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Report On

FCC Testing of the Sharp Quad-band LTE(B1 /B3/ B19/ B21), and Tri-band WCDMA(FDD I/ VI /XIX) Dual mode hand held Mini Phablet with Bluetooth, ANT+, W-LAN, NFC and GPS

In accordance with FCC CFR 47 Part 15C (ANT+)

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00216

Document 75928438 Report 05 Issue 1

January 2015



Product Service

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COMMERCIAL-IN-CONFIDENCE

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FCC Testing of the Sharp Quad-band LTE(B1 /B3/ B19/ B21), and
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DATED

13 January 2015

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 15C. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

J Tuckwell





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SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp Quad-band LTE(B1 /B3/ B19/ B21), and Tri-band WCDMA(FDD I/ VI /XIX) Dual mode
hand held Mini Phablet with Bluetooth, ANT+, W-LAN, NFC and GPS
In accordance with FCC CFR 47 Part 15C (ANT+)



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1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC Testing of the Sharp Quad-band LTE(B1 /B3/ B19/ B21), and Tri-band WCDMA(FDD I/ VI /XIX) Dual mode hand held Mini Phablet with Bluetooth, ANT+, W-LAN, NFC and GPS to the requirements of FCC CFR 47 Part 15C.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Sharp Corporation
Serial Number(s)	IMEI 004401115303352
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 15C (2013)
Disposal	Held Pending Disposal
Reference Number	Not Applicable
Date	Not Applicable
Order Number	10377
Date	02 December 2014
Start of Test	2 December 2014
Finish of Test	12 December 2014
Name of Engineer(s)	J Tuckwell
Related Document(s)	ANSI C63.10: 2009



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1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 15C is shown below.

Section	Spec Clause	Test Description	Result	Comments/Base Standard
ANT+				
2.1	15.207	AC Line Conducted Emissions	Pass	
2.2	15.249 (a) and 15.35 (b)	Field Strength of Fundamental	Pass	
2.3	15.249 (a)(d)	Field Strength of Spurious Emissions	Pass	



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1.3 PRODUCT TECHNICAL DESCRIPTION

Please refer to the Model Description Form, referenced to FCC ID: APYHRO00216.

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp Quad-band LTE(B1 /B3/ B19/ B21), and Tri-band WCDMA(FDD I/ VI /XIX) Dual mode hand held Mini Phablet with Bluetooth, ANT+, W-LAN, NFC and GPS. A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 4.0 V DC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard were made during testing.

1.7 MODIFICATION RECORD

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Serial Number: IMEI 004401115303352			
0	As supplied by manufacturer.	N/A	N/A
1	Adjusted display driver parameters in firmware	M Russell	11/12/2014

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.



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SECTION 2

TEST DETAILS

FCC Testing of the
Sharp Quad-band LTE(B1 /B3/ B19/ B21), and Tri-band WCDMA(FDD I/ VI /XIX) Dual mode
hand held Mini Phablet with Bluetooth, ANT+, W-LAN, NFC and GPS
In accordance with FCC CFR 47 Part 15C (ANT+)



2.1 AC LINE CONDUCTED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.207

2.1.2 Equipment Under Test and Modification State

S/N: IMEI 004401115303352 - Modification State 0

2.1.3 Date of Test

4 December 2014

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

A test environment and testing arrangement meeting the specification of ANSI C63.4 was used during all testing. The Equipment Under Test (EUT) was set upon a non-conducting platform at an elevation of 80 cm above a horizontal reference ground plane. A vertical reference ground plane was situated 40 cm from the EUT and bonded to the horizontal reference ground plane.

The EUT was powered by a Line Impedance Stabilization Network (LISN), whereby emissions measurements of the current-carrying conductors were made through this LISN. The LISN was bonded to the horizontal reference ground plane with a separation distance greater than 80 cm from the EUT. A mains supply cable of 1 m length was used to supply mains power to the EUT from the LISN.

A preliminary emissions scan was conducted for each current-carrying conductor of the EUT, using a peak detector over a frequency range of 150 kHz to 30 MHz. At least six of the greatest peak emissions, frequency positions were selected from each preliminary emissions scan for further evaluation as final measuring points.

Final measurement points were measured using quasi-peak and average detectors. All final measurements were assessed against the emission limits in Clause 15.207 of FCC CFR 47 FCC Part 15.

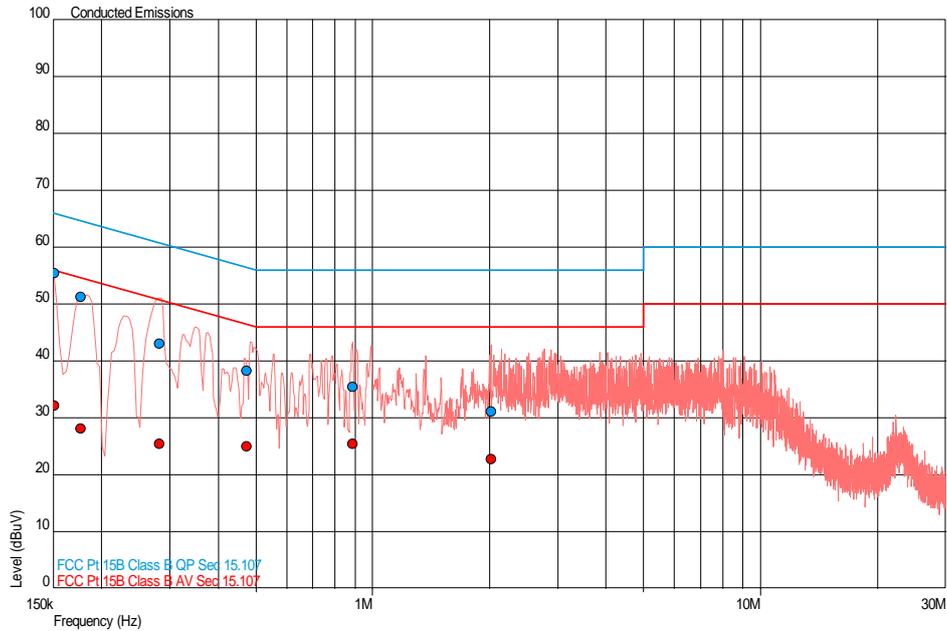
2.1.6 Environmental Conditions

Ambient Temperature	19.3°C
Relative Humidity	31.0%



2.1.7 Test Results

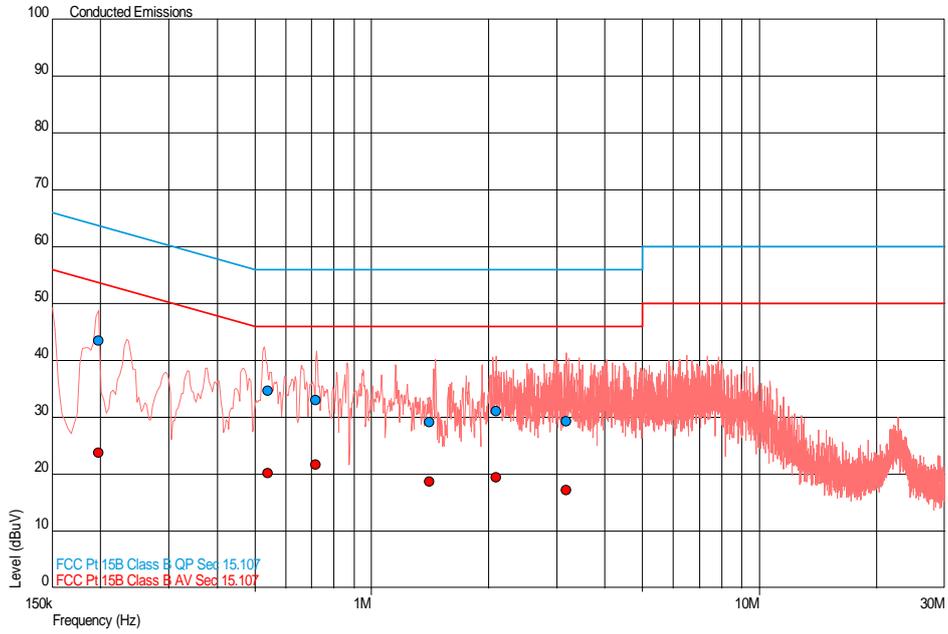
Live Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.151	55.5	65.9	-10.5	32.2	55.9	-23.7
0.177	51.3	64.6	-13.3	28.2	54.6	-26.4
0.282	43.1	60.8	-17.7	25.5	50.8	-25.3
0.474	38.2	56.4	-18.2	25.0	46.4	-21.5
0.890	35.4	56.0	-20.6	25.4	46.0	-20.6
2.019	31.1	56.0	-24.9	22.7	46.0	-23.3



Neutral Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.198	43.4	63.7	-20.3	23.8	53.7	-29.9
0.541	34.7	56.0	-21.3	20.2	46.0	-25.8
0.719	33.1	56.0	-22.9	21.8	46.0	-24.2
1.407	29.1	56.0	-26.9	18.8	46.0	-27.2
2.096	31.1	56.0	-24.9	19.5	46.0	-26.5
3.183	29.3	56.0	-26.7	17.2	46.0	-28.8



2.2 FIELD STRENGTH OF FUNDAMENTAL

2.2.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.249 (a) and 15.35 (b)

2.2.2 Equipment Under Test and Modification State

S/N: IMEI 004401115303352 - Modification State 0

2.2.3 Date of Test

2 December 2014

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

The EUT is placed on a test table 800mm above the ground plane.

During formal measurement the spectrum analyser is tuned to the frequency of the fundamental. The turntable azimuth is adjusted from 0 to 360 degrees to determine the point at which the maximum level occurs. Then the height of the measuring antenna is adjusted from a height of 1m to 4m to determine the height at which the maximum level occurs. Once the point of maximum emission has been determined the emission is measured at a distance of 3 meters.

2.2.6 Environmental Conditions

Ambient Temperature	19.9°C
Relative Humidity	32.0 - 34.0%

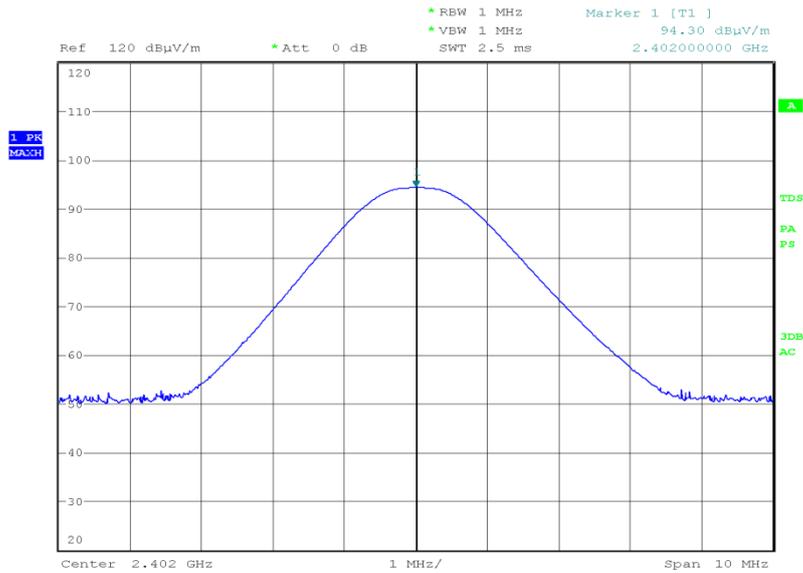


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2.2.7 Test Results

2402 MHz

Fundamental



Date: 2.DEC.2014 13:40:28

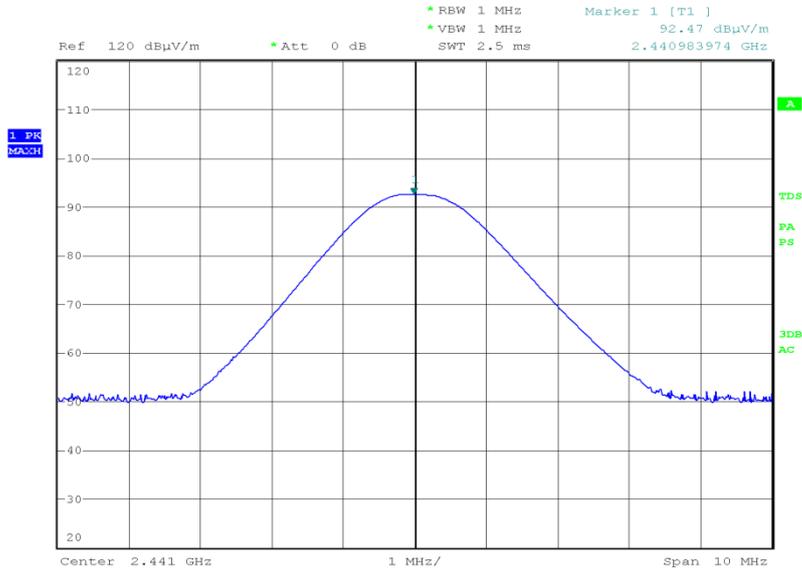
Frequency (MHz)	Result (dBµV/m)	Limit (dBµV/m)
2402.000	62.818	93.980



Product Service

2441 MHz

Fundamental



Date: 2.DEC.2014 15:16:08

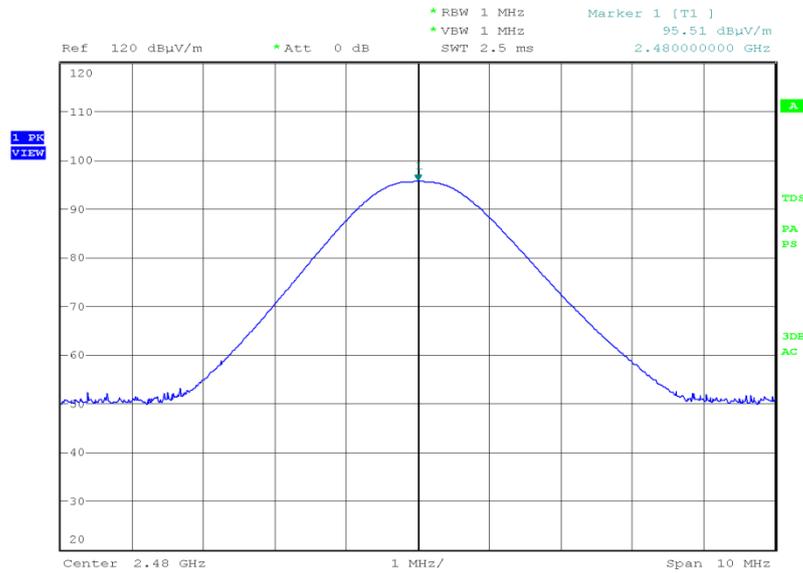
Frequency (MHz)	Result (dBμv/m)	Limit (dBμv/m)
2441.000	62.438	93.980



Product Service

2480 MHz

Fundamental



Date: 2.DEC.2014 15:50:08

Frequency (MHz)	Result (dBµV/m)	Limit (dBµV/m)
2480.000	62.978	93.980

Limit Clause

15.249 (a)

Fundamental Frequency (MHz)	Average Field Strength of Fundamental (millivolts/meter)
2400 to 2483.5	50

15.35 (b)

The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.



2.3 FIELD STRENGTH OF SPURIOUS EMISSIONS

2.3.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.249 (a)(d)

2.3.2 Equipment Under Test and Modification State

S/N: IMEI 004401115303352 - Modification State 0 and 1

2.3.3 Date of Test

2 December 2014, 3 December 2014 & 12 December 2014

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

A preliminary profile of the Spurious Radiated Emissions is obtained up to the 10th harmonic of the EUT's fundamental frequency. For frequencies from 30 MHz to 18 GHz the EUT is placed on a test table 800mm above the ground plane. For frequencies above 18 GHz, the EUT height is increased by 200 mm to a height of 1000 mm. This is to ensure the beam width of the measuring antenna gives sufficient vertical coverage of the EUT.

During characterisation the turntable azimuth is adjusted from 0 to 360 degrees with the measuring antenna in one polarity. It is then repeated for the other polarity. Any frequencies of interest are noted for formal measuring later. The distance from the measuring antenna to the boundary of the EUT is 3 m. Above 18 GHz this distance may be reduced to 1m.

During formal measurement the spectrum analyser is tuned to the frequency of the emission. The turntable azimuth is adjusted from 0 to 360 degrees to determine the point at which the maximum emission level occurs. Then the height of the measuring antenna is adjusted from a height of 1 m to 4 m to determine the height at which the maximum emission level occurs. Once the point of maximum emission has been determined the emission is measured. Emissions in the 30 MHz to 1 GHz range are measured using a CISPR Quasi – Peak detector function in a 120 kHz bandwidth. Emissions in the range 1 GHz to 40 GHz require Peak and Average measurements. The Peak measurements are made using a peak detector with 1MHz Resolution and Video bandwidths. The average measurements employ a peak detector with a Resolution bandwidth of 1 MHz and a Video bandwidth of 10 Hz minimum. If measurements are made at a 1m measuring distance, then 10 dB is added to the specification limit.

2.3.6 Environmental Conditions

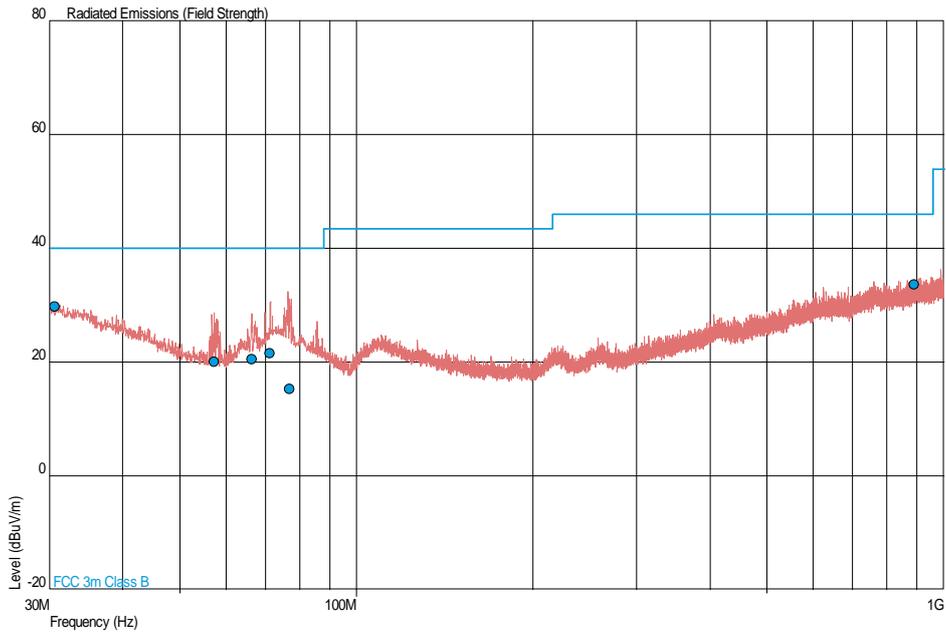
Ambient Temperature	19.2 - 19.9°C
Relative Humidity	32.0 - 34.0%



2.3.7 Test Results

2402 MHz

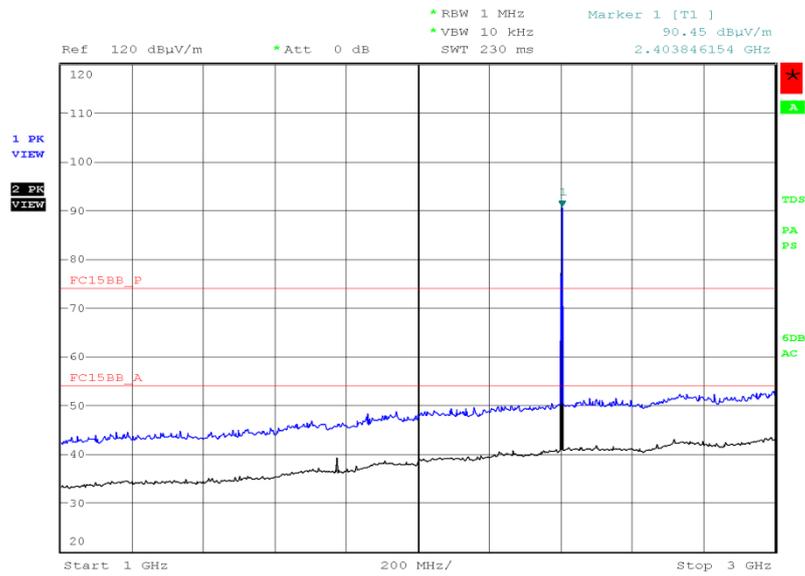
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
30.632	29.8	30.9	40.0	100	-10.2	-69.1	31	3.38	Vertical
57.216	20.0	10.0	40.0	100	-20.0	-90.0	212	1.00	Vertical
66.368	20.5	10.6	40.0	100	-19.5	-89.4	89	1.00	Vertical
71.202	21.5	11.9	40.0	100	-18.5	-88.1	211	1.37	Vertical
77.076	15.3	5.8	40.0	100	-24.7	-94.2	265	1.00	Horizontal
890.202	33.6	47.9	46.0	200	-12.4	-152.1	47	1.00	Vertical

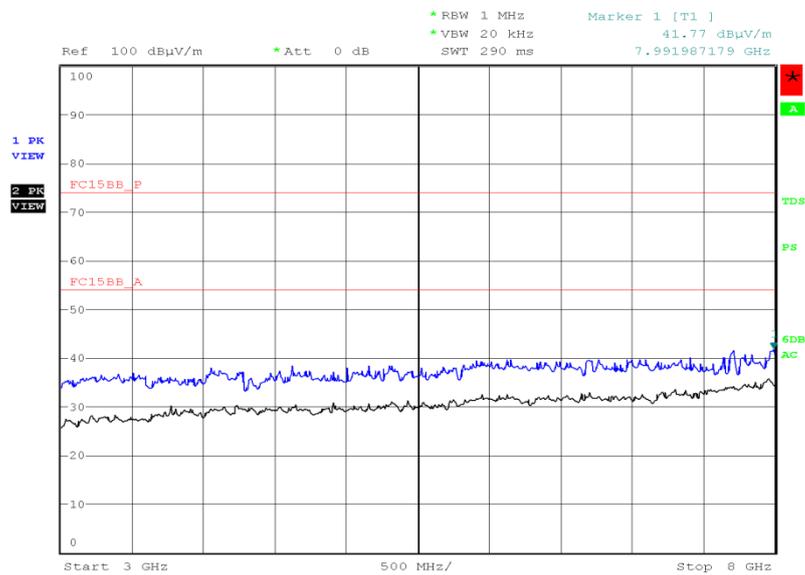


1 GHz to 3 GHz



Date: 3.DEC.2014 15:25:45

3 GHz to 8 GHz

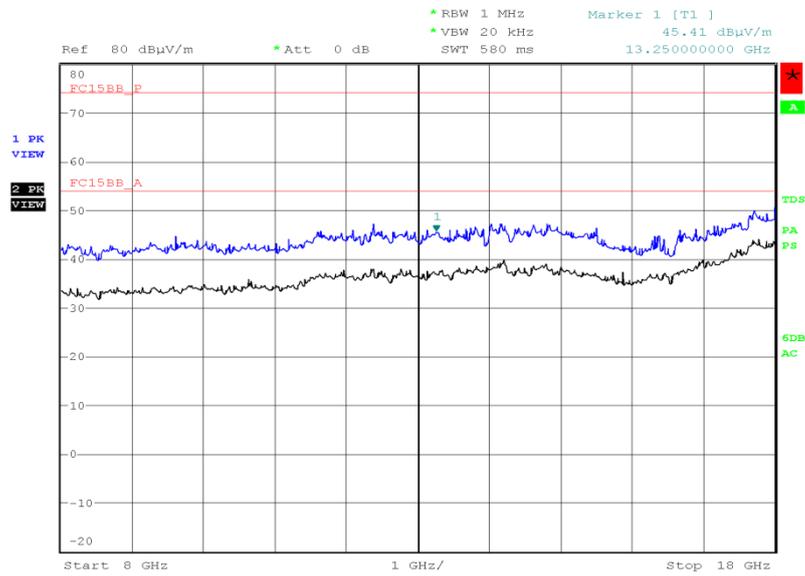


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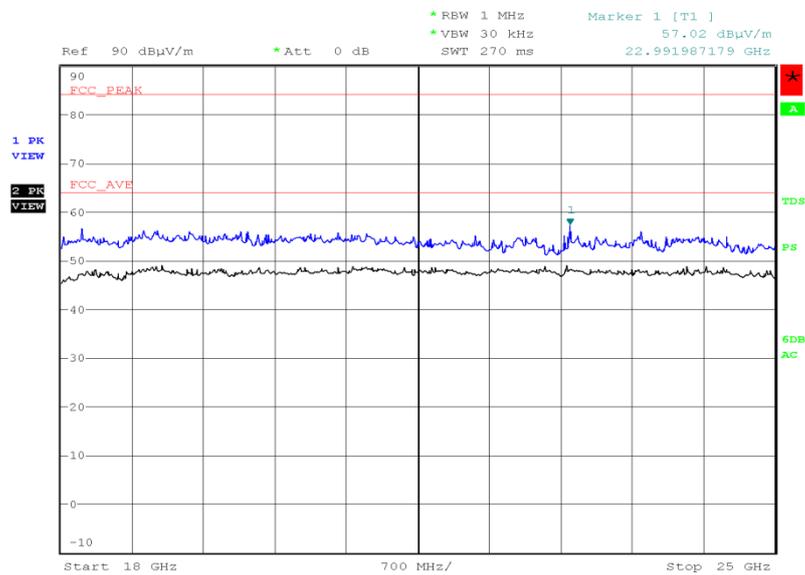
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8 GHz to 18 GHz



Date: 3.DEC.2014 16:15:29

18 GHz to 25 GHz



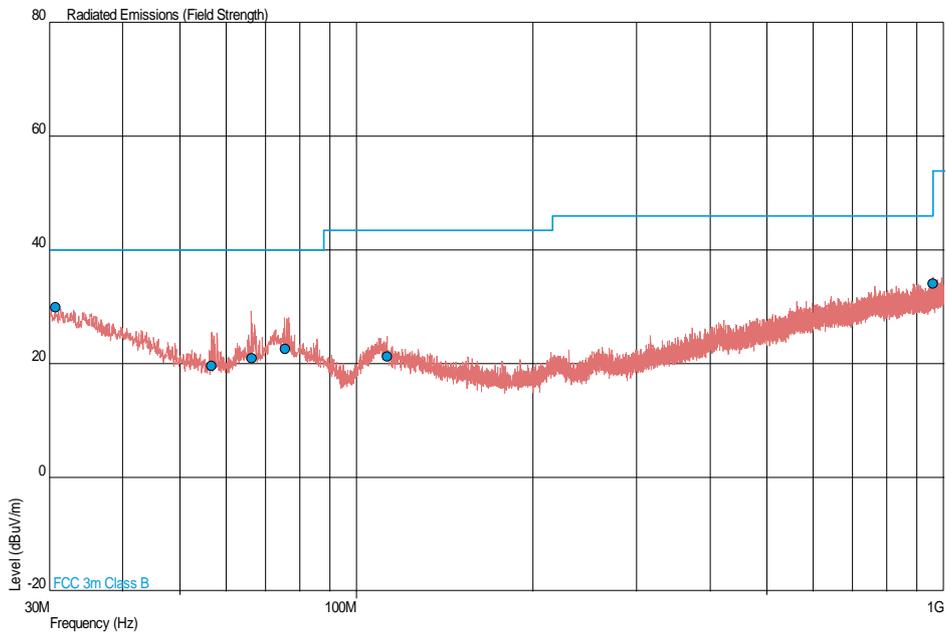
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2441 MHz

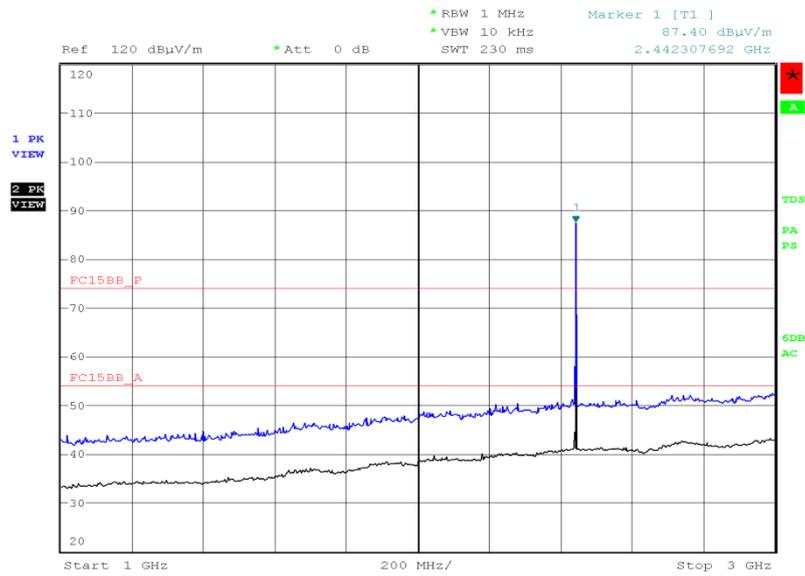
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBµV/m)	QP Level (µV/m)	QP Limit (dBµV/m)	QP Limit (µV/m)	QP Margin (dBµV/m)	QP Margin (µV/m)	Angle (Deg)	Height (m)	Polarity
30.726	29.9	31.3	40.0	100	-10.1	-68.7	7	1.00	Vertical
56.717	19.7	9.7	40.0	100	-20.3	-90.3	310	1.00	Vertical
66.410	21.0	11.2	40.0	100	-19.0	-88.8	0	1.00	Vertical
75.605	22.6	13.5	40.0	100	-17.4	-86.5	249	1.25	Vertical
112.759	21.3	11.6	43.5	150	-22.2	-138.4	306	1.00	Vertical
958.420	34.1	50.7	46.0	200	-11.9	-149.3	122	1.00	Horizontal

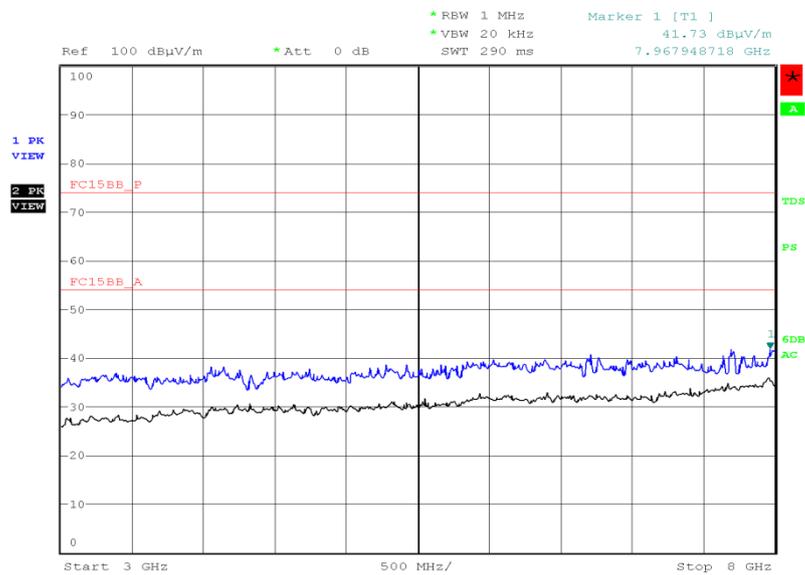


1 GHz to 3 GHz



Date: 3.DEC.2014 15:29:53

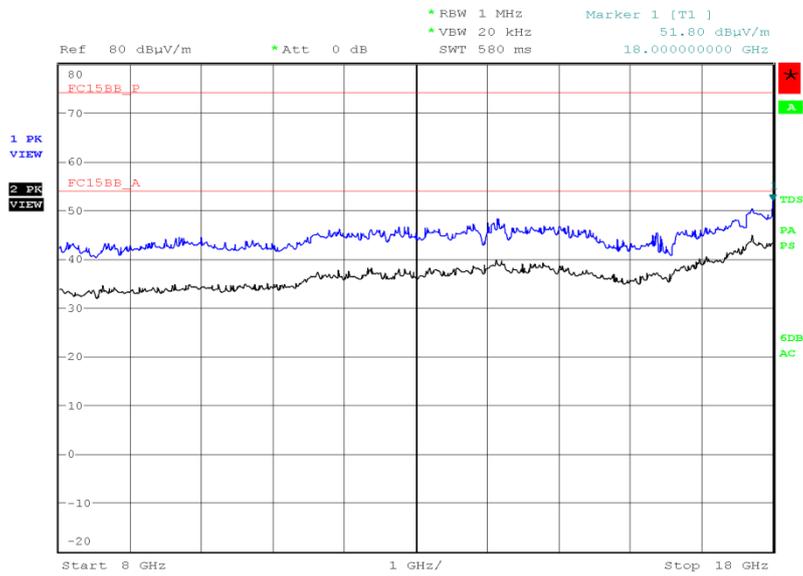
3 GHz to 8 GHz



Date: 3.DEC.2014 15:10:09

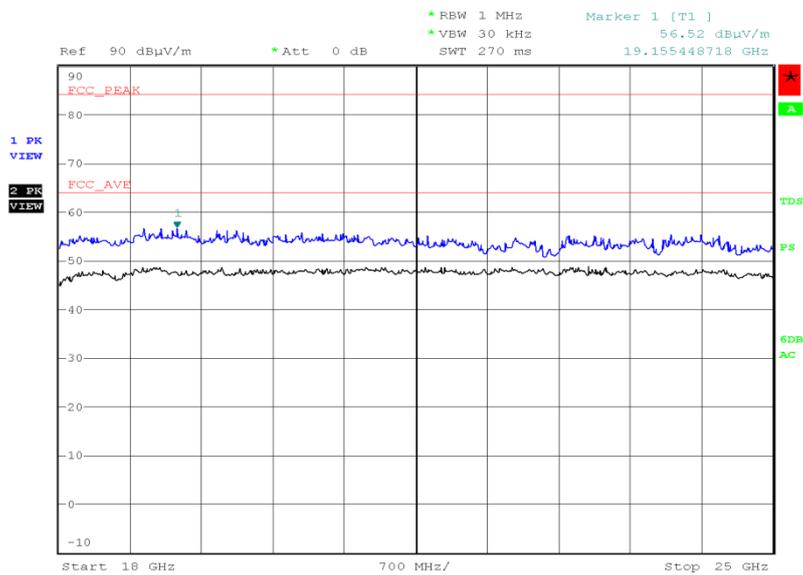


8 GHz to 18 GHz



Date: 3.DEC.2014 16:00:17

18 GHz to 25 GHz

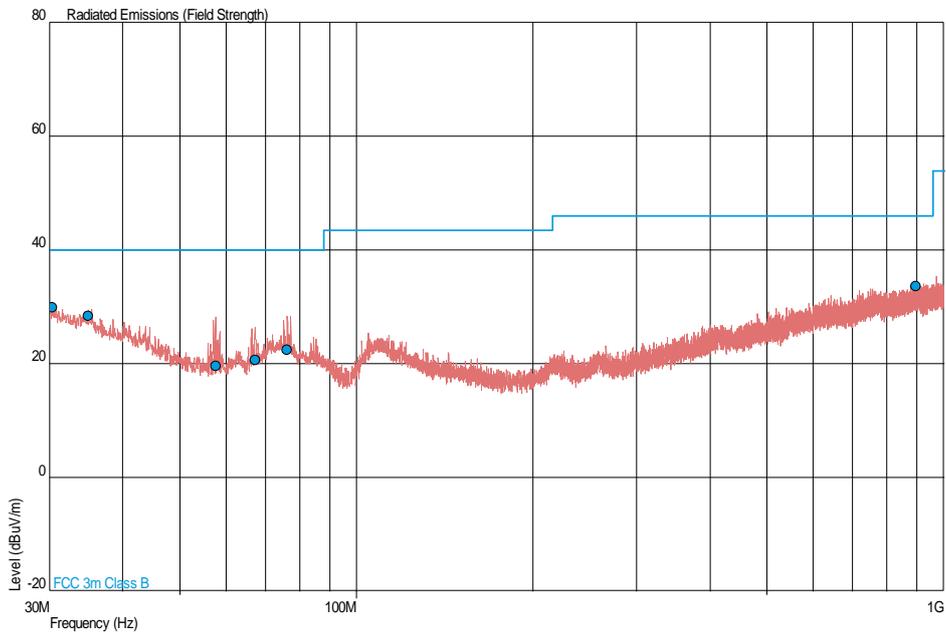


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2480 MHz

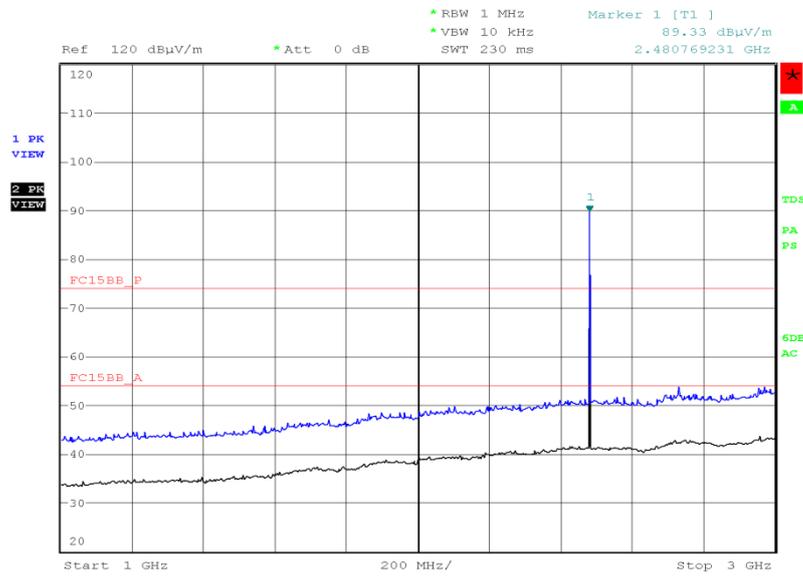
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBµV/m)	QP Level (µV/m)	QP Limit (dBµV/m)	QP Limit (µV/m)	QP Margin (dBµV/m)	QP Margin (µV/m)	Angle (Deg)	Height (m)	Polarity
30.385	29.9	31.3	40.0	100	-10.1	-68.7	62	1.00	Horizontal
34.987	28.4	26.3	40.0	100	-11.6	-73.7	135	1.00	Vertical
57.594	19.6	9.5	40.0	100	-20.4	-90.5	36	1.00	Vertical
67.203	20.7	10.8	40.0	100	-19.3	-89.2	253	1.00	Vertical
76.070	22.4	13.2	40.0	100	-17.6	-86.8	178	1.00	Vertical
895.414	33.7	48.4	46.0	200	-12.3	-151.6	121	1.00	Horizontal

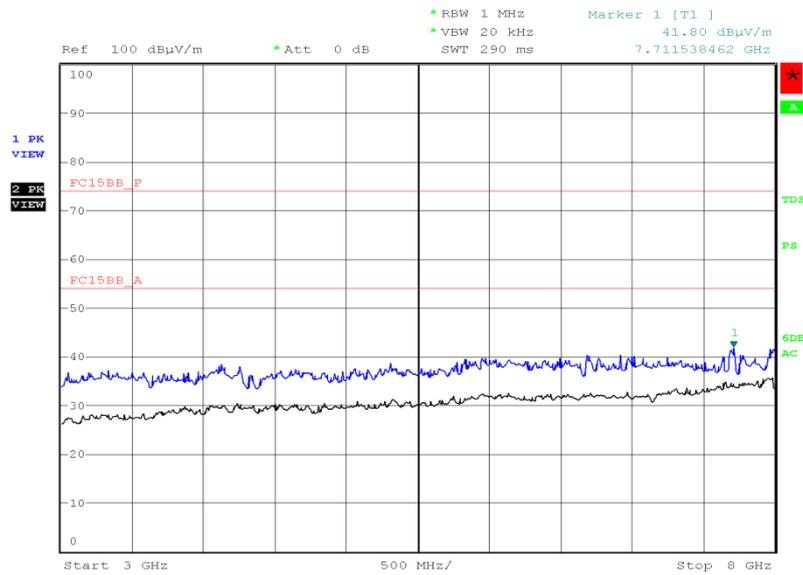


1 GHz to 3 GHz



Date: 2.DEC.2014 16:06:56

3 GHz to 8 GHz

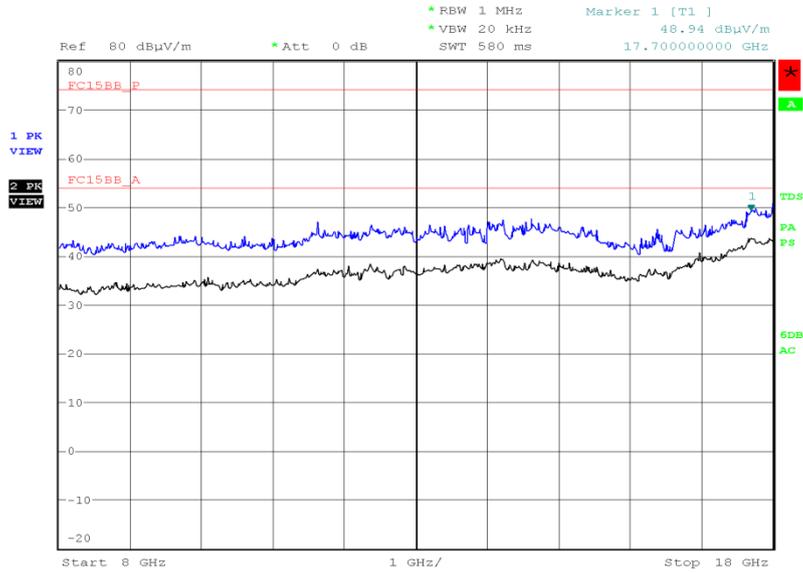


Date: 3.DEC.2014 15:01:36



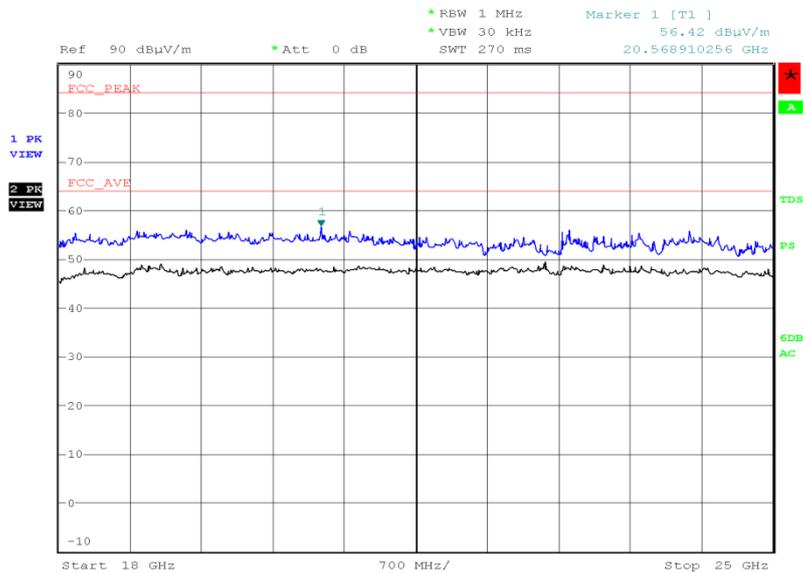
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8 GHz to 18 GHz



Date: 3.DEC.2014 16:29:11

18 GHz to 25 GHz



Date: 3.DEC.2014 14:14:07



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Limit Clause

15.249 (a)

Fundamental Frequency (MHz)	Field Strength of Harmonics (microvolts/meter)
2400 to 2483.5	500

15.249 (d), 15.209

Frequency (MHz)	Field Strength (microvolts/meter)
0.009 to 0.490	2400/F (kHz)
0.490 to 1.705	24000/F (kHz)
1.705 to 30.0	30
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

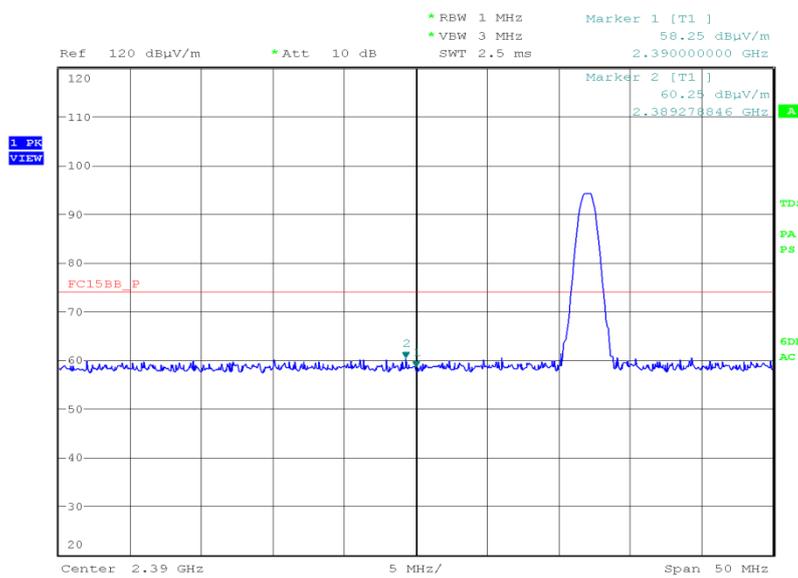


Band Edge Emissions

Restricted Bands of Operation		
Frequency (MHz)	Final Peak (dBμV/m)	Final Average (dBμV/m)
2390.00	60.25	47.82
2483.50	60.99	47.79

2390.00 MHz

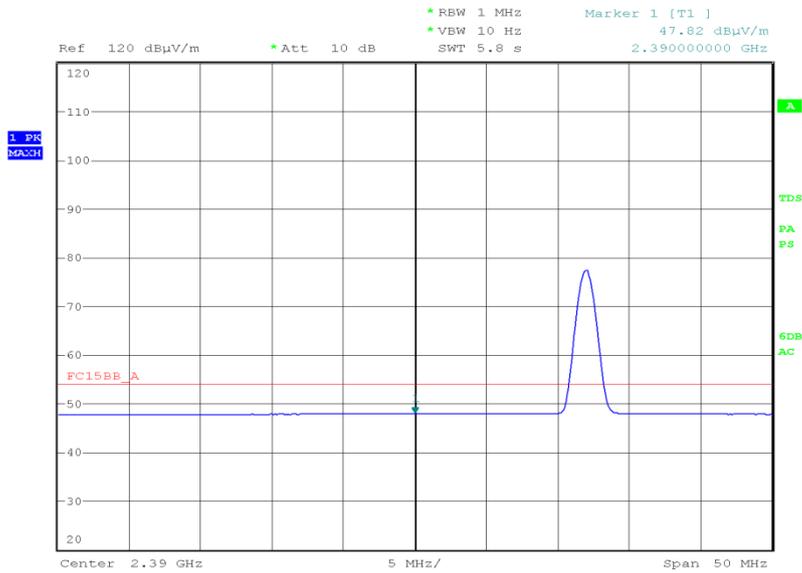
Final Peak



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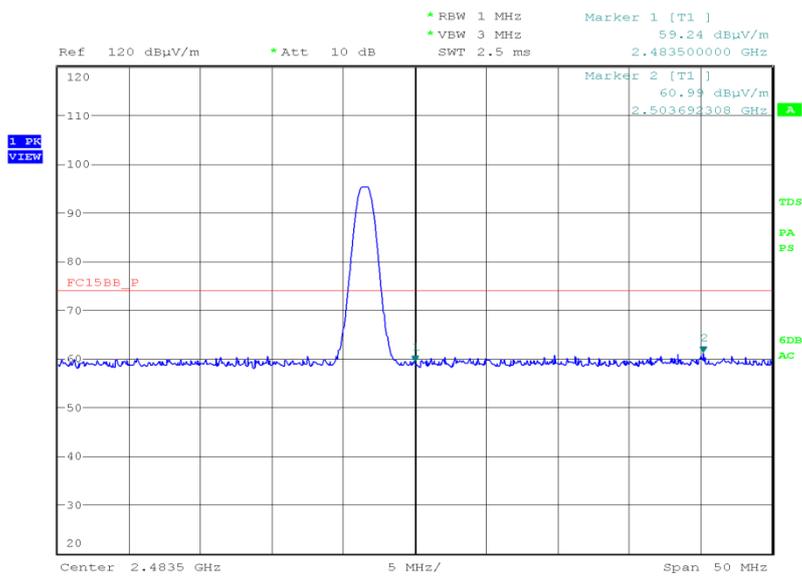
Final Average



Date: 2.DEC.2014 13:48:48

2483.50 MHz

Final Peak

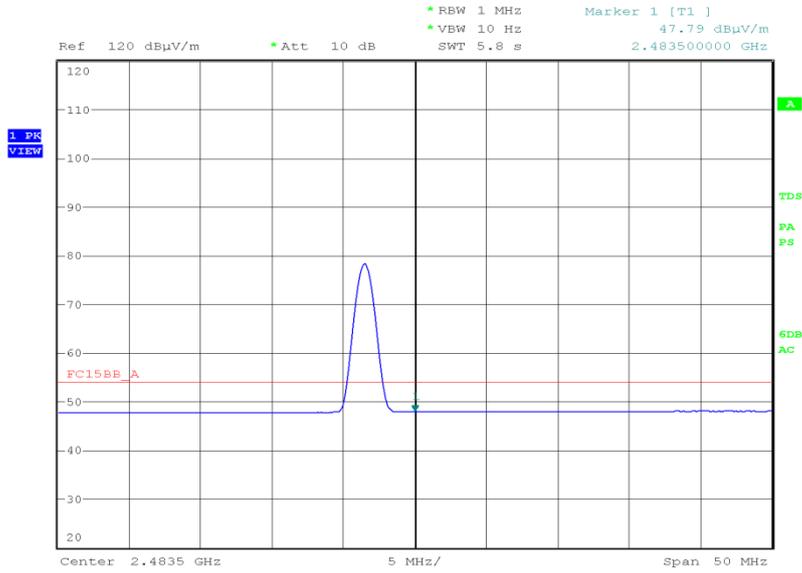


Date: 2.DEC.2014 15:55:57



Product Service

Final Average



Date: 2.DEC.2014 15:56:50

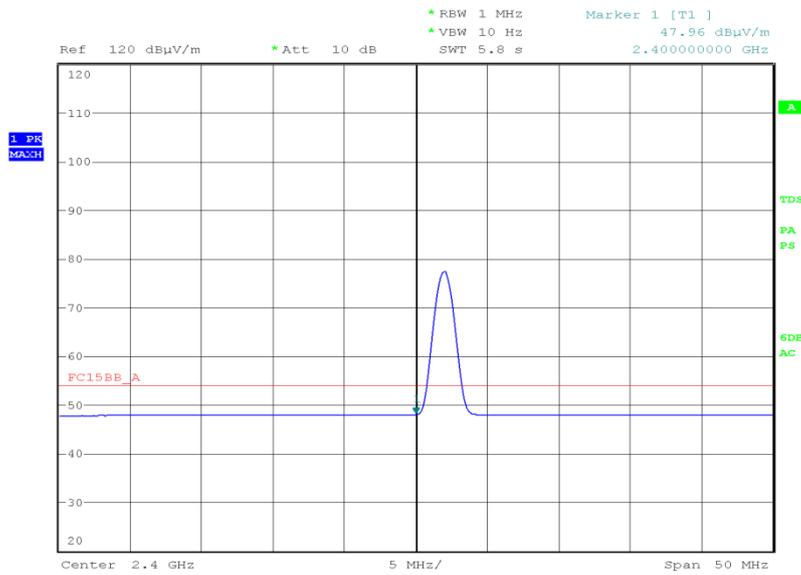


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Band Edge	
Frequency (MHz)	Final Average (dBμV/m)
2400.00	47.96
2483.50	47.79

2400.00 MHz

Final Average



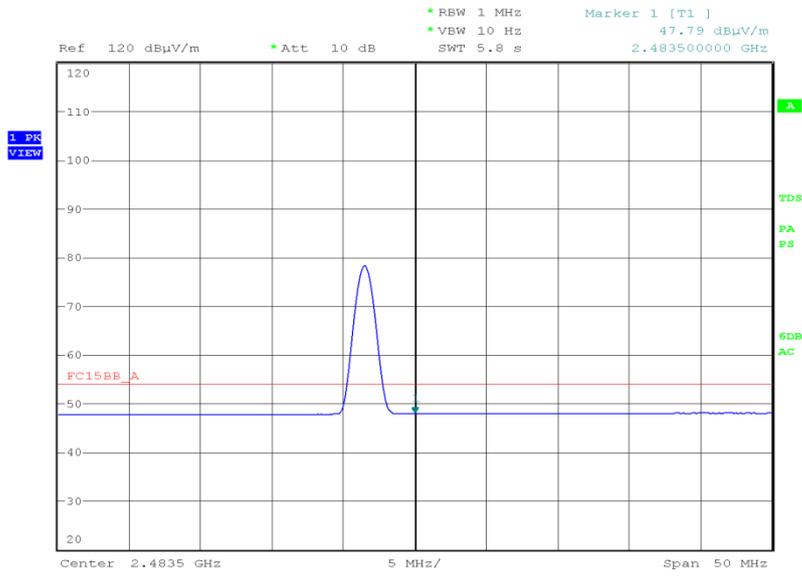
Date: 2.DEC.2014 13:55:55



Product Service

2483.50 MHz

Final Average



Date: 2.DEC.2014 15:56:50

Limit

Peak (dBμV/m)	Average (dBμV/m)
74.0	54.0



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1– AC Line Conducted Emissions					
Transient Limiter	Hewlett Packard	11947A	15	12	10-Dec-2014
3 phase LISN	Rohde & Schwarz	ESH2-Z5	323	12	16-Jan-2015
Screened Room (5)	Rainford	Rainford	1545	24	10-Jan-2015
Compliance 5 Emissions	Schaffner	C5e Software V.5.00.00	3275	-	N/A - Software
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	27-Oct-2015
Section 2.2 Field Strength of Fundamental					
Antenna (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	26-Nov-2015
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	27-Oct-2015
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	28-Feb-2015
Cable 1503 2M 2.92(P)m 2.92(P)m	Rhophase	KPS-1503A-2000-KPS	4293	12	3-Jun-2015
Section 2.3– Field Strength of Spurious Emissions					
Antenna (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	26-Nov-2015
Pre-Amplifier	Phase One	PSO4-0087	1534	12	1-Oct-2015
Screened Room (5)	Rainford	Rainford	1545	24	10-Jan-2015
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	10-Jun-2015
Compliance 5 Emissions	Schaffner	C5e Software V.5.00.00	3275	-	N/A - Software
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	27-Oct-2015
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	28-Feb-2015
Tilt Antenna Mast	mature GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	mature GmbH	NCD	3917	-	TU
Cable 1503 2M 2.92(P)m 2.92(P)m	Rhophase	KPS-1503A-2000-KPS	4293	12	3-Jun-2015

TU – Traceability Unscheduled

O/P MON – Output Monitored with Calibrated Equipment



Product Service

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
AC Line Conducted Emissions	± 3.2 dB
Field Strength of Fundamental	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Field Strength of Spurious Emissions	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB



Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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