FCC Test Report

FOR:

Model Name: 40318
Two-piece offender tracking device containing a low power, high sensitivity GPS reciever and a wireless U-Blox LEON G200 GSM/GPRS modem.

FCC ID: NC3XT40318

47 CFR Part 15.231

TEST REPORT #: EMC_PROTC_004_11001_FCC15.231_Rev1
DATE: 2011-04-25

Bluetooth Qualification Test Facility (BQTF)

FCC listed
A2LA Accredited

IC recognized # 3462B

***CETECOM* Inc.**
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Board of Directors: Dr. Harald Ansorge, Hans Peter May

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1 Assessment

The following device was tested against the applicable criteria specified in FCC rules Parts 15.231 of Title 47 of the Code of Federal Regulations.
No deviations were ascertained during the course of the tests performed.

Company	Description	Model #
Pro Tech Monitoring, LLC	Two-piece offender tracking device which contains a low power, high sensitivity GPS reciever and a wireless U-Blox LEON G200 GSM/GPRS modem with the FCC ID: XPYLEONG100	40318

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2011-04-25	Compliance	Sajay Jose (Test Lab Manager)	Sajay Jose 2011.04.25 15:33:36 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2011-04-25	Compliance	Christopher Torio (EMC Test Engineer)	Christopher Torio 2011.04.26 09:17:47 -07'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Test Lab Director:	Heiko Strehlow
Responsible Project Leader:	David Ahn

2.2 Identification of the Client

Applicant's Name:	Pro Tech Monitoring, Inc.
Street Address:	1838 Gunn Highway
City/Zip Code	Odessa, FL 33556
Country	USA
Contact Person:	Chris Defant
Phone No.	727-481-1133
Fax:	813-479-5474
e-mail:	cdefant@ptm.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Partner Manufacturing
Manufacturers Address:	6 Efal
City/Zip Code	Petach-Tikva, 49511
Country	Israel

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name / Model No:	Smart XT / 40318
HW / SW Revision :	4.0; Leon-100: GB1.HW.HR.100AA1 5.1.4.0; Leon-100; GB01. SW.SR.G100_07.50.00
FCC-ID:	NC3XT40318
Product Description:	Two-piece offender tracking device which contains a low power, high sensitivity GPS reciever and a wireless U-Blox LEON G100 GSM/GPRS modem with the FCC ID: XPYLEONG100
Frequency Range / number of channels:	GSM 850: 824.2-848.8MHz / 125; PCS 1900: 1850.2-1909.8MHz / 300; UHF Transmitter: 318MHz / 1
Type(s) of Modulation:	2G: GMSK
Modes of Operation:	GSM/GPRS MS Class 10, GPRS Capability Class B
Antenna Type / gain / position / min. distance to other antenna (if appl):	GSM: PCB/-3dBi
Output Powers:	GSM850 GMSK Conducted: 32.8dBm; GSM850 GMSK Radiated: 33.4dBm GSM1900 GMSK Conducted: 30.6dBm GSM1900 GMSK Radiated: 32.8dBm *conducted values are from module test reports*
power supply	AA lithium battery pack (dedicated), 3.3V DC;
operating temperature range	0ºC to 50ºC
Prototype / Production unit	Prototype

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	HW Version	SW Version	Cetecom ID
1	35000068	4.0; Leon-100: GB1.HW.HR.100AA1	5.1.4.0; LEON-100; GB01. SW.SR.G100_07.50.00	C010401

3.1 Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Cetecom ID
1	AC Adapter	MLF	70067	C010302

4 Subject of Investigation

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in FCC rules Part 15.231 of Title 47 of the Code of Federal Regulations.

This test report is to support a request for new equipment authorization under the FCC ID: **NC3XT40318.**

All testing was performed on the product referred to in Section 3 as EUT.
This test report contains full radiated and conducted testing results as per

- 47 CFR Part 15: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter A- General, Part 15- Radio Frequency Devices.

During the testing process the EUT was set on continuous transmit mode using a test SW provided by the manufacturer. The following settings were used-
Transmit mode: Continuous

All radiated data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

5 Summary of Measurement Results

Test Specification	Test Case	Temperature and Voltage Conditions	Pass	Fail	NA	NP	Result
§15.231 (e)	Transmitter Fundamental Field Strength	Nominal	■	☐	☐	☐	Complies
§15.231 (c)	Transmitter 20dB bandwidth	Nominal	■	☐	☐	☐	Complies
§15.231 (a)	Transmitter Timeout	Nominal	■	☐	☐	☐	Complies
§15.35 (c)	Transmitter Duty Cycle	Nominal	■	☐	☐	☐	Complies
§15.231 (e) §15.209	Transmitter Radiated Emissions	Nominal	■	☐	☐	☐	Complies
§15.109	RX Spurious Emissions Radiated	Nominal	■	☐	☐	☐	Complies
§15.207	TX Conducted Emissions <30MHz	Nominal	■	☐	☐	☐	Complies
§15.107(a)	RX Conducted Emissions <30MHz	Nominal	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.

6 Measurements

6.1 Radiated Measurement Procedure

ANSI C63.4: 2009 Section 8.3.1.1: Exploratory radiated emission measurements

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT. At near distances, for EUTs of comparably small size, it is relatively easy to determine the spectrum signature of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. A shielded room may be used for exploratory testing, but may have anomalies that can lead to significant errors in amplitude measurements.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of testing. It is recommended that either a headset or loudspeaker be connected as an aid in detecting ambient signals and finding frequencies of significant emission from the EUT when the exploratory and final testing is performed in an OATS with strong ambient signals. Caution should be taken if either antenna height between 1 and 4 meters or EUT azimuth is not fully explored. Not fully exploring these parameters during exploratory testing may require complete testing at the OATS or semi-anechoic chamber when the final full spectrum testing is conducted.

The EUT should be set up in its typical configuration and arrangement, and operated in its various modes. For tabletop systems, cables or wires should be manipulated within the range of likely arrangements. For floor-standing equipment, the cables or wires should be located in the same manner as the user would install them and no further manipulation is made. For combination EUTs, the tabletop and floor-standing portions of the EUT shall follow the procedures for their respective setups and cable manipulation. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions.

For each mode of operation required to be tested, the frequency spectrum shall be monitored. Variations in antenna height between 1 and 4 m, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) shall be explored to produce the emission that has the highest amplitude relative to the limit. A step-by-step technique for determining this emission can be found in Annex C.

When measuring emissions above 1 GHz, the frequencies of maximum emission shall be determined by manually positioning the antenna close to the EUT and by moving the antenna over all sides of the EUT while observing a spectral display. It will be advantageous to have prior knowledge of the frequencies of emissions above 1 GHz. If the EUT is a device with dimensions approximately equal to that of the measurement antenna beamwidth, the measurement antenna shall be aligned with the EUT.

ANSI C63.4: 2009 Section 8.3.1.2: Final radiated emission measurements

Based on the measurement results in 8.3.1.1, the one EUT, cable and wire arrangement, and mode of operation that produces the emission that has the highest amplitude relative to the limit is selected for the final measurement. The final measurement is then performed on a site meeting the requirements of 5.3, 5.4, or 5.5 as appropriate without variation of the EUT arrangement or EUT mode of operation. If the EUT is relocated from an exploratory test site to a final test site, the highest emission shall be remaximized at the final test location before final radiated emissions measurements are performed. However, antenna height and polarity and EUT azimuth are to be varied. In addition, the full frequency spectrum (for the range to be checked for meeting compliance) shall be investigated.

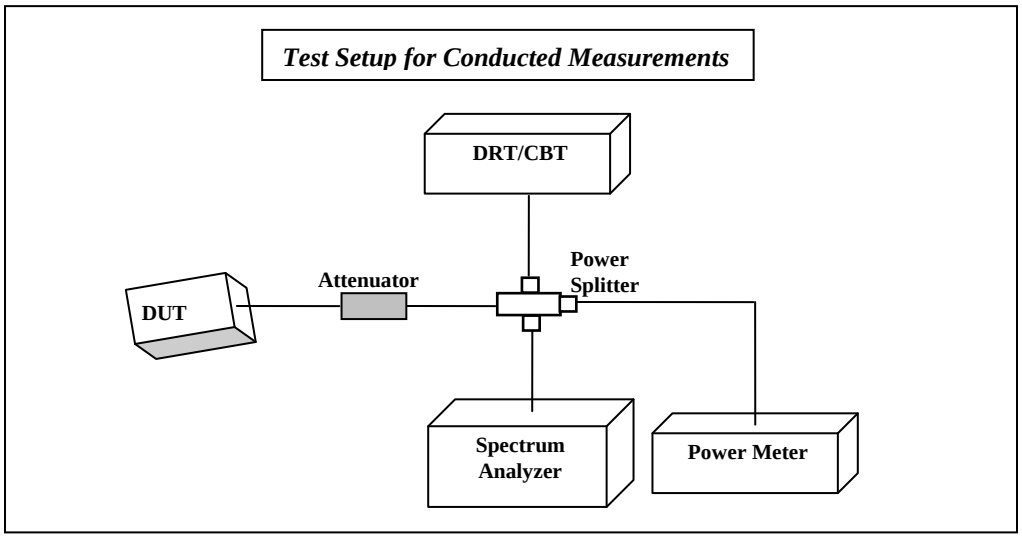
This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. During the full frequency spectrum investigation, particular focus should be made on those frequencies found in exploratory testing that were used to find the final test configuration, mode of operation, and arrangement (associated with achieving the least margin with respect to the limit). This full spectrum test constitutes the compliance measurement.

For measurements above 1 GHz, use the cable, EUT arrangement, and mode of operation determined in the exploratory testing to produce the emission that has the highest amplitude relative to the limit. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the antenna in the “cone of radiation” from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response. The antenna may have to be higher or lower than the EUT, depending on the EUT’s size and mounting height, but the antenna should be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. If the transmission line for the measurement antenna restricts its range of height and polarization, the steps needed to ensure the correct measurement of the maximum emissions, shall be described in detail in the report of measurements. Data collected shall satisfy the report requirements of Clause 10.

NOTES

1— Where limits are specified by agencies for both average and peak (or quasi-peak) detection, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.
2—Use of waveguide and flexible waveguide may be necessary at frequencies above 10 GHz to achieve usable signal-to noise ratios at required measurement distances. If so, it may be necessary to restrict the height search of the antenna, and special care should be taken to ensure that maximum emissions are correctly measured.
3—All presently known devices causing emissions above 10 GHz are physically small compared with the beam-widths of typical horn antennas used for EMC measurements. For such EUTs and frequencies, it may be preferable to vary the height and polarization of the EUT instead of the receiving antenna to maximize the measured emissions.

6.2 Conducted Measurement Procedure



1. Connect the equipment as shown in the above diagram.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to connect the EUT at the required channel.
   Alternatively, the EUT can be programmed using test utility provided by the manufacturer to set the required channel.
3. Measurements are to be performed with the EUT set to the required transmit channel.

6.3 Transmitter Fundamental Field Strength

6.3.1 Limits:

6.3.1.1 §15.231 (e)

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66–40.70	1,000	100
70–130	500	50
130–174	500 to 1,500[1]	50 to 150[1]
174–260	1,500	150
260–470	1,500 to 5,000[1]	150 to 500[1]
Above 470	5,000	500

6.3.2 Test Conditions:

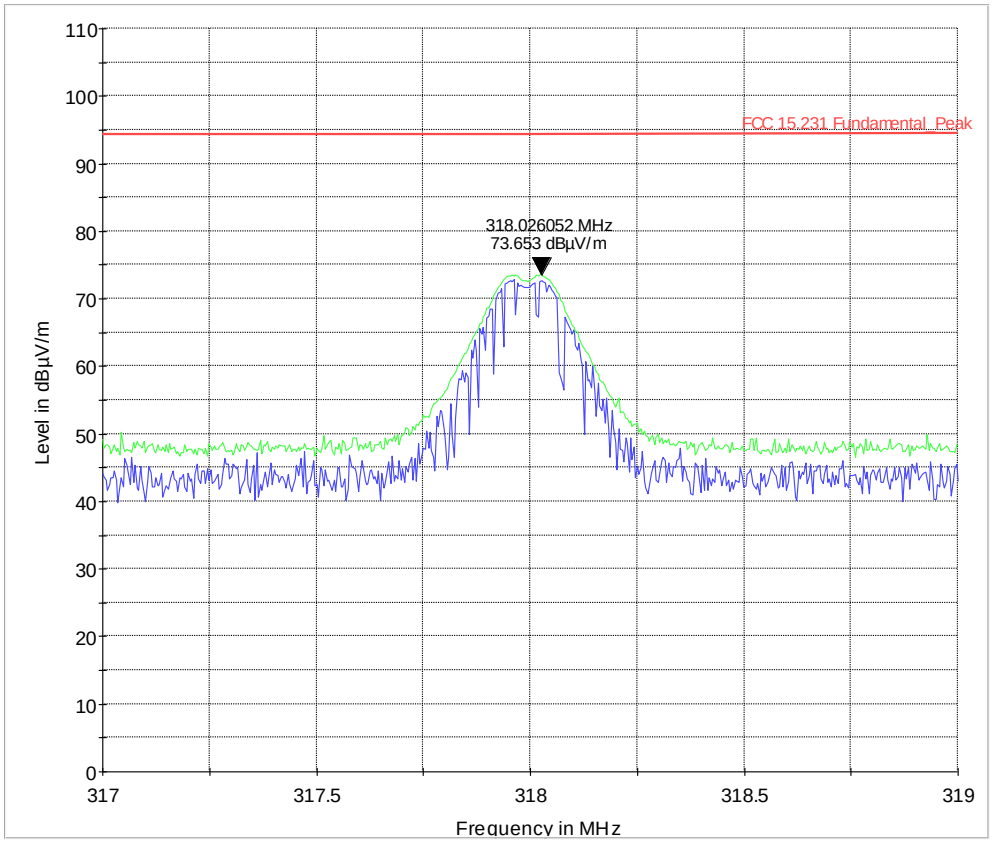
Tnom: 25°C; Vnom

Spectrum Analyzer settings:

RBW=120 kHz; VBW=300 kHz; Detector: Peak; Sweep Time: Auto; Span=2MHz

Maximized result for all orientations of the EUT and H/V measurement antenna polarizations shown here.

6.3.3 Test Data:



Fundamental peak signal strength = 73.65 dBµV/m
Average level= Fundamental Peak- Duty Cycle= 73.65-24.9= 48.67 dBµV/m

6.3.3.1 Measurement Result

Pass.

6.4 Transmitter 20dB Bandwidth

6.4.1 Limits:

6.4.1.1 §15.231 (c)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

For 318MHz transmitter, 20dB bandwidth < 795 kHz

6.4.2 Test Conditions:

Tnom: 25°C; Vnom

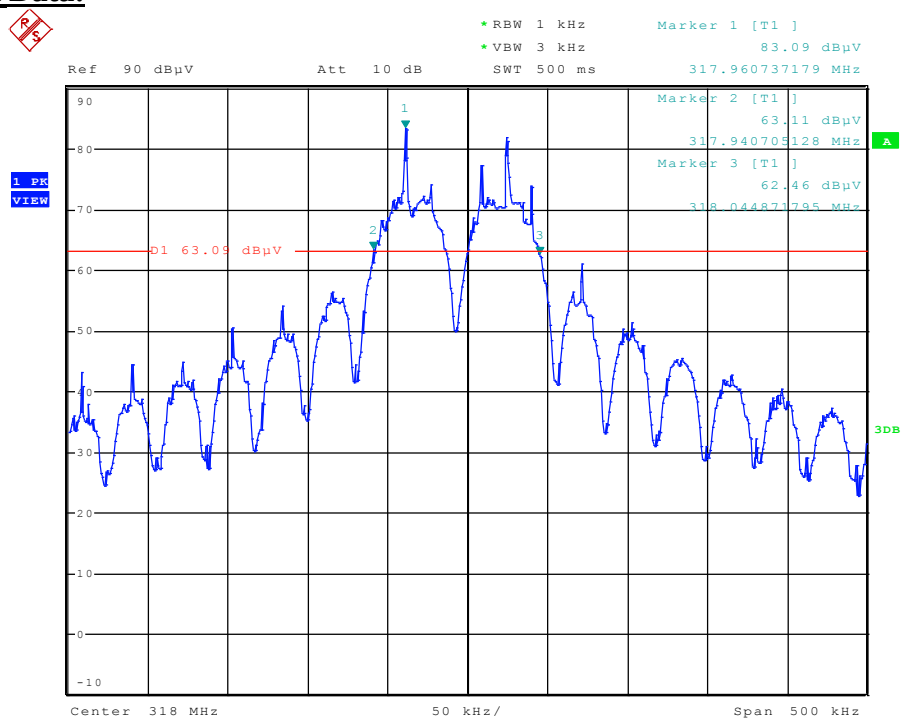
Spectrum Analyzer settings:

RBW=1kHz, VBW=3kHz, Detector: Peak- Max hold;

Sweep Time: Auto

Span=500 kHz

6.4.3 Test Data:



20dB Bandwidth= 105.0 kHz

6.4.3.1 Measurement Result

Pass.

6.5 Transmitter Timeout

6.5.1 Limits:

6.5.1.1 §15.231 (a)

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

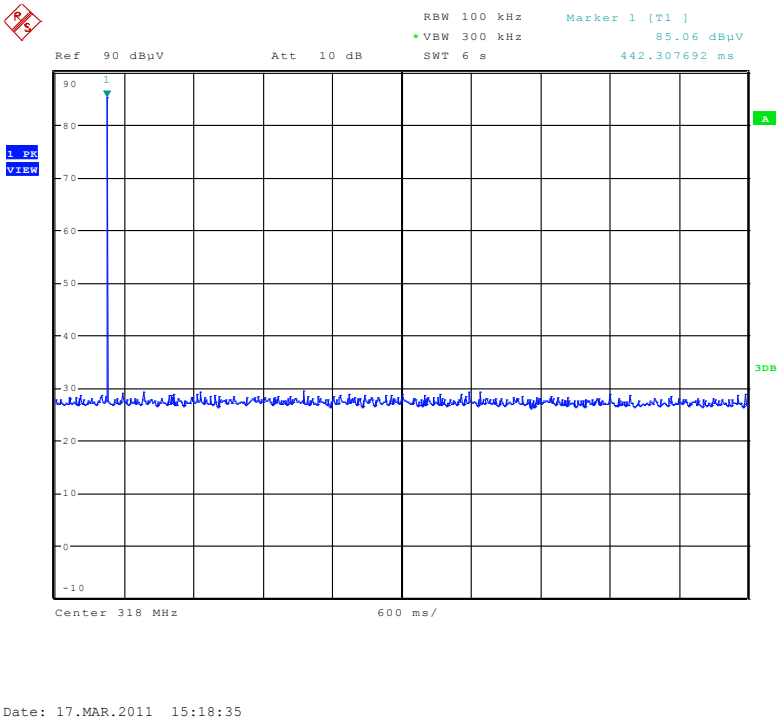
(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

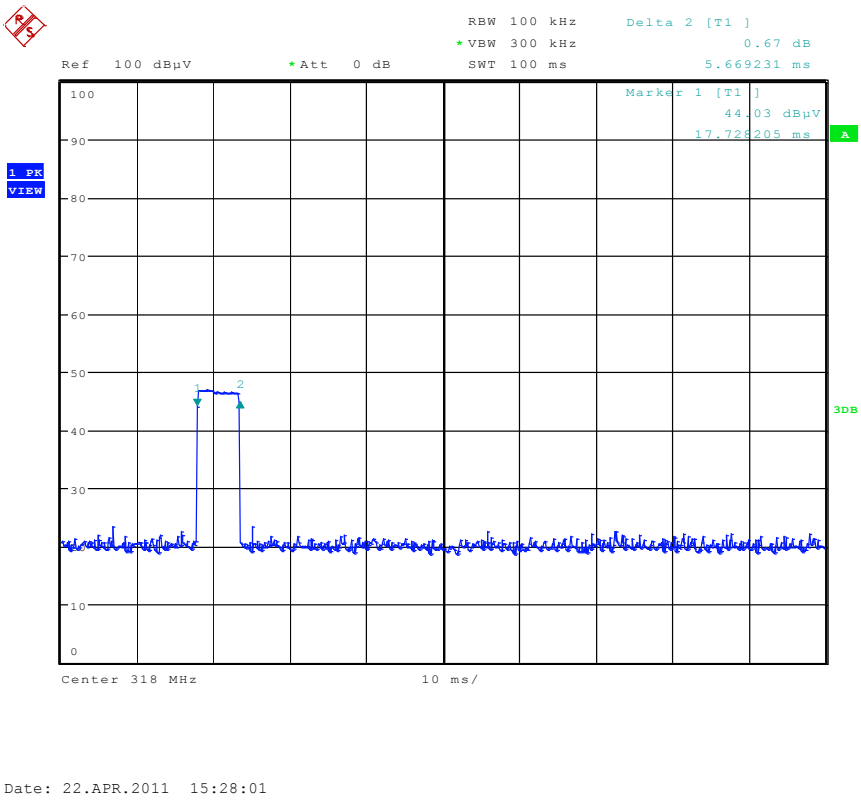
6.5.2 Test Conditions:

Tnom: 25°C; Vnom

Spectrum Analyzer settings:
RBW=100 kHz, VBW=300 kHz, Detector: Peak- Max hold;
Sweep Time: 6s
Span=Zero

6.5.3 Test Data:





6.5.3.1 Measurement Result

EUT transmission monitored on the spectrum analyzer for 6 secs. Transmission stopped within 5 secs after activation.

The manufacturer declaration of conformance to the operation of this transmitter also affirms to the above requirement under normal operation.

6.6 Transmitter Duty Cycle

This is a reference measurement only.

6.6.1 Reference:

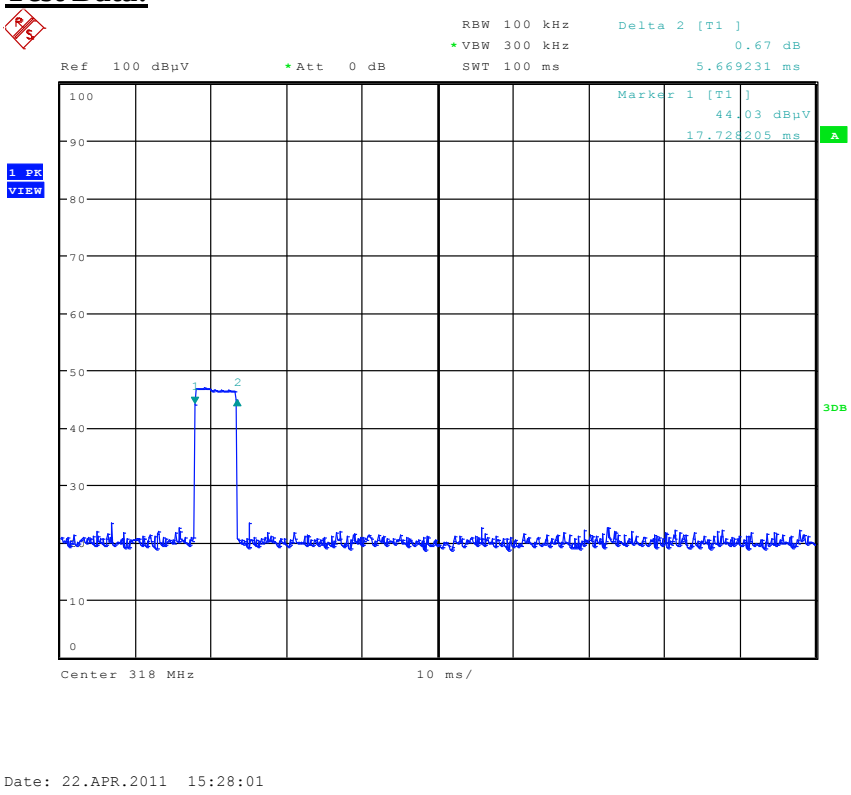
6.6.1.1 §15.35 (c)

6.6.2 Test Conditions:

Tnom: 25°C; Vnom

Spectrum Analyzer settings:
RBW=100 kHz, VBW=100 kHz, Detector: Peak- Max hold;
Sweep Time: 100 ms
Span=Zero

6.6.3 Test Data:



6.6.3.1 Measurement Result
Pulse duration= 5.67 ms
Duty Cycle= 20 Log(Pulse Duration (ms)/ 100 ms)= -24.9 dB

6.7 Transmitter Spurious Emissions- Radiated

6.7.1 References:

FCC CFR 2.1053
FCC CFR 15.231 (e) and 15.209

6.7.2 Measurement requirements:

6.7.2.1 FCC 2.1053: Field strength of spurious radiation.

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission.

6.7.3 Limits:

§15.231 (e)

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66–40.70	1,000	100
70–130	500	50
130–174	500 to 1,500[1]	50 to 150[1]
174–260	1,500	150
260–470	1,500 to 5,000[1]	150 to 500[1]
Above 470	5,000	500

6.7.4 Measurement Settings:

Peak detector used for the measurements- with RBW=120KHz for measurements below 1GHz and RBW= 1MHz for measurements above 1GHz.
Testing performed up to 10x Transmit frequency.

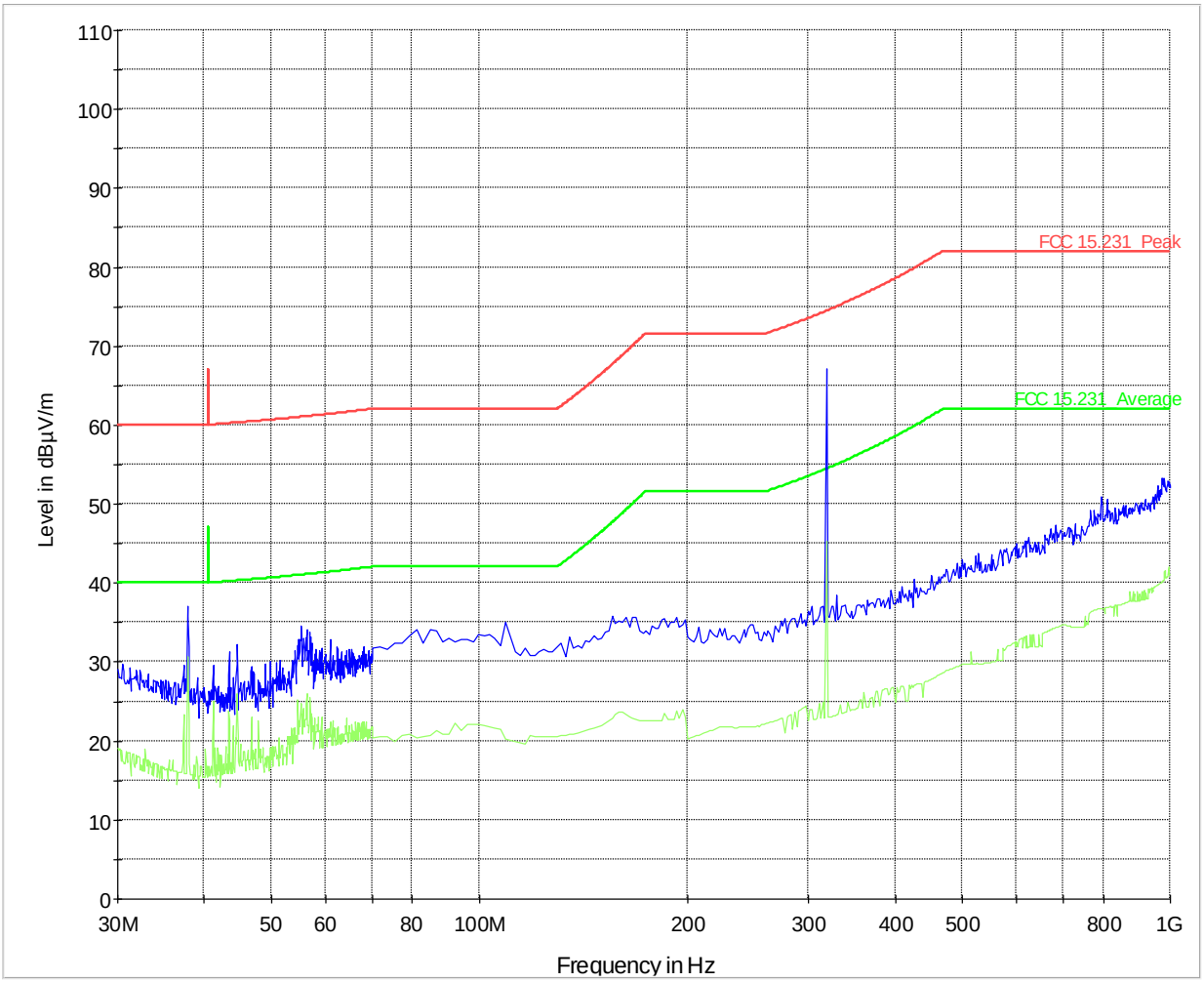
Average measurements in the plots are for reference only- at 20dB below the peak readings.

6.7.4.1 Measurement Result

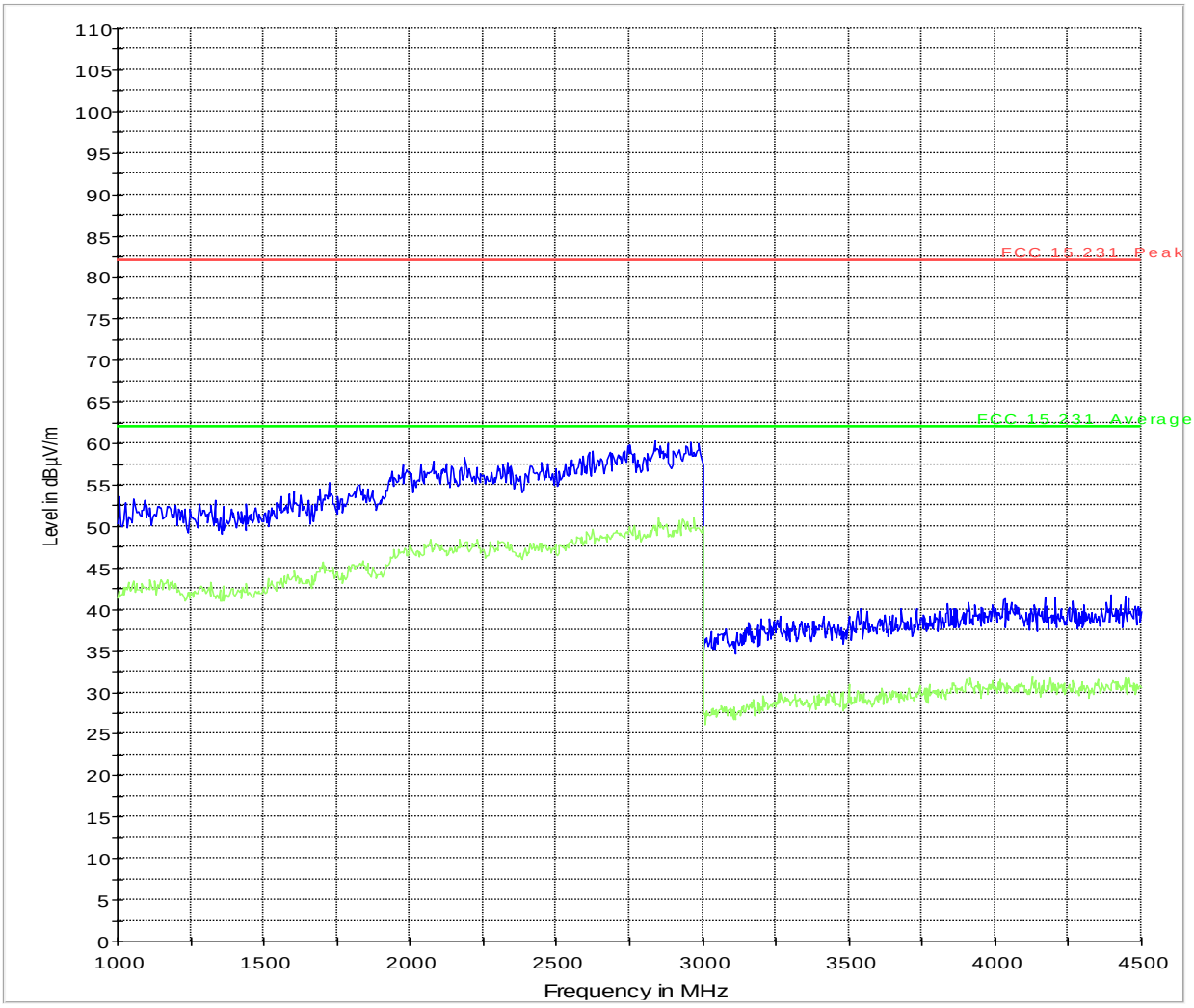
Pass.

6.7.5 Test data/ plots:

Radiated spurious emissions: 30M-1GHz



Radiated spurious emissions: >1GHz



6.8 Receiver Spurious Emissions- Radiated

6.8.1 Limits:

6.8.1.1 FCC CFR §15.109

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 (40dBµV/m)	3
88–216	150 (43.5 dBµV/m)	3
216–960	200 (46 dBµV/m)	3
Above 960	500 (54 dBµV/m)	3

6.8.2 Test Result:

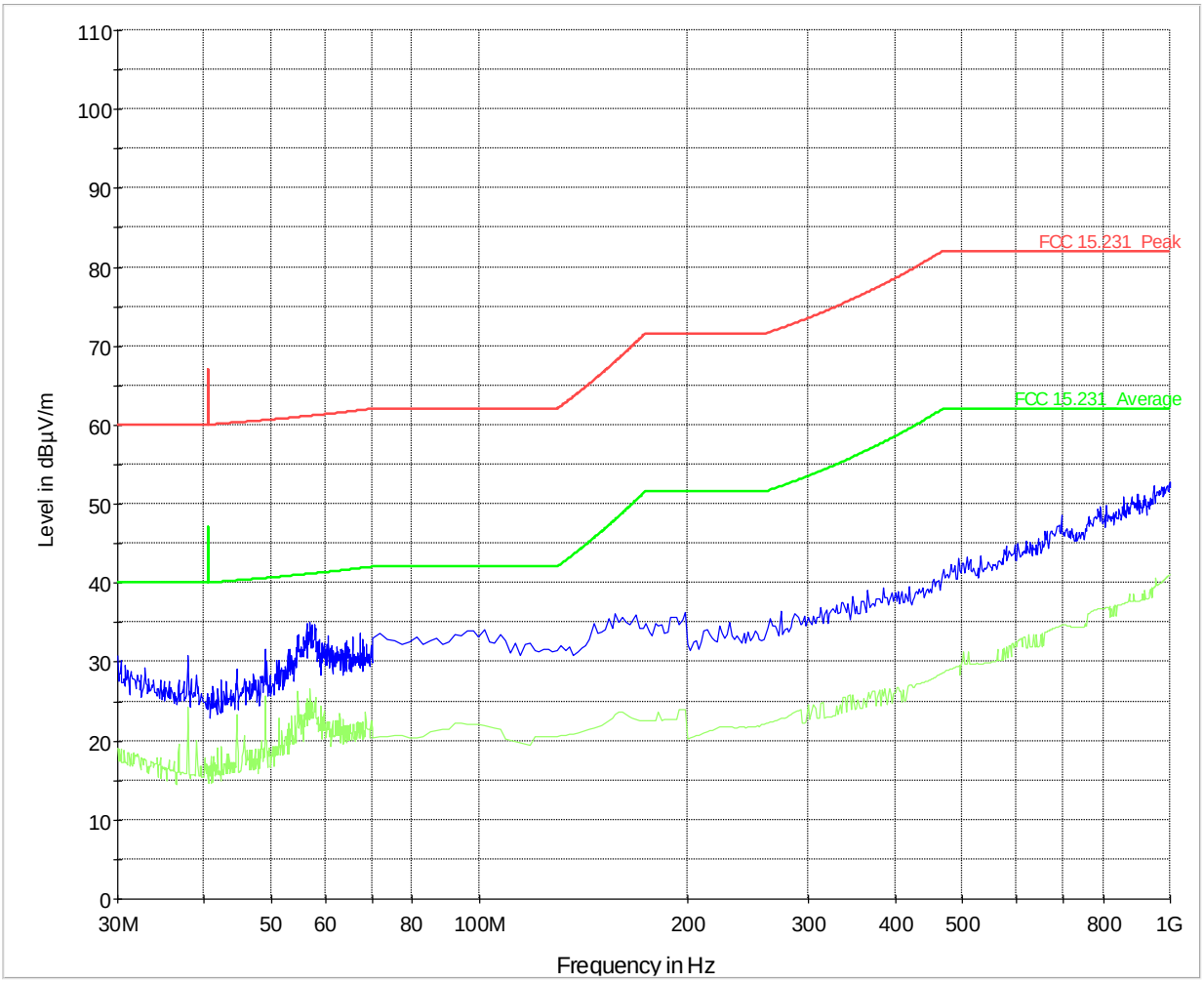
No significant emissions measurable. Plots reported here represent the worse case emissions for horizontal and vertical antenna polarizations and for three orientations of the EUT.

6.8.2.1 Measurement Result

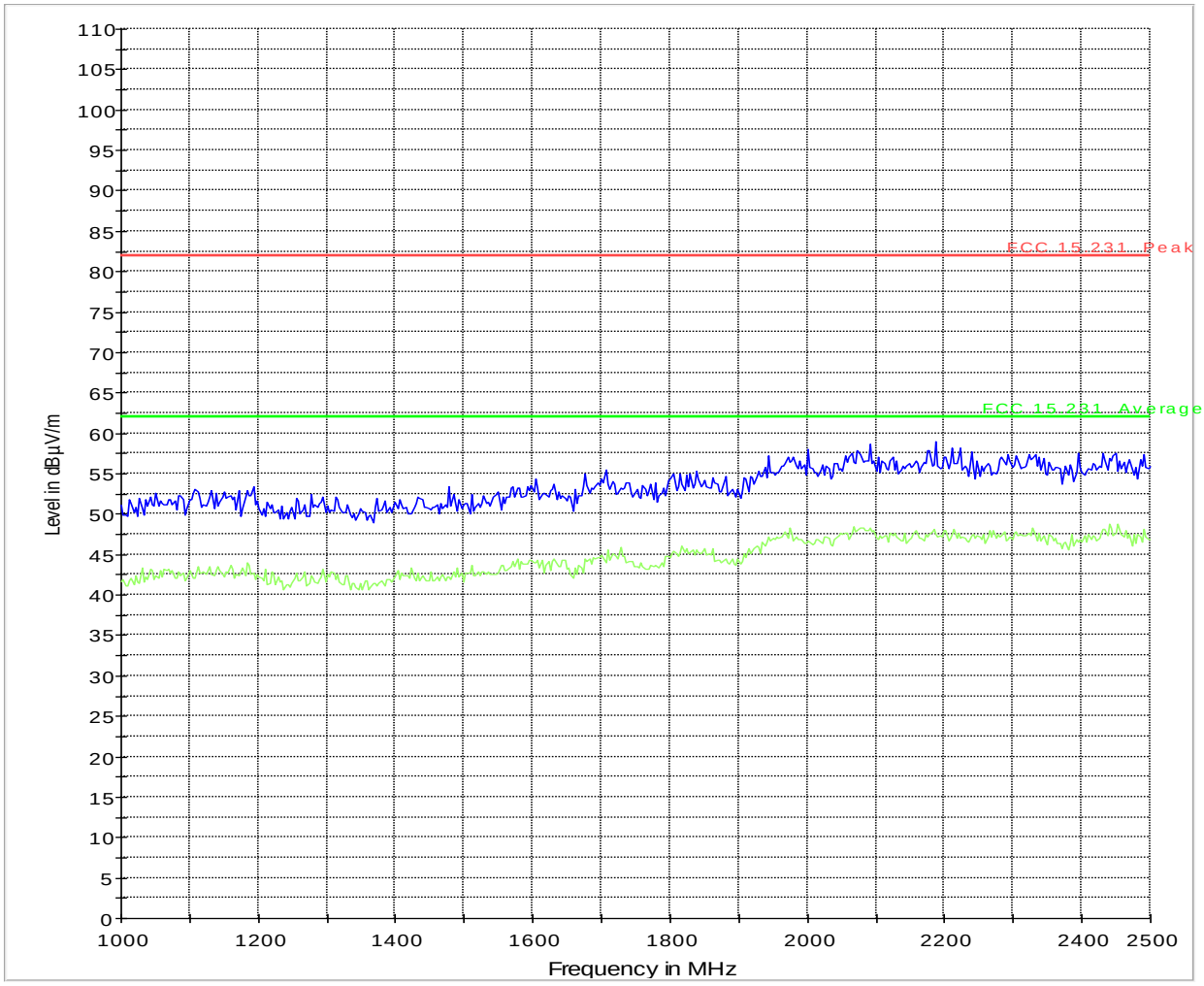
Pass.

6.8.3 Test data/ plots:

Receive Mode: 30MHz-1GHz



Receive Mode: >1GHz



6.9 AC Power Line Conducted Emissions

6.9.1 References:

FCC: CFR Part 15.107
FCC: CFR Part 15.207
The purpose of this test is to measure unwanted radio frequency currents induced in any AC conductor external to the equipment which could conduct interference to other equipment via the AC electrical network.

6.9.2 Limits:

6.9.2.1 §15.207 Conducted limits- Intentional Radiators:

(a) Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Table 1:

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

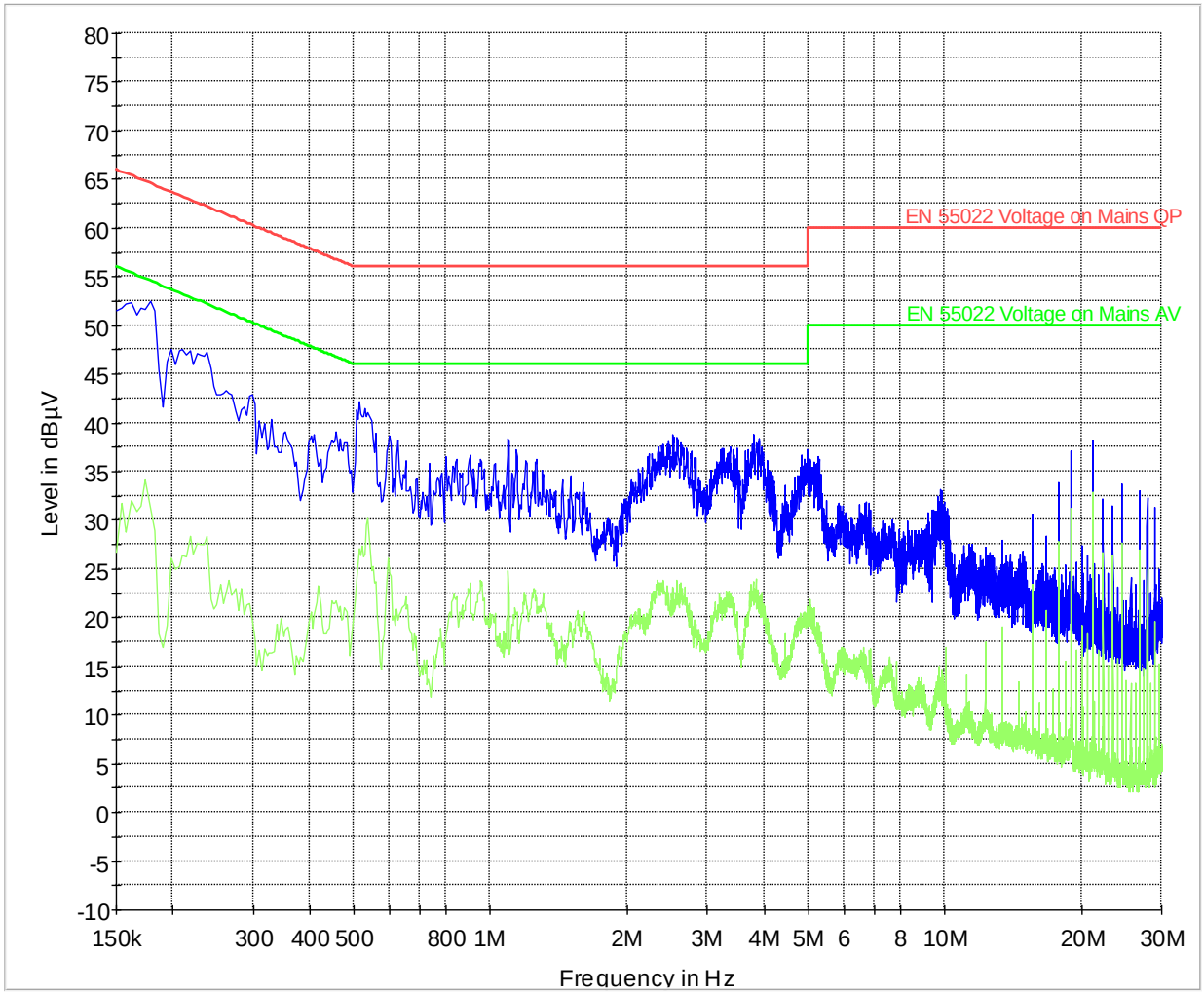
Analyzer Settings: CISPR Bandwidth- 9KHz.

6.9.3 Results

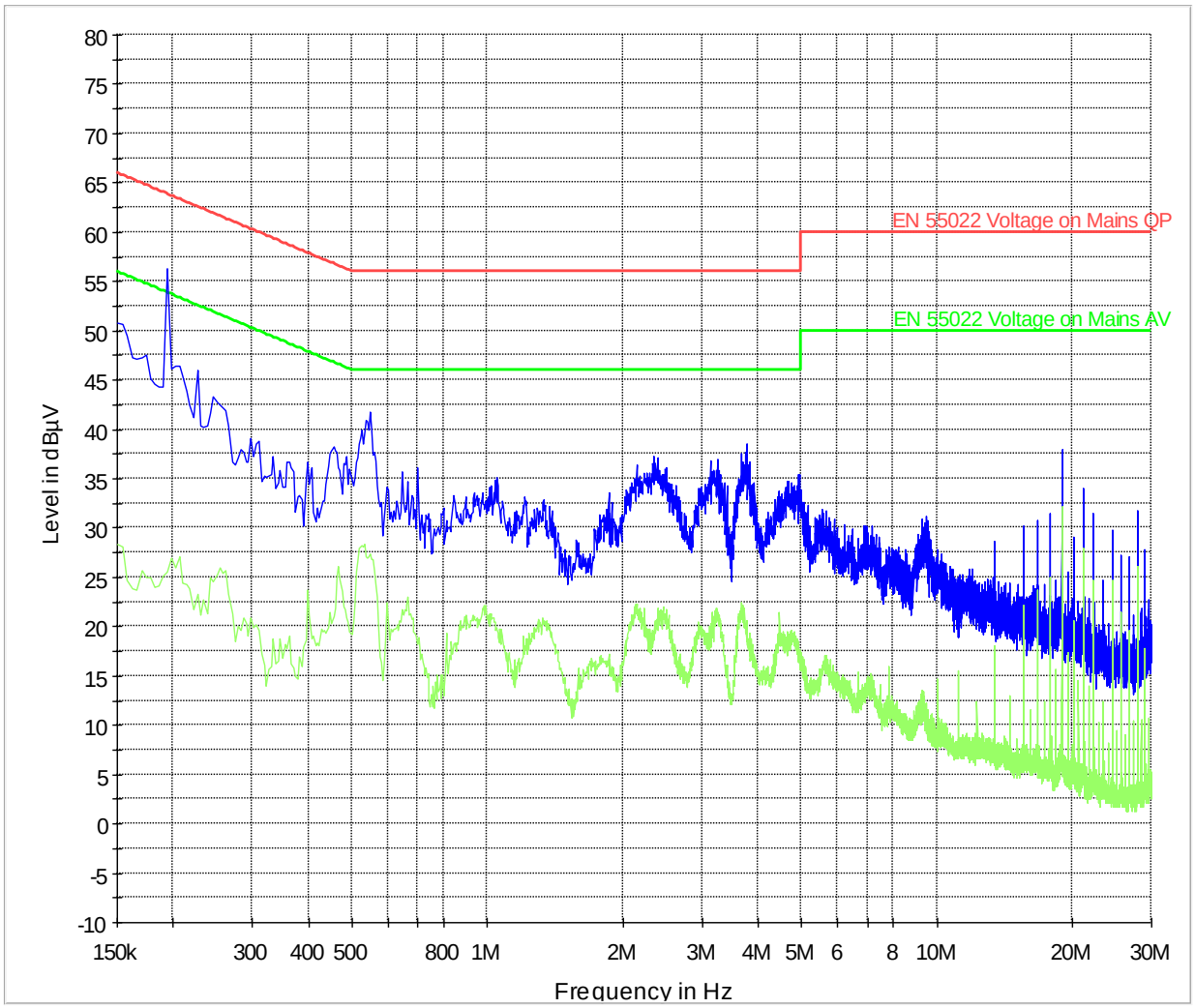
Plots shown here represent the combined worse case emissions for power lines, phases and neutral line.
6.9.3.1 Measurement Result
Pass.

6.9.4 Test Results:

TX Mode:



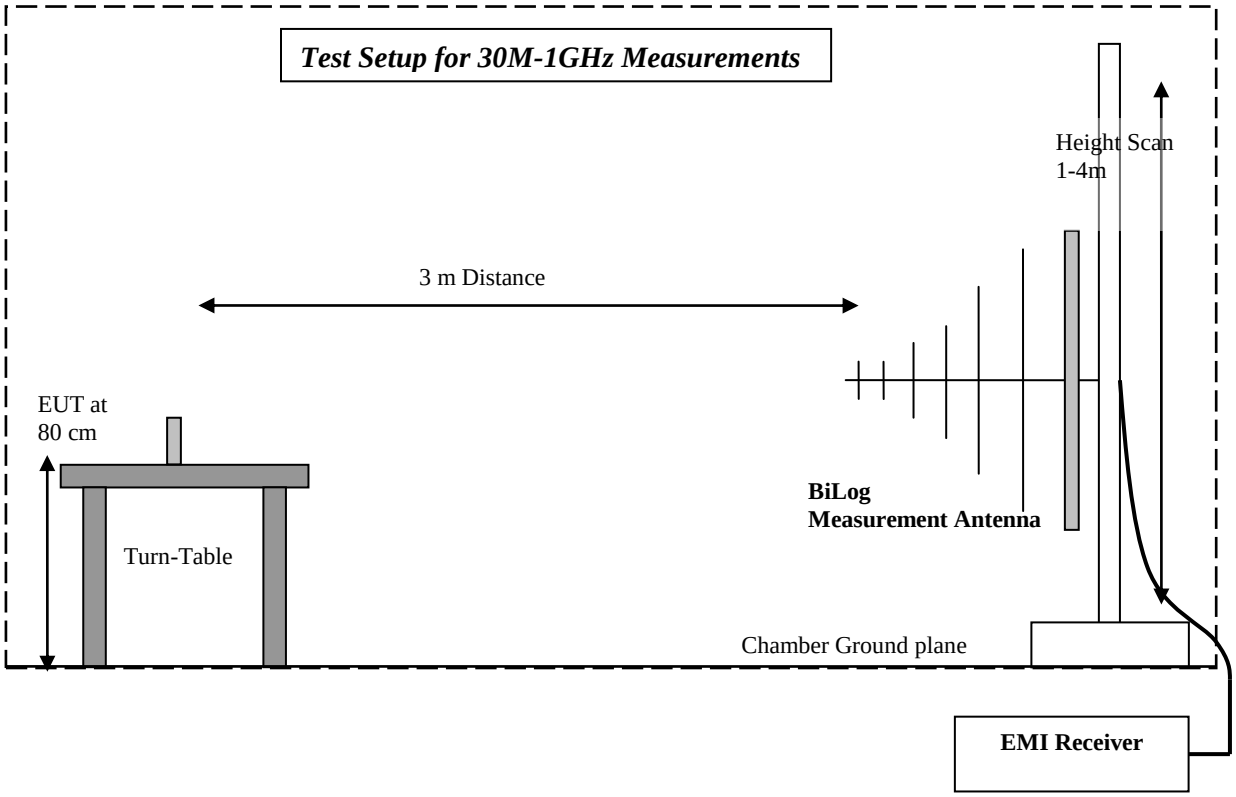
Receive Mode:

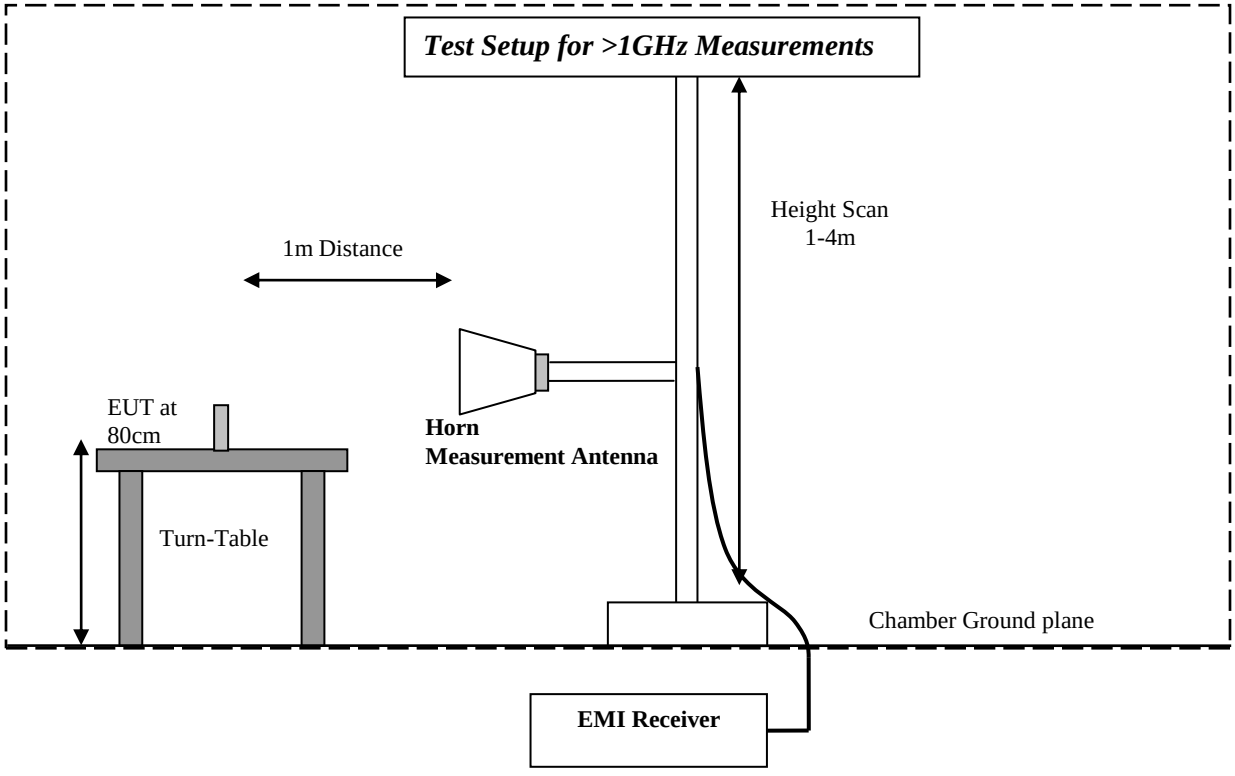


7 Test Equipment and Ancillaries used for tests

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
EMI Receiver/Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2010	1 year
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	Jul 2010	1 year
Loop Antenna	6512	EMCO	00049838	April 2009	3 years
Biconilog Antenna	3141	EMCO	0005-1186	June 2009	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Jan 2009	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Jan 2009	3 years
Communication Antenna	IBP5-900/1940	Kathrein	n/a	n/a	n/a
High Pass Filter	5HC2700	Trilithic Inc.	9926013	Part of system calibration	
High Pass Filter	4HC1600	Trilithic Inc.	9922307	Part of system calibration	
6GHz High Pass Filter	HPM50106	Microtronics	001	Part of system calibration	
Pre-Amplifier	JS4-00102600	Miteq	00616	Part of system calibration	
LISN	50-25-2-08	FCC	08014	June 2010	1 year
Power Smart Sensor	R&S	NRP-Z81	100161	June 2010	1 Year
Multimeter	400	Klein	N/A	April 2011	1 Year
Temp Hum Logger	TM320	Dickson	03280063	Feb 2011	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Feb 2011	1 Year

8 Test Setup Info:





9 Revision History

Date	Report Name	Changes to report	Report prepared by
2011-04-06	EMC_PROTC_004_11001_FCC15.231	First Version	C Torio
2011-04-25	EMC_PROTC_004_11001_FCC15.231_Rev1	Reporting peak measurement data for all radiated tests. Added 100ms plot for Duty Cycle evaluation.	C Torio