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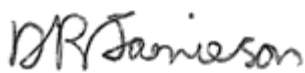
Email: [compliance@raymarine.com](mailto:compliance@raymarine.com)

<http://www.raymarine.com>

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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<br>Mike Thompson<br>EMC Engineer    |  | Date | 4 <sup>th</sup> July 2014 |
| Technical Check<br>David Jamieson<br>EMC Engineer |  | Date | 8 <sup>th</sup> July 2014 |
| Approval<br>Andrew Little<br>Compliance Manager   |  | Date | 8 <sup>th</sup> July 2014 |

|                 |                                                        |
|-----------------|--------------------------------------------------------|
| Test Date Range | 24 <sup>th</sup> June 2014 – 3 <sup>rd</sup> July 2014 |
|-----------------|--------------------------------------------------------|

|                |      |
|----------------|------|
| Product Status | PASS |
|----------------|------|

This test report shall not be reproduced except in full, without written approval of Raymarine UK Ltd.

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)<br>Radiated Emissions | RSS-GEN<br>7.5.2              | Pass |
| 15.247(d)<br>Spurious Emissions | A8.5<br>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<br>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<br>EMC Engineer |  | 4 <sup>th</sup> 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: 7<sup>th</sup> July 2014**

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3 Test Information

3.1 Test Facilities

|        |                                         |                            |                           |
|--------|-----------------------------------------|----------------------------|---------------------------|
| Site 1 | 9m x 6m x 5.5m<br>Semi Anechoic Chamber | FCC ID<br>IC Certification | Reg 371673<br>Reg 4069B-2 |
|--------|-----------------------------------------|----------------------------|---------------------------|

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<br>(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

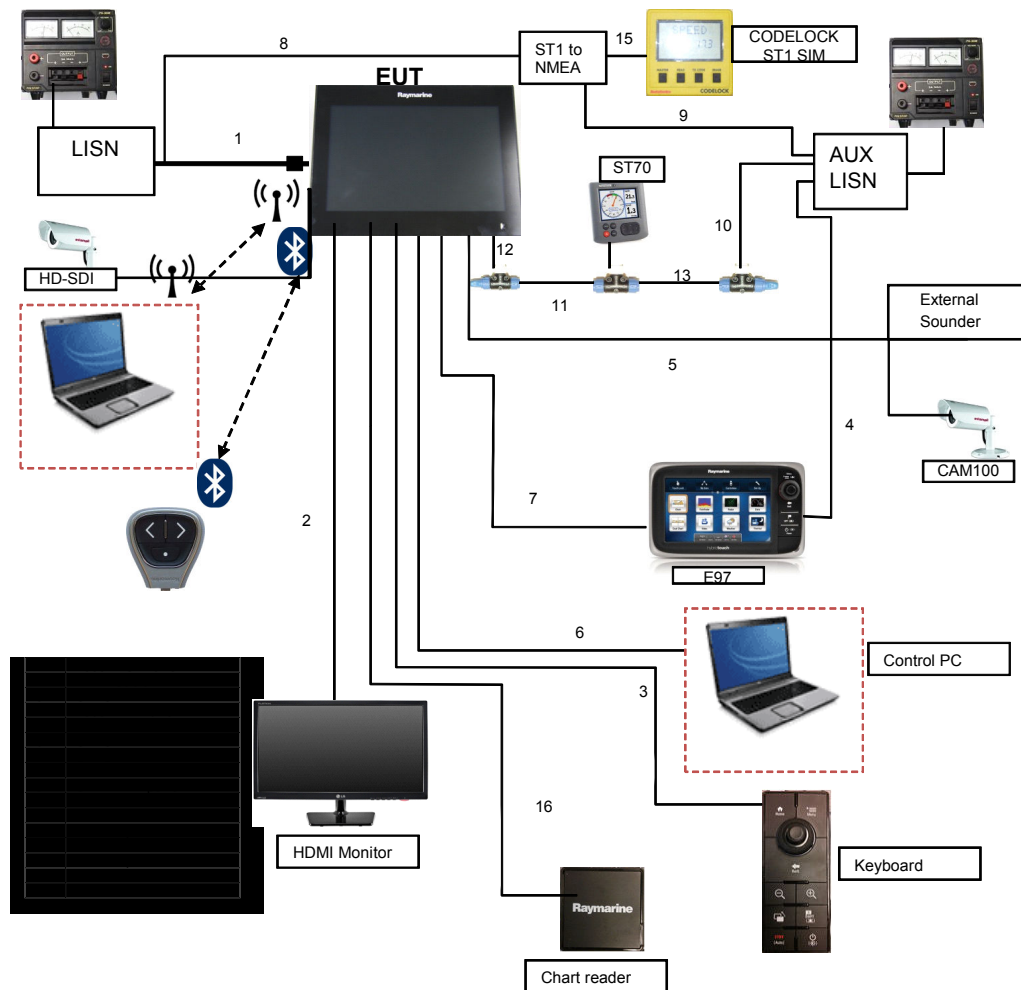
|                                 |                                              |
|---------------------------------|----------------------------------------------|
| Model Name or Number:           | gS195                                        |
| FCC ID                          | PJ5-WFBT9                                    |
| 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<br>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



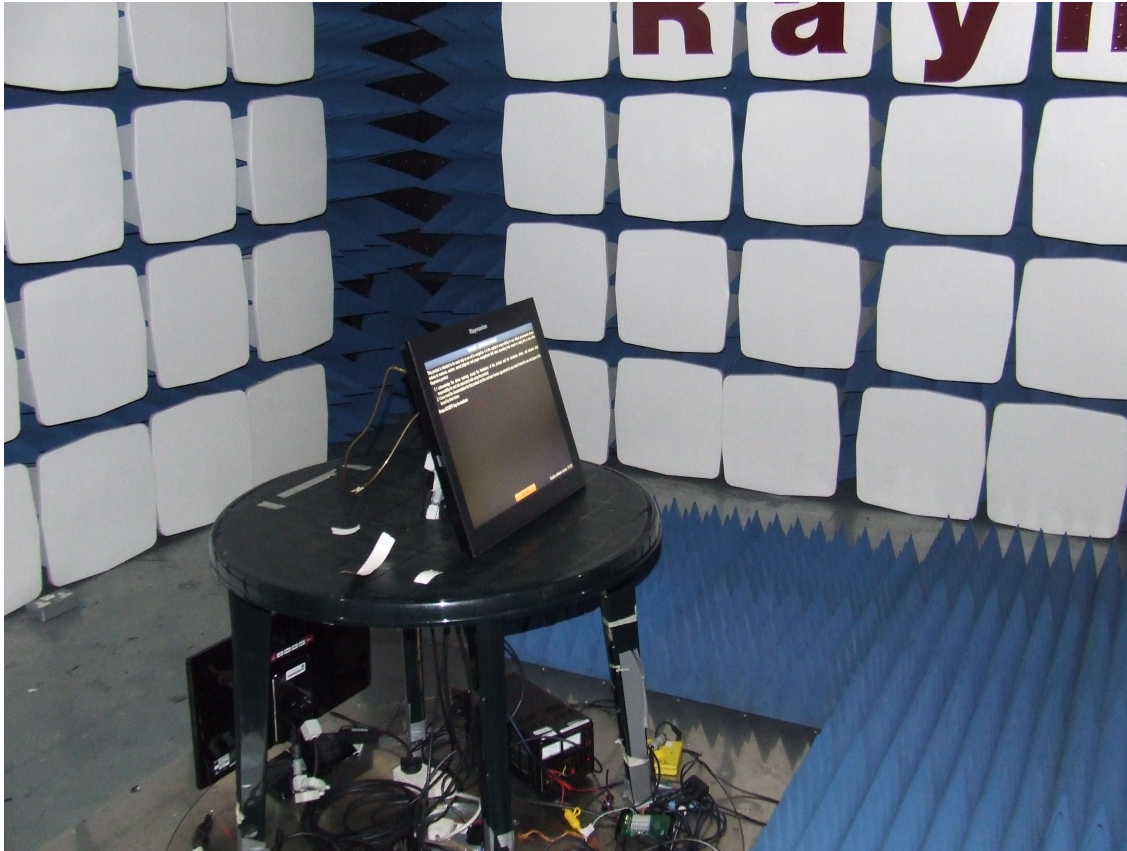
#### 4.6 Emissions – Below 2GHz

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

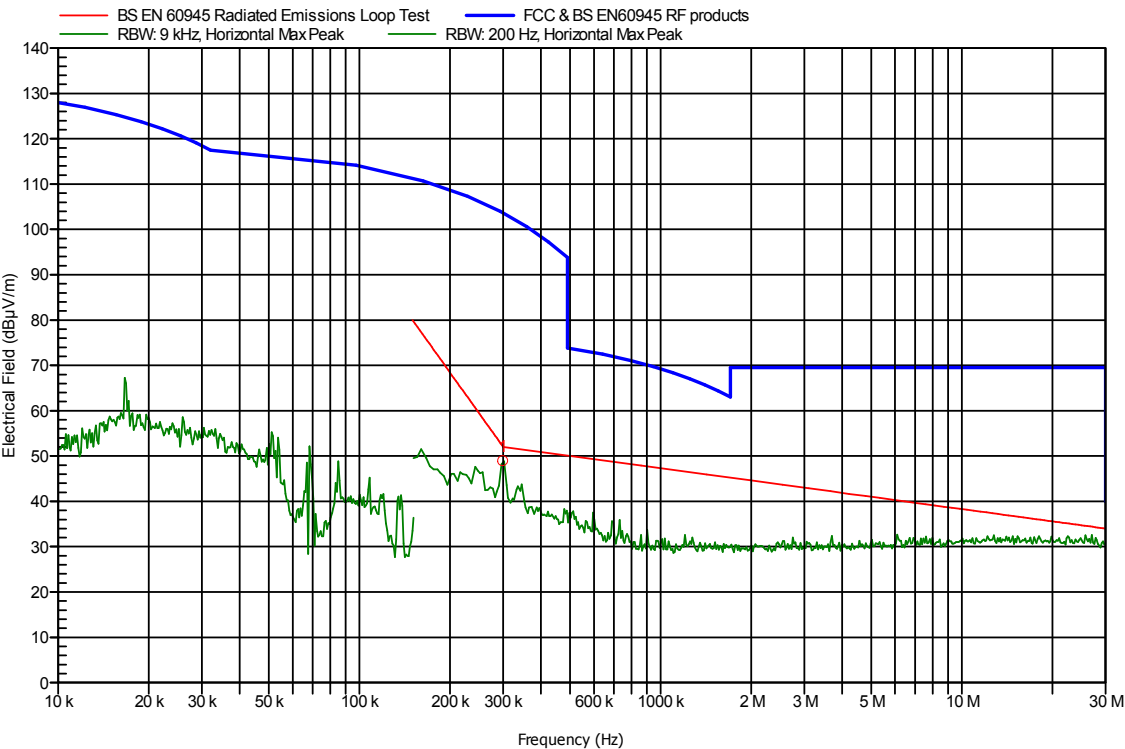
#### 4.7 Transmitter Spurious Emissions – 2GHz - 26GHz

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.

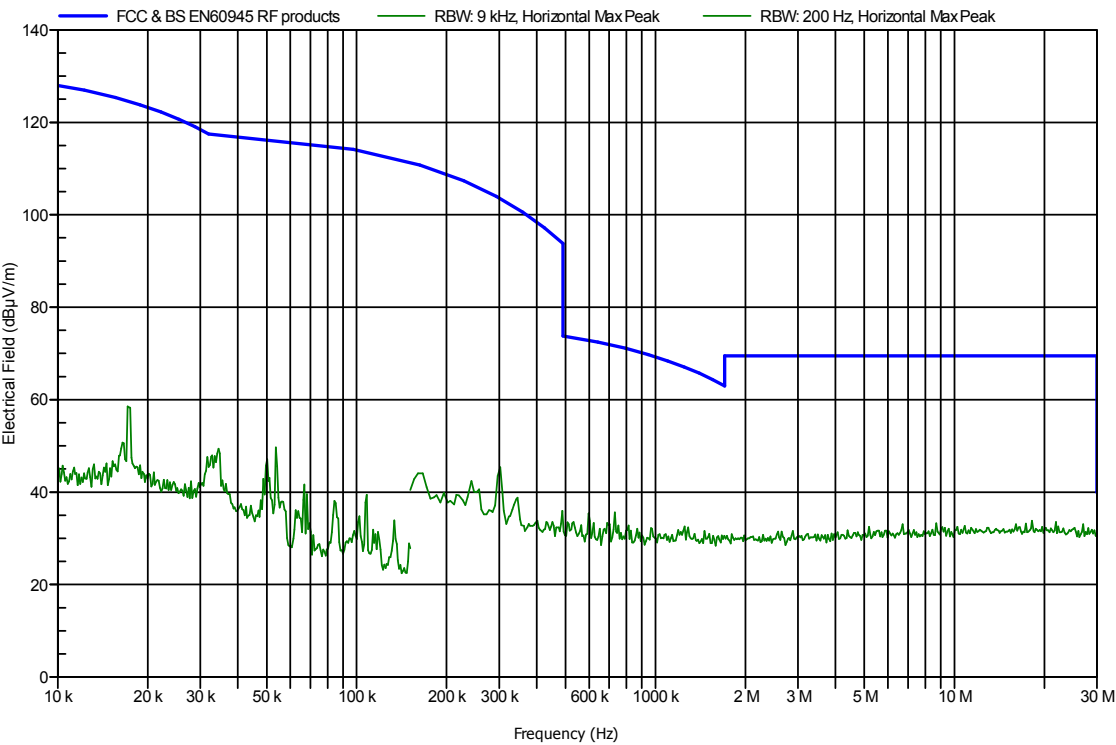
## 5 Photographs



6 Emissions Results  
6.1 gS195 Emissions 9kHz - 30MHz

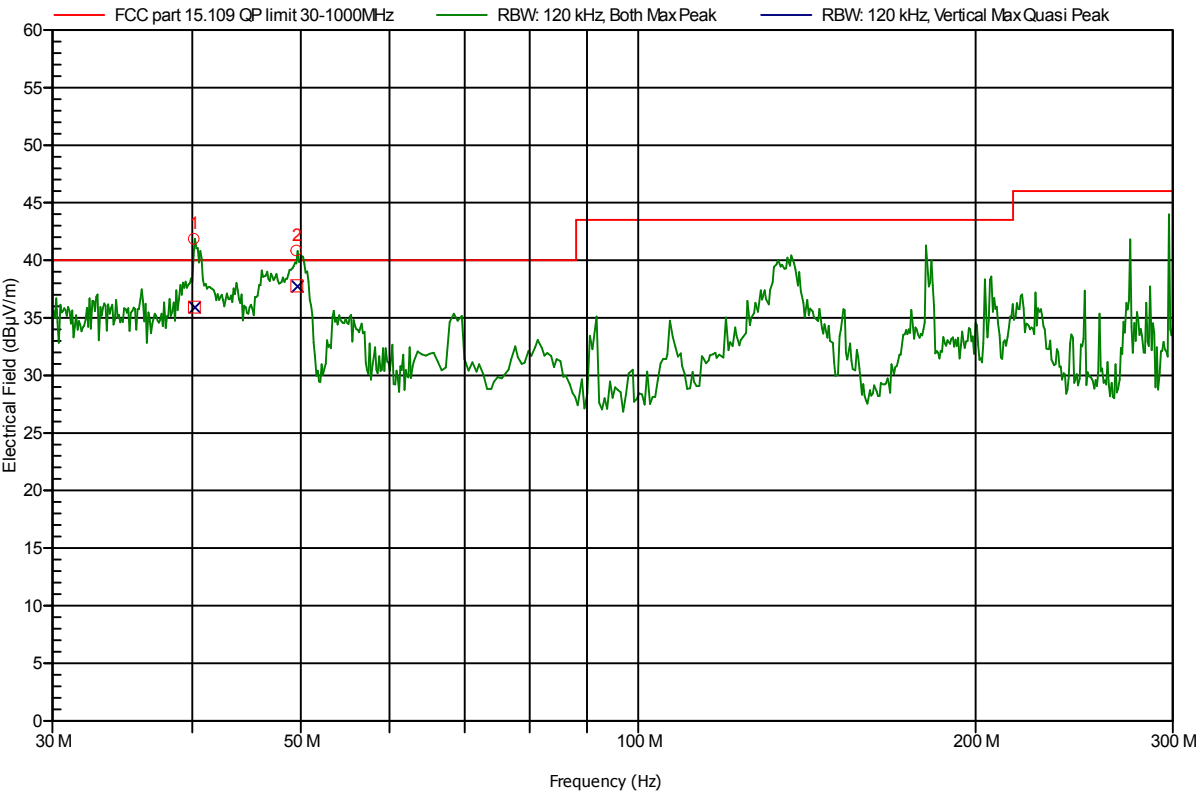


Loop Face On



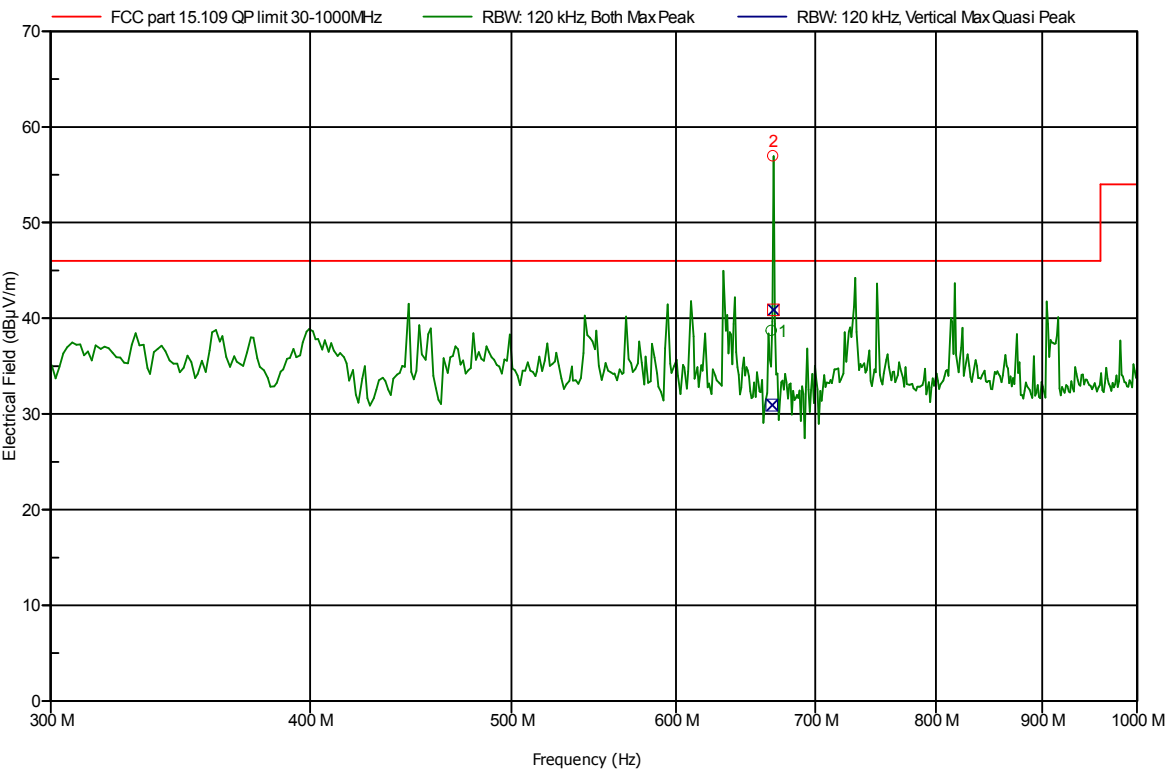
Loop Side On

6.2 gS195 Emissions 30MHz - 300MHz EUT



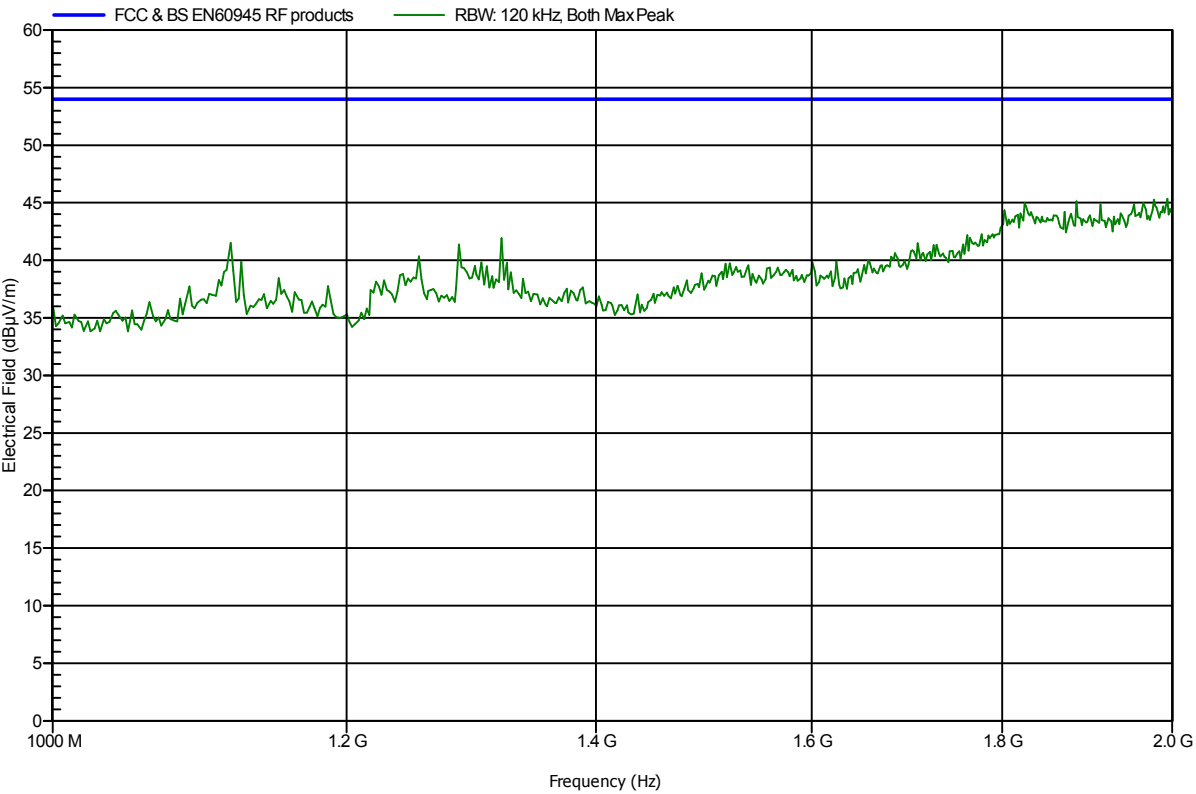
| Nr | Frequency  | Peak Value (dBµV/m) | QP Value (dBµV/m) | QP Limit (dBµV/m) | Result | Angle      | Height (m) | H/V |
|----|------------|---------------------|-------------------|-------------------|--------|------------|------------|-----|
| 1  | 40.172 MHz | 41.81               | 35.94             | 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

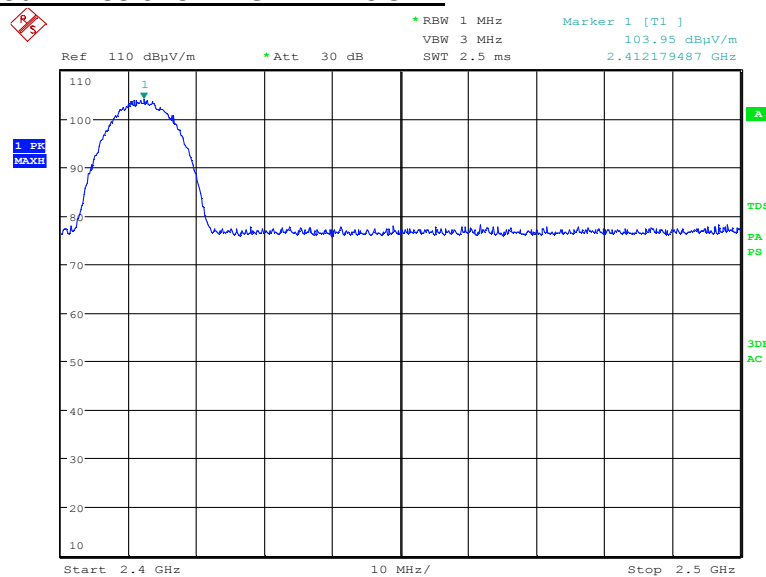


## 6.5 FCC Part 15, Chapter 47\_15.247 Spurious Emissions – 2GHz to 26GHz

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 2<sup>nd</sup> 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.

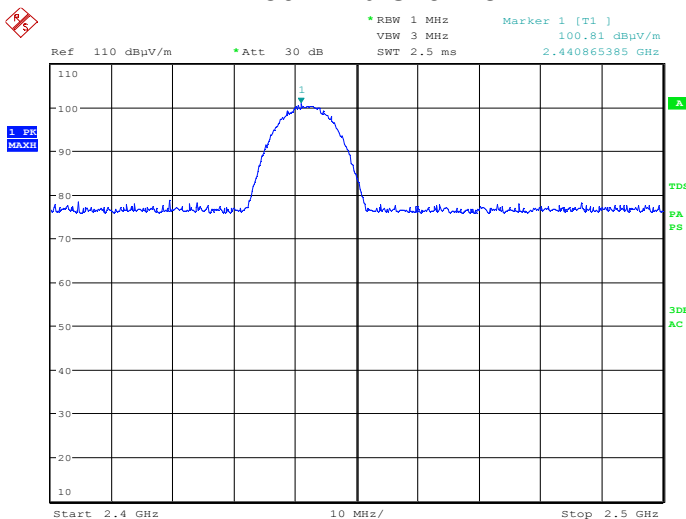
### 6.5.1 Wi-Fi Emissions

#### 6.5.1.1 Radiated Emissions 2.4GHz - 2.5GHz



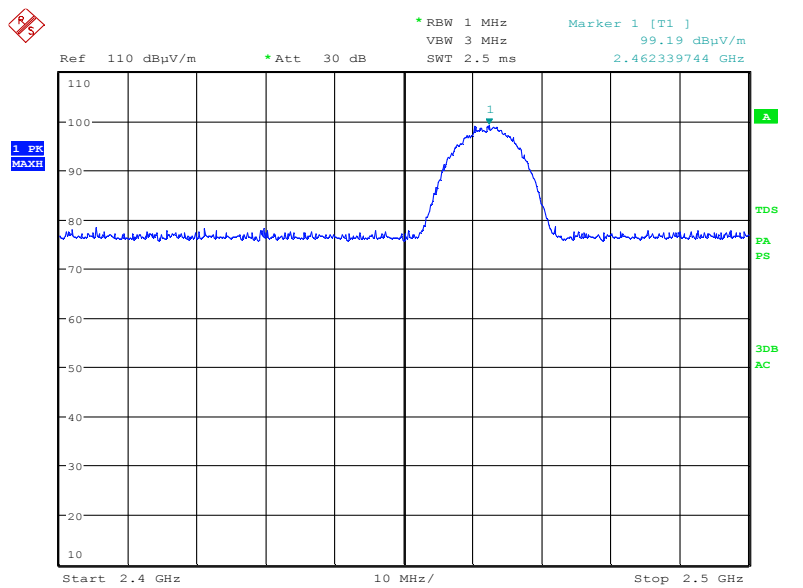
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#### 802.11b Channel 1



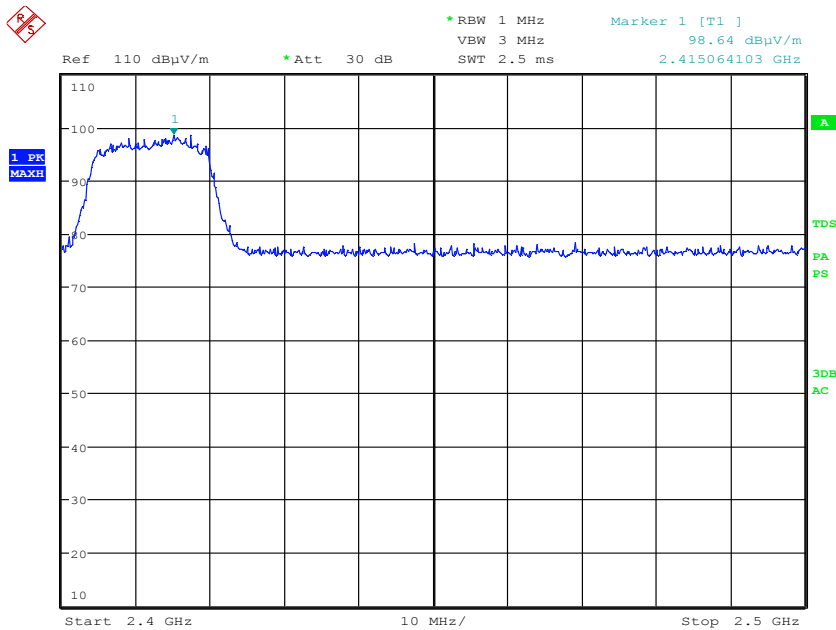
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#### 802.11b Channel 7



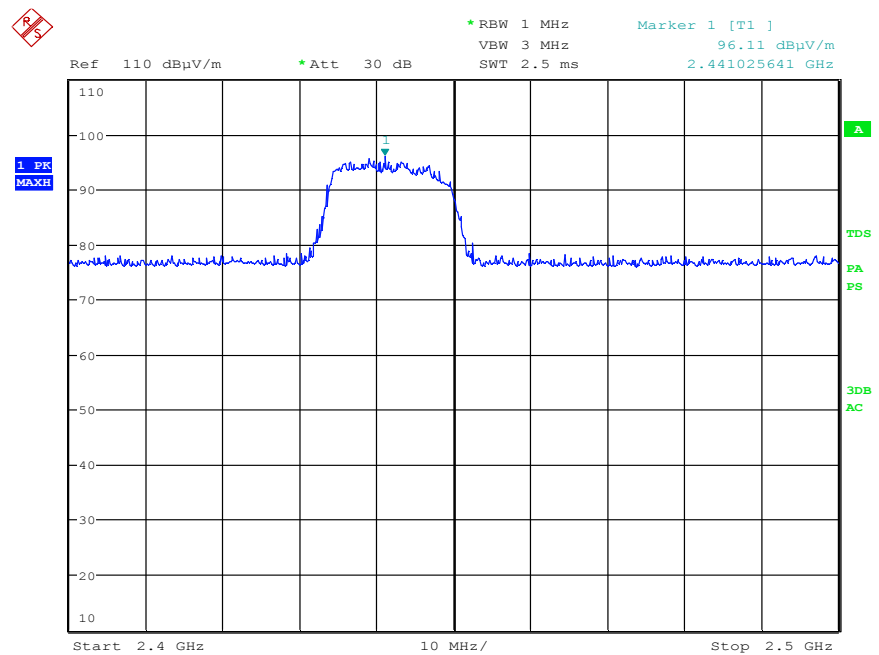
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802.11b Channel 11



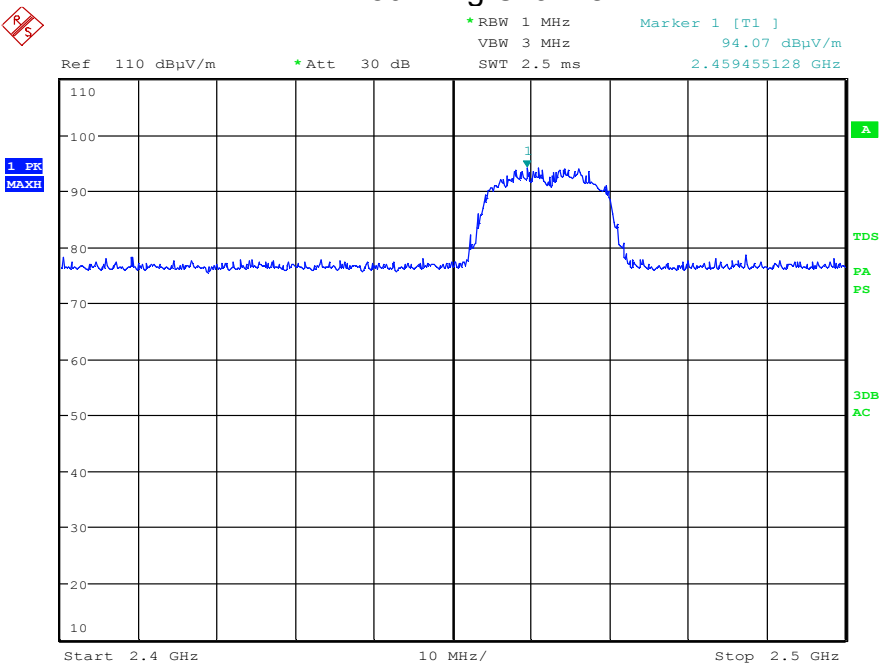
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802.54g Channel 1



Date: 3.JUL.2014 10:48:00

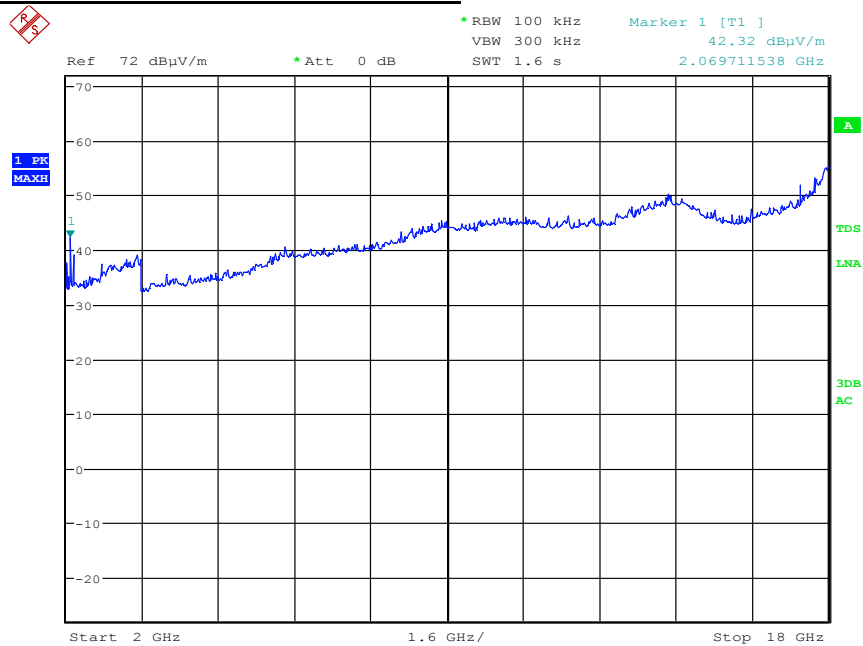
802.11g Channel 7



Date: 3.JUL.2014 10:49:48

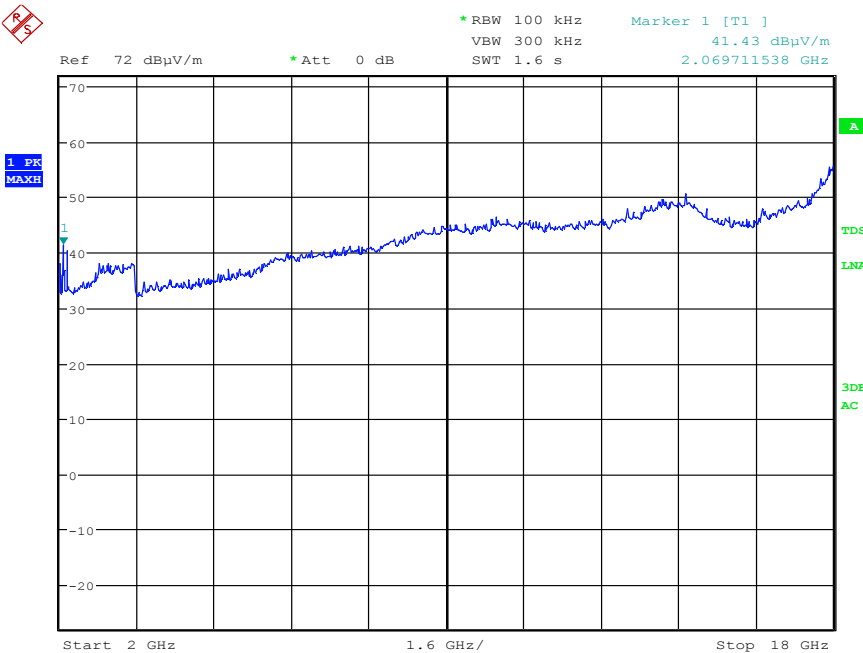
802.11g Channel 11

6.5.1.2 Radiated Emissions 2GHz - 18GHz



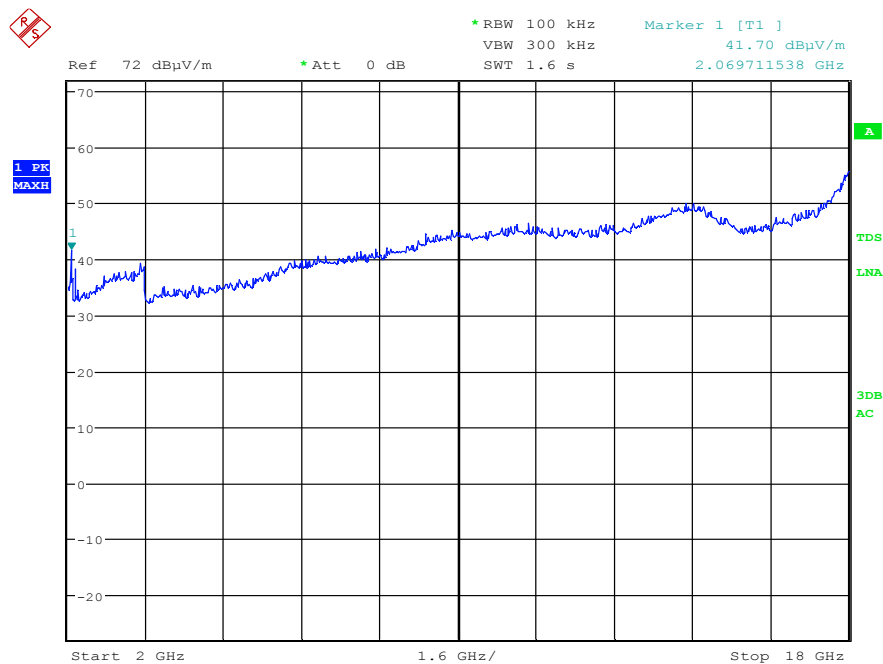
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802.11b Channel 1



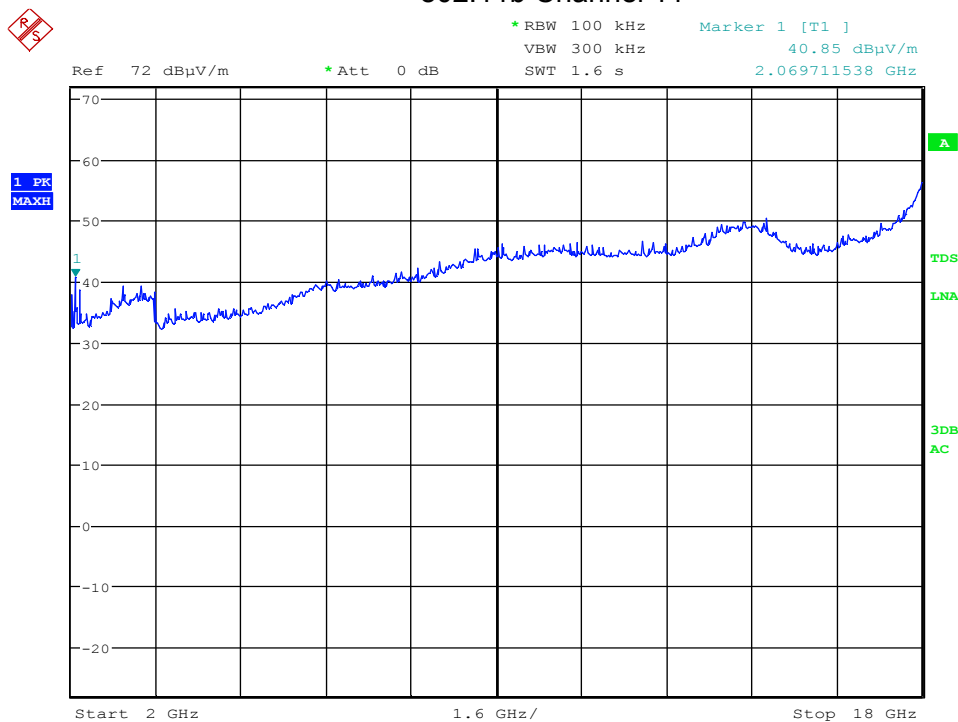
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802.11b Channel 7



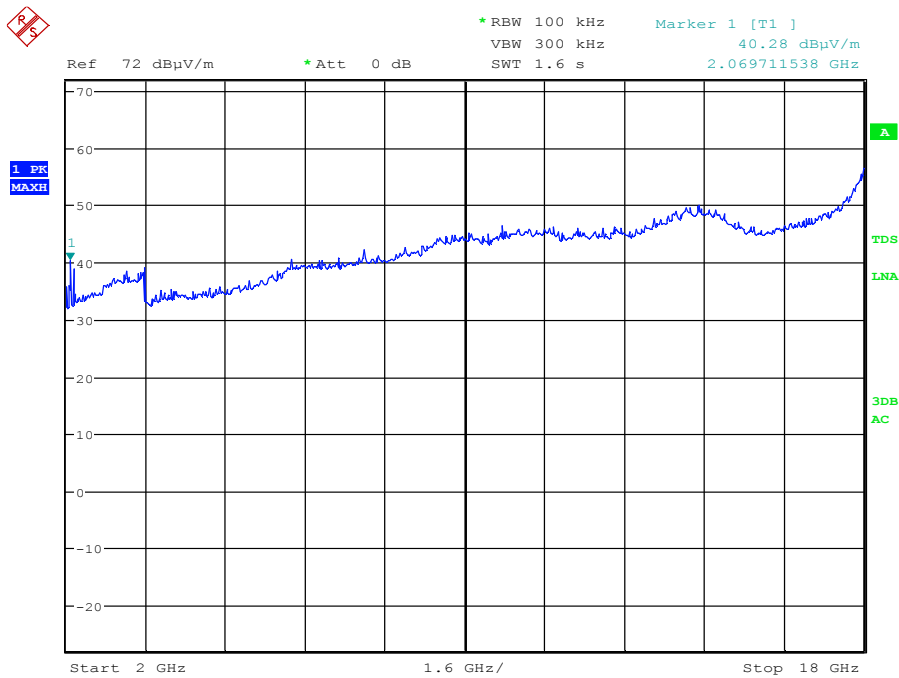
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802.11b Channel 11



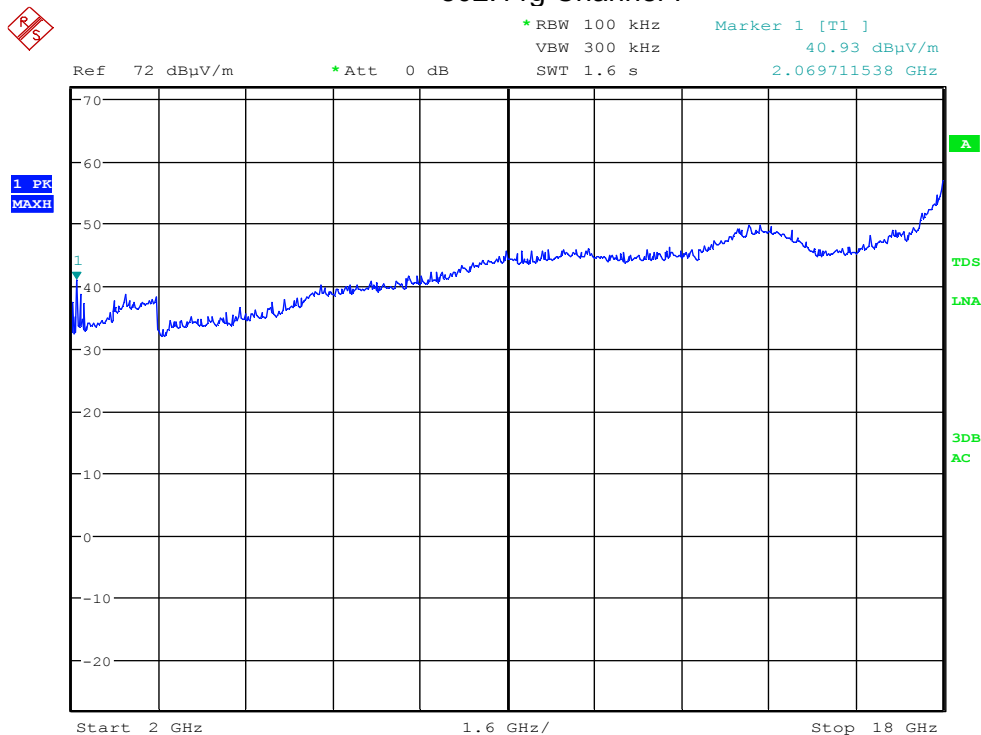
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802.11g Channel 1



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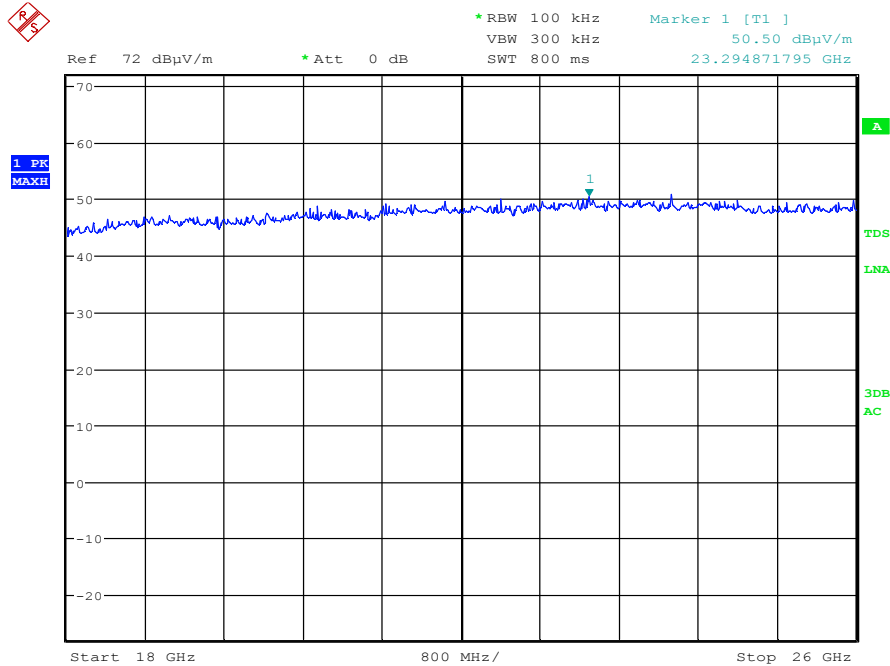
802.11g Channel 7



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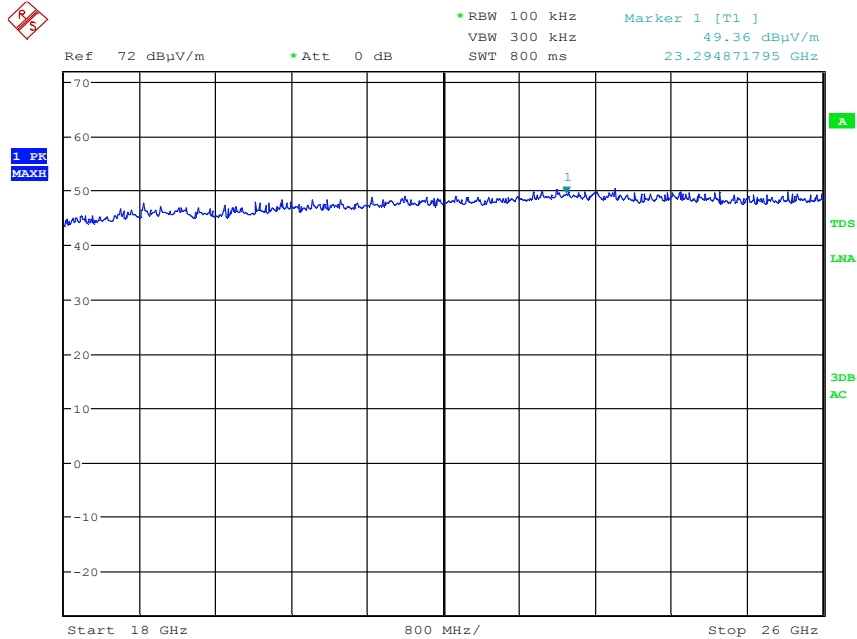
802.11g Channel 11

6.5.1.3 Radiated Emissions 18GHz - 26GHz



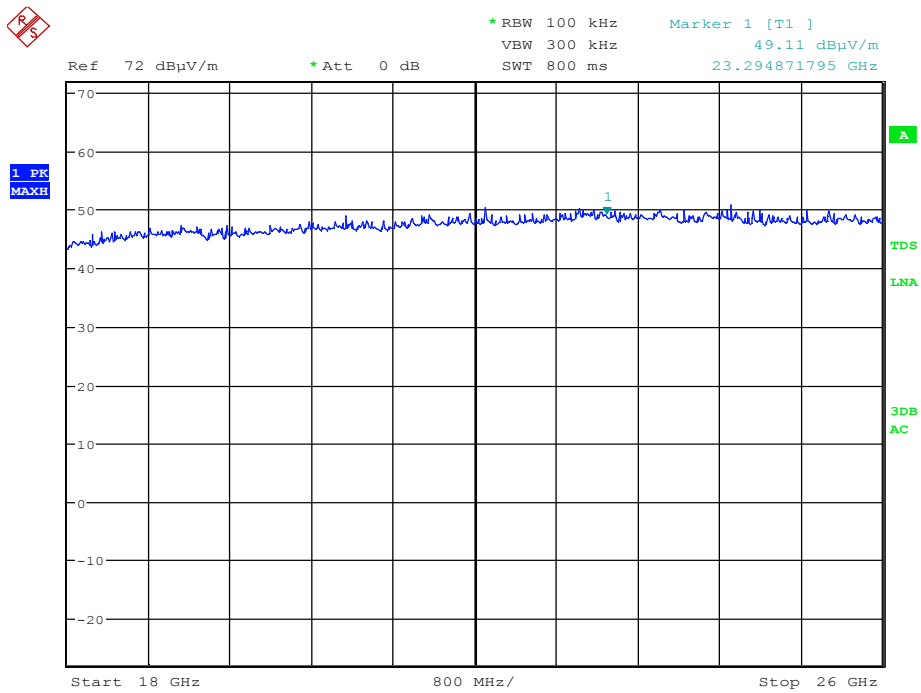
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802.11b Channel 1



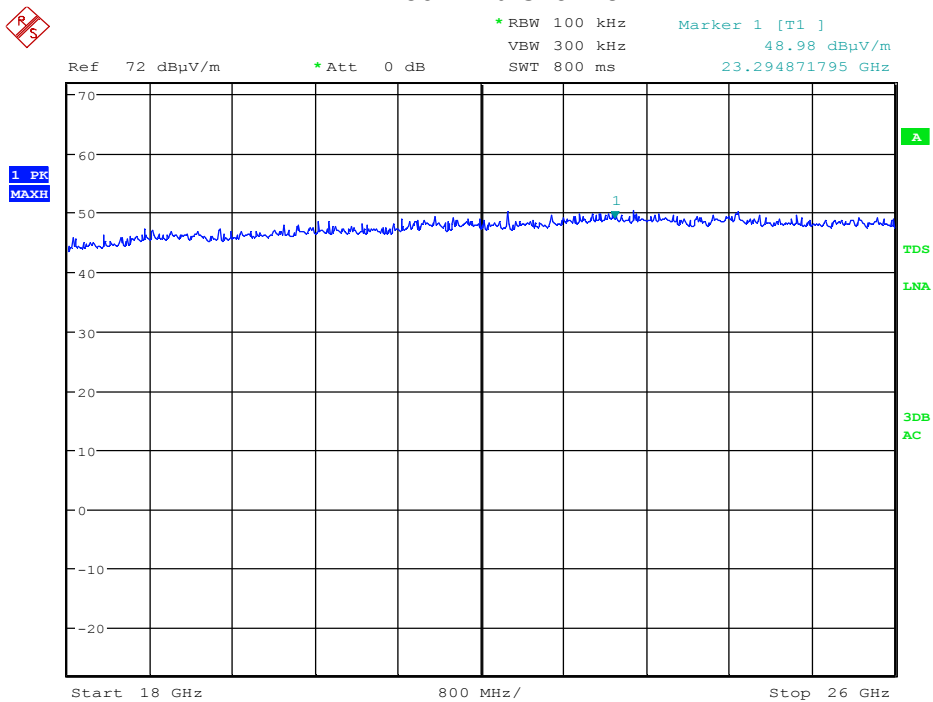
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802.11b Channel 7



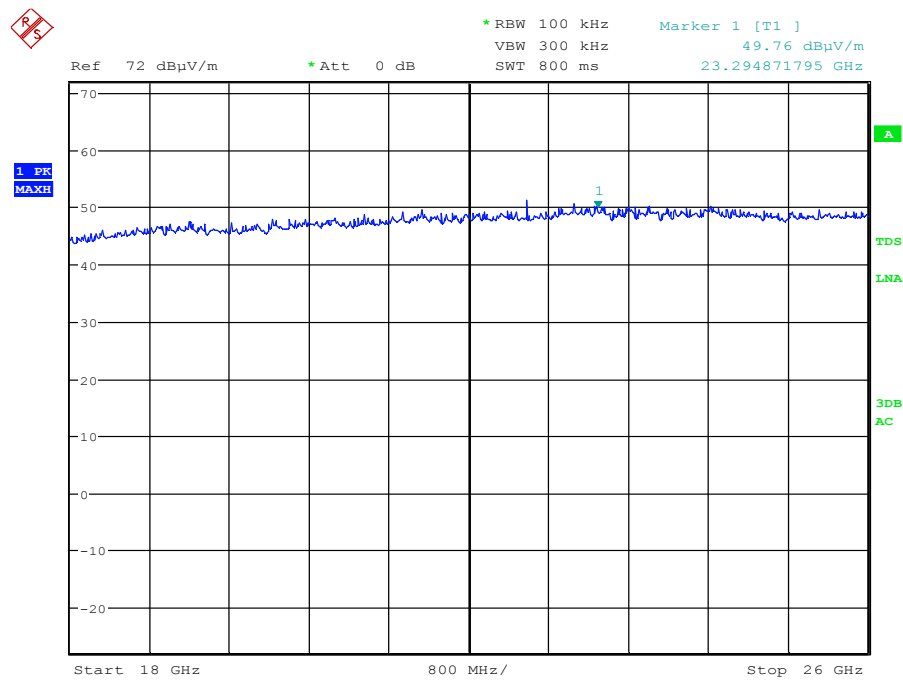
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802.11b Channel 11



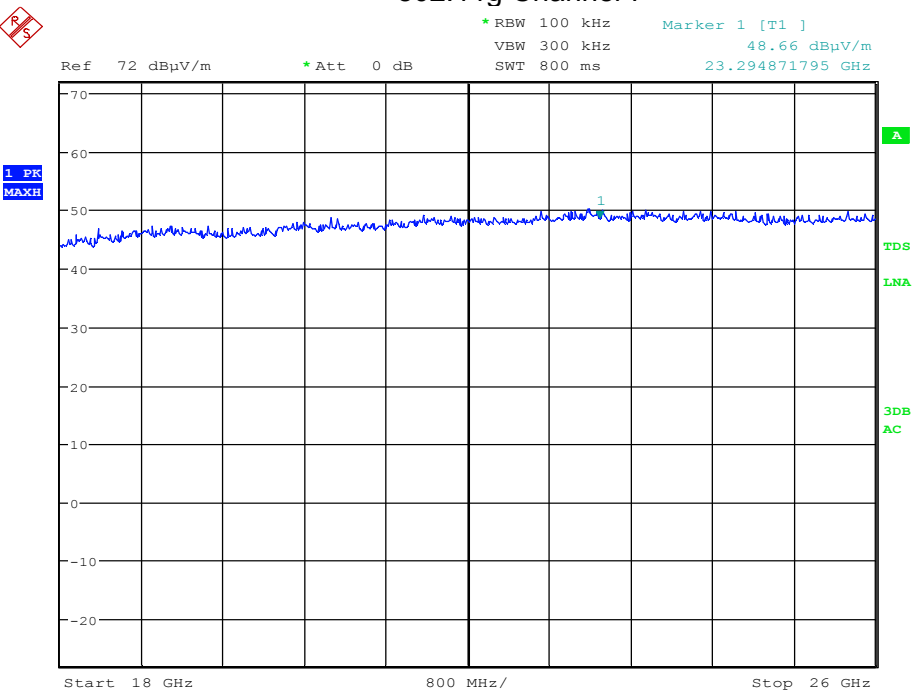
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802.11g Channel 1



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

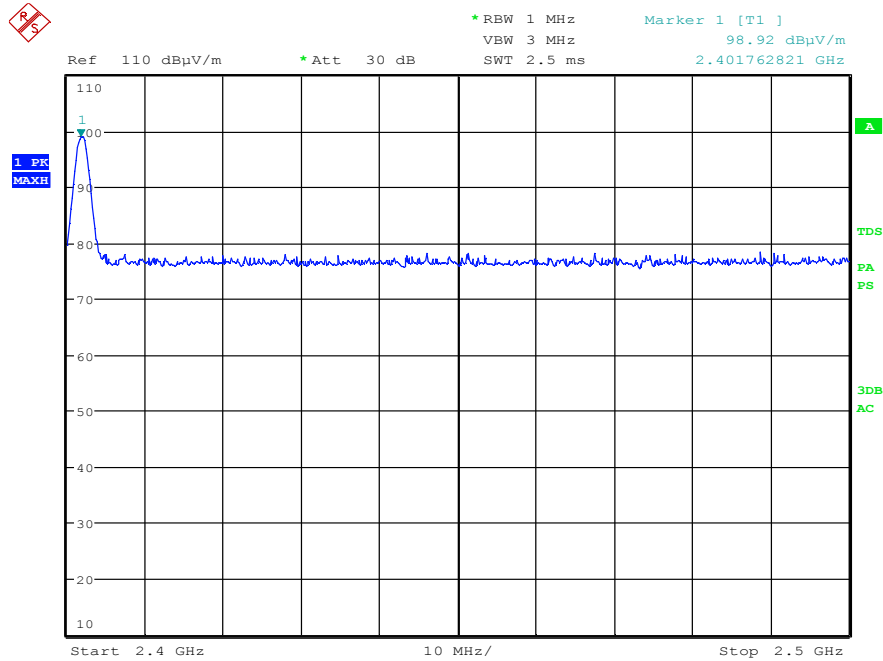
802.11g Channel 7



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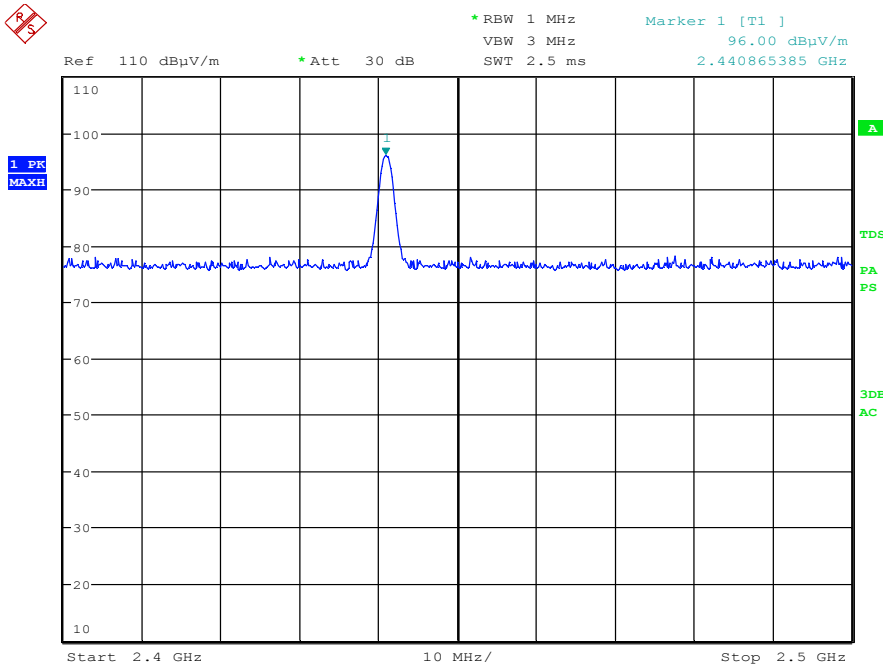
802.11g Channel 11

6.5.2 Bluetooth Emissions  
6.5.2.1 Radiated Emissions 2.4GHz – 2.5GHz



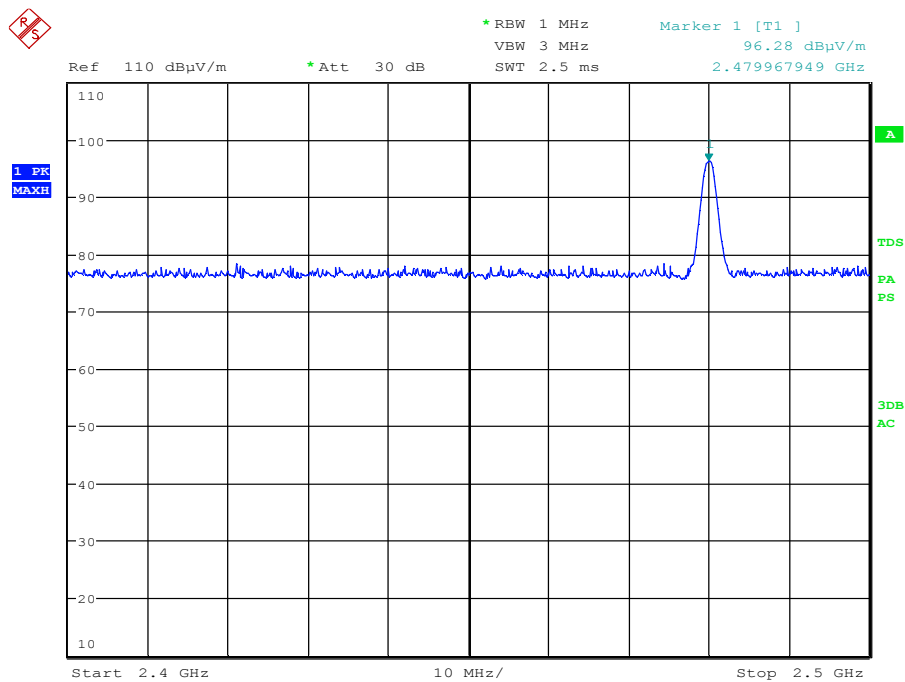
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Channel 1



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

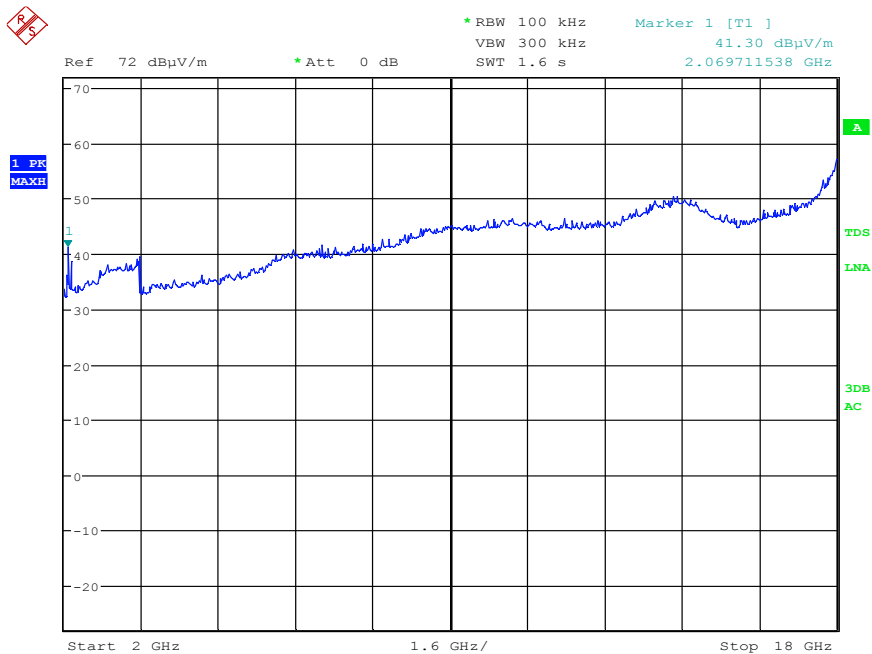
Channel 40



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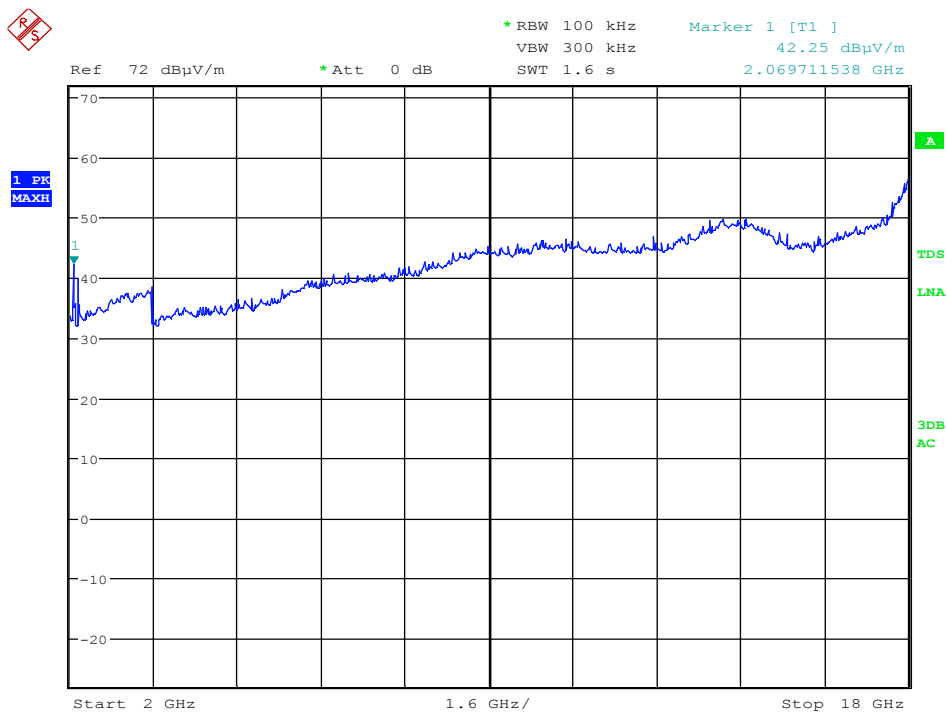
Channel 79

6.5.2.2 Radiated Emissions 2GHz to 18GHz



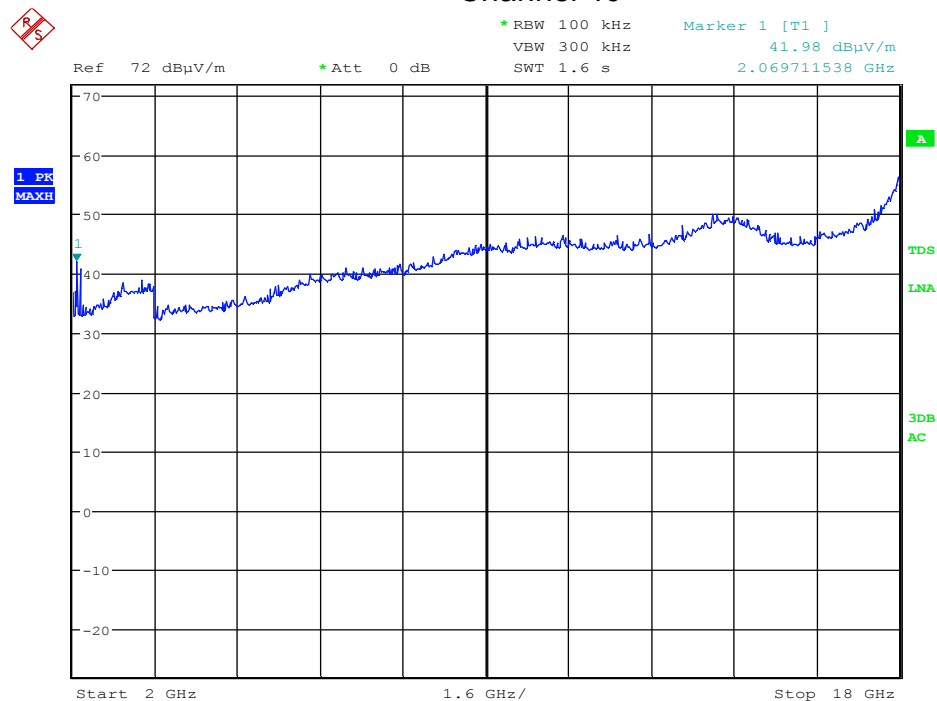
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Channel 1



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

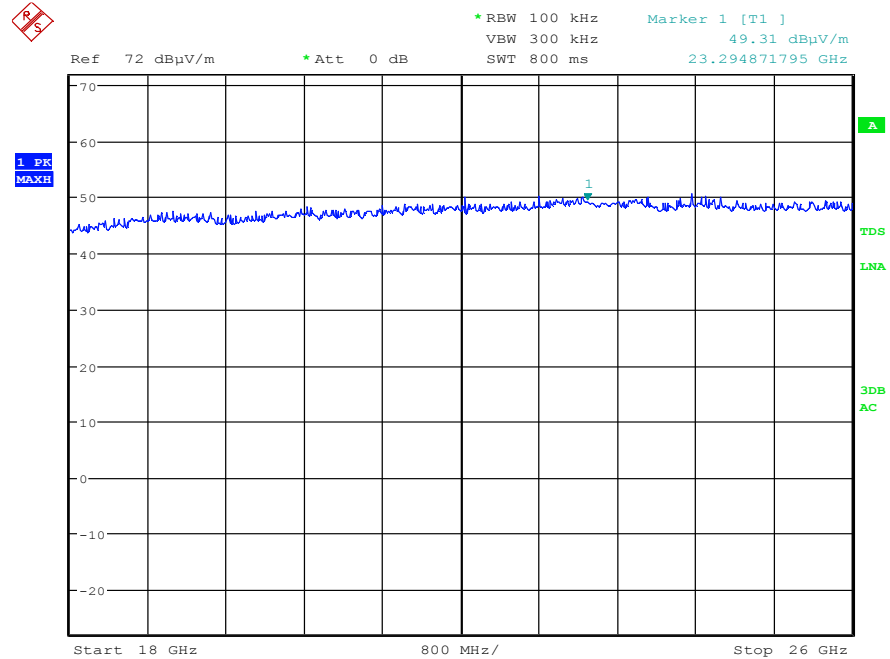
Channel 40



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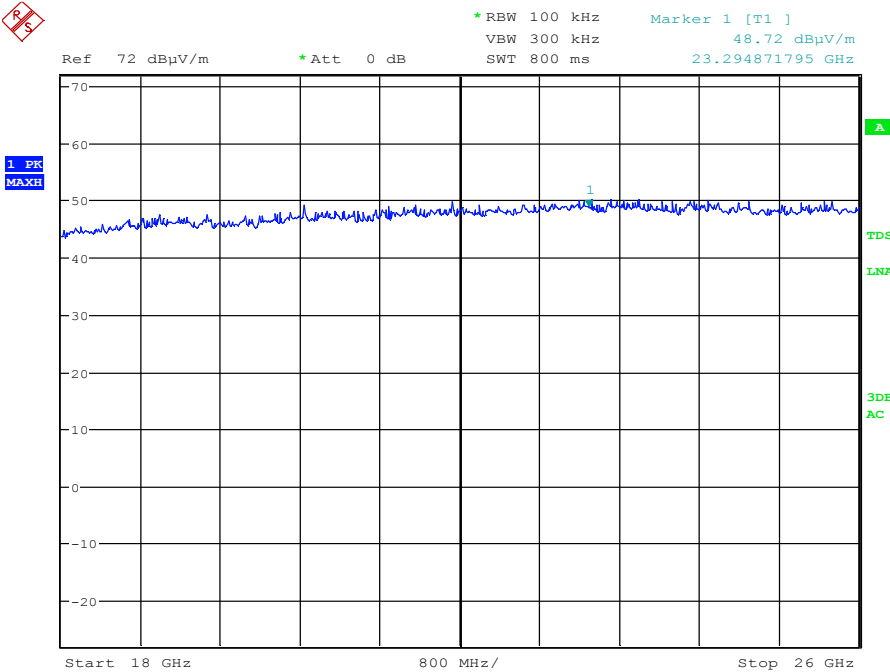
Channel 79

6.5.2.3 Radiated Emissions 18GHz to 26GHz



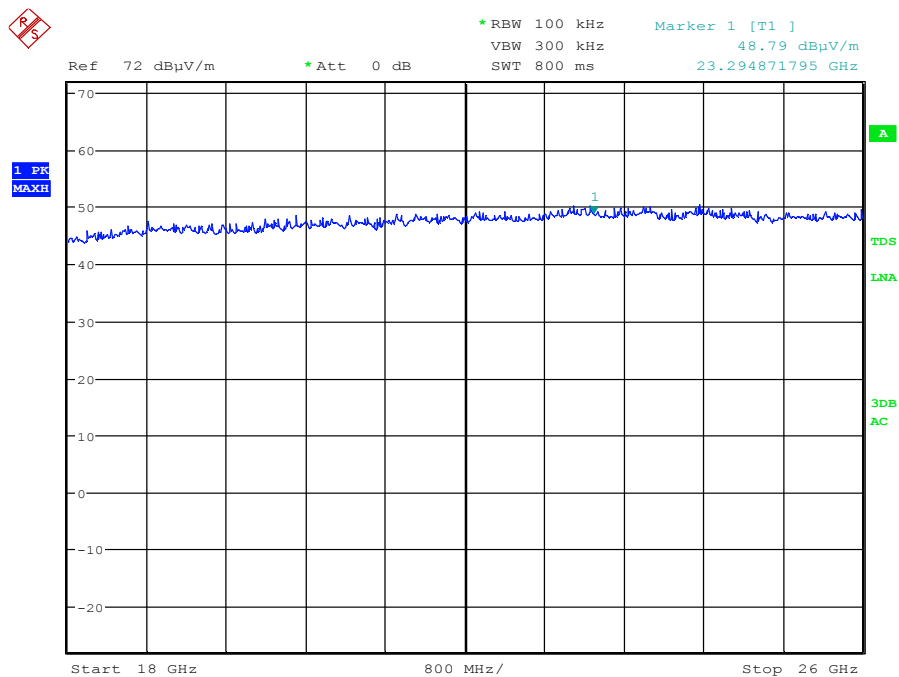
Date: 3.JUL.2014 13:23:10

Channel 1



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

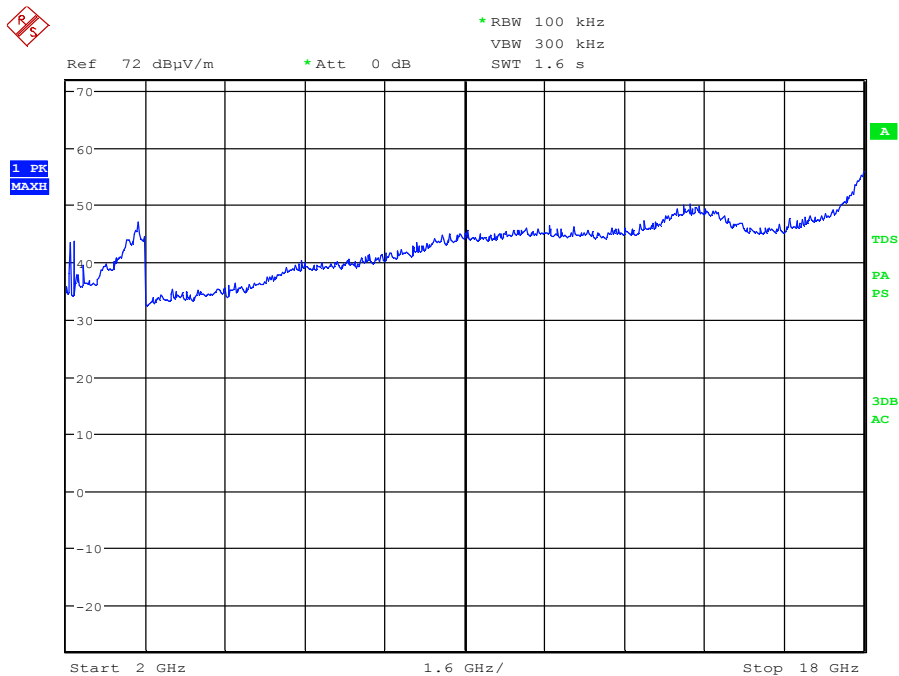
Channel 40



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 <sup>th</sup> Nov 2014 |
| EMI Receiver 20Hz to 26.5GHz       | Rohde & Schwarz ESI-26       | 832692/006                  | 00886   | 12 <sup>th</sup> Sep 2014 |
| Active Loop Antenna 9kHz - 30MHz   | Chase EMC HLA6120            | 1122                        | 00442   | 14 <sup>th</sup> Feb 2014 |
| Loop Antenna PSU/Charger           | Chase EMC CBP9721            | N/A                         | 02671   | N/A                       |
| Antenna Horn 1-18GHz               | Chase BBHA9120D              | 9120D-578                   | 01719   | 2 <sup>nd</sup> Nov 2014  |
| Antenna Horn 18GHz-26GHz           | Credowan 20-R-2843-0007      | 36755                       | 482     | 16 <sup>th</sup> Nov 2014 |
| Antenna 30MHz-3GHz                 | Chase CBL6141                | 22932                       | 01802   | 23 <sup>rd</sup> Jul 2014 |
| Antenna Mast (Site 1)              | Inn-co GmbH MM4000           | MM4000/056/13750<br>806/L   | 02075   | N/A                       |
| Turntable (Site 1)                 | Inn-co GmbH DS1200S          | DS1200S/175/1375<br>0806/L  | 02076   | N/A                       |
| Mast/Turntable Controller (Site 1) | Inn-co GmbH Co 2000          | CO/2000/359/137/5<br>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.