1394 Copper Automotive Standard

Collaborators and M. Wollitzer

Outline of the 1394Automotive Spec

Contents

Environmental Specs of the 1394 Automotive Standard

Parameter	Requirement
High Temperature	+100°C, 1008h
Thermal Shock	99 cycles Tu-40°C, To+100°C
Temperature and Humidity	RH 80-100%, 40 Cycles, Tu-40°C, To+100°C
Mechanical Shock	10 Shocks, 35g, 10ms
Random Vibration	10 -1000Hz, Grms 1.81

Table 1 -- Environmental requirements of the automotive industry

Parameter	Minimum	Maximum	Units
Mating Cycles	25		Cycles
Mating Force Connector Pair		55	N
Unmating Force Connector Pair	5	55	N
Retention Force Connector Lock	100		N
Connector Lock Manipulation Force	3	60	N
Polarization Feature Effectiveness	80		N
Cable to Connector Retention Force	100		N

Table 2 – Mechanical requirements of the automotive industry

Parameter	Requirement
System Impedance (ZTP)	100 Ω or 110 Ω
Mated connector and termination impedance[1]	ZTP +/- 15 Ω
Cable impedance	ZTP +/- 6 Ω
TDR rise time	160 ps
Propagation velocity within cable	min. 66 % c_0
Propagation delay skew within a mated connector pair – straight	max. 10 ps
Cable propagation delay skew within a wire pair	max. 10 ps/m
Maximum propagation delay skew of entire cable assembly	160 ps
Total insertion loss budget f < 250 MHz f < 400 MHz f < 500 MHz f < 800 MHz f < 1000 MHz	 <4.8 dB <6.0 dB <6.8 dB <9.2 dB <10.4 dB
Variation of insertion loss in the temp.-range -40°C to +100°C	+/- 0.05 dB/m (0 – 1 GHz)
Return loss -- mated connector pair	min. 20 dB (0 – 1 GHz)
Near end crosstalk – mated connector pair	max. 5 % (differential TDT at 160 ps, 10-90% rise time max. -30 dB (0 – 1 GHz)
Far end crosstalk -- mated connector pair	max. 5 % (differential TDT at 160 ps, 10-90% rise time max. -30 dB (0 – 1 GHz)

Table 3 – STP/STQ copper backbone electrical requirements

Comparison of EMI-Specs of contributing Carmakers

	0,1 to 0.15 MHz	0.15 to 0.5 MHz	0.5 to 2 MHz	2 to 41 MHz	41 to 68 MHz	68 to 242.4 MHz	242.4 to 900 MHz	900 to 2800 MHz
Quasi-Peak (broadband)	55	41	30	22	22	12	15	20
Peak (narrowband)	31	21	18	22	18	12	15	20

Table 1: Limits for narrowband and broadband radiated disturbances

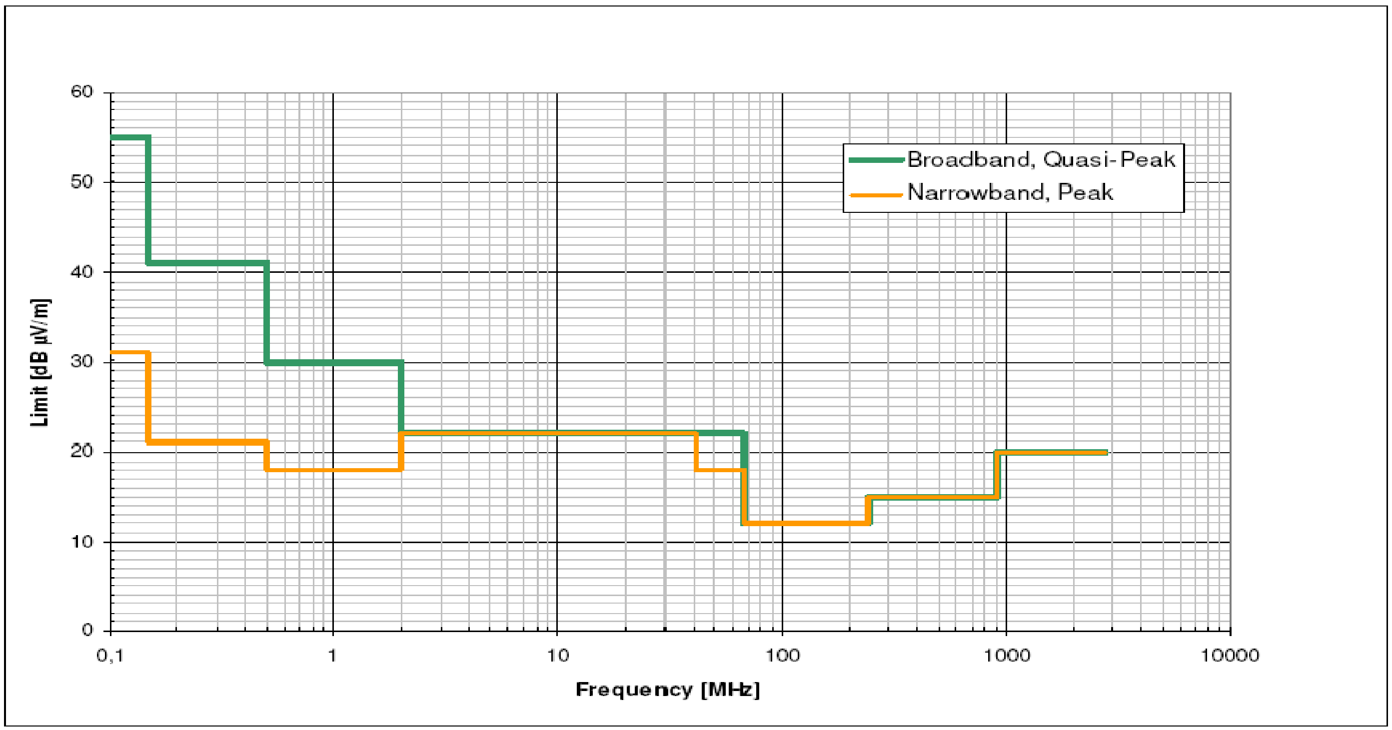


Figure 1: Limits for narrowband and broadband radiated disturbances

5.7.1 EMI-Tests on System Level

The copper backbone shall meet the EMI-requirements following CISPR 25 Grade 5, latest revision.

The copper backbone shall meet the EMS-requirements following ISO 11452-4, latest revision. A test current of 100 mA shall be applied in closed loop configuration in the frequency range from 1 MHz to 400 MHz.

Alternatively, EMS-tests may also be carried out following the procedures described in ISO 11452-5, latest version. In this case, the test field strength shall be 200 V/m in the frequency range from 1 MHz to 400 MHz.

No bus resets may be observed in both test procedures at the specified limits.

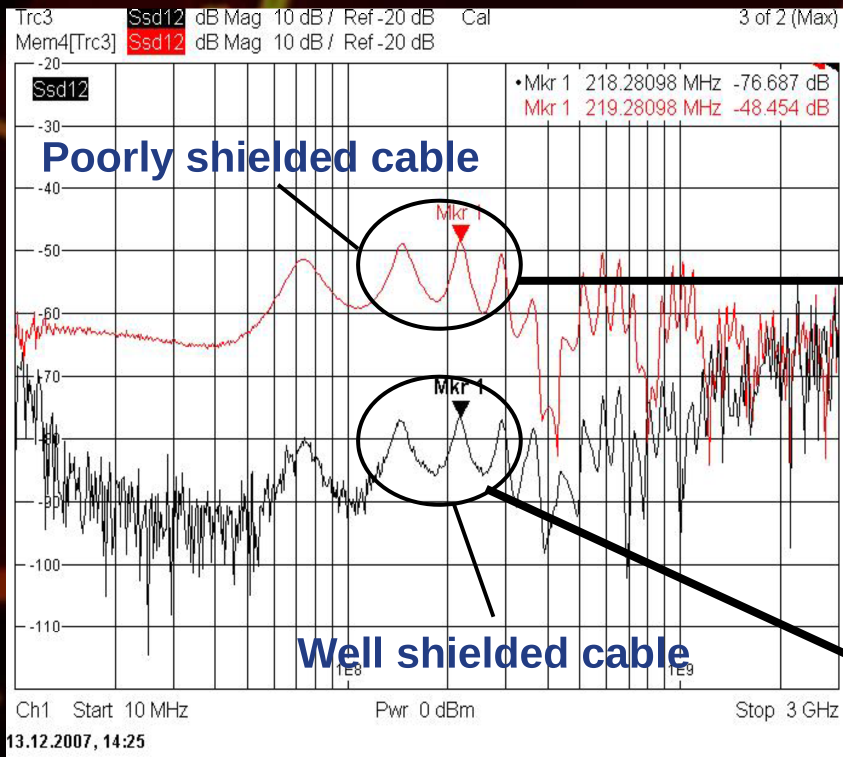
5.7.2 EMI-Tests on Component Level

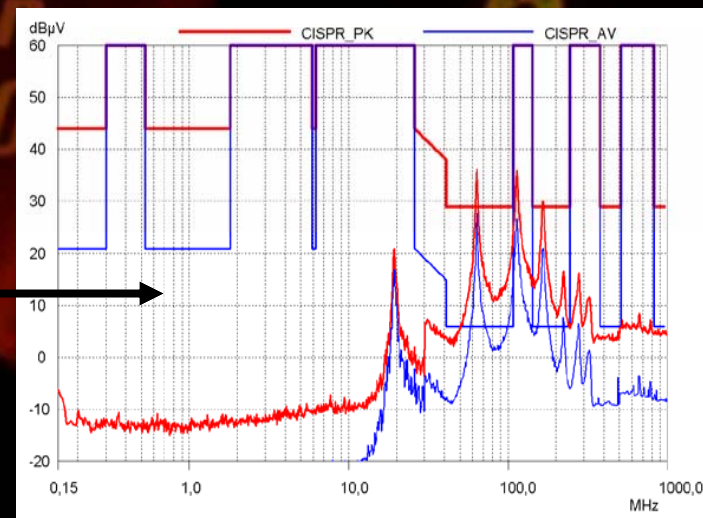
A very suitable means to ensure proper shielding of each of the components involved in the signal path is to evaluate their EMI-performance on component level. The advantage of this approach is, that measurements may be carried out before the integration of the whole system. When testing on system-level, the system integrator can therefore rely on the EMI/EMC-performance of each of the components of the copper backbone.

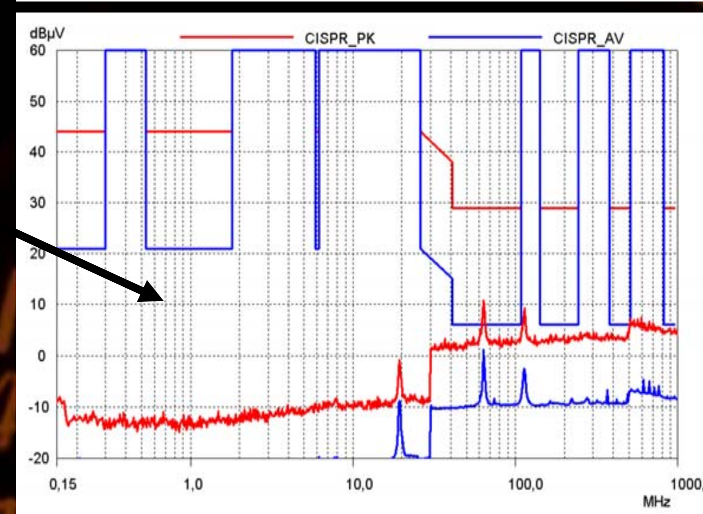
It is strongly recommended to carry out the EMI-test on component level by application of the coaxial test setups described by the specifications IEC62153-4-4, IEC62153-4-7 and IEC62153-4-10.

IEC 62153-4-4,	Screening attenuation of cables	-65 dB to 2 GHz
IEC 62153-4-7,	Screening attenuation of connectors	-65 dB to 2 GHz
IEC 62153-4-10,	Screening attenuation of RF-feedthroughs	-65 dB to 2 GHz

Specification of EMI-Levels on Component- and Devicelevel







ΔP = 28.2 dB

A linear relation between screening perfor-mance and system level noise is observed.
-> Verify component screening in order to

Power States of Automotive PHY-Devices

8.1.3 IEEE 1394 Power Management

IEEE 1394-2008 provides limited power management capability. The capability is limited to power class report PHY port state control, and the ability to notify the layers above the PHY to turn on. This specification does support 1394 cable power therefore all devices shall report a power class of zero (000_2). This specification not utilizes the IEEE 1394 defined PHY port state control, it adds an additional port state sleep.

8.1.4 Device Power Modes

This specification defines five device power modes. Off and Active are the only required power modes and car implemented without an LPM. The other 3 power modes require an LPM.

- Ultra-Low Power
- Low Power
- PHY Only