
Project: ADSL

Title: Proposal for ADSL Performance Requirements

Source: FTW

Authors: Tomas Nordström

Contact: Tomas Nordström
Forschungszentrum Telekommunikation Wien (FTW),
Donau-City-Strasse 1/3
AT-1220 Wien, Austria
Telephone: +43 1 5052830-22
Fax: +43 1 5052830-99
Email: Tomas.Nordstrom@ftw.at

Abstract:

This paper proposes an updated set of ADSL performance requirement tables and recommends them to be adopted in RTS/TM-06025.

Distribution: ETSI STC TM6 working group members

Status: For information and decision

1. Introduction

These are the latest results from FTW's effort to simulate the performance requirements for ETSI ADSL. We propose these performance requirements, given in Section 2, as an update to the tables 19-50 in RTS/TM-06025 [1].

The performance numbers in Section 2 are based on numbers generated using the FTW xDSL simulator [2]. Appendix A provides the assumptions used (in addition to [1]) when generating the simulation performance numbers. These assumptions are based on recommendations from the ADSL teleconferences (see TD34 in Stockholm, and TD46 this meeting) and all the ad hoc meetings on ADSL performance requirements.

Note that power cut-back (PCB) is used when calculating these results. Therefore any DS reach that would be below 750 m without PCB now will be strongly reduced.

We would also like to suggest that any reach below 300 m be omitted from the tables before inclusion into the standard.

These revised numbers include a shaped noise for FDD ADSL (both over POTS and over ISDN). This noise is added to capture ISI/ICI effects and is therefore dependent on the received SNR, cf. Figure 1 in Appendix A. The ISI/ICI has been shown to reduce the reach for the case "FDD ADSL" for the highest bit-rates (384-640 kbit/s) in the upstream direction. This is most visible if no other external noise is injected, that is, for noise model FD. Unfortunately, this effect is dependent on the ISDN splitter high pass filter, the FDD filters used, and the implementation of the TEQ, thus this is clearly manufacturer dependent. Anyway, this simple ISI/ICI model has shown, to a large extent, capture the effects of ISI/ICI that has been seen in accurate time-domain simulations.

2. Proposed tables

Numbers with a “*” indicate that they are determined by the maximum reach in the other direction.

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EC ADSL over ISDN DOWNSTREAM				Noise FA					
128	300	37.00*	38.50*	37.50*	37.00*	38.00*	38.00*	38.50*	40.00*
		(2594)	(3600)	(3004)	(3135)	(3341)	(3179)	(4950)	(2143)
512	300	37.00*	37.00	37.50*	37.00*	37.50	37.50	36.50	40.00*
		(2594)	(3459)	(3004)	(3135)	(3306)	(3144)	(4810)	(2143)
768	300	37.00*	36.00	37.00	36.50	36.50	37.00	35.50	40.00*
		(2594)	(3366)	(2969)	(3099)	(3236)	(3109)	(4740)	(2143)
1024	300	37.00*	35.50	36.00	36.00	36.00	36.00	35.00	40.00*
		(2594)	(3319)	(2899)	(3064)	(3201)	(3039)	(4704)	(2143)
1544	300	35.50	34.00	34.50	34.00	34.00	34.50	33.00	40.00*
		(2489)	(3179)	(2794)	(2924)	(3061)	(2934)	(4564)	(2143)
2048	300	33.50	32.00	32.50	32.00	32.00	32.50	31.00	40.00*
		(2349)	(2992)	(2653)	(2784)	(2920)	(2793)	(4424)	(2143)
3072	300	30.00	28.50	29.00	28.50	28.50	28.50	-	37.00
		(2103)	(2664)	(2408)	(2538)	(2674)	(2512)	(-)	(1934)
4096	300	25.00	23.00	23.50	-	22.50	23.50	-	33.00
		(1752)	(2149)	(2021)	(-)	(2253)	(2162)	(-)	(1653)
5120	300	18.00	15.50	-	-	-	-	-	28.00
		(1260)	(1447)	(-)	(-)	(-)	(-)	(-)	(1314)
6144	300	1.00	0.50	-	-	-	-	-	-
		(75)	(51)	(-)	(-)	(-)	(-)	(-)	(-)

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EC ADSL over ISDN UPSTREAM				Noise FA					
64	150	30.50	29.50	30.00	29.00	30.00	30.00	28.50	31.00
		(2582)	(3610)	(3002)	(3117)	(3338)	(3170)	(4944)	(2146)
128	150	29.00	27.50	28.50	27.00	28.00	28.00	26.50	29.00
		(2455)	(3366)	(2876)	(2949)	(3169)	(3001)	(4776)	(1977)
256	150	26.50	25.00	25.50	24.50	25.50	25.50	23.50	25.50
		(2244)	(3060)	(2622)	(2737)	(2958)	(2790)	(4516)	(1676)
384	150	22.50	21.50	22.00	21.00	22.00	22.00	20.00	22.50
		(1907)	(2632)	(2327)	(2441)	(2663)	(2495)	(4236)	(1439)
512	150	19.00	18.00	18.50	-	18.50	18.50	-	19.50
		(1611)	(2204)	(2030)	(-)	(2367)	(2198)	(-)	(1146)
640	150	15.50	14.50	15.00	-	15.00	15.00	-	-
		(1316)	(1776)	(1738)	(-)	(2072)	(1907)	(-)	(-)

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EC ADSL over ISDN DOWNSTREAM				Noise FB					
128	300	43.50*	45.00	44.00*	43.00*	44.50*	44.50*	44.50	46.50*
		(3051)	(4208)	(3461)	(3556)	(3798)	(3636)	(5372)	(2599)
512	300	43.00	41.50	42.50	42.00	42.00	42.50	41.50	46.50*
		(3016)	(3881)	(3356)	(3486)	(3622)	(3495)	(5161)	(2599)
768	300	42.00	40.00	41.00	41.00	40.50	41.00	40.00	46.50*
		(2945)	(3740)	(3250)	(3415)	(3517)	(3390)	(5056)	(2599)
1024	300	41.00	39.00	40.00	40.00	40.00	40.00	39.00	46.50*
		(2875)	(3647)	(3180)	(3345)	(3482)	(3320)	(4985)	(2599)
1544	300	39.50	38.00	39.00	38.50	38.50	38.50	37.50	46.50
		(2770)	(3553)	(3110)	(3240)	(3376)	(3215)	(4880)	(2599)
2048	300	38.00	36.00	37.00	36.50	36.50	36.50	36.00	44.50
		(2664)	(3366)	(2969)	(3099)	(3236)	(3074)	(4775)	(2459)
3072	300	35.00	33.50	34.00	33.50	33.50	34.00	32.50	41.50
		(2454)	(3132)	(2759)	(2889)	(3025)	(2899)	(4530)	(2249)
4096	300	31.50	30.00	30.50	30.00	30.00	30.00	28.50	38.00
		(2208)	(2804)	(2513)	(2643)	(2780)	(2618)	(4249)	(2002)
5120	300	27.00	25.50	26.00	25.50	25.00	25.50	-	35.00
		(1892)	(2383)	(2197)	(2326)	(2429)	(2301)	(-)	(1789)
6144	300	21.00	19.50	20.00	-	18.50	19.50	-	30.50
		(1471)	(1822)	(1775)	(-)	(1971)	(1881)	(-)	(1467)

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EC ADSL over ISDN UPSTREAM		Noise FB							
64	150	36.00	34.00*	35.50	34.50	35.00	35.50	33.50*	36.00
		(3046)	(4160)	(3467)	(3581)	(3760)	(3635)	(5365)	(2567)
128	150	34.00	33.00	33.50	32.50	33.50	33.50	32.00	34.50
		(2878)	(4038)	(3298)	(3413)	(3634)	(3466)	(5238)	(2439)
256	150	31.50	30.00	31.00	30.00	30.50	31.00	28.50	31.00
		(2666)	(3671)	(3087)	(3201)	(3380)	(3255)	(4944)	(2146)
384	150	28.00	26.50	27.50	26.50	27.00	27.00	25.50	27.50
		(2371)	(3243)	(2791)	(2907)	(3085)	(2917)	(4689)	(1846)
512	150	24.50	23.50	24.00	23.00	24.00	24.00	22.00	24.00
		(2075)	(2876)	(2496)	(2609)	(2831)	(2664)	(4396)	(1559)
640	150	21.00	20.00	20.50	19.50	20.50	20.50	-	20.00
		(1780)	(2449)	(2200)	(2319)	(2537)	(2368)	(-)	(1191)

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EC ADSL over ISDN DOWNSTREAM		Noise FC							
128	300	39.00	39.50	38.50	38.50	38.50	38.50	39.50	44.50
		(2735)	(3693)	(3075)	(3240)	(3376)	(3215)	(5020)	(2459)
512	300	36.50	35.50	36.00	36.00	35.50	36.00	35.50	42.00
		(2559)	(3319)	(2899)	(3064)	(3166)	(3039)	(4740)	(2284)
768	300	35.00	34.00	34.50	34.00	34.00	34.50	34.00	40.50
		(2454)	(3179)	(2794)	(2924)	(3061)	(2934)	(4634)	(2179)
1024	300	32.50	32.00	32.00	32.00	32.00	32.00	31.50	39.00
		(2278)	(2992)	(2618)	(2784)	(2920)	(2758)	(4460)	(2071)
1544	300	29.50	28.50	29.00	28.50	28.50	28.50	28.00	35.50
		(2068)	(2664)	(2408)	(2538)	(2674)	(2512)	(4216)	(1827)
2048	300	27.00	26.00	26.50	26.00	26.00	26.00	-	33.50
		(1892)	(2430)	(2232)	(2361)	(2499)	(2337)	(-)	(1685)
3072	300	23.50	22.50	22.50	-	22.00	22.50	-	30.00
		(1646)	(2103)	(1951)	(-)	(2218)	(2092)	(-)	(1429)
4096	300	20.50	19.50	19.50	-	19.00	19.50	-	27.00
		(1436)	(1822)	(1739)	(-)	(2006)	(1881)	(-)	(1247)
5120	300	17.00	16.50	16.50	-	16.00	-	-	-
		(1190)	(1541)	(1532)	(-)	(1799)	(-)	(-)	(-)
6144	300	14.00	13.00	-	-	-	-	-	-
		(980)	(1214)	(-)	(-)	(-)	(-)	(-)	(-)

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EC ADSL over ISDN UPSTREAM		Noise FC							
64	150	32.50*	30.00*	31.00*	30.50*	30.00*	30.50*	29.50*	35.00*
		(2751)	(3671)	(3087)	(3243)	(3338)	(3213)	(5027)	(2482)
128	150	32.50*	30.00*	31.00*	30.50*	30.00*	30.50*	29.50*	34.50
		(2751)	(3671)	(3087)	(3243)	(3338)	(3213)	(5027)	(2439)
256	150	31.50	30.00*	31.00*	30.00	30.00*	30.50*	28.50	31.00
		(2666)	(3671)	(3087)	(3201)	(3338)	(3213)	(4944)	(2146)
384	150	28.00	26.50	27.50	26.50	27.00	27.00	25.50	27.50
		(2371)	(3243)	(2791)	(2907)	(3085)	(2917)	(4689)	(1846)
512	150	24.50	23.50	24.00	23.00	24.00	24.00	22.00	24.00
		(2075)	(2876)	(2496)	(2609)	(2831)	(2664)	(4396)	(1559)
640	150	21.00	20.00	20.50	19.50	20.50	20.50	-	20.00
		(1780)	(2449)	(2200)	(2319)	(2537)	(2368)	(-)	(1191)

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EC ADSL over ISDN DOWNSTREAM		Noise FD							
128	300	40.50*	43.00*	41.50*	40.50*	41.50*	41.50*	42.00*	44.00*
		(2840)	(4021)	(3285)	(3380)	(3587)	(3425)	(5196)	(2423)
512	300	40.50*	43.00*	41.50*	40.50*	41.50*	41.50*	42.00*	44.00*
		(2840)	(4021)	(3285)	(3380)	(3587)	(3425)	(5196)	(2423)
768	300	40.50*	43.00*	41.50*	40.50*	41.50*	41.50*	42.00*	44.00*
		(2840)	(4021)	(3285)	(3380)	(3587)	(3425)	(5196)	(2423)
1024	300	40.50*	43.00*	41.50*	40.50*	41.50*	41.50*	42.00*	44.00*
		(2840)	(4021)	(3285)	(3380)	(3587)	(3425)	(5196)	(2423)
1544	300	40.50*	42.00	41.50*	40.50*	41.50*	41.50*	41.50	44.00*
		(2840)	(3927)	(3285)	(3380)	(3587)	(3425)	(5161)	(2423)
2048	300	40.50*	40.00	41.00	40.50*	40.50	40.50	39.00	44.00*
		(2840)	(3740)	(3250)	(3380)	(3517)	(3355)	(4985)	(2423)
3072	300	38.00	36.00	37.00	36.50	36.50	37.00	35.00	44.00*
		(2664)	(3366)	(2969)	(3099)	(3236)	(3109)	(4704)	(2423)
4096	300	33.00	31.50	32.00	31.50	31.00	31.50	29.00	41.00
		(2313)	(2945)	(2618)	(2748)	(2850)	(2723)	(4283)	(2214)
5120	300	25.50	23.00	23.50	-	22.00	23.50	-	36.50
		(1787)	(2149)	(2021)	(-)	(2218)	(2162)	(-)	(1900)
6144	300	16.00	13.50	-	-	-	-	-	29.00
		(1120)	(1261)	(-)	(-)	(-)	(-)	(-)	(1368)

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EC ADSL over ISDN UPSTREAM				Noise FD					
64	150	33.50	32.50	33.00	32.00	33.00	33.00	31.50	34.00
		(2835)	(3977)	(3256)	(3370)	(3591)	(3424)	(5196)	(2397)
128	150	32.00	31.00	31.50	30.50	31.00	31.50	29.50	32.00
		(2709)	(3794)	(3129)	(3243)	(3422)	(3297)	(5027)	(2229)
256	150	29.00	27.50	28.50	27.50	28.00	28.50	26.50	28.50
		(2455)	(3366)	(2876)	(2991)	(3169)	(3044)	(4776)	(1934)
384	150	25.50	24.50	25.00	24.00	25.00	25.00	23.00	25.50
		(2160)	(2999)	(2580)	(2694)	(2916)	(2748)	(4475)	(1676)
512	150	22.00	21.00	21.50	20.50	21.50	21.50	-	20.50
		(1864)	(2571)	(2285)	(2400)	(2621)	(2453)	(-)	(1242)
640	150	18.50	18.00	18.00	-	18.00	18.00	-	19.50
		(1569)	(2204)	(1988)	(-)	(2324)	(2156)	(-)	(1146)

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EC ADSL over POTS DOWNSTREAM				Noise FA					
128	300	45.00	50.50	47.00	47.50	48.00	47.50	53.50	50.00*
		(3156)	(4723)	(3672)	(3872)	(4044)	(3847)	(6004)	(2845)
512	300	41.50	41.00	41.00	41.00	41.00	41.00	41.50	47.00
		(2910)	(3834)	(3250)	(3415)	(3552)	(3390)	(5161)	(2634)
768	300	39.50	39.00	39.50	39.00	39.00	39.50	39.50	46.00
		(2770)	(3647)	(3145)	(3275)	(3412)	(3285)	(5020)	(2564)
1024	300	38.50	37.50	38.00	37.50	37.50	37.50	37.50	45.00
		(2700)	(3506)	(3040)	(3170)	(3306)	(3144)	(4880)	(2494)
1544	300	37.00	35.50	36.50	36.00	36.00	36.00	35.50	43.50
		(2594)	(3319)	(2934)	(3064)	(3201)	(3039)	(4740)	(2388)
2048	300	35.50	34.50	35.00	34.50	34.50	34.50	34.00	42.00
		(2489)	(3225)	(2829)	(2959)	(3096)	(2934)	(4634)	(2284)
3072	300	32.00	31.00	31.50	31.50	31.00	31.50	30.50	38.50
		(2243)	(2898)	(2583)	(2748)	(2850)	(2723)	(4387)	(2036)
4096	300	28.50	27.50	27.50	27.50	27.50	27.50	-	35.50
		(1997)	(2570)	(2302)	(2468)	(2604)	(2443)	(-)	(1827)
5120	300	23.50	22.00	22.50	-	21.50	22.00	-	31.50
		(1646)	(2056)	(1951)	(-)	(2183)	(2056)	(-)	(1551)
6144	300	17.00	15.50	-	-	-	-	-	26.50
		(1190)	(1447)	(-)	(-)	(-)	(-)	(-)	(1186)

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EC ADSL over POTS UPSTREAM				Noise FA					
64	75	32.50*	32.50*	32.50*	32.50*	32.50*	32.50*	33.00*	40.00
		(3153)	(4721)	(3649)	(3867)	(4024)	(3836)	(6001)	(2828)
128	75	32.50*	32.50*	32.50*	32.50*	32.50*	32.50*	33.00*	36.50
		(3153)	(4721)	(3649)	(3867)	(4024)	(3836)	(6001)	(2489)
256	75	31.50	31.50	31.50	30.50	31.00	31.50	30.00	33.50
		(3057)	(4576)	(3553)	(3675)	(3880)	(3740)	(5714)	(2205)
384	75	27.00	27.00	27.00	26.00	26.50	26.50	25.50	29.00
		(2625)	(3926)	(3121)	(3242)	(3448)	(3260)	(5281)	(1782)
512	75	22.50	22.50	22.00	21.50	22.00	22.00	21.50	25.00
		(2193)	(3275)	(2640)	(2812)	(3016)	(2828)	(4895)	(1344)
640	75	18.00	18.00	18.00	17.00	17.50	18.00	16.50	22.50
		(1762)	(2625)	(2258)	(2382)	(2585)	(2446)	(4431)	(1132)

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EC ADSL over POTS DOWNSTREAM				Noise FB					
128	300	53.50	59.50	55.50	56.00	56.00	56.00	62.00	56.00
		(3753)	(5565)	(4268)	(4469)	(4605)	(4443)	(6600)	(3266)
512	300	46.50	46.00	46.50	46.00	46.50	46.50	47.00	52.00
		(3261)	(4302)	(3636)	(3766)	(3938)	(3776)	(5547)	(2985)
768	300	44.50	44.00	44.00	44.00	44.00	44.00	44.50	50.50
		(3121)	(4114)	(3461)	(3626)	(3763)	(3601)	(5372)	(2880)
1024	300	43.00	42.50	42.50	42.50	42.50	42.50	42.50	49.50
		(3016)	(3974)	(3356)	(3521)	(3657)	(3495)	(5231)	(2810)
1544	300	41.50	40.00	40.50	40.50	40.50	40.50	40.00	48.00
		(2910)	(3740)	(3215)	(3380)	(3517)	(3355)	(5056)	(2704)
2048	300	40.00	38.50	39.00	39.00	39.00	39.00	38.00	46.50
		(2805)	(3600)	(3110)	(3275)	(3412)	(3250)	(4915)	(2599)
3072	300	37.00	35.50	36.00	36.00	36.00	36.00	35.50	43.00
		(2594)	(3319)	(2899)	(3064)	(3201)	(3039)	(4740)	(2353)
4096	300	34.00	33.00	33.50	33.00	33.00	33.00	32.50	40.50
		(2384)	(3085)	(2724)	(2854)	(2990)	(2828)	(4530)	(2179)
5120	300	30.50	29.50	30.00	29.50	29.50	30.00	28.50	37.50
		(2138)	(2758)	(2478)	(2608)	(2745)	(2618)	(4249)	(1968)
6144	300	26.50	25.50	26.00	25.50	25.00	25.50	-	34.00
		(1857)	(2383)	(2197)	(2326)	(2429)	(2301)	(-)	(1718)

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EC ADSL over POTS UPSTREAM				Noise FB					
64	75	38.50*	38.00*	39.00*	39.00*	38.50*	38.50*	39.00*	44.50*
		(3729)	(5516)	(4272)	(4490)	(4600)	(4412)	(6577)	(3260)
128	75	38.50*	38.00*	39.00*	39.00*	38.50*	38.50*	39.00*	42.00
		(3729)	(5516)	(4272)	(4490)	(4600)	(4412)	(6577)	(3021)
256	75	37.00	36.50	37.00	36.00	37.00	37.00	35.50	40.00
		(3585)	(5299)	(4080)	(4202)	(4456)	(4268)	(6241)	(2828)
384	75	32.50	32.50	32.50	32.00	32.50	32.50	31.50	34.50
		(3153)	(4721)	(3649)	(3819)	(4024)	(3836)	(5858)	(2298)
512	75	28.00	28.00	28.00	27.00	28.00	28.00	27.00	30.00
		(2721)	(4070)	(3217)	(3338)	(3592)	(3404)	(5426)	(1880)
640	75	23.50	23.50	23.50	22.50	23.50	23.50	22.50	25.50
		(2289)	(3419)	(2785)	(2906)	(3160)	(2972)	(4990)	(1397)

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EC ADSL over POTS DOWNSTREAM				Noise FC					
128	300	53.50	59.50	55.50	56.00	56.00	56.00	62.00	55.00
		(3753)	(5565)	(4268)	(4469)	(4605)	(4443)	(6600)	(3196)
512	300	42.00	45.50	43.50	44.00	43.50	44.00	47.00	47.00
		(2945)	(4255)	(3426)	(3626)	(3728)	(3601)	(5547)	(2634)
768	300	39.00	40.50	39.00	39.00	39.00	39.00	41.50	44.00
		(2735)	(3787)	(3110)	(3275)	(3412)	(3250)	(5161)	(2423)
1024	300	37.00	37.00	37.00	37.00	37.00	37.00	37.50	43.00
		(2594)	(3459)	(2969)	(3135)	(3271)	(3109)	(4880)	(2353)
1544	300	34.00	34.00	34.00	34.00	34.00	34.00	34.50	39.50
		(2384)	(3179)	(2759)	(2924)	(3061)	(2899)	(4669)	(2107)
2048	300	31.00	31.00	31.00	31.00	31.00	31.00	31.00	36.50
		(2173)	(2898)	(2548)	(2713)	(2850)	(2688)	(4424)	(1900)
3072	300	26.50	26.00	26.00	26.00	25.50	26.00	-	32.50
		(1857)	(2430)	(2197)	(2361)	(2464)	(2337)	(-)	(1622)
4096	300	23.00	22.50	22.50	-	22.50	22.50	-	30.00
		(1611)	(2103)	(1951)	(-)	(2253)	(2092)	(-)	(1429)
5120	300	20.50	19.50	20.00	-	19.50	19.50	-	26.50
		(1436)	(1822)	(1775)	(-)	(2042)	(1881)	(-)	(1186)
6144	300	17.50	16.50	16.50	-	16.50	-	-	-
		(1225)	(1541)	(1532)	(-)	(1834)	(-)	(-)	(-)

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EC ADSL over POTS UPSTREAM				Noise FC					
64	75	38.50*	38.00*	39.00*	39.00*	38.50*	38.50*	39.00*	43.50*
		(3729)	(5516)	(4272)	(4490)	(4600)	(4412)	(6577)	(3164)
128	75	38.50*	38.00*	39.00*	39.00*	38.50*	38.50*	39.00*	42.00
		(3729)	(5516)	(4272)	(4490)	(4600)	(4412)	(6577)	(3021)
256	75	37.00	36.50	37.00	36.00	37.00	37.00	35.50	40.00
		(3585)	(5299)	(4080)	(4202)	(4456)	(4268)	(6241)	(2828)
384	75	32.50	32.50	32.50	32.00	32.50	32.50	31.50	34.50
		(3153)	(4721)	(3649)	(3819)	(4024)	(3836)	(5858)	(2298)
512	75	28.00	28.00	28.00	27.00	28.00	28.00	27.00	30.00
		(2721)	(4070)	(3217)	(3338)	(3592)	(3404)	(5426)	(1880)
640	75	23.50	23.50	23.50	22.50	23.50	23.50	22.50	25.50
		(2289)	(3419)	(2785)	(2906)	(3160)	(2972)	(4990)	(1397)

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EC ADSL over POTS DOWNSTREAM				Noise FD					
128	300	60.50*	67.00*	62.00*	62.00*	63.50*	62.50*	68.00*	57.50*
		(4244)	(6267)	(4725)	(4890)	(5132)	(4900)	(7022)	(3372)
512	300	60.50*	67.00*	62.00*	62.00*	63.50*	62.50*	68.00*	57.50*
		(4244)	(6267)	(4725)	(4890)	(5132)	(4900)	(7022)	(3372)
768	300	60.50*	64.50	62.00*	62.00*	63.50*	62.50*	65.00	57.50*
		(4244)	(6033)	(4725)	(4890)	(5132)	(4900)	(6811)	(3372)
1024	300	60.50*	62.00	62.00*	62.00*	62.00	62.00	62.00	57.50*
		(4244)	(5799)	(4725)	(4890)	(5027)	(4865)	(6600)	(3372)
1544	300	58.00	57.50	57.50	57.50	57.50	57.50	57.50	57.50*
		(4069)	(5378)	(4409)	(4574)	(4711)	(4549)	(6284)	(3372)
2048	300	54.50	53.50	54.00	54.00	54.00	54.00	53.50	57.50*
		(3823)	(5004)	(4163)	(4328)	(4465)	(4303)	(6004)	(3372)
3072	300	48.50	47.00	48.00	47.50	47.50	47.50	47.00	55.00
		(3402)	(4395)	(3742)	(3872)	(4008)	(3847)	(5547)	(3196)
4096	300	43.50	42.00	43.00	42.50	42.50	42.50	41.00	50.50
		(3051)	(3927)	(3391)	(3521)	(3657)	(3495)	(5126)	(2880)
5120	300	39.00	37.50	38.00	38.00	37.50	38.00	36.00	47.00
		(2735)	(3506)	(3040)	(3205)	(3306)	(3179)	(4775)	(2634)
6144	300	33.50	31.00	32.00	31.00	30.00	31.50	-	42.50
		(2349)	(2898)	(2618)	(2713)	(2780)	(2723)	(-)	(2318)

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EC ADSL over POTS UPSTREAM

Noise FD

64	75	44.00	43.00	43.50	43.00	44.00	43.50	43.50	45.50
		(4256)	(6239)	(4704)	(4874)	(5128)	(4892)	(7009)	(3356)
128	75	40.50	40.00	40.00	39.50	40.50	40.50	39.50	41.50
		(3920)	(5805)	(4368)	(4538)	(4792)	(4604)	(6625)	(2973)
256	75	36.00	35.50	35.50	35.00	35.50	35.50	34.50	39.00
		(3489)	(5155)	(3936)	(4106)	(4312)	(4124)	(6145)	(2732)
384	75	31.50	31.50	31.50	30.50	31.00	31.50	30.50	33.00
		(3057)	(4576)	(3553)	(3675)	(3880)	(3740)	(5762)	(2158)
512	75	26.50	26.50	26.50	26.00	26.50	26.50	25.50	29.00
		(2577)	(3853)	(3073)	(3242)	(3448)	(3260)	(5281)	(1782)
640	75	22.50	22.50	22.00	21.50	22.00	22.00	21.00	25.00
		(2193)	(3275)	(2640)	(2812)	(3016)	(2828)	(4848)	(1344)

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FDD ADSL over ISDN DOWNSTREAM

Noise FA

128	300	38.00*	39.00*	38.00*	37.50*	38.50*	38.50*	38.50	40.50*
		(2664)	(3647)	(3040)	(3170)	(3376)	(3215)	(4950)	(2179)
512	300	38.00*	35.50	36.50	36.00	36.00	36.00	34.50	40.50*
		(2664)	(3319)	(2934)	(3064)	(3201)	(3039)	(4669)	(2179)
768	300	37.50	35.50	36.00	35.50	35.50	35.50	34.00	40.50*
		(2629)	(3319)	(2899)	(3029)	(3166)	(3004)	(4634)	(2179)
1024	300	37.00	34.50	35.50	35.00	35.00	35.00	33.50	40.50*
		(2594)	(3225)	(2864)	(2994)	(3131)	(2969)	(4599)	(2179)
1544	300	34.50	32.50	33.00	32.50	32.50	33.00	31.00	40.50*
		(2419)	(3038)	(2688)	(2819)	(2955)	(2828)	(4424)	(2179)
2048	300	32.00	30.00	30.50	30.00	30.00	30.00	29.00	39.00
		(2243)	(2804)	(2513)	(2643)	(2780)	(2618)	(4283)	(2071)
3072	300	27.50	25.50	25.50	25.00	24.50	25.50	-	34.00
		(1927)	(2383)	(2162)	(2291)	(2394)	(2301)	(-)	(1718)
4096	300	19.50	16.50	-	-	-	-	-	29.00
		(1366)	(1541)	(-)	(-)	(-)	(-)	(-)	(1368)
5120	300	2.50	1.00	-	-	-	-	-	-
		(168)	(95)	(-)	(-)	(-)	(-)	(-)	(-)
6144	300	-	-	-	-	-	-	-	-
		(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)

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FDD ADSL over ISDN UPSTREAM

Noise FA

64	150	31.00	29.50	30.50	29.00	30.50	30.50	28.50*	31.00
		(2624)	(3610)	(3044)	(3117)	(3380)	(3213)	(4944)	(2146)
128	150	29.50	28.50	29.00	27.50	29.00	29.00	27.00	29.00
		(2498)	(3488)	(2918)	(2991)	(3254)	(3086)	(4818)	(1977)
256	150	25.00	24.50	25.00	23.00	24.50	24.50	22.50	25.00
		(2118)	(2999)	(2580)	(2609)	(2873)	(2706)	(4435)	(1636)
384	150	19.50	19.00	19.00	-	19.00	19.00	-	20.00
		(1653)	(2326)	(2073)	(-)	(2409)	(2240)	(-)	(1191)
512	150	14.00	13.50	13.00	-	13.00	-	-	-
		(1189)	(1653)	(1567)	(-)	(1906)	(-)	(-)	(-)
640	150	3.50	3.00	-	-	-	-	-	-
		(305)	(366)	(-)	(-)	(-)	(-)	(-)	(-)

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FDD ADSL over ISDN DOWNSTREAM

Noise FB

128	300	43.00*	43.00	43.50*	43.00*	43.50	43.50	42.00	46.50*
		(3016)	(4021)	(3426)	(3556)	(3728)	(3566)	(5196)	(2599)
512	300	41.50	39.50	40.50	40.00	40.00	40.00	39.00	46.50*
		(2910)	(3693)	(3215)	(3345)	(3482)	(3320)	(4985)	(2599)
768	300	41.00	38.50	39.50	39.00	39.00	39.50	38.00	46.50*
		(2875)	(3600)	(3145)	(3275)	(3412)	(3285)	(4915)	(2599)
1024	300	40.00	38.00	38.50	38.00	38.00	38.50	37.00	46.50*
		(2805)	(3553)	(3075)	(3205)	(3341)	(3215)	(4845)	(2599)
1544	300	38.50	36.50	37.00	36.50	36.50	36.50	35.50	44.00
		(2700)	(3413)	(2969)	(3099)	(3236)	(3074)	(4740)	(2423)
2048	300	36.50	34.50	35.00	34.50	34.50	34.50	33.50	42.50
		(2559)	(3225)	(2829)	(2959)	(3096)	(2934)	(4599)	(2318)
3072	300	33.00	31.00	31.50	31.00	31.00	31.50	29.50	38.50
		(2313)	(2898)	(2583)	(2713)	(2850)	(2723)	(4317)	(2036)
4096	300	28.50	26.50	27.00	26.50	26.00	26.50	-	35.00
		(1997)	(2477)	(2267)	(2397)	(2499)	(2372)	(-)	(1789)
5120	300	22.50	19.50	19.00	-	17.00	18.00	-	30.50
		(1576)	(1822)	(1704)	(-)	(1868)	(1777)	(-)	(1467)
6144	300	13.00	10.00	-	-	-	-	-	-
		(909)	(934)	(-)	(-)	(-)	(-)	(-)	(-)

FDD ADSL over ISDN UPSTREAM		Noise FB							
64	150	35.50	32.50*	35.00	33.50	34.50*	34.50*	31.50*	36.00
		(3004)	(3977)	(3424)	(3497)	(3718)	(3550)	(5196)	(2567)
128	150	34.00	32.50*	33.50	32.00	33.50	33.50	31.50	33.50
		(2878)	(3977)	(3298)	(3370)	(3634)	(3466)	(5196)	(2354)
256	150	30.00	29.00	29.50	28.00	29.50	29.50	27.50	29.50
		(2540)	(3549)	(2960)	(3032)	(3296)	(3128)	(4861)	(2020)
384	150	24.50	23.50	24.00	22.50	24.00	24.00	22.00	24.50
		(2075)	(2876)	(2496)	(2566)	(2831)	(2664)	(4396)	(1597)
512	150	19.00	18.50	18.50	-	18.50	18.50	-	19.50
		(1611)	(2265)	(2030)	(-)	(2367)	(2198)	(-)	(1146)
640	150	8.00	7.50	-	-	-	-	-	-
		(684)	(919)	(-)	(-)	(-)	(-)	(-)	(-)

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FDD ADSL over ISDN DOWNSTREAM				Noise FC					
128	300	36.00	35.00	34.50	34.50	34.50	34.50	34.00	41.00
		(2524)	(3272)	(2794)	(2959)	(3096)	(2934)	(4634)	(2214)
512	300	33.00	31.50	32.00	31.50	31.50	31.50	30.50	38.50
		(2313)	(2945)	(2618)	(2748)	(2885)	(2723)	(4387)	(2036)
768	300	31.00	29.50	30.00	29.50	29.50	29.50	28.50	36.00
		(2173)	(2758)	(2478)	(2608)	(2745)	(2582)	(4249)	(1864)
1024	300	29.00	27.50	27.50	27.00	27.00	27.50	-	34.50
		(2033)	(2570)	(2302)	(2432)	(2569)	(2443)	(-)	(1753)
1544	300	26.00	24.50	24.50	24.00	24.00	24.50	-	31.50
		(1822)	(2290)	(2092)	(2223)	(2358)	(2231)	(-)	(1551)
2048	300	24.00	22.50	22.50	-	22.00	22.00	-	30.00
		(1681)	(2103)	(1951)	(-)	(2218)	(2056)	(-)	(1429)
3072	300	20.50	19.50	19.00	-	18.50	19.00	-	26.50
		(1436)	(1822)	(1704)	(-)	(1971)	(1847)	(-)	(1186)
4096	300	17.00	15.50	-	-	-	-	-	-
		(1190)	(1447)	(-)	(-)	(-)	(-)	(-)	(-)
5120	300	13.00	12.00	-	-	-	-	-	-
		(909)	(1120)	(-)	(-)	(-)	(-)	(-)	(-)
6144	300	3.00	1.00	-	-	-	-	-	-
		(201)	(95)	(-)	(-)	(-)	(-)	(-)	(-)

FDD ADSL over ISDN UPSTREAM		Noise FC							
64	150	29.50*	26.50*	27.50*	27.00*	27.00*	27.00*	25.00*	32.00*
		(2498)	(3243)	(2791)	(2949)	(3085)	(2917)	(4645)	(2229)
128	150	29.50*	26.50*	27.50*	27.00*	27.00*	27.00*	25.00*	32.00*
		(2498)	(3243)	(2791)	(2949)	(3085)	(2917)	(4645)	(2229)
256	150	29.50*	26.50*	27.50*	27.00*	27.00*	27.00*	25.00*	29.50
		(2498)	(3243)	(2791)	(2949)	(3085)	(2917)	(4645)	(2020)
384	150	24.50	23.50	24.00	22.50	24.00	24.00	22.00	24.50
		(2075)	(2876)	(2496)	(2566)	(2831)	(2664)	(4396)	(1597)
512	150	19.00	18.50	18.50	-	18.50	18.50	-	19.50
		(1611)	(2265)	(2030)	(-)	(2367)	(2198)	(-)	(1146)
640	150	8.00	7.50	-	-	-	-	-	-
		(684)	(919)	(-)	(-)	(-)	(-)	(-)	(-)

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FDD ADSL over ISDN UPSTREAM

Noise FD

64	150	43.50*	38.00*	41.50*	40.50*	40.50*	41.00*	38.00*	46.00*
		(3680)	(4649)	(3973)	(4088)	(4225)	(4099)	(5745)	(3411)
128	150	43.50*	38.00*	41.50*	40.50*	40.50*	41.00*	38.00*	46.00*
		(3680)	(4649)	(3973)	(4088)	(4225)	(4099)	(5745)	(3411)
256	150	43.50*	38.00*	41.50*	40.50*	40.50*	41.00*	38.00*	46.00*
		(3680)	(4649)	(3973)	(4088)	(4225)	(4099)	(5745)	(3411)
384	150	43.00	38.00*	41.50*	40.00	40.50*	41.00*	38.00*	42.50
		(3637)	(4649)	(3973)	(4046)	(4225)	(4099)	(5745)	(3115)
512	150	36.00	34.00	35.50	32.50	35.00	35.00	31.50	35.00
		(3046)	(4160)	(3467)	(3413)	(3760)	(3592)	(5196)	(2482)
640	150	20.50	15.00	17.50	-	12.00	13.50	-	19.00
		(1738)	(1837)	(1946)	(-)	(1819)	(1775)	(-)	(1106)

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FDD ADSL over POTS DOWNSTREAM

Noise FA

128	300	41.00	39.50	40.00	39.50	39.50	39.50	38.50	47.00
		(2875)	(3693)	(3180)	(3310)	(3447)	(3285)	(4950)	(2634)
512	300	38.00	36.50	36.50	36.00	36.00	36.50	35.50	44.00
		(2664)	(3413)	(2934)	(3064)	(3201)	(3074)	(4740)	(2423)
768	300	37.50	35.50	36.00	35.50	35.50	36.00	34.50	43.50
		(2629)	(3319)	(2899)	(3029)	(3166)	(3039)	(4669)	(2388)
1024	300	37.00	35.00	35.50	35.00	35.00	35.50	34.00	43.50
		(2594)	(3272)	(2864)	(2994)	(3131)	(3004)	(4634)	(2388)
1544	300	34.50	33.00	33.50	33.00	33.00	33.00	32.00	41.00
		(2419)	(3085)	(2724)	(2854)	(2990)	(2828)	(4495)	(2214)
2048	300	32.50	31.50	31.50	31.00	31.00	31.00	30.00	39.00
		(2278)	(2945)	(2583)	(2713)	(2850)	(2688)	(4352)	(2071)
3072	300	29.00	27.00	27.50	27.00	26.50	27.00	-	35.50
		(2033)	(2524)	(2302)	(2432)	(2534)	(2407)	(-)	(1827)
4096	300	23.50	21.50	20.50	-	19.00	20.00	-	30.50
		(1646)	(2009)	(1811)	(-)	(2006)	(1915)	(-)	(1467)
5120	300	16.00	13.50	-	-	-	-	-	-
		(1120)	(1261)	(-)	(-)	(-)	(-)	(-)	(-)
6144	300	8.00	1.50	-	-	-	-	-	-
		(556)	(136)	(-)	(-)	(-)	(-)	(-)	(-)

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FDD ADSL over POTS UPSTREAM

Noise FA

64	75	29.50*	25.50*	27.50*	26.50*	26.50*	26.50*	22.00*	38.00*
		(2865)	(3709)	(3169)	(3290)	(3448)	(3260)	(4943)	(2635)
128	75	29.50*	25.50*	27.50*	26.50*	26.50*	26.50*	22.00*	36.50
		(2865)	(3709)	(3169)	(3290)	(3448)	(3260)	(4943)	(2489)
256	75	29.50*	25.50*	27.50*	26.50*	26.50*	26.50*	22.00*	32.00
		(2865)	(3709)	(3169)	(3290)	(3448)	(3260)	(4943)	(2066)
384	75	26.00	25.50*	25.50	25.00	25.50	25.50	22.00*	27.00
		(2529)	(3709)	(2977)	(3145)	(3352)	(3164)	(4943)	(1567)
512	75	20.00	20.00	20.00	19.00	20.00	20.00	19.00	23.50
		(1953)	(2914)	(2449)	(2576)	(2824)	(2636)	(4664)	(1208)
640	75	12.00	12.00	11.50	-	11.50	11.50	-	-
		(1184)	(1757)	(1628)	(-)	(2006)	(1812)	(-)	(-)

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FDD ADSL over POTS DOWNSTREAM

Noise FB

128	300	45.50	44.00	44.50	44.00	44.00	44.00	43.50	51.00
		(3191)	(4114)	(3496)	(3626)	(3763)	(3601)	(5301)	(2915)
512	300	42.00	40.50	41.00	40.50	40.50	41.00	40.00	48.50
		(2945)	(3787)	(3250)	(3380)	(3517)	(3390)	(5056)	(2740)
768	300	41.50	39.50	40.00	39.50	39.50	40.00	38.50	47.50
		(2910)	(3693)	(3180)	(3310)	(3447)	(3320)	(4950)	(2669)
1024	300	40.50	39.00	39.50	39.00	39.00	39.50	38.00	47.00
		(2840)	(3647)	(3145)	(3275)	(3412)	(3285)	(4915)	(2634)
1544	300	39.00	37.50	37.50	37.50	37.00	37.50	36.50	45.00
		(2735)	(3506)	(3004)	(3170)	(3271)	(3144)	(4810)	(2494)
2048	300	37.00	35.50	36.00	35.50	35.50	36.00	35.00	43.00
		(2594)	(3319)	(2899)	(3029)	(3166)	(3039)	(4704)	(2353)
3072	300	34.50	32.50	33.00	32.50	32.50	32.50	31.00	40.00
		(2419)	(3038)	(2688)	(2819)	(2955)	(2793)	(4424)	(2143)
4096	300	30.50	29.00	29.00	28.50	28.50	29.00	-	36.50
		(2138)	(2711)	(2408)	(2538)	(2674)	(2547)	(-)	(1900)
5120	300	25.50	24.00	24.00	-	23.00	23.50	-	33.00
		(1787)	(2243)	(2056)	(-)	(2288)	(2162)	(-)	(1653)
6144	300	19.00	17.00	-	-	-	-	-	28.00
		(1331)	(1588)	(-)	(-)	(-)	(-)	(-)	(1314)

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FDD ADSL over POTS UPSTREAM

Noise FB

64	75	32.50*	28.00*	30.50*	30.00*	29.50*	30.00*	25.50*	41.00*
		(3153)	(4070)	(3457)	(3627)	(3736)	(3596)	(5281)	(2925)
128	75	32.50*	28.00*	30.50*	30.00*	29.50*	30.00*	25.50*	41.00*
		(3153)	(4070)	(3457)	(3627)	(3736)	(3596)	(5281)	(2925)
256	75	32.50*	28.00*	30.50*	30.00*	29.50*	30.00*	25.50*	37.50
		(3153)	(4070)	(3457)	(3627)	(3736)	(3596)	(5281)	(2586)
384	75	31.00	28.00*	30.50*	30.00*	29.50*	30.00*	25.50*	33.00
		(3009)	(4070)	(3457)	(3627)	(3736)	(3596)	(5281)	(2158)
512	75	25.00	25.00	25.00	24.00	25.00	25.00	24.00	26.50
		(2433)	(3636)	(2929)	(3049)	(3304)	(3116)	(5135)	(1509)
640	75	17.50	17.50	17.00	16.50	17.50	17.00	16.00	-
		(1714)	(2552)	(2163)	(2332)	(2585)	(2351)	(4381)	(-)

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FDD ADSL over POTS DOWNSTREAM

Noise FC

128	300	38.50	39.00	38.00	38.00	38.00	38.00	38.50	42.50
		(2700)	(3647)	(3040)	(3205)	(3341)	(3179)	(4950)	(2318)
512	300	35.50	34.50	34.50	34.50	34.00	34.50	34.00	40.00
		(2489)	(3225)	(2794)	(2959)	(3061)	(2934)	(4634)	(2143)
768	300	33.50	32.50	32.50	32.50	32.00	32.50	31.50	38.50
		(2349)	(3038)	(2653)	(2819)	(2920)	(2793)	(4460)	(2036)
1024	300	31.50	30.50	30.50	30.50	30.00	30.50	30.00	36.50
		(2208)	(2851)	(2513)	(2678)	(2780)	(2653)	(4352)	(1900)
1544	300	28.50	27.50	27.00	27.00	27.00	27.00	-	33.50
		(1997)	(2570)	(2267)	(2432)	(2569)	(2407)	(-)	(1685)
2048	300	26.00	25.00	24.50	24.50	24.50	24.50	-	31.50
		(1822)	(2336)	(2092)	(2257)	(2394)	(2231)	(-)	(1551)
3072	300	22.50	21.00	21.00	-	20.50	21.00	-	28.00
		(1576)	(1962)	(1847)	(-)	(2113)	(1984)	(-)	(1314)
4096	300	19.00	18.00	18.00	-	17.50	-	-	-
		(1331)	(1681)	(1636)	(-)	(1902)	(-)	(-)	(-)
5120	300	16.00	15.00	-	-	-	-	-	-
		(1120)	(1400)	(-)	(-)	(-)	(-)	(-)	(-)
6144	300	12.50	11.50	-	-	-	-	-	-
		(873)	(1073)	(-)	(-)	(-)	(-)	(-)	(-)

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FDD ADSL over POTS UPSTREAM

Noise FC

64	75	27.50*	25.00*	26.00*	25.50*	25.00*	25.50*	22.00*	34.50*
		(2673)	(3636)	(3025)	(3193)	(3304)	(3164)	(4943)	(2298)
128	75	27.50*	25.00*	26.00*	25.50*	25.00*	25.50*	22.00*	34.50*
		(2673)	(3636)	(3025)	(3193)	(3304)	(3164)	(4943)	(2298)
256	75	27.50*	25.00*	26.00*	25.50*	25.00*	25.50*	22.00*	34.50*
		(2673)	(3636)	(3025)	(3193)	(3304)	(3164)	(4943)	(2298)
384	75	27.50*	25.00*	26.00*	25.50*	25.00*	25.50*	22.00*	33.00
		(2673)	(3636)	(3025)	(3193)	(3304)	(3164)	(4943)	(2158)
512	75	25.00	25.00*	25.00	24.50	25.00	25.00	22.00*	26.50
		(2433)	(3636)	(2929)	(3097)	(3304)	(3116)	(4943)	(1509)
640	75	17.50	17.50	17.50	16.50	17.50	17.50	16.00	-
		(1714)	(2552)	(2210)	(2332)	(2585)	(2399)	(4381)	(-)

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FDD ADSL over POTS DOWNSTREAM

Noise FD

128	300	73.00	73.00	72.50	72.50	72.00	72.50	72.00	77.50
		(5122)	(6828)	(5462)	(5627)	(5729)	(5602)	(7303)	(4776)
512	300	66.50	66.00	65.50	65.50	65.50	65.50	65.00	71.00
		(4666)	(6173)	(4971)	(5136)	(5272)	(5110)	(6811)	(4320)
768	300	63.00	62.50	62.00	62.00	62.00	62.00	61.50	68.00
		(4420)	(5846)	(4725)	(4890)	(5027)	(4865)	(6565)	(4109)
1024	300	60.50	59.50	59.50	59.50	59.00	59.50	59.00	65.50
		(4244)	(5565)	(4549)	(4714)	(4816)	(4689)	(6390)	(3933)
1544	300	56.00	54.50	54.50	54.50	54.50	54.50	53.50	61.50
		(3928)	(5097)	(4198)	(4363)	(4500)	(4338)	(6004)	(3653)
2048	300	52.50	50.50	51.00	50.50	50.50	50.50	49.00	58.00
		(3683)	(4723)	(3952)	(4082)	(4219)	(4057)	(5688)	(3407)
3072	300	46.00	43.00	44.00	43.50	43.50	44.00	41.50	52.00
		(3226)	(4021)	(3461)	(3591)	(3728)	(3601)	(5161)	(2985)
4096	300	40.50	38.00	38.50	38.00	38.00	38.50	35.00	47.50
		(2840)	(3553)	(3075)	(3205)	(3341)	(3215)	(4704)	(2669)
5120	300	34.50	30.50	30.50	29.50	28.00	30.00	-	42.50
		(2419)	(2851)	(2513)	(2608)	(2639)	(2618)	(-)	(2318)
6144	300	20.00	14.00	-	-	-	-	-	36.00
		(1401)	(1307)	(-)	(-)	(-)	(-)	(-)	(1864)

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FDD ADSL over POTS UPSTREAM

Noise FD

64	75	53.00*	47.00*	51.50*	50.50*	50.00*	50.50*	46.50*	60.00*
		(5120)	(6817)	(5472)	(5594)	(5703)	(5563)	(7297)	(4747)
128	75	53.00*	47.00*	51.50*	50.50*	50.00*	50.50*	46.50*	60.00*
		(5120)	(6817)	(5472)	(5594)	(5703)	(5563)	(7297)	(4747)
256	75	53.00*	47.00*	51.50*	50.50*	50.00*	50.50*	46.50*	56.00
		(5120)	(6817)	(5472)	(5594)	(5703)	(5563)	(7297)	(4363)
384	75	48.50	47.00*	48.50	48.50	48.50	48.50	46.50*	50.00
		(4688)	(6817)	(5184)	(5402)	(5559)	(5372)	(7297)	(3788)
512	75	43.00	42.50	43.00	42.00	42.50	42.50	41.50	44.50
		(4160)	(6167)	(4656)	(4778)	(4984)	(4796)	(6817)	(3260)
640	75	31.00	30.50	31.00	30.00	30.50	31.00	28.50	34.50
		(3009)	(4432)	(3505)	(3627)	(3832)	(3692)	(5570)	(2298)

3. References

- [1] ETSI RTS/TM-06025 (Draft), ADSL – European specific requirements, ETSI (m01p07a2), Version 1a, September 2001.
- [2] Nordström T., D. Bengtsson, *FTW xDSL simulation tool*, Version 2.3beta3, 2002. Version 2.2 is available at <<http://www.xdsl.ftw.at/xdslsimu/>>.

Appendix A Simulation assumption

The simulations to generate the performance numbers are based on the following assumptions:

1. Assume margin of 6dB (teleconference April 23)
2. Assume tone allocation given in Table B-1 (teleconference March 28)
3. Assume raw coding gain of 4.25dB with 13% RS overhead and 32kbps framing overhead. For data rates with S=16 (low data rate) assume R=16 instead of 13% coding overhead (teleconference April 23)
4. Assume upstream modem noise floor of -120dBm/Hz at all frequencies and all loop lengths (teleconference June 19)
5. Assume an overall background noise of -140dBm/Hz
6. For EC ADSL assume downstream modem noise floor according to equation (1) (teleconference May 2)
7. For FDD ADSL assume downstream modem noise floor according to equation (2) and (3) (ad hoc September 12)
8. Assume same pair ISDN noise consisted with realistic ISDN PSD, 3-7order filter in the LP path, and two 27nF blocking capacitors in the HP path (teleconference May 31)
9. Use the same pair ISDN model given in [014t13].
10. Implementation loss according to Table B-2 (ad hoc September 12 + discussion Torino)
11. Compensation for impedance mismatch between noise injection normalization and actual test has been implemented as described in [014w20]
12. Uses a shaped SNR dependent noise for FDD (both over POTS and over ISDN) to model ISI/ICI effects. The shape is shown in Figure 1. For “over POTS” the design parameters are [36, 42, 33], for the case “over ISDN” they are [33, 41, 33].

Table B-1: Allocation of tones for performance simulations

	Upstream tones	Downstream tones
EC ADSL over POTS	7-31	7-255
FDD ADSL over POTS	7-30	38-255
EC ADSL over ISDN	33-63	33-255
FDD ADSL over ISDN	33-56	64-255

For EC ADSL the assumed downstream modem noise floor is:

$$NOISE_FLOOR = \begin{cases} \frac{-20}{4\text{km}}L - 120 & \text{for } L \leq 4\text{km} \\ -140, & \text{for } L > 4\text{km} \end{cases} \text{ dBm/Hz}, \quad (1)$$

For FDD ADSL the assumed downstream modem noise floor is as given in (2) and (3).
For loop lengths L less than 4km,

$$N(f) = \begin{cases} -114 - 6\log_2\left(\frac{f}{250}\right) - 5L, & f < 500 \\ -120 - 5L, & f \geq 500 \end{cases} \text{ dBm/Hz}, \quad (2)$$

with L in km and f in kHz.

For loop lengths L greater than or equal to 4km,

$$N(f) = \begin{cases} -134 - 6\log_2\left(\frac{f}{250}\right), & f < 500 \\ -140, & f \geq 500 \end{cases} \text{ dBm/Hz}, \quad (3)$$

with L in km and f in kHz.

Table B-2: Implementation loss

ADSL version	Implementation loss
EC ADSL	1.5dB on all loops
FDD ADSL (DS)	2.0dB on Loops 1 & 2 2.5dB on Loops 3-7 3.0dB on Loops 8
FDD ADSL (US)	2.5dB on Loops 4 & 8, 2 dB on all other loops

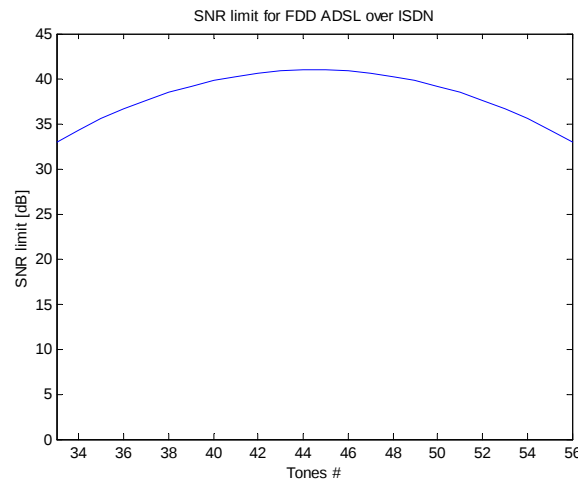


Figure 1. ISI and ICI noise modeled for FDD ADSL over POTS as a shaped SNR limiting noise