

	 MS ISO/IEC 17025 TESTING SAMM No. 0825																										
MOTOROLA PENANG ADV. COMM. LABORATORY Motorola Solutions Malaysia Sdn. Bhd. Innoplex Plot 2A Medan Bayan Lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia.	FCC / IC TEST REPORT Report Revision : Rev. B																										
<table><tr><td>Date/s Tested</td><td>: 29-June-2018 - 01-July-2018</td></tr><tr><td>Report Issue Date</td><td>: 10-July-2018</td></tr><tr><td>Manufacturer/Location</td><td>: Motorola Solutions - Penang</td></tr><tr><td>Requestor</td><td>: OOI, YUH SHENG</td></tr><tr><td>Product Type</td><td>: Portable</td></tr><tr><td>Model Number</td><td>: DLR1060BHLAB</td></tr><tr><td>Frequency Band</td><td>: 902 - 928 MHz</td></tr><tr><td>Rated / Max RF Output Power</td><td>: 1 Watt</td></tr><tr><td>Applicant Name</td><td>: Motorola Solutions Inc.</td></tr><tr><td>Applicant Address</td><td>: 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322</td></tr><tr><td>FCC Registrations</td><td>: 461337</td></tr><tr><td>IC Registrations</td><td>: 109AK</td></tr></table>  The equipment was tested accordance to the requirement listed below: <table><tr><td>(900MHz ISM) Part 15C ISED RSS-GEN/247</td><td>PASS</td></tr></table>		Date/s Tested	: 29-June-2018 - 01-July-2018	Report Issue Date	: 10-July-2018	Manufacturer/Location	: Motorola Solutions - Penang	Requestor	: OOI, YUH SHENG	Product Type	: Portable	Model Number	: DLR1060BHLAB	Frequency Band	: 902 - 928 MHz	Rated / Max RF Output Power	: 1 Watt	Applicant Name	: Motorola Solutions Inc.	Applicant Address	: 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322	FCC Registrations	: 461337	IC Registrations	: 109AK	(900MHz ISM) Part 15C ISED RSS-GEN/247	PASS
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Prepared By: Gan Boon Teong Test Personnel	Approved By: Ho Sze Khian Responsible Engineer																										

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REVISION HISTORY

Revision History	Description	Date	Originator
Rev. A	Initial Report	05-July-2018	Gan Boon Teong
Rev. B	Change Applicant Name and Applicant Address	10-July-2018	Gan Boon Teong

1.0. General Information

EUT Description:

Technologies	900MHz ISM
TX Frequency range	902MHz – 928MHz
Modulation Type	8FSK
No of Hopset	10
No of Channel Per Hopset	50
Input/Output	RF port
Connector type	PROGRAMMING
Antenna type	Helix Fixed Antenna
Antenna Gain	2.5 dBi

The EUT contains following accessory devices and data cable:

Item	Brand	Model or P/N
IMPRES 1800 mAH, LI-ION BATTERY	MOTOROLA	HKNN4013A
PROGRAMMING, TEST & ALIGNMENT CABLE	MOTOROLA	HKNN4027A

General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, the EUT is to comply with the requirements of the following standards:

ANSI C63.10-2013

2.0. Summary of Test Results

FCC Clause	IC Clause	Test Item	Result	Remark
15.247 (b)(2)	RSS-247 5.4(1)	Conducted RF Output Power (Peak) & EIRP Measurement	NA	NA
15.247 (a)(1)	RSS-247 5.1(3) RSS-247 5.1(2)	(1) 20dB Channel Bandwidth (2) Channel Separation	NA	NA
15.247(a)(1)(i)	RSS-247 5.1(3)	Number of hopping Frequency used	NA	NA
15.247(a)(1)(i)	RSS-247 5.1(3)	Dwell time on each channel	NA	NA
15.247 (d)	RSS-247 5.5	Band Edge Conducted Spurious Emission	NA	NA
15.247 (d)	RSS-247 5.5	Conducted Spurious Emission	NA	NA
15.205, 15.209, 15.247 (d)	RSS-247 5.5	Radiated Emission within Restricted Bands	Pass	NA
15.207	RSS-Gen 8.8	AC Powerline Conducted Emission	NA	Testing is not required, radio shall turn off during charging mode

3.0. Measurement Uncertainty

Measurement	Frequency	Expended Uncertainty (k=1.96) (±)
AC Power Line Conducted Spurious Emission	150KHz ~ 30MHz	3.43
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	5.01
	200MHz ~ 1000MHz	5.01
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.01
	18GHz ~ 25GHz	5.01

4.0. Equipment List

Radiated Emission Station (SW Version: EMC FCC RE v1.5.1)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
DRG HORN FREQ.	SAS-571	719	18-Jul-17	18-Jul-19
DRG HORN FREQ.	SAS-571	720	2-Mar-17	2-Mar-19
POWER SUPPLY	6032A	MY41001736	16-May-18	16-May-19
MICROWAVE SIGNAL GENERATOR	SMP04	100127	19-Jul-17	18-Jul-18
EMI TEST RECEIVER	ESIB26	100336	13-Jul-17	12-Jul-18
SIGNAL ANALYZER	FSV40	101103	18-Jul-17	17-Jul-18
5m Semi-anechoic Chamber	S800-HX	J2308	Not Required	Not Required
BILOG ANTENNA	CBL6112D	30991	23-Apr-18	23-Apr-19
BILOG ANTENNA	CBL6112B	2964	16-Feb-18	16-Feb-20
BROAD-BAND HORN ANTENNA	BBHA9170	BBHA9170255	7-Nov-17	7-Nov-18
DATA LOGGER	SDL500	A.016776	18-Mar-17	18-Mar-19
LOOP ANTENNA	6502	208416	27-Jul-17	27-Jul-18
SYSTEM CONTROLLER	SC104V	050806-1	Not Required	Not Required
TURNTABLE FLUSH MOUNT 2M	FM2011	NA	Not Required	Not Required
ANTENNA POSITIONING TOWER	TLT2	NA	Not Required	Not Required
18 - 40GHz PREAMPLIFIER	Miteq Hi Gain Sucoflex	002	Not Required	Not Required
PREAMPLIFIER	PAM-0118P	361	Not Required	Not Required

5.0. Test Mode Applicability and Test Channel Detail

Radiated Emission Test (Above 1GHz)

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Radiated Emission Test (Below 1GHz)

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Total Channel	Tested Channel	Modulation Technology	Modulation Type
Test Mode	1 to 500	Low,Mid,High	FHSS	8FSK

Power Line Conducted Emission Test

☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☐ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type

Antenna Port Conducted Measurement:

☐ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

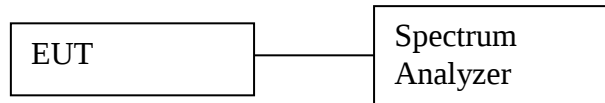
☐ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Total Channel	Tested Channel	Modulation Technology	Modulation Type

6.0. Transmitter Test Parameters

6.1. Conducted RF Output Power (Peak) and E.I.R.P Measurement

6.1.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and set EUT to transmit in hopping disable mode.
- c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = > 20 dB bandwidth
 - b. VBW = RBW
 - c. Detector mode = Peak
 - d. AMPLITUDE → Scale/Div = 10 dB
 - e. Trace = Max hold
 - f. Sweep = auto
- e) Measure the captured power within the band and recording the plot.
- f) Repeat above procedure with different channel frequency of operation.

6.1.2. Test Limits

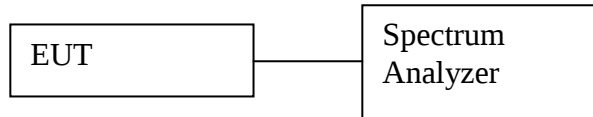
Normal Condition (25 ° C)
Peak Output Power : < 1W (or 30dBm); E.I.R.P: < 4W

6.1.3. Test Data

Not Applicable.

6.2. 20dB Channel Bandwidth

6.2.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and set EUT to transmit in hopping disable mode.
- c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 1 kHz
 - b. VBW = 3 kHz
 - c. SPAN = 130kHz, center on test frequency
 - d. AMPLITUDE → Scale/Div = 10 dB
 - e. Detector mode = Peak
 - f. Trace = Max hold
 - g. Sweep = auto
- e) Measure 20dB & 99% Bandwidth and record as the emission bandwidth.
- f) Save the plot result from spectrum analyzer screen.
- g) Repeat above procedure with different channel frequency of operation.

6.2.2. Test Limits

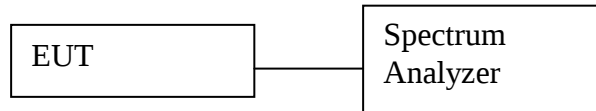
Normal Condition (25 ° C)
For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies

6.2.3. Test Data

Not Applicable.

6.3. Band-edge Conducted Spurious Emission

6.3.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and keep the EUT in hopping mode.
- c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. SPAN = 4 MHz (Low channel) or 6MHz(High Channel)
 - d. Detector mode = Peak
 - e. Trace = Max hold
 - f. Sweep = auto
- e) Measure the captured band edge emission result and recording the plot.
- f) Repeat above on EUT with hopping disable.
- g) Repeat above procedure with other different test frequency.

6.3.2. Test Limits

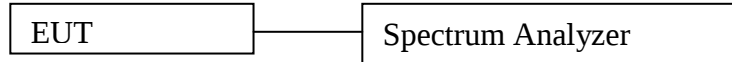
Normal Condition (25 ° C)
Shall be at least 20 dB below the peak power.

6.3.3. Test Result

Not Applicable.

6.4. Dwell time on each channel

6.4.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and keep the EUT in hopping mode.
- c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 10 kHz
 - b. VBW = 30 kHz
 - c. SPAN = Zero SPAN, center on hopping frequency
 - d. Detector mode = Peak
 - e. Trace = Max hold
 - f. Sweep time = 10 second
 - g. Sweep = Single
- e) Measure total numbers of transmissions occur in 10 second and save the plot.
- f) Change the setting of spectrum analyzer :
 - a. RBW = 10 kHz
 - b. VBW = 30 kHz
 - c. Sweep time = sufficient to capture dwell time for 1 transmission
 - d. Sweep = Single
- g) Measure dwell time for 1 transmission and save the plot.
- h) Calculate accumulate dwell time in a given period equal to number of hopping frequencies.
- i) Repeat above procedure with different channel frequency of operation

6.4.2. Test Limits

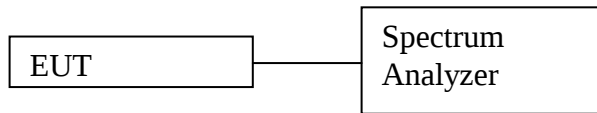
Normal Condition (25 ° C)
$\leq 0.4\text{sec}$

6.4.3. Test Result

Not Applicable.

6.5. Number of hopping Frequency

6.5.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and keep the EUT in hopping mode.
- c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 10 kHz
 - b. VBW = 10 kHz
 - c. Detector mode = Peak
 - d. Trace = Max hold
- e) Allow the trace to stabilized & save the plot result from spectrum analyzer screen.
- f) Count number of channel frequency in the operating.
- g) Repeat above procedure for other test frequency.

6.5.2. Test Limits

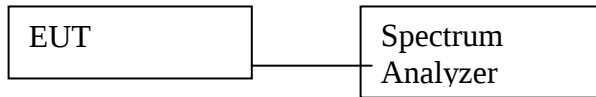
Normal Condition (25 ° C)
≥ 50

6.5.3. Test Result

Not Applicable.

6.6. Channel Separation

6.6.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and keep the EUT in hopping mode.
- c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 10 kHz
 - b. VBW = 30 kHz
 - c. SPAN = 1 MHz, center on test frequency
 - d. Detector mode = Peak
 - e. Trace = Max hold
 - f. Sweep = auto
- e) Measure the frequency different of these two adjacent channels with marker delta function & record the measurement results.
- f) Repeat above procedure with different channel frequency of operation

6.6.2. Test Limits

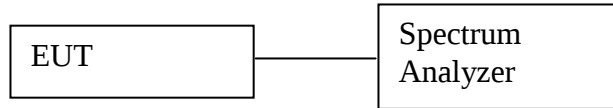
Normal Condition (25 ° C)
At least 25kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

6.6.3. Test Result

Not Applicable.

6.7. Conducted Spurious Emission

6.7.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the EUT and set EUT to transmit maximum data rate with hopping disable.
- c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. SPAN = Cover until 10th harmonic
 - d. Detector mode = Peak
 - e. AMPLITUDE → Scale/Div = 10 dB
 - f. Trace = Max hold
 - g. Sweep = auto
- e) Measure the captured spurious emission result and recording the plot.
- f) Repeat above procedure with different channel frequency of operation.

6.7.2. Test Limits

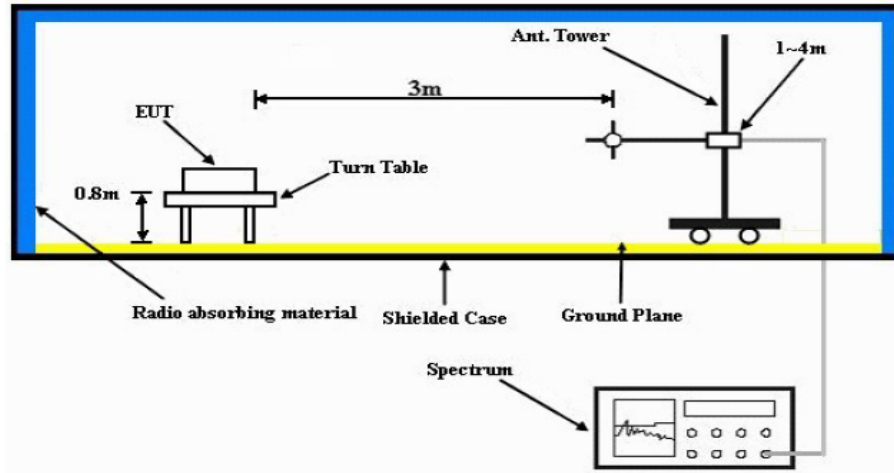
Normal Condition (25 ° C)
Shall be at least 20 dB below for peak power.

6.7.3. Test Data

Not Applicable.

6.8. Radiated Spurious Emission

6.8.1. Test Setup



- The EUT is placed on the top of a rotating table 0.8m (<1Ghz) and 1.5m (>1Ghz) above the ground at a 3m semi-anechoic chamber. The table is rotated 360 degrees to determine the position of the highest radiation.
- The EUT is set 3m away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
- The antenna is Bilog/Horn antenna depend on which frequency range uses, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1m to 4m and the rotatable table is turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system is set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode is fall within the range of 10dB from the limit specified, the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. Otherwise, the testing could be stopped and the peak values of the EUT would be reported.

NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1 GHz.
- All modes of operation were investigated and the worst-case emissions are reported.

6.8.2. Test Limits

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power.

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

NOTE:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = 20 log Emission level (uV/m).
- For frequencies above 1000 MHz, the field strength limits are based on 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.

Test: Bluetooth SAC Transmitter Radiated Emission

EMC SR ID#: 11945-EMC-00015

Accessory: NA

Test Standard: ANSI C63.10-2013

Worst Case Plane: X-Plane

Vertical Radiated Emission Result

Horizontal Radiated Emission Result

Remarks:
Pass Result

Fail Result

Humidity (%): 69.3

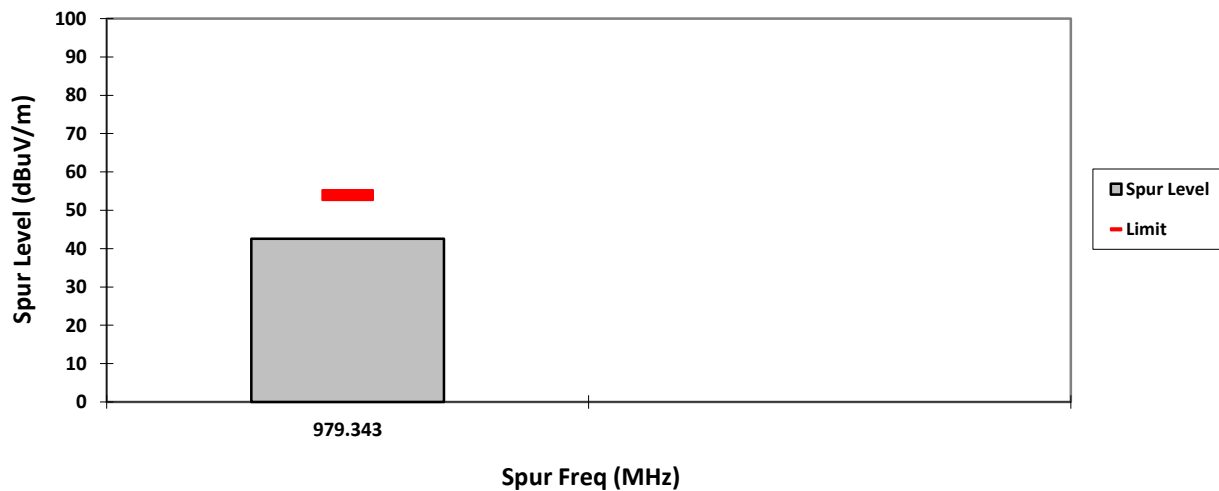
Test Date: Sat, Jun 30, 2018

System MU: 5.01dB

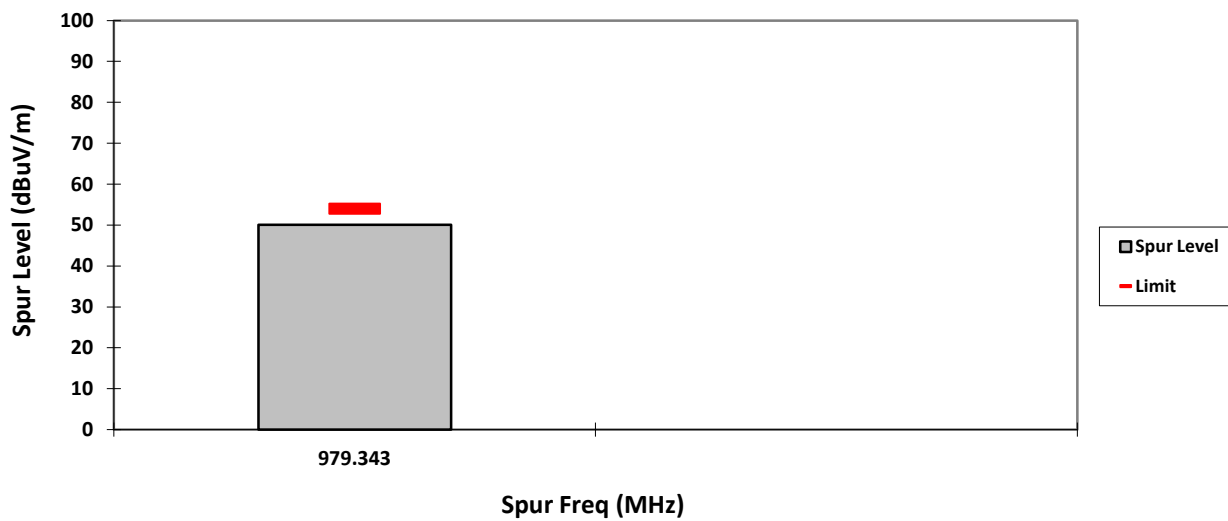
*Pursuant to CFR 47 Part 2.1057 (c), emissions attenuated more than 20 dB below the permissible limit are not reported.

Dwell time = (274 symbols)/(3200 symbols/sec)/(8 frequencies) = 10.70 ms
Correction factor 20 Log (10.70 ms/100 ms) = -19.4 dB

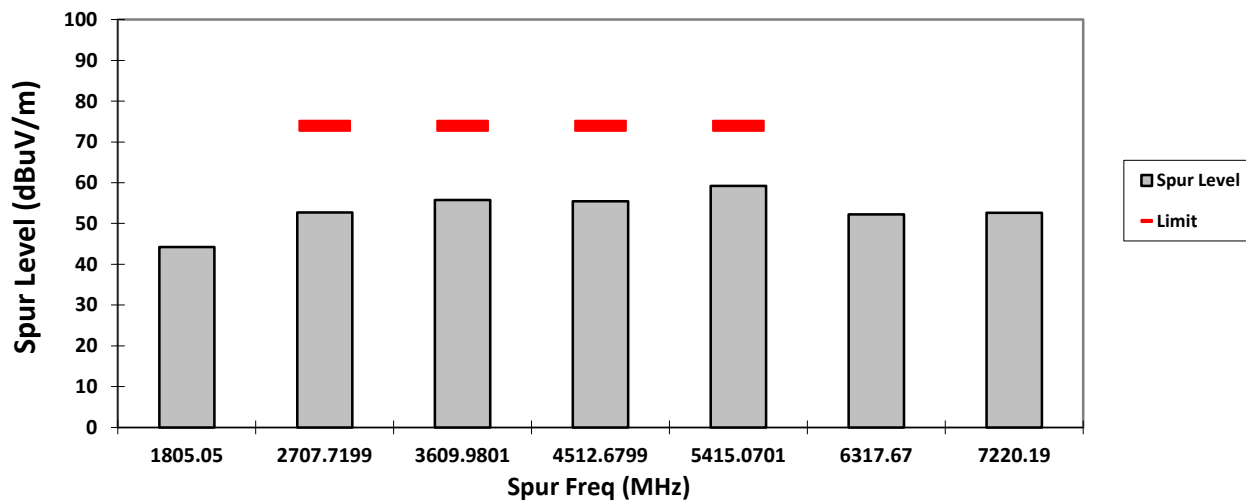
VERTICAL, QPK



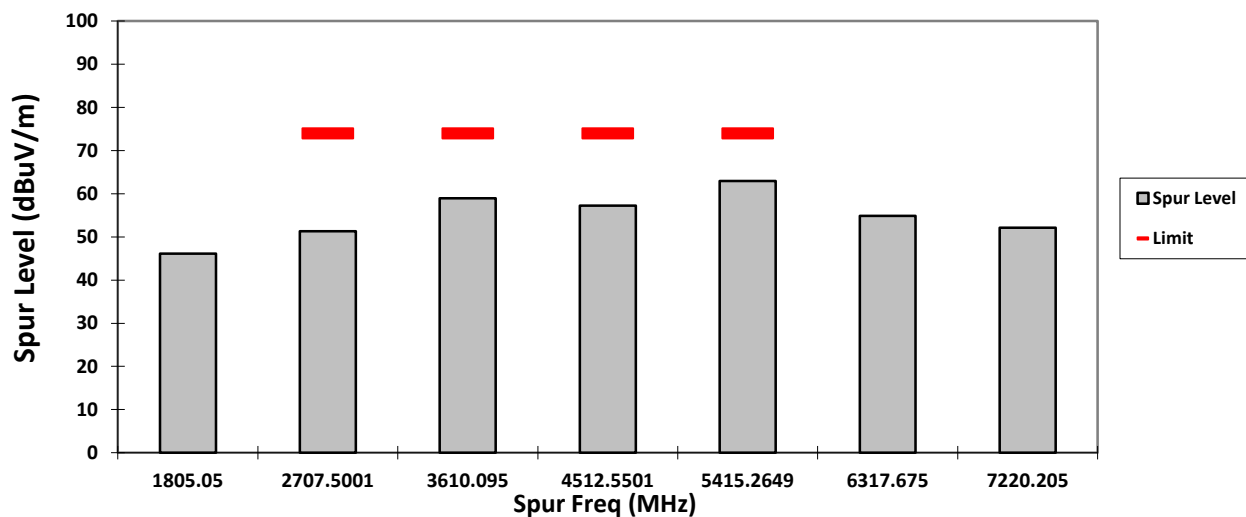
HORIZONTAL, QPK



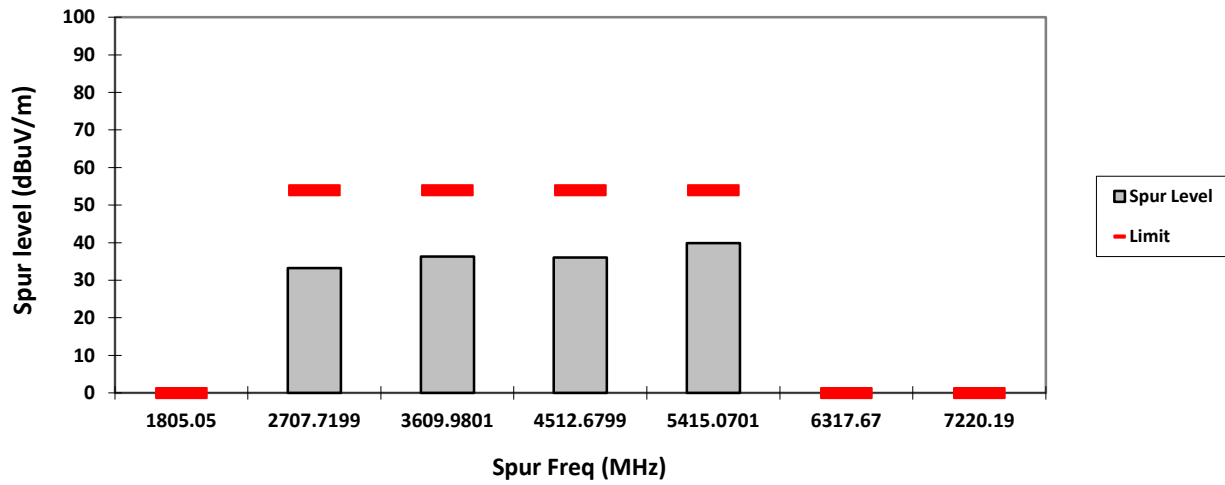
VERTICAL, PK



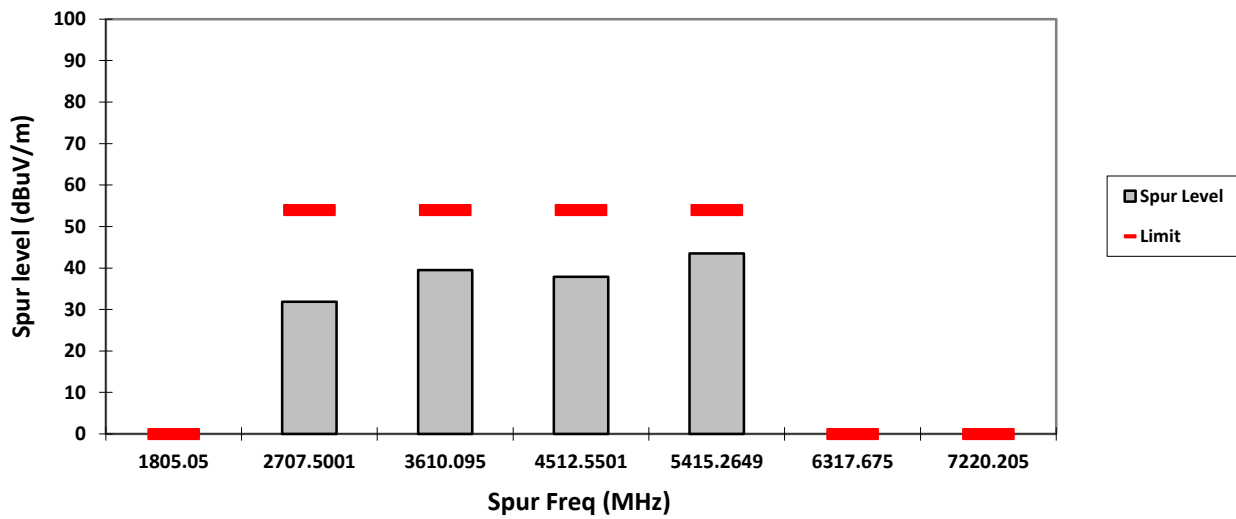
HORIZONTAL, PK



VERTICAL, AV



HORIZONTAL, AV



Test: Bluetooth SAC Transmitter Radiated Emission

Model#: DLR1060BHLAB

S/N: 550PUJ6372

EMC SR ID#: 11945-EMC-00015

Battery: HKNN4013A

Accessory: NA

Test Channel: Mid

Test Frequency: 915.0250 MHz

Test Standard: ANSI C63.10-2013

Worst Case Plane: X-Plane

Radiated Emission (Mid Channel) tabular data

[illegible]

Remarks: Pass Result	Marginal Result	Fail Result
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Temperature (degC): 23.6

Humidity (%): 69.3

Test Performed by: Nazrin&Qawiman

Test Date: Sat, Jun 30, 2018

System MU: 5.01dB

Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.

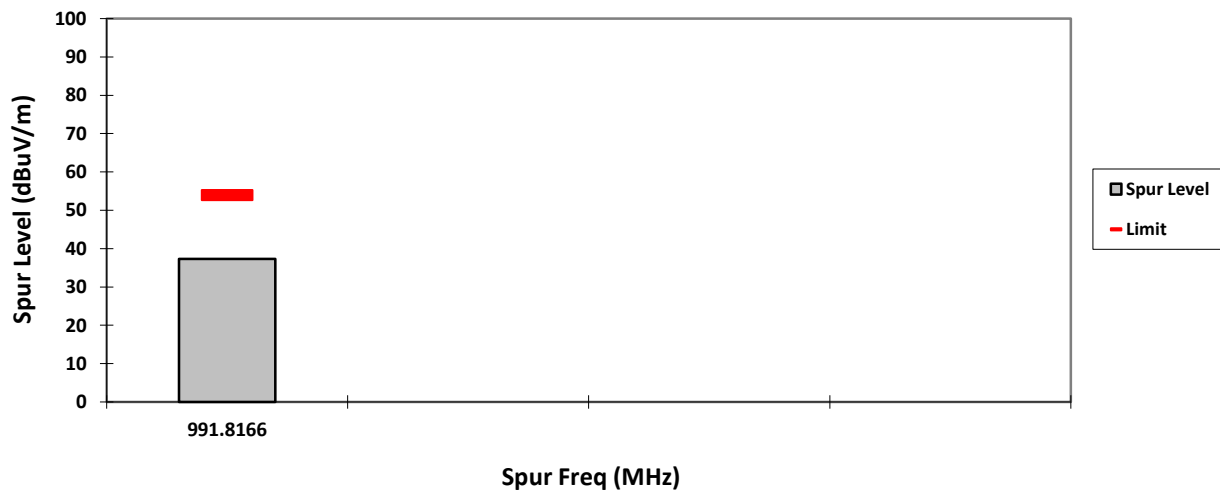
*Pursuant to CFR 47 Part 2.1057 (c), emissions attenuated more than 20 dB below the permissible limit are not reported.

Duty cycle correction factor is determined using the formula $20 \log (\text{dwell time}/100 \text{ ms})$, and for the MOTOtalk emission, this factor is:

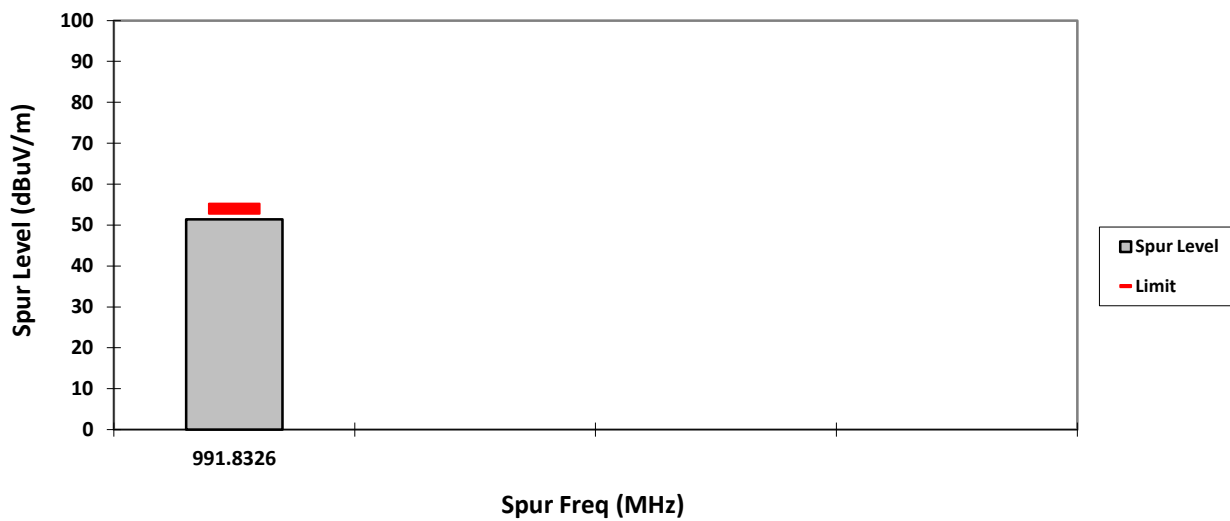
Dwell time = (274 symbols)/(3200 symbols/sec)/(8 frequencies) = 10.70 ms

Correction factor 20 Log (10.70 ms/100 ms) = -19.4 dB

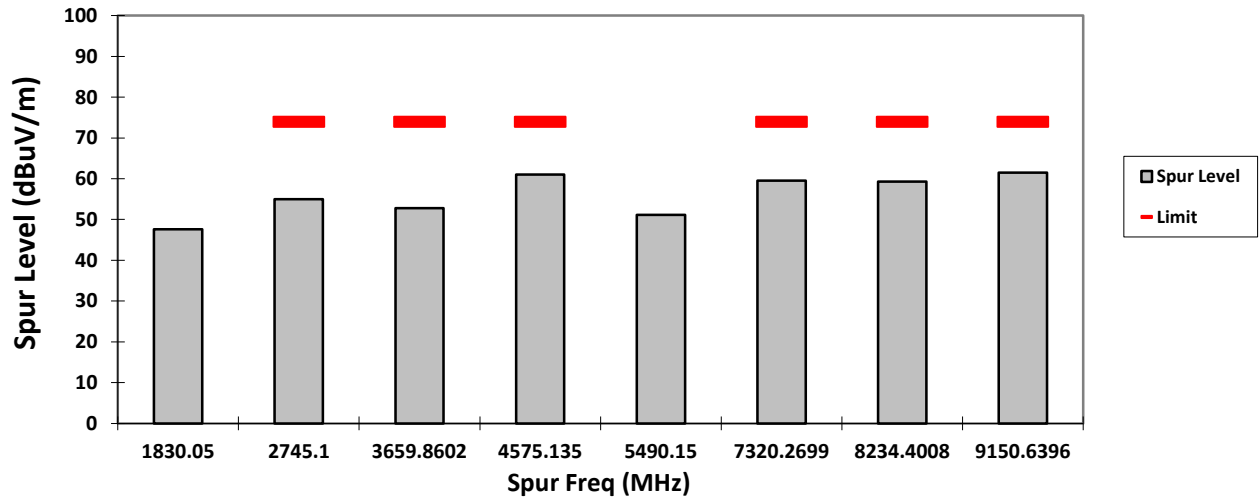
VERTICAL, QPK



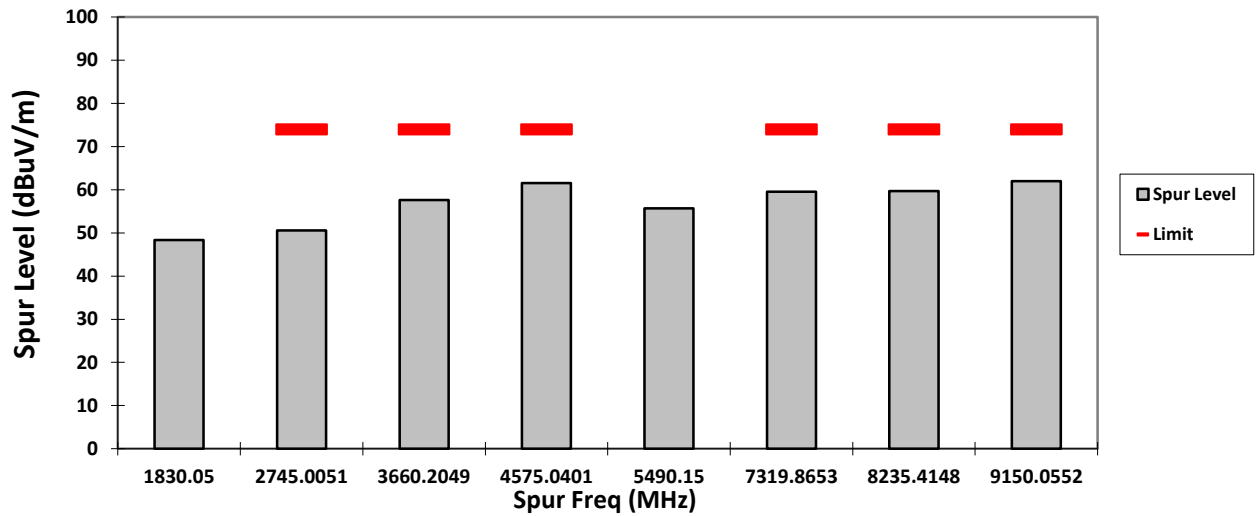
HORIZONTAL, QPK



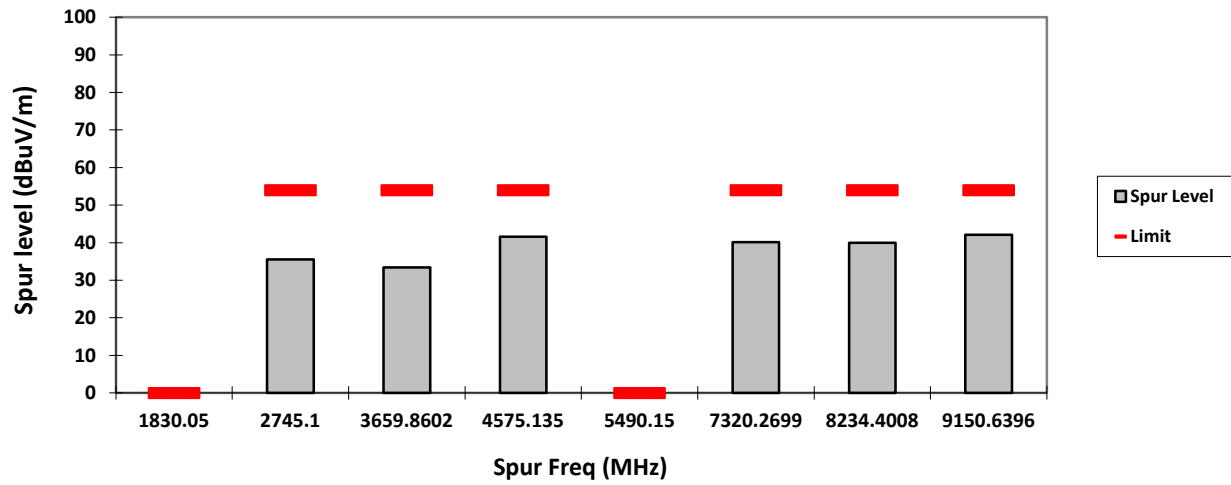
VERTICAL, PK



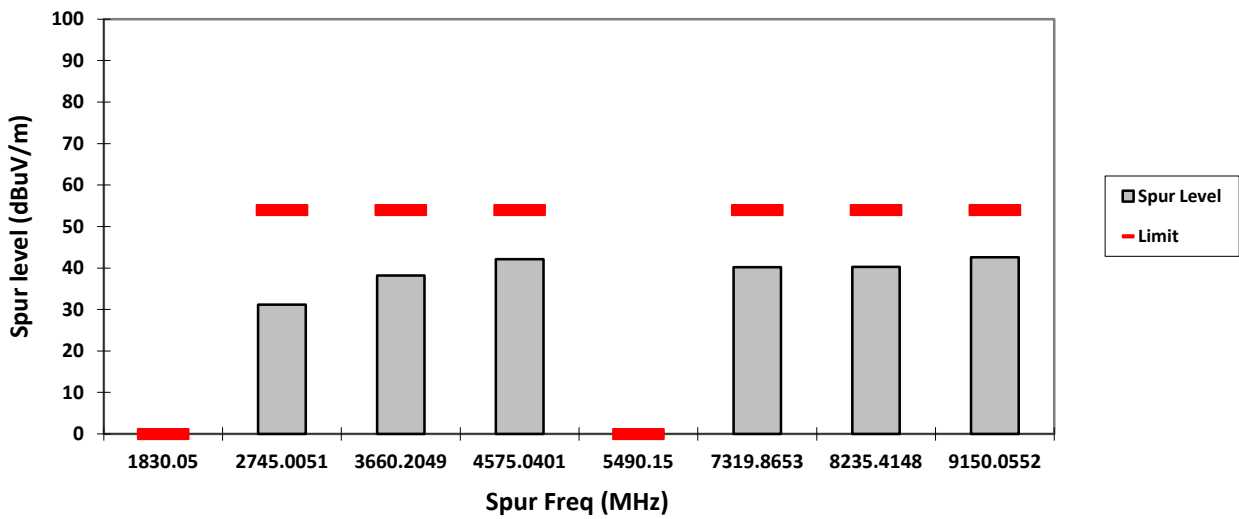
HORIZONTAL, PK



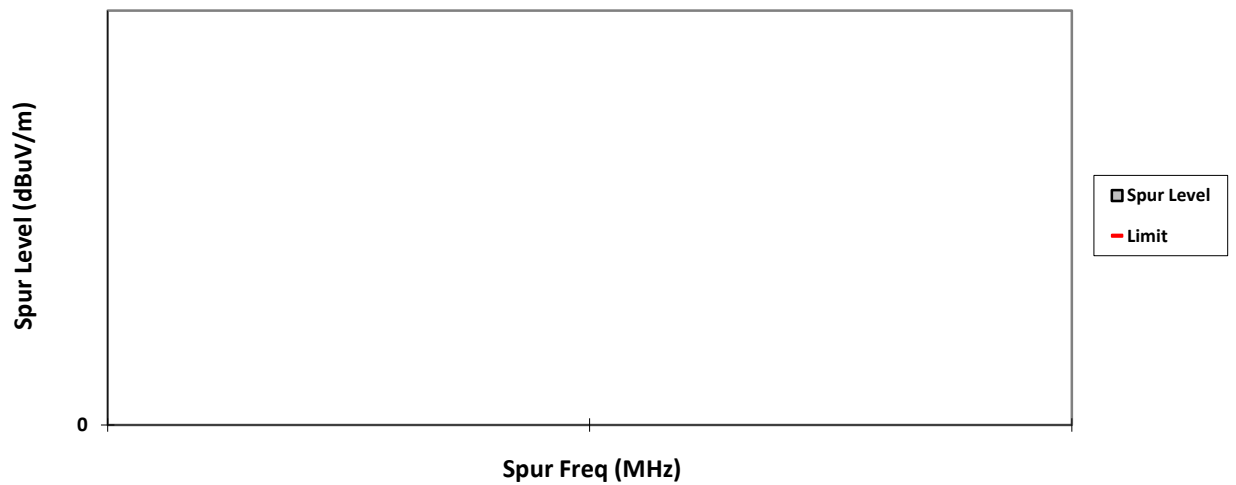
VERTICAL, AV



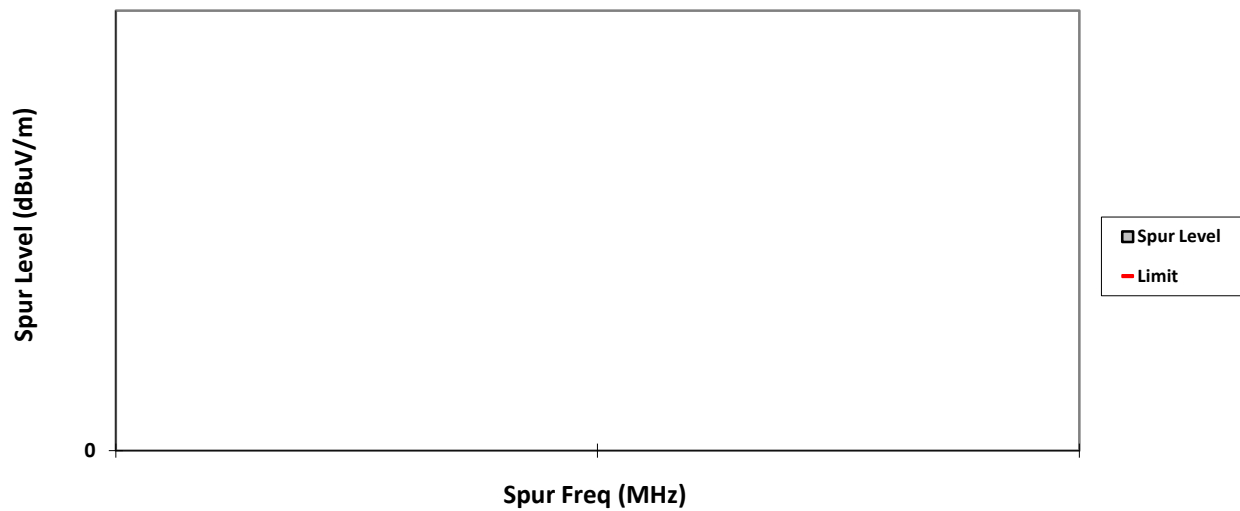
HORIZONTAL, AV



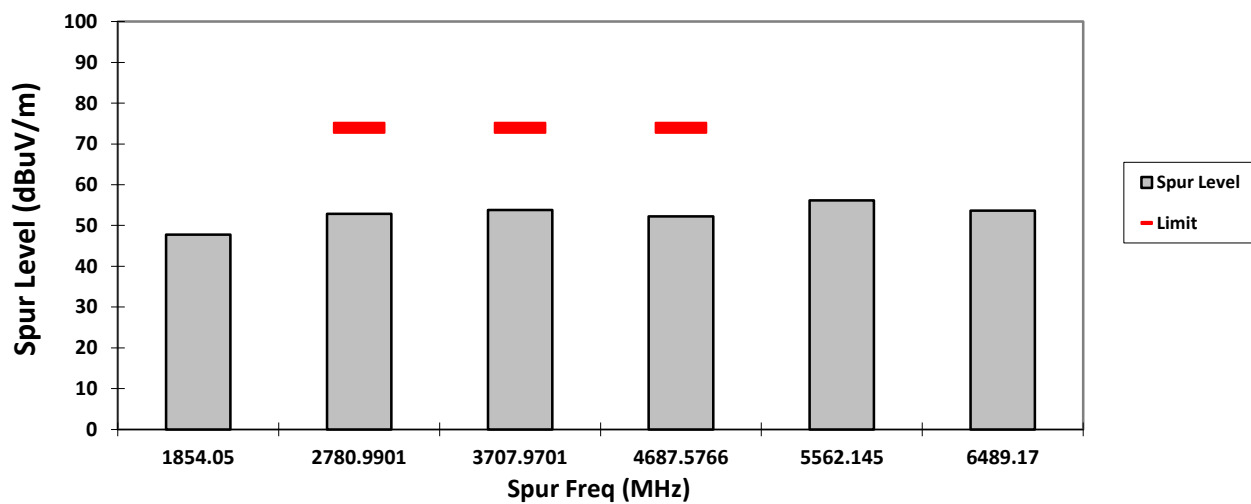
VERTICAL, QPK



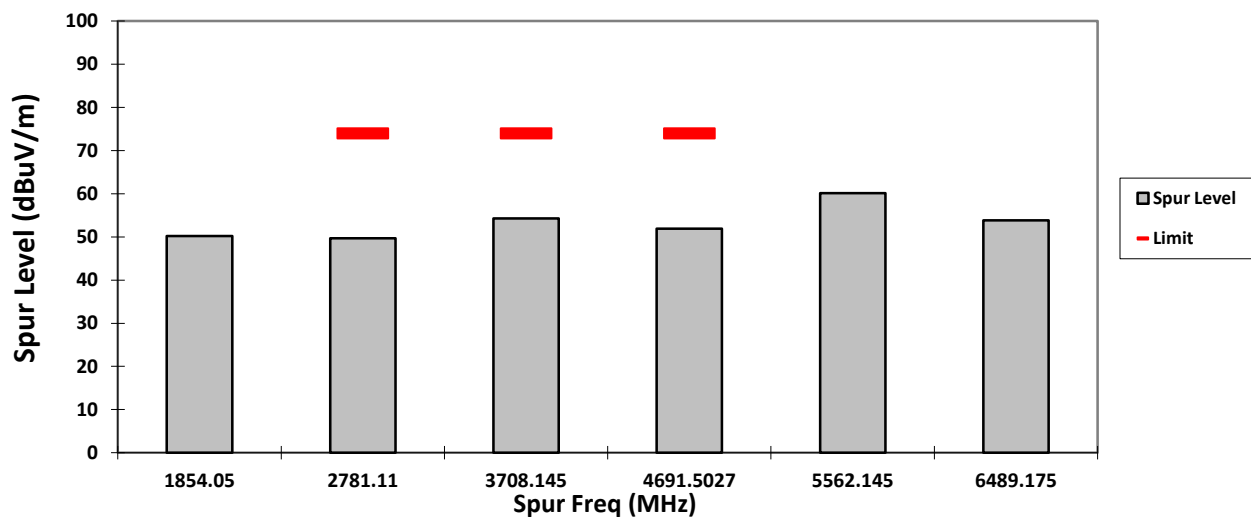
HORIZONTAL, QPK



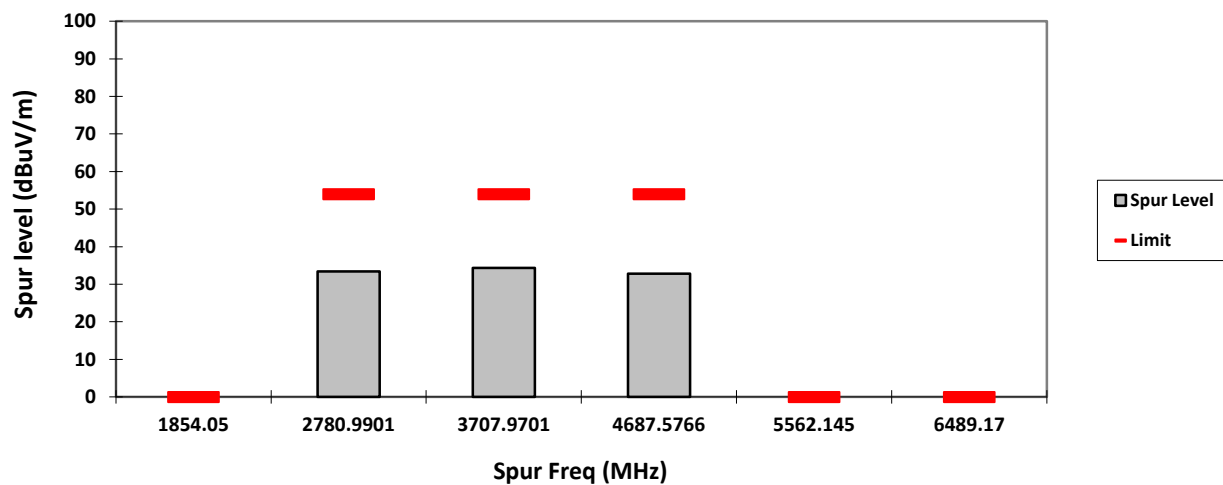
VERTICAL, PK



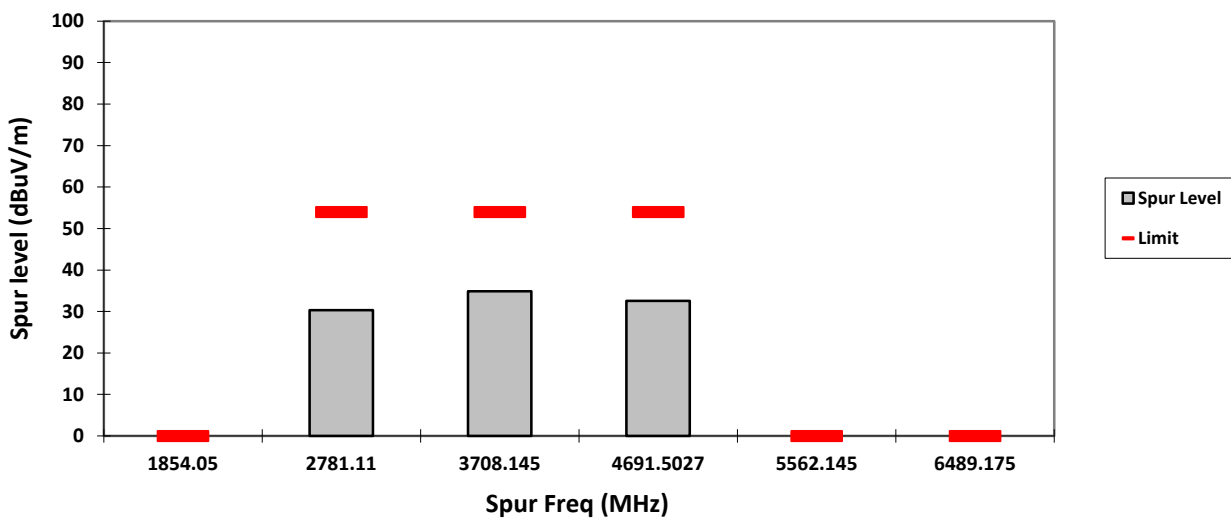
HORIZONTAL, PK



VERTICAL, AV

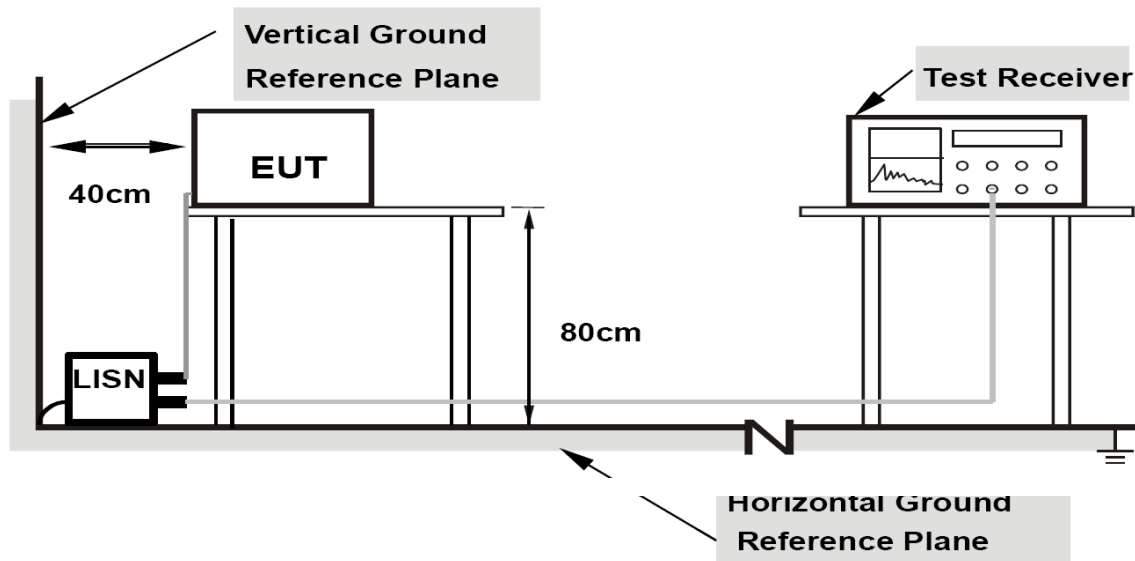


HORIZONTAL, AV



6.9. AC Powerline Conducted Emission

6.9.1. Test Setup



- 1) Tests were conducted for both Receive and Transmit Mode of the EUT.
- 2) The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50uH of coupling impedance for the measuring instrument.
- 3) Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 4) The frequency range from 150 kHz to 30MHz was measured.

6.9.2. Test Limits

For AC Power Line Conducted Test Limit can be Class A or B depends on product classification.

**Limits for conducted disturbance at the mains ports
of class A ITE**

Frequency range MHz	Limits dB(μ V)	
	Quasi-peak	Average
0,15 to 0,50	79	66
0,50 to 30	73	60
NOTE The lower limit shall apply at the transition frequency.		

Table 1: Limits for Conducted Disturbance at the Mains Ports of Class A ITE.

**Limits for conducted disturbance at the mains ports
of class B ITE**

Frequency range MHz	Limits dB(μ V)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50
NOTE 1 The lower limit shall apply at the transition frequencies. NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

Table 2: Limits for Conducted Disturbance at the Mains Ports of Class B ITE

6.9.3. Test Result

Not Applicable. Testing is not required, radio shall turn off during charging mode