HomeSeer Technologies

Report of FCC Intentional Radiator Testing

Prepared For:	***Eric Ryherd***
Applicant	***Express Controls 150 Witches Spring Road Hollis, NH 03049***
Company	***HomeSeer Technologies 10 Commerce Park North, #10 Bedford, NH 03110***
Applicable Models	***Zee S2***
Test Laboratory	***Core Compliance Testing Services, LLC 79 River Road Hudson, NH 03051***
Test Dates	**November 30 - December 21, 2015**
Tested & Reviewed By	***Ken MacGrath, Manager George Correia, Test Engineer***
Signature, Manager	
Signature, Test Engineer	

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1.0 GENERAL INFORMATION

1.1 Product Description & Support Equipment

Equipment Under Test (EUT): Zee S2

Manufacturer: *HomeSeer Technologies*

Applicable Models: Zee S2
consisting of: EZZee Revision E and Raspberry Pi 2 Model B printed circuit boards

Power Supply: PW Model BBT-502A; input: 100-240V, 50/60Hz; output: 5.0VDC, 2.1A

Support Equipment			
Description	**Qty**	**Model Number**	**Serial Number**
Monitor, LG	1	Flatron 23EA63V	303NDWEAP761
Keyboard, Logitech	1	K120	1438MG03DFJ8
Mouse, Logitech	1	M100	LZ015ME
AC Adapter, LG	1	ADS-40-FSG-19	HD34D627900075210
AC Adapter, PW	1	BBT-502A	None
Unterminated USB	2	N/A	N/A

Cable Description	Qty	Shielded Yes/No	Ferrite Yes/No	Length (meters)
Keyboard	1	No	No	1.5
USB Cable	1	No	No	1.0
USB Cable	1	No	No	1.8
Mouse	1	No	No	1.8
CAT 5 UTP	1	No	No	3.0
HDMI	1	No	No	1.5
AC Adapter	1	No	No	1.8
AC Adapter	1	No	No	1.5

1.1 Product Description & Support Equipment (continued)

Tested Channel	Operating Frequency (MHz)	Modulation Type
1	908.40MHz	2FSK
2	908.43MHz	2FSK
3	916.00MHz	2GFSK

EUT Technical Specifications:

A) Channels, Operating Frequency and Modulation
B) Rated output power: 0.585mW (-2.3dBm) based on measurements given in section 5.2 (peak field strength of 92.9 dBµV/m at 3 meter distance).
C) Antenna Designation: PCB trace antenna, non-user replaceable (fixed), 0.0dBi (1.0 numerical gain).
D) This report documents the results for the HomeSeer Technologies, Model Zee S2 which is a Home Automation Controller.
F) FCC ID: UTH-ZW1512

1.2 Applicable Documents and Standards

This test report is based on the following standards.

Intentional Radiators:

- FCC CFR 47, Part 15, Subpart C, Section 15.249
- ANSI C63.10: 2013

Unintentional Radiators:

- FCC CFR47, Part 15, Subpart B, Digital Devices, Class B

1.3 Test Dates

November 30 - December 21, 2015

1.4 Test Methodology

Testing was done according to the standards listed in section 1.2. Radiated testing was performed at an antenna-to-EUT distance of 3-meters.

1.5 Test Facility

The Open Area Test Site (OATS) and ferrite lined shielded chamber used to collect the radiated data is located at Core Compliance Testing Services, 79 River Road, Hudson, NH. The OATS is constructed and calibrated to meet the FCC requirements of ANSI C63.4: 2003, MP5, and OST-55. The test facility is listed with the FCC (registration number 792478) and ISO 17025 accredited by A2LA (2778.01).

1.6 Test Equipment List

All equipment used in the testing process has up to date calibrations traceable to the National Institute of Standards and Technology (NIST). Refer to the Table 1 on the following page for a complete list of equipment used during the test.

Test Equipment

Asset #	Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
3	Preamplifier 8447F OPT H64	Agilent/HP	8447F-H64	3113A07400	12/26/13	12/26/15
4	LISN	Rohde & Schwarz	ESH3-Z5	826789/014	N/A	N/A
6	EMI Receiver	HP	8546A/85460A	3906A00498	01/31/15	01/31/16
15	Horn Antenna	EMCO	3115	9906-5841	N/A	N/A
19	Pre amplifier	HP/Agilent	08449B	3008A01322	04/07/14	04/07/16
20	8-meter Low Loss Cable	Andrew	ETS1-50T	0081108339	03/17/15	03/17/16
21	25-meter Low Loss Cable	Andrew	ETS1-50T	00A1108341	03/17/15	03/17/16
30	Semi-Anechoic chamber	Keene Ray Proof	N/A	8298	08/25/15	08/25/16
46	Antenna	Chase	CBL6111	2602	N/A	N/A
50	Multi Meter	Fluke	85	64050063	10/16/14	12/31/15e
51,52	Receiver	Rohde & Schwarz	ESMI	845364/009	12/31/14	12/31/15
61	8-meter Low Loss Cable	Andrew	ETS1-50T	00A1108347	08/28/15	08/28/16
103	Magnetic Loop Antenna	A.H.Systems	SAS-200/562B	216	03/18/15	03/18/16
109	Alternative Open Area Test Site	Strongwell	10 Meter	None	12/15/14	12/15/17
123	Spectrum Analyzer	HP	E4405B	US39440317	N/A	N/A
126	Horn Antenna	A.H.Systems	SAS-571	782	03/20/14	03/20/16
132	AC Power Source	CA Instruments	FCS18-3PT-HV5-OR-PRC-MODE	54522	N/A	N/A

All equipment used for testing has been calibrated according to methods and procedures defined by the National Institute of Standards and Technology (NIST).

1.7 Measurement Uncertainty

The measurement uncertainty of radiated emissions data is 4.06dB based on the test equipment used and the OATS site attenuation data.

1.8 Equipment Modifications

Not applicable.

2.0 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing was based on the requirements as given in the applicable standards and was operated in a manner which intends to maximize its emissions characteristics in a continuous transmit application. Constant transmit is not an intended mode of operation but was used to produce maximum emissions. Preliminary testing was done with primary supply voltage variations between 85% and 115% of nominal (120VAC, 60Hz). There was no difference in the EUT transmitter output between (102 and 138VAC); therefore, all testing was done at 120VAC.

The California Instruments power source was used for primary supply voltage variation testing.

The following table shows the results of the voltage variation test.

3-Meter Radiated Emissions Results

Date: 12/9/15
Test Engineer: GC

Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 916MHz
EUT Voltage: 120VAC, 60Hz plus 85% to 115% voltage variation testing

Temperature (°C): 21.9
Relative Humidity (%): 37

Test Distance: **3 meters**
Frequency Range: **30-1000MHz**
Antenna Asset #: **17**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	Peak Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	Net (dBµV/m)	Voltage (VAC)
270.0	1.0	H	908.40	65.1	21.8	3.5	90.4	101.6
270.0	1.0	H	908.40	65.1	21.8	3.5	90.4	120.0
270.0	1.0	H	908.40	65.1	21.8	3.5	90.4	138.3
270.0	1.0	H	908.42	65.3	21.8	3.5	90.6	101.6
270.0	1.0	H	908.42	65.3	21.8	3.5	90.6	120.0
270.0	1.0	H	908.42	65.3	21.8	3.5	90.6	138.3
270.0	1.0	H	916.00	66.5	21.7	3.5	91.7	101.6
270.0	1.0	H	916.00	66.5	21.7	3.5	91.7	120.0
270.0	1.0	H	916.00	66.5	21.7	3.5	91.7	138.3

NOTES: RBW=120kHz

2.2 EUT Exercise

The EUT has been tested under operating conditions and was programmed to allow it to remain in continuous transmitting mode.

The EUT was operated as follows:

Transmit Channel	Transmit Freq. (MHz)	Transmit Power Setting	Test Mode	Modulation
1	908.40MHz	30	continuous transmit	ON, 40kbps
2	908.43MHz	30	continuous transmit	ON, 9.6kbps
3	916.00MHz	30	continuous transmit	ON, 100kbps

3.0 SUMMARY OF TEST RESULTS

Test Results Summary

Rules	Description Of Test	Test Report Section	Result
FCC 15.249(a)	Field Strength of Fundamental (50 millivolts/meter)	5.0	*Pass*
FCC 15.209(a) through (f) FCC Part 15, Subpart B, Class B, EN55022/CISPR22 Class B	Unintentional/Spurious Emissions	6.0	*Pass*
FCC 15.249(d)	Band Edge Measurement	7.0	*Pass*
FCC 15.207(a)	Conducted Emissions	8.0	*Pass*

4.0 FCC Part 15 Limits

4.1 Limits of Radiated Emission Measurements

Field Strength of Fundamental and Harmonics per CFR 47, Part 15.249 (a).

The field strength of emissions for intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 – 928 MHz	50	500
2400 – 2483.5 MHz	50	500
5725 – 5875	50	500
24.0 – 24.25 GHz	250	2500

Any emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits as shown in the table below, whichever is the lesser attenuation.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

Notes:

1. The lower limit shall apply at the transition frequencies.
2. The emission level in dBµV/m = 20 log emission level in µV/m.
3. For frequencies above 1000MHz, the field strength limits are based on an average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.2 Limit Extrapolation Method for Frequencies Below 30MHz

For radiated emissions results below 30MHz, the limit was adjusted based on a 40dB/decade extrapolation factor for distance (Reference: FCC Part 15.31 f 2). The field strength limit is calculated and converted to dBµV/m and then the 3m Limit Adjustment was added to this to get the 3-meter limit shown in the 9kHz - 30MHz results tables.

Frequency (MHz)	Field strength limit (microvolts/meter)	Measurement distance (meters)	3m Limit Adjustment (dB)	3m Limit (dBµV/m)
0.009-0.490	2400/F(kHz)	300	80	128.5 - 93.8
0.490-1.705	24000/F(kHz)	30	40	73.8 – 62.9
1.705-30.0	30	30	40	69.5 – 69.5
30.0	100	3	N/A	40.0

For example: At 32kHz, the field strength limit is 2400/32 = 75 µV/m. This converts to 37.5dBµV/m. To this is added the 3m Limit Adjustment of 80dB. Therefore the 3m limit at 32kHz is 117.5dBµV/m.

5.0 Field Strength of Fundamental (50 millivolts/meter)

5.1 Test Setup and Procedure

Place the EUT on the 80 cm high wooden table. Set the EUT into constant transmitting mode with modulation as shown in Section 2.2 of this report. The EUT transmit power level setting was 30.

Utilizing the radiated emissions method, the EUT was set up on a three meter OATS. The field strength was maximized by rotating the turntable and adjusting the antenna height between 1 and 4 meters. Measurements were further optimized for vertical and horizontal polarization of the receive antenna.

Repeat the above procedures for each of the 3 channels, 908.40, 908.43, and 916.00MHz.

5.2 Field Strength of Fundamental Test Results

Test Results with EUT fully cabled

3-Meter Radiated Emissions Results

Date: 12/10/2015
Test Engineer: GC

Customer: HomeSeer
Product: Zee S2
Configuration: With cables, VGA mode. CH 1 = 908.40MHz, 40kbps; CH2 = 908.43MHz, 9.6kbps; CH3 = 916.00MHz, 100kbps
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 20.9
Relative Humidity (%): 37

Test Distance: 3 meters
Frequency Range: ≤1.0 GHz
Antenna Asset #: 17

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	PK Reading (dBµV)	AV Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	8m Cable Factor (dB)	HP8449B Factor (dB)	PK Net (dBµV/m)	AV Net (dBµV/m)	FCC 15.249 PK Limit ($dB_\mu V/m$)	FCC 15.249 PK Margin (dBµV/m)	FCC 15.249 AV Limit ($dB_\mu V/m$)	FCC 15.249 AV Margin (dBµV/m)
CH1: 908.40, Power level setting = 30						#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	80.0	#N/A	60.0	#N/A
270.0	1.4	V	908.40	60.9	60.3	21.8	3.5	0.0	0.0	86.2	85.6	113.9	-27.7	93.9	-8.3
270.0	1.0	H	908.40	65.1	64.5	21.8	3.5	0.0	0.0	90.4	89.8	113.9	-23.5	93.9	-4.1
CH2: 908.42, Power level setting = 30						#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	80.0	#N/A	60.0	#N/A
270.0	1.4	V	908.43	61.2	60.6	21.8	3.5	0.0	0.0	86.5	85.9	113.9	-27.4	93.9	-8.0
270.0	1.0	H	908.43	65.3	64.8	21.8	3.5	0.0	0.0	90.6	90.1	113.9	-23.3	93.9	-3.8
CH3: 916.00, Power level setting = 30						#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	80.0	#N/A	60.0	#N/A
270.0	1.4	V	916.00	61.9	61.1	21.7	3.5	0.0	0.0	87.1	86.3	113.9	-26.8	93.9	-7.6
270.0	1.0	H	916.00	66.5	65.6	21.7	3.5	0.0	0.0	91.7	90.8	113.9	-22.2	93.9	-3.1

5.2 Field Strength of Fundamental Test Results (continued)

Test Results with EUT with no cables, except power cable attached

3-Meter Radiated Emissions Results

Date: 12/10/2015
Test Engineer: GC

Customer: HomeSeer
Product: Zee S2
Configuration: No cables, VGA mode. CH 1 = 908.40MHz, 40kbps; CH2 = 908.43MHz, 9.6kbps; CH3 = 916.00MHz, 100kbps
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 20.9
Relative Humidity (%): 37

Test Distance: 3 meters
Frequency Range: ≤1.0 GHz
Antenna Asset #: 17

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	PK Reading (dBµV)	AV Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	8m Cable Factor (dB)	HP8449B Factor (dB)	PK Net (dBµV/m)	AV Net (dBµV/m)	FCC 15.249 PK Limit ($dB_{\mu}V/m$)	FCC 15.249 PK Margin (dBµV/m)	FCC 15.249 AV Limit ($dB_{\mu}V/m$)	FCC 15.249 AV Margin (dBµV/m)
CH1: 908.40, Power level setting = 30						#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	80.0	#N/A	60.0	#N/A
225.0	1.4	V	908.40	64.7	64.1	21.8	3.5	0.0	0.0	90.0	89.4	113.9	-23.9	93.9	-4.5
315.0	1.0	H	908.40	66.7	66.2	21.8	3.5	0.0	0.0	92.0	91.5	113.9	-21.9	93.9	-2.4
CH2: 908.42, Power level setting = 30						#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	80.0	#N/A	60.0	#N/A
225.0	1.4	V	908.43	65.5	65.0	21.8	3.5	0.0	0.0	90.8	90.3	113.9	-23.1	93.9	-3.6
292.5	1.0	H	908.43	66.0	65.5	21.8	3.5	0.0	0.0	91.3	90.8	113.9	-22.6	93.9	-3.1
CH3: 916.00, Power level setting = 30						#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	80.0	#N/A	60.0	#N/A
225.0	1.2	V	916.00	65.9	65.1	21.7	3.5	0.0	0.0	91.1	90.3	113.9	-22.8	93.9	-3.6
292.5	1.0	H	916.00	67.7	67.1	21.7	3.5	0.0	0.0	92.9	92.3	113.9	-21.0	93.9	-1.6

5.3 Field Strength of Fundamental Conclusion

The EUT meets the fundamental field strength requirements of FCC Part 15.249 (a). The EUT had a worst-case margin to the limit of -1.6dB when set up with no cables attached and transmitting on channel 3.

Additionally, the maximum power output was calculated. To convert field strength at 3 meters to power in Watts, the following formula was used:

$$P = (E \times d)^2 / (30 \times G)$$

where:
P = Power in Watts
E = Field strength in V/m
d = Measurement distance in meters
G = Numerical Gain of Antenna

The calculated power output based on the worst case peak field strength reading of 92.9 dBµV/m is 0.585mW (-2.3dBm).

6.0 Unintentional/Spurious Emissions

Preliminary testing was done in a ferrite lined shielded enclosure for frequency identification from the EUT. All final measurements were done on the OATS.

6.1 Prescan Test Setup and Procedure

Prescans from 9kHz to 10GHz were done in the ferrite-lined shielded chamber for EUT frequency identification. These scans are exploratory emission tests only that are voluntarily submitted.

The turntable was rotated 360 degrees to determine the position of maximum emission level at the transmit frequency. Scans from 1-10GHz were done at this azimuth angle at both horizontal and vertical receive antenna polarization.

In the 9kHz - 1000MHz range, the EUT Prescans were done at 0°, 90°, 180°, and 270° turntable angles.

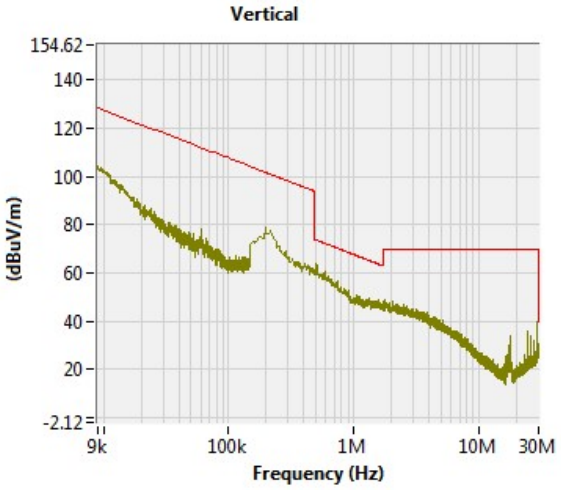
Emissions were measured with the EUT transmitting on Channels 1, 2, and 3 as detailed in Section 2.2 of this report with the exception that the EUT transmit power was set to a maximum value of 63.

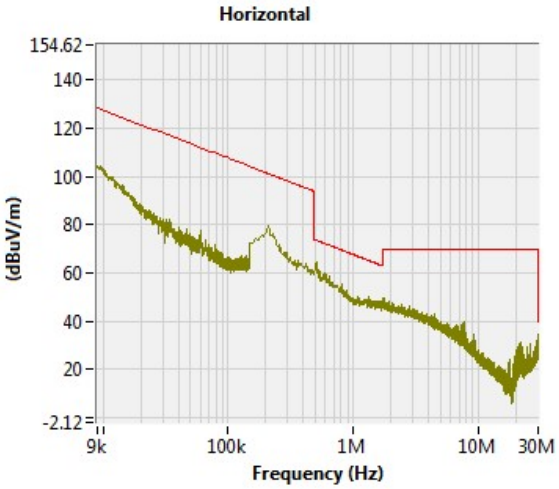
6.2 Prescan Measurement Data

The following plots show a summary of the Prescan data that was collected.

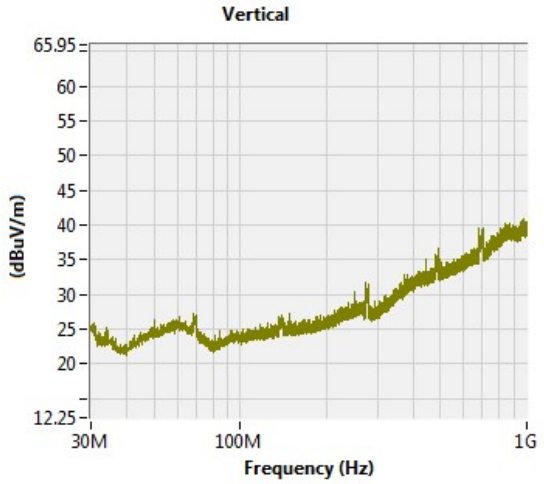
Summary of Prescan Data

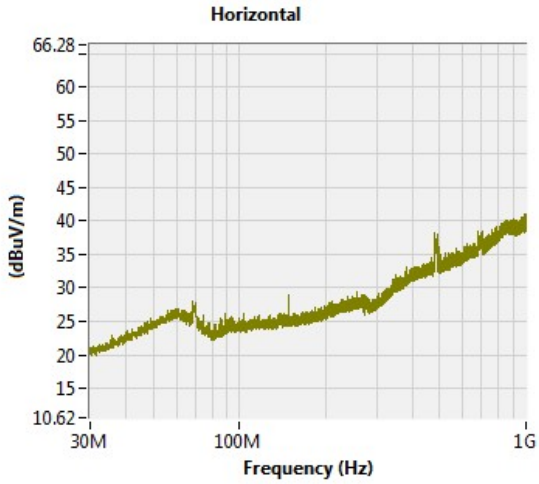
9kHz – 30MHz





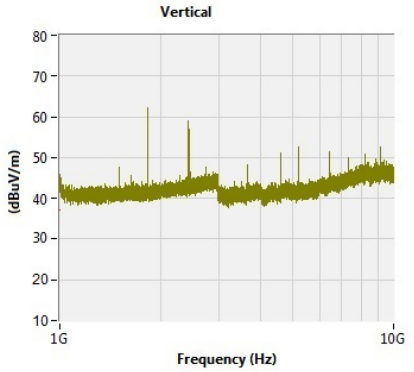
30MHz – 1000MHz

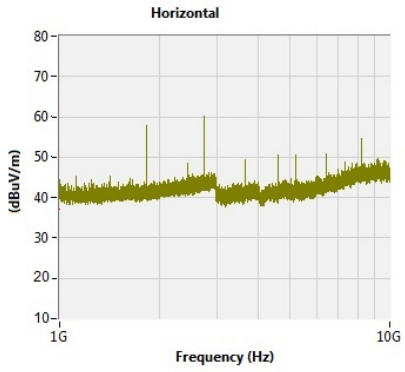




Prescan Data (continued):

1GHz – 10GHz





6.3 Radiated Unintentional/Spurious Emissions Test Setup and Procedure

The radiated emissions tests were performed on the 3-meter open area test site, in accordance with ANSI C63.4-2003.

Place the EUT on the 80 cm high wooden table for testing between 9 kHz and 1000 MHz. For testing above 1000MHz, place the EUT on the combination wooden table and polystyrene support at a height of 1.5m. Set the EUT into constant transmitting mode with modulation as shown in Section 2.2 of this report. The EUT transmit power level setting was 30.

Utilizing the radiated emissions method, the EUT was set up on a three meter OATS. The field strength was maximized by rotating the turntable and adjusting the antenna height between 1 and 4 meters. Measurements were further optimized for vertical and horizontal polarization of the receive antenna.

Emissions were measured with the EUT transmitting on Channels 1, 2, and 3 as detailed in Section 2.2 of this report with the exception that the EUT transmit power was set to a maximum value of 63 for all testing at 1000MHz or less for worst case conditions.

6.4 Radiated Unintentional/Spurious Emissions Test Results

The data tables on the following page show the Radiated Emissions test results.

6.4 Radiated Unintentional/Spurious Emissions Test Results (continued)

9kHz – 30MHz, EUT Fully cabled, transmitting on Channel 1, 908.40MHz

3-Meter Magnetic Loop Radiated Emissions Results

Date: 12/10/15
Test Engineer: KM

Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, transmitting 908.40 MHz @max. power (power setting = 63).
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 24.9
Relative Humidity (%): 41

Test Distance: **3 meters**
Frequency Range: **9kHz-30MHz**
Antenna Asset #: **103**
Detector used: **Quasi-peak (QP) for all except as follows: Average (AVG) 9-90kHz & 110-490kHz**
Antenna Polarity: **V=plane of loop perpendicular to EUT face; H=plane of loop parallel to EUT face**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	Detector (QP or AV)	Reading (dBµV)	Mag Loop E-Factor (dB)	25m Cable Factor (dB)	Net (dBµV/m)	FCC 15.209 Limit (dBµV/m)	FCC 15.209 Margin (dBµV/m)
225.0	1.0	V	0.080	AV	22.6	70.4	0.0	93.0	109.5	**-16.5**
135.0	1.0	V	0.175	AV	2.6	63.7	0.0	66.3	102.7	**-36.4**
225.0	1.0	V	0.200	AV	1.9	62.2	0.0	64.1	101.6	**-37.4**
180.0	1.0	V	0.600	QP	0.2	53.0	0.1	53.3	72.0	**-18.8**
180.0	1.0	V	17.730	QP	31.4	0.0	0.4	31.8	69.5	**-37.7**
225.0	1.0	V	29.000	QP	2.2	25.3	0.6	28.1	69.5	**-41.4**

NOTES:
Use the detector shown based on the frequency.
EN55022 has no limits below 30MHz.

6.4 Radiated Unintentional/Spurious Emissions Test Results (continued)

30 - 1000MHz, EUT Fully cabled, transmitting on Channel 1, 908.40MHz

3-Meter Radiated Emissions Results

Date: 12/3/15
Test Engineer: GC/KM

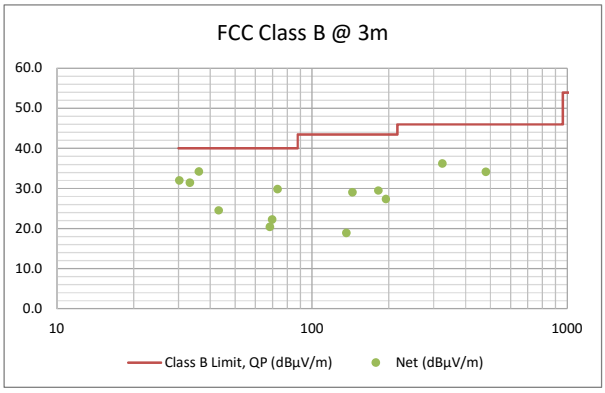
Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 908.40 MHz at maximum power (power setting = 63).
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 20.6
Relative Humidity (%): 42

Test Distance: **3 meters**
Frequency Range: **30-1000MHz**
Antenna Asset #: **17**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	QP Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	Net (dBµV/m)	FCC Class B QP Limit (dBµV/m)	FCC Class B QP Margin (dBµV/m)
315.0	1.0	V	30.2	11.4	20.1	0.6	32.0	40.0	**-8.0**
180.0	1.0	V	33.2	12.7	18.2	0.6	31.5	40.0	**-8.5**
180.0	1.0	V	36.1	17.2	16.4	0.6	34.3	40.0	**-5.7**
0.0	1.0	V	43.1	11.5	12.4	0.7	24.5	40.0	**-15.5**
202.5	2.0	V	68.3	13.1	6.4	0.9	20.4	40.0	**-19.6**
135.0	1.0	V	69.9	14.8	6.6	0.9	22.3	40.0	**-17.7**
180.0	1.8	V	73.4	21.9	7.0	0.9	29.9	40.0	**-10.1**
135.0	1.4	V	136.3	5.5	12.2	1.3	18.9	43.5	**-24.6**
157.5	1.1	V	144.0	16.2	11.6	1.3	29.1	43.5	**-14.4**
180.0	1.0	V	182.0	18.0	10.0	1.5	29.5	43.5	**-14.0**
180.0	1.0	V	194.9	15.5	10.3	1.5	27.3	43.5	**-16.2**
157.5	1.0	V	324.0	19.7	14.5	2.0	36.2	46.0	**-9.8**
157.5	1.3	V	479.9	14.0	17.7	2.5	34.2	46.0	**-11.8**

NOTES:
RBW=120kHz
Scanned 30-1000 MHz



6.4 Radiated Unintentional/Spurious Emissions Test Results (continued)

1 – 10GHz, EUT Fully cabled, transmitting on Channel 1, 908.40MHz

3-Meter Radiated Emissions Results Above 1GHz

Date: 12/10/2015
Test Engineer: GC

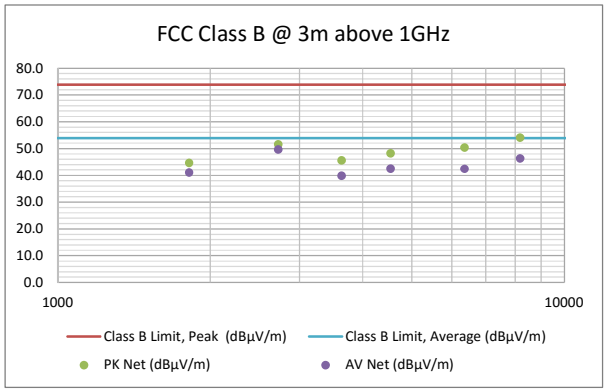
Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 908.40 MHz at power setting = 30.
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 20.6
Relative Humidity (%): 42

Test Distance: **3 meters**
Frequency Range: **>1.0 GHz**
Antenna Asset #: **126**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	PK Reading (dBµV)	AV Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	8m Cable Factor (dB)	HP8449B Factor (dB)	PK Net (dBµV/m)	AV Net (dBµV/m)	FCC Class B PK Limit ($dB_{\mu}V/m$)	FCC Class B PK Margin (dBµV/m)	FCC Class B AV Limit ($dB_{\mu}V/m$)	FCC Class B AV Margin (dBµV/m)
202.5	1.7	H	1816.8	48.8	45.2	26.2	5.0	2.0	37.3	44.6	41.0	73.9	-29.3	53.9	-12.9
180.0	1.6	V	2725.2	50.7	48.7	29.2	6.3	2.5	37.1	51.6	49.6	73.9	-22.3	53.9	-4.3
180.0	1.7	V	3633.6	41.9	36.2	30.1	7.3	2.9	36.7	45.5	39.8	73.9	-28.4	53.9	-14.1
225.0	2.1	H	4542.0	40.9	35.2	32.1	8.3	3.3	36.4	48.2	42.5	73.9	-25.7	53.9	-11.4
180.0	1.9	V	6358.8	37.4	29.4	35.3	10.0	4.1	36.5	50.4	42.4	73.9	-23.5	53.9	-11.5
202.5	2.0	V	8175.6	37.6	29.8	37.7	11.2	4.7	37.1	54.1	46.3	73.9	-19.8	53.9	-7.6

NOTES:
RBW=1MHz
Scanned 1-10GHz.



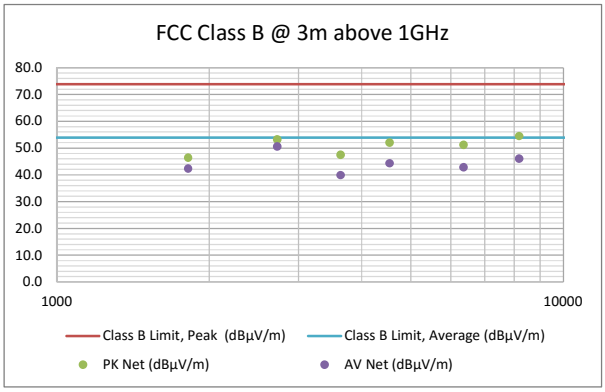
6.4 Radiated Unintentional/Spurious Emissions Test Results (continued)

1 – 10GHz, EUT with no cables, transmitting on Channel 1, 908.40MHz

Configuration: No cables, VGA mode, and transmitting 908.40 MHz at power setting = 30.

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	PK Reading (dBµV)	AV Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	8m Cable Factor (dB)	HP8449B Factor (dB)	PK Net (dBµV/m)	AV Net (dBµV/m)	FCC Class B PK Limit (dBµV/m)	FCC Class B PK Margin (dBµV/m)	FCC Class B AV Limit (dBµV/m)	FCC Class B AV Margin (dBµV/m)
202.5	1.7	H	1816.8	50.6	46.5	26.2	5.0	2.0	37.3	46.4	42.3	73.9	-27.5	53.9	-11.6
202.5	1.5	V	2725.2	52.3	49.7	29.2	6.3	2.5	37.1	53.2	50.6	73.9	-20.7	53.9	-3.3
225.0	1.4	V	3633.6	43.8	36.3	30.1	7.3	2.9	36.7	47.4	39.9	73.9	-26.5	53.9	-14.0
247.5	1.9	H	4542.0	44.7	37.0	32.1	8.3	3.3	36.4	52.0	44.3	73.9	-21.9	53.9	-9.6
202.5	1.8	V	6358.8	38.2	29.8	35.3	10.0	4.1	36.5	51.2	42.8	73.9	-22.7	53.9	-11.1
225.0	1.8	V	8175.6	38.0	29.5	37.7	11.2	4.7	37.1	54.5	46.0	73.9	-19.4	53.9	-7.9

NOTES:
RBW=1MHz
Scanned 1-10GHz.



6.4 Radiated Unintentional/Spurious Emissions Test Results (continued)

9kHz – 30MHz, EUT Fully cabled, transmitting on Channel 2, 908.43MHz

3-Meter Magnetic Loop Radiated Emissions Results

Date: 12/10/2015
Test Engineer: KM

Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 908.43 MHz at maximum power (power setting = 63).
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 24.9
Relative Humidity (%): 41

Test Distance: **3 meters**
Frequency Range: **9kHz-30MHz**
Antenna Asset #: **103**
Detector used: **Quasi-peak (QP) for all except as follows: Average (AVG) 9-90kHz and 110-490kHz**
Antenna Polarity: **V=plane of loop perpendicular to EUT face; H=plane of loop parallel to EUT face**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	Detector (QP or AV)	Reading (dBµV)	Mag Loop E Factor (dB)	25m Cable Factor (dB)	Net (dBµV/m)	FCC 15.209 Limit (dBµV/m)	FCC 15.209 Margin (dBµV/m)
337.5	1.0	V	0.080	AV	4.7	70.4	0.0	75.1	109.5	-34.4
337.5	1.0	V	0.175	AV	-2.1	63.7	0.0	61.6	102.7	-41.1
157.5	1.0	V	0.200	AV	1.6	62.2	0.0	63.8	101.6	-37.7
157.5	1.0	V	0.600	QP	6.8	53.0	0.1	59.9	72.0	-12.2
180.0	1.0	V	17.730	QP	33.0	0.0	0.4	33.4	69.5	-36.1
157.5	1.0	V	29.000	QP	6.1	25.3	0.6	32.0	69.5	-37.5

NOTES:
Use the detector shown based on the frequency.
EN55022 has no limits below 30MHz.

6.4 Radiated Unintentional/Spurious Emissions Test Results (continued)

30 - 1000MHz, EUT Fully cabled, transmitting on Channel 2, 908.43MHz

3-Meter Radiated Emissions Results

Date: 12/9/2015
Test Engineer: GC

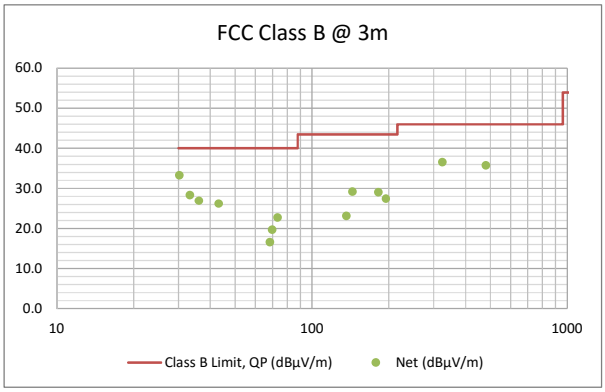
Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 908.43 MHz at maximum power (power setting = 63).
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 20.3
Relative Humidity (%): 40

Test Distance: **3 meters**
Frequency Range: **30-1000MHz**
Antenna Asset #: **17**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	QP Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	Net (dBµV/m)	FCC Class B QP Limit (dBµV/m)	FCC Class B QP Margin (dBµV/m)
157.5	1.0	V	30.2	12.7	20.1	0.6	33.3	40.0	-6.7
180.0	1.0	V	33.2	9.6	18.2	0.6	28.4	40.0	-11.6
180.0	1.0	V	36.1	9.9	16.4	0.6	27.0	40.0	-13.0
225.0	1.0	V	43.1	13.2	12.4	0.7	26.2	40.0	-13.8
22.5	1.6	V	68.3	9.3	6.4	0.9	16.6	40.0	-23.4
45.0	1.0	V	69.9	12.2	6.6	0.9	19.7	40.0	-20.3
180.0	1.0	V	73.4	14.8	7.0	0.9	22.8	40.0	-17.2
135.0	1.0	V	136.3	9.7	12.2	1.3	23.1	43.5	-20.4
22.5	1.0	V	144.0	16.3	11.6	1.3	29.2	43.5	-14.3
180.0	1.0	V	182.0	17.6	10.0	1.5	29.1	43.5	-14.4
180.0	1.0	V	194.9	15.6	10.3	1.5	27.4	43.5	-16.1
157.5	1.0	V	324.0	20.1	14.5	2.0	36.6	46.0	-9.4
45.0	1.4	H	479.9	15.6	17.7	2.5	35.8	46.0	-10.2

NOTES:
RBW=120kHz
Scanned 30-1000 MHz



6.4 Radiated Unintentional/Spurious Emissions Test Results (continued)

1 – 10GHz, EUT Fully cabled, transmitting on Channel 2, 908.43MHz

3-Meter Radiated Emissions Results Above 1GHz

Date: 12/10/2015
Test Engineer: GC

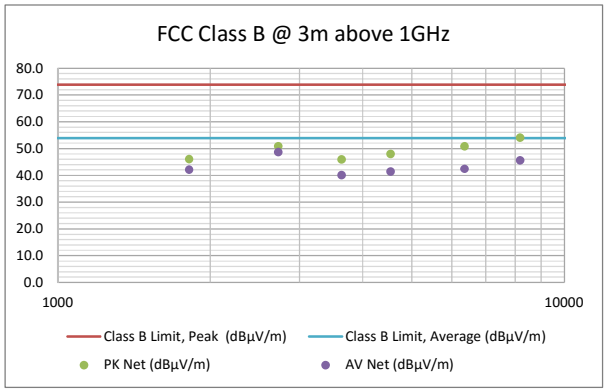
Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 908.43 MHz at power setting = 30.
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 20.6
Relative Humidity (%): 45

Test Distance: **3 meters**
Frequency Range: **>1.0 GHz**
Antenna Asset #: **126**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	PK Reading (dBµV)	AV Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	8m Cable Factor (dB)	HP8449B Factor (dB)	PK Net (dBµV/m)	AV Net (dBµV/m)	FCC Class B PK Limit ($dB_{\mu}V/m$)	FCC Class B PK Margin (dBµV/m)	FCC Class B AV Limit ($dB_{\mu}V/m$)	FCC Class B AV Margin (dBµV/m)
135.0	2.3	H	1816.9	50.2	46.3	26.2	5.0	2.0	37.3	46.0	42.1	73.9	-27.9	53.9	-11.8
180.0	2.1	V	2725.3	50.0	47.8	29.2	6.3	2.5	37.1	50.9	48.7	73.9	-23.0	53.9	-5.2
135.0	2.0	V	3633.7	42.3	36.4	30.1	7.3	2.9	36.7	45.9	40.0	73.9	-28.0	53.9	-13.9
225.0	2.1	H	4542.2	40.7	34.1	32.1	8.3	3.3	36.4	48.0	41.4	73.9	-25.9	53.9	-12.5
202.5	1.9	V	6359.0	37.8	29.4	35.3	10.0	4.1	36.5	50.8	42.4	73.9	-23.1	53.9	-11.5
180.0	1.4	V	8175.9	37.5	29.1	37.7	11.2	4.7	37.1	54.0	45.6	73.9	-19.9	53.9	-8.3

NOTES:
RBW=1MHz
Scanned 1-10GHz.



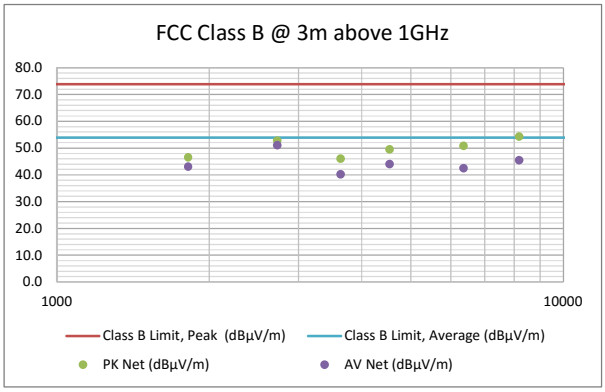
6.4 Radiated Unintentional/Spurious Emissions Test Results (continued)

1 – 10GHz, EUT with no cables, transmitting on Channel 2, 908.43MHz

Configuration: No cables, VGA mode, and transmitting 908.43 MHz at power setting = 30.

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	PK Reading (dBµV)	AV Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	8m Cable Factor (dB)	HP8449B Factor (dB)	PK Net (dBµV/m)	AV Net (dBµV/m)	FCC Class B PK Limit (dBµV/m)	FCC Class B PK Margin (dBµV/m)	FCC Class B AV Limit (dBµV/m)	FCC Class B AV Margin (dBµV/m)
180.0	1.7	H	1816.9	50.7	47.2	26.2	5.0	2.0	37.3	46.5	43.0	73.9	-27.4	53.9	-10.9
180.0	1.6	V	2725.3	51.9	50.2	29.2	6.3	2.5	37.1	52.8	51.1	73.9	-21.1	53.9	-2.8
202.5	1.7	V	3633.7	42.4	36.6	30.1	7.3	2.9	36.7	46.0	40.2	73.9	-27.9	53.9	-13.7
247.5	2.4	H	4542.2	42.2	36.7	32.1	8.3	3.3	36.4	49.5	44.0	73.9	-24.4	53.9	-9.9
202.5	2.0	V	6359.0	37.8	29.5	35.3	10.0	4.1	36.5	50.8	42.5	73.9	-23.1	53.9	-11.4
225.0	1.8	V	8175.9	37.8	29.0	37.7	11.2	4.7	37.1	54.3	45.5	73.9	-19.6	53.9	-8.4

NOTES:
RBW=1MHz
Scanned 1-10GHz.



6.4 Radiated Unintentional/Spurious Emissions Test Results (continued)

9kHz – 30MHz, EUT Fully cabled, transmitting on Channel 3, 916.00MHz

3-Meter Magnetic Loop Radiated Emissions Results

Date: 12/10/2015
Test Engineer: KM

Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 916.00 MHz at maximum power (power setting = 63).
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 24.9
Relative Humidity (%): 41

Test Distance: **3 meters**
Frequency Range: **9kHz-30MHz**
Antenna Asset #: **103**
Detector used: **Quasi-peak (QP) for all except as follows: Average (AVG) 9-90kHz and 110-490kHz**
Antenna Polarity: **V=plane of loop perpendicular to EUT face; H=plane of loop parallel to EUT face**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	Detector (QP or AV)	Reading (dBµV)	Mag Loop E Factor (dB)	25m Cable Factor (dB)	Net (dBµV/m)	FCC 15.209 Limit (dBµV/m)	FCC 15.209 Margin (dBµV/m)
337.5	1.0	V	0.080	AV	5.7	70.4	0.0	76.1	109.5	**-33.4**
337.5	1.0	V	0.175	AV	1.3	63.7	0.0	65.0	102.7	**-37.7**
45.0	1.0	V	0.200	AV	-2.3	62.2	0.0	59.9	101.6	**-41.6**
157.5	1.0	V	0.600	QP	2.3	53.0	0.1	55.4	72.0	**-16.7**
180.0	1.0	V	17.730	QP	32.2	0.0	0.4	32.6	69.5	**-36.9**
180.0	1.0	V	29.000	QP	5.6	25.3	0.6	31.5	69.5	**-38.0**

NOTES:
Use the detector shown based on the frequency.
EN55022 has no limits below 30MHz.

6.4 Radiated Unintentional/Spurious Emissions Test Results (continued)

30 - 1000MHz, EUT Fully cabled, transmitting on Channel 3, 916.00MHz

3-Meter Radiated Emissions Results

Date: 12/2/2015
Test Engineer: KM

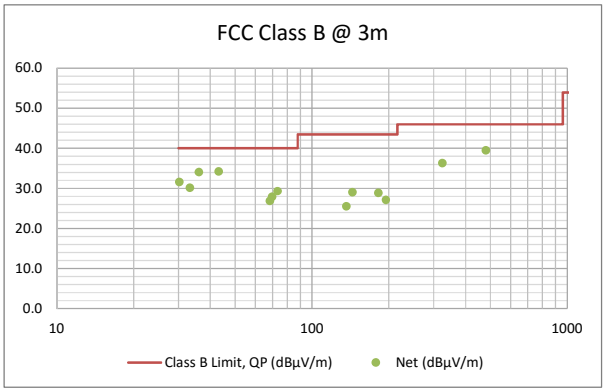
Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 916.00 MHz at maximum power (power setting = 63).
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 15.9
Relative Humidity (%): 47

Test Distance: **3 meters**
Frequency Range: **30-1000MHz**
Antenna Asset #: **17**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	QP Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	Net (dBµV/m)	FCC Class B QP Limit (dBµV/m)	FCC Class B QP Margin (dBµV/m)
315.0	1.0	V	30.2	11.0	20.1	0.6	31.6	40.0	-8.4
180.0	1.0	V	33.2	11.4	18.2	0.6	30.2	40.0	-9.8
180.0	1.0	V	36.1	17.0	16.4	0.6	34.1	40.0	-5.9
202.5	1.0	V	43.1	21.2	12.4	0.7	34.2	40.0	-5.8
202.5	2.0	V	68.3	19.6	6.4	0.9	26.9	40.0	-13.1
202.5	1.1	V	69.9	20.5	6.6	0.9	28.0	40.0	-12.0
202.5	1.8	V	73.4	21.4	7.0	0.9	29.4	40.0	-10.6
180.0	1.0	V	136.3	12.1	12.2	1.3	25.5	43.5	-18.0
90.0	1.2	V	144.0	16.2	11.6	1.3	29.1	43.5	-14.4
180.0	1.0	V	182.0	17.4	10.0	1.5	28.9	43.5	-14.6
180.0	1.0	V	194.9	15.3	10.3	1.5	27.1	43.5	-16.4
157.5	1.0	V	324.0	19.8	14.5	2.0	36.3	46.0	-9.7
157.5	1.3	H	479.9	19.3	17.7	2.5	39.5	46.0	-6.5

NOTES:
RBW=120kHz
Scanned 30-1000 MHz



6.4 Radiated Unintentional/Spurious Emissions Test Results (continued)

1 – 10GHz, EUT Fully cabled, transmitting on Channel 3, 916.00MHz

3-Meter Radiated Emissions Results Above 1GHz

Date: 12/10/2015
Test Engineer: GC

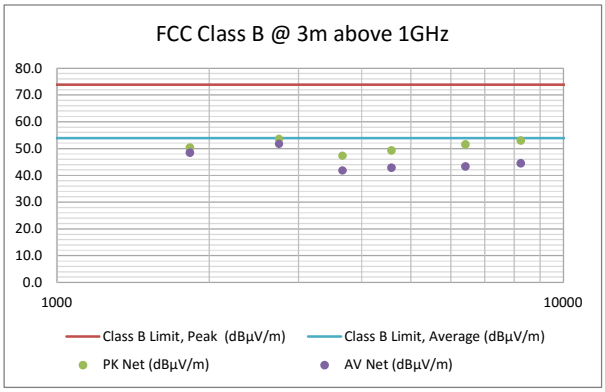
Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 916.00 MHz at power setting = 30.
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 20.6
Relative Humidity (%): 42

Test Distance: **3 meters**
Frequency Range: **>1.0 GHz**
Antenna Asset #: **126**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	PK Reading (dBµV)	AV Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	8m Cable Factor (dB)	HP8449B Factor (dB)	PK Net (dBµV/m)	AV Net (dBµV/m)	FCC Class B PK Limit ($dB_{\mu}V/m$)	FCC Class B PK Margin (dBµV/m)	FCC Class B AV Limit ($dB_{\mu}V/m$)	FCC Class B AV Margin (dBµV/m)
337.5	1.9	H	1832.0	54.4	52.5	26.3	5.0	2.0	37.3	50.4	48.5	73.9	-23.5	53.9	-5.4
180.0	1.7	V	2748.0	52.7	50.9	29.1	6.4	2.5	37.1	53.6	51.8	73.9	-20.3	53.9	-2.1
180.0	1.8	V	3664.0	43.5	38.0	30.2	7.3	2.9	36.6	47.3	41.8	73.9	-26.6	53.9	-12.1
225.0	1.8	H	4580.0	41.8	35.4	32.2	8.3	3.3	36.4	49.3	42.9	73.9	-24.6	53.9	-11.0
202.5	1.9	V	6412.0	38.2	30.0	35.6	10.1	4.1	36.4	51.5	43.3	73.9	-22.4	53.9	-10.6
225.0	2.1	V	8244.0	36.5	28.0	37.6	11.2	4.7	37.1	53.0	44.5	73.9	-20.9	53.9	-9.4

NOTES:
RBW=1MHz
Scanned 1-10GHz.



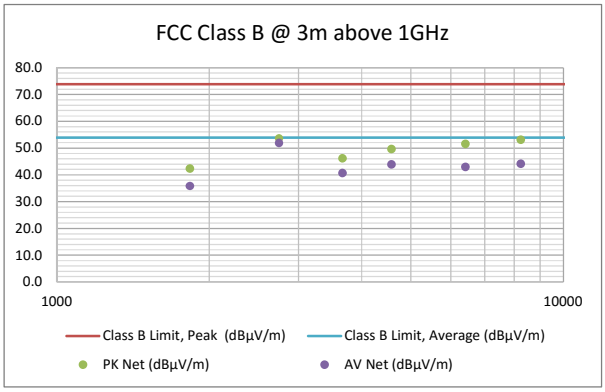
6.4 Radiated Unintentional/Spurious Emissions Test Results (continued)

1 – 10GHz, EUT with no cables, transmitting on Channel 3, 916.00MHz

Configuration: No cables, VGA mode, and transmitting 916.00 MHz at power setting = 30.

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	PK Reading (dBµV)	AV Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	8m Cable Factor (dB)	HP8449B Factor (dB)	PK Net (dBµV/m)	AV Net (dBµV/m)	FCC Class B PK Limit (dBµV/m)	FCC Class B PK Margin (dBµV/m)	FCC Class B AV Limit (dBµV/m)	FCC Class B AV Margin (dBµV/m)
225.0	2.8	H	1832.0	46.4	39.9	26.3	5.0	2.0	37.3	42.4	35.9	73.9	-31.5	53.9	-18.0
180.0	2.1	V	2748.0	52.8	51.0	29.1	6.4	2.5	37.1	53.7	51.9	73.9	-20.2	53.9	-2.0
180.0	1.8	V	3664.0	42.4	36.9	30.2	7.3	2.9	36.6	46.2	40.7	73.9	-27.7	53.9	-13.2
247.5	1.7	H	4580.0	42.1	36.4	32.2	8.3	3.3	36.4	49.6	43.9	73.9	-24.3	53.9	-10.0
202.5	2.0	V	6412.0	38.3	29.6	35.6	10.1	4.1	36.4	51.6	42.9	73.9	-22.3	53.9	-11.0
180.0	1.8	V	8244.0	36.6	27.6	37.6	11.2	4.7	37.1	53.1	44.1	73.9	-20.8	53.9	-9.8

NOTES:
RBW=1MHz
Scanned 1-10GHz.



6.5 Radiated Unintentional/Spurious Emissions Conclusion

The EUT meets the radiated unintentional/spurious emissions requirements of FCC Part 15.209 (a) through (f). The EUT had a worst case margin to the limit of -2.0dB when set up with no cables attached and transmitting on channel 3 (916MHz) at the third harmonic of the fundamental (2748MHz).

7.0 Band Edge Measurement

7.1 Test Setup and Procedure

Place the EUT on the 80 cm high wooden table. Set the EUT into constant transmitting mode with modulation as shown in Section 2.2 of this report. The EUT transmit power level setting was 30.

Utilizing the radiated emissions method, the EUT was set up on a three meter OATS. The field strength was maximized by rotating the turntable and adjusting the antenna height between 1 and 4 meters. Measurements were further optimized for vertical and horizontal polarization of the receive antenna.

Repeat the above procedures for each of the 3 channels, 908.40, 908.43, and 916.00MHz.

7.2 Band Edge Measurement Test Results

EUT Transmitting on Channel 1, 908.40MHz

3-Meter Radiated Emissions Results

Date: 12/9/2015
Test Engineer: GC

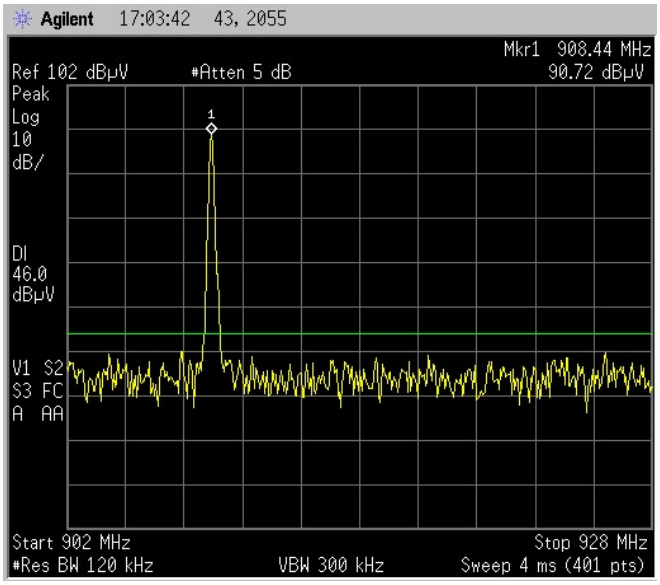
Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 908.40 MHz at power setting = 30.
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 20.6
Relative Humidity (%): 42

Test Distance: **3 meters**
Frequency Range: **30-1000MHz**
Antenna Asset #: **17**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	QP Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	Net (dBµV/m)	FCC Class B QP Limit (dBµV/m)	FCC Class B QP Margin (dBµV/m)
315.0	1.0	H	902.00	9.5	21.7	3.5	34.7	46.0	-11.3
270.0	1.0	H	908.40	65.1 PK	21.8	3.5	90.4		Fundamental
					#N/A	#N/A	#N/A	40.0	#N/A
315.0	1.0	V	902.00	9.7	21.7	3.5	34.9	46.0	-11.1
270.0	1.0	V	908.40	60.9 PK	21.8	3.5	86.2		Fundamental

NOTES:
RBW=120kHz



7.2 Band Edge Measurement Test Results (continued)

EUT Transmitting on Channel 2, 908.43MHz

3-Meter Radiated Emissions Results

Date: 12/9/2015
Test Engineer: GC

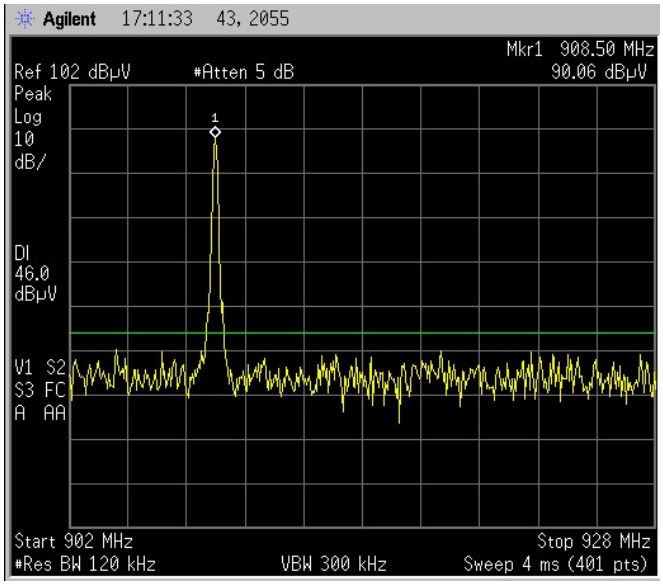
Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 908.43 MHz at power setting = 30.
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 21.1
Relative Humidity (%): 38

Test Distance: **3 meters**
Frequency Range: **30-1000MHz**
Antenna Asset #: **17**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	QP Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	Net (dBµV/m)	FCC Class B QP Limit (dBµV/m)	FCC Class B QP Margin (dBµV/m)
180.0	1.0	H	902.00	10.3	21.7	3.5	35.5	46.0	**-10.5**
270.0	1.0	H	908.43	65.3 PK	21.8	3.5	90.6		Fundamental
					#N/A	#N/A	#N/A	40.0	#N/A
202.5	1.4	V	902.00	10.2	21.7	3.5	35.4	46.0	**-10.6**
270.0	1.0	V	908.43	61.2 PK	21.8	3.5	86.5		Fundamental

NOTES:
RBW=120kHz



7.2 Band Edge Measurement Test Results (continued)

EUT Transmitting on Channel 3, 916.00MHz

3-Meter Radiated Emissions Results

Date: 12/9/2015
Test Engineer: GC

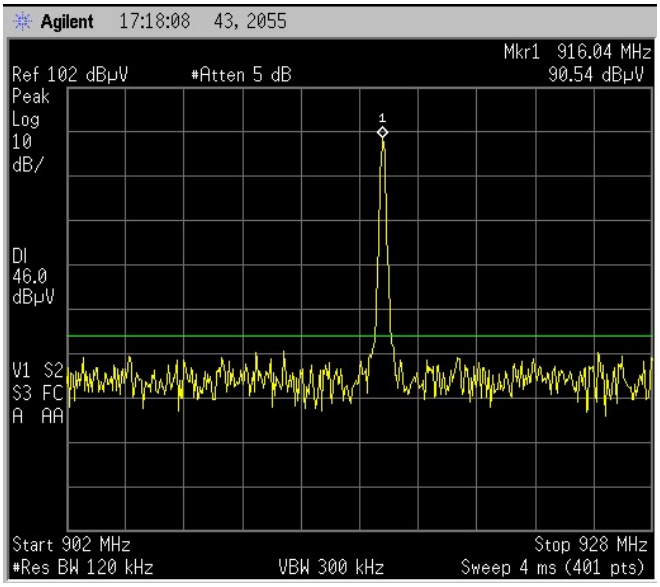
Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 916.00 MHz at power setting = 30.
EUT Voltage: 120VAC, 60Hz

Temperature (°C): 21.1
Relative Humidity (%): 38

Test Distance: **3 meters**
Frequency Range: **30-1000MHz**
Antenna Asset #: **17**

Azimuth (deg)	Ant. Ht. (m)	Ant. Polarity	Frequency (MHz)	QP Reading (dBµV)	3m Antenna Factor (dB)	25m Cable Factor (dB)	Net (dBµV/m)	FCC Class B QP Limit (dBµV/m)	FCC Class B QP Margin (dBµV/m)
270.0	1.0	H	916.00	66.5 PK	21.7	3.5	91.7		Fundamental
180.0	1.0	H	928.00	11.8	21.8	3.5	37.2	46.0	**-8.8**
					#N/A	#N/A	#N/A	40.0	#N/A
270.0	1.0	V	916.00	61.9 PK	21.7	3.5	87.1		Fundamental
180.0	1.2	V	928.00	11.4	21.8	3.5	36.8	46.0	**-9.2**

NOTES:
RBW=120kHz



7.3 Band Edge Measurement Conclusion

The EUT meets the band edge requirements of FCC Part 15.249 (d). All emissions radiated outside of the specified frequency bands were attenuated below the applicable radiated emissions FCC Part 15.209 (a) limit of 46dBµV/m for the frequency range of 902 – 928 MHz.

8.0 CONDUCTED EMISSIONS

8.1 Applicable Standard

Conducted Emissions is done according to FCC 15.207(a).

8.2 Test Setup and Procedure

Testing is performed over a ground reference plane with the EUT placed on an 80cm high wooden table that is positioned 40 cm from a 2-Meter by 2-Meter vertical coupling plane. Each individual current-carrying power lead is individually connected through a 50Ω/50μH Line Impedance Stabilization Network (LISN). The EUT is set into operation such that all parts of the system are exercised, while the RF voltages across the 50Ω measuring port of the LISN are recorded. The test is repeated for each current-carrying power line of the EUT.

8.3 Conducted Emissions Test Results

The data tables on the following page show the Conducted Emissions test results.

8.3 Conducted Emissions Test Results (continued)

0.150 - 30MHz, EUT Fully cabled, transmitting on Channel 1, 908.40MHz

FCC Part 15 / EN55011 / EN55022 Class B Conducted Emissions Results

Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 908.40 MHz at maximum power (power setting = 63).
Test Engineer: GC
Date: 12/15/2015

Mains Voltage:	**120VAC**
Frequency:	**60Hz**
Line Under Test:	**L**

Freq. (MHz)	Peak (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	LISN Factors	Cable Factors	Quasi-Peak Limit	Average Limit	Margin (dB)
0.150	62.2	58.7	41.0	0.10	0.05	66.0	56.0	-7.2
0.201	58.7	54.6	38.8	0.10	0.05	63.6	53.6	-8.8
0.415	46.5	40.8	29.7	0.13	0.07	57.6	47.6	-16.6
0.526	42.2	35.6	26.9	0.14	0.07	56.0	46.0	-18.9
1.477	35.3	31.7	26.5	0.16	0.09	56.0	46.0	-19.2
8.669	34.0	29.5	23.6	0.38	0.16	60.0	50.0	-25.9
23.460	34.2	29.6	22.8	0.84	0.18	60.0	50.0	-26.2

Mains Voltage:	**120VAC**
Frequency:	**60Hz**
Line Under Test:	**N**

Freq. (MHz)	Peak (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	LISN Factors	Cable Factors	Quasi-Peak Limit	Average Limit	Margin (dB)
0.150	61.2	57.9	39.7	0.10	0.05	66.0	56.0	-8.0
0.201	57.6	54.4	37.4	0.11	0.05	63.6	53.6	-9.0
0.417	43.7	38.6	22.5	0.15	0.07	57.5	47.5	-18.7
0.525	41.2	34.9	17.6	0.17	0.07	56.0	46.0	-20.9
1.489	30.8	24.6	16.8	0.20	0.09	56.0	46.0	-28.9
8.575	32.7	26.1	15.7	0.43	0.16	60.0	50.0	-33.3
23.460	36.2	28.2	18.0	0.93	0.18	60.0	50.0	-30.7

8.3 Conducted Emissions Test Results (continued)

0.150 - 30MHz, EUT Fully cabled, transmitting on Channel 2, 908.43MHz

FCC Part 15 / EN55011 / EN55022 Class B Conducted Emissions Results

Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 908.43 MHz at maximum power (power setting = 63).
Test Engineer: GC
Date: 12/15/2015

Mains Voltage:	**120VAC**
Frequency:	**60Hz**
Line Under Test:	**L**

Freq. (MHz)	Peak (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	LISN Factors	Cable Factors	Quasi-Peak Limit	Average Limit	Margin (dB)
0.150	59.6	56.5	39.6	0.10	0.05	66.0	56.0	-9.4
0.201	56.8	53.0	38.1	0.10	0.05	63.6	53.6	-10.4
0.415	46.9	39.6	29.5	0.13	0.07	57.6	47.6	-17.8
0.526	41.4	34.6	27.0	0.14	0.07	56.0	46.0	-18.8
1.477	35.5	31.7	26.5	0.16	0.09	56.0	46.0	-19.2
8.669	33.5	29.4	23.5	0.38	0.16	60.0	50.0	-26.0
23.460	34.8	29.5	22.6	0.84	0.18	60.0	50.0	-26.4

Mains Voltage:	**120VAC**
Frequency:	**60Hz**
Line Under Test:	**N**

Freq. (MHz)	Peak (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	LISN Factors	Cable Factors	Quasi-Peak Limit	Average Limit	Margin (dB)
0.150	59.9	56.6	38.7	0.10	0.05	66.0	56.0	-9.3
0.201	56.1	53.0	36.5	0.11	0.05	63.6	53.6	-10.4
0.417	43.2	37.4	22.0	0.15	0.07	57.5	47.5	-19.9
0.525	41.4	34.0	17.3	0.17	0.07	56.0	46.0	-21.8
1.489	29.8	24.1	16.7	0.20	0.09	56.0	46.0	-29.0
8.575	30.6	25.6	15.6	0.43	0.16	60.0	50.0	-33.8
23.460	33.9	28.8	17.9	0.93	0.18	60.0	50.0	-30.1

8.3 Conducted Emissions Test Results (continued)

0.150 - 30MHz, EUT Fully cabled, transmitting on Channel 3, 916.00MHz

FCC Part 15 / EN55011 / EN55022 Class B Conducted Emissions Results

Customer: HomeSeer
Product: Zee S2
Configuration: Fully cabled, VGA mode, and transmitting 916.00 MHz at maximum power (power setting = 63).
Test Engineer: GC
Date: 12/15/2015

Mains Voltage:	**120VAC**
Frequency:	**60Hz**
Line Under Test:	**L**

Freq. (MHz)	Peak (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	LISN Factors	Cable Factors	Quasi-Peak Limit	Average Limit	Margin (dB)
0.150	60.0	56.6	39.6	0.10	0.05	66.0	56.0	-9.3
0.201	56.8	53.0	38.0	0.10	0.05	63.6	53.6	-10.4
0.415	45.6	39.6	29.4	0.13	0.07	57.6	47.6	-17.8
0.526	40.7	34.4	26.8	0.14	0.07	56.0	46.0	-19.0
1.477	36.5	31.6	26.6	0.16	0.09	56.0	46.0	-19.1
8.669	33.8	29.3	23.3	0.38	0.16	60.0	50.0	-26.2
23.460	35.7	29.1	22.6	0.84	0.18	60.0	50.0	-26.4

Mains Voltage:	**120VAC**
Frequency:	**60Hz**
Line Under Test:	**N**

Freq. (MHz)	Peak (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	LISN Factors	Cable Factors	Quasi-Peak Limit	Average Limit	Margin (dB)
0.150	59.4	56.5	38.7	0.10	0.05	66.0	56.0	-9.4
0.201	56.0	53.0	36.5	0.11	0.05	63.6	53.6	-10.4
0.417	43.0	37.4	22.0	0.15	0.07	57.5	47.5	-19.9
0.525	40.3	34.0	17.1	0.17	0.07	56.0	46.0	-21.8
1.489	29.7	24.0	16.7	0.20	0.09	56.0	46.0	-29.0
8.575	30.7	25.0	15.6	0.43	0.16	60.0	50.0	-33.8
23.460	34.3	28.7	18.2	0.93	0.18	60.0	50.0	-30.2

8.4 Conducted Emissions Conclusion

The EUT meets the Conducted Emissions requirements of FCC Part 15.207 (a). The EUT had a worst-case margin to the limit of -7.2dB when transmitting on channel 1 (908.40MHz) at 150kHz.

9.0 PHOTOGRAPHS

Zee S2

Additional Photographs can be found in separate documents:

ZeeS2 Tsup.pdf
ZeeS2 Intpho.pdf
ZeeS2 Extpho.pdf.

END OF TEST REPORT