



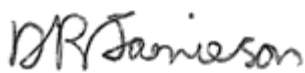
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Test Report for gS195 Marine Multifunction Display

To RSS-210 and 47 CFR Part 15 Subpart C – Spurious Emissions

Model Number	E70213		
Product Description	gS195 Marine Multifunction Displays		
Report Number	TP/873/1037		
Report Author Mike Thompson EMC Engineer		Date	4 th July 2014
Technical Check David Jamieson EMC Engineer		Date	8 th July 2014
Approval Andrew Little Compliance Manager		Date	8 th July 2014

Test Date Range	24 th June 2014 – 3 rd July 2014
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Product Status	PASS
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The test data and results contained within this report relate only to the items tested.

1 RSS 210 and 47 CFR Part 15 Test Summary

1.1 Radiated Measurements

47 CFR Part 15	RSS-210	
15.209(a) Radiated Emissions	RSS-GEN 7.5.2	Pass
15.247(d) Spurious Emissions	A8.5 Out of band emissions	Pass

1.2 Conducted Measurements

Conducted measurements are referenced in Report Raymarine 839-1056 as the gS195 uses identical RF circuitry, power supplies, software and layout as the other gS displays in the family.

	CFR 47 Part 15	RSS-210	Section	Result
Hopping Sequence	15.247(a)		5.4	Pass
Peak Output Power	15.247(b)	A8.4(2)	5.3	Pass
Carrier Frequency Separation	15.247(a)	A8.1(b)	5.4	Pass
Frequency Band Edges	15.247(d)		5.8	Pass
20dB Bandwidth	15.247(a)(1)	A8.1(a)	5.7	Pass
Number of Channels	15,247(a)(1)	A8.1(d)	5.4	Pass
Directional antenna with >6dBi	15.247(c)		5.2 Antenna<6dBi	N/A
Dwell Time	15.247(a)	A8.1(d)	5.4	Pass
6dB Bandwidth		A8.2(a)	5.9	Pass
Power Spectral Density		A8.2(b)	5.10	Pass

2 Attestations

This equipment has been tested in accordance with the standards identified in this report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in these reports.

All measuring instruments used to determine the status of the product's compliance to the identified standards are calibrated regularly in accordance with UKAS requirements.

A comprehensive system of traceable calibration in accordance with ISO9001 is maintained.

Name/Position	Signature	Date
Mike Thompson EMC Engineer		4 th July 2014

I attest that the necessary measurements were made, under my supervision at:

Raymarine UK Ltd, Marine House, Cartwright Drive, Segensworth, Fareham, Hampshire,
PO15 5RJ.



Andy Little
Compliance Manager

Date: 7th July 2014

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3 Test Information

3.1 Test Facilities

Site 1	9m x 6m x 5.5m Semi Anechoic Chamber	FCC ID IC Certification	Reg 371673 Reg 4069B-2
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3.2 Overall Test Conditions

Work Area	Relative Humidity (%)	Air Pressure (mbar)	Ambient Temperature (°C)
Site 1-5	60-65	1003-1005	18.5-19.6
Sites 6-10	59-65	1013-1015	21.2-22.0

3.3 Test Methods

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C paragraph 15.247(d) (Bluetooth and WIFI, 2.4GHz ISM band radiators) for the EUT FCC ID Certification:

Number	Standard Number	Document Title
1	47 CFR Part 15 (10-01-09 Edition)	Radio Frequency Devices

3.3.1 Deviations from Test Methods

None

4 EUT Information

4.1 Test Rationale

Tested to ensure compliance to FCC Chapter 47, part 15:
15.209(a) Radiated Emissions
15.247(d) Spurious Emissions

4.2 Description of Equipment under Test (EUT)

Date of Receipt:	20-5-2014
Client:	Chris Freeman
Brand Name:	Raymarine
Product Range:	Multifunction Display
Country of Manufacture:	China
Operational voltage range:	10.8V to 31.2V

Unit 3

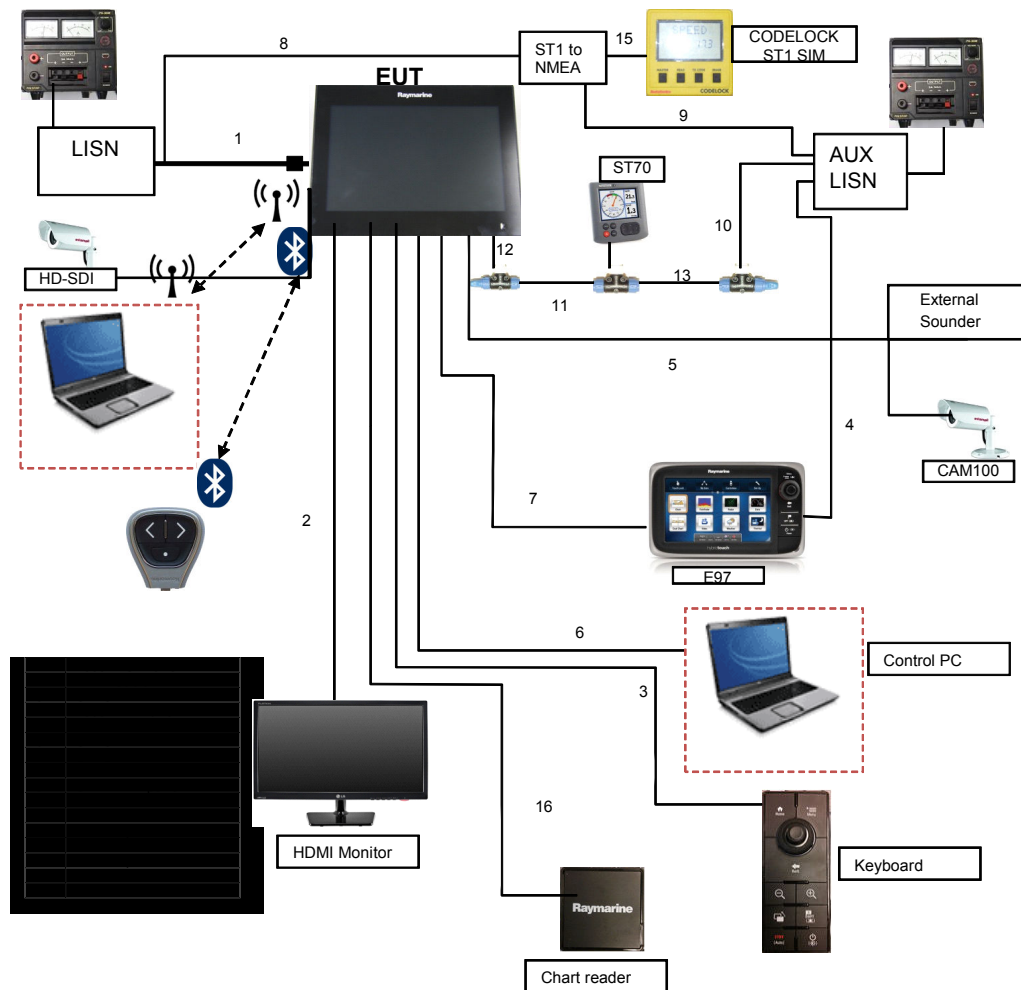
Model Name or Number:	gS195
FCC ID	PJ5-WFBT9
IC ID	4069B-WFBT9
Unique Type Identification:	E70213
Serial Number:	0540010
CCT Diagram Number(s) & Issue:	1003173-2, 1003183-5
PCB Assembly Number(s) & Issue:	1003174-3, 1003184-5
Software Version:	Platform V10.13-00069 Application V11.03D
Modifications to Unit:	None

4.3 Additional information

4.4 Description of Auxiliary Equipment

Product Type	Part Number	Serial Number
ST1 Simulator	Codelock	EMC170306d
HD-SDI Source		
ST1 to NMEA Converter	E85001	EMC111004a
ST70	E22105	1270965
Compaq Laptop	NC6220	RM0048
RCU-3	E62351	
Card Reader	A80218	0530036
RMK-9 Aux Keyboard	A80217	0530008
LG Monitor	IPS237LY	208NDHBKL057
Raymarine MFD e97	E70022	EMC120117A

4.5 Test setup



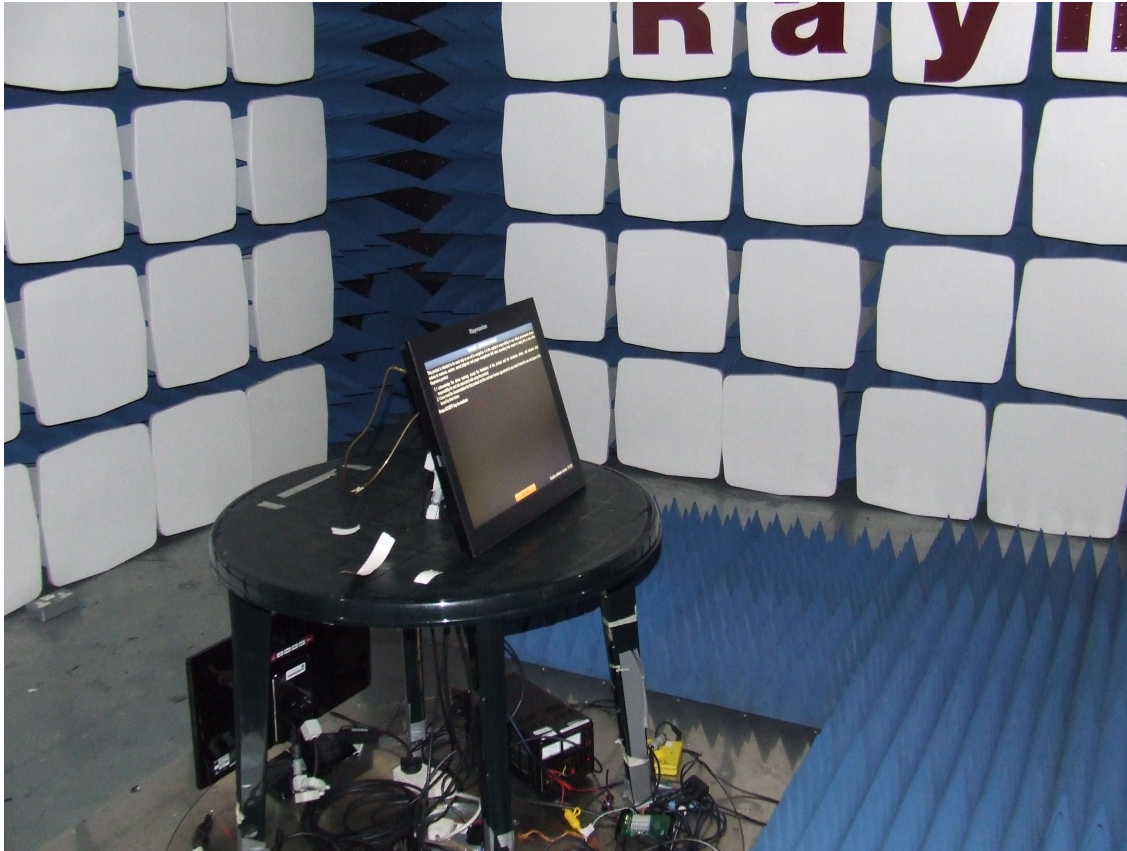
4.6 Emissions – Below 2GHz

Below 2GHz the unit was setup in a system to ensure the EUT was fully functional. The Bluetooth and WIFI were functional during testing.

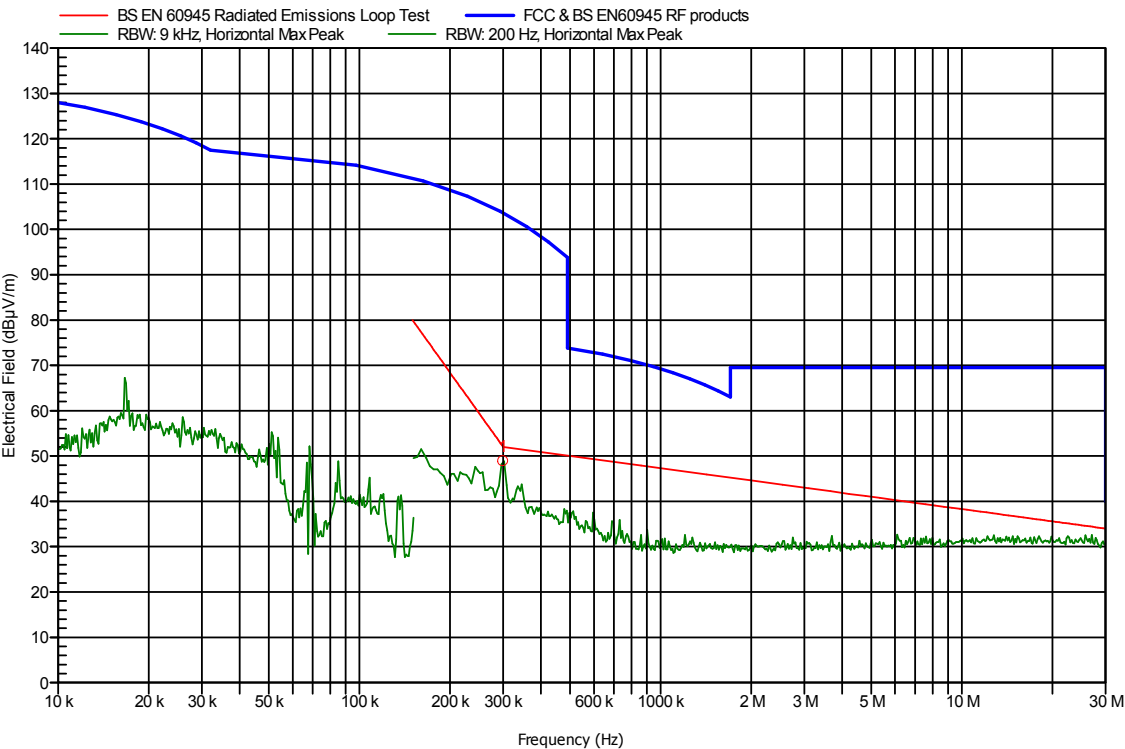
4.7 Transmitter Spurious Emissions – 2GHz - 26GHz

2GHz to 26GHz the unit was setup in a system to ensure the EUT was fully functional. Control of the WIFI and Bluetooth was controlled externally to enable the WIFI and Bluetooth Emissions to be measured separately.

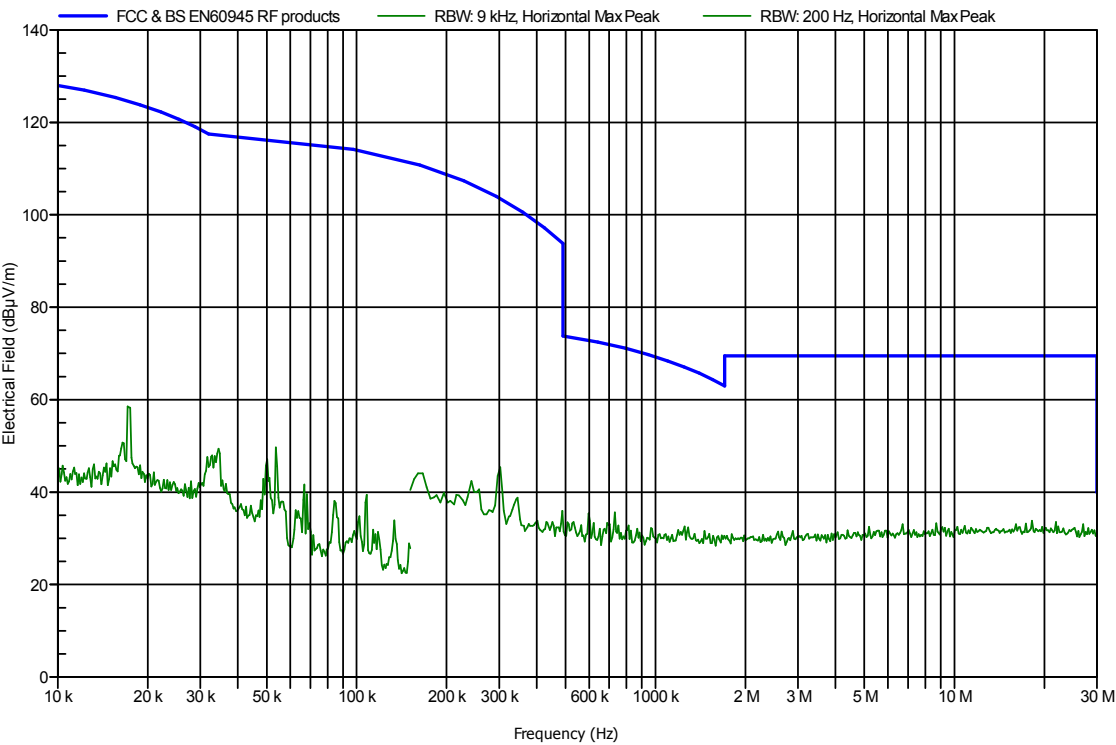
5 Photographs



6 Emissions Results
6.1 gS195 Emissions 9kHz - 30MHz

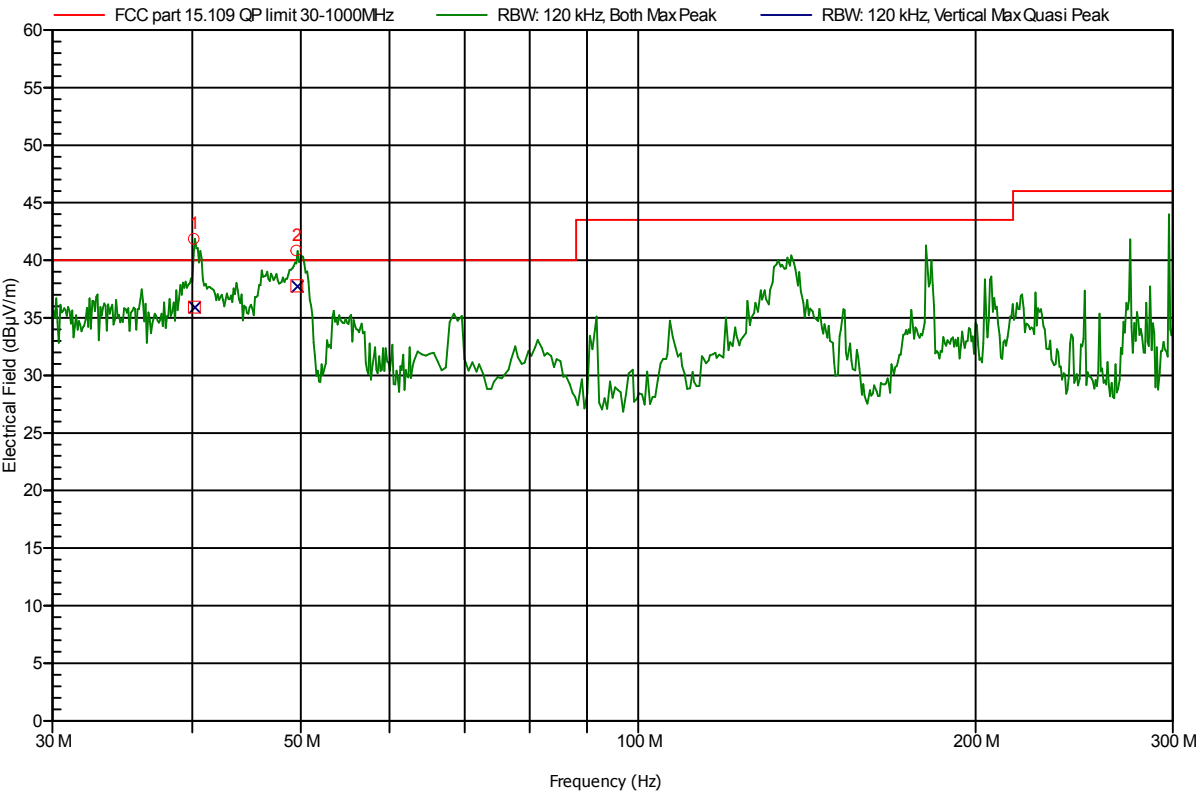


Loop Face On



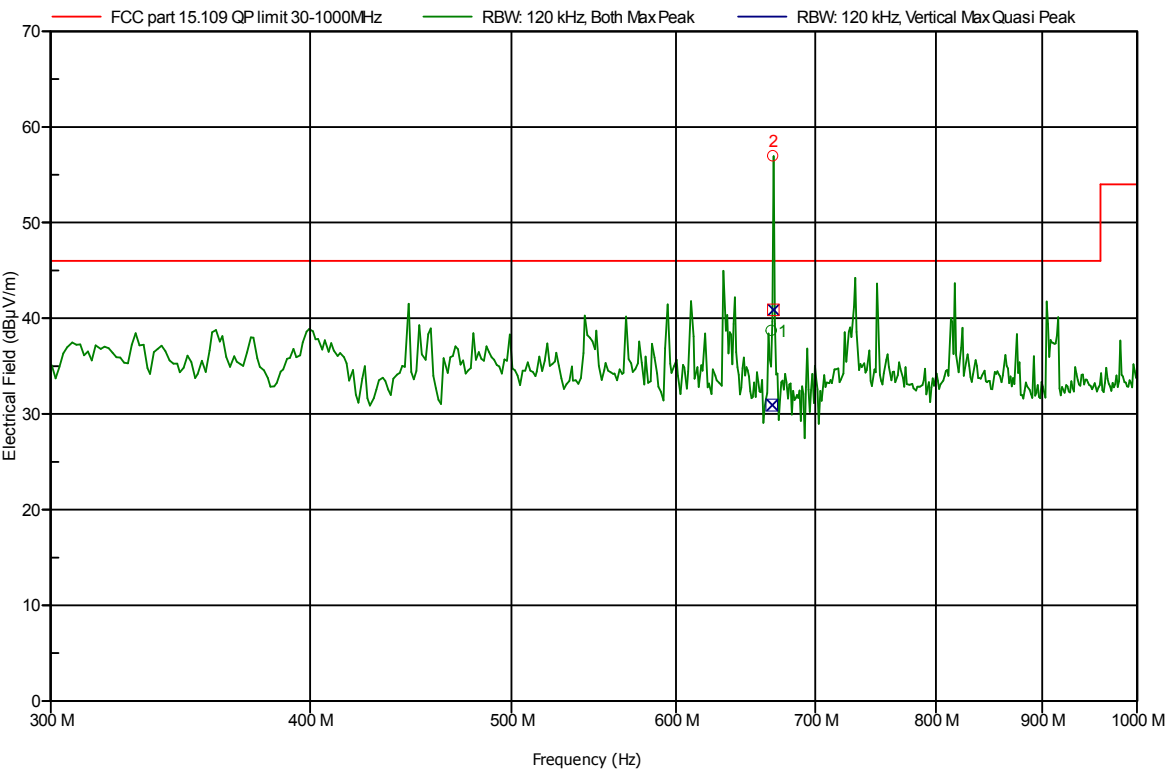
Loop Side On

6.2 gS195 Emissions 30MHz - 300MHz EUT



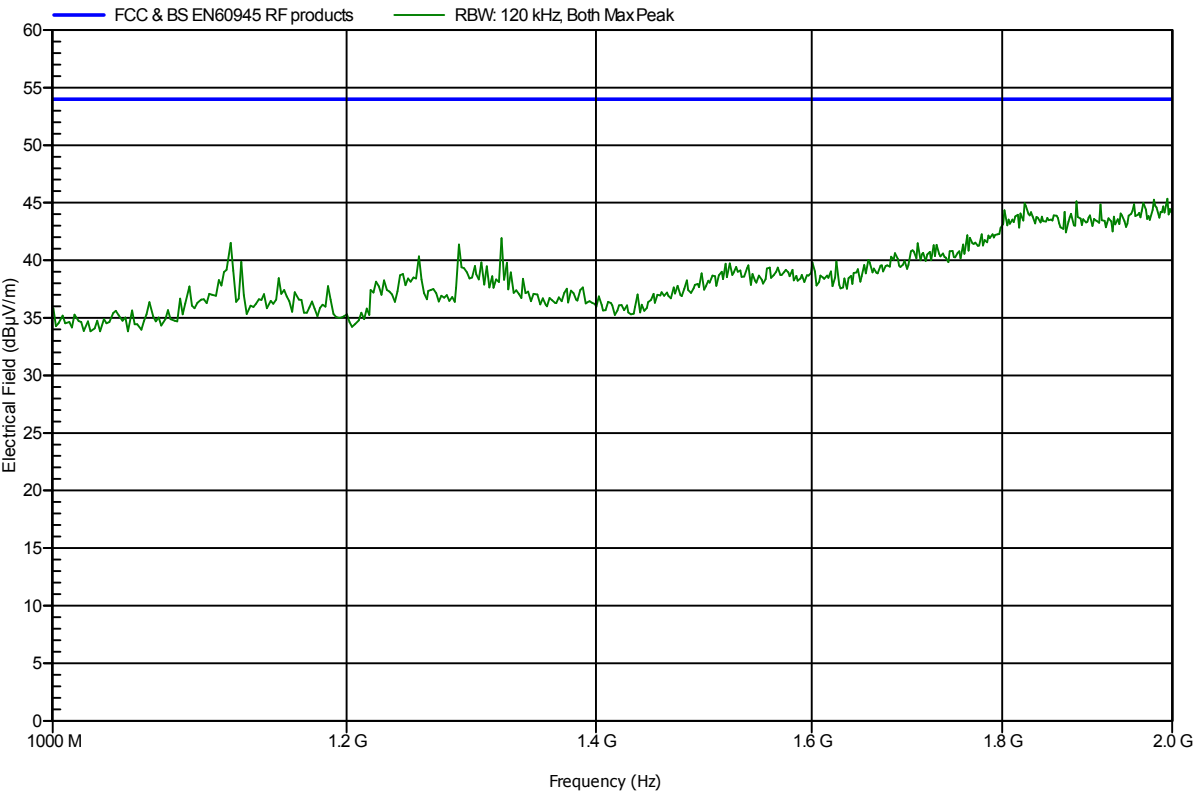
Nr	Frequency	Peak Value (dBµV/m)	QP Value (dBµV/m)	QP Limit (dBµV/m)	Result	Angle	Height (m)	H/V
1	40.172 MHz	41.81	35.94	40	Pass	300 Degree	100 cm	V
2	49.595 MHz	40.8	37.77	40	Pass	225 Degree	100 cm	V

6.3 gS195 Radiated Emissions 300MHz - 1GHz



Nr	Frequency	Peak Value (dBµV/m)	QP Value (dBµV/m)	QP Limit (dBµV/m)	Result	Angle	Height (m)	H/V
1	667.126 MHz	38.66	30.93	46	Pass	225 Degree	100 cm	V
2	668.246 MHz	56.92	40.87	46	Pass	225 Degree	100 cm	V

6.4 gS195 Radiated Emissions 1GHz - 2GHz

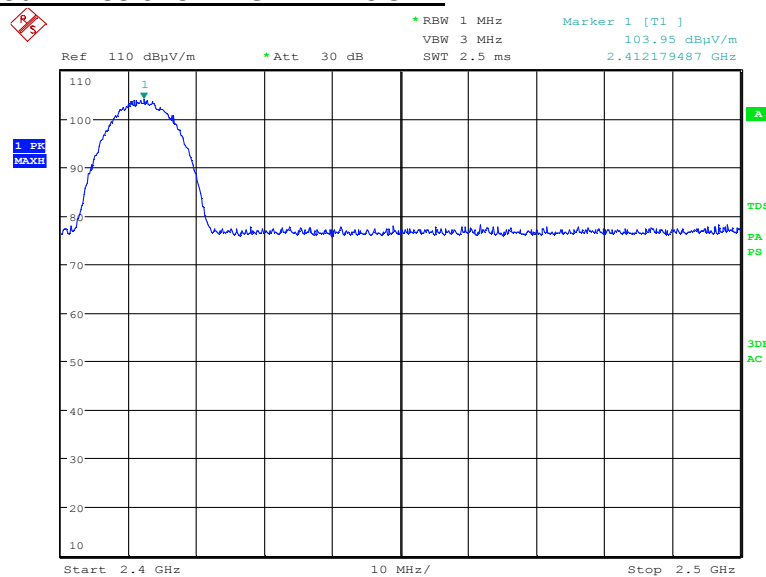


6.5 FCC Part 15, Chapter 47_15.247 Spurious Emissions – 2GHz to 26GHz

The following plots illustrate the radiated emissions of the EUT from 2GHz to 26GHz. The limits for emissions in this band is 20dBc and 500µV/m. Any emissions more than 10dB of this limit are not recorded, however all emissions were more than 10dB below this limit. The 2nd harmonic is due to the receiver and not from the EUT. In the range 2GHz to 18GHz a 2.4GHz Wi-Fi/BT blocking filter was used to prevent distortion on the measuring receiver.

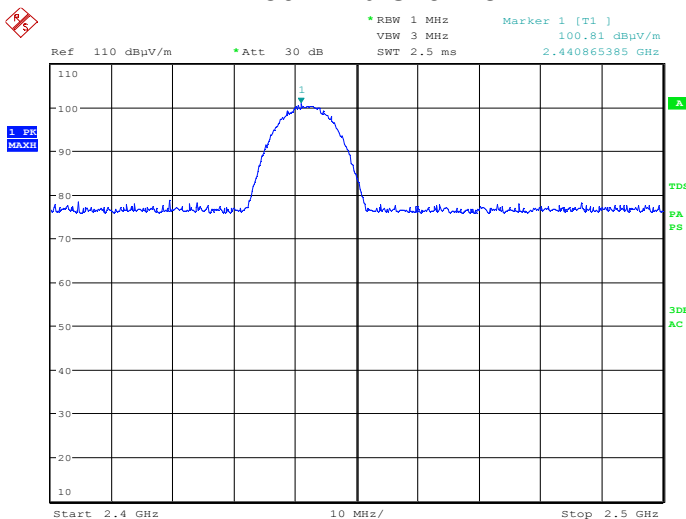
6.5.1 Wi-Fi Emissions

6.5.1.1 Radiated Emissions 2.4GHz - 2.5GHz



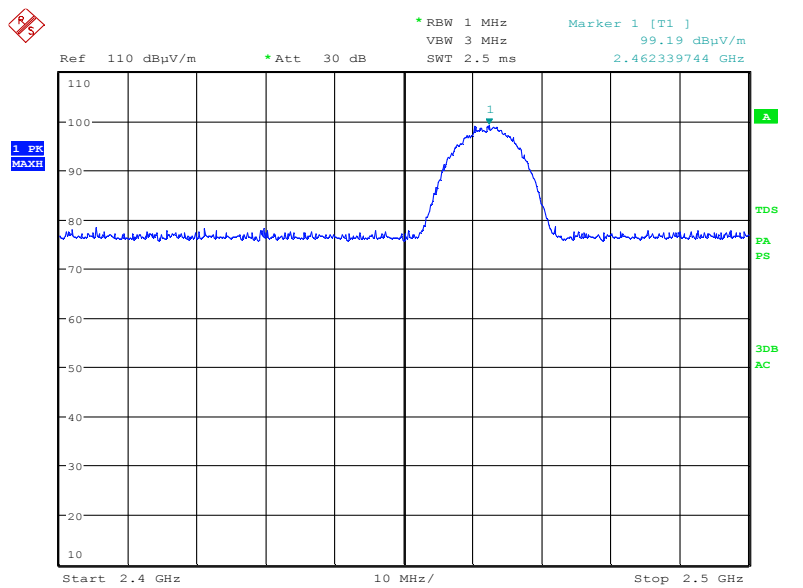
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802.11b Channel 1



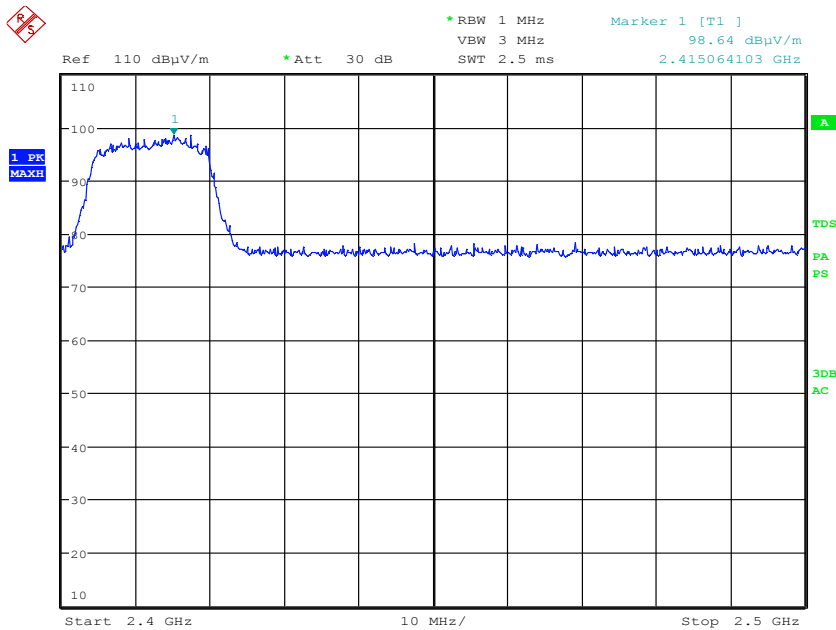
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802.11b Channel 7



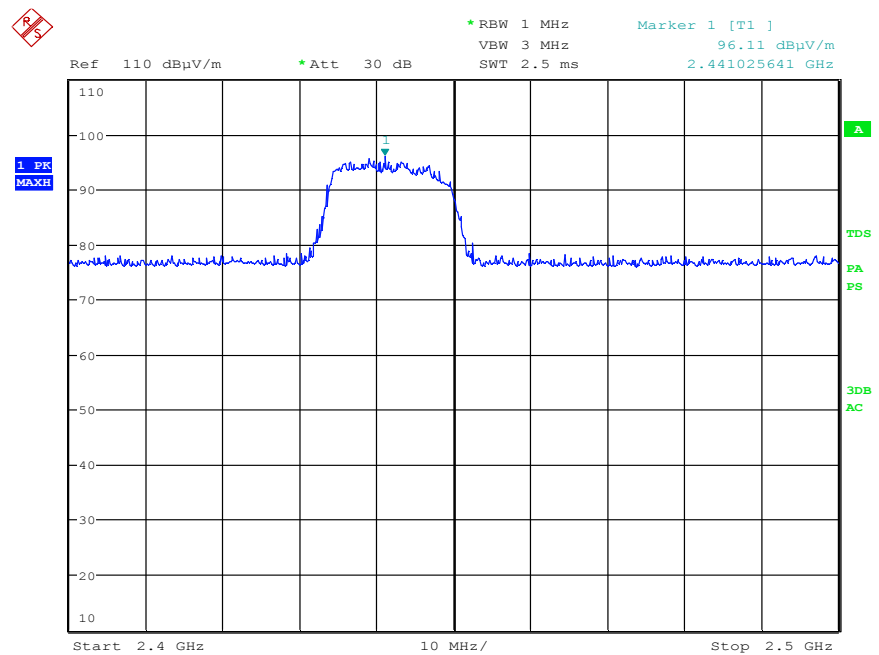
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802.11b Channel 11



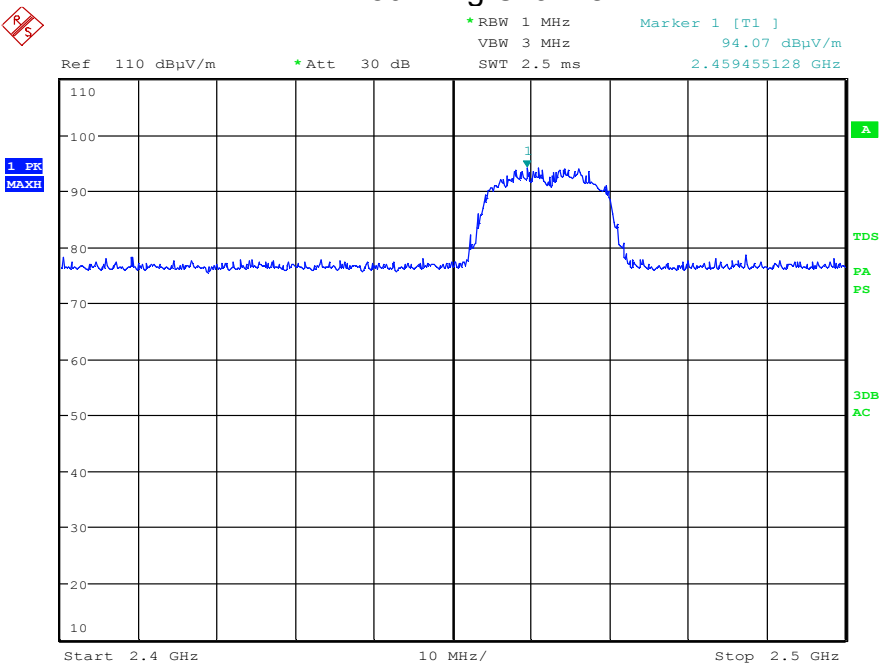
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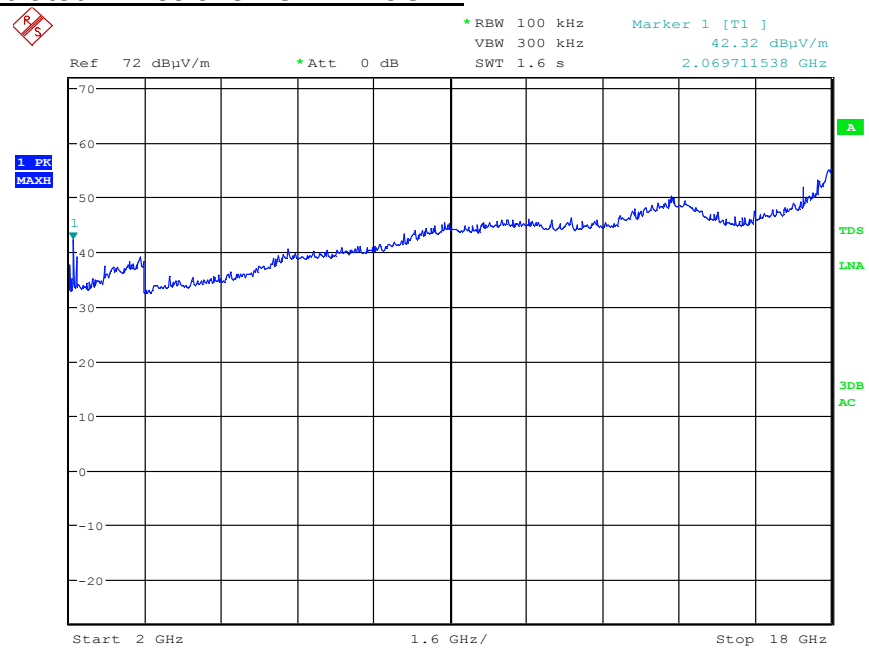
802.11g Channel 7



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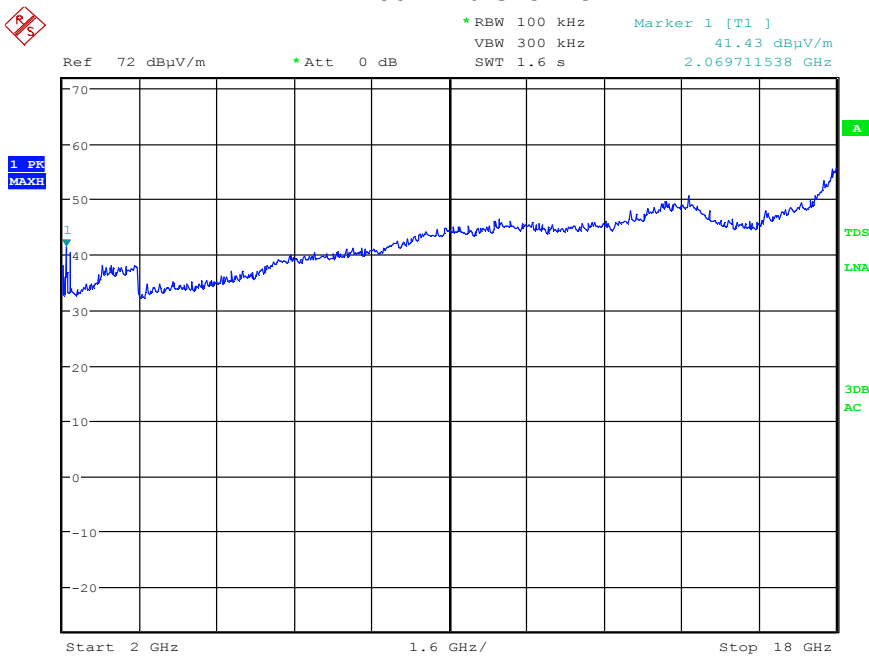
802.11g Channel 11

6.5.1.2 Radiated Emissions 2GHz - 18GHz



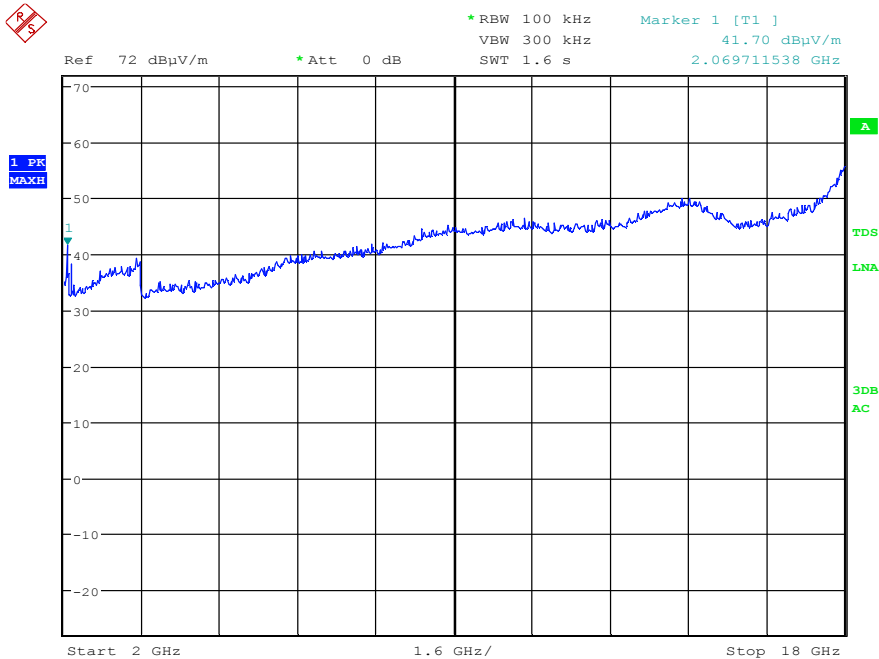
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802.11b Channel 1



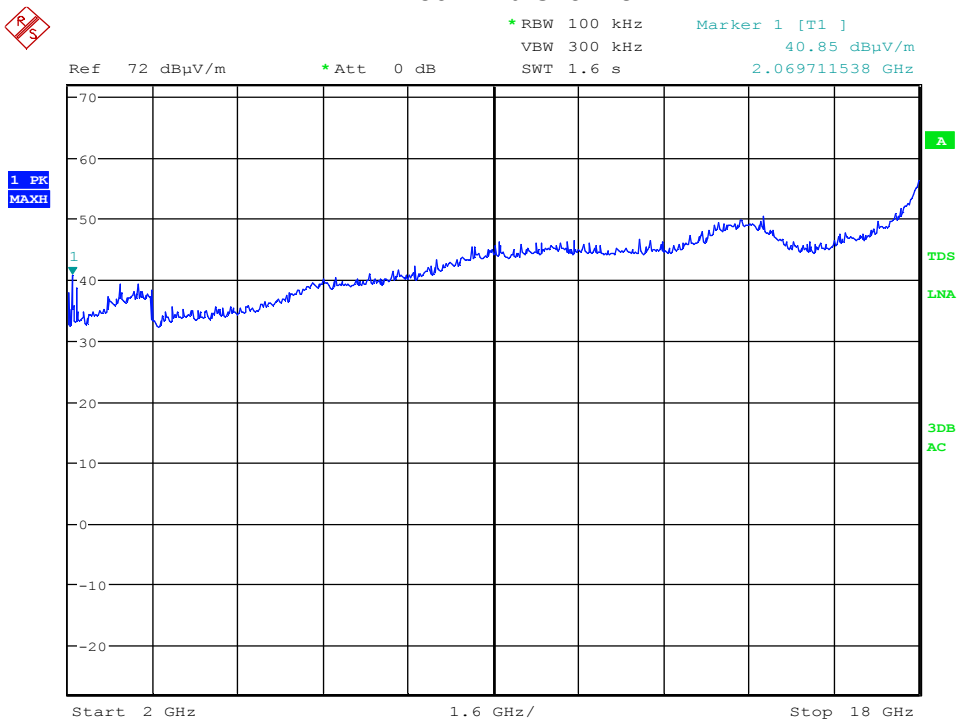
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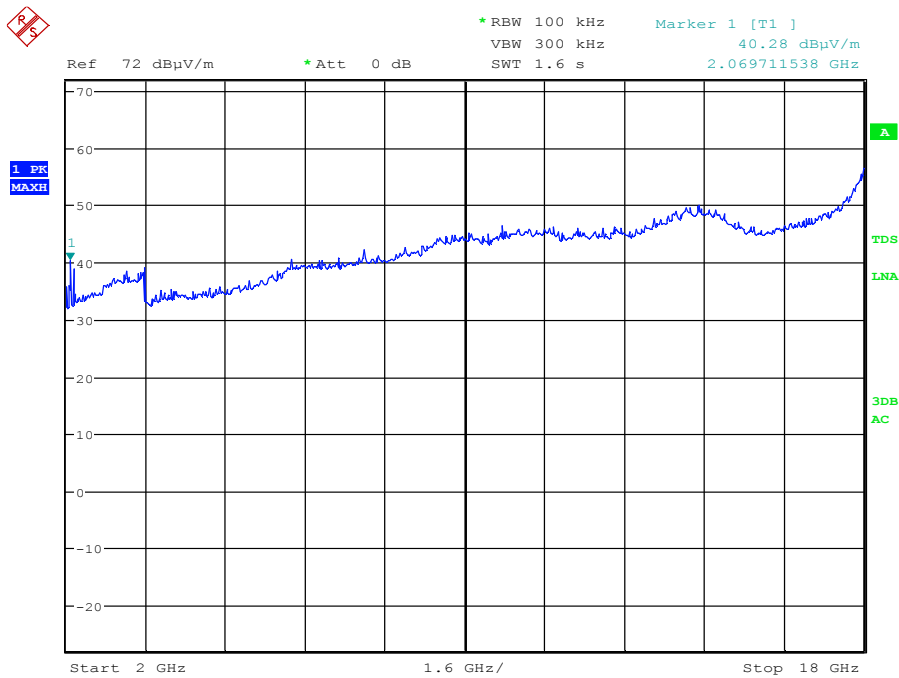
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802.11b Channel 11



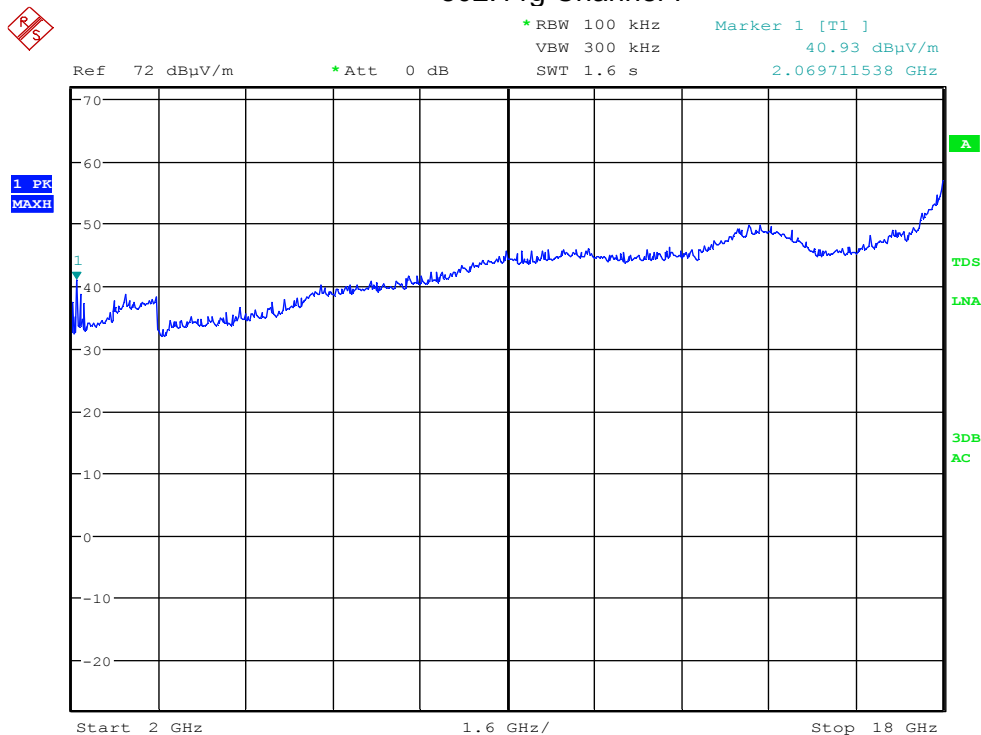
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802.11g Channel 1



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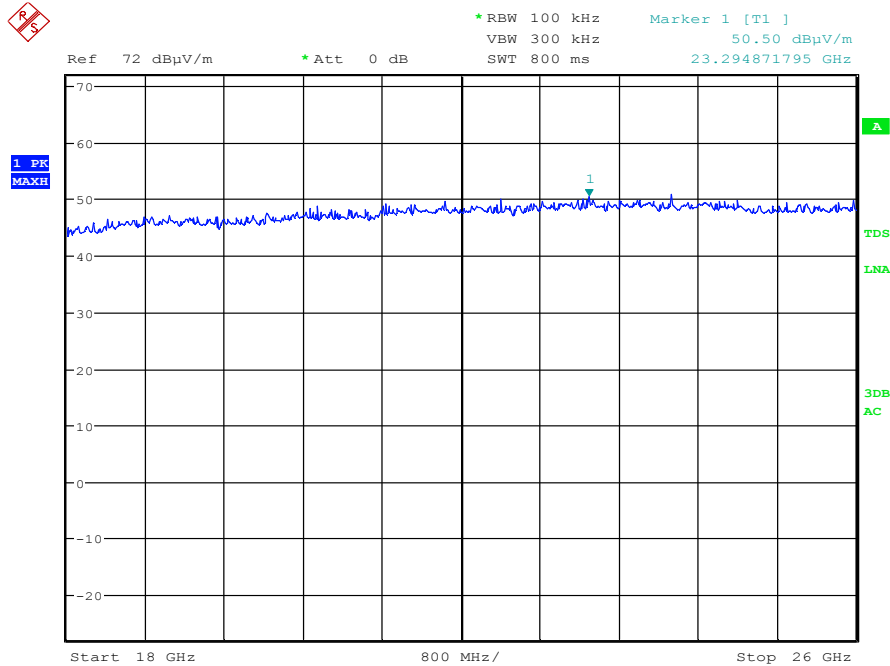
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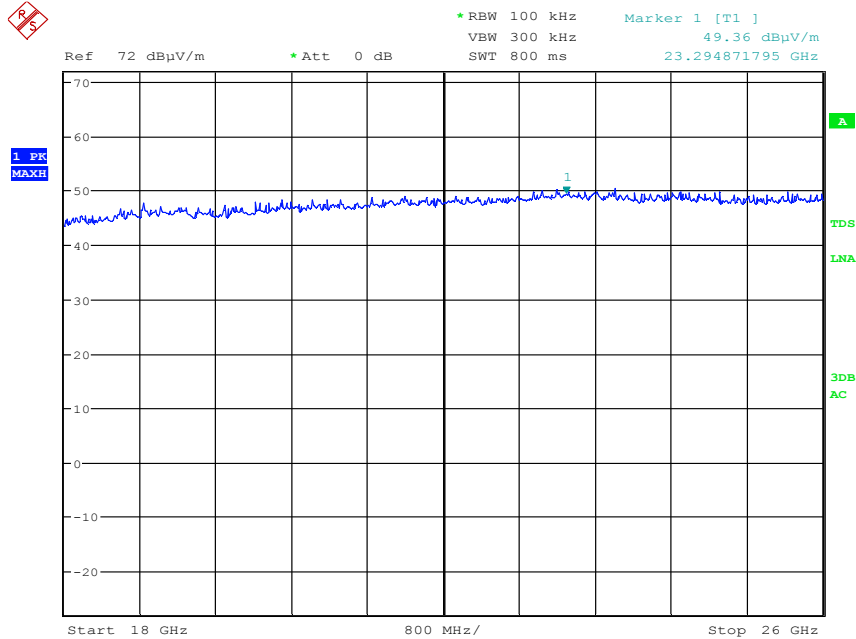
802.11g Channel 11

6.5.1.3 Radiated Emissions 18GHz - 26GHz



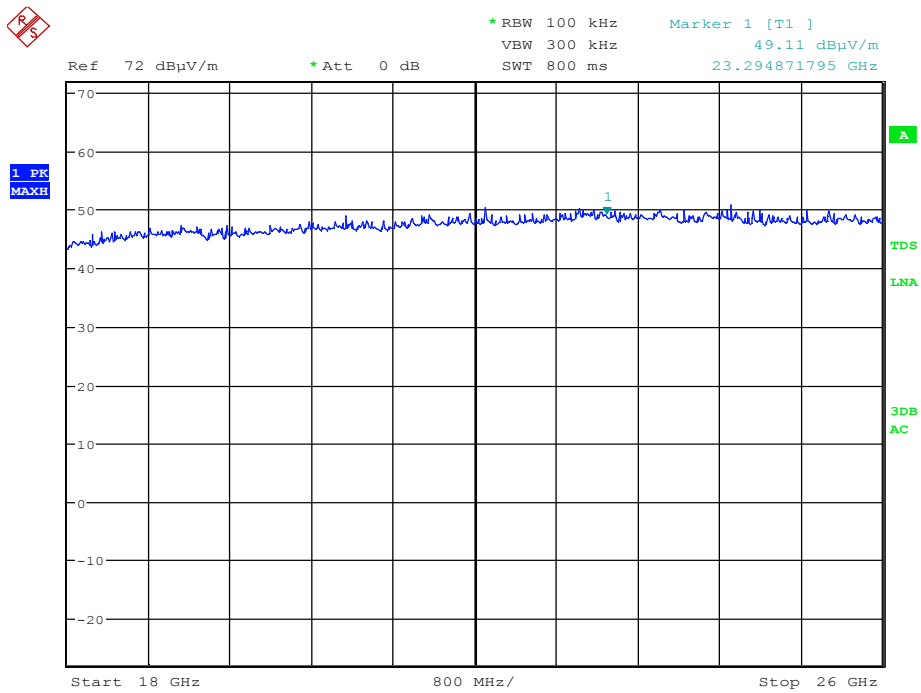
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802.11b Channel 1



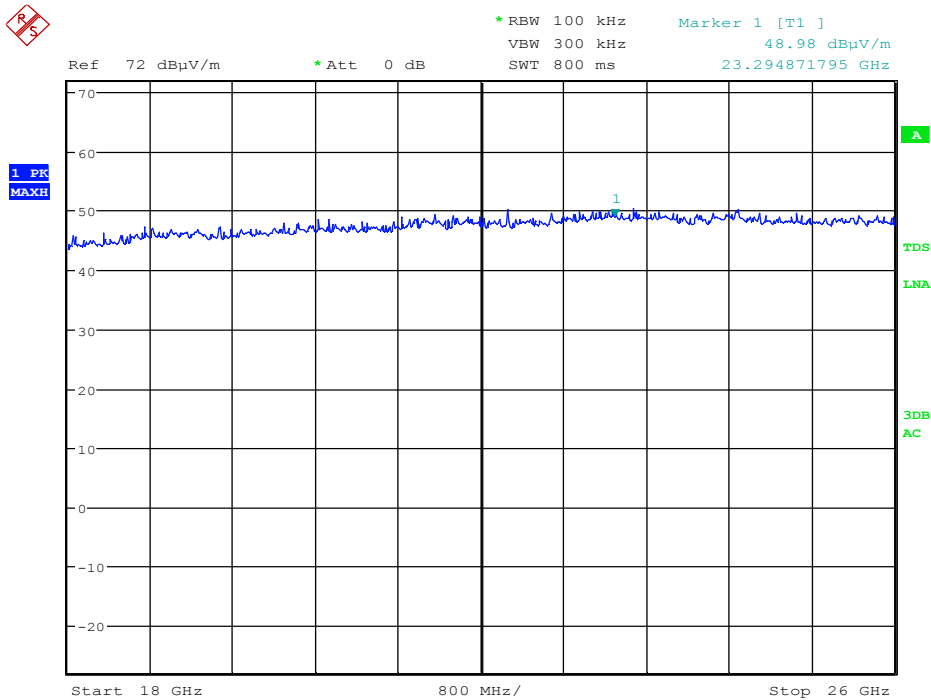
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802.11b Channel 7



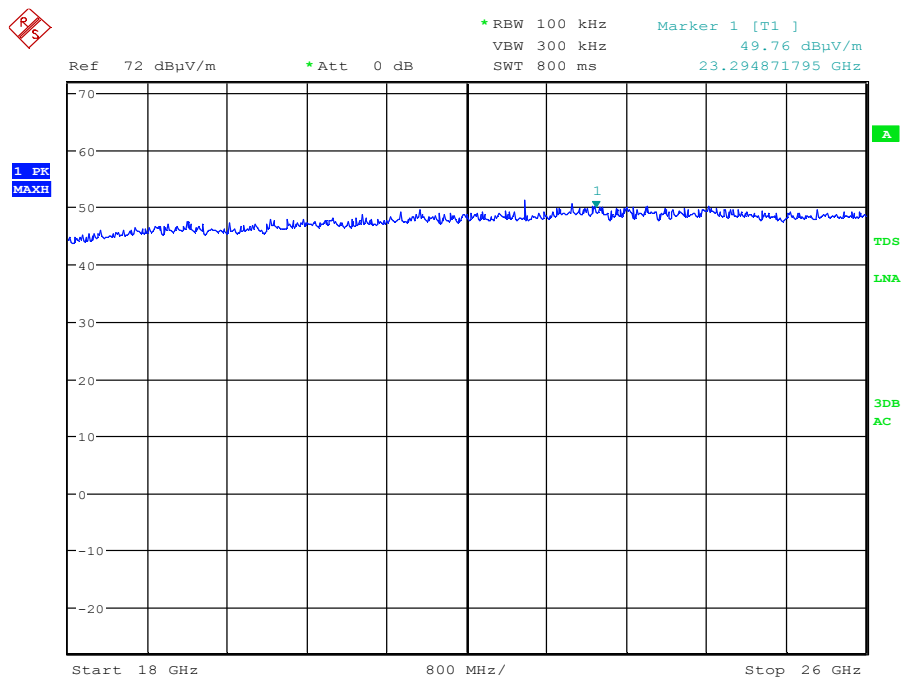
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802.11b Channel 11



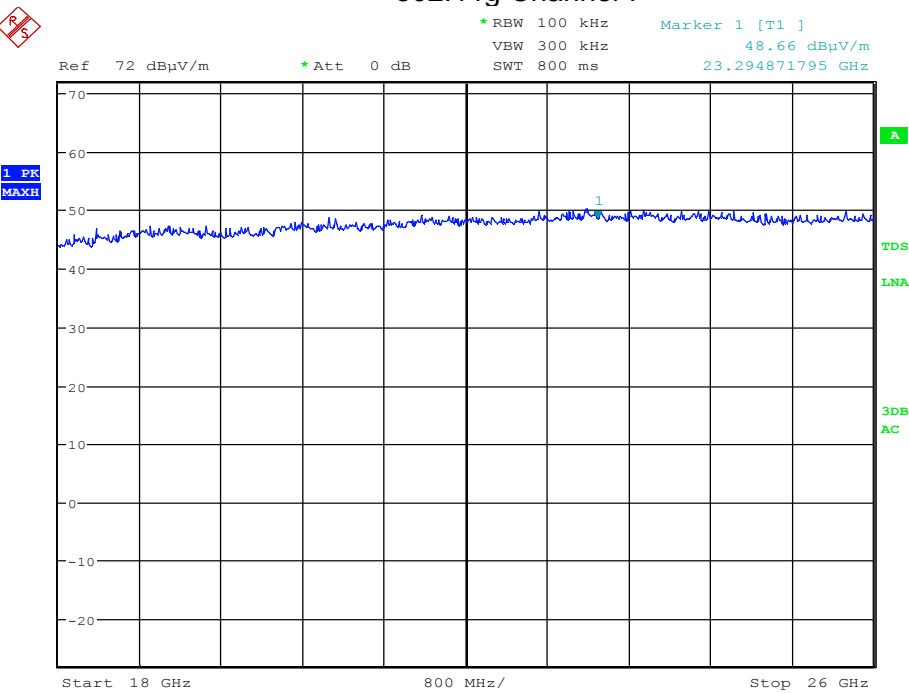
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802.11g Channel 1



Date: 3.JUL.2014 12:54:10

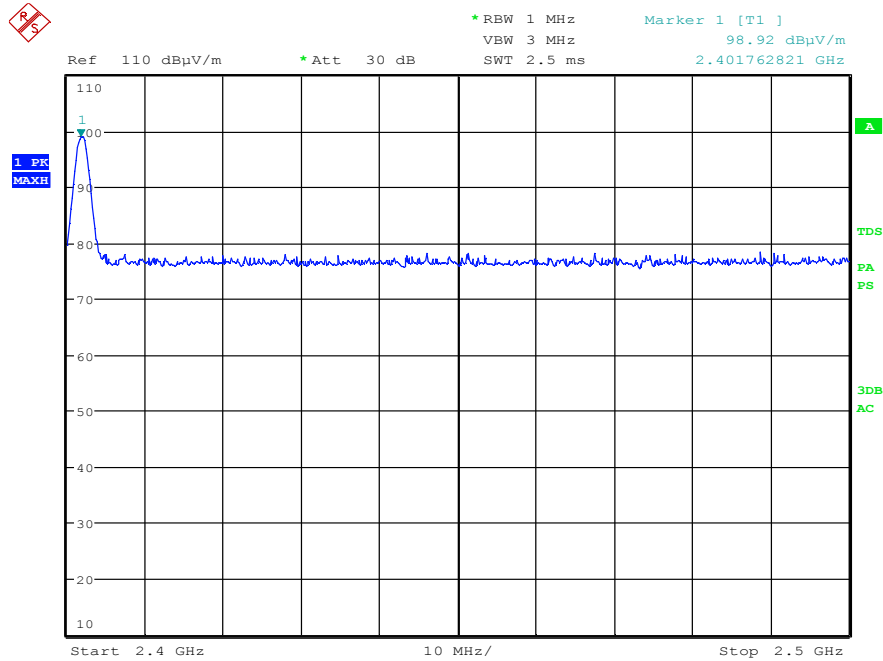
802.11g Channel 7



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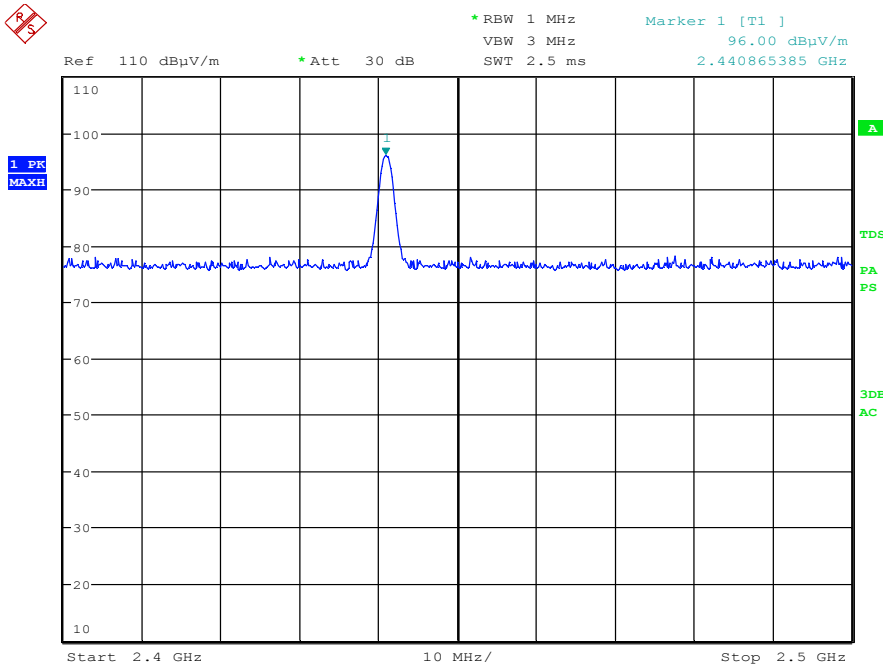
802.11g Channel 11

6.5.2 Bluetooth Emissions
6.5.2.1 Radiated Emissions 2.4GHz – 2.5GHz



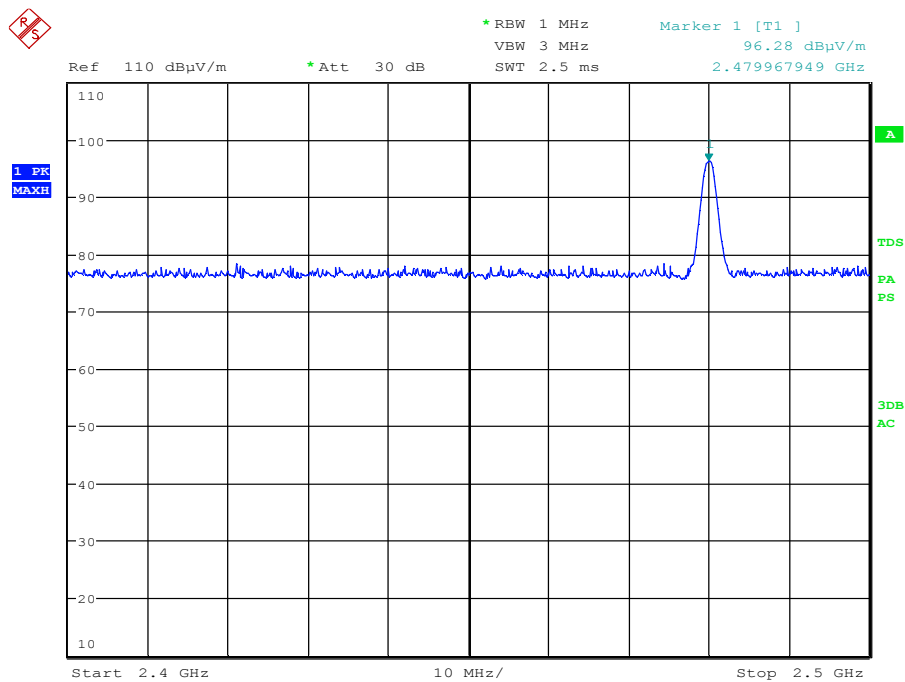
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Channel 1



Date: 3.JUL.2014 11:01:50

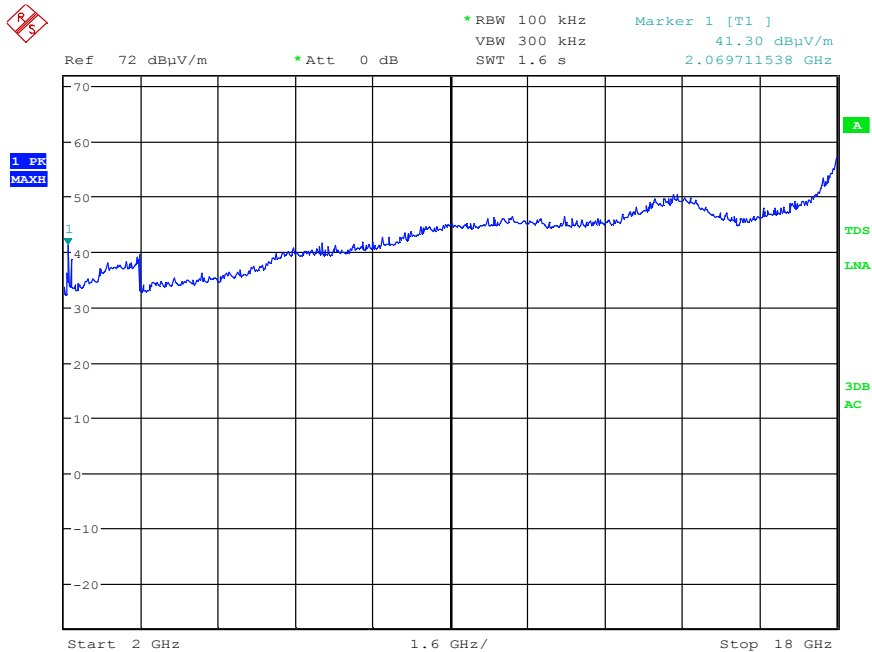
Channel 40



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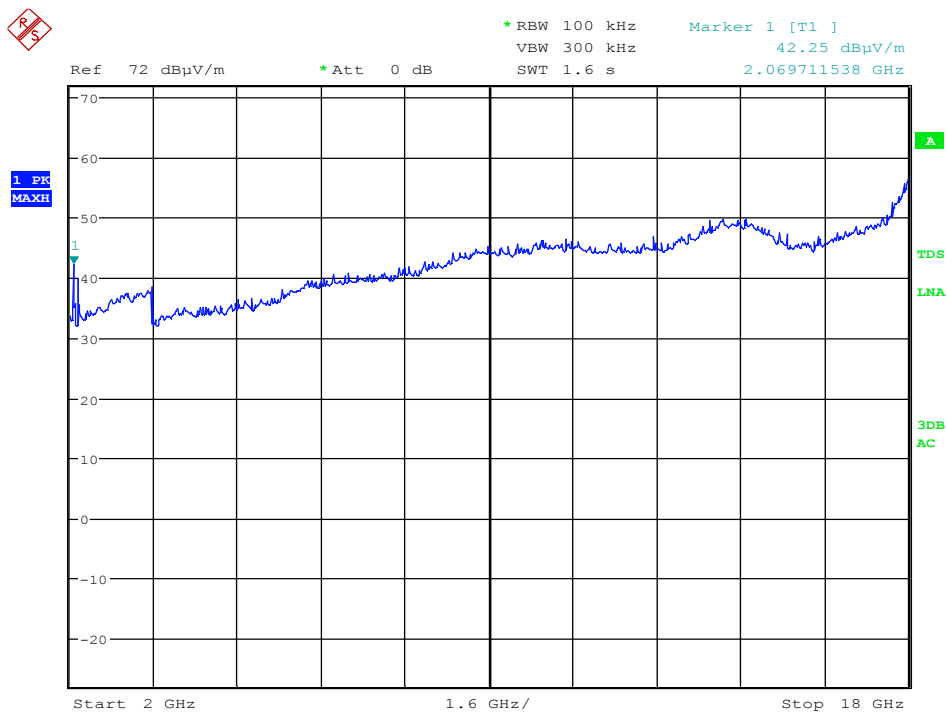
Channel 79

6.5.2.2 Radiated Emissions 2GHz to 18GHz



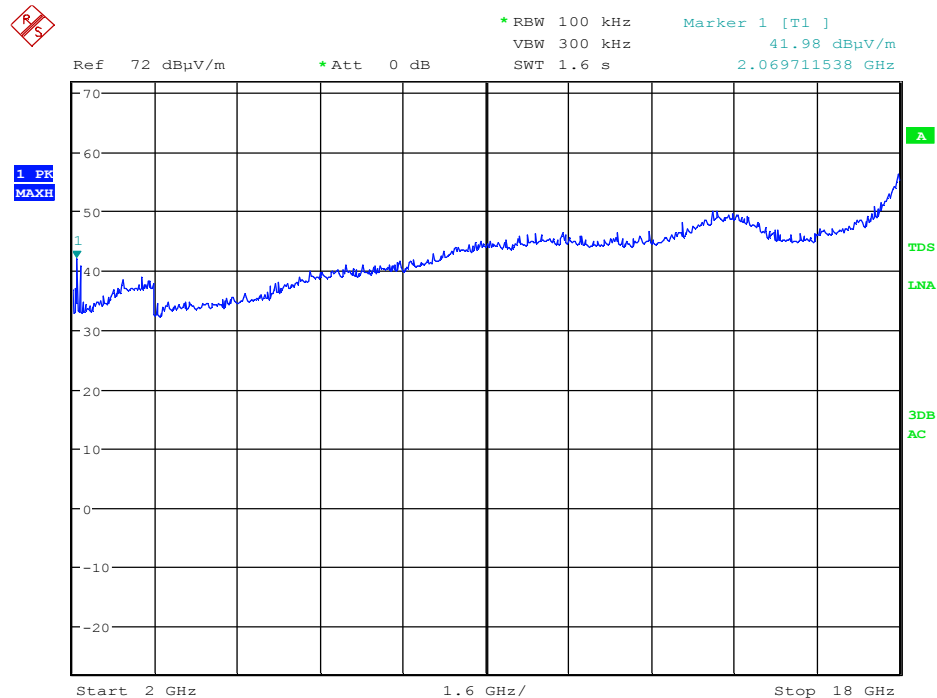
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Channel 1



Date: 3.JUL.2014 11:16:30

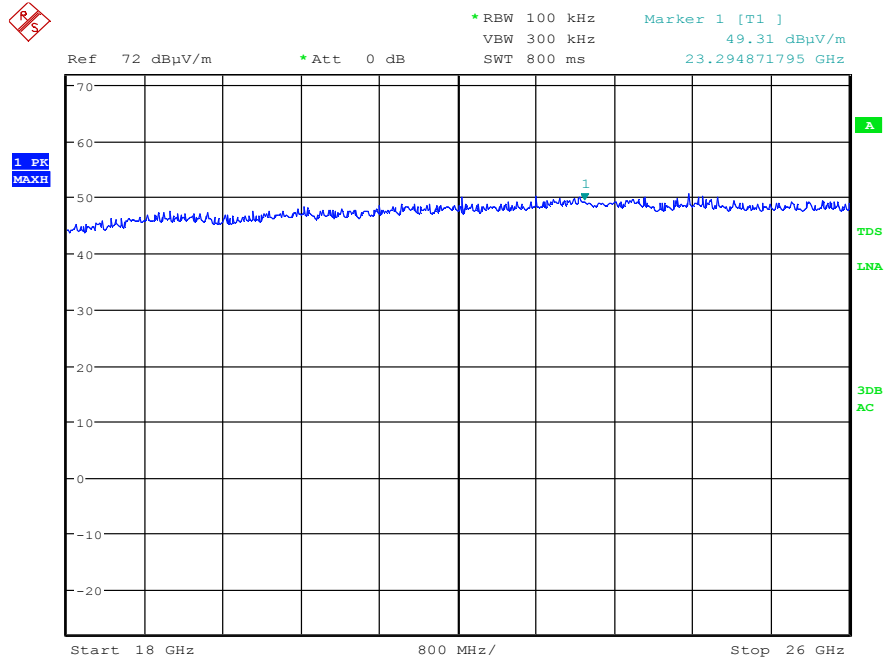
Channel 40



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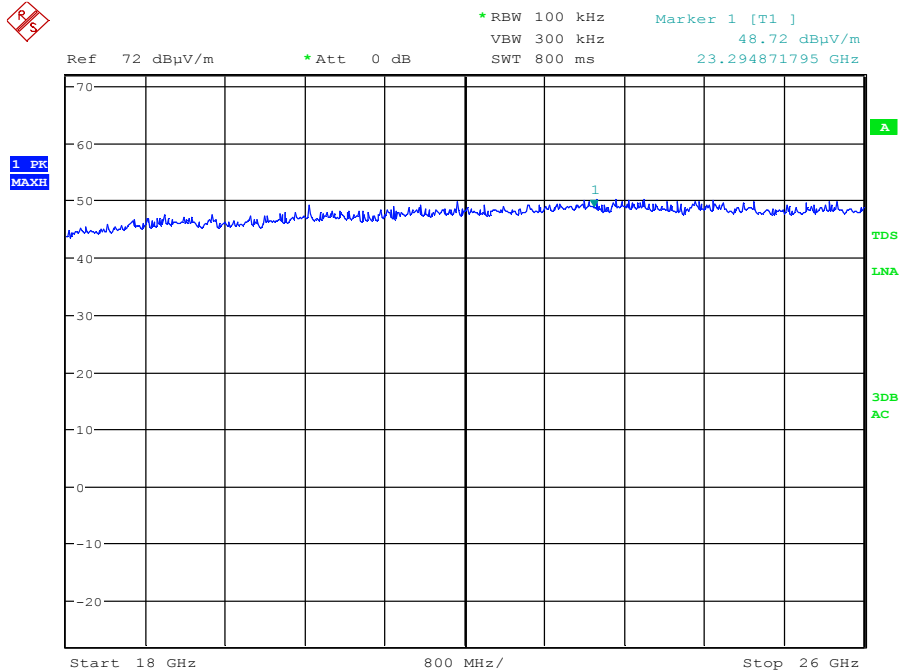
Channel 79

6.5.2.3 Radiated Emissions 18GHz to 26GHz



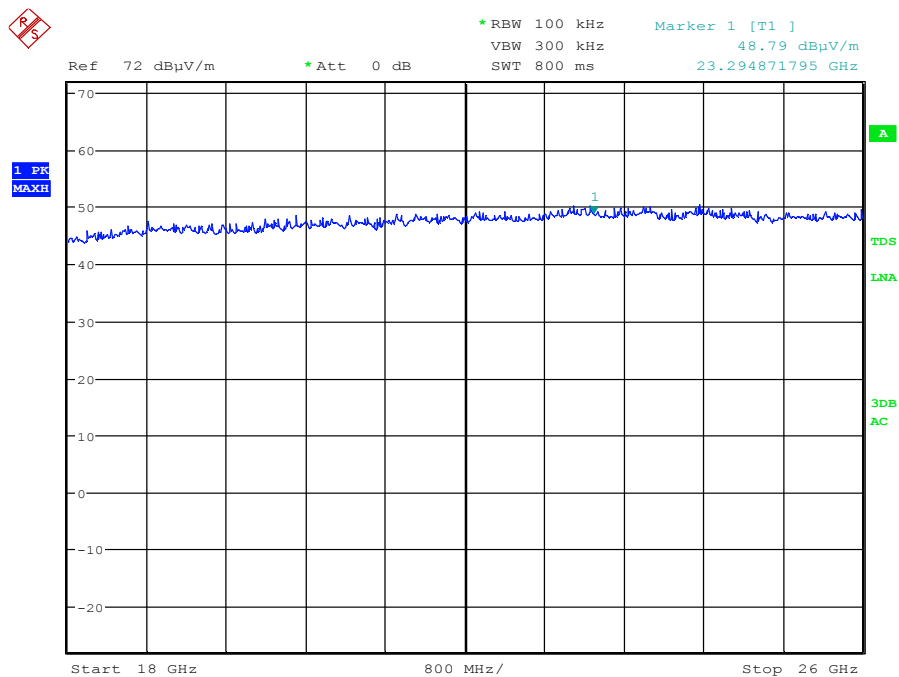
Date: 3.JUL.2014 13:23:10

Channel 1



Date: 3.JUL.2014 13:25:25

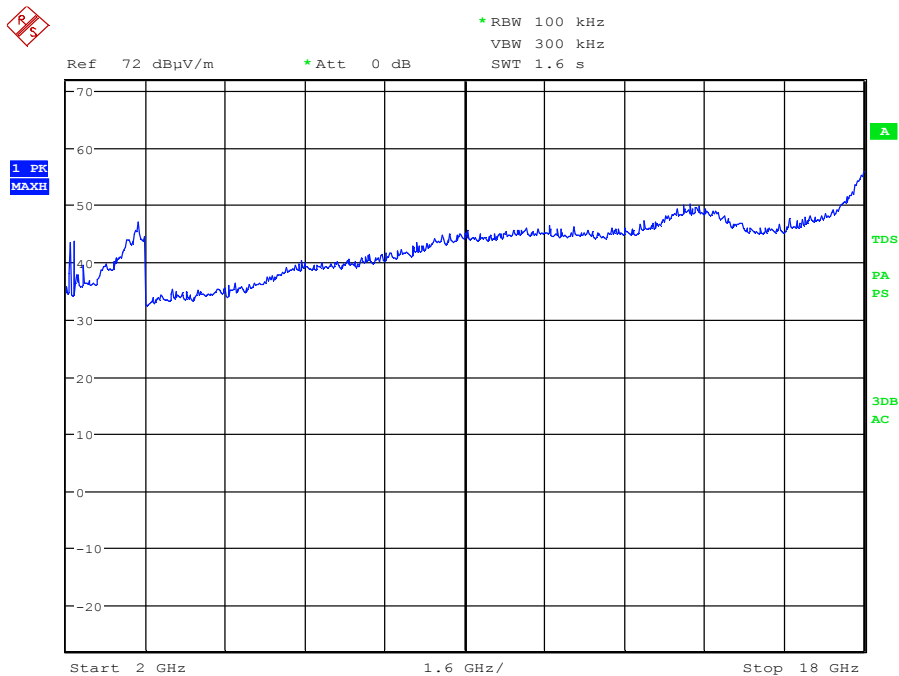
Channel 40



Date: 3.JUL.2014 13:27:31

Channel 79

6.5.3 Receiver Spurious Emissions



Date: 3.JUL.2014 10:32:02

7 List of Test Equipment

Test Equipment Type	Manufacturer and Type Number	Serial Number	Cal No.	Cal Due
Digital Multimeter	Fluke 175	97460092	2248	13 th Nov 2014
EMI Receiver 20Hz to 26.5GHz	Rohde & Schwarz ESI-26	832692/006	00886	12 th Sep 2014
Active Loop Antenna 9kHz - 30MHz	Chase EMC HLA6120	1122	00442	14 th Feb 2014
Loop Antenna PSU/Charger	Chase EMC CBP9721	N/A	02671	N/A
Antenna Horn 1-18GHz	Chase BBHA9120D	9120D-578	01719	2 nd Nov 2014
Antenna Horn 18GHz-26GHz	Credowan 20-R-2843-0007	36755	482	16 th Nov 2014
Antenna 30MHz-3GHz	Chase CBL6141	22932	01802	23 rd Jul 2014
Antenna Mast (Site 1)	Inn-co GmbH MM4000	MM4000/056/13750 806/L	02075	N/A
Turntable (Site 1)	Inn-co GmbH DS1200S	DS1200S/175/1375 0806/L	02076	N/A
Mast/Turntable Controller (Site 1)	Inn-co GmbH Co 2000	CO/2000/359/137/5 0806/L	02077	N/A
EMI Receiver 20Hz to 40GHz	Rohde & Schwarz ESU40	100017	01721	7th Apr 2015
Power Supply Unit	Palstar PS30M	G290775401	2020	N/A

In accordance with UKAS requirements, all measuring equipment is on a calibration cycle.