5.1.5. Radiated Emissions

FCC, Part 15 Subpart C §15.407(b), §15.205(a)/15.209(a)
Industry Canada RSS-247, §5.2

Test Procedure

Testing was performed in a 3-meter anechoic chamber. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. Preliminary emissions were recorded with in Spectrum Analyzer mode, using a maximum peak detector while in peak hold mode. Depending on the frequency band spanned a notch filter and/or waveguide filter was used to remove the fundamental frequency.

Emissions nearest the limits were chosen for maximization and formal measurement using a CISPR compliant receiver. Emissions above 1000 MHz are measured utilizing a CISPR compliant average detector with a tuned receiver, using a bandwidth of 1 MHz. Emissions from 30 MHz – 1000 MHz are measured utilizing a CISPR compliant quasi-peak detector with a tuned receiver, using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR – FO

FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor

CORR = Correction Factor = CL – AG + NFL

CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

Field Strength Calculation Example:

Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength (dBμV/m);

$$E = \frac{1000000 \times \sqrt{30P}}{3} \ \mu V/m$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

Note: The data in this Section identifies that the EUT is in compliance with the -27dBm/MHz EIRP limit (68.23 dBμV/m) for out of band emissions. All out of band emissions are less than 68.23 dB μV/m.

Specification

Radiated Spurious Emissions

15.407 (b)(2). All emissions outside of the 5,150-5,350MHz band shall not exceed an EIRP of -27dBm/MHz.

FCC §15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

FCC §15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC §15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

Table 1: FCC 15.209 Spurious Emissions Limits

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement Uncertainty	+5.6/ -4.5 dB

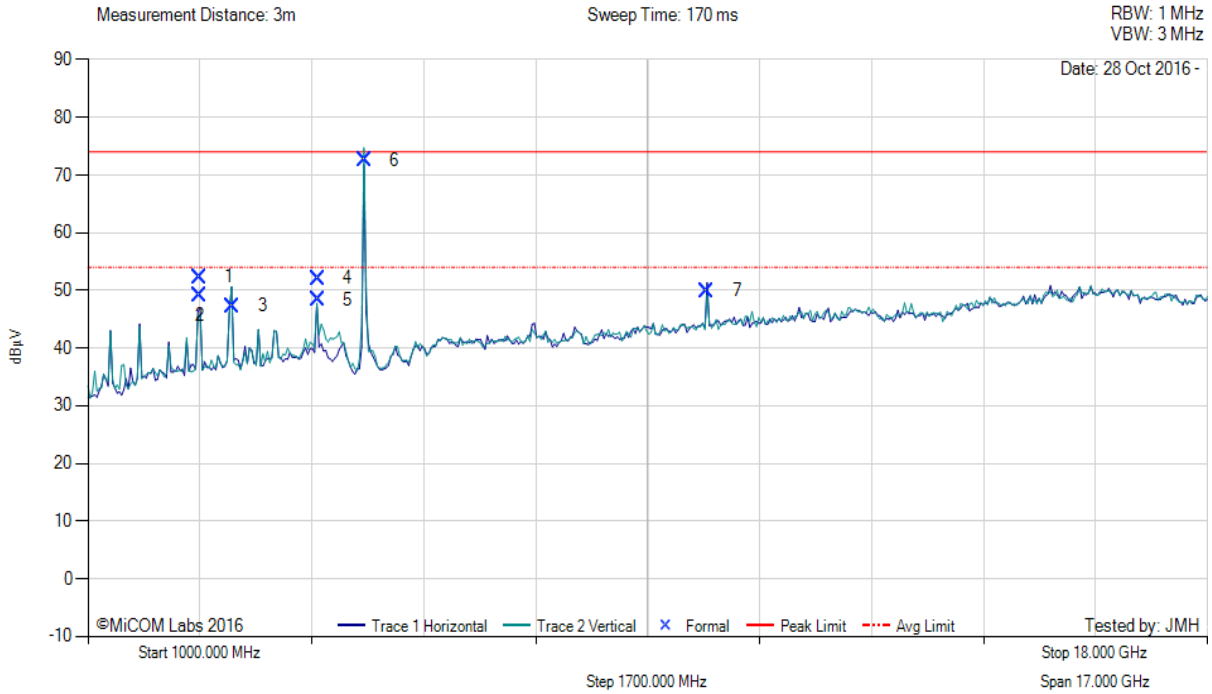
Spot Check Radiated Results

Antenna:	Laird Laird NanoGreen	**Variant:**	802.11a
Antenna Gain (dBi):	2.0	**Modulation:**	OFDM
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	5200.00	**Data Rate:**	6.00 MBit/s
Power Setting:	10	**Tested By:**	JMH

Test Measurement Results

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5200.00 MHz, Antenna: Laird Laird NanoGreen, Power Setting: 10, Duty Cycle (%): 99



1000.00 - 18000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	2699.92	60.86	2.84	-11.39	52.31	Max Peak	Horizontal	147	352	74.0	-21.7	Pass
2	2699.92	57.76	2.84	-11.39	49.21	Max Avg	Horizontal	147	352	54.0	-4.8	Pass
3	3199.72	55.60	3.00	-11.29	47.31	Peak (NRB)	Horizontal	151	80	--	--	Pass
4	4500.01	60.17	3.49	-11.60	52.06	Max Peak	Horizontal	186	172	74.0	-21.9	Pass
5	4500.01	56.51	3.49	-11.60	48.40	Max Avg	Horizontal	186	172	54.0	-5.6	Pass
6	5201.80	80.38	3.66	-11.46	72.58	Fundamental	Vertical	101	1	--	--	
7	10404.61	49.45	5.44	-5.00	49.89	Peak (NRB)	Horizontal	101	62	--	--	Pass

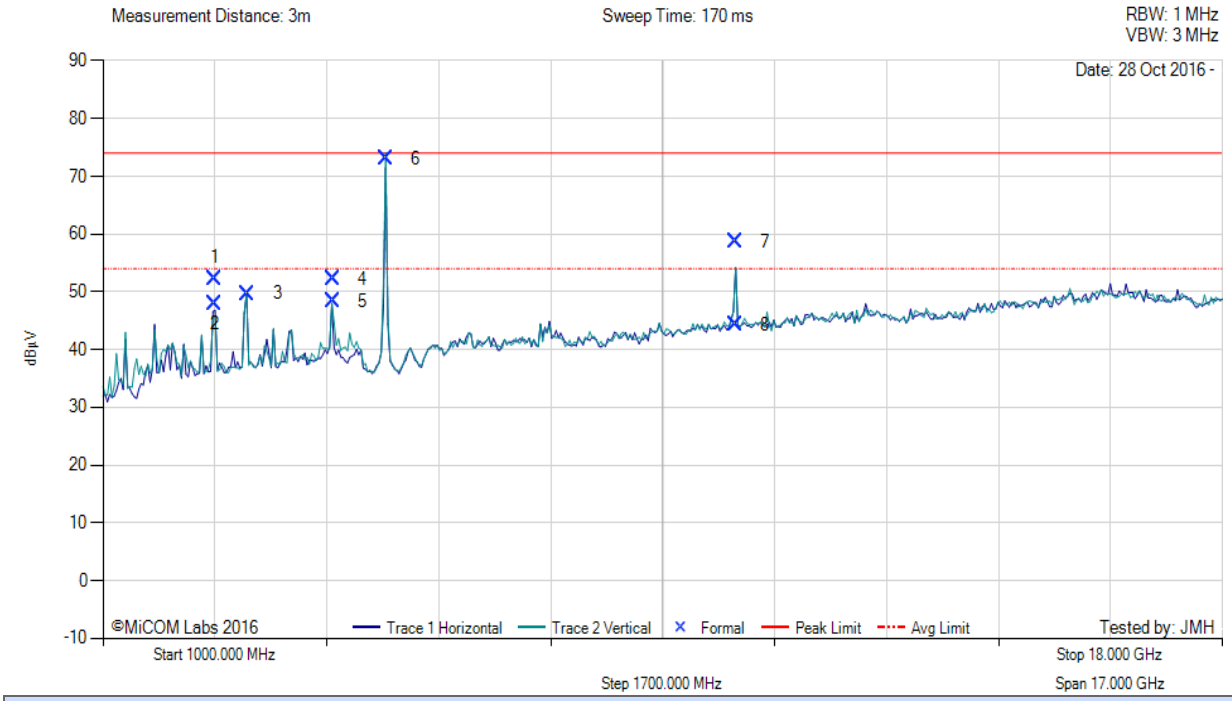
Test Notes: EUT powered by 3501G POE and connected to laptop inside chamber.

Antenna:	Laird Laird NanoGreen	**Variant:**	802.11a
Antenna Gain (dBi):	2.0	**Modulation:**	OFDM
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	5300.00	**Data Rate:**	6.00 MBit/s
Power Setting:	17	**Tested By:**	JMH

Test Measurement Results

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5300.00 MHz, Antenna: Laird Laird NanoGreen, Power Setting: 17, Duty Cycle (%): 99



1000.00 - 18000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	2699.95	60.86	2.84	-11.39	52.31	Max Peak	Horizontal	110	0	74.0	-21.7	Pass
2	2699.95	56.53	2.84	-11.39	47.98	Max Avg	Horizontal	110	0	54.0	-6.0	Pass
3	3199.88	58.00	3.00	-11.29	49.71	Peak (NRB)	Horizontal	101	141	--	--	Pass
4	4500.01	60.31	3.49	-11.60	52.20	Max Peak	Horizontal	195	169	74.0	-21.8	Pass
5	4500.01	56.55	3.49	-11.60	48.44	Max Avg	Horizontal	195	169	54.0	-5.6	Pass
6	5294.31	80.44	3.78	-11.12	73.10	Fundamental	Vertical	101	1	--	--	
7	10600.37	56.97	5.58	-3.94	58.61	Max Peak	Vertical	194	205	74.0	-15.4	Pass
8	10600.37	42.61	5.58	-3.94	44.25	Max Avg	Vertical	194	205	54.0	-9.8	Pass

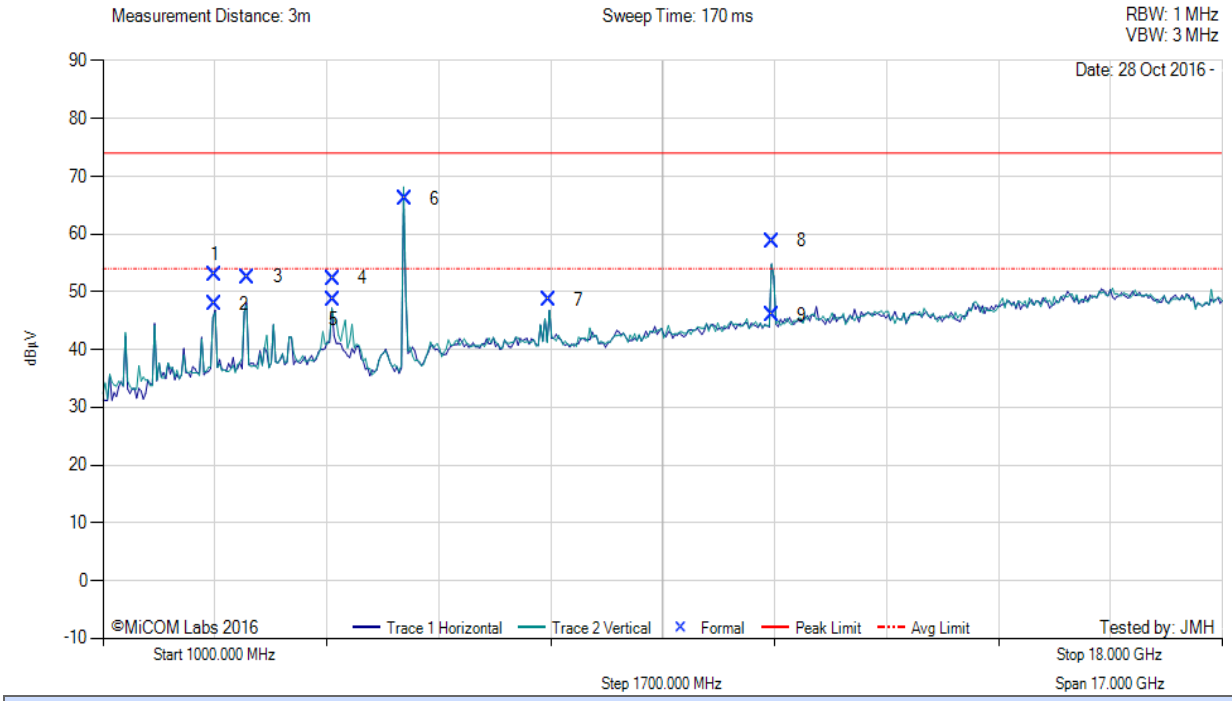
Test Notes: EUT powered by 3501G POE and connected to laptop inside chamber.

Antenna:	Laird Laird NanoGreen	**Variant:**	802.11a
Antenna Gain (dBi):	2.0	**Modulation:**	OFDM
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	5580.00	**Data Rate:**	6.00 MBit/s
Power Setting:	18	**Tested By:**	JMH

Test Measurement Results

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5580.00 MHz, Antenna: Laird Laird NanoGreen, Power Setting: 18, Duty Cycle (%): 99



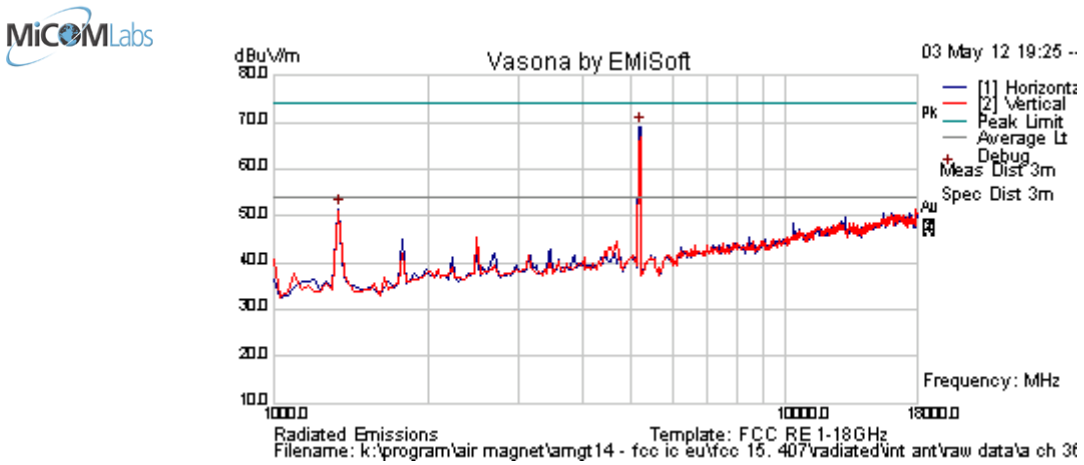
1000.00 - 18000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	2699.87	61.41	2.84	-11.39	52.86	Max Peak	Horizontal	184	0	74.0	-21.1	Pass
2	2699.87	56.50	2.84	-11.39	47.95	Max Avg	Horizontal	184	0	54.0	-6.1	Pass
3	3199.96	60.83	3.00	-11.29	52.54	Peak (NRB)	Horizontal	101	136	--	--	Pass
4	4500.01	60.45	3.49	-11.60	52.34	Max Peak	Horizontal	188	168	74.0	-21.7	Pass
5	4500.01	56.84	3.49	-11.60	48.73	Max Avg	Horizontal	188	168	54.0	-5.3	Pass
6	5578.16	73.50	3.81	-11.20	66.11	Fundamental	Vertical	101	1	--	--	
7	7766.52	50.96	4.43	-6.71	48.68	Peak (NRB)	Horizontal	151	155	--	--	Pass
8	11161.86	57.09	5.76	-4.06	58.79	Max Peak	Vertical	191	331	74.0	-15.2	Pass
9	11161.86	44.21	5.76	-4.06	45.91	Max Avg	Vertical	191	331	54.0	-8.1	Pass

Test Notes: EUT powered by 3501G POE and connected to laptop inside chamber.

Original Radiated Emissions Result

5.1.5.1. Integral Antenna

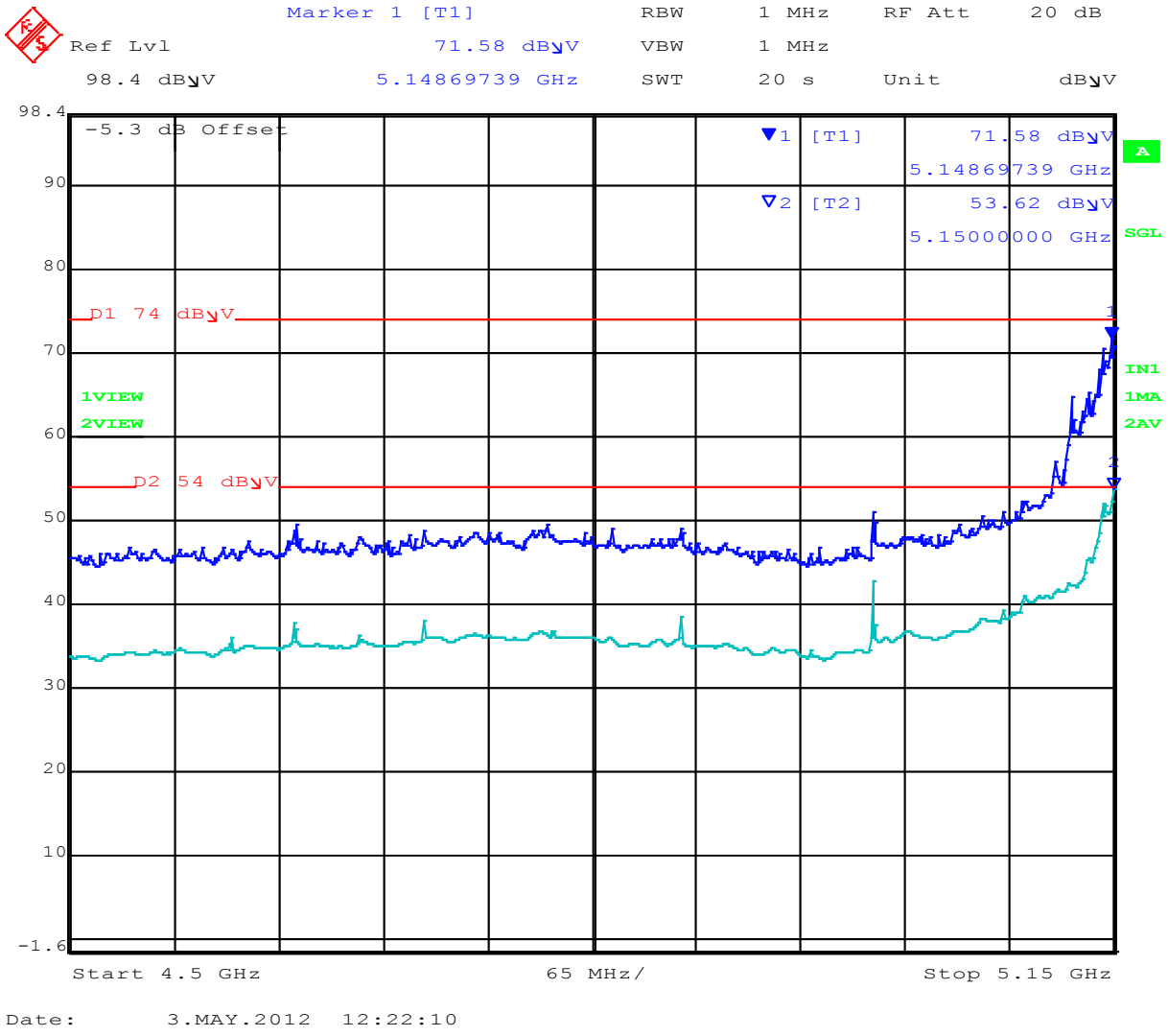
Test Freq.	5180 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	16	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

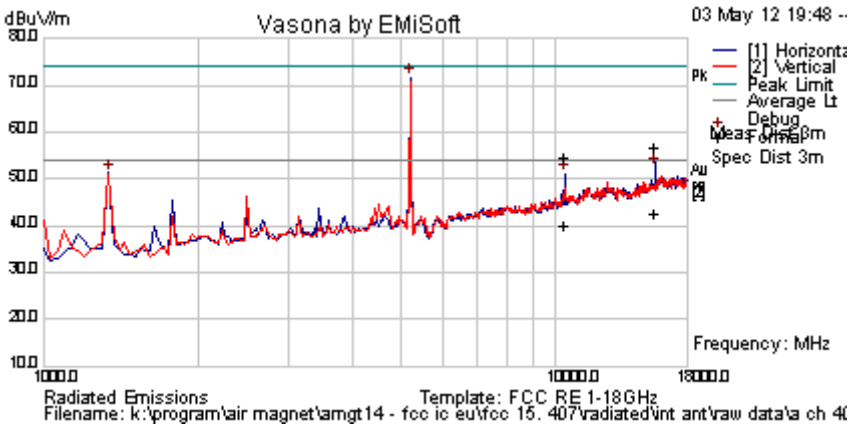
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5190.381	74.4	4.6	-9.9	69.1	Peak [Scan]	H	200	0				FUND
1340.68136	63.2	2.3	-13.9	51.5	Peak [Scan]	H	100	0	54.0	-2.5	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11a Channel Frequency 5180 MHz

Test Freq.	5200 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

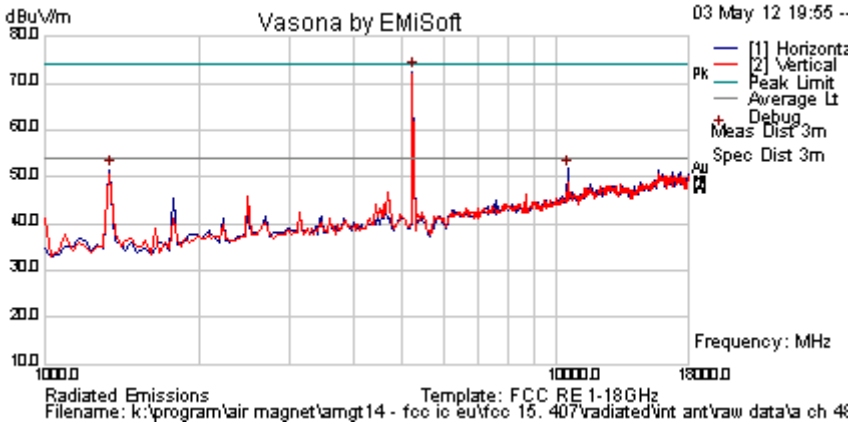


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
15606.134	49.0	8.4	-0.6	56.8	Peak Max	H	100	327	74.0	-17.2	Pass	RB
10395.231	50.3	6.7	-2.5	54.5	Peak Max	H	166	345	74.0	-19.5	Pass	RB
15606.134	35.0	8.4	-0.6	42.8	Average Max	H	100	327	54.0	-11.3	Pass	RB
10395.231	35.8	6.7	-2.5	40.1	Average Max	H	166	345	54	-13.9	Pass	RB
5190.381	77.0	4.6	-9.9	71.8	Peak [Scan]	H	200	0				FUND
1340.681	62.9	2.3	-13.9	51.3	Peak [Scan]	H	100	0	54	-2.7	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5240 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

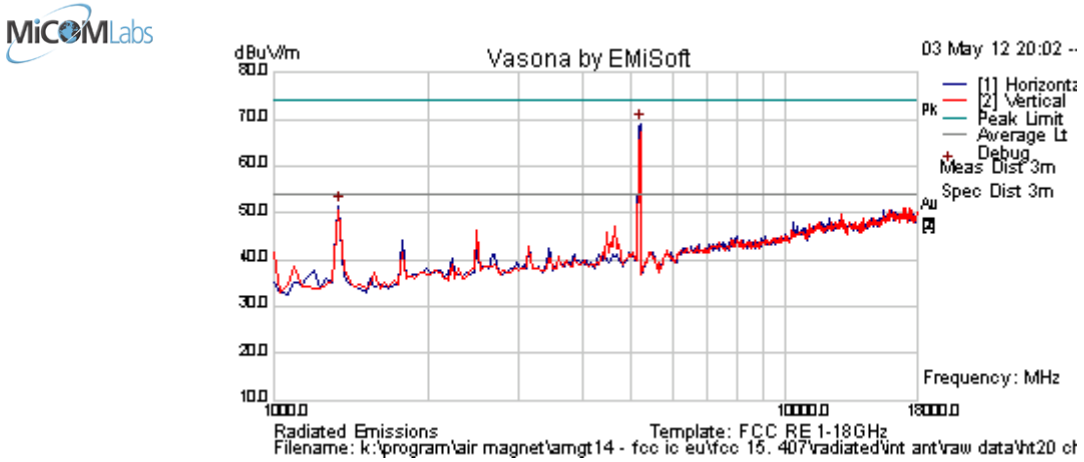


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
10505.01	50.3	6.7	-2.5	54.5	Peak Max	H	166	345	74.0	-19.5	Pass	RB
10505.01	35.8	6.7	-2.5	40.1	Average Max	H	166	345	54	-13.9	Pass	RB
1340.681	63.2	2.3	-13.9	51.6	Peak [Scan]	H	100	0	54.0	-2.4	Pass	RB
5224.449	77.7	4.6	-9.8	72.5	Peak [Scan]	H	100	0				FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

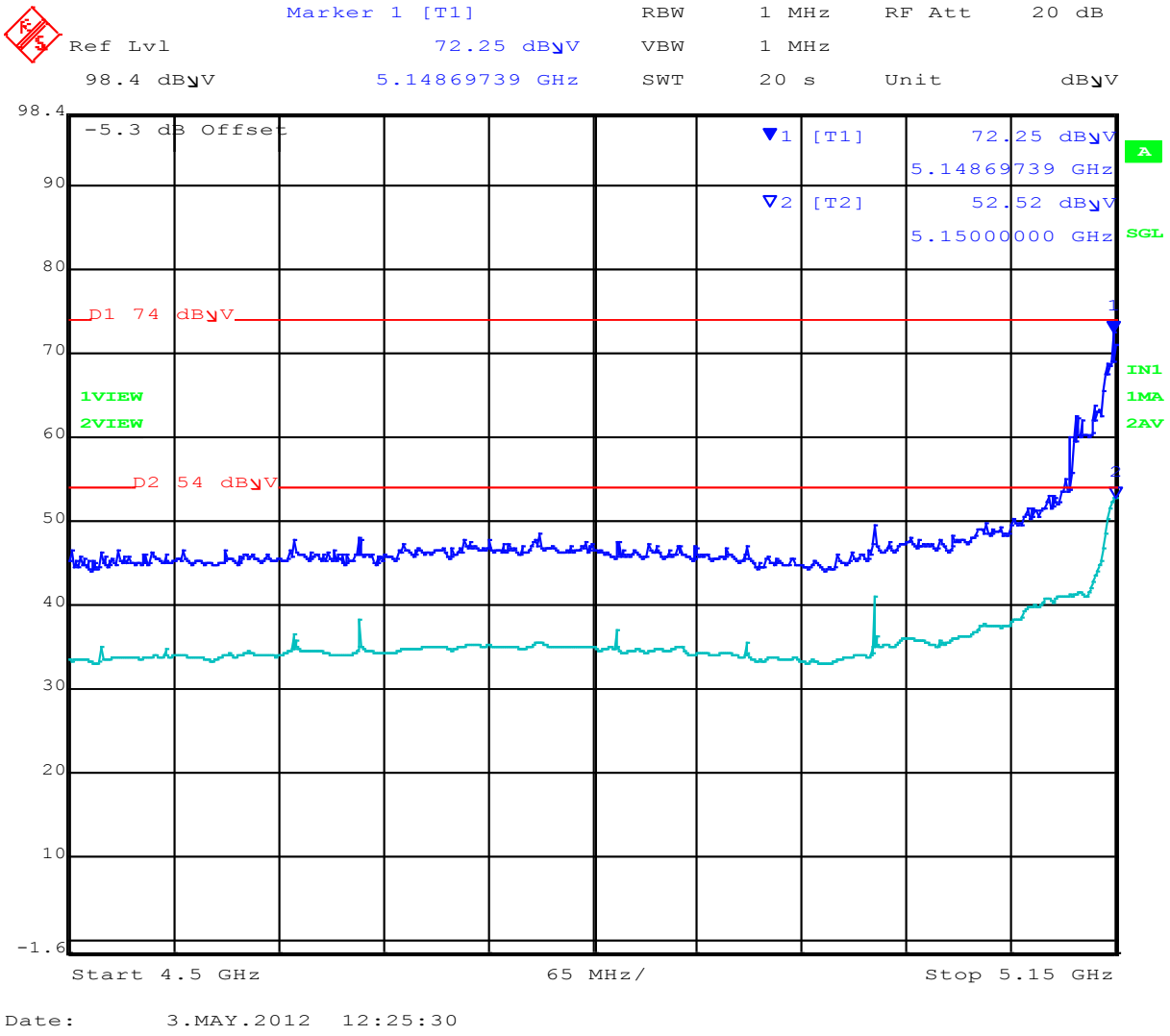
Test Freq.	5180 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	17	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

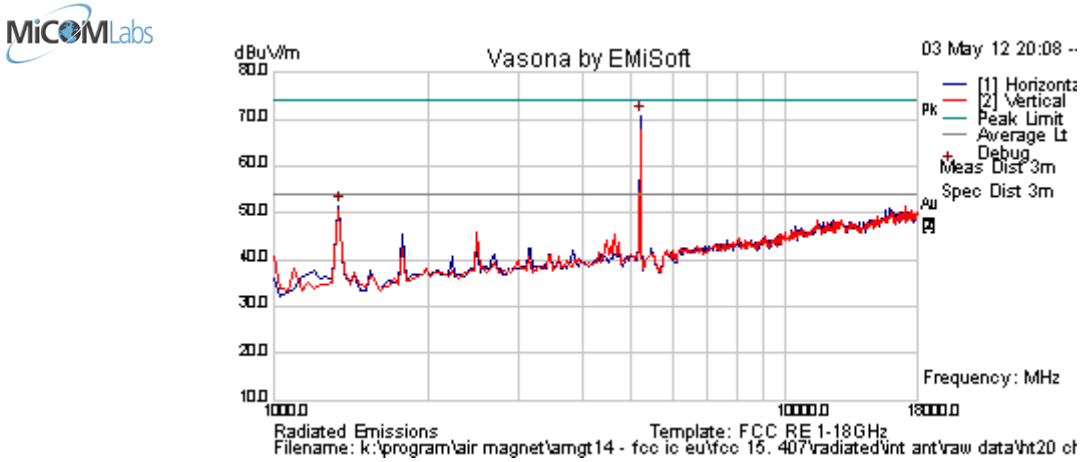
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5190.381	74.5	4.6	-9.9	69.2	Peak [Scan]	H	200	0				FUND
1340.68136	63.1	2.3	-13.9	51.5	Peak [Scan]	H	100	0	54.0	-2.5	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11n HT-20 Channel Frequency 5180 MHz

Test Freq.	5200 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

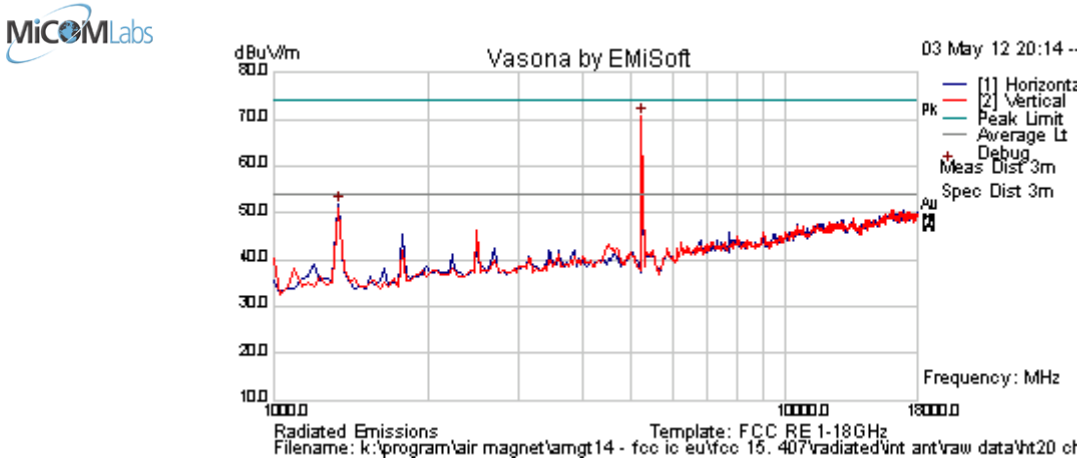


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5190.381	76.1	4.6	-9.9	70.9	Peak [Scan]	H	200	0				FUND
1340.68136	63.1	2.3	-13.9	51.5	Peak [Scan]	H	100	0	54.0	-2.6	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5240 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

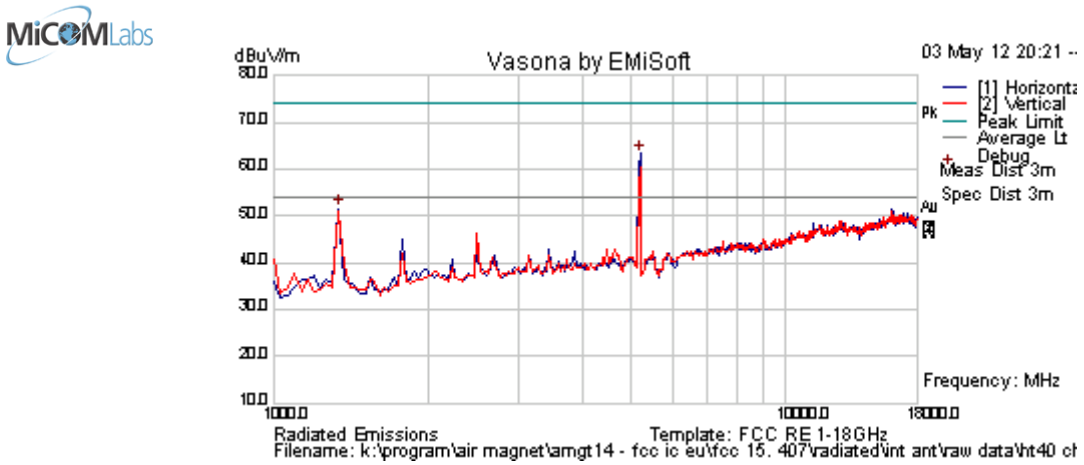


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5224.449	75.9	4.6	-9.8	70.7	Peak [Scan]	V	150	0				FUND
1340.68136	63.3	2.3	-13.9	51.7	Peak [Scan]	H	100	0	54.0	-2.4	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

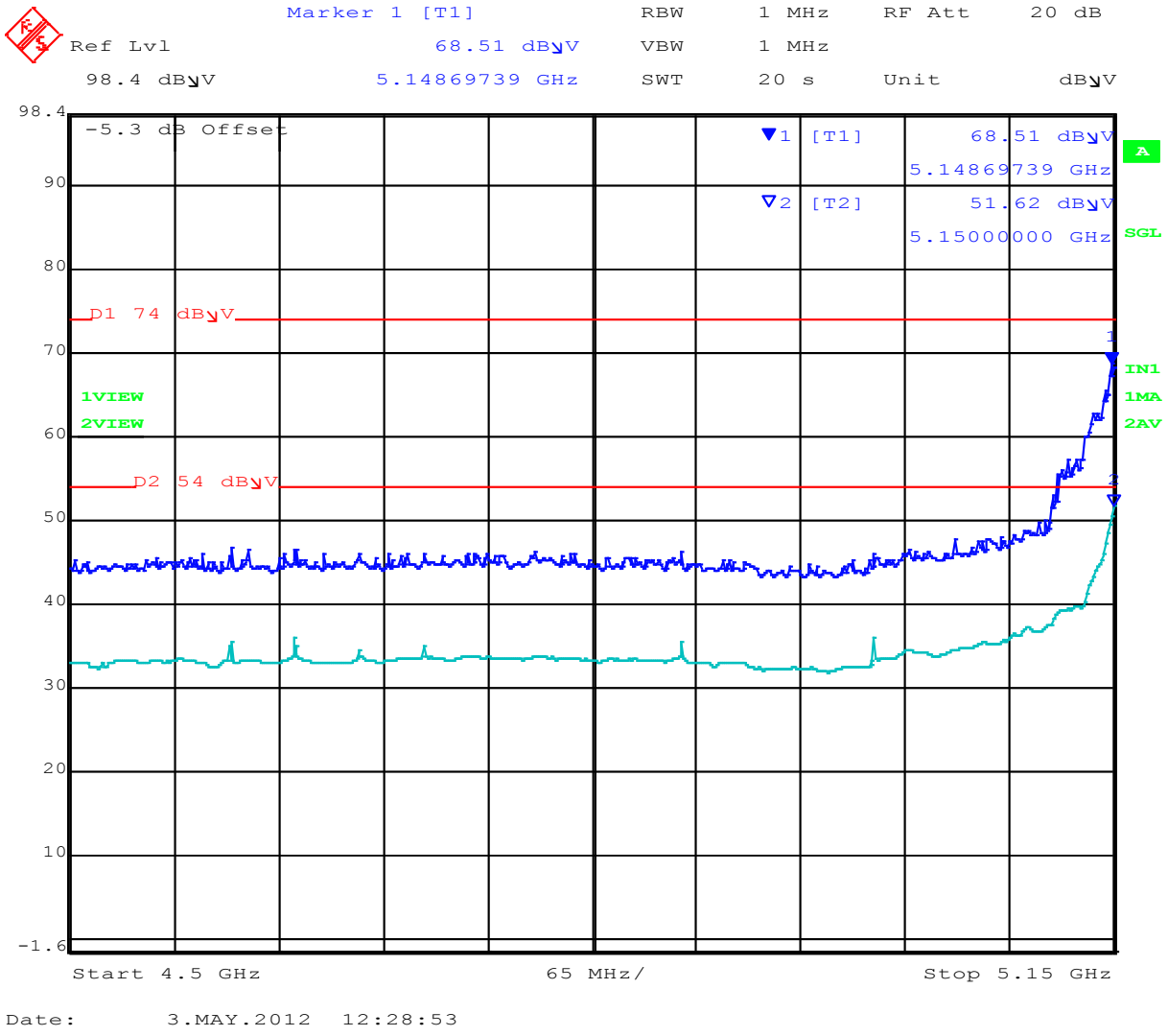
Test Freq.	5190 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	12	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

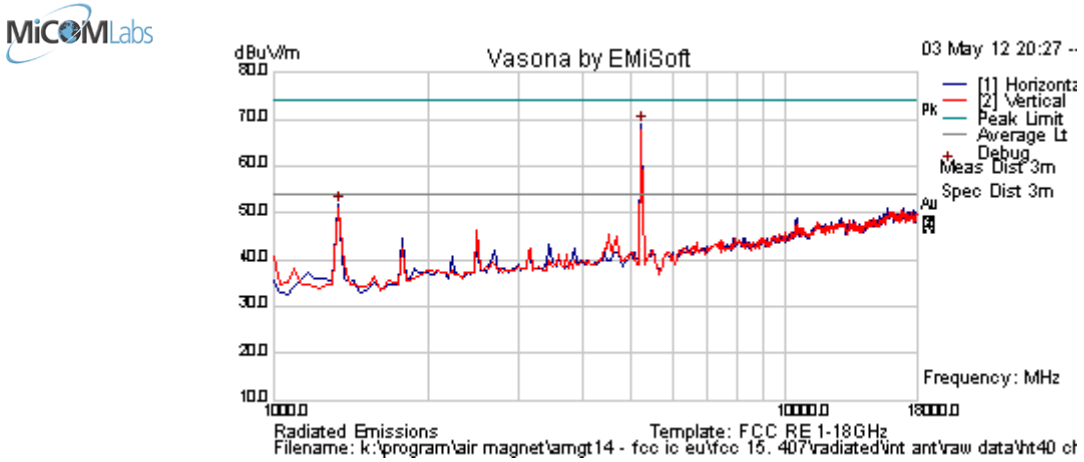
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5190.381	68.5	4.6	-9.9	63.2	Peak [Scan]	H	200	0				FUND
1340.68136	63.2	2.3	-13.9	51.6	Peak [Scan]	H	100	0	54.0	-2.4	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11n HT-40 Channel Frequency 5190 MHz

Test Freq.	5230 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

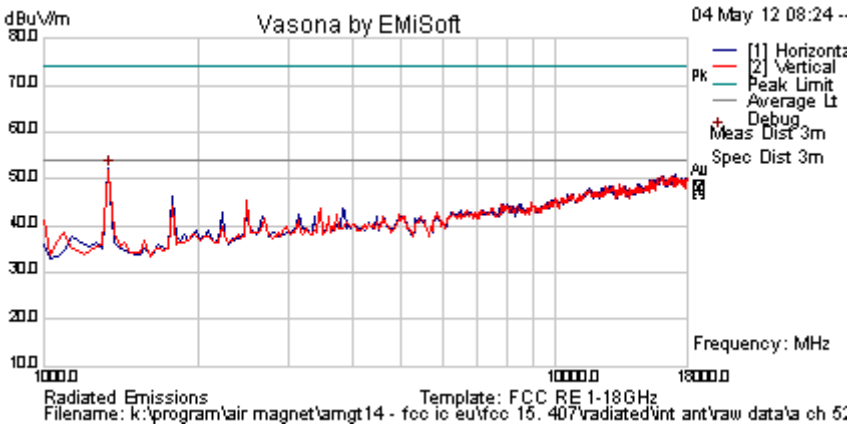


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5224.449	74.1	4.6	-9.8	68.9	Peak [Scan]	H	100	0				FUND
1340.68136	63.3	2.3	-13.9	51.7	Peak [Scan]	H	100	0	54.0	-2.3	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5260 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

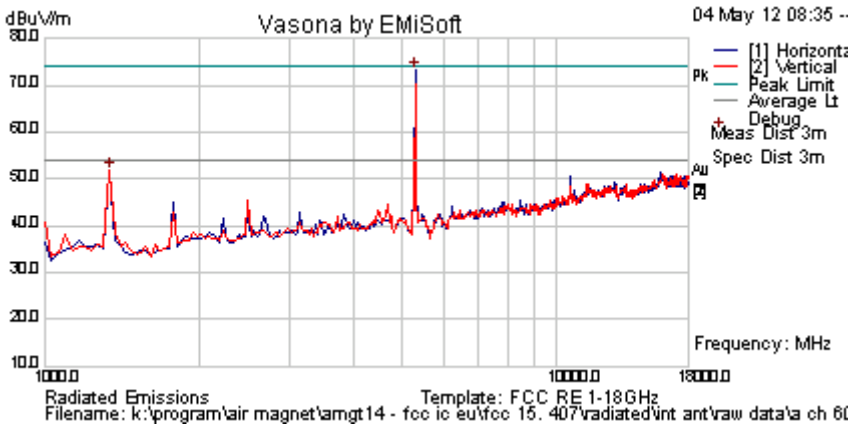


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1340.681	63.8	2.3	-13.9	52.2	Peak [Scan]	H	100	0	54.0	-1.8	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5300 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

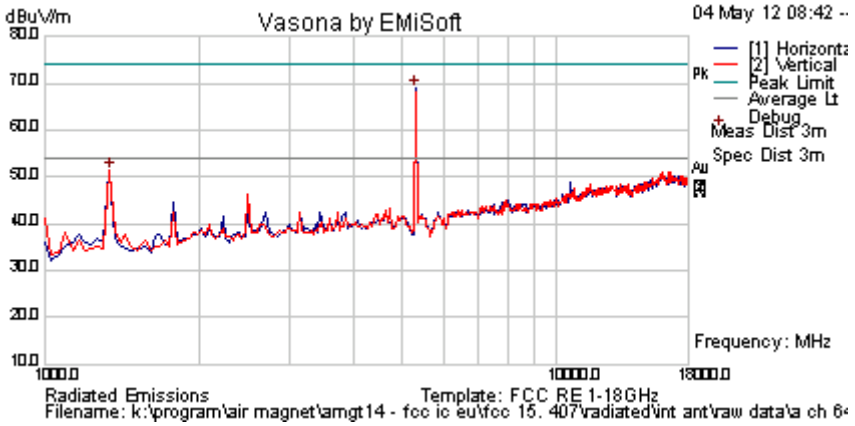


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5292.585	78.1	4.6	-9.6	73.1	Peak [Scan]	H	100	0				FUND
1340.68136	63.5	2.3	-13.9	51.9	Peak [Scan]	V	100	0	54.0	-2.2	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

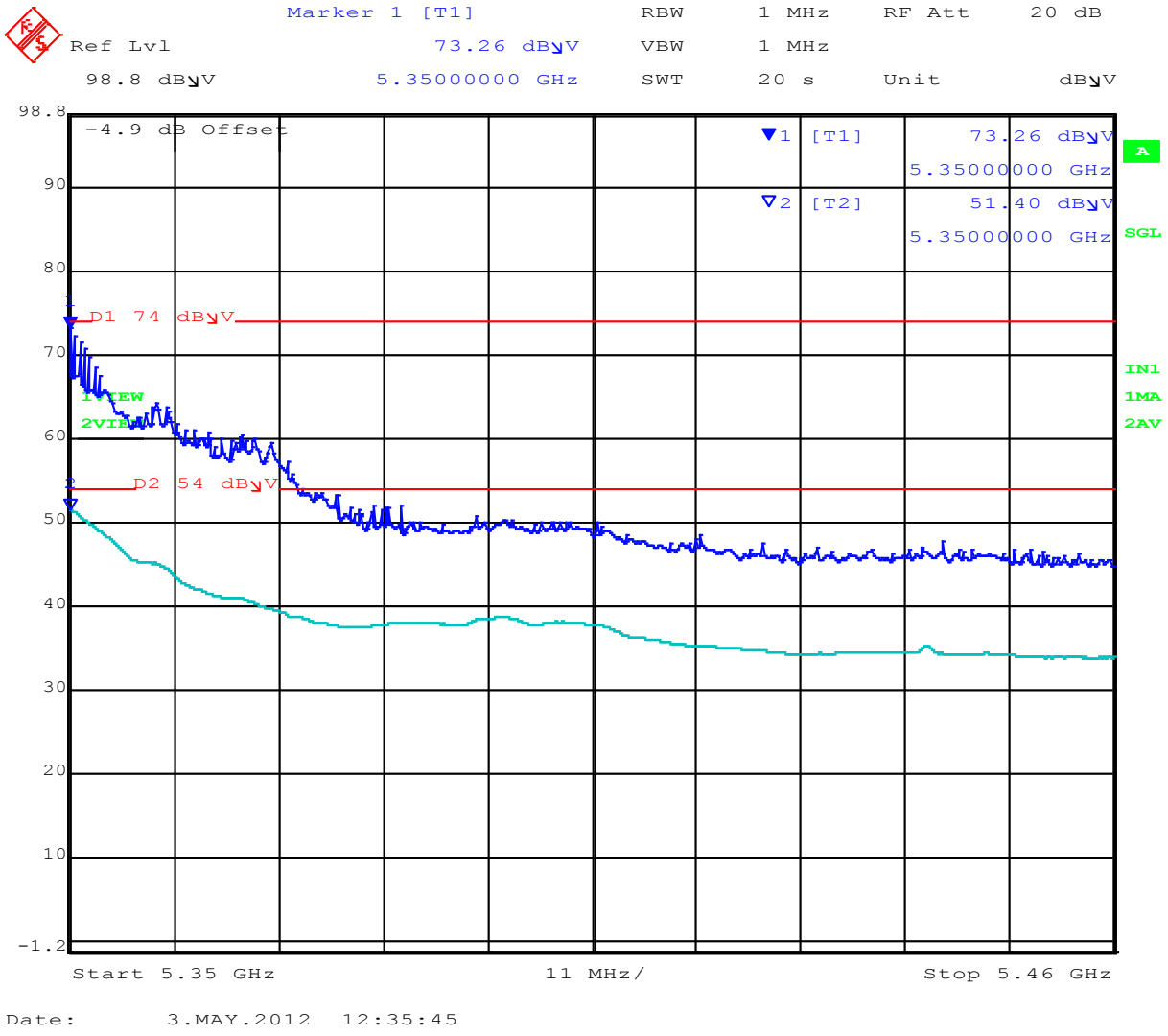
Test Freq.	5320 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	16	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

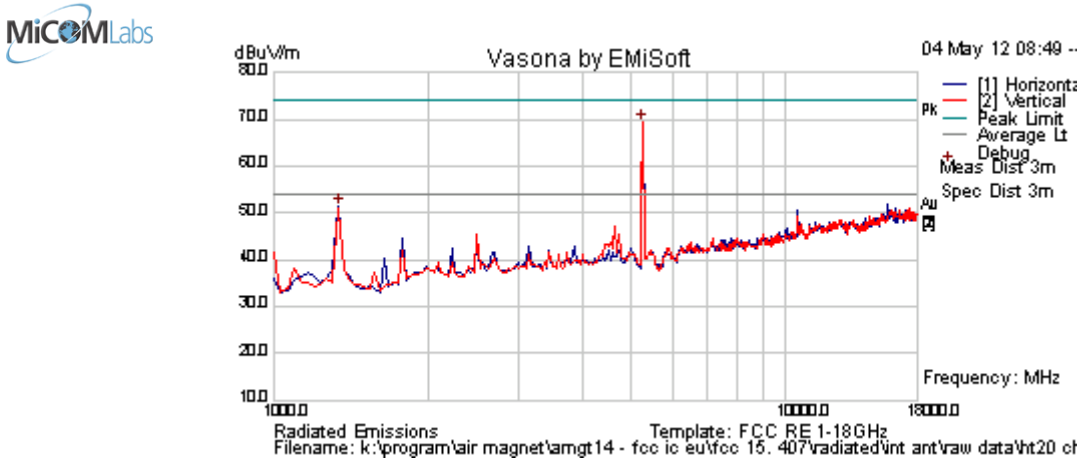
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5292.585	73.9	4.6	-9.6	68.9	Peak [Scan]	H	100	0				FUND
1340.68136	63.0	2.3	-13.9	51.4	Peak [Scan]	V	100	0	54.0	-2.6	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11a Channel Frequency 5320 MHz

Test Freq.	5260 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

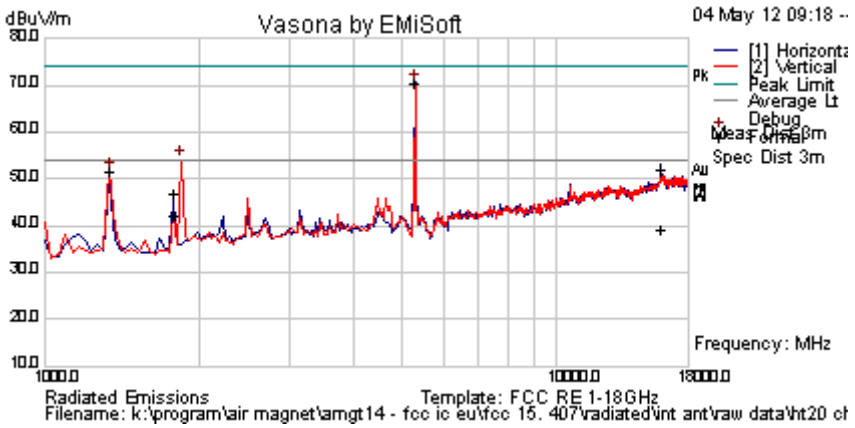


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5258.517	74.4	4.6	-9.7	69.3	Peak [Scan]	V	200	0				FUND
1340.68136	63.0	2.3	-13.9	51.4	Peak [Scan]	H	100	0	54.0	-2.6	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5300 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

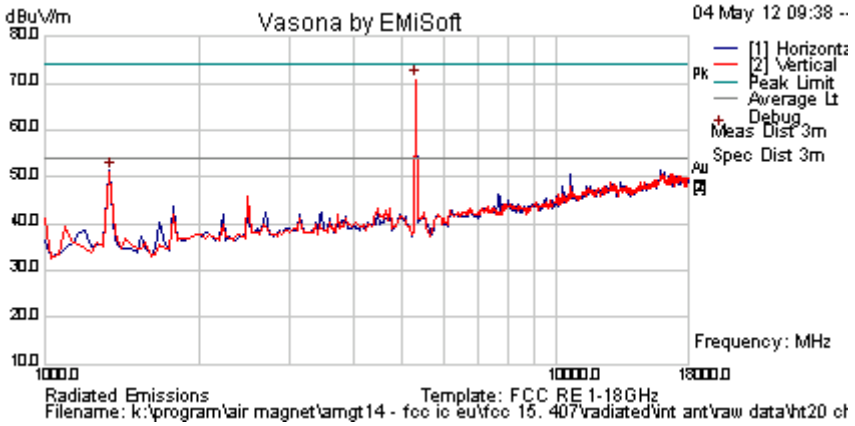


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
15962.502	42.9	9.0	0.0	51.9	Peak Max	V	175	227	74.0	-22.1	Pass	RB
1799.96	57.0	2.6	-12.6	47.0	Peak Max	V	108	172	74.0	-27.0	Pass	RB
15962.502	30.2	9.0	0.0	39.2	Average Max	V	175	227	54.0	-14.8	Pass	RB
1799.960	52.3	2.6	-12.6	42.3	Average Max	V	108	172	54	-11.7	Pass	RB
5292.585	75.6	4.6	-9.6	70.7	Peak [Scan]	H	150	0				FUND
1340.681	63.4	2.3	-13.9	51.8	Peak [Scan]	V	100	0	54	-2.2	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

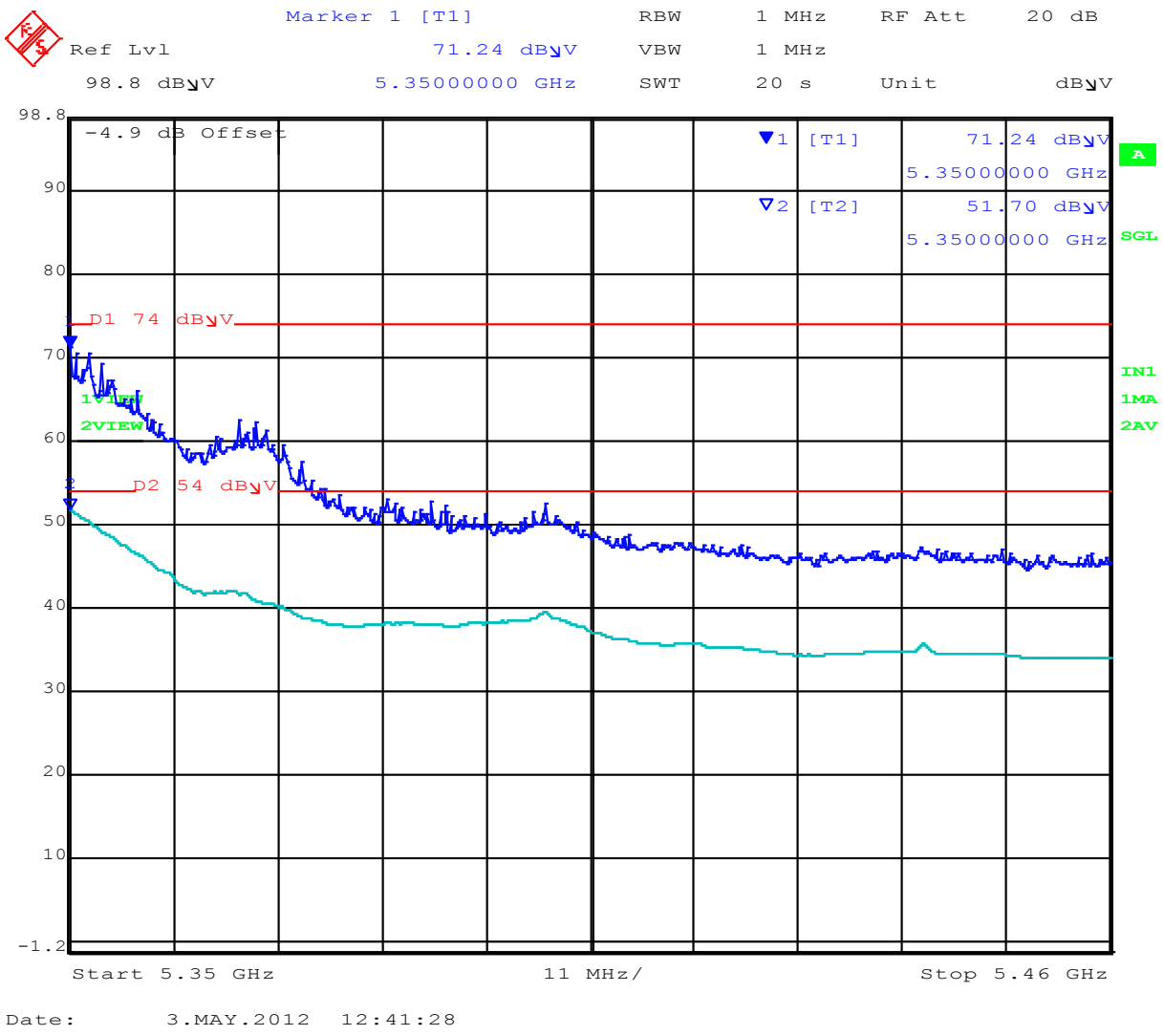
Test Freq.	5320 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	16	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

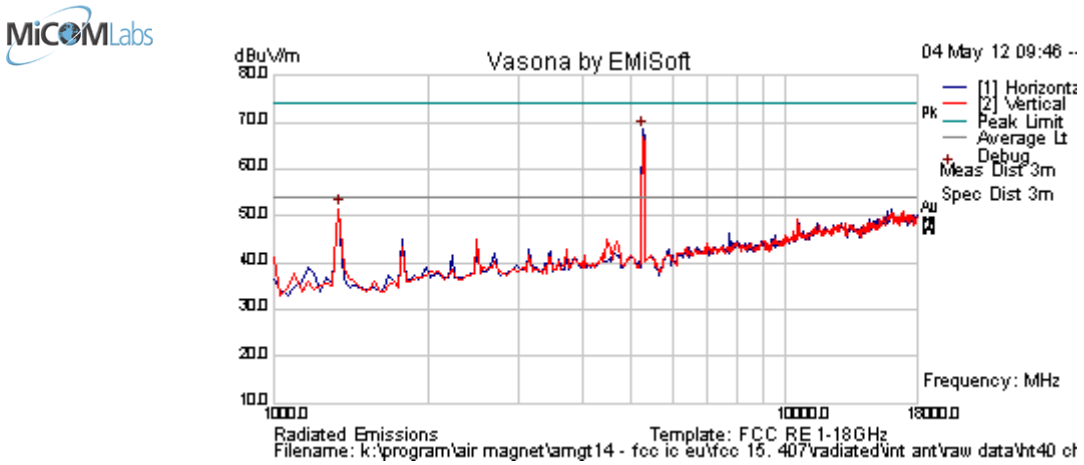
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5292.585	75.7	4.6	-9.6	70.8	Peak [Scan]	V	100	0				FUND
1340.68136	62.9	2.3	-13.9	51.2	Peak [Scan]	H	100	0	54.0	-2.8	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11n HT-20 Channel Frequency 5320 MHz

Test Freq.	5270 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

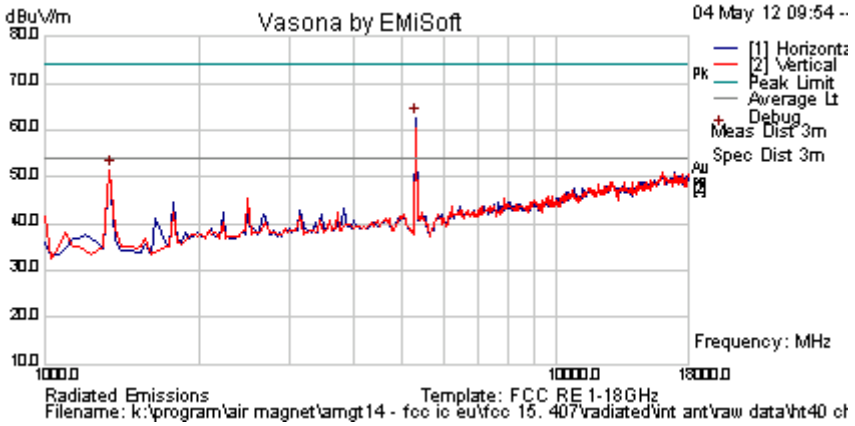


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5258.517	73.6	4.6	-9.7	68.4	Peak [Scan]	H	100	0				FUND
1340.68136	63.2	2.3	-13.9	51.6	Peak [Scan]	V	100	0	54.0	-2.4	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

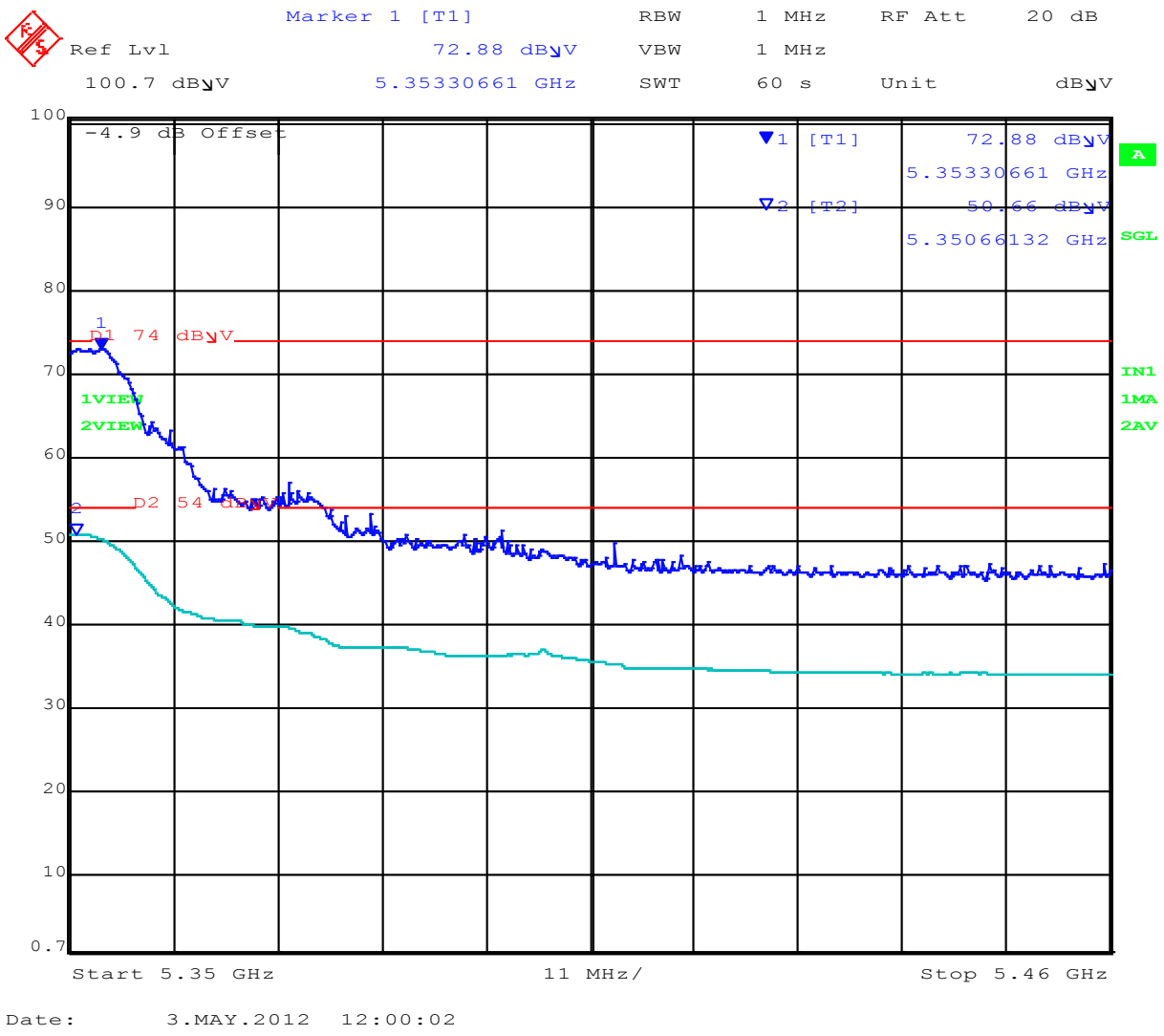
Test Freq.	5310 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	13	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

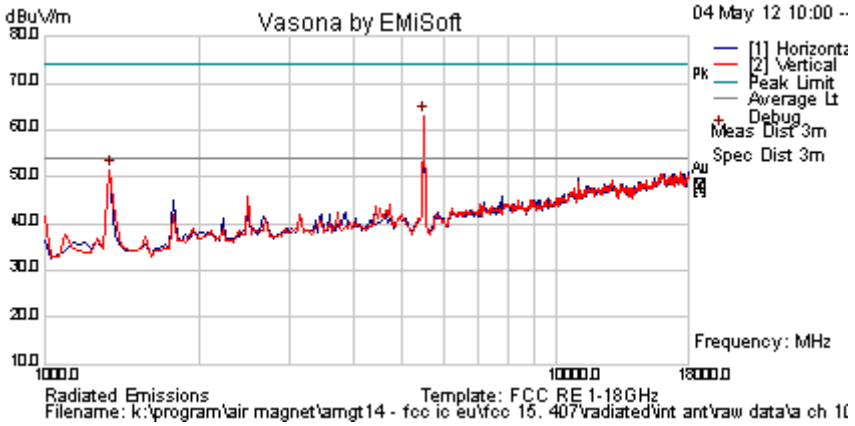
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5292.585	67.7	4.6	-9.6	62.8	Peak [Scan]	H	100	0				FUND
1340.68136	63.1	2.3	-13.9	51.5	Peak [Scan]	V	100	0	54.0	-2.5	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11n HT-40 Channel Frequency 5310 MHz

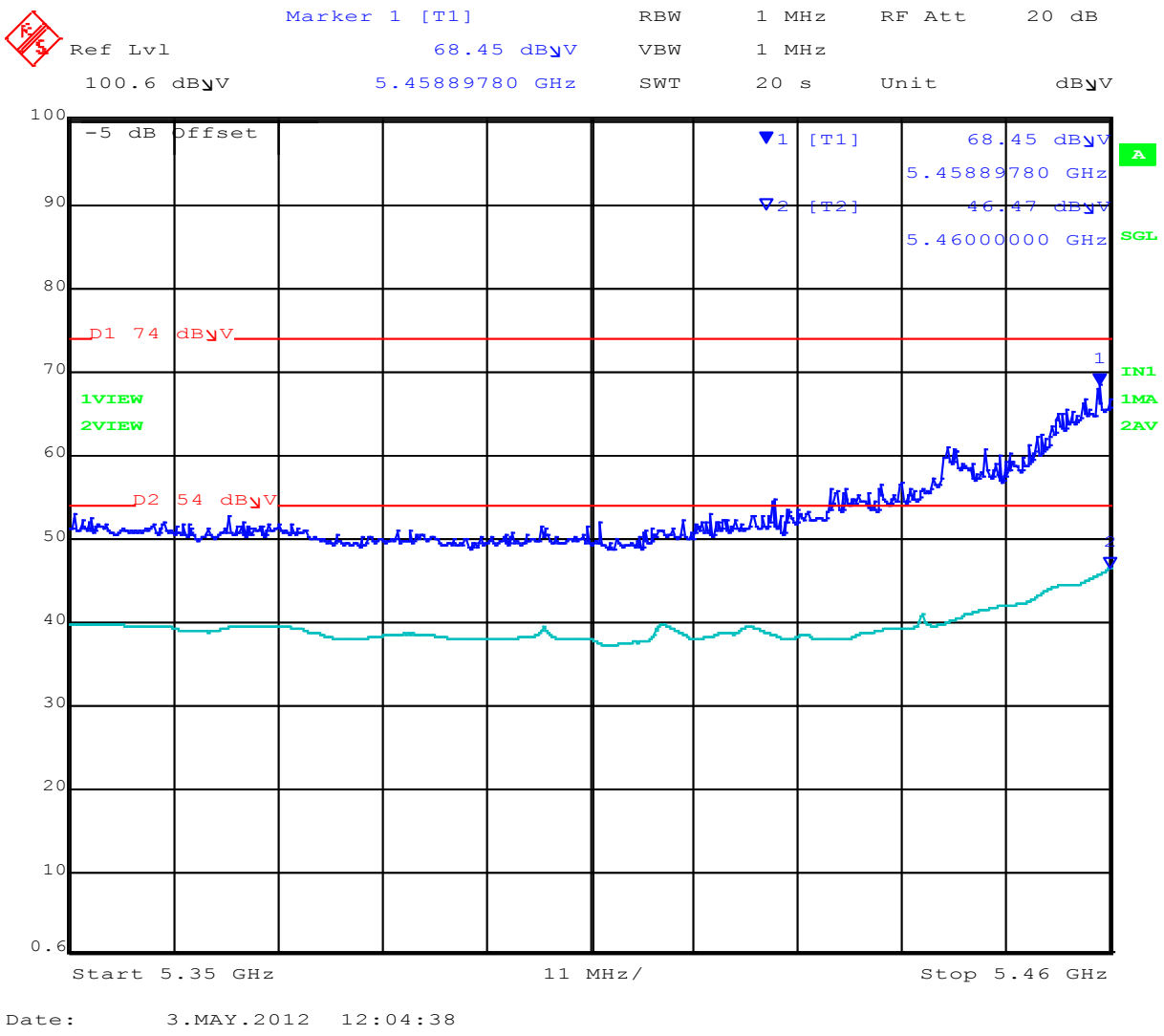
Test Freq.	5500 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

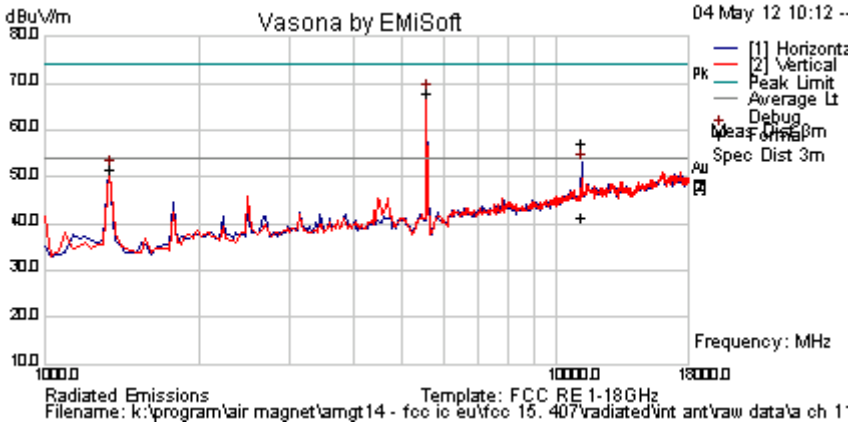
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5496.994	68.1	4.6	-9.6	63.1	Peak [Scan]	V	100	0				FUND
1340.68136	63.2	2.3	-13.9	51.6	Peak [Scan]	H	100	0	54.0	-2.4	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11a Channel Frequency 5500 MHz

Test Freq.	5580 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

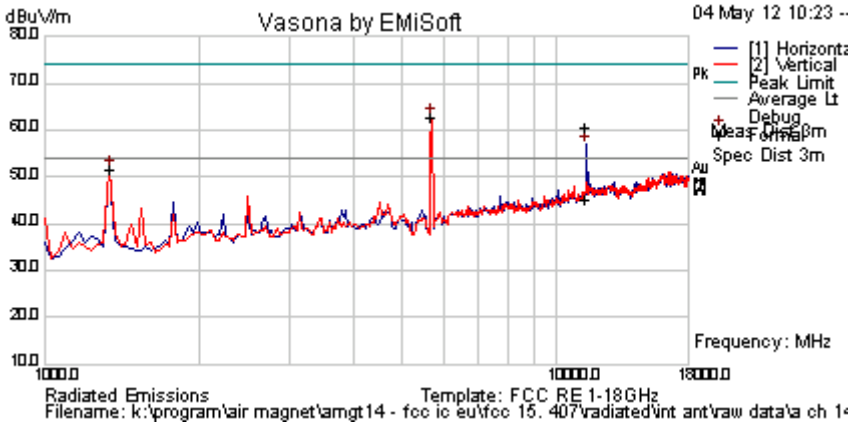


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
11167.375	53.4	6.9	-3.0	57.4	Peak Max	H	144	19	74.0	-16.7	Pass	RB
11167.375	37.2	6.9	-3.0	41.2	Average Max	H	144	19	54.0	-12.8	Pass	RB
5565.130	73.1	4.7	-9.7	68.0	Peak [Scan]	V	100	0				FUND
1340.681	63.3	2.3	-13.9	51.7	Peak [Scan]	H	100	0	54	-2.3	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5700 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

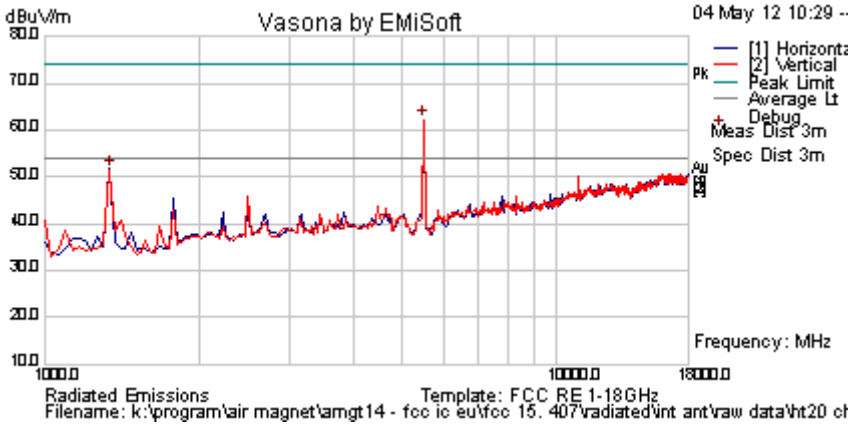


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
11401.604	56.1	6.8	-2.2	60.7	Peak Max	H	122	1	74.0	-13.3	Pass	RB
11401.604	40.6	6.8	-2.2	45.2	Average Max	H	122	1	54.0	-8.8	Pass	RB
5701.403	67.6	4.7	-9.6	62.7	Peak [Scan]	V	100	0				FUND
1340.681	63.4	2.3	-13.9	51.7	Peak [Scan]	V	100	0	54	-2.3	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

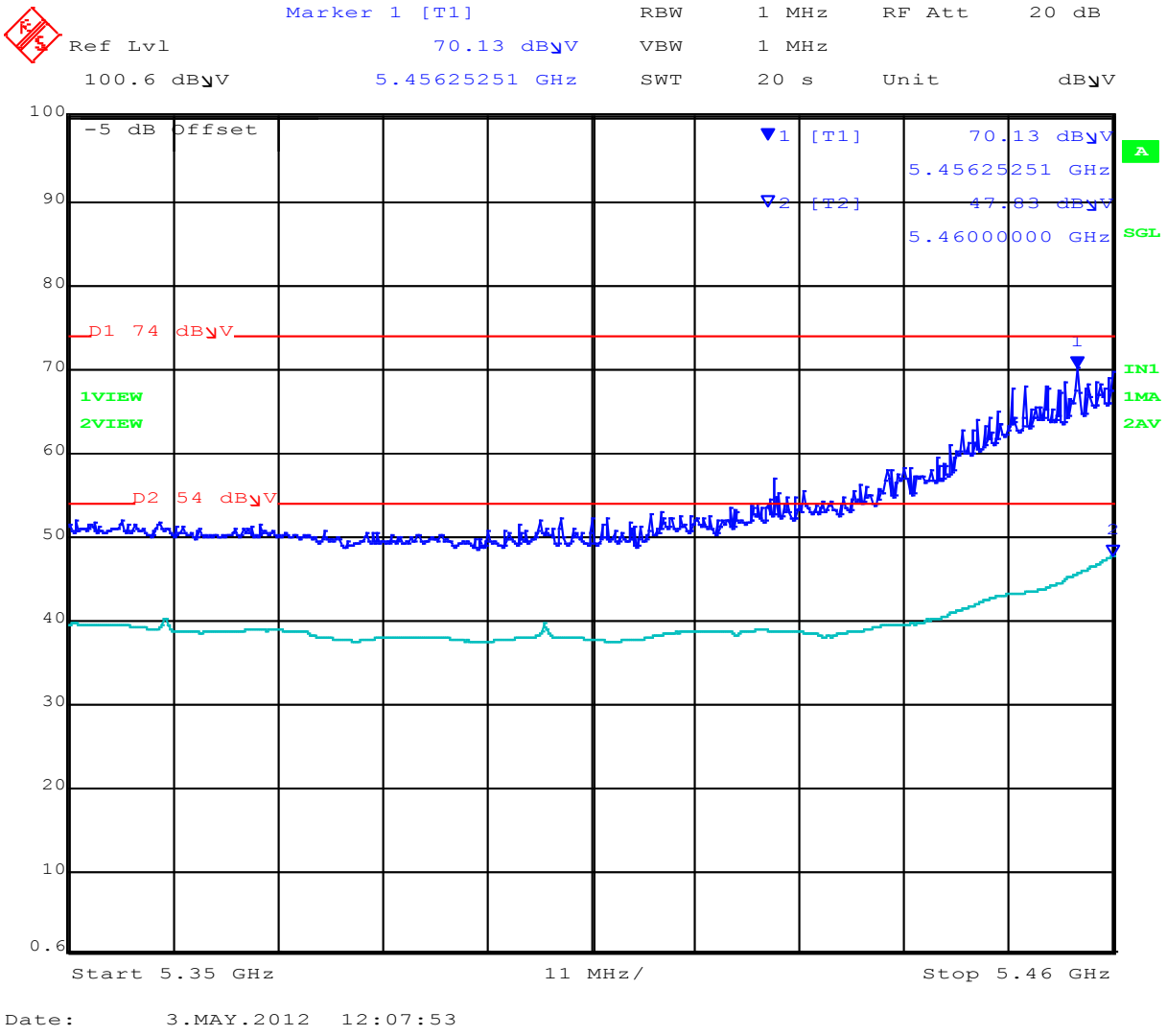
Test Freq.	5500 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

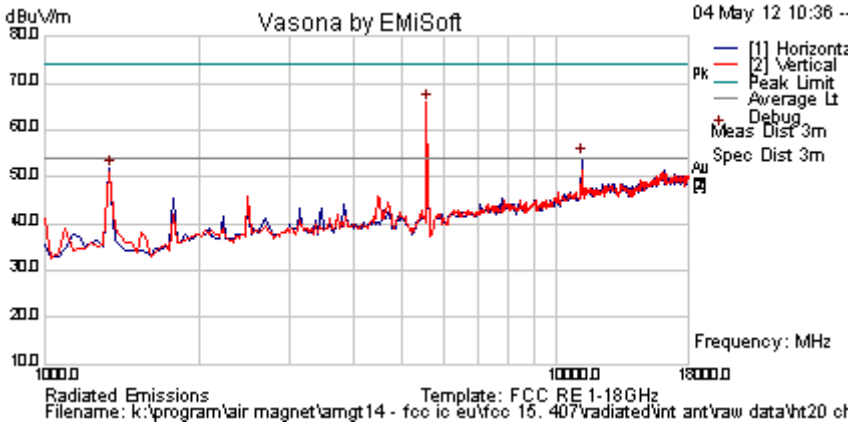
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5496.994	67.2	4.6	-9.6	62.2	Peak [Scan]	V	100	0				FUND
1340.68136	63.3	2.3	-13.9	51.7	Peak [Scan]	H	100	0	54.0	-2.3	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11n HT-20 Channel Frequency 5500 MHz

Test Freq.	5580 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

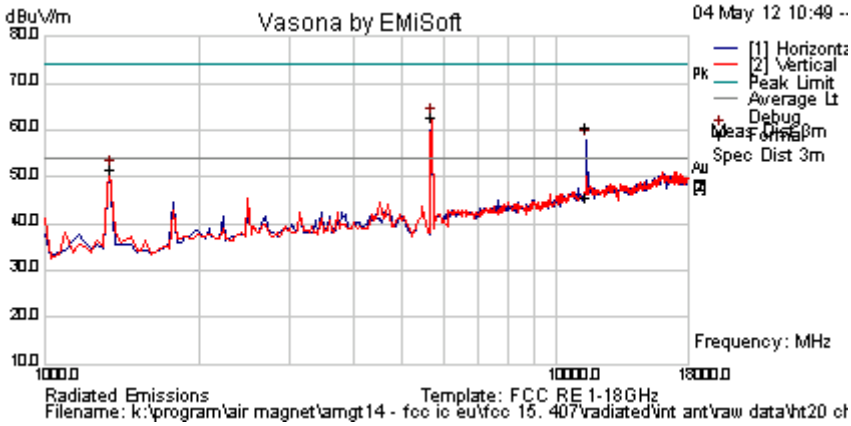


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
11152.305	53.4	6.9	-3.0	57.4	Peak Max	H	144	19	74.0	-16.7	Pass	RB
11152.305	37.2	6.9	-3.0	41.2	Average Max	H	144	19	54.0	-12.8	Pass	RB
5565.130	71.0	4.7	-9.7	65.9	Peak [Scan]	V	100	0				FUND
1340.681	63.3	2.3	-13.9	51.7	Peak [Scan]	H	100	0	54.0	-2.3	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5700 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

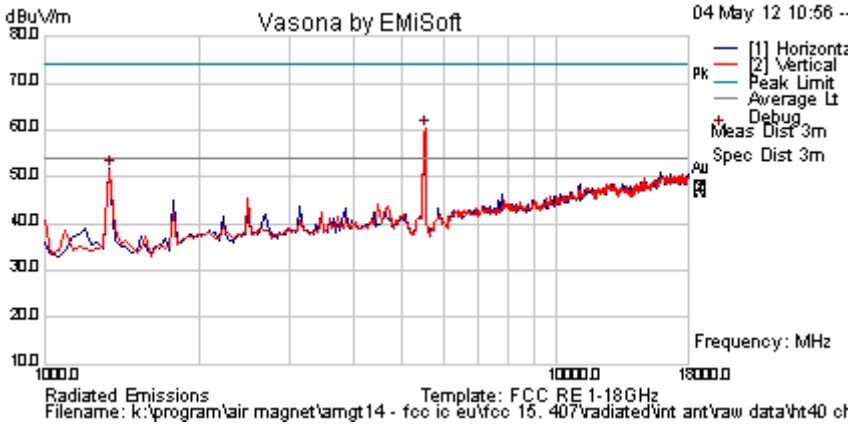


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
11401.123	56.1	6.8	-2.3	60.7	Peak Max	H	111	0	74.0	-13.3	Pass	
11401.123	41.0	6.8	-2.3	45.6	Average Max	H	111	0	54.0	-8.4	Pass	
5701.40281	67.5	4.7	-9.6	62.6	Peak [Scan]	V	100	0				FUND
1340.68136	63.3	2.3	-13.9	51.7	Peak [Scan]	V	100	0	54.0	-2.3	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

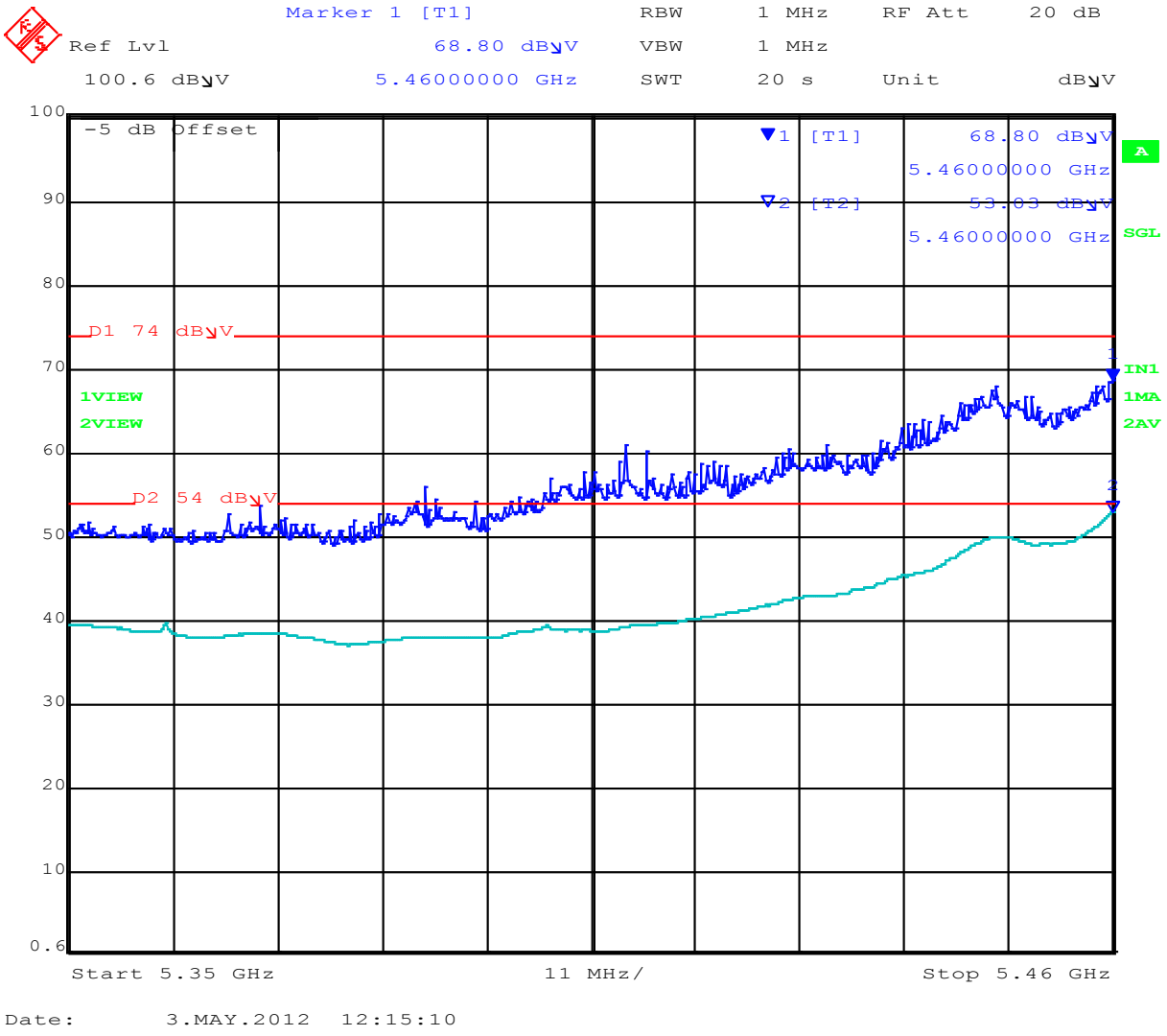
Test Freq.	5510 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

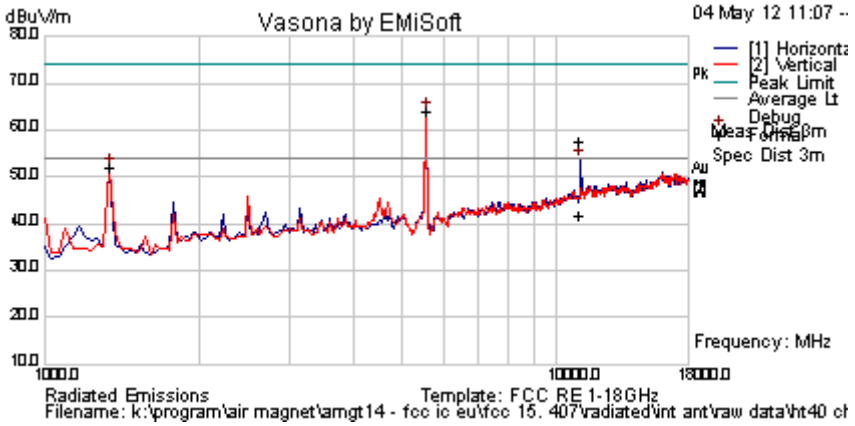
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5531.062	65.3	4.6	-9.7	60.2	Peak [Scan]	V	100	0	54.0	6.2	Fail	
1340.68136	63.4	2.3	-13.9	51.8	Peak [Scan]	H	100	0				FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11n HT-40 Channel Frequency 5510 MHz

Test Freq.	5550 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

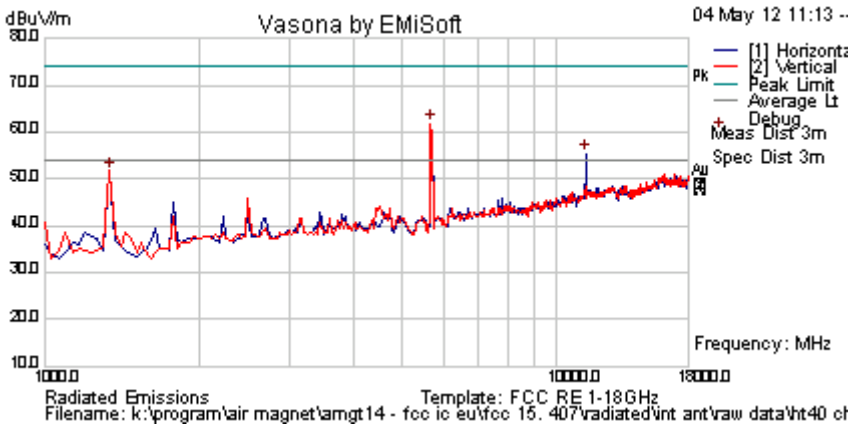


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
11101.402	53.8	6.9	-3.2	57.5	Peak Max	H	109	0	74.0	-16.5	Pass	RB
11101.402	37.9	6.9	-3.2	41.7	Average Max	H	109	0	54.0	-12.3	Pass	RB
5565.130	69.0	4.7	-9.7	64.0	Peak [Scan]	V	100	0				FUND
1340.681	63.6	2.3	-13.9	52.0	Peak [Scan]	V	100	0	54	-2.0	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5670 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	Integral	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



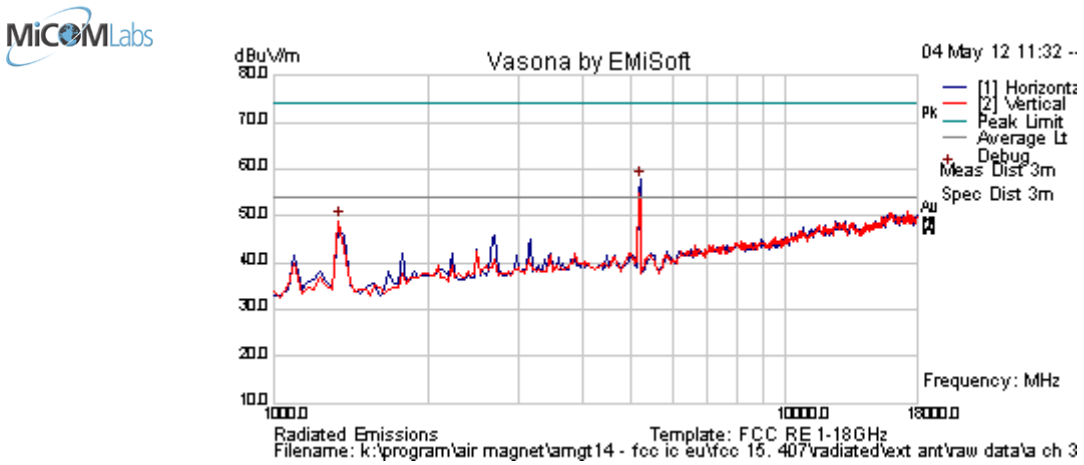
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
11397.636	55.6	6.8	-2.3	60.2	Peak Max	H	132	0	74.0	-13.8	Pass	RB
1350.060	64.9	2.3	-14.0	53.2	Peak Max	H	98	1	74.0	-20.8	Pass	RB
11397.636	40.9	6.8	-2.3	45.4	Average Max	H	132	0	54.0	-8.6	Pass	RB
1350.06	61.8	2.3	-14.0	50.1	Average Max	H	98	1	54.0	-3.9	Pass	RB
5667.335	65.2	4.7	-9.7	60.2	Peak [Scan]	H	150	0				FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

5.1.5.2. External Antenna

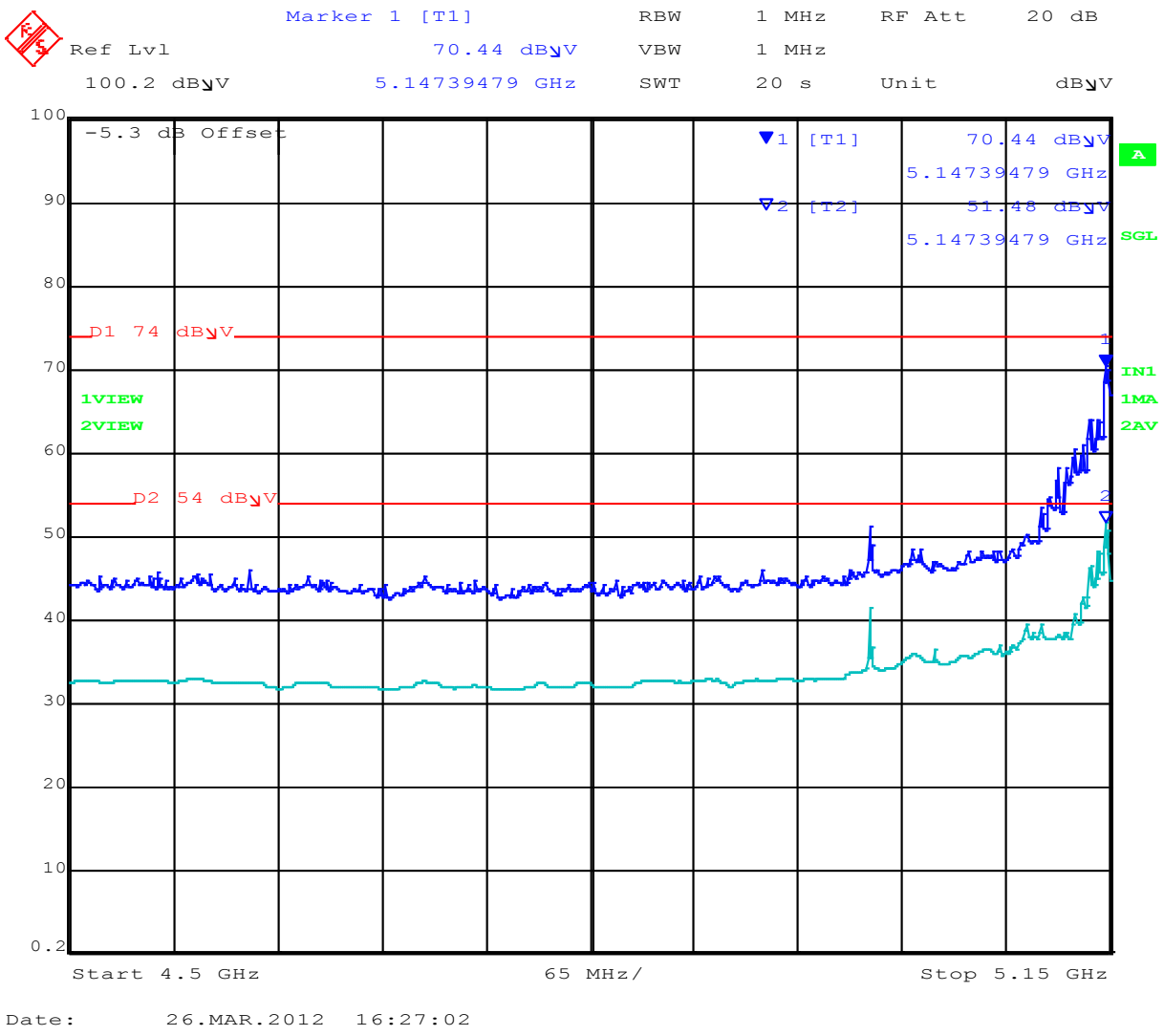
Test Freq.	5180 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	17	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

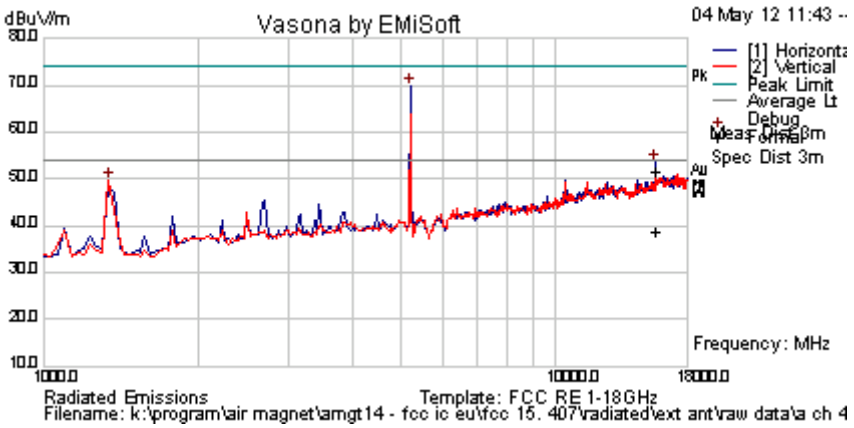
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5190.381	63.1	4.6	-9.9	57.9	Peak [Scan]	H	100	0				FUND
1340.68136	60.6	2.3	-13.9	49.0	Peak [Scan]	V	100	0	54.0	-5.0	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11a Channel Frequency 5180 MHz

Test Freq.	5200 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

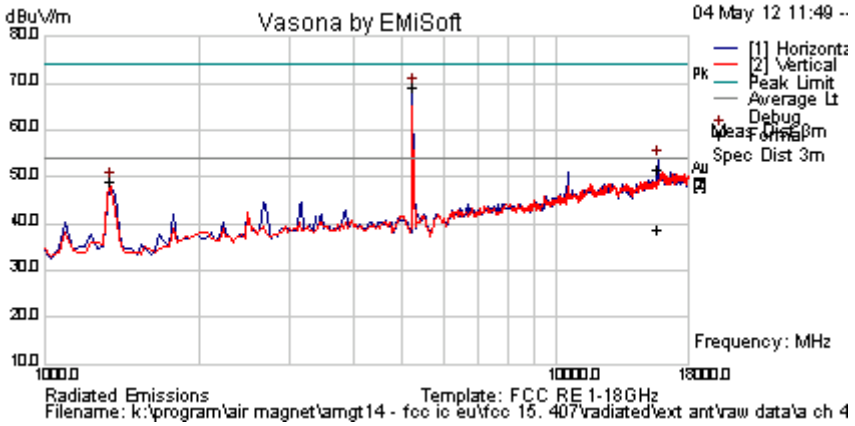


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
15765.611	43.1	8.6	-0.3	51.5	Peak Max	H	113	81	74.0	-22.6	Pass	RB
15765.611	30.4	8.6	-0.3	38.8	Average Max	H	113	81	54.0	-15.2	Pass	RB
5190.381	75.1	4.6	-9.9	69.9	Peak [Scan]	H	100	0				FUND
1340.681	61.2	2.3	-13.9	49.5	Peak [Scan]	V	100	0	54	-4.5	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5240 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

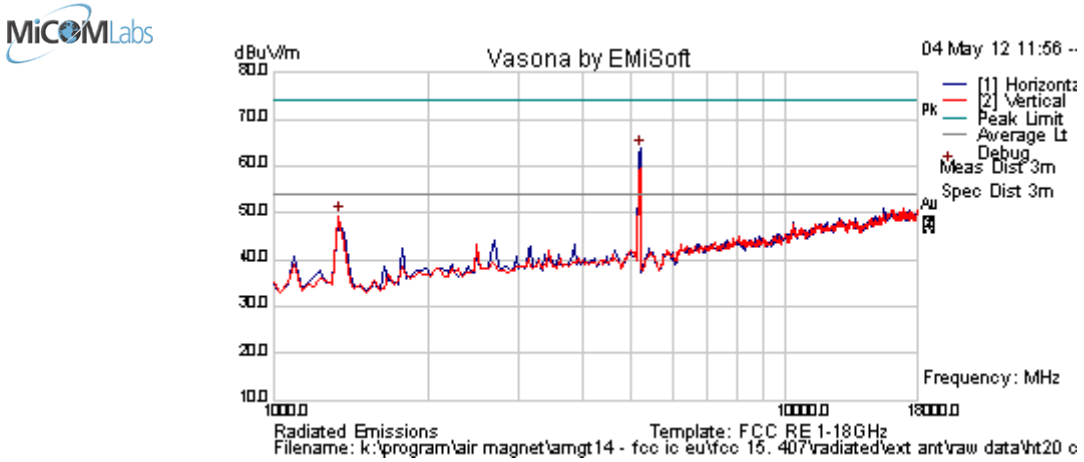


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
15717.448	43.1	8.6	-0.3	51.5	Peak Max	H	113	81	74.0	-22.6	Pass	
15717.448	30.4	8.6	-0.3	38.8	Average Max	H	113	81	54.0	-15.2	Pass	
5224.449	74.4	4.6	-9.8	69.2	Peak [Scan]	H	150	0				FUND
1340.681	60.8	2.3	-13.9	49.2	Peak [Scan]	V	100	0	54	-4.8	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

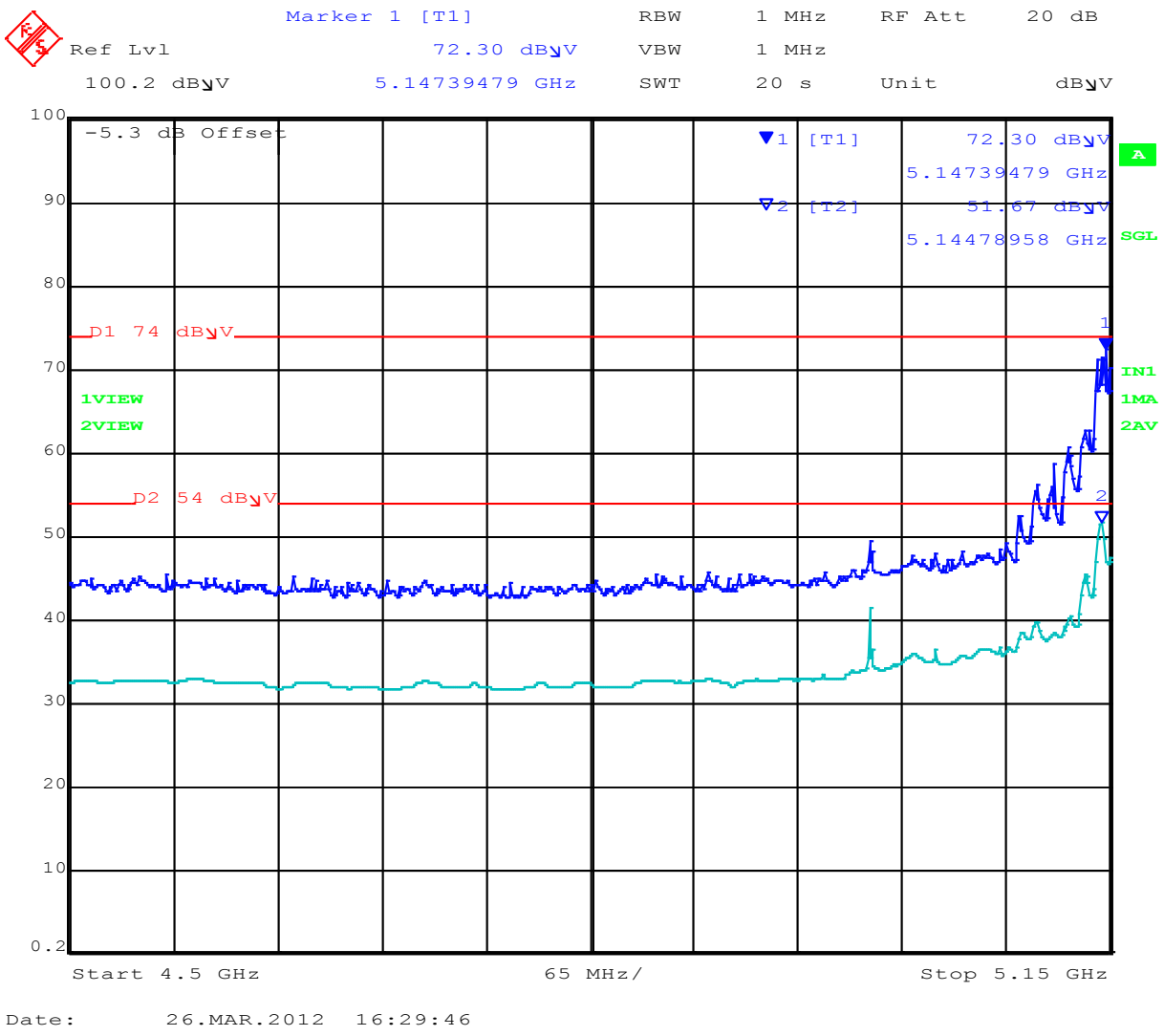
Test Freq.	5180 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	17	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

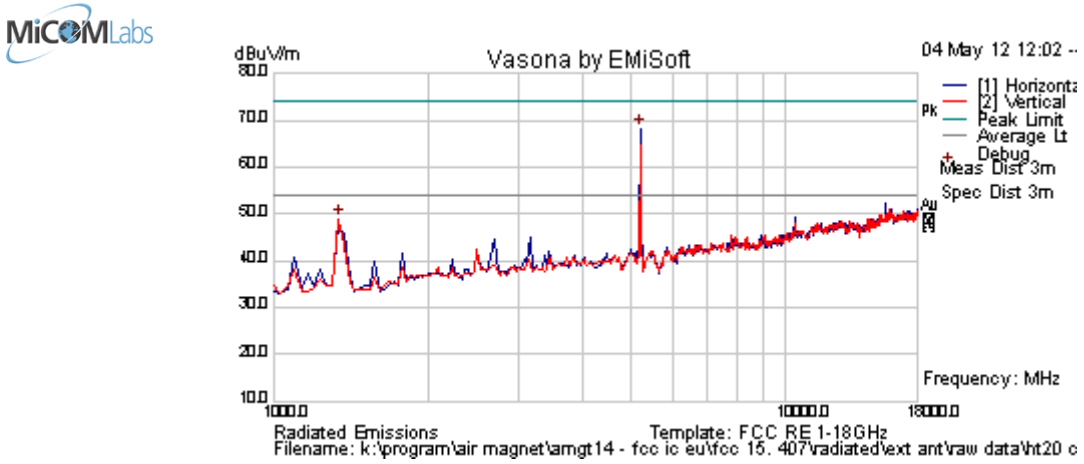
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5190.381	68.9	4.6	-9.9	63.7	Peak [Scan]	H	100	0				FUND
1340.68136	61.0	2.3	-13.9	49.4	Peak [Scan]	V	100	0	54.0	-4.6	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11n HT-20 Channel Frequency 5180 MHz

Test Freq.	5200 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

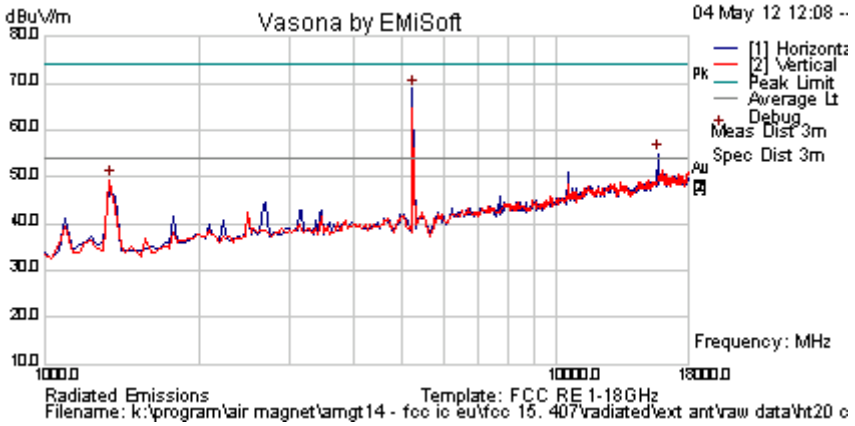


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5190.381	73.6	4.6	-9.9	68.3	Peak [Scan]	H	100	0				FUND
1340.68136	60.6	2.3	-13.9	49.0	Peak [Scan]	V	100	0	54.0	-5.0	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5240 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

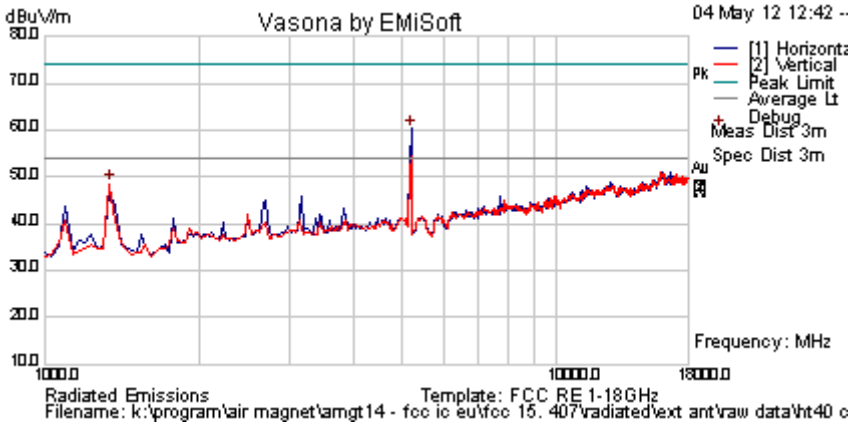


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
15717.435	43.1	8.6	-0.3	51.5	Peak Max	H	113	81	74.0	-22.6	Pass	
15717.435	30.4	8.6	-0.3	38.8	Average Max	H	113	81	54.0	-15.2	Pass	
5224.449	74.2	4.6	-9.8	69.0	Peak [Scan]	H	150	0	54.0	15.0	Fail	
1340.681	61.1	2.3	-13.9	49.4	Peak [Scan]	V	100	0	54	-4.6	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

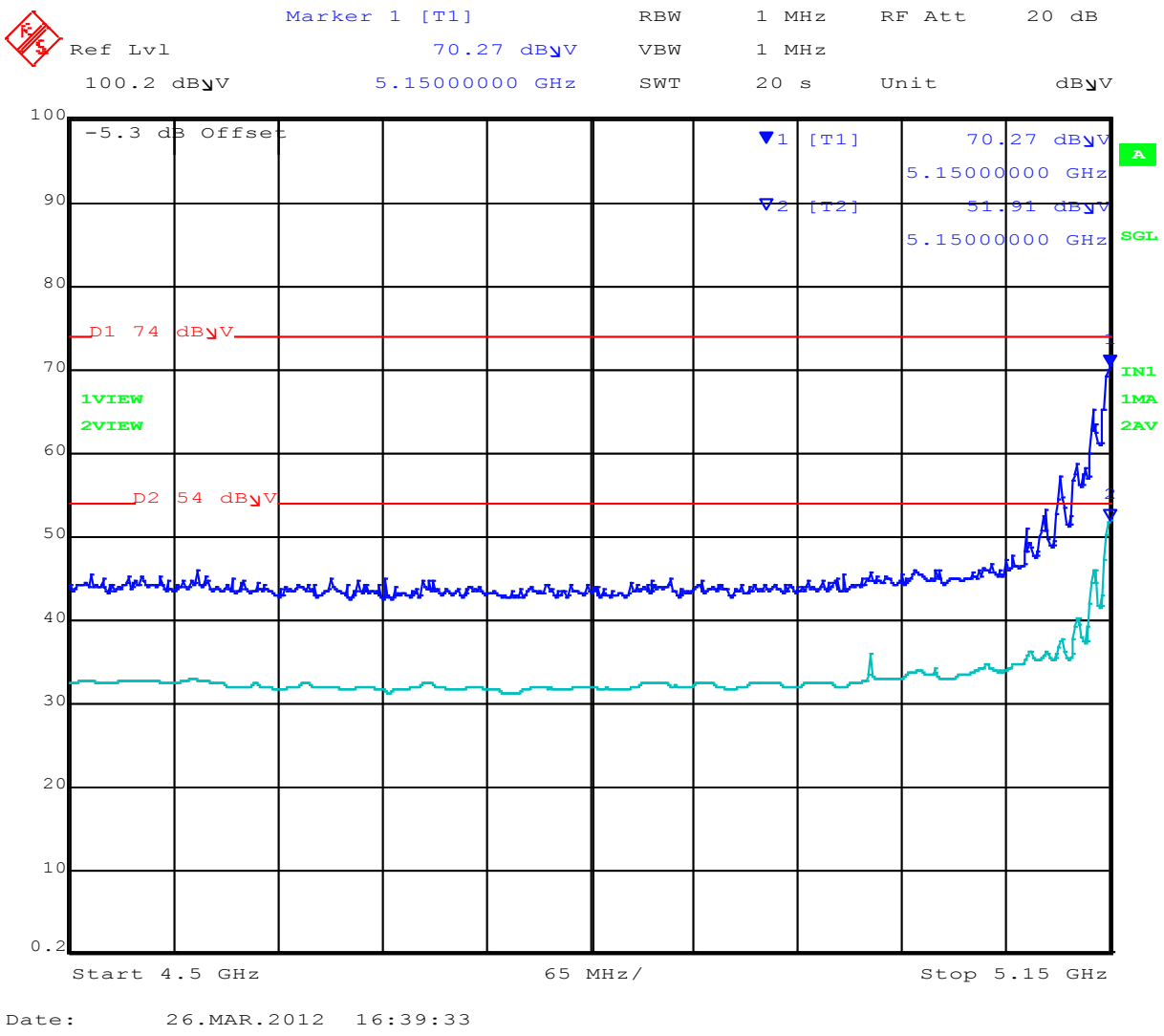
Test Freq.	5190 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	11	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

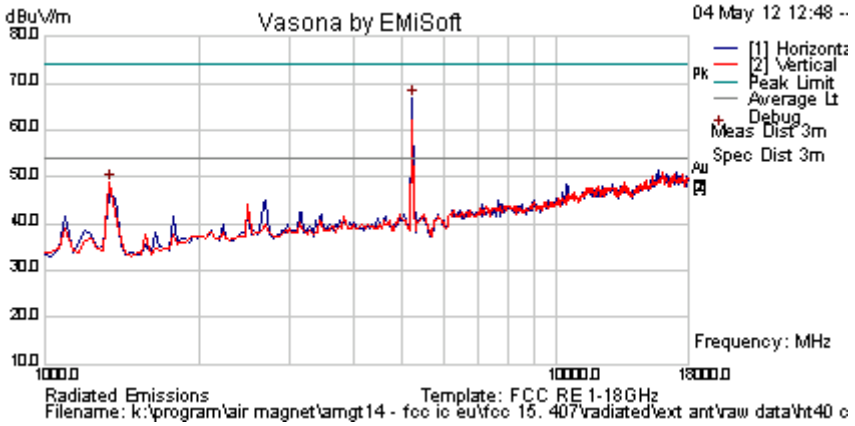
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5190.381	65.5	4.6	-9.9	60.3	Peak [Scan]	H	100	0				FUND
1340.68136	60.2	2.3	-13.9	48.5	Peak [Scan]	V	100	0	54.0	-5.5	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11n HT-40 Channel Frequency 5190 MHz

Test Freq.	5230 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

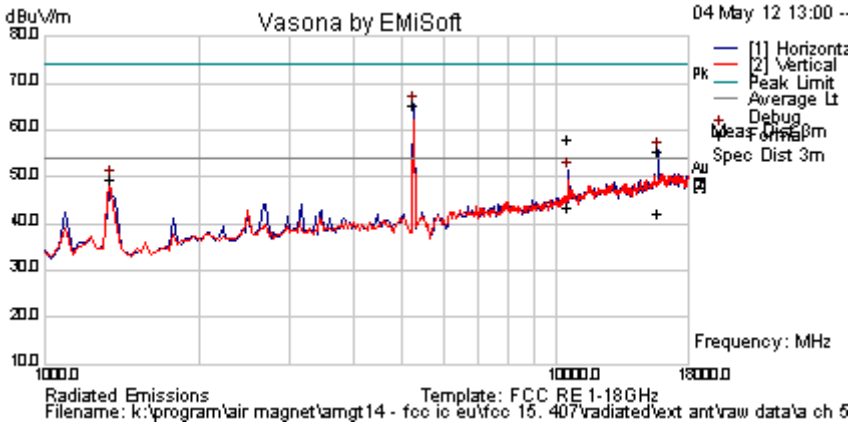


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5224.449	72.0	4.6	-9.8	66.8	Peak [Scan]	H	150	0				FUND
1340.68136	60.4	2.3	-13.9	48.8	Peak [Scan]	V	100	0	54.0	-5.2	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5260 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

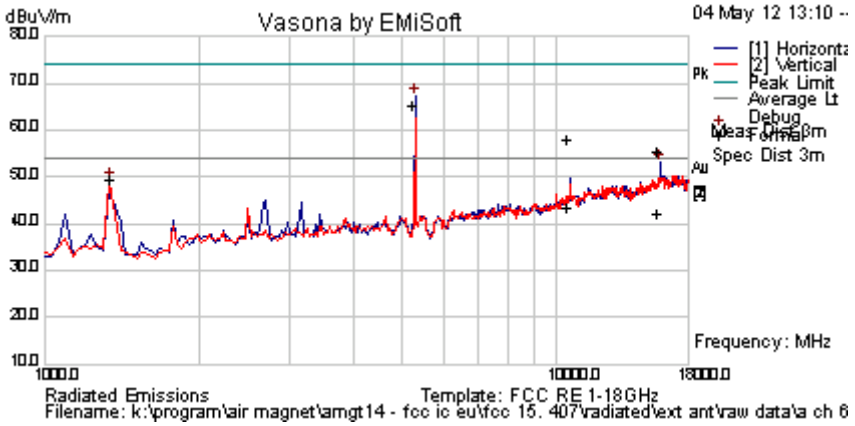


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
15789.258	47.1	8.7	-0.3	55.5	Peak Max	H	109	289	74.0	-18.5	Pass	RB
10524.008	53.8	6.8	-2.4	58.1	Peak Max	H	198	350	74.0	-15.9	Pass	RB
15789.258	33.6	8.7	-0.3	42.0	Average Max	H	109	289	54	-12.0	Pass	RB
10524.008	39.0	6.8	-2.4	43.3	Average Max	H	198	350	54	-10.7	Pass	RB
5258.517	70.6	4.6	-9.7	65.5	Peak [Scan]	H	150	0				FUND
1340.681	61.1	2.3	-13.9	49.5	Peak [Scan]	V	100	0	54	-4.5	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5300 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

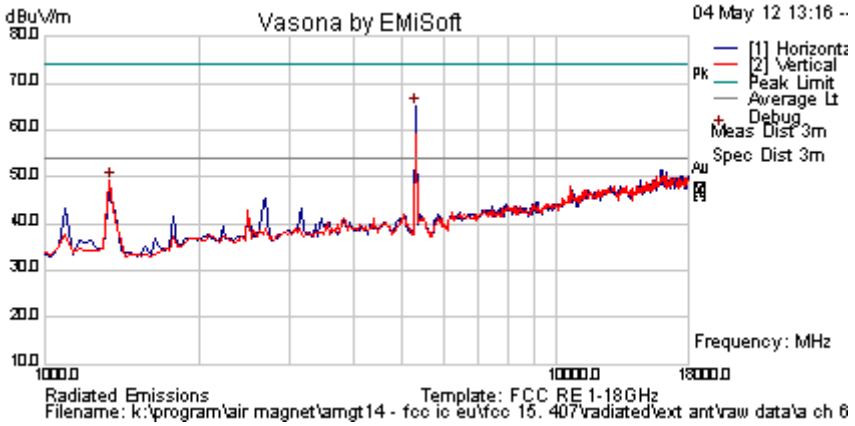


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
15893.989	47.1	8.7	-0.3	55.5	Peak Max	H	109	289	74.0	-18.5	Pass	RB
15893.989	33.6	8.7	-0.3	42.0	Average Max	H	109	289	54	-12.0	Pass	RB
5292.58517	72.2	4.6	-9.6	67.3	Peak [Scan]	H	100	0				FUND
1340.681	60.7	2.3	-13.9	49.1	Peak [Scan]	V	100	0	54	-5.0	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

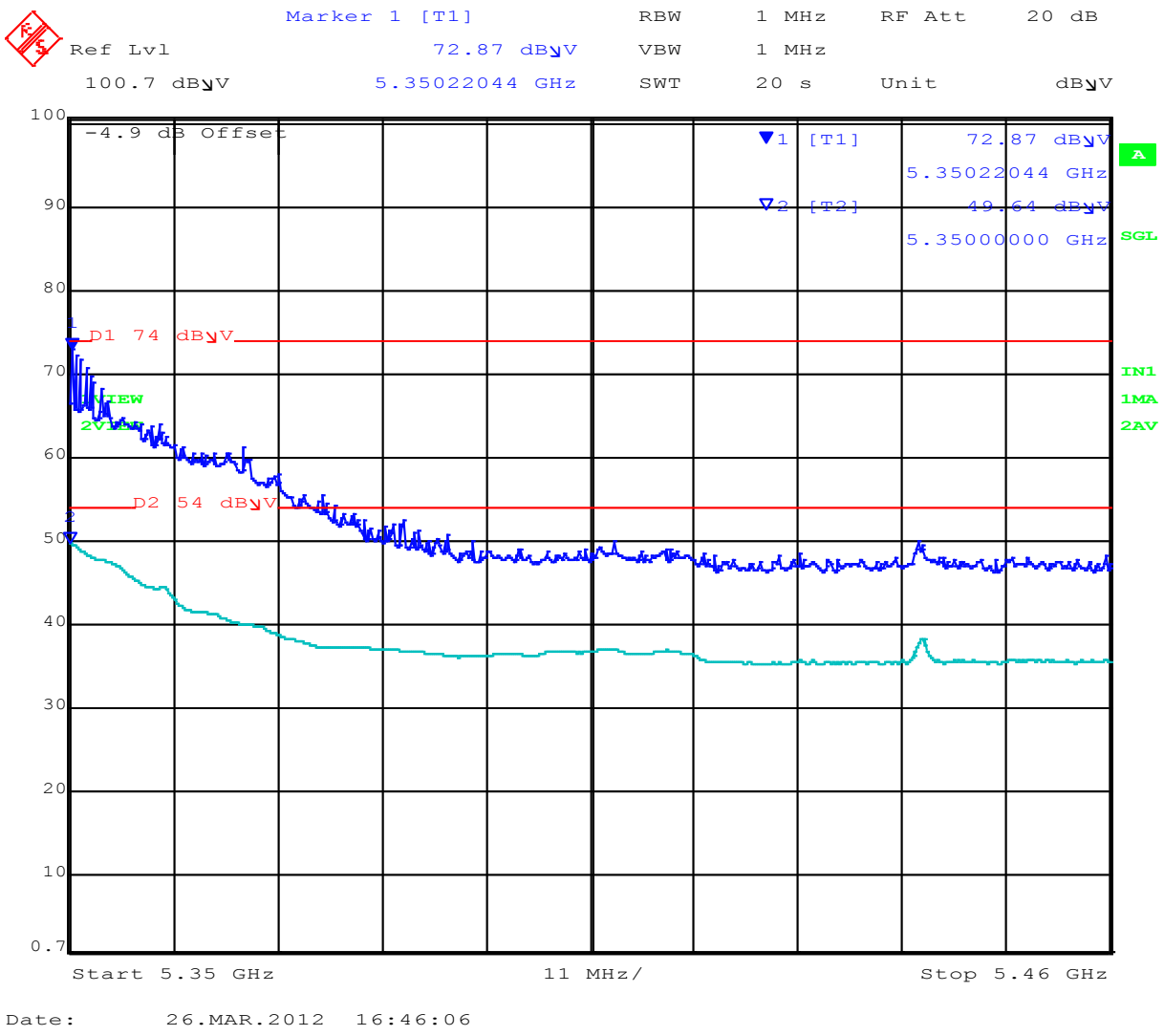
Test Freq.	5320 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	18	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

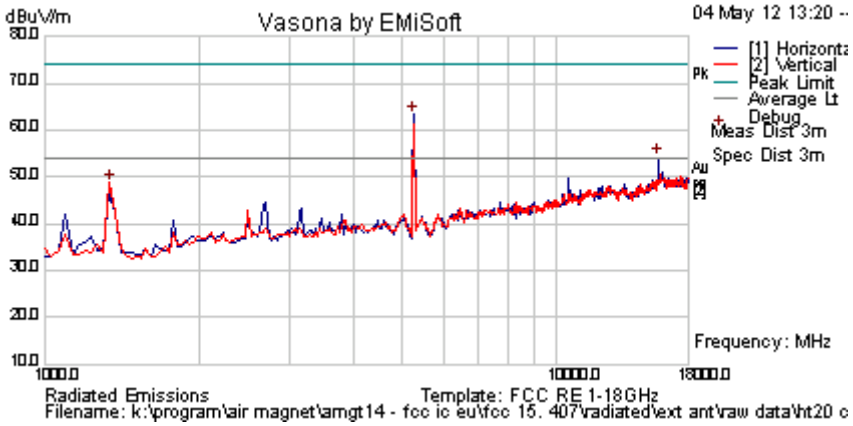
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5292.585	70.0	4.6	-9.6	65.0	Peak [Scan]	H	100	0				FUND
1340.68136	60.9	2.3	-13.9	49.3	Peak [Scan]	V	100	0	54.0	-4.7	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11a Channel Frequency 5320 MHz

Test Freq.	5260 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

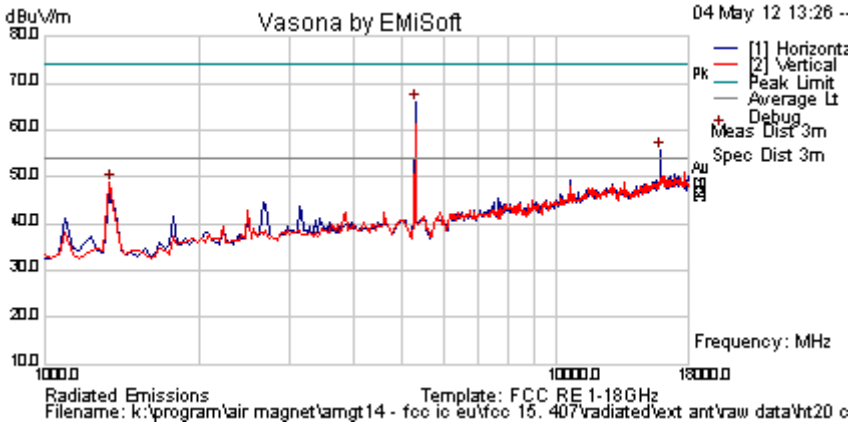


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
15785.571	47.1	8.7	-0.3	55.5	Peak Max	H	109	289	74.0	-18.5	Pass	RB
15785.571	33.6	8.7	-0.3	42.0	Average Max	H	109	289	54	-12.0	Pass	RB
5258.517	68.4	4.6	-9.7	63.3	Peak [Scan]	H	100	0				FUND
1340.681	60.4	2.3	-13.9	48.8	Peak [Scan]	V	100	0	54	-5.2	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5300 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

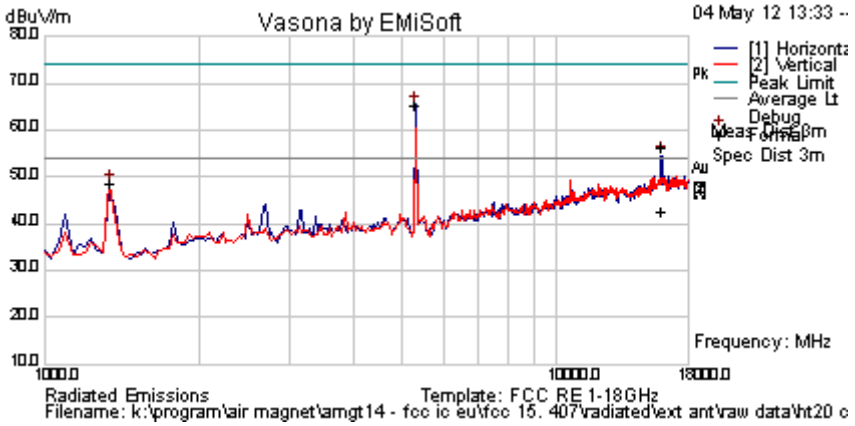


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
15921.844	47.1	8.7	-0.3	55.5	Peak Max	H	109	289	74.0	-18.5	Pass	RB
15921.844	33.6	8.7	-0.3	42.0	Average Max	H	109	289	54	-12.0	Pass	RB
5292.585	70.9	4.6	-9.6	66.0	Peak [Scan]	H	100	0				FUND
1340.681	60.3	2.3	-13.9	48.7	Peak [Scan]	V	100	0	54	-5.3	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

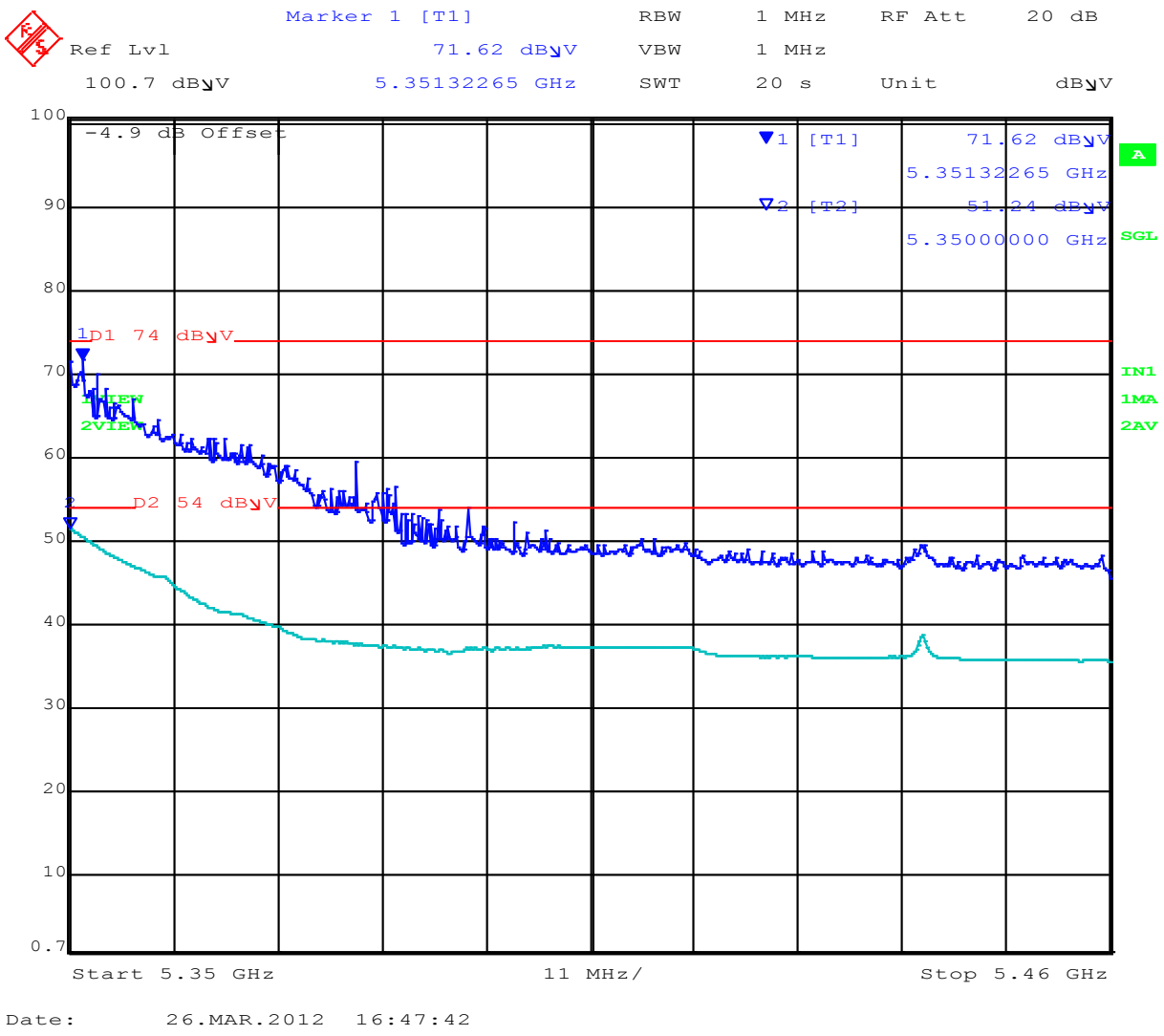
Test Freq.	5320 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (°C)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	18	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

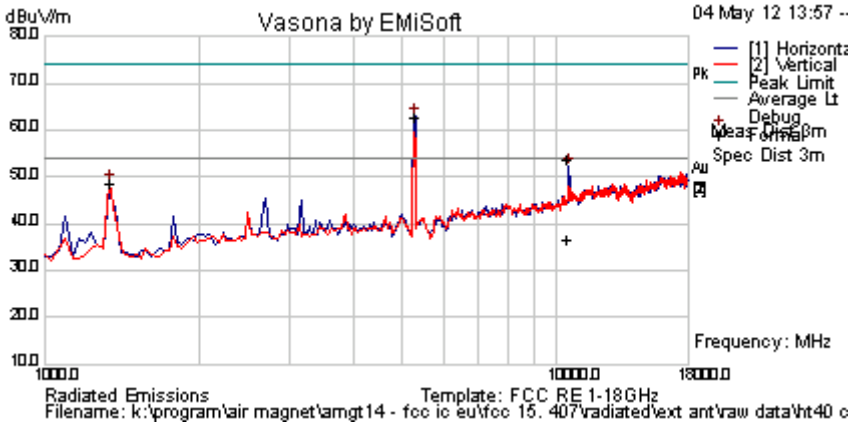
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
15961.283	47.4	9.0	0.0	56.4	Peak Max	H	111	26	74.0	-17.6	Pass	RB
15961.283	33.8	9.0	0.0	42.7	Average Max	H	111	26	54.0	-11.3	Pass	RB
5292.585	70.4	4.6	-9.6	65.5	Peak [Scan]	H	100	0				FUND
1340.681	60.3	2.3	-13.9	48.7	Peak [Scan]	V	100	0	54	-5.3	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11n HT-20 Channel Frequency 5320 MHz

Test Freq.	5270 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

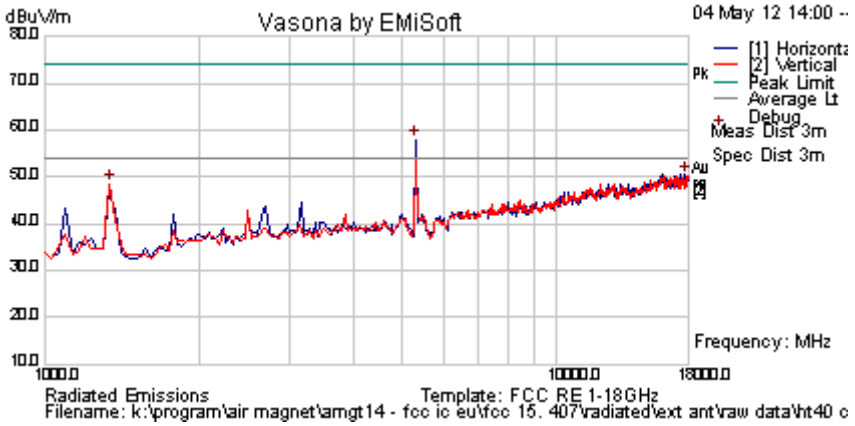


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
10534.308	49.2	6.8	-2.5	53.6	Peak Max	H	178	344	74.0	-20.4	Pass	RB
10534.308	32.3	6.8	-2.5	36.6	Average Max	H	178	344	54.0	-17.4	Pass	RB
5292.585	67.8	4.6	-9.6	62.8	Peak [Scan]	H	100	0				FUND
1340.681	60.3	2.3	-13.9	48.7	Peak [Scan]	V	100	0	54	-5.4	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

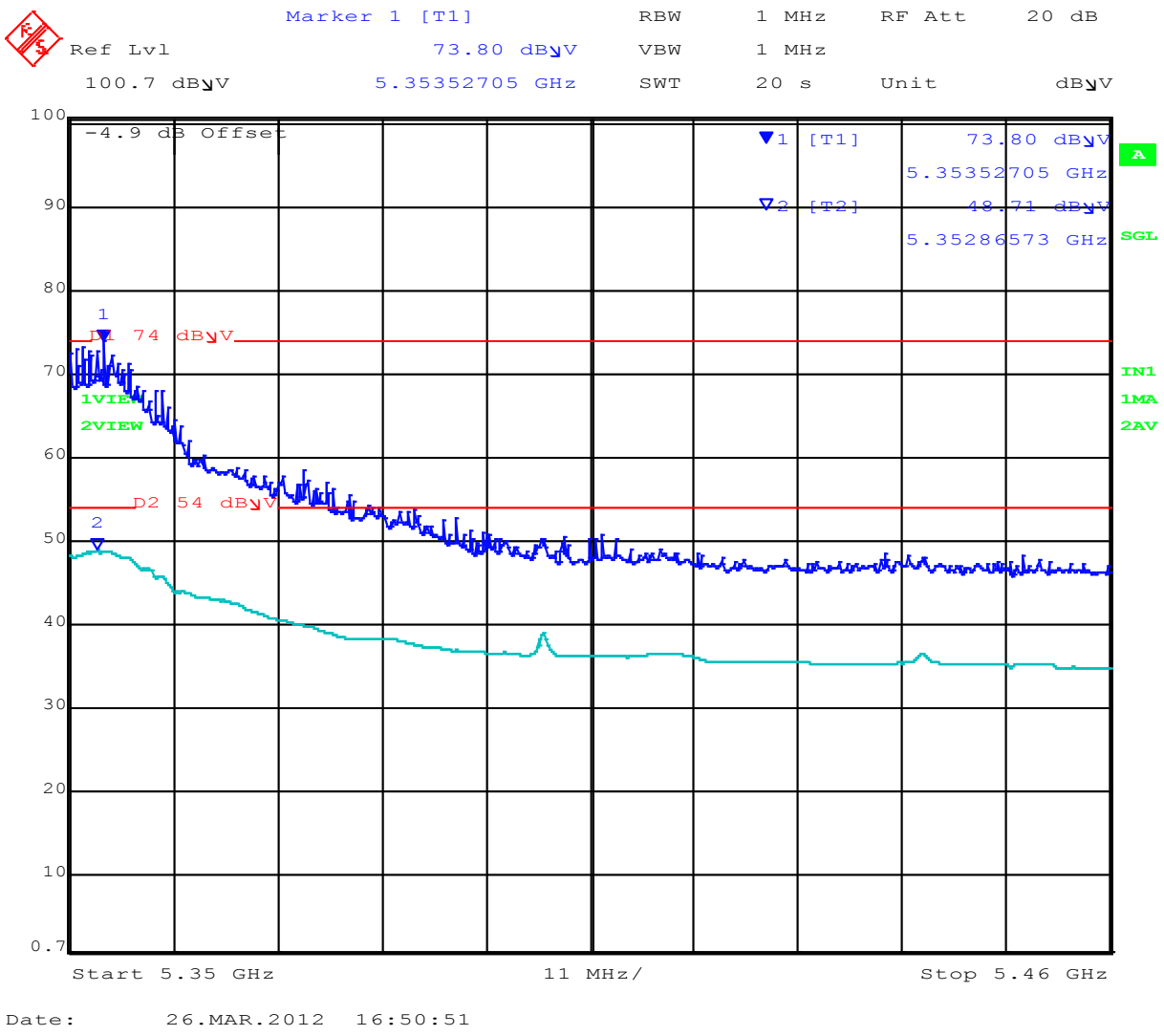
Test Freq.	5310 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

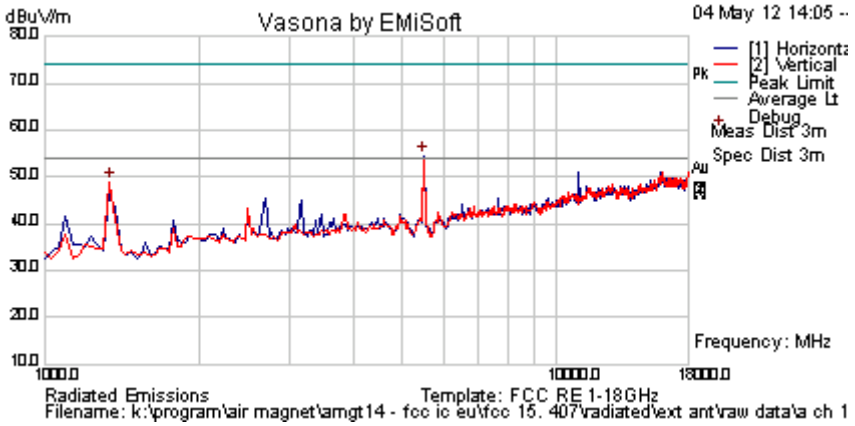
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5292.585	62.9	4.6	-9.6	58.0	Peak [Scan]	H	100	0				FUND
1340.68136	60.3	2.3	-13.9	48.6	Peak [Scan]	V	100	0	54.0	-5.4	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11n HT-40 Channel Frequency 5310 MHz

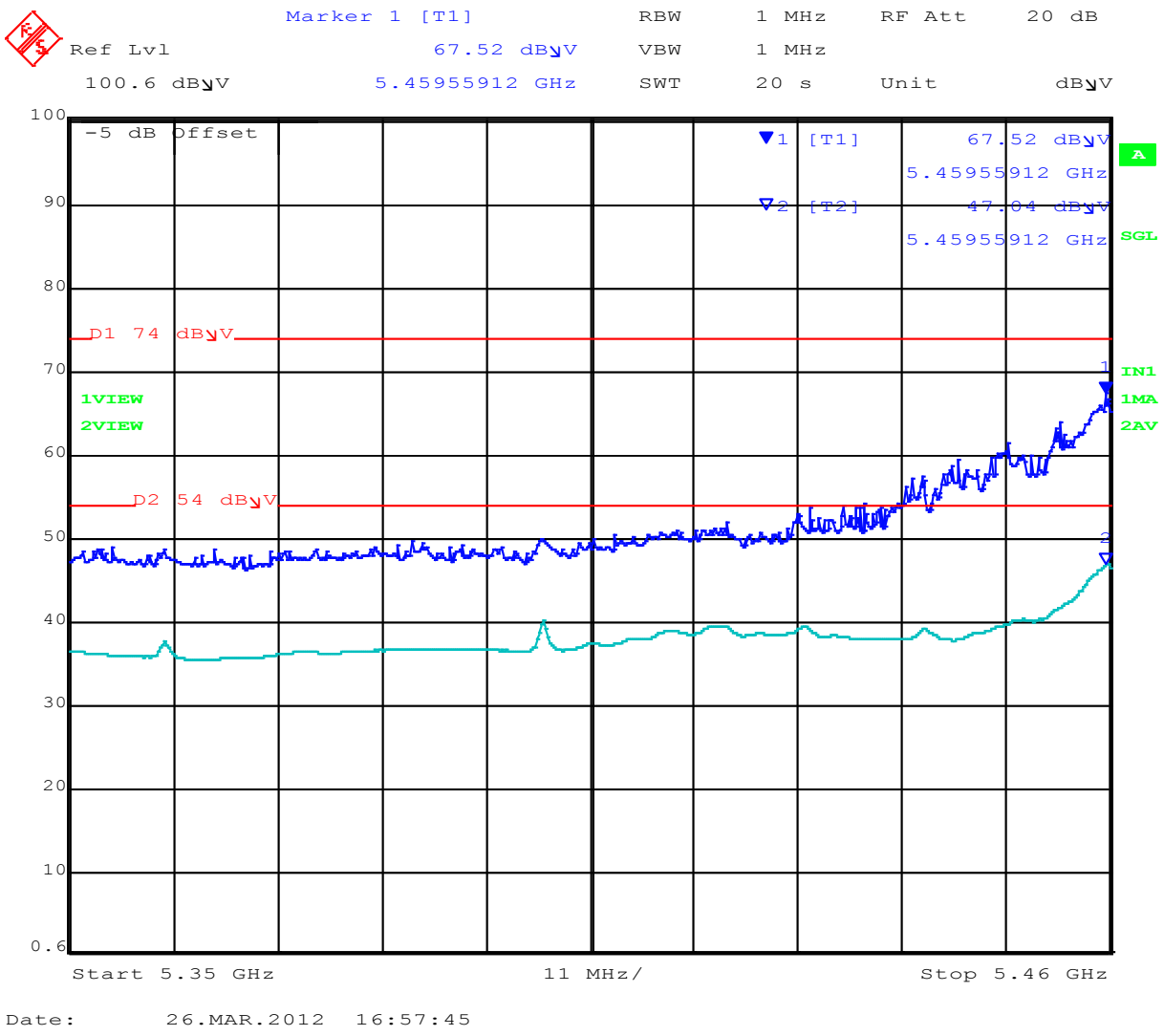
Test Freq.	5500 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

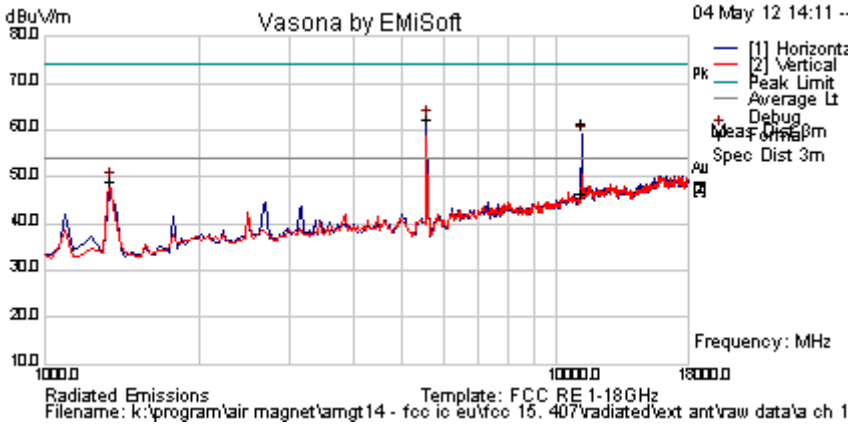
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5496.994	59.5	4.6	-9.6	54.5	Peak [Scan]	H	100	0				FUND
1340.68136	60.7	2.3	-13.9	49.1	Peak [Scan]	V	100	0	54.0	-5.0	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge 802.11a Channel Frequency 5500 MHz

Test Freq.	5580 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

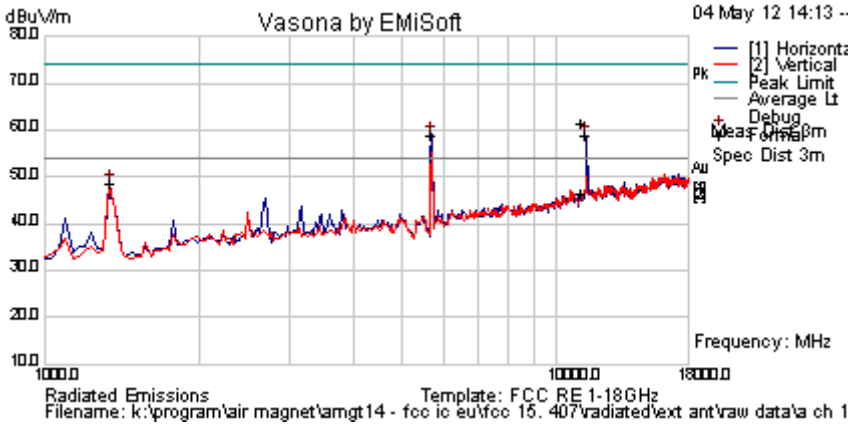


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
11171.383	57.6	6.9	-2.9	61.6	Peak Max	H	112	350	74.0	-12.4	Pass	RB
11171.383	42.5	6.9	-2.9	46.5	Average Max	H	112	350	54.0	-7.5	Pass	RB
5565.130	67.5	4.7	-9.7	62.4	Peak [Scan]	H	100	0				FUND
1340.681	60.8	2.3	-13.9	49.2	Peak [Scan]	V	100	0	54	-4.8	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5700 MHz	**Engineer**	SB
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

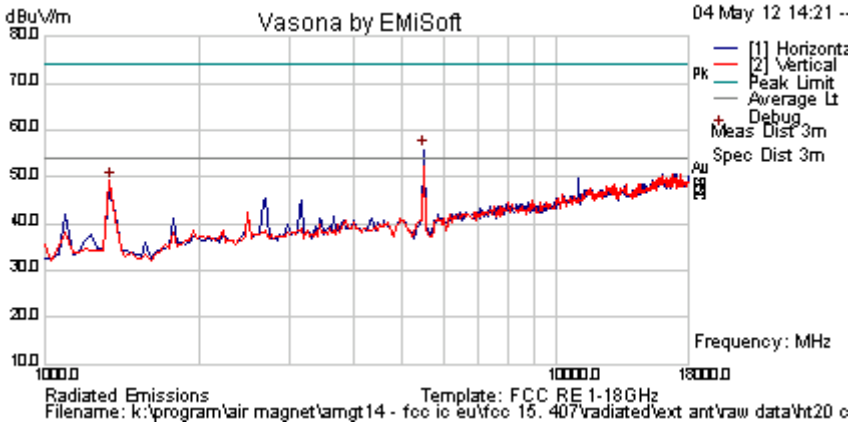


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
11390.782	59.0	6.9	-2.9	63.0	Peak Max	H	112	350	74.0	-11.0	Pass	
11390.782	43.3	6.9	-2.9	47.3	Average Max	H	112	350	54.0	-6.7	Pass	
5701.403	63.8	4.7	-9.6	59.0	Peak [Scan]	H	100	0				FUND
1340.681	60.3	2.3	-13.9	48.7	Peak [Scan]	V	100	0	54	-5.3	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

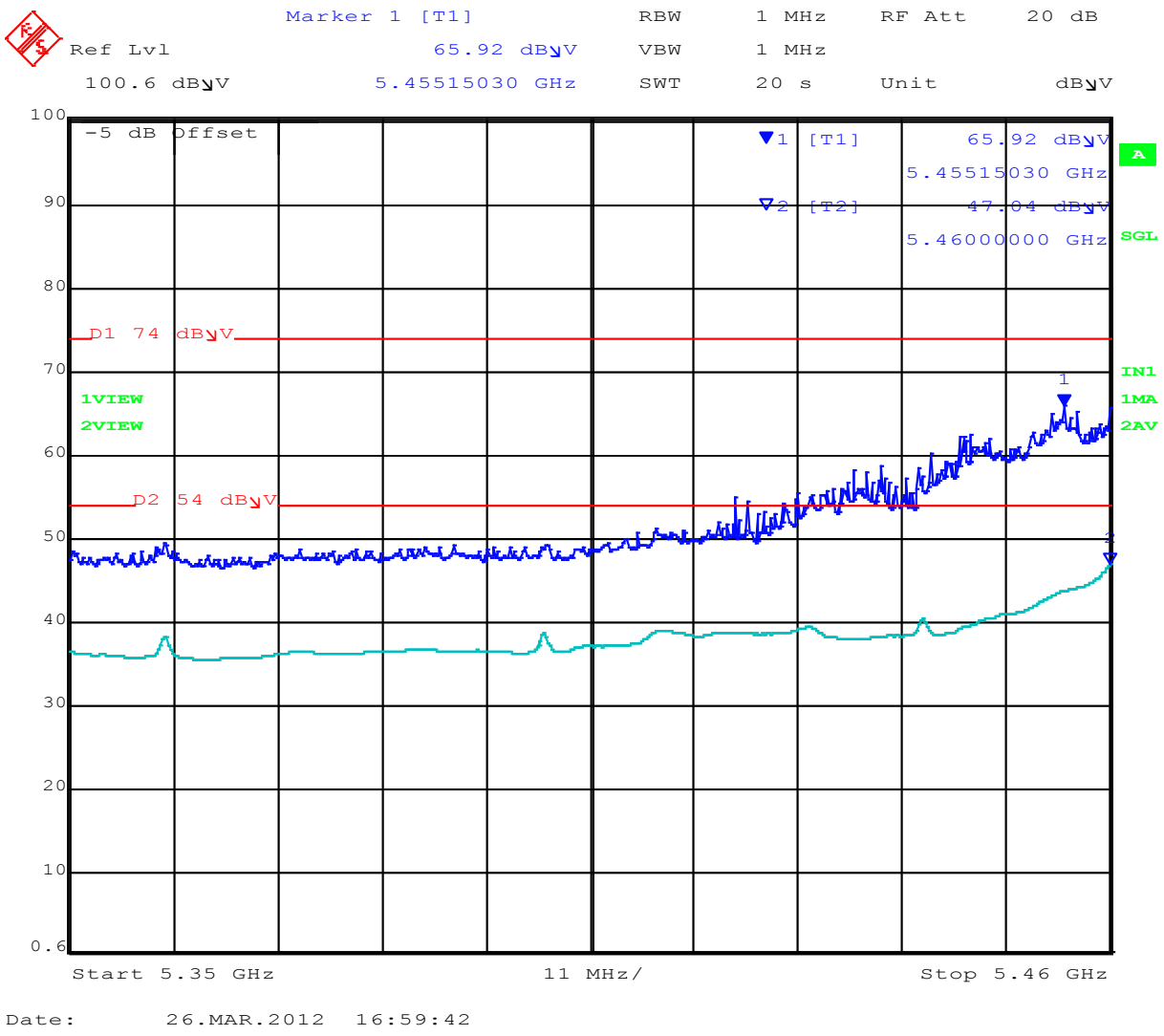
Test Freq.	5500 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

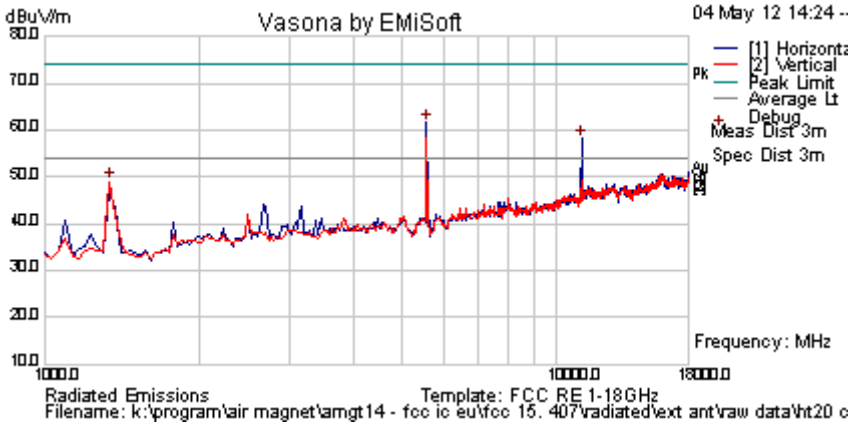
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5496.994	60.8	4.6	-9.6	55.9	Peak [Scan]	H	100	0				FUND
1340.68136	60.9	2.3	-13.9	49.3	Peak [Scan]	V	100	0	54.0	-4.7	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge HT-20 Channel Frequency 5500 MHz

Test Freq.	5580 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

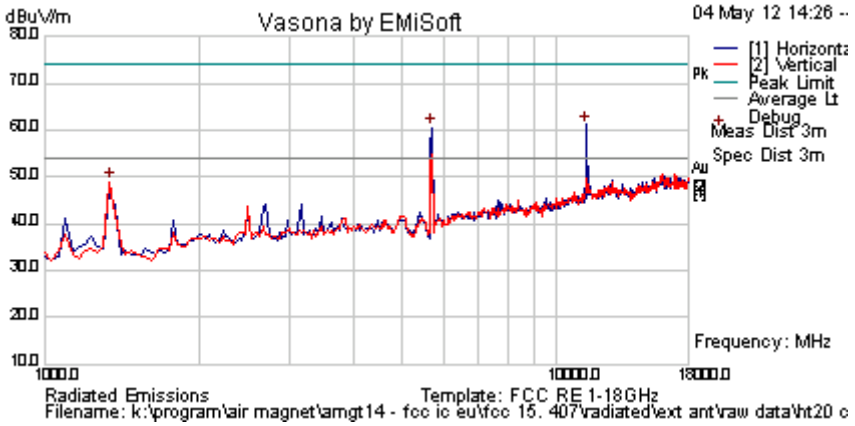


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
11152.305	61.3	6.9	-2.9	65.3	Peak Max	H	112	350	74.0	-8.7	Pass	RB
11152.305	46.3	6.9	-2.9	50.3	Average Max	H	112	350	54.0	-3.7	Pass	RB
5565.130	66.7	4.7	-9.7	61.7	Peak [Scan]	H	100	0				FUND
1340.681	60.7	2.3	-13.9	49.0	Peak [Scan]	V	100	0	54	-5.0	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5700 MHz	**Engineer**	SB
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

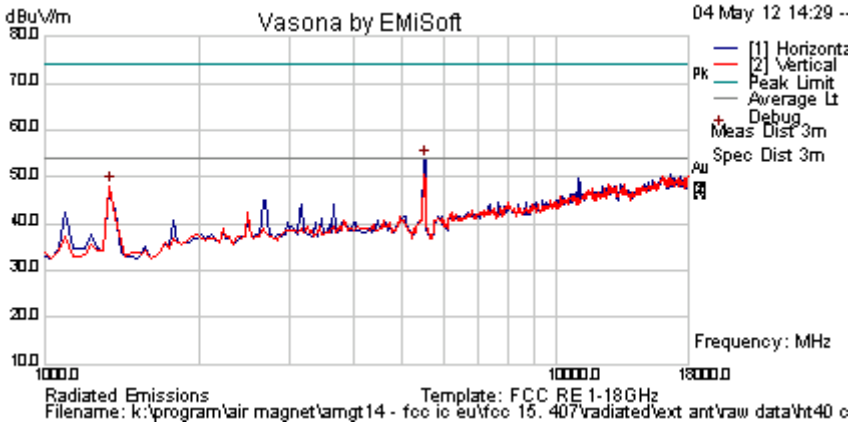


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
11390.782	56.9	6.9	-2.9	60.9	Peak Max	H	112	350	74.0	-13.1	Pass	RB
11390.782	44.8	6.9	-2.9	48.8	Average Max	H	112	350	54.0	-5.2	Pass	RB
5701.40281	65.4	4.7	-9.6	60.5	Peak [Scan]	H	100	0				FUND
1340.681	60.7	2.3	-13.9	49.1	Peak [Scan]	V	100	0	54	-5.0	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

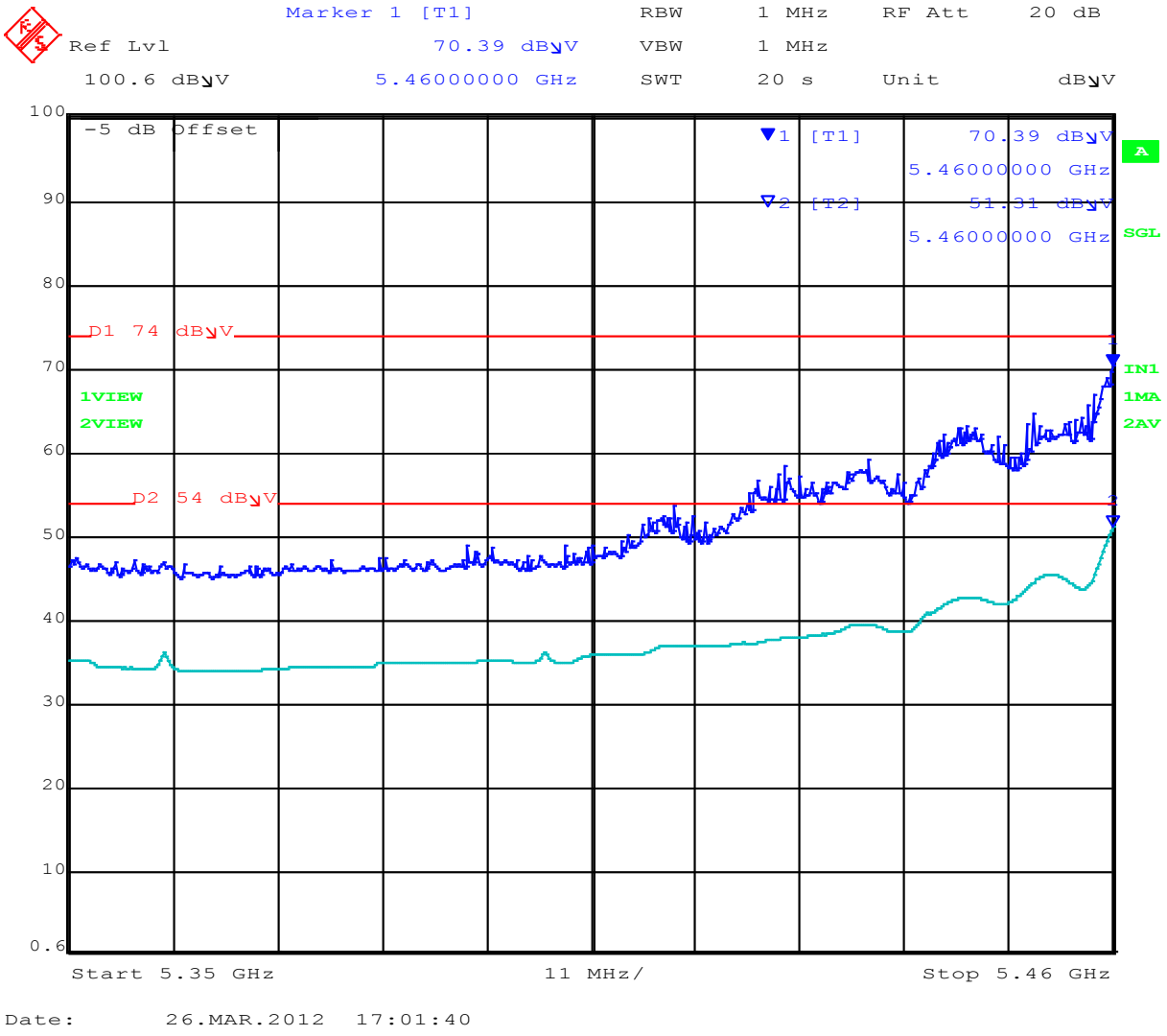
Test Freq.	5510 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

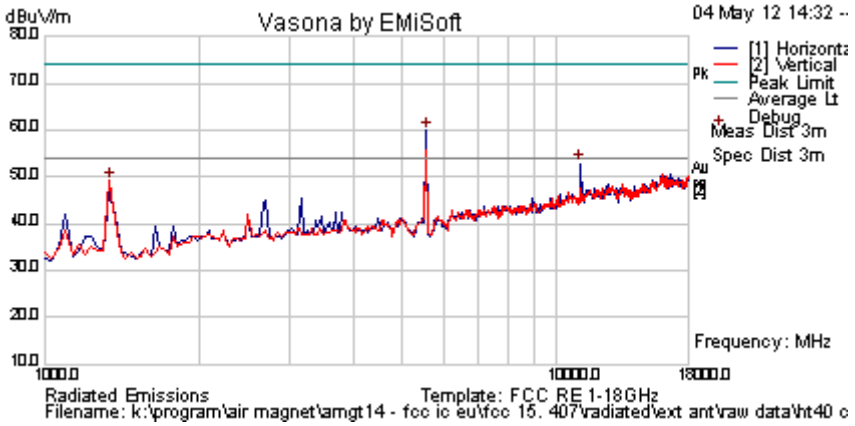
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5531.062	58.8	4.6	-9.7	53.8	Peak [Scan]	H	100	0	54.0	-0.2	Pass	FUND
1340.68136	59.8	2.3	-13.9	48.1	Peak [Scan]	V	100	0	54.0	-5.9	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205



Band-Edge HT-40 Channel Frequency 5510 MHz

Test Freq.	5550 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

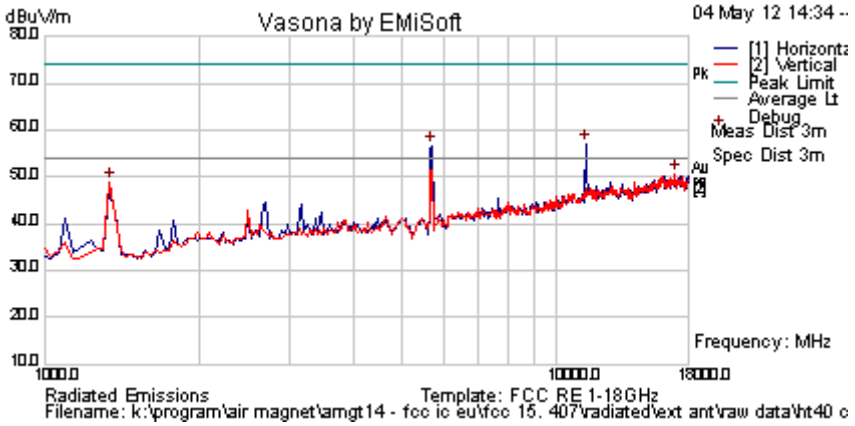


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
11118.236	50.0	6.9	-2.9	54.0	Peak Max	H	112	350	74.0	-20.0	Pass	RB
11118.236	41.3	6.9	-2.9	45.3	Average Max	H	112	350	54.0	-8.7	Pass	RB
5565.13	64.9	4.7	-9.7	59.9	Peak [Scan]	H	100	0				FUND
1340.68136	59.8	2.3	-13.9	48.1	Peak [Scan]	V	100	0	54.0	-5.9	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5670 MHz	**Engineer**	SB
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	993
Antenna	External	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
11356.713	55.7	6.9	-2.9	59.7	Peak Max	H	112	350	74.0	-14.4	Pass	RB
11356.713	46.0	6.9	-2.9	50.0	Average Max	H	112	350	54.0	-4.0	Pass	RB
5701.40281	61.5	4.7	-9.6	56.7	Peak [Scan]	H	100	0				FUND
1340.681	60.6	2.3	-13.9	49.0	Peak [Scan]	V	100	0	54	-5.0	Pass	RB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

5.1.5.3. Radiated Spurious Emissions – 30MHz – 1000MHz

FCC, Part 15 Subpart C §15.205/ §15.209
Industry Canada RSS-247 §2.2

Test Procedure

Testing 30M-1 GHz was performed in a 3-meter anechoic chamber using a CISPR compliant receiver. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. To further maximize emissions the receive antenna was varied between 1 and 4 meters. The emissions are recorded with receiver in peak hold mode. Emissions closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed. The anechoic chamber test set-up is identified in Section 6 Test Set-Up Photographs.

The EUT had two methods of powering on ac/dc converter and Power over Ethernet (POE). Both modes were tested for emissions below 1GHz.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver.

$$FS = R + AF + CORR$$

where:

FS = Field Strength
R = Measured Receiver Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain

For example:
Given a Receiver input reading of 51.5dBμV; Antenna Factor of 8.5dB; Cable Loss of 1.3dB; Falloff Factor of 0dB, an Amplifier Gain of 26dB and Notch Filter Loss of 1dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

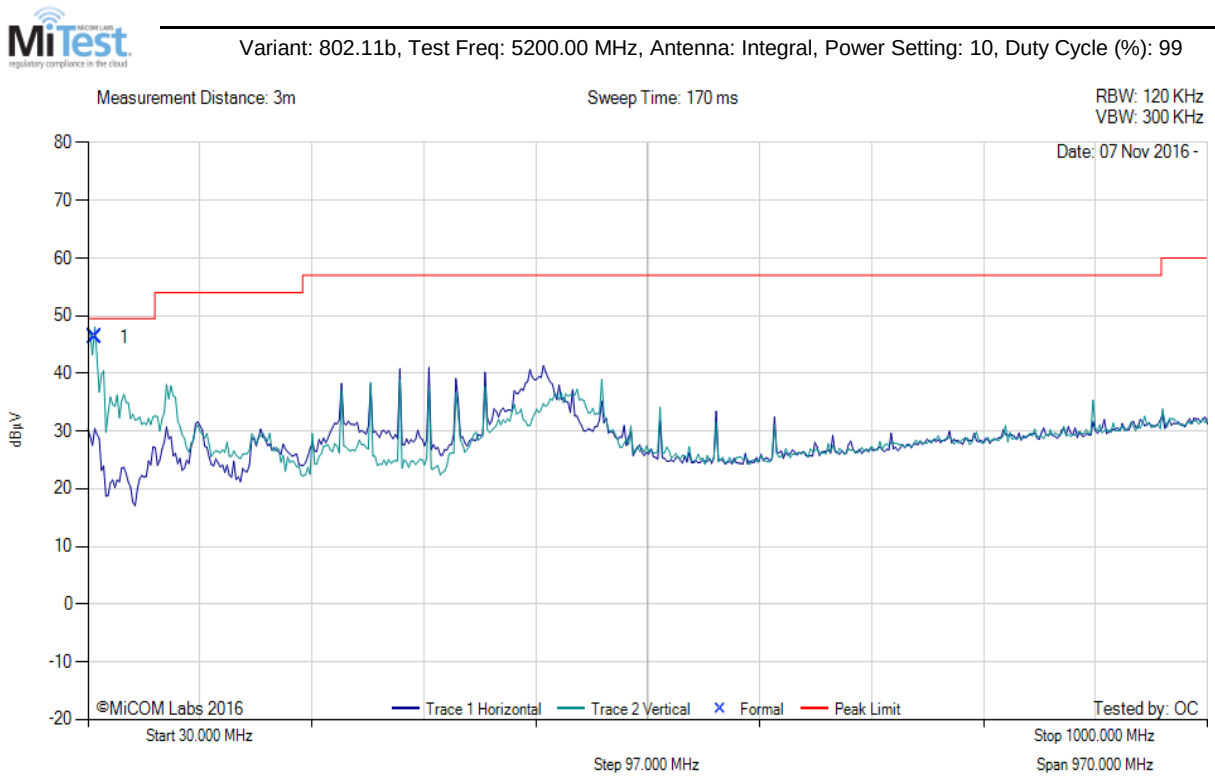
40 dBμV/m = 100μV/m
48 dBμV/m = 250μV/m

Spot Check Results for Digital Emissions

Below 1GHz

Antenna:	Integral	**Variant:**	802.11a
Antenna Gain (dBi):	2.0	**Modulation:**	OFDM
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	5200.00	**Data Rate:**	6 Mbit/s
Power Setting:	10	**Tested By:**	OC

Test Measurement Results



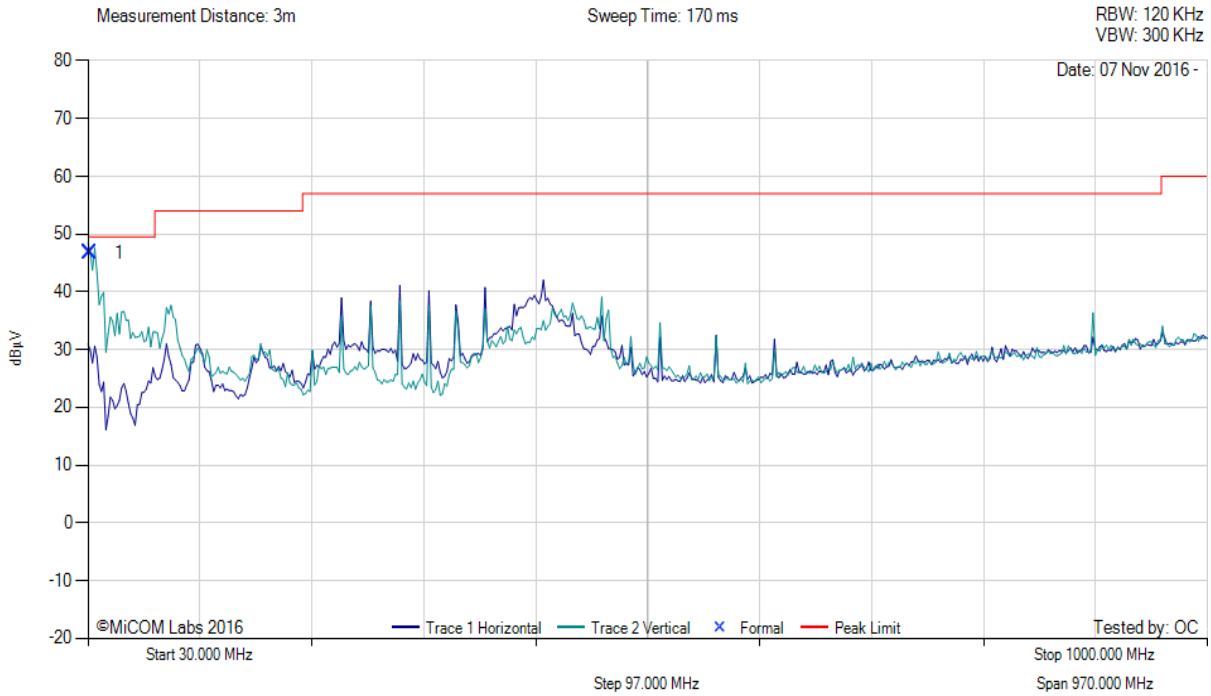
30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	36.21	57.21	3.47	-14.37	46.31	MaxQP	Vertical	100	217	49.5	-3.2	Pass

Test Notes: Model: SENSOR4-R2S1-I, S/N: 1517048. PoE powered and placed at 150cm non-conductive table.

Antenna:	Integral	**Variant:**	802.11a
Antenna Gain (dBi):	2.0	**Modulation:**	OFDM
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	5300.00	**Data Rate:**	6 Mbit/s
Power Setting:	17	**Tested By:**	OC

Test Measurement Results

Variant: 802.11b, Test Freq: 5300.00 MHz, Antenna: Integral, Power Setting: 17, Duty Cycle (%): 99



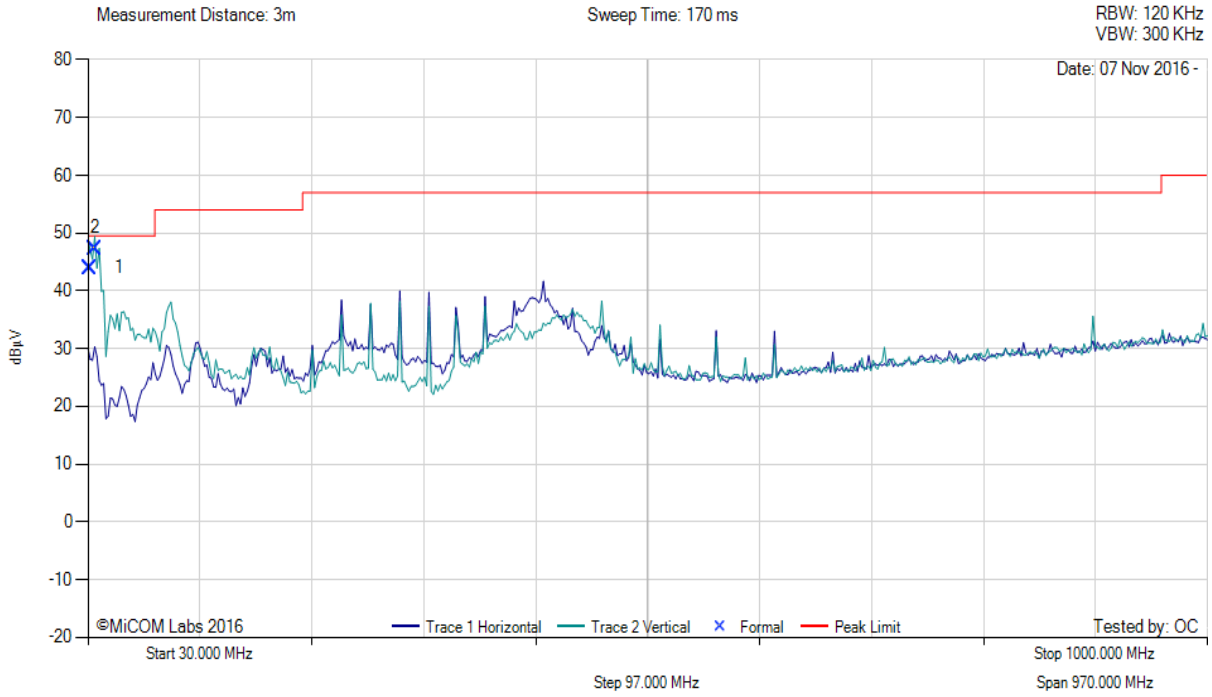
30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	31.84	54.54	3.44	-11.21	46.77	MaxQP	Vertical	100	139	49.5	-2.7	Pass

Test Notes: Model: SENSOR4-R2S1-I, S/N: 1517048. PoE powered and placed at 150cm non-conductive table.

Antenna:	Integral	**Variant:**	802.11a
Antenna Gain (dBi):	2.0	**Modulation:**	OFDM
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	5580.00	**Data Rate:**	6 Mbit/s
Power Setting:	18	**Tested By:**	OC

Test Measurement Results

Variant: 802.11a, Test Freq: 5580.00 MHz, Antenna: Integral, Power Setting: 18, Duty Cycle (%): 99



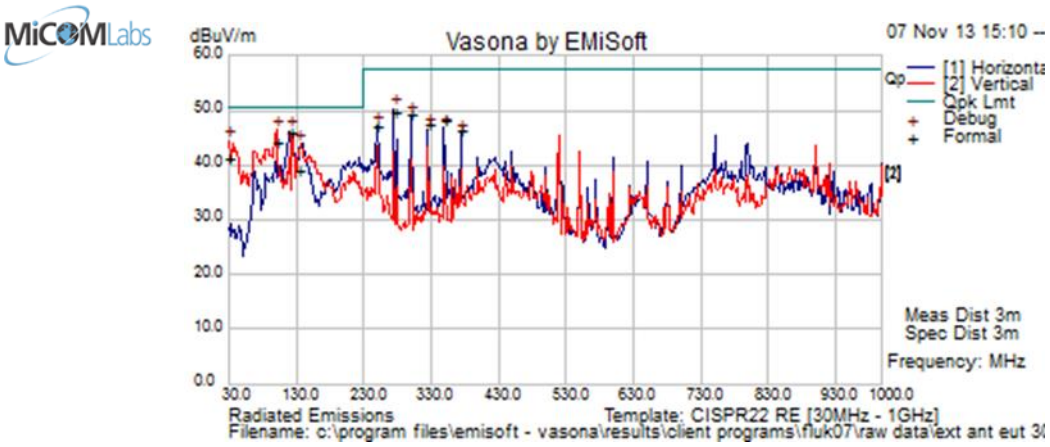
30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	31.81	51.81	3.44	-11.21	44.04	MaxQP	Vertical	100	212	49.5	-5.5	Pass
2	36.21	58.25	3.47	-14.37	47.35	MaxQP	Vertical	100	146	49.5	-2.2	Pass

Test Notes: Model: SENSOR4-R2S1-I, S/N: 1517048. PoE powered and placed at 150cm non-conductive table.

Original Test Results for Digital Emissions

New SENSOR4 Variant

Test Freq.	NA	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	20
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	37
Power Setting	Not Applicable	**Press. (mBars)**	1007
Antenna	External Antenna		
Test Notes 1	Fairway AC Adapter (Model: VEG20C-120F)		
Test Notes 2	Class A limits		

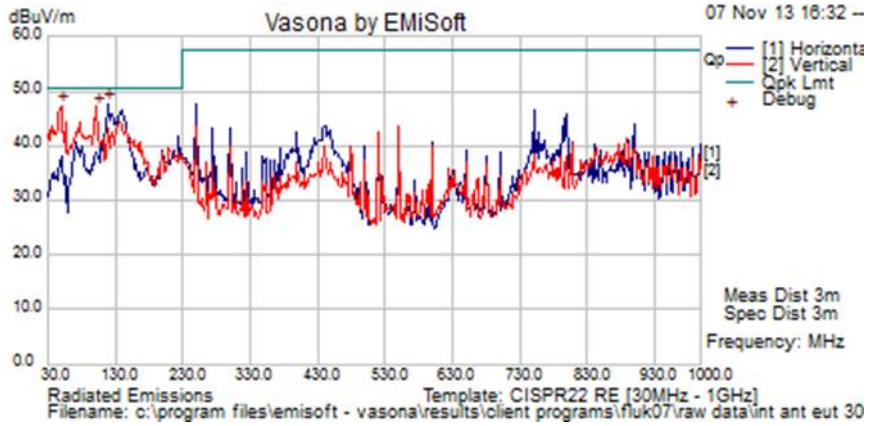


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
120.003	58.9	4.2	-17.2	45.9	Quasi Max	H	261	350	50.5	-4.6	Pass	
100.025	60.9	4.1	-20.8	44.2	Quasi Max	V	128	358	50.5	-6.3	Pass	
274.995	61.9	5.0	-17.2	49.7	Quasi Max	H	108	15	57.5	-7.8	Pass	
299.975	61.3	5.1	-17.0	49.4	Quasi Max	H	117	140	57.5	-8.1	Pass	
30.031	47.3	3.5	-9.5	41.3	Quasi Max	V	112	49	50.5	-9.2	Pass	
349.991	58.4	5.3	-15.7	48.0	Quasi Max	H	104	13	57.5	-9.5	Pass	
324.995	58.6	5.2	-16.5	47.3	Quasi Max	H	100	41	57.5	-10.2	Pass	
249.985	61.0	4.9	-18.8	47.1	Quasi Max	H	142	26	57.5	-10.4	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Test Freq.	NA	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	20
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	37
Power Setting	Not Applicable	**Press. (mBars)**	1007
Antenna	Integral		
Test Notes 1	POE		
Test Notes 2	Class A limits		



Formally measured emission peaks

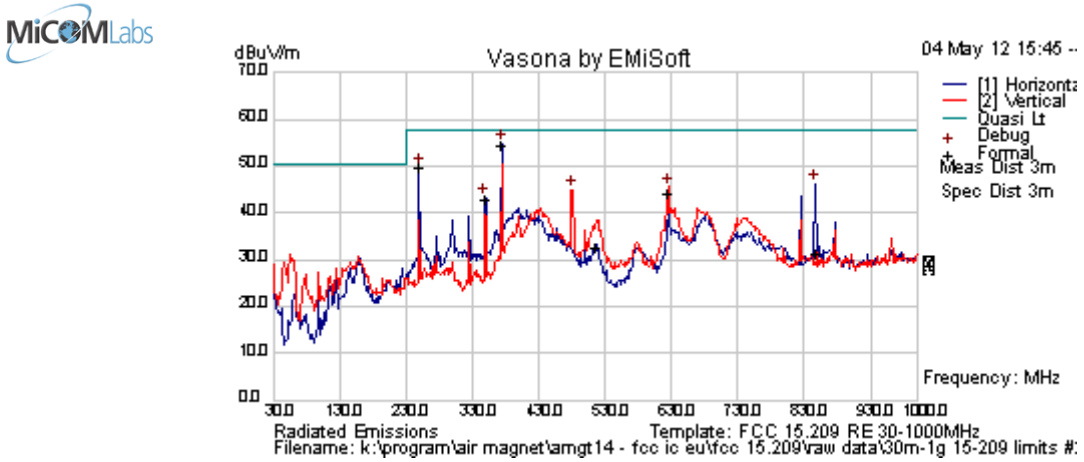
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
119.985	61.1	4.2	-17.2	48.1	Quasi Max	H	255	204	50.5	-2.4	Pass	
47.856	59.7	3.7	-21.9	41.5	Quasi Max	V	115	141	50.5	-9.0	Pass	
101.889	62.9	4.1	-20.3	46.8	Quasi Max	V	100	35	50.5	-3.7	Pass	
249.469	60.5	4.9	-18.8	46.5	Peak [Scan]	H	99	35	57.5	-11.0	Pass	
442.619	51.4	5.6	-13.9	43.1	Peak [Scan]	H	99	35	57.5	-14.4	Pass	
751.232	48.6	6.7	-8.9	46.4	Peak [Scan]	H	99	35	57.5	-11.1	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Existing Variant

Ferrites clamped-on antenna cables

Test Freq.	2437 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	19.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	1004
Antenna	external ant		
Test Notes 1			
Test Notes 2	ac/dc adaptor 110Vac 60 Hz		



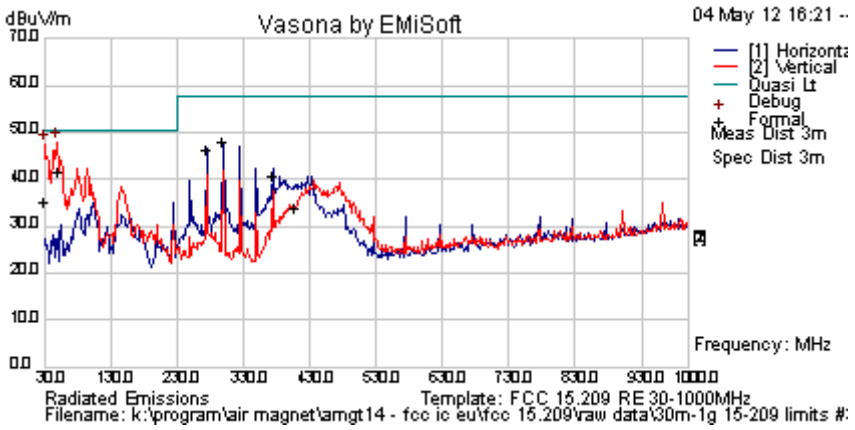
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
375.020	64.5	5.4	-15.4	54.5	Quasi Max	H	208	184	57.5	-3.0	Pass	
249.984	64.0	4.9	-19.0	49.8	Quasi Max	H	104	167	57.5	-7.7	Pass	
850.080	32.8	7.0	-8.3	31.5	Quasi Max	H	251	273	57.5	-26.1	Pass	
624.985	49.1	6.3	-11.0	44.4	Quasi Max	V	187	342	57.5	-13.1	Pass	
516.381	39.6	5.9	-12.7	32.8	Quasi Max	V	155	159	57.5	-24.7	Pass	
350.016	53.3	5.3	-15.7	42.8	Quasi Max	H	98	187	57.5	-14.7	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Ferrites clamped-on antenna cables

Test Freq.	2437 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	19.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	1004
Antenna	external ant		
Test Notes 1			
Test Notes 2	POE 110Vac 60 Hz		



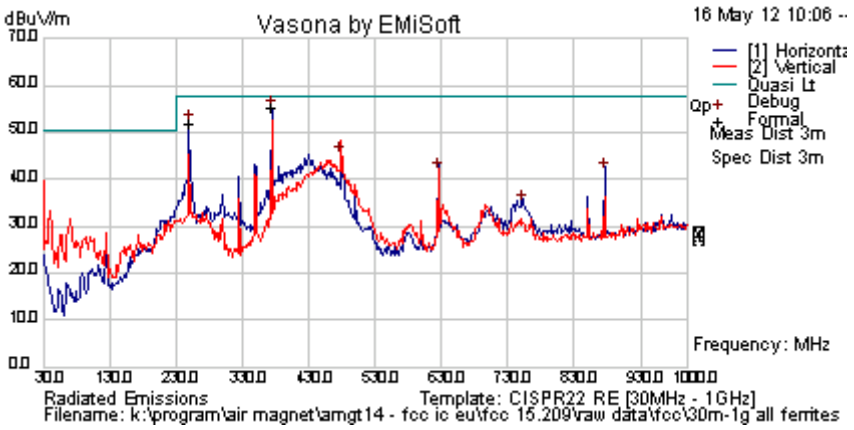
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
49.816	61.1	3.7	-23.1	41.7	Quasi Max	V	139	184	50.5	-8.8	Pass	
30.001	41.5	3.5	-9.7	35.3	Quasi Max	V	132	201	50.5	-15.2	Pass	
299.982	59.9	5.1	-17.2	47.8	Quasi Max	H	103	29	57.5	-9.7	Pass	
274.980	58.8	5.0	-17.4	46.4	Quasi Max	H	101	3	57.5	-11.1	Pass	
374.979	50.6	5.4	-15.4	40.6	Quasi Max	H	212	3	57.5	-16.9	Pass	
409.043	42.9	5.5	-14.5	33.9	Quasi Max	H	223	178	57.5	-23.6	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Ferrites removed from antenna cables

Test Freq.	2437 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	19.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	1004
Antenna	external ant		
Test Notes 1	All ferrites removed except for one which is located on the cable to the dedicated RX Ant		
Test Notes 2	ac/dc adaptor 110Vac 60 Hz		



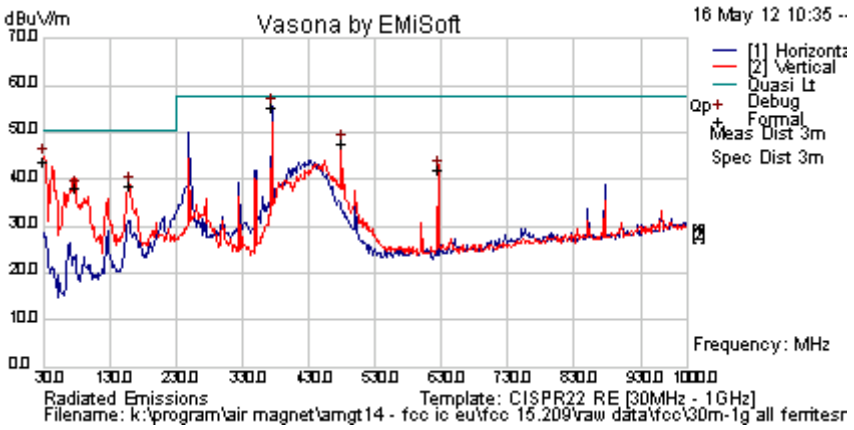
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
375.018	65.2	5.4	-15.4	55.2	Quasi Max	H	208	12	57.5	-2.3	Pass	
249.993	66.2	4.9	-19.0	52.0	Quasi Max	H	122	178	57.5	-5.5	Pass	
478.140	52.3	5.8	-12.9	45.2	Peak [Scan]	H	122	178	57.5	-12.3	Pass	
624.888	46.4	6.3	-11.0	41.8	Peak [Scan]	H	122	178	57.5	-15.8	Pass	
753.135	37.5	6.7	-9.4	34.8	Peak [Scan]	H	122	178	57.5	-22.7	Pass	
875.483	42.8	7.1	-8.1	41.8	Peak [Scan]	H	122	178	57.5	-15.7	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Ferrites removed from antenna cables

Test Freq.	2437 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	19.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	1004
Antenna	external ant		
Test Notes 1	All ferrites removed except for one which is located on the cable to the dedicated RX Ant		
Test Notes 2	POE 110Vac 60 Hz		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
375.006	65.2	5.4	-15.4	55.3	Quasi Max	H	98	212	57.5	-2.2	Pass	
30.628	50.6	3.5	-10.3	43.8	Quasi Max	V	98	360	50.5	-6.7	Pass	
479.055	54.5	5.8	-12.9	47.5	Peak [Scan]	V	98	0	57.5	-10.1	Pass	
624.709	46.6	6.3	-11.0	41.9	Peak [Scan]	V	98	0	57.5	-15.6	Pass	
79.470	57.6	3.9	-23.5	38.0	Peak [Scan]	V	98	0	50.5	-12.5	Pass	
160.950	53.0	4.4	-18.8	38.6	Peak [Scan]	V	98	0	50.5	-11.9	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Specification

Limits

§15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

§15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

§15.209 (a) and **ICES §6.2** Limit Matrix

Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

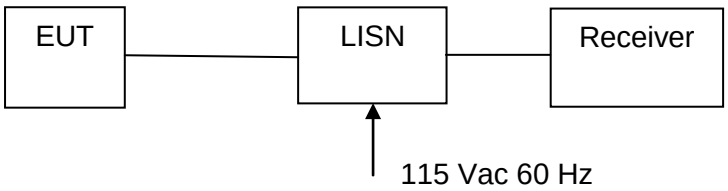
5.1.6. AC Wireline Conducted Emissions (150 kHz – 30 MHz)

FCC, Part 15 Subpart C §15.207
Industry Canada ICES-003

Test Procedure

The EUT is configured in accordance with ANSI C63.4. The conducted emissions are measured in a shielded room with a spectrum analyzer in peak hold in the first instance. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

Test Measurement Set up



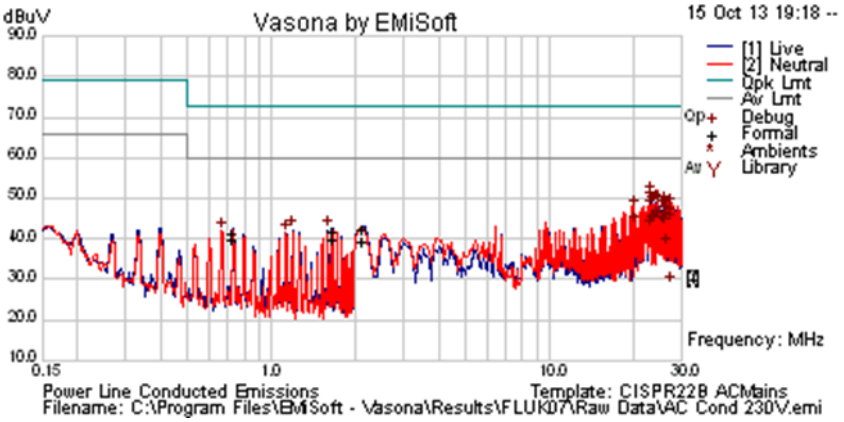
Measurement set up for AC Wireline Conducted Emissions Test

Measurement Results for AC Wireline Conducted Emissions (150 kHz – 30 MHz)

Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

New SENSOR4 Variant

Test Freq.	N/A	**Engineer**	JMH
Variant	AC Line Emissions	**Temp (ºC)**	24
Freq. Range	0.150 MHz - 30 MHz	**Rel. Hum.(%)**	33
Power Setting	Not Applicable	**Press. (mBars)**	1002
Antenna	Not Applicable		
Test Notes 1	POE PS, 230V 50 Hz		
Test Notes 2			

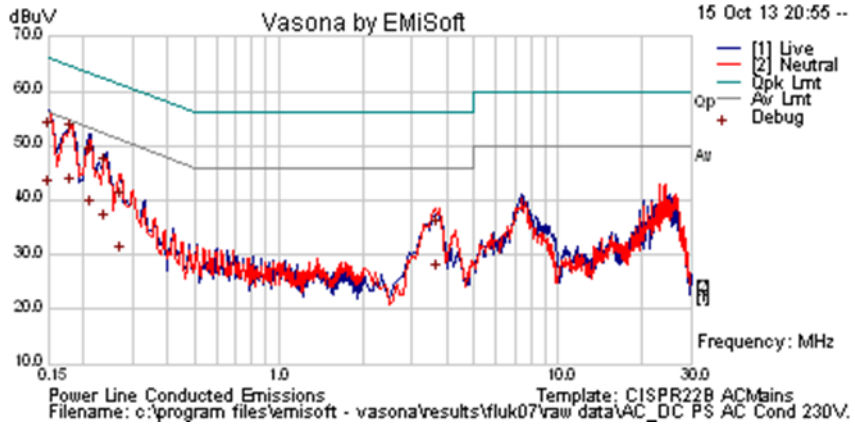


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
23.132	37.6	10.6	0.9	49.1	Average	Live	60	-10.9	Pass	
23.132	39.2	10.6	0.9	50.7	Quasi Peak	Live	73	-22.3	Pass	
24.381	33.4	10.6	0.9	44.9	Average	Neutral	60	-15.1	Pass	
24.381	37.3	10.6	0.9	48.8	Quasi Peak	Neutral	73	-24.2	Pass	
24.381	33.4	10.6	0.9	44.9	Average	Neutral	60	-15.1	Pass	
24.699	36.8	10.6	0.9	48.3	Quasi Peak	Neutral	73	-24.7	Pass	
24.699	32.8	10.6	0.9	44.3	Average	Neutral	60	-15.7	Pass	
25.664	35.9	10.6	0.9	47.4	Quasi Peak	Neutral	73	-25.6	Pass	
25.664	31.7	10.6	0.9	43.3	Average	Neutral	60	-16.7	Pass	
25.981	36.6	10.7	0.9	48.2	Quasi Peak	Live	73	-24.8	Pass	
25.981	32.7	10.7	0.9	44.3	Average	Live	60	-15.7	Pass	
27.265	32.1	10.7	0.9	43.8	Average	Neutral	60	-16.2	Pass	
27.265	36.1	10.7	0.9	47.8	Quasi Peak	Neutral	73	-25.2	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Test Freq.	N/A	**Engineer**	JMH
Variant	AC Line Emissions	**Temp (ºC)**	24
Freq. Range	0.150 MHz - 30 MHz	**Rel. Hum.(%)**	33
Power Setting	Not Applicable	**Press. (mBars)**	1002
Antenna	Not Applicable		
Test Notes 1	POE 230V 50 Hz		
Test Notes 2			



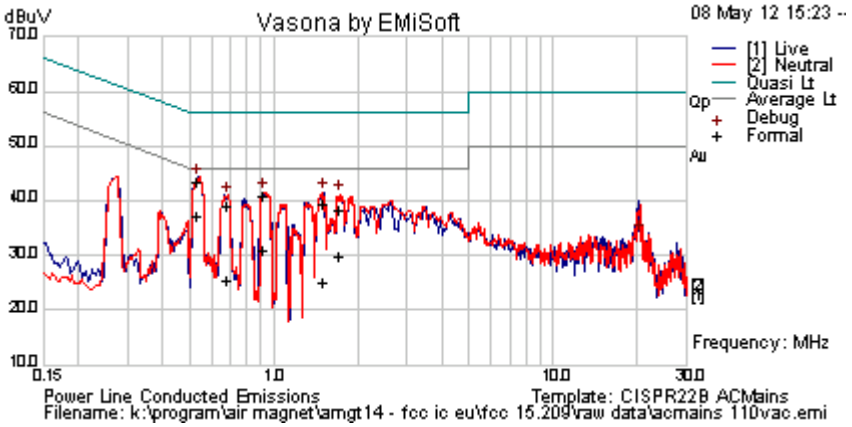
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.151	32.2	9.9	0.1	42.1	Average	Live	55.94	-13.8	Pass	
0.151	42.8	9.9	0.1	52.8	Quasi Peak	Live	65.94	-13.2	Pass	
0.179	32.4	9.9	0.1	42.3	Average	Live	54.53	-12.2	Pass	
0.179	42.5	9.9	0.1	52.5	Quasi Peak	Live	64.53	-12.1	Pass	
0.211	38.0	9.9	0.1	48.0	Quasi Peak	Live	63.17	-15.2	Pass	
0.211	28.3	9.9	0.1	38.2	Average	Live	53.17	-14.9	Pass	
0.239	36.0	9.9	0.1	46.0	Quasi Peak	Live	62.13	-16.2	Pass	
0.239	25.9	9.9	0.1	35.9	Average	Live	52.13	-16.3	Pass	
0.271	29.8	9.9	0.1	39.7	Quasi Peak	Neutral	61.09	-21.4	Pass	
0.271	19.8	9.9	0.1	29.7	Average	Neutral	51.09	-21.4	Pass	
3.664	16.2	10.1	0.2	26.4	Average	Neutral	46	-19.6	Pass	
3.664	24.5	10.1	0.2	34.8	Quasi Peak	Neutral	56	-21.2	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Existing Variant

Test Freq.	N/A	**Engineer**	SB
Variant	AC Line Emissions	**Temp (ºC)**	19.5
Freq. Range	0.150 MHz - 30 MHz	**Rel. Hum.(%)**	35
Power Setting	20	**Press. (mBars)**	1004
Antenna	N/A		
Test Notes 1			
Test Notes 2	Ac adaptor 110Vac 60 Hz		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.535	33.4	9.9	0.1	43.4	Quasi Peak	Neutral	56	-12.6	Pass	
1.502	29.4	10.0	0.1	39.5	Quasi Peak	Neutral	56	-16.5	Pass	
0.926	30.8	9.9	0.1	40.8	Quasi Peak	Neutral	56	-15.2	Pass	
1.734	28.4	10.0	0.1	38.5	Quasi Peak	Neutral	56	-17.5	Pass	
0.686	29.2	10.0	0.1	39.2	Quasi Peak	Neutral	56	-16.8	Pass	
0.535	27.2	9.9	0.1	37.2	Average	Neutral	46	-8.8	Pass	
1.502	14.9	10.0	0.1	25.0	Average	Neutral	46	-21.0	Pass	
0.926	20.9	9.9	0.1	30.9	Average	Neutral	46	-15.1	Pass	
1.734	19.9	10.0	0.1	30.1	Average	Neutral	46	-16.0	Pass	
0.686	15.6	10.0	0.1	25.6	Average	Neutral	46	-20.4	Pass	
20.594	22.7	10.5	0.8	34.0	Peak [Scan]	Neutral	50	-16.0	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Specification

Limit

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μΩ line impedance stabilization network (LISN), see §15.207 (a) matrix below. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

ICES-003 §6.1
The radio frequency voltage that is conducted back into the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The tighter limit applies at the frequency range boundaries.

§15.207 (a) and **ICES-003** Limit Matrix
The lower limit applies at the boundary between frequency ranges

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

Laboratory Measurement Uncertainty for Conducted Emissions

Measurement uncertainty	±2.64 dB

5.2. DFS (Dynamic Frequency Selection)

Dynamic Frequency Selection (DFS) Overview

A U-NII network will employ a DFS function to detect signals from radar systems and to avoid co-channel operation with these systems. This applies to the 5250-5350 MHz and/or 5470-5725 MHz bands. Within the context of the operation of the DFS function, a U-NII device will operate in either Master Mode or Client Mode. U-NII devices operating in Client Mode can only operate in a network controlled by a U-NII device operating in Master Mode. The following tables summarize the requirements.

Requirement	Master Device or Client with Radar Detection	Client without Radar Detection
	Operational Mode	
DFS Detection Threshold	Yes	Not Required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not Required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required

NOTE: Frequencies selected for statistical performance check should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.

The operational behavior and individual DFS requirements associated with these modes are as follows:

Master Devices

a) The Master Device will use DFS in order to detect Radar Waveforms with received signal strength above the DFS Detection Threshold in the 5250 − 5350 MHz and 5470 − 5725 MHz bands. DFS is not required in the 5150 − 5250 MHz or 5725 – 5850 MHz bands.

b) Before initiating a network on a Channel, the Master Device will perform a Channel Availability Check for a specified time duration (Channel Availability Check Time) to ensure that there is no radar system operating on the Channel, using DFS described under subsection a) above.

c) The Master Device initiates a U-NII network by transmitting control signals that will enable other U-NII devices to Associate with the Master Device.

d) During normal operation, the Master Device will monitor the Channel (In-Service Monitoring) to ensure that there is no radar system operating on the Channel, using DFS described under a).

e) If the Master Device has detected a Radar Waveform during In-Service Monitoring as described under d), the Operating Channel of the U-NII network is no longer an Available Channel. The Master Device will instruct all associated Client Device(s) to stop transmitting on this Channel within the Channel Move Time. The transmissions during the Channel Move Time will be limited to the Channel Closing Transmission Time.

f) Once the Master Device has detected a Radar Waveform it will not utilize the Channel for the duration of the Non-Occupancy Period.

g) If the Master Device delegates the In-Service Monitoring to a Client Device, then the combination will be tested to the requirements described under d) through f) above.

Client Devices

a) A Client Device will not transmit before having received appropriate control signals from a Master Device.

b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing Transmission Time requirements. The Client Device will not resume any transmissions until it has again received control signals from a Master Device.

c) If a Client Device is performing In-Service Monitoring and detects a Radar Waveform above the DFS Detection Threshold, it will inform the Master Device. This is equivalent to the Master Device detecting the Radar Waveform and d) through f) of section 5.1.1 apply.

d) Irrespective of Client Device or Master Device detection the Channel Move Time and Channel Closing Transmission Time requirements remain the same.

e) The client test frequency must be monitored to ensure no transmission of any type has occurred for 30 minutes. Note: If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shutdown (rather than moving channels), no beacons should appear.

DFS Detection Thresholds

The table below provides the DFS Detection Thresholds for Master Devices as well as Client Devices incorporating In-Service Monitoring.

DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

Maximum Transmit Power	Value (see Notes 1, 2 and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power density <10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm

NOTE 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna

NOTE 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

NOTE 3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.

Response Requirements

The following table provides the response requirements for Master and Client Devices incorporating DFS.

DFS Response Requirement Values

Parameter	Value
Non-Occupancy Period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds, see NOTE 1
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period, see NOTES 1 and 2
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth, see NOTE 3

NOTE 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

NOTE 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

NOTE 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Short Radar Pulses

Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (µS)	PRI (µS)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	60%	30
		Test B: 15 unique PRI values randomly selected in the range 518-3066 µS, with a minimum increment of 1 µS, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Note 1: Short Radar Pulse Type 0 should be used for the Detection Bandwidth test, Channel Move Time and Channel Closing Time tests

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

Long Radar Pulse Test

Long Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse radar test signal. If more than 30 waveforms are used for the Long Pulse radar test signal, then each additional waveform must also be unique and not repeated from the previous waveforms.

Each waveform is defined as follows:

1. The transmission period for the Long Pulse Radar test signal is 12 seconds.

2. There are a total of 8 to 20 Bursts in the 12 second period, with the number of Bursts being randomly chosen. This number is Burst Count.

3. Each Burst consists of 1 to 3 pulses, with the number of pulses being randomly chosen. Each Burst within the 12 second sequence may have a different number of pulses.

4. The pulse width is between 50 and 100 microseconds, with the pulse width being randomly chosen. Each pulse within a Burst will have the same pulse width. Pulses in different Bursts may have different pulse widths.

5. Each pulse has a linear frequency modulated chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a transmission period will have the same chirp width. The chirp is centered on the pulse. For example, with a radar frequency of 5300 MHz and a 20 MHz chirped signal, the chirp starts at 5290 MHz and ends at 5310 MHz.

6. If more than one pulse is present in a Burst, the time between the pulses will be between 1000 and 2000 microseconds, with the time being randomly chosen. If three pulses are present in a Burst, the time between the first and second pulses is chosen independently of the time between the second and third pulses.

7. The 12 second transmission period is divided into even intervals. The number of intervals is equal to Burst_Count. Each interval is of length (12,000,000 / Burst_Count) microseconds. Each interval contains one Burst. The start time for the Burst, relative to the beginning of the interval, is between 1 and [(12,000,000 / Burst_Count) – (Total Burst Length) + (One Random PRI Interval)] microseconds, with the start time being randomly chosen. The step interval for the start time is 1 microsecond. The start time for each Burst is chosen independently.

A representative example of a Long Pulse radar test waveform:

1. The total test signal length is 12 seconds.

2. 8 Bursts are randomly generated for the Burst_Count

3. Burst 1 has 2 randomly generated pulses.

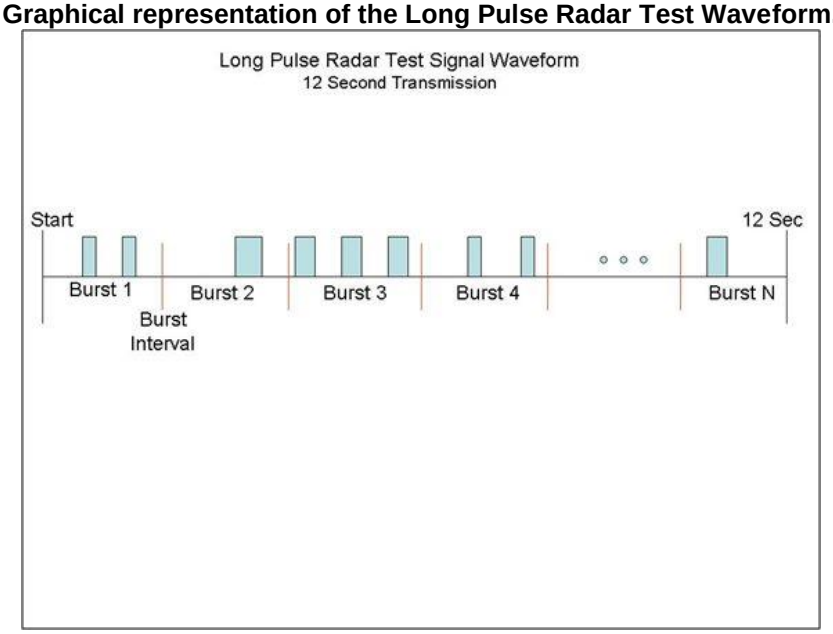
4. The pulse width (for both pulses) is randomly selected to be 75 microseconds.

5. The PRI is randomly selected to be at 1213 microseconds.

6. Bursts 2 through 8 are generated using steps 3 – 5.

7. Each Burst is contained in even intervals of 1,500,000 microseconds. The starting location for Pulse 1, Burst 1 is randomly generated (1 to 1,500,000 minus the total Burst 1 length + 1 random PRI interval) at the 325,001 microsecond step. Bursts 2 through 8 randomly fall in successive 1,500,000 microsecond intervals (i.e. Burst 2 falls in the 1,500,001 – 3,000,000 microsecond range).

Graphical representation of the Long Pulse Radar Test Waveform.



Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	.333	300	70%	30

For the Frequency Hopping Radar Type, the same Burst parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected from the hopping sequence defined by the following algorithm:

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

Radar Waveform Calibration

The following equipment setup was used to calibrate the Radar Waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process there were no transmissions by either the Master or Client Device. The spectrum analyzer was switched to the zero span (Time Domain) mode at the frequency of the Radar Waveform generator. Peak detection was utilized. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz.

The signal generator amplitude was set so that the power level measured at the spectrum analyzer was equal to the DFS detection threshold +1dB (Ref Section 9.2).

5.2.1. DFS Test Program Details

EUT Type: Master with radar detection

Frequency band(s): 5,250 - 5,350 MHz and 5,470 – 5,725 MHz

Uniform Loading: For the above frequency band(s) the manufacturer declared that the device provides an aggregate uniform loading of the spectrum across all devices by selecting an operating channel among the available channels using a random algorithm.

Test Environment: Conducted
Antenna Gain used for Testing: 6.0 dBi

[Repeat for each different data rate]
802.11a: Transmit Power: 15 dBm Data Rate: 6 Mbit/s Duty Cycle: 20%
802.11n HT-40: Transmit Power: 15 dBm Data Rate: 18 Mbit/s Duty Cycle: 20%
802.11ac-80: Transmit Power: 15 dBm Data Rate: 29 Mbit/s Duty Cycle: 20%

Number of Antenna Chains: 3
Test Communication Throughput Methodology
The requisite MPEG video file (“TestFile.mpg” available on the NTIA website at the following link http://ntiacsd.ntia.doc.gov/dfs/) is used during this video stream.

EUT Software Version: 6.3.1.0
EUT Build number: 40232
Test Environmental Conditions - Ambient:
Temperature: 17 to 23 °C
Relative humidity: 31 to 57%
Pressure: 999 to 1012 mbar

5.2.2. Dynamic Frequency Selection (DFS) Test Results

In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period

Channel Close / Transmission Time

The steps below define the procedure to determine the above mentioned parameters when a radar Burst with a level equal to the DFS Detection Threshold is generated on the Operating Channel of the U-NII device.
The EUT will is associated with a support U-NII device in order to setup an appropriate transmission media in accordance with the FCC requirements.

Channel Closing Transmission Time and Channel Mode Time - Measurement
The test system was set-up to capture all transmission data for access point events above a threshold level of -56 dBm. The test equipment time stamps all captured events.
A Type 0 waveform was introduced to the EUT, from which a 12 second transmission record was digitally captured. The start of the Type 0 radar waveform is indicated in the test result plot as “Start Waveform”, the end of the waveform is indicated as “End waveform”.
Channel Closing Transmission Time, and the Channel Move Time start immediately after the last radar pulse is transmitted.
The aggregate of all pulses seen after the end of the radar injection are measured as the “Channel Closing Transmission time”, seen in the test plot as “10s total”.
The last EUT activity after the end of the radar pulse is identified and used to determine the “Channel Move Time”

Frequency 5510 MHz Channel 102

The PXI system measures and aggregates the pulses occurring after the end of the radar pulse to determine the Channel Closing Transmission Time, it also records the total time where signals are present for the Channel Move Time.

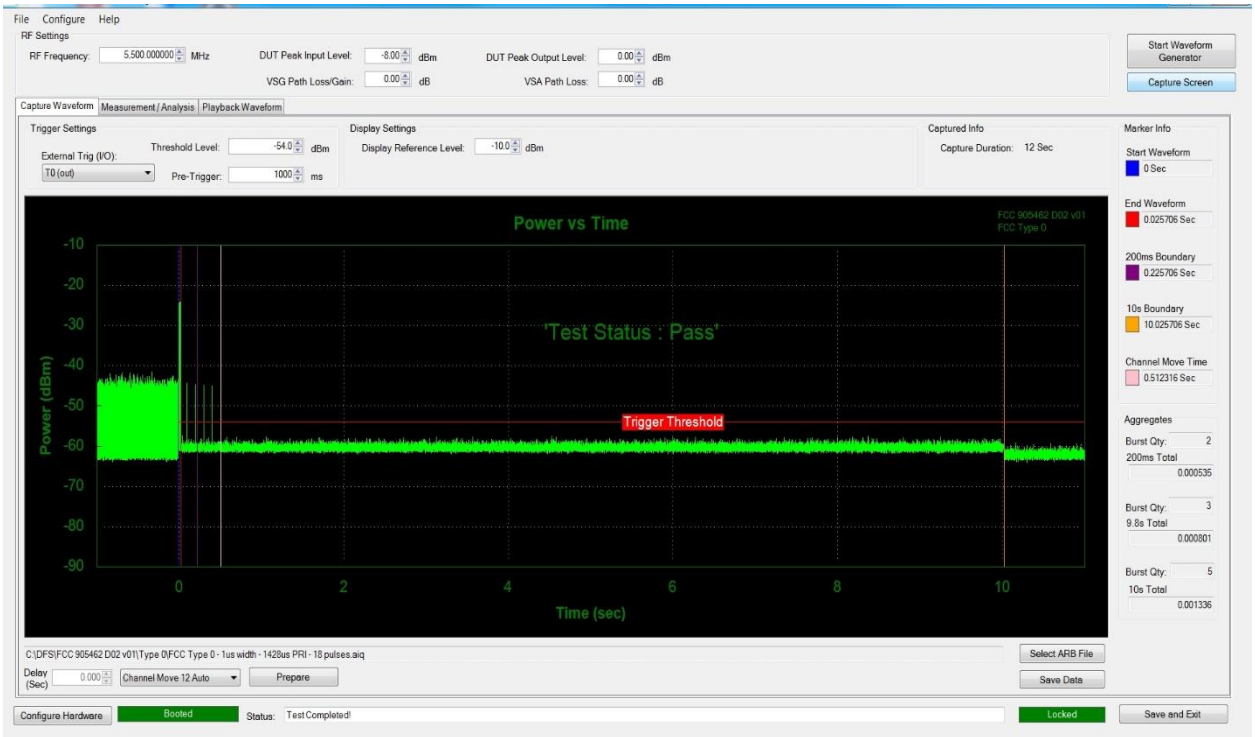
1) Channel Closing Transmission Time (limit is 260 milliseconds over 10 second period)

2) Channel Move Time (limit is 10 seconds)

1) Channel Closing Transmission Time = 1.336 mSec (limit 260 mSec)

2) Channel Move Time = 0.512316 Secs (limit is 10 seconds)

Channel Move Time, Channel Closing Transmission Time for Type 1 Radar Captured by the Test System - 0-12 Seconds

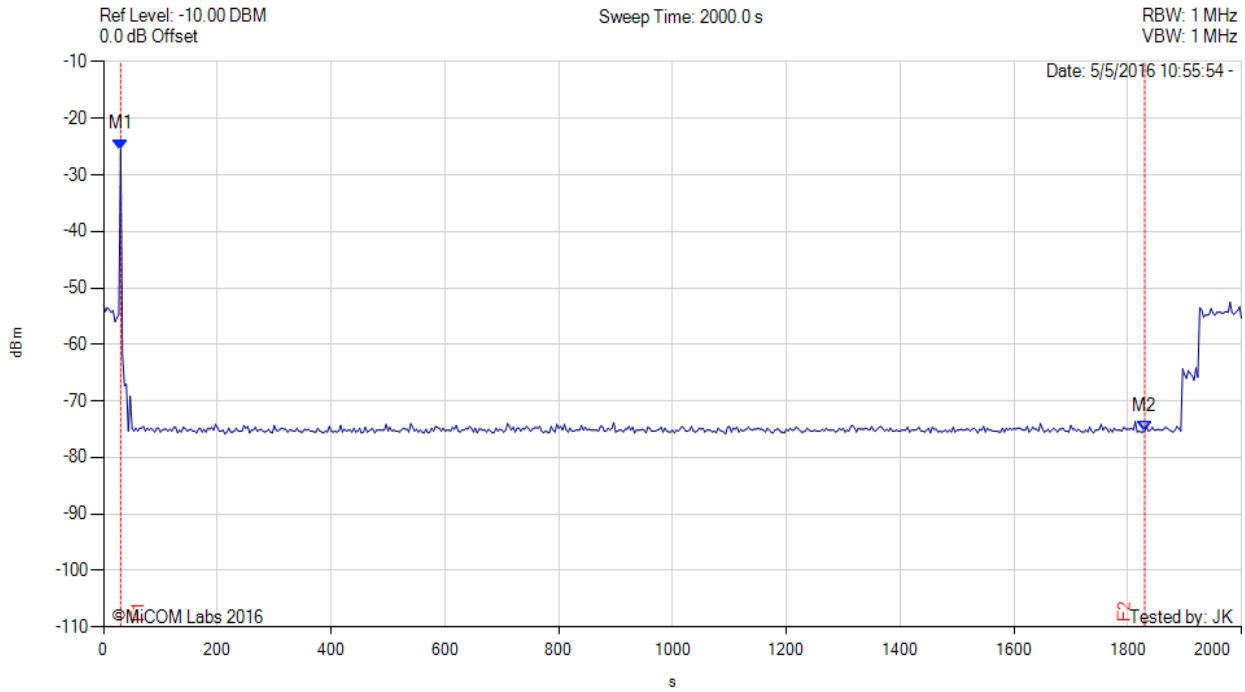


Non-Occupancy Period

The EUT is monitored for more than 30 minutes following the channel close/move time to verify no transmissions resume on this Channel. There should be no transmissions on the frequency of interest during the non-occupancy period.

NON-OCCUPANCY PERIOD

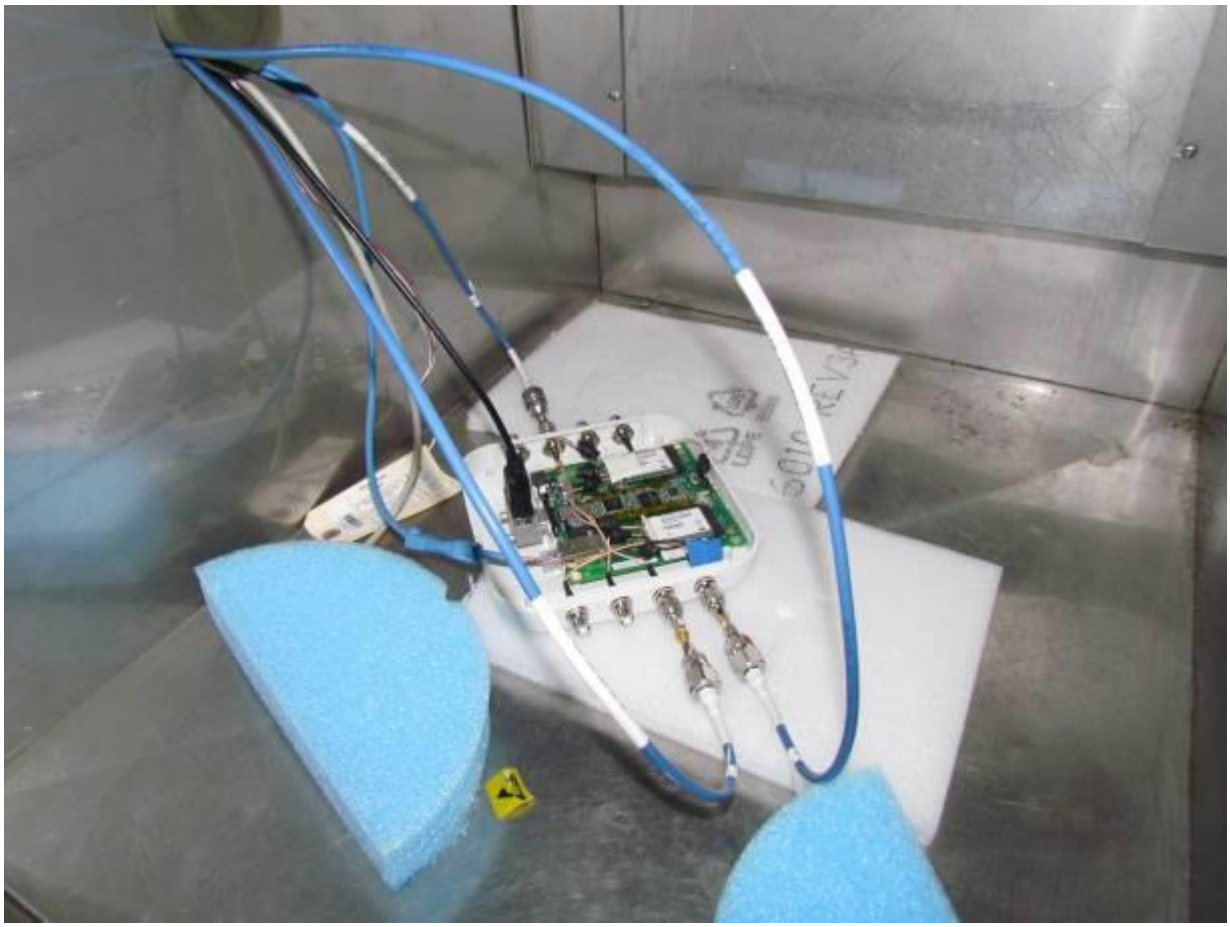
Variant: 802.11n HT40, Channel: 5510.00 MHz, Data Rate: 18 Mbit/s, Duty Cycle: 17.00%, Antenna Gain: 2.0 dBi



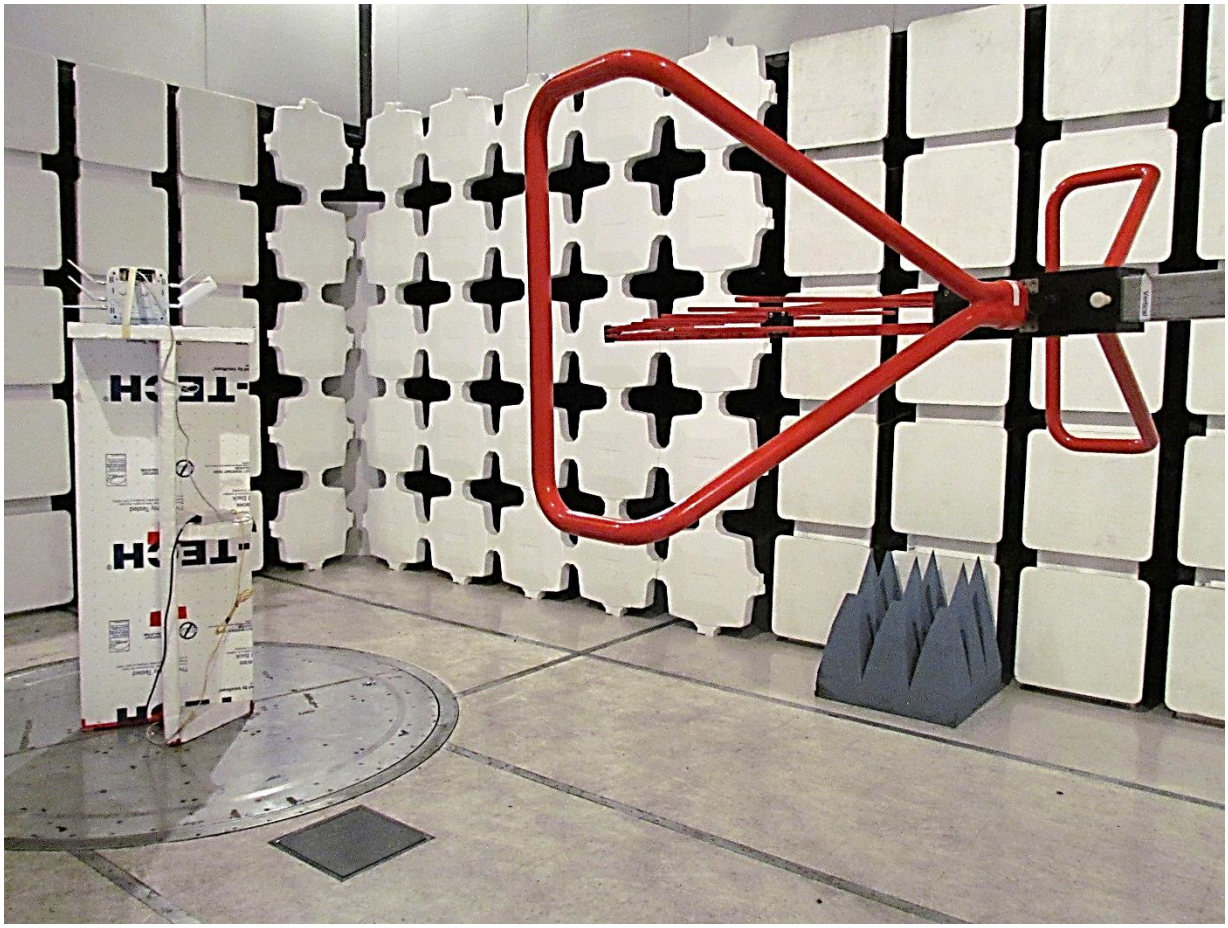
Analyzer Setup	Marker:Time:Amplitude	Test Results
Detector = POS Sweep Count = View RF Atten (dB) = 0 Trace Mode = 0	M1 : 50.000 s : -25.660 dBm M2 : 1850.000 s : -74.660 dBm	Channel Frequency: 5510.00 MHz

PHOTOGRAPHS

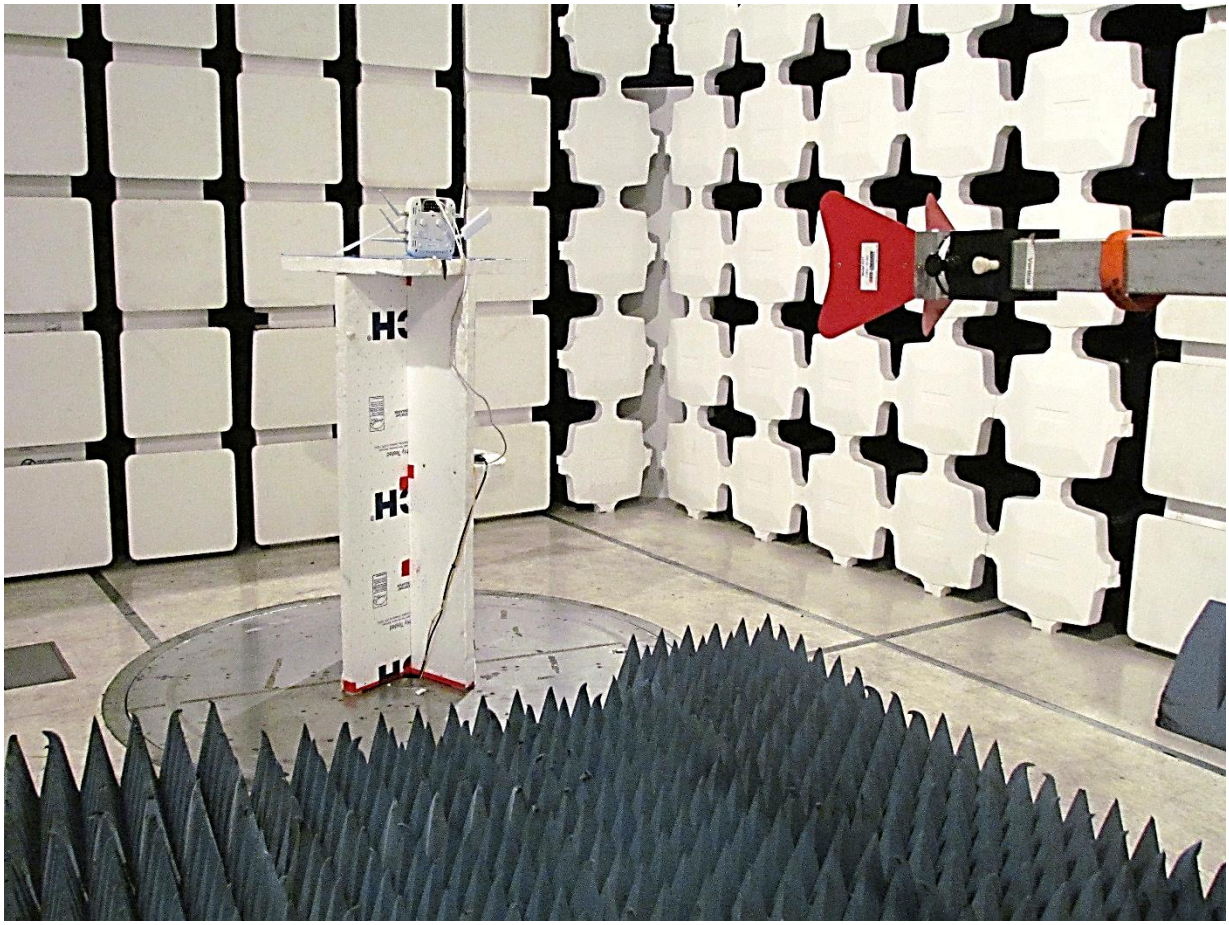
Conducted Test Setup



Radiated Emissions below 1GHz



Radiated Emissions above 1GHz



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