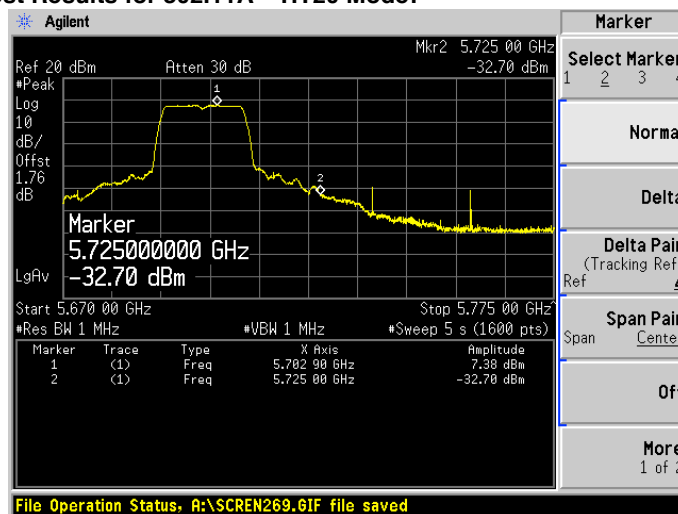
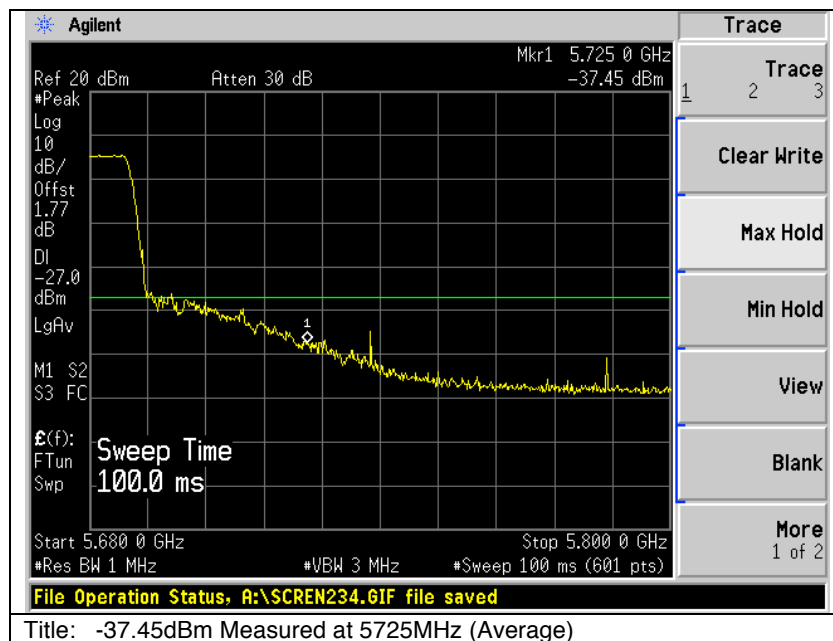
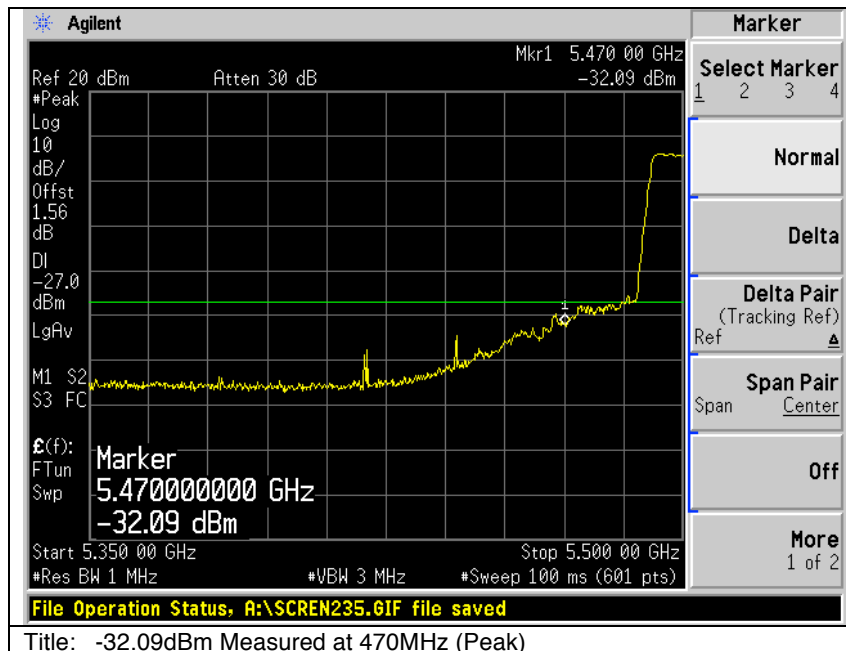


Conducted Graphical Test Results for 802.11A – HT20 Mode:



Graphical Test Results for 802.11A – HT40 Mode:



20dB Bandwidth



Connect the antenna port(s) to the spectrum analyzer input. Using the spectrum analyzer Channel Bandwidth mode, configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).

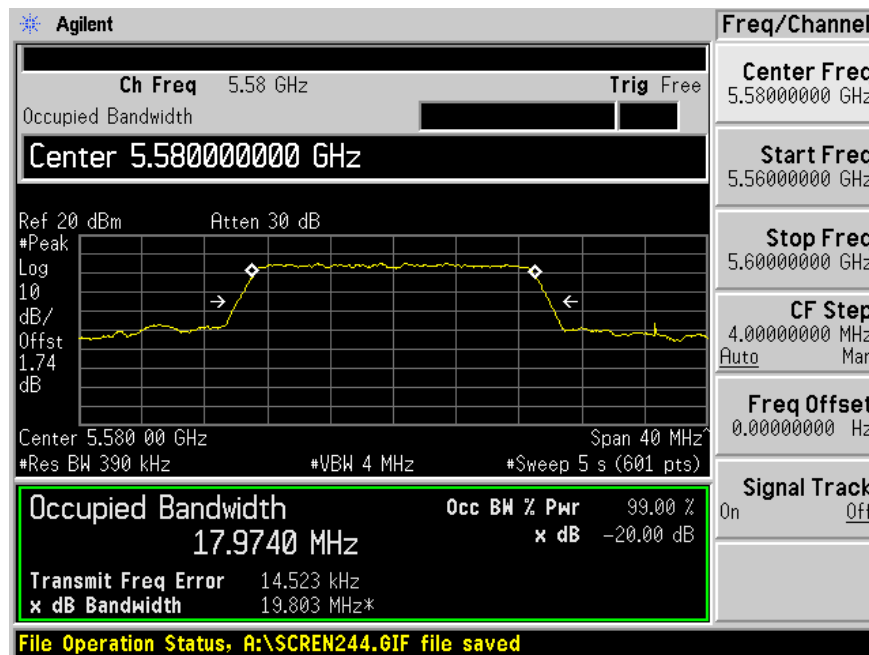
Center Frequency: Frequency from table below
 Span: 2 x Nominal Bandwidth (e.g. 40MHz for a 20MHz channel)
 Reference Level: 20 dBm
 Attenuation: 10 dB
 Sweep Time: 5 s
 Resolution Bandwidth: 1%-3% of 20 dB Bandwidth
 Video Bandwidth: ≥Resolution Bandwidth
 X dB Bandwidth: 20 dB
 Detector: Peak
 Trace: Single

Place the radio in continuous transmit mode. View the transmitter waveform on the spectrum analyzer, and record the pertinent measurements:

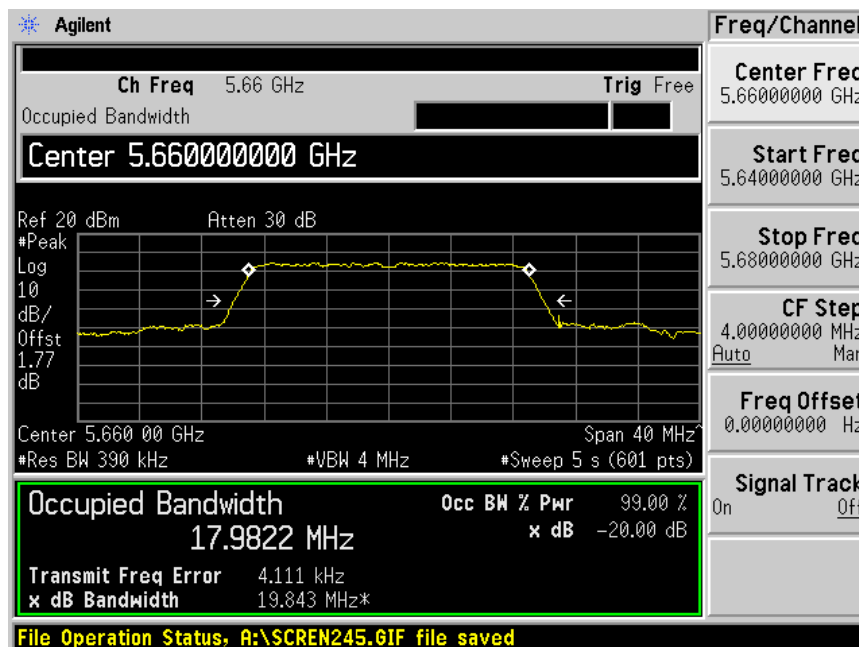
Frequency (MHz)	Mode	Data Rate (Mbps)	20dB BW (MHz)	Limit (MHz)	Margin (MHz)
5580	20 MHz Bandwidth	m0	19.80	20	0.2
5660	20 MHz Bandwidth	m0	19.84	20	0.2
5540/5560	40 MHz Bandwidth	m0	39.54	40	0.5
5660/5680	40 MHz Bandwidth	m0	39.53	40	0.5



20dB Bandwidth, 5580 MHz, 20 MHz BW

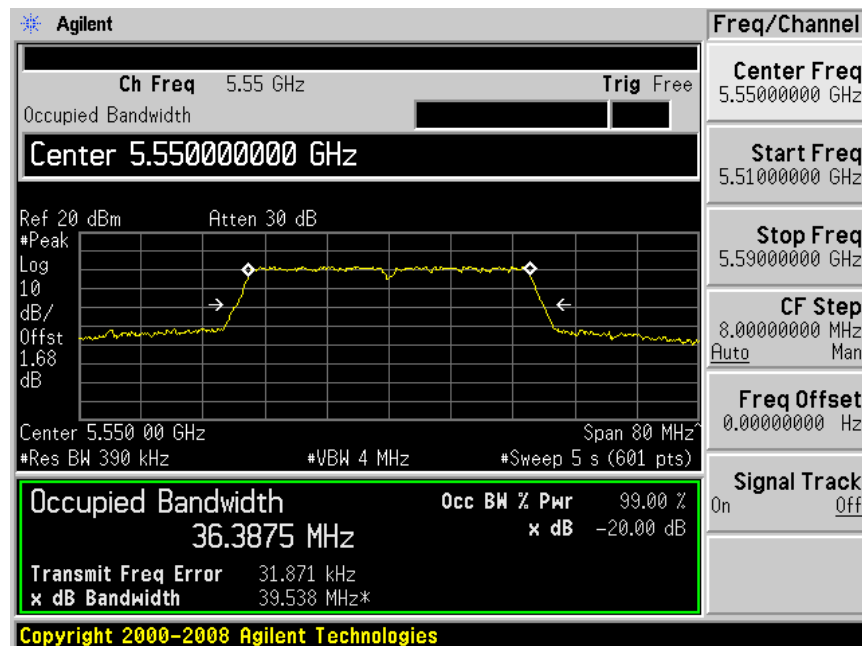


20dB Bandwidth, 5660 MHz, 20 MHz BW

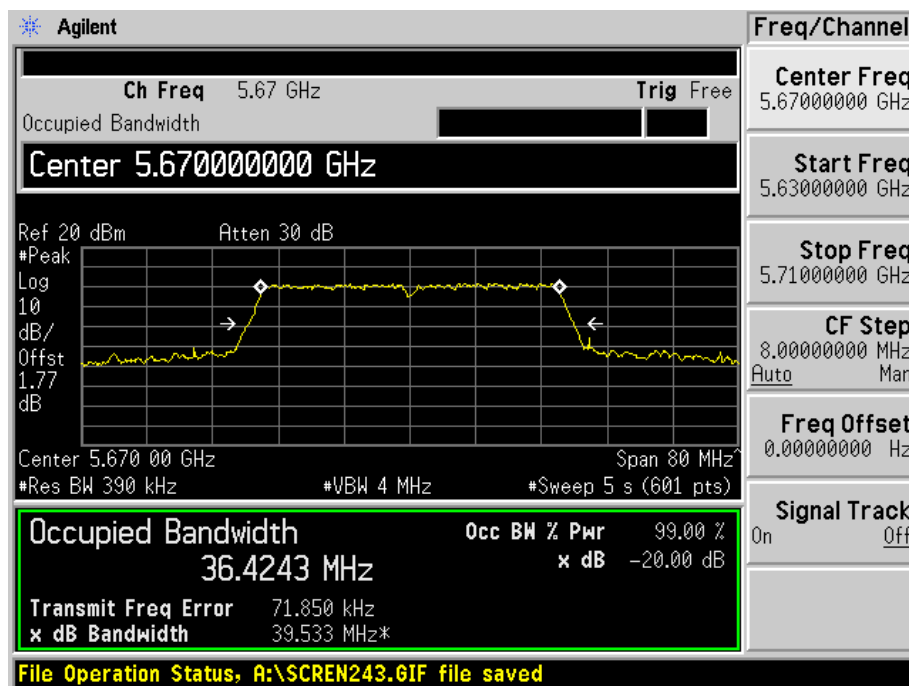


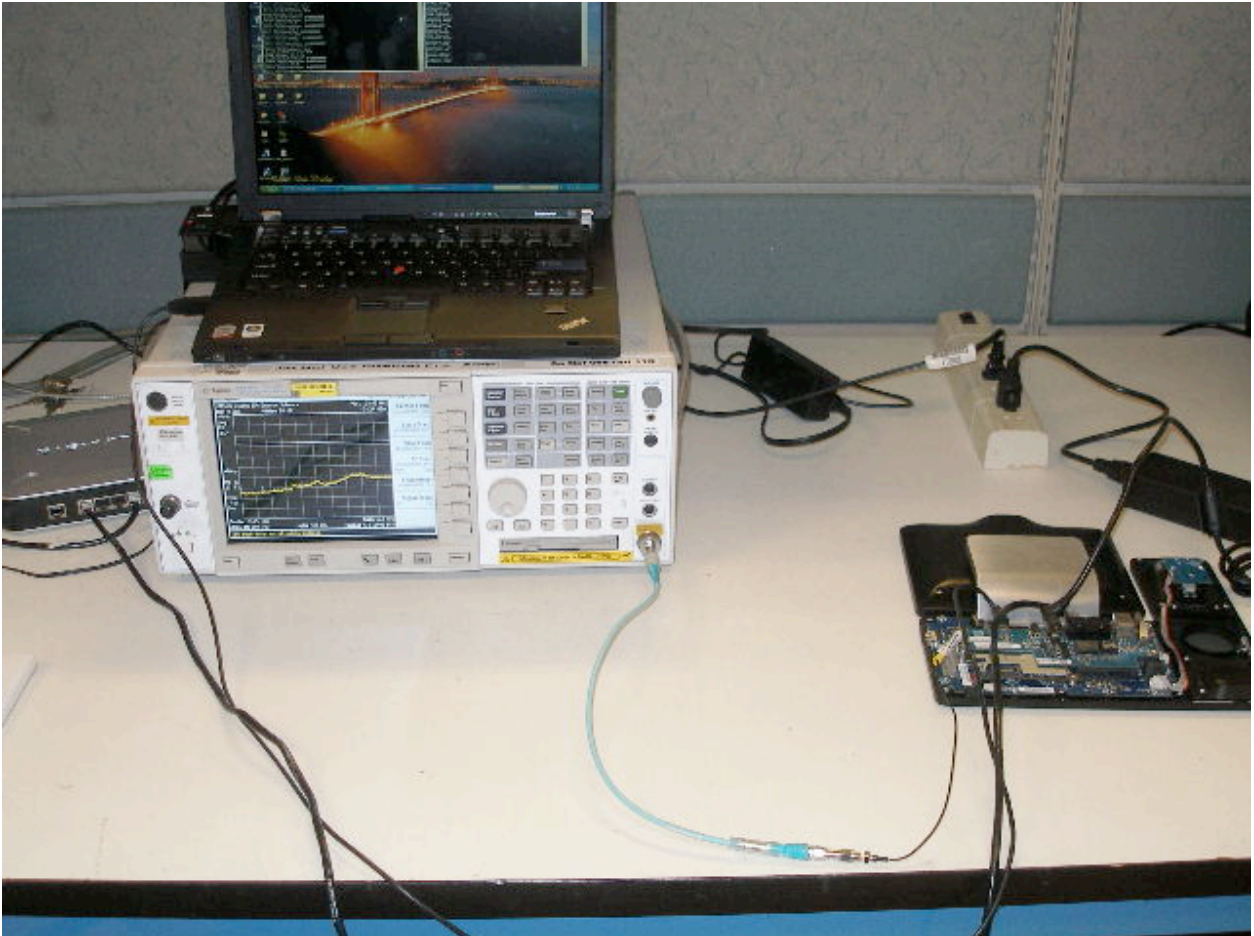


20dB Bandwidth, 5550 MHz, 40 MHz BW



20dB Bandwidth, 5670 MHz, 40 MHz BW





Title: Conducted Test Setup



Appendix B: Emission Test Results

Testing Laboratory: Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134, USA

Radiated Spurious Emissions

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

Span:	1GHz – 15GHz
Reference Level:	80 dBuV
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	1MHz
Video Bandwidth:	1 MHz for peak, 10 Hz for average
Detector:	Peak

Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

Save 2 plots: 1) Average Plot (Vertical and Horizontal), Limit= 54dBuV @3m
 2) Peak plot (Vertical and Horizontal), Limit = 74dBuV @3m

Place a marker at the end of the restricted band closest to the transmit frequency to show compliance.
Also measure any emissions in the restricted bands.

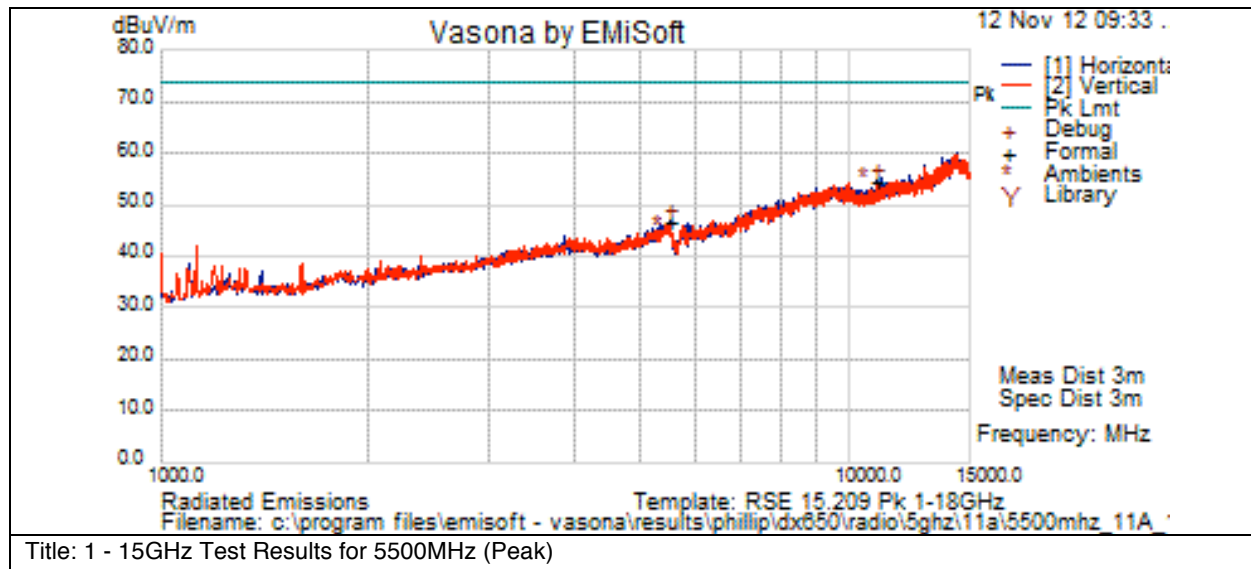
This report represents the worst case data for all supported operating modes and antennas.
System was evaluated up to 40GHz but there were no measurable emissions above 15 GHz.

Note: A Notch Filter was used during formal testing from 1 – 15GHz to help prevent the front end of the analyzer from over loading. The Notch filters used are designed to suppress Tx fundamental frequency but do not effect harmonics of the fundamental frequency from being measured



Graphical Test Results 802.11A: 1 – 15GHz (5500MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements

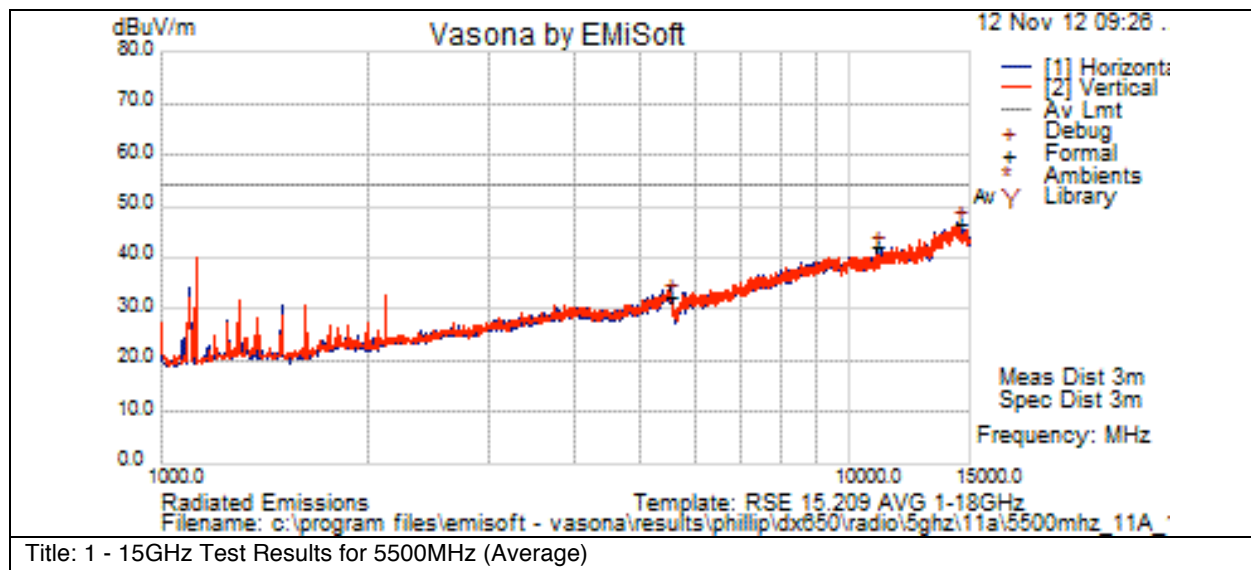


Test Results Table

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
5505.627	42.9	7.2	-3.3	46.8	Pk	H	99	360	74	-27.2	Pass	Tx Signal
11000.004	37.9	11.2	5.4	54.5	Pk	H	99	360	74	-19.5	Pass	

Graphical Test Results 802.11A: 1 – 15GHz (5500MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



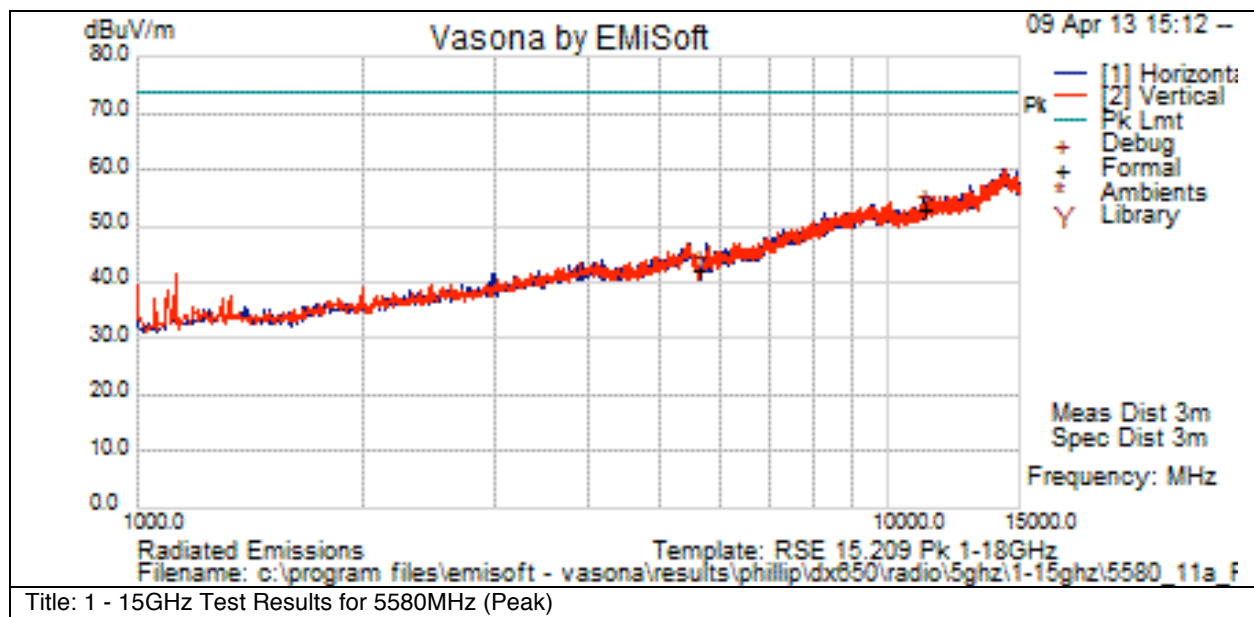
Test Results Table

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
5500	28.3	7.2	-3.4	32.2	Av	H	99	361	54	-21.8	Pass	Tx Signal
11000	25.3	11.2	5.4	41.9	Av	H	99	361	54	-12.1	Pass	
14430	26.1	14	6.8	46.8	Av	H	100	0	54	-7.2	Pass	Noise Floor



Graphical Test Results 802.11A: 1 – 15GHz (5580MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



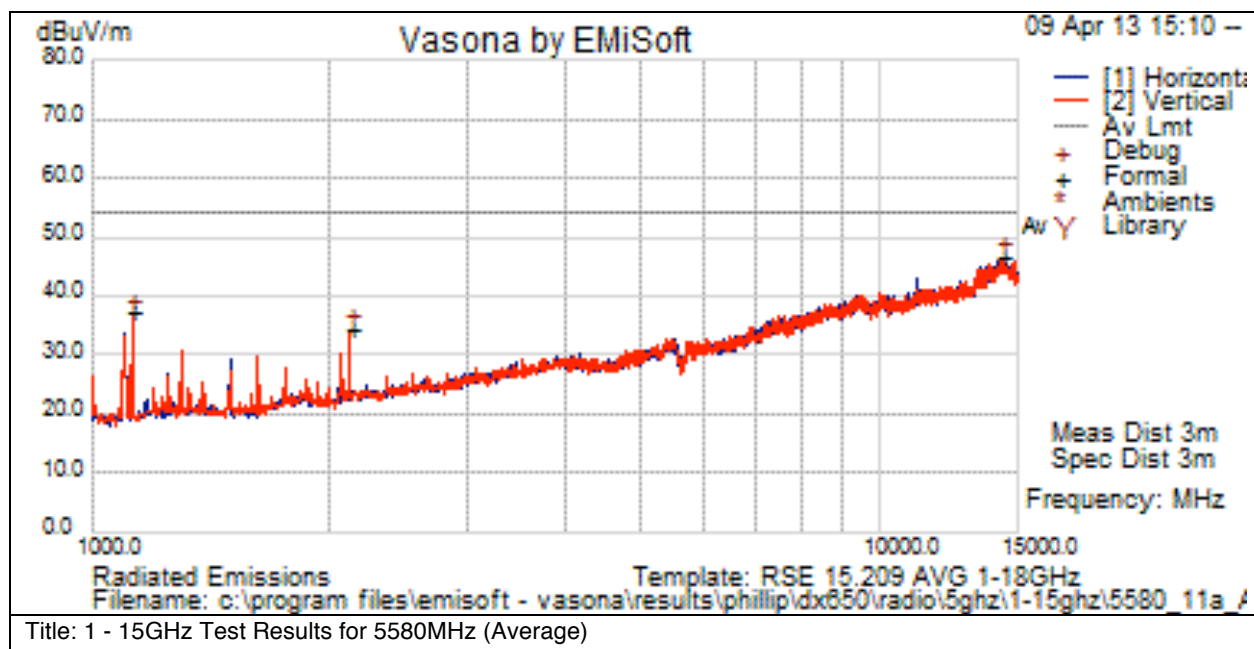
Test Results Table

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
5580.136	38.9	7.3	-3.7	42.5	Pk	V	99	360	74	-31.5	Pass	Tx Signal
11159.975	36.8	11.5	5.5	53.8	Pk	H	99	360	74	-20.2	Pass	



Graphical Test Results 802.11A: 1 – 15GHz (5580MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



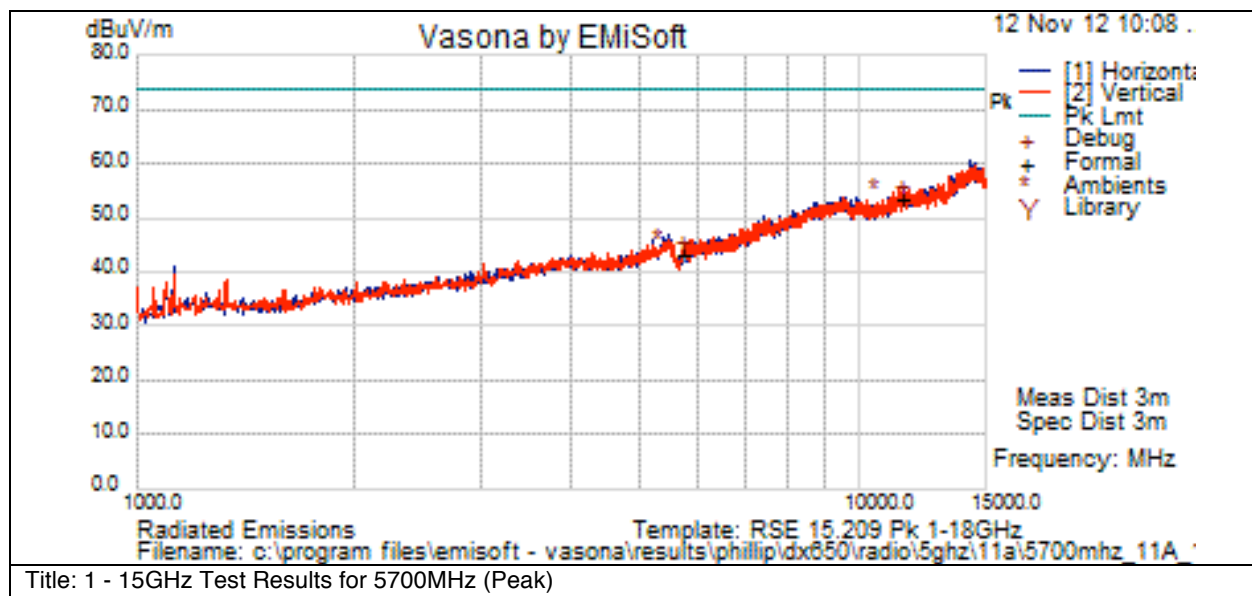
Test Results Table

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
14229.063	25.5	13.9	7.2	46.7	Av	V	100	0	54	-7.3	Pass	Noise Floor
1127.5	45.4	3.2	-8	40.6	Av	V	100	0	54	-13.4	Pass	
2136.24	40.4	3.2	-8	29.2	Av	V	100	0	54	-24.8	Pass	



Graphical Test Results 802.11A: 1 – 15GHz (5700MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



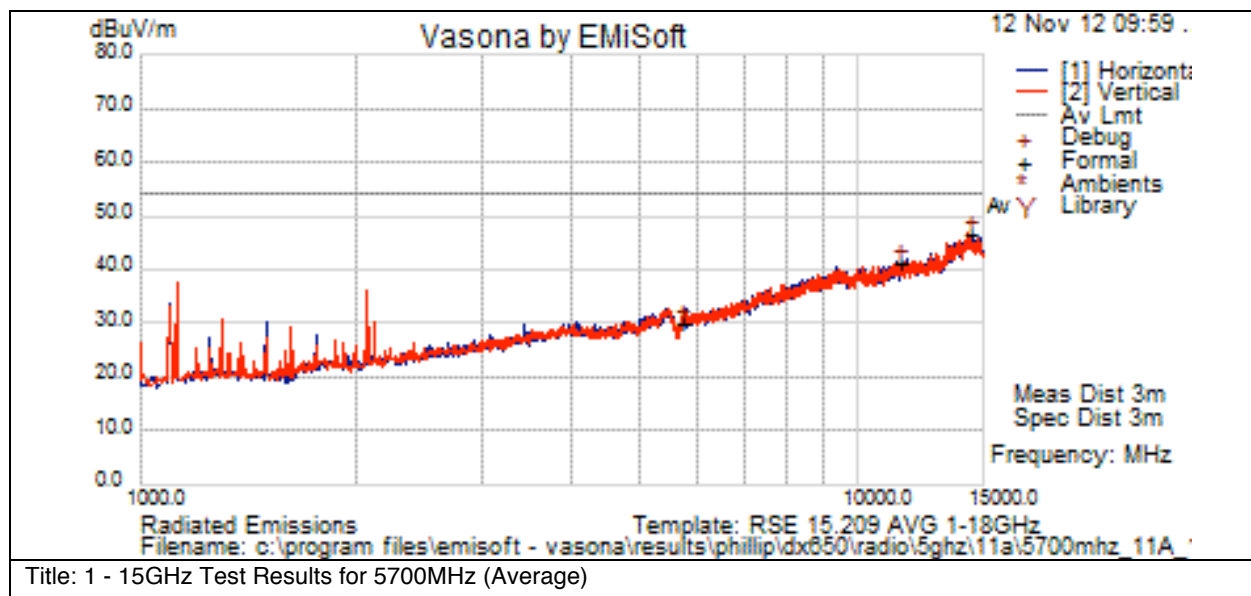
Test Results Table

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
5700.001	39.4	7.4	-3.7	43.1	Pk	V	99	360	74	-30.9	Pass	Tx Signal
11399.997	36.5	11.8	5.3	53.6	Pk	V	99	360	74	-20.4	Pass	



Graphical Test Results 802.11A: 1 – 15GHz (5700MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



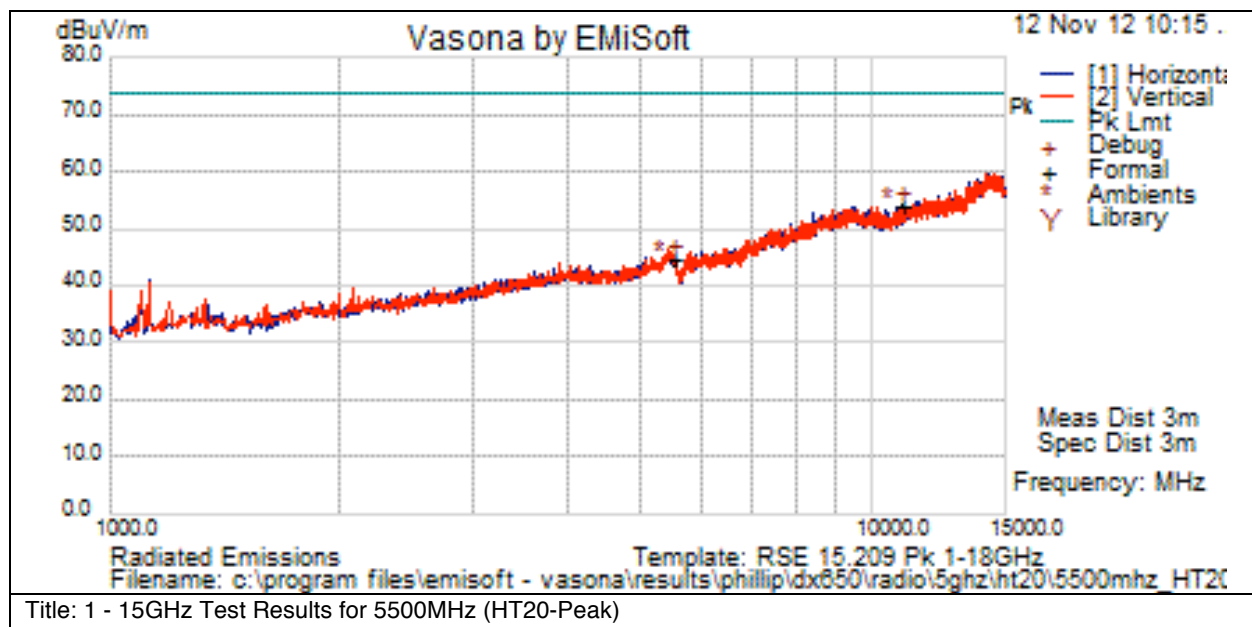
Test Results Table

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
5700	26.1	7.4	-3.7	29.8	Av	H	99	360	54	-24.2	Pass	Tx Signal
11400.024	24.1	11.8	5.3	41.2	Av	H	99	360	54	-12.8	Pass	
14329.063	25.5	13.9	7.2	46.7	Av	V	100	0	54	-7.3	Pass	Noise Floor



Graphical Test Results HT20: 1 – 15GHz (5500MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



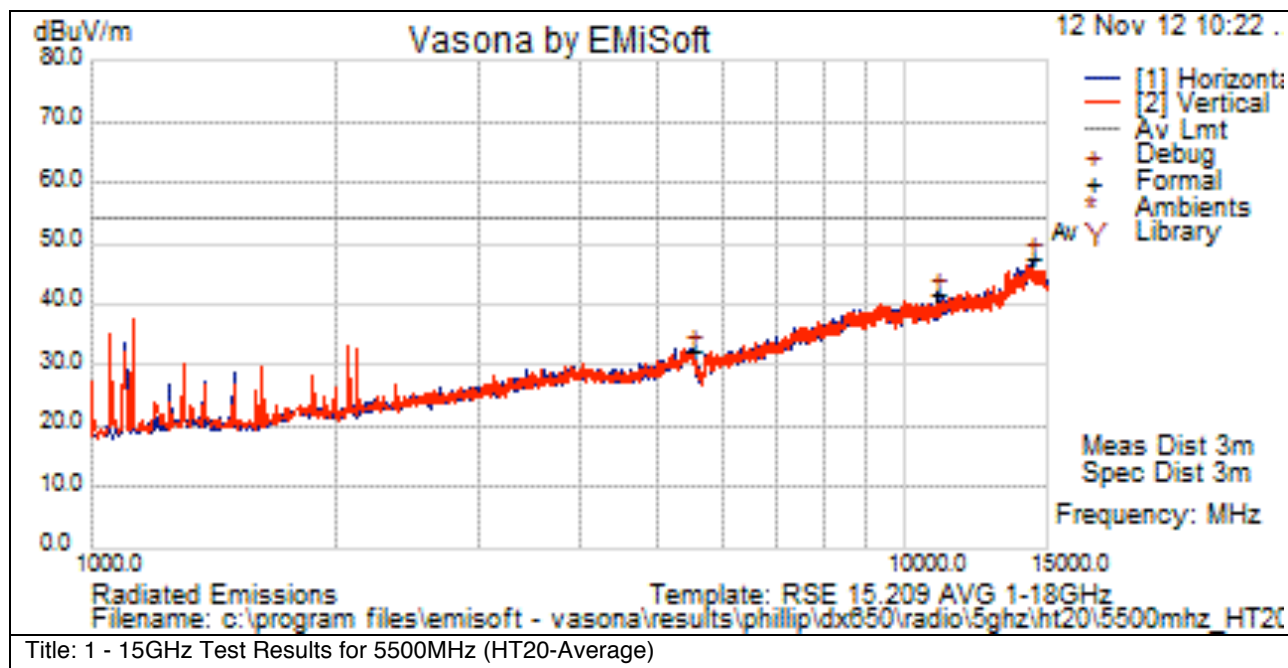
Test Results Table

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
5500.002	41	7.2	-3.4	44.9	Pk	H	99	361	74	-29.1	Pass	Tx Signal
11000.001	37.5	11.2	5.4	54.1	Pk	H	99	361	74	-19.9	Pass	



Graphical Test Results HT20: 1 – 15GHz (5500MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



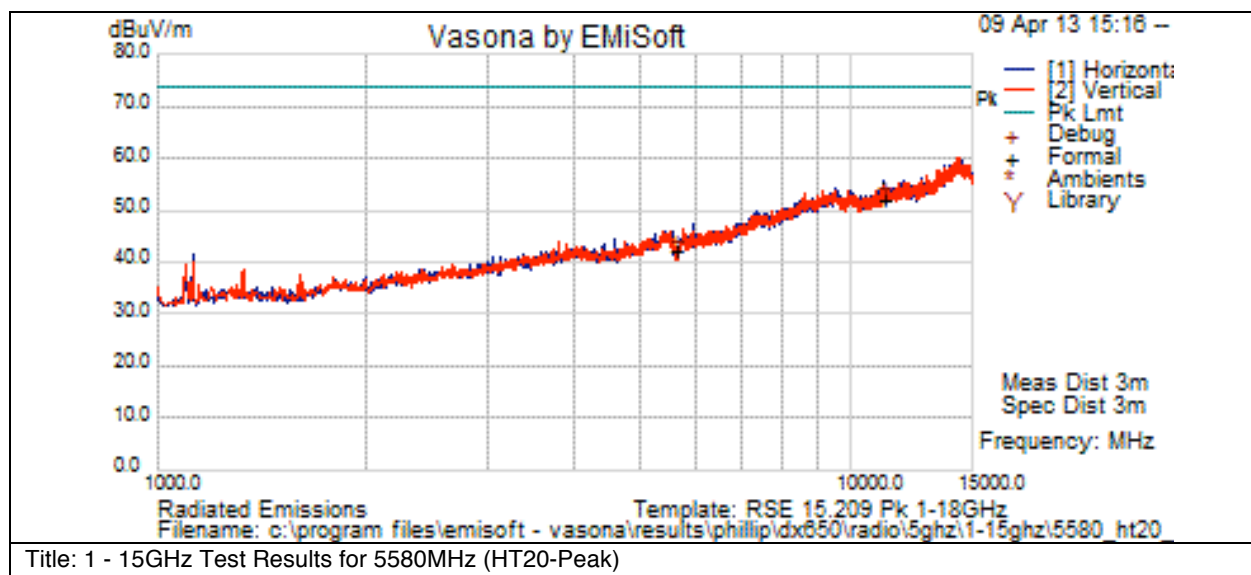
Test Results Table

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
5500	28.7	7.2	-3.4	32.5	Av	H	99	360	54	-21.5	Pass	Tx Signal
11003.227	25.3	11.2	5.4	41.9	Av	H	99	360	54	-12.1	Pass	
14419.375	26.6	14	6.9	47.4	Av	H	100	0	54	-6.6	Pass	Noise Floor



Graphical Test Results HT20: 1 – 15GHz (5580MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



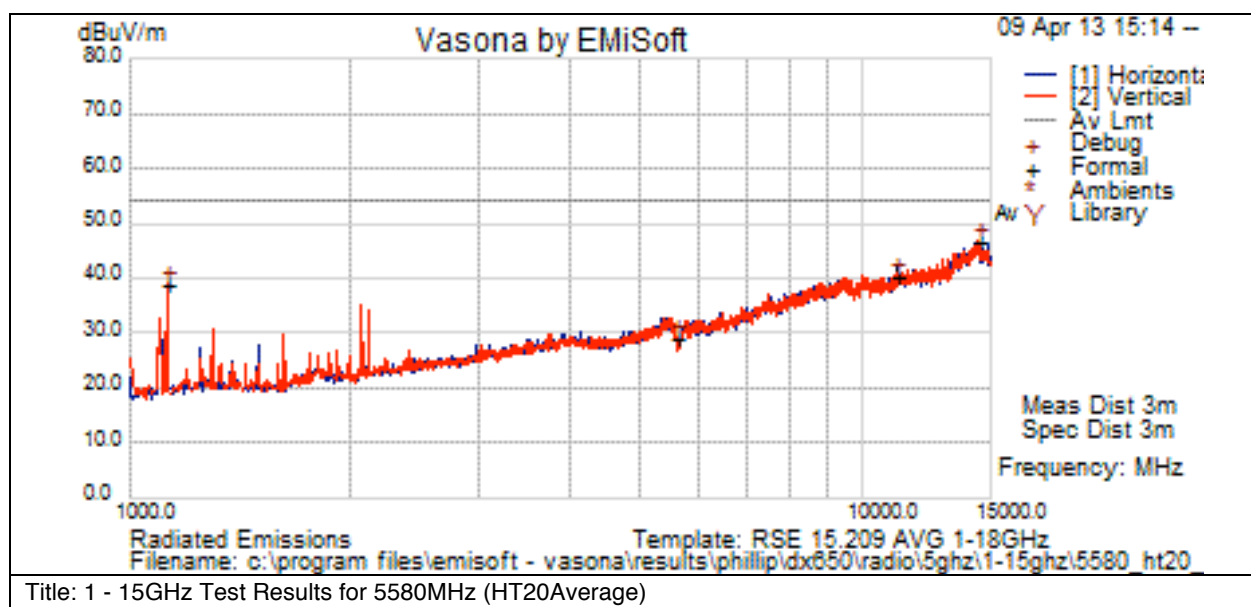
Test Results Table

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
5580.365	38.3	7.3	-3.7	42	Pk	V	99	360	74	-32	Pass	Tx Signal
11160.309	35.1	11.5	5.5	52.1	Pk	H	99	360	74	-21.9	Pass	



Graphical Test Results HT20: 1 – 15GHz (5580MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



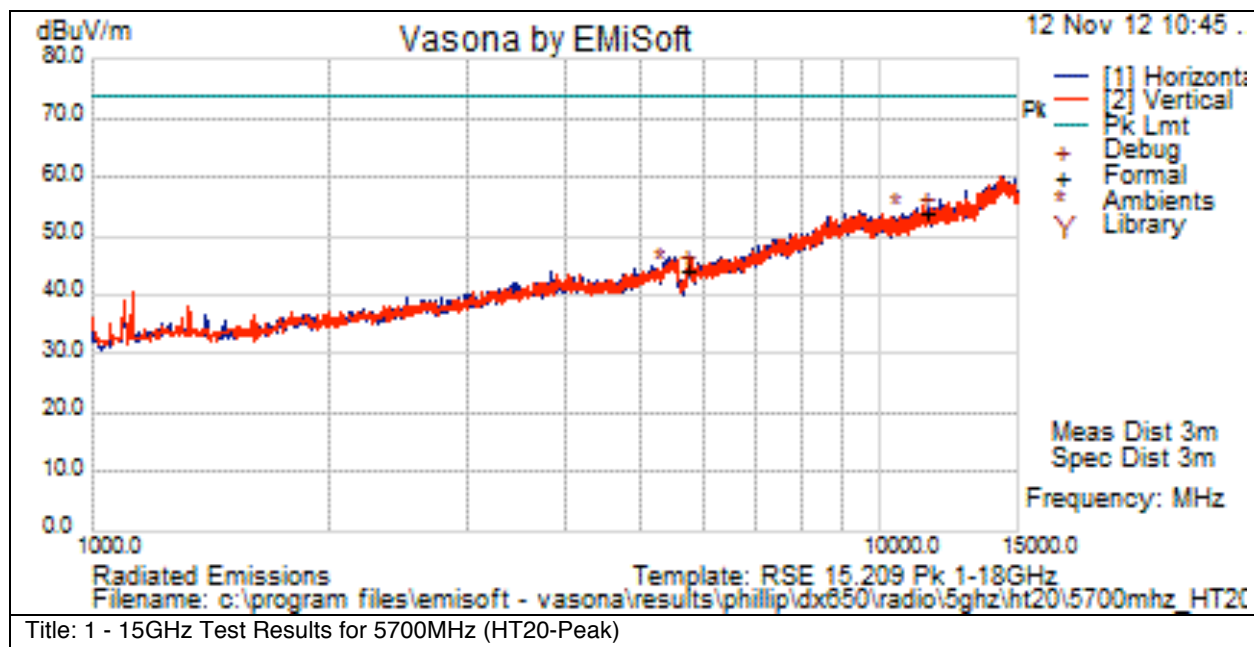
Test Results Table

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
5580.408	25.5	7.3	-3.7	29.1	Av	H	99	360	54	-24.9	Pass	Tx Signal
11200.001	25	11.5	5.5	42	Av	H	99	360	54	-12	Pass	
14451.25	25.9	14	6.8	46.7	Av	V	100	0	54	-7.3	Pass	Noise Floor
1127.5	43.7	3.2	-8	38.9	Av	V	100	0	54	-15.1	Pass	



Graphical Test Results HT20: 1 – 15GHz (5700MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



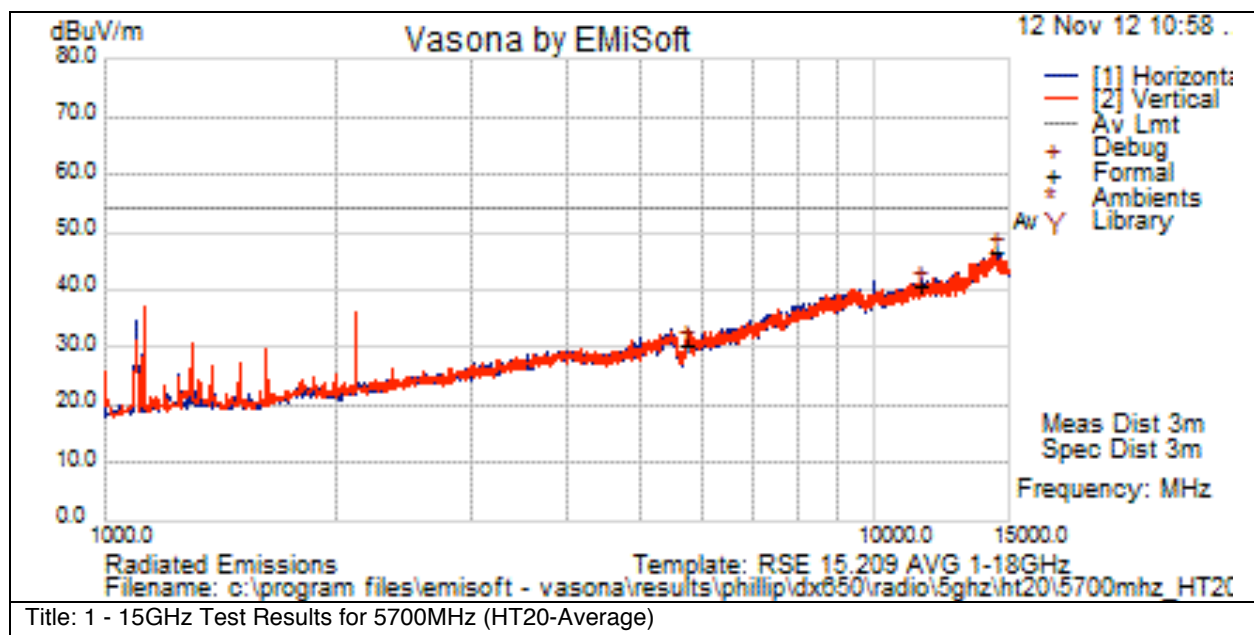
Test Results Table

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
5700.008	40.4	7.4	-3.7	44.1	Pk	V	99	360	74	-29.9	Pass	Tx Signal
11400.022	36.7	11.8	5.3	53.8	Pk	H	99	360	74	-20.2	Pass	



Graphical Test Results HT20: 1 – 15GHz (5700MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



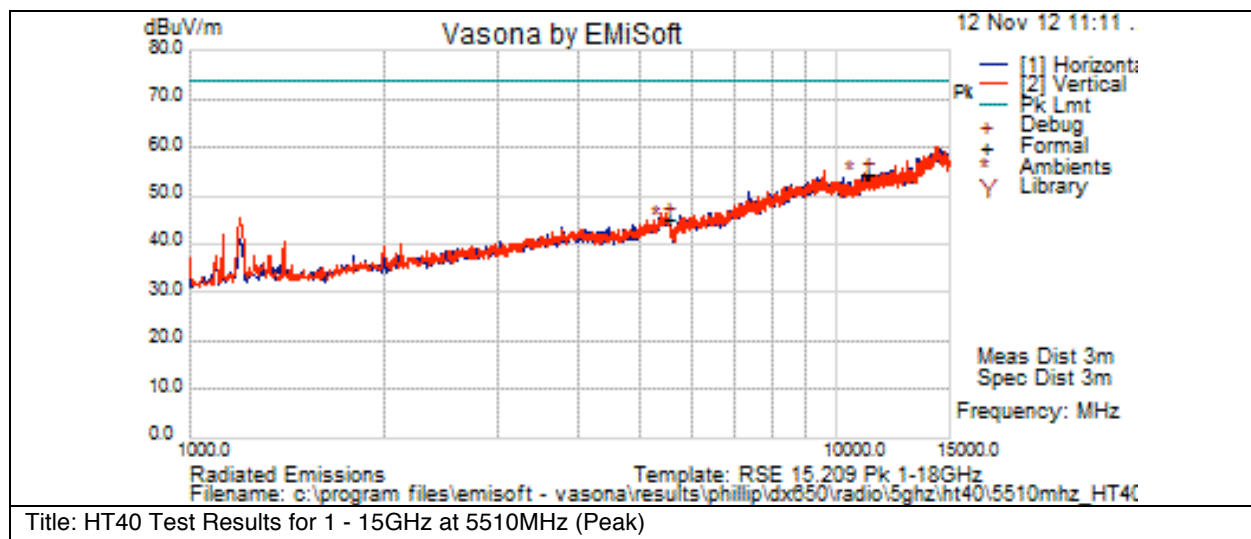
Test Results Table

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
5700	26.6	7.4	-3.7	30.3	Av	H	99	360	54	-23.7	Pass	Tx Signal
11400.017	23.8	11.8	5.3	40.8	Av	H	99	360	54	-13.2	Pass	
14323.75	25.6	14	7.3	46.8	Av	V	100	0	54	-7.2	Pass	Noise Floor



Graphical Test Results HT40: 1 – 15GHz (5510MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements

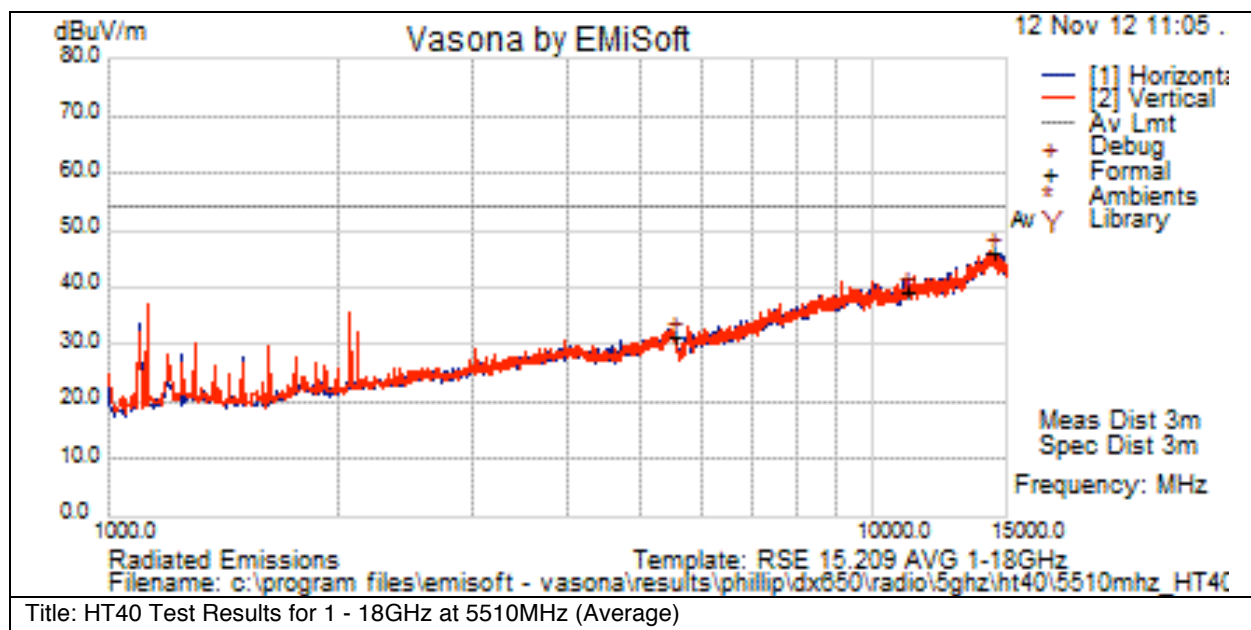


Test Results Table

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
5510.001	41.1	7.3	-3.3	45	Pk	V	99	360	74	-29	Pass	Tx Signal
11120.006	37.8	11.3	5.5	54.5	Pk	H	99	360	74	-19.5	Pass	

Graphical Test Results HT40: 1 – 15GHz (5510MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements

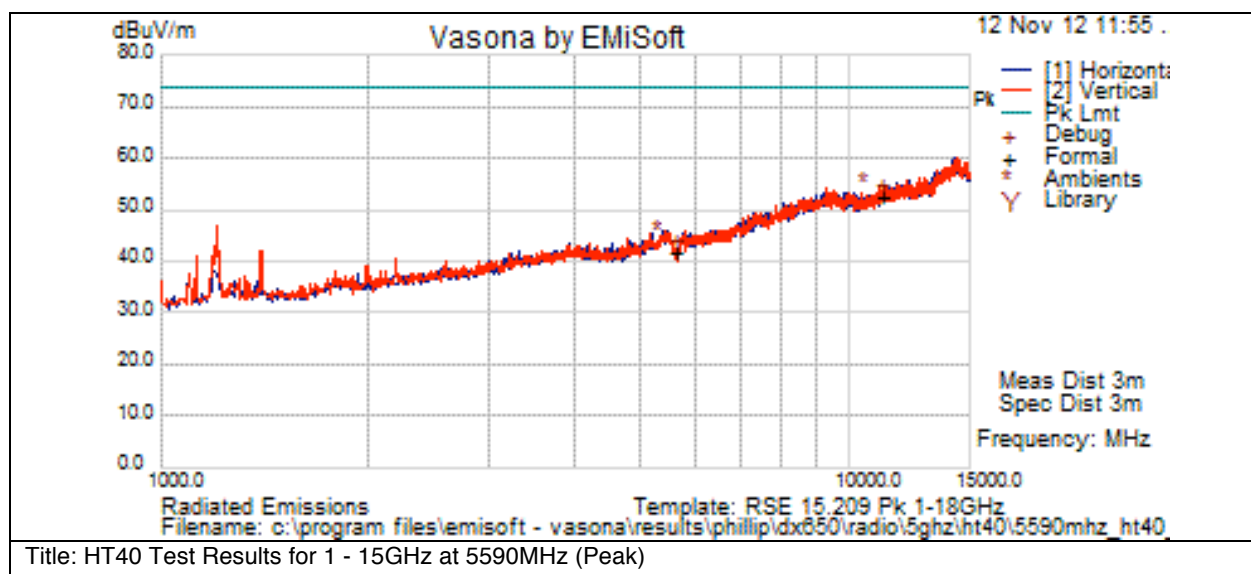


Test Results Table

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
5510.005	27.6	7.3	-3.3	31.5	Av	V	99	360	54	-22.5	Pass	Tx Signal
11020.013	22.8	11.2	5.4	39.4	Av	H	99	360	54	-14.6	Pass	
14334.375	25.1	13.9	7.2	46.2	Av	H	100	0	54	-7.8	Pass	Noise Floor

Graphical Test Results HT40: 1 – 15GHz (5590MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements

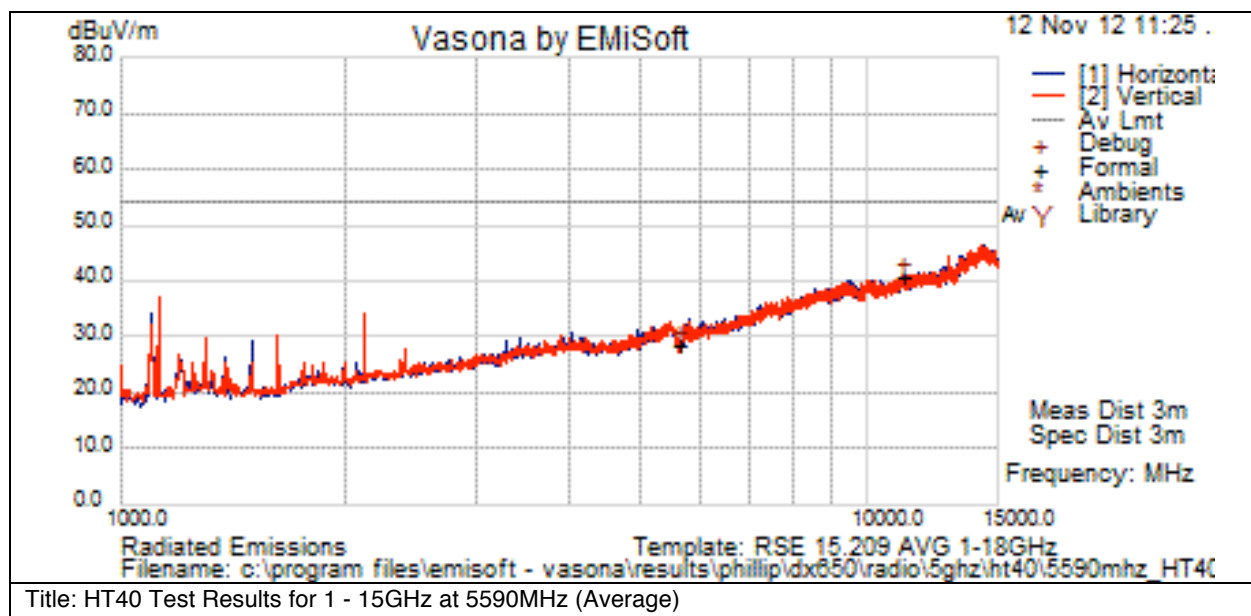


Test Results Table

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
5590.017	38.1	7.3	-3.8	41.7	Pk	H	99	361	74	-32.3	Pass	Tx Signal
11180.008	35.8	11.4	5.5	52.7	Pk	H	99	361	74	-21.3	Pass	

Graphical Test Results HT40: 1 – 15GHz (5590MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Test Results Table

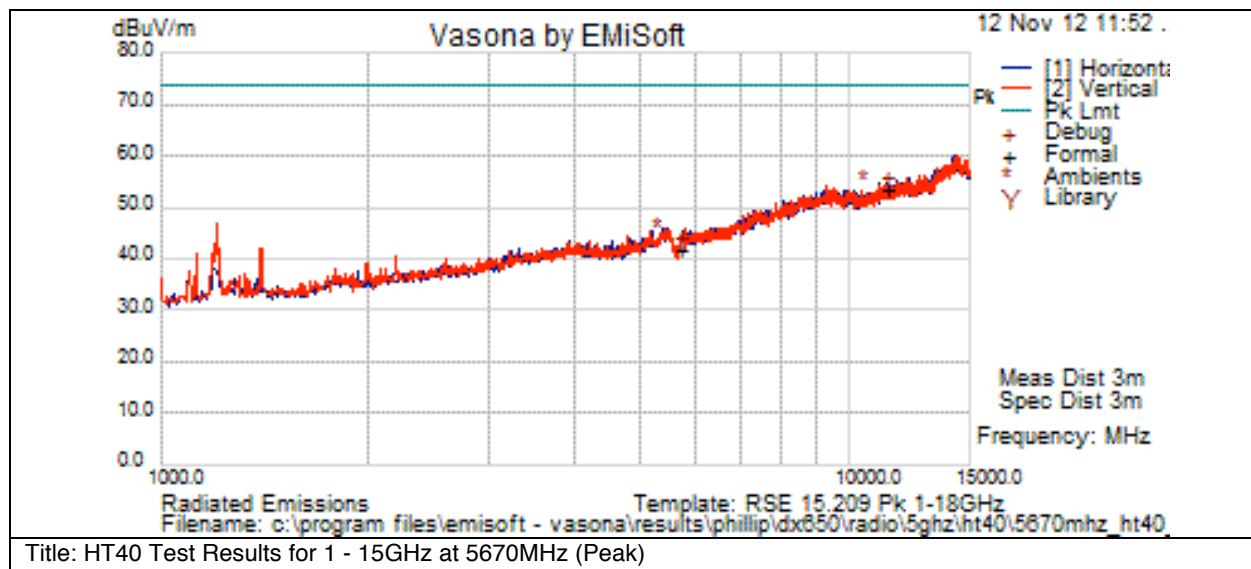
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5590.008	24.9	7.3	-3.8	28.5	Av	V	99	360	54	-25.5	Pass	Tx Signal



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
11180.053	23.9	11.4	5.5	40.7	Av	H	99	360	54	-13.3	Pass	

Graphical Test Results HT40: 1 – 15GHz (5670MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



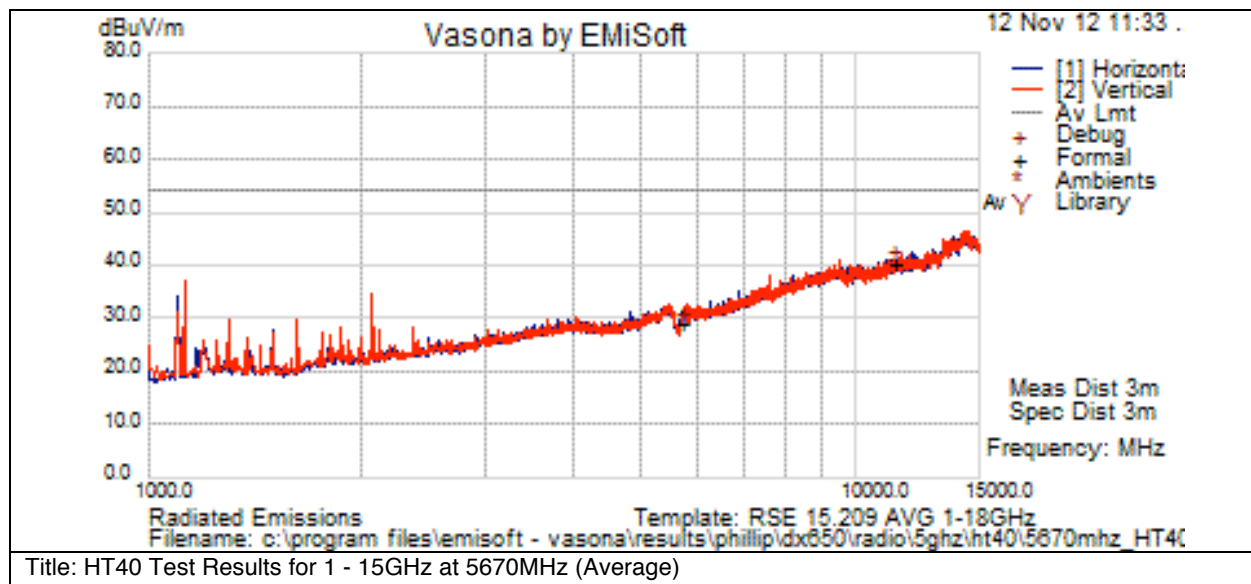
Test Results Table



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
5670.001	38.3	7.4	-3.8	41.9	Pk	H	99	360	74	-32.1	Pass	Tx Signal
11340.003	36.6	11.6	5.4	53.6	Pk	H	99	360	74	-20.4	Pass	

Graphical Test Results HT40: 1 – 15GHz (5670MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Test Results Table



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
5670.014	25.1	7.4	-3.8	28.7	Av	H	99	360	54	-25.3	Pass	Tx Signal
11340.012	23.3	11.6	5.4	40.4	Av	H	99	360	54	-13.7	Pass	

Co-Locator Radiated Spurious Emissions

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

Span: 1GHz – 15GHz
Reference Level: 80 dBuV
Attenuation: 10 dB
Sweep Time: Coupled
Resolution Bandwidth: 1MHz
Video Bandwidth: 1 MHz for peak, 10 Hz for average
Detector: Peak

Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

Save 2 plots: 1) Average Plot (Vertical and Horizontal), Limit= 54dBuV @3m
2) Peak plot (Vertical and Horizontal), Limit = 74dBuV @3m

Place a marker at the end of the restricted band closest to the transmit frequency to show compliance.
Also measure any emissions in the restricted bands.

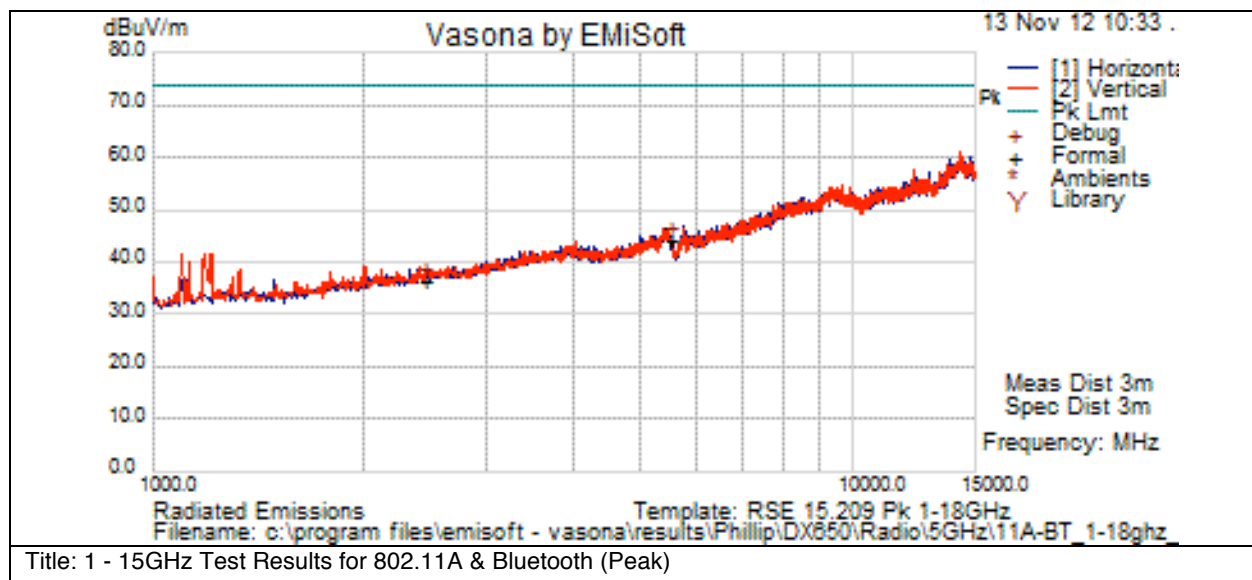
This report represents the worst case data for all supported operating modes and antennas.
There are no measurable emissions above 15 GHz.

Note: A Notch Filter was used during formal testing from 1 – 15GHz to help prevent the front end of the analyzer from over loading. The Notch filters used are designed to suppress Tx fundamental frequency but do not effect harmonics of the fundamental frequency from being measured



Graphical Test Results for 802.11A & Bluetooth: 1 – 15GHz (Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements

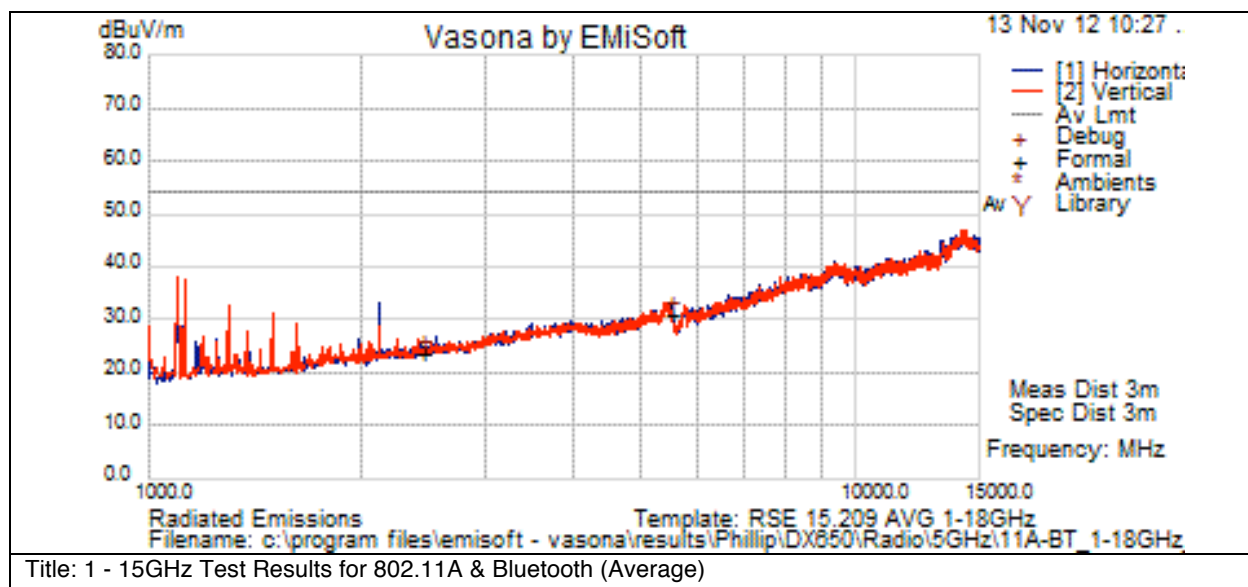


Test Results Table

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
2441.041	37	4.6	-5.2	36.4	Pk	H	99	360	74	-37.6	Pass	Tx Signal
5500.079	40.2	7.2	-3.4	44	Pk	H	99	360	74	-30	Pass	Tx Signal

Graphical Test Results for 802.11A & Bluetooth: 1 – 15GHz (Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



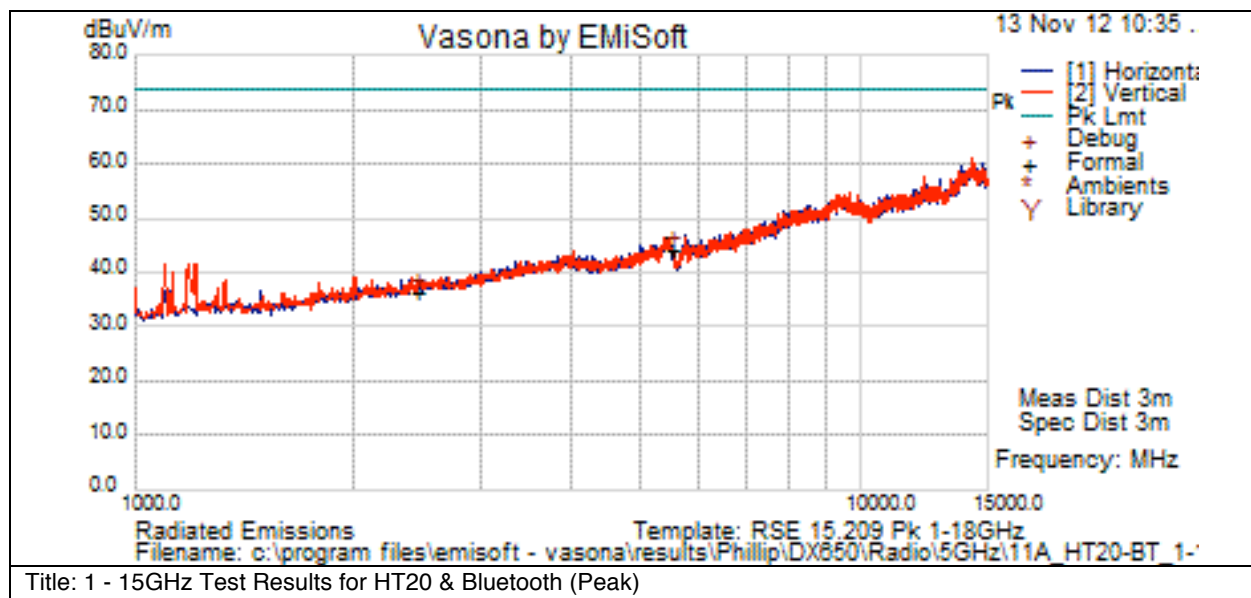


Test Results Table

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
2441.026	24.4	4.6	-5.2	23.7	Av	H	99	360	54	-30.3	Pass	Tx Signal
5500.106	26.9	7.2	-3.4	30.7	Av	H	99	360	54	-23.3	Pass	Tx Signal

Graphical Test Results for HT20 & Bluetooth: 1 – 15GHz (Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements

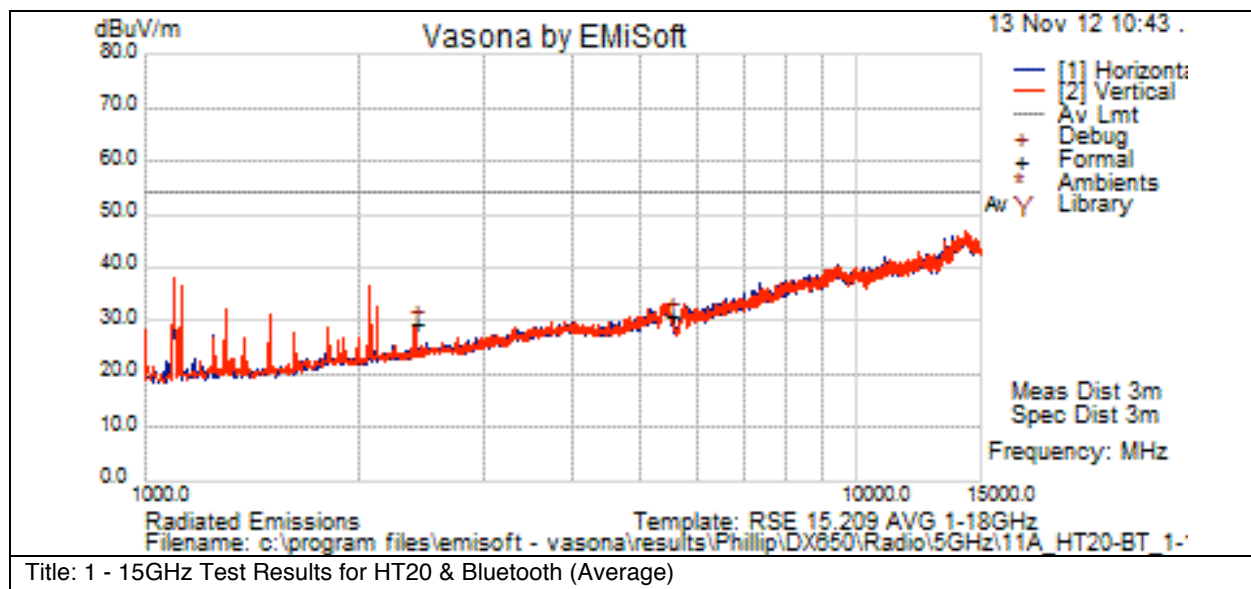


Test Results Table

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
2441.01	37	4.6	-5.2	36.4	Pk	V	99	360	74	-37.6	Pass	Tx Signal
5500.006	40.2	7.2	-3.4	44	Pk	H	99	360	74	-30	Pass	Tx Signal

Graphical Test Results for HT20 & Bluetooth: 1 – 15GHz (Average)

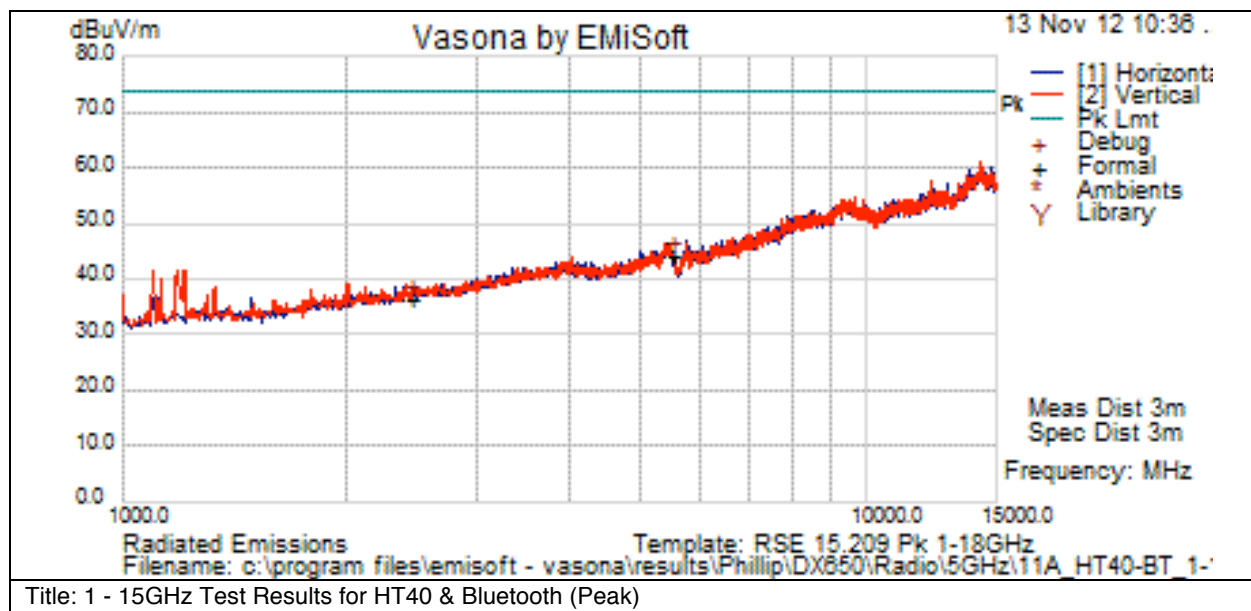
Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements

**Test Results Table**

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
2402.02	29.8	4.6	-5.1	29.3	Av	V	99	360	54	-24.7	Pass	Tx Signal
5500.154	26.9	7.2	-3.4	30.8	Av	H	99	360	54	-23.2	Pass	Tx Signal

Graphical Test Results for HT40 & Bluetooth: 1 – 15GHz (Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



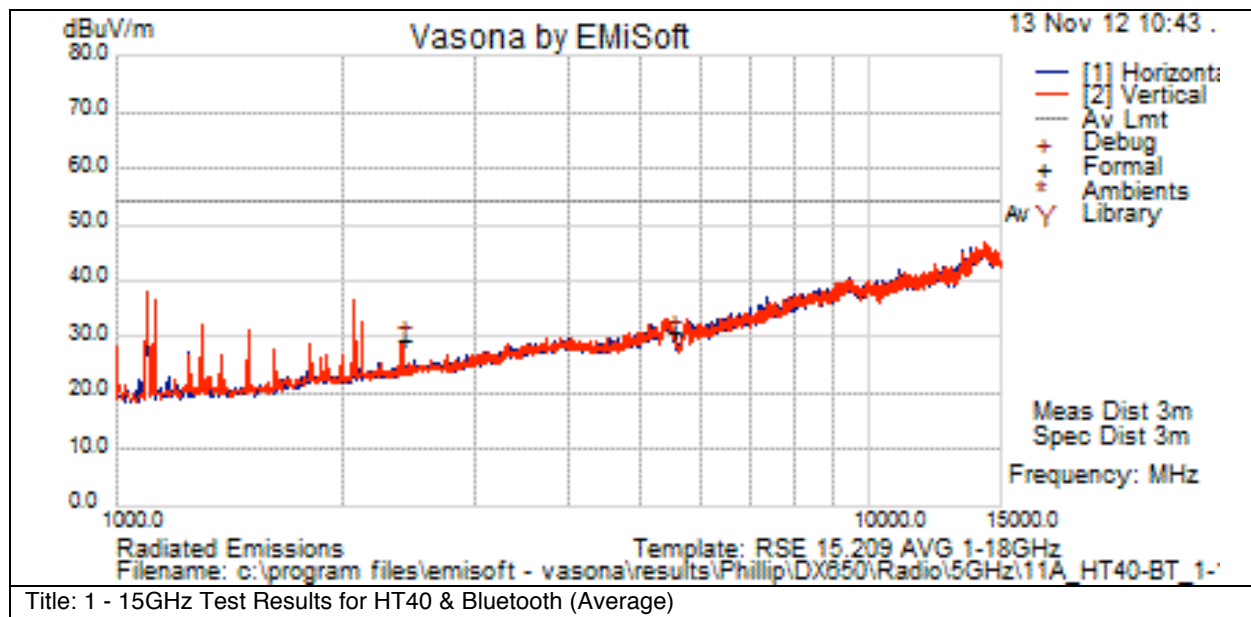
Test Results Table

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
2441.01	37	4.6	-5.2	36.4	Pk	V	99	360	74	-37.6	Pass	Tx Signal
5509.999	40.3	7.3	-3.3	44.2	Pk	H	99	360	74	-29.8	Pass	Tx Signal

Graphical Test Results for HT40 & Bluetooth: 1 – 15GHz (Average)



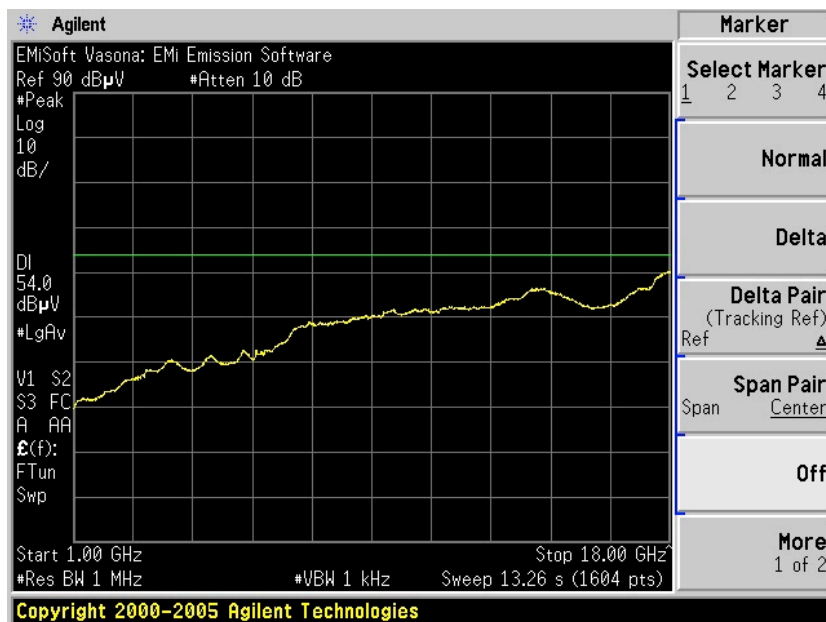
Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



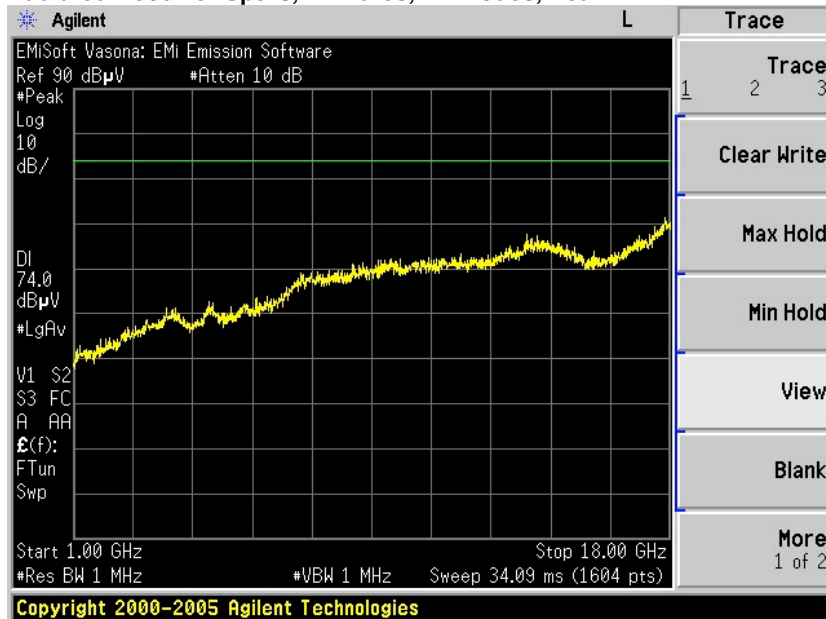
Test Results Table

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
2402.02	29.8	4.6	-5.1	29.3	Av	V	99	360	54	-24.7	Pass	Tx Signal
5510.019	26.8	7.3	-3.3	30.7	Pk	H	99	360	54	-23.3	Pass	Tx Signal

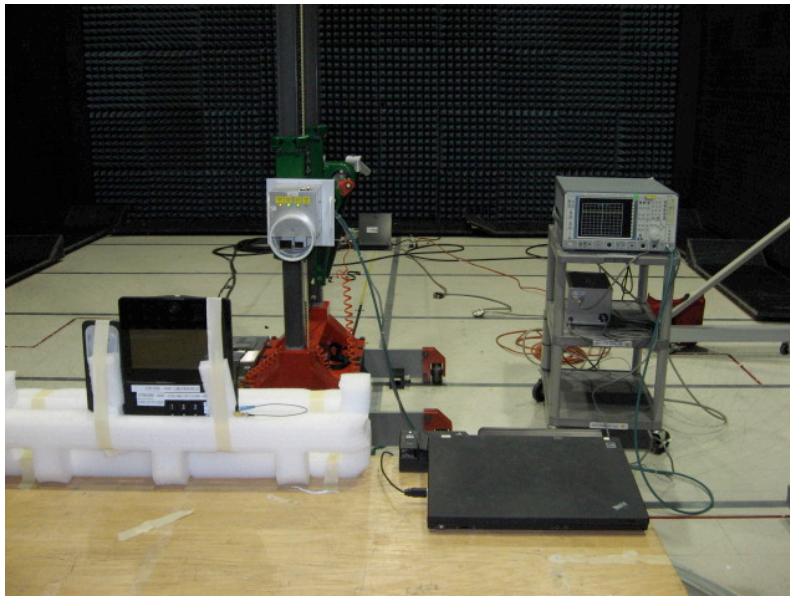
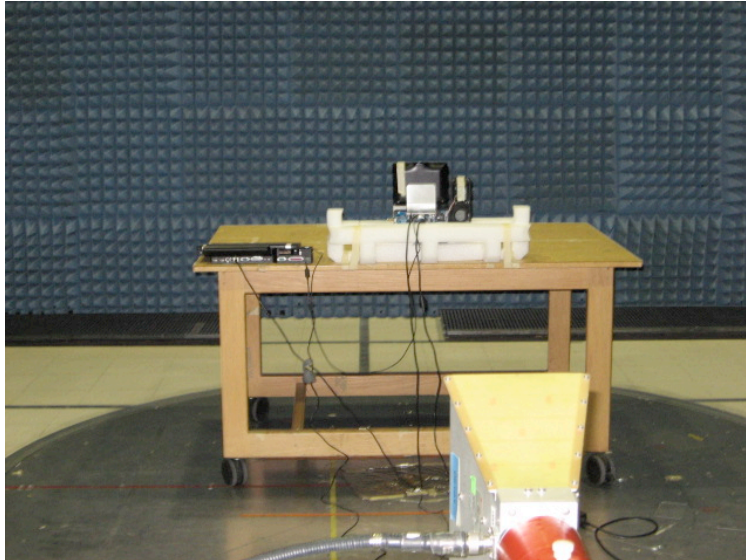
Radiated Receiver Spurs, All Rates, All Modes, Average



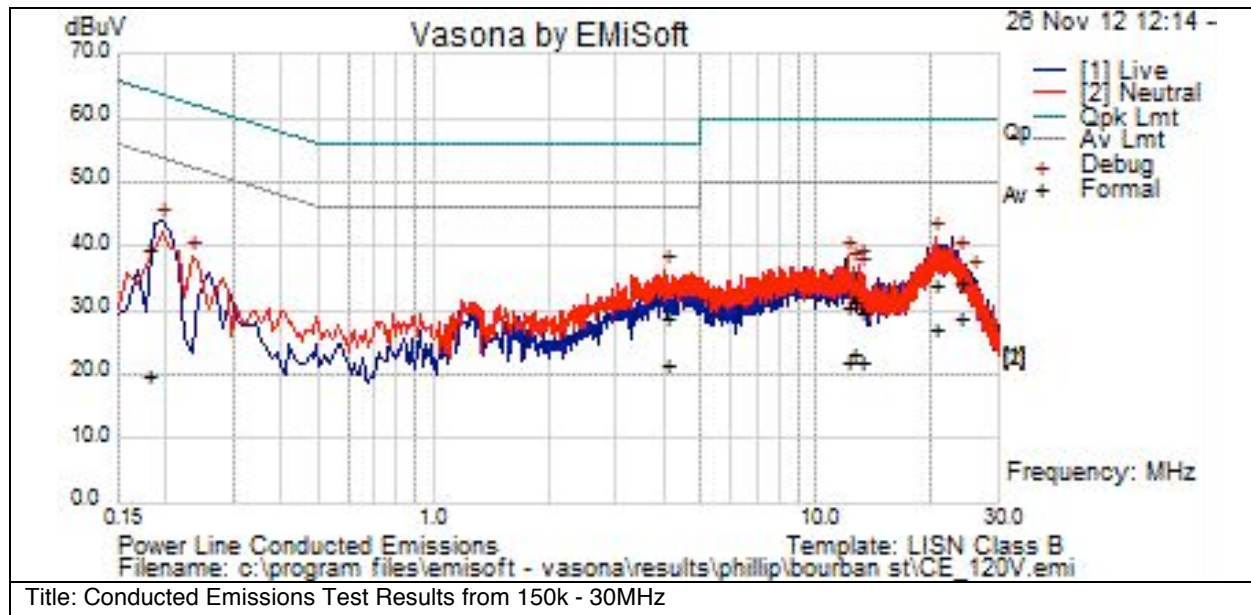
Radiated Receiver Spurs, All Rates, All Modes, Peak



Radiated Spurs/Harmonics Test Setup



Conducted emissions



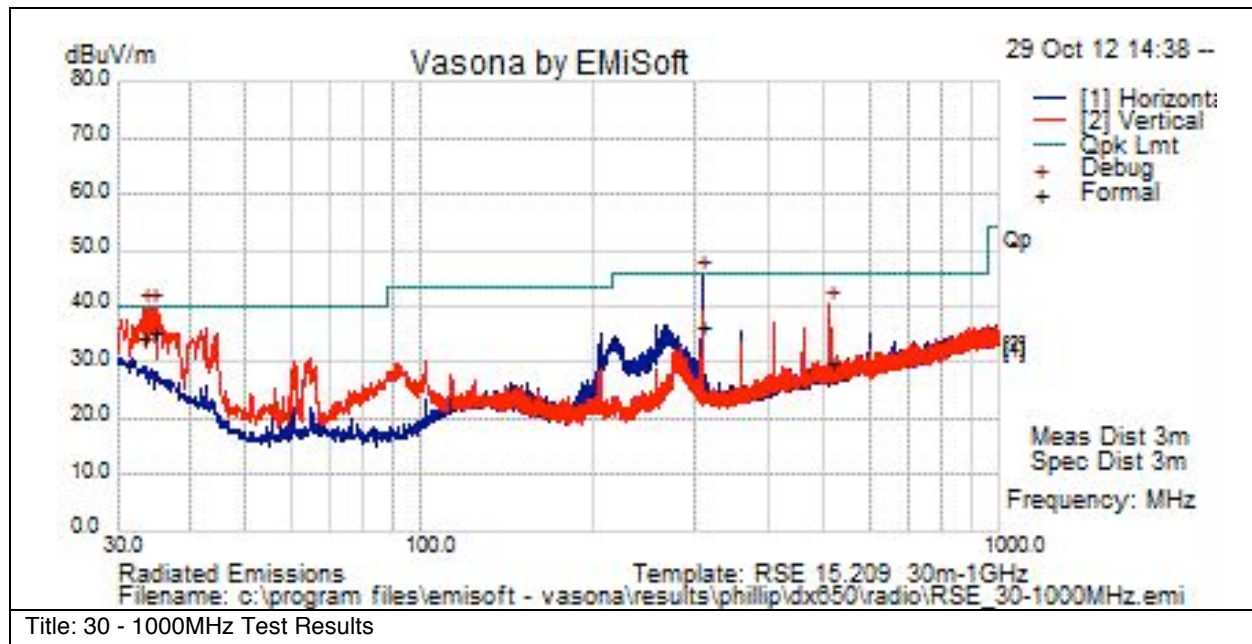
Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
23.664	7.5	21	0.2	28.6	Av	L	50	-21.4	Pass	
20.566	6.5	20.4	0.2	27.1	Av	N	50	-22.9	Pass	
4.035	1.5	20	0	21.6	Av	N	46	-24.4	Pass	
0.1799	18.6	21	0	39.6	Qp	L	64.5	-24.9	Pass	
23.664	13.4	21	0.2	34.5	Qp	L	60	-25.5	Pass	
20.566	13.2	20.4	0.2	33.8	Qp	N	60	-26.2	Pass	
12.47	2.7	20.2	0.1	23.1	Av	N	50	-26.9	Pass	
4.035	8.5	20	0	28.6	Qp	N	56	-27.4	Pass	
13.054	1.4	20.3	0.1	21.8	Av	N	50	-28.2	Pass	
12.136	1.5	20.2	0.1	21.8	Av	N	50	-28.2	Pass	
12.47	10.8	20.2	0.1	31.2	Qp	N	60	-28.8	Pass	
12.136	10	20.2	0.1	30.3	Qp	N	60	-29.7	Pass	
13.054	9.1	20.3	0.1	29.5	Qp	N	60	-30.5	Pass	
0.1799	-1.2	21	0	19.8	Av	L	54.5	-34.7	Pass	



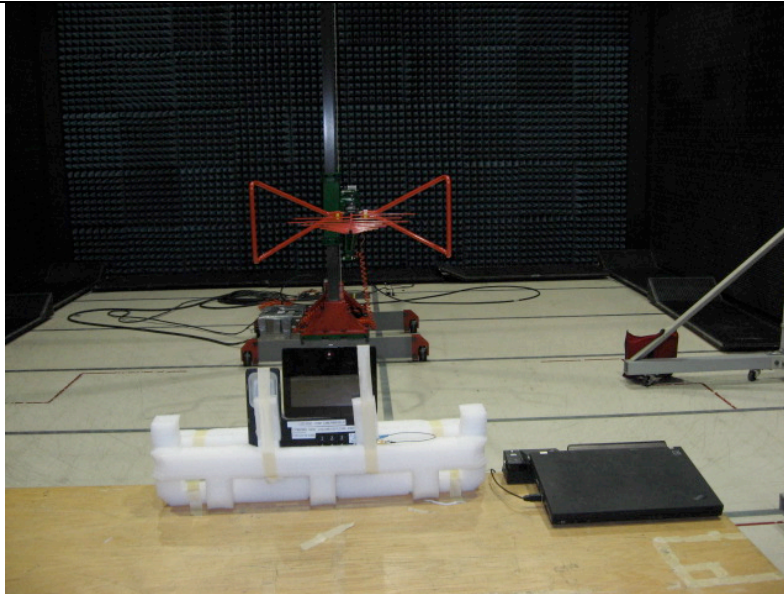
Title: Conducted Emissions Configuration Photograph

Radiated emissions



Test Results Table

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
34.38	16.9	0.5	18	35.4	Qp	V	110	66	40	-4.6	Pass	
33.179	14.9	0.5	18.9	34.3	Qp	V	105	38	40	-5.7	Pass	
307.047	21.2	1.6	13.6	36.4	Qp	H	103	97	46	-9.6	Pass	
511.908	10	2.1	17.8	29.8	Qp	V	101	148	46	-16.2	Pass	



Title: Radiated Emissions Configuration Photograph



Maximum Permissible Exposure (MPE) Calculations

15.407: U-NII devices are subject to the radio frequency radiation exposure requirements specified in Sec. 1.1307(b), Sec. 2.1091 and Sec. 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

Given

$$E = \sqrt{(30 \cdot P \cdot G)/d} \text{ and } S = E^2/3770$$

where

E=Field Strength in Volts/meter

P=Power in Watts

G=Numeric Antenna Gain

d=Distance in meters

S=Power Density in mW/cm²

Combine equations and rearrange the terms to express the distance as a function of the remaining variables:

$$d = \sqrt{((30 \cdot P \cdot G)/(3770 \cdot S))}$$

Changing to units of power in mW and distance in cm, using:

$$P(\text{mW}) = P(\text{W})/1000 \quad d(\text{cm}) = 100 \cdot d(\text{m})$$

yields

$$d = 100 \cdot \sqrt{((30 \cdot (P/1000) \cdot G)/(3770 \cdot S))}$$

$$d = 0.282 \cdot \sqrt{(P \cdot G/S)}$$

where

d=Distance in cm

P=Power in mW

G=Numerica Antenna Gain

S=Power Density in mW/cm²

Substituting the logarithmic form of power and gain using:

$$P(\text{mW}) = 10^{(P(\text{dBm})/10)} \quad G(\text{numeric}) = 10^{(G(\text{dBi})/10)}$$

yields

$$d = 0.282 \cdot 10^{((P+G)/20)/\sqrt{S}} \quad \text{Equation (1)}$$

and

$$s = ((0.282 \cdot 10^{((P+G)/20)})/d)^2 \quad \text{Equation (2)}$$

where

d=MPE distance in cm

P=Power in dBm

G=Antenna Gain in dBi

S=Power Density in mW/cm²



Equation (1) and the measured peak power are used to calculate the MPE distance. Note that for mobile or fixed location transmitters such as an access point, the minimum separation distance is 20 cm even if the calculations indicate that the MPE distance may be less.

$S=1\text{mW/cm}^2$ maximum. The highest supported antenna gain is 6 dBi (9dBi with beamforming). Using the peak power levels recorded in the test report along with Equation 1 above, the MPE distances are calculated as follows.

Frequency (MHz)	Bit Rate (Mbps)	Power Density (mW/cm ²)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)	Limit (cm)	Margin (cm)
5500	6	1	15.2	3.8	2.51	20	17.49
5580	6	1	15.3	3.8	2.55	20	17.45
5590	M0	1	15.1	3.8	2.48	20	17.52
5700	6	1	15.0	3.8	2.44	20	17.56

MPE Calculations

To maintain compliance, installations will assure a separation distance of at least 20cm.

Using Equation 2, the MPE levels (s) at 20 cm are calculated as follows:

Frequency (MHz)	Bit Rate (Mbps)	MPE Distance (cm)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Margin (mW/cm ²)
5500	6	20	15.2	9	0.05	1	0.95
5580	6	20	15.32	9	0.05	1	0.95
5590	M0	20	15.07	9	0.05	1	0.95
5700	6	20	14.95	9	0.05	1	0.95



Appendix C: Test Equipment used to perform the test

Equip#	Manufacturer/ Model	Description	Last Cal	Next Due
041986	Murata Electronics MXGS83RK3000	Special Radio Test Adaptor Cable	29-MAY-2012	29-MAY-2013
034974	Midwest Microwave ATT-0640-20-29M-02	Attenuator, 20dB, DC-40GHz	25-MAY-2012	25-MAY-2013
035609	Micro-Tronics BRC50703-02	Notch Filter, SB: 5.150-5.350 GHz, to 11 GHz	06-JUL-2012	06-JUL-2013
033988	Agilent E4446A	Precision Spectrum Analyzer	27-NOV-2012	27-NOV-2013
008024	Huber + Suhner SF106A	3 meter Sucoflex cable	05-NOV-2012	05-NOV-2013
030443	Micro-Coax UFB311A-0-1560-520520	RF Coaxial Cable, to 18GHz, 156 In.	05-NOV-2012	05-NOV-2013
033602	Midwest Microwave CSY-NMNM-80-273001	RF Coaxial Cable, 27ft. to 18GHz	05-NOV-2012	05-NOV-2013
045588	Sunol Sciences JB1	Combination Antenna	14-DEC-2011	14-DEC-2012
045051	Rohde & Schwarz ESCI	EMI Test Receiver	02-NOV-2012	02-NOV-2013
002119	EMC Test Systems/ 3115	Double Ridged Guide Horn Antenna	07-AUG-2012	07-AUG-2013
008022	Huber + Suhner SF106A	1m Sucoflex cable	16-DEC-2011	16-DEC-2012
005691	Miteq NSP1800-25-S1	Broadband Preamplifier (1-18GHz)	31-JAN-2012	31-JAN-2013
035613	Micro-Tronics BRM50702-02	Notch Filter, SB: 2.4 - 2.5 GHz, to 18 GHz	30-MAY-2012	30-MAY-2013
042000	Agilent E4440A	Spectrum Analyzer	29-JUN-2012	29-JUN-2013
024201	Rohde & Schwarz FSEK30	EMI Test Receiver	30-NOV-2012	30-NOV-2013
028072	CISCO 1840	18-40GHz EMI Test Fixture	15-FEB-2012	15-FEB-2013
035095	Micro-Coax UFA147A-0-0180-110200	RF Coax Cable to 40 GHz, 18in	25-OCT-2012	25-OCT-2-13
043023	Anritsu MT8852B	Bluetooth Test Set	14-SEP-2012	14-SEP-2013
035639	Micro-Tronics BRC50704-02	Notch Filter, SB: 5.470-5.725 GHz, to 12 GHz	09-AUG-2012	09-AUG-2013
031700	Micro-Tronics BRC50705	Notch Filter, SB: 5.725-5.875 GHz, to 12 GHz	30-MAY-2012	30-MAY-2013
008097	Huber + Suhner/ RG-223	RG-223 Cable 9m	24-JUL-2012	24-JUL-2013
004924	Rohde & Schwarz/ ESHS30	EMI Receiver (9KHz-30MHz)	29-NOV-12	29-NOV-13
008185	Fischer Custom Communications/ FCC-450B-2.4-N	Instrumentation Limiter	01-AUG-2012	01-AUG-2013
008197	TTE/ H613-150K-50-21378	Hi Pass Filter - 150KHz cutoff	10-APR-2012	10-APR-2013
008394	Coleman/ RG-223	RG-223 Cable 6 ft	23-MAY-2012	23-MAY-2013
008490	Bird/ 5-T-MN	5W 50 Ohm Terminator	01-JUN-2012	01-JUN-2013



007036	HP/ E7401A	Spectrum Analyzer	12-SEP-2012	12-SEP-2013
018981	Fischer Custom Communications/ FCC-801-M2-32A	Power Line Coupling/Decoupling Network	03-MAY-2012	03-MAY-2013
020767	Fischer Custom Communications/ FCC-450B-2.4-N	Instrumentation Limiter	01-AUG-2012	01-AUG-2013
023874	Fischer Custom Communications/ FCC-LISN-PA-NEMA-5-15	Power Adaptor, Polarized 120VAC	07-SEP-2012	07-SEP-2013
036033	York/ CNE V	Comparison Noise Emitter	Cal Not Required	N/A
044940	Rohde & Schwarz/ ESU40	EMI Test Receiver, 20Hz-40GHz	08-MAY-12	08-MAY-13

Appendix D: Test Procedures

Measurements were made in accordance with

- KDB Publication No. 789033
- Measurement method of spurious emission tolerance to the International Telecommunication Union (ITU) Recommendation SM329.
- ANSI C63.4
- ANSI C63.10/D8

Test procedures are summarized below

6dB Bandwidth	EDCS # - 422115
26dB Bandwidth	EDCS # - 422115
Average Output Power	EDCS # - 422117
Co-Located Transmitter	EDCS # - 422118
Conducted Spurious Test	EDCS # - 422119
Peak Transmit Power Measurement	EDCS # - 422123
Power Spectral Density	EDCS # - 422113
Peak Excursion Test	EDCS # - 422121
Radiated Band Edge	EDCS # - 422124
Radiated Spurious Test	EDCS # - 422125

