REV	Δ	Description	Sheet Effected	Date	Drawn	Checked
A				26.03.03	D.Lanuel	S.Cohen

EMC Laboratory

MMR-R

FCCID :NTAMMR2

Manufactured by Tadiran-Telematics

EMC Test Report

According FCC Part 15 Requirements

Appendix B

	Function/Title	Name	Signature	Date
Prepared by	**Test Engineer**	D.Lanuel		26-Mar-03
Approved by	EMC Lab. Manager	S.Cohen		26-Mar-03

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1. CONDUCTED EMISSIONS, AC POWER LEADS ACCORDING TO FCC 15.107

Frequency Range: **450 kHz – 30 MHz**

Testing Engineer: D.Lanuel **Date :** 19/02/03

1.1. Equipment Under Test Description and Operation

MMR-R, FAT, S/N 0001 manufactured by TADIRAN-Telematics

1.1.1. Modes of Operation

The MMR-R was set to Battery Charge at RX Mode

1.1.2. Operating Voltage110 V, AC 60Hz

1.2. Test Results Summary & Conclusions

The MMR-R complies with FCC, Part 15.107 conducted emissions requirement.

1.3. Limits of Conducted Emission at Mains Terminals

The test unit shall meet the limits of Table 1 for FCC Part 15 Para 15.107 equipment.

Table 1 Limits for intentional radiator according 15.107

Frequency Range MHz	Quasi-peak Limits dBμV
0.45 – 30	48

1.4. Test Instrumentation and Equipment

Table CE-A – Test Instrumentation and Equipment

Item	Model	Manufacturer	Next Date Calibration
Spectrum Analyzer	**8593E**	**HP**	**31/01/04**
Signal Generator	**2017**	**Marconi**	**21/06/03**
LISN	**FCC-LISN-3B**	**FISCHER**	**31/08/04**

1.5. Test Setup

1.5.1. Calibration setup shown in Figure CE-1.

1.5.2. The testing setup shown in Figure CE-2.

1.5.3. Equipment and cable configuration shown in Figure CE-3.

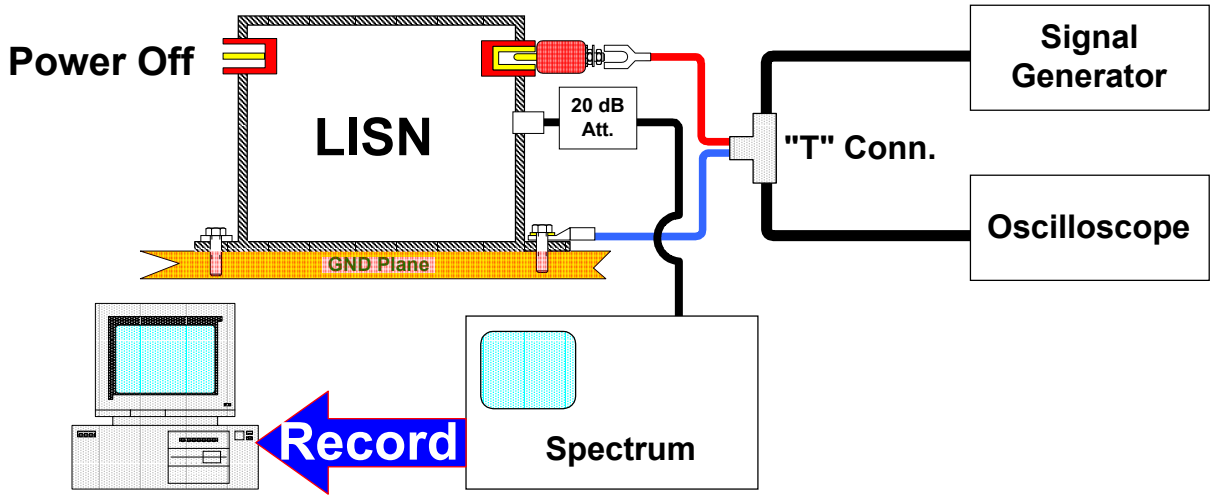


Figure CE-1

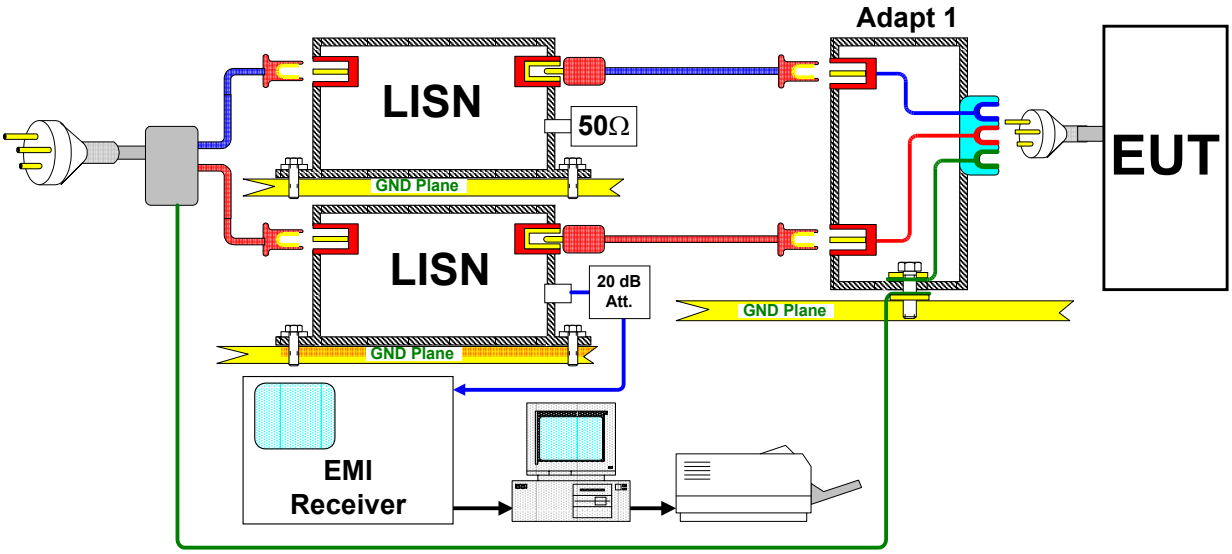


Figure CE-2

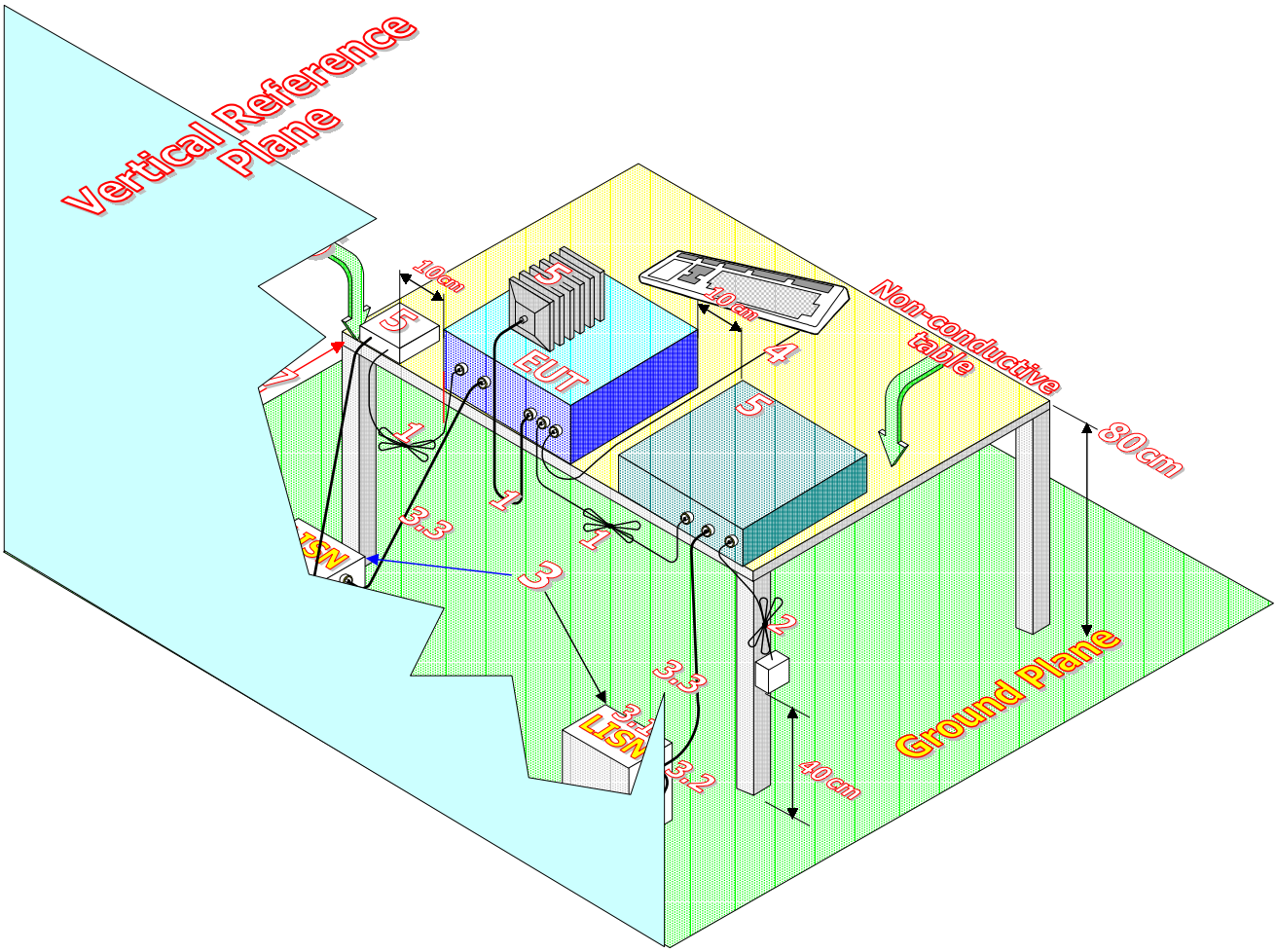


Figure CE-3

1 Interconnecting cables that hand closer than 40 cm to the horizontal ground plane shall be folded back and forth forming a bundle 30 cm to 40 cm long, hanging approximately in the middle between ground plane and table.

2 I/O cables are connected to a peripheral shall be bundled in the center. The end of the cable may be terminated if required using correct terminating impedance.

3 The total length shall not exceed 1 m.

3 EUT is connected to one LISN. Unused LISN connectors shall be terminated in 50 Ω.

4 All other equipment powered from second LISN

5 A multiple outer strip can be used for multiple power cords of non-EUT equipment.

6 LISN at least 80 cm from nearest part of EUT chassis.

7 Cables of hand operated devices such as keyboards, mousses; etc. have to be placed as close as possible to the host Non-EUT components being tested.

8 Rear of EUT, including peripherals shall be all aligned and flush with the rear tabletop.

9 Rear tabletop shall be 40 cm removed from a vertical conducting plane that bonded to the floor ground plane.

1.6. Test Procedure

The test procedure shall be as follows:

1.6.1. Calibration.

Perform the measured system check using the calibration setup shown in Figure CE-1.

1.6.2. Turn on the measurement equipment and allow sufficient time for stabilization.

1.6.3. Apply the calibrated signal level, which is 6 dB below the limit given in Table 1 at 500kHz and 29 MHz to the power output terminal of LISN.

1.6.4. Scan the spectrum analyzer for each frequency in the same manner as a normal data scan. Verify that the spectrum analyzer indicates a level within ± 3 dB of injected level. Correction factor shall be applied for LISN and 20 dB for attenuator.

1.6.5. EUT Testing. Perform emission data scan using the measurement setup shown in Figures CE-2 and CE-3.

1.6.6. Turn on the EUT to operational mode and allow sufficient time for stabilization.

1.6.7. Select (Phase) lead for testing.

1.6.8. Scan the spectrum analyzer over the applicable frequency range

1.6.9. Repeat (2) and (3) for (Neutral) lead.

1.6.10. Choose six highest emissions relative to limit and feel Table CE-D.

1.6.11. Perform measurements for selected frequencies using quasi-peak detector.

Table CE-B Calibration Results

Lead P/N	Frequency MHz	Plot No.	Test Signal DBuV(peak)	Result dBuV	Deviation dB
Phase(Line 1)	**0.5**	CE-CAL/ 1	48	48.2	**0.2**
	29	CE-CAL/ 2	48	46.8	**-1.2**
Neutral	**29**	CE-CAL/ 3	48	47.7	**-0.3**

Table CE-C Test Results 15.107

Lead P/N	Mode of Operation	Frequency Range (MHz)	Resolution BW (kHz)	Plot No.	Comply. Y/N
Phase	**RX**	**0.45 – 30**	9	CE/ 1	Y
Neutral		**0.45 – 30**		CE/ 2	Y

EUT File:
N:\COMMON\Telematics\MMR-R\Data\Mmr-r.eut
Order Number:

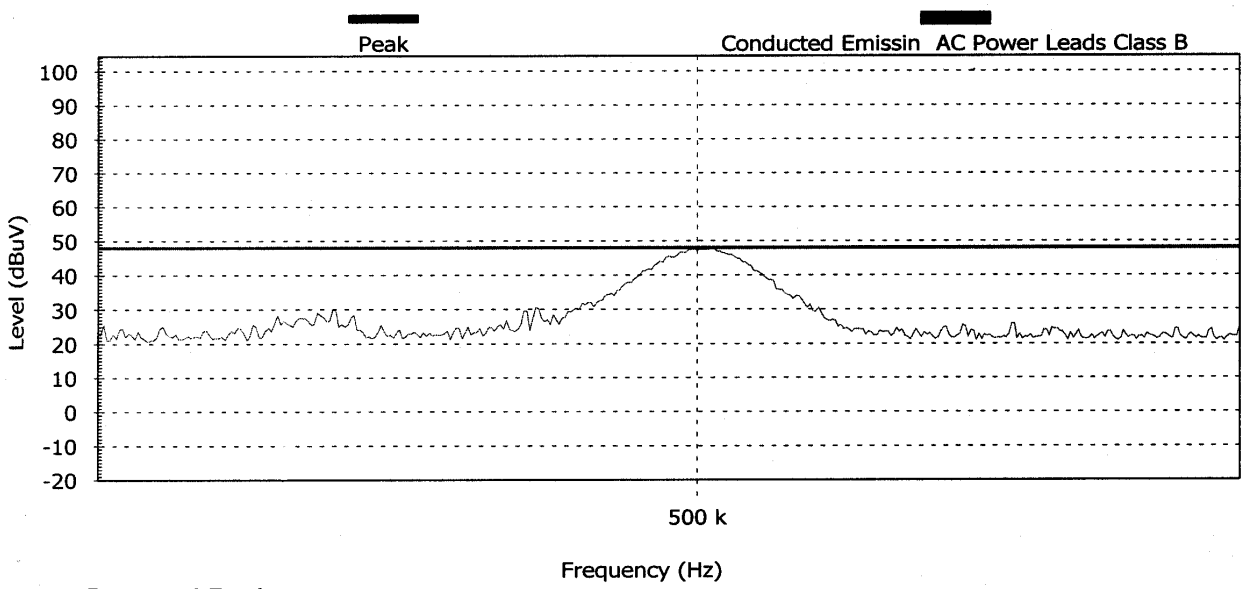
EUT
Name:
Serial Number:

Client
Name:
Contact Person:

Conducted Emission LISN

Description: 21) Calibration 500KHz CE FCC CLASS B
From 0.45 MHz to 0.55 MHz

Graph:



Detected Peaks:

Nr	Frequency (MHz)	PK (dBuV)	PK Limit (dBuV)	PK Pass	Pass	Line
1	0.5	48.2		Pass	Pass	Line 2

Settings:
Description: 21) Calibration 500KHz CE FCC CLASS B
From 0.45 MHz to 0.55 MHz
Ref. Level: 80.0 dBuV Att: 0 dB. RBW: 9 kHz. VBW: 30 kHz. Sweep time: 33.3330001831055 ms
Detect all peaks above 6 dB below the limit lines with a maximum of 1 peaks.
Measure the peaks with the peak detector

Note:

Plot CEcal/ 1

EUT File:
N:\COMMON\Telematics\MMR-R\Data\Mmr-r.eut
Order Number:

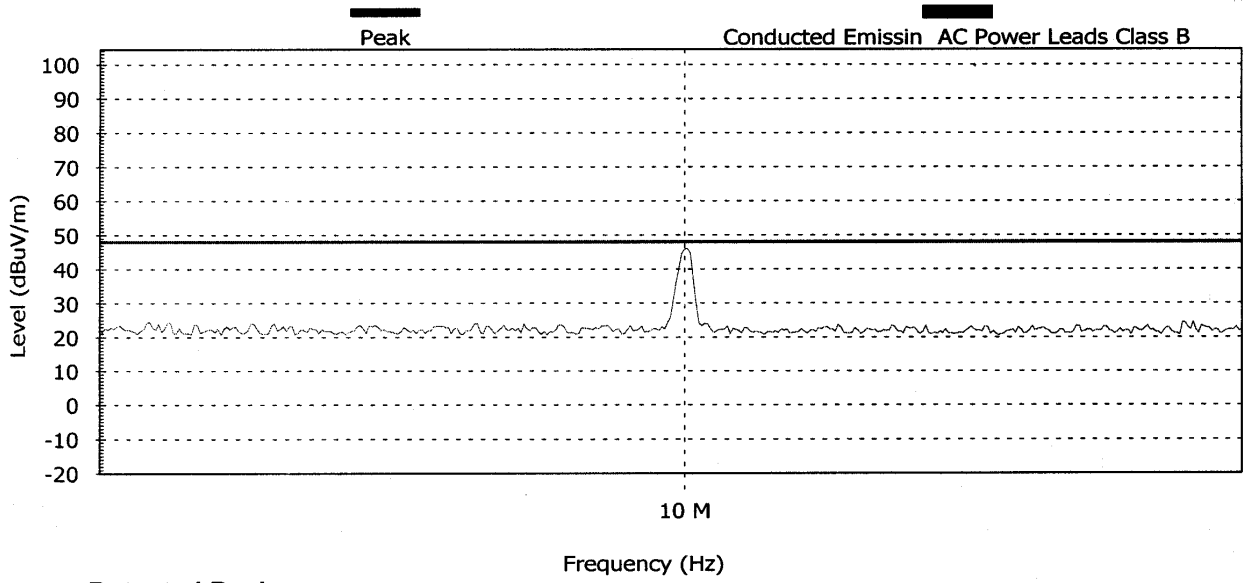
EUT
Name:
Serial Number:

Client
Name:
Contact Person:

Conducted Emission LISN

Description: 24) Calibration 10MHz CE FCC CLASS B
From 9.5 MHz to 10.5 MHz

Graph:



Detected Peaks:

Nr	Frequency (MHz)	PK (dBuV/m)	PK Limit (dBuV/m)	PK Pass	Pass	Line
1	10	46.8		Pass	Pass	Line 2

Settings:
Description: 24) Calibration 10MHz CE FCC CLASS B
From 9.5 MHz to 10.5 MHz
Ref. Level: 80.0 dBuV/m Att: 0 dB. RBW: 9 kHz. VBW: 30 kHz. Sweep time: 37.0369987487793 r
Detect all peaks above 6 dB below the limit lines with a maximum of 1 peaks.
Measure the peaks with the peak detector

Note:

Plot CEcal/ 2

EUT File:
N:\COMMON\Telematics\MMR-R\Data\Mmr-r.eut
Order Number:

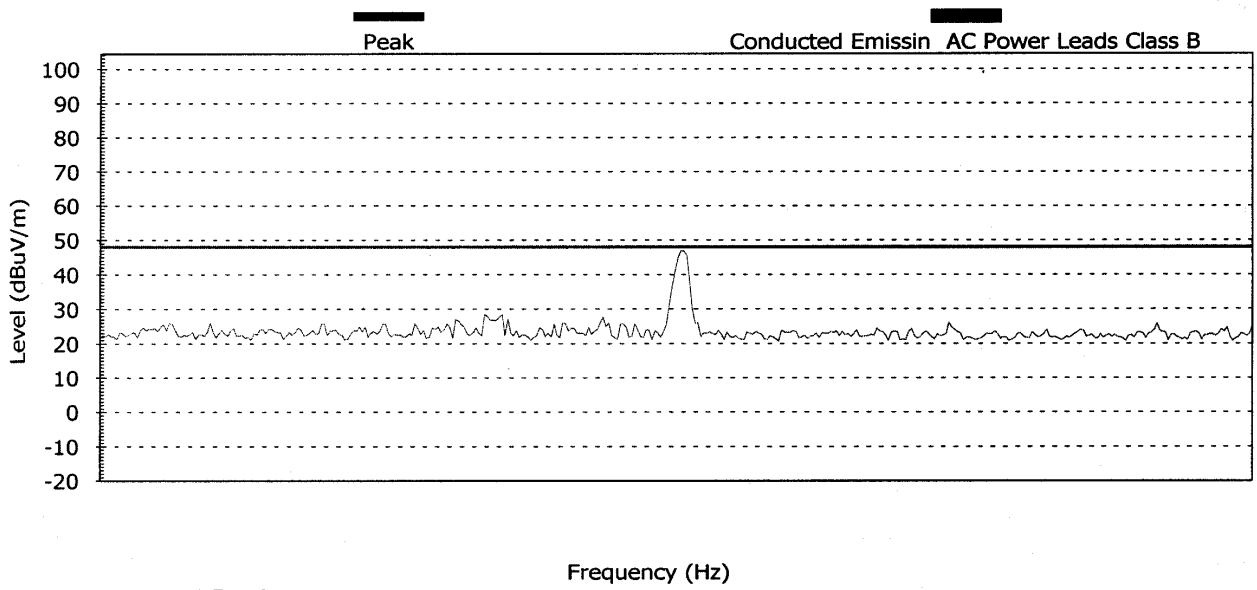
EUT
Name:
Serial Number:

Client
Name:
Contact Person:

Conducted Emission LISN

Description: 26) Calibration 29MHz CE FCC CLASS B
From 28.5 MHz to 29.5 MHz

Graph:



Detected Peaks:

Nr	Frequency (MHz)	PK (dBuV/m)	PK Limit (dBuV/m)	PK Pass	Pass	Line
1	29	47.7		Pass	Pass	Line 2

Settings:
Description: 26) Calibration 29MHz CE FCC CLASS B
From 28.5 MHz to 29.5 MHz
Ref. Level: 80.0 dBuV/m Att: 0 dB. RBW: 9 kHz. VBW: 30 kHz. Sweep time: 37.0369987487793 r
Detect all peaks above 6 dB below the limit lines with a maximum of 1 peaks.
Measure the peaks with the peak detector

Note:

Plot CEcal/ 3

EUT File:
N:\COMMON\Telematics\MMR-R\Data\Mmr-r.eut
Order Number:

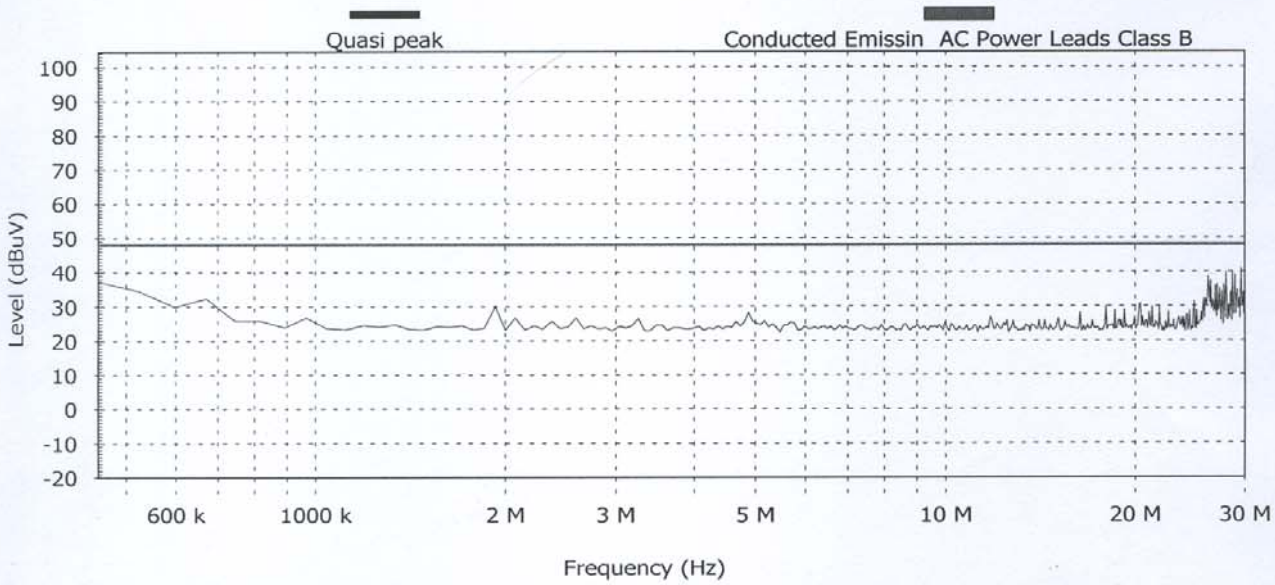
EUT
Name:
Serial Number:

Client
Name:
Contact Person:

Conducted Emission LISN

Description: 19) CE FCC CLASS B
From 0.45 MHz to 30 MHz

Graph:



Detected Peaks:

Nr	Frequency (MHz)	PK (dBuV)	QP (dBuV)	PK Limit (dBuV)	QP Limit (dBuV)	PK Pass	QP Pass	Pass	Line
1	27.153	39.7	40.0		48.0	Pass	Pass	Pass	Line 1
2	28.828	47.5	44.5		48.0	Pass	Pass	Pass	Line 1
3	29.631	40.9	-80.0		48.0	Pass	Pass	Pass	Line 1

Settings:
Description: 19) CE FCC CLASS B
From 0.45 MHz to 30 MHz
Ref. Level: 80.0 dBuV Att: 0 dB. RBW: 9 kHz. VBW: 30 kHz. Sweep time: 1094.44494628906 ms
Detect all peaks above 10 dB below the limit lines with a maximum of 3 peaks.
Measure the peaks with the quasi-peak detector

Note:

Plot CE/ 1

EUT File:
N:\COMMON\Telematics\MMR-R\Data\Mmr-r.eut
Order Number:

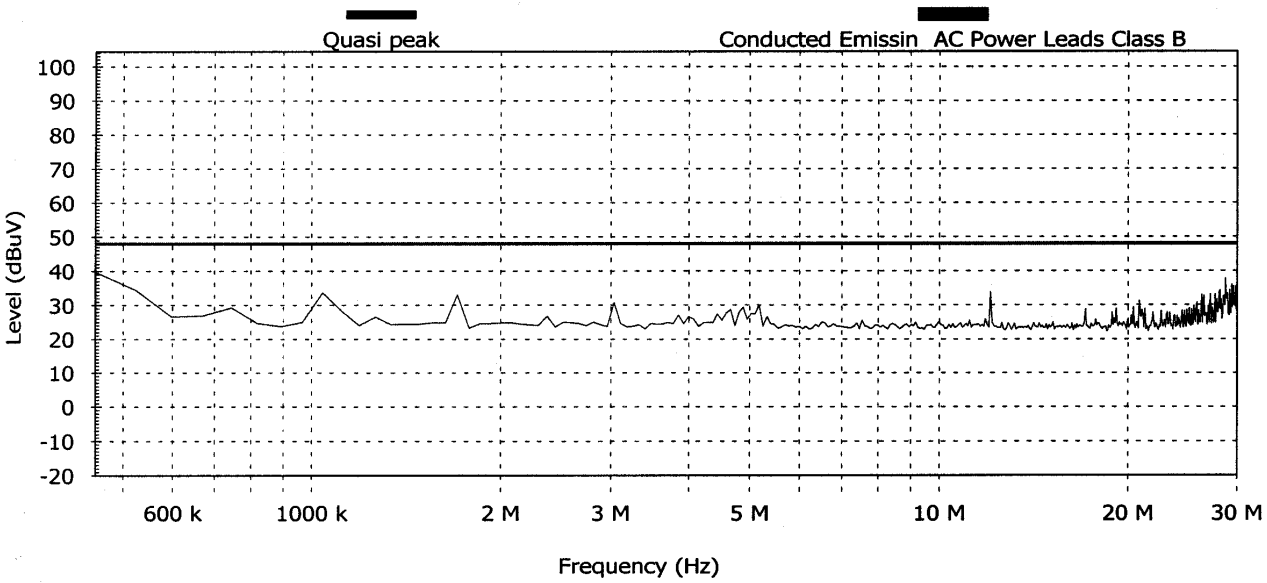
EUT
Name:
Serial Number:

Client
Name:
Contact Person:

Conducted Emission LISN

Description: 20) CE FCC CLASS B
From 0.45 MHz to 30 MHz

Graph:



Detected Peaks:

Nr	Frequency (MHz)	PK (dBuV)	QP (dBuV)	PK Limit (dBuV)	QP Limit (dBuV)	PK Pass	QP Pass	Pass	Line
1	0.45	39.8	-80.0		48.0	Pass	Pass	Pass	Line 2

Settings:
Description: 20) CE FCC CLASS B
From 0.45 MHz to 30 MHz
Ref. Level: 80.0 dBuV Att: 0 dB. RBW: 9 kHz. VBW: 30 kHz. Sweep time: 1094.44494628906 ms
Detect all peaks above 10 dB below the limit lines with a maximum of 3 peaks.
Measure the peaks with the quasi-peak detector

Note:

Plot CE/ 2

2. REJECTION OF UNDESIRED RESPONSE TO CELLULAR FREQUENCIES

2.1. Requirements

2.1.1. The test sample shall not exhibit any undesired response when subjected to the test signal level and frequencies as shown on Table CS04-A

2.1.2. Frequency scanning: see table CS04-A

Table - CS04-A

Start scanning frequency [MHz]	Stop scanning frequency [MHz]	Freq. Increment[KHz]
824.040	893.970	500

2.2. Test Instrumentation

Table CS04-B - Test Instrumentation

Item	Model	Manufacturer
RF Signal Generator	83712A	HP
RF Signal Generator	8620A	HP
Audio Analyzer	8903B	HP
Power Splitter	11667A	HP
Low pass Filter	360C	HP
Computer	Pentium	IBM Compatible

2.3. Test Setup Measuring system block diagram is shown Figure CS04-1

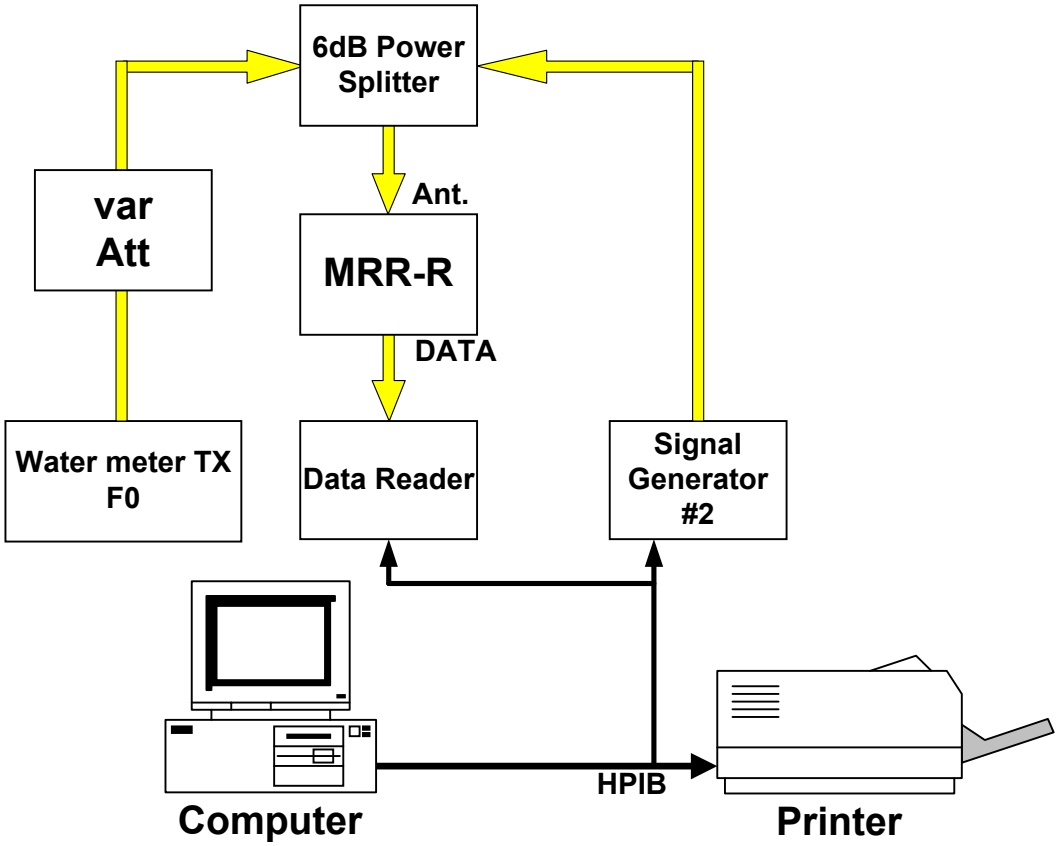


Figure CS04-1

2.4. Test Procedures The test procedures shall be as follows:

2.4.1. Maintain test setup as shown in Figure CS04-1.

2.4.2. Select E.U.T. Operation Mode.

2.4.3. When Signal Generator #2 is off, set attenuator from Water meter TX signal to the MMR-R. to read undisturbed data reading as displayed by the data reader

2.4.4. Adjust the attenuator to a level to the sensitivity threshold by getting error reading on the data reader. Record the level at the Ant. input as SR. Increase SR by 3 dB.

2.4.5. Turn signal generator #2 on and set its frequency to the lowest interfering frequency required in table CS04-A. Scan the frequency range maintaining level of 70 dB above SR by 3 dB , The interfering signal shall be unmodulated.

2.4.6. Monitor the data reader to see if there is any degradation of data reading measurement. If such degradation is present reduce the level of generator #2 until the data reader reads undisturbed data reading. The difference between this level and the Limit level is the E.U.T. rejection of undesired signals

2.5. Data presentation

2.5.1. Show tabular data for the interference threshold levels.

3. REJECTION OF UNDESIRED RESPONSE TO CELLULAR FREQUENCIES

E.U.T.: MMR-R S/N: 001

Operation Modes: **SCANNING RECEIVER**

Limit: **FCC PART 15 CLASS B PARA 15.121(b)**

Test Setup: Test Plan Doc. No. 30010AF01011 Fig.CS04-1.

Test Instrumentation**: Table CS04-A**

Test Results: **Table CS04-1 through CS04-2**

Conclusions**:** The EUT complied with requirements of Part 15 class B Para 15.121(b) see detailed results in table

Testing Eng. D.Lanuel **Date** 19/2/03

Table- CS04-A Test Instrumentation

Item	Model	Manufacturer	Next Date Calibration
RF Signal Generator	**83712**	**MARCONI**	**28.10.03**
RF Signal Generator	**83620A**	**HP**	**15.05.03**
Audio Analyzer	**8903B**	**HP**	**19.06.03**
Power Splitter	**11667A**	**HP**	**01.09.03**
Tunable band reject filter		**TELONIC**	**20.04.03**

3.1. Test results

3.1.1. The MMR-R complies with the requirement of 15.121(b)

Test method	U.U.T. Mode of Operation.	Interference Frequency	Interference level(dBm)	rejection(db)	Rejection (db) limit	Comply. Y/N
15.121(b)	Scanning 905-924	824-830	-46	56	38	Y
		830-840	-46	56	38	Y
		840-850	-47	55	38	Y
		850-860	-48	54	38	Y
		860-870	-48	54	38	Y
		870-880	-49	53	38	Y
		880-894	-49	53	38	Y