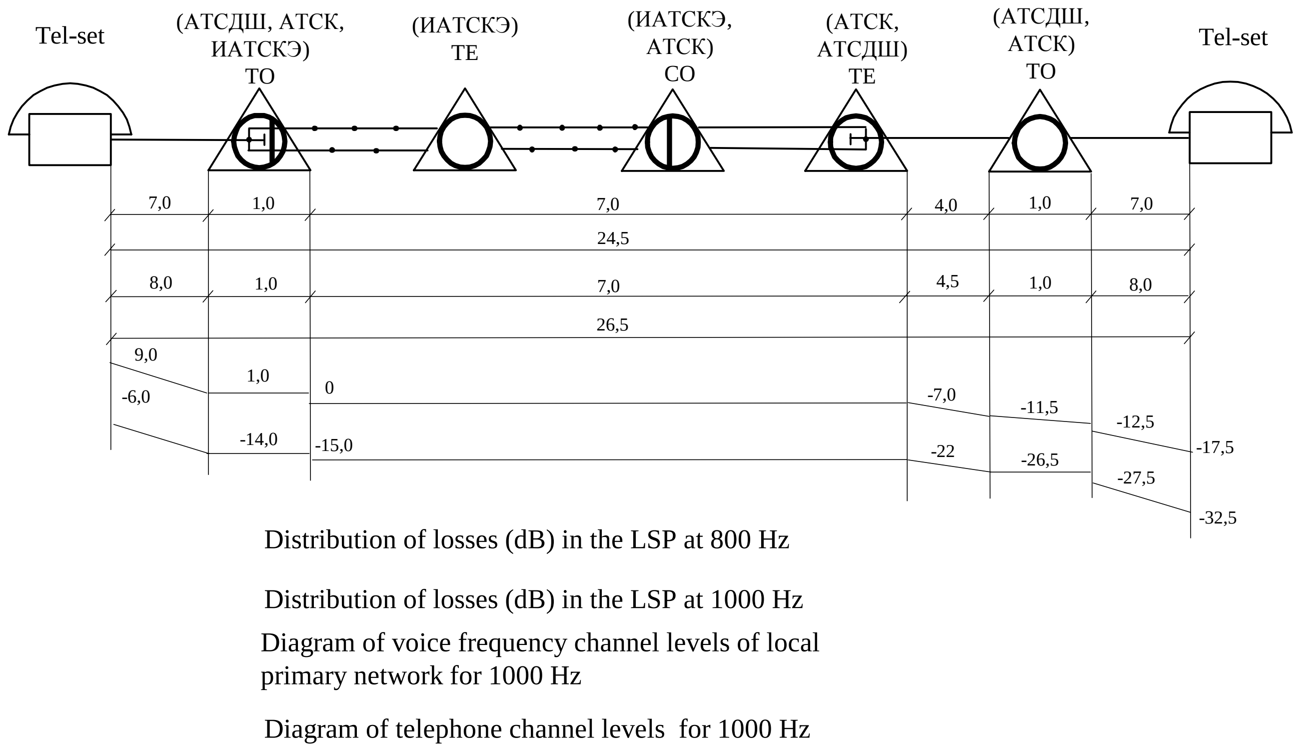


Fig.1.2.25

Table 1.3. Zonal Telephone Channels (ZTNC) of PSTN

Parameters	Standard for analog Telephone channels: FD TS and physiga trunks	Standard for analog Telephone channels: FD TS	Notes
1	2	3	4
1.3.1. General characteristics			
1.3.1.1. Structure	Figure 1.3.1.	figure 1.3.1.	*subscriber line length is not considered
Maximum LTNC length, km	1600*	1600*	
Maximum number of switched sections in ZTNC, Pi	7	7	
- for intrazonel network sections, P - for local network sections, P	2 4	2 4	
Maximum length of intrazone network channel, km	1400	1400	
Maximum number of switched sections in this channel, P			
1.3.2. Channel electrical parameters			
1.3.2.1. Channel accumulated loss,deviation iof its average from nominal, time accumulated iloss mean square deviation rms, loss values idistribution.			
Nominal value of ZTNC accumulated loss, 1000 Hz, dB			Loss values of mismat-ched PSTN local network are not considered
for UTN subscribers for RTN subscribers for ZTNHC with two-wire transit	26,0 28,0 32,5	16,0 23,0	*two - wire transit is allowed for the first stage
Difference between average and nominal values	**		
of ZTNC accumulated loss,1000 Hz, dB	< 1,2	< 1,4	**Physical trunk tempe-rature variation influen-ces on accumulated loss not considered and are to be determined
Deviation of ZTNC accumulated loss mean square	**		
deviation value rms from nominal value, 1000 Hz, dB	< 2,1	< 2,9	
Time-dependent ZTNC accumulated loss, 1000 Hz, dB variation, should be as small as possible; short-time ZTNC accumulated loss variations duiring several (about 10 s), dB, should be no imore than	To be determined		
Long-time variations (during long periods including 24 hours and season variations),dB, should be no more than	To be determined		
Loss values distribution, 1000 Hz,for standard ZTNC diagrams and level charts:			
for UTN subscribers for RTN subscribers	figure 1.3.2 figure 1.3.4 figure 1.3.6	figure 1.3.3 figure 1.3.5	

Table 1.3. (cont)

1	2	3	4
1.3.2.2. Frequency variations.			
Frequency variation for ZTNC, Hz :			
common	1,2	1,6	
with probability of 0,99	1,7	2,4	
with probability of 0,999	2,2	3,1	
1.3.2.3. Phase stepwise variation.			
Maximum psophometric noise power average for an hour LTNC phase stepwise variation due to switched generator equipment should occur no more thani once per minute	51	48	
1.3.2.4. Gain/frequency variation of accumulated loss Gain/frequency variation of ZTNC accumulatedi loss, dB, should occur no more than once a minute	Table 1.3.1 lines 1,3	Table 1.3.1 lines 2,4	
1.3.2.5. Abcolute group delay, gain/frequency variation of absolute droup delay.			
Maximum absolute group delay value, ms should be no more than	To be determined		
Group delay deviation (F) from the value measured at 1900 Hz in ZTNC with different number of voice - frequency transits, ms, should be no more than	Table 1.3.2 lines 1,3	Table 1.3.2 lines 2,4	
1.3.2.6. Gain/level variation.			
ZTNC gain/level variation should be of the type that keeps channel accumulated loss,precision measuved in operating band,constant 97% when its output level varies from nominal up to+3,5 dBmO, dB	0,9	1,1	To be detailed by local network data
1.3.2.7. Noise.			
Maximum psophometric noise power,Wp ,at telephone set input should be < W (vf)§ + W ”б« + W k (considering chart of levels).	Table 1.3.3 line 4 column 2	Table 1.3.3 line 4 column 3	Average psophometric power per hour is considered to be noise psophometric power per any minute of busy hours
Maximum psophometric noise power average for an hour, W (v-f) 3 , added to ZTNC by zone network voice-frequency channel, pWp, that is for O point :	Table 1.3.3 line 1 column 2	Table 1.3.3 line 1 column 3	
pWOp	< 11800	< 15800	
dBmop	minus 49,2	minus 48	
Maximum psophometric noise power average for an hour W дб« , added by physical connectors and subscriber lines, pWp ,should be no more than	Table 1.3.3 line 2 column 2	Table 1.3.3 line 2 column 3	

Table 1.3. (cont)

1	2	3	4
Maximum psophometric noise power average for an hour , W , addel by PSTN switcheng k equipment, pWp , should be no more than	Table 1.3.3 line 3 column 2	Table 1.3.3 line 3 column 3	
Average unweighted noise power (average unweighted noise level) added into ZTNC at tel-set input			
pW dBm		1,78 e Wn Pii + 2,5	Unweighted – psophometric noise ratio should be detailed by results of local network analysis
1.3.2.8. Selecteve noise Level of every selective noise in ZTNC should be,dBmO, no more than	To be determined		
1.3.2.9. Protection from distinct transient influences.Distinct transient influence.			
Near and far end protection from distinct transient influences between two four - wire ZTNC located in OTL (TTL) - TTL (OTL) operating band, should be, dB	> 58	> 58	
Protection from distinct transient influences between two different transmission routes of ZTNC located in OTL (TTL) - TTL (OTL) operating band, should be, dB	> 46	> 46	Local network trunks are not considered
probability of distinct trasient influences occurrence, % ,should be no more than	To determined		
1.3.2.10. Relative total time of pulse noise and shirt-time level loss			
In ZTNC relative accumulated time of pulse noise (exceeding - 15 dBmO threshold with duration > 500 ms) and short-time level losses (> 18gЃ with duration > 500 ms) per hour should be no more than	To determined		
1.3.2.11. Pulse noise			
Jn ZTNC, relative time of pulse noise (exceeding threshold - 15 dBmO with duration> 500 ms) influence per hour should be no more than	To be determined		
1.3.2.12. Short - time level losses			
In ZTNC, relative time of short - time level losses (> 18 dB with duration > 500 ms) per hour should be no more than	To be determined		
Short - time level losses with duration > 300 ms are considered failures.			
1.3.2.13. Protection from stray modulation products.			
In ZTNC , protection from stray modulation products by power noises af any frequency different from desired signal for + + 100 - 50,- ietc, (up to 400 Hz), dB	> 47	> 47	Switching eguipment is not considered

Table 1.3. (cont)

1	2	3	4
1.3.2.14. Phase jitter			
Peak - to peak jitter range at 20 - 300 Hz in ZTNC should be no more than (0)	To be determined		
1.3.2.15. Non - linear distortions			
In ZTNC, total coefficient of non lenear distortions should be , %,	< 1.75	< 2	
by second and third harmonics it should be ,%	< 1,4	< 1,6	
by combination (2f1 - f2)			
1.3.2.16. Error rafe			
In ZTNC, bit error rate at 1200 baud should ibe no more than	To be determined		

Table 1.3.2.1. Gain/frequency variation of Accumulated Loss Deviation From Its Value at 1000 Hz in ZTNC

Diagrams of Standard ZTNC		Allowed Deviations of Accumu lated Loss, kHz					
		0.3	0.4	0.6	2.4	3.0	3.4
1		2	3	4	5	6	7
Upper limit of deviation, dB							
Figure 1.3.2.	a_{1000}=26dB	-3.5	-3.9	-2.3	10.4	14.7	17.9
Figure 1.3.3.	a_{1000}=16dB	1.75	0.3	-0.16	5.9	8.7	11.5
Figure 1.3.4.	a_{1000}=28dB	-2.3	3.5	-2.4	10.4	15.1	18.3
Figure 1.3.5.	a_{1000}=23dB	-0.45	-1.9	-1.8	10.4	14.9	19.3
Lower limit of deviation, dB							
Figure 1.3.2	a_{1000}=26dB	-7.7	-6.6	-3.4	9.4	12.0	13.6
Figure 1.3.3.	a_{1000}=16dB	-3.9	-3.7	-3.2	2.8	4.8	6.0
Figure 1.3.4.	a_{1000}=28dB	-8.0	-7.5	-5.4	7.4	11.2	13.4
Figure 1.3.5.	a_{1000}=23dB	-7.7	-6.8	-5.4	6.8	10.0	12.1

Table 1.3.2.2. Gain/frequency variation of Group Delay Deviation.

Diagrams of Standard ZTNC	Allowed Deviations of Accumulated Loss, kHz													
	0.3	0.4	0.5	0.6	0.8	1.0	1.4	1.6	2.2	2.4	2.8	3.0	3.2	3.3
Fig. 1.3.2	11.7	8.4	5.7	3.9	2.4	1.8	1.05	0.9	0.9	1.05	1.95	2.85	6.8	11.7
Fig. 1.3.3	19.7	13.8	9.3	6.5	4.0	2.9	1.5	1.2	1.2	1.5	3.05	4.55	9.8	19.7
Fig. 1.3.4	20.1	14.2	9.7	6.7	4.2	3.1	1.65	1.4	1.4	1.65	3.25	4.75	10.2	20.1
Fig. 1.3.5	28.1	19.6	13.3	9.3	5.8	4.2	2.05	1.7	1.7	2.05	4.35	6.45	13.2	28.1

Table 1.3.2.3. Maximum psophometric noise power average for an hour at ZTNC Output (tel-set input)

Noise at tel-set input	With FD TS and Physical trunks				With FD TS			
	UTN		RTN		UTN		RTN	
	a(sl)=0dB	a(sl)=3.5dB	a(sl)=0dB	a(sl)=4.5dB	a(sl)=0dB	a(sl)=3.5dB	a(sl)= dB	a(sl)=7.0dB
1	2	3	4	5	6	7	8	9
Maximum psophometric noise power average for an hour W(vf)3, pWp	876	391	1026	366	4189	1870	5604	1119
Maximum psophometric noise power average for an hour Wдб«, pWp	417	287	414	248	-	106	-	103
Maximum psophometric noise power average for an hour WЄ, pWp	322	144	341	122	516	203	657	131
Maximum psophometric noise power average for an houri Wp, (level of psophometric noise power average for an hour), pWp (dBmp)	1615	821	1781	736 (2460)*	4705	2206	6261	1352
	(-57.9)	(-60.8)	(-57.4)	(-61.3) (-56.1)*	(-53.2)	(-56.5)	(-52)	(-58.6)

* The value shown is for diagram of figure 1.3.6.

Table 1.3.3 Electrical Parameters of Channel Sections

PARAMETER	STANDARDS FOR ANALOG TELEPHONE CHANNELS		NOTE
	FD TS AND PHYSICAL TRUNKS	FD-TS	
1	2	3	4
1.3.3.1 ATE (ZTN) - ATE (ZTN) channel section.			
1.3.3.1.1 Accumulated loss of the channel, deviation of its average from nominal, time accumulated loss mean square deviation,			Column 2 shows data for the section with 2 wire channel terminal (with hybrids)
Nominal value of accumulated loss for channel section ATE (ZTN) ATE (ZTN), 1000Hz, dB	* 7,0 (9,0)	0,0	* 7,0 at hybridi output 9,0- between exchanges
Difference between average and nominal values of accumulated loss, 1000Hz, should be no more, than, dB	0,5	0,5	
Time accumulated loss mean square deviation from average value for channel section 1000 Hz, should be no more, than, dB	0,64	0,64	
1.3.3.1.2 Accumulated loss gain/frequency variation Accumulated loss gain/frequency variation for a channel section ATE (ZTN) - ATE (ZTN), dB should be no more than	Table 1.3.3.1	Table 1.3.3.1	
1.3.3.1.3 Noise. Maximum psophometric noise power average for an hour(Psophometric noise power average for an hour level) for a channel section ATE (ZTN) -ATE (ZTN) should be no more than	*	*	
pWp (dBmp)	1530 (-58,2)	3000 (-55,2)	* for point of 7 dBm ** for point of 3,5 dBm
Maximum average unweighted noise power (Unweighted noisei power, average for an hour) for ATE (ZTN)-ATE (ZTN) chan nel section should be no more than			
pW (dBm)	2720 (-55,7)	5340 (-52,7)	

Table 1.3.3. (cont)

1	2	3	4
1.3.3.2 OTT (CO) - ITT (CO) channel section.			
1.3.3.2.1 Channel section accumulated loss, deviation of its average from nominal, time accumulated loss mean square deviation			
Accumulated loss for OTT (CO) - ITT (CO) channel section, 1000 Hz, nominal value should be, dB	* 7,0 (9,0)	0,0	Column 2 shows data for the sector with 2-wire channel terminal (withi hybrids) * 7,0 - at hybrid output 9,0 - between exchanges
Difference between average and nominal values of accumulated loss, 1000 Hz, should be no more than, dB	<1,0	<1,0	
Time deviation rms of channel sector accumulated loss from its average, 1000Hz, should be no more, than, dB	<0,7	<0,7	
1.3.3.2.2 Accumulated loss gain/frequency variation.			
Accumulated loss gain/frequency variation for OTT (CO) - ITT (CO) channel sector dB, should be no more than	Table 1.3.3.2	Table 1.3.3.2	
1.3.3.2.3 Noise.			
Maximum psophometric noise power average for an hour(psophometric noise power average for an hour level) for OTT (CO) - ITT (CO) channel section	*	**	
PWp (dBmp)	<3545 (-54,6)	<7800 (-51,1)	* for point - 7 dBm ** for point - 3,5 dBm
Maximum unweighted noise power, average for an hour (average unweighted noise power level) for OTT (CO) - ITT (CO) channel section	*	**	
PW	<6309 (-52,0)	<13880 <(-48,58)	
1.3.3.3 Channel sector CO (TO) - CO (TO).			

Table 1.3.3. (cont)

1	2	3	4
1.3.3.3.1 Channel section accumulated loss, its average from nominal, deviation, time accumulated loss mean square deviation			
Accumulated loss for CO (TO) - CO (TO) channel section, 1000 Hz, nominal value should be, dB	19,0	7,0 (9,0)	7,0 - at hyb- 19,0; 9,0 - between exchanges
Difference between average and nominal values of accumulated loss, 1000 Hz, should be no more than, dB	** <1,2	<1,4	physical trunk temperature variation influences on accumulated loss are not considered and have to be determined
Time deviation rms of channel section accumulated loss from its average, 1000Hz, should be no more, dB	** 2,1	2,9	
1.3.3.3.2 Accumulated loss gain/frequency variation.			
Accumulated loss gain/frequency variation for CO (TO) - CJ (TO) channel sector dB, should be no more than	Table 1.3.3.3	Table 1.3.3.3	
1.3.3.3.3 Noise.			
Maximum psophometric noise power average for an hour(psophometric noise power average for an hour level) for CO (TO) - CO (TO) channel section should be no more than,	*	**	
pWp	<1780	<6260	*for 13 dBm point, fig. 1.3.2
(dBmp)	<(-57,5)	< (-52,0)	**for point - 3,5 dBm
Maximum unweighted noise power, average for an hour (average unweighted noise power level) for CO (TO) - CO (TO) channel section should be no more, than pW	* <3168,9	** <11142,9	
(dBm)	<(-55,0)	<(-49,5)	

Table 1.3.3.1. Gain/frequency variation of Accumulated Loss Deviation from Its Value at 1000 Hz of ZTNC ATE (ZTN) - ATE (ZTN) Section.

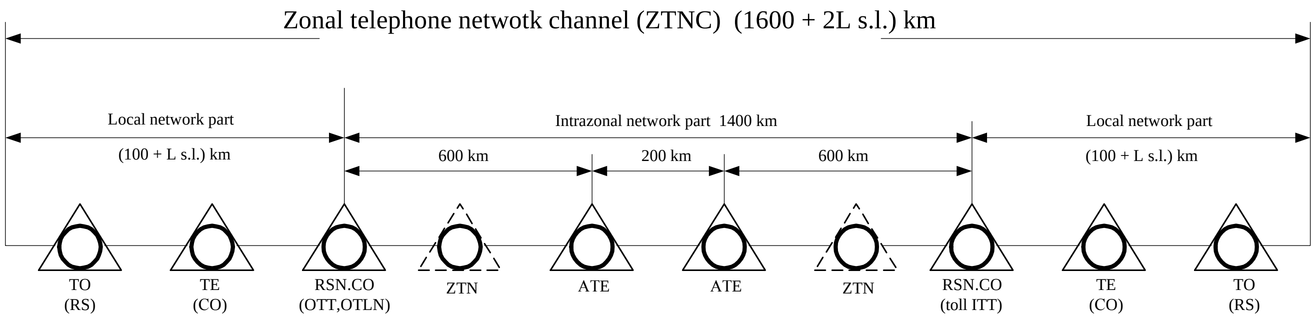
Accumulated loss,1000Hz, dB	Allowed accumulated loss deviations (kHz)						Note
	0.3	0.4	0.6	2.4	3.0	3.4	
	Overflow, dB						
0.0	1.8	1.3	0.8	0.8	1.3	1.8	
9.0	1.9	1.4	0.9	0.9	1.4	1.9	
	Reduction, dB						
0.0	-	-	0.6	0.6	-	-	
9.0	-	-	0.7	0.7	-	-	

Table 1.3.3.2. Gain/frequency variation of Accumulated Loss Deviation from Its Value at 1000 Hz of OTT (CO) - toll ITT (CO) Section.

Accumulated loss of the channel sector,1000Hz, dB	Allowed deviations of accumulated loss (kHz)						Note
	0.3	0.4	0.6	2.4	3.0	3.4	
	Overflow, dB						
0.0	3.7	2.4	1.3	1.3	2.4	3.7	
9.0							
	Reduction, dB						
0.0	0.5	0.6	0.9	0.9	0.6	0.5	
9.0	0.3	0.4	0.8	0.8	0.4	0.3	

Table 1.3.3.3. Gain/frequency variation of Accumulated Loss from
Its Value at 1000 Hz of ZTNC CO (TO) - CO (TO) Section.

Diagram of Standard ZTNC	Accumulated Loss of the channel sector, 1000 Hz, dB	Allowed deviations of accumulated loss (kHz)					
		0.3	0.4	0.6	2.4	3.0	3.4
Upper limit of deviation, dB							
Fig.1.3.2	19	-0.7	-0.8	-0.5	6.3	9.4	11.7
Fig.1.3.3	9	5.5	3.6	2.1	2.1	3.6	5.5
Fig.1.3.4	19	0.9	0.2	0.3	7.1	10.4	13.3
Fig.1.3.5	9	7.1	4.4	3.0	3.0	4.4	7.1
Lower limit of deviation, dB							
Fig.1.3.2	19	-4.3	-4.0	-2.9	3.9	6.2	7.3
Fig.1.3.3	9	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1
Fig.1.3.4	19	-4.4	-4.0	-3.5	-2.7	6.1	7.2
Fig.1.3.5	9	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2



Note: When ZTN is used at the ZTNC the design at the local network should be the one-stage one: TO-CO (without TE)

Fig. 1.3.1. Structure of the Zonal Telephone Network Channel (ZTNC)

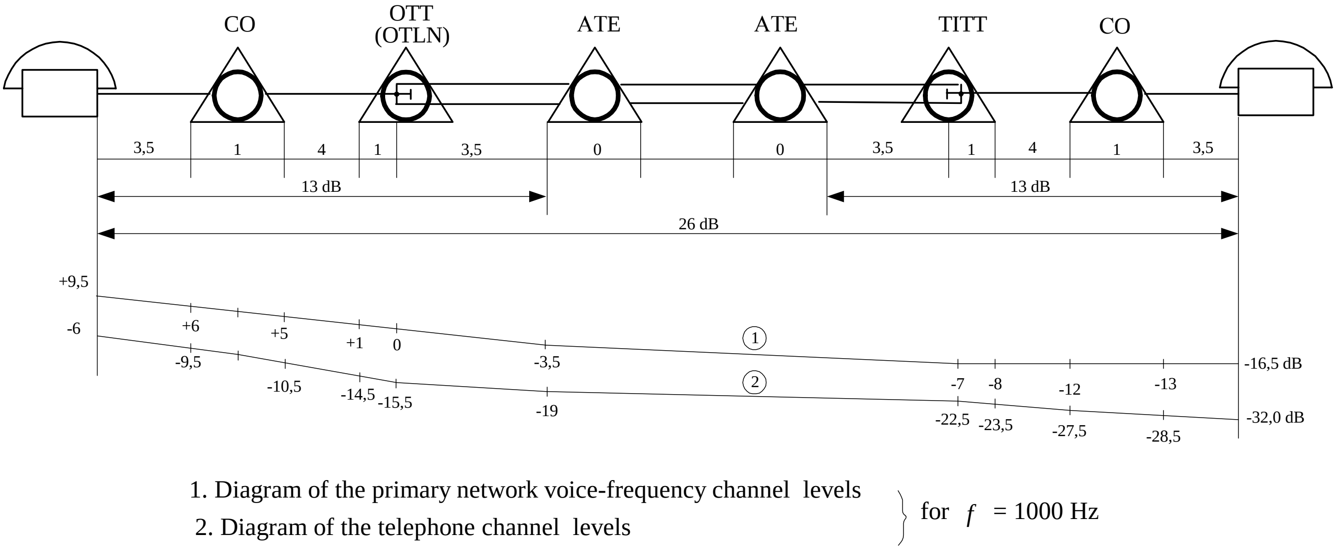


Fig. 1.3.2 Diagram of the typical ZTNC (urban network with FD transmission systems and physical trunks)

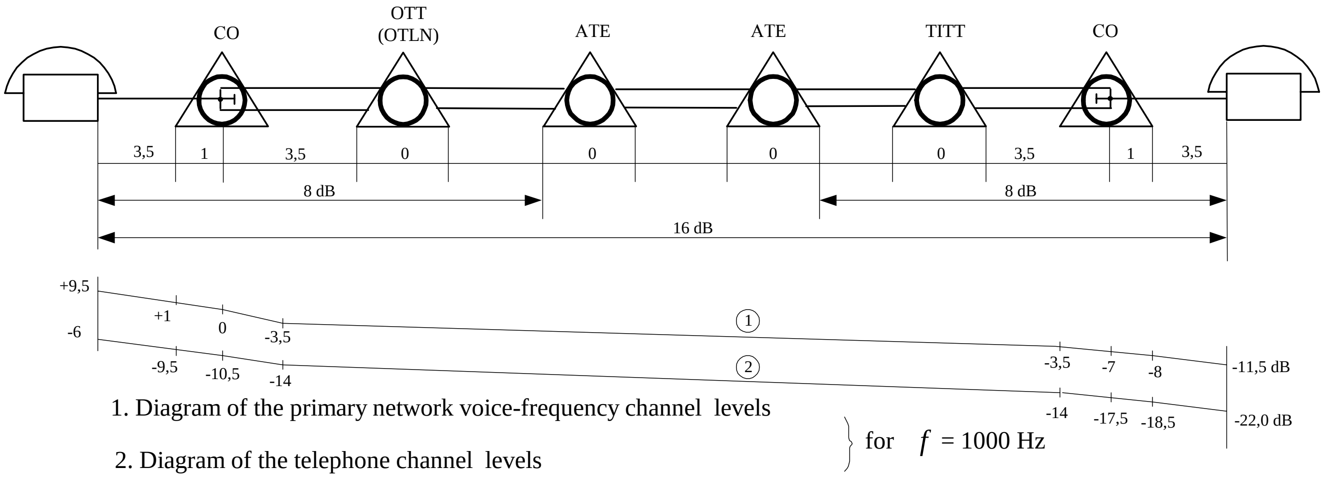


Fig. 1.3.3 Diagram of the typical ZTNC (urban network with FD TS)

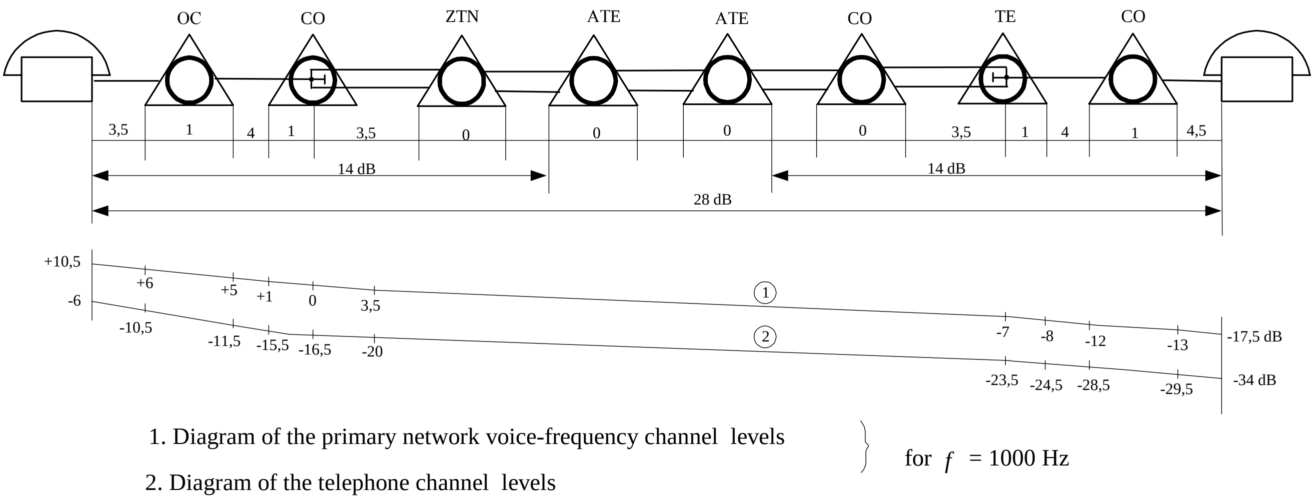


Fig. 1.3.4 Diagram of the typical ZTNC (rural network with FD TS and physical trunks)

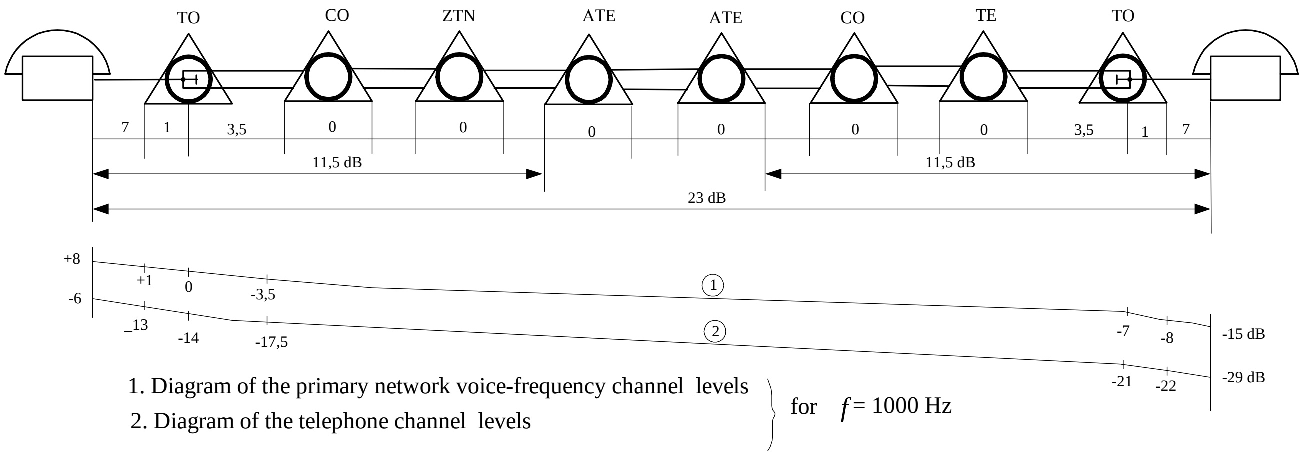
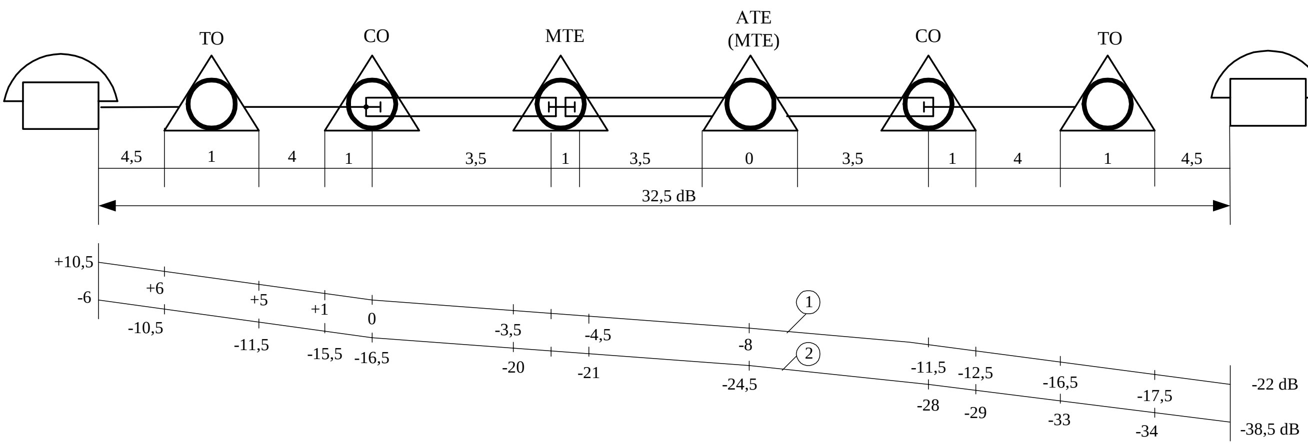


Fig. 1.3.5 Diagram of typical ZTNC (rural network with FD TS)



1. Diagram of the primary network voice-frequency channel levels
2. Diagram of the telephone channel levels

} for f = 1000 Hz

Note: It is allowed to use the two-wire transit at the ZTNC at the first stage

Fig. 1.3.6 Diagram of typical ZTNC with two-wire transit

Table 1.4. The PSTN toll network telephone channels (TNTS)*

PARAMETERS	STANDARDS ON ANALOG TELEPHONE CHANNELS AT USE OF :		NOTE
	TS ** FD and physiga trunks	TS *** FD	
1	2	3	4
1.4.1.General characteristics.			
1.Architecture. nominal TNTS length is,km	fig.1.4.1 13900	fig.1.4.1 13900	Subscribers lines length is not taken into account
Switched sections in TNTS maximum number is, p	11	11	
Of them on toll network section should be, p	5	5	
On intra-zonal telephone networks sections should be, p	2	2	
On local telephone networks sections should be, p	4	4	
* TNTC = toll network telephone ** TS = transmission system *** FD = frequency division			
1.4.2.Channel electric parameters.			
1.4.2.1.Channel accumulated loss, its average value deviation from nominal value, time accumulated loss mean square deviation and the attenuation values distribution. The TNTS accumulated loss nominal value on frequency of 1000 Hz should be, dB			The PSTN local network mismatches attenuation values are not taken into account.
for the UTN subscribers for the RTN subscribers for TNTC with 2-wire transit	28,0 30,0 34,5	18,0 25,0	The 2- wire transistor on
A difference between the TNTC average and nominal accumulated loss values at1000 Hz frequency should be no more, dB	1,6	1,7	TNTS is admissible at a first stage.
The TNTC accumulated loss mean square deviation from its average at frequency of 1000 Hz value should be no more, dB	2,3	3,0	
The TNTC accumulated loss variation on frequency of 1000 Hz in accordance with time should be as small as possible.	Is to be defined after the development of the standarts on intra-zonal and local net works		
The TNTC accumulated loss short-time variation during several seconds(of order 10 s) should be no more than, dB			
The long-time variation(during the prolonged periods including daily and season variations) should be no more than, dB	Is to be defined		

Table 1.4. (cont)

1	2	3	4
The attenuation values distribution on frequency of 1000 Hz for the TNTC standard circuits and levelsi diagrams			
for UTN subscribers for RTN subscribers	fig.1.4.2 fig.1.4.4	fig.1.4.3 fig.1.4.5	
1.4.2.2. Frequency variation.			
The frequency variation in TNTC should be no more than, Hz			
as a rule with 0,99 probability with 0,999 probability	±2,0 ±3,0 ±4,0	±2,0 ±3,0 ±4,0	
1.4.2.3.Transmitted signal stepwise variation			
The transmitted signal stepwise variation in TNTC in consequence of the generator equipment switching should appear no more than once during, min	42	40	
1.4.2.4.Accumulated loss gain/frequency variation. The accumulated loss gain/ frequency variation should be no more than, dB	Table1.4.1. lines 1 and 3	Table1.4.1 lines 2 and 4	
1.4.2.5.Absolute group delay, group delay deviation gain/frequency variation.			
The absolute group delay greatest value in TNTC of land-based telephone communication should be no more than, ms	150	150	Is to be adjusted by the intrazonal and local data
The absolute group delay largest value in TNTC with a sattelite use should be no more, ms	400	400	
of which on the space communication section is assigned, ms on land-based section is assigned, ms	300 100	300 100	
The group delay deviation (T) from the value, measured at 1900 Hz frequency in TNTC at voice frequency delaying different number, should be no more than, ms	table1.4.2. lines 1 and 3	table1.4.2. lines 2 and 4	
i1.4.2.6.Gain-level variation			
The gain-level variation should be such one, that the channel accumulated loss, measured in the operating frequency band for 97%, could remain constant at the level variation from the nominal one to plus 3,5 dBm0 on the channel input, with precision, dB	1,15	1,3	Is to be defined more accurately by the local and intra-zonal networks data.
1.4.2.7.Noise.			
The maximum noise psophometric power average for an hour Wp on the TNTC telephone set input should be no more than the sum of values: Wvfmg + Wftrunk +Wc (with the levels taking into account)	Table1.4.3. line 4 column 2	Table1.4.3. line 4 column 3	1.For the transmission system VF**** PP and TP channels the power average for an hour value is not to be normalised.
**** VF = voice frequency			

Table 1.4. (cont)

1	2	3	4
The maximum noise psophometric power average for an hour: Wvfmg, brought into TNTC by the VF channel of the trunk network should be no more than PWp it makes in the zero point: pW 0p dB 0p	Table1.4.3. line 1 column 2 44000 minus43.6	Table1.4.3. line 1 column 3 48000 minus 43	2.At the necessity to define the total noise power average for ani hour in the combined paths (RRL* + TL** + cable ones) VF channels by convention, the power average for a minute value not exeeded at 80% of any month time (at a sinking absense) for RRL and TS*** TL is taken as the noise power average for an hour.
The maximum noise psophometric power average for an hour Wд, brought in by the physical lines, trunks and subscriber lines should be no more, than, pWp	Table1.4.3. line 2 column 2	Table1.4.3. line 2 column 3	
* RRL= Radio-relay link ** TL= Troposcatter link *** TS= Transmission system			
The maximum noise psophometric power average for an hour Wc, brought in by the PSTN switching equipment should be no more, than, pWp	Table1.4.3 line 3 column 2	Table1.4.3. line 3 column 3	
The maximum noise unweighted average power value (the noise unweighted average power level) on TS* input, brought in TNTC, should be no more , than, pW pW	1,78*Wp Pp+2,5	1,78*Wp Pp+2,5	The unweighted and psophometiric noises ratio is adjusted by the local network analysis results
1.4.2.8.The selective noise			
Each of the selective noise level in TNTC should be no more than, dB m0	Is to be defined		
1.4.2.9.Distinct transient influences protection			
Distinct transient influence			
The distinct transient influences protection value on near and distant end between two any 4-wire TNTC on ATE-ATE section in the operating frequency band should be no less than, dB	58	58	
The distinct transient influences protection value between the different transmission directions of single TNTC on ATE-ATE section in the operating frequency band, should be no less than, dB	44	44	The local network trunks are not taken into account
The distinct transient influence appearance probability should be no more than, %	Is to be defined		
1.4.2.10.The summary relative pulse noise and short-time level losses time.			

Table 1.4. (cont)

1	2	3	4
The summary relative pulse noise (exeeding minus 15 dB m0 threshold more than 500 mcs duration) and transient level losses (more than by 18 dB more than 500 mcs duration) effect time in TNTC for the periods of an hour should be no more than	1,6 * *10exp^{-5}	1,6 * *10exp^{-5}	The local and zonal net-works and the switching nodes and exchanges pulse noise summary relative effects values are not taken into account.
1.4.2.11.Pulse noise			
The relative pulse noise(exeeding minus 15 dB m0 more than 500 mcs duration) in TNTC for the periods of an hour should be no more	0,3 * *10exp^{-5}	0,3 * *10exp^{-5}	The local and zonal networks and swtching nodes and exchanges pul se noise values are not taken into account
1.4.2.12.Short-time level The short-time level effect relative time(more than by 18 dB, more than 500 mcs duration) in TNTC for the periods of an hour, should be no more:	Is to be defined		
The short-time level losses more than300 ms duration should be considered a failure.			
1.4.2.13.Stray modulation products protection			
The stray modulation products protection by the supply noise on any of frequencies, different by frequency from the useful signal by ±500 Hz, ±100 Hz and so on (up to 400Hz frequency) should be no less than, dB	45	45	It is supposed, that the trunk network section brings in TNTC the same modulation pro-ducts power as the zonal network sections do.
1.4.2.14.Phase jitter.			
The phase jitter range from peak to peak on frequen-cies of 20-300 Hz in TNTC should be no more than,	Is to be defined		The switching equipment is not taken into account.
1.4.2.15.Non-linear distortions.			
The summary distortions ratio should be no more than, %	2,3	2,5	
by 2-d and 3-d harmonics no more than, %	1,7	1,8	
by (2f1-f2) combination	Is to be defined		
1.4.2.16.undetected error rate.			
The undetected error rate at bit transmission on rate of 1200 band in TNTC should be no more			

Table 1.4.2.1. The accumulated loss deviation from its value
on TNTC 1000 Hz freguency gain / freguency variation

Standard TNTC Plans		Accumulated loss admissible deviations at freguencies, kHz					
		0.3	0.4	0.6	2.4	3.0	3.4
		Higher deviation limit, dB					
Fig.1.4.2	^{a}1000 = 28 dB	-0,1	-1,9	-1,4	11,4	16,7	21,3
Fig.1.4.3	^{a}1000 = 18 dB	5,0	1,4	0,7	6,7	10,8	14,8
Fig.1.4.4	^{a}1000 = 30 dB	0,4	-1,6	-1,4	13,4	20,0	24,8
Fig.1.4.5	^{a}1000 = 25 dB	2,8	0,2	-1,0	11,2	17,0	22,6
		Lower deviation limit, dB					
Fig.1.4.2	^{a}1000 = 28 dB	-7,7	-6,7	-5,2	7,6	11,9	13,7
Fig.1.4.3	^{a}1000 = 18 dB	-3,8	-3,3	-3,3	2,7	5,1	6,0
Fig.1.4.4	^{a}1000 = 30 dB	-8,6	-7,5	-5,4	9,4	14,1	15,8
Fig.1.4.5	^{a}1000 = 25 dB	-7,6	-6,5	-5,4	6,8	10,3	12,2

Table 1.4.2.2. The TNTC group delay deviation gain/freguency
variation

TNTC standard plan	Group delay admissible deviations relative to its value on a frequency of 1900 Hz, ms at frequencies, kHz													
	0.3	0.4	0.5	0.6	0.8	1.0	1.4	1.6	2.2	2.4	2.8	3.0	3.2	3.3
Fig. 1.4.2	30,2	21,3	14,1	10,0	6,0	4,2	1,95	1,4	1,4	2,0	4,25	6,9	14,0	30,2
Fig. 1.5.3	38,2	26,7	17,7	12,6	7,6	5,4	2,4	1,7	1,7	2,4	5,35	8,6	17,0	38,2
Fig. 1.5.4	38,6	27,1	18,1	12,8	7,8	5,6	2,6	1,9	1,9	2,6	5,55	8,8	17,4	38,6
Fig. 1.5.5	46,6	32,5	21,7	15,4	9,4	6,65	3,0	2,2	2,2	3,0	6,65	10,5	20,4	46,6

Table 1.4.2.3. Maximum psophometric noise power average for an hour on the TNTC output (TS* input)

Noise on TS input	At TS FD and physical trunks implementation				at TS FD implementation			
	U T N		R T R		U T N		R T N	
	a=0 dB	a=3,5 dB	a=0 dB	a=4,5 dB	a=0 dB	a=3,5 dB	a=0 dB	a=4,5 dB
1	2				3			
Maximum psophometric noise power average for an hour value, W , pWp vF mg	3639	1624	3977	1420	12665	5654	13810	2756
Maximum psophometric noise power average for an hour value, W”? , pWp trink	411	283	408	246	-	104	-	106
Maximum psophometric noise powerw average for an hour value, W , pWp c	385	172	418	149	693	309	808	161
Maximum psophometric noise power average for an hour Wp (psophometric noise power average for an hour lewel, pWp)	4434 (-53,5)	207 (-56,8)	4802 (-53,1)	1815 (-57,4)	13357 (-48,7)	6067 (-52,1)	14617 (-48,3)	3019 (-55,2)

Table 1.4.3. The channel sections electrical parameters

Parameter name	Norms on analog telephone channels at use?(implementation)		Notes
	TS FD and physical trunks	FS FD	
1	2	3	4
1.4.3.1. The channel ATE - ATE section			
1.4.3.1.1. The channel section accumulated loss,its average value deviation from the nominal value, the accumulated loss mean square deviation in time.			
ATE - ATE channel section accumulated loss nominal value on frequecncy of 1000 Hz, should be, dB	(7,0 + 0,5 n) (9,0 + 0,5 n)	0,0 + 0,5 n	n - number of ASN There are data for the section with 2 - wire channel terminations (7,0 + 0,5 n) - on the hybrid output (9,0 + 0,5 n) - between exchanges in the column 2
The accumulated loss average and nominal values difference on frequency of 1000 Hz should be no more dB.	1,2	1,2	
The channel section accumulated loss mean square deviation in time from its average value on frequency of1000 Hz, should be no more dB.	1,1	1,1	
1.4.3.1.2. The accumulated loss gain/frequency variation.			
The ATE - ATE channel section accumulated loss gain / frequency variation should be no more, than dB	Table 1.4.3.1	Table 1.4.3.1.	
1.4.3.1.3. Noise.			
The noise maximum psophometric power average for an hour value(psophometric noise power average for an hour level) should be no more, than pWp (dBmp)	13050* (-48,8)	29000** (-45,3)	* - in a point of minus 10 dB **- in a point of minus 5,5 dB
The ATE - ATE channel section unweighed average noise power maximum value the unveighed average noise power level). Should be no more, than pW $_{tp}$ (dB)	18730* (-46,3)	41620** (-42,8)	* - in a point of minus 10 dB **- in a point of minus 5,5 dB
1.4.3.2. The channel section OTT (CO) toll ITT (CO)			
1.4.3.2.1. The channel section accumulated loss, its average value deviation from nominal, the accumulated loss mean square deviation in time			
The channel section accumulated loss nominal value on frequency of 1000 Hz should be, dB	(7,0 + 0,5 n) (9,0 + 0,5)	0,0 + 0,5 n	n - number of ASN There are data for the channel section with 2 - wire termirations (with hybids) (0,7+0,5 n)-between exchanges (9,0+0,5 n)-on the hybrid output

Table 1.4.3. (Cont.)

1	2	3	4
The accumulated loss average and nominal values difference on frequency of 1000 Mz should be no more, dB.	1,4	1,4	
The channel section accumulated loss mean square deviation in time from its average value on frequency of1000 Hz, should be no more dB.	1,25	1,25	
1.4.3.2.2. The accumulated loss gain/frequency variation.			
The channel section accumulated loss gain / frequency variation should be no more, than dB			
1.4.3.2.3. Noise.			
The noise maximum psophometric power average for an hour value(noise psophometric power average for an hour level) should be no more, pWp (dBmp)	18818* (-47,2)	41400** (-43,8)	* - in a point of minus 10 dB **- in a point of minus 5,5 dB
The noise unweighed average power maximum value (of the noise unweighed power average should be no more,than pW, (dBm)			
1.4.3.3. The channel section CO (TO) - CO (TO)			
1.4.3.3.1. The channel section accumulated loss, its average value deviation from nominal, the accumulated loss mean square deviation in time			
The channel section accumulated loss nominal value on frequency of 1000 Hz should be, dB	19,0 + 0,5 n	(7,0 + 0,5n) (9,0 + 0,5n)	(7,0+5,0n)-on the hybrid output (9,0+5,0n)-between exchanges
The accumulated loss average and nominal values difference on frequency of 1000 Hz should be no more, dB.	1,6	1,7	
The channel section accumulated loss mean square deviation in time from its average value on frequency of1000 Hz, should be no more, than dB.	2,3	3,0	
1.4.3.3.2. The accumulated loss gain/frequency variation.	Table 1.4.3.2	Table 1.4.3.2.	
The ATE - ATE channel section accumulated loss gain / frequency variation should be no more, than dB		(ESC)	
1.4.3.3.3. Noise.			
The maximum psophometric noise power average for an hour value (psophometric noise power average for an hour level) should be no more, than pWp (dBmp)	4802,5* (-53,1)	14617,4** (-48,3)	* - in a point of minus 10 dB **- in a point of minus 5,5 dB
The noise unweighed average power maximum value (the noise unveighed power average level) should be no more, than pW $_t$ (dB)	8548,4* (-50,6)	25918,9** (-45,8)	

Table 1.4.3.1. The TVTC OTT (CO) - toll (CO) section acumulated loss deviation from its value on frequency of 1000 Hz gain/frequency variation

Frequency band, kHz	The switched sections number						
	1	2	3	4	5	6	7
	Accumulated loss exceeding relative to its value on frequency of 1000 Hz, dB						
0,3 - 0,4	1,8	2,9	3,7	4,6	5,3	6,2	6,9
0,4 - 0,6	1,3	1,9	2,4	2,9	3,4	3,9	4,2
0,6 - 2,4	0,8	1,1	1,3	1,6	1,8	2,0	2,2
2,4 - 3,0	1,3	1,9	2,4	2,9	3,4	3,9	4,2
3,0 - 3,4	1,8	2,9	3,7	4,6	5,3	6,2	6,9
	Accumulated loss descent relative to its value on frequency						
0,3 - 3,4	0,6	0,8	0,9	1,1	1,2	1,3	1,4

Table 1.4.3.2. The TNTC CO (TO) - CO (TO) section accumulated loss deviation from its value on frequency of 1000 Hz gain/frequency variation

Standart TNTC plan		Accumulated loss admissible deviation on freguencies of, kHz					
		0.3	0.4	0.6	2.4	3.0	3.4
		The deviation higher limit, dB					
Fig.1.4.2	21	3,3	1,0	0,3	7,1	11,1	14,9
Fig.1.4.3	11	8,4	5,6	2,5	2,5	5,6	8,4
Fig.1.4.4	21	4,2	2,0	2,0	7,4	12,1	16,6
Fig.1.4.5	11	9,9	6,1	6,1	2,8	6,1	9,9
		The deviation Lower limit, dB					
Fig.1.4.2	21	-4,3	-6,4	-3,3	3,5	6,2	7,3
Fig.1.4.3	11	-0,4	-0,5	-1,5	-1,5	-0,5	-0,4
Fig.1.4.4	21	-4,4	-3,9	-3,4	3,4	6,3	7,2
Fig.1.4.5	11	-0,3	-0,4	-1,6	-1,6	-0,4	-0,3

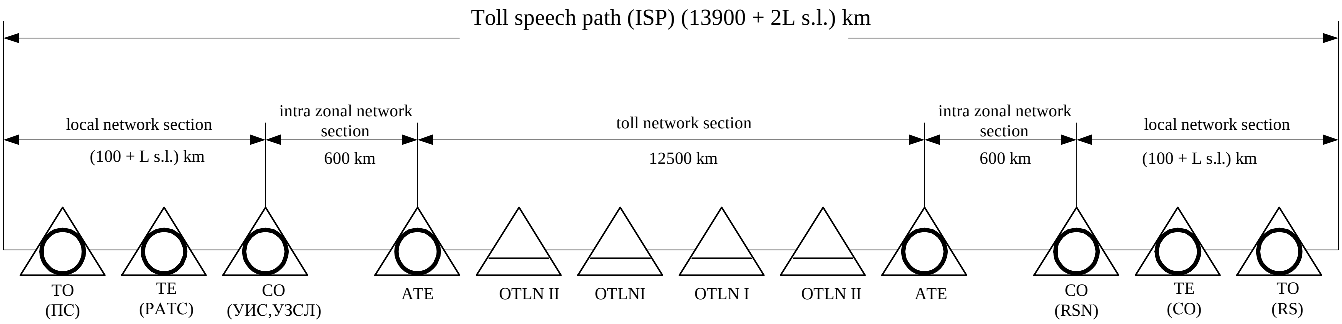


Fig. 1.4.1. The structure of toll telephone channel TSP

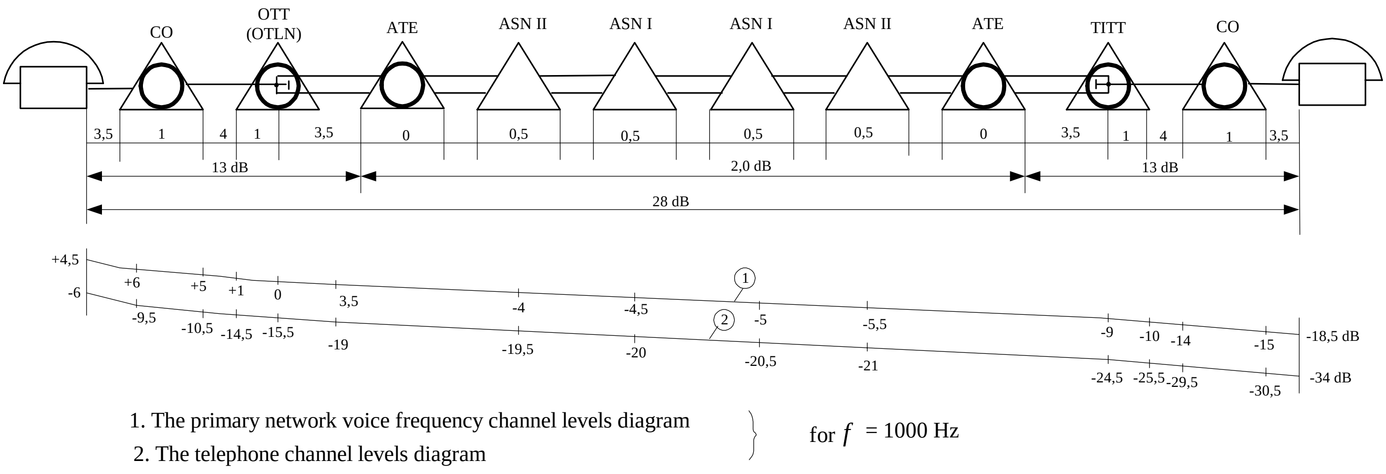
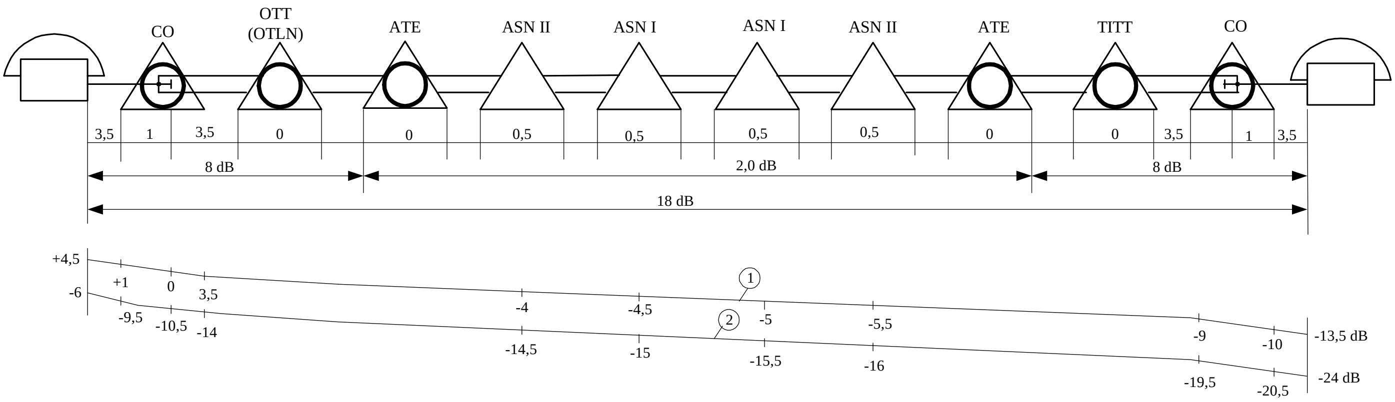


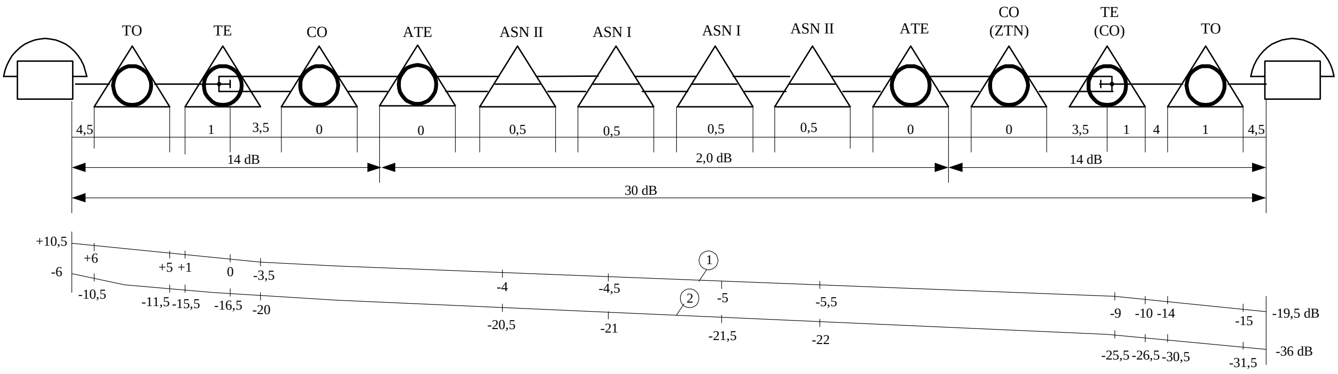
Fig. 1.4.2 Diagram of typical TSP (town network with FD TS and physical trunks implementation)



1. The primary network voice frequency channel levels diagram
2. The telephone channel levels diagram

for f = 1000 Hz

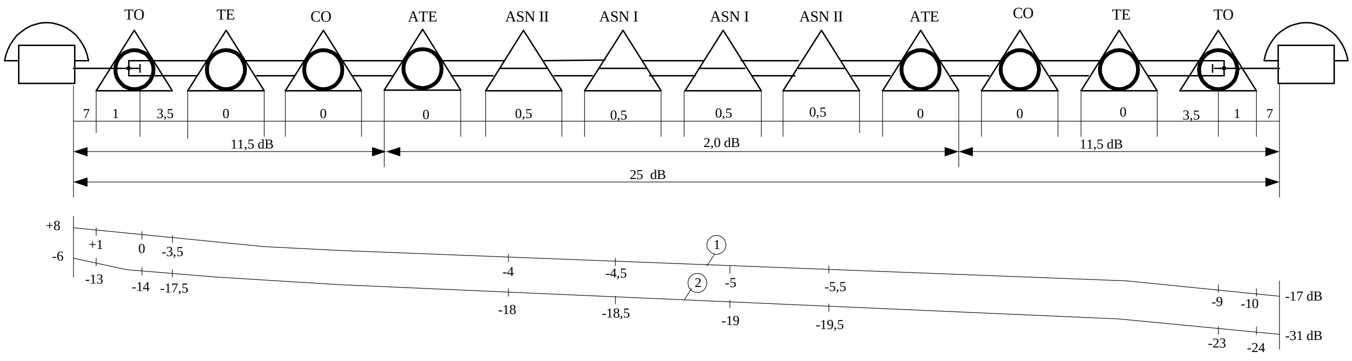
Fig. 1.4.3 Diagram of typical TSP (town network with FD TS implementation)



1. The primary network voice frequency channel levels diagram
2. The telephone channel levels diagram

for f = 1000 Hz

Fig. 1.4.4 Diagram of typical TSP (rural network with FD TS and physical trunks implementation)



1. The primary network voice frequency channel levels diagram
2. The telephone channel levels diagram

for f = 1000 Hz

Fig. 1.4.5 Diagram of typical TSP (town network with FD TS implementation)

Table 1.5. National spanas of jnternational telephone network channels (ITNC)

Parameters	Standards for analog telephone channels AT USE OF : FD TS and physiga trunks	FD TS	Note
1	2	3	4
1.5.1.General characteristics.			
1.5.1.1. Structure Maximum length of ITNC national sector, km	fig.1.5.1 13900	fig.1.5.1 13900	Subscribers lines lengths arenot considered
Maximum number of switched sections	7	7	
- for local telephone network section	4	4	
- for intrazone trlrphone network section	1	1	
- for local telephone network section	2	2	
1.5.2. Elecfrical parameters of ITNC national sections			
1.5.2.1.Channel accumulated loss, deviation of its average value from nominal, time deviation *rms of accumulated loss, loss value distribution. Accumulated loss nominal value for ITNS nominal section,1000 Hz, dB			
for UTN subscribers for RTN subscribers	14,5 15,5	9,5 13,0	Loss values of mismatched PSTN local network are not considered
Difference between accumulated loss average and nominal values for ITNC national section, 1000 Hz, dB	< 1,35	< 1,4	
ITNC national section accumulated loss deviation rms from its average, 1000 Mz, dB	< 1,8	< 2,2	
Time-dependent variation of ITNC national section accumulated loss, 1000 Hz, should be as small as possible short-time variation of accumulated loss for	To be defined		
ITNC national (about 10 s), dB, should be no more than Long-time variation (during long periods including 24 hours and season variations), dB, should be no more than	To be determined		
Attenuation values distribution, 1000 Hz for standart ITNC national section diagrams and level charts			
for UTN subscribers for RTN subscribers	fig.1.5.2 fig.1.5.4	fig.1.5.3 fig.1.5.5	
1.5.2.2. Frequency variations.			
Common	1,4	1,7	
with probability of 0,99 with probability of 0,999	2,0 2,6	2,4 3,2	
1.5.2.3. Stepwise phase variation			
ITNC stepwise phase variation resulted from switched generator equipment should occur no more than once a minute	60	48	

Tabl. (1.5) cont

1	2	3	4
1.5.2.4. Gain/frequency variation of accumulated loss. Ggain/ frequency variation of accumulated loss for ITNC national section, dB, should be no more than	Table1.5.1. lines 1, 3	Table1.5.1 lines 2, 4	
1.5.2.5.Absolute group delay, Gain/frequency variation of group delay deviation.			
Maximum absolute group delay value for terrestrial ITNC national section, ms, should be no more than	To be determined		Is to be adjusted by the intrazonal and local data
for satellite communication sector,ms for terrestrial communication sector,ms	300 100	300 100	
Group delay deviation (F) at 1900 Hz ITNS national section urth different number of voice frequency transits, ms, should be no more than	Table1.5.2. lines 1, 3	Table1.5.2. lines 2, 4	
1.5.2.6.Gain-level variation			
Gain/level variation of ITNS national section should be of the type that keeps channel accumulated loss, measured in operating band, constant for 97%, when channel input level varies from nominal up to + 3,5 dBm0, dB	0,0	1,1	
1.5.2.7.Noise.			
Maximum value of average psophometric power per hour,Wp,at ITNS gateway output should be no more than W + W + W (considering level charts) :	Table1.5.3. line 4 column 2	Table1..3. line 4 column 3	
Maximum average psophometric noise power per hour,W added into ITNS national section by voice channel of main network, pWp, should -freguency be no more than			
that is for 0 point :			
pW 0p dB 0p	42600 (- 43,7)	44600 (- 43,5)	
Maximum average psophometric noise power, per hour, W, added by physical connectors and subscriber lines, pWp, should be no more than	Table1.5.3. line 2 column 2	Table1.5.3. line 2 column 3	
Maximum average psophometric noise power, per hour, Wk, added by PSTN switching equipment, pWp, should be no more than	Table1.5.3. line 3 column 2	Table1.5.3. line 3 column 3	
Maximum value of average unweighted noise power (level of average unweighted nose power) at gateway CT1 output added into ITNS national section			Unweighted – psophometric noise ratio is detailed by local network results analysis
pW 0p dBm0p	< 1,78 • Wp < Pp + 2,5		
1.5.2.8. Selective noise			
Level of any selective noise for ITNS national section, dBmO, should be no more than	To be determined		

Tabl. (1.5) cont

1	2	3	4
1.5.2.9. Protection from distinct transient influences.			
Near and far end protection from distinct transient influences between any two ITNS 4-wire national section (ATE - CT1) located in operating band, dB	> 58	> 58	
Protection from distinct transient influences between two different transmission routes of the same national section (ATE-CT1) in operating band, dB	> 46	> 46	Local network trunks are not considered
Probability of distinct transient influence occurrence, Ў/® , should be no more than	To be determined		
1.5.5.10. Relative accumulated time of pulse noise and short time level fadings			
Jn ITNS national section, relative accumulated time of pulse noise(exceeding - 15dBmO threshold wrth duration > 500 ms) influence and short-time level fadings (>18dB with duration >500ms), per hour, should be no more than	To be determined		
1.5.2.11.Pulse noise			
Jn ITNS national section, relative time of pulse noise (exceeding threshold – 15 dBmO with duration >500 ms) influence, per hour, should be more than			
1.5.2.12 Short - time level fadings in ITNS nationai section, relative time of level fading (>18 dB with duration 500 ms),per hour,should be no more than	To be determined		
Short-time level fading >300 ms are considered failures			
1.5.2.13. Protection from stray modulation products			
Jn ITNS national section, protection national from stray modulation products by power noises at any frequency different from desired signal frequency for ± 50Mz, ±100Mz, etc. (up to 400 Hz), dB	> 47	>47	Main network section of ITNS section is assumed to add the same power of modulation products as zone network sections. Switching equipment is not considered
1.5.2.14. Phase jitter			
Peak-to-peak modulation jitter at20-300 Hz,in ITNS national section, ( ), should be mo more than	To be determined		
1.5.2.15. Non-linear distortions			
In ITNC national section,accumulated cofficient of non-linear distortions, %	< 1,85	< 2,0	
by 2d and 3d harmonics if should be, %	< 1,35	< 1,5	
by combination ($2f_1 - f_2$)	To be determined		
1.5.2.16. Error rate. Jn ITNC national section,bit error rate at 1200 baud	< 1,8 e 10^{-4}	< 2,1 e 10^{-4}	Standart shoud be detailed by further processing

Table 1.5.2.1. Gain/frequency variation of Accumulated Loss Deviation From Jts Value at 1000 Hz in ITNC National Sector

Diagrams of Standard INTC National Section		Allowed Deviations of Accumulated Loss, kHz					
		0.3	0.4	0.6	2.4	3.0	3.4
1		2	3	4	5	6	7
		Upper limit of dyration, dB					
Fig.1.5.2	^{a}1000 = 14,5dB	1,5	0,2	-0,4	6,0	9,5	12,2
Fig.1.5.3	^{a}1000 = 9,5 dB	4,3	2,3	1,1	4,1	6,5	9,2
Fig.1.5.4	^{a}1000 = 15,5 dB	2,0	0,3	-0,1	7,3	11,1	14,2
Fig.1.5.5	^{a}1000 = 13,0dB	3,2	1,1	0,2	6,3	9,5	13,1
		Lower limit of deviation, dB					
Fig.1.5.2	^{a}1000 = 14,5dB	-4,2	-3,9	-3,4	3,0	5,4	6,5
Fig.1.5.3	^{a}1000 = 9,5 dB	-2,4	-2,2	-2,3	0,7	2,0	2,5
Fig.1.5.4	^{a}1000 = 15,5 dB	-4,8	-4,3	-2,8	4,6	6,5	7,4
Fig.1.5.5	^{a}1000 = 13,0dB	-4,3	-3,8	-3,3	2,7	4,6	5,6

Table 1.5.2.2. Gain/frequency variation of Group Delay Deviation in INTC National Sector

Diagram of Standart INTC National Channel	Allowed Group Delay Deviation Versus Jts Value at 1900 Hz , ms, kHz													
	0,3	0,4	0,5	0,6	0,8	1,0	1,4	1,6	2,2	2,4	2,8	3,0	3,2	3,3
Fig. 1.5.2	21,7	15,0	10,0	7,0	4,3	3,0	1,3	0,84	0,84	1,3	3,0	4,9	9,0	21,7
Fig. 1.5.3	25,7	17,7	11,8	8,3	5,1	3,55	1,5	1,0	1,0	1,5	3,5	5,72	10,8	25,7
Fig. 1.5.4	25,9	17,9	12,0	8,4	5,2	3,65	1,6	1,1	1,1	1,6	3,6	5,8	11,0	25,9
Fig. 1.5.5	29,9	20,6	13,8	9,7	6,0	4,2	1,8	1,25	1,25	1,8	4,15	6,65	12,85	25,9

Table 1.5.2.3. Maximum Psophometric Noise Power for an Hour
at Output of INTC National Sector
(CT1 Gatewau Input)

Noise at CT1 Gateway	With FD TS and physical trunks		With FD TS	
	U T N	R T N	U T N	R T N
1	2		3	
Maximum value of psophometric noise power for an hour, W вгm-,, pWp	25595	27011	27011	28427
Maximum value of psophometric noise power for an hour, W дб«, pWp	134	134	25	25
Maximum value of psophometric noise powerw for an hour, W_k, pWp	762	904	884	1025
Maximum value of psophomefric noise power per hour WЇ, (level of psophometric noise power for an hour, P_P pWp (dBmp)	26491 (-45,7)	28048 (-45,5)	27920 (-45,5)	29477 (-45,3)

Table 1.5.3. Electrical Parameters of INTC National Sector

Parameter name	Norms for Analog Telephone Channels		Note
	FD TS and physical trunks	FD TS	
1	2	3	4
1.5.3.1. ATE-CT1 channel section			
1.5.3.1.1. Channel accumulated loss, deviation of its average from nominal, time deviation rms of accumulated loss.			
Nominal value of accumulated loss for ATE-CT1 channel section, 1000 Hz, dB	0,0 + 0,5 Pn	0,0 + 0,5 Pn	Ц - number of ASN_s
Difference between average and nominal values for accumulated loss,1000 Hz,dB	< 1,1	< 1,1	
Channel section accumulated loss deviation rms from its average, 1000 Hz, dB.	< 1,0	< 1,0	
1.5.3.1.2 Gain/frequency variation of accumulated loss			
gain/frequency variation of accumulated loss for channel section, dB, should be no more than	Table 1.5.3.1	Table 1.5.3.1.	
1.5.3.1.3. Noise.			
Maximum average value of psophometric noise power for an hour for an hour (level of average psophometric noise power) pWp (dBmp)	 < 24480* < (-46,1)	 < 24480* < (-46,1)	
Value of average noise power (level of average unweighed noise power) pW_{tp} (dBm)	 < 43580* < (-43,6)	 < 43580* < (43,6)	 * tore point - 5,0 dB
1.5.3.2. Channel section OTT (CO) - CT1			
Channel section accumulated loss,deviation of its average from nominal, time deviation rms of accumulated loss			
Nominal value for channel section,1000 Hz,dB	0,0 + 0,5 pn	0,0 + 0,5 pn	n - number of ASN
Difference between average and nominal values for channel section accumulated loss, 1000 Hz, dB	< 1,2	< 1,2	
Time deviation rms of channel section accumulated loss from its average,1000 Hz,dB	< 1,0	< 1,0	

Table 1.5.3. (Cont.)

1	2	3	4
1.5.3.2.2 Gain/frequency variation of accumulated loss			
Gain/frequency variation of accumulated loss for channel section, dB should be no more than	Table 1.5.3.1	Table 1.5.3.1	
1.5.3.2.3. Noise.			
Maximum value of average psophometric noise power for an hour (level of average psophometric noise power for an hour) pWp (dBmp)	26300* (- 45,8)	26300* (- 45,8)	
Maximum value of average unweighted noise power for an hour (level of average unweighted noise power) pW (dBm)	< 46800* < (-43,3)	< 46800* < (- 43,3)	* for point - 5,0 dB
1.5.3.3. CO (TO) - CT1 channel section			
1.5.3.3.1. Channel accumulated loss, deviation of its average from nominal,time deviation rms of value of channel section accumulated loss, accumulated loss. Nominal1000 Hz, dB	(13 + 0,5 n)*	(8 + 0,5 n)*	* between CO and CT1 switching points (- 3,5)
Difference between average and nominal values of accumulated loss,1000 Hz, dB	1,3	1,4	
Value of channel section time deviation rms from its average,1000 Hz, dB	< 1,6	< 2,0	
1.5.3.3.2 Gain/frequency variation of accumulated loss			
Gain/frequency variation of channel section accumulated loss, dB, should be no morethan	Table 1.5.3.2	Table 1.5.3.2.	
1.5.3.3.3. Noise.			
Maximum value of average psophometric noise power for an hour (level of psophometric power for an hour) pWp (dBmp)	27800* (- 45,5)	29300* (- 45,3)	* for point - 5,0 dB
Maximum value of average unweighted noise power (level of unweighted noise power) pW (dBm)	< 49480* < (-43,1)	< 52150* < (- 42,8)	

Table 1.5.3.1. Freguency Response of Accumulated Loss Deviation from Jts Value,1000 Mz, for OTT (CO) - CT1 ITNC Sector

Frequency band, kHz	Number switched sections					Note
	1	2	3	4	5	
	Accumulated loss overflow versus its value, 1000 Hz, dB					
0,3 - 0,4	1,8	2,9	3,7	4,6	5,3	
0,4 - 0,6	1,3	1,9	2,4	2,9	3,4	
0,6 - 2,4	0,8	1,1	1,3	1,6	1,8	
2,4 - 3,0	1,3	1,9	2,4	2,9	3,4	
3,0 - 3,4	1,8	2,9	3,7	4,6	5,3	
	Reduction of accumulated loss versus its value, 1000 Hz, dB					
0,3 - 3,4	0,6	0,8	0,9	1,1	1,2	

Table 1.5.3.2. Freguency Response of Accumulated Loss Deviation from Jts value,1000 Mz, for CO (TO) - CT1 ITNC Sector

Diagram of Standard ITNC National Section	Accumulated loss of channel section, 1000 Hz , dB	Allowed Deviations of Accumulated Loss, kHz					
		0.3	0.4	0.6	2.4	3.0	3.4
		Upper limit of deviation, dB					
Fig.1.5.2	11,0	3,3	1,7	0,6	4,0	6,8	9,1
Fig.1.5.3	6,0	6,1	3,8	2,1	2,1	3,8	6,1
Fig.1.5.4	11,0	4,3	2,2	1,1	4,5	7,3	10,1
Fig.1.5.6	6,0	6,9	4,2	2,2	2,2	4,2	6,9
		Lower limit of deviation, dB					
Fig.1.5.2	11,0	-2,4	-2,4	-2,4	1,0	2,7	3,4
Fig.1.5.3	6,0	-0,6	-0,7	-1,3	-1,3	-0,7	-0,6
Fig.1.5.4	11,0	-2,5	-2,5	-1,6	-1,8	2,7	3,1
Fig.1.5.5	6,0	-0,6	-0,7	-1,3	-1,3	-0,7	-0,6

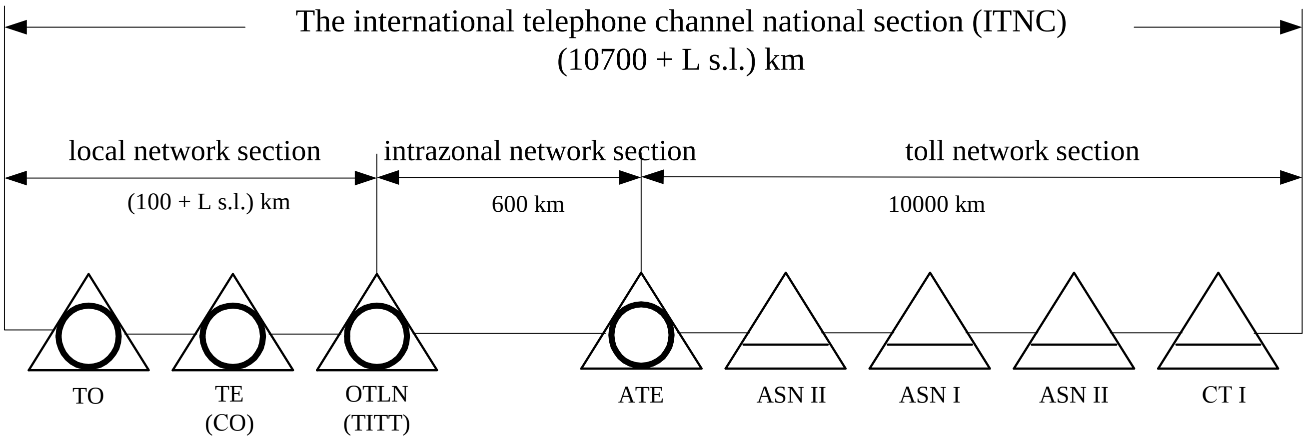
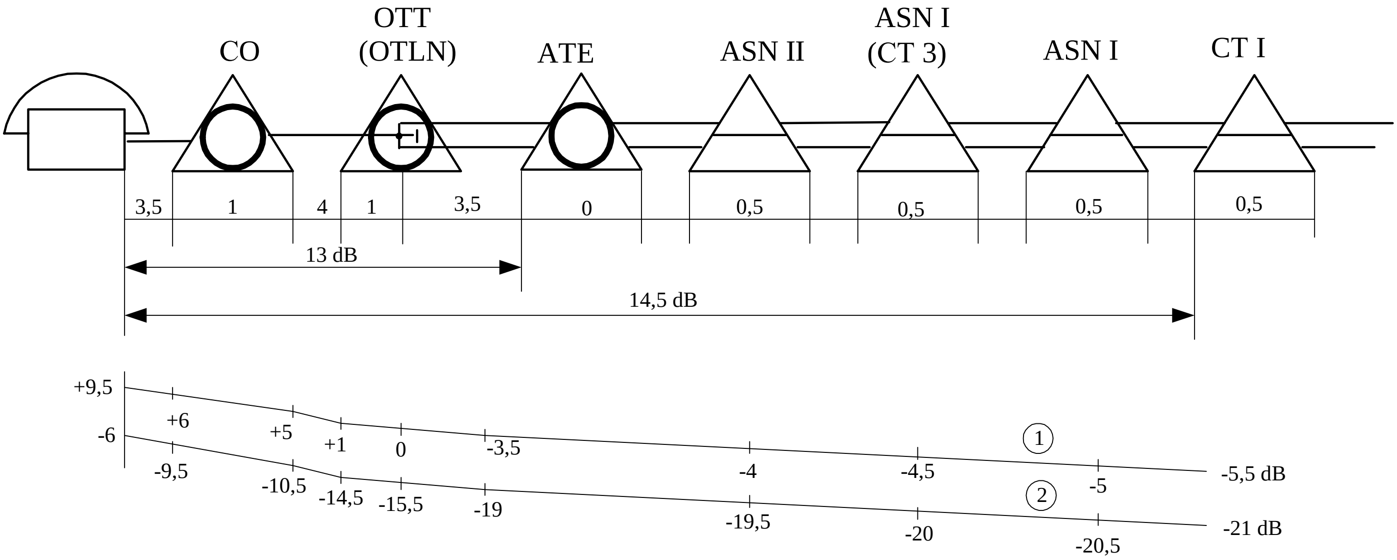


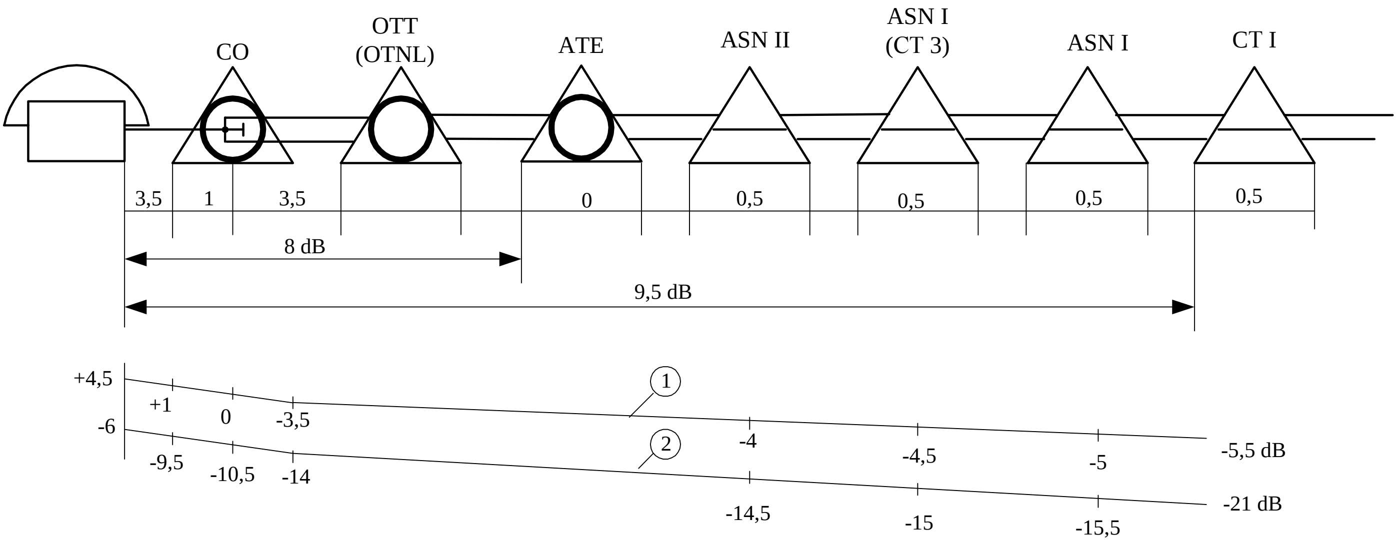
Fig. 1.5.1 The structure of ITNC international telephone network channel national section



1. Diagram of the primary network voice-frequency channel levels
2. Diagram of the telephone channel levels

} for f = 1000 Hz

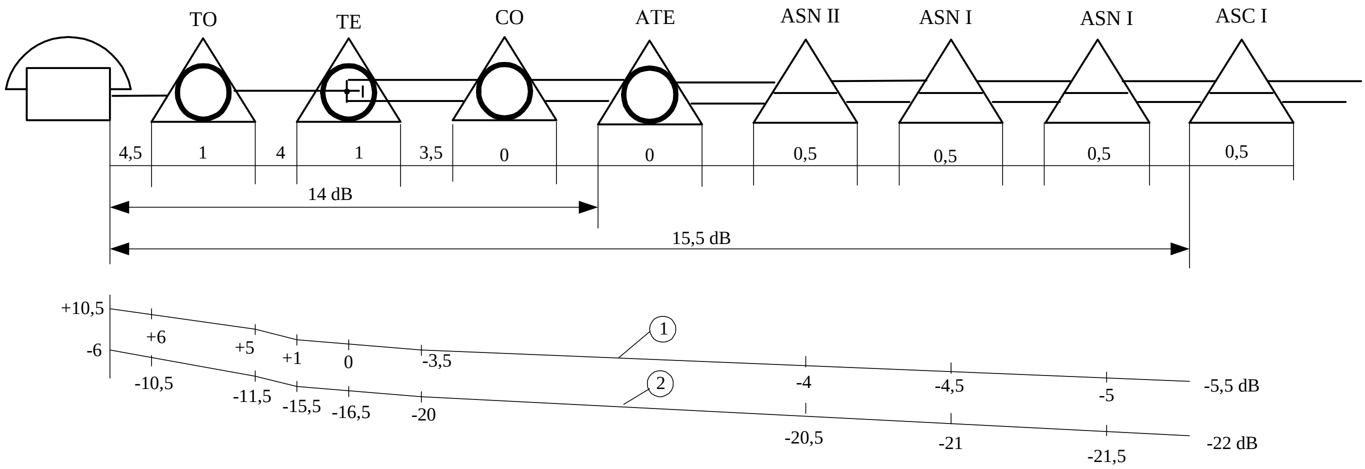
Fig. 1.5.2 Diagram of typical national ITNC section (town network with FD TS and physical trunks implementation)



1. Diagram of the primary network voice-frequency channel levels
2. Diagram of the telephone channel levels

for f = 1000 Hz

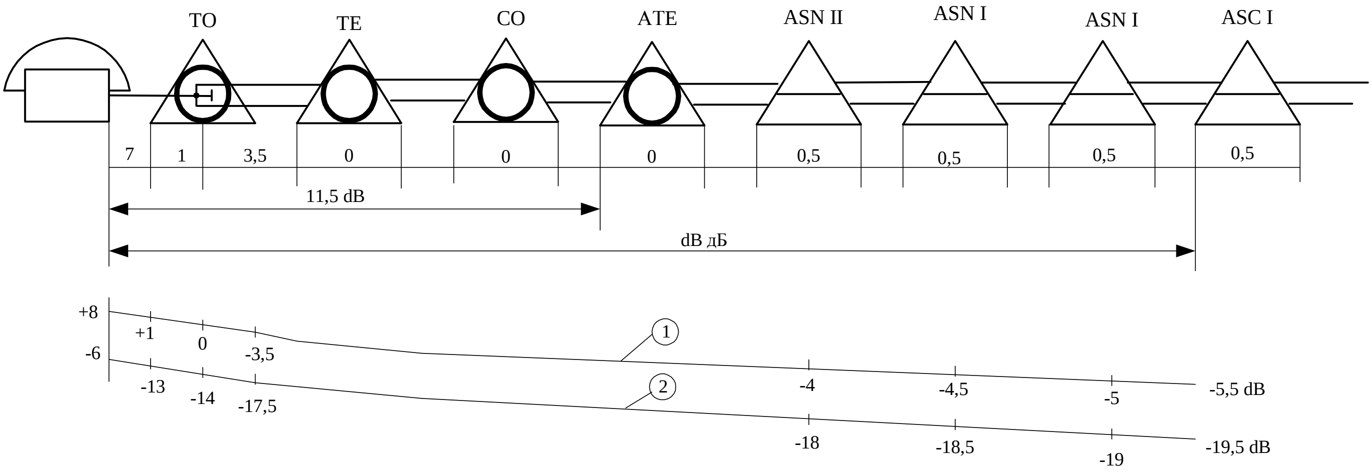
Fig. 1.5.3 Diagram of typical national ITNC section (town network with FD TS implementation)



1. Diagram of the primary network voice-frequency channel levels
2. Diagram of the telephone channel levels

for f = 1000 Hz

Fig. 1.5.4 Diagram of typical national ITNC section (rural network with FD TS implementation)



1. Diagram of the primary network voice-frequency channel levels
2. Diagram of the telephone channel levels

} for f = 1000 Hz

Fig. 1.5.5 Diagram of typical national ITNC section (rural network with FD TS implementation)

Table 1.6. The UTN subscriber-public service telephone channels PS TC

Parameters name	Norms	Note
1	2	3
1.6.1. Architecture.		
The UTN subscriber telephone channel (PS STC) consists of the telephone channel (PS TC), the telephone set,connected on one of the channel ends and information switchboard on the other end.	Fig. 1.6.1.	
The telephone channel represents a combination of technical facilities and transmission medium, providing the speech signal transmission between the subscriber and the public maintenance service operator.	Fig. 1.6.1.	
1.6.2. Electrical parameters		
1.6.2.1. The channel accumulated loss, the accumulated loss mean square deviation in time. The PMS TC maximum accumulated loss should be no more, than dB		Normally, the PMS TC sections inputresistances mismatching is not taken into account. When the "subscriber-02 service","subscriber-052" service path attenuation value is brought to17 dB the attenuation on T NA* imner lines (forward wires) from02 and 052 services to the MHA subscriber should not exceed 7 dB
on frequency of 1000 Hz on frequency of 800 Hz	19,0 17,0	When ‘“ occurs on the CO-SSN section, the nominal accumulated loss on frequency of 1000 Hz on ‘“ SSN section at the two-wire termination should be equal 3,5 dB
The accumulated loss nominal value of the section, organized with the local VF channel inplemen tation, on frequency of 1000 Hz at two-wire termination should be equal, dB	7,0	
The accumulated loss nominal value of section, organized with the local network VF channel implementation on frequency of 1000 Hz at fourwire voice frequency transit, should be equal, dB * - MHA - Ministery of Home Affaire		
The accumulated loss in PS TC (at the transmission system VF two channels implementation) on frequency of 1000 Hz, mean square deviation in time from its average value should be no more, than dB	2,0	
The accumulated loss on frequency of 800 and1000 Hz maximum values distribution and the level diagram for the standard PS TC plans	Fig.1.6.2-1.6.6.	
1.6.2.2. The frequency change		
The transmitted signal change in PS TC (at the FD TS VF two channels implementation) should be no more, than, Hz		
as a rule	1,1	
with probability of 0,99	1,7	
with probability of 0,999	2,2	

Table 1.6. (cont)

1	2	3
The transmitted signal stepwise variation in PS TC at presence of VF two channels owing to the transmission system refreshing equipment switching should appear no more, than once within an hour		
1.6.2.4.The accumulated loss gain-jreguency variation		
The PS TC accumulated loss maximum values of two channels implementation and physical circuits sections greatest lengths, dB	Table 1.6.1	
The PMS TC attenuation maximum values (without VF channel) at the physical circuits sections greatest lengths, dB	Table 1.6.2	
1.6.2.5.The absolute group delay		
The absolute group delau deviation gain-frequency variation		
The group delay maximum value in PS TC should be no more, than ms	is 25 to be defined	
The group delay in PS TC at the VF channels availability value deviation from its vaiue, measured on frequency of 1900 Hz should be no more, than	Table 1.6.3	
1.6.2.6. Gain / level variation		
btis reguired of the PMS TC gain/level variation that the channel accumulated loss, measured in operational frequency dand for 97 percent of instances should remain constant at the level changing on the input from nominal one to plus 3.5 dBm0 accurate to, dB	0,6	
1.6.2.7. Noise		
The psophometrical noise maximum power average for an hour value on the switchboard terminals on reception at anu lind of PMS TC ,should be no more, than pWt0 (mv,dBm0)	1000 (0,75; - 60,0)	
The unweighet noise maximum power average for an hour value on the switchboard terminals on the reception at any type of PS TC for any hour in freguency band of 300-3400 Hz, should be no more, than mWt0 (mv, dBm0)	4000 (1,5;minus54,0)	
1.6.2.8. Selective noise		
The selective noise each level in PS TC, consisted of VF FD, should be no more, than dBm0 from the power supplies on any frequency of 50,100,150,200,250). total value from the carriers residues frequency of 4000 Hz frequency of 4000 Hz, k=1,2,3,4 from the different call frequencies in the VF channel band for each frequency of 700,900,1100, 1200,1300,1500,1600,1700,2600 Hz out of VF channel band for each frequency of3850, 3825 Hz	is 25 to be defined	
1.6.2.3.The transmitted signal stepwise variation in time	0,8	

Table 1.6. (cont)

1	2	3
1.6.2.9. Distinct transient influences protection		
The distinct crosstalk attennuation on the near end between two any PS TC inoperational frequency band should be no less, than dB	52,0	
1.6.2.10. Pulse noise and the transient level losses summary relative action time The pulse noise (exceeding the threshold of minus 15 dBm0, more than 500 mcs duration) and the transient signal level losses (the descent more than by 18 dB, more than 500 mcs duration) summary relative action time in PS TC (at the availa bility of two VF channels) for the periods of an hour should be no more than The transient level losses of duration more than of 300 ms is considered as a failure	is 25 to be defined	
1.6.2.11. Pulse noise		
The relative time in the course of which the pulse noise in PS TC at the availability of two VF chan-nels, exceeding the threshold of minus15 dBm0, more than 500 mcs duration, for the periods of an hour,should be no more	is 25 to be defined	
1.6.2.12.Transient level losses The signal levels transient losses relative action time in PS TC at the availability of two VF channels (the descent more than by 18 dB and more than 500 mcs duration) for the periods of an hour should be no more than The transient level disappearance of duration more than of 300 ms is considered as a failure	is 25 to be defined	
1.6.2.13.Stray modulation products protection from The signal protection in PS TC (at the availability of two VF channels) from the stray modulation pro-ducts by the supply noise at any of the frequencies differing by frequency from the useful signal by 50 Hz and so on (to the frequency of 400 Hz) should be no more, than, dB	50	The switching equipment is not taken into account
1.6.2.14. Phase jitter		
The phase jitter range (swing) on frequency of 20-300 Hz in PS TC at the availability of two VF chanels shannels should be no more ( )	is 25 to be defined	
1.6.2.15. Nonlinear distortions		
The nonlinear distortions ratio in PS TC at the avai lability two VF FD channels should not exceed,%		
summary	1,5	
by 3-d harmonic	1,0	
1.6.2.16. Character error rate		
The character error rate in PS TC at the bit transmission at the rate of 1200 band in the spectrum of 0,3-3,4 Hz should not exceed	1.5*10^(-4)	

Table 1.6.1. The OMS TS accumulated loss maximum values at the VF channel greatest length and the subscriber lines sections greatest lengths with the VF chnnel accumulated loss deviations from the value on frequency of 1000 Hz taking into account.

Frequency, Hz	300	400	600	1000	2400	3000	3400
Accumuiated loss maximum value higher limit, dB	14.0	13.2	13.4	13.5	16.4	17.4	18.9
Accumulated loss maximum value lower limit, dB	10.8	11.1	11.6	13.5	14.6	15.3	15.7

Note. The subscriber cable line is given with the threads diameter of 0,32 mm.

Table 1.6.2. The PS TC attenuation maximum values (without VF channels) at the physical circuits sections greatest lengths.

Frequency, Hz	300	400	600	1000	2400	3000	3400
Accumuiated loss maximum values, dB	10.66	11.95	14.08	19.0	26.0	28.67	30.29

Note. The subscriber cable line is given with the threads diameter of 0.32 mm.

Table. 1.6.3. The group delay deviation from its value on frequency of 1900 Hz for PS TC at the availability of two VF channels.

Frequency, Hz	300	400	500	600	800	1000	1400	1600	2200	2400	2800	3000	3300	3600
Group delay deviations, ms	8,0	5,4	3,6	2,6	1,6	1,1	0,4	0,3	0,4	1,1	1,7	3,0	4,6	8,0

The UTN subscriber speech path structure at the subscriber - special service speech path SS SSSP

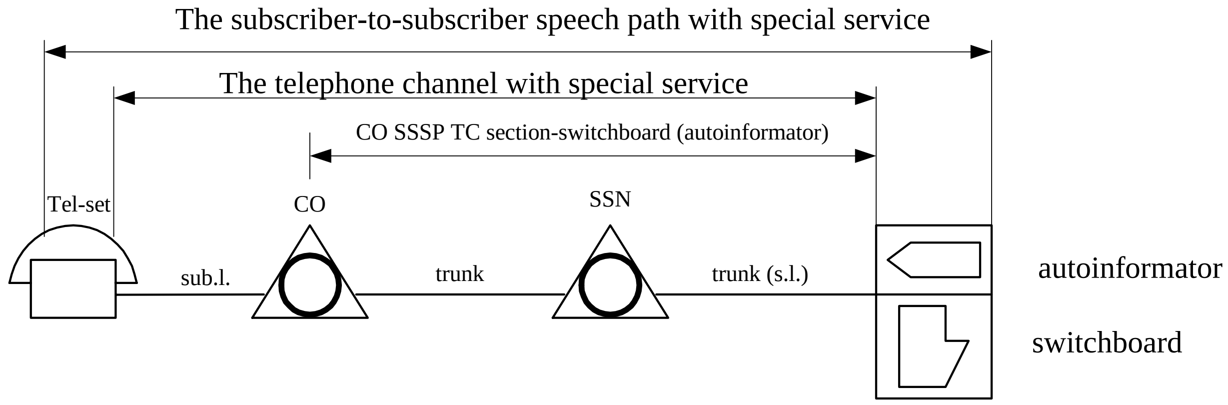


Fig. 1.6.1

Diagram of typical SS SSSP of non-districtive UTN at inquiry-informational and ordered services call by abbriviated dialing at local communication

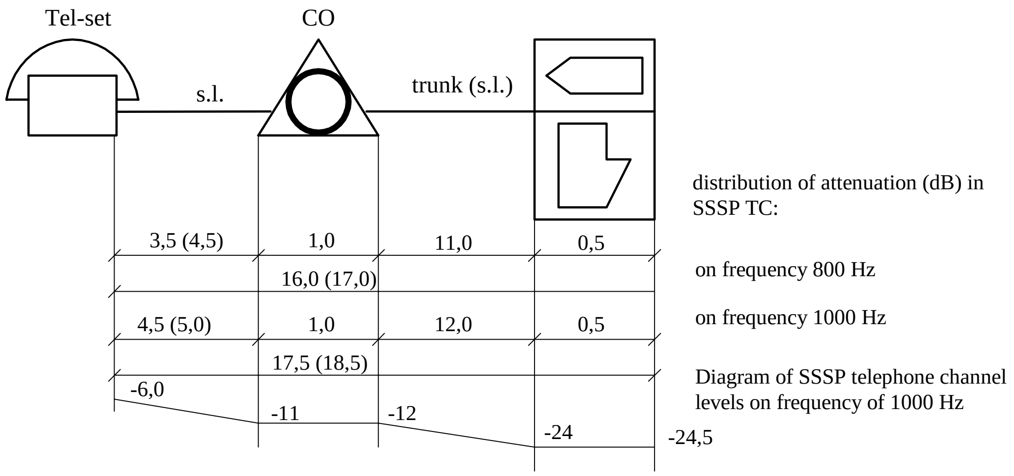


Fig. 1.6.2

Note : from fig. 1.6.2. to fig. 1.6.6

Subscriber line attenuation for cable with threads diametr of 0,32 mm equals 3,5 dB on frequency of 800 Hz and 4,0 dB on frequency of 1000 Hz.

Subscriber line attenuation for cable with threads diametr of 0,4 mm equals 4,0 dB on frequency of 800 Hz and 4,5 dB on frequency 1000 Hz.

Subscriber line attenuation for cable with threads diametr of 0,5 mm, 0,64 mm и 0,7 mm equals 4,5 dB on frequency 800 Hz and 5,0 dB on frequency 1000 Hz.

Diagram of typical SS SSSP of districtive UTN at inquiry-informational and ordered services call by abbriviated dialing at local communication

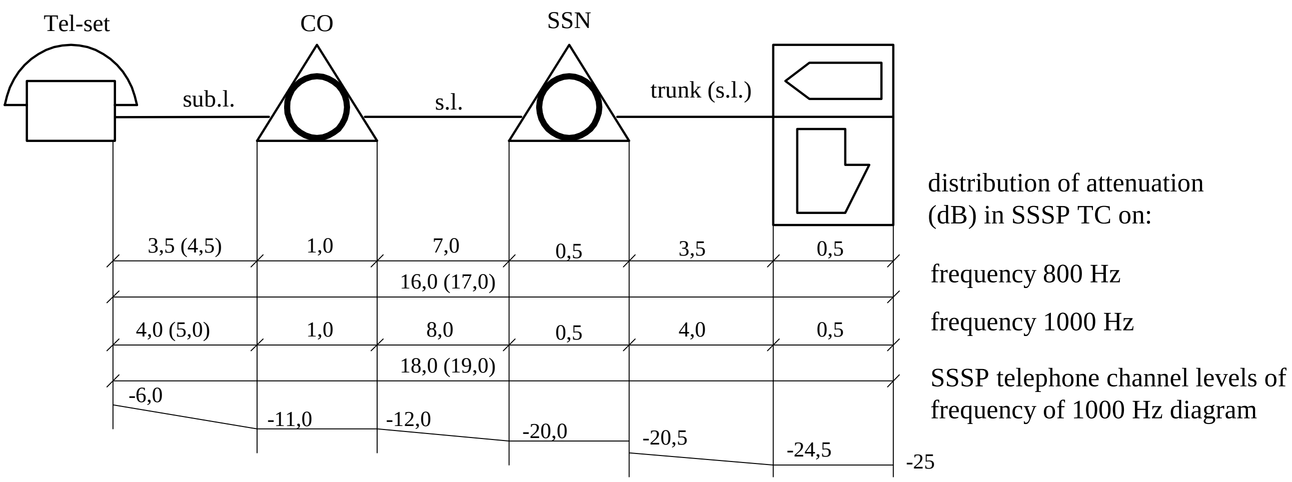


Fig. 1.6.3

Diagram of typical SS SSSP of districtive UTN at inquiry-informational and ordered services call by abbriviated dialing at local communication

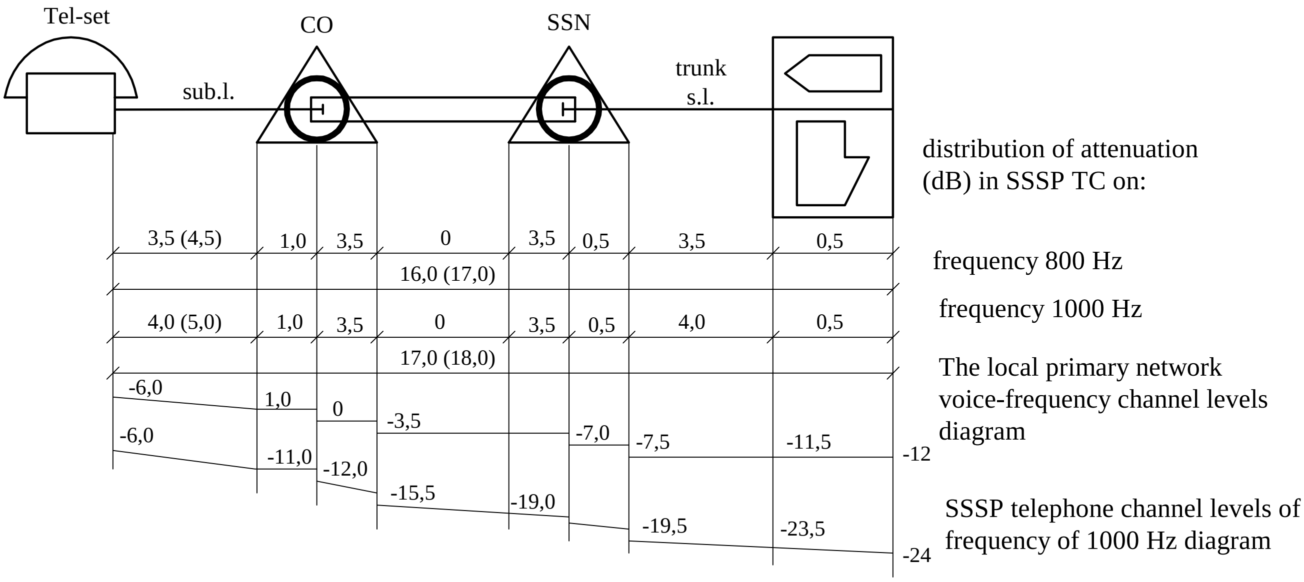


Fig. 1.6.4

Diagram of typical SS SSSP of districtive UTN at inquiry-informational and ordered services call by brief numeration at local communication

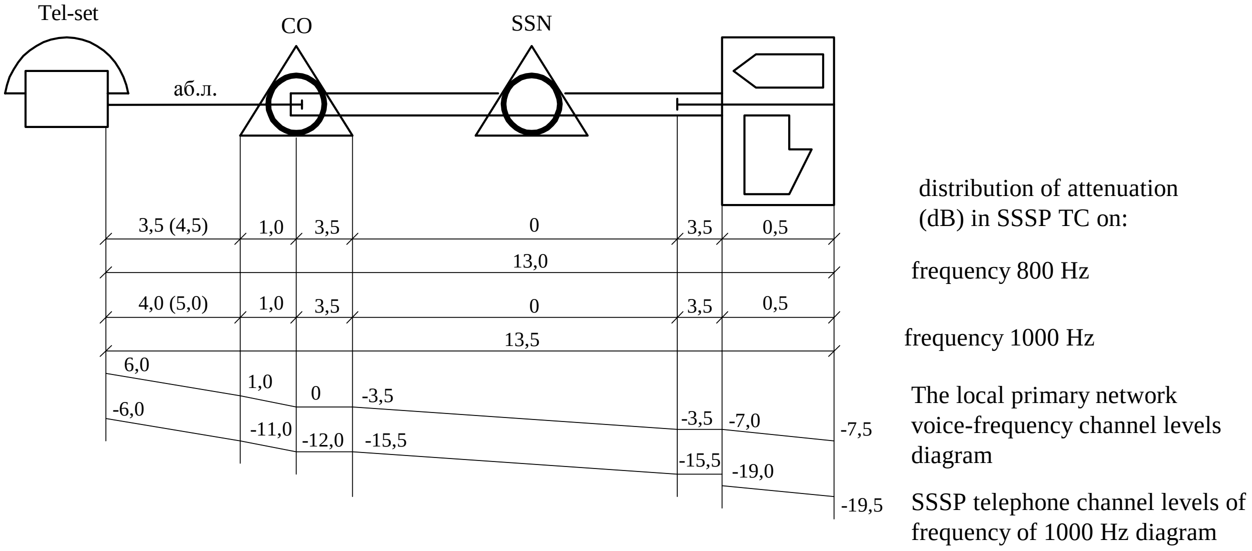


Fig. 1.6.4 a)

Diagram of typical SS SSSP of districtive UTN at inquiry-informational and ordered services call by abbriviated dialing at local communication

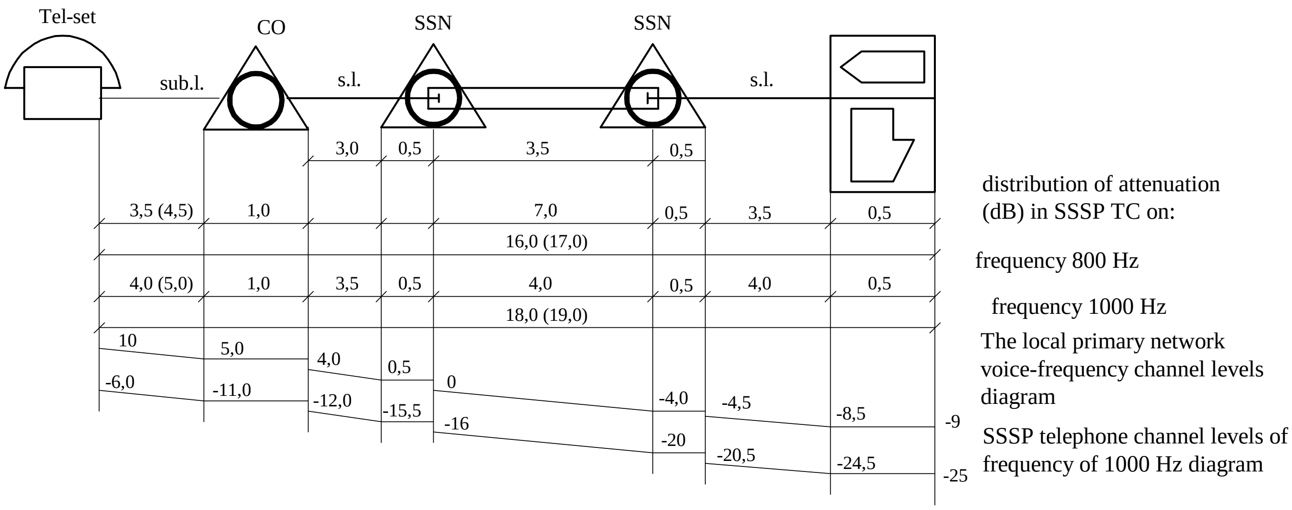


Fig. 1.6.5

Diagram of typical SS SSSP of districtive UTN during the inquiry-informational and ordered services call by abbriviated dialing at local communication

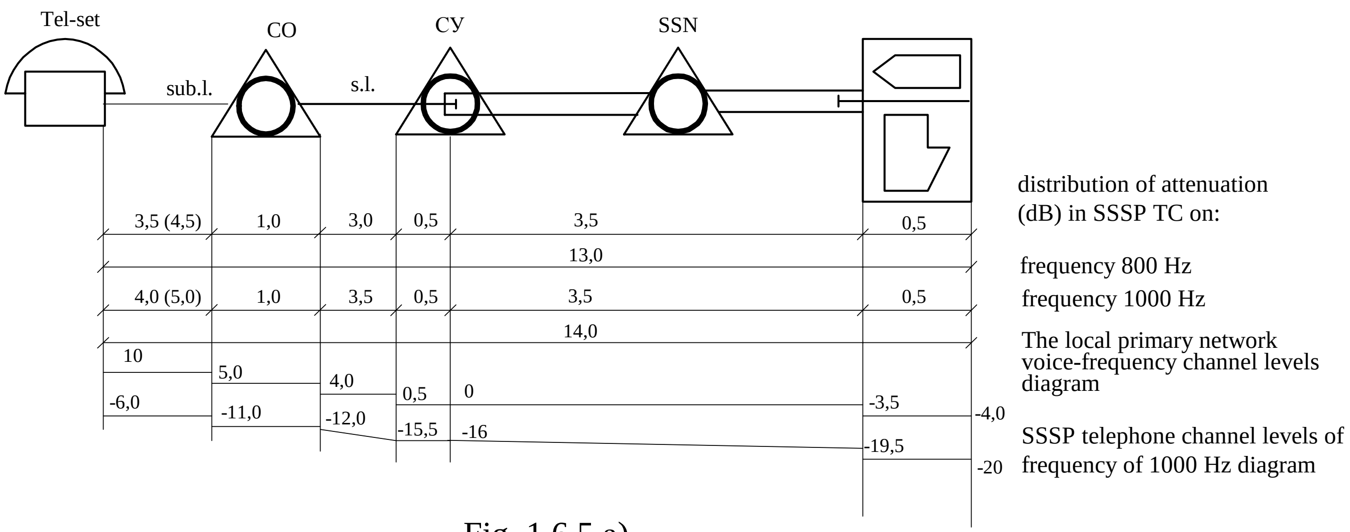


Fig. 1.6.5 a)

2. The perspective norms on the attenuation updated equivalents

Table 2.1. The subscriber local telephone channels (SLTC *) of PSTN

	Norms on analog subscriber channels at implementation of				Nome
	Physical trunks	FD TS	TD TS	FD - TD	
1	2	3	4	5	6
2.1.1. Architecture The subscriber local telephone channel (SLTC) consists of the local telephone channel LTC** and the telephone sets connected to the transmission and the reception ends of LTC	Fig. 1.2.1 and 1.2.2.				The norms are obtained by means of calculation (without the TS ** deterioration factor taking into account) and are to be defined more accurately. All Cќ‡ values are given accurate to the received calculating value rounding off to 0,5 dB.

* SLTC - subscriber local telephone channels

* * LTC - local telephone channel

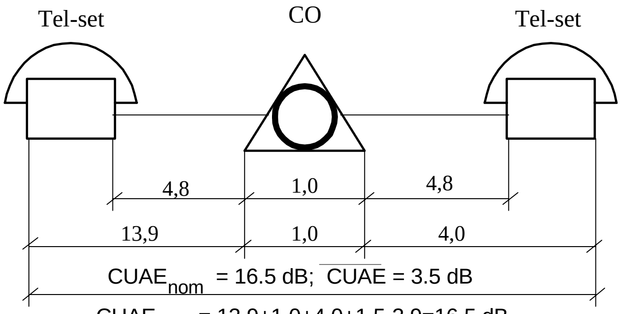
* * * TS - telephone set

Table 2.1 (the end)

1	2	3	4	5	6
2.1.2. Attenuation updated equivalents.					
2.1.2.1. The common updated attenuation equivalent SLTC CUAE * nominal values should be no more, than	28,0 38,4*	33,0 37,0*	33,0 37,0*	33,0	*) The values are defined at the physical trunks an ‘Ц implementation in SLTC
2.1.2.2. The (CUAR) common updated attenuation equivalent nominal values distribution in the standard SLTC.	Fig. 2.1.1. 2.1.2.	Fig. 2.1.3 - 2.1.7	Fig. 2.1.8 - 2.1.15	Fig. 2.1.9; 2.1.11; 2.1.16 - 2.1.19.	
2.1.2.3. The SLTC CUAE weighted average value with the "load" taking into account should be no more than	3,5 - 12,5	8,0 - 21,0	8,0 - 19,5	8,0 - 14,5	

* CUAE - common updated attenuation eguivalent

Distribution of UAE values in typical SSLSP of non-districtive UTN



$CUAE_{nom}$ = 13.9+1.0+4.0+1.5-3.9=16.5 dB

and determined by the expression:

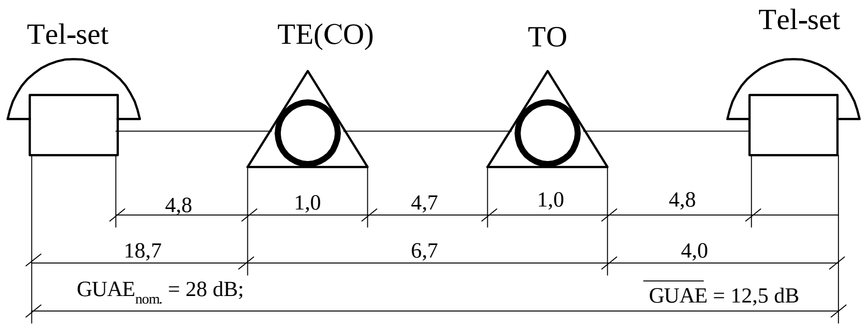
Note: to fig. 2.1.1 - 2.1.19, 2.2.1 - 2.2.11, 2.3.1 - 2.3.11, 2.4.1 - 2.4.4

CUAE values represent the total of the local telephone system updated atteanuation equivalent on transmission ($UAE_{l.s.tr.}$), of telephone exchanges ($UAE_{exch.}$), of channel voice-frequency (UAE_{VF}), physical trunks (UAE_{tr}) local telephone system on reception ($UAE_{l.r.s.}$) of UAE determination because of the impedances mismatch of individual speech path sections (UAEmismatch) and cörrection (D), considering UAE determination of the composite VF channel transit sections number

$$CUAE_{nom} = UAE_{l.s.tr.} + \sum_{1}^{\Pi} UAE_{exch.} + UAE_{vf} + \sum UAE_{tr} + UAE_{l.r.s.} + \Delta UAE_{mismatch} + D$$

Fig. 2.1.1

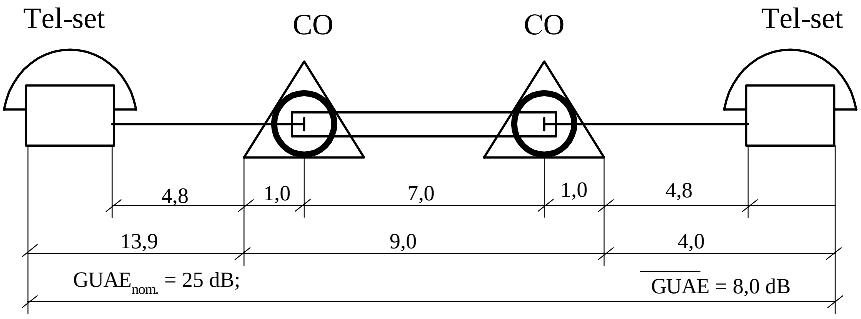
Distribution of UAE values in typical RTN SSLSP
at one-stage radial strucrure



$GUAE_{nom.}$ = 18,7+(2x1,0)+4,7+4,0+2,25-3,9=28,0 dB

Fig. 2.1.2

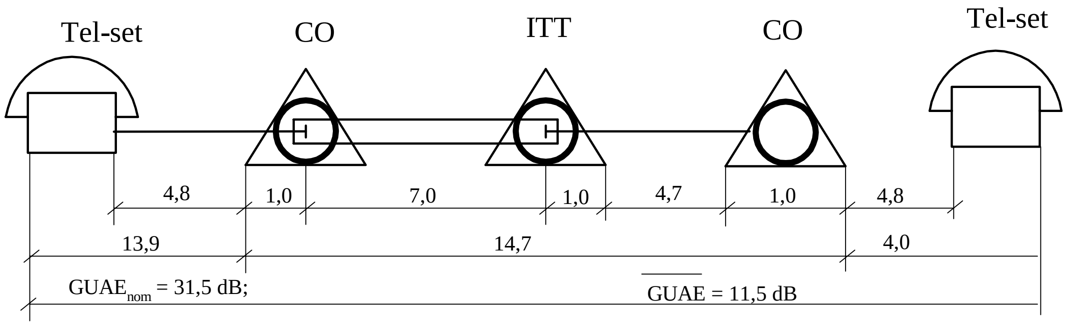
Distribution of UAE values in typical SSLSP of districtive UTN without tandem at FD TS implementation



$$GUAE_{nom.} = 13{,}9+(2x1{,}0)+7{,}0+4{,}0+1{,}5-3{,}3=25{,}0 \text{ dB}$$

Fig. 2.1.3

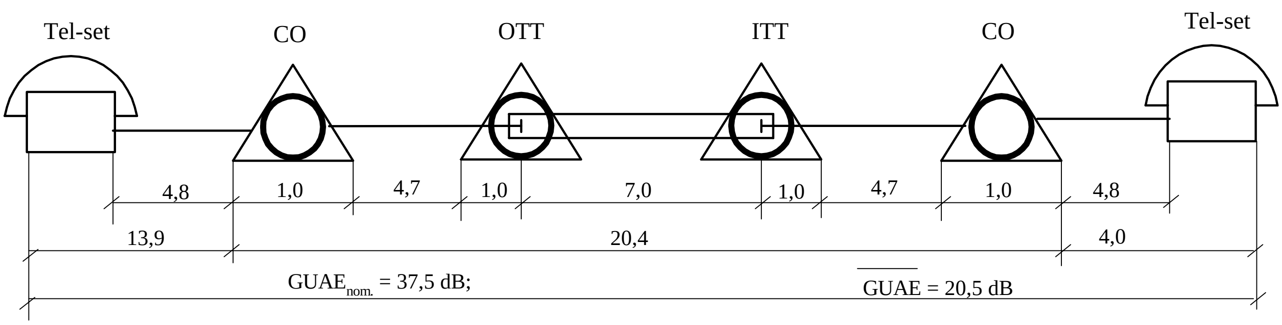
Distribution of UAE values in typical SSLSP of districtive UTN with ITT nodes at FD TS implementation



$$GUAE_{nom.} = 13{,}9+(3x1{,}0)+7{,}0+4{,}7+4{,}0+2{,}25-3{,}3=31{,}5 \text{ dB}$$

Fig. 2.1.4

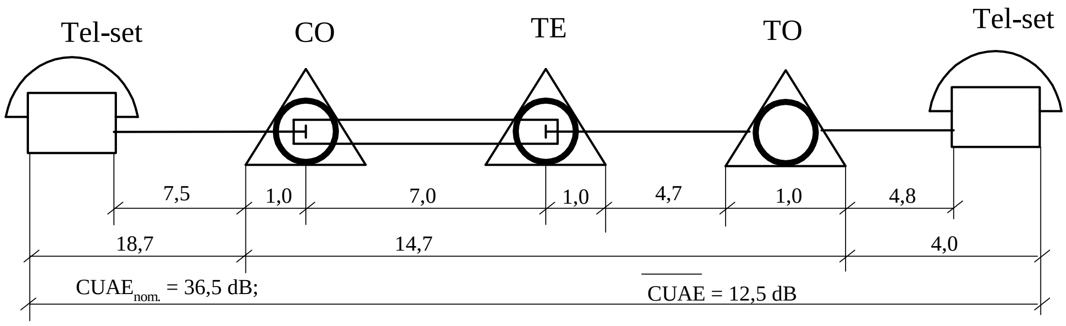
Distribution of UAE values in typical SSLSP of districtive UTN with ITT and OTT nodes at FD TS implementation



$GUAE_{nom.}$ = 13,9+(4x1,0)+7,0+4,7+4,0+3,0-3,3=37,5 dB

Fig. 2.1.5

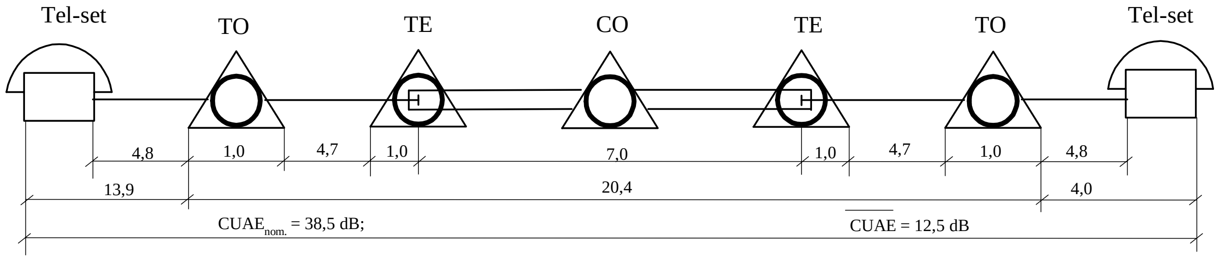
Distribution of UAE values in typical RTN SSLSP at two-stage radial-node structure at FD TS implementation



$$CUAE_{nom.} = 18{,}7+(3x1{,}0)+7{,}0+4{,}7+4{,}0+2{,}25-3{,}3=36{,}5 \text{ dB}$$

Fig. 2.1.6

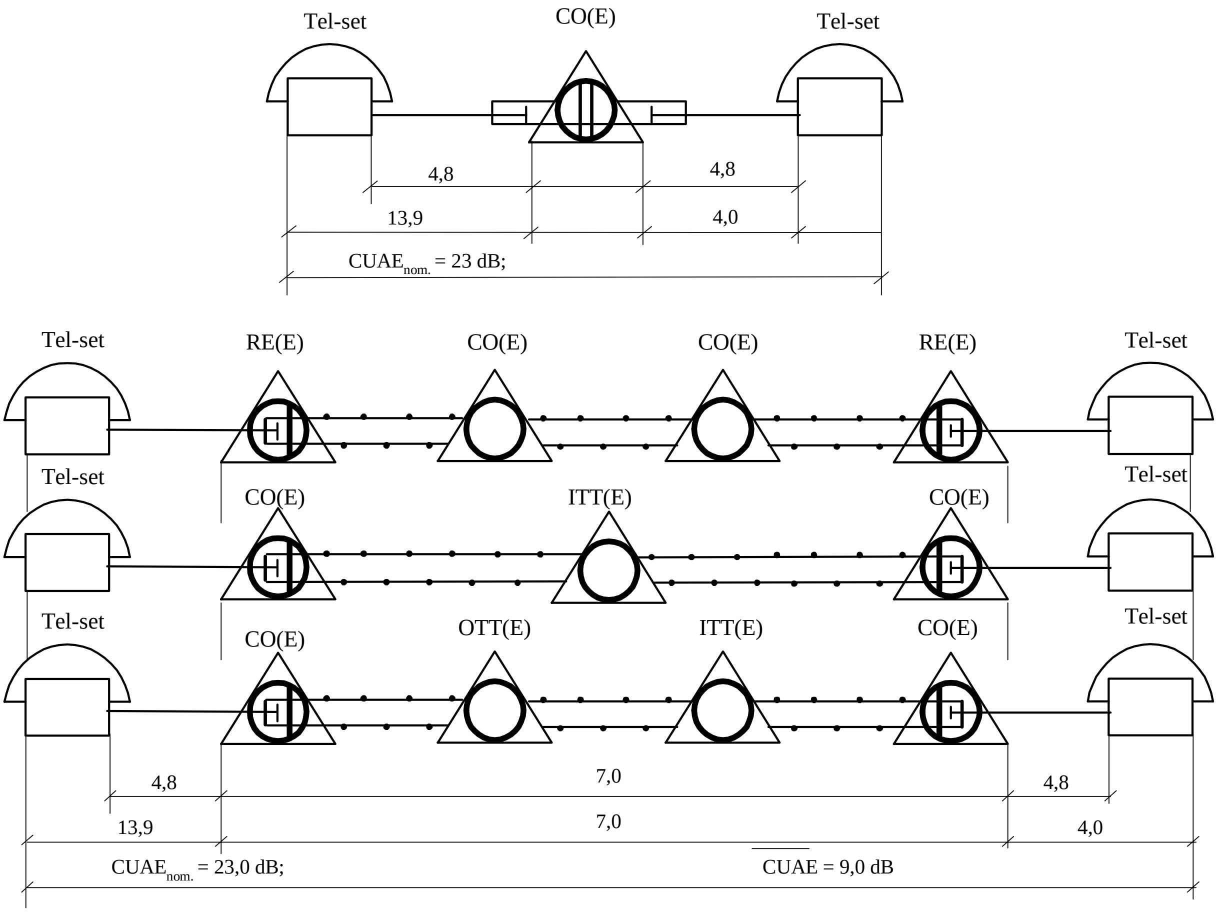
Distribution of UAE values in typical RTN SSLSP
at two-stage radial-node structure at FD TS
implementation



$$CUAE_{nom.} = 13{,}9+(4x1{,}0)+7{,}0+(2x4{,}7)+4{,}0+3{,}0-2{,}7=38{,}5 \text{ dB}$$

Fig. 2.1.7

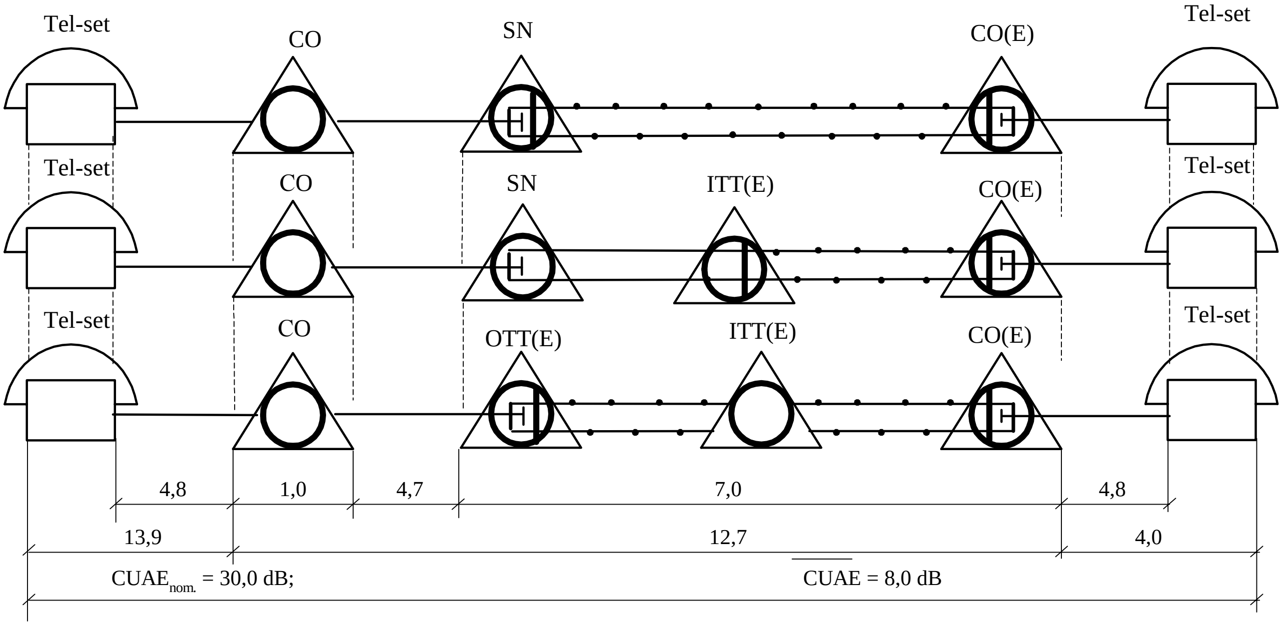
Distribution of UAE values in typical UTN SSLSP
for districtive network at TD TS and electron CO
implementation



$CUAE_{nom.}$ = 13,9+7,0+4,0+1,5-3,3=23,0 dB

Fig. 2.1.8.

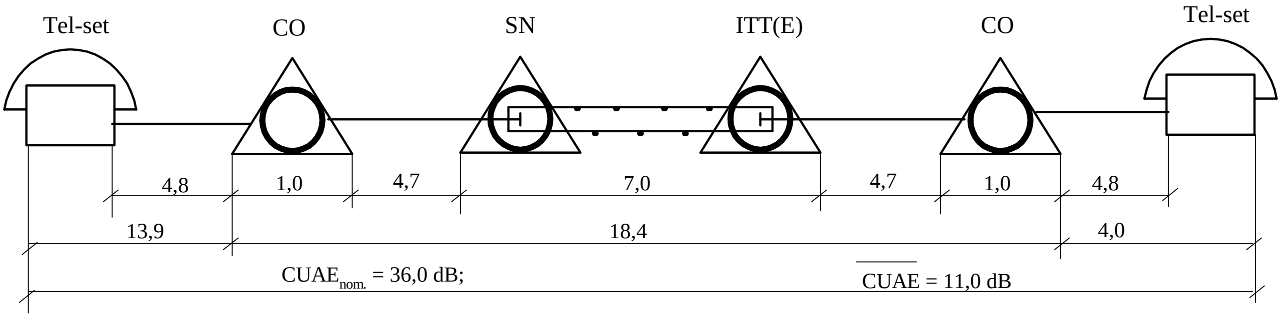
Distribution of UAE values in typical UTN SSLSP for districtive network at TD TS and FD -FD TS implementation



$$CUAE_{nom.} = 13{,}9+1{,}0+7{,}0+4{,}7+4{,}0+2{,}25-2{,}7=30{,}0 \text{ dB}$$

Fig. 2.1.9

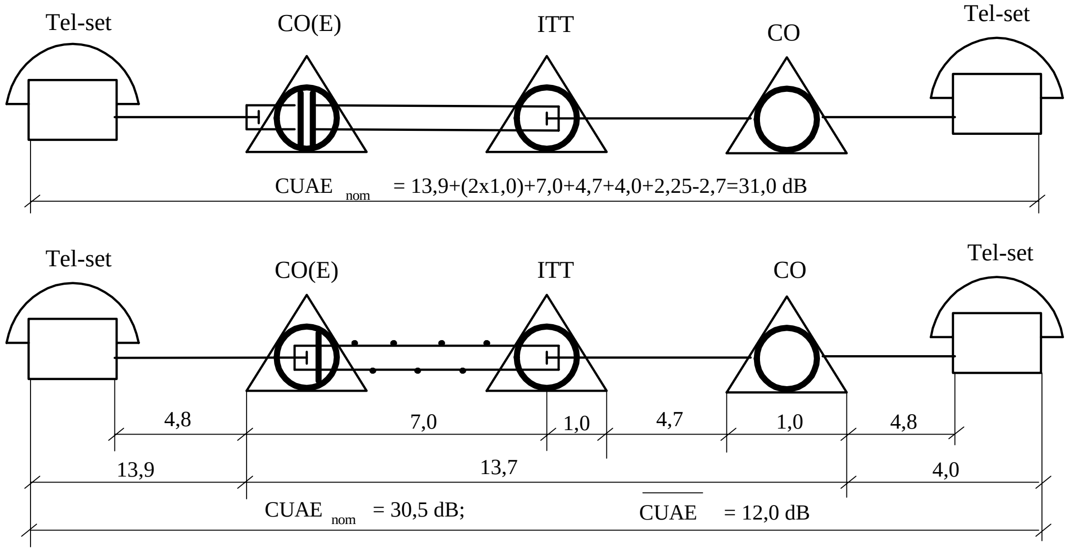
Distribution of UAE values in typical UTN SSLSP
for districtive network at TD TS implementation



$CUAE_{nom.}$ = 13,9+(2x1,0)+7,0+(2x4,7)+4,0+3,0-3,3=36,0 dB

Fig. 2.1.10

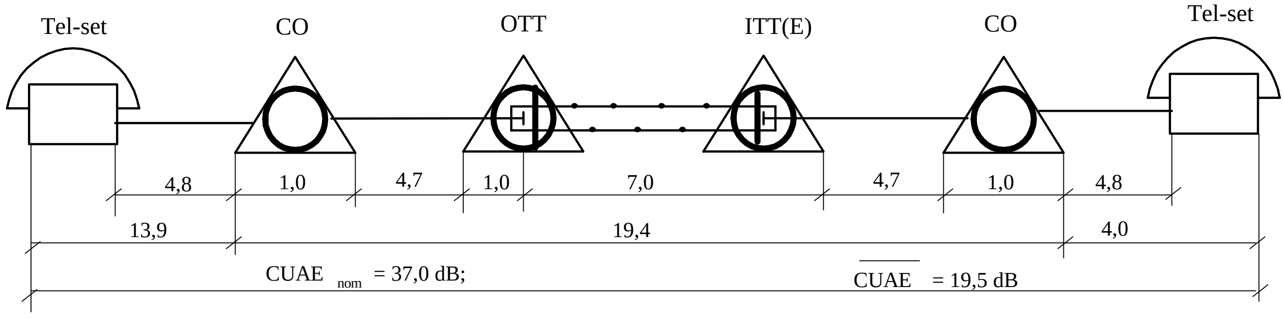
Distribution of UAE values in typical UTN SSLSP for districtive network at FD TS (with ZCO) and TD TS implementation



$$CUAE_{nom} = 13{,}9+(2x1{,}0)+7{,}0+4{,}7+4{,}0+2{,}25-3{,}3=30{,}5 \text{ dB}$$

Fig. 2.1.11

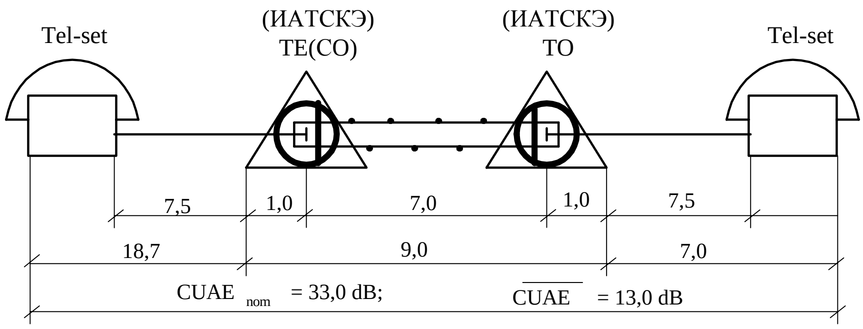
Distribution of UAE values in typical UTN SSLSP
for districtive network at TD TS implementation



$$CUAE_{nom} = 13{,}9+(3x1{,}0)+7{,}0+(2x4{,}7)+4{,}0+3{,}0-3{,}3=37{,}0 \text{ dB}$$

Fig. 2.1.12

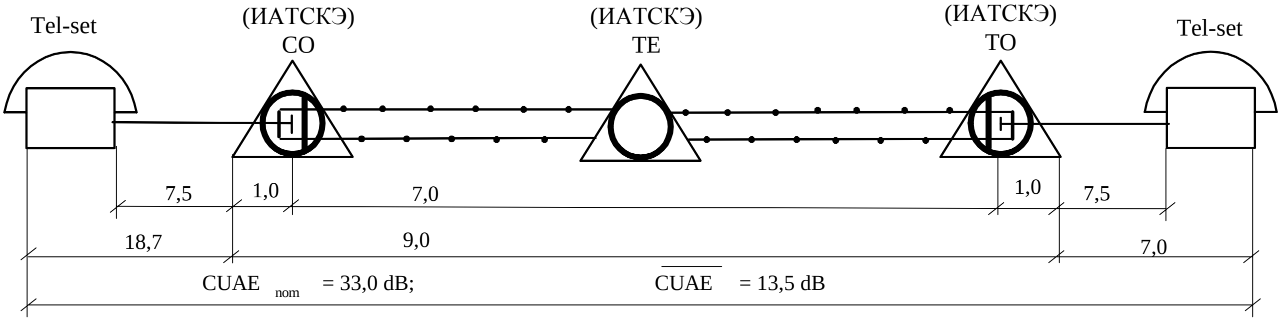
Distribution of UAE values in typical RTN SSLSP at one-stage structure at TD TS implementation



$$CUAE_{nom} = 18{,}7+(2x1{,}0)+7{,}0+7{,}0+1{,}5-3{,}3=33{,}0 \text{ dB}$$

Fig. 2.1.13

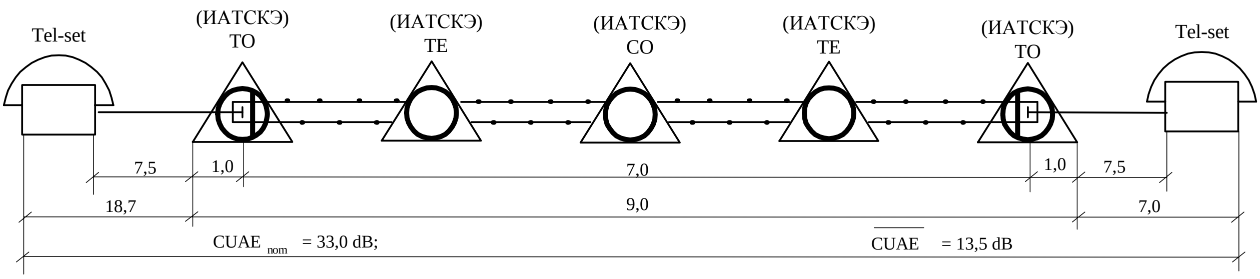
Distribution of UAE values in typical RTN SSLSP at two-stage radial-node structure at TD TS implementation



$$CUAE_{nom} = 18{,}7+(2x1{,}0)+7{,}0+7{,}0+1{,}5-3{,}3=33{,}0 \text{ dB}$$

Fig. 2.1.14

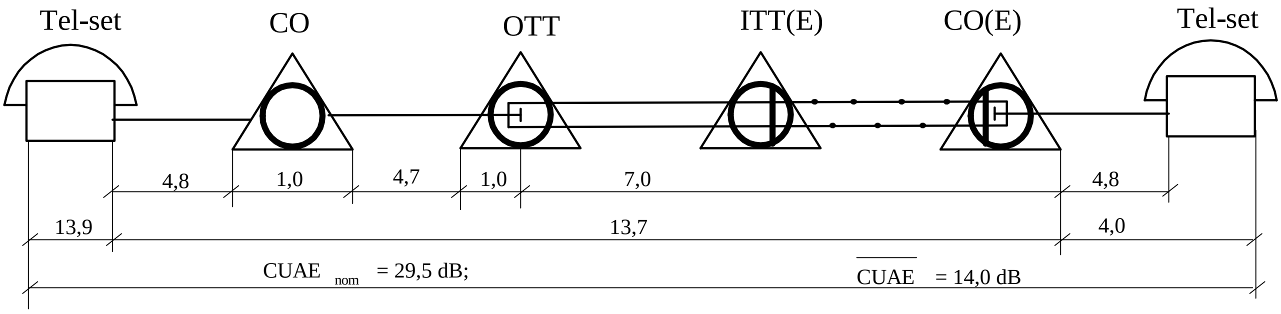
Distribution of UAE values in typical RTN SSLSP
at two-stage radial-node structure at TD TS
implementation



$CUAE_{nom}$ = 18,7+(2x1,0)+7,0+7,0+1,5-3,3=33,0 dB

Fig. 2.1.15

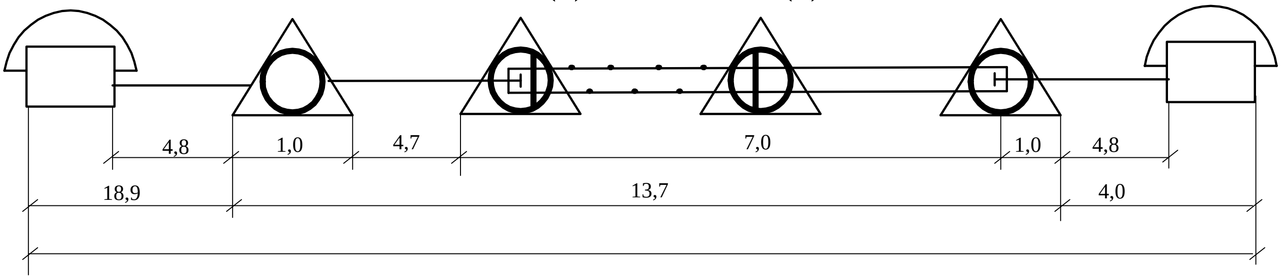
Distribution of UAE values in typical UTN SSLSP
at FD TS and TD TS implementation



$$CUAE_{nom} = 13{,}9+(2x0{,}1)+7{,}0+4{,}7+4{,}0+2{,}25-2{,}7=29{,}5 \text{ dB}$$

Fig. 2.1.16

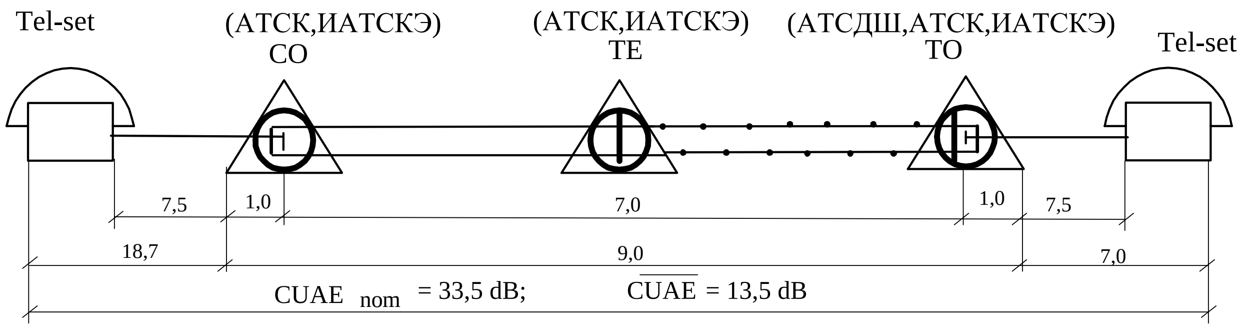
Distribution of UAE values in typical UTN SSLSP for districtive network at FD TS and TD TS implementation



$CUAE_{nom}$ = 13,9+(2x0,1)+7,0+4,7+4,0+2,25-2,7=31,0 dB

Fig. 2.1.17

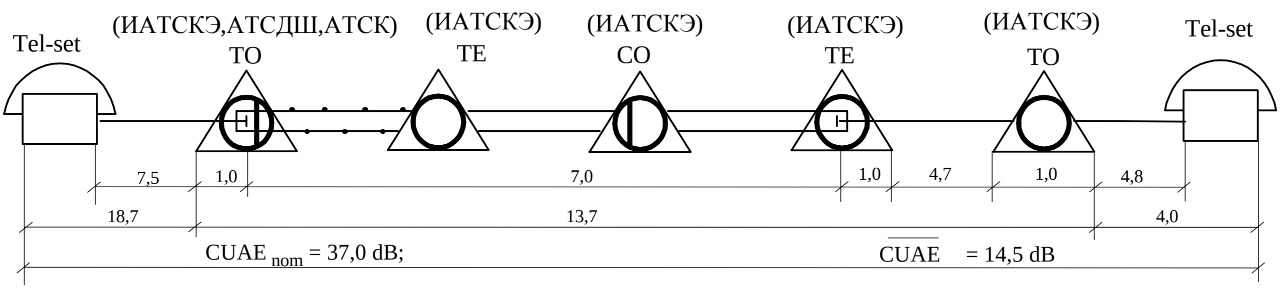
Distribution of UAE values in typical RTN SSLSP at two-stage radial-node structure at FD TS and TD TS implementation



$$CUAE_{nom} = 18{,}7+(2x0{,}1)+7{,}0+7{,}0+1{,}5-2{,}7=33{,}5\ dB$$

Fig. 2.1.18

Distribution of UAE values in typical RTN SSLSP at two-stage radial-node structure at FD TS and TD TS implementation



$CUAE_{nom}$= 18,7+(3x0,1)+7,0+4,7+4,0+2,25-2,7=37,0 dB

Fig. 2.1.19

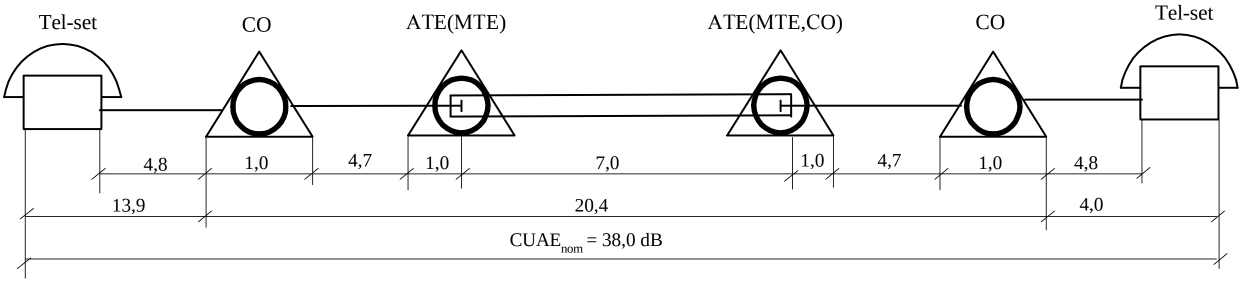
Table 2.2. The subscriber zonal telephone channels of PSTN SZTC

	Norms on analog subscriber channels at implementation of				Nome
	physical trunks	FD TS	TD TS	FD - TD	
1	2	3	4	5	6
2.2.1. Architecture The subscriber zonal telephone channel (SZTC) consists of the zonal telephone channel (ZTC) and the telephone sets, connected to the transmission and the reception ends of ZTC					The norms are obtained by means of calculation (without the TS detervoration factor taking into account) and need to be defined more accurately. All Cќ‡ values are given accurate to the received calculating value reunding off to 0,5 dB.
2.2.2. Attenuation updated equivalents	-	35,0	35,5	35,0	*) The values are defined with the physical trunks and ‘Џ implementation in SZTC
2.2.2.1. The common updated attenuation equivalent SZTC CUAE nominal values should be no more than		40,5*)	40,5*)	40,0*)	
*) SZTC - subscriber zonal telephone channels					

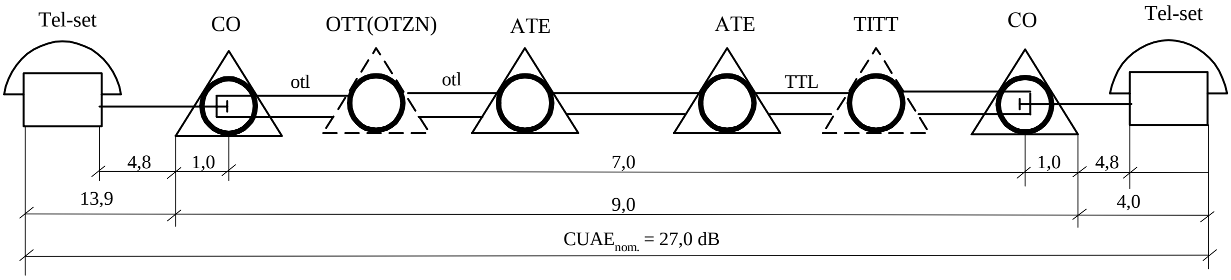
Table 2.2 (The end)

1	2	3	4	5	6
2.2.2.2. The (CUAE) common updated attenuation eguivalent nominal values distribution in standard SZTC.	-	Fig. 2.2.1-2.2.4	Fig. 2.2.5-2.2.11	Fig. 2.2.5-2.2.11	
2.2.2.3. The SZTC CUAE average values ranges without the "load" taking into account, should be no more, than dB.	-	23,0 *)	12,0 - 18,0	12,0 - 28,0	*) The value is defined with the "load" accounting.

Distribution of UAE values in typical SSZSP (automatic, semi-automatic and manual communication of UTN subscriber) at FD TS implementatien



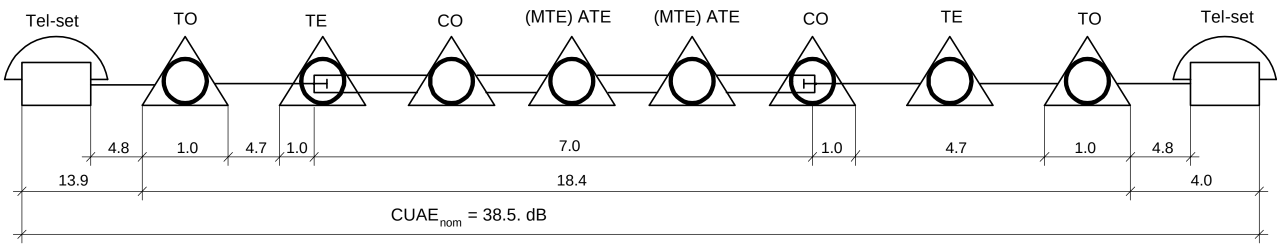
$$CUAE_{nom} = 13,9+(4x1,0)+7,0+(2x4,7)+4,0+3,0-3,3=38,0 \text{ dB}$$



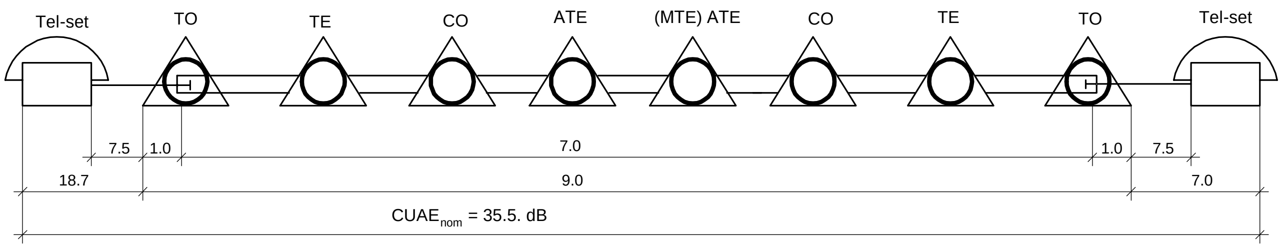
$$CUAE_{nom.} = 13,9+(2x1,0)+7,0+4,0+1,5-1,2=27,0 \text{ dB}$$

Fig. 2.2.1

Distribution of UAE values in typical SSZSP (automatic, semi-automatic and manual communication of RTN subscriber) at FD TS implementatien



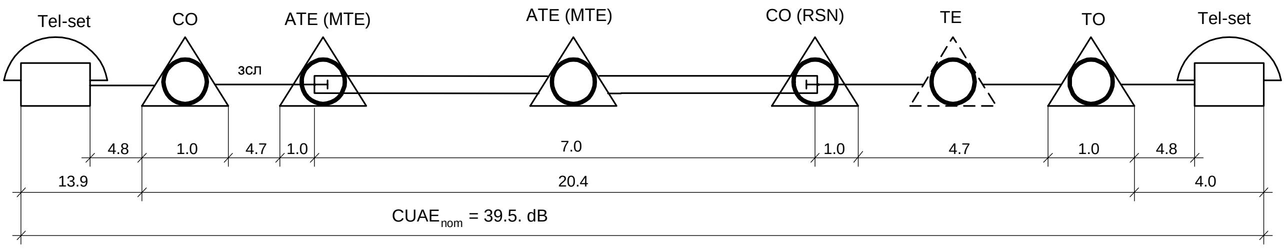
$CUAE_{nom}$ = 13.9+(4 x 1.0)+7.0+(2 x 4.7)+4.0+3.75-1.5 = 38.5 dB



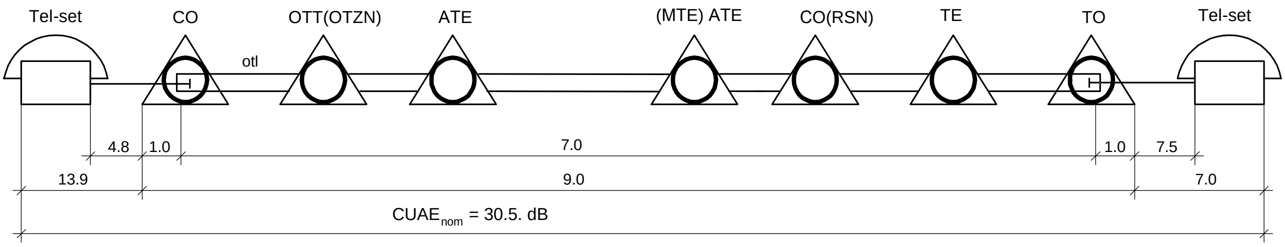
$CUAE_{nom}$ = 18.7+(4 x 1.0)+7.0+(2 x 4.7)+4.0+3.75-2.7 = 35.5 dB

Fig. 2.2.2

Distribution of UAE values in typical SSZSP (automatic, semi-automatic and manual communication of UTN and RTN subscriber) at FD TS implementatien



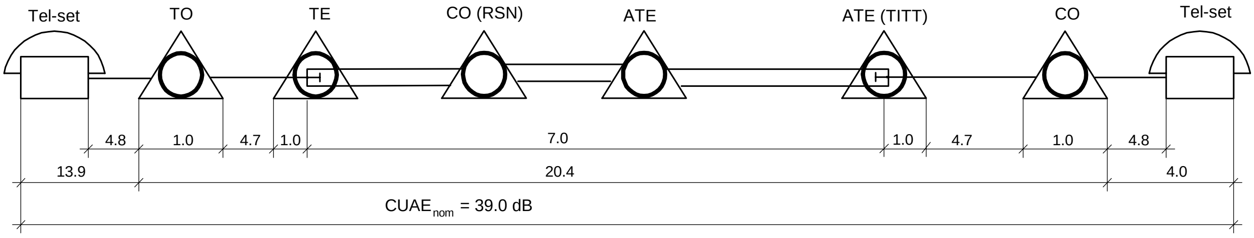
$$CUAE_{nom} = 13.9+(4 \times 1.0)+7.0+(2 \times 4.7)+4.0+3.75-2.7 = 39.5 \text{ dB}$$



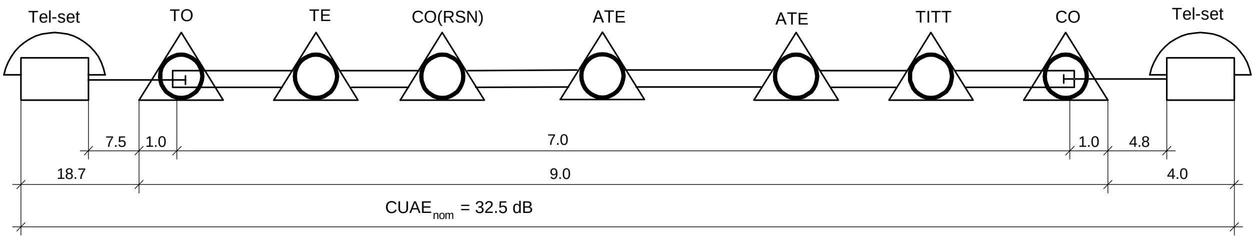
$$CUAE_{nom} = 13.9+(2 \times 1.0)+7.0+ 7.0+1.7-0.9 = 30.5 \text{ dB}$$

Fig. 2.2.3

Distribution of UAE values in typical SSZSP (automatic, semi-automatic and manual communication of UTN and RTN subscriber) at FD TS implementatien



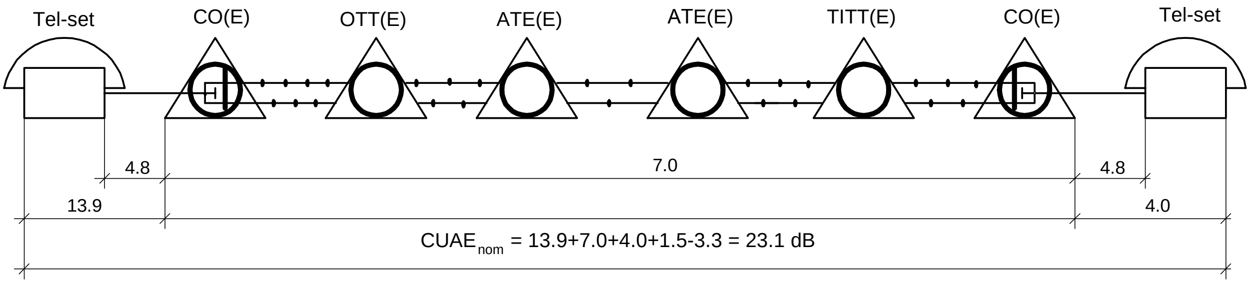
$$CUAE_{nom} = 13.9+(4 \times 1.0)+7.0+4.0+3.0+(2 \times 4.7)-2.1 = 39.0 \text{ dB}$$

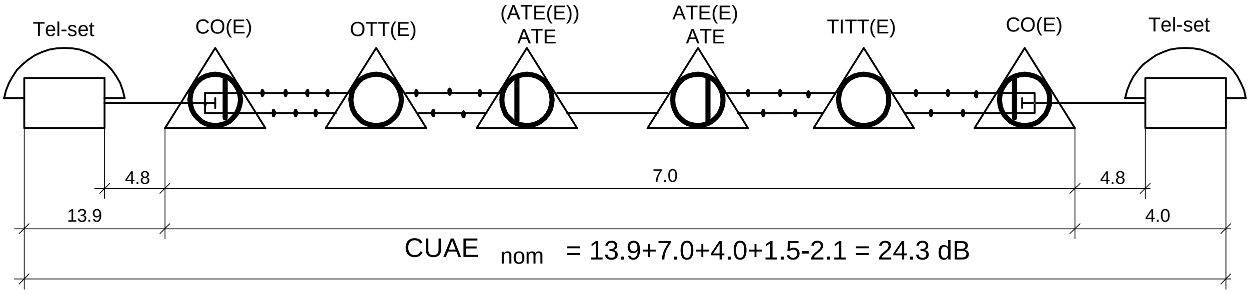


$$CUAE_{nom} = 18.7+(2 \times 1.0)+7.0+ 4.0+1.5-0.9 = 32.5 \text{ dB}$$

Fig. 2.2.4

Distribution of UAE values in typical SSZSP (the UTN subscribers automatic communication) at FD TS and TD TS implementatien





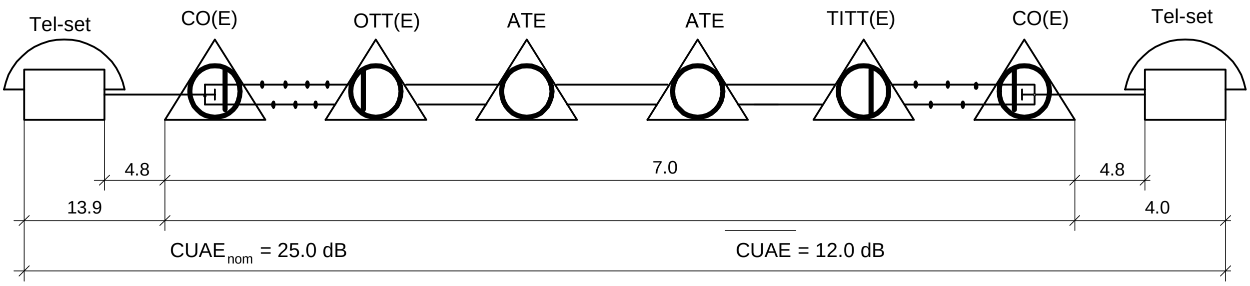


Fig. 2.2.5

Distribution of UAE values in typical SSZSP (the UTN subscribers automatic communication) at FD TS and TD TS implementatien

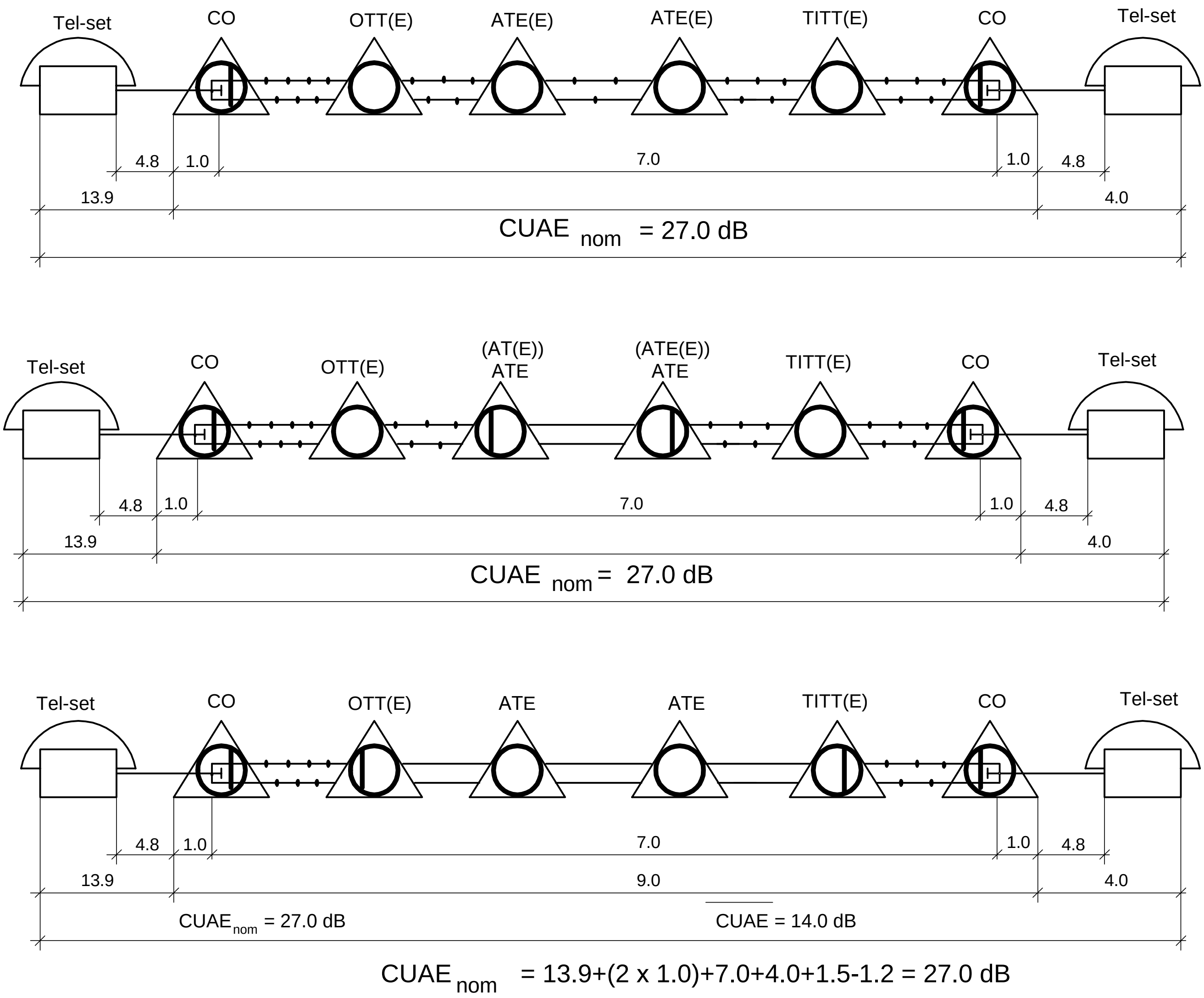


Fig. 2.2.6

Distribution of UAE values in typical SSZSP (the UTN subscribers automatic communication) at FD TS and TD TS implementatien

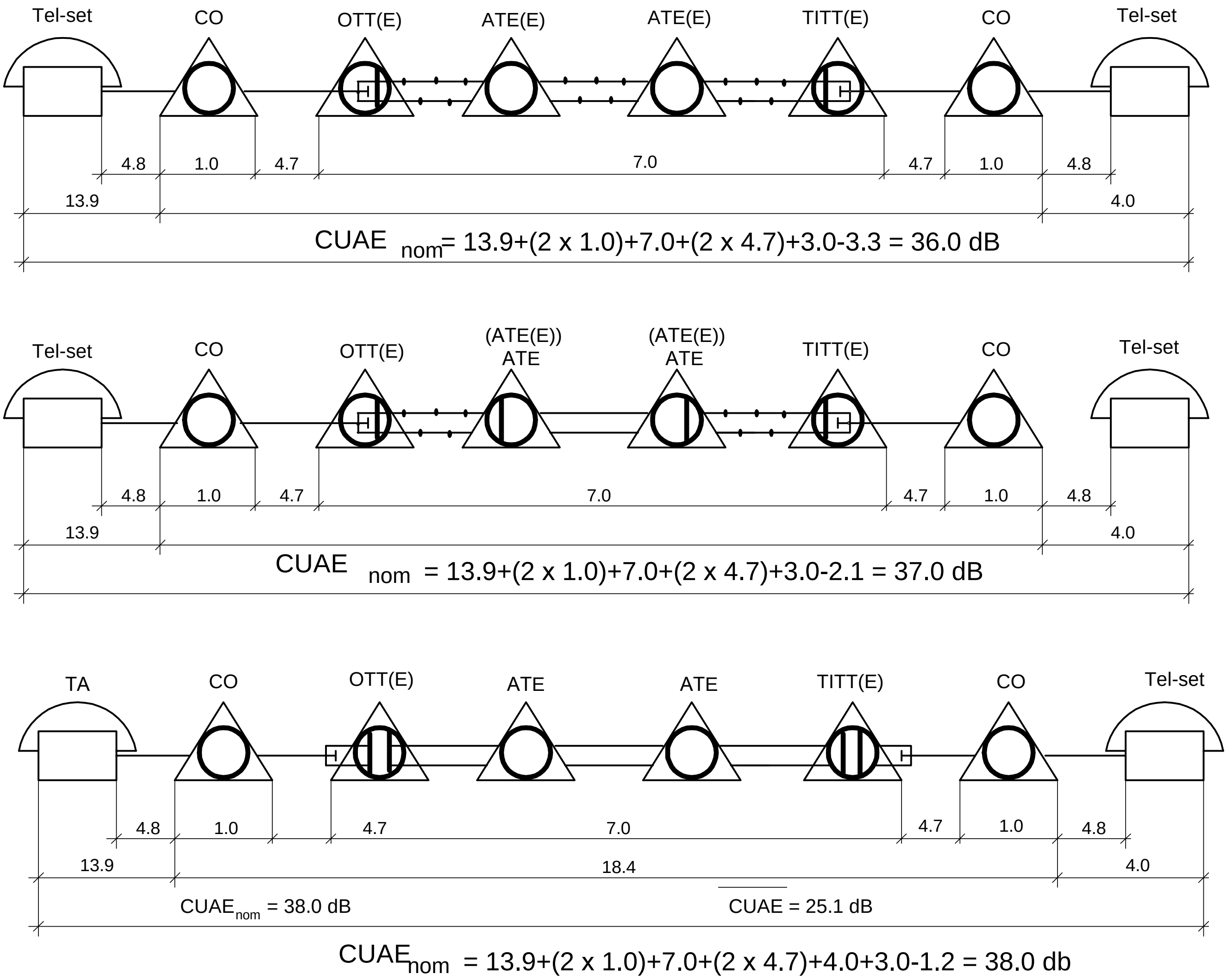


Fig. 2.2.7

Distribution of UAE values in typical SSZSP (the UTN and RTN subscribers automatic communication) at FD TS and TD TS implementatien

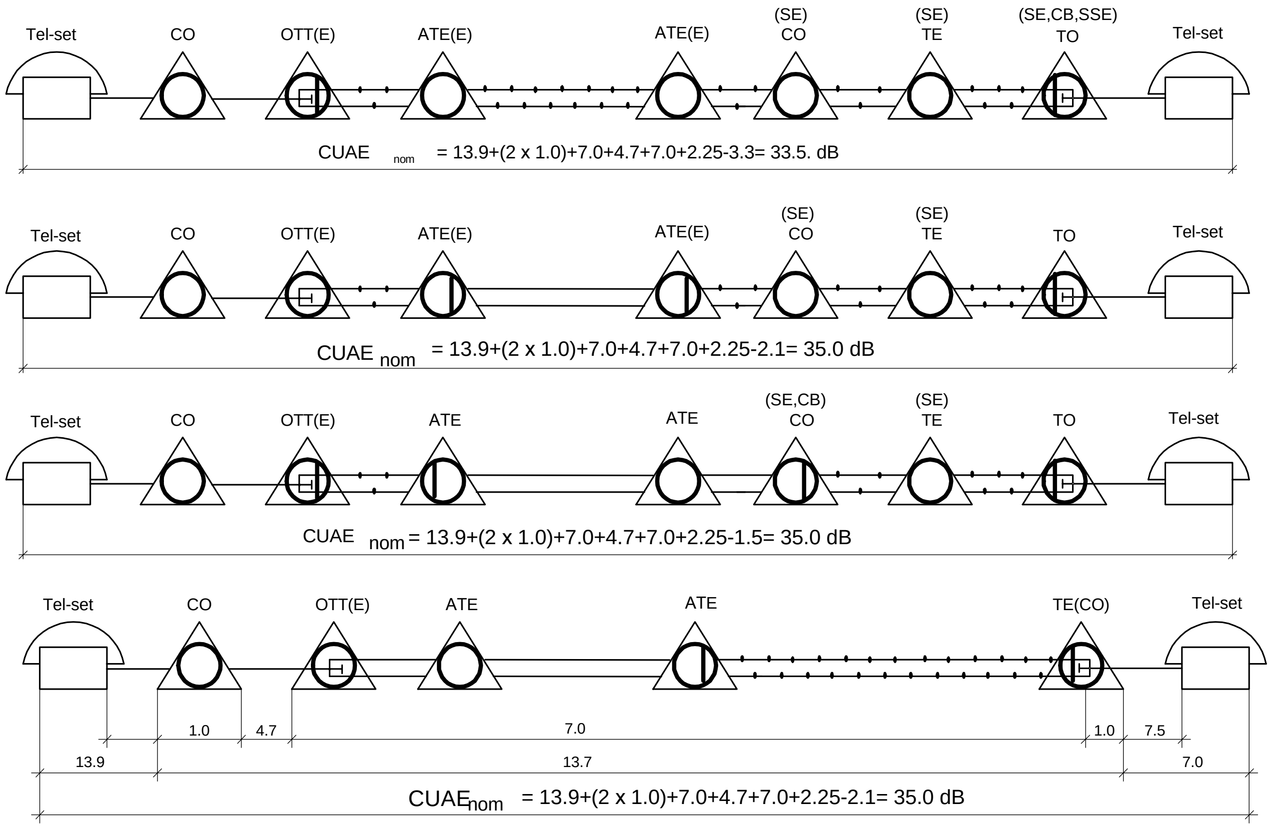


Fig. 2.2.8

Distribution of UAE values in typical SSZSP (the RTN subscribers automatic communication) at FD TS and TD TS implementatien

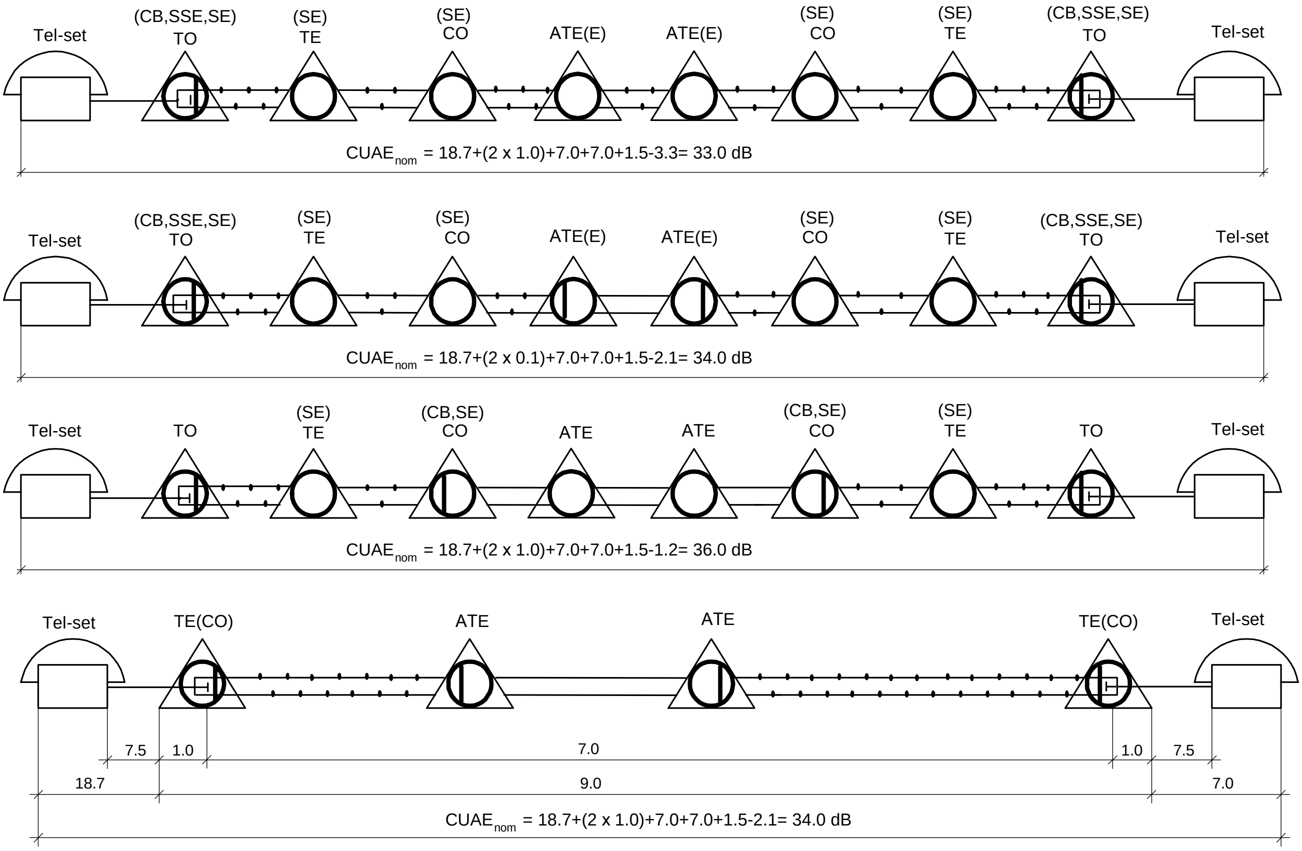


Fig. 2.2.9

Distribution of UAE values in typical SSZSP (the RTN subscribers automatic communication) at FD TS and TD TS implementatien

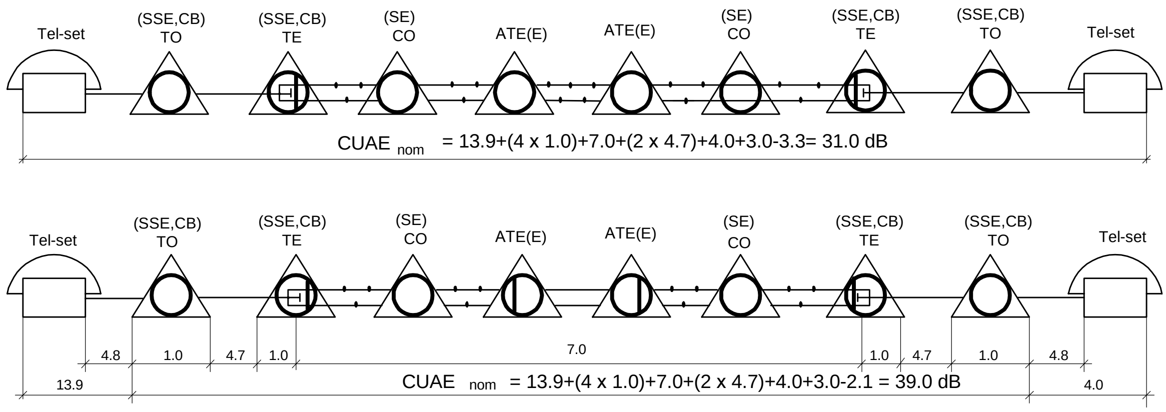


Fig. 2.2.10

Distribution of UAE values in typical SSZSP (the RTN subscribers automatic communication) at FD TS and TD TS implementatien

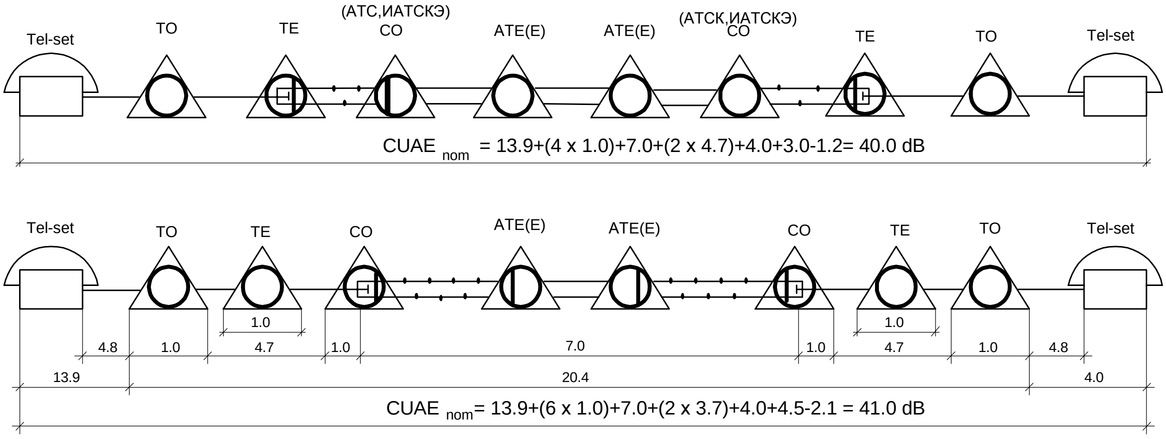
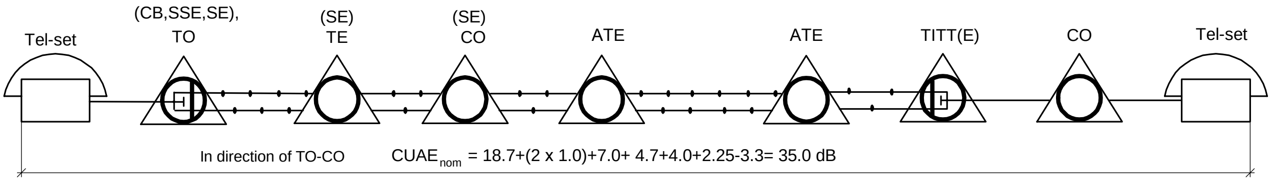


Fig. 2.2.10 a)

Distribution of UAE values in typical SSZSP (the RTN-UTN subscribers automatic communication) at FD TS and TD TS implementatien



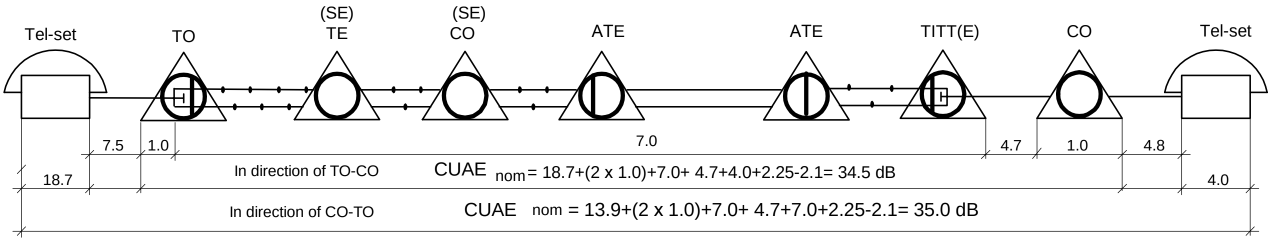


Fig. 2.2.11

Distribution of UAE values in typical SSZSP (the RTN-UTN subscribers automatic communication) at FD - TD TS implementatien

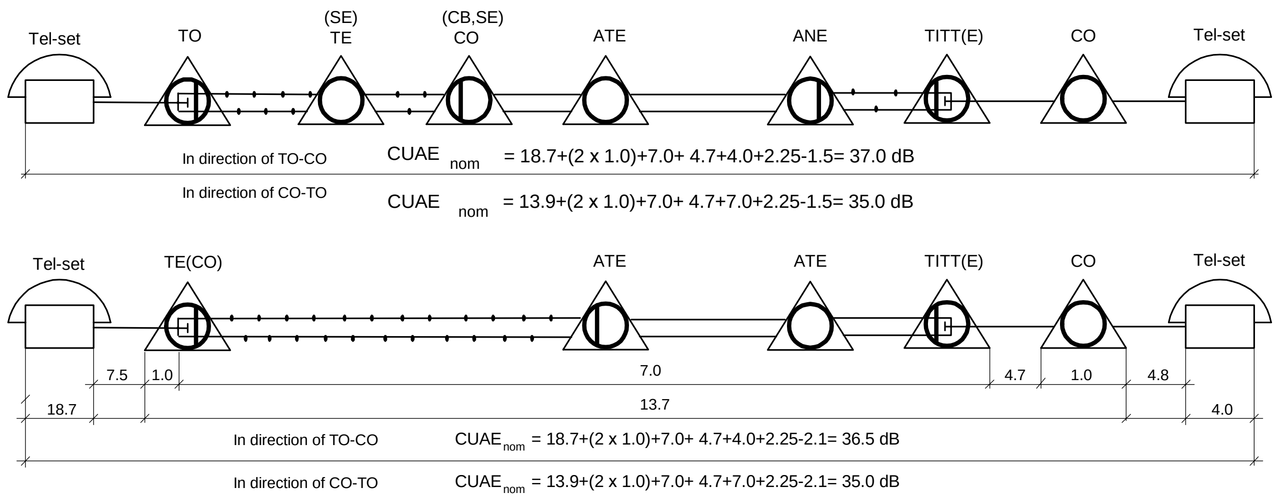


Fig. 2.2.11 a)

Table 2.3. The PSTN subscriber toll telephone channels (STTC) *

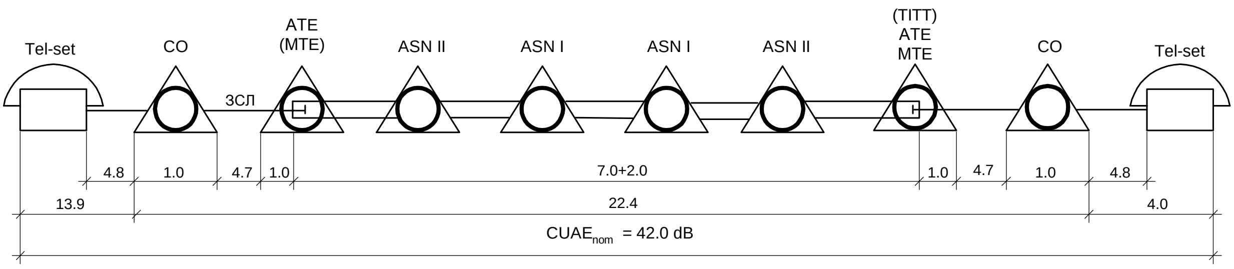
	Norms on analog subscriber channels at implementation of				Nome
	physical trunks	FD TS	TD TS	FD - TD	
1	2	3	4	5	6
2.3.1 Architecture. The subscriber toll telephone channel (STTC) consists of the toll telephone channel (TTC) and telephone sets, connected to the transmission and the reception ends of TTC**					The norms are obtained by means of calculating (without the TS deterioration factor taking into account) and need to be defined more accurately all UAE value are given accurate to the received calculating value rounding off to 0,5 dB.
2.3.2. Attenuation updated equivalents					
2.3.2.1. The common updated attenuation equivalent STTC CUAE nominal values should be no more than, dB	-	38,0 43,5*)	38,0 40,0*)	38,0 42,0*)	*) The values are defined with the physical trunks and ‘Ц implementation in STTC.
2.3.2.2. The updated attenuation equivalent nominal values distribution in the standard STTC	-	Fig. 2.3.1-2.3.4	Fig. 2.3.5-2.3.11	Fig. 2.3.5-2.3.11	

* STTC - subscriber toll telephone channels
** TTC - toll telephone channels

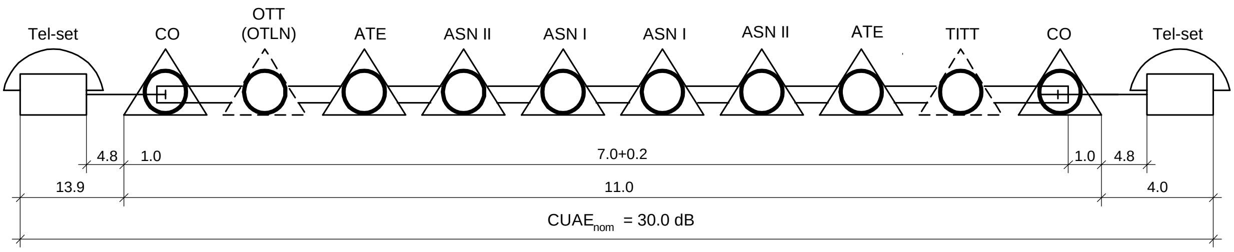
Table 2.3. (Cont.)

1	2	3	4	5	6
2.3.2.3. The STTC CUAE average values range without the "load" taking into account should be no more than,dB		*) 24,0	15,0 - 20,5	17,0 - 29,0	*) The norm is defined with the "load" taking into account.
i2.3.2.4. The SZTC and STTS sections from TS to the minus 3,5 dB point of theswitching node which the VF channel begins on attenuation updated eguivalents nominal values shoukd be no more than,dB. on transmission on reception	30,5 16	19,0 *) 35,0 12,5 *) 15,0	18,0 *) 24,9 12,5 *) 15,0	19,0 *) 25,0 12,5 *) 15,0	*) The values are defined of the physical trunks and implementation of the transmission system
2.3.2.5. The SZTC and STTS sections from TS to the minus 3,5 dB point of the switching node which the VFchannel begins on the UAE least values should be no less,than,dB	5,5	5,5	3,5	5,5	

Distribution of UAE values in typical SSTSP (automatic, semiautomatic and manual communication of UTN subscriber) at FD TS implementation



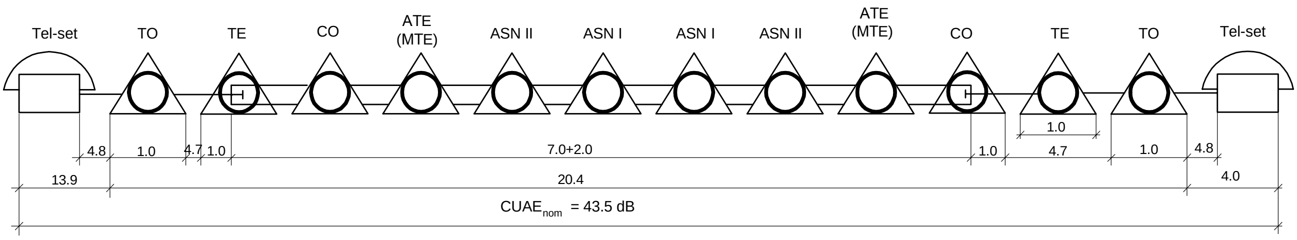
$$CUAE_{nom.} = 13.9+(4 \times 1.0)+(4 \times 0.5)+7.0+(2 \times 4.7)+4.0+3.0-1.2 = 42.0 \text{ dB}$$



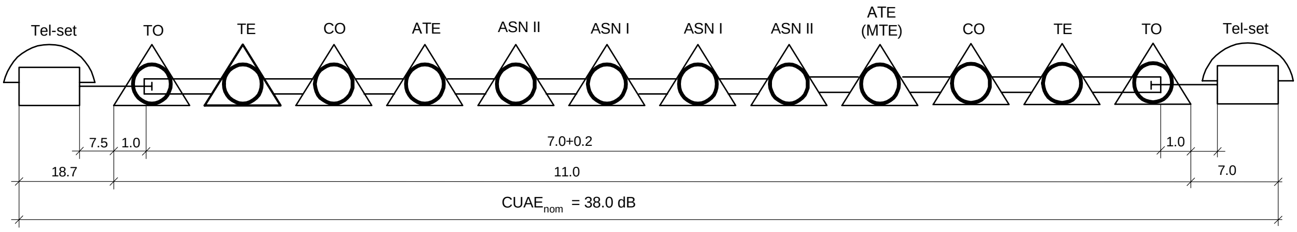
$$CUAE_{nom.} = 13.9+(2 \times 1.0)+(4 \times 0.5)+7.0+4.0+1.5-0.3 = 30.0 \text{ dB}$$

Fig. 2.3.1

Distribution of UAE values in typical SSTSP (automatic, semiautomatic and manual communication of RTN subscriber) at FD TS implementation



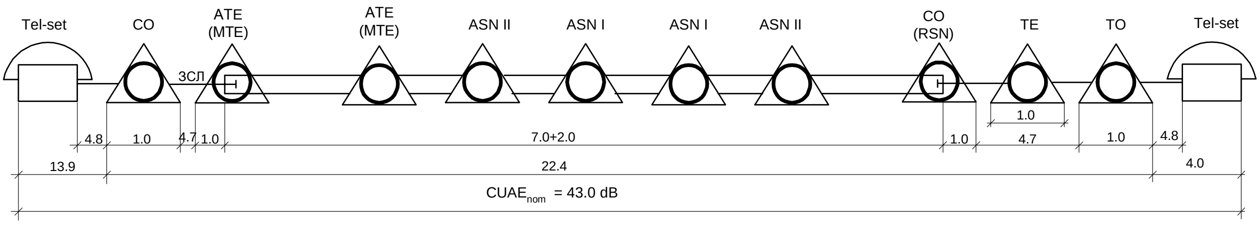
$$CUAE_{nom.} = 13.9+(4 \times 1.0)+(4 \times 0.5)+7.0+(2 \times 4.7)+4.0+3.75-0.4 = 43.5 \text{ dB}$$



$$CUAE_{nom.} = 18.7+(2 \times 1.0)+(4 \times 0.5)+7.0+7.0+1.5-0.1 = 38.0 \text{ dB}$$

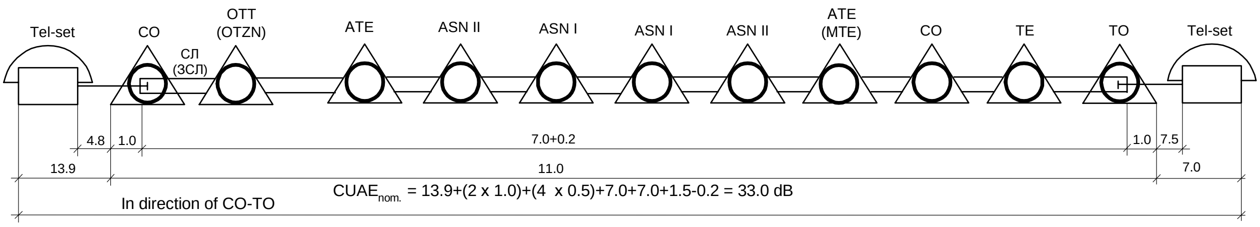
Fig. 2.3.2

Distribution of UAE values in typical SSTSP (automatic, semiautomatic and manual communication of UTN and RTN subscribers) at FD TS implementation



CUAE$_{nom.}$ = 13.9+(4 x 1.0)+(4 x 0.5)+7.0+(2 x 4.7)+4.0+3.75-0.9 = 43.0 dB

Note: CUAE$_{nom}$ is the same in CO-TO and NO-CO directions

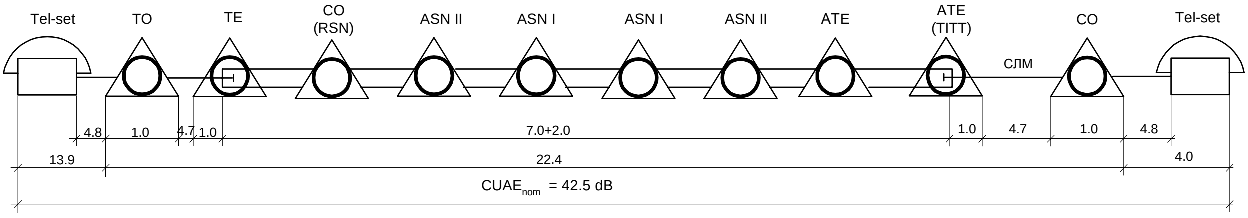


In direction of TO-CO

CUAE$_{nom.}$ = 18.7+(2 x 1.0)+(4 x 0.5)+7.0+4.0+1.5-0.2 = 35.0 dB

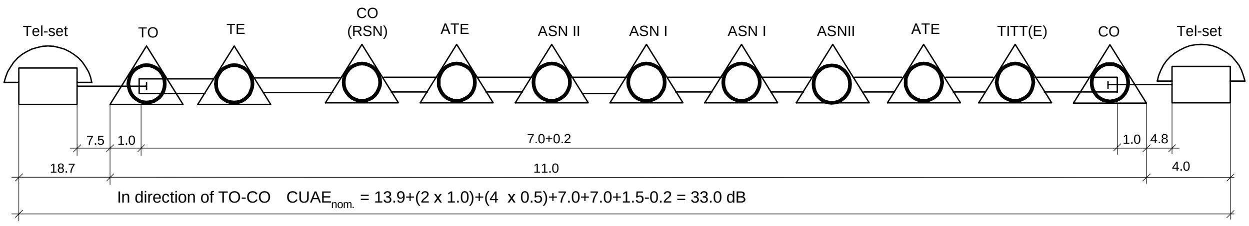
Fig. 2.3.3

Distribution of UAE values in typical SSTSP (automatic, semiautomatic and manual communication of RTN and UTN subscribers) at FD TS implementation



CUAE$_{nom.}$ = 13.9+(4 x 1.0)+(4 x 0.5)+7.0+(2 x 4.7)+4.0+3.0-0.6 = 42.5 dB

Note: CUAE$_{nom}$ is the same in TO-CO and CO-TO directions



In direction of TO-CO CUAE$_{nom.}$ = 13.9+(2 x 1.0)+(4 x 0.5)+7.0+7.0+1.5-0.2 = 33.0 dB

In direction of CO-TO CUAE$_{nom.}$ = 18.7+(2 x 1.0)+(4 x 0.5)+7.0+4.0+1.5-0.2 = 35.0 dB

Fig. 2.3.4

Distribution of UAE values in typical SSTSP (UTN subscribers automatical communication) at TD TS and FD TS implementation

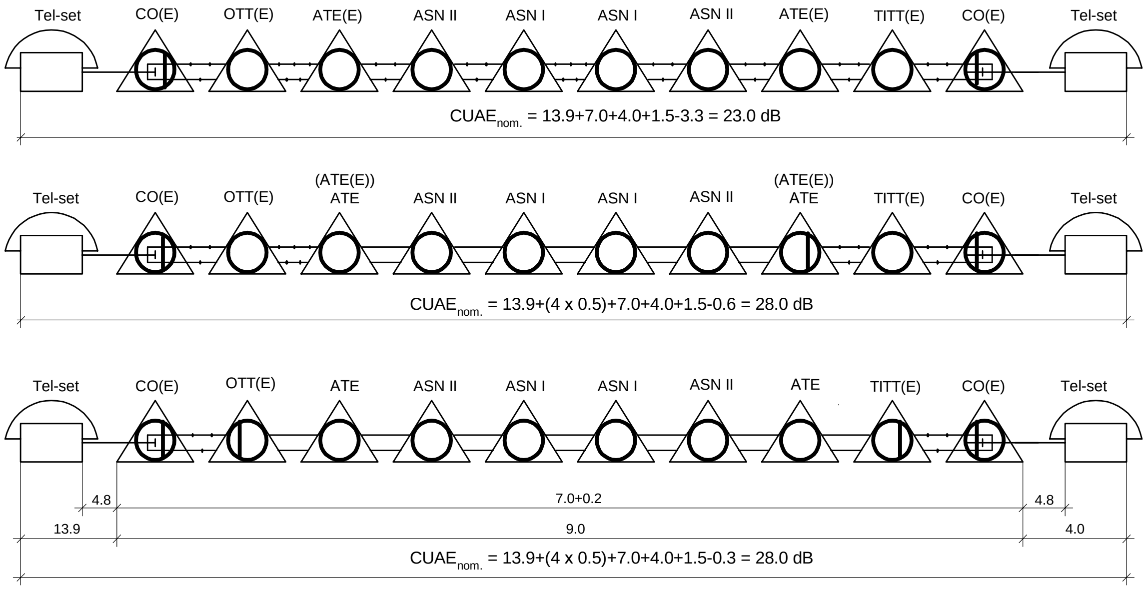


Fig. 2.3.5

Distribution of UAE values in typical SSTSP (UTN subscribers automatical communication) at TD TS and FD TS implementation

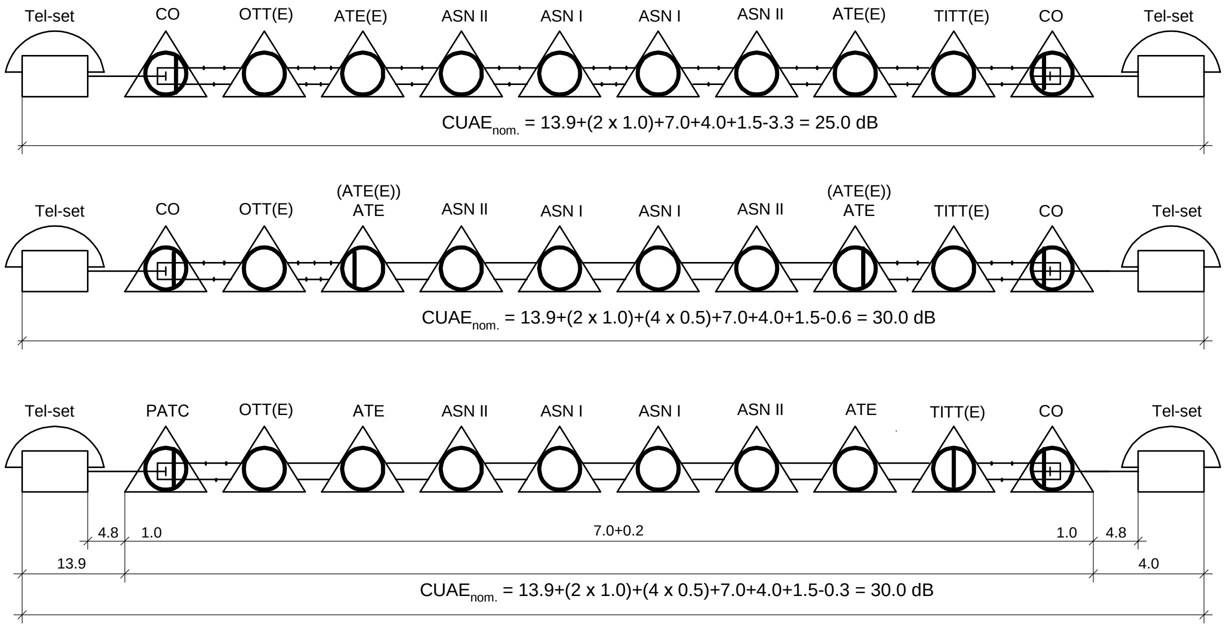


Fig. 2.3.6

Distribution of UAE values in typical SSTSP (UTN subscribers automatical communication) at TD TS and FD TS implementation

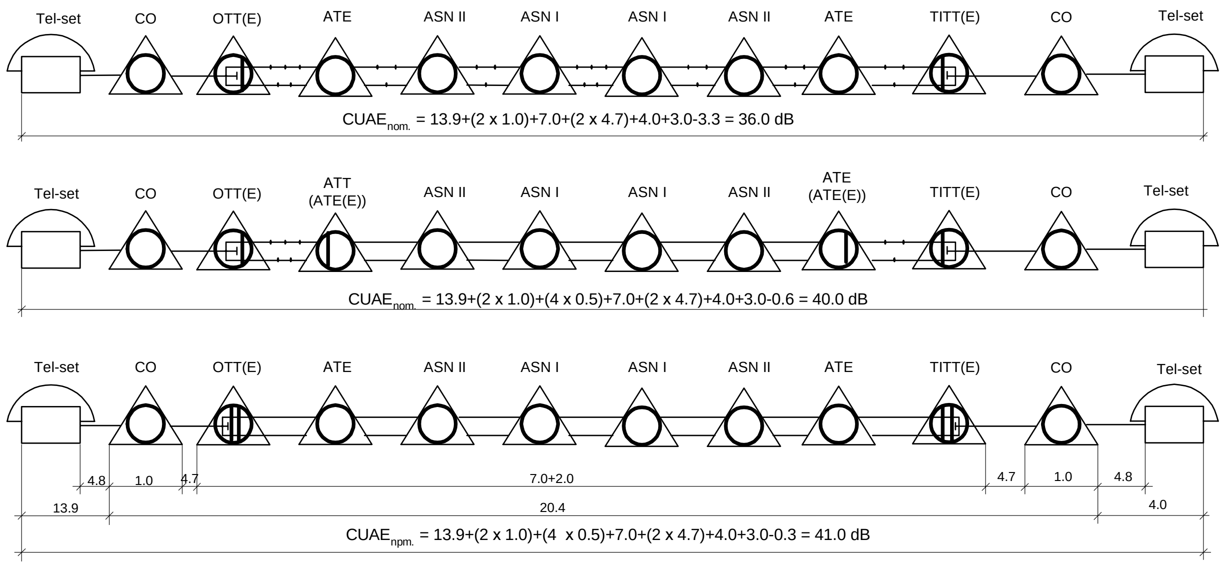


Fig. 2.3.7

Distribution of UAE values in typical SSTSP (RTN subscribers automatical communication) at TD TS and FD TS implementation

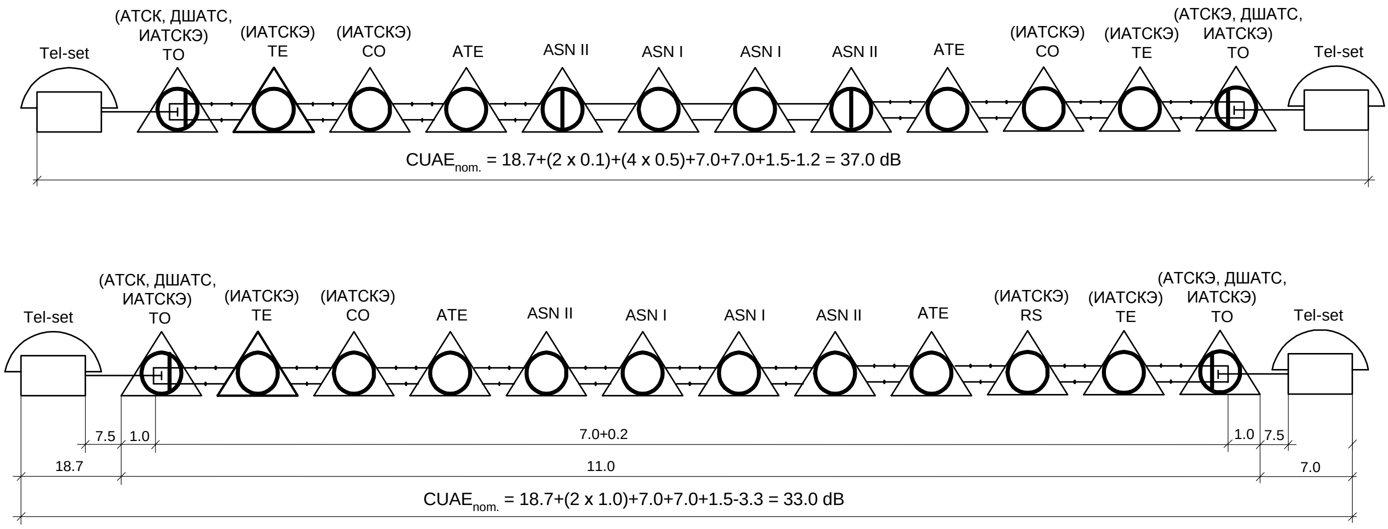


Fig. 2.3.8

Distribution of UAE values in typical SSTSP (RTN subscribers automatical communication) at TD TS and FD TS implementation

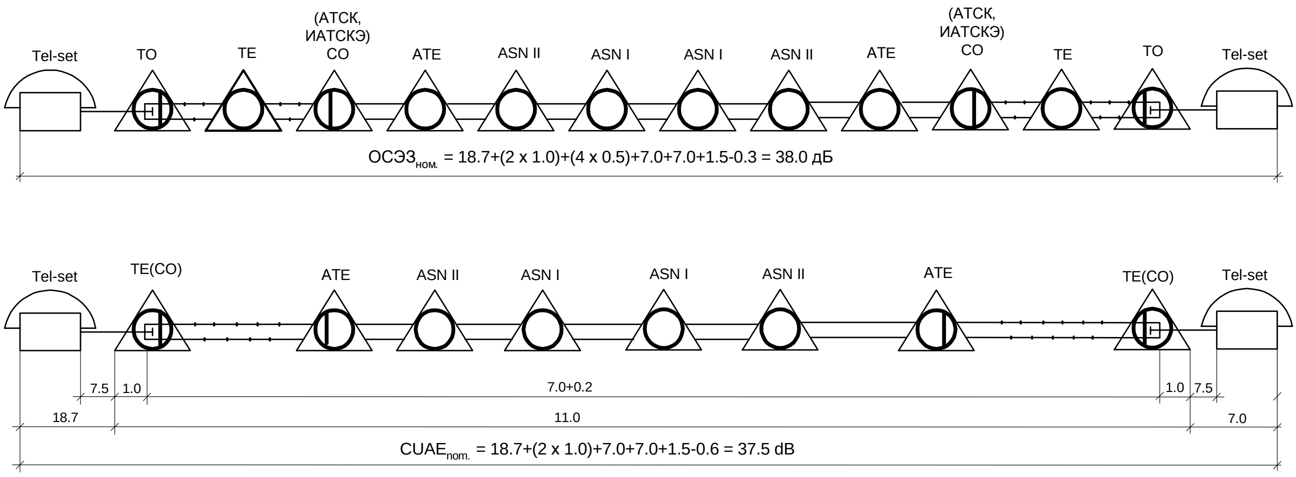


Fig. 2.3.8 a)

Distribution of UAE values in typical SSTSP (RTN subscribers automatical communication) at TD TS and FD TS implementation

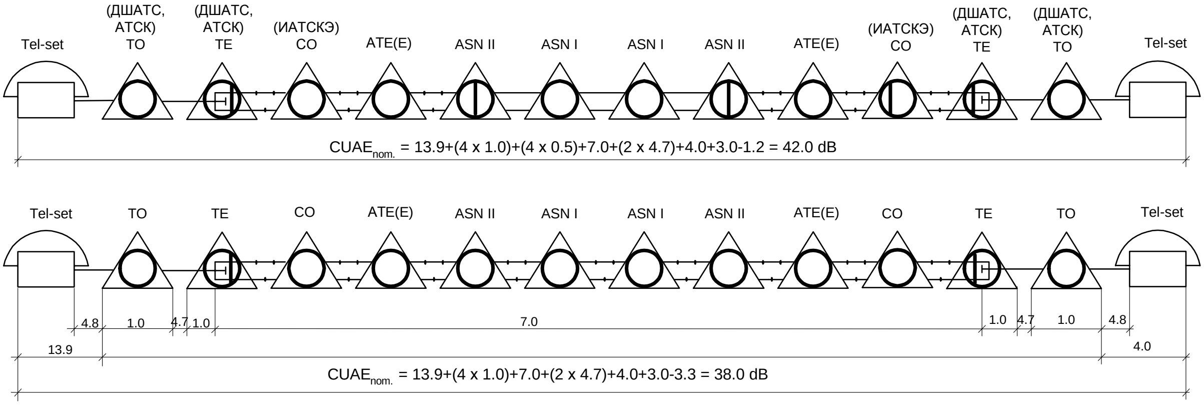


Fig. 2.3.9

Distribution of UAE values in typical SSTSP (RTN subscribers automatical communication) at TD TS and FD TS implementation

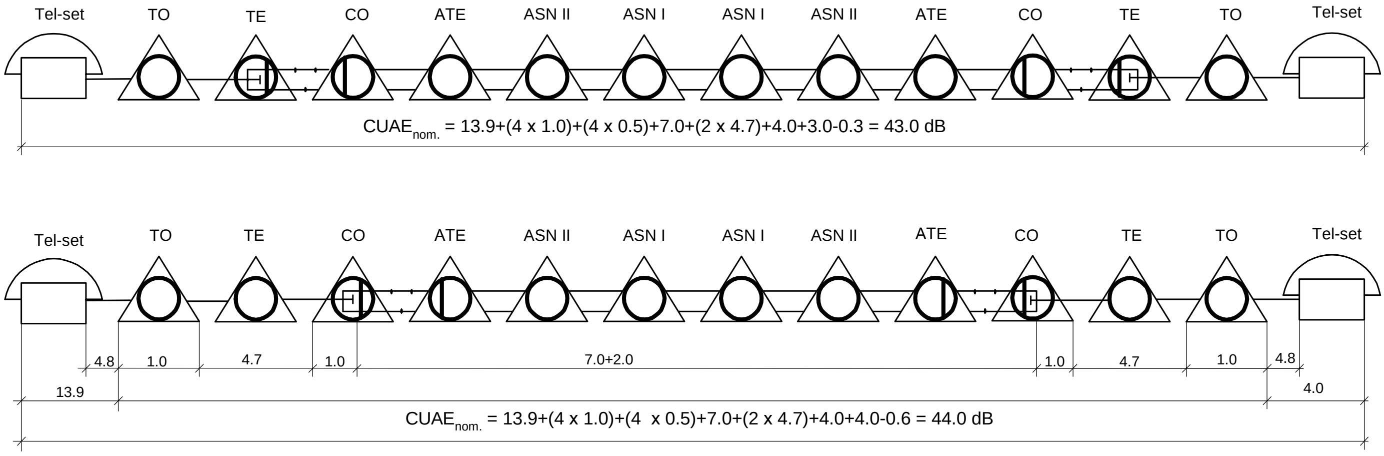


Fig. 2.3.9 a)

Distribution of UAE values in typical SSTSP (UTN-RTN subscribers automatical communication) at TD TS and FD TS implementation

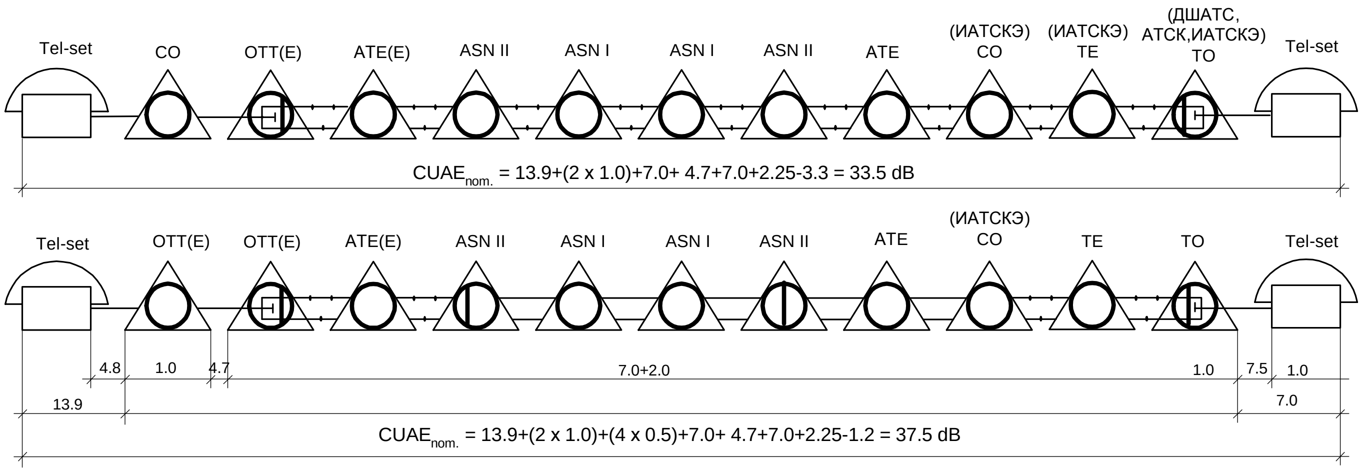


Fig. 2.3.10

Distribution of UAE values in typical SSTSP (UTN-RTN subscribers automatical communication) at TD TS and FD TS implementation

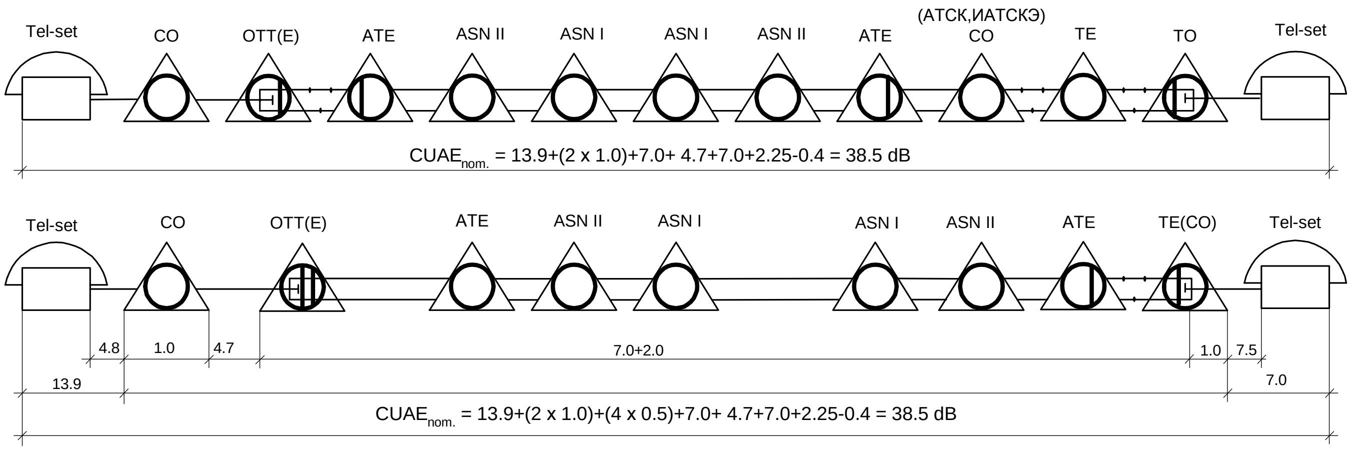


Fig. 2.3.10 a)

Distribution of UAE values in typical SSTSP (RTN-UTN subscribers automatical communication) at TD TS and FD TS implementation

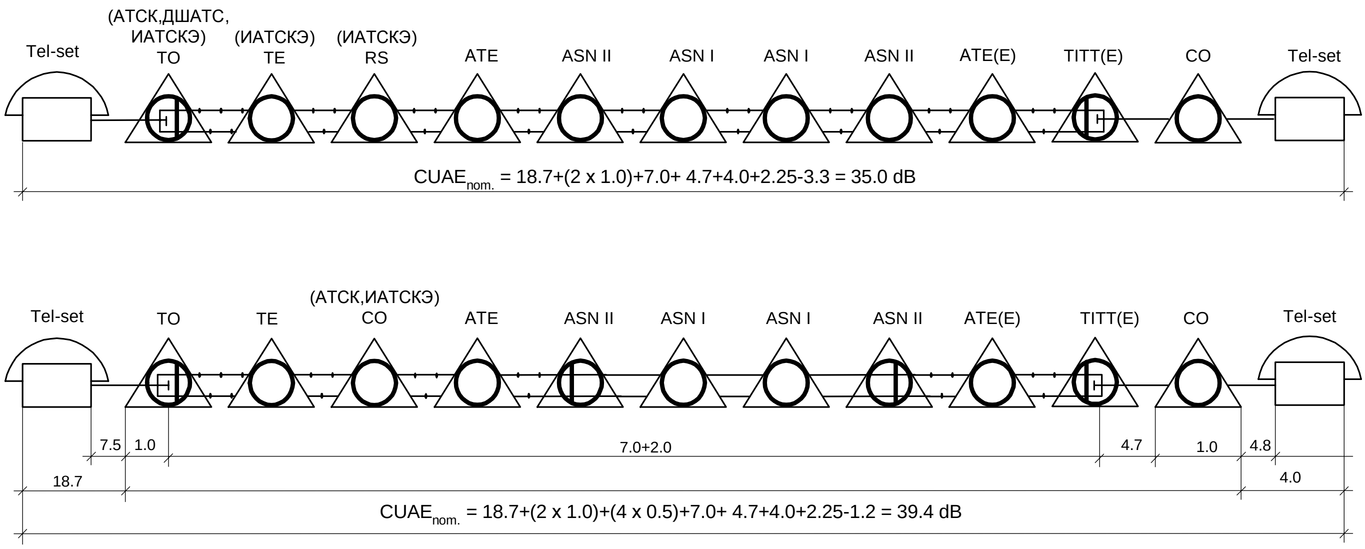


Fig. 2.3.11

Distribution of UAE values in typical SSTSP (RTN-UTN subscribers automatical communication) at TD TS and FD TS implementation

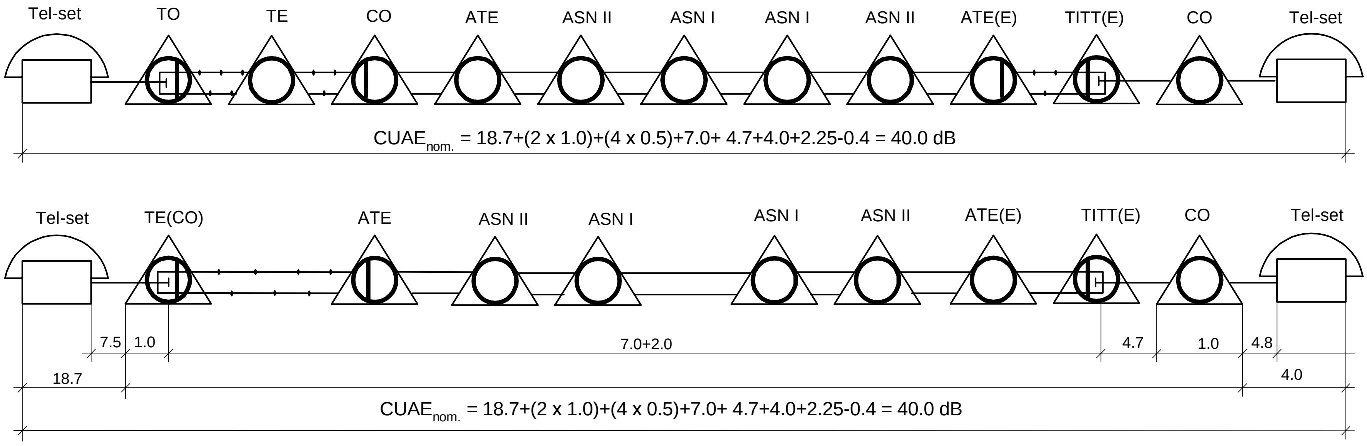
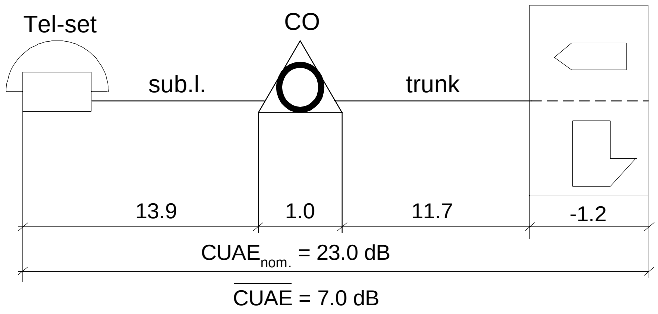


Fig. 2.3.11 a)

Table 2.4. The PSTN subscriber-public maintenance service subscriber local telephone channel (PMS SLTC)

Parameters names	Norm	Note
1	2	3
2.4.1. The CUAE PMS SLTC common updated attenuation equivalent values should be no more, than	24,0	The norms are obtained by means of calculating and need to be defined more accurately. All UAE values are given accurate to the received calculating value rounding off to 0,5 dB.
2.4.2. The updated attenuation equivalent (UAE) maximum values distribution in the standard PMS SLTC	Fig. 2.4.1 - 2.4.4	
2.4.3. The CUAE PMS SLTC should be in the range, dB.	7,0 -14,0	

Distribution UAE values in typical SSSP of nondistrictive UTN at call of the inquiry-informational and ordered services by abbreviated dialing at local communication

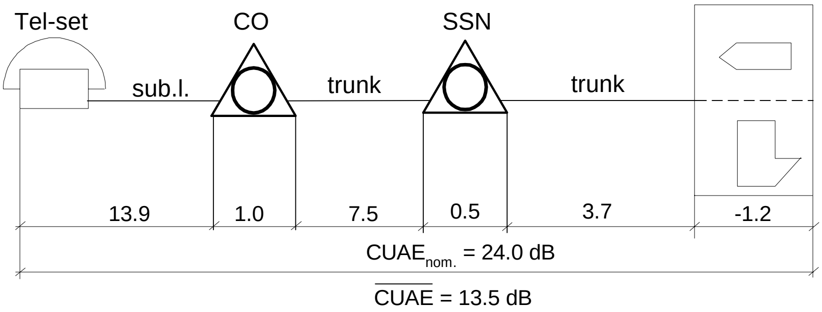


$$CUAE_{nom.} = 13.9+1.0+11.7-1.2+1.5-3.9 = 23.0\ dB$$

$$\overline{CUAE} = 6.5+1.0+5.8-4.2+1.5-3.9 = 6.7\ dB = 7.0\ dB$$

Fig. 2.4.1

Distribution UAE values in typical SSSP of nondistrictive UTN at call of the inquiry-informational and ordered services by abbreviated dialing at local communication

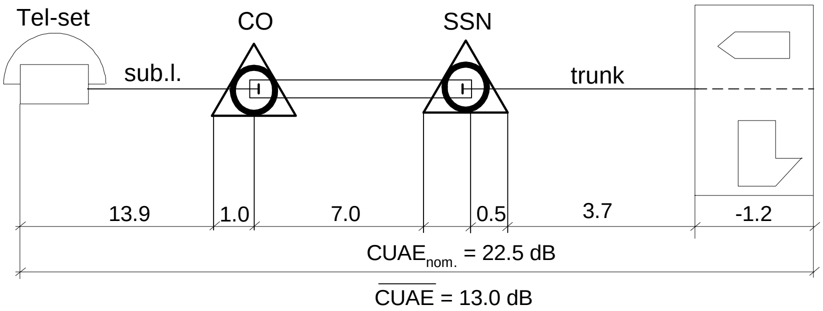


$CUAE_{nom.}$ = 13.9+1.0+7.5+0.5+3.7+2.25-1.2-3.9 = 24.0 dB

$\overline{CUAE}$ = 6.5+1.0+7.5+0.5+3.7-4.2+2.25-3.9 = 13.5 dB

Fig. 2.4.2

Distribution UAE values in typical SSSP of districtive UTN at call of the inquiry-informational and ordered services by abbreviated dialing at local communication

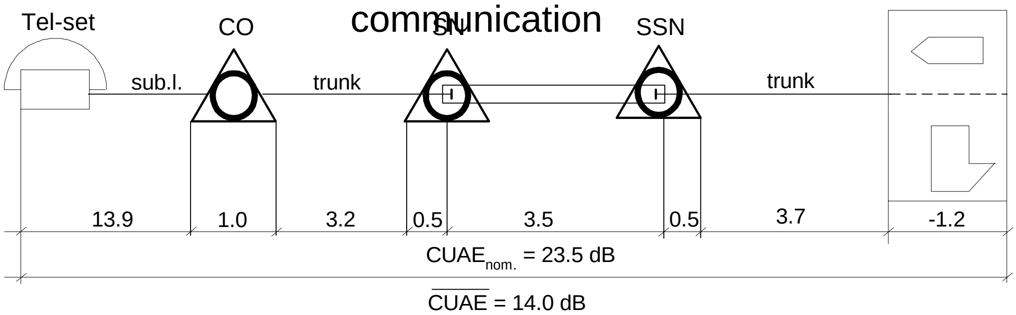


$CUAE_{nom.}$ = 13.9+1.0+7.0+0.5+3.7+1.5-1.2-3.3 = 22.5 dB

$\overline{CUAE}$ = 6.5+1.0+7.0+0.5+3.7-4.2+1.5-3.3 = 13.0 dB

Fig. 2.4.3

Distribution UAE values in typical SSSP of districtive UTN at call of the inquiry-informational and ordered services by abbreviated dialing at local communication



$CUAE_{nom.}$ = 13.9+1.0+3.2+(2 x 0.5)+3.5+3.7+2.25-1.2-3.3 = 23.5 dB

$\overline{CUAE}$ = 6.5+1.0+3.2+(2 x 0.5)+3.5+3.7-4.2+2.25-3.3 = 14.0 dB

Fig. 2.4.4

3. Measuring Technique for Electrical Parameters of Local, Zone and Toll Telephone Channels

Measuring Technique is designed considering CCITT Recommendations, volume IV.2, Sceplement IV.5.

3.1. Test program.

3.1.1. Measuring of electrical parameters for local, zone and toll telephone channels from subscriber to subscriber.

3.1.2. Measuring of electrical parameters sectors of local, zone and toll telephone channels.

3.2. Tests.

3.2.1. Types of tested connections.

3.2.1.1. Local switched connection "subscriber-subscriber", zone switched connection "subscriber-subscriber", toll switched connection "subscriber-subscriber".

3.2.1.2. Local, zone, toll switched connection for sector "subscriber-CO (TO), OTT (CO), ATE 4-wire switching point".

3.2.1.3. International switched connection for sector "subscriber - gateway 4-wire switching point".

3.2.1.4. Local, zone, toll switched connection for sectors CO(TO) - CO(TO); OTT(CO); ATE-ATE.

3.2.2. Connections.

3.2.2.1. Connections are set up in the way typical of conventional automatic local, zone and toll telephone calls.

Note. International calls are set up only within national network.

3.2.2.2. Telephone set disconnection from set up calls and connection to relevant measuring equipment should not damage set up connections.

Note. Subscriber telephone connection change over to connection both end measuring equipment could be made up with measuring device shown in figure 3.1.1.

3.2.2.3. Faults observed are recorded at out coming end cleared if necessary.

3.2.3. Parameters measured.

General characteristics:

- signal power;
- operating band;
- input impedance;
- relative nominal transmission levels;
- accumulated loss;
- stability;
- echo;
- subscriber-subscriber connection;
- accumulated loss (level chart);
- frequency variation;
- phase hopping;
- frequency response;
- amplitude response;
- noise;
- selective noise;
- protection from distinct transient influences between
- channels;
- relative time of pulse noise influence and short-time
- fading;
- impulse noise;
- short-time level fading;
- protection from stray modulation;
- phase jitter;
- non-linear distortions;
- error rate,
- total distortions accompanying signal (including
- quantization distortions);
- out-of-band signal noise at channel input;
- out-of-band signal noise at channel output;
- congestion threshold.

Channel sectors:

- accumulated loss;
- frequency response;
- noise;
- protection from distinct transient influences within channels.

Note. Techniques for measuring signal power, phase hopping, selective noise, relative time of ИП and КП influences, pulse noise, short-time level fading, phase jitter and error rate are not presented because they are to be developed.

3.3. Measuring technique.

3.3.1. General.

3.3.1.1. Generally, allowed (maximum probable) errors of measuring equipment are specially noted and provide standard check with probability 0,997 (triple standard-fault ratio).

Exceptions: errors in absolute transmission levels measuring, accumulated less set up in particular. Technically emplemented errors provide in this case probability of measured value correspondence to actual value only less than 0,682 (maximum probable error value equals normalized parameter deviation from nominal). Total errors and measured values as well are assumed random values subject to distributive law.

In a number of cases with temporary recommended equipment, normalized value is exceeded by maximum probable error and adequate validity of standards check is not provided.

3.3.1.2. Generally, value of the metering pulse launched to telephone channel input is recommended to be -6 dBmO.

In some cases, when proper measuring equipment is non-available due to state of the art, equal or even higher level versus nominal is allowed to be used (but no more than +3 dBmO adequate to congestion threshold of voice-frequency channels).

Voice-frequency channels and FD TS measuring of telephone channels with increased measuring signal level intermittent signal with duration and pause about 5-7 s is recommended (to eliminate FD ‘Ц congestion). Prior to development of special devices signal discontinuity is provided by periodic signal hold executed manually by pushing special button of measuring generation. Moreover, measurement of measuring signal with increased level should be carried out only in hours with minimum transmission load.

3.3.1.3. Measurements of all telephone channel characteristics should begin with accumulated loss measurement.

Measuring signal level error and level measuring set error there with should be provided when instrument input/output is resistance-loaded in accordance with input impedance nominal of the channel/path measured (allowance < 0.5%).

3.3.1.4. Telephone channels and their sectors measurements are provided with external channel/path load per input impedance nominal 600 Ohm.

When characteristics dependent on absolute signal levels would change allowed deviation of instrument load resistance or I/O impedance should be no more than ±1%, 1020 Hz. This complies with reflection ratio, 0.5%, or reflection loss, 46 dB.

For measurement of other characteristics (either relative or dependent on signal frequency phase-measurement and noise measurement as well) deviation of measuring equipment I/O impedance in operating band should be no more than 3.5% (reflection loss no less than 30 dB).

3.3.1.5. Measuring of a number of characteristics that require selective level measuring sets rhythmical flickers of instrument pointer are observed at low levels measurement.

In this case measured value should be considered

$$P_{sm} = 10\lg\frac{1}{2}\left(10^{0,1P_{\max}} + 10^{0,1P_{\min}}\right),$$

or

$$U_{sm} = \sqrt{\frac{U_{\max}{}^2 + U_{\min}{}^2}{2}},$$

where P_{max} (U_{max}), P_{min} (U_{min}) are signal voltage level values corresponding to maximum/minimum instrument pointer deviation, respectively.

3.3.1.6. Measured signal frequency should not be subharmonic of sampling rate (8 kHz) to eliminate additional error or beats that could reach ±0.15 dB for a single signal. In perspective measuring equipment this frequency is 1020 Hz (in accordance with CCITT Recommendations). However, prior to putting this equipment into networks, frequency 800 Hz is allowed. It means that if quartz measuring generator is used, 800 Hz should be set with some shift, namely, for 800-860 Hz band 820 Hz is preferable.

When non-quartz generator is used measurements could be carried out at 800 Hz, the shift set up is not necessary because it actually occurs due to generator frequency set up error within tolerances.

These recommendations apply at any frequency selection for measuring signal applied to ТЧ ЦСП channel input, for frequency response measurement frequency shift versus nominal should be up to 60 Hz for quartz frequencies.

3.3.2. Methods of measurement.

3.3.2.1. General characteristics.

3.3.2.1.1. Operating band is determined by frequency response data.

3.3.2.1.2. Input impedance is measured in accordance with ГОСТ-21655.

3.3.2.1.3. Nominal relative values of transmission should not be measured in intermediate points but calculated in accordance with standards drawings.

3.3.2.1.4. Accumulated loss and level chart are measured on "subscriber-subscriber" connections (figure 3.1.2) when telephone channels use transmission levels minus 6 dB at telephone set transmitting output 1020 Hz (level is preset to 600 Ohm).

Level error of measuring signal applied to channel output should be no more than +/-0.1 dB, level measurement error at channel output should be no more than +/-0.1 dB for normal operation, ±0.2 dB for normal operation, ±0.2 dB for load conditions.

Accumulated loss for a03 channel is determined by

a03 = P(tr) - P(recep) dB

where P(tr) is measurement signal level at channel input;

P (recep) is measuring signal level at channel output.

3.3.2.1.5. Loss value for path "a-t-b" from the point of stability should be carried out with measuring generator and level measuring set according diagram, figure 3.1.3., by applying of measuring signal with frequencies specified 300, 400, 600, 1020 (800), 1200, 1400, 1600, 200, 2400, 3000, 3400 Hz. The level of frequencies specified should be minus 10 dBmO.

"*a-t-b*" path loss value and hybrids balance loss values are determined by averaging of minimum values derived from different channel termination plans used.

Balance loss value is determined by

$a_{bal} = a_{a\text{-}t\text{-}b} - a_{a\text{-}y} - A_{t\text{-}b}$

where aa-t-b - is path loss value for *a-t-b* path;

aa-t - is path loss value for *a-t* ;

at-b is path loss value for *t-b* .

3.3.2.1.6. Loss value measurement for "a-t-b" path from the point of "echo" should be carried out with quasi-noise measuring signal and level measuring set according diagram (figure 3.1.3.). Measurements are made in frequency band 500-2500 Hz.

Sequence of measurements:

- instrument output (point c) is connected to instrument input (point d) and relevant level is recorded (p1);

- instrument output is connected to path *a-t*, instrument input is connected to *t-b* path and next level is recorded (*Pr*);

- *a-t-b* path loss value is determined by:

$$aa\text{-}t\text{-}b = P_1 - P_2$$

3.3.2.2. Connection "subscriber-subscriber".

3.3.2.2.1. Accumulated loss and level chart measurements are made in accordance with technique described in paragraphs 3.3.2.1.3. and 3.3.2.1.4.

Accumulated loss stability, 03, of telephone channel, i.e., time variation of telephone channel accumulated loss is measured by application of sine wave, 1020 Hz, to channel input (see p.3.3.1.6. of this methodics).

Parameters characteristics of telephone channel accumulated loss stability: for deviation of accumulated loss average from nominal and time deviation rms of accumulated loss automatic measurement is recommended. If automatic measuring equipment is non-available manual measurement is allowed.

Measuring signal set up accuracy and time level stability should not be worse than +/-0.1 dB, level measurement error should not be worse than +/-0.3 dB. Measurement cycle duration should be 72 hours. Measurement period (time between counts) should be no more than 260 s for automated measurement (this corresponds to 1000 counts during 72 hours) and no more than an hour for manual measurement. For automated measurement one minute measurement period is recommended.

In automated measurement an instrument that measures periodic variations of measurement signal according a programme is connected to channel output. The instrument should display results for measured normalized accumulated loss stability (03) at the end of measurement cycle. Individual 03 values, relative to each count are calculated by the instrument in terms of measured values for measurement signal level and level nominal at channel output (see expression 1). Calculation for accumulated loss average (α_{cp}) deviation from nominal and accumulated loss average rms from average (δ) per measurement cycle should be automatic and made according expression (2) and (3).

$$a_{cp} = \frac{1}{N}\sum_{i=1}^{N} a_i \text{, dB} \qquad (2)$$

where a_i - is accumulated loss value deviation from nominal, dB, corresponding to i-ed count;

N - number of counts per measurement cycle.

$$\delta = \sqrt{\left(\frac{\sum_{I}^{N} a_i^2}{N} - a_{cp}^2\right)\frac{N}{N-1}} \text{, dB} \qquad (3)$$

Above calculations, when automatic measured, could be made by computer rather than by special instrument providing that periodic counts are acquired in digits from measurement level output.

If automated measurement instrument is non-available accumulated loss stability could be determined with level measuring set by manual measurement results. Measurements could be also made with oscillograph connected to level measuring set DC-output. Results should be processed according equations (2) and (3).

For receiving end tests of 03 telephone channel short time variations a recording millivoltmeter that is direct/level measuring set connected to channel output and has DC output to oscillograph should be used. In the first case, an oscillograph should be used that records AC signal variations in telephone channel band with measurement limit about 0.5 B and high-resistance input impedance (connection is parallel to terminated channel). In the second case, an oscillograph should be used that records DC-signal variations and has measurement limit corresponding to nominal voltage at DC output of used measuring level set.

In both cases the tape speed should be about 1-2 mm/s.

Long-time measurement of 03 telephone channel is tested, if necessary, by 03 routing measurements.

3.3.2.2.2. Frequency variations of transmitted signal are measured with instrument based on principals and characteristics complied with CCITT Recommendation 0.111. Measuring method is briefly described in the following.

Two-frequency measuring signal with total level minus 6 dBmO is applied to channel output from transmitting part of the instrument. Frequencies of signals, making this composite signal, have accurate harmonic ratio 1:2 and are 1020 and 2040 Hz. Measuring signal is applied to the instrument receiving part from channel output. In the receiving part from channel output. In the receiving part it is devided in two frequency components each of them equal frequency variated in the channel measured. Then, frequencies of these signal components are multiplied to equal their nominals and subtracted that results in desired value of frequency variation in the channel displayed with deviation character by the instrument indicator.

This method is illustrated in figure 3.1.4.

Measuring based on direct frequency - metered measuring signal at channel output is allowed as well. The signal applied to channel output should be 1020 Hz and minus 6 dBmO. Relative measuring signal frequency deviation from nominal should not be more than $0.5*10^{-4}$ for any operation conditions. Measuring signal frequency is metered with error rate no more than ±0.1 Hz at channel output and desired frequency variation is determined by expression (4)

$$\Delta f = f_{sm}, - 1020, Hz$$

Measurements based on the last method could be made with electronic frequency meter, therefore, calculation according expression (4) would be either manual or automated when measured results are displayed on special instrument panel in the form of transmitted signal frequency variations and could be printed out to desired document. If special instrument for documentation is nonavailable digit outprint of electronic frequency meter could be used.

If special instruments or instruments meeting above requirements for accuracy of measuring signal frequency are non-available the measurement are allowed with electronic frequency meters with resolution no more than 0.1 Hz connected to measured channel input and output. The signal applied to the channel input should have nominal frequency 1020 Hz and level minus 6 dBmO. In this case, frequency variation of the signal transmitted in the channel is determined by difference between simultaneously recorded readings of frequency meters. These measurements are only manual.

3.3.2.2.3. Frequency response of telephone channel accumulated loss is recommended to be measured with instruments designed for automated/semi-automated frequency response measurements providing that the second route of transmission is disconnected.

Semi-automated measurement is considered to be automated measurements without record. Readings should be taken manually.

The following method is recommended both for automated and semi-automated measurements. Frequency variation of measurement signal applied to channel input should be automatic (step-by-step frequency variation, step value - no more than 100 Hz). Frequency values should not be multiple to ЦСП sampling rate. After rate to measurement frequency signal, reference frequency signal, 1020 Hz with minus 6 dBmO level is applied to the channel from transmitting part output. Frequency irregularity of measuring generator level in telephone channel frequency band (relative to 1020 Hz) should not be more than ±0.1 dB.

Instrument receiving part measures level difference between signals of measurement and reference frequency signals and shows values of accumulated loss deviation from its value at 1020 Hz. These values and values of measured frequency have to be indicated (and documented as well). Relative frequency response error (measuring signal level deviation from reference frequency signal level) should not be more than +/-0.1 dB. Relative error of measured frequency value should not be worse than $1*10^{-3}$.

Automated measuring without alternate reference frequency signal applied to channel is allowed. In this case, automated variation of measurement signal frequency should be provided.

Frequency irregularity of measurement signal level in this case should be the same, i.e., no more than ±0.1 dB, but during measurement time additional requirements are imposed upon signal level stability that should be as small as possible but no more than 0.05 dB in 15 minutes. In this case, conventional level measuring set with frequency response irregularity <±0.1 dB and instability of readings <±0.05 dB during measurement time should be used as receiving measuring device.

Automated instruments non-available, manual measurement of accumulated loss frequency response is allowed with measuring generator and level measuring set in accordance with diagram of figure 3.1.2. Frequency of measurement signal applied to the channel is manually set.

A set measured frequencies should have the following values: 300, 400, 600, 1020 (800), 1200, 1400, 1600, 2000, 2400, 3000, 3400 Hz. Frequency set up error should not be >±1% and at 3400 Hz <±5 Hz. The less measurement errors should not be worse than above specified for automated measurements.

3.3.2.2.4. Frequency response of relative group delay is recommended to be measured with special measuring equipment designed for automated measurement and providing documented measurement results. Semi-automated measurement instruments with manual reading of results could also be used.

In both measurements either automatic or semi-automatic measurement frequency variation of the signal applied to channel output should be made in transmitting part of the instrument automatically (step-by-step frequency variation with step value <100 Hz). Nominal frequency values selected are: 300, 400, 500, 600, 800, 1000, 1400, 1600, 1900, 2200, 2400, 2800, 3000, 3200, 3300, 3400 Hz.

Alternate to measurement frequency signal reference frequency signal, 1900 Hz, with minus 6 dBmO level is applied. Backward direction should be disconnected. If the second direction disconnection is impossible, measurements should be made on 4-wire channel sectors with the level 10 dB lower than voice-frequency nominal.

Both signals are amplitude modulated with modulation frequency 41.66 Hz in accordance with CCITT Recommendation 0.81. If instrument error rate meets requirements discribed in the following, modulation frequency of less values is allowed.

In the instrument reception part connected to measured channel output, modulation frequency pulse is disengaged from other signal components. Phase difference of modulated pulse envelope is measured between reference and measurement signals. Irregularity measurement error for group delay frequency response in frequency band from 0.6 to 3.1 kHz should not be >±(0.02 +0.03) ms, where is the value measured, ms.

Absolute group delay of the signal is determined by USSR national standard ГОСТ-21655.

3.3.2.2.5. Amplitude response of telephone channel accumulated loss is measured on 4-wire path in minimum busy hours.

Sine signal, 1020 Hz, with different levels: - 18dBmO; -9dBmO; 0dBmO; +1dBmO; +2dBmO; +2.5dBmO; +3dBmO; +3.5dBmO is applied to measuring generator channel input (see diagram, fig.3.1.5.). Measurement signal set up error at the channel input should not be >±0.1 dB, stability during measurement time for complete characteristic should not be worse than ±0.05 dB. Measurement signal level could be controlled either by step-by-step control with step no more than 1 dB, built in the measuring generator, or by external attenuator connected between generator output and channel input. Output level control error should not be >±0.1dB (preferably, ±0.05 dB).

Channel output measurements are made with broadband level measuring set. If noise protection for last points measurement is <10dB, selective level measuring set should be used. In this case, noise is considered to be total distortions including quantizing distortion. Level measuring set should have built-in attenuator (step-by-step sensitivity control) with step no more than 0.1 dB and expended seal (±1 or ±2 dB) with scales no more than 0.05 dB per scale. If built-in attenuator is non-available external 600 Ohm attenuator could be used. Control errors within measurement signal levels from -4 to +3 dBmO should not be >±0.1dB (preferably, ±0.05 dB). The instrument pointer is set to zero or < 0.1 dB with sensitivity control of level measuring set (or attenuator) for every measurement.

Channel output level is determined by sensitivity control (attenuator) positions and readings of level measuring set expanded scale accumulated loss value isdetermined by expression (1).

3.3.2.2.6. Values for average psophometric noise power and average unweighted noise power per hour and per minute are measured in telephone channel in busy hour when transmission systems are full-loaded.

Psophometric coefficient specifying instrument sensitivity t different frequencies should comply with CCITT Recommendations P.53 and ГОСТ 24019-80 (USSR national standard), the instrument characteristic for unweighted noise measurement mode - with ѓЋ‘’ 24019-80 (USSR national standard).

Average noise power measurement is commended to be made with special measurement is set to desired measurement mode (psophomentic or unweighted noise in telephone channel) and relative nominal level at the point of measurement.

Results off measured average noise power in pW0p or pW0 are read out from the instrument digital display and recoded by roll telegraph.

Average unweighted noise power per hour, dBmO, if necessary, could be derived by translation in terms of average power, pW0.

Time percent within a month when average noise power exceeds threshold should be determined by computer. In this case, results of average noise per minute measurement should be recorded on perfotape (to the instrument digit printout a perforator is connected).

Perfotape data are entered into computer and processed according relative additional developed program.

If automated instrument for average noise power measurement is non-- available, manual measurement (with psophometer) with 1 minute time interval between measurements is allowed. Integration time should be about 35 s. Mean instrument readouts are recorded during measurements, some bursts (about 2-3 bursts) per measurement are not considered. If instrument has no integration time, psophometer with integration time 200 ms is cased. In this case, value corresponding (approximately) to average pointer position within a few seconds (measurement error is increased therefore) is recorded as the result. In terms of acquired results power values respective to measured voltages and levels are calculated. Desired average power value per hour is determined by expression (2), where a is noise power corresponding to i-ed count.

One-time measurements for psophometric noise test are made with psophometer, integration time 200 ms, psophometric filter mode for telephone channel. Measured result mV/dB, and noise nature are determined by pointer indicator. Unweighted time is measured in the same way but with another measurement mode - unweighted noise mode for telephone channel.

3.3.2.2.7. Protection from distinct transient influences between telephone channels and forward and backward telephone channel direction is measured in accordance with diagrams, fig. 3.1.6.

Measurement signal 1020 Hz is applied to affecting channel input. The level of induced cross-talk is measured at affected channel output (at the far end) or backward direction reception path of the same channel (at the near end).

In channels with noise levels above minus 55 dBmO measurements are carried out by cross-talks level measurement at the level of measuring signal applied to affecting channel. Measurements are made with selective level measuring set or harmonic analyser with bandwidth no more than 10 Hz. Distinct transient influence protection value is determined by:

$a = P(m) - P(ct), dB$

where $P(m)$ - is measurement signal level at affecting channel output,

$P(sm)$ - is cross-talks level at affected channel output.

3.3.2.2.8. Signal protection from stray modulation products by power noise is measured manually, with selective level measuring set in accordance with diagram, fig. 3.1.2.

Measuring generator signal with frequency 1020 Hz, level - 6 dBmO and stray modulation protection no less than 75-80 dB is applied to 4-wire path of the channel. Measurement signal level is measured with selective level measuring set at channel output, then, stray modulation voltage levels resulted from carried modulated currents transmission system and measurement signal is protected by noise existing in power circuits (in converting equipment, linear paths and switching system). Measurements are carried out at frequencies ±50, 100...400 Hz away from measurement signal.

Measuring level set bandwidth should be <10 Hz, the instrument should provide measurements in presence of signal with frequency ±50 Hz away from measurement signal frequency and exceeding it level for > 70-75 dB.

Value of signal protection from any stray modulation product is determined by

a (sm) = P(m) - P(sm), dB,

where *P(m)* - is measurement signal level at channel output,

P(sm) - is stay modulation product level at channel output.

Measurements could be made with standard harmonic analyser or spectrum analyser. Prior to measurement the instrument capability for measurement of stray modulation products normalized for the given channel should be inspected.

3.3.2.2.9. Non-linear distortion coefficient of telephone channel is measured for both directions of transmission. Prior to measurement accumulated loss nominal value, of the channel is tested at 1020 Hz.

Then, the current with frequency 1020 Hz and measuring level that keeps ТЧ level of measuring generator with non-linearity coefficient < 0.1 - 0.2% equal to 0 dBmO in point 0 of the channel chart. When the worst non linearly coefficient generator is used, a choke-filter (Д - 1.0 kHz) is connected to its input. Voltages of 2-d and 3-d harmonics, 1020 Hz, are measured with voltage analyser at the channel output. Percent coefficient off non-linear distortions is determined by

$$K = \frac{\sqrt{V_2^2 + V_3^2}}{V_1} \cdot 100,$$

where V_1, V_2, V_3 are voltage values of 1, 2 and 3 harmonics measured with analyser.

Notes:

1. At V_2 and V_3 voltage variations rhythmical flickers of the instrument pointer could be observed. Then, the measured value should be considered $\frac{V_{max}^2 + V_{min}^2}{2}$.
2. Measurements should be made at minimum busy hours of transmission system. Transmission of currents with measure levels >-10 dBmO should not be more 6 s.
3. Measurements are carried out on two adjacent (by sensitivity) analyser scales. Both instrument readings are compared afterwards. If there are no differences in the readings the measurement is considered valid. This, possibility of measurement at analyser overloading with base frequency current is eliminated.

Non-linear distortions of telephone channel with TD VF circuits or mixed TD VF - FD circuits are measured by the third order combination of the type $2f_1$-f_2. Two sine measurement signals, 850 and 680 Hz, and minus 4 dBmO levels are simultaneously applied to the channel input.

Measurements are made in accordance with diagram, figure 3.1.7., at 1020 Hz with selective level measuring set or harmonic analyser having bandurdth > 10 Hz, selectivity > 55 dB at misalignment for 100 Hz and more. Two sine signals: one 1020 Hz, - 9 dBmO and another, 50 Hz, 23 dBmO are semulaneously applied to the channel input.

Measurements are made with selective level measuring set (in accordance with diagram, fig. 3.1.7.) having bandwidth < 10 Hz and selectivity > 65 - 70 dB at misalignment for ±50 Hz and more for frequencies different from 1020 Hz (signal applied to channel output) for ±50; ±100; ±150; ±20...Hz.

3.3.2.2.10. Total signal accompanying distortions including quantization distortions are measured with an instrument with specifications complying CCITT Recommendations O.1331 and O.132 for quasi-noise and line signals respectively. Quasi-noise signal should meet the following base requirements: practically normal amplitudes distribution; frequency band no wider than from 350 to 550 Hz (level 3 dB); spectral lines number no less than 25 with interval between them no more than 8 Hz, peak factor (signal amplitude value - signal ms value ratio) 10.5 ±0.5 dB.

Sine measurement signal should have frequency 1020 Hz. Signal measurement in frequency band 800-865 and 1000 and 1025 Hz is allowed.

Quasi-noise signal is applied to the telephone channel output with VF channel level equal to -3; -6; -12; -18; -24; -36; -42; -48; -55 dBmO.

Sine signal is applied to channel with levels 0; -3; -6; -12; -18; -24; -36; -45 dBmO.

Measurement of signal protection from accompanying noise power is measured at the channel output. In case of quasi-noise measurement signal, unweighted power of accompanying noise in channel band should be evaluated, in case of sine signal - psophometric power should be evaluated. Measurement signal cancellation in reception part of the instrument should be no less than 55 dB for quasi-noise and 50 dB for sine signals. The instrument should have guardature detector. Measurement error for signal power - accompanying noise power ratio including quantization distortions should be no more than ±1dB within 10-40 dB range.

In case of highly noised channels measurement, i.e. channels with high noise values in non-busy channel due to long distance channelling in FD TS, low values of the signal level are allowed to be non-measured. Minimum level of measuring signal is determined for every particular case depending on measurement equipment used and measured channel noise.

3.3.2.2.11. In TD TS Telephone Channels, channel input noise level relative to outband signals is measured at the channel output with selective voltmeter with selectivity no worse than 30 dB for load 600 Ohm at frequencies 300, 800 and 1000 Hz when outband sine signal, 0 dBmO (by VF), and frequencies (7.7; 8.3; 15.7; 16.3 kHz), (7.2; 8.8; 15.2; 16.8 kHz) and (5.0; 11.0; 13.0; 19.0 kHz), non-multiple to sampling rate 8 kHz is applied to communication channel input.

3.3.2.2.12. In TD TS telephone channels, channel output noise is measured with selective voltmeter with selectivity no worse than 30 dB for load 600 Ohm at frequencies non-multiple to sampling rate 8 kHz (7.7; 8.3; 15.7; 16.3 kHz), (7.2; 8.8; 15.2; 16.8 kHz) and (5.0; 11.0; 13.0; 19.0 kHz) when sine signal, 0 dBmO (by VF), and frequencies 300; 800 and 3000 Hz is applied to the sine signal input.

3.3.2.2.13. Congestion threshold in telephone channel TD VF TS is measured only on sets of channelling equipment transmission part. Sine measurement signal, 1020 Hz and smooth increased level from 0 dBmO and higher: 0 dBmO; +1; +2; +2.1 dBmO and so on, after 0.1 dB, is applied to the channel input. Digital signal is tested at the equipment transmitting part output. At occurrence of the first code combination corresponding to the highest either positive or negative signal level, sine signal level value is measured with level measuring set (base error <±0.1 dB) at the channel input. Desired congestion level is more than the value measured for 0.3 dB. Code combination relative to congestion threshold is determined with code combination analyser. When it is non-available, control is carried out by oscillograph at channel reception part output with loop channelling equipment connected at digital path end. At the same time, limiting moment of sine, which is discrete sequence envelope; is recorded.

3.3.2.3. Channel sectors.

3.3.2.3.1. See paragraph 3.3.2.1.3.; paragraph 3.3.2.1.3.; paragraph 3.3.2.2.1.

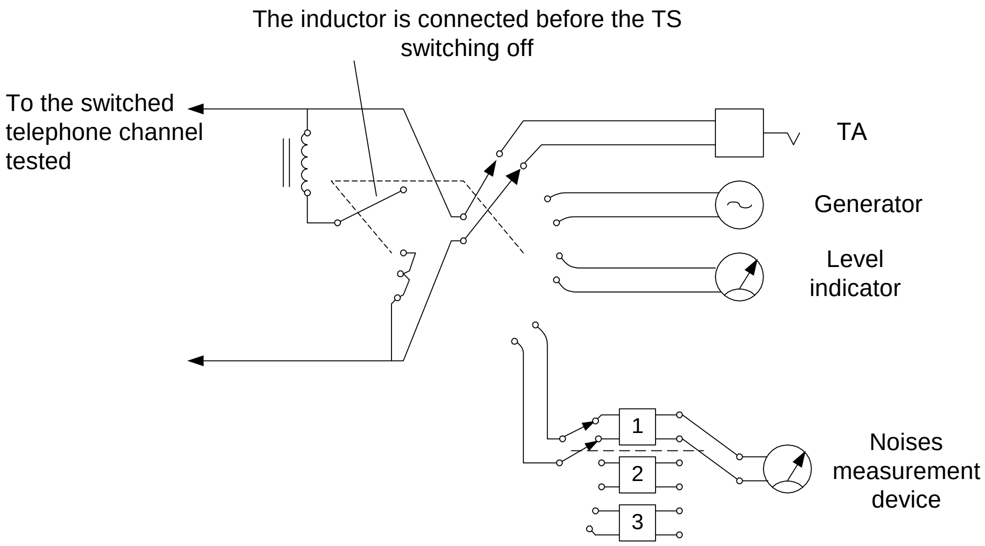
3.3.2.3.2. See paragraph 3.3.2.2.3.

3.3.2.3.3. See paragraph 3.3.2.2.6.

3.3.2.3.4. See paragraph 3.3.2.2.7.

3.3.2.4. Telephone sets and subscriber lines.

Loss equivalent measurements for telephone sets and subscriber lines are carried out in accordance with ГОСТ-715--385 (USSR national standard).



Notes: 1. Inductor L = 4.2 Henry, R = 4000 Ohm.

2. 1 - Psephometric circuit.
2 - Filter in frequency bond of 300-3400 Hz
3 - Without the filter

3. It's possible to use the socket permitting hold of connection insted of the inductor.

Fig. 3.1.1 The test facility plan

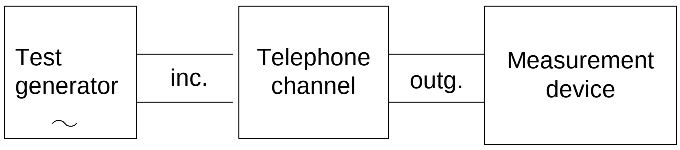


Fig. 3.1.2

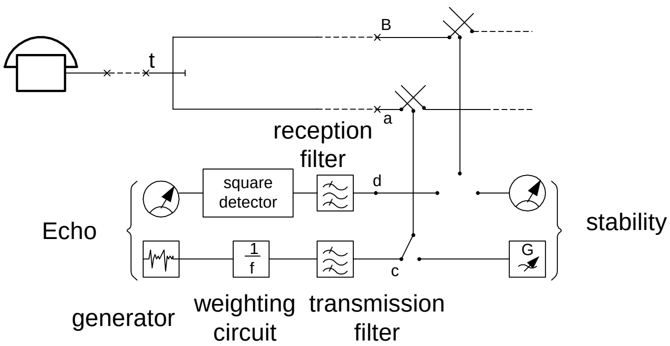


Fig. 3.1.3

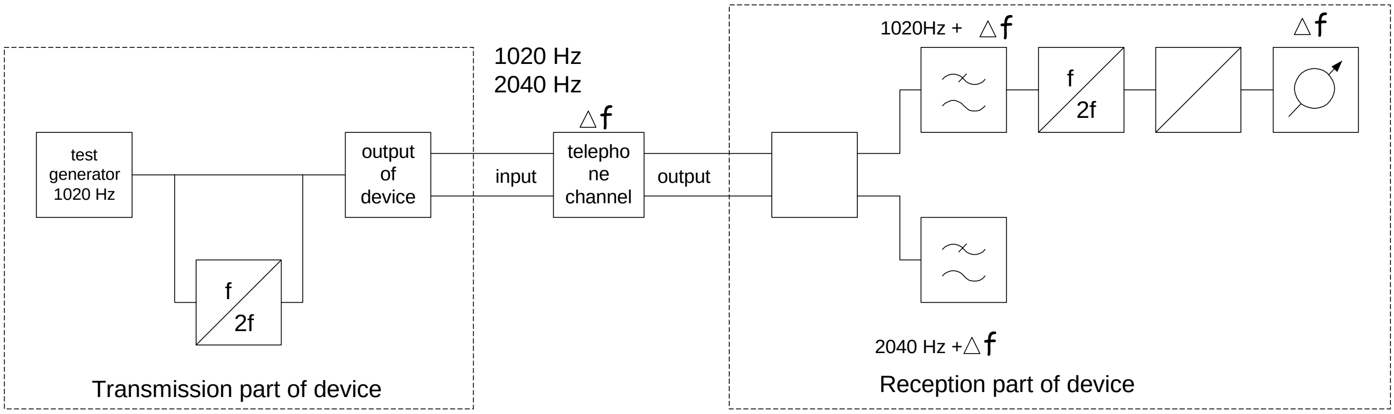


Fig. 3.1.4

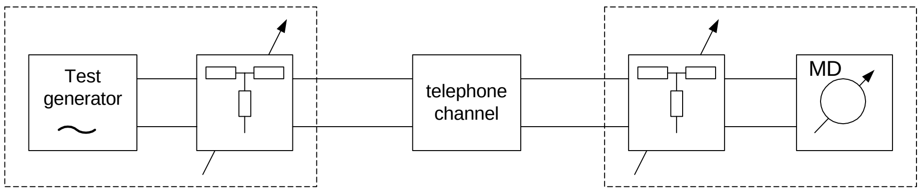


Fig. 3.1.5

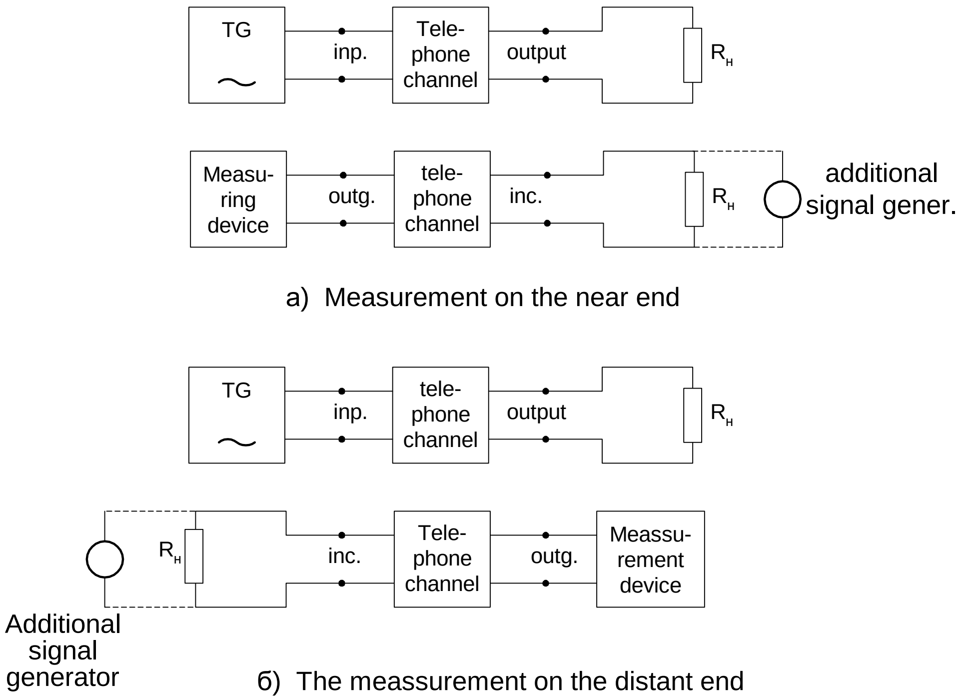


Fig. 3.1.6

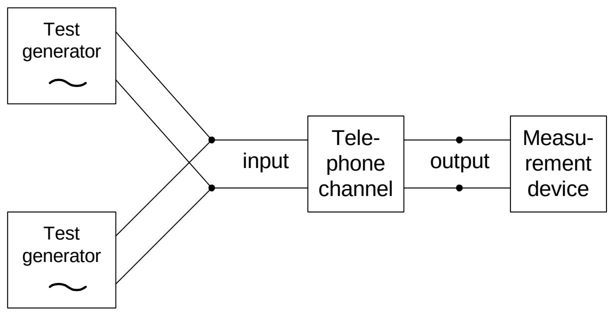


Fig. 3.1.7

4. METHODICS FOR DETERMINATION OF UPDATED ATTENUATION EQUIVALENT VALUES FOR PSTN LOCAL, ZONE AND TOLL CHANNELS.

4.1. According to paragraphs 2.1.2.1.; 2.2.2.1.; 2.3.2.1.

Maximum values of common updated attenuation equivalent for 100% SSLSP, SSZSP and SSTSP (Ћ‘Ђ‡) are determined by UAE is maximum value of generl updated attenuation equivalent for SSLSP, SSZSP or SSTSP;

GUAE = UAEmaxl.s.tr+ UAEex+UAEvf+ UAEtr+UAEmaxl.s.ter+ UAEras+D (1)

GUAE - LSSP, ZSSP, TSSP general updated attenuation equevalnt value UAE is maximum value of updated attenuation equivalent for local telephone transmission system equal to 13.9 dB UAE is total value of maximum updated attenuation equivalents for trunks;

UAE is nominal value of updated equivalent for VF channel attenuation (7.0 dB) equal to nominal value for VF overall loss at 1000 Hz on two-wire termination;

UAE are nominal values of updated attenuation equivalents for analog station exchange speech path equal to attenuation values at 1000 Hz, namely: 1.0 dB for CO, TO, TrO and 0.5 dB for ITT and OTT; 0.0 dB for any switched four-wire lines.

Maximum values of electronic exchanges updated attenuation equivalents equal to attenuation values at 1000 Hz, namely: 7.0 dB for subscriber - subscriber transmission within exchange, exchange-subscriber transmission towards two-wire trunk and backward; two-wire subscriber line/trunks - 4-wire subscriber line/trunk transmission and vice a versa; 0.0 dB for any switched 4-wire lines.

UAE is maximum value of updated attenuation reception equivalent for local telephone system reception equal 4.0 dB;

D is correction considering difference of GUAE channel values determined by direct measurement or adding GUAE values for channel transmission and reception parts.

In accordance with CCITT Recommendation (G.121), D=-3,9dB for SSLSP without FD and TD FF TS - channels.

With FD and TD VF TS channels and mixed FD-TD VF TS channels values for D area determined dependent on transit sections number by Table 3.3.1.

Number of transit sections	0	1	2	3	4	5	6	7	8	9	10	11	12
D	-3,9	-3,3	-2,7	-2,1	-1,5	-1,2	-0,9	-0,6	-0,4	-0,3	-0,2	-0,1	0

UAErac - UAE deterioration due to mismatch of input impedances for individual channel sections, adapted 0.75 dB for any mismatched point in SSLSP in accordance with CCITT Recommendation.

Values for UAE and UAE are determined by the following expression.

$UAEm.s. = 0,082\ AE^2 m.s. + 1,148\ AEm.s. + 0,48$

Local system equivalents for transmission and reception (AEm.s.) are determined in accordance with GOST - 7153-85.

4.2. By paragraph 2.1.2.3.

Average weighted SSLSP GUAE values considering "load" are determined for every standard SSLSP circuit taking into consideration intra- and interexchange set up of calls.

For trunk group area without noding, GUAE is determined by expression:

$$\overline{GUAE} = \overline{GUAE_1} * P_1 + GUAE_2 * P2 \quad (2)$$

where $\overline{GUAE}$ is average GUAE value for trunk group are standard SSLSP without noding;

$GUAE_1$ is average $GUAE_2$ value for interexchange connections;

P_1 and P_2 are probabilities of intra- and interexchange occurrences in accordance with (P_1=0.42; P_2=0.58).

For trunk group area with noding and for RTN with one-step and two-step radial-node structure, GTS determined considering probabilities of intraexchange connections (P_1), interexchange connections within node groups (P_2) and interexchange connections of subscribers within different node groups (P_3) by:

$$\overline{GUAE} = \overline{GUAE_1} * P_1 + \overline{GUAE_2} * P_2 + GUAE_3 * P_3 \qquad (3)$$

For trunk group areas with ITT

P_1= 0,22; P_2= 0,5 and P_3= 0,28

For trunk group areas with ITT and OTT nodes

P_1 = 0,17; P_2 = 0,07 and P_3 = 0,76

Average value of SSLSP $\overline{GUAE_1}$ with intraexchange connections is determined by:

$$\overline{GUAE_1} = \overline{UAE_l}.s.tr + UAEtr + UAE_l.s.rec + UAEa + D \qquad (4)$$

where $\overline{UAEl.s.tr.}$ and $\overline{UAE_l.s.rec}$ - are average values of local telephone system UAE for transmission and reception

$UAE_{l}.s.tr$ = 6,5 dB; $UAE_{l}.s.rec$ =minus 1,6 dB

UAEtr,D and UAEa - the nominal values of UAE exchange speech paths D and UAEa , see p. 3.3.1.

Average values of GUAE2 SSLSP with interexchange connections are determined for standard SSLSP by expression:

$$\overline{GUAE_2} = \overline{UAE_{l}.s.tr} + \overline{UAEtr} + UAEvf + \overline{UAEex} + \overline{UAE_{l}.s.rec} + UAEa + D \quad (5)$$

4.3. See paragraph 2.2.2.3. and 2.3.2.3.

Average values of GUAE SSZSP and SSTSP with TD VF TS and FD - TD channels without "load" are determined for standard SSZSP and SSTSP (see fig. 2.2.5. - 2.2.11. and fig.2.3.5. - 2.3.11.) by the following expression:

$$\overline{GUAE} = \overline{UAE_{l}}.s.tr + \overline{UAE}^{max}co\text{-}co + \overline{UAE}_{l.s.rec} + UAEa + D \quad (6)$$
to-to

where is total of maximum UAEmax values for sections CO - CO, TO - TO; CO - TO with VF ch UAE annels, exchange quardupoles and trunks.

Average value range are determined in accordance with GUAE values for total SSZSP/SSTSP standard circuits.

Average weighted GUAE, SSZSP and SSTSP values with FD VF TS channels considering "load" are determined from average weighted Ћ‘ќ‡ sections of SSZSP/SSTSP for transmission (16.0dB) and reception (8.5 dB) and in zone communiction from average number of FD ‘Џ filters adapted equal to 4 (D - minus 1.5dB), and in toll communication - equal to 6 (D=-0.9)

GUAE SSZSP = 16.0 + 8.5 - 1.5 = 23.0 dB

GUAE SSTSP = 16.0 + 8.5 - 0.9 = 24.0 dB

4.4. According paragraph 2.3.2.4.

Maximum values of corrected equivalents for SSZSP and SSTSP section loss from TS up to point -3.5 of the first CP is determined by:

For transmission

$$UAE^{max}_{tr} = UAE^{max}_{l.s.tr} + UAEtr + UAEvf + UAEexch + UAEa \quad (7)$$

For reception

$$UAEmaxrec = UAEmaxl.s.rec + UAEtr + UAEvf + UAEexch + UAEa \quad (8)$$

where UAEvf=3.5 dB.

4.5. According to paragraph 2.3.2.5.

Minimum allowed value of updated attenuation equivalent for SSZSP and SSTSP section from ’Ђ up to point -3.5dB of the first transmission system channel, UAEmintr in determined by:

$$UAE^{min}_{tr} = UAE^{min}_{TStr} + UAE^{min} + UAEco + 3{,}5\ dB + UAE_{ATE} + UAEa \qquad (9)$$

where UAEmin is minimum UAE ’Ђ value equal to -1.0dB;

$UAE^{min}_{T.S.tr}$ is minimum $UAE_{T.S}$ value of subscriber line equal to 0dB

UAECO are nominal values of CO and ATE loss ATE equivalent equal to 1.0dB

3.5dB is channel accumulated loss half-value UAEa =0.75dB

Fo FD ЧРК channels

UAE^{min}_{tr} =-1.0 + 3.5 + 2.0 + 0.75 *** 5.5 dB

Fo TD TS channels

UAE^{min}_{tr} =-1.0 + 3.5 + 0.75 *** 3.5 dB

Application 1

Table P1. The intial data for the toll, zonal, local telephone channels normalization

Parameters nam	Norm	Note
1	2	3
1.1. Subscriber physical line		
1.1.1 The aftenuation and the attenuation gain frequency variation		
The subcriber lines inherent attenuations both at the TS availability and without it should be no more than dB: On the UTN (cable with the threads diameter of 0,32 mm)		
on frequency of 800 Hz on frequency of 1000 Hz	3,5 4,0	
on the UTN (cable with the thread diameter of 0,4 mm)		
on frequency of 800 Hz on frequency of 1000 Hz	4,0 4,5	
On the UTN and RTN (cable with the threads diameter of 0,5 , 0,64 and 0,7 mm)		
on frequency of 800 Hz on frequency of 1000 Hz	4,5 5,0	
On the RTN at the standard VF channel organization with the hybrid allocation on the TO (cable with the threads diameter of 0,5; 0,64 and 0,64 and 0,7 mm)		
on frequency of 800 Hz on frequency of 1000 Hz	7,0 8,0	
The subscriber lines inherent attenuation gain/frequency variations should correspond to the values, indicated in the table	Table. P1.1	
1.1.2 NOISE		
The noise psophometric power average for an hour, measured in BH should be no more than PW	100	The psophometric and inweighted noises ratio is to be defined more accurately
The unweihted noise average for an hour in frequency band of 0,3-3,4 kHz measured in BH should be no more than pW.	200	
1.1.3. Crosstalk attenuation		
The crosstalk attenuation value between the circuits on the near end on frequency of 1000 Hz should be no lessi than, dB	69,5	
1.1.4. Balance return loss		
The subscriber line balance return loss in the frequency band of 9,3-3,4 kHz should be no less, than dB	43,5	
1.1.5 Error rate		
The bit transmission error rate should be no more than	3.10^{-5}	
1.1.6 Updated attenuation equivalents		
The subscriber lines updated attenuation equivalents should be no more dB		
on the UTN (cable with the thereads diameter of 0,32; 0,4 and 0,5 mm);	4,8	

Table P1.(cont)

1	2	3
on the RTN (cable with the threads diameter of 0,5; 0,64 and 0,7mm);	4,8	
on RTN at the standard VF channel organization on the trunk with the hybrid allocation on the TO (cable with the threds diameter of 0,5; 0,64 and 0,7 mm)	7,5	
1.2 Physical trunks		
1.2.1. The attenuation and the attenuation gain/frequency variarion,		
The trunks inherent attenuation on frequencies of 800 and 1000 Hz should be no more than	Table P.1.2	
The trunks inherent attenuation gain/frequency variations should correspond to the values, indicated in the table	Table P.1.3	
1.2.2. The noise psophometric power average for an hour, measured in BH, should be no more than PW	500	The psophometric and unweighted noises ratio is to be defined more accurately
The umweighted noise power average for an hour in frequency band of 0,3-3,4 kHz measured in BH, should be no more than pW	1000	
1.2.3 The crosstalk attenuation value between the circuits on near end, on frequency of 1000 Hz, should be no less than, dB	69,5	
1.2.4 The trunk balance return loss in the frequency band of 0,3-3,4 k Hz should be no less than dB	43,0	
1.2.5 The bit transmission error rate should be no more, than	$3x10^{-5}$	
1.3 Transmission systems with FD VF channel		
The transmission with FD VF channel parameters corres pond to the parameters given in " The perspective norms on the VF channels and the zonal network network paths electric parameters" ZNIIS * , 1985. Adopted by the comission of MC of USSR		
1.4 Trunk network VF channel		
The trunk network VF channel parameters correspond to the parameters, applied in the Perspective norms on the standard channels and the UASC *** network paths electric parameters		
1.5 Transmission systems with TD VF channel		
The local network transmission system with TD VF channel parameters correspond to the parameters given in " The provisional norms on the transmission systems with UASC PCM VF channels electric parameters ZNIIS, 1985, adopted by the comission of MC of USSR.		
The local network FD-TD transmission systems hybrid VF channel parameters correspond to the parameters, given in " The provisional norms on the UASC hybrid channels and paths, organized at the analog and digital transmission system implementation electric parameters, ZNIIS, 1985. Adopted by the commission of MC of USSR.		
*** UASC - united automatic communication system ** MC - ministery of communication		

Table P.1 (cont)

1	2	3
1.6 Analog CO exchange speech path (transmission characteristics). 1.6.1. Architecture The exchange transmission characteristics in accordance with the exchange function contains the protective components, the subscriber sets, the feeding bridges, the line sets (including the elongaters set), the exchange switching field and the exchange wiring 1.6.2. Operating attenuation, operation attenuation deviation. The exchange transmission characteristics with two-wire switching operating attenuation on frequency of 1000 Hz nominal value should not exceed, dB		
for the single exchange subscribers connection	1,2	
for TS, CO and TO at outgoing and incoming communication	1,0	
for CO and TE, switching the physical trunks	1,0	
for ITT, OTT, PBX, switching the physical trunks	0,5	
The exchange transmission characteristics operating attenuation on frequency of 1000 Hz nominal value at the transmission systems communication should make, dB		
for CO, OTT, ITT, TO, CO at the transition from the two-wire path to the four-wire path	13,0 x) 14,0	x) With taking into account the attenuation of 1,0 dB, brought in by the feeding bridges, the protective components and the exchange wiring components (in addition to that, the nominal level on the two-wire CO input is equal to +1,0 dB)
for OTT, ITT; CO; TE at the transition from the four-wire path to the two-wire path	11,0 x) 12,0	x) With taking into account the attenuation of 1,0 dB, brought in by the feeding bridges, the protective components and the exchange wiring (in addition to thatnominal level on the two-wire CO input is equals +1,0 dB)
for OTT,ITT,TE, CO at the four-wire transmission systems VF channels switching	17,0	
The mean square deviation from the nominal value of the operating attenuation should be no more, than dB		
The operating attenuation maximum deviation in frequency band of 0,3-3,4 Hz from the attenuation on frequency of1000 Hz, should be no more than, dB		
for CO with two-wire switching		
in frequency band of 0,3-0,4 kHz	±0,5	
in band of 0,4-2,4 kHz	±0,3	
in band of 2,4-3,4 kHz	±0,5	

Table P.1 (cont)

1	2	3
for CO with four-wire switching in band of 0,3-0,4 kHz	plus 0,5 - minus 0,2	
in band of 0,4-2,4 kHz	plus 0,3 - minus 0,2	
in band of 2,4-3,4 kHz	plus 0,5 - minus 0,2	
1.6.3. Gain/level variation		The two/four wire path measurements are perfor med at the level of +1,0 dB on the two-wire input
The two/four wire and the four-wire paths gain/level variation should remain constant at the level change on the input relative to nominal level from minus 40 dBm0 to plus 3,5 dBm0	±0,2	
1.6.4. Noise		
The noise psophometric power average for an hour, measured in BH, should be, no more, than PW		
on TO and CO TS output	200	The unweighted and psophometric noises ratio is to be defined more accurately
on the tandem exchanges output with two and four-wire switching (ITT, OTT, TE, CO)	100	
The unweighted noise power average for an hour, in frequency band of 0,3-3,4 kHz, measured in BH, should be no more, than pW		
on TO and CO TS output	1500	
on the tandem exchanges output with two and four-wire switching (ITT, OTT, TE, CO) output	750	
The unweighted noise power average for an hour in frequency band of 0,003-20 kHz, measured in BH, should be no more than, pW		
on CO TO and TS output	100000	
on the tandem exchanges output with two and four-wire switching (ITT, OTT, TE, CO)	50000	
1.6.5. Crosstalk attenuation, the distinct transient influences attenuation		
The crosstalk attenuation between two paths via CO in frequency band of 0,3-3,4 kHz should be no less than dB	78	
The crosstalk attenuation between the reception path and transmission path at the hybrid two-wire input loading on the resistance, equal to the balanced circuit resistance in frequency band of 0,3-3,4 kHz should be no less, dB	65	
The distinct transient influences protection between the four-wire path transmission and reception directions in frequency band of 0,3-3,4 kHz should be no less, than dB	70	
1.6.6. Balance return loss		
The balance return loss relative to the earth should be no less, dB		
for the four-wire path		
in band of 0,3-0,6 kHz	43	
in band of 0,6-3,4 kHz	46	
for the two-wire path		
in band of 0,3-0,6 kHz	40	
in band of 0,6-3,4 kHz	46	

Table P.1 (cont)

1	2	3
1.6.7. The mismatching attenuation		
The two-wire path mismatching attenuation relative to the resistance of 600 Ohm should be no less than dB		
in band of 0,3-0,6 kHz in band of 0,6-3,4 kHz	20 26	
The four-wire path mismatching attenuation relative to the resistance of 600 Ohm in frequency band of 0,3-3,4 kHz, should be no less than dB	20	
1.6.8 Pulse noise		
The noise pulses number during 5 min at the maximum level of 35 dB m0 should not exceed, p	5	
1.6.9 Group delay deviation gain frequency variation		
The group delay value deviation from its value, measured on frequency of 1900 Hz, should be more than, ms		
in band of 0,6-3,0 kHz in band of 0,3-0,6 kHz and 3,0-3,4 kHz	0,1 0,2	
1.6.10 Nonlinear distortions		
The 2-d type third degree nonlinearity products (frequencies of 750 and 1140 Hz) should be below the basic signal level on frequencies of 900 and 1020 Hz with level of minus 6 dB each of them in the point with zero relative level by, dB	40	
1.6.11 Error rate		
The error rate at the bit transmission at the rate of 1200 Band should not exceed	10^(-6)	
1.7. Exchange speech path (transmission characteristics) of the digital CO		
1.7.1. Architecture		
The CO exchange transmission characteristics (in accordance with the exchange function may contain the protective components, the subscriber sets, the feeding bridges, line sets (including the elongater sets), the exchange wiring		
1.7.2. Effectively transmitted frequency band. The effectively transmitted frequency band should be, kHz	0,3-3,4	
1.7.3. Transmission characteristics operating attenuattion, measured on frequency of 1000 Hz, should be		
at the single exchange subscribers connection at the transmission from the subscriber to the two-wire trunk and backwards at the transmission from the two-wire trunk to the two-wire trunk	7,0 7,0 7,0	
At the transition from the two-wire subscriber line or trunk to the four-wire subsriber line or trunk and inversely	3,5	
at any four-wire line switching	0,0	
The operating attenuation maximum deviation in frequency band of 0,3-3,4 kHz from the attenuation on frequency of 1000 Hz in all other cases should be no more than dB		

Table P.1 (cont)

1	2	3
in frequency band of 0,3-3,0 kHz in frequency band of 3,0-3,4 kHz	- 0,5...+0,5 - 0,5...+1,8	
The quadrupole operating attenuation maximum deviation in frequency band of 0,3-3,4 kHz from the deviation on frequency of 1000 Hz between any subscriber lines two two-wire inputs should not be more, than, dB		
in frequency band of 0,3-3,0 kHz in frequency band of 0,4-0,6 kHz in frequency band of 0,6-2,4 kHz in frequency band of 2,4-3,0 kHz in frequency band of 3,0-3,4 kHz	- 0,6...+2,0 - 0,6...+1,5 - 0,6...+0,7 - 0,6...+1,1 - 0,6...+3,0	
The mean square deviation from the operating attenuation nominal value, should be no more than, dB	0,2	
The path accumulated loss, measured on frequency of1000 Hz at the signal nominal levels and at the environment temperature and power supply voltages variation in admissible limits, should not change more, than, dB	± 0,2	
1.7.4. Balance return loss		
The balance return loss should be no less, than, dB		
for the four-wire path in frequency band of 0,3-0,6 kHz in frequency band of 0,6-3,4 kHz for the trunk two-wire path in frequency band of 0,3-0,6 kHz in frequency band of 0,6-3,4 kHz for the subscriber lines in frequency of band 0,3-0,6 kHz in frequency of band 0,6-3,4 kHz	43 46 40 46 40 46	
1.7.5. Mismatch attenuation		
The two-wire path mismatch attenuation relative to the resistance of 600 Ohm, should be no less, than, dB		
in frequency band of 0,3-0,6 kHz in frequency band of 0,6-3,4 kHz	20 26	
The four-wire path mismatch attenuation relative to the resistance of 600 Ohm in frequency band of 0,3-3,4 kHz should be no less, than, dB	20	
1.7.6. Group delay deviation gain/frequency variation		
The four-wire path group delay deviation from its value, me-asured on frequency of 1900 Hz, should be no more, than, ms		
in frequency band of 1,0-2,6 kHz in frequency band of 0,6-1,0 kHz in frequency band of 0,5-0,6 kHz and 2,6-2,8 kHz	0,25 0,75 1,5	
1.7.7. Gain-level variation. Congestion threshold		
The four-wire path gain/level variation should be con stant with a precision of, dB at the path input level variation relative to the nominal one		
from minus 40 to plus 3,0 dBmO from minus 50 to minus 40 dBmO from minus 55 to minus 50 dBmO	± 0,5 ± 1,0 ± 3,0	

Table P.1 (cont)

1	2	3
The congestion threshold should be, dB	3,14 ± 0,3 dB	
1.7.8. Noise		
The noise psophometric power average for an hour, measured in BH in the point with zero relative level, should be no more, than pWtO (dBmOp)	100 (minus 70)	
The unweighted noise power average for an hour, measured in BH in the point with zero relative level, should be no more, than, pW (dBmO)		
in frequency band of 0,3-3,4 kHz in frequency band of 0,03-20 kHz	400 x) (-64) 100.000(-40)	*) The value is to be defined more accurately
The additional noise power on the path output in frequency band of 0-4,0 kHz, brought in by the quadrupole PCM path because of the out-of-band signals presence on its input, should be no more, than PWP	100	
The equipment reception part noise psophometric power at the delivery on its input the PCM signal, corresponding to "I" value on the decoder output should be lower, dBmOp	minus 75 PW0P	
1.7.9. Pulse noise	Is to be defined	
1.7.10. Selective noise		
Any selective noise level should not exceed, dBmO	minus 50	
1.7.11 Distinct transient influences protection		
The transient influences protection between the forward and inverse directions on one four-wire path output in frequency band of 0,3-3,4 kHz should be no less than, dB	60	
The distinct transient influences protection between the different paths in frequency band of 0,3-3,4 kHz should be no less, dB	70	
The distinct and indistinct transient influences level in the FD systems with connected channel because of out-of-band signals presence on the quadrupole PCM path output, should be no more, than dBmO	minus 65	
1.7.12. Third degree combinational product level		
The cross modulation any product level of 2f1-f2 type on the quadrupole path output at the simultaneous delivery on its input of two sine signals with different and non-multiple f1, and f2 frequencies, lying in the frequency band of 0,3-3,4 kHz and with the same levels in limits from minus 4 dB to minus 21 dB should be lower than any input signal by, dB,	35	
The cross modulation any product level on the quadrupole path output at the simultaneous delivery on its input of the sine signal with any frequency in the band of 0,3-3,4 kHz with minus 9dBm0 level and the signal with frequency of 0,05 kHz with minus23dBm0 level, should be less, than, dBm0	minus 49	

Table P.1 (cont)

1	2	3
1.7.13. Summary distortions, following the signal (including the quantization distortion)		
The signal protection from the following noise unveighted power in the quadrupole path, should be no less dB at the noise input signal level variation, dBm0		
minus 3 from minus 6 to minus 27 from minus 27 to minus 30 from minus 30 to minus 34 from minus 34 to minus 40 from minus 40 to minus 55	26 34 33 32 28 13	
1.7.14 Out-of-band signal noise on the quadrupole input		
Any product level on the quadrupole path output at the sine signal delivery on its input with frequency in limits from 4,6 to 72 kHz should be lower than the test signal level by the value, above, dB	25	
1.7.15. Out-of-band noise on the quadrupole output		
Any product on the path output of quadrupole, measured out of operating frequency band at the sine signal with nominal level and on frequency of 0,3-3,4 kHz delivery on its input level, should be less, than, dB	minus 25	
1.7.16. Intra-pole noise on the quadrupole output	minus 40	
Any product on the path output of the transmission characteristics measured by the selective device in fre quency band of 0,3-3,4 kHz at the sine signal with nominal level and the frequency in band of 700-1100 Hz(except the frequency of 8 kHz subharmonics) delivery on its input level should be lower than nominal one no less, dB		
1.7.17. Any noise in the quadrupole		
Any noise, caused by the simultaneous active state of all signalling channels, in the quadrupole path maximum level should be less,than dB0p	minus 60	
1.7.18. Error rate		
The error rate at the bit transmission at1200 Band rate should be no more, than	$10^{(-6)}$	
1.8. Toll trunk network automatic switching node		
1.8.1. The effectively transmitted frequency band, should be, Hz	300-3400	
1.8.2. The nominal relative transmission levels in the telephone channels four-wire automatic switching points on frequency of 1000 Hz, should be equal:		
ATE on transmission, dB Ohm on reception, dB Ohm	 minus 3,5 minus 3,5	
ATE on transmission, dB Ohm on reception, dB Ohm	 minus 3,5 minus 4,0	

Table P.1 (cont)

1	2	3
The nominal relative level in the ATE and ASN (VF channels switching points) input and output points on frequency of 1000 Hz should be equal		
ATE input (the VF channel outpit), dB Ohm output (the VF chammel input), dB Ohm	 plus 4,0 minus 13,0	
ASN input (the VF channel output), dB Ohm output (the VF channel imput), dB Ohm	 plus 4,0 minus 13,5	
1.8.3. The four speech path input resistance nominal value in frequency band of 300-3400 Hz should be equal, Ohm	600	
The reflection ratio relative to the four-wire speech patn nominal in frequency band of 300-3400 Hz should be no more, than, %	10	
The reflection ratio relative to the two/ four-wire speech path nominal in frequency band of 300-3400 Hz, should be no more, than %	7	
The balance return should be no less, than, dB		
Four-wire speech path in frequency band of 600-3400 Hz in freqiency band of 300-600 Hz	 46 43	
Two/four-wire speech path in frequency band of 300-3400 Hz	40	
1.8.4. The four-wire speech path attenuation on frequency of 1000 Hz value should be equal, dB		
for ATE for ASN	17 17,5	
The two-four wire speech path attenuation value on frequency of, 1000 Hz should be equal, dB		
transmission reception	13 11	
Difference between the average and nominal speech path attenuation on frequency of 1000 Hz should be no more. than dB	0	setting and operating norm
The speech path attenuation, at all possible connections, mean square deviation from its average value on frequency of 1000 Hz value should be no more, than, dB	0,2	
1.8.5 The speech path attenuation in frequency band of 300-400 Hz value variation relative to the attenuation on frequency of 1000 Hz should be no more, than dB		
in frequency band of 300-400 Hz in frequency band of 400-2400 Hz in frequency band of 2400-3400 Hz	-0,2...+ 0,5 -0,2...+ 0,3 -0,2...+ 0,5	
1.8.6. The group delay value deviation ( ) from the value, measured on frequency of 1900 Hz in speech path should be no more, mcs		
in frequency band of 0,6-3,0 kHz	100	

in frequency band of 0,3-0,6 kHz	200	

Table P.1 (cont)

1	2	3
1.8.7. It is required the speech path gain/level variation that the speech path attenuation, measured in frequency band of 0,3-3,4 kHz should remain constant at the signal level variation from minus 40 to plus 6,0 dBmo on the speech path input, with a precision of, dB		
1.8.8. The noise psophometric power average for an hour value, brought in by the switching facilities in the speech path, should be no more pWt Op (dBmOp)	200 (-67,0)	
The noise umveighed power value, brought in by the switching facilities in the speech path in frequency band of 30-20000 Hz, should be no more, PWt0, (dBm0)	100 000 (-40,0)	
1.8.9. The distinct transient influences protection between two any speech path in frequency band of 0,3-3,4 kHz, value should be no less, than, dB	70	
The distinct transient influences protection between the one four-wire speech path forward and inverse directions in frequency band of 0,3-3,4 kHz, value should be no less, than dB	65	
1.8.10. The crosstalk attenuation from reception to transmission of two/four-wire path in frequency band of0,3-3,4 kHz at the loading from two-wire termination on 600 Ohm value should be no less, than	65	
1.8.11. The non-linear distortions in the speech path on the 3-d harmonic from the basic signal on frequecy of 900 and 1020 Hz with minus 6,0 dB0 level ratio should be no less, than, %		
1.8.12. The validity loss by bursts at the digital information transmission, should be no more	$10^{(-6)}$ Is to be defined	
1.8.13. Pulse noise		
1.8.14. The transient level disappearances	Is to be defined	
1.8.15. The pulse noise and the transient level disappearances operating summary relative time	Is to be defined	
1.9. Telephone sets	13,9	
1.9.1. The telephone set, connected to the supply bridge via the subscriber line with attenuation on frequency of 1000 Hz 4,0 dB (cable with the threads diameter of 0,32 mm) or with attenuation of 5,0 dB (cable with thei threads diameter of 0,5 mm), transmission updated atten uation equivalent maximum value should be no more, than, dB		At TS connection to subscriber line with attenua tion of 1000 Hz, 8,0 dB(cable with the threads diameters of 0,5 mm), the transmission attenuation updated equivalent maximum value should be no more than 18,7 dB
1.9.2. The TS transmission attenuation updated equivalent minimum value, at the subscriber line attenuation of 0dB, no less than	minus 1,0	
1.9.3. The TS transmission attenuation updated equivalent average value, at the subscriber line attenuation of 0 dB,	2,0	

should be , dB		

Table P.1 (cont)

1	2	3
1.9.4. The TS transmission attenuation updated equivalent mean square deviation value, at the subscriber line attenuation of 0 dB, is equal to,	1,0	
1.9.5. The telephone set, connected to the supply bridge via the sibscriber line with attenuation on frequency of 1000 Hz 4,0 dB (cable with the threads diameter of 0,32 mm) or with attenuation of 5,0 dB (cable with the threads diameter of 0,5 mm), reception updated attenuation equivalent maximum value should be no more than, dB	4,0	At TS connection to the sub-bscriber line with attenuati-on of 1000 Hz, 8,0 dB (cable with the threads diameter of 0,5 mm), the updapted equva lent reception atte nuation maximum value should be no more than, 7,0 dB
1.9.6. The reception attenuation updated equivalent minimum value at the subscriber line attenuation of 0 dB should be no less, than, dB	minus 7,15	
1.9.7. The TS reception attenuation updated equivalent average value at the subscriber line attcnuation of 0 dB is aqual to , dB	minus 4,2	
1.9.8. The TS reception attenuation updated equivalent mean square deviation at the subscriber line attenuation of 0 dB, is equal to, dB	0,7	
1.9.9. The remaining telephone set telephonometric electrop-honic and electric parameters are adequate to GOST 7153-85		
1.10. The telephonist garnitures		
The telephonist garniture connected to the telephonist working place plan, should have:		
1.10.1. The transmission attenuation updated equivalent maximum value, no more, than, dB	9,5	The telephonist garniture transmission and recepti tion updated attenuation equiva-lent values are measured in the "09" reference service working place plan
The transmission updated attenuation equivalent minimum value, no less, than, dB	0,5	
The transmission attenuation updated equivalent average value, dB	5,0	
The transmission updated attenuation equivalent equivalent mean square deviation, dB	1,5	
1.10.2. The reception updated attenuation equivalent maximum value, no more, than dB	minus 1,2	
The reception updated attenuation equivalent minimum value no less, than dB	minus 7,15	
The reception attenuation updated average value, dB	minus 4,2	
The reception updated attenuation equivalent mean square deviation, dB	1,0	

Table P 1.1 The subscribers lines inherent attenuation gain/frequency variation

Frequency (Hz)	300	400	600	800	1000	2400	3000	3400
1. The inherent attenuation gain/frequency variation for the cable with the threads diameter of 0,32 mm at the standard of 4,0 dB on frequency of 1000 Hz (UTN), dB	2,2	2,5	3,2	3,5	4,0	6,3	7,0	7,6
2. The inherent attenuation gain/frequency variation for the cable with the threads diameter of 0,4 mm at standard of 4,5 dB on frequency of 1000 Hz (UTN), dB	2,3	2,7	3,3	4,0	4,5	6,7	7,5	7,9
3. The inherent attenuation gain/frequency variation for the cable with the threads diameter of 0,5 mm at standard of 5,0 dB on frequency of 1000 Hz (UTN and RTN), dB	2,6	3,1	3,8	4,5	5,0	7,7	8,6	9,2
4. The inherent attenuation gain/frequency variation for the cable with the threads diameter of 0,5; 0,7; 0,64 mm at norm of 8,0 dB on frequency of 1000 Hz	4,3	4,9	6,9	7,0	8,0	12,1	13,5	14,5

Note: The composite cable subscriber line inherent attenuation gain/frequency variation should be no worse than for the cable with the threads diameter of 0,5 mm implementation cass (line 3).

Table P1.2.

Trunk sections between CO	Physical circuits attenuation, dB		Four-wire section attenuation at VF channels implementa tion on frequency of 800 and1000 Hz, dB
	800 Hz	1000 Hz	
1	2	3	4
CO-CO	-	-	7,0
CO-OTT/ITT (CO-ATE)	4,0	4,5	3,5
CO-CO (via OTT-ITT)	-	-	7,0
CO-ITT	-	-	7,0
OTT-ITT	-		7,0
TO-TO (via TE-CO-TE)	2x4,0=8,0	2x4,5=9,0	7,0
TO-TO (via TE-CO)	2x4,0=8,0	2x4,5=9,0	7,0
TO-TO (via CO)	2x4,0=8,0	2x4,5=9,0	7,0
TO-TE	4,0	4,5	-
CO-TE	-	-	7,0
TO-CO for TE-CO	4	4,5	7,0
CO-switchboard (at the local communication)	11,0	12,0	7,0
CO-switchboard at zonal and toll (trunk) comminication	3,0	3,5	-
CO-SSN	7,0	8,0	7,0
SSN -switchboard	3,5	4,0	3,5
CO-SN	3,0	3,5	-
SN-SSN	-	-	3,5
CO-toll exchange	4,0	i 4,5	-

TABLE P.1.3.
THE TRUNKS INHERENT ATTENUATION
GAIN/FREQUENCY VARIATION.

FREQUENCY, Hz	300	400	600	800	1000	2400	3000	3400
The trunks inherent attenuation gain/ frequency frequency variation at standard on of 1000 Hz equal to 4,5 dB for the cable with threads diameter of 0,5; 0,64; 0,7 mm	2,4	2,6	3,4	4,0	4,5	6,8	7,7	8,2

Application 2.

LIST OF IMPLEMENTED MEASUREMENT INSTRUMENTATION.

FACILITY NAME	FACILITY TYPE
1. Decade-step and tandem type UTN CO and RTN CO ordered trunk lines, interexchange and automatic toll trunks automatic control equipment	АПЗИСЛУ
2. Trunk control semi-automatic equipment.	ПРСО
3. Periodic centralized control semi-automatic equipment	ПЦП
4. Cross attenuation measurement facility (measurer).	ИПЗ-2, ИПЗ-3, ИПЗ-4, ИПЗ-300
5. UTN multypair cables cross attenuation automatic control facility	УППЗ
6. Measurement generator.	ГЗ-36, ГЗ-109, ЕТ-40-Т/А, МР-62
7. Harmonics analyser.	С4-44,С4-48, С6-5
8. Spectrum analyser (voltage selective measurer).	С5-3
9. Attenuation stack.	МЗ-600
10. Measurement filter of 300-3400 Hz	Measurement set "Elephant"
11. Psophometer.	УПН-60, ПЩ-23, ИШС-НЧ-86
12. Reflection and balance return ratio measurement facility.	ИП-ТЧ, КА-701, ЕТ-100Т/А, ЕТ-70Т/У, ИГ-НЧ÷ИУ-НЧ
13. Group delay measurement facility.	ИГ-С1-82-43-54, ИЗВЗ-НЧ, ФЧ-16
14. VF channels statistical parameter automatic measurement facility.	АИСТ-ТЧ
15. VF channel noise measurement facility.	ИП-ТЧ
16. Deveces for telephonometrical parameters measurement.	ГОСТ 17153-68
17. Level panoramic measurement facility.	ИЗВЗ-НЧ, -61 с, КА-701
18. Voltage level measurement	ИП-ТЧ, МР-62, ЕТ-100Т/А, ЕТ70Т/У
19. Pulse noise measurement device.	ИАПП-2, СИПП-П323
20. Resistances stack.	Р-33
21. Device, corresponding to MKKTT recommendations Q.131 and Q.132 for pseudonoise and sine signals.	

Application 3

THE STATISTICAL DATA PROCESSING METHODICS

As a check on correspondence between the norms and statistic data, obtained in consequence of measurements, it is essential to process them and work out their distribution parameters.

The measurements should be performed both on the connections of the same type (that is connections, passing through the same exchanges in the same direction) and on the connections (sections) of various type. In this case the multiple sampling should be performed on every parameter for every connection type.

The number of such repeated samplings for each connection type (sections) is chosen in accordance to the results obtained but should not be less than 8. During the measurements the samples done number sufficiency estimation periodically should be carried out. For this purpose the data obtained are divided arbitrary by two series, the average value is accounted in each samples series and if these average values don't differ (from one another) more than by 10%, the samples number for given type of connections is sufficient.

If the samples number on any parameter is found to be the significant one, more than 20, then the data obtained are to be grouped together ao that auch groups number should not be above 10.

The statistic estimations should be made for each gained - distribution: mean value $\bar{a}$, mean square deviation.

$$\bar{a} = \frac{\sum_{i=1}^{N} a_i}{n}$$

$$\delta = \sqrt{\left(\frac{\sum_{i=1}^{N} a_i^2}{N} - \bar{a}^2 \right) \mathrm{x} \frac{\mathrm{N}}{\mathrm{N-1}}}$$ - at small number of samples

$$\delta = \sqrt{\frac{\sum_{i=1}^{N} a_i^2}{N} - \bar{a}^2}$$ - at significant number of samples

where a_i - the result of i-th sample;

N - samples total number.

Besides, $F(a>a_o)$ function would be found, that is measuring results above ao value proportion (percentage):

$$F_{(a-a_0)} = \frac{N - Na_0}{N} \mathrm{x}\, 100\%$$

Where Na_o - number of samples such that studied parameter value is above ao value.

The measurements results processing should be performed in the same units as the norm is given.

Application 4

TABLE P.4. The UAE value, recommended by CCITT, and norms, set for USSR telephone channels.

	CCITT	USSR NORMS ON ANALOG CHANNELS (dB) AT IMPLEMENTATION OF				NOTE
	NORM	PHYSICAL TRUNKS	FD-FS	TD TS	FD-TD TS	
1	2	3	4	5	6	7
Average weighed with "loading" taking into account telephone channels common UAE values recommended for further outlook	13-16	(**) SLTC 3,5-12,5 (***) SZTC - (****) STTC	SLTC 8,0-13,5 SZTC 12-18 STTC 15-21	SLTC 8,0-14,5 SZTC 12-18 STTC 15-21	SLTC 8,0-14,5 SZTC 12-18 STTC 15-21	Norms for SZTC and STTC are set without "loading" taking into account Norm for further outlook are set at physical trunk absence on all SLTC, SZTC or STTC sections
Recommended for near outlook	13-25,5	SLTC 3,5-12,5 SZTC - STTC	SLTC 8,0-20,5 SZTC 12,0-31,0 STTC 17,0-29,0	SLTC 8,0-19,5 SZTC 12,0-31,0 STTC 17,0-29,0	SLTC 8,0-19.5 SZTC 12,0-31,0 STTC 17,0-29,0	
Maximum admis - sible UAE values of national telephone systems (telephone channel section from TS to minus 3,5 dB point) for 97 per cent of real outging or incomimg states of connections for middle extention:						
transmission	25	-	-	-	-	
reception	14	-	-	-	-	
states of great exten- tion:	for 97 per cent of channels		for 100 per cent of channels			
transmission	26	30,5	25	24	25	
reception	15	16,5	15	15	15	

Table P4 (cont)

1	2	3	4	5	6	7
Minimum ad missible UAE values for national telephone system on transmission	7	5,5	5,5	5,5	5,5	
Common UAE maxi-mum valuei not set for 100 per cent of toll and local telepho-ne channels with D? value and misma-tching on local networks sections taking into account	not set	SLTC 28,0 SZTC - STTC -	SLTC 38,5 SZTC 39,5 STTC 43,5	SLTC 37,0 SZTC 37,0 STTC 40,0	SLTC 37,0 SZTC 40,5 STTC 42,0	
Common UAE maximum value for 95 per cent of	Explicitly not nor-ma lized, but C UAE (95					

Application 5

The designation of updated attenuation equivalents, their units. The terms of electrical parameters, used in this document and their depenitions.

Table P5

NAME	Designation	Unit	NOTE
1. General updated attenuation equivalent of SSLSP	SSLSP GUAE	dB	
2.General updated attenuation equivalent of SSZSP.	SSZSP GUAE	dB	
3.General updated attenuation equivalent of SSTSP.	SSTSP GUAE	dB	
4.Updated attenuation equivalent of SSZSP or SSTSP section from TS up to virtual points of VF channel analog switching at toll communication			
for transmission for reception	UAEtr UAEr		
5.General updated attenuation equivalent of SSlSP mean value with allowance made for loading	SSLSP GUAE	dB	By "loading" is meant the probability of the GUAB occurrence, defined as product SSLSP circuits occurrence probability at local network and the connectvons(intraexchange and interexchange ones) on every tipical SSLSP circuit occurrency probability.
6.SSZSP general updated attenuation equivalent mean value range.	SSZSP GUAE		It is defined from SSZSP GUAE values on all tipical SSZSP circuits.
7.SSTSP general updated attenuation equivalent mean value range.	SSTSP GUAE		It is defined from SSTSP GUAE values on all tipical SSTSP circuits.
8.Updated attenuation equivalent of SSZSP or SSTSP from TS up to virtual points of VF channel analog switching at toll communication with allowance made for "loading" mean value.			By "loading" is meant the probability of UAEtr or UAErec occurrence, defined by occurency probabilities of tipical cir cuit of UTN and RTN to ATE outgoing and incoming call organization.
for transmission for reception	GUAEtr GUAErec	dB dB	

The terms of electrical parametrs, used in this document and their definitions.

9.Terms of electrical	National Standart 21655-76 National Standart 22348-77
parameters, used	National Standart 19472-80 National Standart 18490-85
in this document	National Standart 21835-84 National Standart 603-25-86

Application 6

Table P.6. The cables with threads diameter of 0,32; 0,4; 0,5; 0,64 and 0,7 mm, dB/km inherent kilometric attenuation gain/frequency variations.

Cable threads diameter, mm	Frequency, Hz								R0 Om/km	AT. F/km
	300	400	600	800	1000	2400	3000	3400		
0,32	1,18	1,36	1,66	1,92	2,15	3,33	3,72	3,96	216	$45*10^{(-9)}$
0,40	0,95	1,09	1,33	1,54	1,72	2,67	2,98	3,17	139	$45*10^{(-9)}$
0,50	0,75	0,87	1,06	1,24	1,38	2,13	2,38	2,54	90	$45*10^{(-9)}$
0,64	0,58	0,67	0,82	0,95	1,06	1,65	1,85	1,96	54	$45*10^{(-9)}$
0,70	0,53	0,61	0,75	0,88	0,96	1,49	1,66	1,77	45	$45*10^{(-9)}$

CONTENTS

INTRODUCTION 4
1. The perspective norms on electrical parameter of the PSTN channels 6
1.1. The norms on general characteristics 6
1.2. Local speech paths (LSP) 10
1.3. Zonal Telephone Channels (ZTNC) of PSTN 43
1.4. The PSTN toll network telephone channels (TNTS)* 59
1.5. National section of international telephone network channels (ITNC) 77
1.6. The UTN subscriber-special service speech paths SSSP 94
2. THE PERSPECTIVE NORMS ON THE ATTENUATION UPDATED EQUIVALENTS 106
2.1. The subscriber local telephone channels. (SSLSP) of PSTN 106
2.2. The subscriber zonal telephone channels of PSTN SSZSP 127
2.3. The PSTN subscriber toll telephone channels (SSTSP) 142
2.4. The PSTN subscriber-to-subscriber local speech path special service speech path (SSSP SSLSP) 159
3. MEASURING TECHNIQUE FOR ELECTRICAL PARAMETERS OF LOCAL, ZONE AND TOLL TELEPHONE CHANNELS 164
4. METHODICS FOR DETERMINATION OF UPDATED ATTENUATION EQUIVALENT VALUES FOR PSTN LOCAL, ZONE AND TOLL CHANNELS 189
APPLICATION 1. THE INITIAL DATA FOR THE TOLL, ZONAL, LOCAL TELEPHONE CHANNELS NORMALIZATION 194
APPLICATION 2. LIST OF IMPLEMENTED MEASUREMENT INSTRUMENTATION 210
APPLICATION 3. THE STATISTIC DATA PROCESSING 211
APPLICATION 4. THE UAE VALUE, RECOMMENDED BY CCITT, AND NORMS, SET FOR USSR TELEPHONE CHANNELS 213
APPLICATION 5. THE UPDATED ATTENUATION EQUIVALENT LETTERING, THEIR UNITS. THE ELECTRICAL PARAMETERS TERMS, USED IN THE DOCUMENT AND THEIR IDENTIFICATIONS 215
APPLICATION 6. THE CABLES WITH THREADS DIAMETER OF 0,32; 0,4; 0,5; 0,64 AND 0,7 mm, dB/km INHERENT KILOMETRIC ATTENUATION GAIN/FREQUENCY VARIATIONS 217
LIST OF ABBREVIATIONS 218