

Summary of Results

Configuration 1

Pass: All Radiated Spurious Emissions were found with more than 20dB margin of the limit line. Performed on 50ft, 100ft and 150ft Cables

Frequency Range of measurement 9kHz → 22GHz

Configuration 4

Pass: All Radiated Spurious Emissions were found with more than 20dB margin of the limit line. Only Contract to perform on a 50ft cable

Frequency Range of measurement 9kHz → 22GHz

Configuration 5

Pass: All Radiated Spurious Emissions were found with more than 20dB margin of the limit line. Only contract to perform on a 50ft cable

Frequency Range of measurement 9kHz → 22GHz

LIMIT LINE FOR SPURIOUS RADIATED EMISSION

$$\text{REQUIRED ATTENUATION} = 43 + 10 \log P \text{ (DB)}$$

For radiated spurious emission measured at 3-meter test distance,

$$\begin{aligned} \text{Required attenuation} &= 43 + 10 \log P_{t \text{ at 3 meter}} \text{ dB} \\ \text{Limit line (dBuV)} &= E_{\text{dBuV}} - \text{Attenuation} \end{aligned}$$

E_{dBuV} = Measured field strength at 3 meter in dBuV/m

Power Density (Isotropic)

$$P_D = \frac{P_t}{4\pi r^2}$$

P_D = Power Density in Watts /m²

P_t = Average Transmit Power

r = Test distance

Field Intensity E (V/m)

$$P_t = \left(\frac{E^2 \times 30}{4\pi r^2} \right)$$

$$E = \frac{\sqrt{P_t \times 377}}{4\pi r^2}$$

$$E = \sqrt{\frac{P_t \times 30}{r^2}}$$

$$10 \log P_t = 10 \log E^2 \text{ (V/m)} + 10 \log r^2 - 10 \log 30$$

$$10 \log P_t = 20 \log E \text{ (V/m)} + 20 \log r - 10 \log 30$$

At 3 meter, $r = 3 \text{ m}$

$$10 \log P_t = 20 \log E \text{ (V/m)} + 20 \log 3 - 10 \log 30$$

$$10 \log P_t = 20 \log E \text{ (V/m)} + 9.54 - 14.77$$

$$10 \log P_t = 20 \log E \text{ (V/m)} - 5.23$$

$$\text{Since } 20 \log E \text{ (V/m)} = 20 \log E \text{ (uV/m)} - 120$$

$$10 \log P_t = 20 \log E \text{ (uV/m)} - 120 - 5.23$$

$$10 \log P_t = 20 \log E \text{ (uV/m)} - 125.23$$

$$\begin{aligned} \text{Limit line (dBuV) at 3 meter} &= E_{\text{dBuV}} - \text{Attenuation} \\ &= E_{\text{dBuV}} - (43 + 10 \log P_{t \text{ at 3 meter}}) \\ &= E_{\text{dBuV}} - 43 - 10 \log P_{t \text{ at 3 meter}} \\ &= E_{\text{dBuV}} - 43 - (20 \log E \text{ (uV/m)} - 125.23) \\ &= E_{\text{dBuV}} - 43 - 20 \log E \text{ (uV/m)} + 125.23 \\ &= E_{\text{dBuV}} - 20 \log E \text{ (uV/m)} + 82.23 \end{aligned}$$

$$\text{Since } 20 \log E \text{ (uV/m)} = E \text{ in dBuV/m} = E_{\text{dBuV}} - E_{\text{dBuV}} + 82.23$$

$$\text{Radiated Emission limit 3 meter} = 82.23 \text{ dBuV at any power level measured in dBuV}$$

7.14 Dual Enclosure

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: Cellphone-Mate, Inc.
 Specification: **7.14 Additional requirements for cable-connected dual-enclosure wideband consumer signal boosters**
 Work Order #: **102129** Date 06/12,13/2019 and 08/27/2019
 Test Type: **Conducted Emissions**
 Tested By: **Hieu Song Nguyenpham**
 Software: **EMITest 5.03.11**

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

06/12/2019:
 Test environment conditions: Temperature: 22.5°C, Relative Humidity: 44%, Atmospheric Pressure: 102.1kPa
 06/13/2019:
 Test environment conditions: Temperature: 21.8°C, Relative Humidity: 46%, Atmospheric Pressure: 101.9kPa
 08/27/2019:
 Test environment conditions: Temperature: 23.4°C, Relative Humidity: 46%, Atmospheric Pressure: 100.9kPa
Section 7.14.3 Set up: The pair system was set up and operated as intended. Either Donor or Server Unit was connected to the signal generator. The Signal Generator was set as 4.1MHz AWGN at -80ddBm and injected to the pair system during exposure.
 Modification 1 and 3 was in place during testing.

Test Equipment:

Asset #	Description	Manufacturer	Model	Calibration Date	Cal Due Date
P05411	Attenuator	Weinschel	54A-10	1/19/2018	1/19/2020
P07192	Cable	Astro	32022-29094K-29094K-48TC	10/9/2017	10/9/2019
P07191	Cable	Astro	32022-29094K-29094K-48TC	10/30/2017	10/30/2019
03418	Signal Generator	Agilent	E4438C	5/13/2019	5/13/2021
03471	Spectrum Analyzer	Agilent	E4440A	1/18/2018	1/18/2020

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: Cellphone-Mate, Inc.
 Specification: **7.14 Additional requirements for cable-connected dual-enclosure wideband consumer signal boosters**
 Work Order #: **102129** Date 06/18/2019 and 11/26/2019
 Test Type: **Conducted Emissions**
 Tested By: **Hieu Song Nguyenpham**
 Software: **EMITest 5.03.11**

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

06/18/2019:
 Test environment conditions: Temperature: 20.9°C, Relative Humidity: 48%, Atmospheric Pressure: 101.4kPa

11/26/2019:
 Test environment conditions: Temperature: 19.1°C, Relative Humidity: 36%, Atmospheric Pressure: 101.5kPa

Section 7.14.3 Set up: The pair system was set up and operated as intended. Either Donor or Server Unit was connected to the signal generator. The Signal Generator was set as 4.1MHz AWGN at -80ddBm and injected to the pair system during exposure.

Modification 1 and 3 was in place during testing.

Test Equipment:

Asset #	Description	Manufacturer	Model	Calibration Date	Cal Due Date
P05411	Attenuator	Weinschel	54A-10	1/19/2018	1/19/2020
P06901	Cable	Astrolab	32022-29094K-29094K-36TC	1/4/2018	1/4/2020
03360	Cable	Astrolab	32022-2-29094-36TC	6/25/2018	6/25/2020
03418	Signal Generator	Agilent	E4438C	5/13/2019	5/13/2021
03471	Spectrum Analyzer	Agilent	E4440A	1/18/2018	1/18/2020

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: Cellphone-Mate, Inc.
 Specification: **7.14 Additional requirements for cable-connected dual-enclosure wideband consumer signal boosters**
 Work Order #: **102129** Date 06/19/2019 and 08/27/2019
 Test Type: **Conducted Emissions**
 Tested By: **Hieu Song Nguyenpham**
 Software: **EMITest 5.03.11**

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

06/19/2019:
 Test environment conditions: Temperature: 21°C, Relative Humidity: 43%, Atmospheric Pressure: 101.5kPa
 08/27/2019:
 Test environment conditions: Temperature: 23.4°C, Relative Humidity: 46%, Atmospheric Pressure: 100.9kPa
Section 7.14.3 Set up: The pair system is set up and operated as intended. Either Donor or Server Unit was connected to the signal generator. The Signal Generator was set as 4.1MHz AWGN at -80ddBm and injected to the pair system during exposure.
 Modification 1 and 3 was in place during testing.

Test Equipment:

Asset #	Description	Manufacturer	Model	Calibration Date	Cal Due Date
P05411	Attenuator	Weinschel	54A-10	1/19/2018	1/19/2020
P07192	Cable	Astro	32022-29094K-29094K-48TC	10/9/2017	10/9/2019
P07191	Cable	Astro	32022-29094K-29094K-48TC	10/30/2017	10/30/2019
03418	Signal Generator	Agilent	E4438C	5/13/2019	5/13/2021
03471	Spectrum Analyzer	Agilent	E4440A	1/18/2018	1/18/2020

Summary of Results

Configuration 1

Additional Requirement for cable connected Dual Enclosure wideband Consumer booster - Summary of Results

7.14.1

Section	Cable length		
	Shortest	Medium	Longest
7.1 Authorized Frequency Band Verification Test	Pass	NA	NA
7.2 Maximum Power Measurement Procedure	Pass	Pass	Pass
7.3 Maximum Booster Gain Computation	Pass	Pass	Pass
7.4 Intermodulation Product	Pass	Pass	Pass
7.5 Out of Band Emissions	Pass	Pass	Pass
7.6 Conducted Spurious Emission	Pass	NA	NA
7.7 Noise Limit Procedure	Pass	Pass	Pass
7.8 Uplink inactivity	Pass	Pass	Pass
7.9 Variable Booster Gain	Pass	Pass	Pass
7.10 Occupied Band Width	Pass	NA	NA
7.11 Anti-Oscillation	Pass	Pass	Pass
7.12 Radiated Spurious Emission	Pass	Pass	Pass

NA: Not required according to KBD 935210 D03 Signal Booster Measurements v04r03.

7.14.2 Verification of Self-Monitoring

Uplink and downlink	Simulated cable loss / Cable length tested	
	Shortest -10%	Longest + 10%
Power	NA	Pass
Noise	NA	Pass
Gain	NA	Pass
Shut down in 300 second	Pass (Note 1)	Pass (Note 2)

Note 1: The EUT shuts down after powering up and the noise was under -70dBm/MHz when a 45 ft cable is connected between the server and the donor unit.

Note 2: The EUT shuts down in 300 seconds and the noise was under -70dBm/MHz on UP link. The EUT did not shut down in 300 second on down link, however, the noise was under -70dBm/MHz in this condition.

NA: Not applicable since the EUT since the EUT shuts off in this condition.

a/ Gain and Power on Downlink when using a 165ft Cable

Pre AGC						
	Pulse GSM			4.1 MHz AWGN		
Frequency (MHz)	Input (dBm)	Output (dBm)	Gain (dB)	Input (dBm)	Output (dBm)	Gain (dB)
DL2110-2155	-62.5	-0.8	61.7	-64.7	-3.0	61.7
DL1930-1995	-59.4	0.6	60.0	-61.3	-1.3	60.0
DL869-894	-55.7	4.5	60.2	-56.4	2.6	59.0
DL:728-746	-54.7	4.8	59.5	-56.2	2.7	58.9
DL 746-757	-56.2	3.7	59.9	-57.6	1.7	59.3

Pulse GSM					Conducted	Conducted and EIRP
Frequency (MHz)	Output Power (dBm)	*Ant Gain (dBi)	Cable (dB)	EIRP (dBm)	Limit Min (dBm)	Limit Max (dBm)
DL2110-2155	-0.8	10.0	3.8	5.4	NA	17
DL1930-1995	0.6	10.0	3.6	7.0	NA	17
DL869-894	4.5	7.0	2.3	9.2	NA	17
DL:728-746	4.8	7.0	2.1	9.7	NA	17
DL 746-757	3.7	7.0	2.1	8.6	NA	17

4.1MHz AWGN					Conducted	Conducted and EIRP
Frequency (MHz)	Output Power (dBm)	*Ant Gain (dBi)	Cable (dB)	EIRP (dBm)	Limit Min (dBm)	Limit Max (dBm)
DL2110-2155	-3.0	10.0	3.8	3.2	NA	17
DL1930-1995	-1.3	10.0	3.6	5.1	NA	17
DL869-894	2.6	7.0	2.3	7.3	NA	17
DL:728-746	2.7	7.0	2.1	7.6	NA	17
DL 746-757	1.7	7.0	2.1	6.6	NA	17

* Antenna gain and cable losses indicated from Fusion4Home V1.01 Antenna Kit.

DL: SC248W and SC240-20NN

b/ Max Noise when using a 165ft cable

Maximum Noise Power (Fixed)			
Freq (MHz)	Measured (dBm./MHz)	Limit (dBm/MHz)	Margin
DL2110-2155	-45.10	-37.70	-7.40
DL1930-1995	-45.18	-37.00	-8.18
DL869-894	-46.46	-44.10	-2.36
DL:728-746	-47.59	-45.50	-2.09
DL 746-757	-47.14	-44.60	-2.54

7.14.3 Verification of two enclosure booster system operation

Booster setup	Device shuts down after powering up
7.14.3 (a) Standalone Server unit without Donor unit.	Pass
7.14.3 (b) Standalone Donor unit without Server unit	NA
7.14.3 (d) Server-Server-Donor	Pass
7.14.3 (e) Server-Donor-Donor	Pass

Note: The pair system shut down after powering up, the noise was under -70dBm/MHz.

NA: Not applicable since the Donor Unit is powered from Server Unit.

Configuration 2

Additional Requirement for cable connected Dual Enclosure wideband Consumer booster - Summary of Results

7.14.1

Section	Cable length		
	Shortest	Medium	Longest
7.1 Authorized Frequency Band Verification Test	Pass	NA	NA
7.2 Maximum Power Measurement Procedure	Pass	NA	NA
7.3 Maximum Booster Gain Computation	Pass	NA	NA
7.4 Intermodulation Product	Pass	NA	NA
7.5 Out of Band Emissions	NA	NA	NA
7.6 Conducted Spurious Emission	Pass	NA	NA
7.7 Noise Limit Procedure	Pass	NA	NA
7.8 Uplink inactivity	NA	NA	NA
7.9 Variable Booster Gain	NA	NA	NA
7.10 Occupied Band Width	NA	NA	NA
7.11 Anti-Oscillation	NA	NA	NA
7.12 Radiated Spurious Emission	Pass	NA	NA

NA: Not contracted to test all requirements as these sections were tested in configuration 1. Only perform on a shortest cable since the donor unit was different, while the Server unit remains unchanged.

7.14.2 Verification of Self-Monitoring

Uplink and downlink	Simulated cable loss / Cable length tested	
	Shortest -10%	Longest + 10%
Power	NA	NA
Noise	NA	NA
Gain	NA	NA
Shut down in 300 second	Pass (Note 1)	Pass (Note 1)

Note 1: The EUT would not power up when using 45 ft cable or 165ft cable to connect between the server and the donor unit.

NA: Not applicable since the EUT would not turn on and the noise was under -70dBm/MHz.

7.14.3 Verification of two enclosure booster system operation

Booster setup	Device shuts down after powering up
7.14.3 (a) Standalone Server unit without Donor unit.	Pass
7.14.3 (b) Standalone Donor unit without Server unit	NA
7.14.3 (d) Server-Server-Donor	Pass
7.14.3 (e) Server-Donor-Donor	Pass

Note: Shutdown meet the limit as defined in Part 20 for transmit power off mode.

NA: Not applicable since the Donor unit is powered from a Server Unit.

Configuration 3

Additional Requirement for cable connected Dual Enclosure wideband Consumer booster - Summary of Results

7.14.1

Section	Cable length		
	Shortest	Medium	Longest
7.1 Authorized Frequency Band Verification Test	Pass	NA	NA
7.2 Maximum Power Measurement Procedure	Pass	NA	NA
7.3 Maximum Booster Gain Computation	Pass	NA	NA
7.4 Intermodulation Product	Pass	NA	NA
7.5 Out of Band Emissions	NA	NA	NA
7.6 Conducted Spurious Emission	Pass	NA	NA
7.7 Noise Limit Procedure	Pass	NA	NA
7.8 Uplink inactivity	NA	NA	NA
7.9 Variable Booster Gain	NA	NA	NA
7.10 Occupied Band Width	NA	NA	NA
7.11 Anti-Oscillation	NA	NA	NA
7.12 Radiated Spurious Emission	Pass	NA	NA

NA: Not contracted to test all requirements as these sections were tested in configuration 1. Only perform on a shortest cable since the donor unit was different, while the Server unit remains unchanged.

7.14.2 Verification of Self-Monitoring

Uplink and downlink	Simulated cable loss / Cable length tested	
	Shortest -10%	Longest + 10%
Power	NA	NA
Noise	NA	NA
Gain	NA	NA
Shut down in 300 second	Pass (Note 1)	Pass (Note 1)

Note 1: The EUT shut down after powering since using a 45ft cable and a 165 cable to connect between a server unit and a donor unit.

NA: Not applicable since the EUT was not on, and the noise was under -70dBm/MHz.

7.14.3 Verification of two enclosure booster system operation

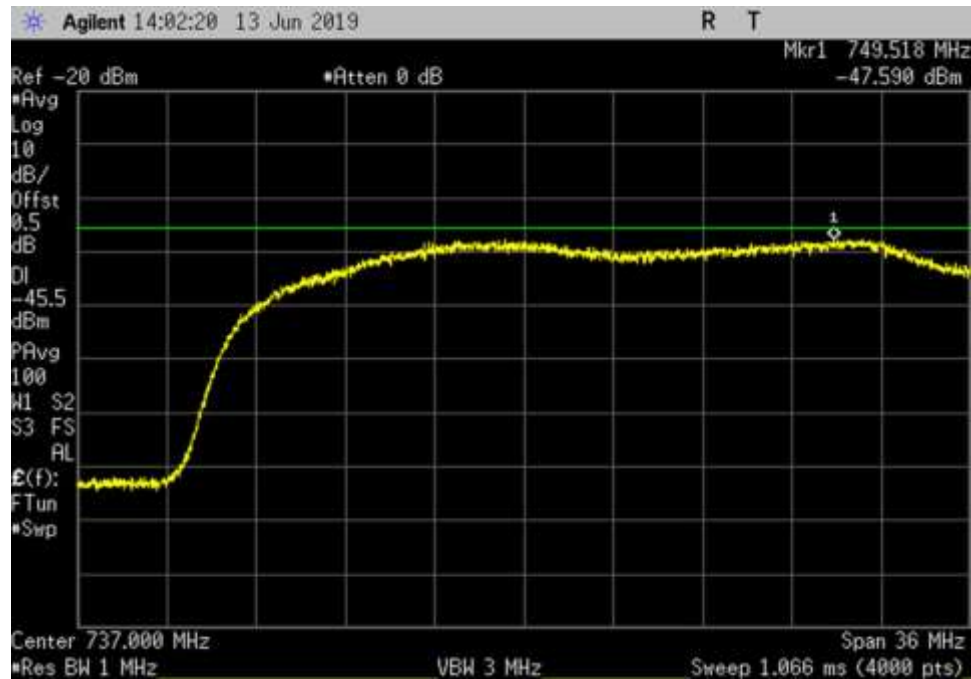
Booster setup	Device shuts down after powering up
7.14.3 (a) Standalone Server unit without Donor unit.	Pass
7.14.3 (b) Standalone Donor unit without Server unit	NA
7.14.3 (d) Server-Server-Donor	Pass
7.14.3 (e) Server-Donor-Donor	Pass

Note: The pair system shut down after powering, and the noise was under -70dBm/MHz.

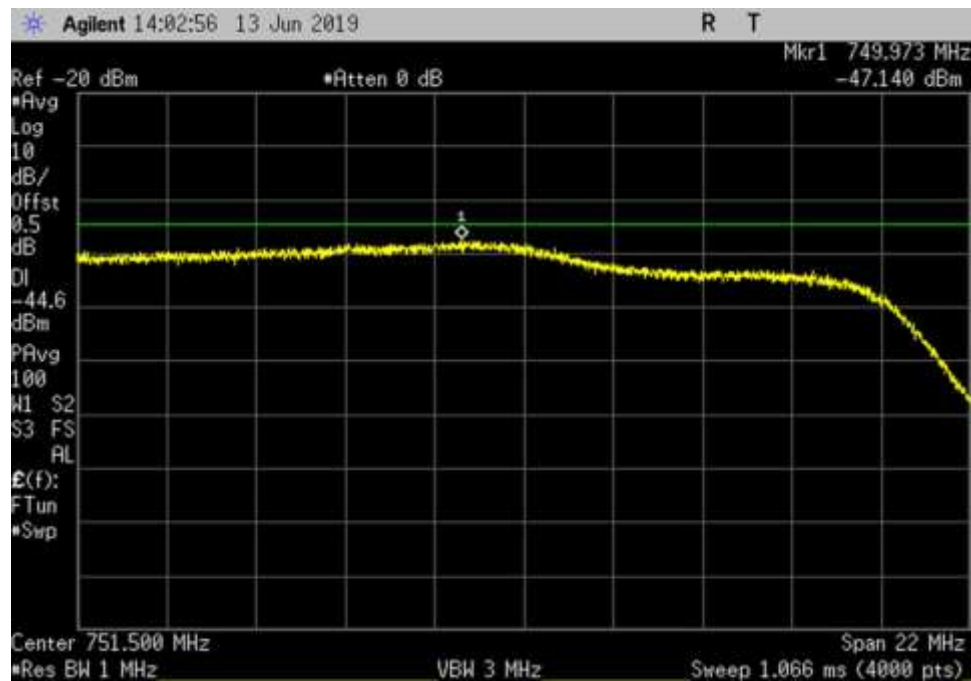
NA: Not applicable since the Donor Unit is powered by the Server Unit.

Plots

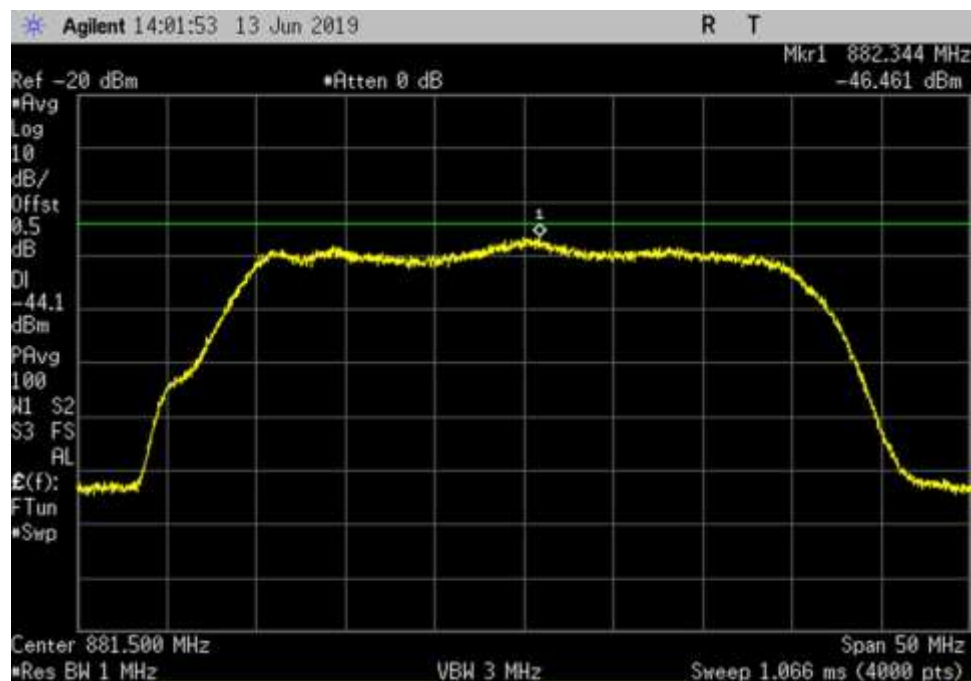
Configuration 1



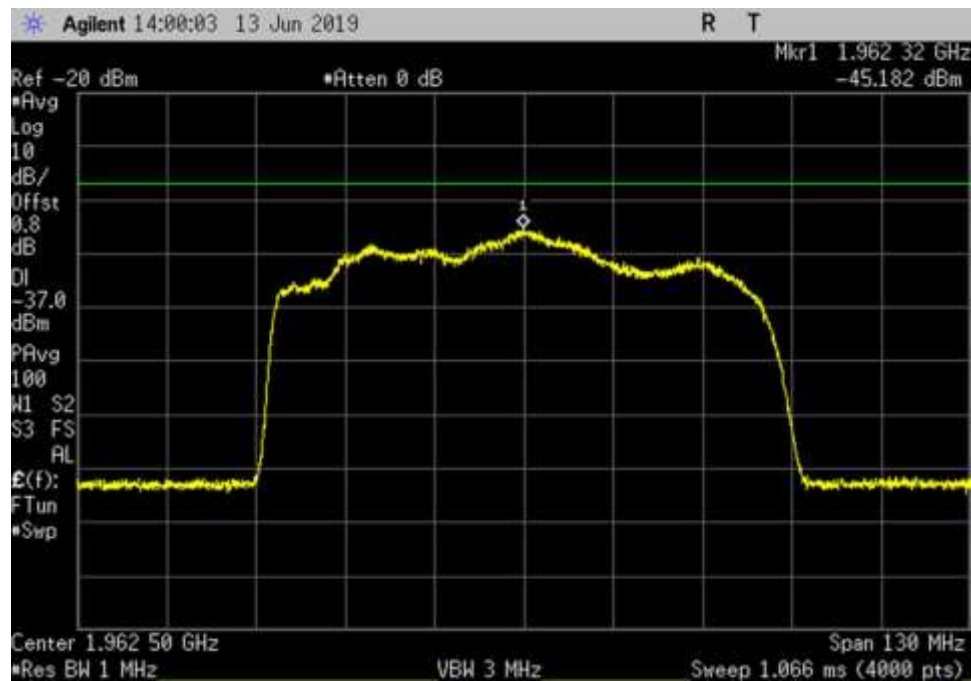
DL_728-746_ 737MHz_165ft Cable



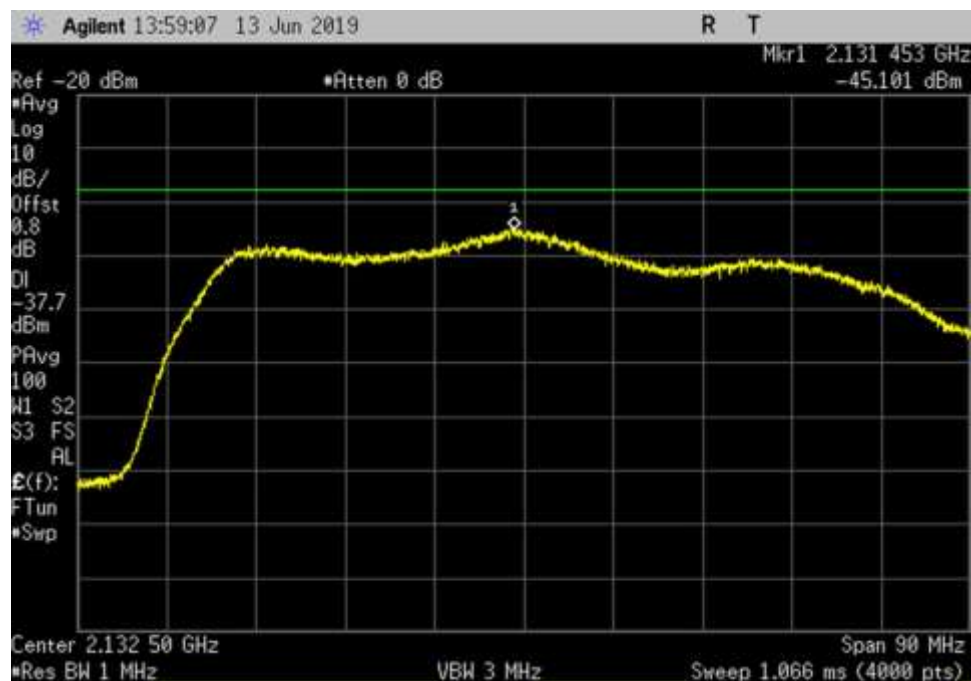
DL_746-757_751.5MHz_165ft Cable



DL_869-894_881.5MHz_165ft Cable



DL_1930-1995_ 1962.5MHz_165ft Cable



DL_2110-2155_ 2132.5MHz_165ft Cable

Exhibit A: Test Setup Photos



Section 7.2-7.3 – Verification Testing performed May 24, 2021



Section 7.1, 7.2, 7.3 – Test Setup Configuration 1



Section 7.1, 7.2, 7.3 – Test Setup Configuration 2



Section 7.1, 7.2, 7.3 – Test Setup Configuration 3



Section 7.4, 7.5, 7.6, 7.10 – Test Setup Configuration 1



Section 7.4, 7.6 – Test Setup Configuration 2



Section 7.4, 7.6 – Test Setup Configuration 3



Section 7.7, 7.8 – Max Noise Configuration 1



Section 7.7 – Variance Noise Configuration 1



Section 7.7 – Test Setup Configuration 2



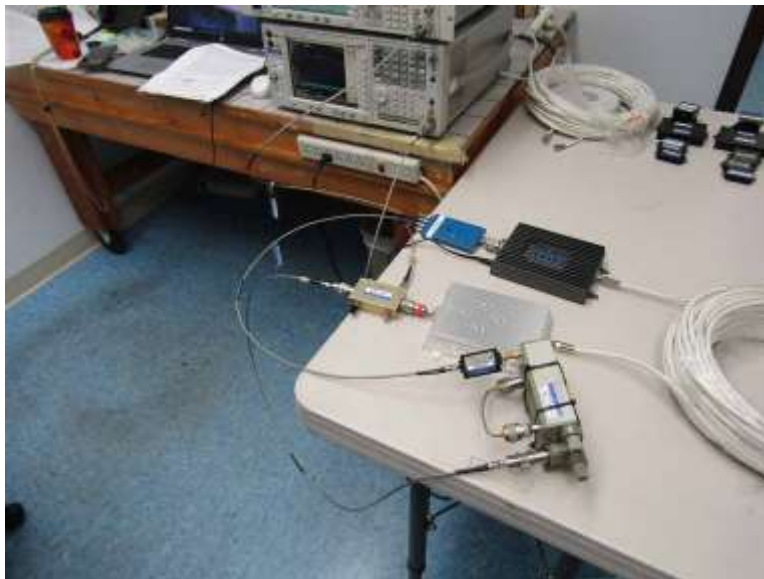
Section 7.7 – Test Setup Configuration 3



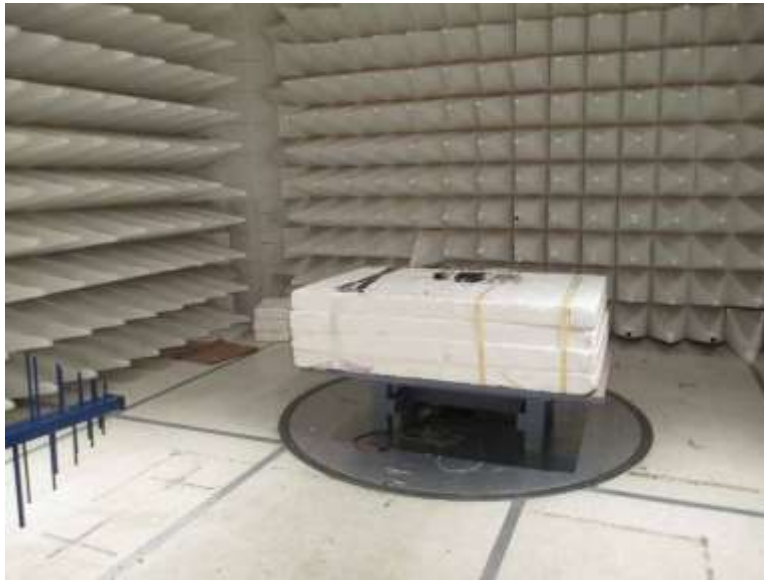
Section 7.9 – Test Setup Configuration 1



Section 7.11.2 – Test Setup Configuration 1



Section 7.11.3 – Test Setup Configuration 1



Section 7.12 – Below 1GHz Configuration 1



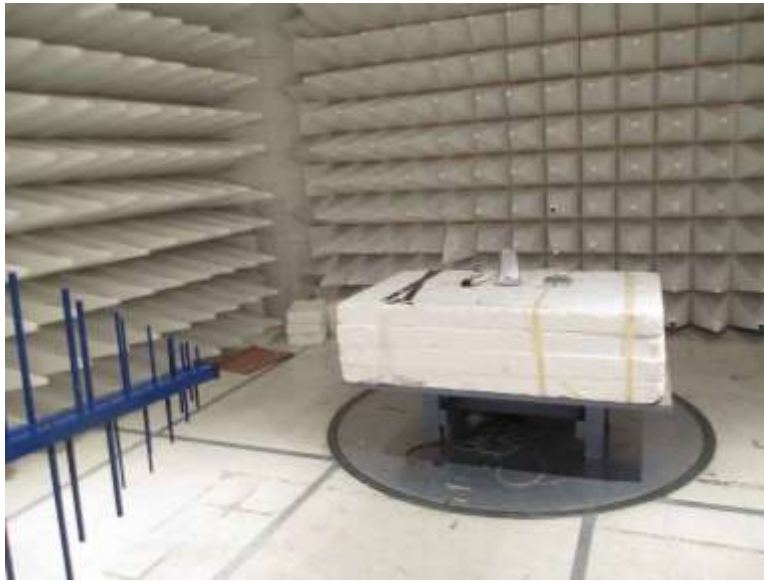
Section 7.12 – Below 1GHz Configuration 1



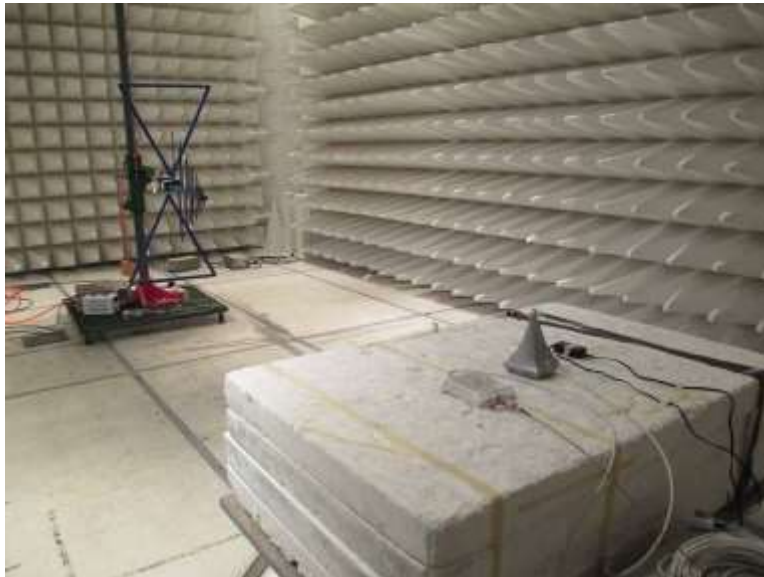
Section 7.12 – Above 1GHz Configuration 1



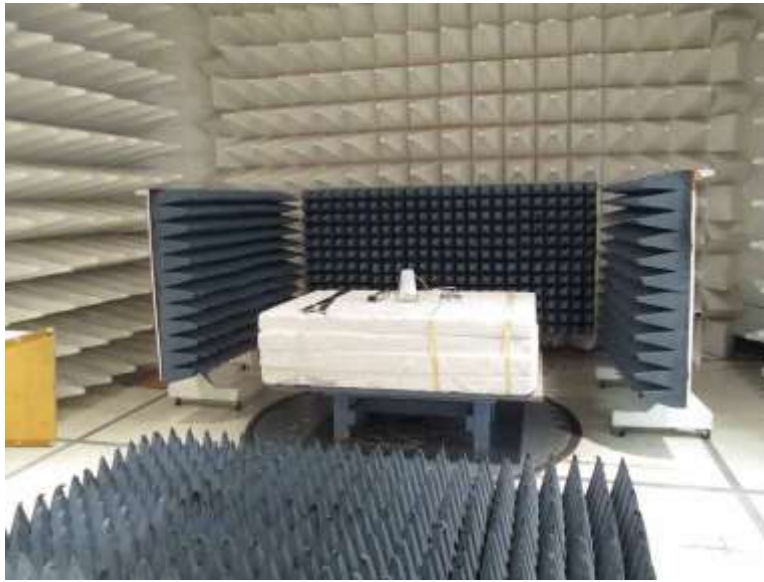
Section 7.12 – Above 1GHz Configuration 1



Section 7.12 – Below 1GHz Configuration 4



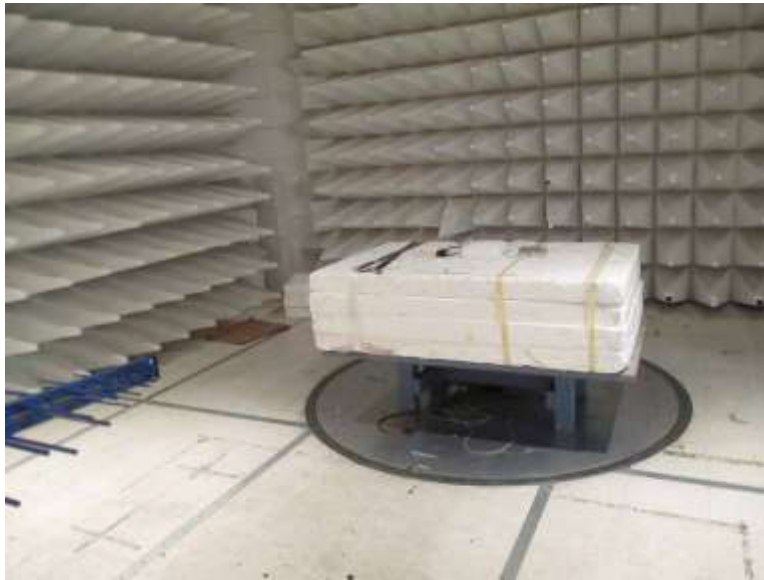
Section 7.12 – Below 1GHz Configuration 4



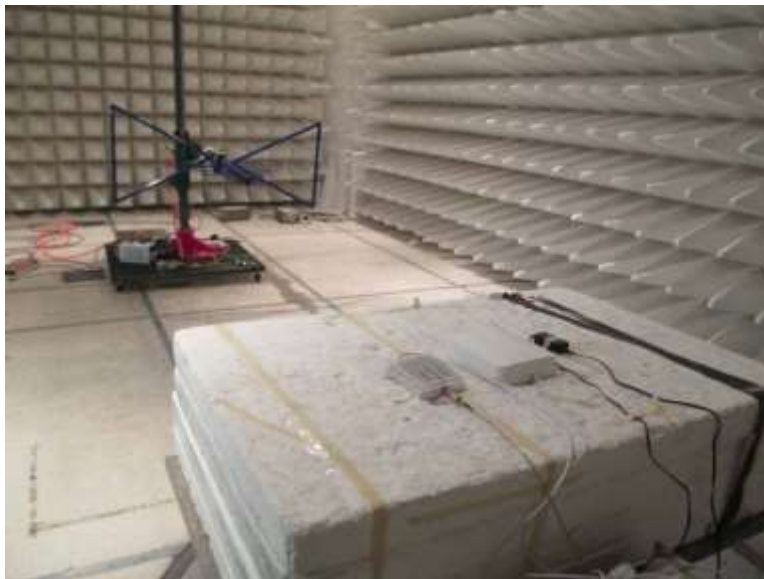
Section 7.12 – Above 1GHz Configuration 4



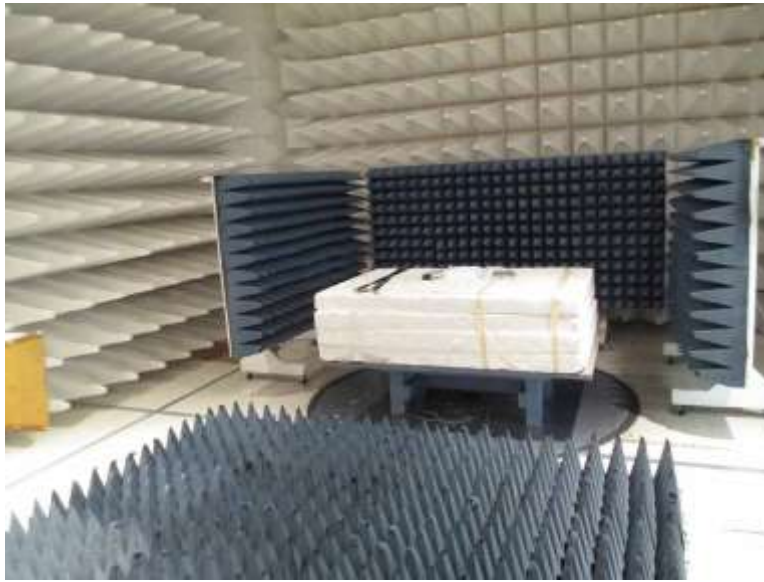
Section 7.12 – Above 1GHz Configuration 4



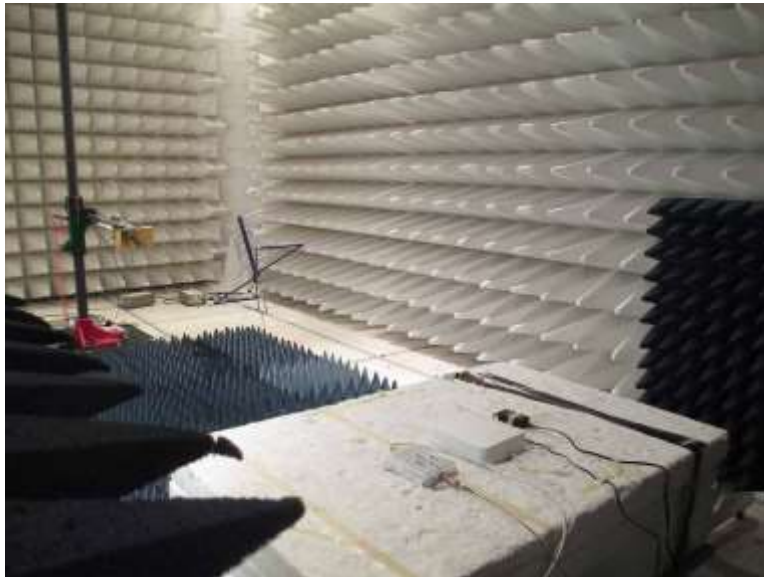
Section 7.12 – Below 1GHz Configuration 5



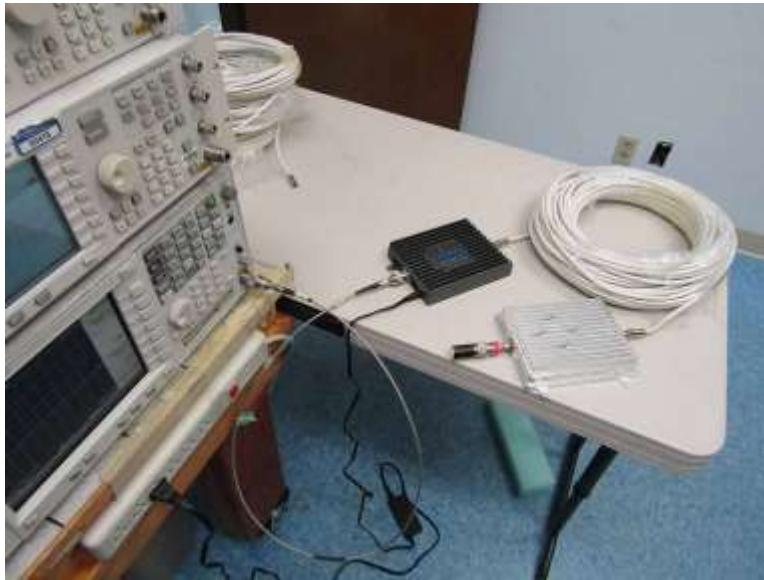
Section 7.12 – Below 1GHz Configuration 5



Section 7.12 – Above 1GHz Configuration 5



Section 7.12 – Above 1GHz Configuration 5



Section 7.14.2(f)(2) – Test Setup Configuration 1



Section 7.14.2(f)(1)(2) – Test Setup Configuration 1



Section 7.14.3(d) – Test Setup Configuration 1



Section 7.14.3(e) – Test Setup Configuration 1



Section 7.14.2 – Test Setup Configuration 2



Section 7.14.3(d) – Test Setup Configuration 2



Section 7.14.3(e) – Test Setup Configuration 2



Section 7.14.2 – Test Setup Configuration 3



Section 7.14.3(d) – Test Setup Configuration 3



Section 7.14.3(e) – Test Setup Configuration 3

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k=2$. Compliance is deemed to occur provided measurements are below the specified limits.