
TITLE	Extending the specification of SDSL testloops beyond 500 kHz		
PROJECT	SDSL		
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STATUS	For decision		
ABSTRACT	The specification of the SDSL testloops stops at 500 kHz, while state of the art cable simulators are usable up to 2 MHz. Extending the specification of cable sections up to 2 MHz, enables the harmonization of test equipment from different vendors, and also the simulation of SDSL performance under various conditions. This contribution proposes the missing numbers, based on TD23 from Edinburgh, and confirmed later at the Montreux meeting.		

1. Problem

The cable sections that are used to build the testloops of the SDSL performance tests, are based on specifications taken from the existing HDSL standard. Currently their specification is lacking above 500 kHz. This prevents harmonization of test equipment from different vendors, and also the simulation of SDSL performance under various conditions.

2. Solution

In TD23 from Edinburgh [1], we made a first estimate on loop behavior above 500kHz, based on a physical understanding of cables in general. This was an educated guess only, not confirmed by measurements, and unclear (by that time) if real cable simulators can meet these specifications.

In TD15 from Montreux [2], DSL testworks demonstrated that state-of-the-art cable simulators reflect our estimates quite well. This is remarkable, since these cable simulators were developed independently from our educated guess in TD15, and our guess was made independently from these simulators.

This demonstrates that our educated guess in TD15 is an excellent basis for extending the testloop specification beyond 500 kHz.

In the next section, we propose literal text, for inclusion in the SDSL draft. The numbers in <bold>face have been added; the other numbers are equal to those already specified for SDSL.

3. Proposed RCL parameters above 500kHz

The primary cable parameters $Z_s=R_s+j\omega L_s$ and $Y_p=0+j\omega C_p$ per unit length are specified for various frequencies in Table A.1 and A.2. They are based on existing RLCG tables specified for HDSL [*], and extended up to 2 MHz. The values for frequencies in between are to be found by using a "cubic spline interpolation", as described in many textbooks, including [3].

freq [Hz] $\times 10^{+3}$	SDSL.PE04			SDSL.PE05			SDSL.PE06			SDSL.PE08		
	Rs [W/m] $\times 10^{-3}$	Ls [H/m] $\times 10^{-9}$	Cp [F/m] $\times 10^{-12}$	Rs [W/m] $\times 10^{-3}$	Ls [mH/m] $\times 10^{-9}$	Cp [F/m] $\times 10^{-12}$	Rs [W/m] $\times 10^{-3}$	Ls [H/m] $\times 10^{-9}$	Cp [F/m] $\times 10^{-12}$	Rs [W/k] $\times 10^{-3}$	Ls [H/k] $\times 10^{-9}$	Cp [F/k] $\times 10^{-12}$
0	268	680	45.5	172	680	25	119	700	56	67	700	37.8
10	268	678	45.5	172	678	25	120	695	56	70.0	700	37.8
20	269	675	45.5	173	675	25	121	693	56	72.5	687	37.8
40	271	669	45.5	175	667	25	125	680	56	75.0	665	37.8
100	282	650	45.5	190	646	25	146	655	56	91.7	628	37.8
150	295	642	45.5	207	637	25	167	641	56	105	609	37.8
200	312	635	45.5	227	629	25	189	633	56	117	595	37.8
400	390	619	45.5	302	603	25	260	601	56	159	568	37.8
500	425	608	45.5	334	592	25	288	590	56	177.5	543+17	37.8
700	493	593	45.5	392	577	25	340	576	56	209	553	37.8
1000	582	582	45.5	466	572	25	405	570	56	250	547	37.8
2000	816	571	45.5	655	565	25	571	560	56	353	540	37.8

Table A.1 : Line constants for the cable sections in the SDSL test loops.

freq [Hz] $\times 10^{+3}$	SDSL.PVC032			SDSL.PVC04			SDSL.PVC063					
	Rs [W/m] $\times 10^{-3}$	Ls [H/m] $\times 10^{-9}$	Cp [F/m] $\times 10^{-12}$	Rs [W/m] $\times 10^{-3}$	Ls [mH/m] $\times 10^{-9}$	Cp [F/m] $\times 10^{-12}$	Rs [W/m] $\times 10^{-3}$	Ls [H/m] $\times 10^{-9}$	Cp [F/m] $\times 10^{-12}$			
0	419	650	120	268	650	120	108	635	120			
10	419	650	120	268	650	120	108	635	120			
20	419	650	120	268	650	120	108	635	120			
40	419	650	120	268	650	120	111	630	120			
100	427	647	120	281	635	120	141	604	120			
150	453	635	120	295	627	120	173	584	120			
200	493	621	120	311	619	120	207	560	120			
400	679	577	120	391	592	120	319	492	120			
500	750	560	120	426	579	120	361	469	120			
700	877	546	120	494	566	120	427	450	120			
1000	1041	545	120	584	559	120	510	442	120			
2000	1463	540	120	817	550	120	720	434	120			

Table A.2 : Line constants for the cable sections in the SDSL test loops.

References

- [1] Rob van den Brink, KPN, "Compromise proposal for SDSL Testloops" ETSI TM6 contribution TD23 (993t23a0), Edinburgh, sept 1999.
- [2] Jim Eyres, DSL Testworks: "Characteristics of Cables and Testloops for SDSL" ETSI TM6 contribution TD15 (001t15a0), Montreux, feb 2000.
- [3] W.H. Press, S.A. Teukolsky, W.T.Vetterling, B.P.Flannery: "Numerical Recipes in Fortran - The Art of Scientific Computing", 2nd edition, Cambridge University Press 1992, ISBN 0-521-43064-X.