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 : DRTFCC1909-0257
2. Customer
   - Name : Teltron Inc.
   - Address : No. 202, ITplex, Gajungbuk-ro 26-41, Yusung-gu, Daejeon, South Korea
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : RF Doppler Sensor(Motion Sensor) / TMS230IF
   FCC ID : 2AJWPTMS230IF
5. Test Method Used : ANSI C63.10-2013
   Test Specification : FCC Part 15.245
6. Date of Test : 2019.06.01 ~ 2019.08.02
7. Testing Environment : Refer to appended test report.
8. Test Result : Refer to the attached test result.

Affirmation	Tested by Name: JaeHyeok Bang (Signature)	Reviewed by Name: GeunKi Son (Signature)

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

2019 . 09 . 26 .

DT&C Co., Ltd.

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

Test Report Version

Test Report No.	Date	Description
DRTFCC1909-0257	Sep. 26, 2019	Initial issue

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1. General Information

1.1. Testing Laboratory

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 test site complies with the requirements of § 2.948 according to ANSI C63.4-2014. **- FCC MRA Accredited Test Firm No. : KR0034**		
www.dtnc.net		
Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

1.2. Testing Environment

Ambient Condition	
▪ Temperature	+20 ℃ ~ +24 ℃
▪ Relative Humidity	40 % ~ 43 %

1.3. Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of *k* = 2 to indicate a 95 % level of confidence.

Parameter	Measurement uncertainty
AC conducted emission	2.4 dB (The confidence level is about 95 %, k=2)
Radiated spurious emission (1 GHz Below)	5.1 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz ~ 18 GHz)	5.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (18 GHz Above)	5.3 dB (The confidence level is about 95 %, k = 2)

1.4. Details of Applicant

Applicant	:	Teltron Inc.
Address	:	No. 202, ITplex, Gajungbuk-ro 26-41, Yusung-gu, Daejeon, South Korea
Contact person	:	Jaejin Lee

1.5. Description of EUT

FCC Equipment Class	Field Disturbance Sensor(FDS)
EUT	RF Doppler Sensor(Motion Sensor)
Model Name	TMS230IF
Add Model Name	NA
Serial Number	Identical prototype
Power Supply	DC 3.3V / DC 5.0V
Frequency Band	10.525 GHz
Modulation Type	CW signal
Channel(s)	1
Antenna type	Slot Antenna

1.6. EUT CAPABILITIES

This module contains the following capabilities:
10.525 GHz Motion Sensor.

2. Information about test items

2.1 Test mode

Test Mode	Power Supply	Description
TM 1	3.3V	Continuous transmitting mode
TM 2	5.0V	Continuous transmitting mode

2.2 Tested frequency

Channel	TX Frequency(GHz)
Lowest	**10.525**
Middle	**-**
Highest	**-**

2.3 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. Antenna requirements

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

The antenna is permanently attached on the PCB.
Therefore this E.U.T Complies with the requirement of §15.203

4. Test report

4.1 Summary of tests

FCC Part	Parameter	Limit	Test Condition	Status Note 1
15.215(c)	20 dB Bandwidth	NA	Radiated	C
15.245 15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	FCC 15.245 limits, FCC 15.209 limits		C
15.207	AC Line Conducted Emissions	FCC 15.207 limits	AC Line Conducted	C
15.203	Antenna Requirements	FCC 15.203	-	C

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable
Note 2: For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS.

4.2 Transmitter requirements

4.2.1 20dB bandwidth

- Limit:

According to 15.215(c), the requirement is to ensure the 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified, is contained within the frequency band designated in the rule section under which the equipment is operated.

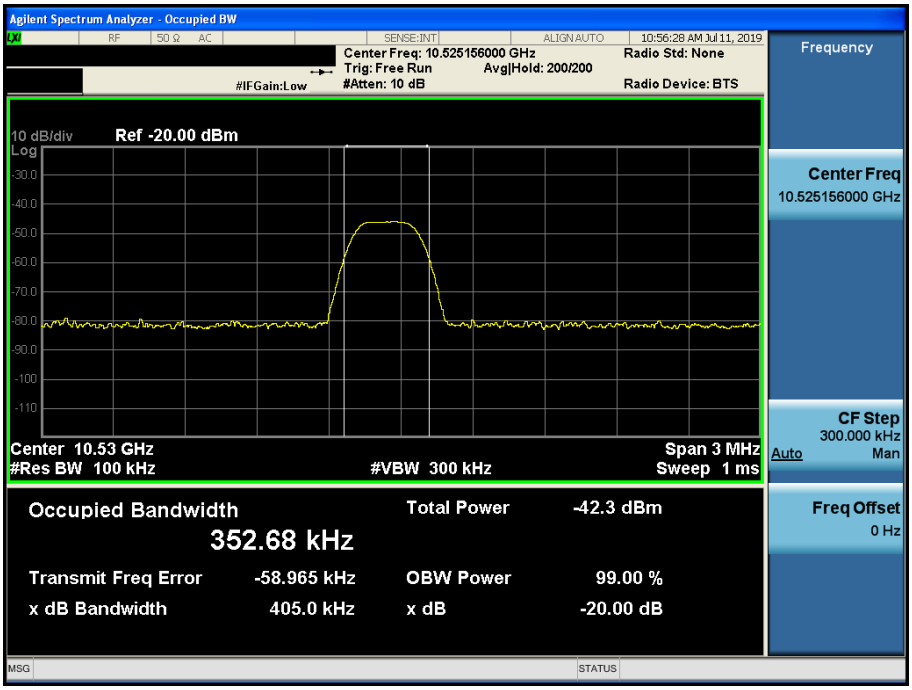
- Procedure:

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 300 kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

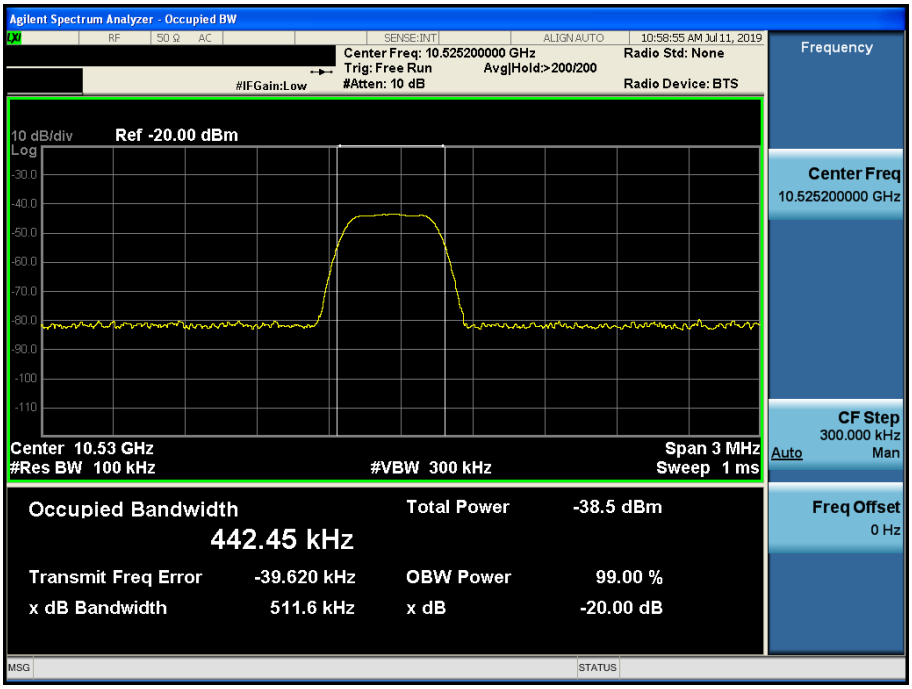
Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span from band

- Measurement Data: Comply

TM 1



TM 2


Agilent Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
10:58:55 AM Jul 11, 2019
Center Freq: 10.525200000 GHz
Trig: Free Run
Avg|Hold:>200/200
#IFGain:Low
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Frequency
10 dB/div
Log
Ref -20.00 dBm
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100
-110
Center Freq
10.525200000 GHz
Center 10.53 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
CF Step
300.000 kHz
Auto
Man
Occupied Bandwidth
442.45 kHz
Total Power -38.5 dBm
Freq Offset
0 Hz
Transmit Freq Error -39.620 kHz
OBW Power 99.00 %
x dB Bandwidth 511.6 kHz
x dB -20.00 dB
MSG
STATUS

4.2.2 Radiated Emissions

Requirements, §15.245, §15.205, §15.209

- Part 15.245

(b) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency (MHz)	Limit @ 3m	
	Field strength of fundamental(mV/m)	Field strength of harmonics(mV/m)
902 ~ 908	500	1.6
2435 ~ 2465	500	1.6
5785 ~ 5815	500	1.6
10500 ~ 10550	2500	25.0
24075 ~ 24175	2500	25.0

(1) Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in §15.205, shall not exceed the field strength limits shown in §15.209. Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:

(i) For the second and third harmonics of field disturbance sensors operating in the 24075-24175 MHz band and for other field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m.

(ii) For all other field disturbance sensors, 7.5 mV/m.

(iii) Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands, other than the second and third harmonics from devices operating in the 24075-24175 MHz band, fully comply with the limits given in §15.209. Continuous operation of field disturbance sensors designed to be used in farm equipment, vehicles such as fork lifts that are intended primarily for use indoors or for very specialized operations, or railroad locomotives, railroad cars and other equipment which travels on fixed tracks is permitted. A field disturbance sensor will be considered not to be operating in a continuous mode if its operation is limited to specific activities of limited duration (e.g., putting a vehicle into reverse gear, activating a turn signal, etc.).

(2) Field strength limits are specified at a distance of 3 meters.

(3) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

- Part 15.209

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following 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

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

- Part 15.205

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.009 ~ 0.110	16.42 ~ 16.423	399.90 ~ 410	4.5 ~ 5.15
0.495 ~ 0.505	16.69475 ~ 16.69525	608 ~ 614	5.35 ~ 5.46
2.1735 ~ 2.1905	16.80425 ~ 16.80475	960 ~ 1240	7.25 ~ 7.75
4.125 ~ 4.128	25.5 ~ 25.67	1300 ~ 1427	8.025 ~ 8.5
4.17725 ~ 4.17775	37.5 ~ 38.25	1435 ~ 1626.5	9.0 ~ 9.2
4.20725 ~ 4.20775	73 ~ 74.6	1645.5 ~ 1646.5	9.3 ~ 9.5
6.215 ~ 6.218	74.8 ~ 75.2	1660 ~ 1710	10.6 ~ 12.7
6.26775 ~ 6.26825	108 ~ 121.94	1718.8 ~ 1722.2	13.25 ~ 13.4
6.31175 ~ 6.31225	123 ~ 138	2200 ~ 2300	14.47 ~ 14.5
8.291 ~ 8.294	149.9 ~ 150.05	2310 ~ 2390	15.35 ~ 16.2
8.362 ~ 8.366	156.52475 ~ 156.52525	2483.5 ~ 2500	17.7 ~ 21.4
8.37625 ~ 8.38675	156.7 ~ 156.9	2690 ~ 2900	22.01 ~ 23.12
8.41425 ~ 8.41475	162.0125 ~ 167.17	3260 ~ 3267	23.6 ~ 24.0
12.29 ~ 12.293	167.72 ~ 173.2	3332 ~ 3339	31.2 ~ 31.8
12.51975 ~ 12.52025	240 ~ 285	3345.8 ~ 3358	36.43 ~ 36.5
12.57675 ~ 12.57725	322 ~ 335.4	3600 ~ 4400	Above 38.6
13.36 ~ 13.41			

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

Test Configuration

Refer to the APENDIX I

Test Procedure

1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m.
2. The table was rotated 360 degrees to determine the position of the highest radiation.
3. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 1 or 3 meter away from the interference-receiving antenna.
4. 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.
5. The antenna is a broadband antenna, 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.
6. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
7. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
8. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Note: Measurement Instrument Setting for Radiated Emission Measurements.

1. Frequency Range Below 1GHz
RBW = 100 or 120 kHz, VBW = 3 x RBW, Detector = Peak or Quasi Peak
2. Frequency Range Range > 1 GHz
Peak Measurement
RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Sweep time = Auto, Trace mode = Max Hold until the trace stabilizes
Average Measurement> 1GHz
RBW = 1MHz, VBW ≥ 1/T, Detector = Peak, Sweep Time = Auto, Trace Mode = Max Hold until the trace stabilizes

Test Results: TM 1

Tested Frequency : **10.525 GHz**

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*10524.82	H	Y	PK	92.89	6.12	N/A	N/A	99.01	147.95	48.94
*10524.85	H	Y	AV	92.82	6.12	N/A	N/A	98.94	127.95	29.01
21048.70	H	Y	PK	64.82	8.24	N/A	-9.54	63.52	97.50	33.98
21048.77	H	Y	AV	64.48	8.24	N/A	-9.54	63.18	77.50	14.32
31573.11	V	Z	PK	71.61	9.10	N/A	-9.54	71.17	97.50	26.33
31572.98	V	Z	AV	71.46	9.10	N/A	-9.54	71.02	77.50	6.48
42102.17	V	Y	PK	69.50	4.44	N/A	-15.56	58.38	97.50	39.12
42101.93	V	Y	AV	67.62	4.44	N/A	-15.56	56.50	77.50	21.00
52625.57	V	Z	PK	31.56	40.46	N/A	-15.56	56.46	97.50	41.04
52625.09	V	Z	AV	20.06	40.46	N/A	-15.56	44.96	77.50	32.54

▪ **Note.**

1. * is fundamental frequency.
2. The radiated emissions were investigated 9 kHz to 5th harmonic of highest fundamental frequency. And no other spurious and harmonic emissions were found above listed frequencies.
3. Information of Distance Factor

   For finding emissions, above 18GHz measurements were performed at a distance closer than the specified distance.

   In this case, the distance factor is applied to the result. Calculation of distance factor = 20 log(d_{test} / d_{limit})

   20 log(1 m / 3 m) = **-9.54 dB, 20 log(0.50 m / 3 m)** = **-15.56 dB**

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

   Margin = Limit – Result / Result = Reading + T.F + DCCF + DCF / T.F = AF + CL – AG

   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

Test Results: TM 2

Tested Frequency : **10.525 GHz**

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*10527.02	H	Y	PK	90.53	6.12	N/A	N/A	96.65	147.95	51.30
*10527.05	H	Y	AV	90.52	6.12	N/A	N/A	96.64	127.95	31.31
21053.98	H	Y	PK	67.11	8.25	N/A	-9.54	65.82	97.50	31.68
21053.98	H	Y	AV	66.82	8.25	N/A	-9.54	65.53	77.50	11.97
31581.06	V	Z	PK	73.49	9.10	N/A	-9.54	73.05	97.50	24.45
31581.11	V	Z	AV	73.47	9.10	N/A	-9.54	73.03	77.50	4.47
42107.23	V	Y	PK	69.37	4.44	N/A	-15.56	58.25	97.50	39.25
42107.03	V	Y	AV	67.09	4.44	N/A	-15.56	55.97	77.50	21.53
52633.53	V	Y	PK	31.37	40.46	N/A	-15.56	56.27	97.50	41.23
52633.46	V	Y	AV	21.62	40.46	N/A	-15.56	46.52	77.50	30.98

▪ **Note.**

1. * is fundamental frequency.
2. The radiated emissions were investigated 9 kHz to 5th harmonic of highest fundamental frequency. And no other spurious and harmonic emissions were found above listed frequencies.
3. Information of Distance Factor

   For finding emissions, above 18GHz measurements were performed at a distance closer than the specified distance.

   In this case, the distance factor is applied to the result. Calculation of distance factor = 20 log(d_{test} / d_{limit})

   20 log(1 m / 3 m) = **-9.54 dB, 20 log(0.50 m / 3 m)** = **-15.56 dB**

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

   Margin = Limit – Result / Result = Reading + T.F + DCCF + DCF / T.F = AF + CL – AG

   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

4.2.3 AC Line Conducted Emissions

Requirements, §15.207
For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Test Configuration
See test photographs for the actual connections between EUT and support equipment.

Test Procedure
1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

Test Results: Comply

Test Mode: TM 1

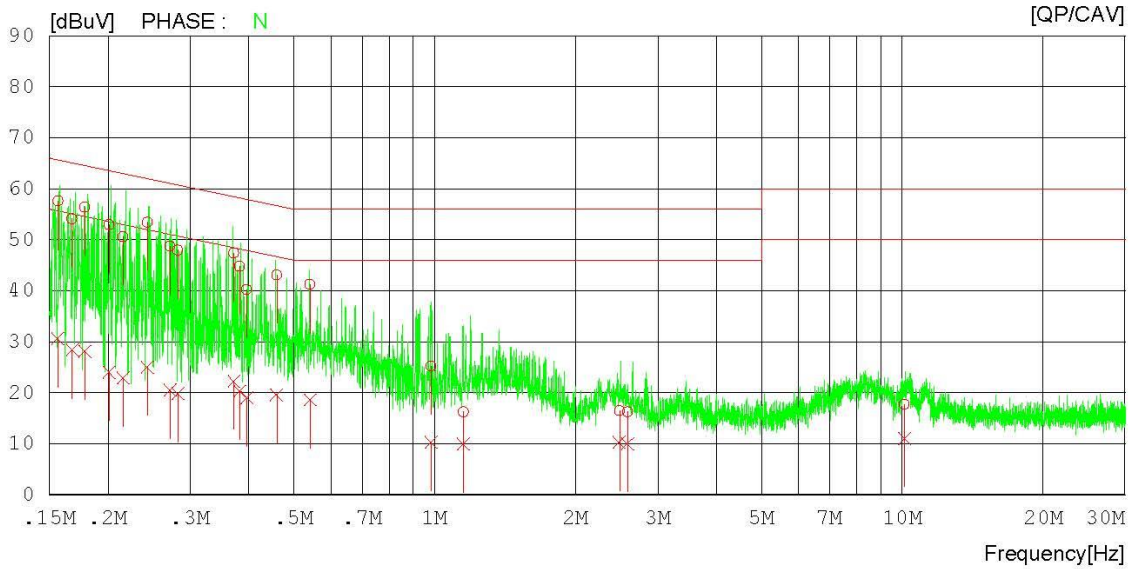
Results of Conducted Emission

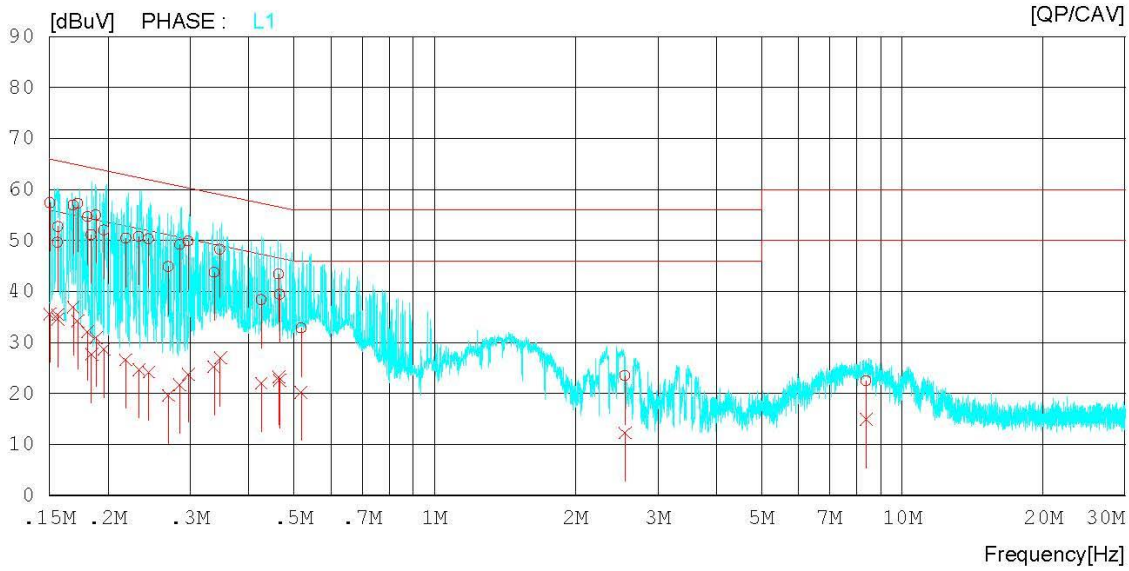
DTNC Date 2019-08-02

Order No.	DTNC1905-03834	Referrence No.	
Model No.	TMS230IF	Power Supply	3.3 V
Serial No.		Temp/Humi.	23 'C / 42 %
Test Condition	10.525 GHz	Operator	JaeHyeok Bang

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV





Test Mode: TM 1

Results of Conducted Emission

DTNC Date 2019-08-02

Order No.	DTNC1905-03834	Referrence No.	
Model No.	TMS230IF	Power Supply	3.3 V
Serial No.		Temp/Humi.	23 'C / 42 %
Test Condition	10.525 GHz	Operator	JaeHyeok Bang

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ [MHz]	READING QP [dBuV]	READING CAV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT CAV [dBuV]	LIMIT QP [dBuV]	LIMIT CAV [dBuV]	MARGIN QP [dBuV]	MARGIN CAV [dBuV]	PHASE
1	0.15643	47.66	20.68	9.94	57.60	30.62	65.65	55.65	8.05	25.03	N
2	0.16779	44.12	18.42	9.94	54.06	28.36	65.07	55.07	11.01	26.71	N
3	0.17868	46.43	18.20	9.94	56.37	28.14	64.55	54.55	8.18	26.41	N
4	0.20131	43.04	14.07	9.94	52.98	24.01	63.56	53.56	10.58	29.55	N
5	0.21562	40.67	13.00	9.94	50.61	22.94	62.99	52.99	12.38	30.05	N
6	0.24273	43.54	15.15	9.94	53.48	25.09	62.00	52.00	8.52	26.91	N
7	0.27166	38.79	10.59	9.94	48.73	20.53	61.07	51.07	12.34	30.54	N
8	0.28215	38.06	9.89	9.94	48.00	19.83	60.75	50.75	12.75	30.92	N
9	0.37181	37.49	12.32	9.95	47.44	22.27	58.46	48.46	11.02	26.19	N
10	0.38274	34.87	10.39	9.95	44.82	20.34	58.22	48.22	13.40	27.88	N
11	0.39656	30.30	9.08	9.95	40.25	19.03	57.93	47.93	17.68	28.90	N
12	0.45950	33.15	9.63	9.95	43.10	19.58	56.70	46.70	13.60	27.12	N
13	0.54098	31.26	8.68	9.95	41.21	18.63	56.00	46.00	14.79	27.37	N
14	0.98160	15.30	0.28	9.97	25.27	10.25	56.00	46.00	30.73	35.75	N
15	1.15140	6.31	-0.06	9.98	16.29	9.92	56.00	46.00	39.71	36.08	N
16	2.48280	6.38	0.21	10.05	16.43	10.26	56.00	46.00	39.57	35.74	N
17	2.58440	6.20	-0.05	10.05	16.25	10.00	56.00	46.00	39.75	36.00	N
18	10.11560	7.37	0.75	10.34	17.71	11.09	60.00	50.00	42.29	38.91	N
19	0.15031	47.41	25.66	9.94	57.35	35.60	65.98	55.98	8.63	20.38	L1
20	0.15615	39.64	24.65	9.94	49.58	34.59	65.67	55.67	16.09	21.08	L1
21	0.15641	42.81	25.48	9.94	52.75	35.42	65.65	55.65	12.90	20.23	L1
22	0.16866	46.94	27.01	9.94	56.88	36.95	65.03	55.03	8.15	18.08	L1
23	0.17237	47.29	24.28	9.94	57.23	34.22	64.85	54.85	7.62	20.63	L1
24	0.18087	44.67	22.11	9.94	54.61	32.05	64.45	54.45	9.84	22.40	L1
25	0.18441	41.21	17.68	9.94	51.15	27.62	64.28	54.28	13.13	26.66	L1
26	0.18870	45.04	20.93	9.94	54.98	30.87	64.09	54.09	9.11	23.22	L1
27	0.19620	42.13	18.75	9.94	52.07	28.69	63.77	53.77	11.70	25.08	L1
28	0.21850	40.44	16.62	9.94	50.38	26.56	62.88	52.88	12.50	26.32	L1
29	0.23301	40.86	14.70	9.94	50.80	24.64	62.34	52.34	11.54	27.70	L1
30	0.24443	40.34	14.22	9.94	50.28	24.16	61.94	51.94	11.66	27.78	L1
31	0.26968	34.91	9.67	9.94	44.85	19.61	61.13	51.13	16.28	31.52	L1
32	0.28485	39.28	11.78	9.94	49.22	21.72	60.67	50.67	11.45	28.95	L1
33	0.29725	39.87	13.86	9.94	49.81	23.80	60.32	50.32	10.51	26.52	L1
34	0.33723	33.81	15.23	9.94	43.75	25.17	59.27	49.27	15.52	24.10	L1
35	0.34766	38.27	17.02	9.94	48.21	26.96	59.02	49.02	10.81	22.06	L1
36	0.42536	28.44	12.05	9.95	38.39	22.00	57.34	47.34	18.95	25.34	L1
37	0.46375	33.45	13.29	9.95	43.40	23.24	56.63	46.63	13.23	23.39	L1
38	0.46597	29.43	12.64	9.95	39.38	22.59	56.59	46.59	17.21	24.00	L1
39	0.51779	22.83	10.30	9.95	32.78	20.25	56.00	46.00	23.22	25.75	L1
40	2.55040	13.40	2.18	10.04	23.44	12.22	56.00	46.00	32.56	33.78	L1
41	8.37720	12.20	4.65	10.27	22.47	14.92	60.00	50.00	37.53	35.08	L1

Test Mode: TM 2

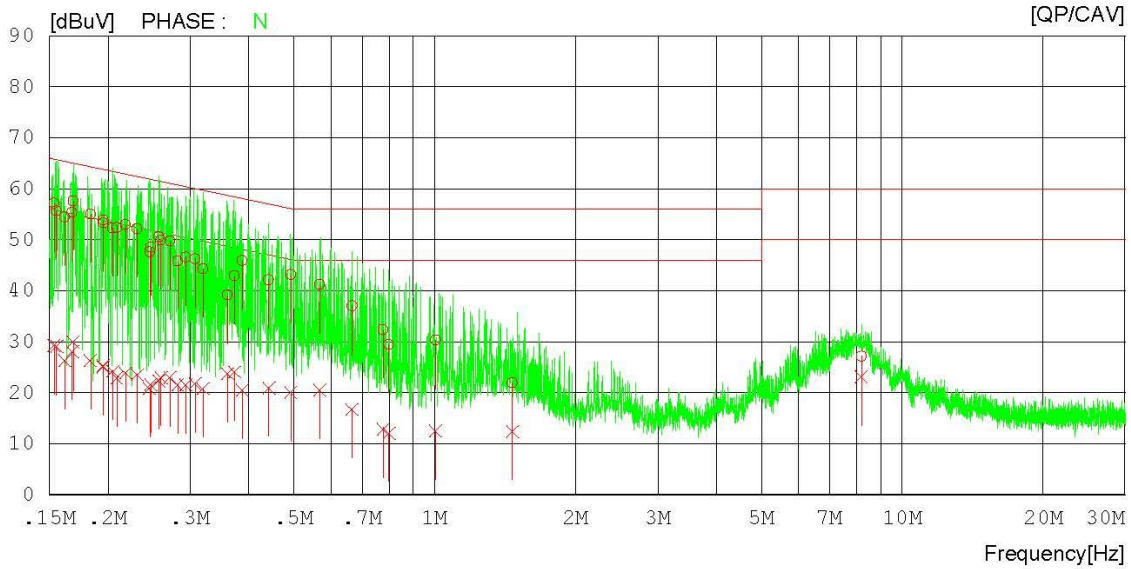
Results of Conducted Emission

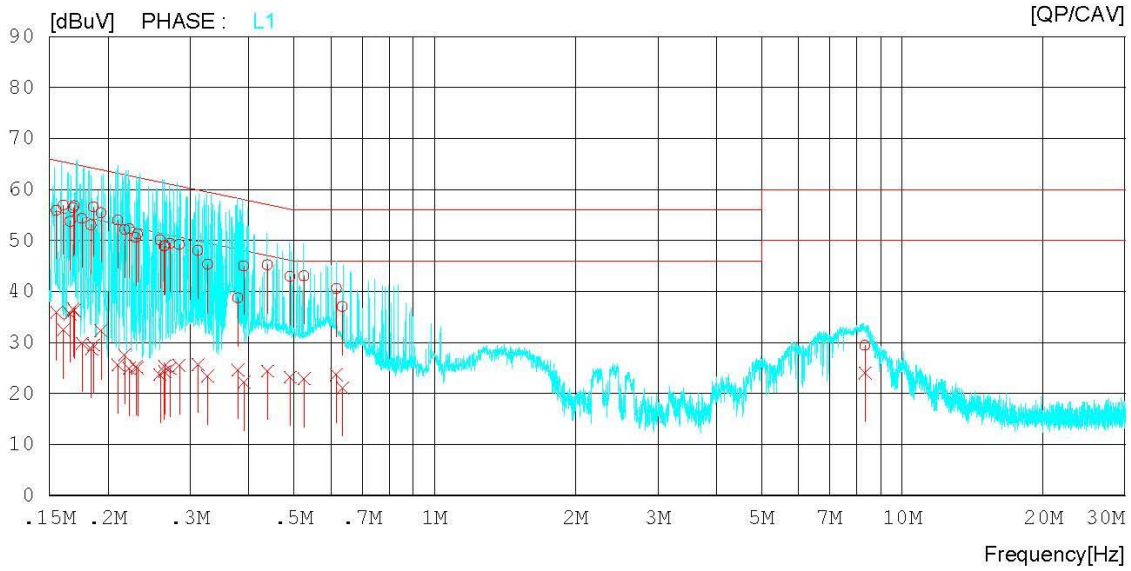
DTNC Date 2019-08-02

Order No.	DTNC1905-03834	Referrence No.	
Model No.	TMS230IF	Power Supply	5.0 V
Serial No.		Temp/Humi.	23 'C / 42 %
Test Condition	10.525 GHz	Operator	JaeHyeok Bang

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV





Test Mode: TM 2

Results of Conducted Emission

DTNC

Date 2019-08-02

Order No.	DTNC1905-03834	Referrence No.	
Model No.	TMS230IF	Power Supply	5.0 V
Serial No.		Temp/Humi.	23 'C / 42 %
Test Condition	10.525 GHz	Operator	JaeHyeok Bang

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ [MHz]	READING QP [dBuV]	READING CAV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT CAV [dBuV]	LIMIT QP [dBuV]	LIMIT CAV [dBuV]	MARGIN QP [dBuV]	MARGIN CAV [dBuV]	PHASE
1	0.15331	47.23	19.35	9.94	57.17	29.29	65.82	55.82	8.65	26.53	N
2	0.15532	45.82	19.08	9.94	55.76	29.02	65.71	55.71	9.95	26.69	N
3	0.16164	44.53	16.37	9.94	54.47	26.31	65.38	55.38	10.91	29.07	N
4	0.16790	45.39	18.16	9.94	55.33	28.10	65.06	55.06	9.73	26.96	N
5	0.16856	47.65	19.97	9.94	57.59	29.91	65.03	55.03	7.44	25.12	N
6	0.18350	45.10	16.38	9.94	55.04	26.32	64.33	54.33	9.29	28.01	N
7	0.19546	43.89	15.34	9.94	53.83	25.28	63.80	53.80	9.97	28.52	N
8	0.19542	43.34	15.13	9.94	53.28	25.07	63.80	53.80	10.52	28.73	N
9	0.20505	42.33	14.26	9.94	52.27	24.20	63.40	53.40	11.13	29.20	N
10	0.20898	42.46	12.99	9.94	52.40	22.93	63.25	53.25	10.85	30.32	N
11	0.21836	43.00	13.94	9.94	52.94	23.88	62.88	52.88	9.94	29.00	N
12	0.23107	42.23	13.57	9.94	52.17	23.51	62.41	52.41	10.24	28.90	N
13	0.24558	37.73	10.89	9.94	47.67	20.83	61.91	51.91	14.24	31.08	N
14	0.24718	38.60	11.68	9.94	48.54	21.62	61.85	51.85	13.31	30.23	N
15	0.25718	40.60	12.42	9.94	50.54	22.36	61.52	51.52	10.98	29.16	N
16	0.25975	39.91	13.03	9.94	49.85	22.97	61.44	51.44	11.59	28.47	N
17	0.27127	39.81	12.99	9.94	49.75	22.93	61.08	51.08	11.33	28.15	N
18	0.28199	35.92	11.60	9.94	45.86	21.54	60.76	50.76	14.90	29.22	N
19	0.29365	36.70	11.61	9.94	46.64	21.55	60.42	50.42	13.78	28.88	N
20	0.30751	36.36	11.84	9.94	46.30	21.78	60.04	50.04	13.74	28.26	N
21	0.31965	34.41	10.86	9.94	44.35	20.80	59.72	49.72	15.37	28.92	N
22	0.36063	29.23	13.80	9.95	39.18	23.75	58.71	48.71	19.53	24.96	N
23	0.37340	33.01	14.13	9.95	42.96	24.08	58.42	48.42	15.46	24.34	N
24	0.38746	35.93	10.56	9.95	45.88	20.51	58.12	48.12	12.24	27.61	N
25	0.44199	32.23	11.05	9.95	42.18	21.00	57.02	47.02	14.84	26.02	N
26	0.49234	33.24	10.10	9.95	43.19	20.05	56.13	46.13	12.94	26.08	N
27	0.56859	31.28	10.58	9.95	41.23	20.53	56.00	46.00	14.77	25.47	N
28	0.66596	27.09	6.72	9.97	37.06	16.69	56.00	46.00	18.94	29.31	N
29	0.77577	22.47	2.93	9.97	32.44	12.90	56.00	46.00	23.56	33.10	N
30	0.79828	19.50	2.09	9.97	29.47	12.06	56.00	46.00	26.53	33.94	N
31	1.00400	20.40	2.56	9.97	30.37	12.53	56.00	46.00	25.63	33.47	N
32	1.46680	11.93	2.39	9.99	21.92	12.38	56.00	46.00	34.08	33.62	N
33	8.16980	16.90	12.85	10.26	27.16	23.11	60.00	50.00	32.84	26.89	N
34	0.15534	45.97	25.91	9.94	55.91	35.85	65.71	55.71	9.80	19.86	L1
35	0.16075	46.93	22.43	9.94	56.87	32.37	65.43	55.43	8.56	23.06	L1
36	0.16610	43.78	25.66	9.94	53.72	35.60	65.15	55.15	11.43	19.55	L1
37	0.16869	46.40	26.70	9.94	56.34	36.64	65.02	55.02	8.68	18.38	L1
38	0.16961	46.90	26.34	9.94	56.84	36.28	64.98	54.98	8.14	18.70	L1
39	0.17613	44.29	19.88	9.94	54.23	29.82	64.67	54.67	10.44	24.85	L1
40	0.18427	43.12	18.73	9.94	53.06	28.67	64.29	54.29	11.23	25.62	L1
41	0.18639	46.60	19.56	9.94	56.54	29.50	64.20	54.20	7.66	24.70	L1
42	0.19325	45.50	22.33	9.94	55.44	32.27	63.90	53.90	8.46	21.63	L1
43	0.21017	44.04	15.65	9.94	53.98	25.59	63.20	53.20	9.22	27.61	L1
44	0.21730	42.18	17.59	9.94	52.12	27.53	62.92	52.92	10.80	25.39	L1
45	0.22234	42.27	15.01	9.94	52.21	24.95	62.73	52.73	10.52	27.78	L1
46	0.22971	40.66	15.25	9.94	50.60	25.19	62.46	52.46	11.86	27.27	L1
47	0.23137	41.32	15.02	9.94	51.26	24.96	62.40	52.40	11.14	27.44	L1
48	0.25856	40.12	13.76	9.94	50.06	23.70	61.48	51.48	11.42	27.78	L1

NO	FREQ	READING		C.FACTOR	RESULT		LIMIT		MARGIN		PHASE
		QP	AV		QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
49	0.26434	38.86	14.35	9.94	48.80	24.29	61.29	51.29	12.49	27.00	L1
50	0.26447	38.99	15.38	9.94	48.93	25.32	61.29	51.29	12.36	25.97	L1
51	0.27151	39.44	14.90	9.94	49.38	24.84	61.07	51.07	11.69	26.23	L1
52	0.28421	39.24	15.50	9.94	49.18	25.44	60.69	50.69	11.51	25.25	L1
53	0.31196	38.10	15.70	9.94	48.04	25.64	59.92	49.92	11.88	24.28	L1
54	0.32680	35.34	13.49	9.94	45.28	23.43	59.53	49.53	14.25	26.10	L1
55	0.37910	28.76	14.64	9.95	38.71	24.59	58.30	48.30	19.59	23.71	L1
56	0.39075	35.05	12.24	9.95	45.00	22.19	58.05	48.05	13.05	25.86	L1
57	0.43921	35.22	14.44	9.95	45.17	24.39	57.08	47.08	11.91	22.69	L1
58	0.49075	32.99	13.19	9.95	42.94	23.14	56.16	46.16	13.22	23.02	L1
59	0.52521	33.07	12.92	9.95	43.02	22.87	56.00	46.00	12.98	23.13	L1
60	0.61636	30.57	13.71	9.96	40.53	23.67	56.00	46.00	15.47	22.33	L1
61	0.63491	27.09	11.11	9.96	37.05	21.07	56.00	46.00	18.95	24.93	L1
62	8.32780	19.07	13.72	10.27	29.34	23.99	60.00	50.00	30.66	26.01	L1

4.3 List of Test Equipment

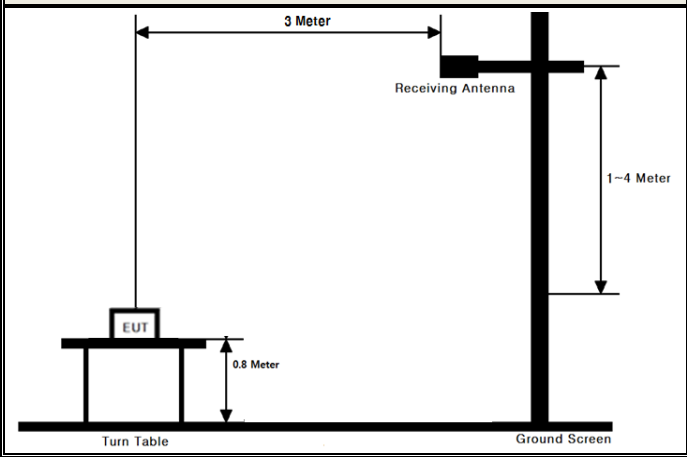
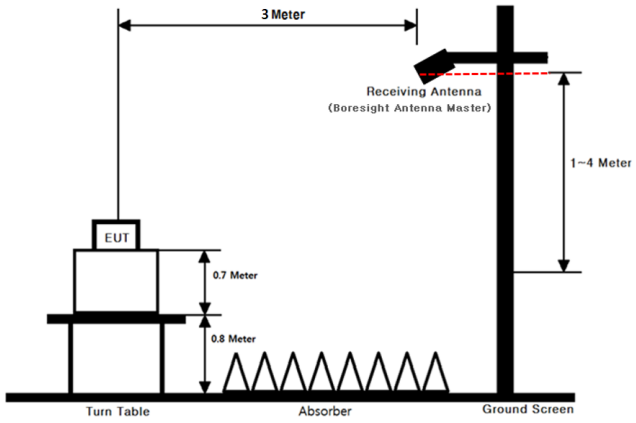
Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	18/12/19	19/12/19	MY48011700
Spectrum Analyzer	Agilent Technologies	N9020A	19/06/26	20/06/26	MY46471251
Spectrum Analyzer	Agilent Technologies	N9030A	19/03/15	20/03/15	MY53310140
Spectrum Analyzer	KEYSIGHT	N9030B	18/12/27	19/12/27	MY55480168
Multimeter	FLUKE	17B+	18/12/18	19/12/18	36390701WS
Signal Generator	Rohde Schwarz	SMBV100A	18/12/19	19/12/19	255571
Signal Generator	ANRITSU	MG3695C	18/12/20	19/12/20	173501
Thermohygrometer	BODYCOM	BJ5478	18/12/27	19/12/27	120612-1
Thermohygrometer	BODYCOM	BJ5478	18/12/27	19/12/27	N/A
HYGROMETER	TESTO	608-H1	19/01/13	20/01/13	34862883
Loop Antenna	Schwarzbeck	FMZB1513	18/01/30	20/01/30	1513-128
BILOG ANTENNA	Schwarzbeck	VULB 9160	18/07/13	20/07/13	3359
HORN ANT	ETS	3117	18/01/30	20/01/30	6419
HORN ANT	A.H.Systems Inc.	SAS-574	17/07/31 19/07/03	19/07/31 21/07/03	155
HORN ANT	MI Wave	RX ANT-5 261U + 410U	17/08/31	19/08/31	4
HORN ANT	MI Wave	RX ANT-6 261V + 410V	17/08/31	19/08/31	5
PreAmplifier	TSJ	MLA-0118-J01-45	18/12/19	19/12/19	17138
PreAmplifier	H.P	8447D	18/12/18	19/12/18	2944A07774
PreAmplifier	tsj	MLA-1840-J02-45	18/07/06 19/06/27	19/07/06 20/06/27	16966-10728
PreAmplifier	Norden Millimeter Inc	NA4060G50N8P12	18/12/21	19/12/21	1003
Harmonic Mixers 50-75 GHz	KEYSIGHT	M197V	18/06/11	20/06/11	MY56390168
High Pass Filter	Wainwright Instruments	WHNX8.0/26.5-6SS	19/06/27	20/06/27	3
EMI Test Receiver	Rohde Schwarz	ESCI7	19/01/30	20/01/30	100910
PULSE LIMITER	Rohde Schwarz	ESH3-Z2	18/09/27	19/09/27	101333
LISN	SCHWARZBECK	NNLK 8121	19/03/19	20/03/19	06183
Cable	DT&C	CABLE	19/01/15	20/01/15	RF-65
Cable	Radiall	TESTPRO3	19/01/16	20/01/16	M-01
Cable	Junkosha	MWX315	19/01/16	20/01/16	M-05
Cable	Junkosha	MWX221	19/01/16	20/01/16	M-06
Cable	Junkosha	MWX241	19/01/14	20/01/14	G-4
Cable	Junkosha	MWX241	19/01/14	20/01/14	G-7
Cable	DT&C	CABLE	19/01/14	20/01/14	G-13
Cable	DT&C	CABLE	19/01/14	20/01/14	G-14
Cable	HUBER+SUHNER	SUCOFLEX104	19/01/14	20/01/14	G-15
Cable	Junkosha	MWX241	19/01/14	20/01/14	G-8
Cable	Junkosha	MWX241	19/01/14	20/01/14	G-10
Cable	DT&C	CABLE	19/01/16	20/01/16	RF-82

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.

APPENDIX I

Test set up diagrams

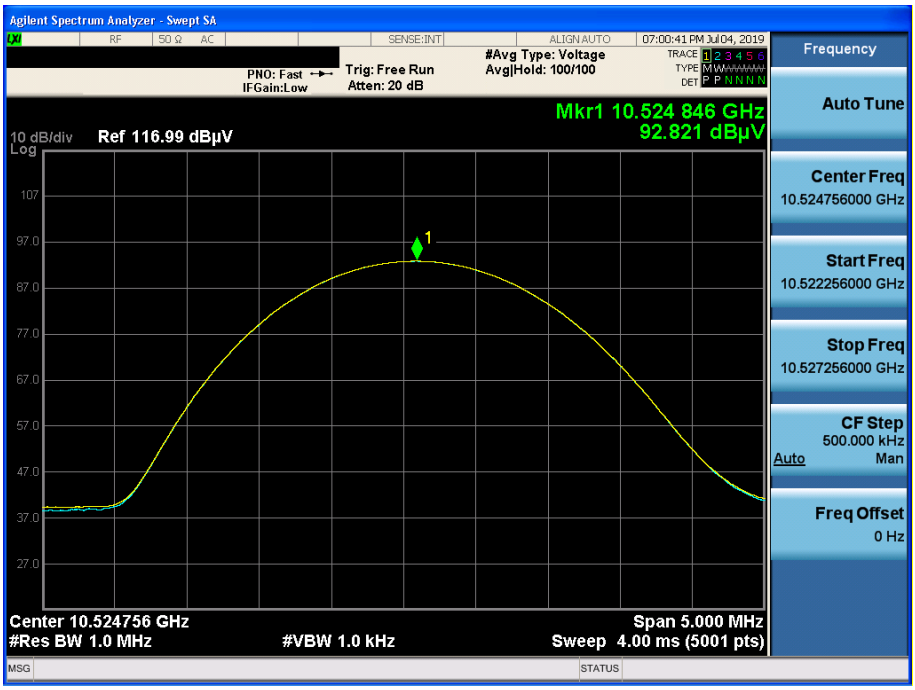
- **Radiated Measurement**

Below 1GHz	Above 1GHz
	

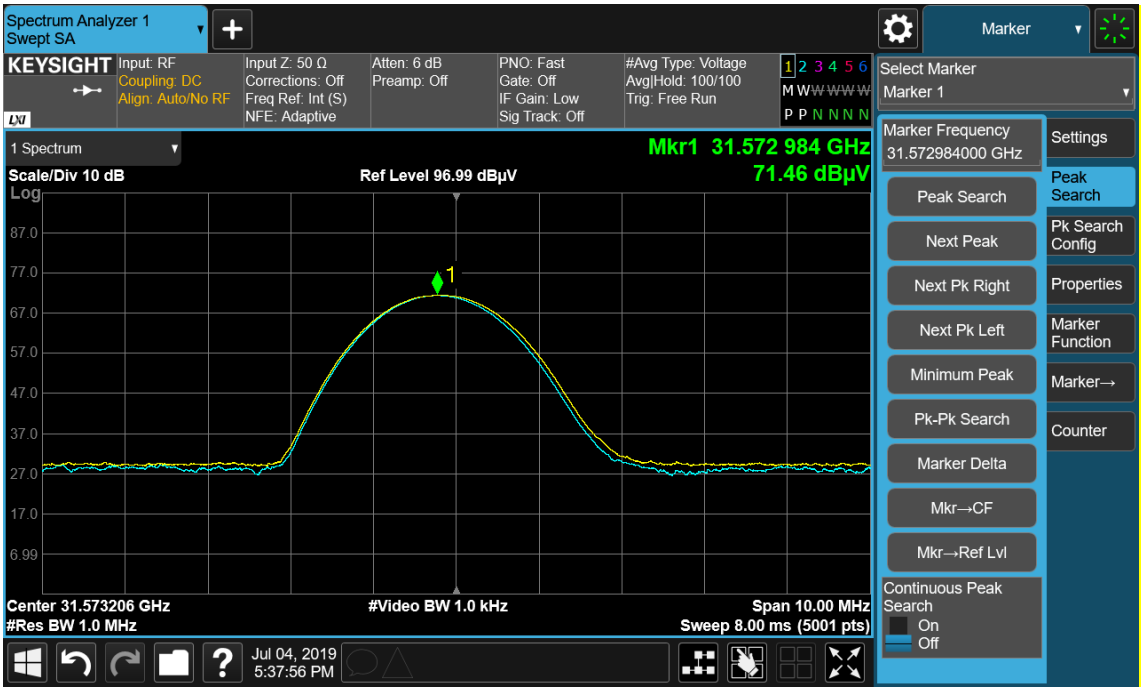
APPENDIX II

Worst-case plots(Reading Value)

Fundamental & TM 1 & Y axis & Hor **Detector Mode : AV**

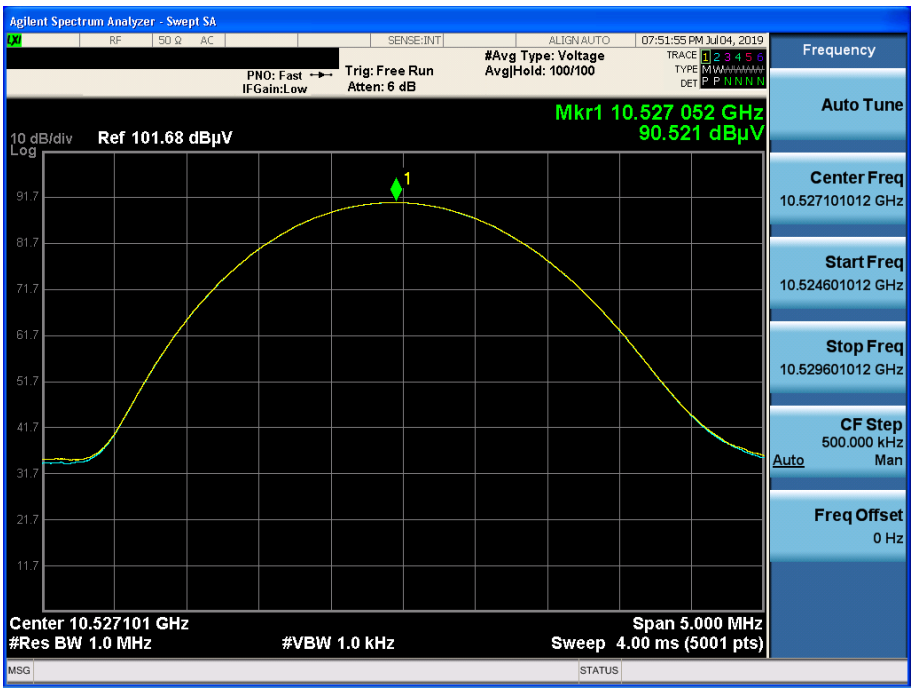
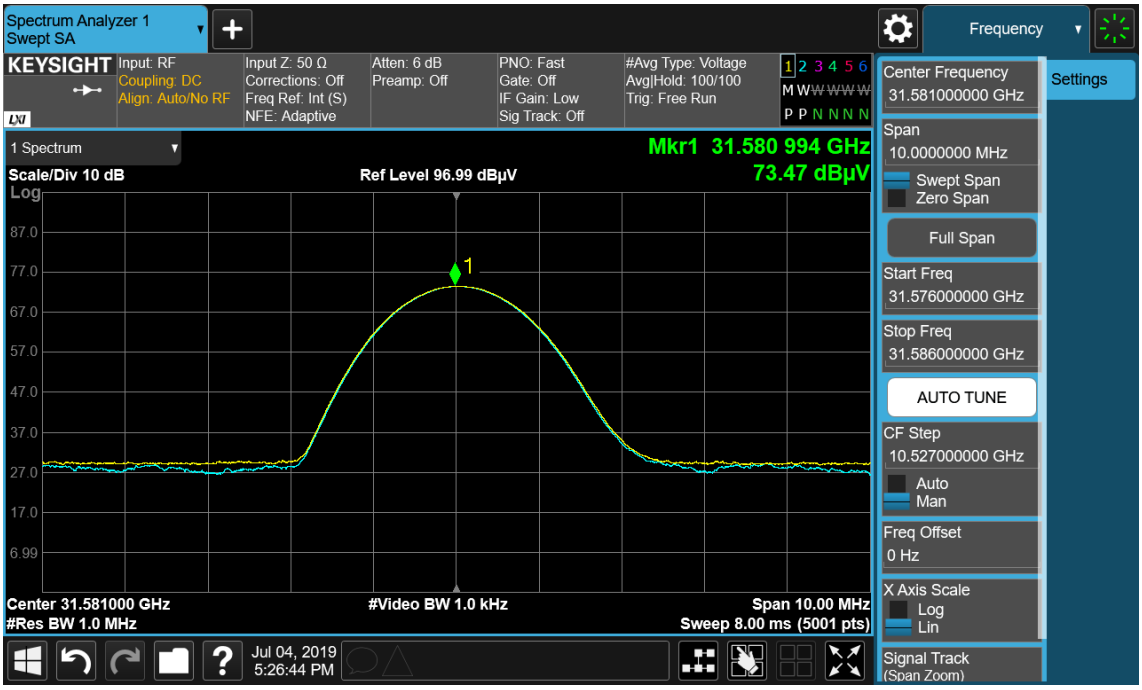


Unwanted emission & TM 1 & Z axis & Ver **Detector Mode : AV**



Worst-case plots(Reading Value)

Fundamental & TM 2 & Y axis & Hor **Detector Mode : AV**



Unwanted emission & TM 2 & Z axis & Ver **Detector Mode : AV**