TEST REPORT

KOSTEC CO., Ltd.

28(175-20, Annyeong-dong) 406-gil sejaro, Hwaseong-si, Gueonggi-do, Korea Tel:031-222-4251, Fax:031-222-4252

Report No.: KST-FCR-160009



1. Applicant

· Name :

Teltron Inc.

Address:

No. 202, ITplex, Gajungbuk-ro 26-41, Yusung-gu, Daejeon, South Korea

2. Test Item

Product Name:

RF Sensor module(motion sensor)

· Model Name:

TMS300

· Brand:

None

· FCC ID:

2AJWPTMS300

3. Manufacturer

· Name :

Teltron Inc.

Address:

No. 202, ITplex, Gajungbuk-ro 26-41, Yusung-gu, Daejeon, South Korea

4. Date of Test:

2016.09.23.

5. Test Method Used: FCC CFR 47, Part 15. Subpart C-15.245

6. Test Result:

Compliance

7. Note:

None

Supplementary Information

The device bearing the brand name and FCC ID specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with measurement procedures specified in ANSI C 63.10-2013.

We attest to the accuracy of data and all measurements reported herein were performed by KOSTEC Co., Ltd. and were made under Chief Engineer's supervision. We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated

(Signature)

Affirmation

Tested by

Name: Lee, Mi-Young

Technical Manager

Name: Park, Gyeong-Hyeon

Signature)

2016.09.26.

KOSTEC Co., Ltd.



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1. GENERAL INFORMATION

1.1 Test Facility

Test laboratory and address

KOSTEC Co., Ltd.

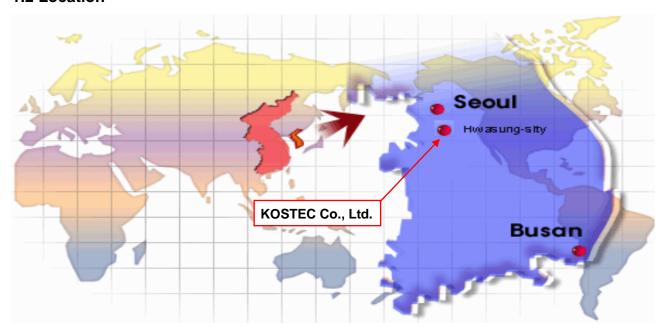
128(175-20, Annyeong-dong) 406-gil sejaro, Hwaseong-si Gyeonggi-do, Korea

Registration information

KOLAS No.: 232

FCC Designation No. : KR0041 IC Registration Site No. : 8305A

1.2 Location



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1.3 Revision History of test report

Rev.	Revisions	Revisions Effect page Reviewed					
-	Initial issue	All	Gyeong Hyeon, Park	2016. 09. 26.			

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2. EQUIPMENT DESCRIPTION

The product specification described herein was declared by manufacturer. And refer to user's manual for the details.

Equipment Name	RF Sensor module(motion sensor)
Model No	TMS300
Usage	RF motion sensor
Serial Number	Proto type
Modulation type	cw
Maximum Field strength of fundamental	100 dBμV/m
Operated Frequency	10.520 GHz
Channel Number	1 ea
Operation temperature	-20 °C ~ 55 °C
Power Source	DC 3.3 V
Antenna Description	Printed Antenna (Without any antenna connector)
Remark	 The device was operating at its maximum output power for all measurements. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case (X) is shown in the report.
	The above DUT's information was declared by manufacturer. Please refer to the specifications or user manual for more detailed description.
FCC ID	2AJWPTMS300

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3. SYSTEM CONFIGURATION FOR TEST

3.1 Characteristics of equipment

TMS300 is X-band Doppler motion sensor to detect motion.

3.2 Used peripherals list

Description	Model No.	Serial No.	Manufacture	Remark		

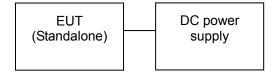
3.3 Product Modification

N/A

3.4 Operating Mode

Constantly transmitting with a carrier at maximum power.

3.5 Test Setup of EUT



3.6 Table for test channel frequencies

Freq Band	Low channel	Middle Channel	High Channel		
10.5 - 10.55 GHz	-	10520 MHz	-		

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3.7 Used Test Equipment List

No.	Instrument	Model	S/N	Manufacturer	Due to cal date	Cal interval	used
1	T & H Chamber	EY-101	90E14260	TABAI ESPEC	2017.09.07	1 year	
2	T & H Chamber	SH-641	92006831	ESPEC CORP	2017.02.04	1 year	
3	Spectrum Analyzer	8563E	3846A10662	Agilent Technology	2017.02.02	1 year	
4	Spectrum Analyzer	8593E	3710A02859	Agilent Technology	2017.02.02	1 year	
5	Spectrum Analyzer	FSV30	20-353063	Rohde& Schwarz	2017.02.02	1 year	
6	Signal Analyzer	N9010A	MY50410369	Agilent Technologies	2017.05.04	1 year	
7	EMI Test Receiver	ESCI7	100823	Rohde& Schwarz	2017.02.02	1 year	\boxtimes
8	EMI Test Receiver	ESI	837514/004	Rohde& Schwarz	2016.10.08	1 year	\boxtimes
9	Vector Signal Analyzer	89441A	3416A02620	Agilent Technology	2017.02.04	1 year	
10	Network Analyzer	8753ES	US39172348	AGILENT	2017.09.06	1 year	
11	EPM Series Power meter	E4418B	GB39512547	Agilent Technology	2017.02.03	1 year	
12	RF Power Sensor	E9300A	MY41496631	Agilent Technology	2017.02.03	1 year	
13	Microwave Frequency Counter	5352B	2908A00480	Agilent Technology	2017.02.01	1 year	
14	Modulation Analyzer	8901A	3538A07071	Agilent Technology	2017.02.03	1 year	
15	Audio Analyzer	8903B	3514A16919	Agilent Technology	2017.02.01	1 year	
16	Audio Telephone Analyzer	DD-5601CID	520010281	CREDIX	2017.02.04	1 year	
17	Digital storage Oscilloscope	TDS3052	B015962	Tektronix	2017.09.06	1 year	
18	ESG-D Series Signal Generator	E4436B	US39260458	Agilent Technology	2017.02.03	1 year	
19	Vector Signal Generator	SMBV100A	257557	Rohde & Schwarz	2017.02.03	1 year	
20	Signal Generator	SMB100A	179628	Rohde & Schwarz	2017.06.02	1 year	
21	Tracking Source 85645A		070521-A1	Agilent Technology	2017.02.02	1 year	
22	SLIDAC	None	0207-4	Myoung sung Ele.	2017.02.01	1 year	
23	DC Power supply	DRP-5030	9028029	Digital Electronic Co.,Ltd	2017.02.01	1 year	
24	DC Power supply	6038A	3440A12674	Agilent Technology	2017.02.01	1 year	
25	DC Power supply	E3610A	KR24104505	Agilent Technology	2017.02.01	1 year	\boxtimes
26	DC Power supply	UP-3005T	68	Unicon Co.,Ltd	2017.02.01	1 year	
27	DC Power Supply	SM 3004-D	114701000117	DELTA ELEKTRONIKA	2017.02.01	1 year	
28	Dummy Load	8173	3780	Bird Electronic Co., Corp	2017.02.03	1 year	
29	Attenuator	50FH-030-500	140410 9433	JEW Idustries Inc.	2017.02.03	1 year	
30	Attenuator	765-20	9703	Narda	2017.09.06	1 year	
31	Attenuator	24-30-34	BX5630	Aeroflex / Weinschel	2016.12.30	1 year	
32	Attenuator	8498A	3318A09485	HP	2017.02.03	1 year	
33	Step Attenuator	8494B	3308A32809	HP	2017.02.03	1 year	
34	Attenuator	18B50W-20F	64671	INMET	2017.02.17	1 year	
35	Attenuator	10 dB	1	Rohde & Schwarz	2017.05.31	1 year	
36	Attenuator	54A-10	74564	WEINSCHEL	2017.06.02	1 year	
37	Attenuator	56-10	66920	WEINSCHEL	2017.06.17	1 year	
38	Power divider	11636B	51212	HP	2017.02.02	1 year	
39	3Way Power divider	KPDSU3W	00070365	KMW	2017.09.06	1 year	
40	4Way Power divider	70052651	173834	KRYTAR	2017.02.02	1 year	
41	3Way Power divider	1580	SQ361	WEINSCHEL	2017.06.02	1 year	
42	White noise audio filter	ST31EQ 101902		SoundTech	2017.09.07	1 year	
43	Dual directional coupler	778D	17693	HEWLETT PACKARD	2017.02.03	1 year	
44	Dual directional coupler	•		HEWLETT PACKARD	2017.02.03	1 year	
45	Band rejection filter	3TNF-0006	26	DOVER Tech	2017.02.04	1 year	
46	Band rejection filter	3TNF-0008	317	DOVER Tech	2017.02.04	1 year	
47	Band rejection filter	3TNF-0007	311	DOVER Tech	2017.02.04	1 year	



No.	Instrument	Model	S/N	Manufacturer	Due to cal date	Cal interval	used
48	Band rejection filter	WTR-BRF2442-84NN	09020001	WAVE TECH Co.,LTD	2017.02.03	1 year	
49	Band rejection filter	WRCJV12-5695-5725- 5825-5855-50SS	1	Wainwright Instruments GmbH	2017.05.31	1 year	
50	Band rejection filter	WRCJV12-5120-5150- 5350-5380-40SS	4	Wainwright Instruments GmbH	2017.05.31	1 year	
51	Band rejection filter	WRCGV10-2360-2400- 2500-2540-50SS	2	Wainwright Instruments GmbH	2017.05.31	1 year	
52	Highpass Filter	WHJS1100-10EF	1	WAINWRIGHT	2017.02.03	1 year	
53	Highpass Filter	WHJS3000-10EF	1	WAINWRIGHT	2017.02.03	1 year	
54	Highpass Filter	WHNX6-5530-3000- 26500-40CC	2	Wainwright Instruments GmbH	2017.06.17	1 year	
55	Highpass Filter	WHNX6-2370-7000- 26500-40CC	4	Wainwright Instruments GmbH	2017.06.17	1 year	
56	WideBand Radio Communication Tester	CMW500	102276	Rohde & Schwarz	2017.02.04	1 year	
57	Radio Communication Tester	CMU 200	112026	Rohde & Schwarz	2017.02.03	1 year	
58	Bluetooth Tester	er TC-3000B		TESCOM CO., LTD.	2017.02.03	1 year	
59	RF Up/Down Converter	DCP-1780	980901003	CREDIX	2017.02.03	1 year	
60	DECT Test set	8923B	3829U00364	HP	2017.02.04	1 year	
61	DECT Test set	CMD60	840677/005	Rohde& Schwarz	2017.09.06	1 year	
62	Loop Antenna	6502	9203-0493	EMCO	2017.06.04	2 year	\boxtimes
63	BiconiLog Antenna	3142B	9910-1432	EMCO	2018.04.25	2 year	\boxtimes
64	Horn Antenna	3115	2996	EMCO	2018.02.11	2 year	\boxtimes
65	Horn Antenna	3160-09	061591-21907	ETS LINDGREN	2018.05.03	2 year	\boxtimes
66	Horn Antenna	3160-10	061221-022	ETS LINDGREN	2018.05.03	2 year	\boxtimes
67	Antenna Master(3)	AT13	None	AUDIX	N/A	N/A	\boxtimes
68	Turn Table(3)	None	None	AUDIX	N/A	N/A	\boxtimes
69	PREAMPLIFIER(3)	8449B	3008A02577	Agilent	2017.02.01	1 year	\boxtimes
70	Low noise Amplifier	TK-PA1840H	160010-L	TESKTEK	2017.07.05	1 year	\boxtimes
71	Antenna Master(10)	MA4000-EP	None	inno systems GmbH	N/A	N/A	\boxtimes
72	Turn Table(10)	None	None	inno systems GmbH	N/A	N/A	\boxtimes
73	AMPLIFIER(10)	TK-PA6S	120009	TESTEK	2017.02.02	1 year	\boxtimes



4. SUMMARY TEST RESULTS

Description of Test	FCC Rule	Reference Clause	Used	Test Result
Field strength of radiated emission	15.245(b)	Clause 5.1		Compliance
AC Conducted emission	15.207	Clause 5.2		N/A
20 dB bandwidth measurement	15.215(c)	Clause 5.3		Compliance
Antenna requirement	15.203	Clause 5.4	\boxtimes	Compliance

Compliance/pass : The EUT complies with the essential requirements in the standard.

Not Compliance: The EUT does not comply with the essential requirements in the standard.

N/A: The test was not applicable in the standard.

Procedure Reference

FCC CFR 47, Part 15. Subpart C-15.245 ANSI C 63.10-2013

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5. MEASUREMENT RESULTS

5.1 Field strength of radiated emission

5.1.1 Standard Applicable [FCC §15.245(b)]

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

	Field strengt	h of funda	amental	Field streng	Measurement			
Fundamental frequency (MHz)	(mV/m)	(dBµ	ıV/m)	(mV/m)	(dBµ	V/m)	distance	
(1411.12)	AV	AV	PK	AV	AV	PK	(meter)	
902 - 928	500	114	134	1.6	64	84	3	
2435 - 2465	500	114	134	1.6	64	84	3	
5785 - 5815	500 114 134		1.6	64	84	3		
10500 - 10550	2500	128	148	25.0	88	108	3	
24075 - 24175	2500	128	148	25.0	88	108	3	

Note:

- Field strength limits are specified at a distance of 3 meters.
- 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.
- The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

§15.209. limits for radiated emissions measurements

Frequency Band	quency Band Limit (µV/m)		Measurement distance (meter)	Detector
0.009 - 0.490	2 400/F (kHz)	-	300	
0.490 - 1.705	2 4000/F (kHz)	-	30	
1.705 – 30.0	30	29.54	30	Quasi peak
30 - 88	100 **	40.0	3	Quasi peak
88 - 216	150 **	43.5	3	Quasi peak
216 - 960	200 **	46.0	3	Quasi peak
Above 960	500	54.0	3	Peak & Average

^{**} fundamental emissions from intentional radiators operation 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 Section 15.231 and 15.241

5.1.2 Test Environment conditions

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5.1.3 Measurement Procedure

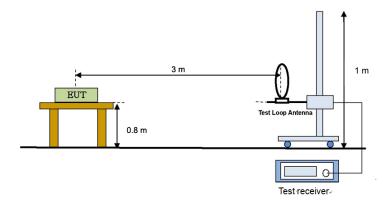
The measurements procedure of the Spurious RF Radiated emissions is as following describe method.

- 1. The EUT was placed on the top of a rotating table (0.8 meters for below 1 GHz and 1.5 meters for above 1 GHz) above the ground at a 3 meter camber. The table was rotated 360 degree to determine the position of the highest radiation.
- 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna master.
- 3. The antenna 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.
- 4. 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 rotating table was turned from 0 360 degrees to find the maximum reading.
- 5. The measuring receiver was set to peak detector and specified bandwidth with max hold function.
- 6. Low, Middle and high channels were measured, and radiation measurements are performed in X, Y, Z axis positioning. And found the worst axis position and only the test worst case mode is recorded in the report.
- The measurement results are obtained as described below:

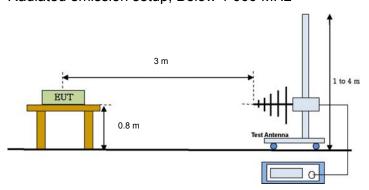
 Result(dB \(\mu \)/m) = Reading(dB \(\mu \) + Antenna factor(dB/m)+ CL(dB) + other applicable factor (dB)
- The resolution bandwidth of test receiver/spectrum analyzer is 1 № and the video bandwidth is 3 № for RMS Average (Duty cycle < 98 %) for Average detection (AV) at frequency above 1 %, then the measurement results was added to a correction factor (10 log(1/duty cycle)).
- The resolution bandwidth of test receiver/spectrum analyzer is 1 Mb and the video bandwidth is 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
- According to §15.33 (a)(1), Frequency range of radiated measurement is performed the fifth harmonic.
- If testing is performed with EUT is set at 1 meter away from the interference-receiving antenna, applied distance factor 20log(3/1)

5.1.4 Test setup

Radiated emission setup, Below 30 MHz



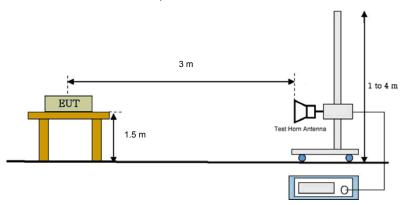
Radiated emission setup, Below 1 000 MHz



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Radiated emission setup, Above 1 GHz



5.1.5 Measurement Uncertainty

All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are test receiver, Cable loss, Antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, Antenna frequency interpolation, measurement distance variation, Site imperfection, mismatch, and system repeatability based on NIS 80,81.

Radiated Emission measurement: 30 - 1000 MHz: 4.4 dB (CL: Approx 95 %, k=2) Above 1 GHz: 4.88 dB (CL: Approx 95 %, k=2)

5.1.6 Measurement Result

■ Field strength of Fundamental

Freq.		ıding ∛/m)	Table	Antenna			CL	_	AMP		Result ⊮/m)		mit ∦/m)	Mg (di		Result
(GHz)	PK	AV	(Deg)	Height (m)	Pol. (H/V)	Fctr. (dB/m)	(dB)	(dB)	PK	AV	PK	AV	PK	AV	rvesuit	
10.511	91.15	91.02	180	1.5	V	38.19	4.97	-34.17	100.1	100.0	148	128	47.9	28.0	Compliance	

■ Field strength of harmonics and radiated emission

Freq.		ading Antenna Antenna		CL AMP		Meas Result (dB /₩/m)		Limit (dB <i>µ</i> V/m)		Mgn. (dB)		Result			
(GHz)	PK	AV	(Deg)	Height (m)	Pol. (H/V)	Fctr. (dB/m)	(dB)	(dB)	PK	AV	PK	AV	PK	AV	Result
-	-	-	-	-	-	-	-	ı	-	-	-	-	ı	ı	Compliance

^{*} There is no harmonic.

■ Radiated emission Below 1 GHz

	Freq.	Reading (dB μV/m)	Table (Deg)	Antenna		CI	AMP	Meas	Limit	Mgn		
	(Mb)			Height (m)	Pol. (H/V)	Fctr. (dB/m)	(dB)	(dB)	Result (dB ≠W/m)	(dB _μ V/ m)	(dB)	Result
	-	-	-	-	•	-	-	-	-	-	1	Compliance

^{*} There is no spurious emission.

- Freq.(MHz): Measurement frequency,
- Reading(dB / M/m): Indicated value for test receiver,
- Table (Deg): Directional degree of Turn table
- Antenna (Height, Pol, Fctr): Antenna Height, Polarization and Factor,
- Cbl(dB): Cable loss, Pre AMP(dB): Preamplifier gain(dB)
- Meas Result ($^{\text{dB}}\mu\text{V/m}$) :Reading($^{\text{dB}}\mu\text{V/m}$)+ Antenna factor.($^{\text{dB}}$ /m)+ CL($^{\text{dB}}$) Pre AMP($^{\text{dB}}$)
- Limit(dB \(\mu \)/m): Limit value specified with FCC Rule, Mgn(dB): FCC Limit (dB \(\mu \)/m) Meas Result(dB \(\mu \)/m)
- · Peak detection was used.

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5.2 AC Power Conducted emissions

5.2.1 Standard Applicable [FCC §15.207(a)]

For 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 frequencies hopping mode within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line Impedance stabilization network(LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

§15.207 limits for AC line conducted emissions;

Fraguency of Emission(NL)	Conducted Limit (dBμV)				
Frequency of Emission(₩z)	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

5.2.2 Test Environment conditions

- Ambient temperature :
- · Relative Humidity:

5.2.3 Measurement Procedure

EUT was placed on a non- metallic table height of 0.8 m above the reference ground plane. Cables connected to EUT were fixed to cause maximum emission. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the Maximum signal strength.

5.2.4 Used equipment

Equipment	Model No.	Serial No.	Manufacturer	Next cal date	Cal interval	Used
Test receiver	ESCS30	100111	Rohde & Schwarz	2017. 02. 02	1 year	
LISN	ESH2-Z5	100044	R&S	2017. 02. 02	1 year	
LISIN	ESH3-Z5	100147	R&S	2017. 02. 02	1 year	

^{*}Test Program: "ESXS-K1 V2.2" Measurement uncertainty

Conducted Emission measurement: 3.5 dB (CL: Approx 95%, k=2)

5.2.5 Measurement Result

- N/A

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5.3 20 dB bandwidth measurement

5.3.1 Standard applicable [FCC §15.215(c), § 2.1049]

According to 15.215(c), Ensure that the 20 dB occupied bandwidth shall be fall in the specified operating frequency range.

5.3.2 Test Environment conditions

5.3.3 Measurement Procedure

- 1. The 20 dB bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.
- 2. Measure the maximum width of the emission that is 20 dB down from the peak of the emission. The 99 % occupied bandwidth is the frequency bandwidth of the signal power at the 99 % channel power of occupied bandwidth.

The spectrum analyzer is set to the as follows:

- RBW: 100 kHz (1% to 5% of the occupied bandwidth)
- VBW : >3 x RBW - Detector function : peak

- Trace : max hold

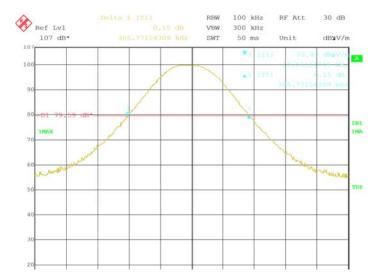
5.3.4 Test setup

Refer 5.1.4

5.3.5 Measurement Result

Frequency (MHz)	20 dB bandwidth (kHz)		
10511	385		
10311	300		

5.3.6 Test plot



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5.4 Antenna requirement

5.4.1 Standard applicable [FCC §15.203]

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by responsible party shall be used with the device.

The use of a permanently attached antenna or of an antenna that user a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The manufacturer may design the unit So that broken antenna can be replaced by the user, but the Use of a standard antenna jack or electrical connector is prohibited.

The antenna is built-in PCB of EUT without any antenna connector. So this product is complies with the requirement of §15.203.

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