



**Telecommunications & Telematics
for Transports Lab.**

TEST REPORT

Ref. No. ARSG00141/a

Date: 2007-08-02

Measurements performed in accordance with:



**FCC Rules: Code of Federal Regulations (CFR) no. 47 -
PART 15 – RADIO FREQUENCY DEVICES**

PRODUCT : Reception unit
 APPLICANT : ADVANCED MICROWAVE ENGINEERING S.r.l. – Via del
 Monasteraccio, 4 - FIRENZE
 MANUFACTURER : ADVANCED MICROWAVE ENGINEERING S.r.l. – Via del
 Monasteraccio, 4 - FIRENZE
 TRADEMARK : ADVANCED MICROWAVE ENGINEERING
 TESTED MODEL : LX 2002
 FCC ID : UKOPLX2002
 RATING : AC/DC 12/24 V
 OTHER INFORMATION : Samples received on : 2006-08-29
 Testing dates : 2006-09-04 ÷ 2006-09-04
 Samples tested No. : 1
 Testing site : IMQ S.p.A – Via Quintiliano, 43 I-20138 MILANO

Tested by : R. Radice Signature: Date : 2007-08-02

Ing. C. Cantaluppi

Checked by: (EMC and R&TTE Lab Head) Signature: Date : 2007-08-02

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2006-09-19	Test Results and Evaluation Report
Rev. 1	2007-02-08	FCC ID number, AC/DC Adapter description
Rev. 2	2007-06-11	FCC ID
Rev. 3	2007-08-02	Conducted emissions test

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IMQ S.p.A. - Via Quintiliano, 43 – I-20138 MILANO

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1 TEST SPECIFICATIONS, METHODS & PROCEDURES

The following tests and relevant standards have been applied to the Equipment Under Test (EUT):

1.1 EMISSION TESTS

Product family standard	Date	Title
FCC Rules	February 1, 2006	Code of Federal Regulations (CFR) no. 47 PART 15 – RADIO FREQUENCY DEVICES

1.2 EQUIPMENT CLASSIFICATION

According to the definition 15.3 (o) EUT is a Class B digital device. A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public. Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use so it shall fulfil provisions of **47CFR Part 15 Subpart B – Unintentional radiators** – Section 15.107 and 15.109.

1.3 ENVIRONMENTAL CONDITIONS

TEST CONDITIONS	MEASURED
Ambient Temperature	20 ÷ 25 °C
Relative Humidity	50 ÷ 60 %
Atmospheric Pressure	900 ÷ 1000 mbar

2 EQUIPMENT UNDER TEST DETAILS

2.1 EUT IDENTIFICATION

The EUT is composed by the following modules/parts:

- Receiver module

EUT classification

- Unintentional radiator

EUT use / installation (fixed/vehicular use/portable use) :

- Fixed use

EUT single or system:

- Single

EUT standing (floor-standing/Table-top-wall-mounted) :

- ---

Dimension of EUT (H x W x D):

- 158x95x45 mm

Weight of EUT:

- ---

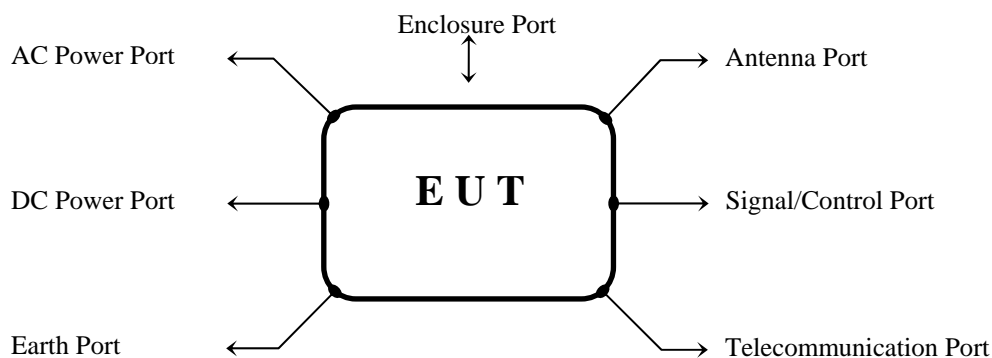
2.2 EUT TECHNICAL DATA


Power supply:	▪ AC/DC 12/24 V (rating power supply through connection to AC Mains Power adaptor input 230V – output 12V)
Power specification	▪ 1 W
Operation frequency	▪ 433.92 MHz
Modulation	▪ OOK / AM
RX Sensitivity	▪ -56 dBm
Processor	▪ ---
Main Battery	▪ None
Main SW identification	▪ ----
Main HW Board identification	▪ ---
Peripherals included (for system application)	▪ None
Interfaces :	▪ ---
Integrated interfaces :	▪ None
AC adapter:	▪ ACCORD type PD253

2.3 TESTED SAMPLES

SAMPLE Nr.	S/N
1	06 0022

2.4 SYSTEM INTERFACE IDENTIFICATION



#	Interface	Description	Maximum length	Ref. Document
1	Enclosure	Plastic surface	----	----
2	AC Power port	12/24 V from an external AC Adaptor	----	
3	DC Power port	12/24 V from an external AC Adaptor (in alternative to AC Power)	----	
4	Signal / control port	Relay (pins 10, 11 and 12) RS232 (pins 3, 4 and 5) RS485 (pins 6, 7, 8 and 9)	----	----
5	Telecomm. Port	Ethernet	> 3 m	----

2.5 DESCRIPTION OF SUPPORT EQUIPMENT

Here following the details concerning equipment needed for correct operation or loading of the EUT, but not considered as part of equipment under test :

EQUIPMENT	MANUFACTURER	MODEL
AC/DC Mains Power adaptor	ACCORD	PD253 – INPUT: AC 100-240 V; 50-60 Hz; 0.17-0.38 A OUTPUT: DC 12 V; 15 VA

3 GENERAL MEASUREMENT CONDITIONS

Unless special conditions specified in the present test report, EUT configuration and general measurement conditions used are based on requirements of ANSI C63.4-2003 and CISPR Pub. 22:1997.

3.1 OPERATION OF THE EQUIPMENT (EUT)

The operational condition of the EUT was determined by the manufacturer according to the typical use of the EUT with respect to the expected highest level of emission.

These operational modes are described in the following table:

Ref.	Description
#1	Receiver supplied in normal operating condition, supplied via connection to AC/DC Mains Power adaptor (In: 230Vac; out: 12Vdc) RS232 and Ethernet cables terminated with typical impedance on Personal Computer
#2	Receiver supplied in normal operating condition, supplied via connection to 12Vac Power RS232 and Ethernet cables terminated with typical impedance on Personal Computer

3.2 EUT PERFORMANCE ASSESSMENT

As declared by manufacturer the following settings have been adopted:

PRIMARY FUNCTIONS	REPRESENTATIVE PARAMETER	TEST INSTRUMENTATION	ACCEPTABLE LEVEL OF PERFORMANCE
Data reception	Radio data reception	---	Radio data received by an associated Radio transmitter equipment.

The test instrumentation used for monitoring the parameters has the following identification:

TEST INSTRUMENTS	MANUFACTURER	MODEL	SERIAL NUMBER
---	---	---	---
---	---	---	---

4 SUMMARY OF TEST RESULTS

4.1 Emission tests

CFR47 Part 15 Subpart B Section:	Title	Port	Operating condition	Result	Test details
15.107	Conducted emission	AC power supply	#1 and #2	Complies	1
15.109	Radiated emission	Enclosure	#2	Complies	2

5 EMC TEST DATA

TEST No. 1	Title "Conducted emission"	47CFR Part 15 Ref. Section
		15.107
TEST REQUIREMENTS	Test setup	ANSI C63.4
	Limits of mains terminal disturbance voltage	15.107 (a)
	Frequency range	150 kHz – 30 MHz
	IF bandwidth	9 kHz
	EMC class	B

TEST DATA	PORT UNDER TEST	OPERATING CONDITION	RESULT
	AC power input port	#1 and #2	Complies
Note: In search of max noise (phase(s) and neutral). The measurements with Quasi-Peak detector are performed only for frequencies for which the Peak values are \geq (Q.P. limit - 10 dB).			

Modification during the test:

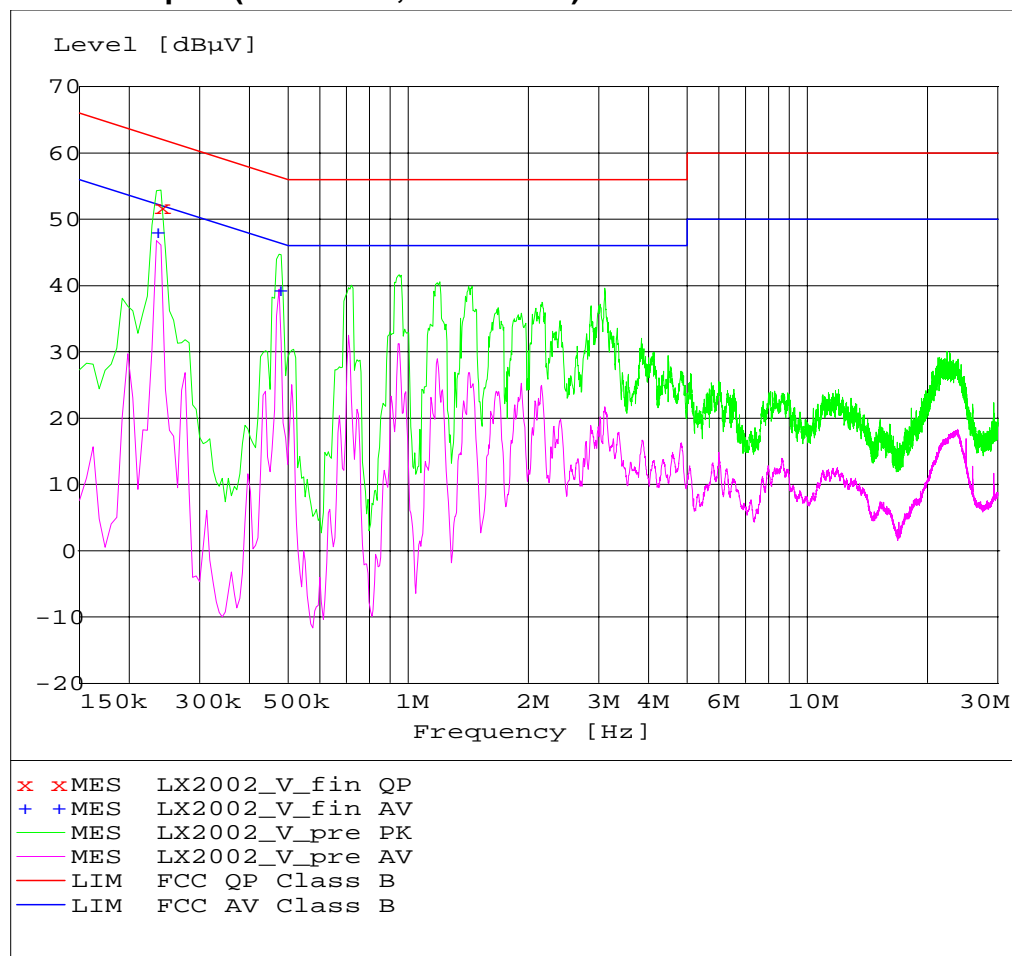
- None

Tested samples

SAMPLE
1

MEASUREMENTS RESULTS

CONDUCTED DISTURBANCE supplied via connection to AC/DC Mains Power adaptor (In: 230Vac; out: 12Vdc)



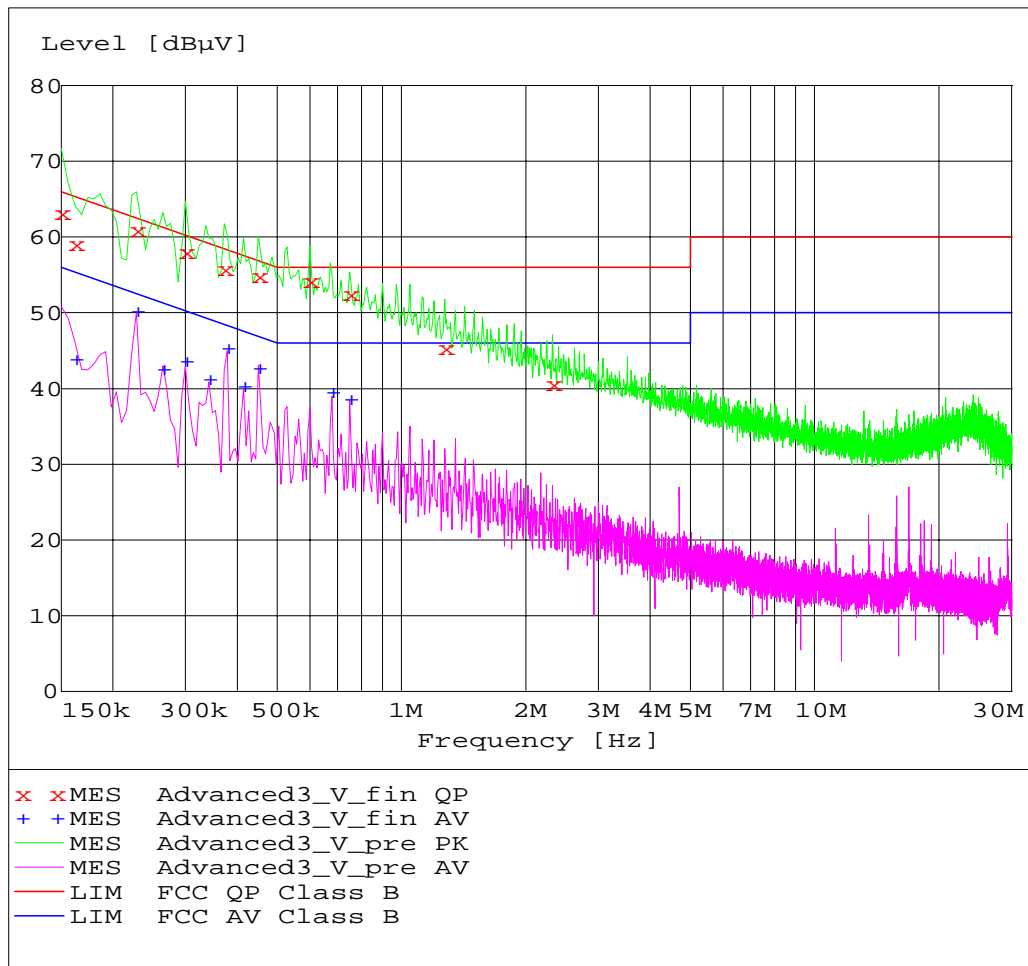
FINAL TEST (QUASI-PEAK DETECTOR)

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dB μ V	dB	dB μ V	dB		
0.240000	51.90	10.40	62.10	10.20	N	GND

FINAL TEST (AVERAGE DETECTOR)

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dB μ V	dB	dB μ V	dB		
0.234000	48.10	10.40	52.30	4.30	L1	GND
0.474000	39.30	10.40	46.40	7.20	L1	GND

CONDUCTED DISTURBANCE supplied via connection to 12Vac Power



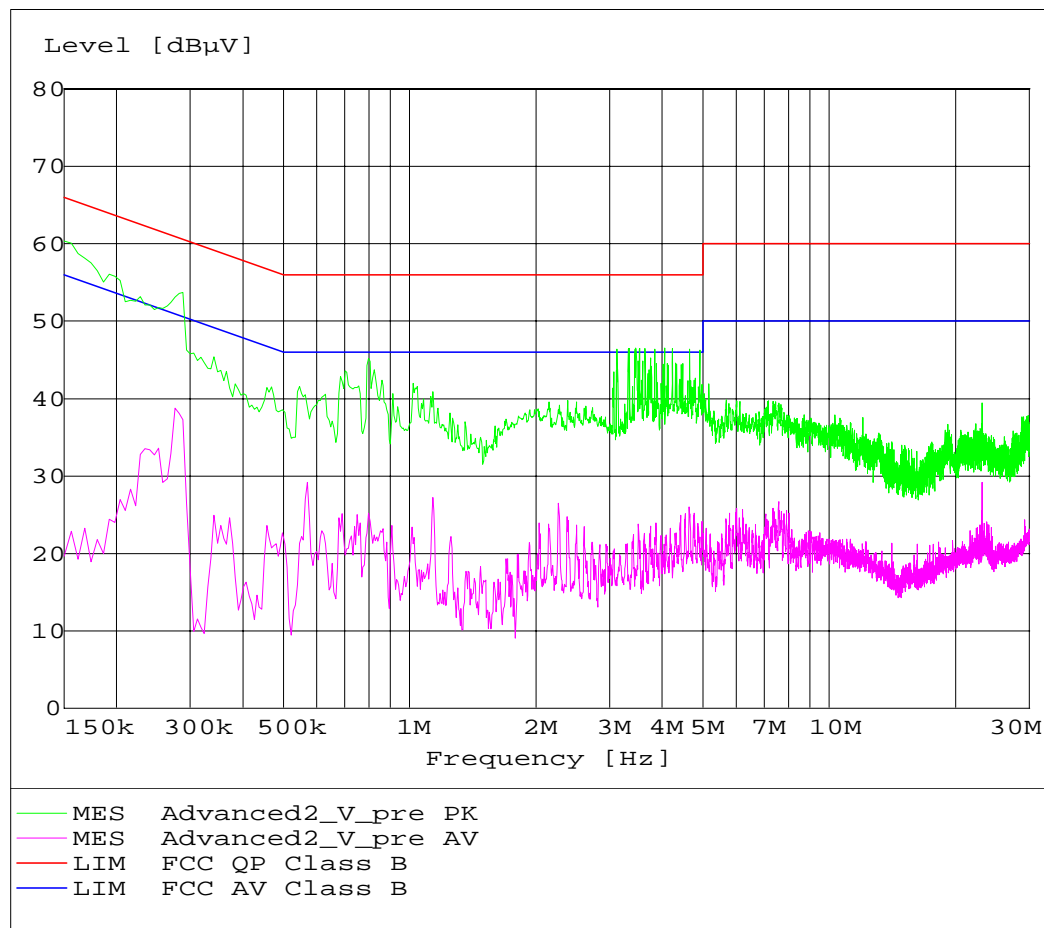
FINAL TEST (QUASI-PEAK DETECTOR)

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dB μ V	dB	dB μ V	dB		
0.150000	63.20	0.10	66.00	2.80	L1	None
0.162000	59.10	0.10	65.00	6.20	L1	None
0.228000	60.90	0.10	63.00	2.10	N	None
0.300000	58.00	0.10	60.00	2.00	N	None
0.372000	55.70	0.10	58.50	2.70	L1	None
0.450000	54.90	0.10	57.00	2.10	N	None
0.600000	54.20	0.10	56.00	1.80	N	None
0.750000	52.50	0.10	56.00	3.50	L1	None
1.272000	45.40	0.10	56.00	10.60	L1	None
2.322000	40.60	0.10	56.00	15.40	L1	None

FINAL TEST (AVERAGE DETECTOR)

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dB μ V	dB	dB μ V	dB		
0.162000	43.90	0.10	55.00	11.40	L1	None
0.228000	50.20	0.10	53.00	2.80	L1	None
0.264000	42.60	0.10	51.00	8.70	L1	None
0.300000	43.60	0.10	50.00	6.40	L1	None
0.342000	41.30	0.10	49.00	7.80	N	None
0.378000	45.30	0.10	48.00	3.00	N	None
0.414000	40.40	0.10	48.00	7.10	N	None
0.450000	42.70	0.10	47.00	4.20	N	None
0.678000	39.50	0.10	46.00	6.50	N	None
0.750000	38.60	0.10	46.00	7.40	N	None

CONDUCTED DISTURBANCE on 230 Vac of PC with RS232 & Ethernet line of equipment under test connected to this Personal Computer.



TEST No. 2	Title "Radiated disturbances"		47CFR Part 15 Ref. Section
			15.109
TEST REQUIREMENTS	TEST SETUP	CISPR Pub. 22 :1997	
	TEST FACILITY	Anechoic chamber	
	TEST DISTANCE	3 m	
	LIMITS FOR RADIATED DISTURBANCES	47CFR Part 15 Ref. Section: 15.109 (a)	
	FREQUENCY RANGE	30 – 1000 MHz 1000 – 4400 MHz	
	DETECTOR	PEAK and AVERAGE	
	IF BANDWIDTH	120 KHz (30 – 1000 MHz) 1 MHz (1000 – 4400 MHz)	
	NOTES: Broadband measurements with Quasi-Peak detector are performed only for frequencies which the Peak values are \geq (Q.P. limit - 6 dB)		

TEST DATA	PORT UNDER TEST	OPERATING CONDITION	RESULT	NOTES
	Enclosure	#2	Complies	---

Modification during the test:

- None

MEASUREMENTS RESULTS

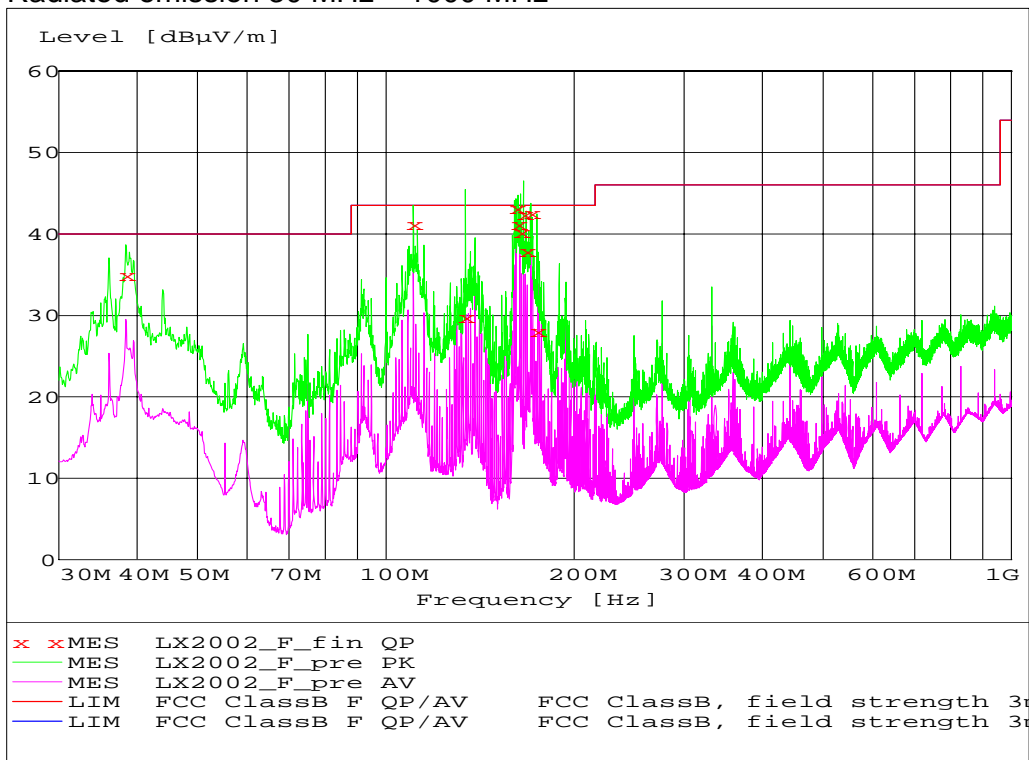
RADIATED DISTURBANCE AT ENCLOSURE PORT

There were no emissions found above 1000 MHz and up-to 4400 MHz at least 10 dB below the limit.

MEASUREMENTS RESULTS

RADIATED DISTURBANCE AT ENCLOSURE PORT

Radiated emission 30 MHz – 1000 MHz



FINAL TEST (QUASI-PEAK DETECTOR)

Frequency	Level	Transd	Limit	Margin	Height	Azimuth	Polarisation
MHz	dBµV/m	dB	dBµV/m	dB	cm	deg	
38.400000	34.90	17.20	40.00	5.10	150.0	45.00	VERTICAL
110.60000	41.20	14.70	43.50	2.30	150.0	287.00	HORIZONTAL
134.00000	29.70	11.50	43.50	13.80	150.0	235.00	HORIZONTAL
161.40000	43.10	11.30	43.50	0.40	150.0	250.00	HORIZONTAL
162.70000	41.20	11.50	43.50	2.40	150.0	260.00	HORIZONTAL
164.20000	40.20	11.70	43.50	3.30	150.0	261.00	HORIZONTAL
165.90000	42.40	11.90	43.50	1.10	150.0	240.00	HORIZONTAL
167.60000	37.90	12.10	43.50	5.60	150.0	269.00	HORIZONTAL
170.40000	42.50	12.50	43.50	1.00	150.0	264.00	HORIZONTAL
174.40000	28.00	13.00	43.50	15.50	150.0	262.00	HORIZONTAL

6 ADDITIONAL TECHNICAL INFORMATION

6.1 Electromagnetically relevant components:

Components	N°	Manufacturer	Type – Technical data

6.2 RFI suppression devices:

Components	N°	Manufacturer	Type – Technical data

6.3 EMI protection devices:

Components	N°	Manufacturer	Type – Technical data

7 TECHNICAL DOCUMENTATION

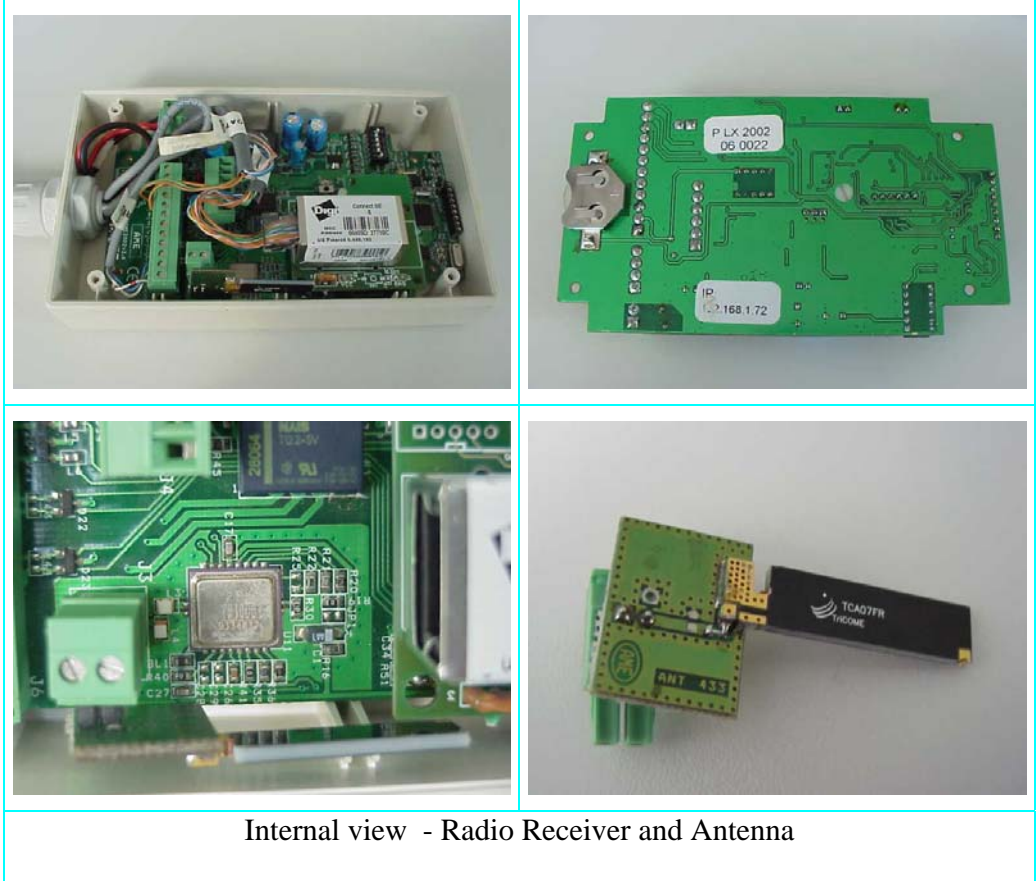
DOCUMENT	REFERENCE
Datasheet LX 2002 FW 3.5 Revision 1.11 Date: 13/09/2005	

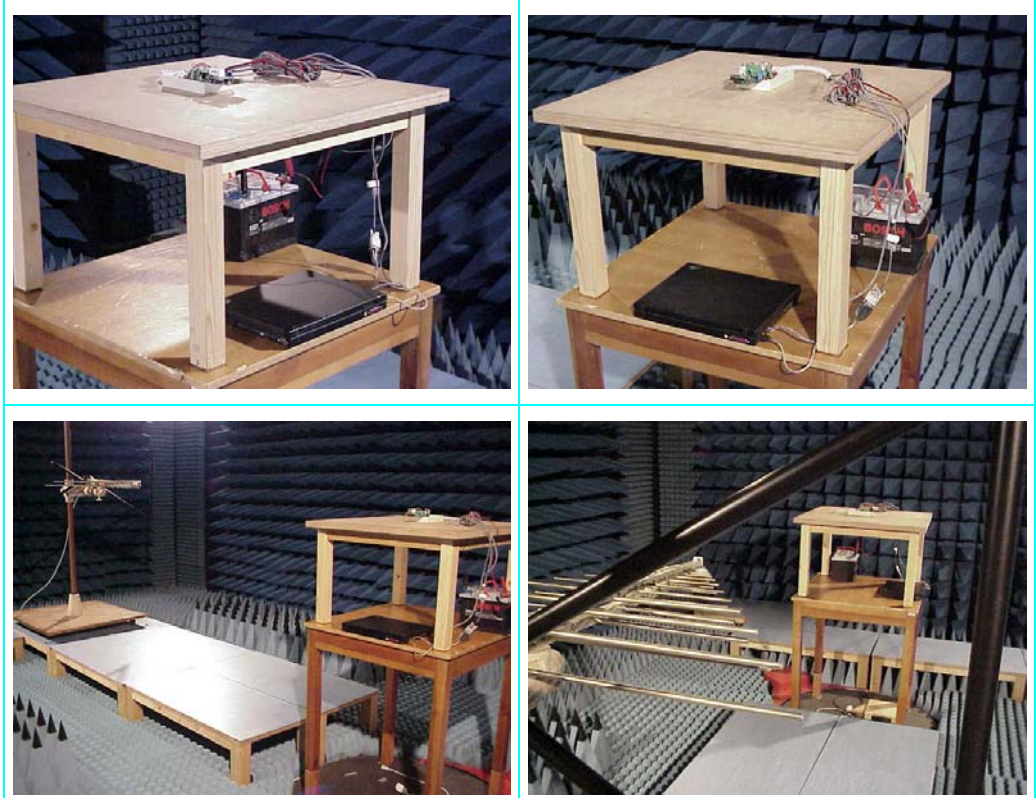
8 PHOTOGRAPHIC DOCUMENTATION

8.1 EUT IDENTIFICATION



Equipment under test identification





Set-up of Emission Radiated test



Set-up of Emission Conducted test

9 MEASUREMENT AND TEST EQUIPMENT

INSTRUMENTS	MANUFACTURER	MODEL	IMQ s/n
LISN	Comtest	/	S-02405
EMI receiver	Rohde & Schwarz	ESHS10	S-03494
EMI receiver	Rohde & Schwarz	ESVS10	S-04197
Spectrum analyzer	Rohde & Schwarz	FSP40	S-02350
Pre-amplifier	HP	HP 8439 B	S-03542
Pulse limiter	Rohde & Schwarz	ESH3-Z2	S-03510
Log-periodic antenna	ARA	LPE-2520/1	S-03511
Ridged horn antenna	Schwarzbeck	BBHA9120D	S-03464
Shielded anechoic chamber	SIDT EUROPE	/	P-02386
PC and SW for test automation	/	/	/