TEST REPORT

Dt&C

DT&C Co., Ltd.

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC2103-0028

2. Customer

- Name (FCC) : Smart Radar System, Inc. / Name (IC) : Smart Radar System
- Address (FCC) : A-7F, 253, Pangyo-ro, Bundang-gu, Seongnam-si Gyeonggi-do South Korea
  Address (IC) : A-7F, 253, Pangyo-ro, Bundang-gu Seongnam-si Gyeonggi-do 13486 Korea (Republic Of)

3. Use of Report : FCC & IC Certification

4. Product Name / Model Name : IRISt-03A / IRISt-03A
   FCC ID : 2AVKZIRIST03A
   IC : 26970-IRIST03A

5. FCC Regulation(s): Part 95(M)
   IC Standard(s): RSS-251 Issue 2, RSS-GEN Issue 5
   Test Method Used : ANSI C63.26-2015, KDB653005 D01v01r01

6. Date of Test : 2021.02.22 ~ 2020.03.29

7. Testing Environment : Refer to appended test report.

8. Test Result : Refer to the attached test result.

Affirmation	Tested by Name : SeungJu Woo (Signature)	Reviewed by Name : JaeJin Lee (Signature)

2021 . 03 . 30 .

DT&C Co., Ltd.

This test report is a general report that does not use the KOLAS accreditation mark and is not related to KS Q ISO/IEC 17025 and KOLAS accreditation.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description	Revised by	Reviewed by
DRTFCC2103-0028	Mar. 30, 2021	Initial issue	SeungJu Woo	JaeJin Lee

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1 GENERAL INFORMATION

Applicant Name (FCC)	Smart Radar System, Inc.
Applicant Name (IC)	Smart Radar System
Address (FCC)	A-7F, 253, Pangyo-ro, Bundang-gu, Seongnam-si Gyeonggi-do South Korea
Address (IC)	A-7F, 253, Pangyo-ro, Bundang-gu Seongnam-si Gyeonggi-do 13486 Korea (Republic Of)

EUT	Millimeter wave radar
Equipment Class	VRD(Vehicular Radar Systems)
Model Name(FCC, IC)	IRISt-03A
Add Model Name(FCC, IC)	3EC-IRISt01
PMN(s)	IRISt-03A, 3EC-IRISt01
FVIN	3
Test Device Serial Number	Not defined
Power Supply	12, 24 V
Antenna Type	Serial Feeding Antenna

Frequency Range(MHz)	Emission Designator	Modulation	EIRP(Peak detector)		EIRP(Average detector)	
			Max power (dBm)	Max power (W)	Max power (dBm)	Max power (W)
77 000 ~ 81 000	3G79F1N	FMCW	20.35	0.108	-10.36	0.0001

2 INTRODUCTION

2.1 EUT DESCRIPTION

The Equipment under Test (EUT) supports 77 ~ 81GHz vehicular radar.

Operation test setup for EUT

- Test software: RISx-3rdEye v1.2.4
- Power setting: NA

2.2 TESTING ENVIRONMENT

Ambient Condition	
▪ Temperature	+21 ℃ ~ +24 ℃
▪ Relative Humidity	40 % ~ 46 %

2.3 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

2.4 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C 63.4-2014. All measurement uncertainty values are shown with a coverage factor of *k* = 2 to indicate a 95 % level of confidence.

Parameter	Measurement uncertainty
Radiated Disturbance (Below 1 GHz)	4.9 dB (The confidence level is about 95 %, k = 2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.1 dB (The confidence level is about 95 %, k = 2)
Radiated Disturbance (Above 18 GHz)	5.3 dB (The confidence level is about 95 %, k = 2)

2.5 TEST FACILITY

DT&C Co., Ltd.

The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042. The site is constructed in conformance with the requirements.

- FCC & IC MRA Designation No. : KR0034

- ISED #: 5740A

www.dtnc.net

Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

3 SUMMARY OF TEST RESULTS

FCC Part RSS Std.	Test Description	Test Limit	Test Condition	Status Note 1
2.1049 RSS-251(7)	Occupied Bandwidth	N/A	Radiated	**C**
95.3367(a) RSS-251(8)	Maximum power(EIRP)	< 50 dBm (Averaging detector)		**C**
95.3367(b) RSS-251(9)	Maximum peak power(EIRP)	< 55 dBm (Peak detector)		**C**
2.1053 95.3379(a) RSS-251(10)	Undesirable Emissions	**FCC** Below 40GHz < Part 95.3379 (a)(a) 40 ~ 200GHz < 600 pW/cm^2 Above 200GHz < 1000 pW/cm^2 **IC** Below 40GHz < RSS-Gen(8.9) 40 – 162GHz < -30 dBm/MHz (e.i.r.p)		**C**
2.1055 95.3379(b) RSS-251(11)	Frequency Stability	Within the frequency bands		**C**

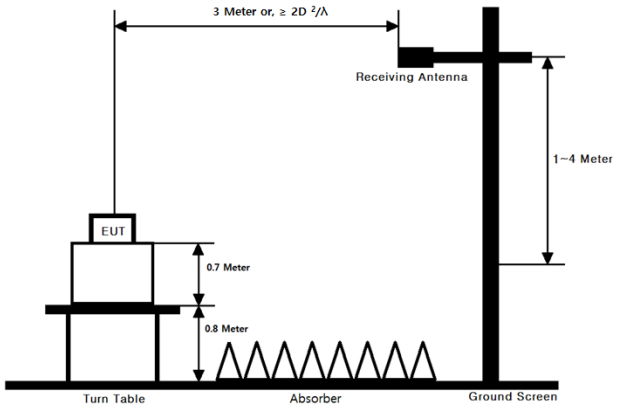
Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

4 TEST RESULTS

4.1 OCCUPIED BANDWIDTH

Test Configuration

Above 1GHz



These measurements were performed at 3 m test site. The equipment under test is placed on a non-conductive table 1.5-meters above a turntable which is flush with the ground plane and 3 meters from the receive antenna. For measurements above 1GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.

Test Procedure

- **ANSI C63.26-2015 – Section 5.4.4**

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power of a given emission.

Test setting

1. The signal analyzer`s automatic bandwidth measurement capability was used to perform the 99 % occupied bandwidth and the 26 dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 ~ 5 % of the expected OBW & VBW ≥ 3 X RBW
3. Detector = Peak
4. Trance mode = Max hold
5. Sweep = Auto couple
6. The trace was allowed to stabilize
7. If necessary, step 2 ~ 6 were repeated after changing the RBW such that it would be within 1 ~ 5 % of the 99 % occupied bandwidth observed in step 6.

Limit

Within the designated 77~81GHz frequency band

Test Results

Frequency Range(MHz)	Occupied Bandwidth(MHz)
77 000 ~ 81 000	3 793.6

Occupied Bandwidth

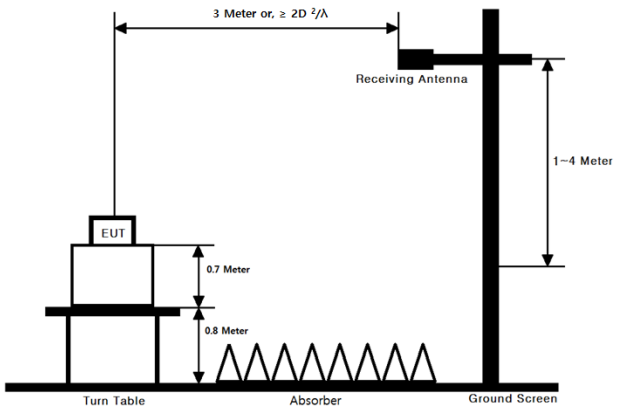
Emission Designator

Emission Designator = **3G79F1N**
OBW = 3 793.6 MHz
F = Frequency modulation
1 = A single channel containing quantized or digital information without the use of a modulating sub-carrier
N = No information transmitted

4.2 EIRP

Test Configuration

Above 1GHz



These measurements were performed at 3 m test site. The equipment under test is placed on a non-conductive table 1.5-meters above a turntable which is flush with the ground plane and 3 meters from the receive antenna. For measurements above 1GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.

Far field distance (R_m)

$R_m = 2D^2 / \lambda$,

where, D=the largest dimension of the antenna / λ=the wavelength of the emissions

Frequency Range(GHz)	λ (cm)	Rm (m)	Measurement Distance(m)
77.0 ~ 81.0	0.37	1.25	1.50

Note: Dimension of EUT Antenna = 3.20cm, Dimension of Measurement Antenna = 4.82cm

Test Procedure

- **ANSI C63.26-2015 – Section 5.**
- **KDB 653005 D01v01r01 – Section 4**

-Maximum power(EIRP) – Averaging detector

The maximum fundamental emission power (EIRP) shall be measured using a power averaging (rms) detector with a 1 MHz resolution bandwidth (RBW) and integrated over the full 99% occupied bandwidth (OBW) to obtain the data necessary to demonstrate compliance to the 50 dBm limit.

-Maximum peak power(EIRP) – Peak detector

The maximum peak fundamental emission power (EIRP) measurement shall be performed by sweeping over the transmitted occupied bandwidth using a positive peak power detector with peak hold activated, and a 1 MHz RBW. Power integration is not to be used in performing this measurement. The resultant peak power spectral density (maximum in any 1 MHz) data shall be used to demonstrate compliance to the 55 dBm/MHz limit.

1) Peak power measurements of swept frequency radar implementations (e.g., high sweep rate FMCW) may require a desensitization correction factor to be applied to the measurement results. See relevant Application Note(s) from the measurement instrumentation vendor for details.

Limit

- Part 95.3367

The fundamental radiated emission limits within the 76-81 GHz band are expressed in terms of Equivalent Isotropically radiated Power (EIRP) and are as follows:
(a) The maximum power (EIRP) within the 76-81 GHz band shall not exceed 50 dBm based on measurements employing a power averaging detector with a 1 MHz Resolution Bandwidth (RBW).
(b) The maximum peak power (EIRP) within the 76-81 GHz band shall not exceed 55 dBm based on measurements employing a peak detector with a 1 MHz RBW.

- RSS-251 [8.2] & [9.2]

The radar device's total average e.i.r.p. shall not exceed 50 dBm over the occupied bandwidth.
The radar device's peak e.i.r.p. spectral density shall not exceed 55 dBm/MHz.

Test Results

Maximum power(EIRP) – Averaging detector & Maximum peak power(EIRP) – Peak detector

Measurement distance(D)	Frequency (GHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Measured Level(dBm)	AFCL (dB/m)	DCF (dB)	E (dBuV/m)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1.5m	80.889	H	Y	PK	-44.55	44.38	14.80	121.63	20.35	55.00	34.65
1.5m	79.000	H	Y	AV	-60.46	44.38	NA	90.92	-10.36	50.00	60.36

Note.

1. The EIRP was measured in each axis EUT positions and the worst case data was reported.
2. For peak power measurement, a desensitization correction factor was applied to the measurement results.
3. Sample Calculation.

E(dBuV/m) = Measured level (dBuV) + 107 + AFCL(dB/m) + DCF(dB)

where, E=field strength / DCF = Desensitization Correction Factor / AFCL = Antenna Factor(dB/m) + Cable Loss(dB)

The mixer loss was applied to the measured level by SA correction factor.

EIRP(dBm) = E(dBuV/m) + 20log(D) - 104.8; where, D is measurement distance (in the far field region) in m.

4. DCF Calculation

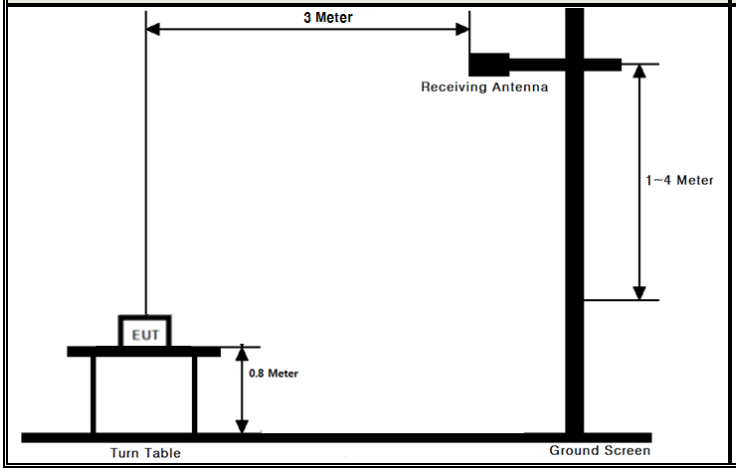
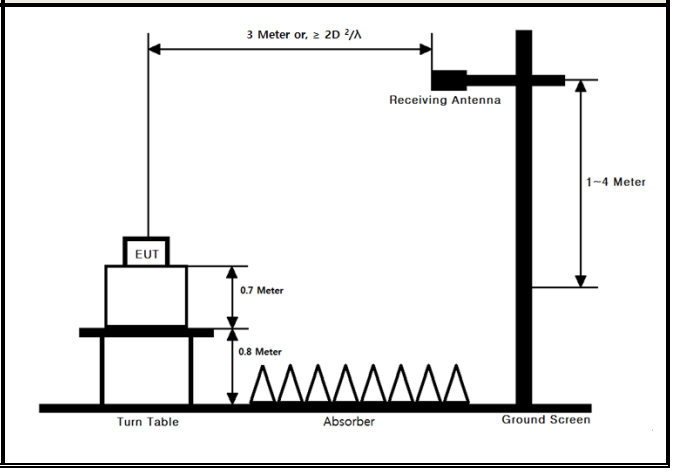
DCF = 5 x log (1+ K x (Sweep bandwidth/ (chirp length x RBW^2)^2)

= 5 x log (1+ 0.1947 x (3.9GHz / (57us x $1MHz^2$)^2) = 14.80 dB

K = a correction factor for the settling process of the gaussian shaped filter (0.1947)

4.3 UNDESIRABLE EMISSIONS

Test Configuration

Below 1GHz	Above 1GHz
	

These measurements were performed at 3 test site. The equipment under test is placed on a non-conductive table 1.5-meters above a turntable which is flush with the ground plane and 3 meters(for below 1GHz: 0.8-m) from the receive antenna. For measurements above 1GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.

Far field distance (R_m)

$R_m = 2D^2 / \lambda$,

where, D=the largest dimension of the measurement antenna / λ=the wavelength of the emissions

Frequency Range(GHz)	D(cm)	λ (cm)	Rm (m)
40 ~ 60	5.79	0.50	1.34
60 ~ 90	4.82	0.33	1.39
90 ~ 140	3.31	0.21	1.02
140 ~ 220	2.13	0.14	0.67
220 ~ 250	1.45	0.12	0.35

Test Procedure

- **ANSI C63.26-2015 – Section 5.5**

Test setting

Below 1GHz

RBW = 100 or 120 kHz, VBW = 3 x RBW, Detector = Peak or Quasi Peak

1~40 GHz

Peak Measurement

RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Sweep time = Auto, Trace mode = Max Hold until the trace stabilizes

Average Measurement

RBW = 1 MHz, VBW = 3 MHz, Detector = RMS, Sweep time = Auto, Trace mode = Averaging or Max hold

Above 40GHz

Average Measurement

RBW = 1 MHz, VBW = 3 MHz, Detector = RMS, Sweep time = Auto, Trace mode = Averaging or Max hold

Limit

Part 95.3379

(a) The power density of any emissions outside the 76-81 GHz band shall consist solely of spurious emissions and shall not exceed the following:

(1) Radiated emissions below 40 GHz shall not exceed the field strength as shown in the following emissions table.

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
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

(i) In the emissions table in paragraph (a)(1) of this section, the tighter limit applies at the band edges.

(ii) The limits in the table in paragraph (a)(1) of this section are based on the frequency of the unwanted emissions and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(iii) The emissions limits shown in the table in paragraph (a)(1) of this section are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9.0-90.0 kHz, 110.0-490.0 kHz, and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector with a 1 MHz RBW.

(2) The power density of radiated emissions outside the 76-81 GHz band above 40.0 GHz shall not exceed the following, based on measurements employing an average detector with a 1 MHz RBW:

(i) For radiated emissions outside the 76-81 GHz band between 40 GHz and 200 GHz from field disturbance sensors and radar systems operating in the 76-81 GHz band: 600 pW/cm^2 at a distance of 3 meters from the exterior surface of the radiating structure.

(ii) For radiated emissions above 200 GHz from field disturbance sensors and radar systems operating in the 76-81 GHz band: 1000 pW/cm^2 at a distance of 3 meters from the exterior surface of the radiating structure.

(3) For field disturbance sensors and radar systems operating in the 76-81 GHz band, the spectrum shall be investigated up to 231.0 GHz.

RSS-251[10]

In addition to the requirements specified in RSS-Gen and the method of measurement of ANSI C63.10, the spectrum shall be investigated up to 162 GHz.

Table 1: Unwanted emissions limits outside the 76-81 GHz frequency band

Emission frequency range	Limit	Applicable detector
Below 40 GHz	RSS-Gen general field strength limits for licence-exempt radio apparatus	RSS-Gen requirements
40-250 GHz *	-30 dBm/MHz (e.i.r.p.)	RMS detector
Note: * For radar devices that operate solely in the 76-77 GHz band (i.e. the occupied bandwidth is entirely contained in the 76-77 GHz band), an unwanted emissions limit of 0 dBm/MHz shall apply for the unwanted emission that fall in the 73.5-76 GHz band. Outside of the 73.5-76 GHz band, the unwanted emission limits prescribed in table 1 shall apply.		

Test Results

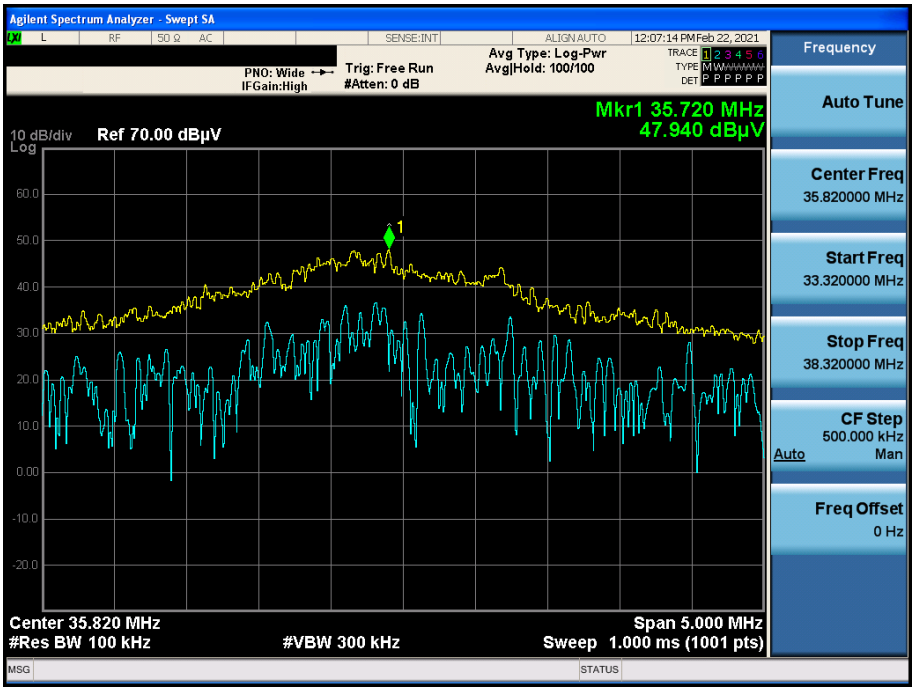
Frequency Range: 9 kHz ~ 1 GHz

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Measured Level(dBuV)	AFCLAG (dB/m)	Distance Factor(dB)	E (dBuV/m)	Limit (dBuV/m)	Margin (dB)
35.72	V	Y	QP	47.9	-10.3	NA	37.6	40.0	2.4
43.58	V	Y	QP	45.4	-9.4	NA	36.0	40.0	4.0
49.40	H	Y	QP	33.7	-8.9	NA	24.8	40.0	15.2
779.80	H	Y	QP	26.6	2.4	NA	29.0	46.0	17.0

Note.

1. No other spurious and harmonic emissions were found above listed frequencies.
2. Measurements were performed using a peak detector. If peak results were meet Quasi-peak limit, Quasi-peak measurements were omitted.
3. Information of Distance Factor
   For finding emissions, measurements may be performed at a distance closer than that specified in the regulations.
   In this case, the distance correction factor is applied to the result.
   - Calculation of distance correction factor
   At frequencies below 30 MHz = 40 log(tested distance / specified distance)
   At frequencies at or above 30 MHz = 20 log(tested distance / specified distance)
   When distance factor is “N/A”, the measurements were performed at the specified distance and distance factor is not applied.
4. Sample Calculation.
   Margin = Limit – Result
   E(dBuV/m) = Measured level (dBuV) + AFCLAG(dB/m)
   where, E=field strength / AFCLAG = Antenna Factor(dB/m) + Cable Loss(dB) – Amp Gain(dB)

Worst data plot (Measured Level), Y axis & Ver



Frequency Range: 1 ~ 40 GHz

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Measured Level(dBuV)	AFCLAG (dB/m)	Distance Factor(dB)	E (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*9501.20	H	Y	PK	39.49	11.05	NA	50.54	74.00	23.46
*16737.60	H	Y	PK	42.24	20.72	-6.02	56.94	74.00	17.06
28800.62	H	Y	PK	50.37	7.76	-6.02	52.11	74.00	21.89
28800.68	H	Y	AV	40.96	7.76	-6.02	42.70	54.00	11.30
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-

Note.

1. No other spurious and harmonic emissions were found above listed frequencies.
2. Information of Distance Factor

   For finding emissions, the test distance might be reduced. In this case, the distance factor is applied to the result.

   - Calculation of distance factor = 20 log(applied distance / required distance)

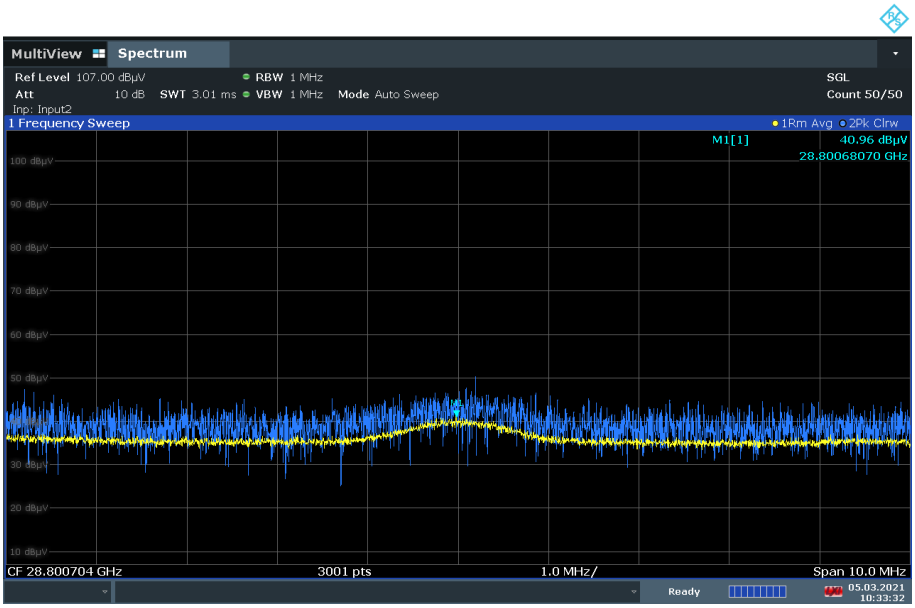
   When distance factor is “N/A”, the distance is 3 m and distance factor is not applied.
3. Sample Calculation.

   Margin = Limit – Result

   E(dBuV/m) = Measured level (dBuV) + AFCLAG(dB/m)

   where, E=field strength / AFCLAG = Antenna Factor(dB/m) + Cable Loss(dB) – Amp Gain(dB)
4. ***** Noise floor.

Worst data plot (Measured Level), Y axis & Hor



Frequency Range: 40 ~ 243 GHz

Measurement distance(D)	Frequency (MHz)	ANT Pol	EUT Axis	Measured Level (dBm)	AFCLAG (dB/m)	E (dBuV/m)	EIRP (dBm)	FCC Power Density (pW/cm^2)	IC Limit (dBm/MHz)	FCC Limit (pW/cm^2)	IC Margin (dB)
#0.2 m	*236947.46	H	Y	-75.78	54.46	85.68	-33.10	0.43	-30.00	1000.00	3.10
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note.

1. The radiated emissions were investigated up to 243GHz. And no other spurious and harmonic emissions were found above listed frequencies.
2. Sample Calculation.

   E(dBuV/m) = Measured level (dBm) + 107 + AFCLAG(dB/m)

   The mixer loss was applied to the measured level by SA correction factor.

   where, E=field strength / AFCLAG = Antenna Factor(dB/m) + Cable Loss(dB) – Amp Gain(dB)

   EIRP(dBm) = E(dBuV/m) + 20log(D) - 104.8; where, D is measurement distance (in the far field region) in m.

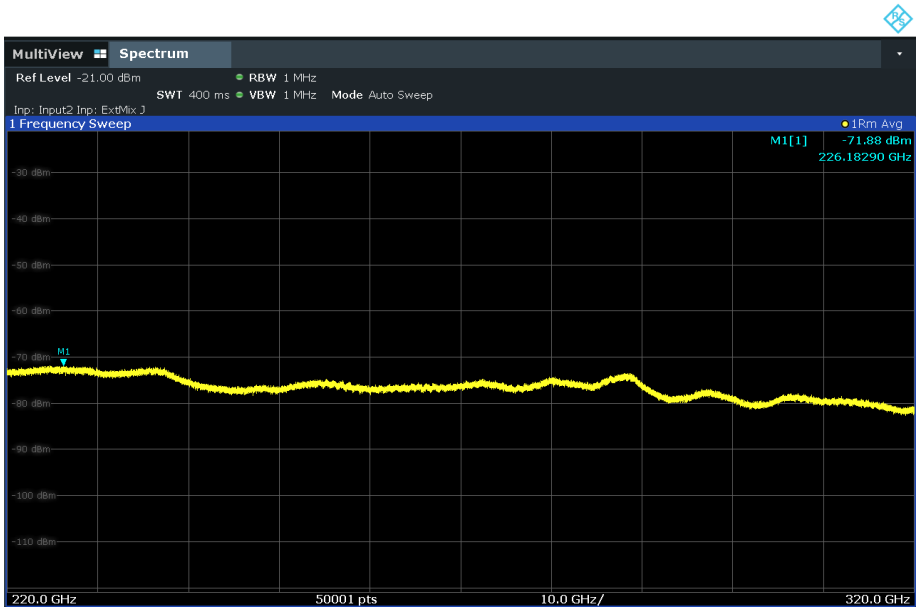
   $PD = EIRP_{Linear} / 4\pi d^2$

   Where, PD = the power density at the distance specified by the limit, in W/m^2

   $EIRP_{Linear}$ = EIRP, in watts

   D = is the distance at which the power density limit is specified, in m
3. ***** Noise floor
4. #The measurements were performed at a closer distance to overcome the noise floor.

Worst data plot (Measured Level), Y axis & Hor

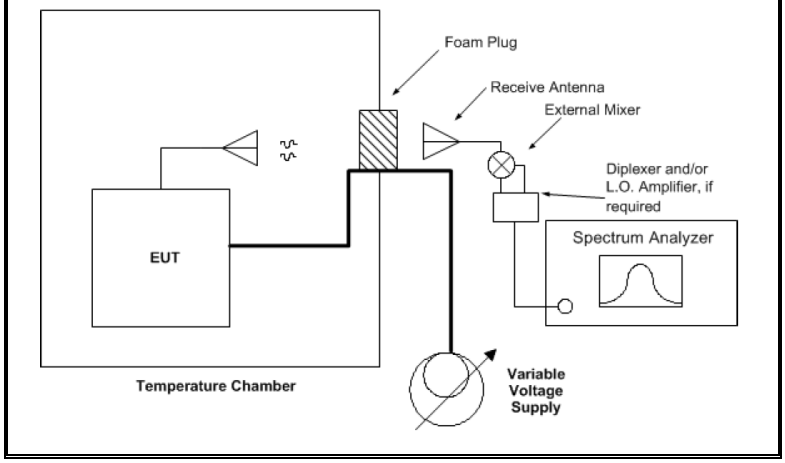


Note: The mixer loss was applied to the measured level by SA correction factor.

4.4 FREQUENCY STABILITY

Test configuration

Frequency stability



Test Procedure

- **ANSI C63.26-2015 – Section 5.6**

The frequency stability of the transmitter is measured by:

1. At 10 °C intervals of temperatures between −30 °C and +50 °C at the manufacturer's rated supply voltage, and

2. At +20 °C temperature and ±15% supply voltage variations. If a product is specified to operate over a range of input voltage then the −15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage.

Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature.
   (20 °C to provide a reference)

2. The equipment is turned on in a "standby" condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.

3. Frequency measurements are made at 10 °C intervals ranging from -30 °C to +50 °C.
   A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Limit

Part 95.3379(b)

Fundamental emissions must be contained within the frequency bands specified in Part 95(M) during all conditions of operation. Equipment is presumed to operate over the temperature range −20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

RSS-251[11.2]

The radar device's occupied bandwidth (i.e. 99% emission bandwidth) shall be maintained within the 76-81 GHz frequency band while subjected to all conditions of operation specified in RSS-Gen.

Test Results

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	Measured low frequency(F_L) (MHz)	Measured high frequency(F_H) (MHz)	Centre frequency of the OBW((F_L + F_H)/2) (MHz)
100%	12.00	+20(Ref)	77 096.67	80 890.02	78 993.35
100%		-30	77 105.50	80 888.46	78 996.98
100%		-20	77 109.27	80 891.12	79 000.20
100%		-10	77 114.46	80 889.35	79 001.91
100%		0	77 108.38	80 889.28	78 998.83
100%		+10	77 120.72	80 891.48	79 006.10
100%		+20	77 096.67	80 890.02	78 993.35
100%		+30	77 104.43	80 889.33	78 996.88
100%		+40	77 115.20	80 891.67	79 003.44
100%		+50	77 098.91	80 888.59	78 993.75
115%	13.80	+20	77 109.37	80 889.62	78 999.50
85%	10.20	+20	77 111.15	80 889.27	79 000.21

Note: Fundamental emissions were contained within the frequency bands.

Test Results

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	Measured low frequency(F_L) (MHz)	Measured high frequency(F_H) (MHz)	Centre frequency of the OBW((F_L + F_H)/2) (MHz)
100%	24.00	+20(Ref)	77 141.36	80 892.36	79 016.86
100%		-30	77 112.45	80 891.26	79 001.86
100%		-20	77 124.80	80 889.44	79 007.12
100%		-10	77 110.88	80 891.34	79 001.11
100%		0	77 116.26	80 890.27	79 003.27
100%		+10	77 124.93	80 890.69	79 007.81
100%		+20	77 141.36	80 892.36	79 016.86
100%		+30	77 127.52	80 891.22	79 009.37
100%		+40	77 136.87	80 891.16	79 014.02
100%		+50	77 131.60	80 890.68	79 011.14
115%	27.60	+20	77 120.33	80 891.52	79 005.93
85%	20.40	+20	77 126.83	80 889.62	79 005.93

Note: Fundamental emissions were contained within the frequency bands.

5 LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal. Date (yy/mm/dd)	S/N
Signal Analyzer	Rohde Schwarz	FSW85	20/12/16	21/12/16	101530
Spectrum Analyzer	Agilent Technologies	N9020A	20/06/24	21/06/24	US47360812
DC Power Supply	SM techno	SDP30-5D	20/06/24	21/06/24	305DMG304
DC Power Supply	SM techno	SDP30-5D	20/06/24	21/06/24	305DMG305
Digital Multimeter	FLUKE	17B+	20/12/16	21/12/16	36390701WS
Thermohygrometer	BODYCOM	BJ5478	20/12/16	21/12/16	120612-1
Thermohygrometer	BODYCOM	BJ5478	20/12/16	21/12/16	120612-2
Thermohygrometer	BODYCOM	BJ5478	20/07/01	21/07/01	N/A
Temp & Humi Test Chamber	SJ Science	SJ-TH-S50	20/12/14	21/12/14	SJ-TH-S50-120203
Signal Generator	ANRITSU	MG3695C	20/12/16	21/12/16	173501
Signal Generator	KEYSIGHT	N5182B	20/12/16	21/12/16	MY53050182
Loop Antenna	ETS-Lindgren	6502	19/09/18	21/09/18	00226186
BILOG ANTENNA	Schwarzbeck	VULB 9160	20/12/16	21/12/16	3362
PreAmplifier	H.P	8447D	20/12/16	21/12/16	2944A07774
PreAmplifier	tsj	MLA-0118-B01-40	20/12/16	21/12/16	1852267
PreAmplifier	tsj	MLA-1840-J02-45	20/06/24	21/06/24	16966-10728
*PreAmplifier	Norden Millimeter Inc.	NA4060G50N8P12	21/02/18	22/02/18	1003
*PreAmplifier	Norden Millimeter Inc.	NN6090G-40N55P-2	21/02/18	22/02/18	1001
Horn Antenna	ETS-Lindgren	3117	20/12/16	21/12/16	00140394
Horn Antenna	A.H. Systems Inc.	SAS-574	20/06/24	21/06/24	154
*Horn Antenna	MI Wave	RX ANT-7 261E	20/06/16	21/06/16	112
*Horn Antenna	MI Wave	RX ANT-5 261U+410U	20/08/05	21/08/05	108
*Horn Antenna	MI Wave	RX ANT-8 261F	20/06/16	21/06/16	114
*Horn Antenna	MI Wave	RX ANT-9 261G	20/06/16	21/06/16	116
*Harmonic Mixers	Rohde Schwarz	FS-Z90	19/08/27	21/08/27	101714
*Harmonic Mixers	Rohde Schwarz	FS-Z140	19/10/14	21/10/14	101009
*Harmonic Mixers	Rohde Schwarz	FS-Z220	19/10/14	21/10/14	101012
*Harmonic Mixers	Rohde Schwarz	FS-Z325	20/04/02	22/04/02	1100925
Cable	Radiall	TESTPRO3	21/01/16	22/01/16	M-01
Cable	Junkosha	MWX315	21/01/16	22/01/16	M-05
Cable	Junkosha	MWX221	21/01/16	22/01/16	M-06
Cable	Junkosha	MWX241	21/01/13	22/01/13	mmw-1
Cable	Junkosha	MWX241	21/01/13	22/01/13	mmw-4
Cable	Junkosha	MWX241	21/01/13	22/01/13	mmw-5
Cable	Junkosha	MWX241	21/01/13	22/01/13	mmw-6
Cable	HUBER+SUHNER	SUCOFLEX 104	21/01/13	22/01/13	mmw-8
Cable	HUBER+SUHNER	SUCOFLEX 104	21/01/13	22/01/13	mmw-9
Cable	SAGE MILLIMETER INC.	SCW-!M1M024-F1	21/03/03	22/03/03	mmw-10
Test Software	tsj	Radiated EmissionMeasurement	NA	NA	Version 2.00.0177

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017.
Note2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.
Note3: * The mm-wave instruments were calibrated by the manufacturer.