

The background of the slide is a close-up photograph of a car's instrument cluster. The top portion shows a tachometer with a red needle and a scale from 0 to 6, with the text "1/min x1000" printed on the dial. The bottom portion shows a speedometer with a needle pointing to 0 and a scale from 0 to 20, with the text "1394 drives automotive" printed on the dial. The numbers and text are in a yellowish-gold color against a dark background.

# 1394 Copper Automotive Standard

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# Outline of the 1394Automotive Spec

## Contents

IEEE Copyright .....	iii
Foreword.....	v
1 Scope and purpose.....	1
1.1 Scope .....	1
1.2 Purpose.....	1
2 Normative references.....	3
2.1 Reference scope.....	3
2.2 Approved references.....	3
2.3 References under development.....	3
2.4 Reference acquisition.....	3
3 Definitions and notation.....	5
3.1 Definitions .....	5
3.2 Notation.....	6
4 System Overview.....	9
4.1 System Requirements.....	9
4.2 System Topology .....	9
4.3 Physical Layer -- Copper Backbone Embedded Devices.....	9
5 General Requirements.....	11
5.1 Introduction .....	11
5.2 Notable elements of an automotive grade captive system.....	11
5.3 Copper Backbone Socket Environmental-, Aging- and Mechanical Criteria.....	11
5.4 Link length and number of inline connectors.....	12
5.5 Copper Backbone Electrical Requirements .....	12
5.6 Validation Requirements.....	14
5.7 Copper Backbone EMI/EMS-Performance .....	14
5.8 Copper Backbone Plating Criteria and Materials (lead free, RoHS) .....	15
6 STP and STQ PMD electrical specification.....	17
6.1 Electrical Characteristics .....	17
6.2 Electrical Measurements.....	17
6.3 System Performance Criteria .....	18
7 Coax PMD electrical specification .....	21
7.1 Introduction .....	21
7.2 Electrical Characteristics .....	21
7.3 System Performance Criteria .....	22
8 Power Management .....	25
8.1 Power Management overview.....	25
8.2 PHY Layer Power Requirements .....	27
8.3 Node Level Power Requirements .....	34

# Environmental Specs of the 1394 Automotive Standard

Parameter	Requirement
High Temperature	+100°C, 1008h
Thermal Shock	55 cycles T <sub>u</sub> -40°C, T <sub>o</sub> +100°C
Temperature and Humidity	RH 80-100%, 40 Cycles, T <sub>u</sub> -40°C, T <sub>o</sub> +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 <sup>1</sup>	ZTP +/- 15 Ω
Cable Impedance	ZTP +/- 6 Ω
TDR rise time	160 ps
Propagation velocity within cable	min. 66 % C <sub>0</sub>
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	<4.8 dB
f < 400 MHz	<6.0 dB
f < 500 MHz	<6.8 dB
f < 800 MHz	<9.2 dB
f < 1000 MHz	<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

1394  
drives automotive

# 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

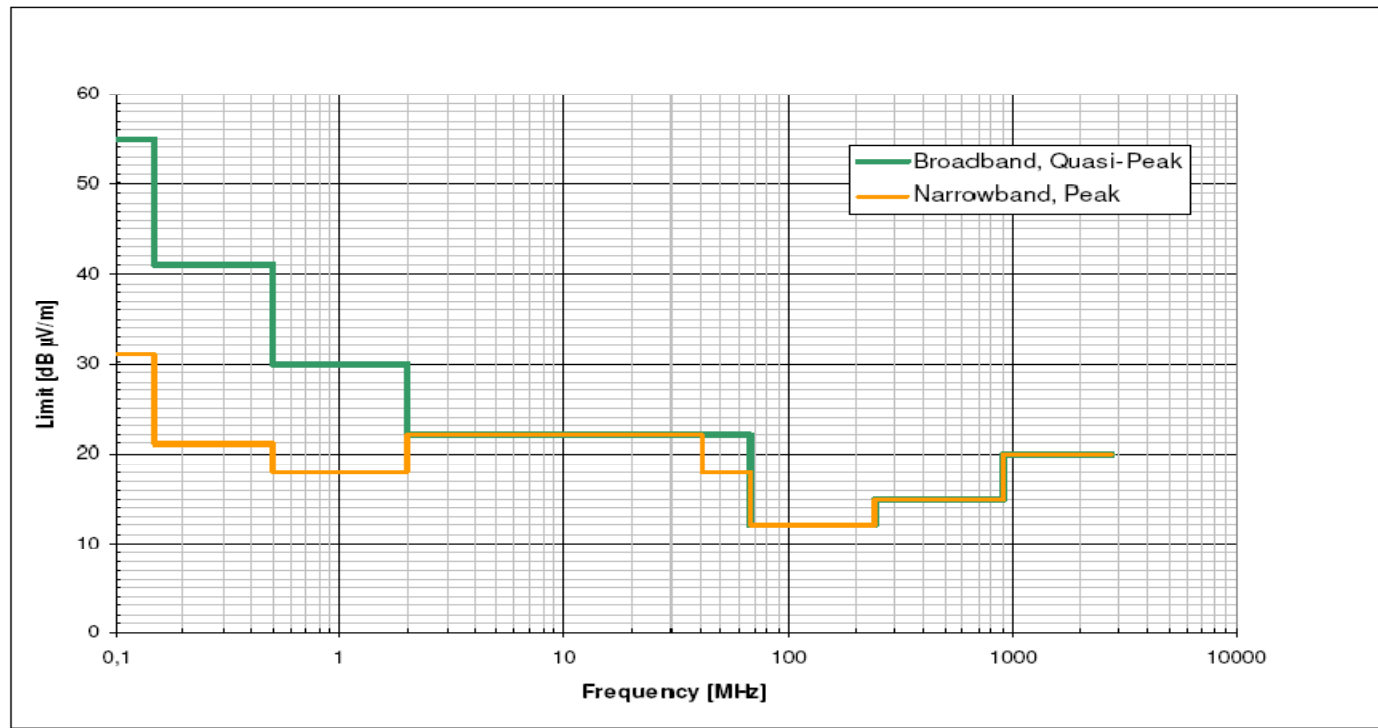


Figure 1: Limits for narrowband and broadband radiated disturbances

### 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.

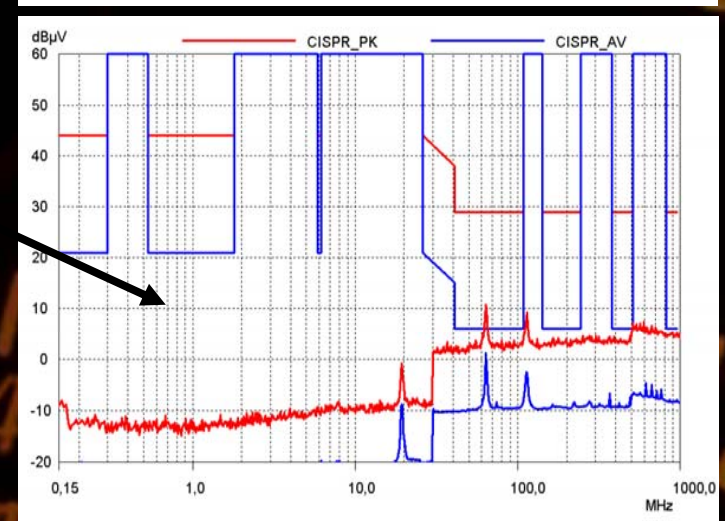
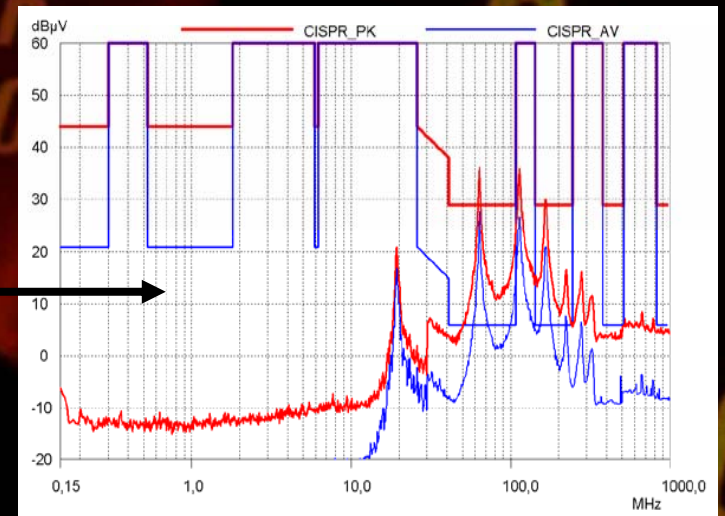
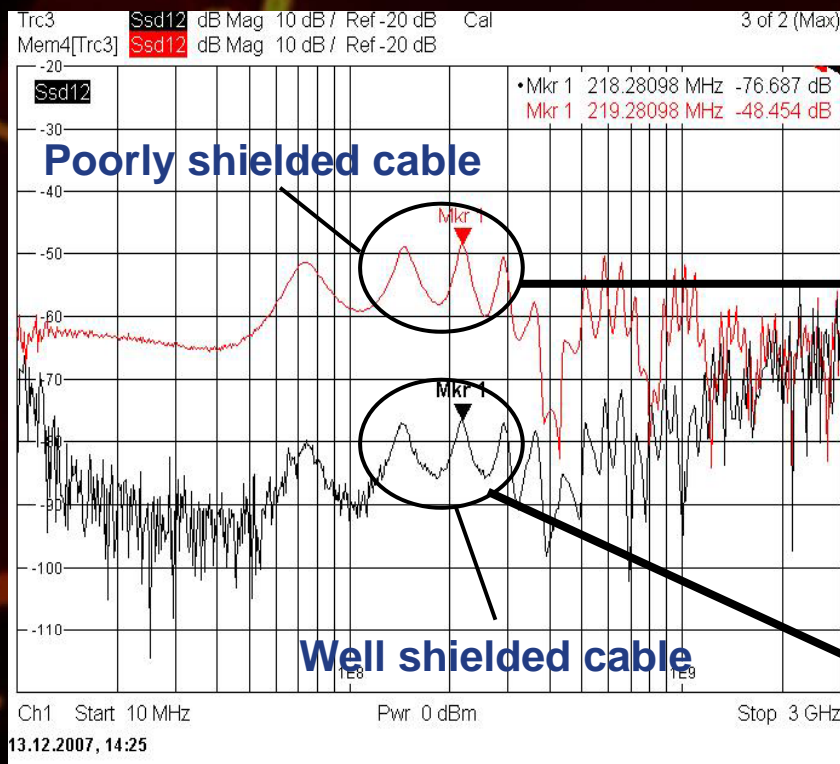
It is strongly recommended to carry out the EMI-test on component level by application of the coaxial test setups described by the specifications IEC62153-4-4, IEC62153-4-7 and IEC62153-4-10.

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



$$\Delta P = 28.2 \text{ dB}$$

A linear relation between screening performance 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 not support 1394 cable power therefore all devices shall report a power class of zero ( $000_2$ ). This specification not only 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 can be implemented without an LPM. The other 3 power modes require an LPM.

- Ultra-Low Power
- Low Power
- PHY Only