

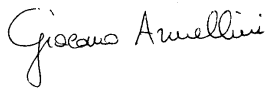




PRIMA

RICERCA & SVILUPPO

RAPPORTO DI PROVA / TEST REPORT

Rif./Ref.No. FCCTR_150385-2	Data / Date: 04/11/2015	Pagine / Pages :21
Scopo delle prove / Test object :	Prove di tipo in accordo a / Type test according to FCC Cfr 47 part 15 - §15.247 d)	
Richiedente / Applicant :	DMD COMPUTERS s.r.l. Via Monviso 14 I-10090 Villarbasse (TO) – ITALY Phone +39 011 9528282, Fax +39 011 9528402	
Persona di riferimento / Applicant's referee :	Mr. Moreno Freguglia (mfreguglia@dmd.it)	
Marchio commerciale / Trade mark :		
Fabbricante / Manufacturer :	DMD COMPUTERS s.r.l.	
Prodotto / Product :	Telematics platform for localization and data acquisition	
Modello / Model :	TELEMACO/RC2015/ERMETE	
Data ricevimento campioni / Date of test sample receipt:	08/04/2015	
Campioni verificati / No. of tested samples	1	
Data verifiche / Testing date :	08/04/2015; 11/05/2015; 04/11/2015	
Sito di prova / Testing site :	Prima Ricerca & Sviluppo Via Campagna - 92 I-22020 FALOPPIO (CO)	
Esito delle valutazioni / Assessment results :	CONFORME/ COMPLIANT	
Verifiche effettuate da / Verifications carried out by :	Enrico BANFI Tecnico Laboratorio EMC e RADIO/ EMC and RADIO Laboratory Engineer	
Approvato / Approved by :	Giacomo ARMELLINI Responsabile Laboratorio EMC e RADIO/ EMC and RADIO Laboratory Manager	

I risultati delle prove riportati nel presente rapporto di prova si riferiscono solo ai campioni esaminati. / The test results reported in this test report shall refer only to the samples tested

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PRIMARICERCA & SVILUPPO

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0 RELEASE CONTROL RECORD

TEST REPORT NUMBER	REASON OF CHANGE	DATE OF ISSUE
FCCTR_150385-0	Original release	31/07/2015
FCCTR_150385-1	Editorial Change	14/10/2015
FCCTR_150385-2	Editorial Change	04/11/2015

1 TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

1.1 EUT Identification

DESCRIPTION :	Telematics platform for localization and data acquisition
TRADEMARK:	DMD COMPUTERS s.r.l.
MODEL:	TELEMACO/RC2015/ERMETE
S/N:	Not present
MANUFACTURER:	DMD COMPUTERS s.r.l.
COUNTRY OF MANUFACTURER:	Italy
MODULE MANUFACTURER (1):	BlueGiga Technologies Inc.
DESCRIPTION	Bluetooth Smart ready HCI
MODULE NAME (1)	BT111
FCC ID (1)	QOQBT111
ANTENNA TYPE (1):	MaxStream. mod. A24-HASM-450 Gain 0 dBi
MODULE MANUFACTURER (2):	BlueGiga Technologies Inc.
DESCRIPTION	IEEE 802.11b/g/n Wi-Fi module
MODULE NAME (2):	WF111
FCC ID (2)	QOQWF111
ANTENNA TYPE:	Jiashan Jinchang Electron CO.,LTD Model: JCE056 Gain 0 dBi
MODULE MANUFACTURER (3):	CINTERION
DESCRIPTION	GSM/GPRS/EDGE/CDMA/UMTS/HSPA Module
MODULE NAME (3):	PXS8
FCC ID (3)	QIPPS8
ANTENNA TYPE:	Jiashan Jinchang Electron CO.,LTD Model: JCE056 Gain 2 dBi
MODULE MANUFACTURER (4):	UBLOX
DESCRIPTION	GPS MODULE
MODULE NAME (4):	NEO6V

ANTENNA TYPE:	Jiashan Jinchang Electron CO.,LTD Model: JCE056 Gain 3 dBi
EUT DIMENSIONS :	See Photographic documentation
EUT STANDING:	Veichle

1.2 EUT Technical Data

POWER SUPPLY NOMINAL VOLTAGE:	12-24 V DC
NOMINAL POWER OR ABSORBING CURRENT :	NOT DECLARED
TYPICAL USAGE :	RADIO EQUIPMENT
TYPE:	INTENTIONAL RADIATOR

1.3 EUT ports identification

This section contains descriptions of all ports, the length and the type of the cable provided by manufacturer needed for the tests. Moreover it is specified if the ports are ever or optionally connected.

Port	Description	Connector	Max cable length																																																																																																																																																																																
1	Enclosure	Plastic	-																																																																																																																																																																																
2	AC mains input/output ports	Port not present	-																																																																																																																																																																																
3	DC mains input/output ports	12/24 V dc	Modello																																																																																																																																																																																
4	Signals / Control Ports	<p>automotive connector MULTILOCK double section</p> <table border="1"> <thead> <tr> <th>Pin</th><th>Signal</th><th>Pin</th><th>Signal</th><th>Pin</th><th>Signal</th><th>Pin</th><th>Signal</th></tr> </thead> <tbody> <tr><td>1A</td><td>GND_RF</td><td>2A</td><td>LAN_RX-</td><td>3A</td><td>GND</td><td>4A</td><td>WU_IN1</td></tr> <tr><td>1B</td><td>GND</td><td>2B</td><td>LAN_RX+</td><td>3B</td><td>RS232c_RI</td><td>4B</td><td>DIG_IO8</td></tr> <tr><td>1C</td><td>CAN4H</td><td>2C</td><td>LAN_TX-</td><td>3C</td><td>RS232c_DCD</td><td>4C</td><td>DIG_IO7</td></tr> <tr><td>1D</td><td>CAN4L</td><td>2D</td><td>LAN_TX+</td><td>3D</td><td>RS232c_CTS</td><td>4D</td><td>DIG_IO6</td></tr> <tr><td>1E</td><td>CAN3H</td><td>2E</td><td>USB_GND</td><td>3E</td><td>RS232c_RX</td><td>4E</td><td>DIG_IO5</td></tr> <tr><td>1F</td><td>CAN3L</td><td>2F</td><td>USB_DM</td><td>3F</td><td>RS232c_DTR</td><td>4F</td><td>DIG_IO4</td></tr> <tr><td>1G</td><td>CAN1L</td><td>2G</td><td>USB_DP</td><td>3G</td><td>RS232c_RTS</td><td>4G</td><td>DIG_IO3</td></tr> <tr><td>1H</td><td>CAN1H</td><td>2H</td><td>USB_VCC</td><td>3H</td><td>RS232c_TX</td><td>4H</td><td>DIG_IO2</td></tr> <tr><td>1J</td><td>CAN2H</td><td>2J</td><td>RS485_N</td><td>3J</td><td>RS232c_DSR</td><td>4J</td><td>DIG_IO1</td></tr> <tr><td>1K</td><td>CAN2L</td><td>2K</td><td>RS485_P</td><td>3K</td><td>GND</td><td>4K</td><td>GND</td></tr> <tr><td>1L</td><td>MIC_GND</td><td>2L</td><td>DIG-OUT2</td><td>3L</td><td>WU_IN2</td><td>4L</td><td>WU_IN3</td></tr> <tr><td>1M</td><td>MIC_IN</td><td>2M</td><td>DIG-OUT1</td><td>3M</td><td>PWR</td><td>4M</td><td>PWR_GND</td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Pin</th><th>Signal</th><th>Pin</th><th>Signal</th><th>Pin</th><th>Signal</th><th>Pin</th><th>Signal</th></tr> </thead> <tbody> <tr><td>1A</td><td>EXP_1</td><td>2A</td><td>EXP_9</td><td>3A</td><td>RS232r_TX</td><td>4A</td><td>CAN5L</td></tr> <tr><td>1B</td><td>EXP_2</td><td>2B</td><td>EXP_10</td><td>3B</td><td>RS232r_RX</td><td>4B</td><td>CAN5H</td></tr> <tr><td>1C</td><td>EXP_3</td><td>2C</td><td>EXP_11</td><td>3C</td><td>GND</td><td>4C</td><td>CAN6L</td></tr> <tr><td>1D</td><td>EXP_4</td><td>2D</td><td>EXP_12</td><td>3D</td><td>K1</td><td>4D</td><td>CAN6H</td></tr> <tr><td>1E</td><td>EXP_5</td><td>2E</td><td>EXP_13</td><td>3E</td><td>K2</td><td>4E</td><td>CANBH</td></tr> <tr><td>1F</td><td>EXP_6</td><td>2F</td><td>EXP_14</td><td>3F</td><td>K3</td><td>4F</td><td>CANBL</td></tr> <tr><td>1G</td><td>EXP_7</td><td>2G</td><td>EXP_15</td><td>3G</td><td>EXP_17</td><td>4G</td><td>GND</td></tr> <tr><td>1H</td><td>EXP_8</td><td>2H</td><td>EXP_16</td><td>3H</td><td>EXP_18</td><td>4H</td><td>TACHO</td></tr> </tbody> </table> <p>SMA connector for GPS antenna SMA-R antenna WiFi SMA antenna for GSM SMA-R BT antenna</p>	Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal	1A	GND_RF	2A	LAN_RX-	3A	GND	4A	WU_IN1	1B	GND	2B	LAN_RX+	3B	RS232c_RI	4B	DIG_IO8	1C	CAN4H	2C	LAN_TX-	3C	RS232c_DCD	4C	DIG_IO7	1D	CAN4L	2D	LAN_TX+	3D	RS232c_CTS	4D	DIG_IO6	1E	CAN3H	2E	USB_GND	3E	RS232c_RX	4E	DIG_IO5	1F	CAN3L	2F	USB_DM	3F	RS232c_DTR	4F	DIG_IO4	1G	CAN1L	2G	USB_DP	3G	RS232c_RTS	4G	DIG_IO3	1H	CAN1H	2H	USB_VCC	3H	RS232c_TX	4H	DIG_IO2	1J	CAN2H	2J	RS485_N	3J	RS232c_DSR	4J	DIG_IO1	1K	CAN2L	2K	RS485_P	3K	GND	4K	GND	1L	MIC_GND	2L	DIG-OUT2	3L	WU_IN2	4L	WU_IN3	1M	MIC_IN	2M	DIG-OUT1	3M	PWR	4M	PWR_GND	Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal	1A	EXP_1	2A	EXP_9	3A	RS232r_TX	4A	CAN5L	1B	EXP_2	2B	EXP_10	3B	RS232r_RX	4B	CAN5H	1C	EXP_3	2C	EXP_11	3C	GND	4C	CAN6L	1D	EXP_4	2D	EXP_12	3D	K1	4D	CAN6H	1E	EXP_5	2E	EXP_13	3E	K2	4E	CANBH	1F	EXP_6	2F	EXP_14	3F	K3	4F	CANBL	1G	EXP_7	2G	EXP_15	3G	EXP_17	4G	GND	1H	EXP_8	2H	EXP_16	3H	EXP_18	4H	TACHO	-
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1L	MIC_GND	2L	DIG-OUT2	3L	WU_IN2	4L	WU_IN3																																																																																																																																																																												
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5	Telecommunication port	Port not present	-																																																																																																																																																																																

Note: During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.

1.4 Modifications incorporated in E.U.T.

The following items are the modifications introduced in the equipment under test :

- None

1.5 Auxiliary equipment

- Notebook DELL
- Communication tester CMD 53

1.6 Test overview

The appliance is classified as “Intentional radiator” in conformity to FCC Part 15 Subpart C § 15.247.
The application is mainly as vehicle telematics platform for localization and data acquisition.
The EUT is a multiradio equipment wich contains four Radio Modules (see section 1.1.) that are already certified.

This Test Report referrers to the assessment of radiated spurious emission in the case of simultaneous transmission of all radio modules into the EUT.

The worst cases chooses for this assessment are:

- EUT with radio communication GSM 1900 communication link; Bluetooth in hopping Mode; Wlan ch1 802.11.gn 20MHz and GPS in receive mode.
- EUT with radio communication GSM 1900 communication link; Bluetooth in hopping Mode; Wlan ch11 802.11.gn 20MHz and GPS in receive mode.

2 REFERENCE STANDARD

CODE OF FEDERAL REGULATIONS	
Title 47 Part 15 Subpart A	Radio frequency devices - General
Title 47 Part 15 Subpart C § 15.247 d)	Radio frequency devices – Intentional Radiators Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz
ANSI C63.4 (2014)	American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz

In the following table there are the operating conditions adopted during tests identified by an indicator (#..) at which has been referred the item “Operating condition of the equipment under test”

3 OPERATING TEST MODES AND CONDITIONS

OPERATING CONDITION	DESCRIPTION
#1	EUT with radio communication GSM 1900 communication link, GPS in receive mode Bluetooth in hopping Mode Wlan ch1 802.11.gn 20MHz
#2	EUT GSM 1900 communication link, GPS in receive mode Bluetooth in hopping Mode Wlan ch11 802.11.gn 20MHz

4 SUMMARY OF TEST RESULTS

Port		Phenomena	Reference Standard	Operating condition	Result
1	Enclosure	RF radiated Spurious Emissions	Title 47 Part 15 Subpart C § 15.247 d)	#1; #2	Within the limit

5 TEST RESULTS

RF RADIATED SPURIOUS EMISSIONS	10
BAND-EDGE	18

**TEST
1.**

RF RADIATED SPURIOUS EMISSIONS

**REFERENCE
DOCUMENT**

Title 47 Part 15 Subpart C § 15.247 d)

- **TEST SETUP:** In according to manufacturer specifications
- **TEST LOCATION:** Semi-anechoic chamber (CISPR 16-1 :1993)
Siemens+Matsushita type B84117-D6019-T232
Measure distance 3 meters
- **TEST EQUIPMENT USED FOR TEST:** EMI receiver Rohde & Schwarz Mod. ESU40
Chase Antenna Mod. CBL 6111 C
R&S Antenna HL050
- **TESTED PORT:** Enclosure
- **FREQUENCY RANGE:** 30MHz-to 10th armhonics
- **MEASUREMENT DISTANCE :** 3mt
- **EMISSION LIMITS:** Acc. to Section 15.249 of reference document
- **UNCERTAINTY OF MEASURE:** Level of confidence = 95%
Degree of freedom = 10
Coverage factor $k_p = 2,28$
Combined uncertainty = 4,49 dB

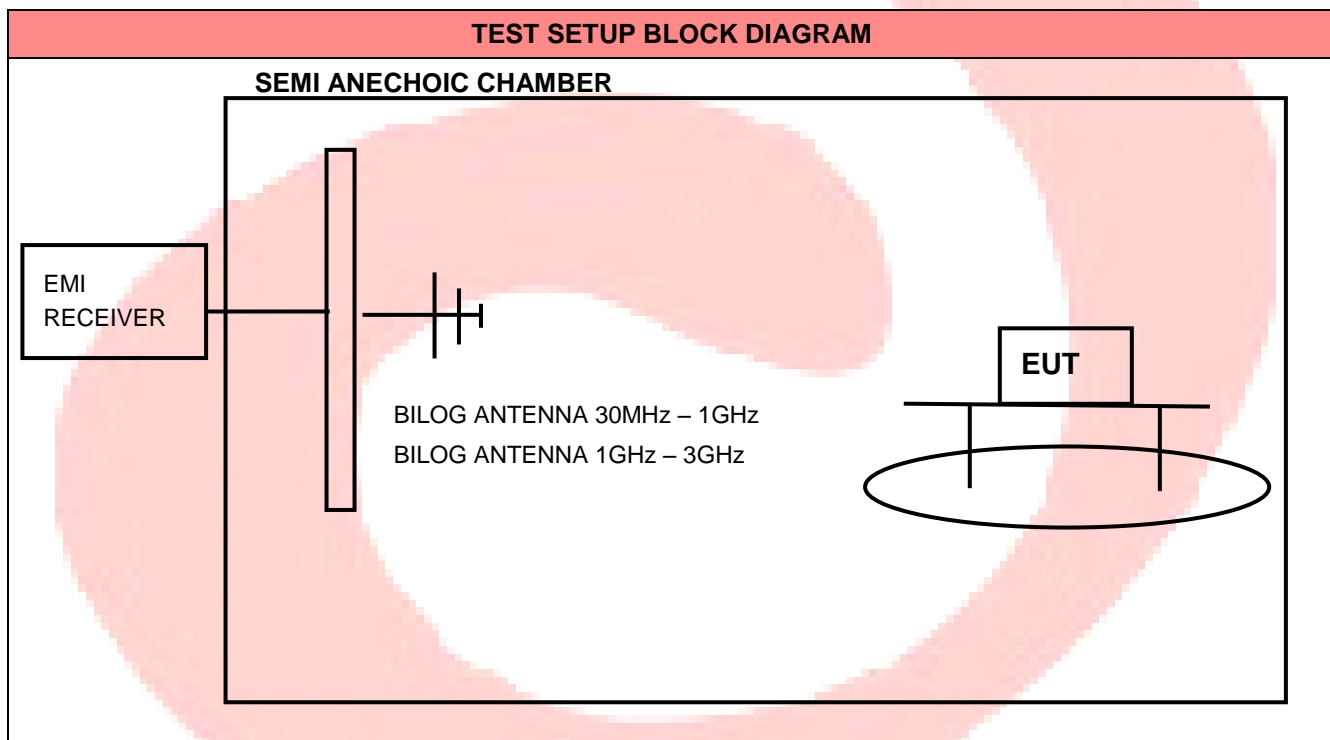
TEST CONDITIONS:	MEASURED
Ambient temperature : 15 - 35 °C	24 ±3 °C
Ambient humidity : 25 - 75 %rH	40 ± 5 %rH
Pressure : 85 - 106 kPa (860 mbar - 1060 mbar)	950 ± 50 mbar
Voltage :	12 V

OPERATING CONDITION (Rif. Section. 3) : #1; #2

RESULT: WITHIN THE LIMITS

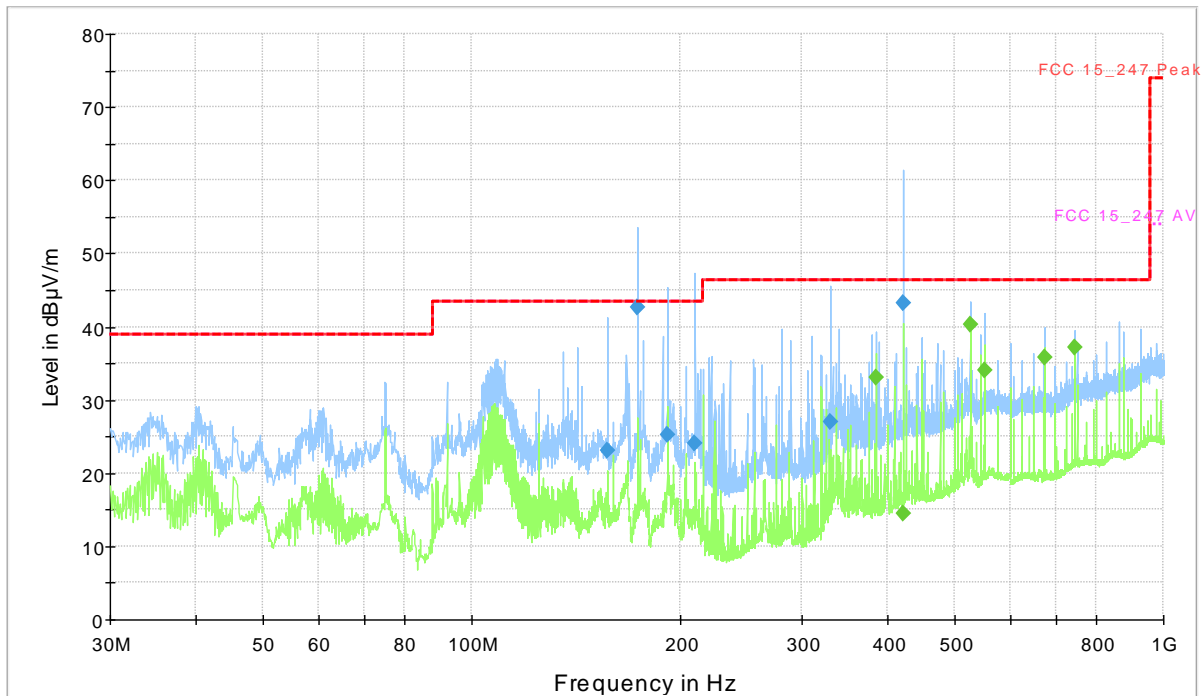
DESCRIPTION

According to §15,247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits, If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB, Attenuation below the general limits specified in Sec, 15,209(a) is not required, In addition, radiated emissions which fall in the restricted bands, as defined in Sec, 15,205(a), must also comply with the radiated emission limits specified in Sec, 15,209(a) (see Sec, 15,205(c)),



OPERATING CONDITION : #1
HORIZONTAL POLARIZATION
FREQUENCY RANGE: 30MHz – 1GHz

FCC_15_247_RADIATED_SPURIOUS_HORIZONTAL



Final Result 1

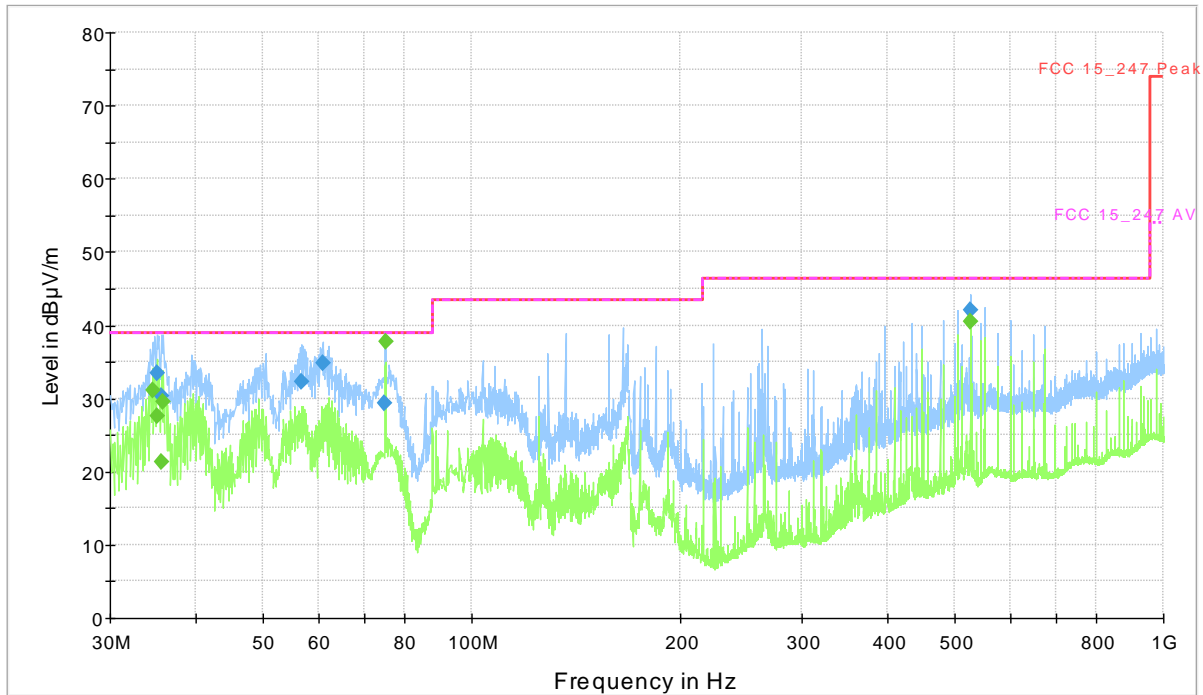
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
157.361000	23.1	1000.0	100.000	102.0	H	270.0	20.40	43.50
173.366000	42.7	1000.0	100.000	259.0	H	178.0	0.80	43.50
191.796000	25.2	1000.0	100.000	103.0	H	2.0	18.30	43.50
210.323000	24.1	1000.0	100.000	101.0	H	90.0	19.40	43.50
330.312000	27.0	1000.0	100.000	102.0	H	270.0	19.40	46.40
420.716000	43.2	1000.0	100.000	101.0	H	90.0	3.20	46.40

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
383.953000	33.1	1000.0	100.000	259.0	H	178.0	13.30	46.40
420.716000	14.4	1000.0	100.000	101.0	H	90.0	32.00	46.40
524.991000	40.4	1000.0	100.000	101.0	H	90.0	6.00	46.40
552.054000	34.1	1000.0	100.000	259.0	H	2.0	12.30	46.40
675.050000	35.9	1000.0	100.000	103.0	H	2.0	10.50	46.40
744.017000	37.1	1000.0	100.000	103.0	H	2.0	9.30	46.40

FREQUENCY RANGE: 30MHz – 1GHz
VERTICAL POLARIZATION

FCC_15_247_RADIATED_SPURIOUS_HORIZONTAL



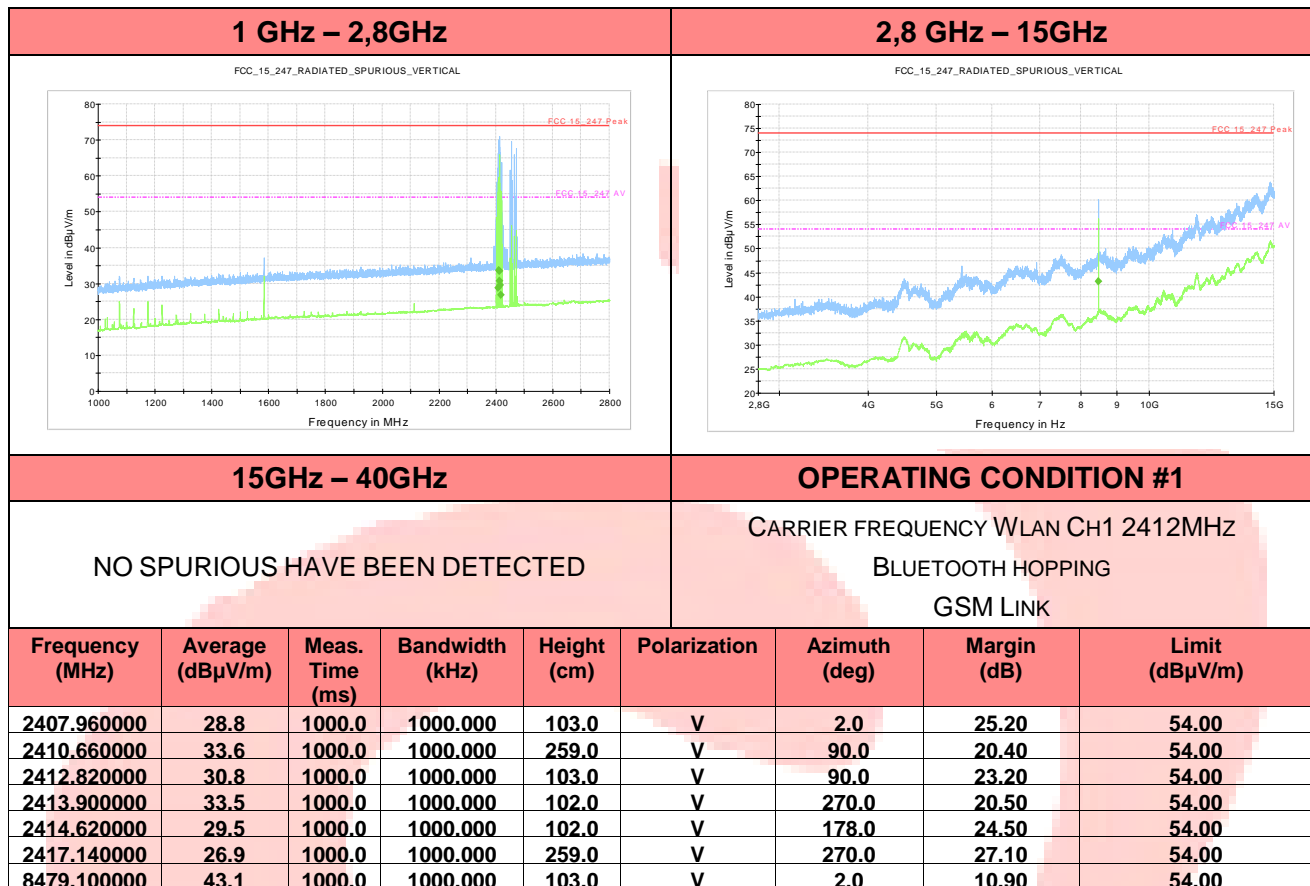
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
35.044000	33.4	1000.0	100.000	103.0	V	270.0	5.60	39.00
35.529000	30.4	1000.0	100.000	103.0	V	270.0	8.60	39.00
56.772000	32.3	1000.0	100.000	103.0	V	270.0	6.70	39.00
60.846000	34.7	1000.0	100.000	103.0	V	270.0	4.30	39.00
74.911000	29.4	1000.0	100.000	103.0	V	270.0	9.60	39.00
524.991000	42.0	1000.0	100.000	103.0	V	1.0	4.40	46.40

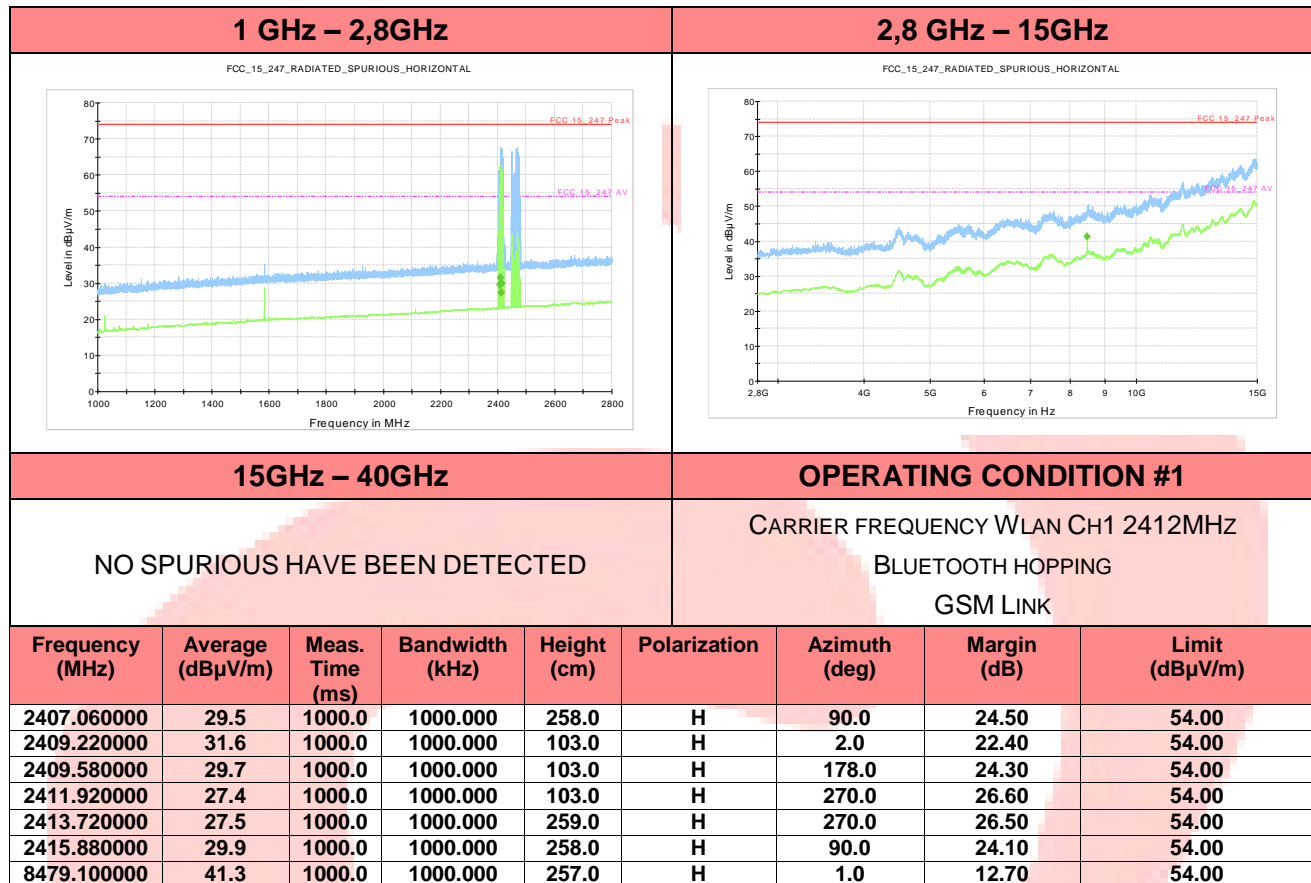
Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
34.559000	31.2	1000.0	100.000	103.0	V	270.0	7.80	39.00
35.044000	27.6	1000.0	100.000	103.0	V	270.0	11.40	39.00
35.529000	21.4	1000.0	100.000	103.0	V	270.0	17.60	39.00
35.820000	29.6	1000.0	100.000	103.0	V	270.0	9.40	39.00
75.008000	37.8	1000.0	100.000	103.0	V	270.0	1.20	39.00
524.991000	40.6	1000.0	100.000	103.0	V	1.0	5.80	46.40

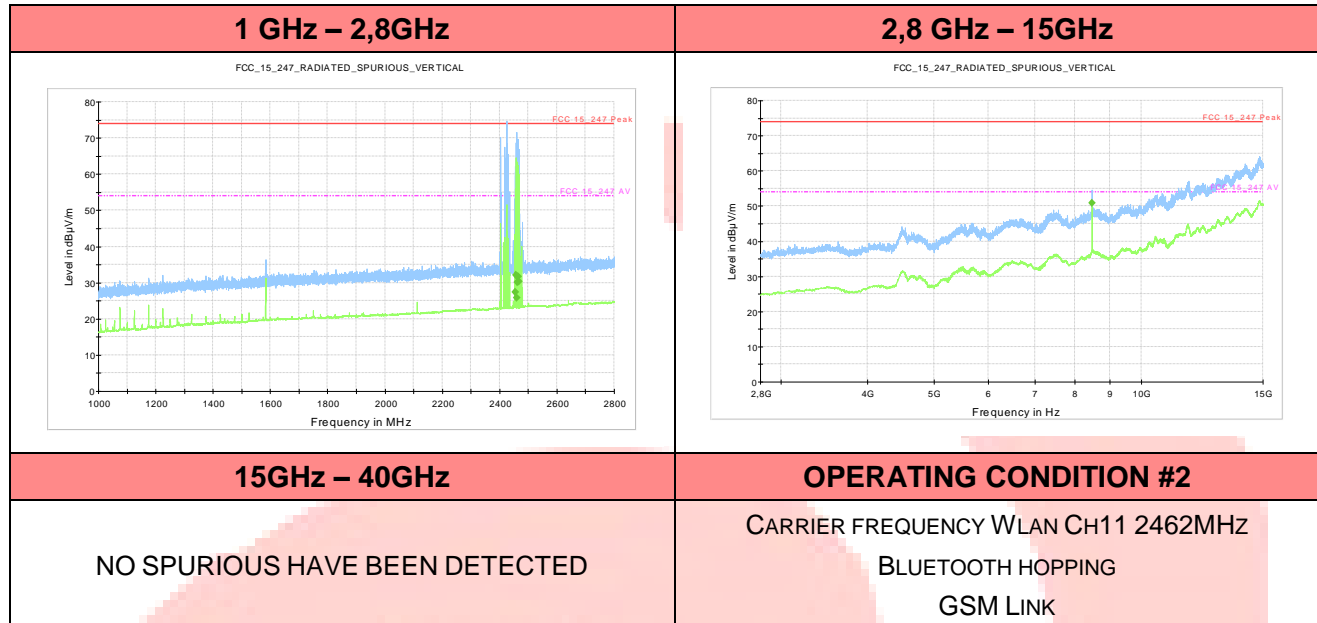
OPERATING CONDITION #1
FREQUENCY RANGE: 1GHz to 10thHARMONICS
VERTICAL POLARIZATION



OPERATING CONDITION #1
FREQUENCY RANGE: 1GHz to 10th ARMHONICS
HORIZONTAL POLARIZATION

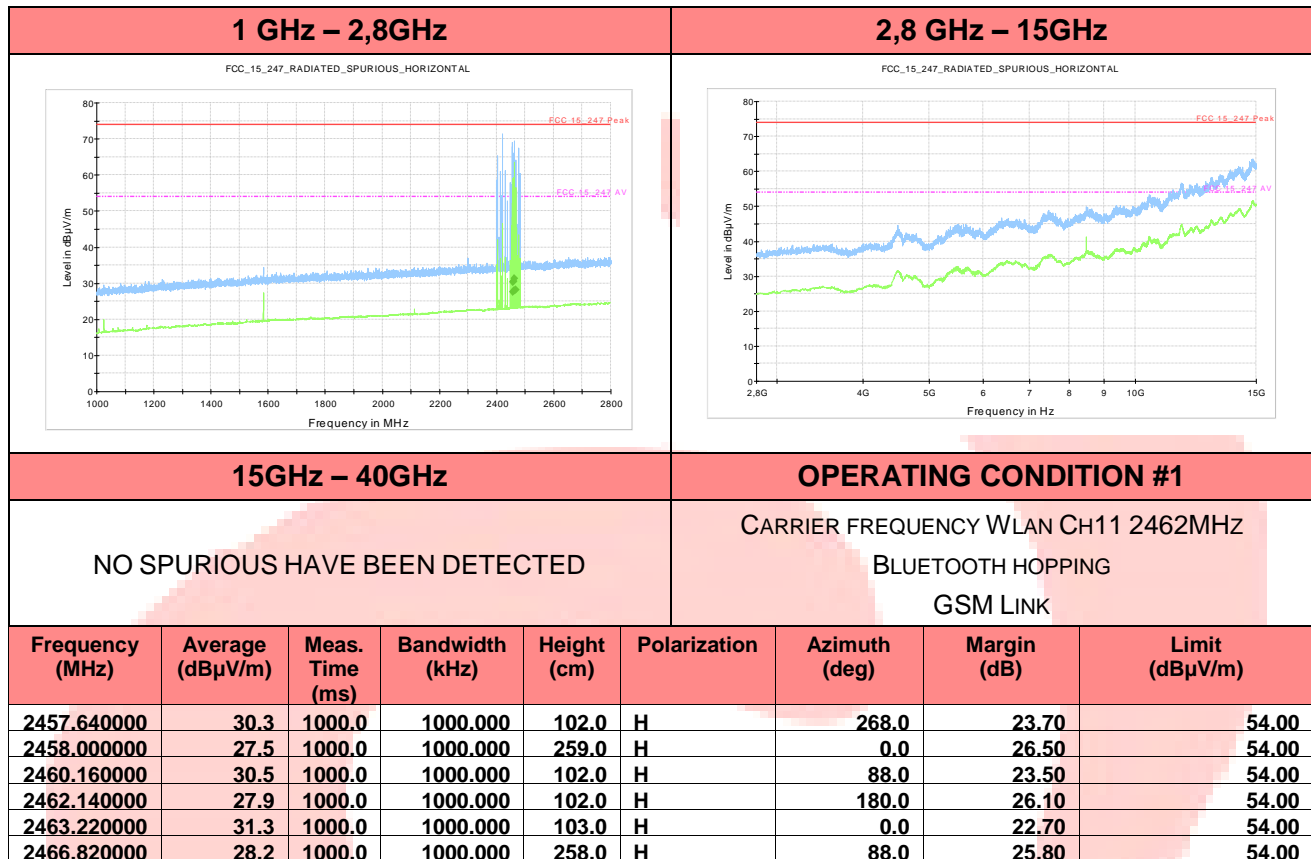


OPERATING CONDITION : #2
FREQUENCY RANGE: 1GHz to 10th HARMONICS
VERTICAL POLARIZATION



Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2454.940000	27.4	1000.0	1000.000	102.0	V	269.0	26.60	54.00
2457.100000	32.1	1000.0	1000.000	259.0	V	91.0	21.90	54.00
2460.700000	25.9	1000.0	1000.000	102.0	V	179.0	28.10	54.00
2462.860000	30.2	1000.0	1000.000	103.0	V	91.0	23.80	54.00
2464.120000	31.7	1000.0	1000.000	102.0	V	269.0	22.30	54.00
2466.280000	30.3	1000.0	1000.000	259.0	V	91.0	23.70	54.00
8479.100000	50.8	1000.0	1000.000	103.0	V	270.0	3.20	54.00

OPERATING CONDITION : #2
FREQUENCY RANGE: 1GHz to 10th ARMHONICS
HORIZONTAL POLARIZATION



**TEST
2.**

Band-Edge

REFERENCE DOCUMENT Title 47 Part 15 Subpart C § 15.247 d)

TEST SETUP	In according to ref std
TEST LOCATION	Radio test area
TYPE OF MEASUREMENT	CONDUCTED
TEST EQUIPMENT	Spectrum Analyzer Rohde&Schwarz mod. FSP40 SYSTEM DC POWER SUPPLY HP mod. 6623A
TEST PERFORMED BY	Enrico Banfi
TESTING DATE	28-29/11/2013

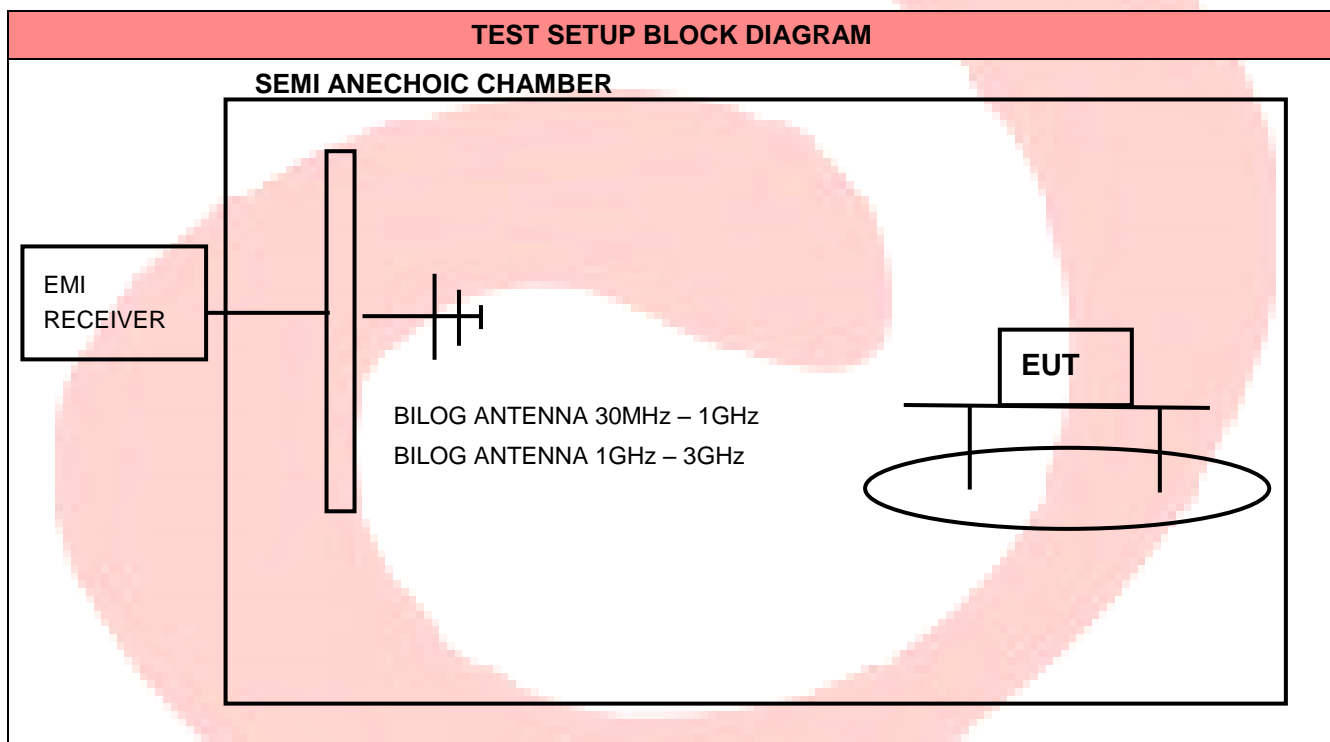
TEST CONDITIONS:	MEASURED
Ambient temperature : 23°C ± 5°C	24°C
Ambient humidity : 25 - 75 %rH	45%
Pressure : 85 - 106 kPa (860 mbar - 1060 mbar)	960mbar

OPERATING CONDITION	#1, #2
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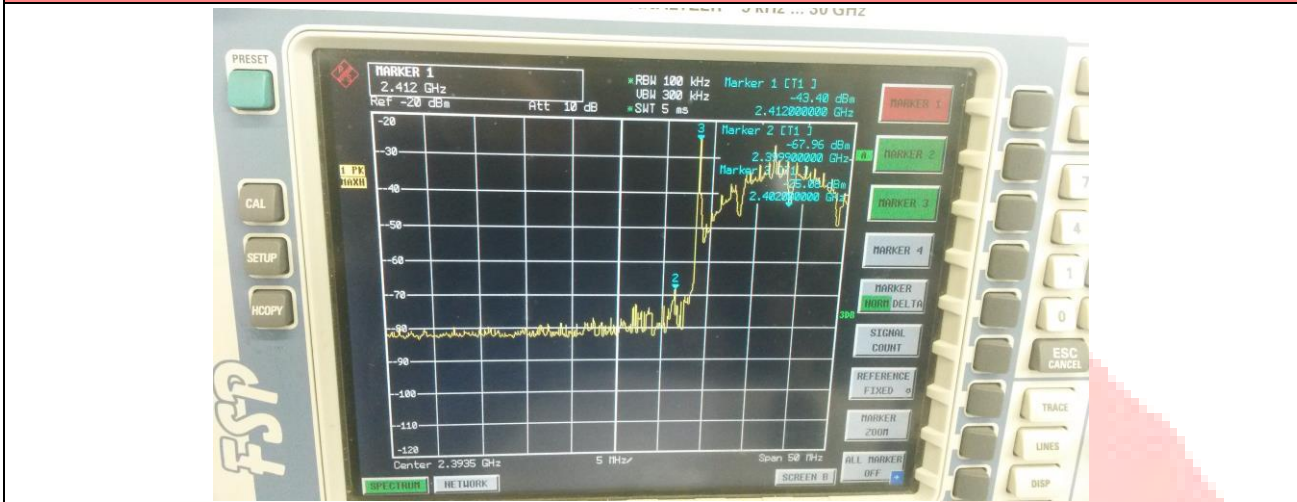
TEST RESULT	WITHIN THE LIMITS
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DESCRIPTION

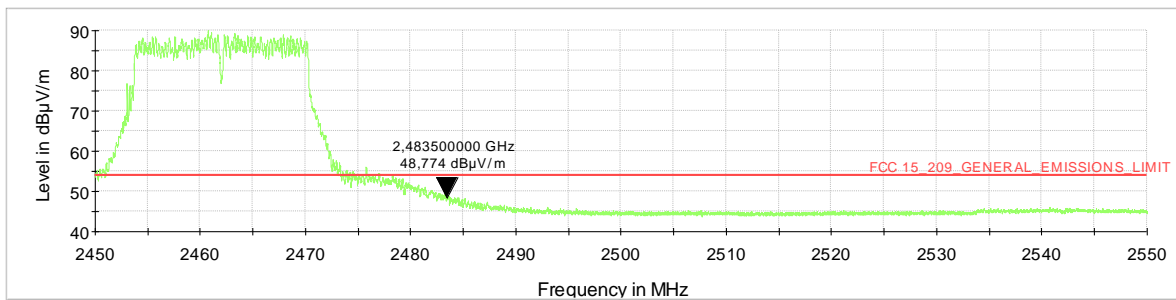
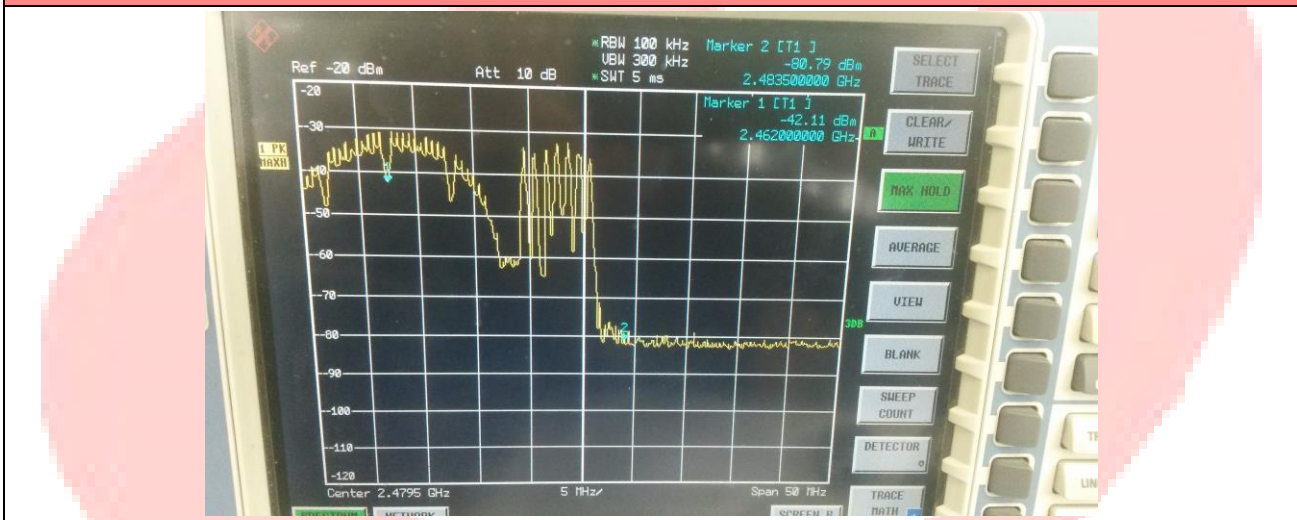
According to §15,247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits, If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB, Attenuation below the general limits specified in Sec, 15,209(a) is not required, In addition, radiated emissions which fall in the restricted bands, as defined in Sec, 15,205(a), must also comply with the radiated emission limits specified in Sec, 15,209(a) (see Sec, 15,205(c)),



Plots of 100KHz Band Edge - Operating Condition #1



Plots of 100KHz Band Edge - Operating Condition #2



6 LIST OF EQUIPMENT USED

EQUIPMENT	IDENTIFICATION NUMBER	CAL. DUE
EMI TEST RECEIVER 20HZ 40GHZ	EMC.359	SEPT.2015
RF SEMI-ANECHOIC CHAMBER (CSSA)	EMC.191	NOV 2015
BILOG ANTENNA	EMC.023	MAY 2016
LOG PERIODICA ANTENNA	EMC.391	DEC 2015
SPECTRUM ANALYZER	EMC.332	JEN 2016