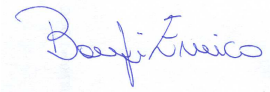
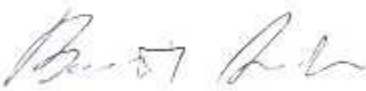
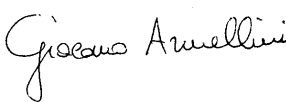


TEST REPORT

APPLICANT:	POWER-ONE ITALY SPA Via San Giorgio 642 – 52028 Terranuova Bracciolini – AR – Italy Tel. +39 055 91951 E-mail: gianfranco.iannuzzi@power-one.com
EUT DESCRIPTION	WIFI LOGGER CARD for Inverter
EUT MODEL	WIFI LOGGER CARD identified by the FCC id: X6W-3N16E
EUT TRADEMARK	
REFERENCE STANDARDS	47 CFR FCC part 15.247
TEST REPORT NUMBER	FCCTR_131623-4
TEST REPORT ISSUE DATE	20/05/2014
TESTING LABORATORY	Prima Ricerca & Sviluppo S.r.l. Via Campagna, 92 -22020 Faloppio (Co) – Italy FCC test registration number: 421808
TESTING LOCATION	As Above
DATE OF TEST SAMPLE RECEIPT	25/11/2013
DATE OF TEST	28-29/11/2013 – 19/03/2014
TESTED BY	Enrico BANFI Tecnico laboratorio / Laboratory technician 
	Andrea BORTOLOTTI Tecnico laboratorio / Laboratory technician 
APPROVED BY	Giacomo ARMELLINI Responsabile Laboratorio EMC e RADIO/ EMC and RADIO Laboratory Manager 

*The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
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1. RELEASE CONTROL RECORD

TEST REPORT NUMBER	REASON OF CHANGE	DATE OF ISSUE
FCCTR_131623-0	Original release	22/01/2014
FCCTR_131623-1	Typographical error correction Added Conducted power measurement plots Removed photo graphic section	18/03/2014
FCCTR_131623-2	Editorial change	08/04/2014
FCCTR_131623-3	Editorial change	05/05/2014
FCCTR_131623-4	Editorial change in radiated measurement section	20/05/2014

2. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

2.1 Identification

Brand name:	
Manufacturer:	Power-One Italy S.p.A.
Type of Equipment :	WIFI LOGGER CARD for inverter
Model name or number :	WIFI LOGGER CARD identified by the FCC id: X6W-3N16E
Serial number :	200071 VCA.V1E01.1 002
FCC ID :	X6W-3N16E
Country of manufacturer:	Italy

2.2 Technical data

FCC class:	47 CFR FCC Part 15 Subpart C § 15.247
Product type:	Radio Equipment
Radio type:	Intentional radiators
Product description / application	The EUT is a WLAN module for photovoltaic inverter
Power supply requirements :	12Vdc powered by inverter board
Frequency range :	2400-2483,5MHz
Std 802.11:	IEEE Std 802.11b, 802.11g and 802.11n
Modulation Type:	CCK DQPSK DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS for 802.11b OFDM for 802.11g/n
Transfer Rate	802.11b: 11 / 5.5 / 2 / 1 Mbps 802.11g: 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6 Mbps 802.11n: 65 / 58.5 / 52 / 39 / 26 / 19.5 / 13 / 6.5 Mbps
RF Output Impedance :	50 Ohms
Channel bandwidth:	20MHz
Channel spacing:	5MHz
Antenna Connector /Types :	RSMA connector

2.3 Technical information

MODULE MANUFACTURER:	EPCOS
MODULE TYPE:	LBEPSC LXRC-701
TYPE OF ANTENNA:	☐ Integral ; ☒ External ; ☐ Dedicated  EA-79 F 2.4 GHZ Swivel RP-SMA
ANTENNA GAIN:	Max. 3.32dBi (worst case)

2.4 Ports identification

This section contains descriptions of all signal ports and AC/DC power input/output 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	Connection
1	Enclosure	Not present (electronic PCB board only)	Plug-in electronic board
2	AC Power Supply	Not present (electronic PCB board only)	-----
3	DC power supply	12Vdc	Plug-in electronic board
4	Signal lines	Signal line	Plug-in electronic board
5	Telecomm. Lines	Not present (electronic PCB board only)	-----
6	Antenna	RSMA connector	Connector

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

2.5 Auxiliary equipment

- Evaluation Board Power-ONE (used during the session to power supply the EUT and to communicate with auxiliary PC for channel and protocol setting)
- Portable PC with dedicated software
- USB-Serial converter Power-One

3. OPERATING TEST MODES AND CONDITIONS

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”

<i>Operating condition</i>	<i>Description</i>
#1	<i>Continuous transmission, modulated carrier, protocol 802.11 b</i>
#2	<i>Continuous transmission, modulated carrier, protocol 802.11 g</i>
#3	<i>Continuous transmission, modulated carrier, protocol 802.11 n</i>

Special Test Software: Special software and hardware by the Applicant to operate the EUT at each channel frequency continuously. For example, the transmitter will be operated at each of the lowest, middle and highest frequencies individually continuously during testing.

Special Hardware Used: The RF Module has been tested by an evaluation board supplied by Power-One (See Photographic documentation).

Transmitter Test Antenna: The EUT has been tested with the antenna fitted in a manner typical of normal intended use as integral / non-integral antenna equipment as described with the test results.

4. REFERENCE STANDARD / DOCUMENT FOR PERFORMED TESTS

Cfr 47 part 15 subpart C par. 15.247	Radio Frequency Devices – Intentional Radiators Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz
ANSI C63.10:2009	American National Standard for Testing Unlicensed Wireless Devices
KDB 558074 D01	Guidance for performing Compliance measurements on Digital Transmission Systems (DTS) Operating under §15.247

5. SUMMARY OF TEST RESULTS

5.1 Emission tests

Port	Phenomena	Basic standard	Operating condition ¹	Result
Antenna port	Antenna requirement ¹	FCC Part 15 §15.203	---	Within the limit
	Maximum Peak Output Power	FCC Part 15 §15.247 (b) (3)	#1 #2 #3	Within the limit
	6 dB Bandwidth	FCC Part 15 §15.247 (a) (2)	#1 #2 #3	Within the limit
	Power Spectral Density	FCC Part 15 §15.247 (e)	#1 #2 #3	Within the limit
	Band-Edge	FCC Part 15 § 15.247 (d)	#1 #2 #3	Within the limit
	RF conducted Spurious Emissions at the Transmitter Antenna Terminal	FCC Part 15 § 15.247 (d)	#1 #2 #3	Within the limit
	RF radiated Spurious Emissions at the Transmitter Antenna Terminal	FCC Part 15 § 15.247 (d)	#1 #2 #3	Within the limit

Notes: ¹ The EUT complies with the requirement; it employs a unique (non-standard) antenna connector (RPSMA/U.FL/IPX), for all external antennas proposed for use with the EUT and permanently mounted integral antenna.

6. TEST RESULTS

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**TEST
1.**

MAXIMUM PEAK OUTPUT POWER

**REFERENCE
DOCUMENT**

According to §15.247(b) (3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

TEST SETUP	In according to ref std
TEST LOCATION	Radio test area
TEST METHOD	KDB 558074 D01 par. 9.1.2 Integrated band power method
TYPE OF MEASUREMENT	CONDUCTED
TEST EQUIPMENT	Spectrum Analyzer Rohde&Schwarz mod. FSP40 SYSTEM DC POWER SUPPLY HP mod. 6623A
TEST PERFORMED BY	Andrea Bortolotti
TESTING DATE	19/03/2014

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, #3 , DUTY CYCLE 100%
----------------------------	------------------------------

TEST RESULT	WITHIN THE LIMITS
--------------------	--------------------------

Protocol B – 11Mbps – CCK (worst case)

Channel	Frequency (MHz)	Output Power in dBm	Antenna Gain (dBi)	Power (dBm)	Limit (dBm)	Result
1	2412	16.85	3.32	20.17	30	WITHIN THE LIMITS
6	2437	17.68		21.00		
11	2462	17.21		20.53		
Incertezza di misura / Measurement Uncertainty : ± 3 dB						

Protocol G – 54Mbps – 64QAM (worst case)

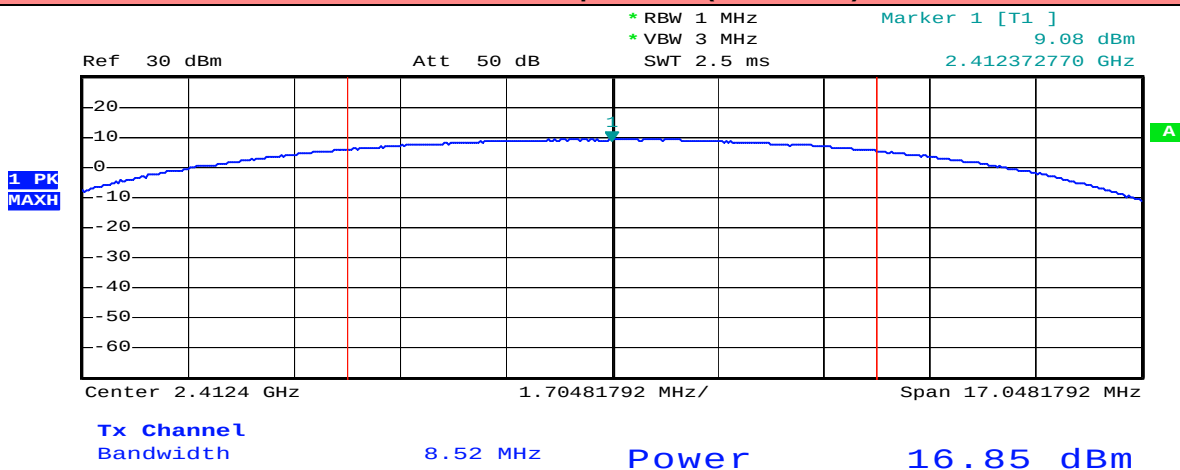
Channel	Frequency MHz	Output Power in dBm	Antenna Gain (dBi)	Power (dBm)	Limit (dBm)	Result
1	2412	16.98	3.32	20.30	30	WITHIN THE LIMITS
6	2437	17.27		20.59		
11	2462	16.83		20.15		
Incertezza di misura / Measurement Uncertainty : ± 3 dB						

Protocol N – 65Mbps - (worst case)

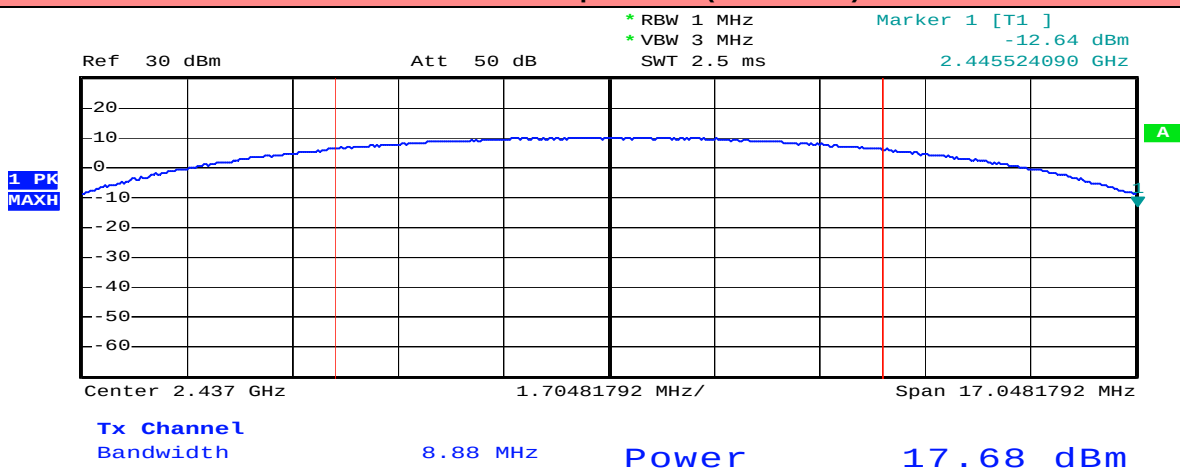
Channel	Frequency MHz	Output Power in dBm	Antenna Gain (dBi)	Power (dBm)	Limit (dBm)	Result
1	2412	16.16	3.32	19.48	30	WITHIN THE LIMITS
6	2437	16.43		19.75		
11	2462	15.97		19.29		
Incertezza di misura / Measurement Uncertainty : ± 3 dB						

GRAPHICS

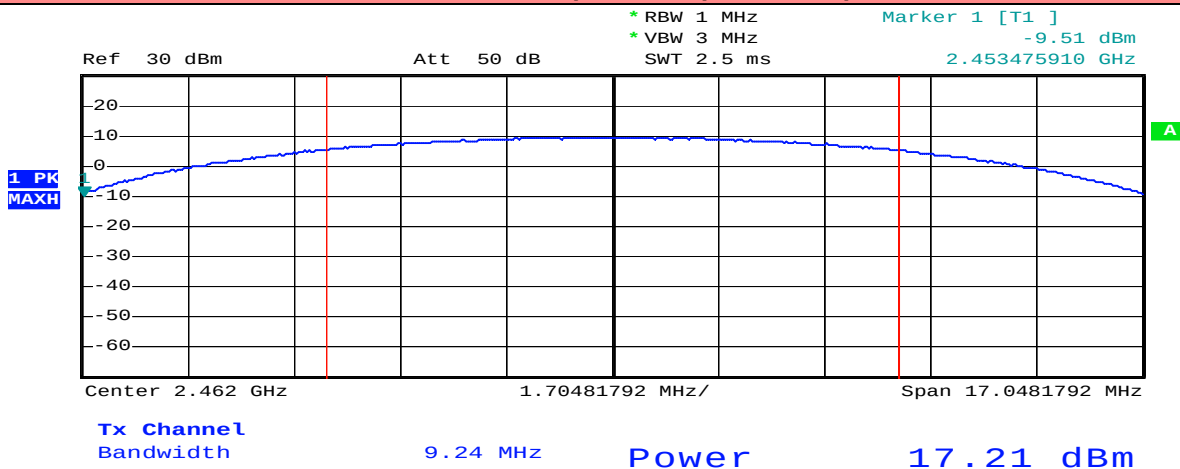
Protocol B – 11Mbps – CCK (worst case) – Ch1



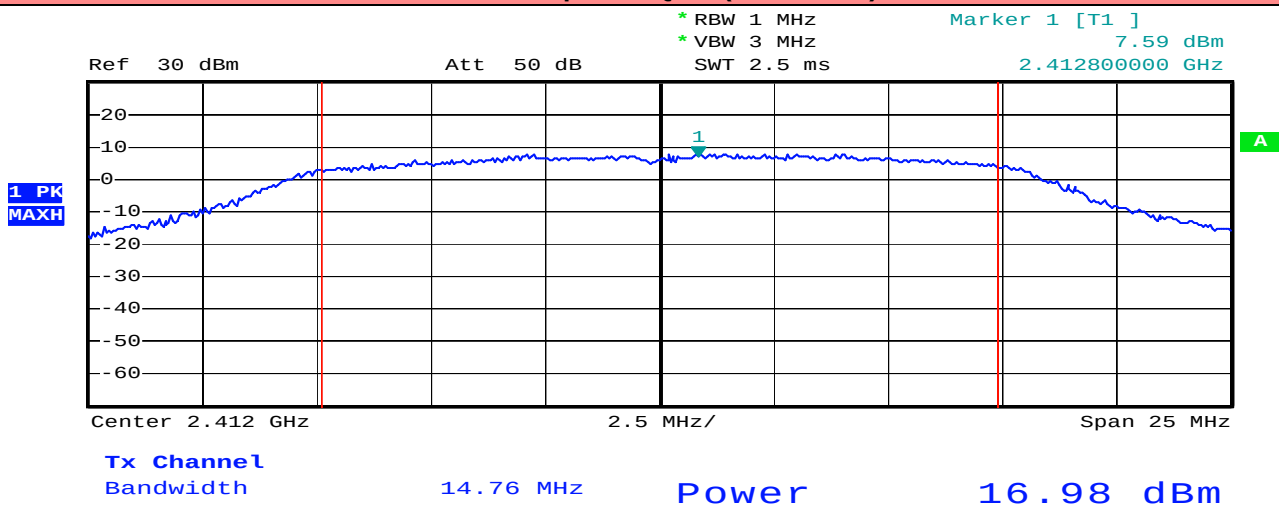
Protocol B – 11Mbps – CCK (worst case) – Ch6



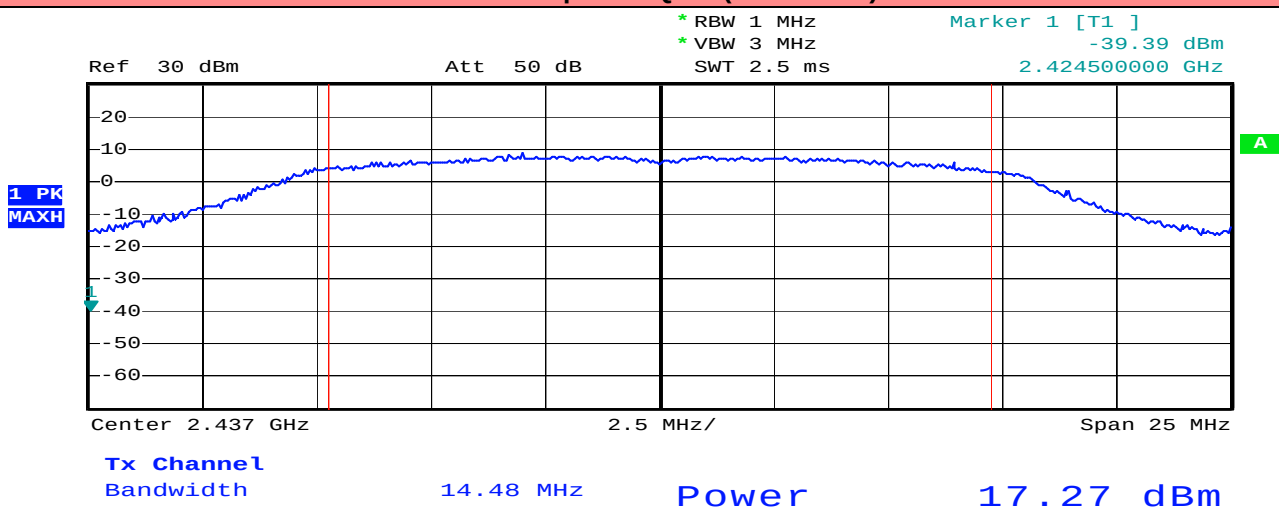
Protocol B – 11Mbps – CCK (worst case) – Ch11



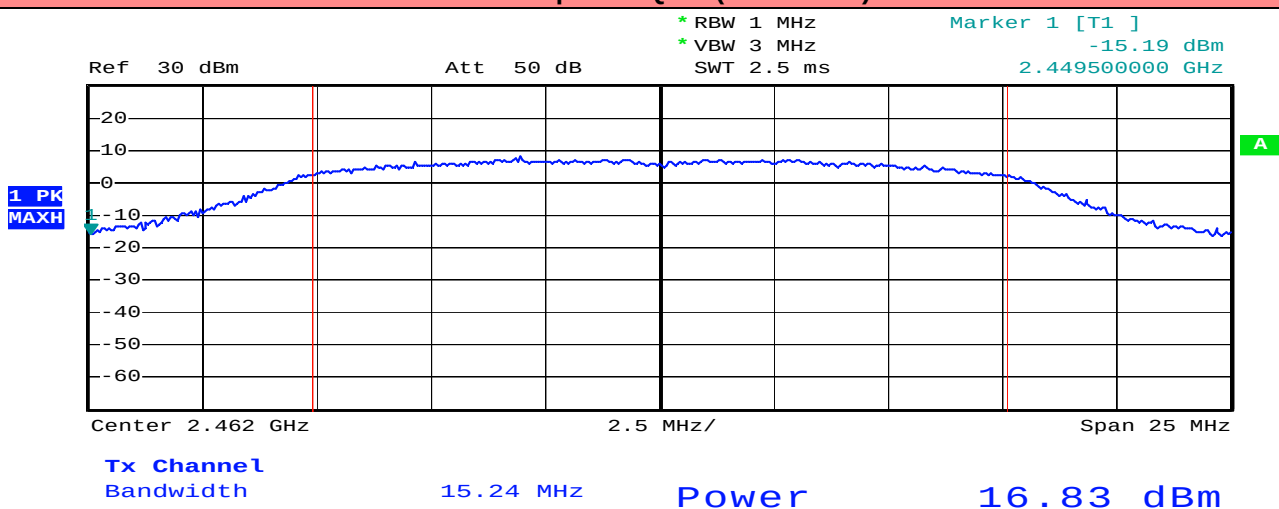
Protocol G – 54Mbps – 64QAM (worst case) – Ch1



Protocol G – 54Mbps – 64QAM (worst case) – Ch6

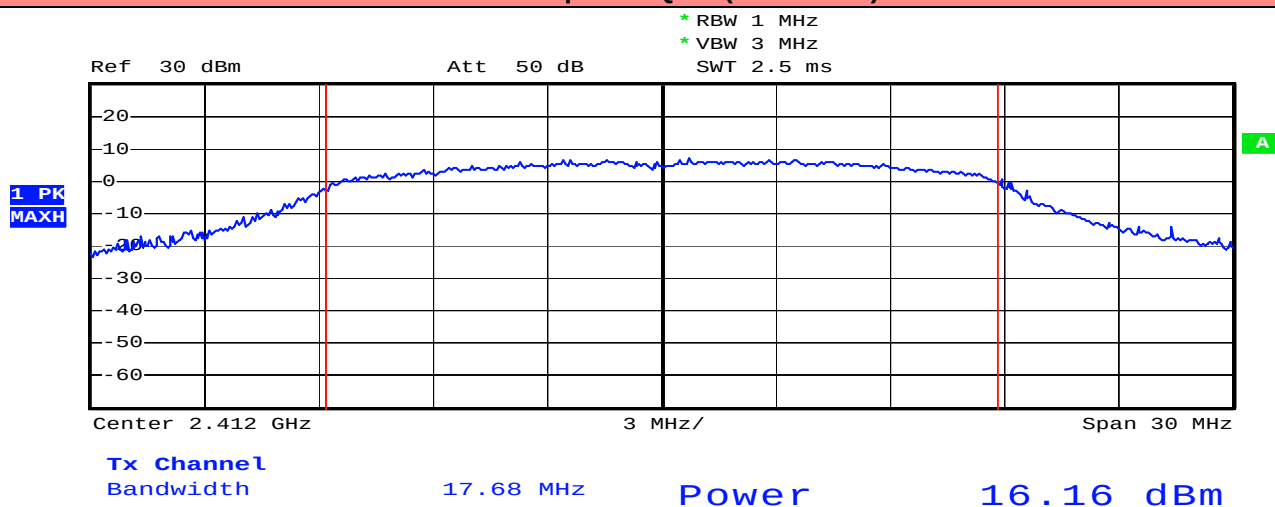


Protocol G – 54Mbps – 64QAM (worst case) – Ch11

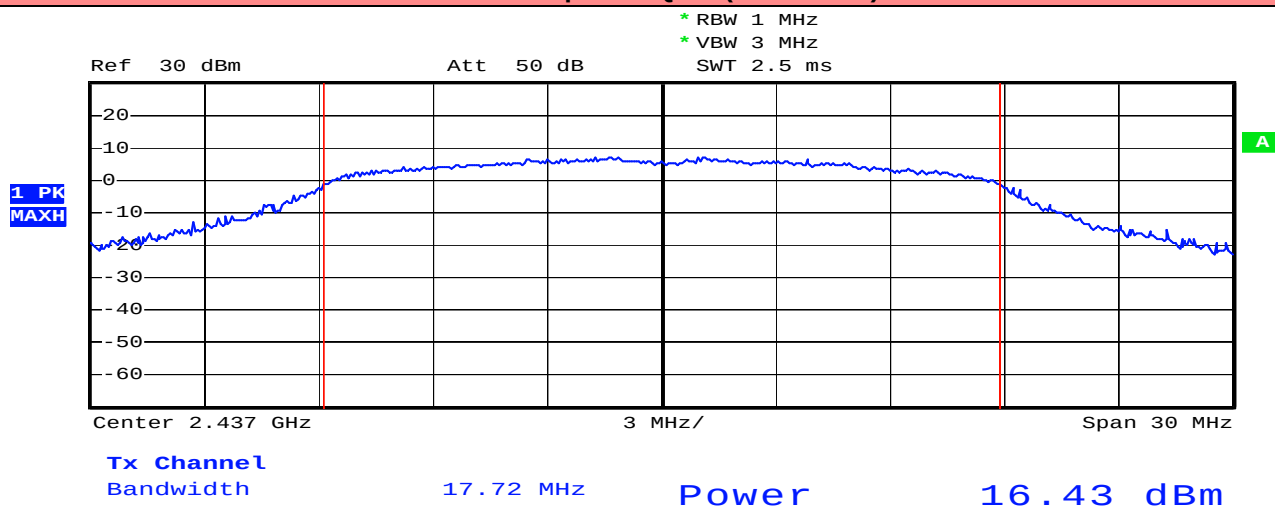




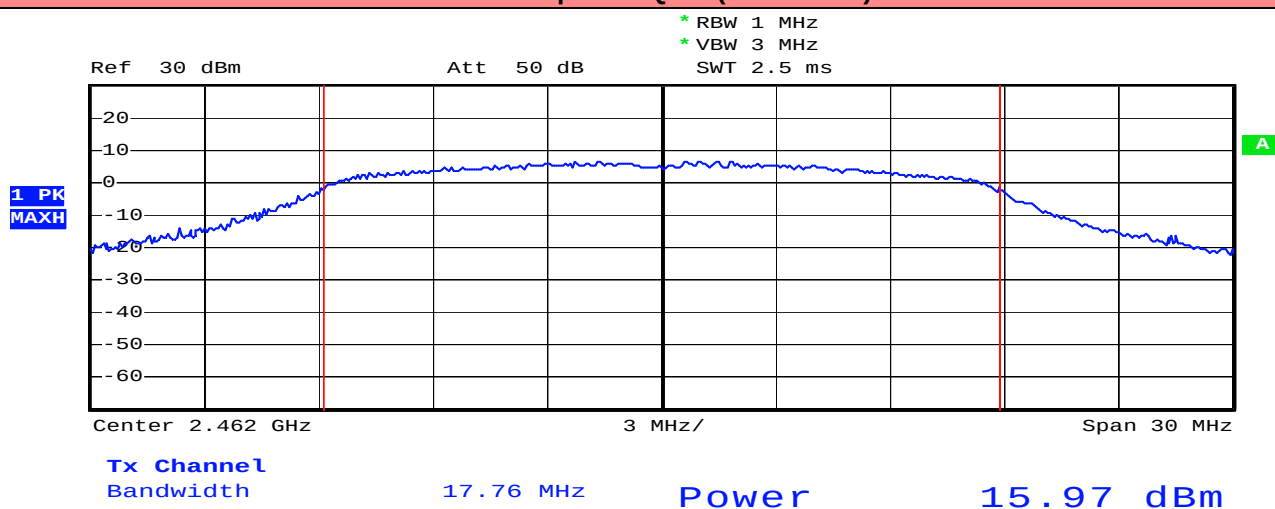
Protocol N - 65Mbps - 64QAM (worst case) - Ch1



Protocol N - 65Mbps - 64QAM (worst case) - Ch6



Protocol N - 65Mbps - 64QAM (worst case) - Ch11



**TEST
2.**

6dB CHANNEL BANDWIDTH

**REFERENCE
DOCUMENT**

According to §15,247(a)(2), Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483,5 MHz, and 5725-5850 MHz bands, The minimum 6 dB bandwidth shall be at least 500 kHz,

TEST SETUP	In according to ref std
TEST LOCATION	Radio test area
TEST METHOD	KDB 558074 D01 par. 8.2 DTS Bandwidth Option 2
TYPE OF MEASUREMENT	CONDUCTED
TEST EQUIPMENT	Spectrum Analyzer Rohde&Schwarz mod. FSP40 SYSTEM DC POWER SUPPLY HP mod. 6623A
TEST PERFORMED BY	Andrea Bortolotti
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, #3 , DUTY CYCLE 100%
----------------------------	------------------------------

TEST RESULT	WITHIN THE LIMITS
--------------------	--------------------------

Measurement Result

Protocol B – 11Mbps – CCK (worst case)

Channel	Frequency (MHz)	Measurement (MHz) 6 dB band	Result	LIMIT
CH 1	2412	8.520	WITHIN THE LIMITS	> 500 kHz
CH 6	2437	8.880	WITHIN THE LIMITS	> 500 kHz
CH 11	2462	9.240	WITHIN THE LIMITS	> 500 kHz

Protocol G – 54Mbps – 64QAM (worst case)

Channel	Frequency (MHz)	Measurement (MHz) 6 dB band	Result	LIMIT
CH 1	2412	14.760	WITHIN THE LIMITS	> 500 kHz
CH 6	2437	14.480	WITHIN THE LIMITS	> 500 kHz
\CH 11	2462	15.240	WITHIN THE LIMITS	> 500 kHz

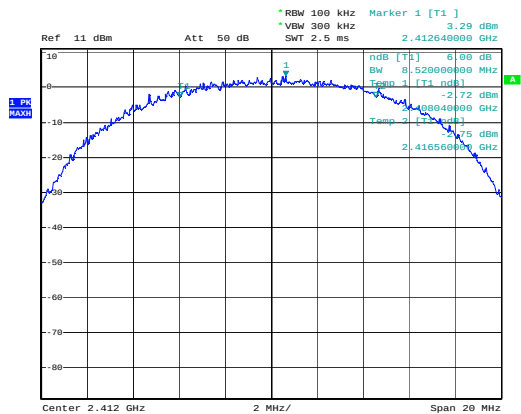
Protocol N – 65Mbps – 64QAM (worst case)

Channel	Frequency (MHz)	Measurement (MHz) 6 dB band	Result	LIMIT
CH 1	2412	17.680	WITHIN THE LIMITS	> 500 kHz
CH 6	2437	17.720	WITHIN THE LIMITS	> 500 kHz
CH 11	2462	17.760	WITHIN THE LIMITS	> 500 kHz

Incertezza di misura / Measurement Uncertainty : ± 1 KHz

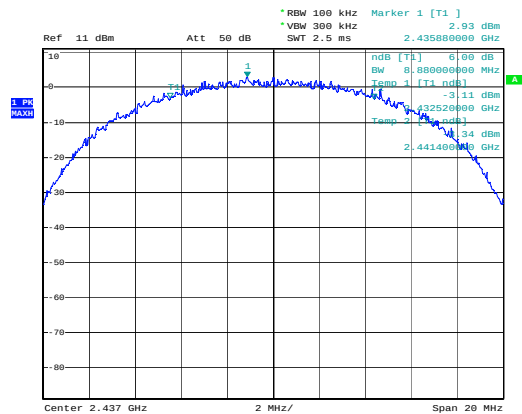
Plots of result

Protocol B CH1



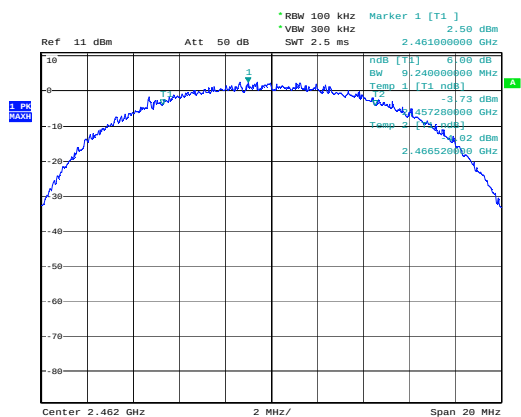
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Protocol B CH6



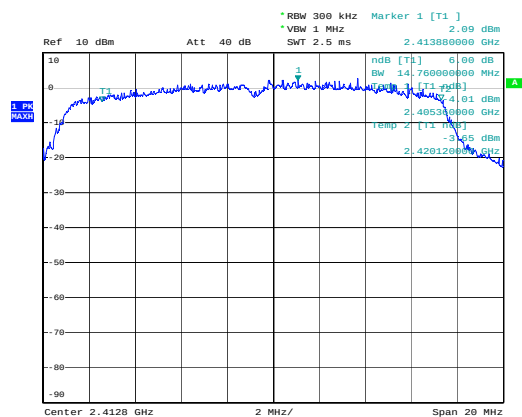
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Protocol B CH11



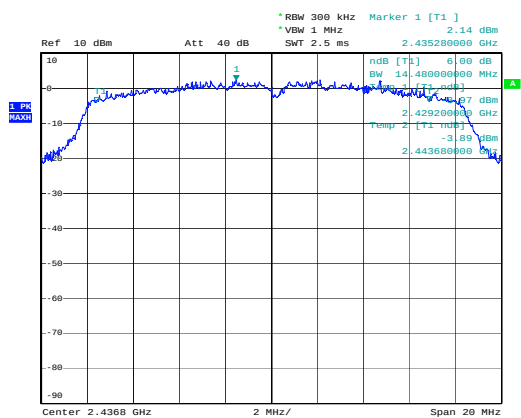
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Protocol G CH1



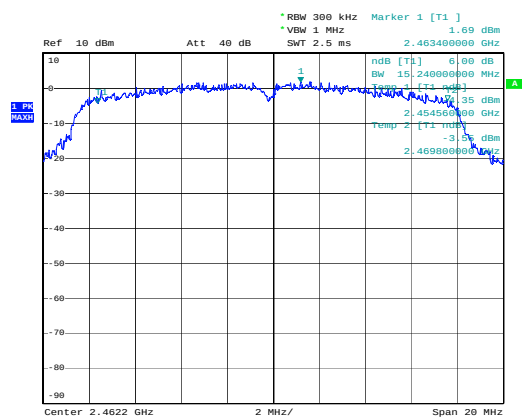
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Protocol G CH6



Date: 2.DEC.2013 20:30:47

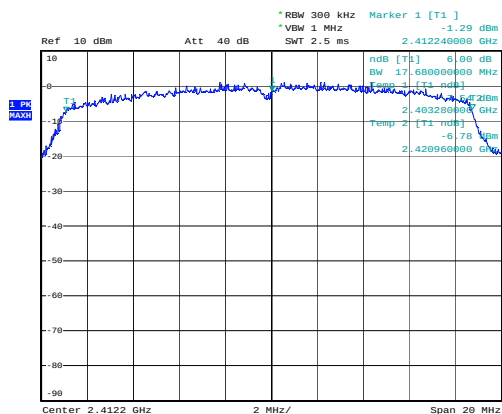
Protocol G CH11



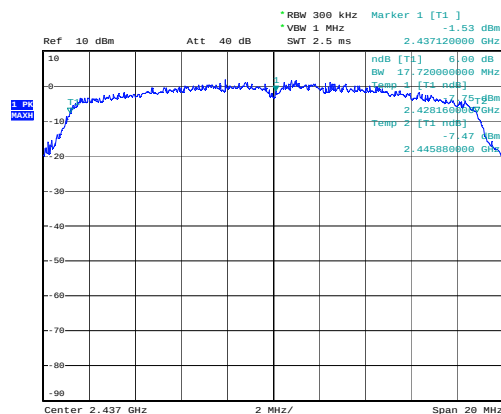
Date: 2.DEC.2013 20:31:26

Plots of result

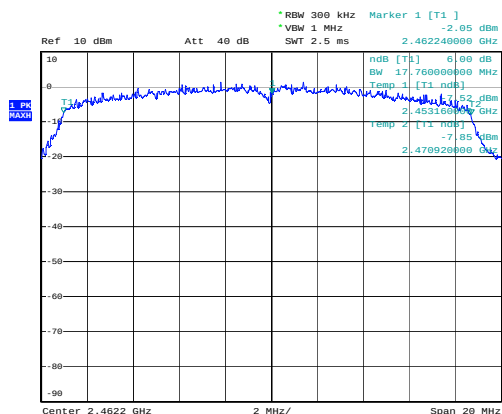
Protocol N CH1



Protocol N CH6



Protocol N CH11



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**TEST
3.**

Band-Edge

**REFERENCE
DOCUMENT**

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)),

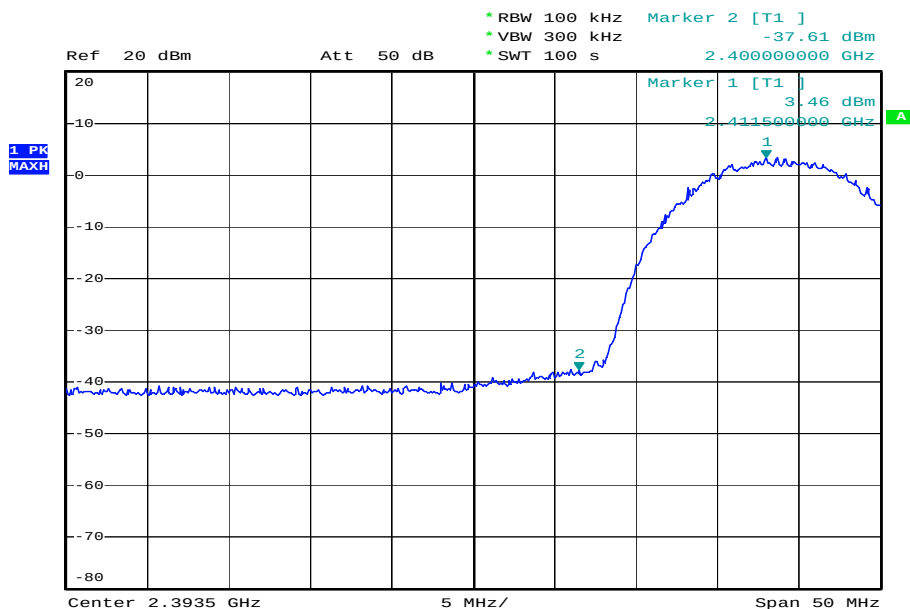
TEST SETUP	In according to ref std
TEST LOCATION	Radio test area
TYPE OF MEASUREMENT	CONDUCTED
TEST EQUIPMENT	Spectrum Analyzer Rohde&Schwarz mod. FSP40 SYSTEM DC POWER SUPPLY HP mod. 6623A
TEST PERFORMED BY	Enrico Banfi
TESTING DATE	28-29/11/2013

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

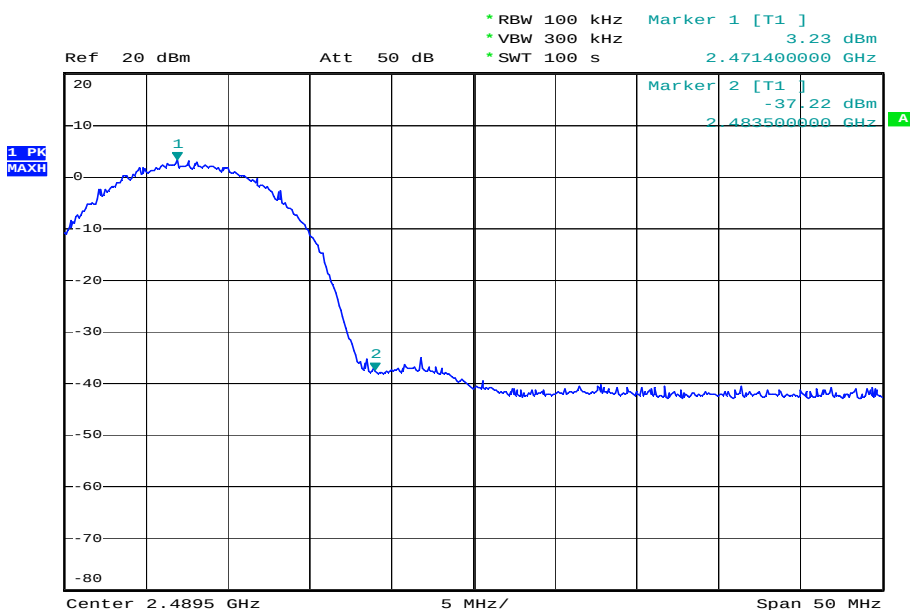
OPERATING CONDITION	#1, #2, #3 , DUTY CYCLE 100%
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TEST RESULT	WITHIN THE LIMITS
--------------------	--------------------------

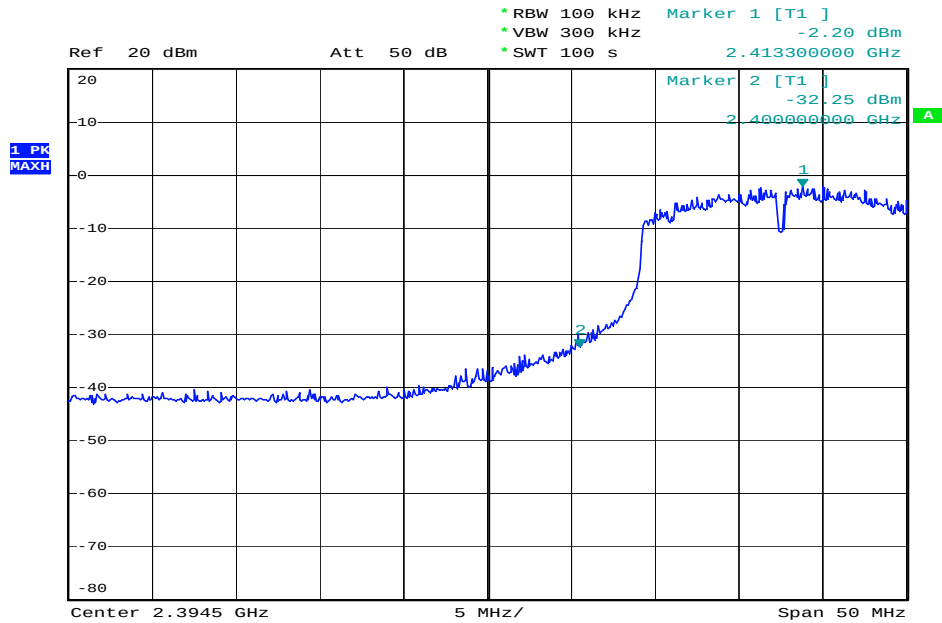
Plots of 100KHz Band Edge low band Protocol B



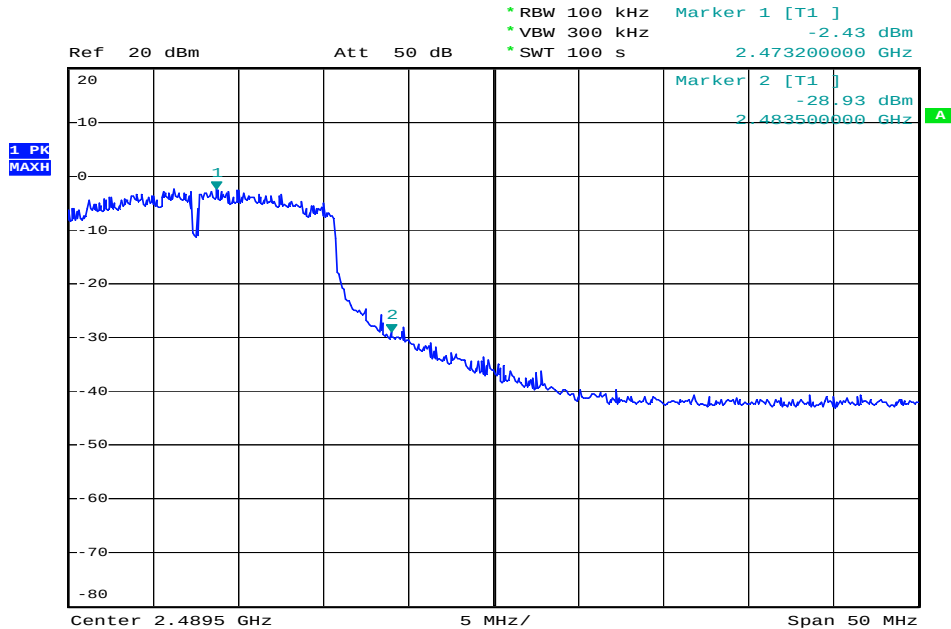
Plots of 100KHz Band Edge highest band Protocol B



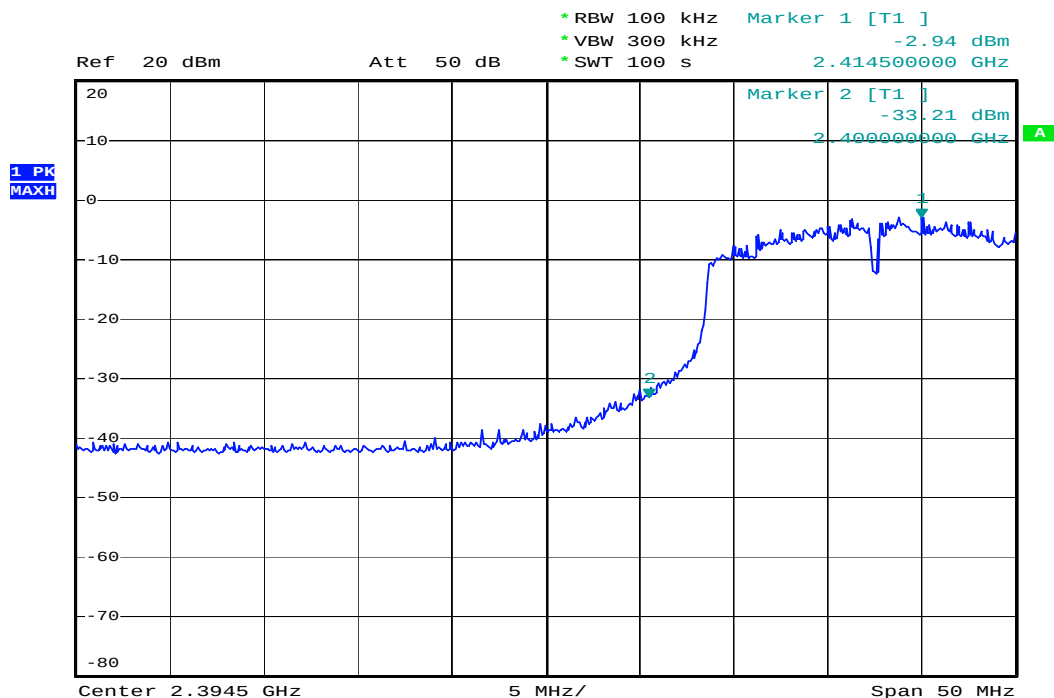
Plots of 100KHz Band Edge low band Protocol G



Plots of 100KHz Band Edge highest band Protocol G

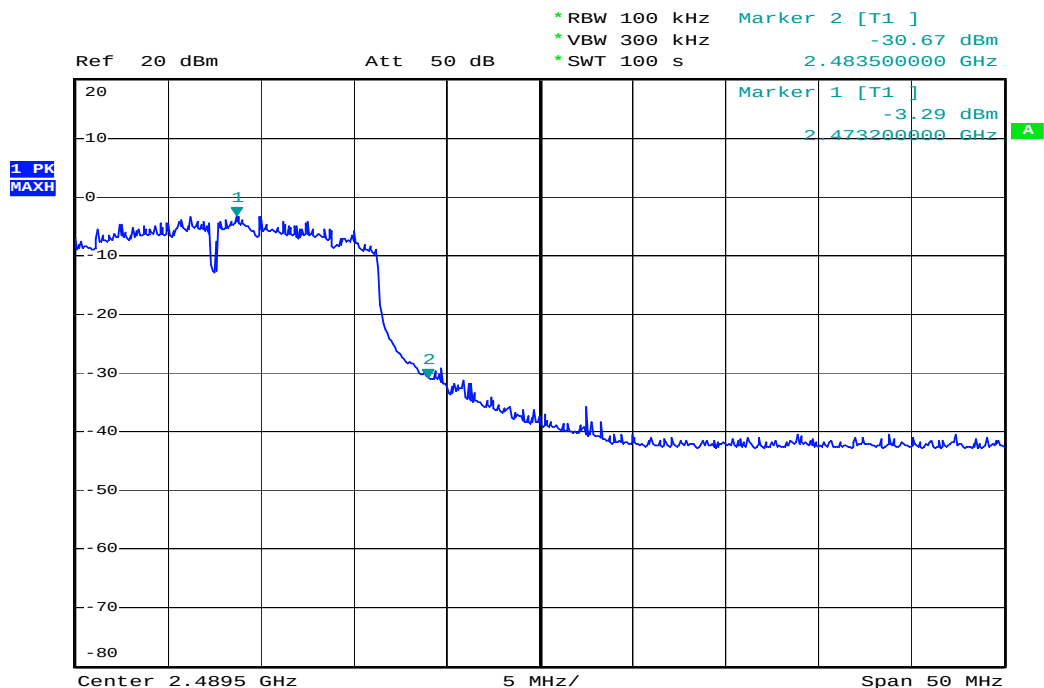


Plots of 100KHz Band Edge low band Protocol N



Date: 27.DEC.2013 15:48:37

Plots of 100KHz Band Edge highest band Protocol N



Date: 27.DEC.2013 15:26:11

**TEST
4.**

POWER SPECTRAL DENSITY

**REFERENCE
DOCUMENT**

According to §15,247) (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission, This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section, The same method of determining the conducted output power shall be used to determine the power spectral density,

TEST SETUP	In according to ref std
TEST LOCATION	Radio test area
TYPE OF MEASUREMENT	CONDUCTED
	KDB 558074 D01 par. 10.2 Method PKPSD (peak PSD)
TEST EQUIPMENT	Spectrum Analyzer Rohde&Schwarz mod. FSP40 SYSTEM DC POWER SUPPLY HP mod. 6623A
TEST PERFORMED BY	Enrico Banfi
TESTING DATE	19/03/2014

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, #3 , DUTY CYCLE 100%
----------------------------	------------------------------

TEST RESULT	WITHIN THE LIMITS
--------------------	--------------------------

Conducted Measurement Result

Protocol B – 11Mbps – CCK (worst case)

Channel	Frequency (MHz)	Power density (dBm)	Limit (dBm)	Margin (dB)	Result
CH 1	2412	3.31	8	4.69	WITHIN THE LIMITS
CH 6	2437	4.27	8	3.73	WITHIN THE LIMITS
CH 11	2462	2.37	8	5.63	WITHIN THE LIMITS
Incertezza di misura / Measurement Uncertainty : ± 1 dB					

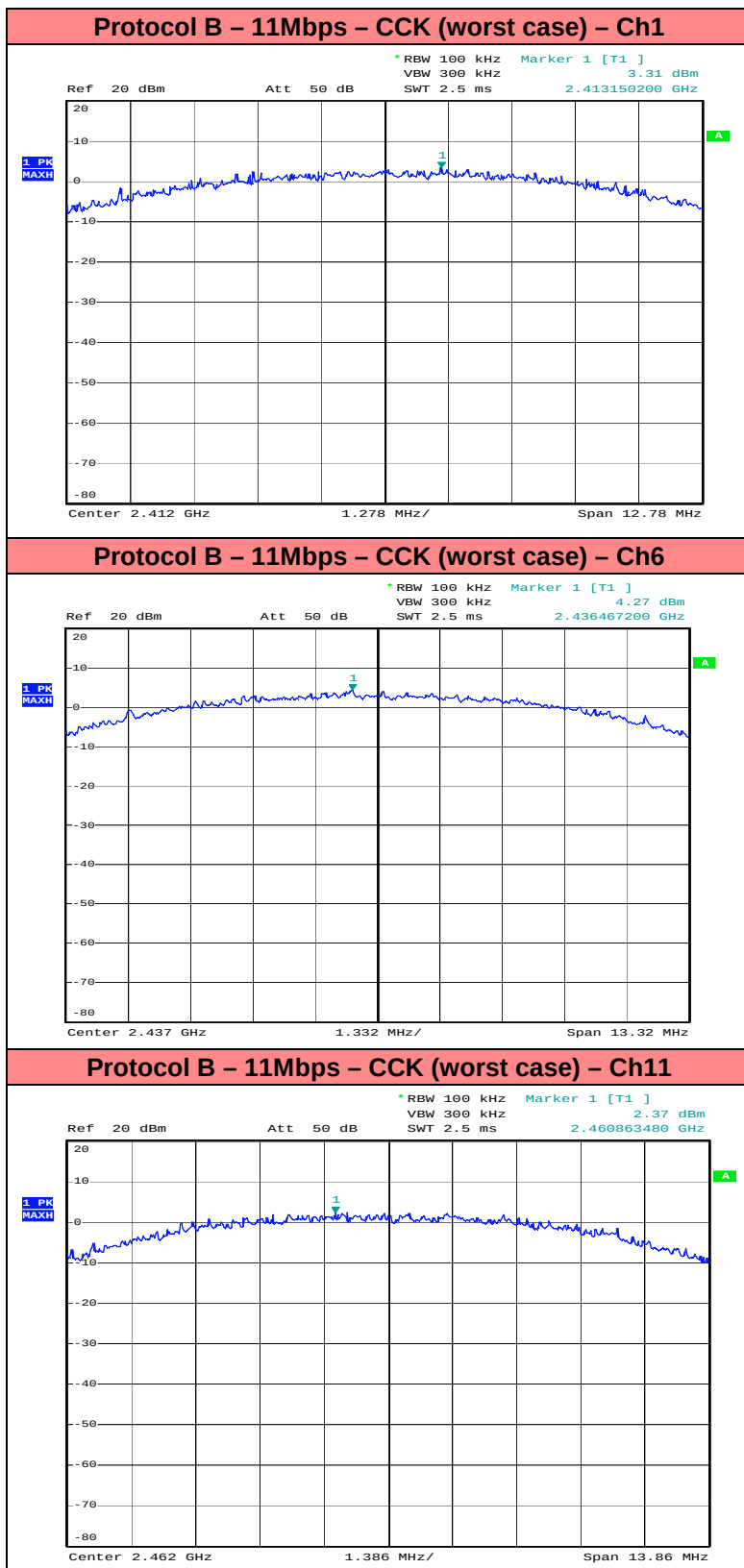
Protocol G – 54Mbps – 64QAM (worst case)

Channel	Frequency (MHz)	Power density (dBm)	Limit (dBm)	Margin (dB)	Result
CH 1	2412	-1.55	8	9.55	WITHIN THE LIMITS
CH 6	2437	-1.09	8	9.09	WITHIN THE LIMITS
CH 11	2462	-1.83	8	9.83	WITHIN THE LIMITS
Incertezza di misura / Measurement Uncertainty : ± 1 dB					

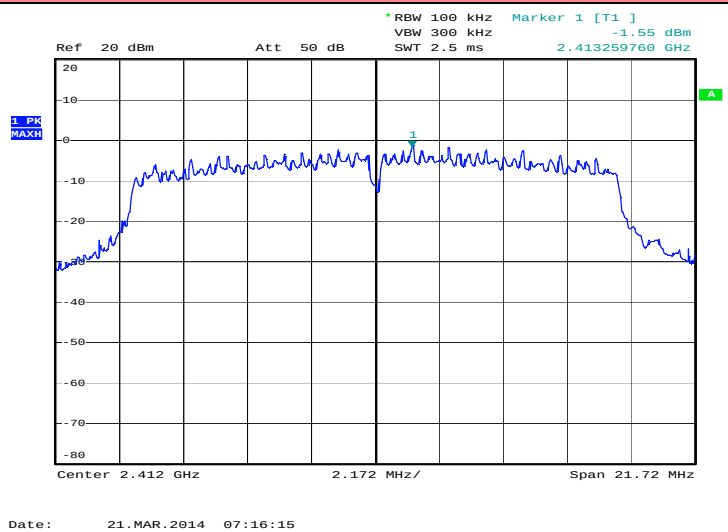
Protocol N – 65Mbps - (worst case)

Channel	Frequency (MHz)	Power density (dBm)	Limit (dBm)	Margin (dB)	Result
CH 1	2412	-2.34	8	10.34	WITHIN THE LIMITS
CH 6	2437	-2.08	8	10.08	WITHIN THE LIMITS
CH 11	2462	-2.69	8	10.69	WITHIN THE LIMITS
Incertezza di misura / Measurement Uncertainty : ± 1 dB					

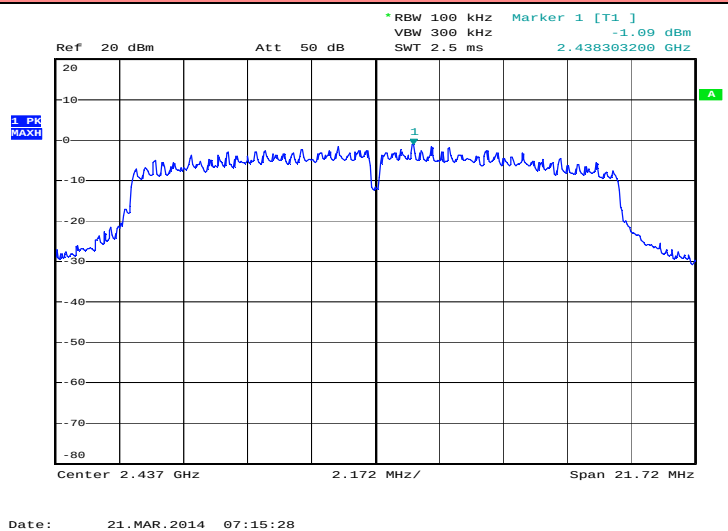
GRAPHICS



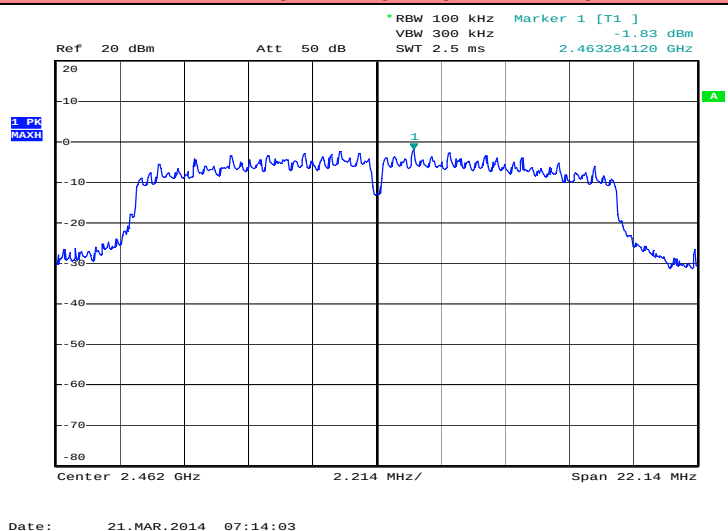
Protocol G – 54Mbps – 64QAM (worst case) – Ch1



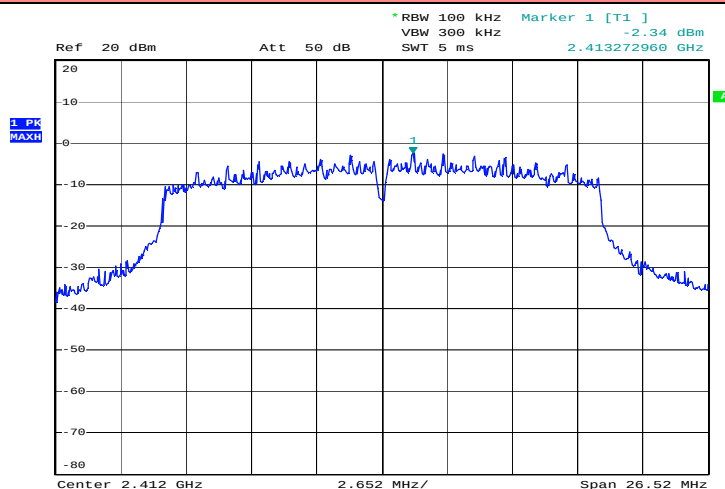
Protocol G – 54Mbps – 64QAM (worst case) – Ch6



Protocol G – 54Mbps – 64QAM (worst case) – Ch11

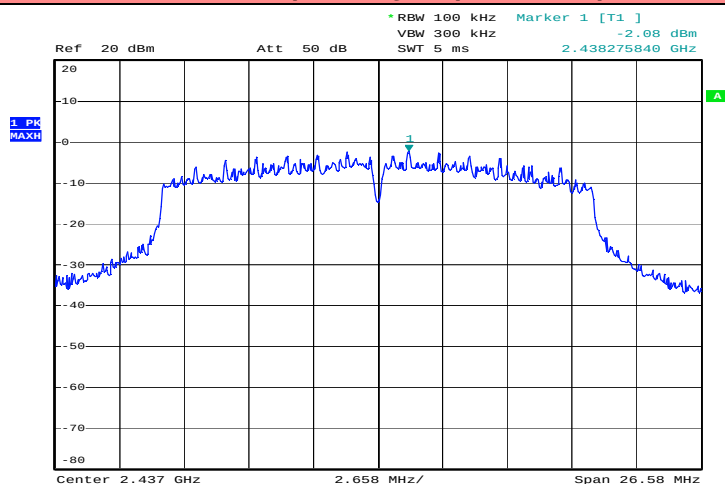


Protocol N – 65Mbps – 64QAM (worst case) – Ch1



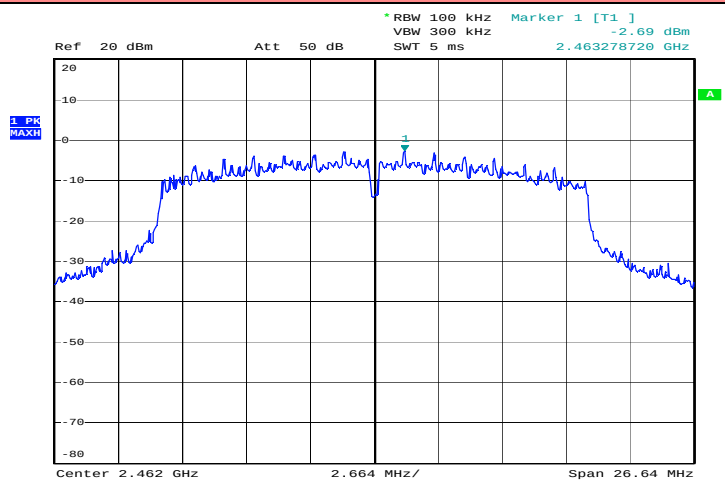
Date: 21.MAR.2014 07:17:13

Protocol N – 65Mbps – 64QAM (worst case) – Ch6



Date: 21.MAR.2014 07:17:53

Protocol N – 65Mbps – 64QAM (worst case) – Ch11



Date: 21.MAR.2014 07:18:49

**TEST
5.**

**RF CONDUCTED SPURIOUS EMISSIONS AT THE
TRANSMITTER ANTENNA TERMINAL**

**REFERENCE
DOCUMENT**

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 §15.209(a) is not required.

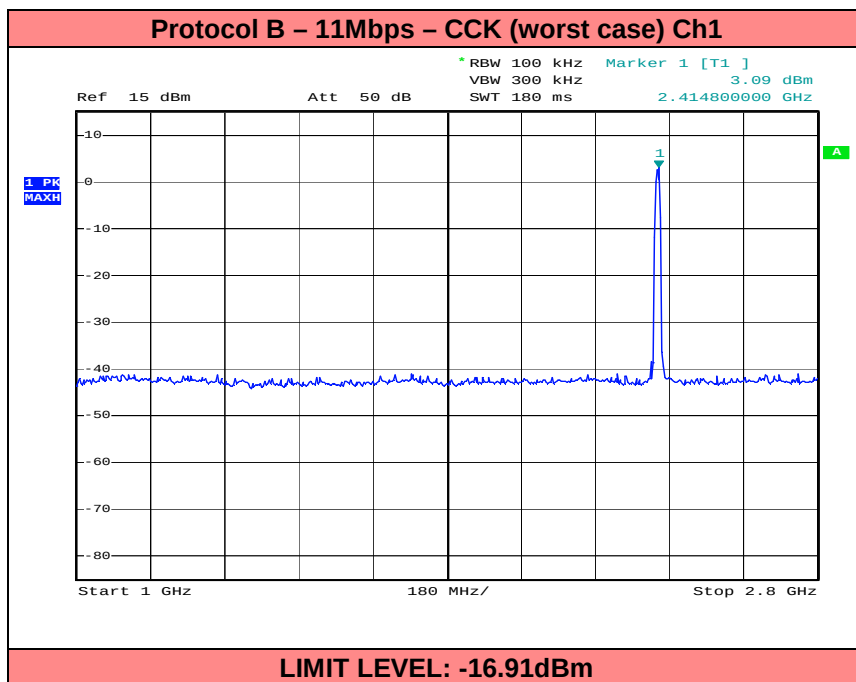
TEST SETUP	In according to ref std
TEST LOCATION	Radio test area
TYPE OF MEASUREMENT	CONDUCTED
	KDB 558074 D01 par. 11.0
TEST EQUIPMENT	Spectrum Analyzer Rohde&Schwarz mod. FSP40 SYSTEM DC POWER SUPPLY HP mod. 6623A High pass filter Wainwright WHNX 2,8/18G-10SS
TEST PERFORMED BY	Enrico Banfi
TESTING DATE	19/03/2014

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, #3 , DUTY CYCLE 100%
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TEST RESULT	WITHIN THE LIMITS
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REFERENCE LEVEL MEASUREMENT

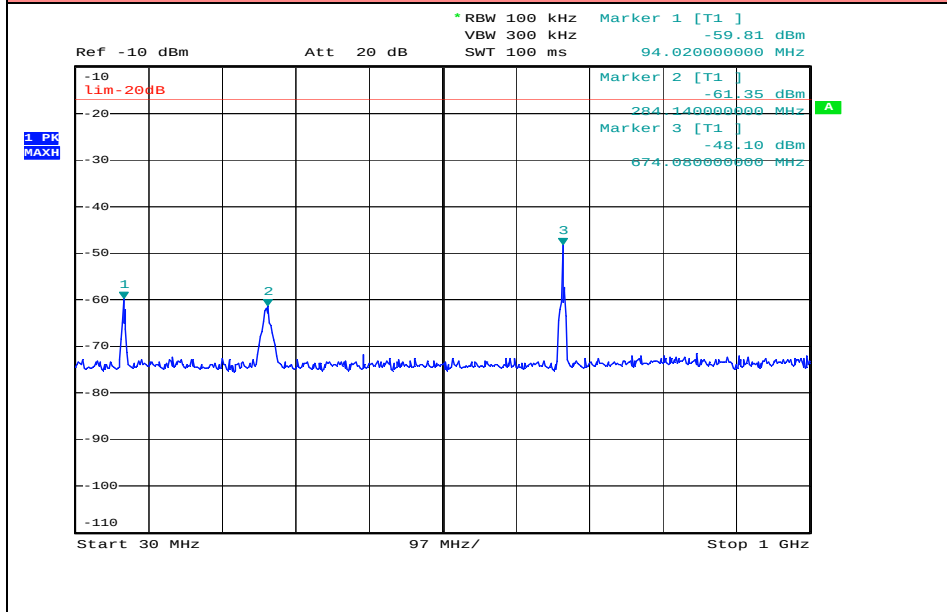


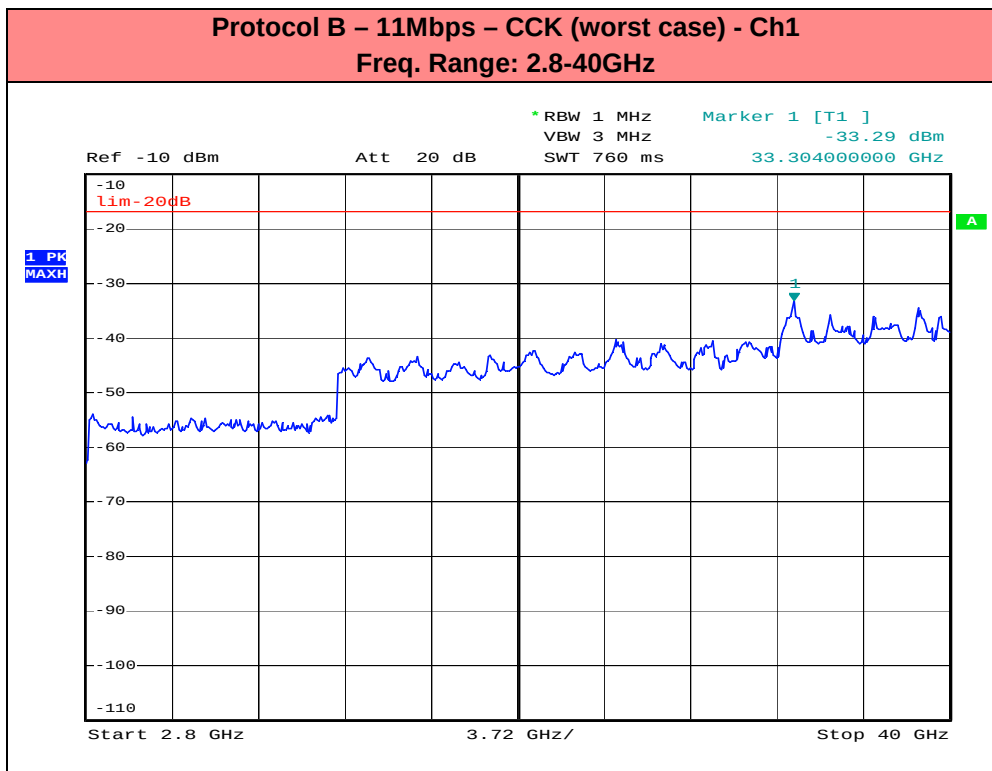
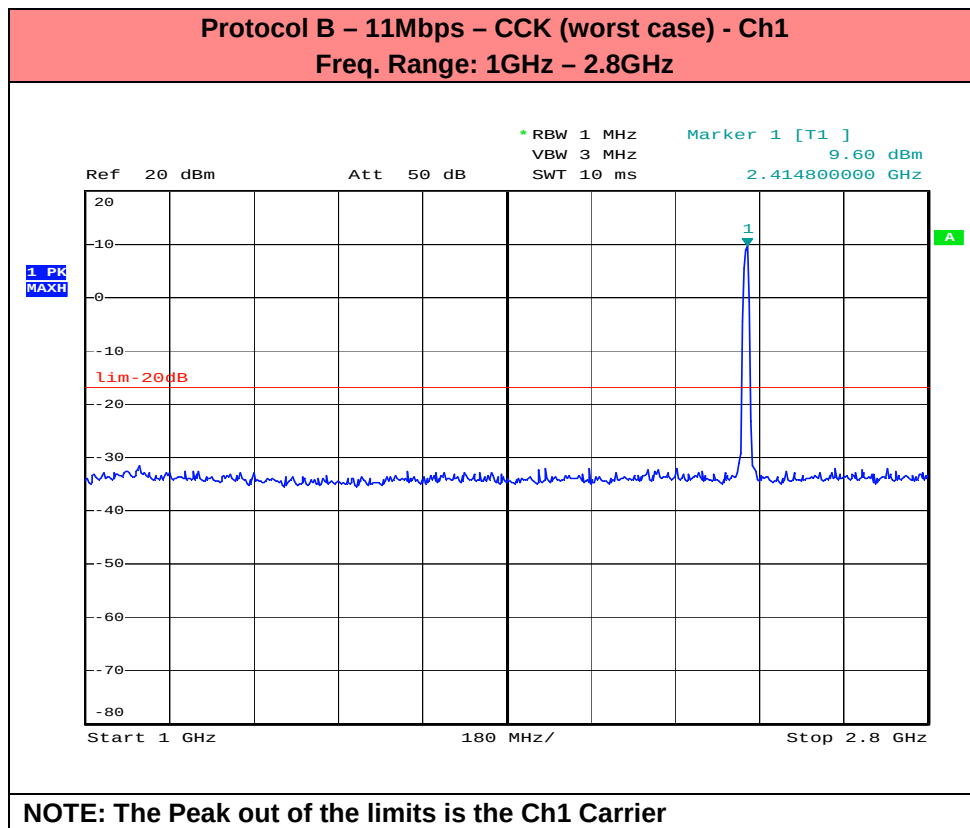
EMISSION LEVEL MEASUREMENT

Protocol B – 11Mbps – CCK (worst case) – Ch1
Freq. Range: 9kHz – 30MHz

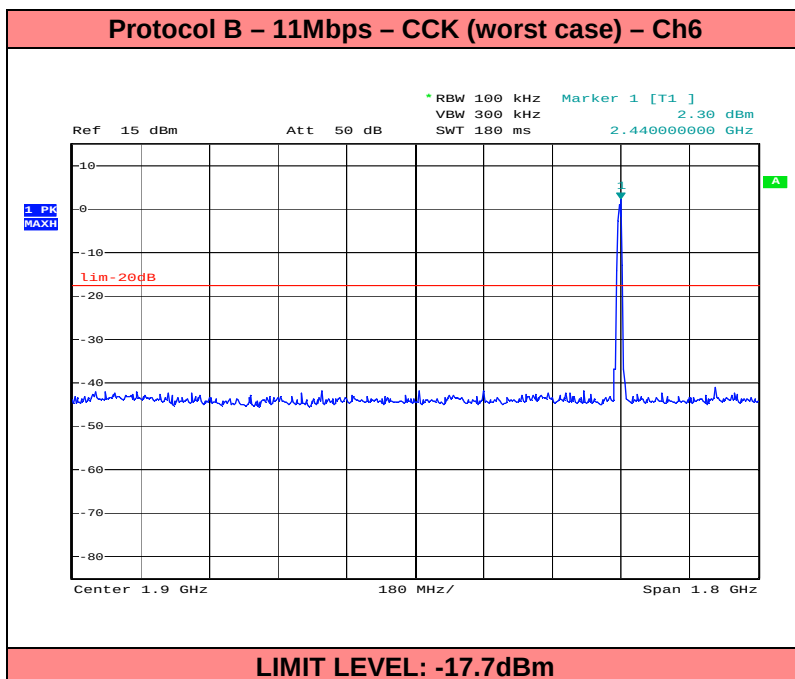
The amplitude of spurious emissions
are attenuated more than 20 dB so the permissible value need not be reported

Protocol B – 11Mbps – CCK (worst case) - Ch1
Freq. Range: 30MHz – 1GHz





REFERENCE LEVEL MEASUREMENT



EMISSION LEVEL MEASUREMENT

Protocol B – 11Mbps – CCK (worst case) – Ch6

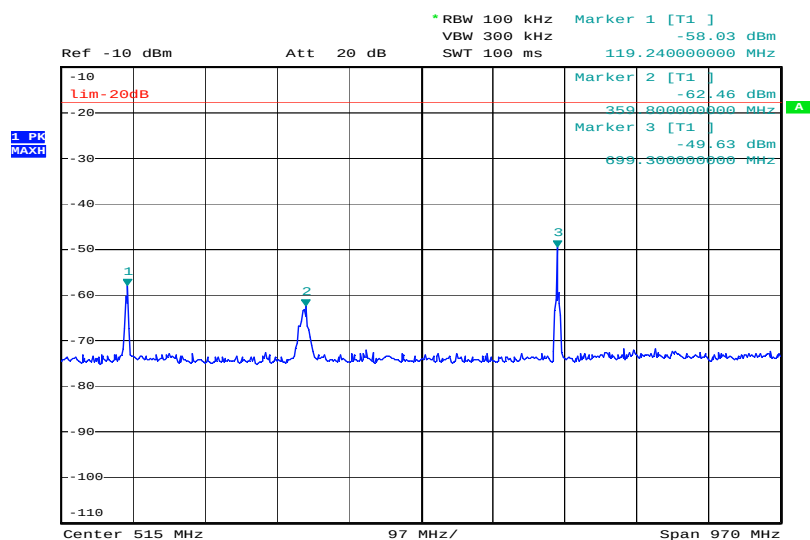
Freq. Range: 9kHz – 30MHz

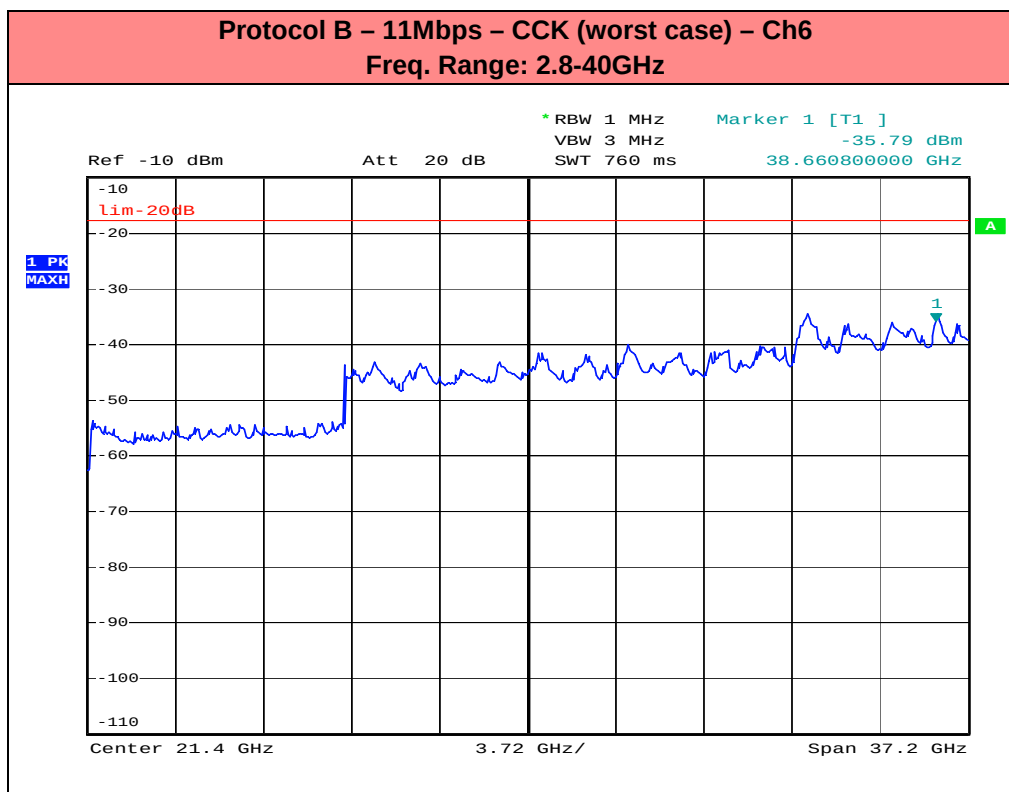
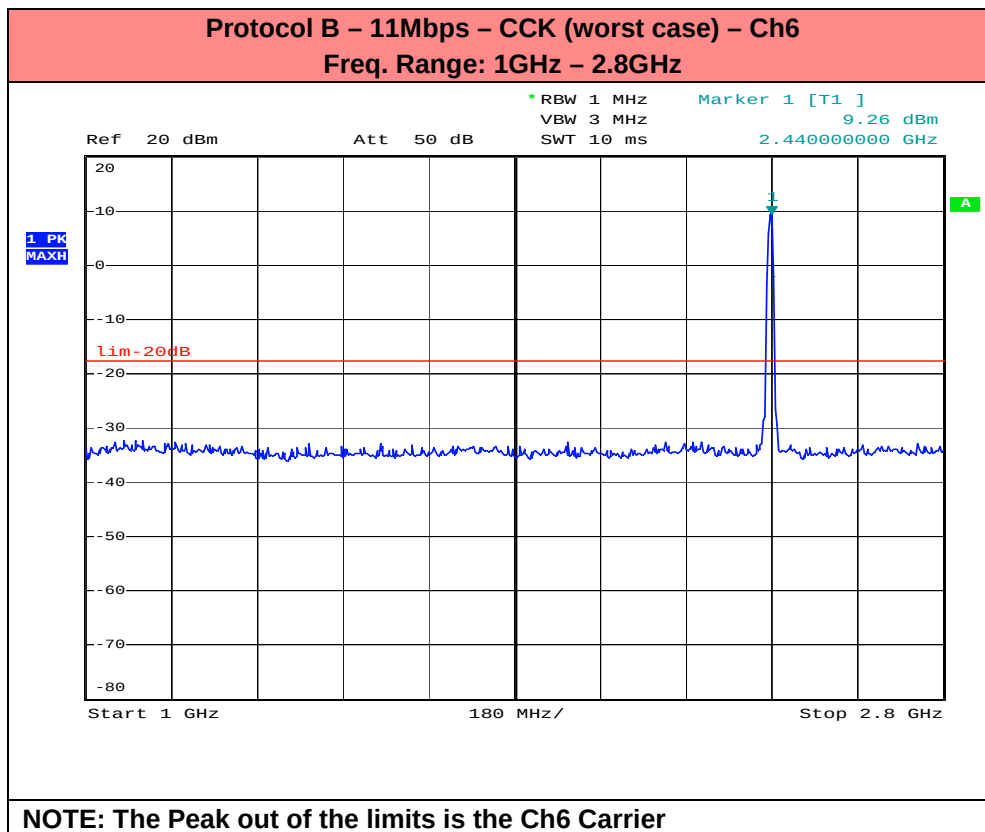
The amplitude of spurious emissions

are attenuated more than 20 dB so the permissible value need not be reported

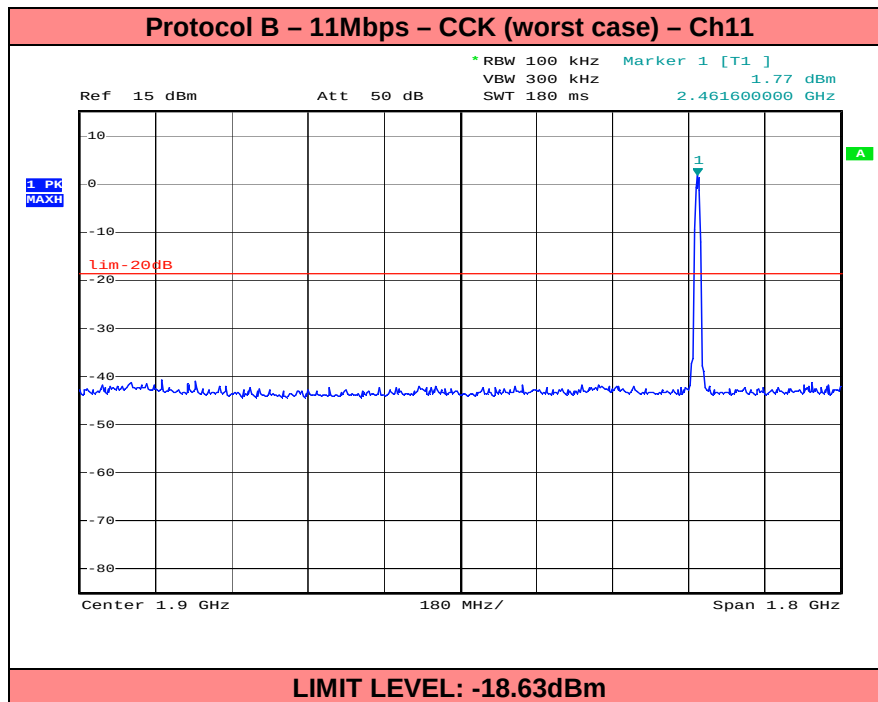
Protocol B – 11Mbps – CCK (worst case) – Ch6

Freq. Range: 30MHz – 1GHz





REFERENCE LEVEL MEASUREMENT

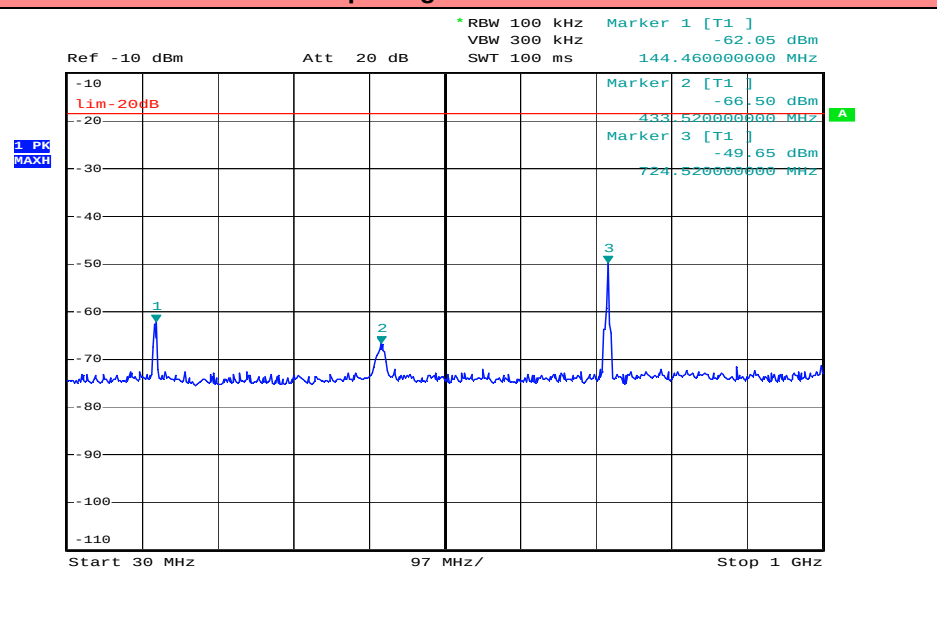


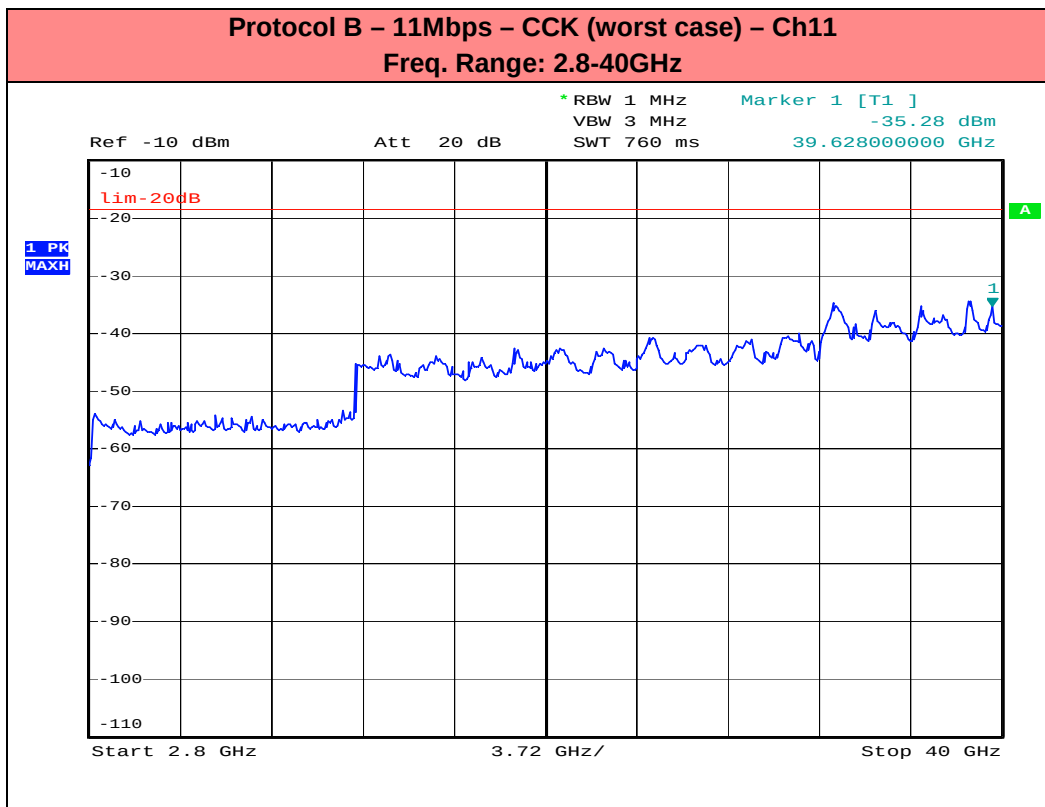
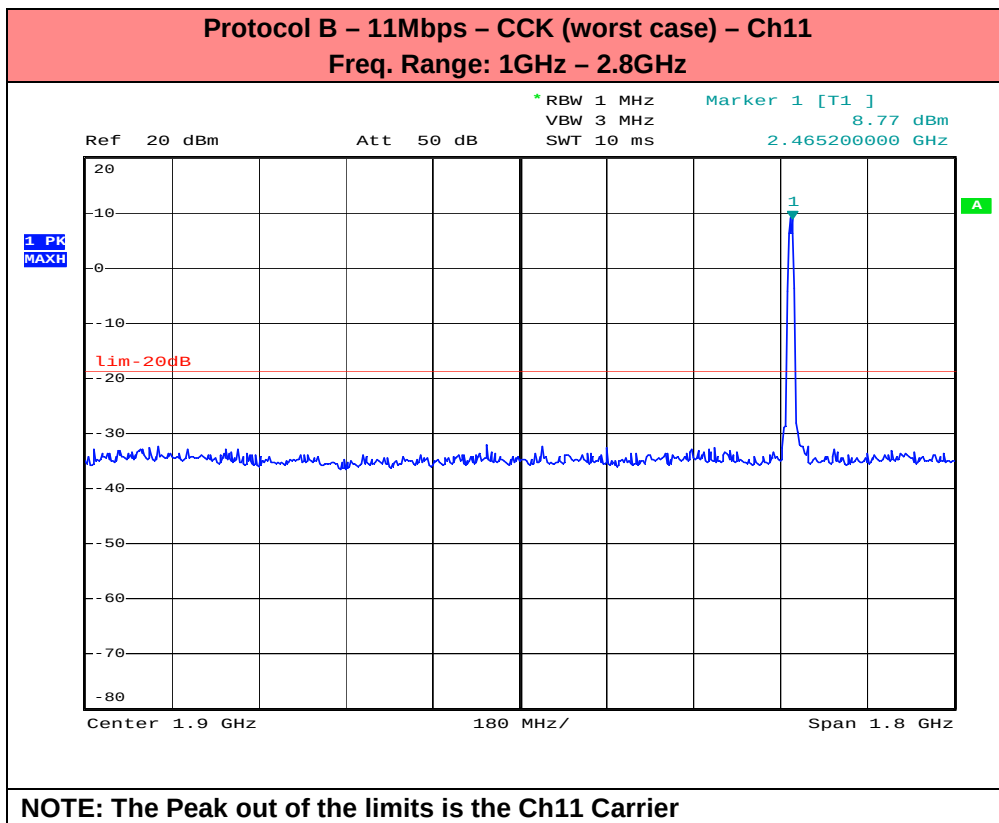
EMISSION LEVEL MEASUREMENT

Protocol B – 11Mbps – CCK (worst case) – Ch11
Freq. Range: 9kHz – 30MHz

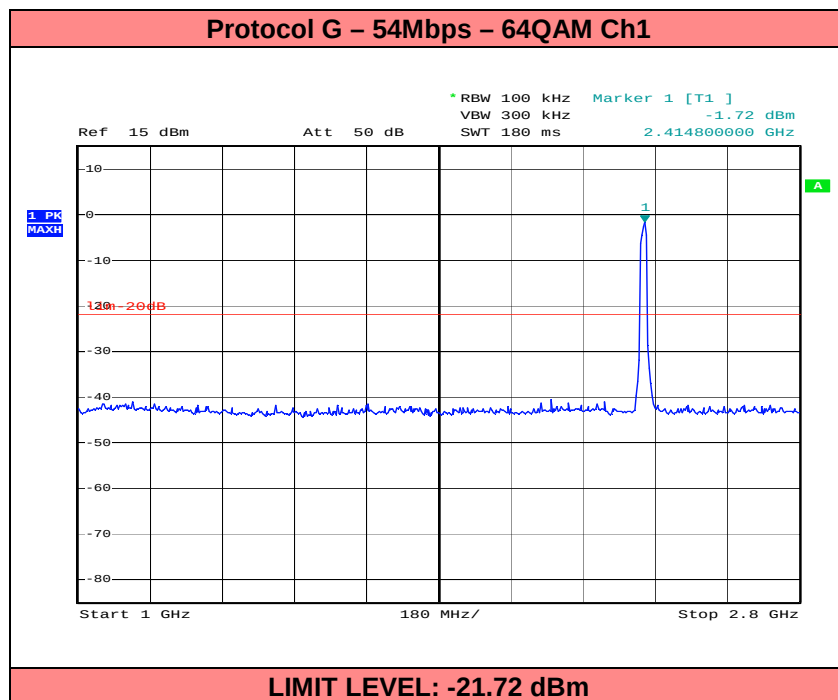
The amplitude of spurious emissions
are attenuated more than 20 dB so the permissible value need not be reported

Protocol B – 11Mbps – CCK (worst case) – Ch11
Freq. Range: 30MHz – 1GHz





REFERENCE LEVEL MEASUREMENT



EMISSION LEVEL MEASUREMENT

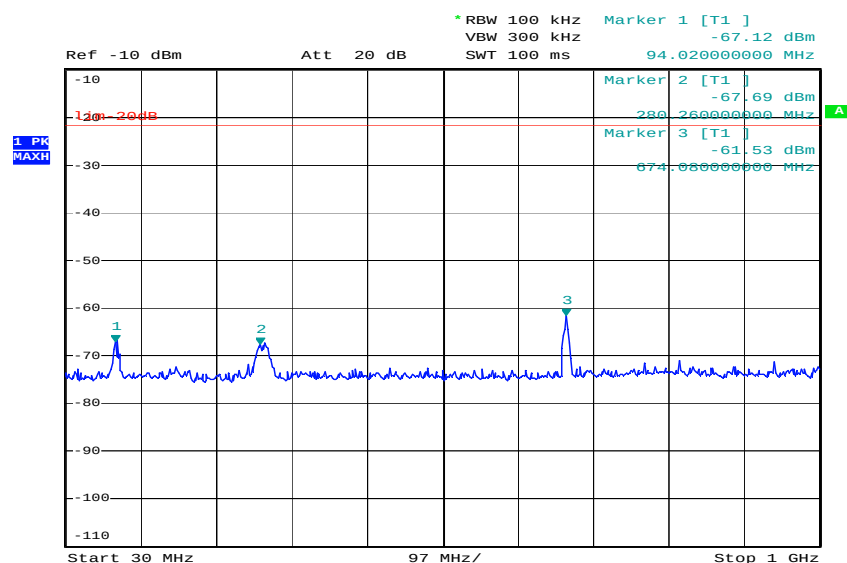
Protocol G – 54Mbps – 64QAM – Ch1

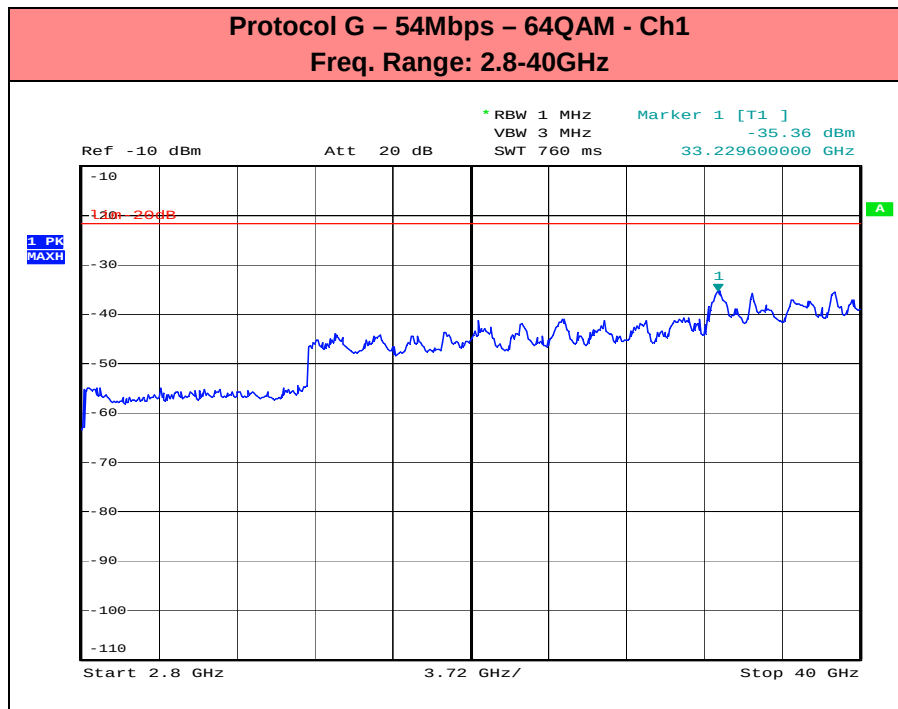
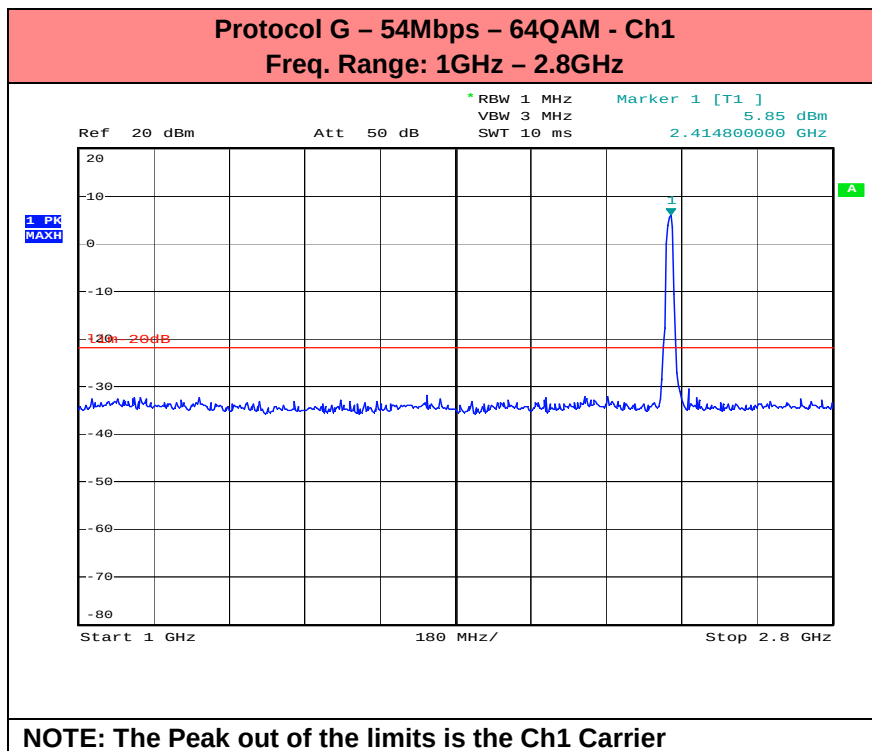
Freq. Range: 9kHz – 30MHz

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

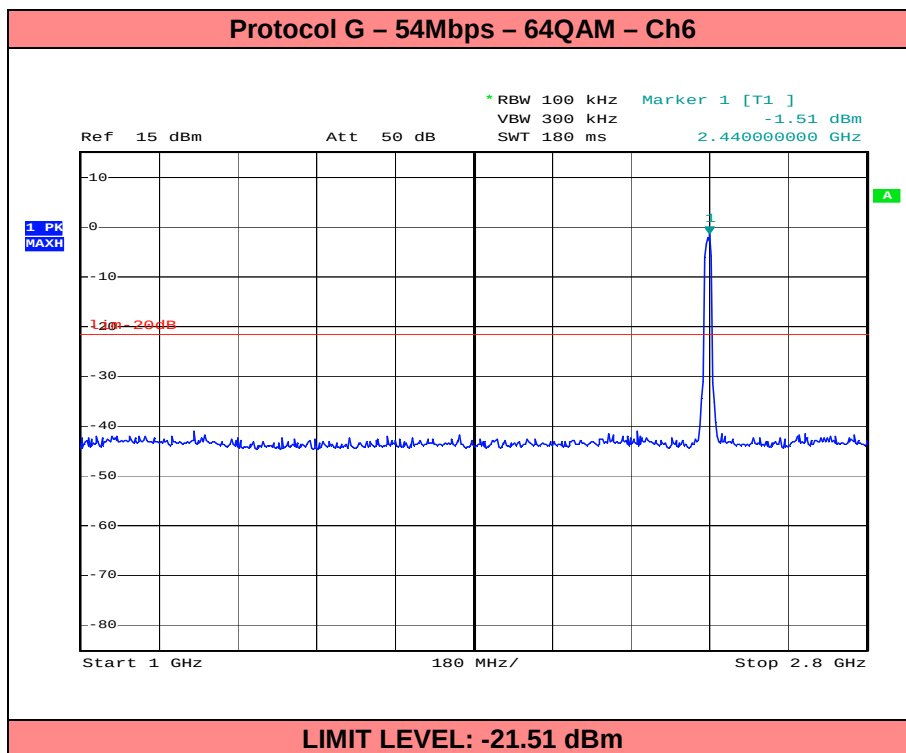
Protocol G – 54Mbps – 64QAM - Ch1

Freq. Range: 30MHz – 1GHz





REFERENCE LEVEL MEASUREMENT



EMISSION LEVEL MEASUREMENT

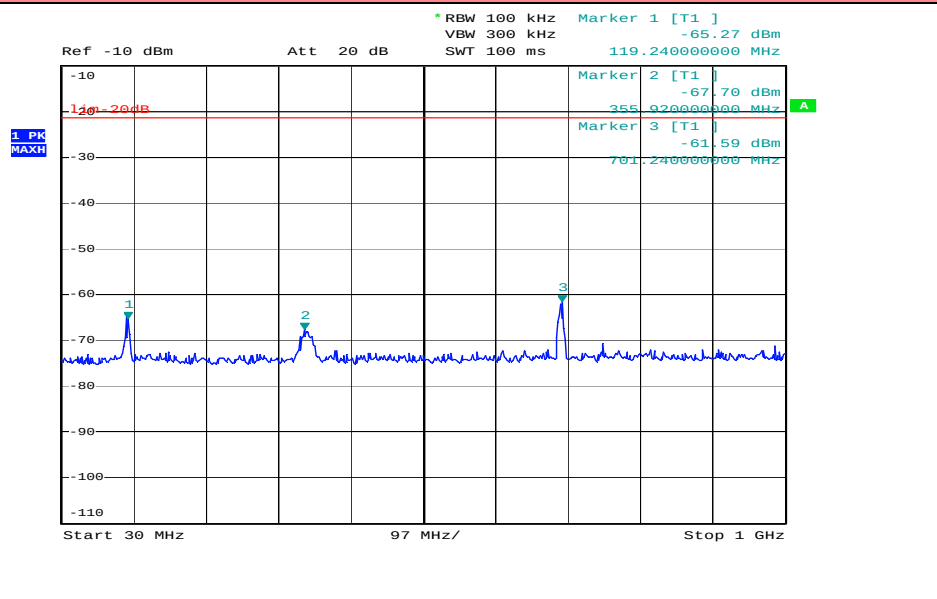
Protocol G – 54Mbps – 64QAM – Ch6

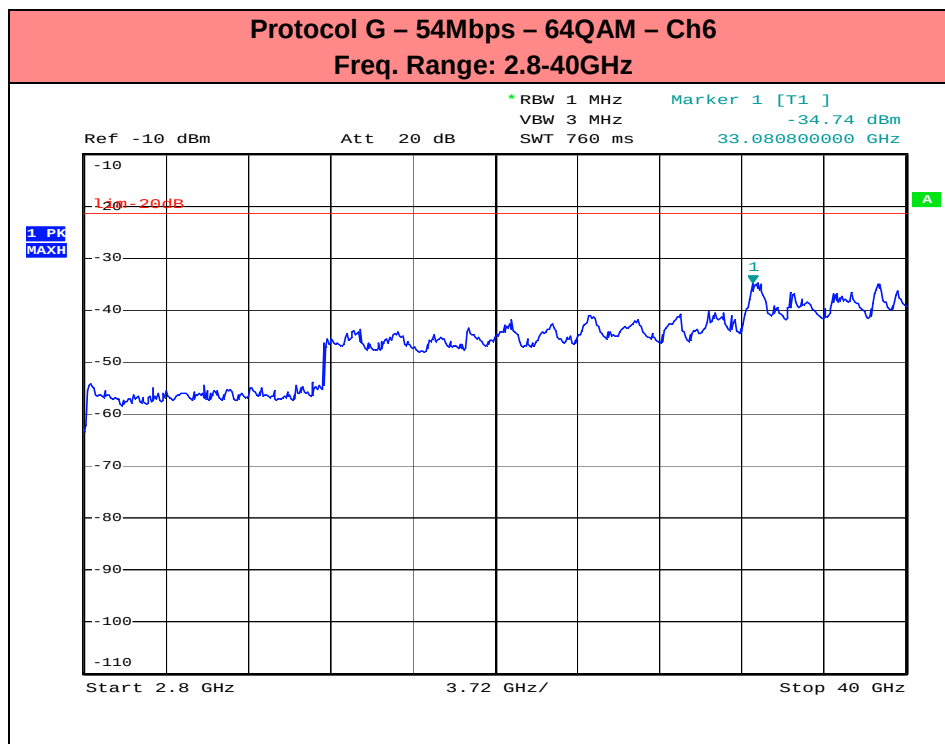
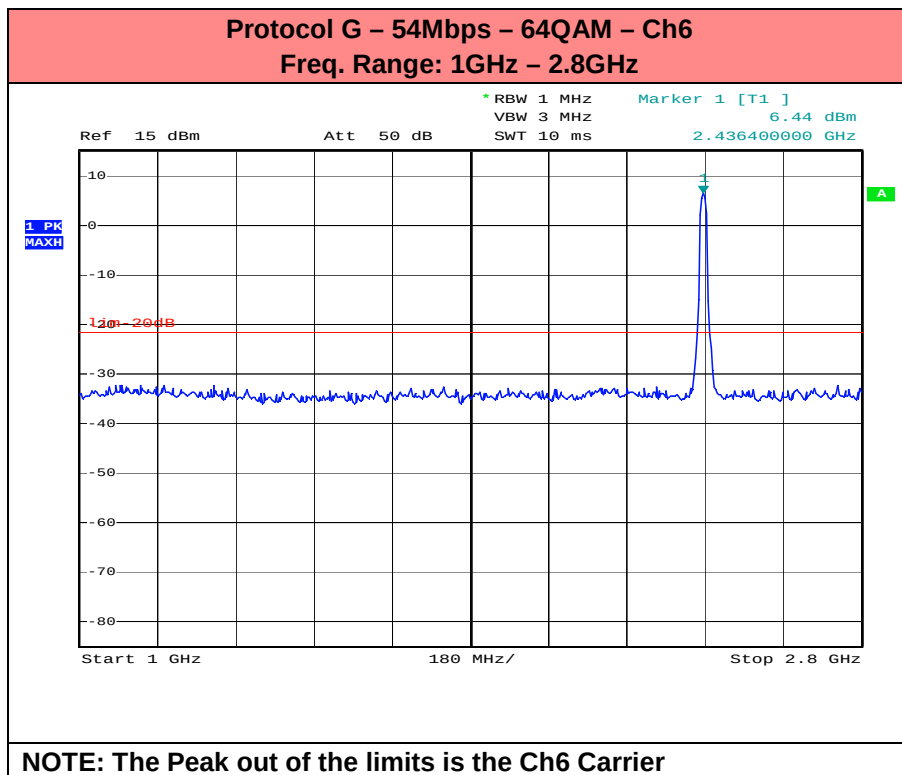
Freq. Range: 9kHz – 30MHz

The amplitude of spurious emissions
are attenuated more than 20 dB so the permissible value need not be reported

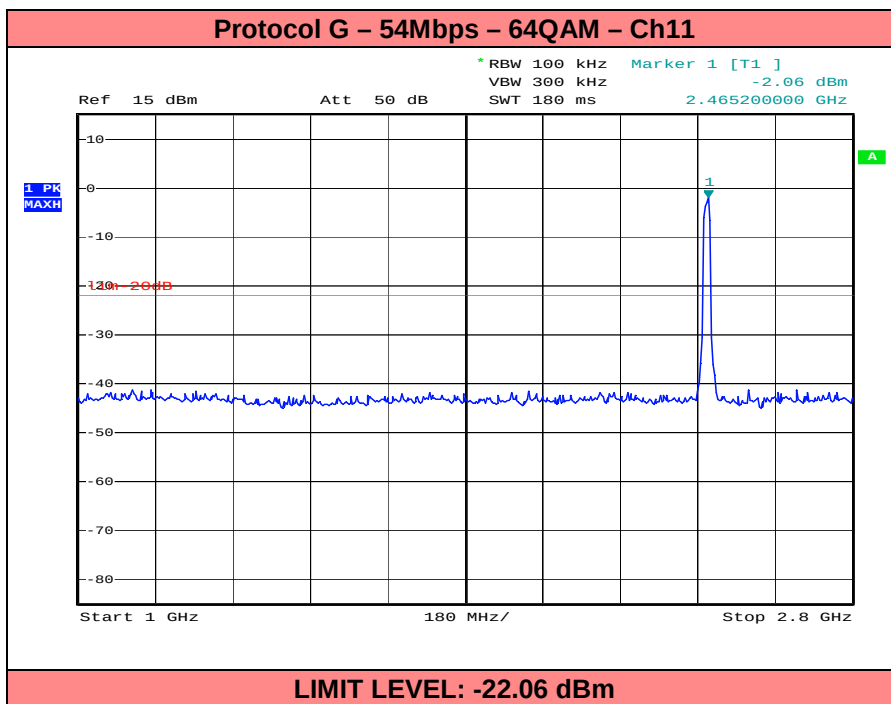
Protocol G – 54Mbps – 64QAM – Ch6

Freq. Range: 30MHz – 1GHz





REFERENCE LEVEL MEASUREMENT



EMISSION LEVEL MEASUREMENT

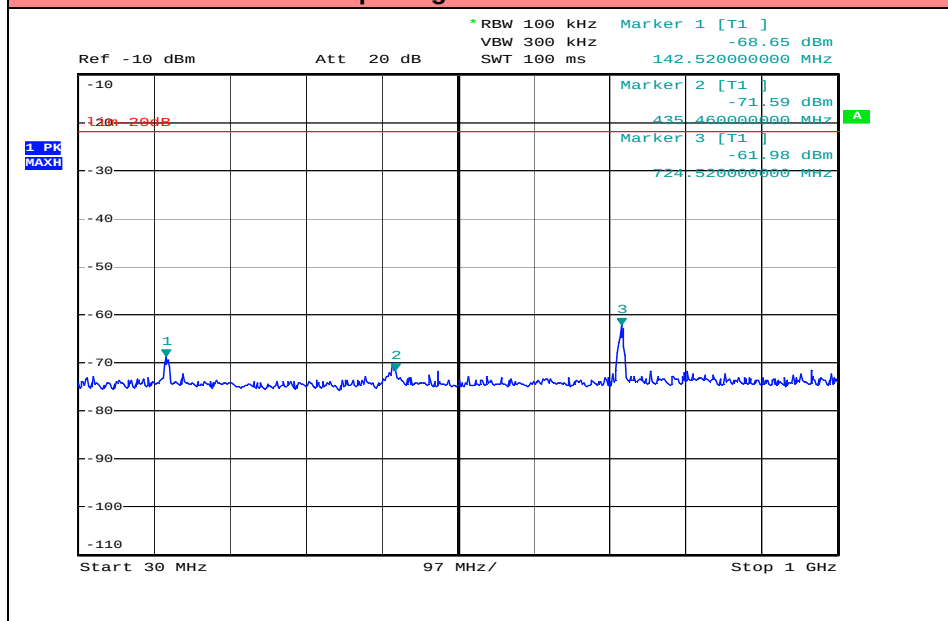
Protocol G – 54Mbps – 64QAM – Ch11

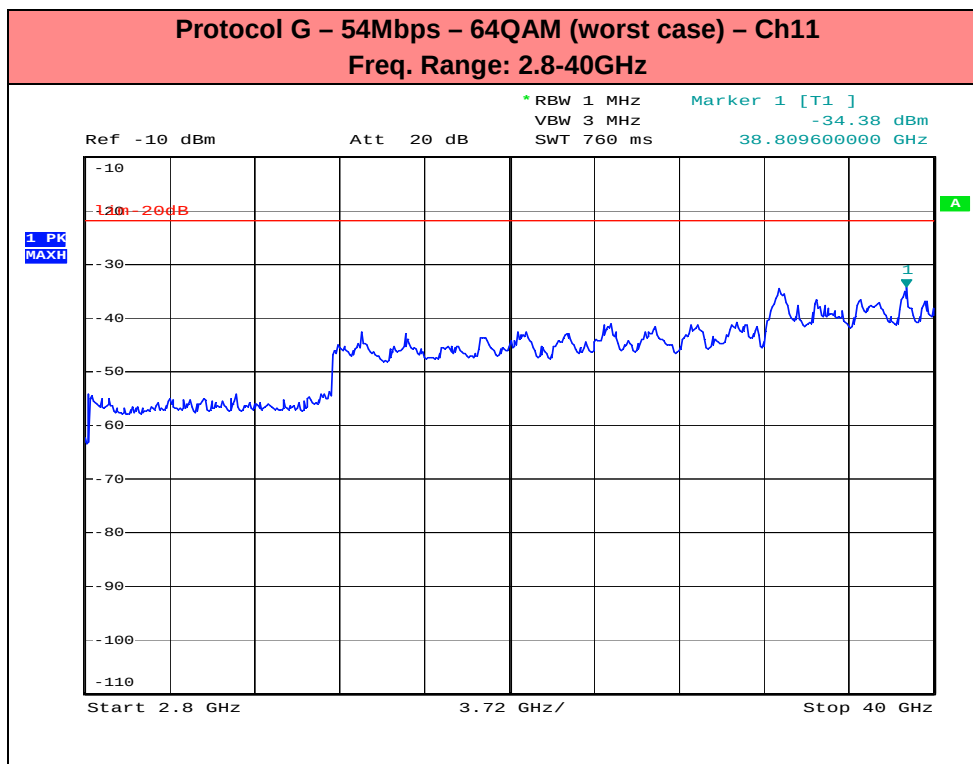
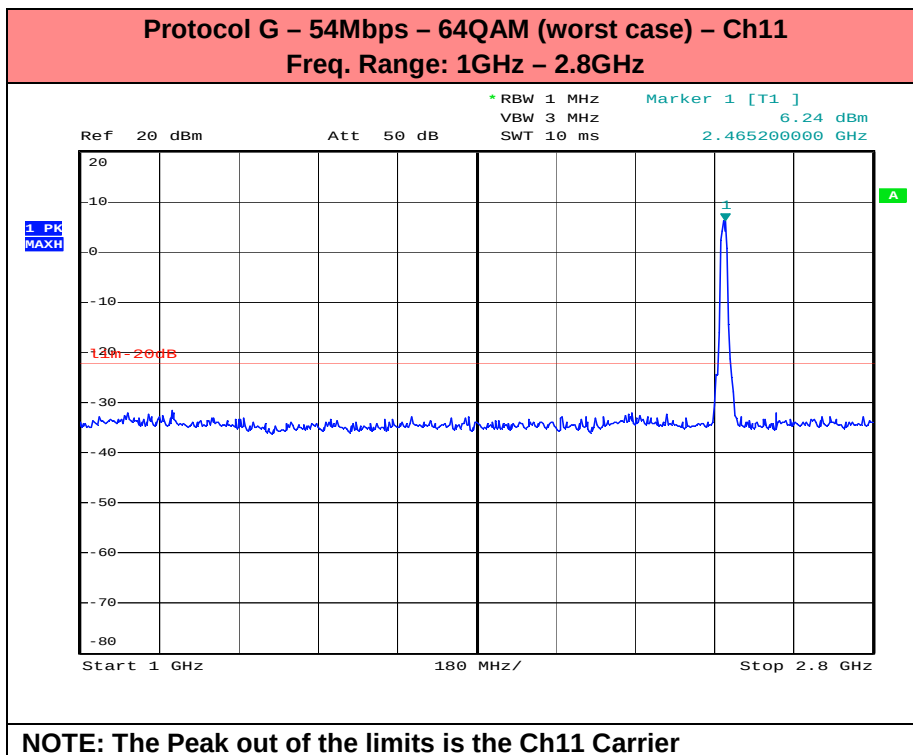
Freq. Range: 9kHz – 30MHz

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

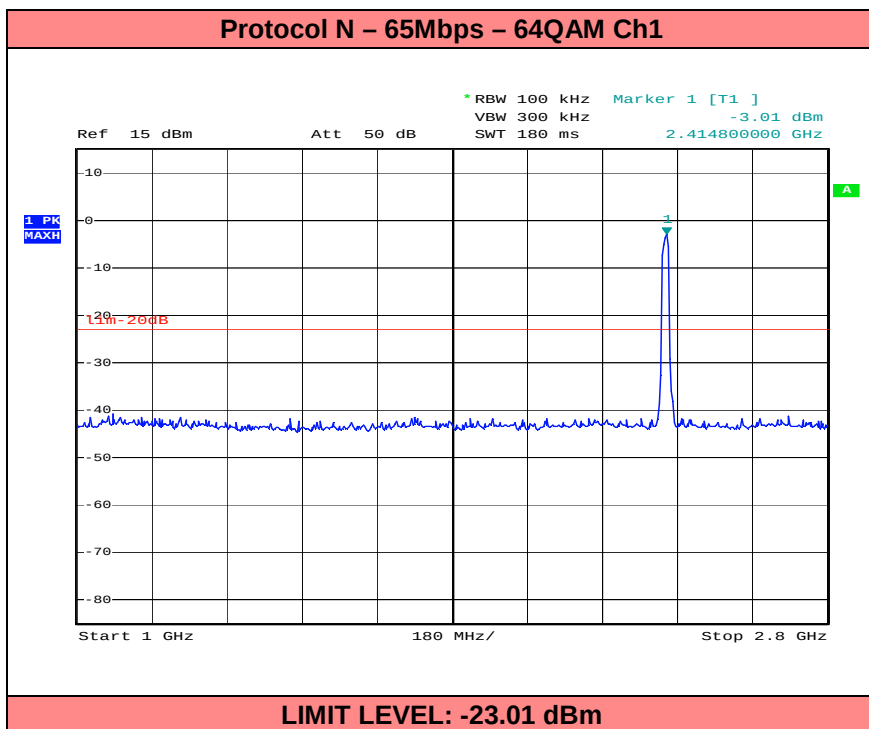
Protocol G – 54Mbps – 64QAM (worst case) – Ch11

Freq. Range: 30MHz – 1GHz





REFERENCE LEVEL MEASUREMENT



EMISSION LEVEL MEASUREMENT

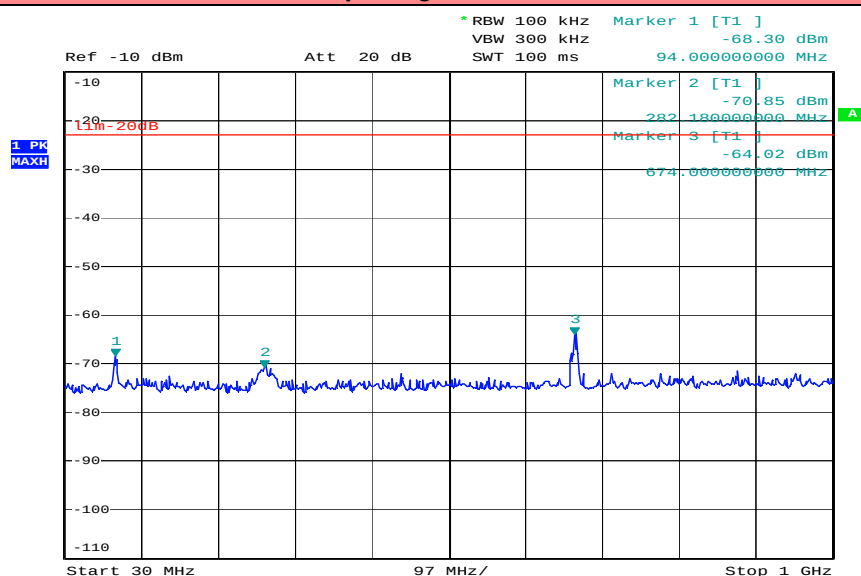
Protocol N – 65Mbps – 64QAM – Ch1

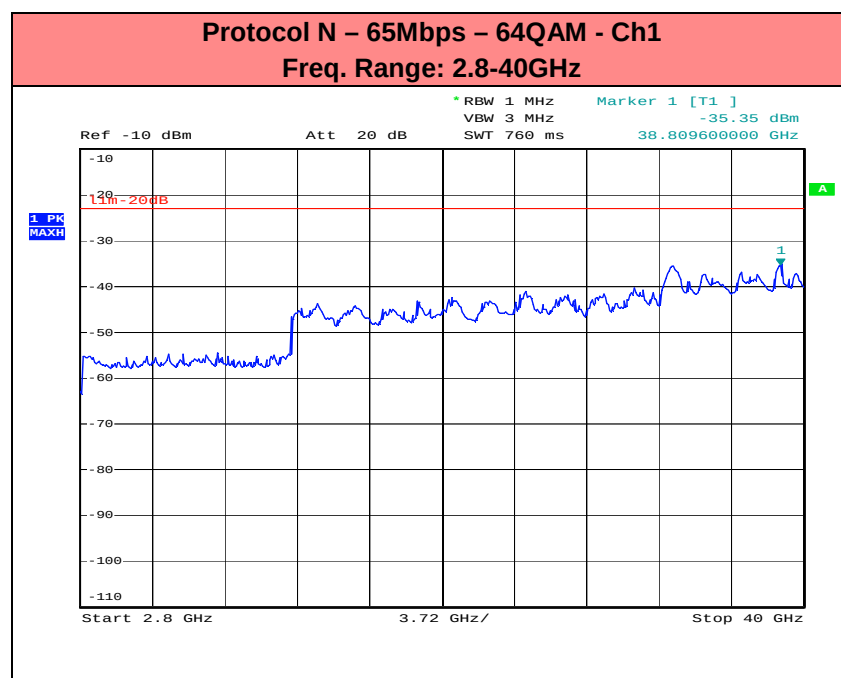
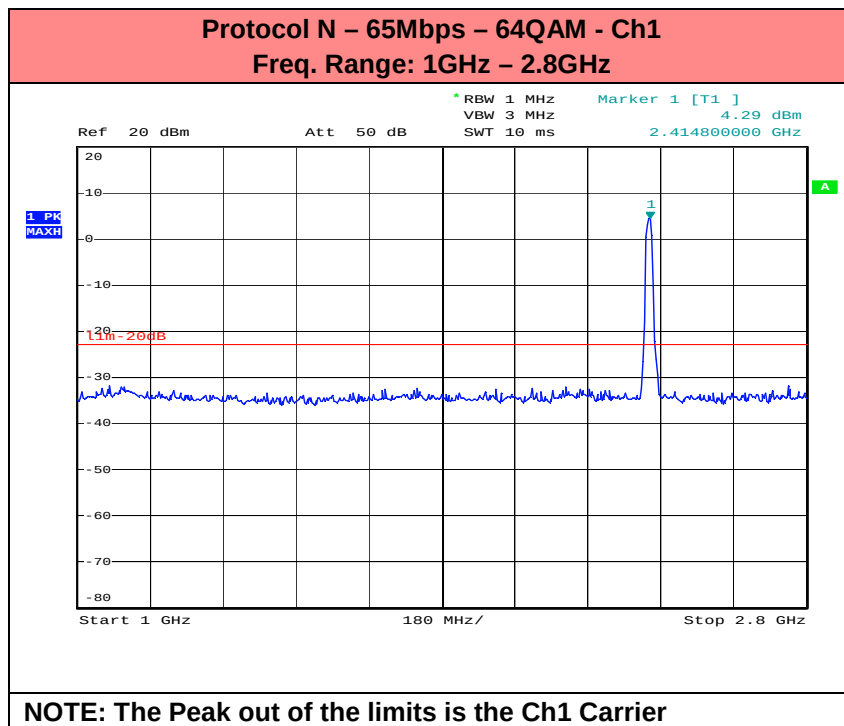
Freq. Range: 9kHz – 30MHz

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

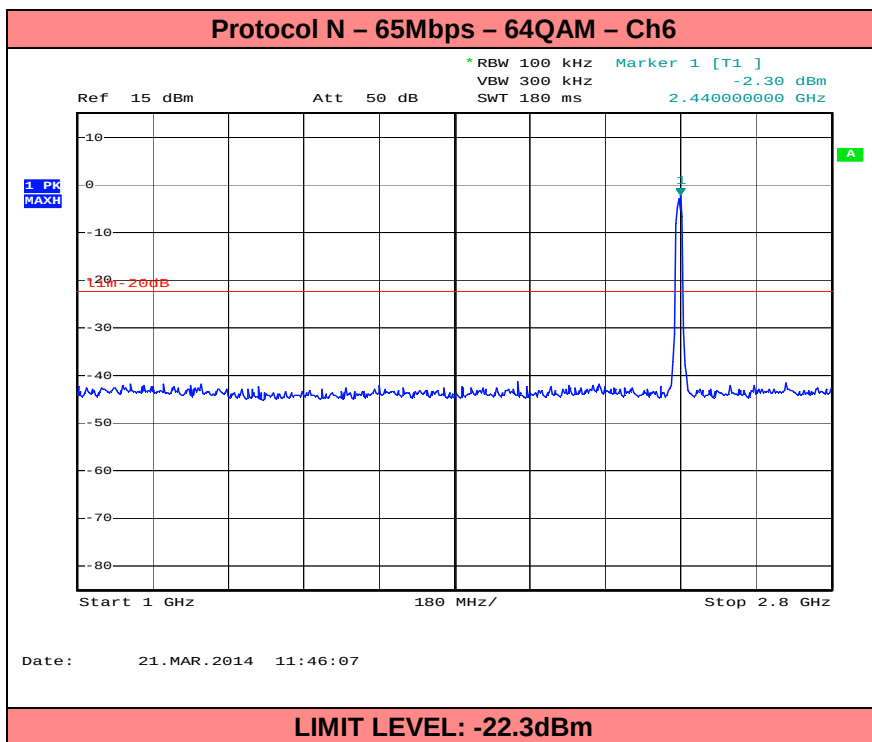
Protocol N – 65Mbps – 64QAM - Ch1

Freq. Range: 30MHz – 1GHz





REFERENCE LEVEL MEASUREMENT



EMISSION LEVEL MEASUREMENT

Protocol N – 65Mbps – 64QAM – Ch6

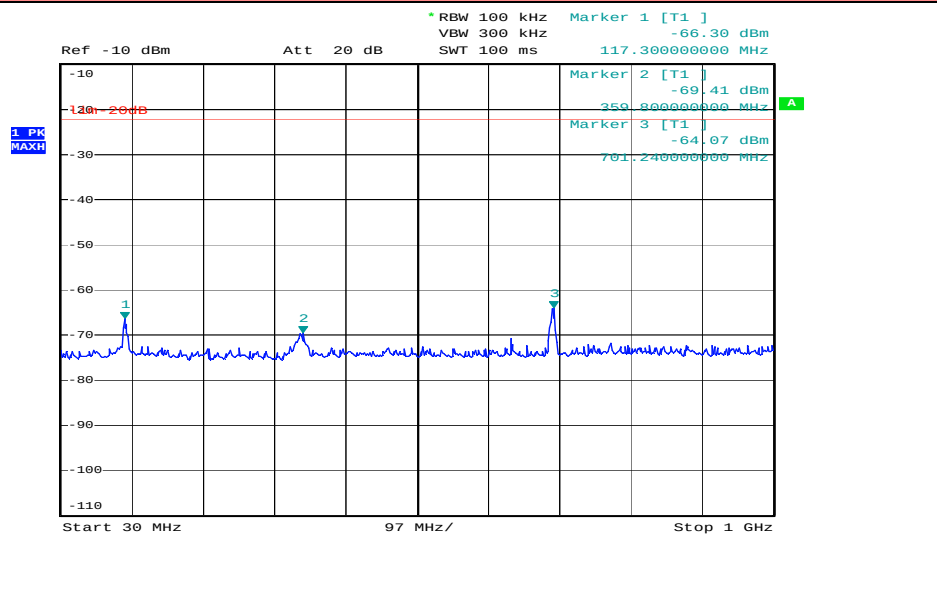
Freq. Range: 9kHz – 30MHz

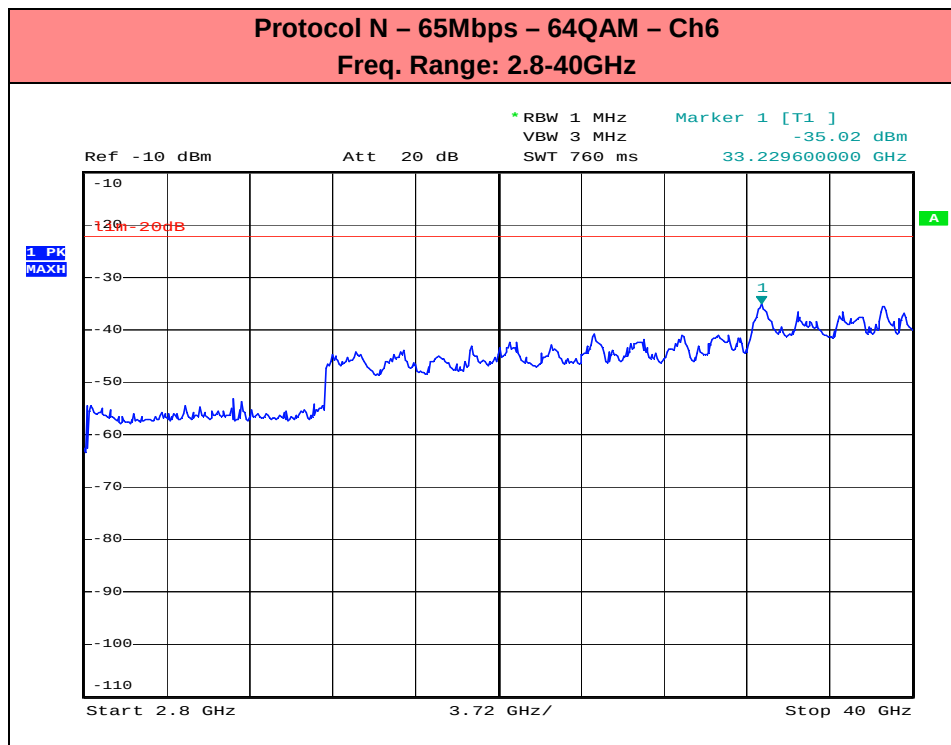
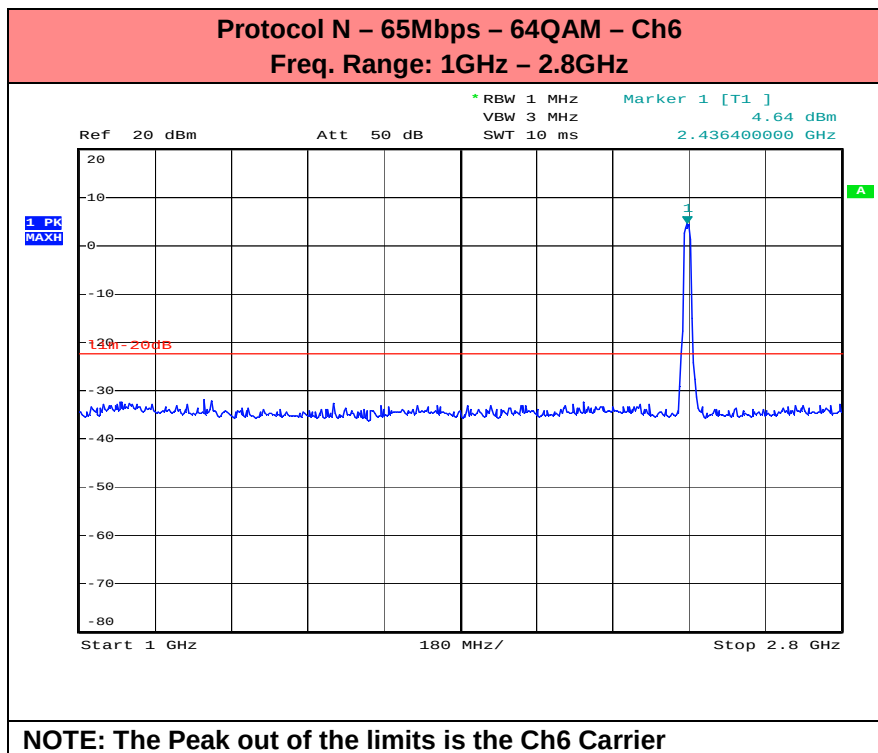
The amplitude of spurious emissions

are attenuated more than 20 dB so the permissible value need not be reported

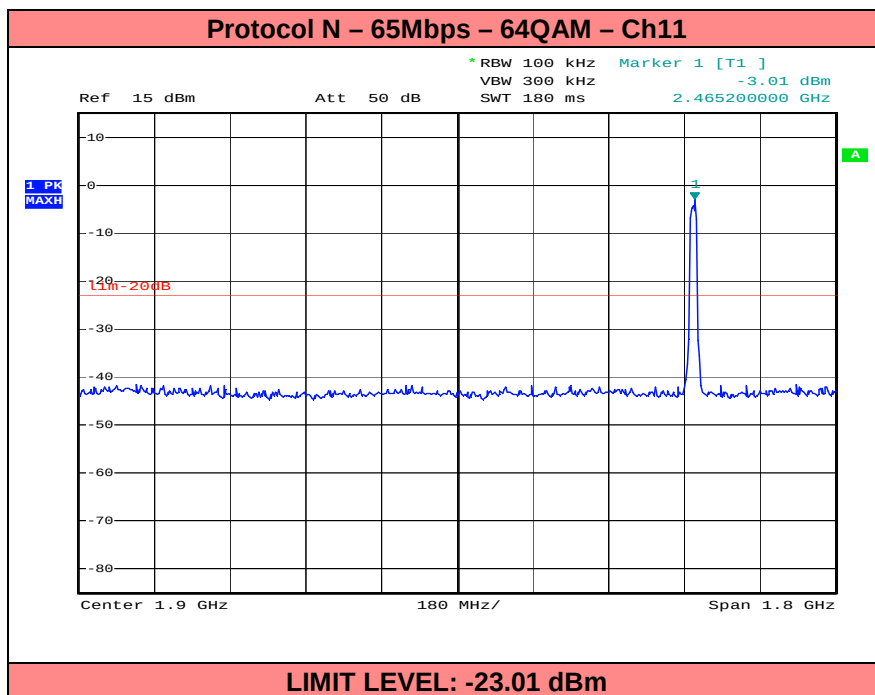
Protocol N – 65Mbps – 64QAM – Ch6

Freq. Range: 30MHz – 1GHz





REFERENCE LEVEL MEASUREMENT



EMISSION LEVEL MEASUREMENT

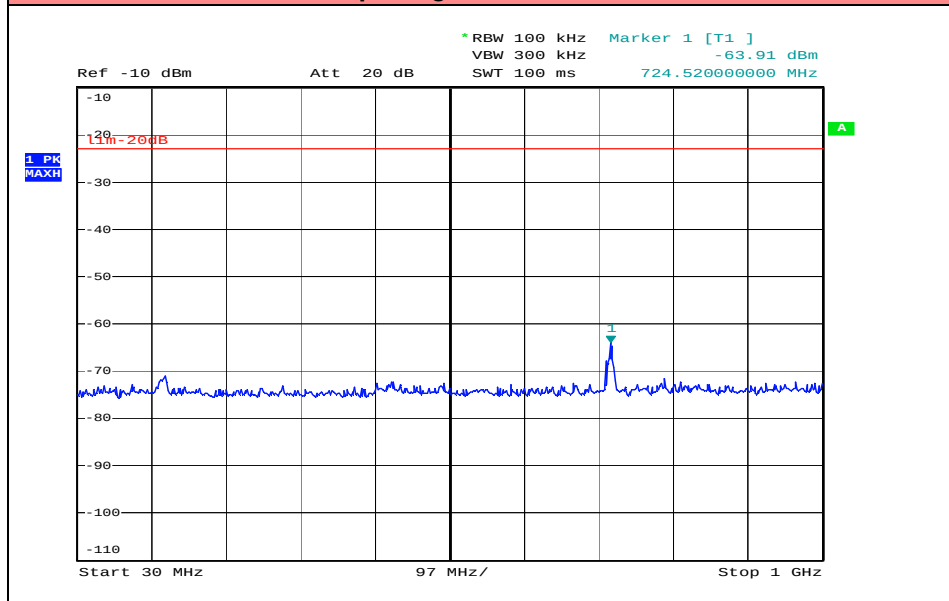
Protocol N – 65Mbps – 64QAM – Ch11

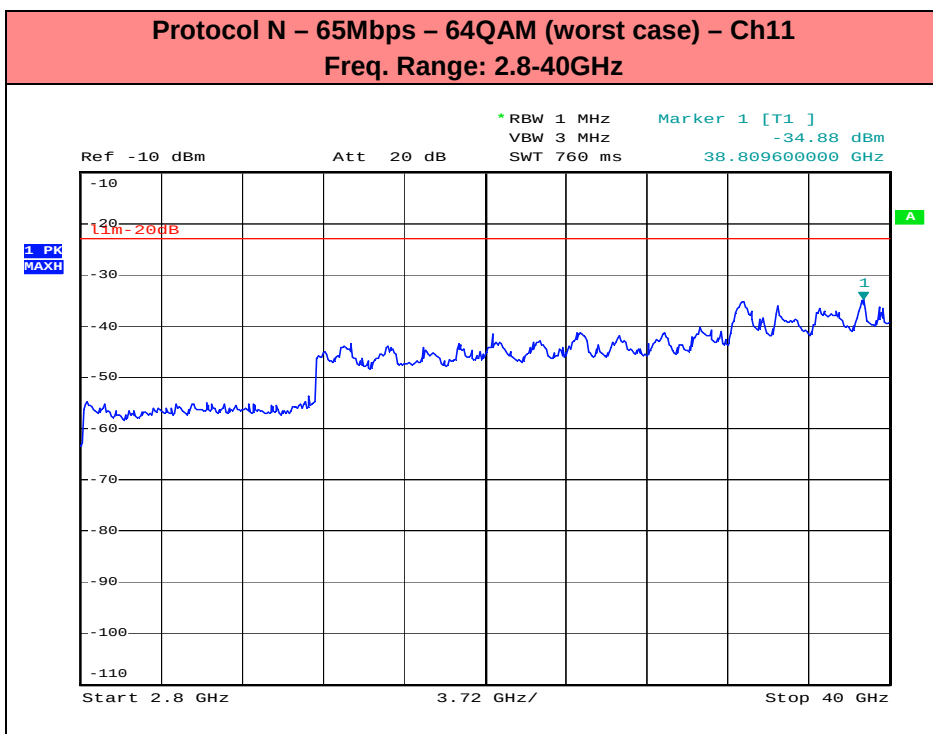
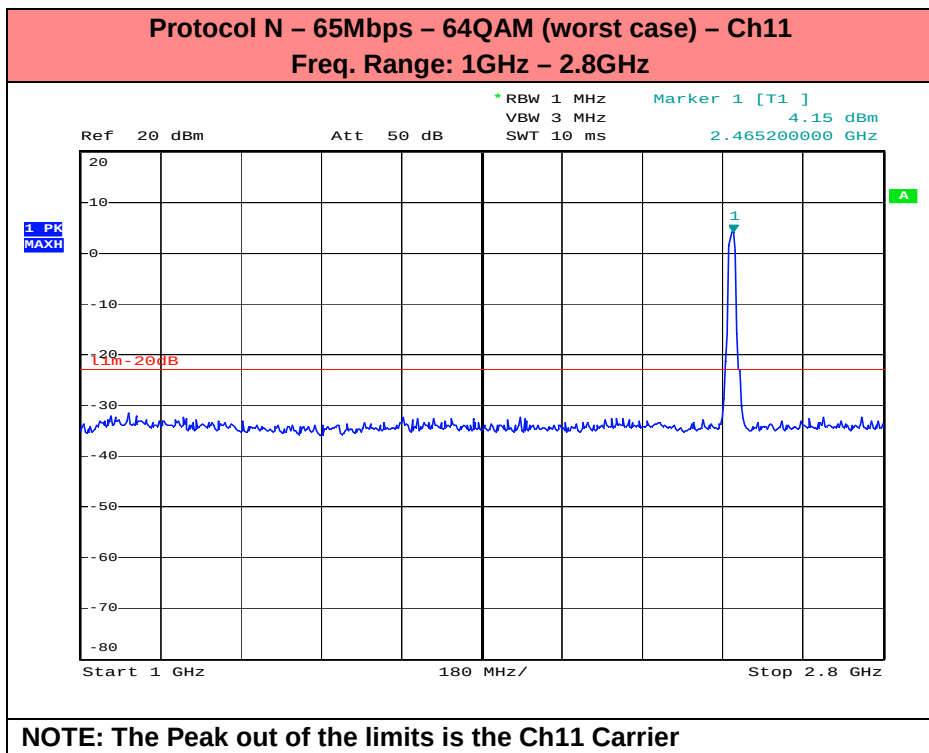
Freq. Range: 9kHz – 30MHz

The amplitude of spurious emissions
are attenuated more than 20 dB so the permissible value need not be reported

Protocol N – 65Mbps – 64QAM (worst case) – Ch11

Freq. Range: 30MHz – 1GHz





**TEST
6.**

RADIATED EMISSION 9KHZ ÷10TH HARMONIC

**REFERENCE
DOCUMENT**

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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST SETUP	In according to ref std
TEST LOCATION	Semi Anechoic Chamber
TYPE OF MEASUREMENT	RADIATED
	KDB 558074 D01 par. 11.0
TEST EQUIPMENT	EMI receiver Rohde & Schwarz Mod, ESU 40 Spectrum Analyzer Rohde & Schwarz Mod, FSP40 Chase Antenna Mod, CBL 6111 C Antenna Rohde & Schwarz mod, HL050 Tunable notch filter Wainwright mod, WRCT2200/2500-5/40-10SK High pass filter Wainwright WHNX 2,8/18G-10SS
TEST PERFORMED BY	Andrea Bortolotti
TESTING DATE	28-29/11/2013
UNCERTAINTY OF MEASURE:	Combined uncertainty = $\pm 1,75$ dB Total uncertainty = (k=2) $\pm 3,5$ dB

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

OPERATING CONDITION	#1, #2, #3 , DUTY CYCLE 100%
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TEST RESULT	WITHIN THE LIMITS
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FREQUENCY RANGE 9kHz - 30MHz 802.11 b - CH1 WORST CASE

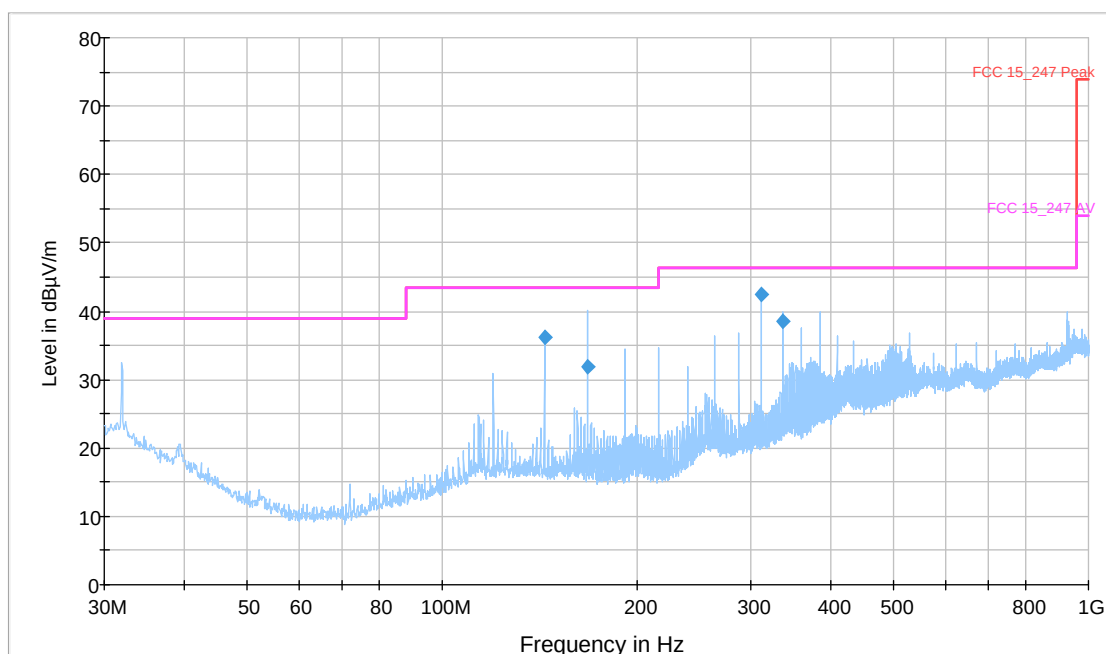
HORIZONTAL POLARIZATION

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 30MHz – 1GHz 802.11 b - CH1 WORST CASE

VERTICAL POLARIZATION

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Frequency (MHz)	QuasiPeak (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
143.975000	36.1	100.0	V	159.0	7.40	43.50
167.934000	32.0	100.0	V	21.0	11.50	43.50
311.979000	42.4	147.0	V	68.0	4.00	46.40
336.035000	38.6	157.0	V	160.0	7.80	46.40

FREQUENCY RANGE 9kHz - 30MHz 802.11 b - CH1 WORST CASE

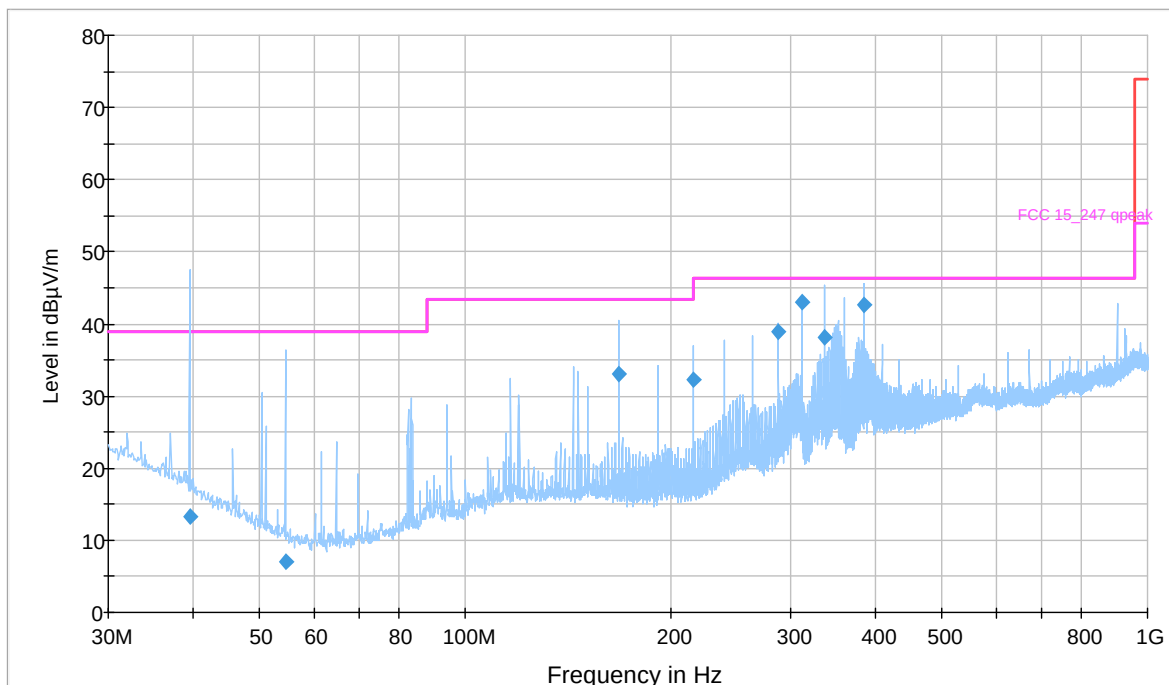
HORIZONTAL POLARIZATION

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 30MHz – 1GHz 802.11 b - CH1 WORST CASE

HORIZONTAL POLARIZATION

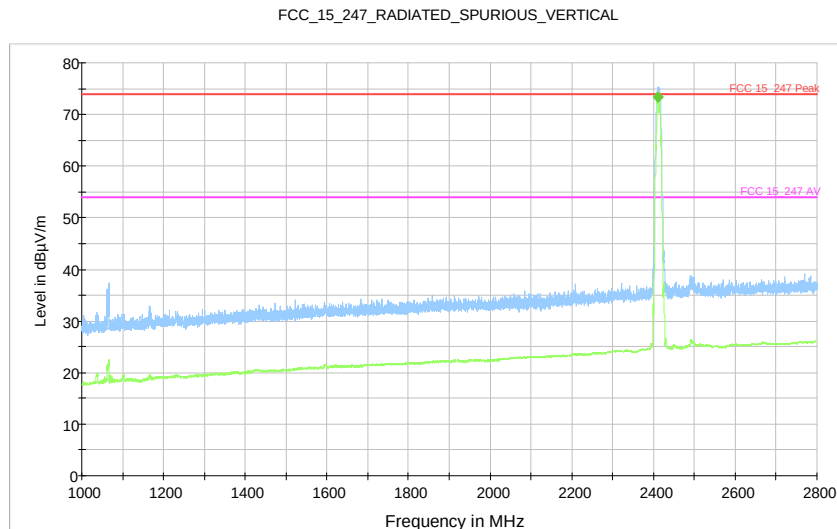
FCC_15_247_RADIATED_SPURIOUS_VERTICAL



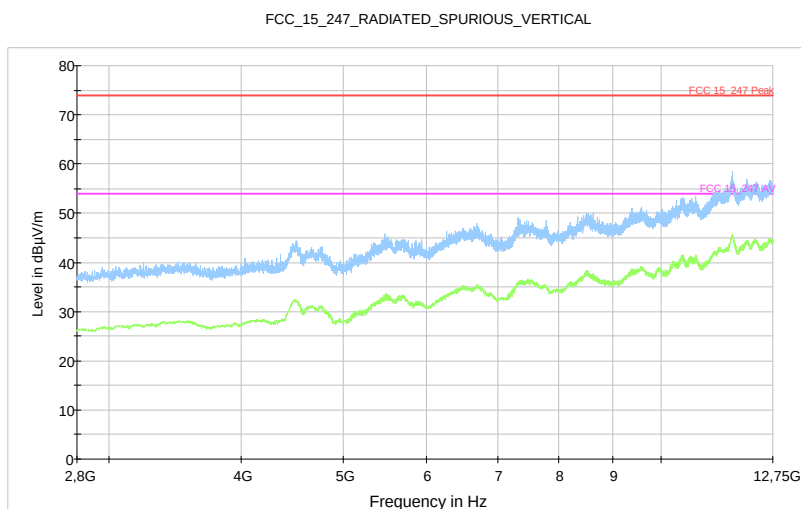
Frequency (MHz)	QuasiPeak (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
39.506000	13.2	255.0	H	90.0	25.80	39.00
54.541000	7.0	302.0	H	97.0	32.00	39.00
167.934000	33.0	200.0	H	246.0	10.50	43.50
215.949000	32.4	147.0	H	246.0	11.10	43.50
288.020000	39.0	100.0	H	97.0	7.40	46.40
311.979000	43.0	100.0	H	246.0	3.40	46.40
335.938000	38.2	100.0	H	246.0	8.20	46.40
384.050000	42.6	100.0	H	110.0	3.80	46.40

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 b - CH1

VERTICAL POLARIZATION



Blue Trace: Peak detector, Green Trace: Average detector



Blue Trace: Peak detector, Green Trace: Average detector

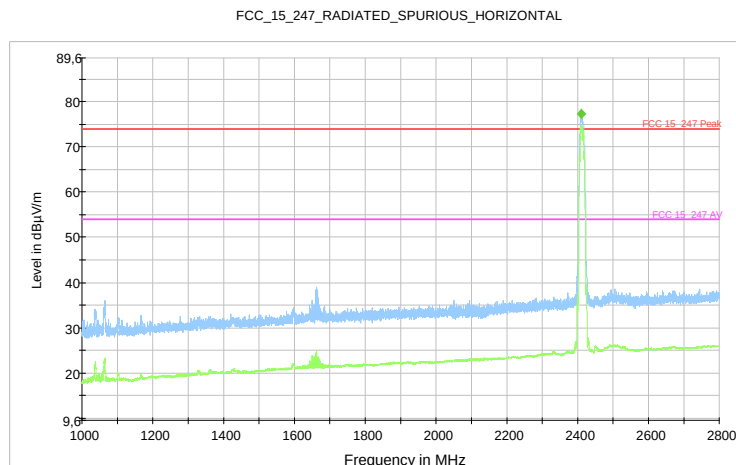
FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 b - CH1

VERTICAL POLARIZATION

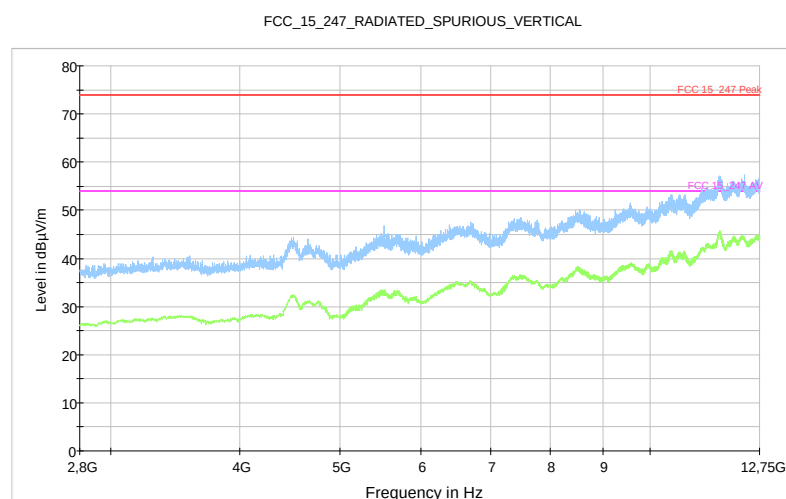
The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 b - CH1

HORIZONTAL POLARIZATION



Blue Trace: Peak detector, Green Trace: Average detector



Blue Trace: Peak detector, Green Trace: Average detector

FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 b - CH1

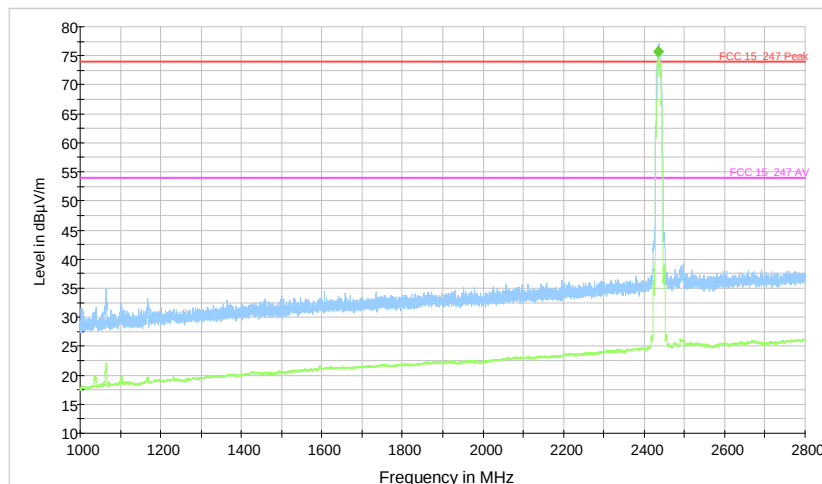
HORIZONTAL POLARIZATION

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 b – CH6

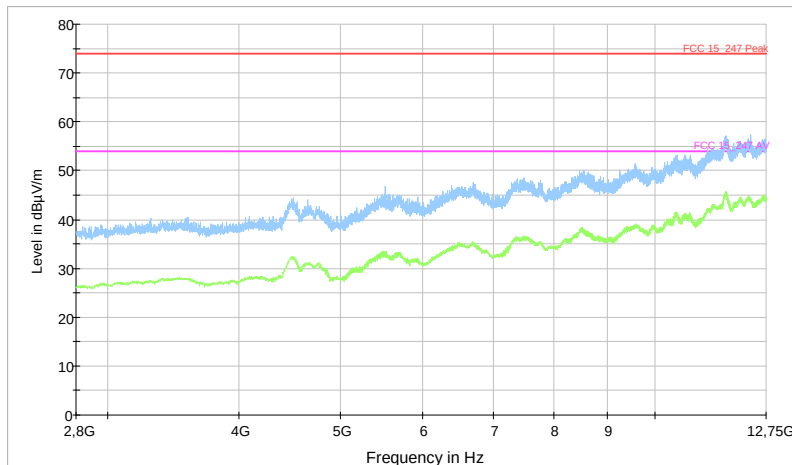
VERTICAL POLARIZATION

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

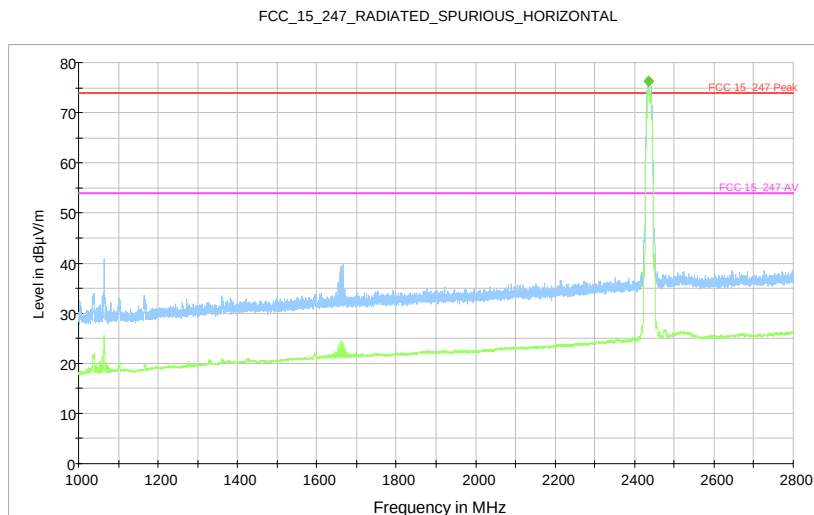
FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 b – CH6

VERTICAL POLARIZATION

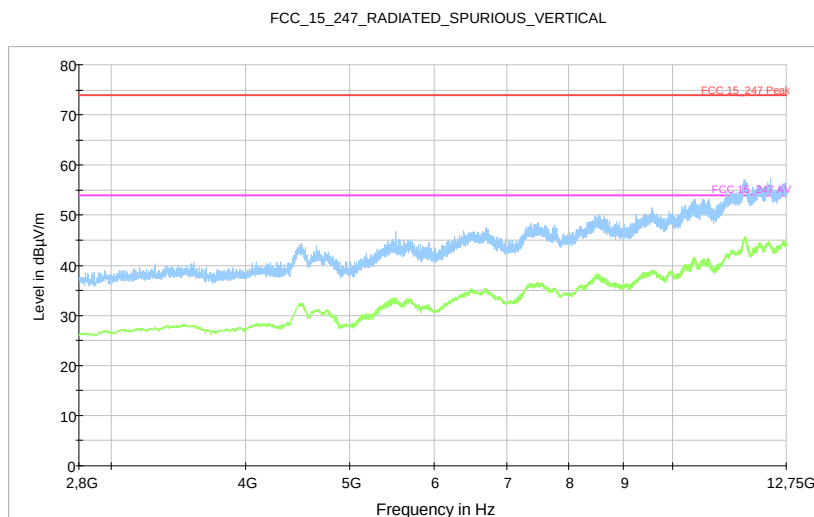
The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 b – CH6

HORIZONTAL POLARIZATION



Blue Trace: Peak detector, Green Trace: Average detector



Blue Trace: Peak detector, Green Trace: Average detector

FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 b – CH6

HORIZONTAL POLARIZATION

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported



PRIMA

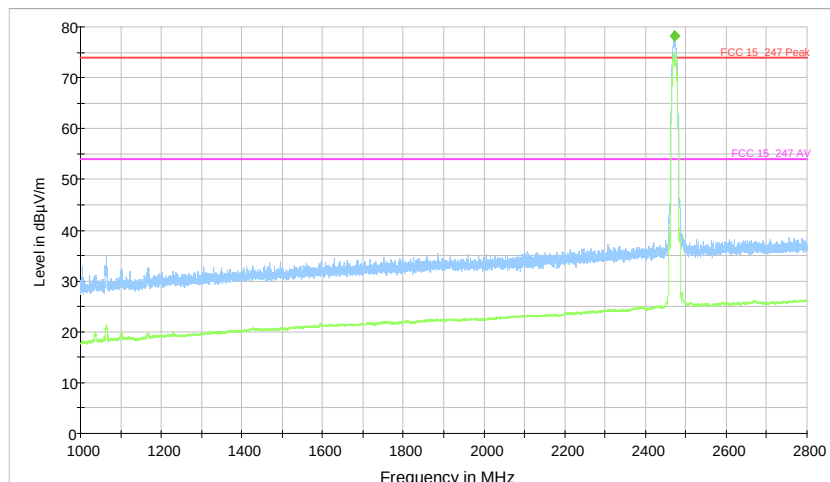
RICERCA & SVILUPPO

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 b – CH11

VERTICAL POLARIZATION

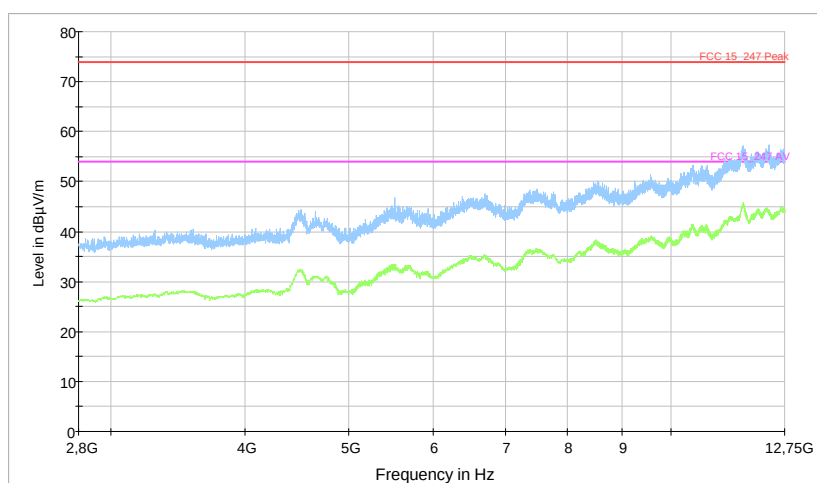
FCCTR_131623-4

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

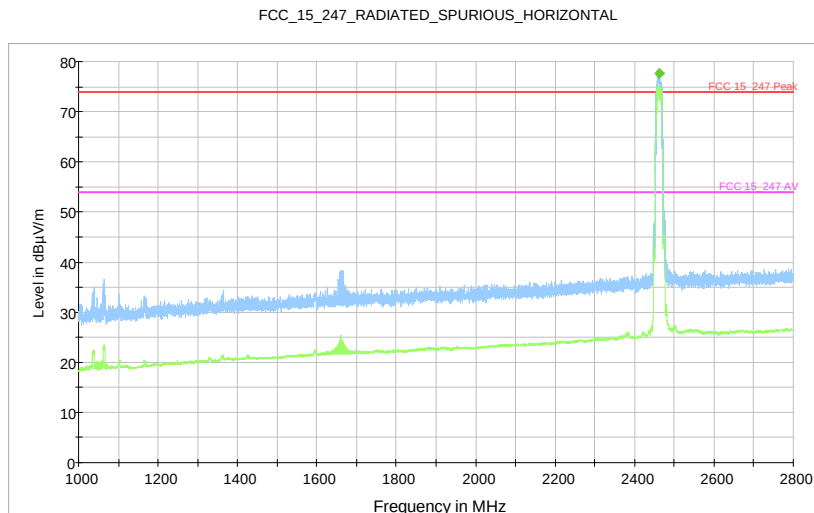
FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 b – CH11

VERTICAL POLARIZATION

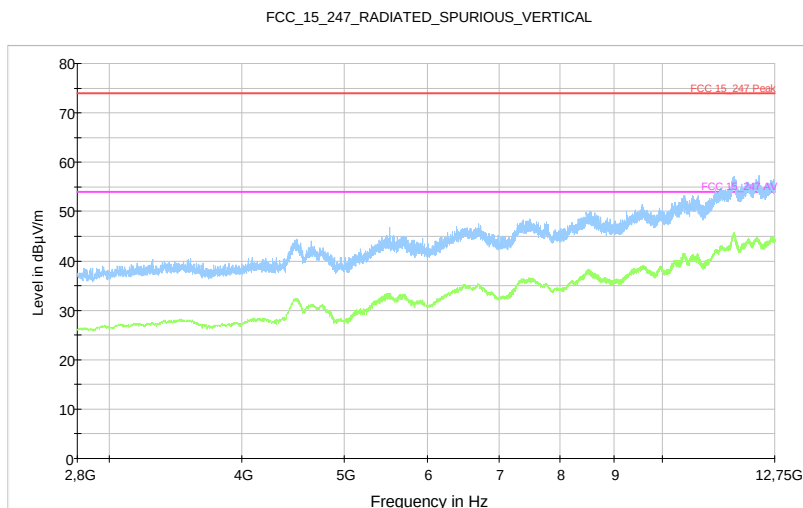
The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 b – CH11

HORIZONTAL POLARIZATION



Blue Trace: Peak detector, Green Trace: Average detector



Blue Trace: Peak detector, Green Trace: Average detector

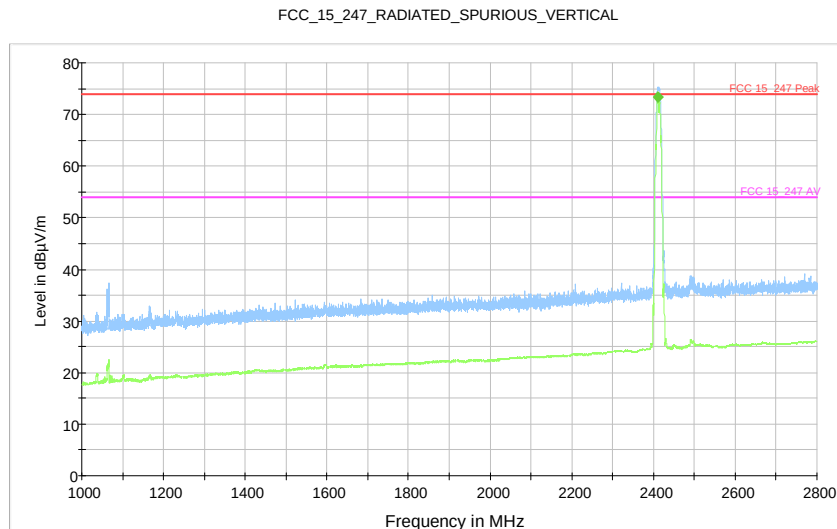
FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 b – CH11

HORIZONTAL POLARIZATION

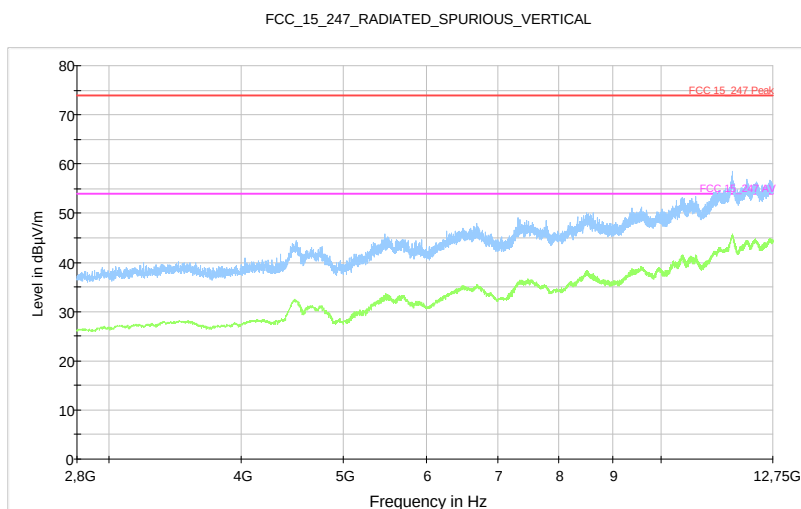
The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 g - CH1

VERTICAL POLARIZATION



Blue Trace: Peak detector, Green Trace: Average detector



Blue Trace: Peak detector, Green Trace: Average detector

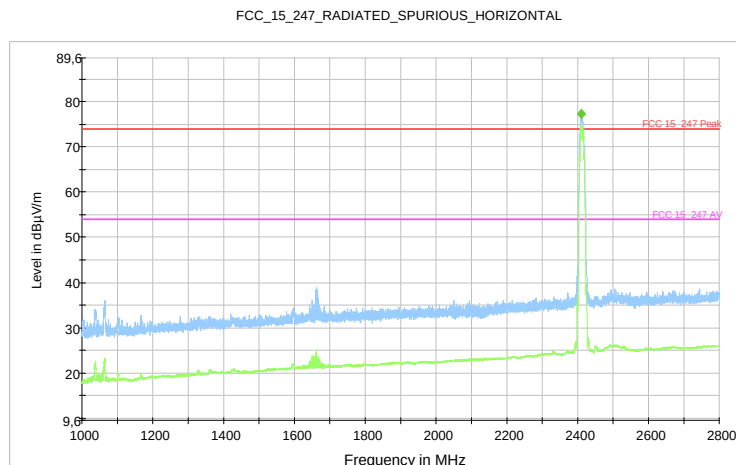
FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 g - CH1

VERTICAL POLARIZATION

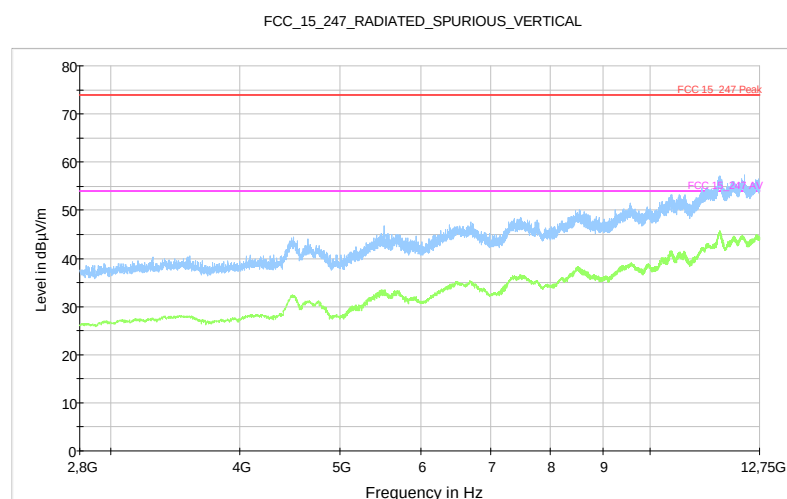
The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 g - CH1

HORIZONTAL POLARIZATION



Blue Trace: Peak detector, Green Trace: Average detector



Blue Trace: Peak detector, Green Trace: Average detector

FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 g - CH1

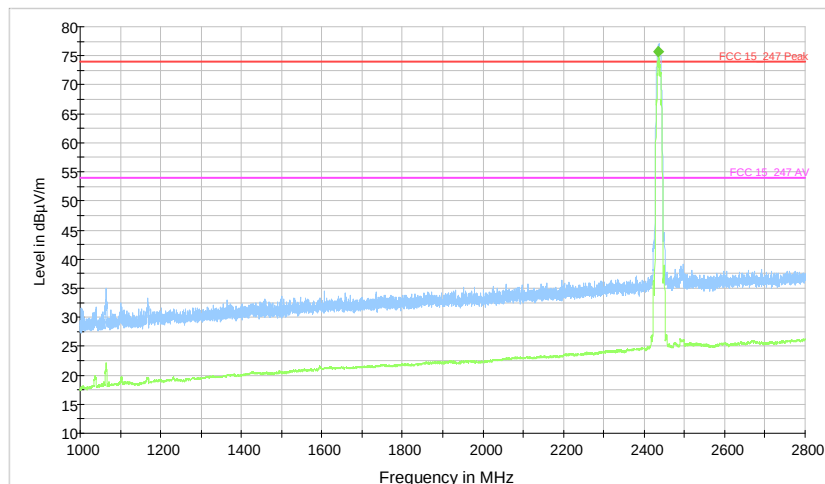
HORIZONTAL POLARIZATION

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 g – CH6

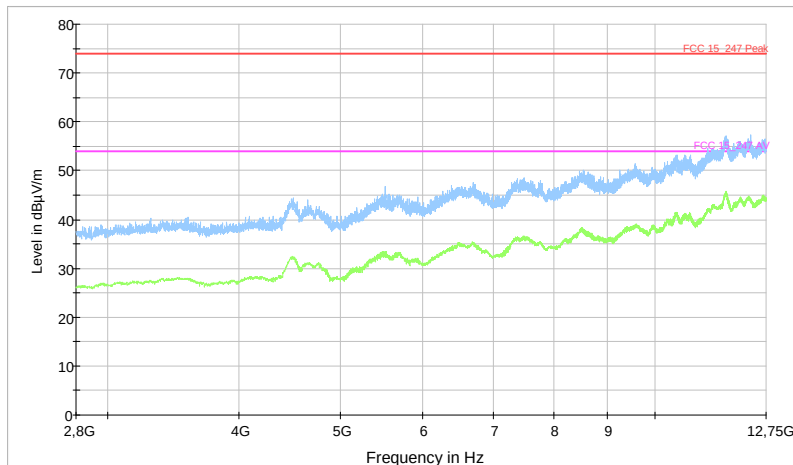
VERTICAL POLARIZATION

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

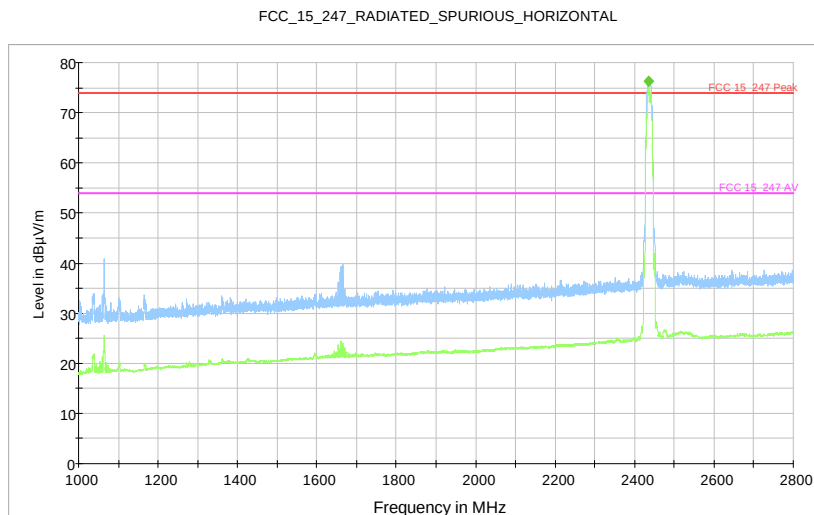
FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 g – CH6

VERTICAL POLARIZATION

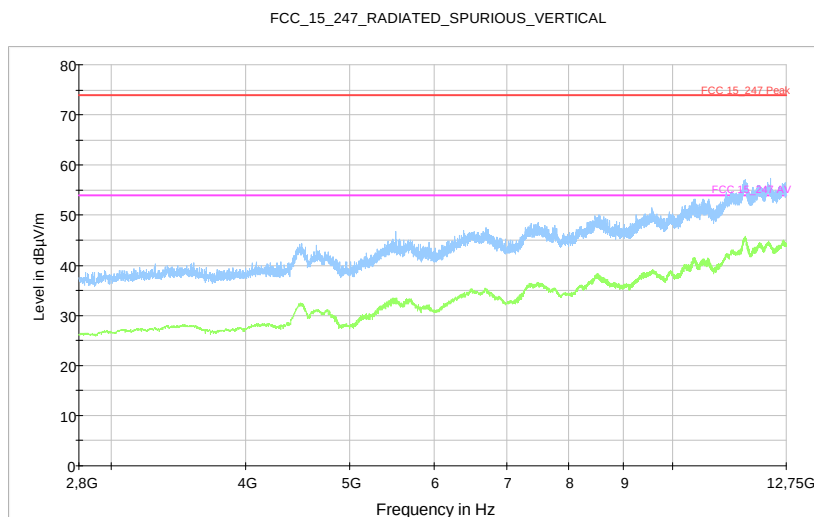
The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 g – CH6

HORIZONTAL POLARIZATION



Blue Trace: Peak detector, Green Trace: Average detector



Blue Trace: Peak detector, Green Trace: Average detector

FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 g – CH6

HORIZONTAL POLARIZATION

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported



PRIMA

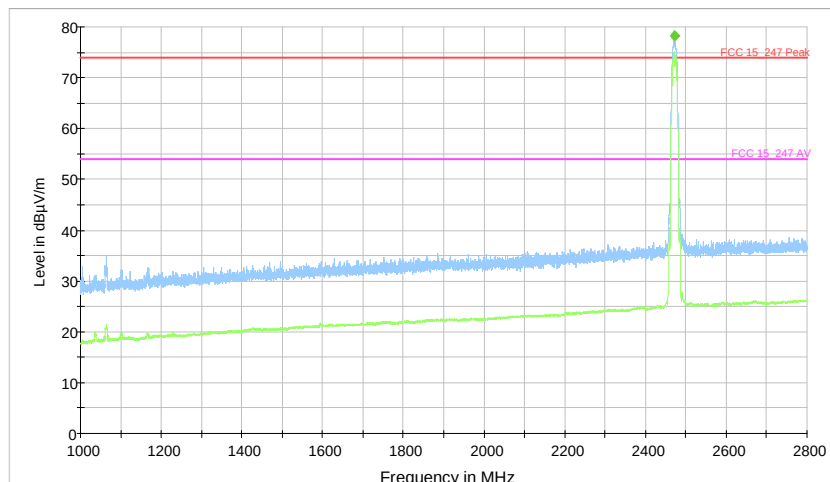
RICERCA & SVILUPPO

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 g – CH11

VERTICAL POLARIZATION

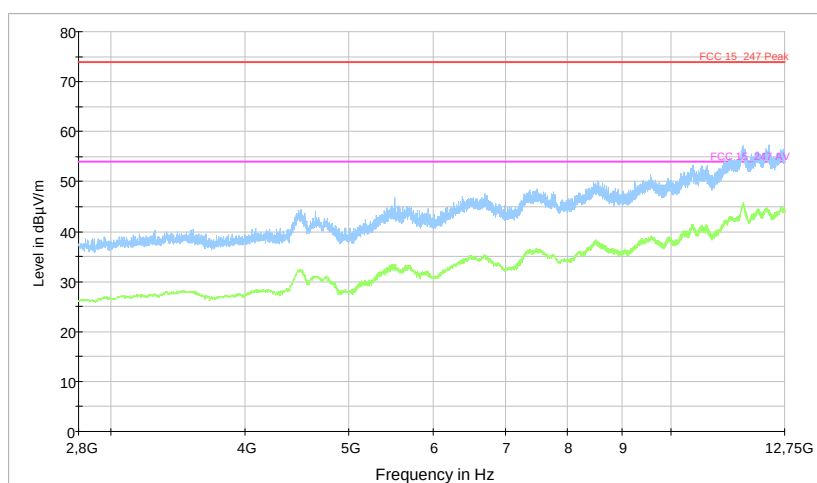
FCCTR_131623-4

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

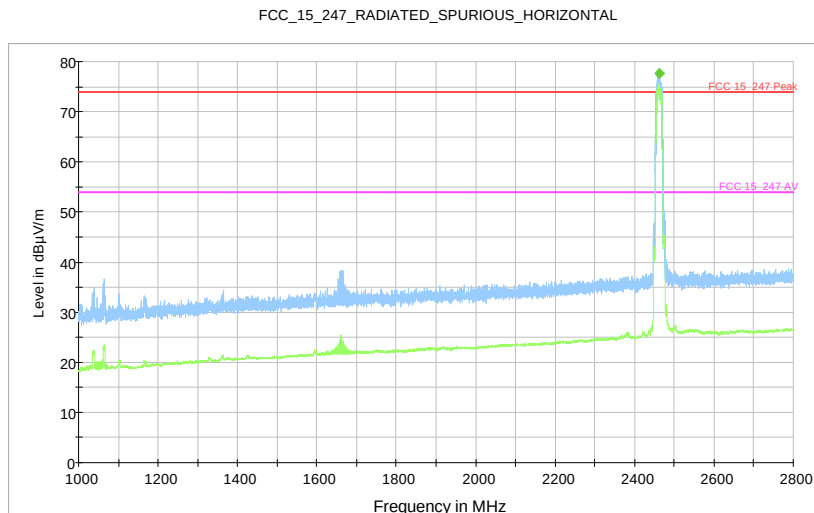
FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 g – CH11

VERTICAL POLARIZATION

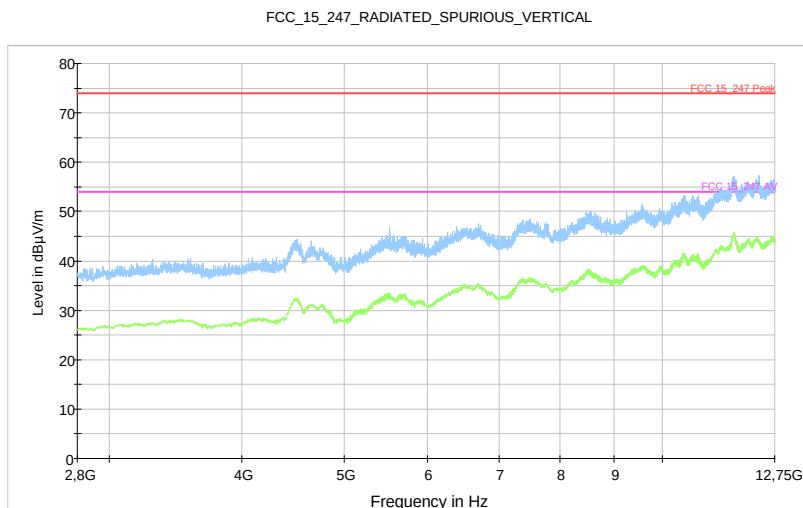
The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 g – CH11

HORIZONTAL POLARIZATION



Blue Trace: Peak detector, Green Trace: Average detector



Blue Trace: Peak detector, Green Trace: Average detector

FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 g – CH11

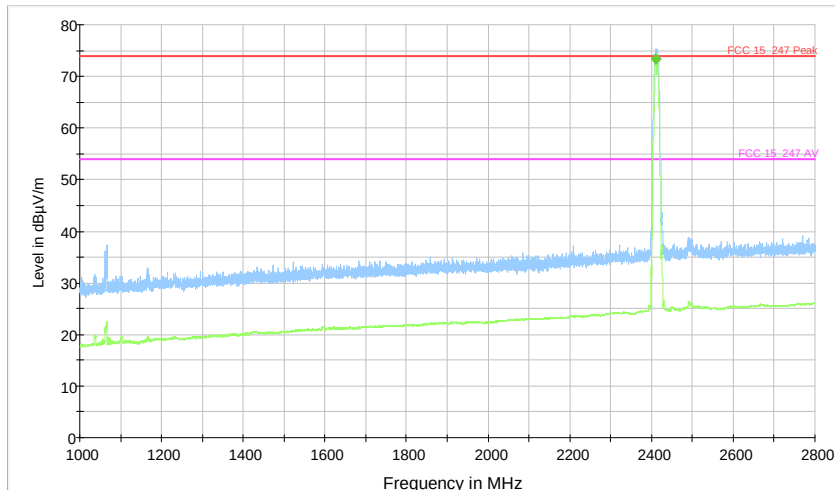
HORIZONTAL POLARIZATION

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 n - CH1

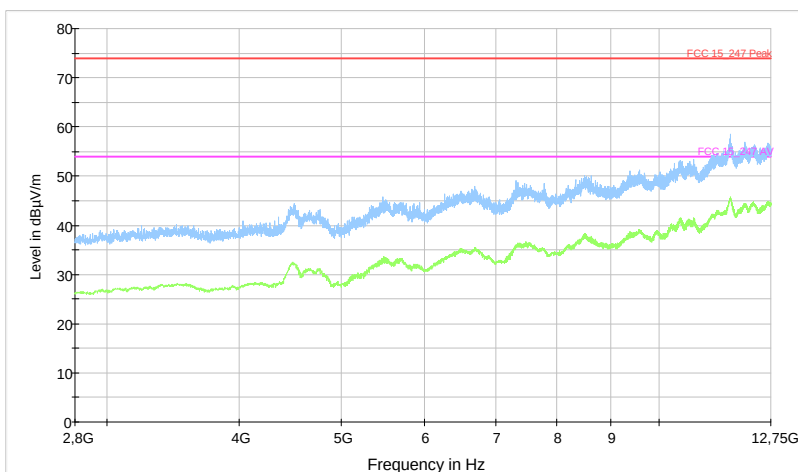
VERTICAL POLARIZATION

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

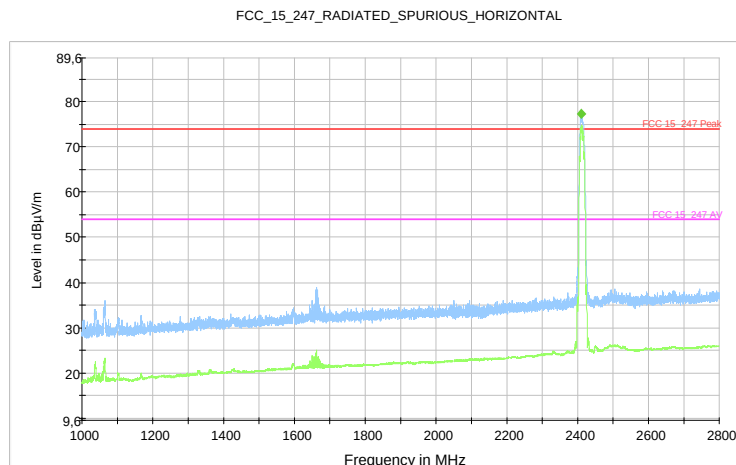
FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 n - CH1

VERTICAL POLARIZATION

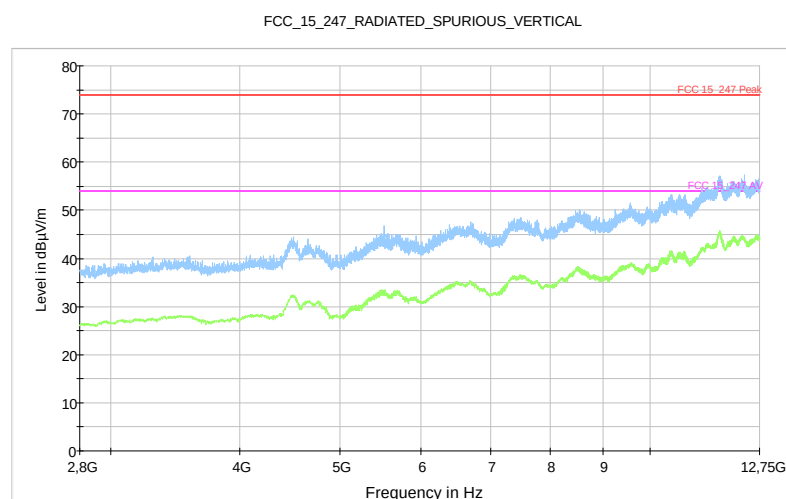
The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 n - CH1

HORIZONTAL POLARIZATION



Blue Trace: Peak detector, Green Trace: Average detector



Blue Trace: Peak detector, Green Trace: Average detector

FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 n - CH1

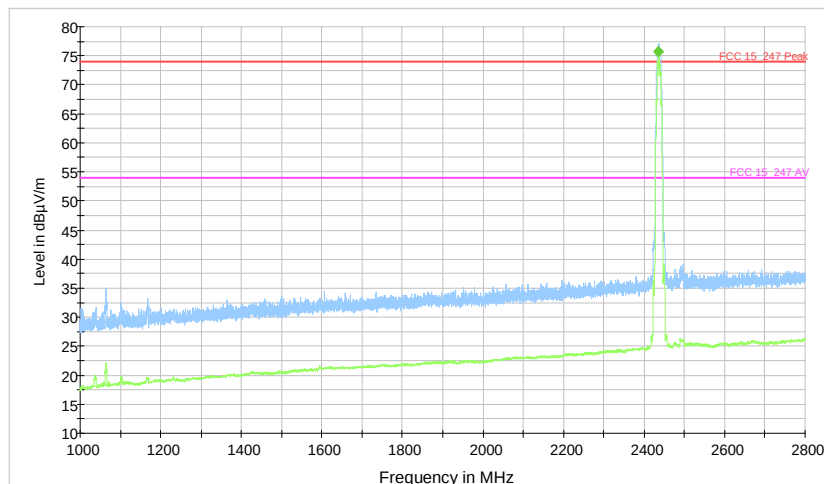
HORIZONTAL POLARIZATION

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 n – CH6

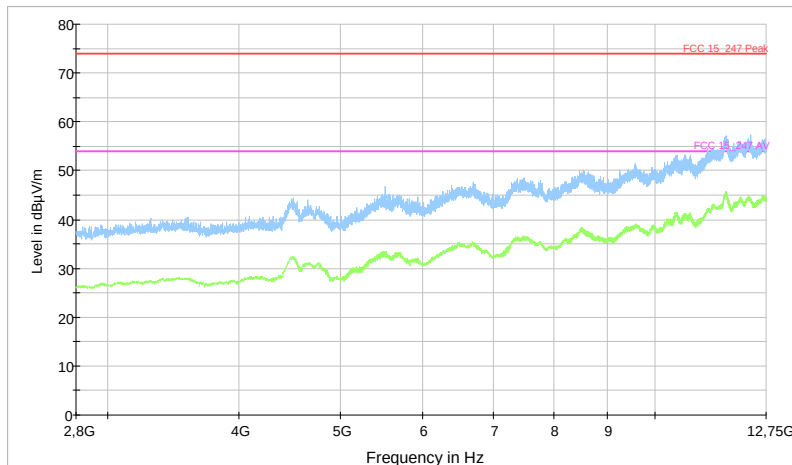
VERTICAL POLARIZATION

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

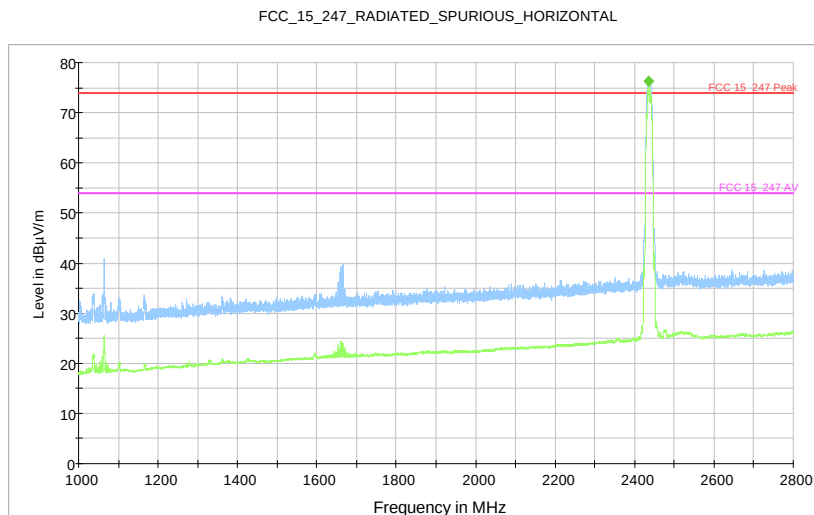
FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 n – CH6

VERTICAL POLARIZATION

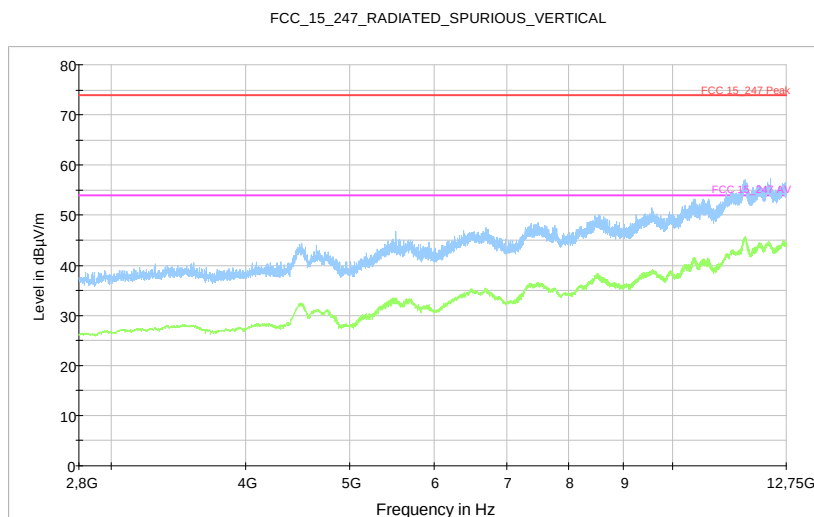
The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 n – CH6

HORIZONTAL POLARIZATION



Blue Trace: Peak detector, Green Trace: Average detector



Blue Trace: Peak detector, Green Trace: Average detector

FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 n – CH6

HORIZONTAL POLARIZATION

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported



PRIMA

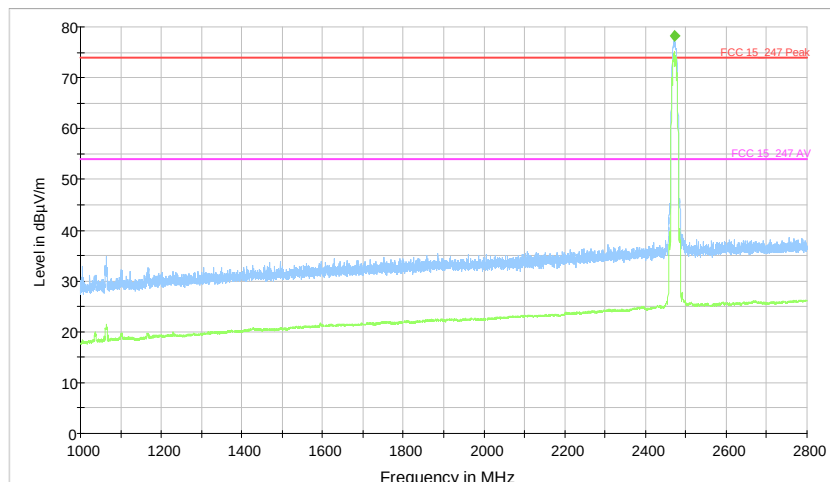
RICERCA & SVILUPPO

FCCTR_131623-4

FREQUENCY RANGE 1GHz – 12.75GHz 802.11 n – CH11

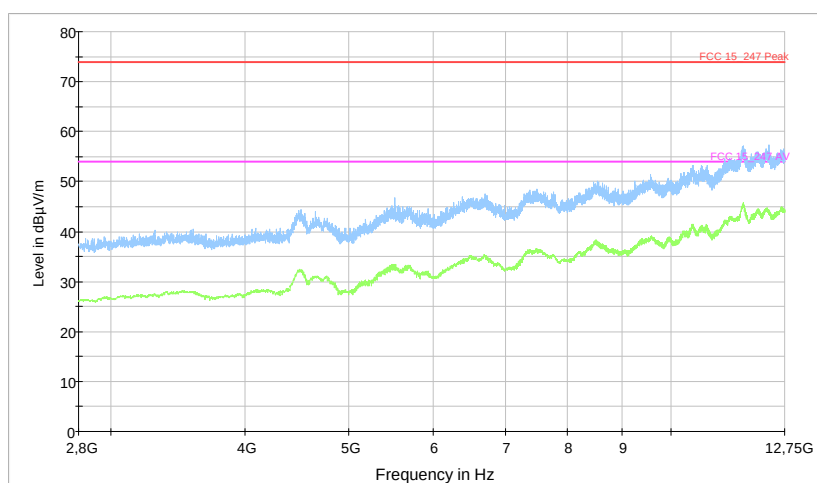
VERTICAL POLARIZATION

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 n – CH11

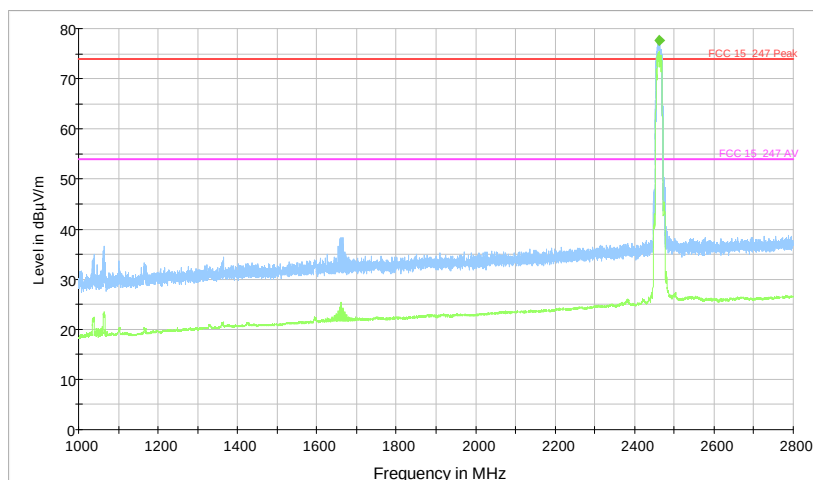
VERTICAL POLARIZATION

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FREQUENCY RANGE 1GHz – 12.75GHz 802.11 n – CH11

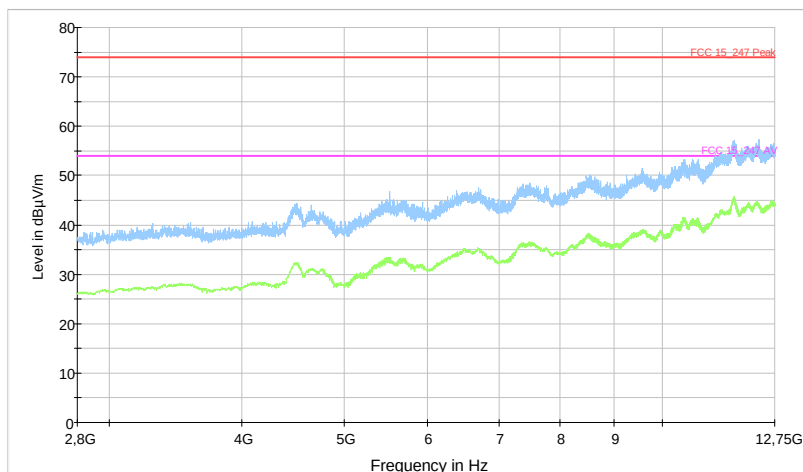
HORIZONTAL POLARIZATION

FCC_15_247_RADIATED_SPURIOUS_HORIZONTAL



Blue Trace: Peak detector, Green Trace: Average detector

FCC_15_247_RADIATED_SPURIOUS_VERTICAL



Blue Trace: Peak detector, Green Trace: Average detector

FREQUENCY RANGE 12.75GHz to 10th HARMONIC 802.11 n – CH11

HORIZONTAL POLARIZATION

The amplitude of spurious emissions are attenuated more than 20 dB so the permissible value need not be reported

7. LIST OF EQUIPMENT USED

EQUIPMENT	MANUFACTURER	MODEL	SERIAL Nr.	CAL. DUE
EMI TEST RECEIVER 20Hz - 40GHz	Rohde & Schwarz	ESU40	100111	10/05/2014
RF SEMI-ANECHOIC CHAMBER (CSSA)	Siemens	B83117-D6019- T232	003-005- 134/94C	01/07/2014
BILOG ANTENNA	Chase	CBL6111C	2717	05/05/2014
LOG PERIODIC ANTENNA BROAD BAND 1-26,5GHz	Rohde & Schwarz	HL050	100437	01/04/2014
SPECTRUM ANALYZER	Rohde & Schwarz	FSP40	100038	16/01/2015
SYSTEM DC POWER SUPPLY	HP	6623A	3448A04501	10/01/2015
TUNABLE NOTCH FILTER	Wainwright	WRCT2200/2500- 5/40-10SK	5	11/11/2014
HIGH PASS FILTER	Wainwright	WHNX 2,8/18G- 10SS	1	11/11/2014