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Test report n° ELC/EMC/654 - 2006.01.26

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Tested Objects

<i>Subject</i>	<i>Manufacturer</i>	<i>Product Name</i>	<i>File Number</i>
Modem Module	Delta Design	SMD24XXL	20060009

Test History

Equipment acceptance and delivery of technical file	2005.08.29
Testing Period	2005.08.29 - 2005.08.30

This report contains 20 pages.

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Standards & Specifications

- EN 61000-4-3 (1996):** Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques. Section 3: Conducted disturbances induced by radio-frequency fields: Immunity test.
- EN 61000-4-4 (1995):** Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques. Section 4: Electrical fast transient/burst immunity test.
- EN 61000-4-5 (1995):** Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques. Section 5: Surge Immunity test.
- EN 61000-4-6 (1996):** Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques. Section 6: Immunity to conducted disturbances induced by radio-frequency fields.
- EN 61000-4-8 (1993):** Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques. Section 8: Power frequency magnetic field immunity test.
- EN 55022 (1994) + A1 (1995) + A2 (1997):**
Limits and methods of measurement of radio disturbance characteristics of ITE-equipment.
- EN 55024 (1998):** Electromagnetic compatibility (EMC) - Information technology equipment Immunity characteristics, Limits and methods of measurement

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2. DESCRIPTION OF THE EQUIPMENT AND OPERATING CONDITIONS

2.1.....General description:

The SMD24XXL MODEM MODULE is a complete modem module that meets global telephone line requirements. Available in a socket (64,5 mm x 26,5mm) size footprint, the device is ideal for embedded modem applications due to its small board space, low power consumption and global compliance. The device is available in 6 different versions, ranging from V.92 down to V.22b.

The module allows you to reduce time to market by using a ready to use approved solution.

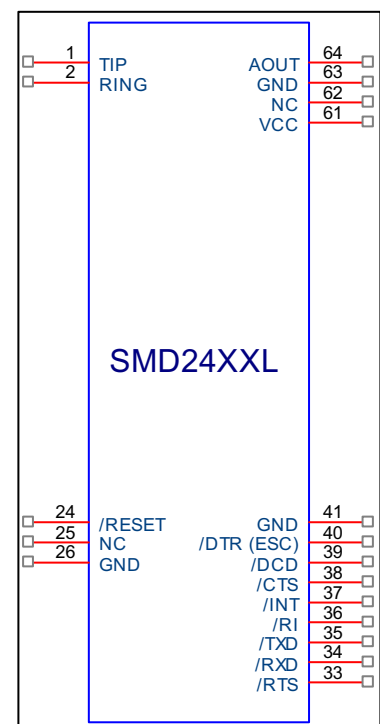
2.2.....Features:

Modulation and protocols ITU-T V.92 *, V.90,V.34, V.32bis, V.32, V.22bis *, V.21,Bell 212A, Bell103, V.23 Reversing,V.23 half-duplex, V.29 FastPOS and V22bis fast connect, V.80 Synchronous Access Mode
 V.44,V.42bis, MNP5 data compression *
 Error Correction: ITU-V.42
 Call Waiting detection *
 DTE/host interface, Serial, Asynchronous mode
 Hardware and software flow control and speed buffering
 Type I and Type II Caller ID detect *
 Call progress,blacklisting
 Integrated DAA, Globally compliant line interface, Extension pickup detection, Digital Line protection, Line –in-Use detection
 3V3 or 5V power supply
 Low power consumption TBD
 Based on Silicon Labs Isomodem solution
 Small Size 64.5 x 26.5 mm
 Reliable SMD based design
 SIA protocol support*

* model depending, see feature table

2.3.....Pins signals and functions:

Pin	Name	Function	Dir
1	Tip	Telephone Line Tip	-
2	Ring	Telephone Line Ring	-
24	/Reset	Reset Active low input	In
25	NC	Not Connected	-
26	GND	Signal Ground	-
33	/RTS	Request to send	In
34	/RXD	Receive Data	Out
35	/TXD	Transmit Data	In
36	/RI	Ring Indicator	Out
37	/INT	Interrupt	Out
38	/CTS	Clear To Send	Out
39	/DCD	Data Carrier Detect	Out
40	/DTR	Data Terminal ready	In
41	GND	Signal ground	-
61	VCC	Vcc Power Supply	In
62	NC	Not Connected	-
63	GND	Signal ground	-
64	AOUT	AOUT Analog Output	Out

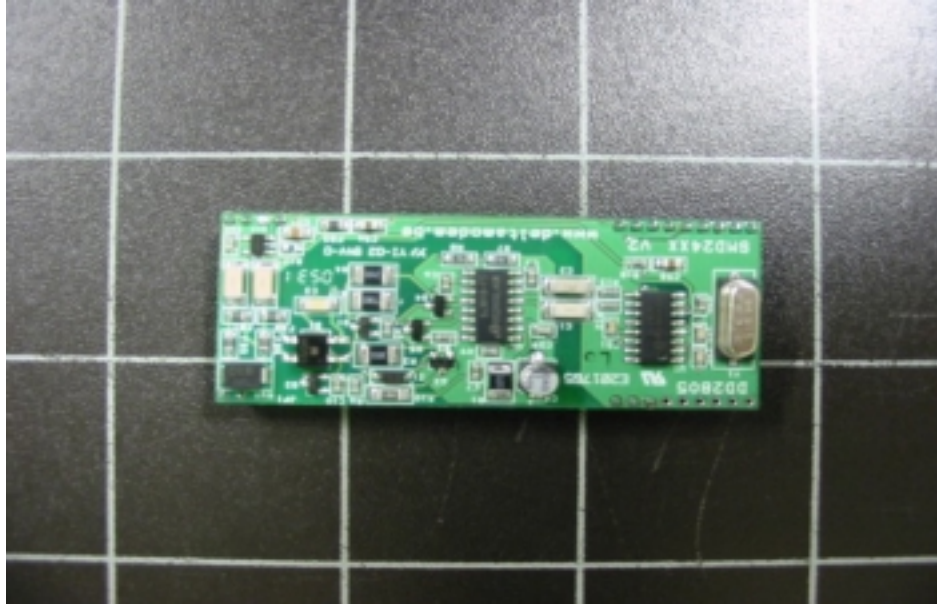


2.4.....Features Table:

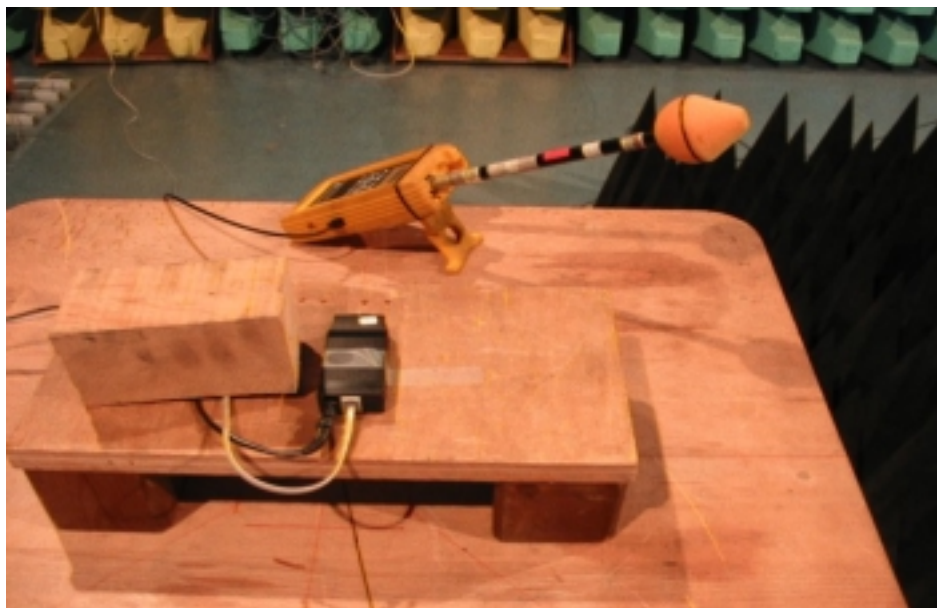
Feature	SMD2401L	SMD2404L	SMD2415L	SMD2434L	SMD2457L	SMD2493L
Max Speed(bps) TX/RX	2400/2400	2400/2400	14400/14400	33600/33600	33600/56000	48000/56000
V.44						X
V.42b MNP5		X	X	X	X	X
V.42 MNP2-4		X	X	X	X	X
Call Waiting detection		X	X	X	X	X
Fast Connect V.22b	X	X	X	X	X	X
Fast Connect V.29		X	X	X	X	X
CID type I	X	X	X	X	X	X
CID type II		X	X	X	X	X
SIA support	X	N	N	N	N	N

2.3.....Presentation of the EUT during the test

General view of the equipment



View during the radiated field immunity test



View during the radiated field from GSM (Bd2) immunity test



View during the radiated emission measurement



3. Radiated, Radio-Frequency, Electromagnetic Field Immunity Test

3.1. Standards and prescriptions:



The test has been performed according to the standard EN 61000-4-3 (2002) with the requested levels of of the EN 55024 (1998).

3.2. Test Equipments:

Equipments	Manufacturers	Models
Anechoic room	Emerson & Cuming	(L x W x H): (9,40 x 6,40 x 6) m ³ .
Generator	Rohde & Schwarz	SMY (9 kHz - 2.08 GHz).
Amplifier	Amplifier Research	250W1000M3 (80MHz - 1 GHz)
Antenna	Schwarzbeck	VULP 9118 (60 MHz – 1000 MHz)
Power meter	Rohde & Schwarz	NRVD
Insertion unit	Rohde & Schwarz	URV5-Z2 / 10 V
Controller	Deisel	HD100
Mast	Deisel	MA240
Turntable	Deisel	DT420
Field probe	Wandel & Goltermann	WG20
Computer	Fujitsu - Siemens	PC with software EMS-K1

3.3. Characteristics:

Field strength: 3 V/m (unmodulated carrier wave),
 Frequency sweep: 80 MHz – 1000 MHz,
 1,4 GHz - 2 GHz,
 Modulation: AM 80 % at 1 kHz,
 Frequency step: 1 %,
 Dwell time: 3 s,
 Polarisation of the antenna: Horizontal and Vertical,
 Test distance: 3 m between antenna and EUT.

Frequency ranges:  from 890 to 960 MHz ± 5 MHz,
 from 1700 to 2000 MHz ± 5 MHz,
 Field strength: 3 V/m (unmodulated carrier wave),
 Modulation: 100 % at 200 Hz (± 1 %),
 Frequency step: 1 %,
 Dwell time: 3 s,
 Polarisation of the antenna: Horizontal and Vertical,
 Test distance: 3 m between antenna and EUT.

3.4. Working conditions of the EUT:

SMD24XXL working and in communication and establishing communication modes.

3.5. Reactions of the EUT:

During and after the tests no changes occur in the functional aspects of the SMD24XXL.

4. Electrical Fast Transient/Burst Immunity Test

4.1. Standards and prescriptions:

The test has been performed according to EN 61000-4-4 (1995) with the required levels of the EN 55024 (1998).

4.2. Test Equipments:

Equipments	Manufacturers	Model
Transients generator	Rhode & Schwarz	VCS-500
Oscilloscope	Lecroy Ltd	9360
PC	Omega	software EM-TEST

4.3. Characteristics:

Voltage levels: 0,5 kV \pm 10%, on I/O.
Polarity: positive and negative.
Burst duration: 15 ms \pm 3 ms.
Repetition frequency: 5 kHz \pm 20 %.
Period: 300 ms \pm 60 ms.
Pulse: Rise time: 5 ns \pm 1,5 ns.
Time to half value: 50 ns \pm 15 ns.
Duration of the test: 60 seconds.

4.4. Working conditions of the EUT:

SMD24XXL working and in communication and establishing communication modes.

Tested inputs: PSTN connection.

4.5. Reactions of the EUT:

During and after the tests no changes occur in the functional aspects of the SMD24XXL.

5. Surge Immunity Test

5.1. Standards and prescriptions:

The test has been performed according to EN 61000-4-5 (1995) with the required levels of the EN 55024 (1998).

5.2. Test Equipments:

Equipments	Manufacturers	Model
Surge generator	Rhode & Schwarz	VCS-500
Oscilloscope	Lecroy Ltd	9360
PC	Omega	software EM-TEST

5.3. Characteristics:

Differential Mode:
Output voltage: 0,5 kV \pm 10% & 1 kV \pm 10%.
Polarity: Positive and negative,
Rise time of the pulse (V): 1,2 μ s \pm 0,36 μ s,
Duration time (V): 50 μ s \pm 10 μ s,
Rise time of the pulse (A): 8 μ s \pm 2,4 μ s,
Duration time (A): 20 μ s \pm 4 μ s,
Number of pulses: 5 for each polarity and each voltage,
Time between two pulses: 10 s.

5.4. Working conditions of the EUT:

SMD24XXL working and in communication and establishing communication modes.

Tested inputs: PSTN connection.

5.5. Reactions of the EUT:

During and after the tests no changes occur in the functional aspects of the SMD24XXL.

6. Conducted, Radio-Frequency, Electromagnetic Field Immunity Test

6.1. Standards and prescriptions:

The test has been performed according to EN 61000-4-6 (1996) with the required levels of the EN 55024 (1998).

6.2. Test Equipments:

Equipments	Manufacturers	Model
Anechoic room	Emerson & Cuming	(L x W x H): (9,40 x 6,40 x 6) m ³ .
Generator	Rohde & Schwarz	SMY (9 kHz - 2.08 GHz).
Amplifier	Amplifier Research	25A250A (25 W, 10kHz - 250 MHz)
CDN	Lütthi Elektronik	EM 101
CDN	Lütthi Elektronik	FTC 101
Power meter	Rohde & Schwarz	NRVD
Insertion unit	Rohde & Schwarz	URV5-Z2 / 10 V
Attenuator	Narda	6 dB / 150 W
Computer	Fujitsu - Siemens	PC with software EMS-K1

6.3. Characteristics:

U: 3 V (unmodulated carrier wave).
 Frequency sweep: 0,15 MHz – 80 MHz.
 AM-Modulation: 80 % at 1 kHz.
 Frequency step: 1,5 x 10 E-3 decades/s.
 Dwell time: 3 s.

*U: 10 V (unmodulated carrier wave).
 Frequency sweep: 0,15 MHz – 1,8 MHz.
 AM-Modulation: 80 % at 1 kHz.
 Frequency step: 1,5 x 10 E-3 decades/s.
 Dwell time: 3 s.*

6.4. Working conditions of the EUT:

SMD24XXL working and in communication and establishing communication modes.

Tested inputs: PSTN connection.

6.5. Reactions of the EUT:

During and after the tests no changes occur in the functional aspects of the SMD24XXL.

7. Power Frequency Magnetic Field Immunity Test

7.1. Standards and prescriptions:

The test has been performed according to EN 61000-4-8 (1995) with the required levels of the EN 55024 (1998).

7.2. Test Equipments:

Equipments	Manufacturers	Models
Measuring and testrack	Spitzenberger & Spies	EMV5000/PAS
4-Quadrants Amplifier	Spitzenberger & Spies	PAS 5000
Current transformer	Spitzenberger & Spies	UT1200/C
Induction coil	Spitzenberger & Spies	Dimensions: 1 m ³ , Coil Factor: 4,812 m ⁻¹ , Conductors section: 7 mm
Measuring rack	Spitzenberger & Spies	ANPI
Computer	Omega	Software Spitzenberger & Spies

7.3. Characteristics:

Magnetic field strength: 3 A/m,
Frequency: 50 Hz,
Axes: X, Y, Z,
Exposure time: 1 min / axis.

7.4. Working conditions of the EUT:

SMD24XXL working and in communication and establishing communication modes.

7.5. Reactions of the EUT:

During and after the tests no changes occur in the functional aspects of the SMD24XXL.

8. Measurement of Radiated Radio-Frequency Disturbances

8.1. Standards and Prescriptions:

The test has been performed according to EN 55022 (1994) + A1 (1995) + A2 (1997).

8.2. Test Equipments:

Equipments	Manufacturers	Models
Anechoic room	Emerson & Cuming	(L x W x H): (9,40 x 6,40 x 6) m ³
Spectrum Analyzer	Rohde & Schwarz	ESPI03
EMI Receiver	Rohde & Schwarz	ESVS10
EMI Receiver	Rohde & Schwarz	ESHS10
Controller	Deisel	HD100
Antenna	Chase	BILOG CBL 6111 (20 MHz - 1000 MHz)
Mast	Deisel	MA240
Turntable	Deisel	DT420
LISN	Rohde & Schwarz	ESH2-Z5
Power meter	Rohde & Schwarz	NRVD
Computer	Fujitsu-Siemens	PC with software ES-K1

8.3. Operating conditions of the EUT:

SMD24XXL working and in communication and establishing communication modes.

8.4. Measurement Results of the Radiated Emission (30 MHz → 1000 MHz):

<p>Results of the final analysis with Quasi-peak detector (Results of the most critical points)</p>
<p>No Final analysis because all measured points are 10 dBμV/m lower than the limit.</p>

See page 17 for the graphical presentation of the test results of **the horizontal polarisation with EN 55022 Class B QP Limits**.

See page 18 for the graphical presentation of the test results of **the vertical polarisation with EN 55022 Class B QP Limits**.

See page 19 for the graphical presentation of the test results of **the horizontal polarisation with FCC Rules 15 subpart J Class B (as required by the manufacturer)**.

See page 20 for the graphical presentation of the test results of **the vertical polarisation with FCC Rules 15 subpart J Class B (as required by the manufacturer)**.

9. Summary of the Test Results

9.1. Performance criteria and classification of the Immunity Tests:

Before, during and after the tests the EUT's has been observed and its reaction corresponds to one of the following performance criteria: A, B or C.

Performance criterion A:

The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and from what the user may reasonably expect from the apparatus if used as intended.

Performance criterion B:

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and from what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C:

Temporary loss of function is allowed, provided the loss of function is self recoverable or can be restored by the operation of the controls.

EUT: SMD24XXL		
Standards	Performance criterion of EUT	Minimum required performance criterion Immunity
EN 61000-4-3 (2002)	A	A
EN 61000-4-4 (1995)	A	B
EN 61000-4-5 (1995)	A	B
EN 61000-4-6 (1996)	A	A
EN 61000-4-8 (1995)	A	A

9.2. Performance criteria and classification of the Emission Tests:

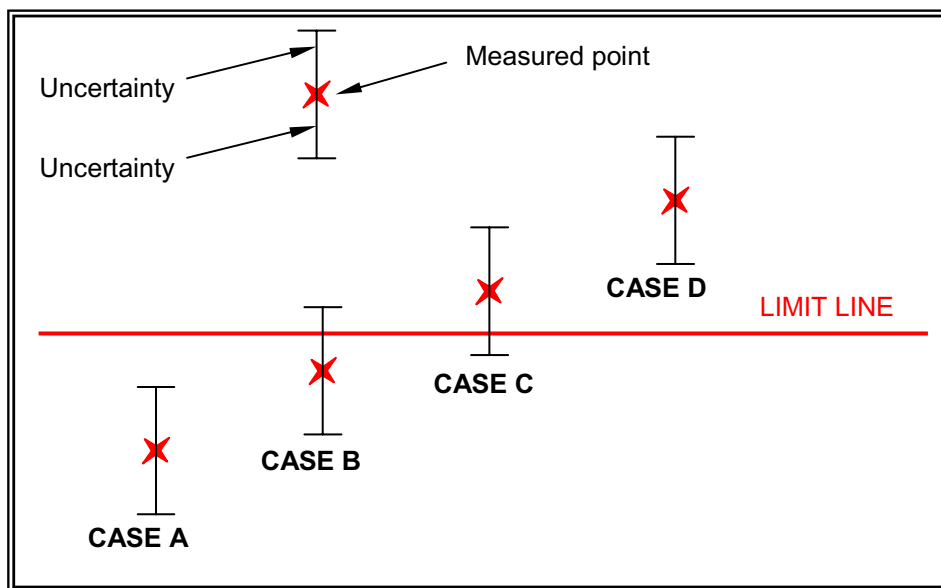
9.2.1. Test results according to EN 55022 (1994) + A1 (1995) + A2 (1997).

9.2.2. The treatment of uncertainty in EMC measurements

For the measurement of the radiated emission levels according to EN 55022 the document NIS 81 (1994-05-01) of NAMAS is used to evaluate the uncertainty of the test Results.

The Uncertainty value in radiated emission measurements = 5,1 dB.

This document describes 4 cases:



- CASE A:** The measurements are less than the limits specified in the standard minus the uncertainty value.
The product tested complies with the requirements.
- CASE B:** The measurements results are below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at a level of confidence of 95 %.
However, the measured results indicate a high probability that the product tested complies with the specification limits.
- CASE C:** The measurements results are above the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine non-compliance at a level of confidence of 95 %.
However, the measured results indicate a high probability that the product tested does not comply with the specification limits.
- CASE D:** The measurements are higher than the limits in the standard added with the uncertainty value.
The product tested does not comply with the requirements.

9.2.3. Results of the Emission Tests.

Classification of the Test Results according to EN 55022 (1994) + Amdts.		
Standard	EUT	Measurements are within the limits of the standard (Yes/No/Remarks)
EN 55022 (1994) + amendments	<i>SMD24XXL</i>	<i>Yes – See remark 1</i>

Results of the measurements of the emissions of the EUT

Remark 1: For the measurements of the radiated emission (30 MHz → 1000 MHz) of the EUT:

- for the Horizontal polarisation **CASE A** applies.
- for the Vertical polarisation: **CASE A** applies.

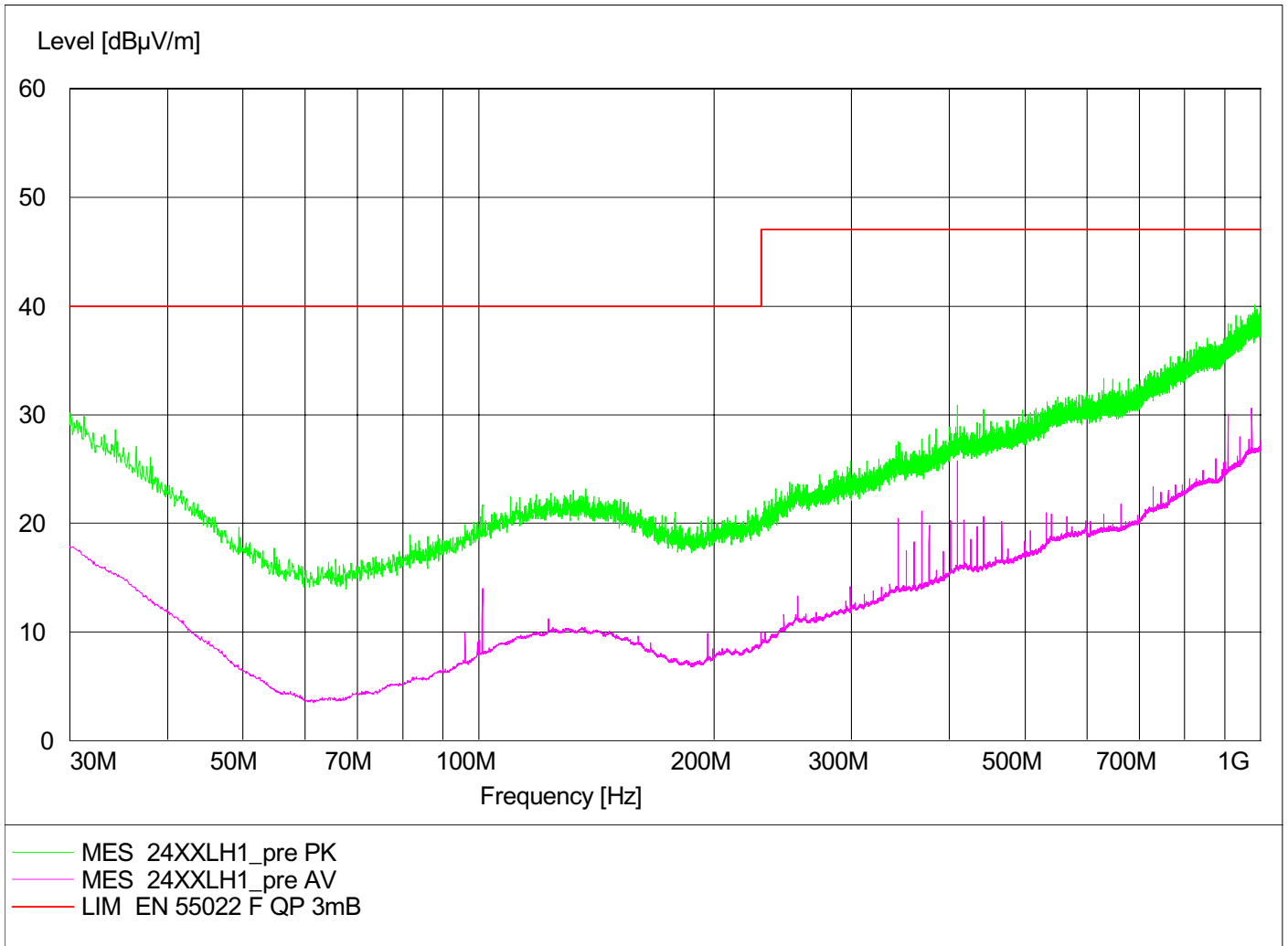
10. Laboratory Opinion

The tested equipment meet all the requirements of the requested tests (and also complies with the emission level of the FCC Rules 15 subpart J Class B).

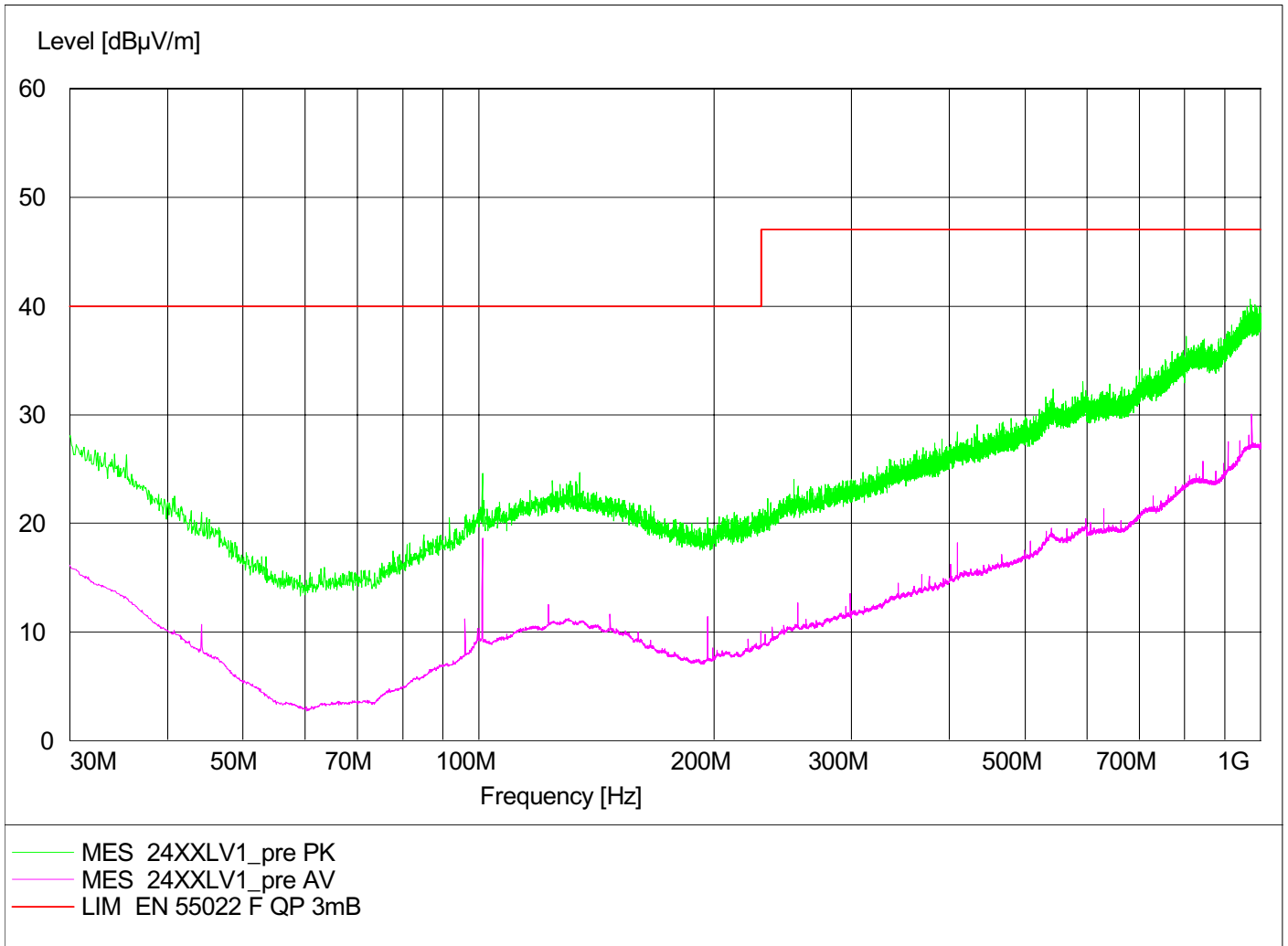
11. Graphical representations of the emissions measurements

- 11.1. Results of the Radiated emission of EUT in horizontal polarisation between 30 MHz and 1 GHz, with EN 55022 Class B limit.
- 11.2. Results of the Radiated emission of EUT in vertical polarisation between 30 MHz and 1 GHz with EN 5502 Class B limit.
- 11.3. Results of the Radiated emission of EUT in horizontal polarisation between 30 MHz and 1 GHz, with FCC Rules 15 subpart J Class B.
- 11.4. Results of the Radiated emission of EUT in vertical polarisation between 30 MHz and 1 GHz with FCC Rules 15 subpart J Class B.

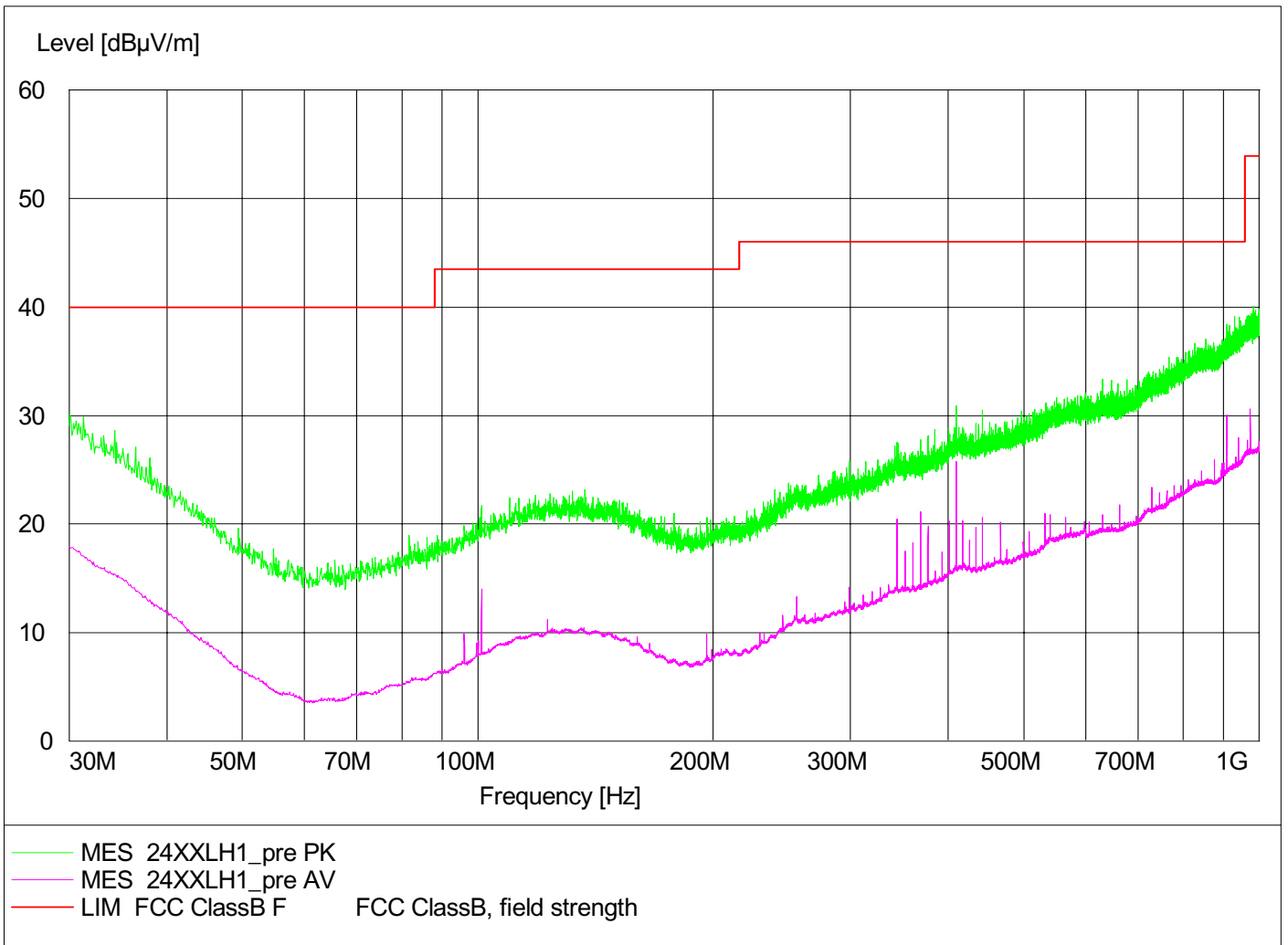
11.1.....Radiated Emission - Horizontal Polarisation - Limit EN 55022 Class B:



11.2.....Radiated Emission - Vertical Polarisation - Limit EN 5502 Class B:



11.3. Radiated Emission - Horizontal Polarisation - Limit FCC Rules 15 subpart J Class B:



11.4.....Radiated Emission - Vertical Polarisation - Limit FCC Rules 15 subpart J Class B:

