

**Referát z laboratorního měření č. 67B**  
**„Měření vlivu rušení na xDSL“**

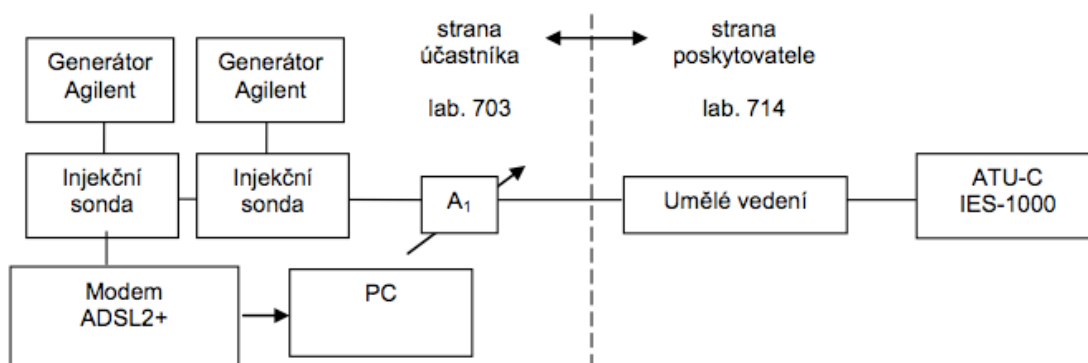
Jan Dohnal (skupina „Blažena“)

11.12.2008

## Zadání:

1. Seznamte se s vlastnostmi modemů, které máte k dispozici.
2. Sestavte datový řetězec podle schématu s modemem ADSLoISDN.
3. Připojte modem k PC pomocí LAN rozhraní
4. Pokračujte bez aktivovaných generátorů Agilent.
5. Webové konfiguračním rozhraní je na adrese <http://xx.xx.xx.xxx> (adresa je napsaná na modemu). Přihlašovací údaje jsou admin – 1234. Na změnu hesla dejte Ignore. Přenosové rychlosti jsou pod položkou Maintenance - System status - Show statistics. Alokace bitů jsou pod položkou Maintenance - Diagnostic - DSL Line.
6. Proveďte měření dosažitelných přenosových rychlostí ADSL2+ v závislosti na útlumu vedení. Nastavujte postupně hodnotu útlumového článku A1 na 0,1; 10; 20; 30; 40; 45 dB. Pro každou hodnotu útlumu proveďte test a zaznamenejte dosažené přenosové rychlosti modemu. Po každé změně útlumu rozpojte spojení a znovu připojte, aby se modem znovu synchronizoval. Nalezněte a zaznamenejte maximální hodnotu útlumu, pro kterou se ještě modem připojí. Pro hodnotu útlumu 1dB a pro hodnotu útlumu 5dB pod nalezenou maximální hodnotou zaznamenejte také tabulku alokace bitů.
7. Bod 6 opakujte pro konfiguraci s aktivovaným generátorem:
  - Přeslechu
  - Impulsního rušení
  - Impulsního rušení a přeslechu
8. Vyneste do grafu závislosti přenosové rychlosti (Interleaved BR) downstream a upstream na útlumu (Attenuation) a porovnejte dosažitelné parametry přenosu pro různé typy rušení. Útlum 20 dB útlumového článku odpovídá prodloužení délky vedení o 2 km při průměru jádra 0,4 mm.
9. Vyneste do grafu naměřený počet alokovaných bitů v závislosti na kmitočtu a porovnejte.
10. Uveďte pracoviště do původního stavu.

## Schéma zapojení pracoviště:



## Potřebné teoretické podklady:

**ADSL** (*Asymmetric Digital Subscriber Line*) je digitální přenosová technologie určená k překlenutí tzv. „poslední míle“ v přístupové síti operátora (k překlenutí úseku v přístupové síti, který je tvořen symetrickými páry vedení). Hlavním přínosem ADSL jsou nové druhy služeb poskytované zejména prostřednictvím sítě Internet s využitím existující infrastruktury metalické přístupové sítě.

Technologie ADSL je navržena pro koexistenci se signály stávající služby POTS (Plain Old Telephone Service, ADSL over POTS) nebo se signály základní přípojky BRA-ISDN (Basic Rate Access – Integrated Services Digital Network, ADSL over ISDN). Koexistence je zajištěna instalací

rozbočovače (splitteru), který obsahuje pasivní filtry a který oddělí frekvenční pásma používaná pro přenos signálů jednotlivých technologií (POTS do 3,4 kHz, BRA-ISDN do 80 kHz). ADSL over POTS využívá frekvenční pásmo od 25 kHz do 1,104 MHz (pro ADSL over ISDN se spodní hranice pásma posouvá na 138 kHz).

Celé využívané frekvenční pásmo se dělí na subpásma o šířce 4,3125 kHz. V jednotlivých subpásmech se přenáší data s modulační rychlostí 4 kBd pomocí kvadraturně amplitudové modulace QAM. Tato metoda přenosu patří do skupiny modulací s více nosnými a označuje se DMT (Discrete Multitone). Ve výsledku pak DMT umožňuje dosažení přenosové rychlosti ve směru od poskytovatele k účastníkovi až 8 Mbit/s (směr downstream) a od účastníka k poskytovateli až 1 Mbit/s (směr upstream). Pro vytvoření obousměrného provozu se používá nejčastěji metoda FDD (Frequency Division Duplex) s dělicím kmitočtem mezi směry přenosu 138 kHz (pro ADSL over POTS), nebo 276 kHz (pro ADSL over ISDN).

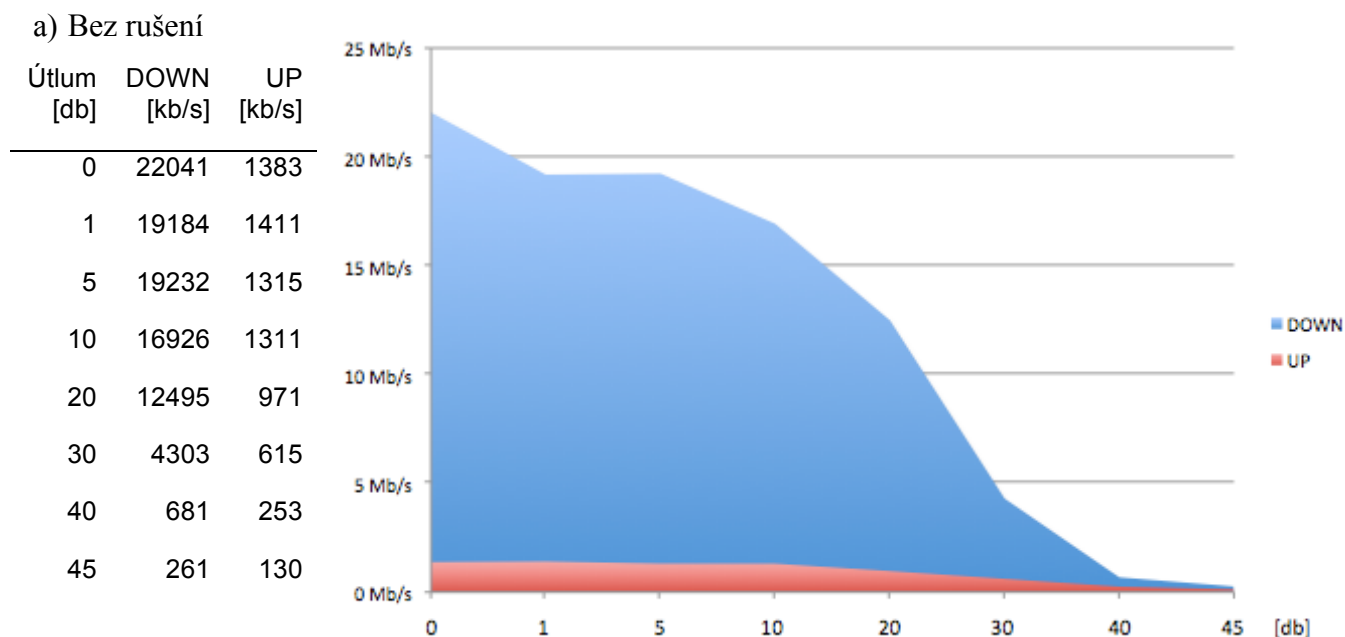
**ADSL 2+** využívá oproti ADSL dvojnásobné frekvenční pásmo do 2,208 MHz rozdělené do 512 subpásem. ADSL2+ over ISDN využívá frekvenční pásmo od 138 do 2,208 MHz. Ve výsledku pak umožňuje dosažení přenosové rychlosti ve směru od poskytovatele k účastníkovi až 25 Mbit/s (směr downstream) a od účastníka k poskytovateli až 1 Mbit/s (směr upstream).

Technologie ADSL je tedy hlavně určena pro privátní koncové uživatele nebo malé firmy, u kterých se předpokládají vyšší datové přenosy ve směru downstream.

## Seznam používaných přístrojů a zařízení:

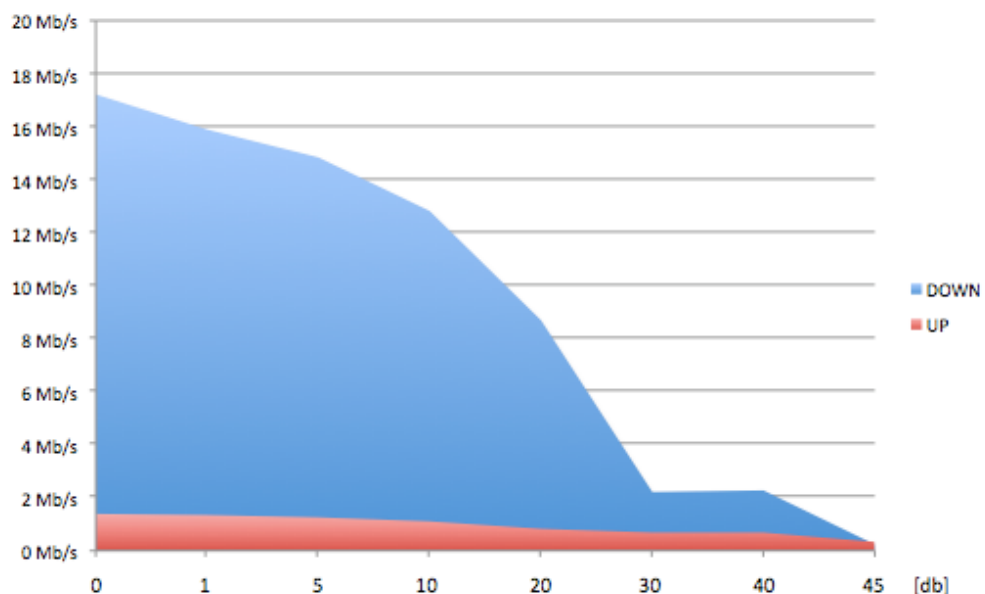
- ZyXEL IES-1000 – ústřednová strana ATU- C (ADSL Transceiver Unit – Central Office).
- PC – osobní počítač pro konfiguraci a vyčítání parametrů, programové vybavení Hyperterminal.
- Umělé vedení – úsek nahrazující metalické vedení o délce 1,2 km.
- A<sub>1</sub> – útlumový článek sloužící ke zvýšení hodnoty útlumu přenosové cesty .
- Agilent – Programovatelný generátor signálu
- Modemy - Zyxel 660RU

## Měření rychlosti připojení v závislosti na rušení:



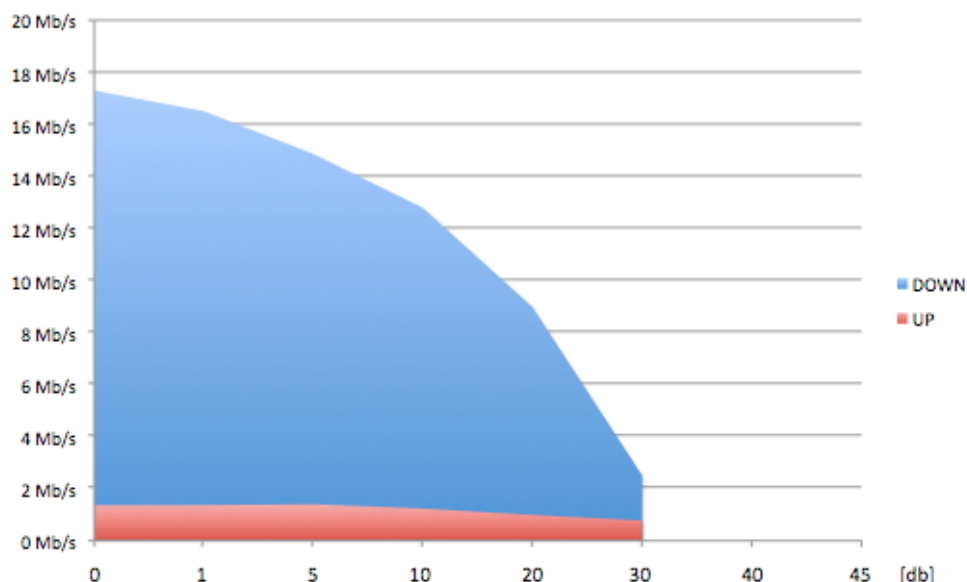
### b) S přeslechem

Utlum [db]	DOWN [kb/s]	UP [kb/s]
0	17214	1391
1	15888	1347
5	14837	1259
10	12815	1107
20	8694	827
30	2215	687
40	2275	687
45	234	331



### c) S rušením

Utlum [db]	DOWN [kb/s]	UP [kb/s]
0	17298	1367
1	16503	1371
5	14857	1403
10	12787	1239
20	8974	995
30	2501	779
40	bez spojení	



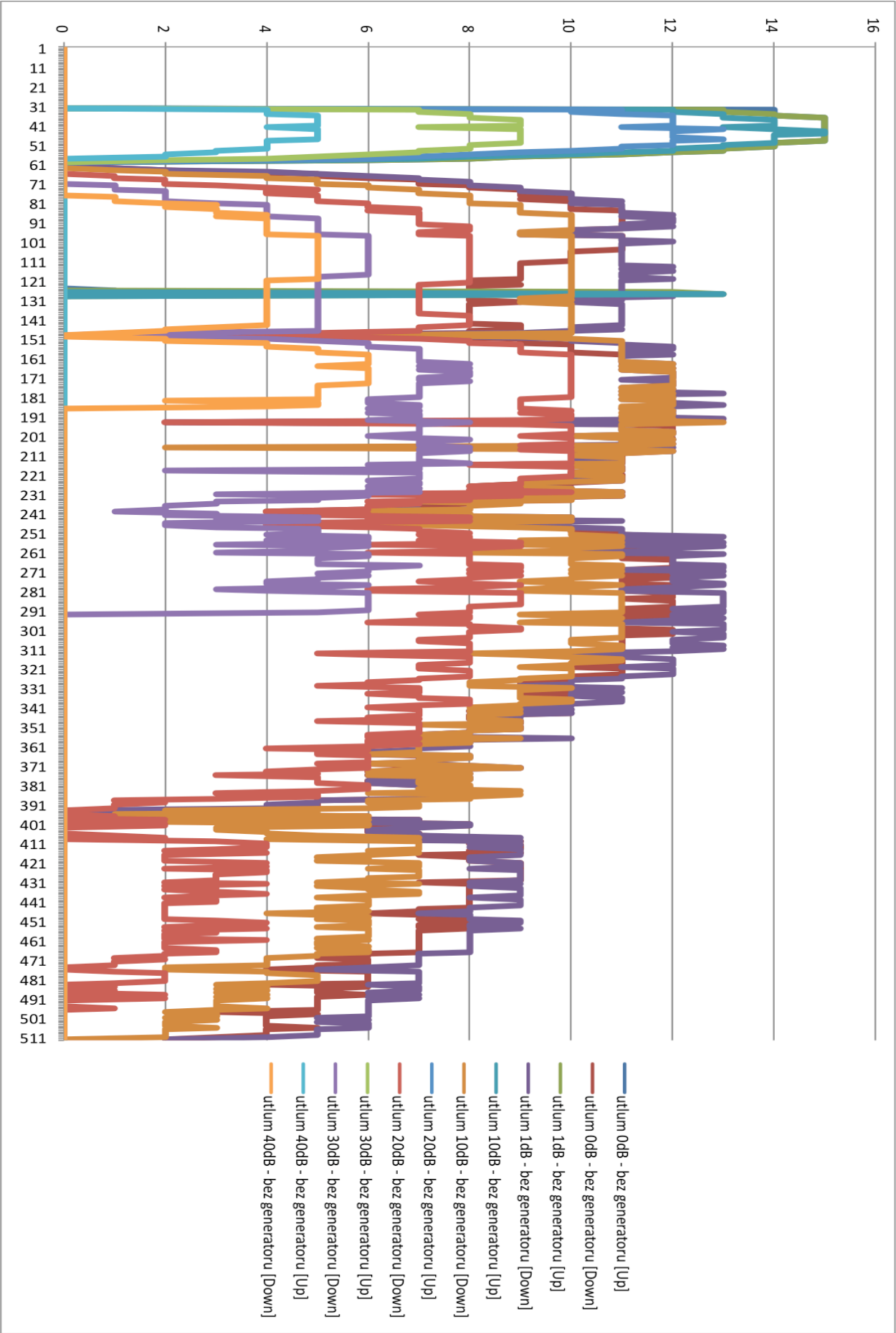
## Naměřený počet alokovaných bitů v závislosti na kmitočtu

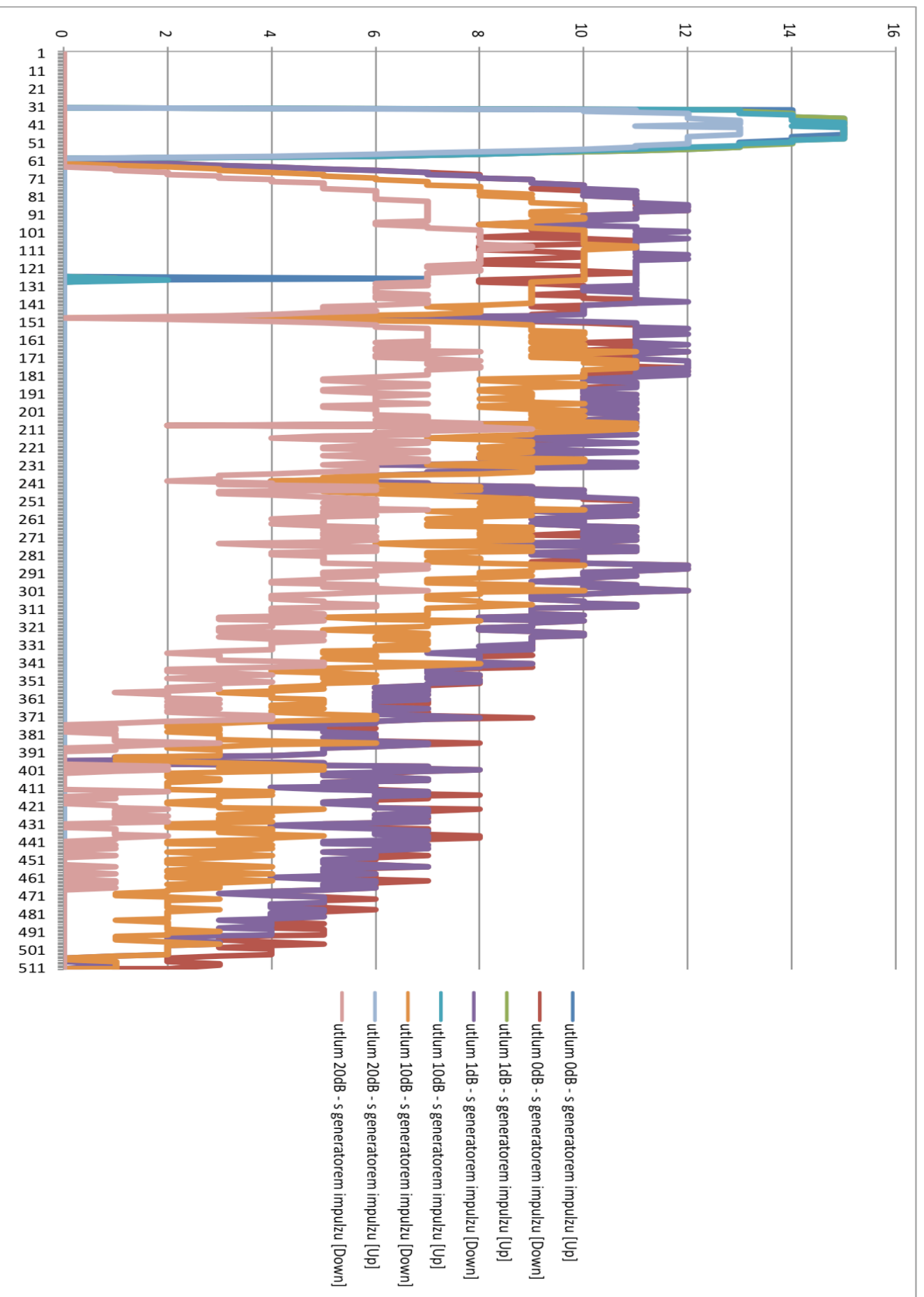
Po naměření alokovaných bitů pro jednotlivá rušení, lze pozorovat závislost na kmitočtu. Nicméně rušení se projevuje víceméně rovnoměrně v celé škále. Hodnoty vynesené do grafů naleznete v příloze.

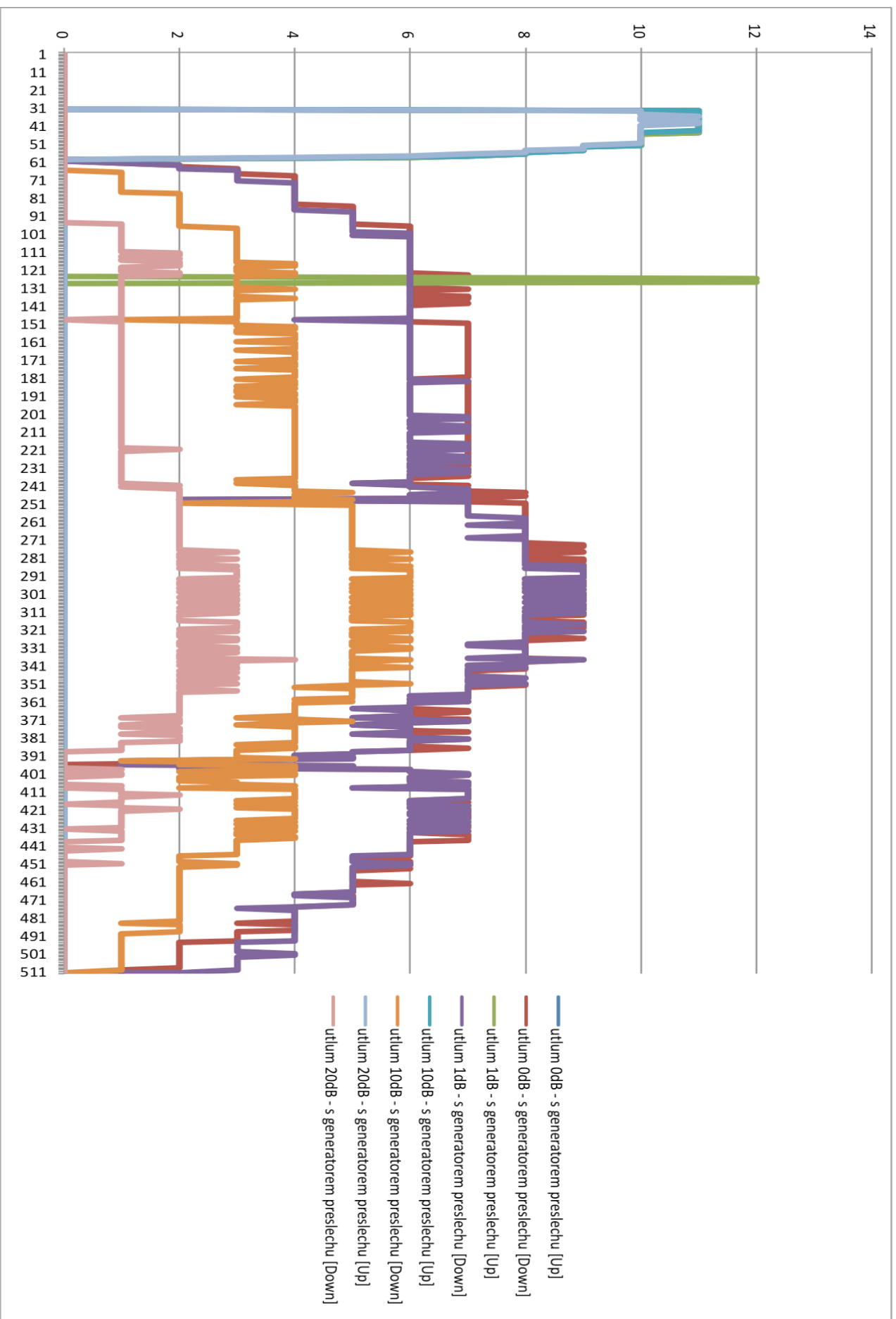
## Závěr

Měření se podařilo uskutečnit celé a splnilo očekávání. Vyzkoušeli jsme si proměřování DSL linky a předvedli si závislost na délce vedení či jak se zhorší kvalita při přeslechu, nebo impulzním rušení.

Příloha 1







## Příloha 2

generator impulzu: 10MHz  
generator preslechu: 129mV (pp)

utlum 0dB - bez generatoru

-----  
Upstream

-----  
noise margin upstream: 5 db

output power downstream: 21 db

attenuation upstream: 19 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 32- 63: ee ee ff ff ff ff ff ff fe ee dd cb 98 60 00 00

tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 01

tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Downstream

-----  
noise margin downstream: 7 db

output power upstream: 12 db

attenuation downstream: 31 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 12

tone 64- 95: 35 56 77 78 89 99 9a 9a aa aa bb bb bb bb bb aa

tone 96-127: 9b bb bb bb ba aa aa a9 99 99 99 99 88 98 88 88

tone 128-159: 88 89 88 88 88 88 88 89 99 88 37 99 9a aa aa bb

tone 160-191: bb bb bc bc cc cc cc cc cc cc cc cc cc cc bc bc

tone 192-223: b2 bc cc cc bc cb cb cb cb bb bb b9 bb ba bb bb

tone 224-255: aa 9a 9b 7b 9a 88 76 64 76 98 a6 9a aa bb cb ac

tone 256-287: ac bb ac cb cc cc cb cb cc bb bc cb bc cc bc cc

tone 288-319: cb cc bb cb bb bb cb cb bb bb bb bb aa bb bb ba

tone 320-351: bb bb aa a9 99 aa a9 aa aa a9 99 8a 88 89 98 99

tone 352-383: 88 77 97 87 77 76 67 77 76 79 76 76 87 66 78 78

tone 384-415: 78 87 55 55 52 41 63 75 88 66 67 78 69 89 99 89

tone 416-447: 78 88 99 99 99 99 99 78 88 88 88 88 88 88 77 67

tone 448-479: 87 88 77 87 77 77 77 77 76 65 66 65 54 66 66

tone 480-511: 66 64 65 55 65 55 55 55 53 54 44 44 45 44 44 32

utlum 1dB - bez generatoru

-----  
Upstream

-----  
noise margin upstream: 5 db

output power downstream: 20 db

attenuation upstream: 14 db



tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: dd ee ff ff ff ff ff ff ee dd cb 98 60 00 00  
tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 cd  
tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

#### Downstream

-----

noise margin downstream: 6 db

output power upstream: 12 db

attenuation downstream: 28 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 12  
tone 64- 95: 45 67 78 88 99 9a aa ab ab bb bb cb cc cb cb aa  
tone 96-127: 9b bb cb bb bb bb bb bb bc bc bb bc bb bb bb bb  
tone 128-159: ca ba bb bb bb bb bb bb ab a9 48 aa bb cc bb cb  
tone 160-191: bb bc bc bc cc cb cc cb cb db cb cc dc bc cc bd  
tone 192-223: a2 bb bb cc ab cb ca ca ca aa ab b8 bb ba aa bb  
tone 224-255: 99 8a 9b 6b 89 77 66 75 76 a8 b7 9a bb bb dc bd  
tone 256-287: ad cc ad cc cc cd db dc dc cc dd cb bd dd dd dd  
tone 288-319: dc dd cc dc bd dd dc dd dc cc dc dc aa bc cc cb  
tone 320-351: cc cc bb aa a9 ba ba ab bb aa 9a 8a 89 89 98 99  
tone 352-383: 88 78 a7 87 87 76 68 87 77 89 77 86 88 66 78 78  
tone 384-415: 88 87 55 45 40 20 51 75 88 76 67 79 59 89 89 99  
tone 416-447: 98 88 99 98 99 99 99 89 89 99 99 89 99 98 88 78  
tone 448-479: 88 99 88 98 88 88 88 88 87 77 77 77 65 77 77  
tone 480-511: 77 76 77 76 76 76 66 66 66 66 56 56 66 55 55 42

utlum 10dB - bez generatoru

-----

#### Upstream

-----

noise margin upstream: 5 db

output power downstream: 22 db

attenuation upstream: 24 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: cc dd de ee ed ef fe ee ee dd cc ba 87 50 00 00  
tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0d  
tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

#### Downstream

-----

noise margin downstream: 6 db

output power upstream: 12 db

attenuation downstream: 38 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01  
tone 64- 95: 22 44 55 56 67 77 88 88 89 99 99 aa aa aa aa a9  
tone 96-127: 9a aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa  
tone 128-159: a9 a9 aa aa aa aa aa aa aa aa aa 69 ab bb bb bb bb  
tone 160-191: bb bc bc bc cc cc cc cb cb cb cb cc cb bc bc bc  
tone 192-223: bd bb bb cc ab cb cb 2b cb ab bb b8 bb ba ab bb  
tone 224-255: 99 8a 9b 6b 8a 79 88 85 86 a8 a6 79 aa aa bb 9b  
tone 256-287: 9b aa 8b ba aa ab ba ba ba a9 ab a9 9b bb bb bb  
tone 288-319: bb bb 9a ba 9b bb bb bb ba aa bb ba 89 ab ba a9  
tone 320-351: aa aa a9 98 88 a9 99 99 aa 99 89 89 88 89 97 99  
tone 352-383: 88 77 97 87 77 77 68 87 76 89 76 86 88 77 88 79  
tone 384-415: 69 88 66 77 62 51 62 62 66 33 44 57 47 77 77 67  
tone 416-447: 65 65 77 76 77 77 66 57 56 67 76 56 66 65 56 45  
tone 448-479: 65 66 65 66 66 65 65 56 56 65 54 44 44 22 44 55  
tone 480-511: 55 43 43 43 43 43 33 34 32 33 23 22 23 22 22 20

utlum 20dB - bez generatoru

-----

#### Upstream

-----

noise margin upstream: 6 db

output power downstream: 22 db

attenuation upstream: 34 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: ba bc cc cc cb dc cc cd cc cb ba 98 76 40 00 00  
tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

#### Downstream

-----

noise margin downstream: 6 db

output power upstream: 12 db

attenuation downstream: 46 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 64- 95: 00 11 22 23 45 44 55 55 66 67 67 77 77 77 88 87  
tone 96-127: 78 88 88 88 88 88 88 88 88 88 88 88 77 77 77  
tone 128-159: 77 77 77 77 77 88 88 88 77 75 15 78 89 99 99 aa  
tone 160-191: aa aa aa aa aa aa aa aa aa aa a9 99 99 9a 9a aa  
tone 192-223: 92 9a aa aa 9a aa a9 a9 aa aa aa a8 aa aa aa 99  
tone 224-255: 99 89 8a 59 78 67 66 64 65 86 84 46 77 87 88 79  
tone 256-287: 69 88 68 88 88 89 98 98 98 87 89 86 69 99 99 99  
tone 288-319: 88 88 78 87 68 89 98 88 87 78 88 88 56 88 88 77  
tone 320-351: 78 88 87 76 65 77 76 77 88 87 67 77 76 75 77 77  
tone 352-383: 77 66 76 67 64 65 56 66 65 66 54 53 55 55 66 65  
tone 384-415: 35 53 12 11 10 00 10 20 22 00 00 12 03 44 43 24  
tone 416-447: 22 22 43 42 44 33 33 24 23 23 43 23 32 22 22 22  
tone 448-479: 22 34 32 42 32 22 42 22 23 32 21 21 11 00 12 22  
tone 480-511: 22 10 10 10 20 20 00 01 00 00 00 00 00 00 00 00

utlum 30dB - bez generatoru

-----  
Upstream

-----  
noise margin upstream: 5 db  
output power downstream: 19 db  
attenuation upstream: 44 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 77 88 89 99 97 99 99 99 99 88 87 76 54 20 00 00  
tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Downstream

-----  
noise margin downstream: 6 db  
output power upstream: 12 db  
attenuation downstream: 55 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 64- 95: 00 00 00 01 11 22 22 22 34 44 44 44 55 55 55 55  
tone 96-127: 56 66 66 66 66 66 66 66 66 66 55 55 55 55 55  
tone 128-159: 55 55 55 55 55 55 55 55 52 02 45 66 67 77 77  
tone 160-191: 77 78 78 78 88 77 87 77 77 77 76 66 77 67 67 77  
tone 192-223: 68 77 77 77 67 87 77 87 87 77 77 86 77 27 77 76  
tone 224-255: 77 67 67 36 55 33 22 21 32 53 52 23 55 54 66 46  
tone 256-287: 36 55 36 65 55 57 66 65 65 54 46 53 46 66 66 66  
tone 288-319: 66 65 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

utlum 40dB - bez generatoru

-----  
Upstream

-----  
noise margin upstream: 6 db  
output power downstream: 16 db  
attenuation upstream: 54 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 44 45 55 55 54 55 55 55 44 44 43 32 20 00 00 00  
tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Downstream

-----  
noise margin downstream: 8 db  
output power upstream: 12 db  
attenuation downstream: 58 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 64- 95: 00 00 00 00 00 00 00 01 11 23 23 33 43 44 44 44  
tone 96-127: 45 55 55 55 55 55 55 55 55 55 55 55 44 44 44 44  
tone 128-159: 44 44 44 44 44 44 44 44 32 21 00 22 44 45 55 66  
tone 160-191: 66 66 56 66 66 66 66 55 55 55 55 25 54 00 00 00  
tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

utlum 0dB - s generatorem impulzu

-----  
Upstream

-----  
noise margin upstream: 6 db

output power downstream: 19 db

attenuation upstream: 13 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 32- 63: ee ee ef ff ff ff ff fe ee dd dd cb 98 60 00 00

tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 71

tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

#### Downstream

-----

noise margin downstream: -8 db

output power upstream: 12 db

attenuation downstream: 26 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 23

tone 64- 95: 45 67 88 89 99 aa 9a ab ab bb bb cb cb ba aa a9

tone 96-127: 89 99 aa 98 ab aa 88 89 aa a9 89 8a aa ab aa 98

tone 128-159: 89 aa aa a9 aa bb ba 9a aa 99 49 9a bb bb bb bb

tone 160-191: bb ab bb ac ba ab bb bb cb ca bb aa bb ba aa ab

tone 192-223: aa ab ba ab aa bb ba ba 2a aa aa a7 9a a9 99 aa

tone 224-255: 99 8a 9a 6a 89 77 66 64 76 98 a6 99 aa bb bb ab

tone 256-287: 9a ba 9a a9 ab ab a9 ba ba 89 bb b9 9a aa 9a cb

tone 288-319: cb aa ba a9 ab ab cb a9 99 aa bb 99 99 a8 8a 99

tone 320-351: 98 89 aa 99 99 99 99 88 98 88 89 89 77 78 87 88

tone 352-383: 87 67 76 76 67 77 66 76 77 79 76 64 46 55 66 66

tone 384-415: 68 76 55 55 41 30 52 76 87 65 67 75 56 56 76 86

tone 416-447: 76 56 66 87 76 77 67 55 57 77 78 87 66 76 76 56

tone 448-479: 76 65 56 76 55 66 56 76 56 65 44 45 65 55 45 65

tone 480-511: 54 54 44 54 45 55 53 33 45 43 44 44 32 22 33 21

utlum 1dB - s generatorem impulzu

-----

#### Upstream

-----

noise margin upstream: 5 db

output power downstream: 20 db

attenuation upstream: 14 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 32- 63: dd ee ef ff ff ff ff fe ee dd cb 98 60 00 00

tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 11

tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

#### Downstream

-----

noise margin downstream: 7 db

output power upstream: 12 db

attenuation downstream: 27 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 23  
tone 64- 95: 45 67 78 89 99 aa ab ab ab bb bc cb cb ba bb aa  
tone 96-127: 9b bb cb bb cb bb bb bb bc bc bb bb bb bb bb bb  
tone 128-159: bb ba ba bb bb bc ba aa aa a9 48 ab bb cb bc bb  
tone 160-191: bb bc bb bc bb bb cc cc cb cb cb aa bb bb aa ab  
tone 192-223: ab ab ba ab aa bb ba bb 2b aa ab a8 aa b9 99 ab  
tone 224-255: 99 8a 9b 6b 89 77 66 65 76 98 a7 a9 ab bb bb ab  
tone 256-287: 9a ba 9a a9 ab ab aa ba ba 89 bb b9 9a aa aa cb  
tone 288-319: cb aa ba a9 ab ab cb a9 99 aa bb 99 99 a8 8a 99  
tone 320-351: 98 89 aa 99 99 98 99 87 88 88 89 88 77 78 77 88  
tone 352-383: 77 67 76 76 67 66 66 76 66 78 76 64 45 55 66 56  
tone 384-415: 67 76 55 55 41 30 52 76 87 55 67 75 56 45 76 76  
tone 416-447: 66 55 66 77 76 76 67 54 56 76 67 77 55 76 76 56  
tone 448-479: 66 55 56 75 55 65 45 66 55 65 43 45 55 54 44 55  
tone 480-511: 44 54 34 44 34 44 42 22 33 22 22 22 10 00 11 00

utlum 10dB - s generatorem impulzu

-----

#### Upstream

-----

noise margin upstream: 5 db

output power downstream: 22 db

attenuation upstream: 24 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: dd de ee ef fe ff ff ff fe ed dc ba 98 60 00 00  
tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 12  
tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

#### Downstream

-----

noise margin downstream: 6 db

output power upstream: 12 db

attenuation downstream: 36 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01  
tone 64- 95: 23 34 55 66 77 78 88 89 89 99 9a aa a9 99 aa 99  
tone 96-127: 89 9a aa aa aa aa bb aa aa aa aa aa aa aa aa  
tone 128-159: 99 99 99 99 99 99 98 78 88 75 04 78 99 99 aa 99  
tone 160-191: a9 9a a9 9b a9 9a ba bb ba aa aa 88 9a a9 88 99  
tone 192-223: 98 99 a8 89 a9 9a 99 ab 2b ba 99 87 89 99 88 99  
tone 224-255: 88 8a a9 79 99 98 65 64 65 87 85 67 89 98 99 8a  
tone 256-287: 78 98 78 87 79 89 88 98 97 67 99 97 77 88 78 a9  
tone 288-319: 99 88 98 77 79 88 a8 87 77 88 98 77 77 75 68 77  
tone 320-351: 76 56 77 66 77 76 67 55 66 56 68 76 44 56 55 66  
tone 352-383: 55 45 43 44 45 55 44 54 45 66 64 32 23 32 33 33  
tone 384-415: 46 43 23 33 31 21 34 53 54 22 23 32 22 22 43 43  
tone 416-447: 33 22 33 54 43 43 34 22 24 43 45 44 22 43 43 23  
tone 448-479: 43 22 23 43 22 42 23 43 23 32 21 12 32 22 22 32  
tone 480-511: 22 22 12 22 22 32 21 11 23 22 22 22 10 01 11 10

utlum 20dB - s generatorem impulzu (pada)

-----  
Upstream

-----  
noise margin upstream: 5 db  
output power downstream: 21 db  
attenuation upstream: 33 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: ba cc cc dd db dd dd dc cc cc bb a9 76 40 00 00  
tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Downstream

-----  
noise margin downstream: 6 db  
output power upstream: 12 db  
attenuation downstream: 44 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 64- 95: 01 12 23 34 45 55 56 66 66 67 77 77 77 77 76  
tone 96-127: 67 78 88 88 88 88 99 88 88 88 87 78 87 77 77  
tone 128-159: 76 76 66 67 66 77 76 55 65 43 02 45 66 77 77 77  
tone 160-191: 77 67 76 68 76 67 87 78 87 77 76 55 67 76 55 67  
tone 192-223: 66 66 75 56 66 67 76 78 28 97 67 54 57 76 55 77  
tone 224-255: 65 67 76 56 66 54 33 32 43 64 63 34 56 65 66 57  
tone 256-287: 55 65 45 54 56 56 55 65 65 34 66 64 45 55 55 76  
tone 288-319: 76 55 65 54 46 56 76 54 44 55 66 44 45 53 35 44  
tone 320-351: 43 33 55 34 54 44 44 32 33 33 55 54 22 34 32 34

tone 352-383: 33 23 21 22 23 23 22 32 23 44 42 10 01 10 11 11  
tone 384-415: 13 21 01 00 00 00 00 20 21 00 00 00 00 00 21 10  
tone 416-447: 10 00 11 21 11 21 12 00 01 11 12 11 00 10 10 00  
tone 448-479: 10 00 00 10 00 10 00 11 00 10 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

utlum 0dB - s generatorem preslechu

-----  
Upstream

-----  
noise margin upstream: 5 db  
output power downstream: 22 db  
attenuation upstream: 13 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: bb bb bb bb bb bb ba aa aa aa 99 98 87 60 00 00  
tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Downstream

-----  
noise margin downstream: 6 db  
output power upstream: 12 db  
attenuation downstream: 26 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 22  
tone 64- 95: 33 33 44 44 44 44 44 44 44 44 45 55 55 55 55 55  
tone 96-127: 66 66 66 66 66 66 66 66 66 66 66 66 66 67 66 66  
tone 128-159: 66 67 66 67 76 67 66 66 66 66 56 77 77 77 77 77  
tone 160-191: 77 77 77 77 77 77 77 77 77 77 76 77 77 77 77 77  
tone 192-223: 77 77 77 77 77 77 77 77 77 77 77 77 77 77 77 77  
tone 224-255: 77 77 77 67 77 67 66 65 76 77 87 87 27 88 88 88  
tone 256-287: 88 88 88 88 88 88 88 88 89 98 89 88 89 98 99 99  
tone 288-319: 99 99 89 99 98 98 99 99 98 99 99 89 98 88 99 99  
tone 320-351: 89 88 89 88 88 88 88 88 89 88 78 87 77 78 77 88  
tone 352-383: 77 77 77 76 76 66 67 76 65 77 65 66 67 56 67 66  
tone 384-415: 66 76 55 45 41 30 52 66 77 66 67 77 57 77 77 76  
tone 416-447: 76 76 77 77 77 67 67 76 76 77 77 66 66 66 66 65  
tone 448-479: 56 66 56 55 55 55 56 55 55 54 55 55 55 44 44 44  
tone 480-511: 44 43 44 44 33 33 33 22 22 22 22 22 22 21 10

utlum 1dB - s generatorem preslechu

-----  
Upstream

-----  
noise margin upstream: 5 db  
output power downstream: 22 db



attenuation upstream: 14 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: bb bb bb bb bb bb ba aa aa aa 99 98 87 60 00 00  
tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0c ac  
tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

#### Downstream

-----

noise margin downstream: 6 db

output power upstream: 12 db

attenuation downstream: 27 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 22  
tone 64- 95: 23 33 33 33 44 44 44 44 44 44 44 44 55 55 55 55  
tone 96-127: 55 55 65 66 66 66 66 66 66 66 66 66 66 66 66 66  
tone 128-159: 66 66 66 66 66 66 66 66 66 66 46 66 66 66 66 66  
tone 160-191: 66 66 66 66 66 66 66 66 66 66 66 76 66 66 66 66  
tone 192-223: 66 66 66 66 66 77 66 67 67 76 66 66 67 66 76 66  
tone 224-255: 76 67 66 67 67 66 66 65 66 77 76 77 27 77 77 77  
tone 256-287: 77 88 88 78 88 88 87 88 88 88 88 88 88 88 89 89  
tone 288-319: 99 99 89 88 98 98 99 89 98 99 89 89 88 88 89 88  
tone 320-351: 89 88 88 88 77 88 88 88 79 88 78 77 77 78 77 87  
tone 352-383: 77 77 76 76 76 66 56 66 65 67 65 66 66 56 67 66  
tone 384-415: 66 66 55 45 51 31 52 66 77 66 67 67 57 77 77 76  
tone 416-447: 66 76 77 66 77 67 67 66 76 66 66 66 66 66 66 55  
tone 448-479: 55 66 55 55 55 55 55 55 55 54 45 55 55 43 44 44  
tone 480-511: 44 44 44 44 44 44 44 33 33 33 44 33 33 33 33 21

utlum 10dB - s generatorem preslechu

-----

#### Upstream

-----

noise margin upstream: 5 db

output power downstream: 22 db

attenuation upstream: 24 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: bb bb bb bb bb bb aa aa aa aa 99 98 87 50 00 00  
tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

#### Downstream

-----

noise margin downstream: 6 db

output power upstream: 12 db

attenuation downstream: 36 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 64- 95: 00 11 11 11 11 11 11 22 22 22 22 22 22 22 22 22  
tone 96-127: 23 33 33 33 33 33 33 33 33 33 34 43 33 44 33 33  
tone 128-159: 33 34 33 33 43 33 33 33 33 33 13 33 44 33 44 44  
tone 160-191: 34 44 43 44 44 43 44 43 44 44 43 44 43 43 34 43  
tone 192-223: 44 43 44 44 44 44 44 44 44 44 44 44 44 44 44 44  
tone 224-255: 44 44 44 44 44 44 43 43 44 44 54 44 54 25 55 55  
tone 256-287: 55 55 55 55 55 55 55 55 55 55 56 55 56 55 56 56  
tone 288-319: 66 66 56 65 65 65 66 56 65 66 56 56 65 55 66 66  
tone 320-351: 56 55 56 65 55 66 55 55 56 55 56 55 55 55 55 65  
tone 352-383: 45 55 55 54 54 44 44 44 43 45 43 44 44 44 44 44  
tone 384-415: 34 43 33 33 41 32 44 42 44 22 23 34 24 44 44 43  
tone 416-447: 43 43 44 44 44 34 34 43 43 34 43 33 33 33 33 22  
tone 448-479: 22 33 22 22 22 22 22 22 22 22 22 22 22 22 22 22  
tone 480-511: 22 21 22 22 21 11 11 11 11 11 11 11 11 11 11 00

utlum 20dB - s generatorem preslechu

-----

#### Upstream

-----

noise margin upstream: 5 db

output power downstream: 21 db

attenuation upstream: 33 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: aa ab aa bb aa aa aa aa a9 99 88 76 40 00 00  
tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 96-127: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 128-159: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 160-191: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 192-223: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 224-255: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 256-287: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 288-319: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 320-351: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 352-383: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 384-415: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 416-447: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 448-479: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

#### Downstream

-----

noise margin downstream: 6 db

output power upstream: 12 db

attenuation downstream: 43 db

tone 0- 31: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 32- 63: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 64- 95: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01  
tone 96-127: 11 11 11 11 11 11 11 11 12 21 21 22 21 11 22 11 11  
tone 128-159: 11 11 11 11 11 11 11 11 11 11 11 01 11 11 11 11 11  
tone 160-191: 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11  
tone 192-223: 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 21 11  
tone 224-255: 11 11 11 11 11 11 11 11 11 21 22 22 22 22 22 22 22  
tone 256-287: 22 22 22 22 22 22 22 22 22 22 23 22 23 22 23 23  
tone 288-319: 33 33 23 22 32 32 33 23 32 33 23 23 22 22 33 33  
tone 320-351: 23 22 23 32 22 33 23 22 24 23 23 32 32 23 22 32  
tone 352-383: 22 32 22 22 22 22 22 22 21 22 21 12 22 12 22 21  
tone 384-415: 11 11 00 00 00 00 00 10 11 00 00 01 01 11 21 11  
tone 416-447: 10 11 21 11 11 11 11 10 11 11 11 00 00 10 00 00  
tone 448-479: 00 10 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
tone 480-511: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

utlum 30dB - s generatorem preslechu

-----  
down :(