Advanced Compliance Laboratory

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ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

of

AMBIENT CYRO TEMPERATURE SENSOR
MODEL: ITD-736TH, ITD-736TO, ITD-736LT
FCC ID: ST2-ITD736 IC:6012A-ITD736

March 14, 2017

This report concerns (check one): Original grant __x__ Class II change _____
Equipment type: Low Power Intentional Radiator

Deferred grant requested per 47 CF 0.457(d)(1)(ii)? yes _____ no __x__
If yes, defer until: _____ (date)
Company agrees to notify the Commission by _____ (date)
of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? yes _____ no __x__
If no, assumed Part 15, Subpart B for unintentional radiators - the new 47 CFR [10-1-90 Edition] provision.

Report prepared for: CENTRAK, INC.
Report prepared by: Advanced Compliance Lab
Report number: 0048-170307-01-FCC-IC

NVLAP®

Lab Code: 200101 **The test result in this report IS supported and covered by the NVLAP accreditation**

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1. GENERAL INFORMATION

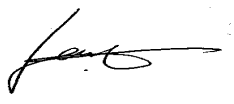
1.1 Verification of Compliance

EUT:	AMBIENT CYRO TEMPERATURE SENSOR
Model:	ITD-736TH, ITD-736TO, ITD-736LT
Applicant:	CENTRAK, INC.
Test Type:	FCC Part 15C Sec. 15.249 CERTIFICATION IC RSS-210 (Issue 8) A2.9 & RSS-Gen (Issue 4) CERTIFICATION
Result:	PASS
Tested by:	ADVANCED COMPLIANCE LABORATORY
Test Date:	March 07, 2017 ~ March 14, 2017
Report Number:	0048-170307-01-FCC-IC

The above equipment was tested by Compliance Laboratory, Advanced Technologies, Inc. for compliance with the requirement set forth in the FCC/IC rules and regulations Part 15 subpart C. This said equipment in the configuration described in the report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

The estimated uncertainty of the test result is given as following. The method of uncertainty calculation is provided in Advanced Compliance Lab. Doc. No. 0048-01-01.

	Prob. Dist.	Uncertainty(dB)	Uncertainty(dB)	Uncertainty(dB)
		30-1000MHz	1-6.5GHz	Conducted
Combined Std. Uncertainty u_c	norm.	±2.36	±2.99	±1.83



Wei Li
Lab Manager
Advanced Compliance Lab

Date March 14, 2017

1.2 Equipment Modifications

N/A

1.3 Product Information

System Configuration

ITEM	DESCRIPTION	ID	CABLE
Product	AMBIENT CYRO TEMPERATURE SENSOR (1)	FCC ID: ST2-ITD736, IC: 6012A-ITD736	
Housing	PLASTICS		
Power Supply	3.6V DC Lithium Battery		
Operation Freq.	904MHz ~ 926MHz , 2402MHz ~ 2480MHz		
Receiver	ITD-736(RX)	Verification	

(1) EUT submitted for grant.

1.4 Test Methodology

Radiated tests were performed according to the procedures in ANSI C63.4-2014 & & ANSI C63.10-2013 at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The open area test site and conducted measurement facility used to collect the radiated and conducted data are located at Hillsborough, New Jersey, which is designated by IC as " site IC 3130A" This site has been accepted by FCC to perform measurements under Part 15 or 18 in a letter dated May 19, 1997 (Refer to: 31040/PRV 1300F2). The NVLAP Lab code for accreditation of FCC EMC Test Method is: 200101-0.

1.6 Test Equipment

Manufacture	Model	Serial No.	Description	Cal Due dd/mm/yy
Hewlett-Packard	HP8546A	3448A00290	EMI Receiver	25/09/17
Agilent	E4440A	US40420700	3Hz-26.5GHz Spectrum Analyzer	17/06/17
R &S	ESPI	100018	9KHz-7GHz EMI Receiver	8/25/17
EMCO	3104C	9307-4396	20-300MHz Biconical Antenna	12/11/17
EMCO	3146	9008-2860	200-1000MHz Log-Periodic Antenna	13/11/17

ARA	MWH-1826/B	1013	18-26GHZ Horn Antena	10/2/18
EMCO	3115	49225	Double Ridge Guide Horn Antenna	28/11/17
Electro-Meterics	ALR-25M/30	289	10KHz-30MHz Active Loop Antenna	28/05/17
ARA	MWH-1826/B	1013	18-26GHZ Horn Antena	10/2/17
COM-POWER	L1215A	191994	Line Impedance Stabilization Networks	24/03/18
Fischer Custom	LISN-2	900-4-0009	Line Impedance Stabilization Networks	18/03/17

All Test Equipment Used are Calibrated Traceable to NIST Standards. Calibration Interval: 2 Years

1.7 Statement for the Document Use

This report shall not be reproduced except in full, without the written approval of the laboratory. And this report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

2. PRODUCT LABELING

Centrak TEMPERATURE SENSOR
Model No.: ITD-736TO

FCC ID: ST2-ITD736 IC: 6012A-ITD736

This device complies with part 15 of the FCC & IC RSS-210 & RSS-Gen Rules. Operating is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Figure 2.1 ID Label

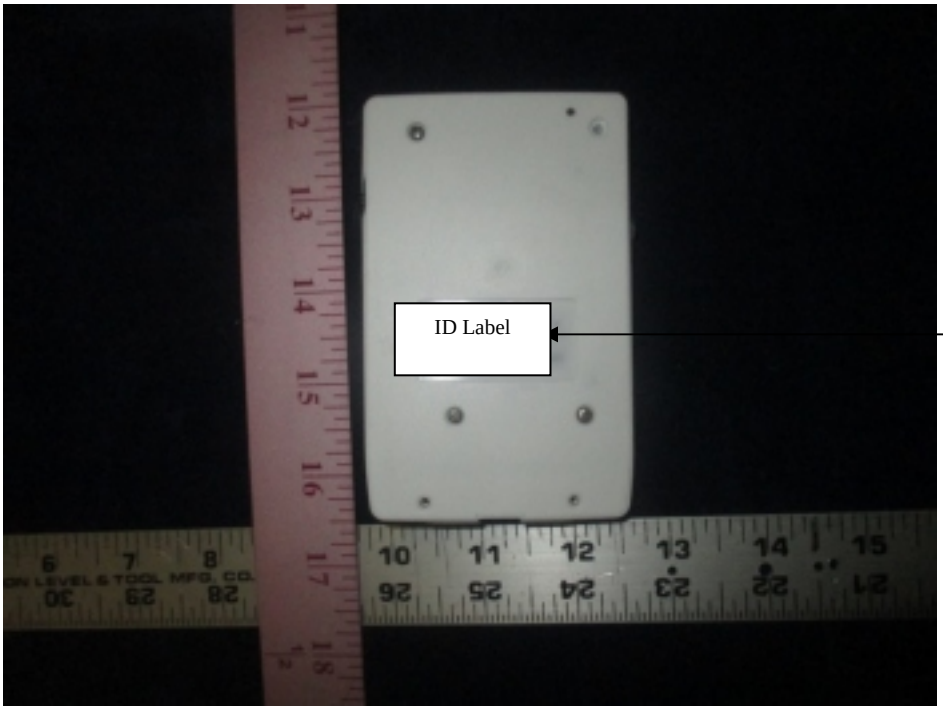


Figure 2.2 Location of Label on EUT

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). And the antennas were permanently attached/mounted to the EUT PCB:

PCB trace antenna with +1dB gain for 900MHz Band
Surface mount antennas:. Johnson Technology, Inc., P/N 2450AT42A100, 2.4GHz Band, 0 dBi, typ. (XZ-Vertical Polarization)

Testing was performed as EUT was continuously operated at the following frequency channels:

Low=904MHz, Middle= 915MHz, High=926MHz
Low=2402MHz, Middle= 2440MHz, High=2480MHz

The power consumption for this EUT is very low. Therefore a fresh external battery pack with large capacity was used for extended operating time. The battery voltage level was verified after testing to ensure that required power level was provided during the test.

USB ports are for Probe Connection only. Not USB protocol port. No Data transfer

3.2 Special Accessories

N/A

3.3 Configuration of Tested System

Figure 3.1 to Figure 3.3 illustrate this system, which is tested standing along.

Figure 3.1 Radiated Test Setup
position 1 (Button Up)

Figure 3.2 Radiated Test Setup
position 2 (Button Down)

Figure 3.3 Radiated Configuration Test Setup

4. SYSTEM SCHEMATICS

See Attachment.

Figure 4.1 System Schematics

5. RADIATED EMISSION DATA

5.1 Field Strength Calculation

The corrected field strength is automatically calculated by EMI Receiver using following:

$$FS = RA + AF + CF + AG$$

where FS: Corrected Field Strength in dBμV/m
RA: Amplitude of EMI Receiver before correction in dBμV
AF: Antenna Factor in dB/m
CF: Cable Attenuation Factor in dB
AG: Built-in Preamplifier Gain in dB (Stored in receiver as part of the calibration data)

THE "DUTY CYCLE CORRECTION FACTOR" FOR SPURIOUS RADIATED EMISSIONS IS;
Max. 20 log * (4 ms / 100 ms) = -28 dB, WHICH WAS USED TO CORRECT THE AVERAGE RADIATED EMISSION READINGS.

5.2 Test Methods and Conditions

The initial step in collecting radiated data is a EMI Receiver scan of the measurement range below 30MHz using peak detector and 9KHz IF bandwidth / 30KHz video bandwidth. For the range 30MHz - 1GHz, 100KHz IF bandwidth / 100KHz video bandwidth are used. Both bandwidths are 1MHz for above 1GHz measurement. Up to 10^{th} harmonics were investigated.

5.3 Test Data

The following data lists the significant emission frequencies, polarity and position, peak reading of the EMI Receiver, the FCC limit, and the difference between the peak reading and the limit. Explanation of the correction and calculation are given in section 5.1.

Test Personnel: 

Typed/Printed Name: Edward Lee Date: March 14, 2017

Radiated Test Data for 900 Band (CH-904MHz/915MHz/926MHz & Harmonics)

Frequency (MHz)	Polarity (V,H) Position (Zup,Zdown)	Antenna Height (m)	Azimuth (Degree)	Peak Reading at 3m (2) (dBuV/m)	Reading After Correction (dBuV/m)	FCC/IC 3m Limit (1) (dBuV/m)	Difference (dBuV/m)
904	V/Z-up	1.1	235	90.6		94	-3.6
1808	V/Z-up	1.1	180	60.5	32.5	54	-21.5
2712	V/Z-up	1.1	270	53.4	25.4	54	-28.6
904	H/Z-up	1.0	180	82.7		94	-11.3
1808	H/Z-up	1.1	180	62.1	34.1	54	-19.9
2712	H/Z-up	1.1	235	55.5	27.5	54	-26.5
915	V/Z-up	1.1	235	91.2		94	-2.8
1830	V/Z-up	1.1	180	61.1	33.1	54	-20.9
2745	V/Z-up	1.1	270	52.5	24.5	54	-29.5
915	H/Z-up	1.0	330	82.8		94	-11.2
1830	H/Z-up	1.1	180	63.7	35.7	54	-18.3
2745	H/Z-up	1.1	235	54.9	26.9	54	-27.1
926	V/Z-up	1.1	235	91.6		94	-2.4
1852	V/Z-up	1.1	180	61.8	33.8	54	-20.2
2778	V/Z-up	1.1	270	53.0	25.0	54	-29.0
926	H/Z-up	1.0	330	83.6		94	-10.4
1852	H/Z-up	1.0	180	63.8	35.8	54	-18.2
2778	H/Z-up	1.1	235	55.3	27.3	54	-26.7
904	V/Z-down	1.1	110	92.0		94	-2.0
1808	V/Z-down	1.1	270	66.9	38.9	54	-15.1
2712	V/Z-down	1.1	090	59.8	31.8	54	-22.2
904	H/Z-down	1.0	330	85.0		94	-9.0
1808	H/Z-down	1.1	000	64.2	36.2	54	-17.8
2712	H/Z-down	1.1	000	57.3	29.3	54	-24.7
915	V/Z-down	1.1	110	92.5		94	-1.5
1830	V/Z-down	1.1	270	67.5	39.5	54	-14.5
2745	V/Z-down	1.1	090	59.1	31.1	54	-22.9
915	H/Z-down	1.0	330	84.7		94	-9.3
1830	H/Z-down	1.1	000	65.0	37.0	54	-17.0
2745	H/Z-down	1.1	000	56.7	28.7	54	-25.3

926	V/Z-down	1.1	110	92.6		94	-1.4
1852	V/Z-down	1.1	270	68.2	40.2	54	-13.8
2778	V/Z-down	1.1	090	59.4	31.4	54	-22.6
926	H/Z-down	1.0	330	84.1		94	-9.9
1852	H/Z-down	1.1	000	65.9	37.9	54	-16.1
2778	H/Z-down	1.1	000	57.1	29.1	54	-24.9

(1) The limit for emissions within the 902-928MHz band is 50mV(94dB) per Sec. 15.249 & RSS-210. The limit for its harmonics is 500uV (54dB). Other spurious emissions shall be lower than either its fundamental by 50dB or the limit defined in Sec. 15.209 & RSS-210, whichever is higher.
(2) If each peak reading is less than the FCC average limit, it'll be not necessary to show the measured/ calculated average reading.

Radiated Test Data for 2.4GHz Band (CH-2402MHz/2440MHz/2480MHz & Harmonics)

Frequency (MHz)	Polarity (V,H) Position (X,Y,Z)	Antenna Height (m)	Azimuth (Degree)	Peak Reading at 3m (2) (dBuV/m)	Reading After Correction (dBuV/m)	FCC/IC 3m Limit (1) (dBuV/m)	Difference (dBuV/m)
2402	V/Z-up	1.1	180	92.3	64.3	94	-29.7
4804	V/Z-up	1.1	270	62.3	34.3	54	-19.7
7206	V/Z-up	1.1	135	59.5	31.5	54	-22.5
2402	H/Z-up	1.1	200	95.3	67.3	94	-26.7
4804	HZ-/up	1.1	090	60.3	32.3	54	-21.7
7206	HZ-/up	1.1	235	65.3	37.3	54	-16.7
2440	V/Z-up	1.1	180	92.8	64.8	94	-29.2
4880	V/Z-up	1.1	270	60.3	32.3	54	-21.7
7320	V/Z-up	1.1	135	57.5	29.5	54	-24.5
2440	H/Z-up	1.1	200	95.4	67.4	94	-26.6
4880	HZ-/up	1.1	000	58.7	30.7	54	-23.3
7320	HZ-/up	1.1	235	63.8	35.8	54	-18.2
2480	V/Z-up	1.1	180	92.7	64.7	94	-29.3
4960	V/Z-up	1.1	270	58.2	30.2	54	-23.8
7440	V/Z-up	1.1	135	54.8	26.8	54	-27.2
2480	H/Z-up	1.1	200	95.4	67.4	94	-26.6
4960	HZ-/up	1.1	045	58.1	30.1	54	-23.9
7440	HZ-/up	1.1	235	61.3	33.3	54	-20.7
2402	V/Z-down	1.1	090	94.1	66.1	94	-27.9
4804	V/Z-down	1.1	270	61.7	33.7	54	-20.3
7206	V/Z-down	1.1	270	57.3	29.3	54	-24.7
2402	H/Z-down	1.1	000	94.6	66.6	94	-27.4
4804	H/Z-down	1.1	330	58.7	30.7	54	-23.3
7206	H/Z-down	1.1	160	61.3	33.3	54	-20.7
2440	V/Z-down	1.1	090	96.3	68.3	94	-25.7
4880	V/Z-down	1.1	270	60.2	32.2	54	-21.8
7320	V/Z-down	1.1	270	56.4	28.4	54	-25.6
2440	H/Z-down	1.1	000	95.5	67.5	94	-26.5
4880	H/Z-down	1.1	330	58.5	30.5	54	-23.5
7320	H/Z-down	1.1	160	57.3	29.3	54	-24.7

2480	V/Z-down	1.1	090	97.4	69.4	94	-24.6
4960	V/Z-down	1.1	270	57.5	29.5	54	-24.5
7440	V/Z-down	1.1	270	52.9	24.9	54	-29.1
2480	H/Z-down	1.1	000	95.1	67.1	94	-26.9
4960	H/Z-down	1.1	000	58.0	30	54	-24
7440	H/Z-down	1.1	160	54.2	26.2	54	-27.8

The limit for emissions within the 2400-2483.5MHz band is 50mV(94dB) per Sec. 15.249 & RSS-210. The limit for its harmonics is 500uV (54dB). Other spurious emissions shall be lower than either its fundamental by 50dB or the limit defined in Sec. 15.209 & RSS-210, whichever is higher.

(2) If each peak reading is less than the FCC average limit, it'll be not necessary to show the measured/ calculated average reading.

Other Spurious outside of the band 902-928MHz

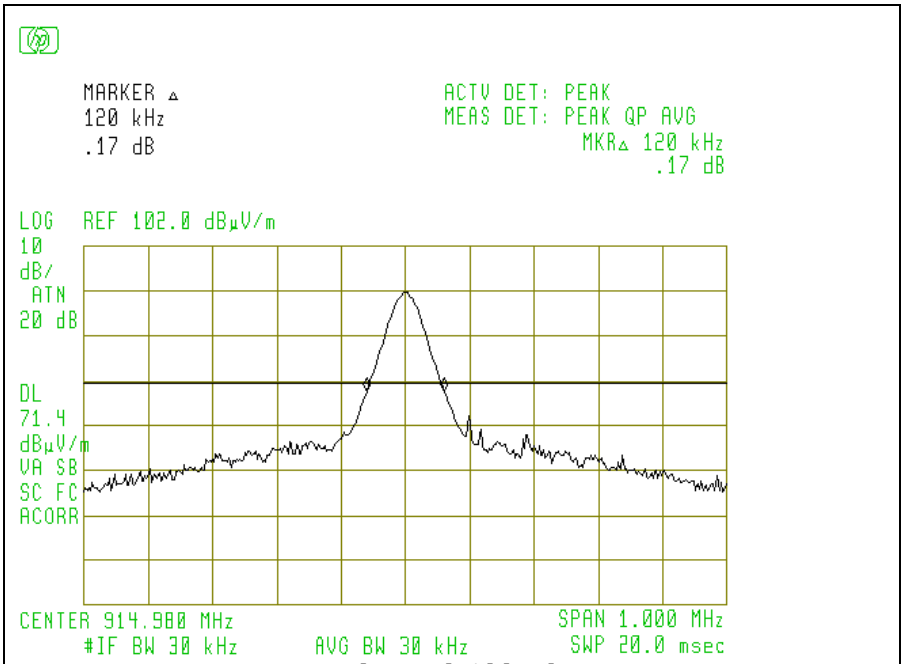
Frequency (MHz)	Polarity (V,H) Position (Z-down)	Antenna Height (m)	Azimuth (Degree)	Peak Reading at 3m (dBuV/m)	FCC/IC 3m Limit (dBuV/m)	Difference (dBuV/m)
700.5	V	1.1	235	31.8	46.5	-14.7
847.6	V	1.1	235	31.0	46.5	-15.5
855.9	V	1.1	090	32.7	46.5	-13.8
973.3	V	1.0	045	32.4	46.5	-14.1
727.8	H	1.0	180	30.3	46.5	-16.2
734.0	H	1.0	235	30.5	46.5	-16.0
866.9	H	1.0	235	32.0	46.5	-14.5
930.0	H	1.0	000	32.2	46.5	-14.3

Other Spurious outside of the band 2400-2483.5MHz

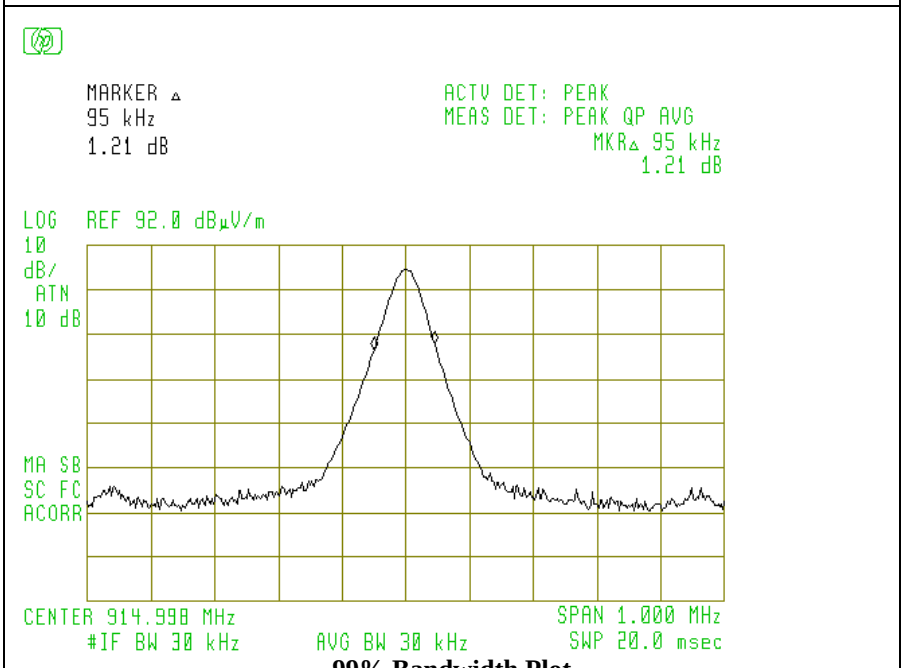
Frequency (MHz)	Polarity (V,H) Position (Z-down)	Antenna Height (m)	Azimuth (Degree)	Reading After Correction (dBuV/m)	FCC/IC 3m Limit (dBuV/m)	Difference (dBuV/m)
2387.2	V	1.1	000	33.5	54.0	-20.5
2392.1	V	1.1	000	35.2	54.0	-18.8
2397.0	V	1.1	100	39.1	54.0	-14.9
2392.0	H	1.0	220	35.8	54.0	-18.2
2485.3	H	1.0	100	39.4	54.0	-14.6
2489.6	H	1.0	100	35.6	54.0	-18.4

Comparing to the limit defined in Sec. 15.209 & RSS-Gen, emissions below the limit by 20dB were not recorded.

20 dB Bandwidth : 900MHz Band

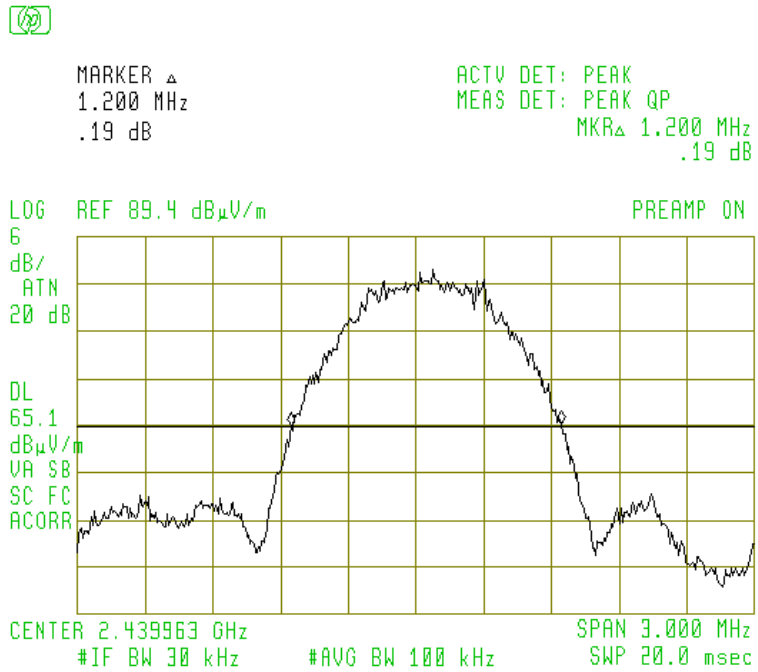


20dB Bandwidth Plot

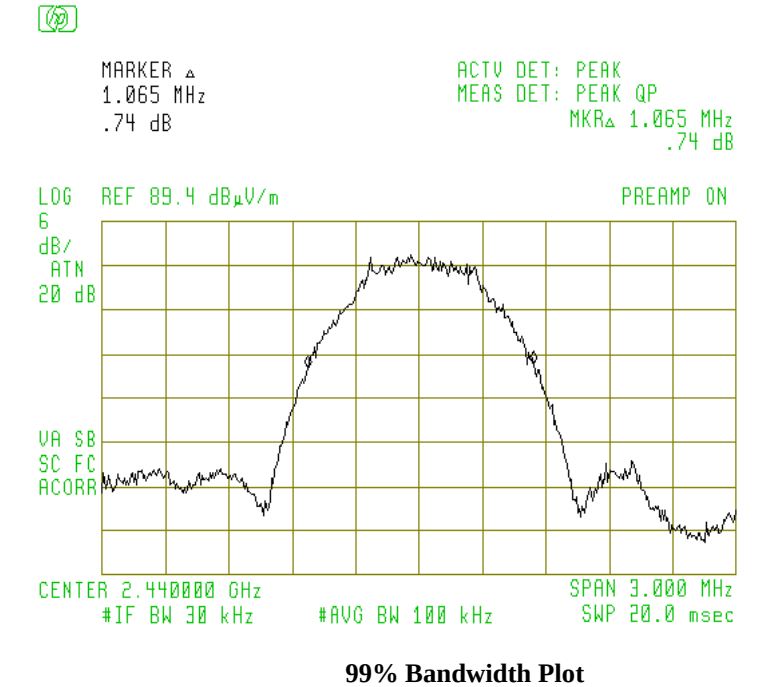


99% Bandwidth Plot

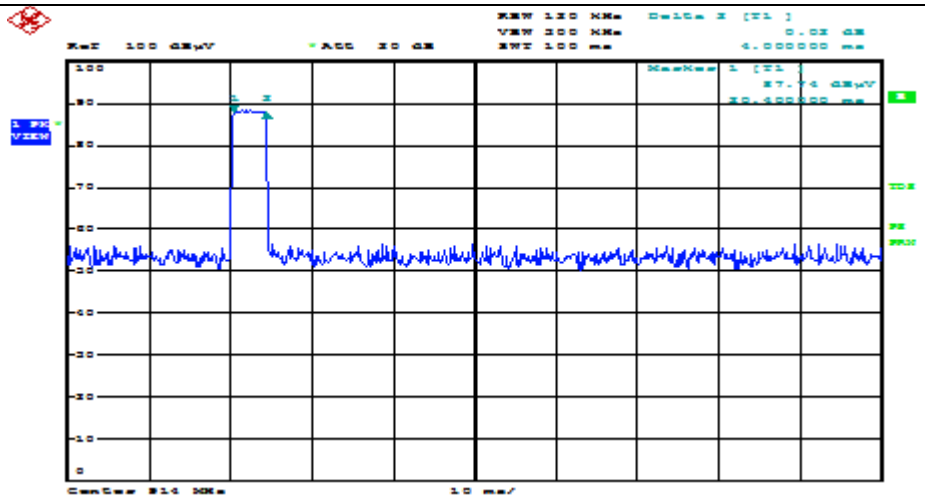
20 dB Bandwidth &99% Bandwidth : 2400MHz Band



20dB Bandwidth Plot

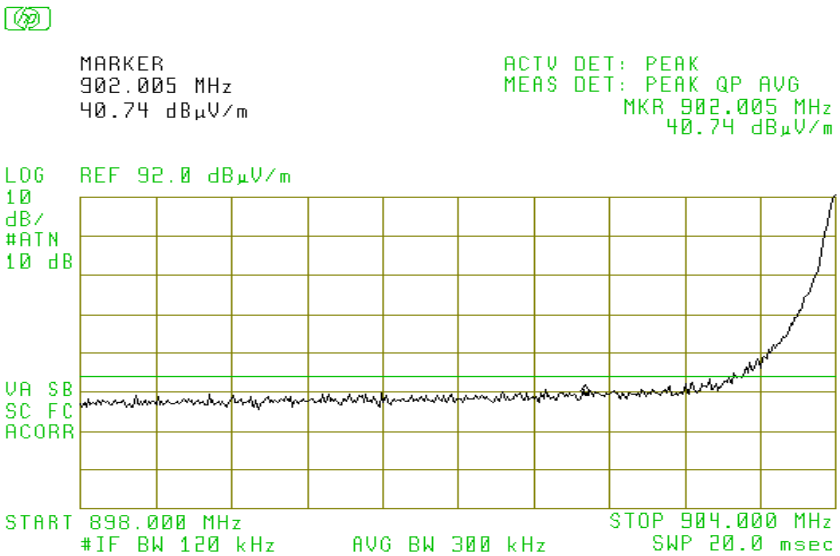


99% Bandwidth Plot

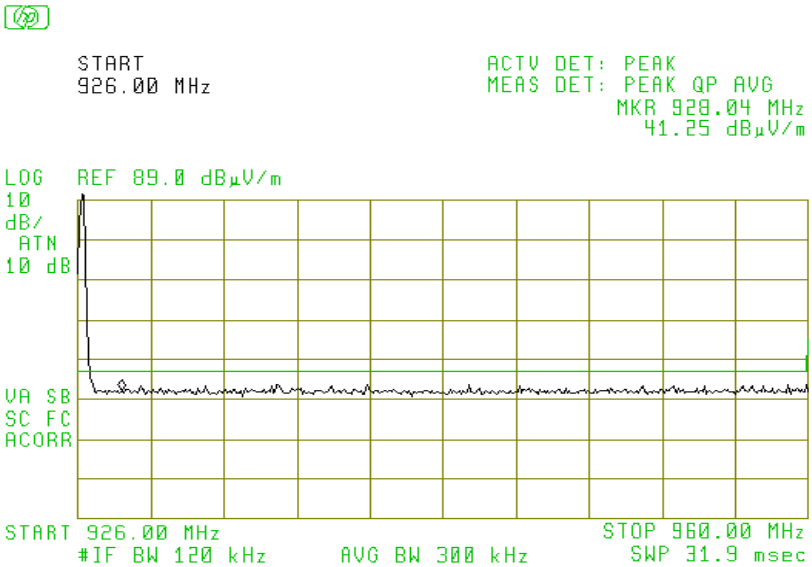


Duty Cycle Plot

900MHz Band-edge Spurious

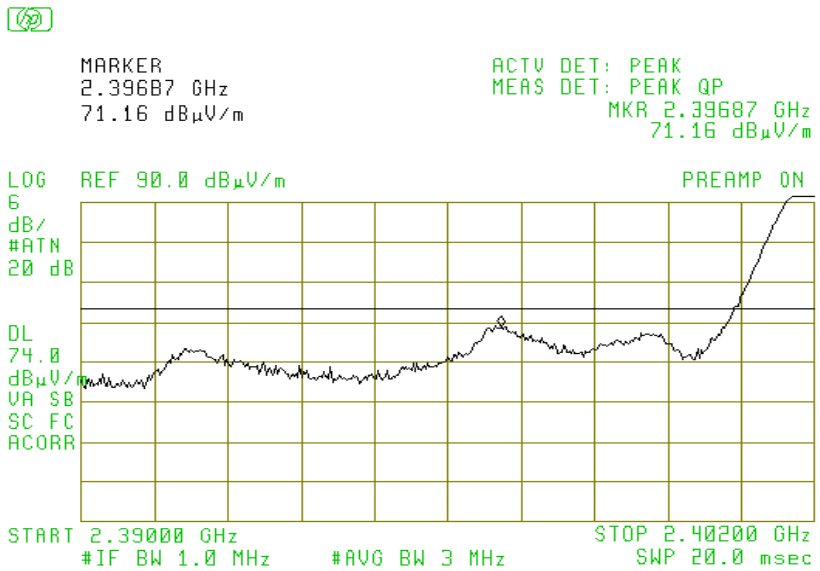


* Max. Peak Reading is 40.74dBuV/m @902MHz with correction factors. It is under FCC /IC limit.

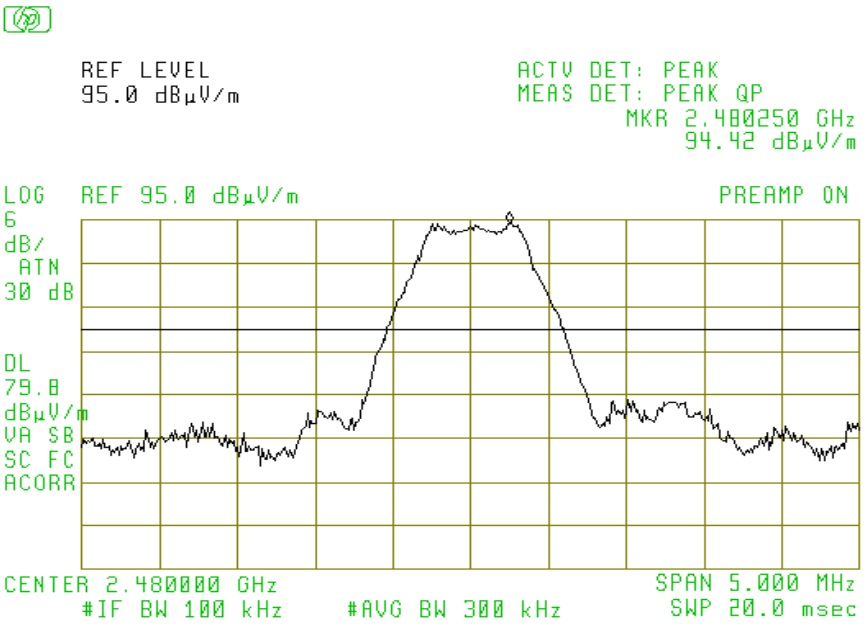


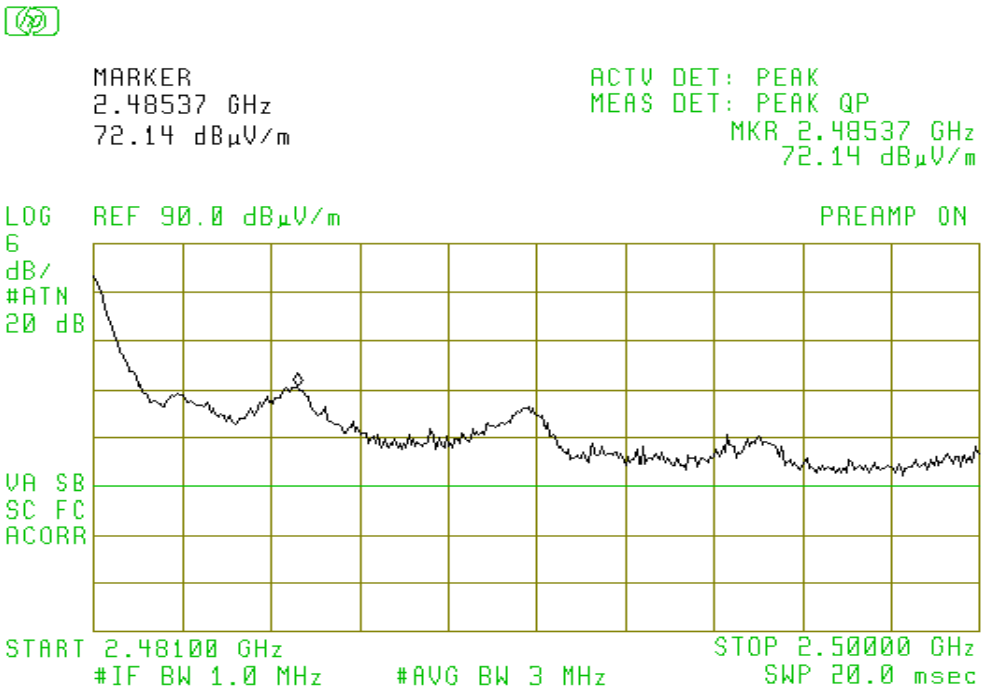
* * Max. Peak Reading is 41.2dBuV/m @908MHz with correction factors. It is under FCC /IC limit.

2400MHz Band-edge Spurious



* Max. Peak Reading is 71.06dBuV/m, Average Reading 43.0dBuV/m @2.3969Hz with correction factors. Both are under FCC /IC limit.





* Max. Peak Reading is 72.14dBuV/m, Average Reading 44.0dBuV/m @2.4854GHz with correction factors. Both are under FCC /IC limit.

6. EUT RECEIVING MODE VERIFICATION

Radiated Test Data for Receiving Mode (worst case: Z-down position)

Frequency (MHz)	Polarity (H or V)	Antenna Height (m)	Azimuth (Degree)	Peak Reading at 3m(2) (dBuV/m)	FCC 3m Limit(1) (dBuV/m)	Difference (dBuV/m)
45.3	H	1.8	270	30.8	40.0	-9.2
100.1	H	1.8	335	31.0	43.5	-12.5
115.4	H	1.4	235	32.2	43.5	-11.3
186.8	H	1.1	235	35.1	43.5	-8.4
490	H	1.1	135	31.4	46.5	-15.1
680	H	1.0	270	34.6	46.5	-11.9
700	H	1.0	000	37.0	46.5	-9.5
880	H	1.0	090	37.9	46.5	-8.6
37.7	V	1.1	180	32.8	40.0	-7.2
115.9	V	1.1	180	32.5	43.5	-11.0
171.1	V	1.1	000	34.3	43.5	-9.2
294	V	1.1	090	31.3	46.5	-15.2
690	V	1.1	180	35.7	46.5	-10.8
876	V	1.1	235	37.3	46.5	-9.2
896	V	1.1	090	37.8	46.5	-8.7

(1) Receiving mode spurious emissions shall be lower than the limit defined in Sec. 15.209 & RSS-Gen

(2) If each peak reading is less than the FCC average limit, it'll be not necessary to show the measured/ calculated average reading.