

Test Report

FCC Part15.249

Product Name : MAG2/GR Sensor
Model No. : VSN240-F-2, VSN240-T-2,
VSN240-F-GR, VSN240-T-GR
FCC ID : TDB-MAG2

Applicant : Sensys Networks, Inc.

Address : 1608 Fourth Street, Suite 200 Berkeley, CA 94710, U.S.A

Date of Receipt : Jul. 09, 2014
Test Date : Jul. 09, 2014~Aug. 05, 2014
Issued Date : Aug. 12, 2014
Report No. : 1470253R-RF-US-P06V01
Report Version : V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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Test Report Certification

Issued Date : Aug. 12, 2014

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Product Name : MAG2/GR Sensor
 Applicant : Sensys Networks, Inc.
 Address : 1608 Fourth Street, Suite 200 Berkeley, CA 94710, U.S.A
 Manufacturer : Sensys Networks, Inc.
 Address : 1608 Fourth Street, Suite 200 Berkeley, CA 94710, U.S.A
 Model No. : VSN240-F-2, VSN240-T-2, VSN240-F-GR, VSN240-T-GR
 FCC ID : TDB-MAG2
 Brand Name : SENSYS
 EUT Voltage : DC: 3.6V
 Applicable Standard : FCC CFR Title 47 Part 15 Subpart C: 2012
 ANSI C63.4: 2009, ANSI C63.10:2009
 Test Result : Complied
 Performed Location : Suzhou EMC Laboratory
 No.99 Hongye Rd., Suzhou Industrial Park Loufeng Hi-Tech
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 TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098
 FCC Registration Number: 800392

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 Approved By : Jeff Chen

Laboratory Information

We, **Quietek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	:	BSMI, NCC, TAF
Germany	:	TUV Rheinland
Norway	:	Nemko, DNV
USA	:	FCC
Japan	:	VCCI
China	:	CNAS

The related certificate for our laboratories about the test site and management system can be downloaded from Quietek Corporation's Web Site :<http://www.quietek.com/tw/ctg/cts/accreditations.htm>

The address and introduction of Quietek Corporation's laboratories can be founded in our Web site :
<http://www.quietek.com/>

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1470253R-RF-US-P06V01	V1.0	Initial Issued Report	Aug. 12, 2014

1. General Information

1.1. EUT Description

Product Name	MAG2/GR Sensor
Model No.	VSN240-F-2, VSN240-T-2, VSN240-F-GR, VSN240-T-GR
Working Voltage	DC: 3.6V
Frequency Range	2405~2480 MHz
Channel Number	16
Type of Modulation	QPSK
Date Rate	250kbps
Channel Control	Auto
Antenna Type	microstrip patch antenna
Antenna Gain	3dBi

The differences among the models are as below:

model	Installation
VSN240-F-2	Flush-mount wireless sensor for in-pavement installation
VSN240-T-2	Flush-mount wireless sensor for in-pavement installation
VSN240-F-GR	For up to 7" depth in-pavement installation
VSN240-T-GR	For up to 7" depth in-pavement installation

The RF specifications of four models are identical. And there is no other difference between these models, layout, schematic, and Bom list are identical.

We use model VSN240-F-GR to perform all the test items.

Channel List

Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2405	4	2425	8	2445	12	2465
1	2410	5	2430	9	2450	13	2470
2	2415	6	2435	10	2455	14	2475
3	2420	7	2440	11	2460	15	2480

1.2. Mode of Operation

QuieTek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmit

Note:

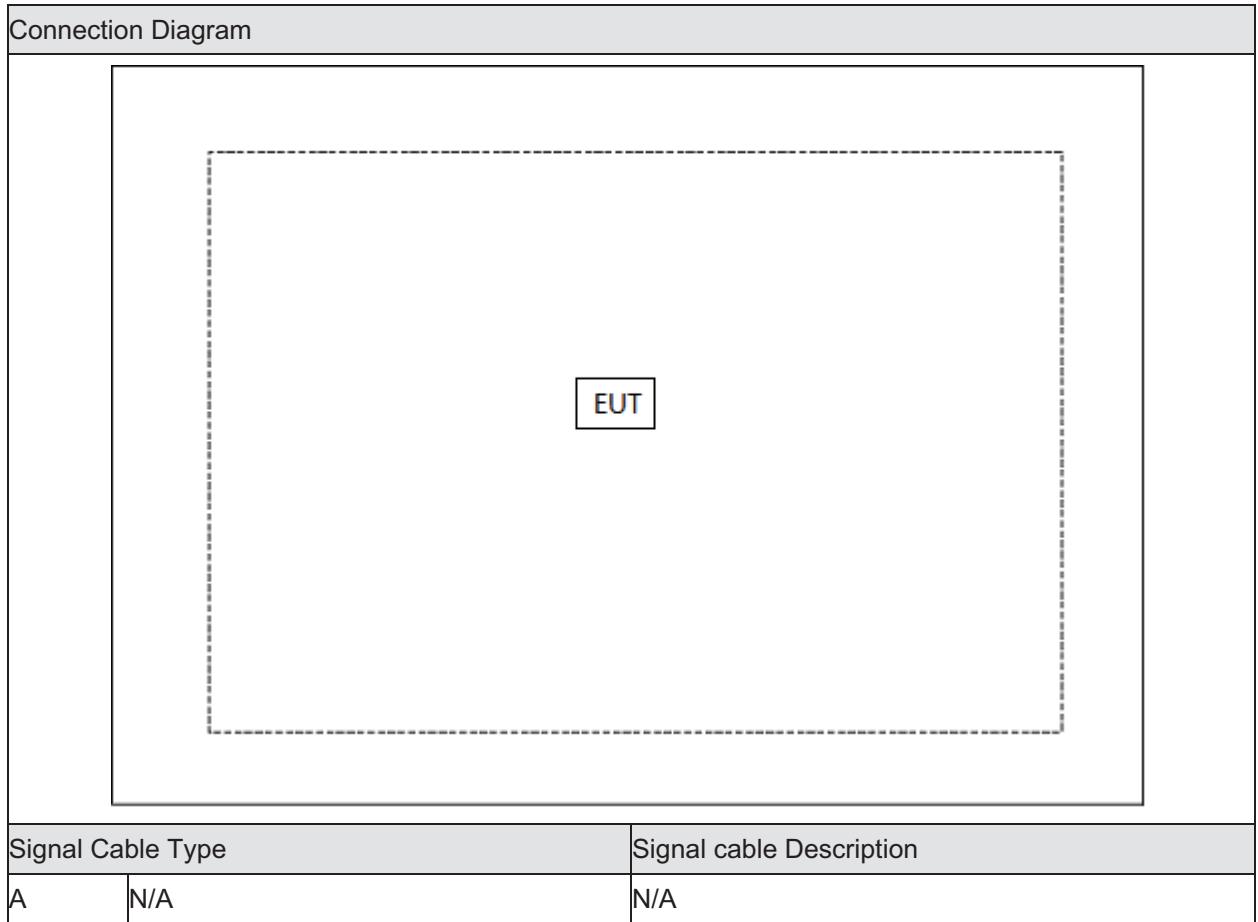
1. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.

1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	N/A	N/A	N/A	N/A	N/A

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment.
3	Select the channel and start to test.

2. Technical Test

2.1. Summary of Test Result

No deviations from the test standards

Deviations from the test standards as below description:

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.207 RSS-Gen Issue 3 December 2010 Section 7.2.2	N/A	No
20dB Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.215(c)	Yes	No
Radiated Emission	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.209 and 15.249 RSS-210 Issue 8 December 2010 Section 2.7 Table 2 and Table 3	Yes	No
Band-edge Compliance of RF Conducted Emissions	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.215(c)	Yes	No

2.2. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

3. Conducted Emission

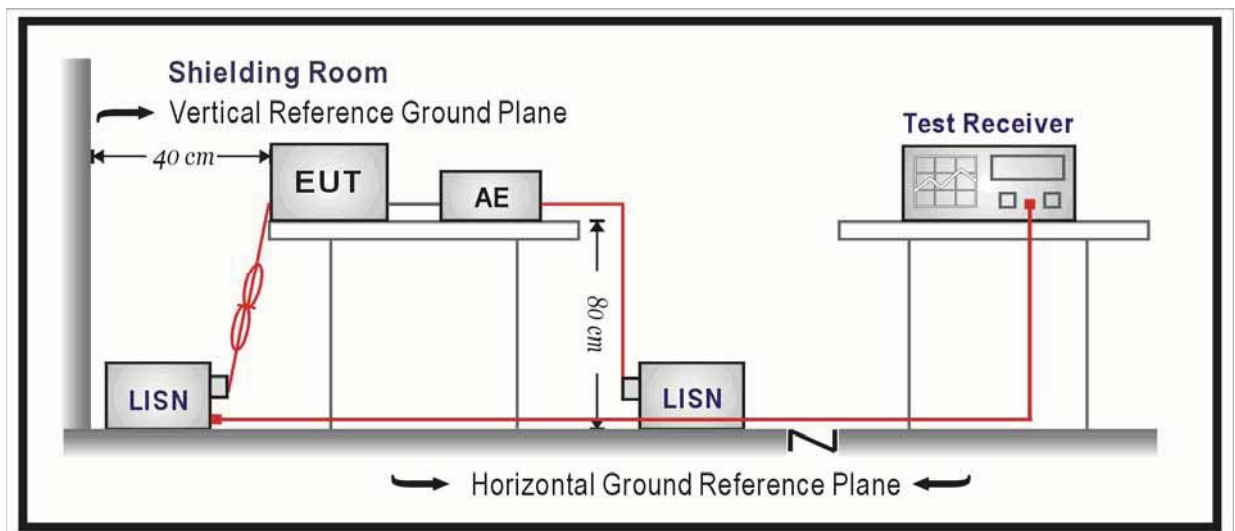
3.1. Test Equipment

Conducted Emission / TR-1

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
EMI Test Receiver	R&S	ESCI	100726	2015.03.28
Two-Line V-Network	R&S	ENV216	101043	2015.03.28
Two-Line V-Network	R&S	ENV216	101044	2014.09.16
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2015.03.01
50ohm Termination	SHX	TF2	07081401	2014.09.16
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2015.01.08

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup



3.3. Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.4. Test Procedure

The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)

Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

3.6. Test Result

Not applicable.

4. 20dB Bandwidth

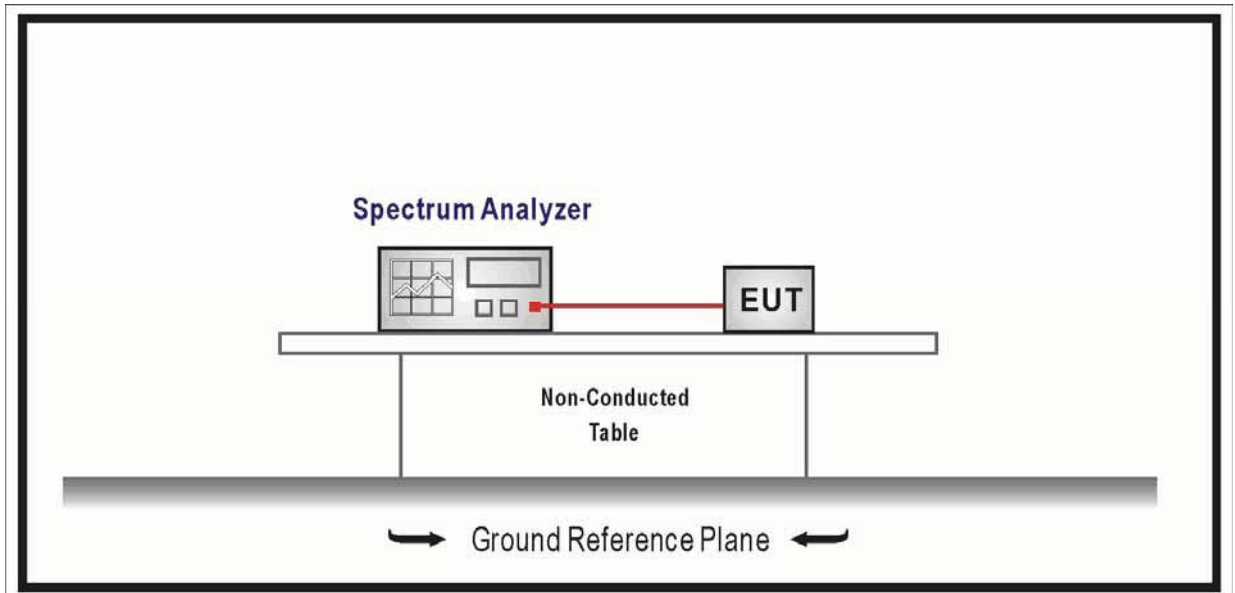
4.1. Test Equipment

20dB Bandwidth / TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.21
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2015.05.08

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

4.2. Test Setup



4.3. Limit

- For frequency hopping systems operating in 2400-2483.5 MHz band, no limitation.
- For frequency hopping systems operating in 902-928 MHz band, the maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
- For frequency hopping systems operating in 5725-5850 MHz band, the maximum 20 dB bandwidth of the hopping channel is 1 MHz.

4.4. Test Procedure

According to ANSI C63.10: 2009.

Use the following spectrum analyzer settings:

Span = shall be between two times and five times the OBW

RBW \cong 1% of the 20dB bandwidth

VBW \cong RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize.

Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

4.5. Uncertainty

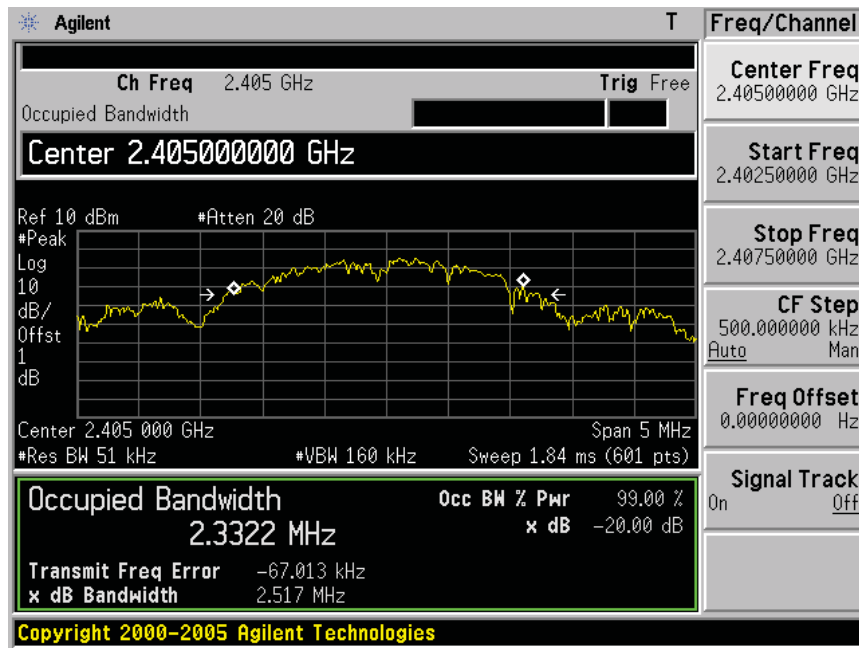
The measurement uncertainty is defined as ± 1 kHz

4.6. Test Result

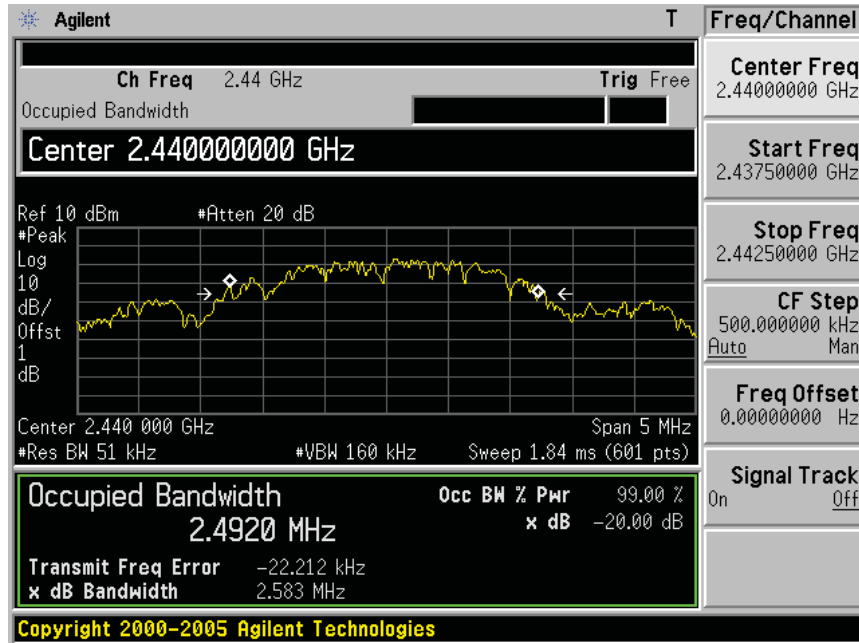
Product	:	MAG2/GR Sensor
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)
00	2405	2517
07	2440	2583
15	2480	2606

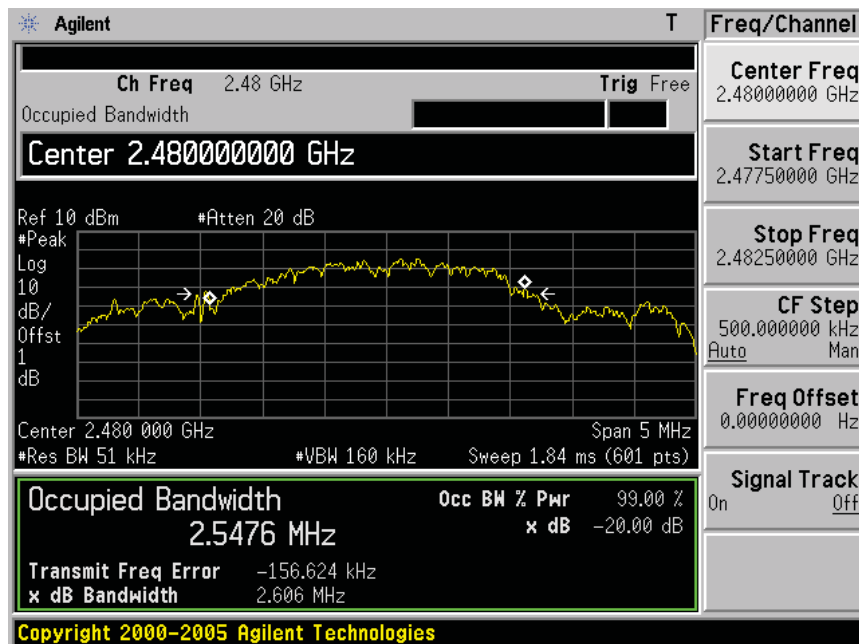
Channel 00 (2405MHz)



Channel 07 (2440MHz)



Channel 15 (2480MHz)



5. Radiated Emission

5.1. Test Equipment

Radiated Emission / AC-2

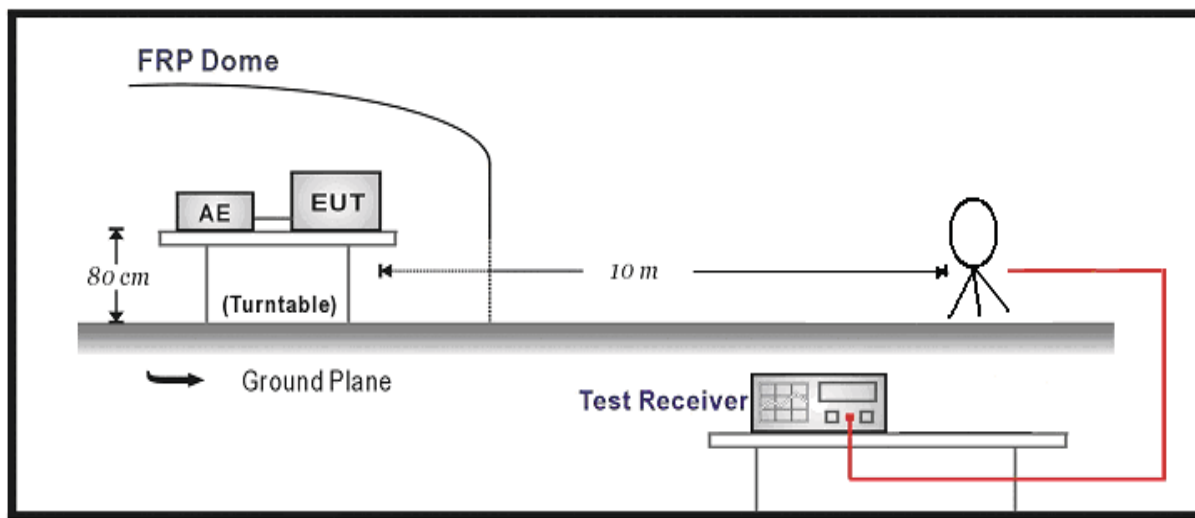
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
EMI Test Receiver	R&S	ESCI	100573	2015.03.28
Loop Antenna	R&S	HFH2-Z2	833799/003	2014.11.16
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2014.10.15
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2015.03.01
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2015.04.09

Radiated Emission / AC-5

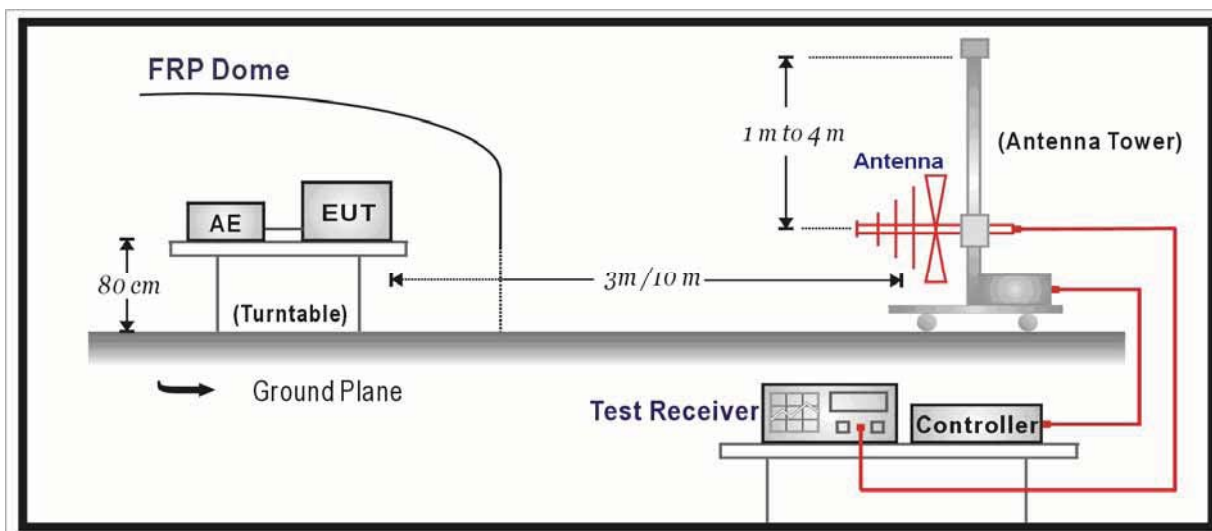
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2015.03.28
Preamplifier	QuieTek	AP-025C	CHM-0602008	2015.05.03
Preamplifier	Miteq	NSP1800-25	1364185	2015.05.03
Preamplifier	QuieTek	AP-040G	CHM-0906001	2015.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2014.10.15
DRG Horn	ETS-Lindgren	3117	00123988	2015.01.07
Horn Antenna	Schwarzbeck	BBHA9170	294	2015.04.10
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2015.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2015.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2015.03.01
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC5-TH	2015.01.08

5.2. Test Setup

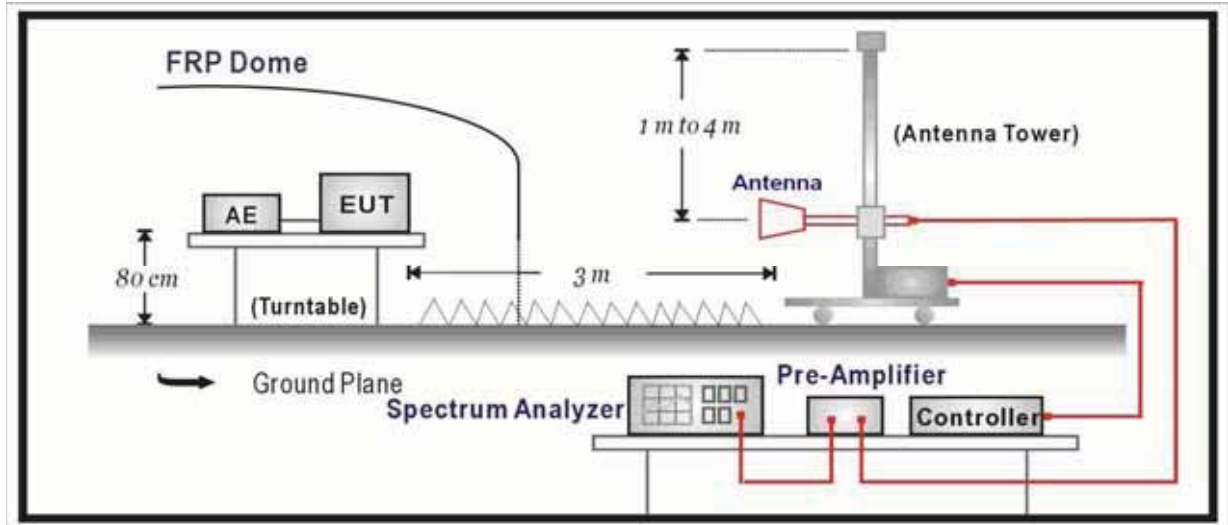
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



5.3. Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (uV/m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-80	100**	3
80-216	150**	3
216-960	200**	3
Above 960	500	3

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m).

FCC Part 15 Subpart C Paragraph 15.249		
Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902-928(MHz)	50	500
2400-2483.5(MHz)	50	500
5725-5875(MHz)	50	500
24.0-24.25(GHz)	250	2500

- FCC Part 15.249 (d), 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.

5.4. Test Procedure

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2009 / ANSI C63.10: 2009 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn antenna will be bended down a little (as horn antenna has the narrow beamwidth) in order to keeping the antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 60~10 degrees for H-plane and 90~10 degrees for E-plane.

5.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB
 below 1G is defined as ± 3.8 dB

5.6. Test Result

All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

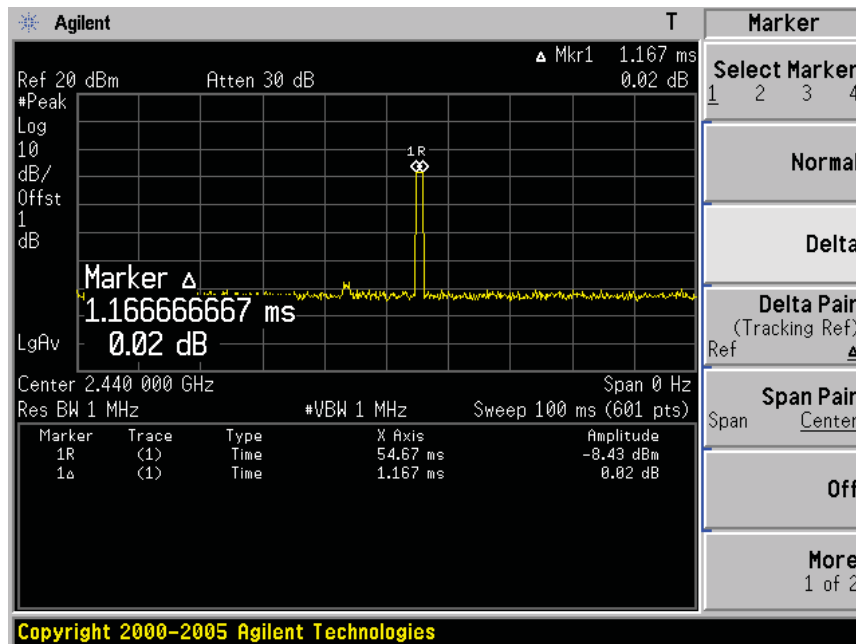
Peak detector: RBW = 3MHz, VBW = 3MHz, sweep time = 200ms;

Average detector = Peak detector - 20*Log(1/Duty Cycle)

The maximum duty cycle plot is as the following:

$$\text{Duty cycle correction factor (DCCF)} = 20 * \text{Log}(1.16667/100) = -38.66\text{dB}$$

duty cycle



Fundamental Radiated Emission

Product	:	MAG2/GR Sensor
Test Item	:	Fundamental Radiated Emission
Test Site	:	AC-5
Test Mode	:	Mode 1: Transmitting

Frequency (MHz)	Antenna	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Type
2405	H	61.4	38.4	99.8	114	-14.2	PK
	V	58.6	37.7	96.3	114	-17.7	PK
2440	H	57.2	36.5	93.7	114	-20.3	PK
	V	59.6	37.2	96.8	114	-17.2	PK
2480	H	56.1	39.1	95.2	114	-18.8	PK
	V	58.1	39.1	97.2	114	-16.8	PK

Note: 1. Measure Level = Reading Level + Factor.

2. Factor = Antenna factor + cable loss factor – preamp factor

Frequency (MHz)	Antenna	Peak Measure (dBuV/m)	Duty Cycle Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Type
2405	H	99.8	-38.66	61.14	94	-32.86	AV
	V	96.3	-38.66	57.64	94	-36.36	AV
2440	H	93.7	-38.66	55.04	94	-38.96	AV
	V	96.8	-38.66	58.14	94	-35.86	AV
2480	H	95.2	-38.66	56.54	94	-37.46	AV
	V	97.2	-38.66	58.54	94	-35.46	AV

Note: 1. Average Measure Level = Peak Measure Level + Duty Cycle Correct Factor.

Harmonic Radiated Emission

PK: Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 500ms;

For average, use peak measure level + Duty Cycle Correct Factor.

Product	:	MAG2/GR Sensor
Test Item	:	Harmonic Radiated Emission
Test Site	:	AC-5
Test Mode	:	Mode 1: Transmit at Low Channel

Frequency (MHz)	Antenna	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Type
4810.0	H	36.8	9.4	46.2	74	-27.8	PK
4810.0	V	35.4	9.3	44.7	74	-29.3	PK
7215.0	H	31.8	11.6	43.4	74	-30.6	PK
7215.0	V	30.9	11.5	42.4	74	-31.6	PK

Note: Measure Level = Reading Level + Factor.

Frequency (MHz)	Antenna	Peak Measure (dBuV/m)	Duty Cycle Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Type
4810.0	H	46.2	-38.66	7.54	54	-46.46	AV
4810.0	V	44.7	-38.66	6.04	54	-47.96	AV
7215.0	H	43.4	-38.66	4.74	54	-49.26	AV
7215.0	V	42.4	-38.66	3.74	54	-50.26	AV

Note: Average Measure Level = Peak Measure Level + Duty Cycle Correct Factor.

Product	:	MAG2/GR Sensor
Test Item	:	Harmonic Radiated Emission
Test Site	:	AC-5
Test Mode	:	Mode 1: Transmit at Mid Channel

Frequency (MHz)	Antenna	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Type
4880.0	H	39.0	9.9	48.9	74	-25.1	PK
4880.0	V	40.8	9.7	50.5	74	-23.5	PK
7320.0	H	31.6	11.7	43.3	74	-30.7	PK
7320.0	V	31.4	11.7	43.1	74	-30.9	PK

Note: Measure Level = Reading Level + Factor.

Frequency (MHz)	Antenna	Peak Measure (dBuV/m)	Duty Cycle Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Type
4880.0	H	48.9	-38.66	10.24	54	-43.76	AV
4880.0	V	50.5	-38.66	11.84	54	-42.16	AV
7320.0	H	43.3	-38.66	4.64	54	-49.36	AV
7320.0	V	43.1	-38.66	4.44	54	-49.56	AV

Note: Average Measure Level = Peak Measure Level + Duty Cycle Correct Factor.

Product	:	MAG2/GR Sensor
Test Item	:	Harmonic Radiated Emission
Test Site	:	AC-5
Test Mode	:	Mode 1: Transmit at High Channel

Frequency (MHz)	Antenna	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Type
4960.0	H	38.9	10.1	49.0	74	-25.0	PK
4960.0	V	39.6	10.1	49.7	74	-24.3	PK
7440.0	H	32.1	11.8	43.9	74	-30.1	PK
7440.0	V	31.4	11.8	43.2	74	-30.8	PK

Note: Measure Level = Reading Level + Factor.

Frequency (MHz)	Antenna	Peak Measure (dBuV/m)	Duty Cycle Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Type
4960.0	H	49.0	-38.66	10.34	54	-43.66	AV
4960.0	V	49.7	-38.66	11.04	54	-42.96	AV
7440.0	H	43.9	-38.66	5.24	54	-48.76	AV
7440.0	V	43.2	-38.66	4.54	54	-49.46	AV

Note: Average Measure Level = Peak Measure Level + Duty Cycle Correct Factor.

General Radiated Emission

Product	:	MAG2/GR Sensor
Test Item	:	General Radiated Emission
Test Mode	:	Mode 1: Transmit at Mid Channel

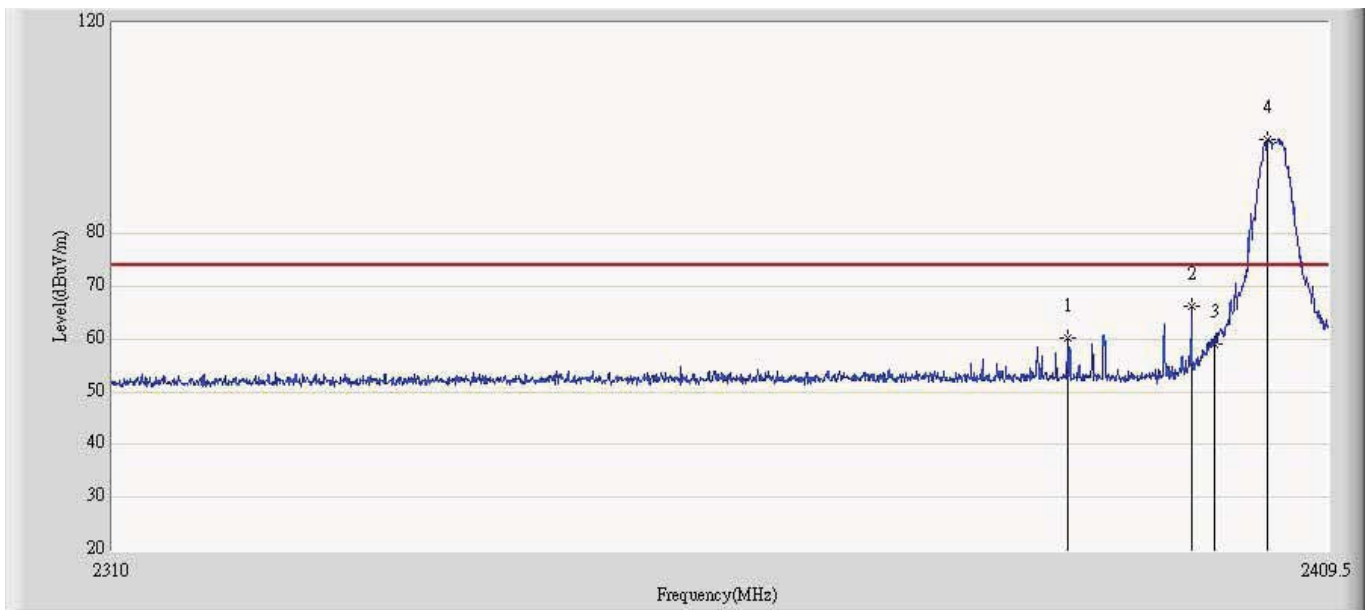
Frequency (MHz)	Antenna	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
132.8	H	3.9	11.8	15.7	43.5	-27.8	QP
127.5	V	3.0	12.0	15.0	43.5	-28.5	QP
300.1	H	5.5	13.4	18.9	46.0	-27.1	QP
230.8	V	5.0	10.6	15.6	46.0	-30.4	QP
4850.5	H	38.1	9.6	47.7	74	-26.3	PK
4808.0	V	37.1	9.2	46.3	74	-27.7	PK
7215.0	H	31.2	11.6	42.8	74	-31.2	PK
7215.0	V	31.1	11.5	42.6	74	-31.4	PK

Note:

1. Measure Level = Reading Level + Factor.
2. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.
3. The middle channel is the worst case among all test modes.

Restricted Band Result:

Engineer: Cloud	
Site: AC5	Time: 2014/07/22 - 20:46
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Sensor	Power: by battery
Note: Mode 1 transmit at channel 0	

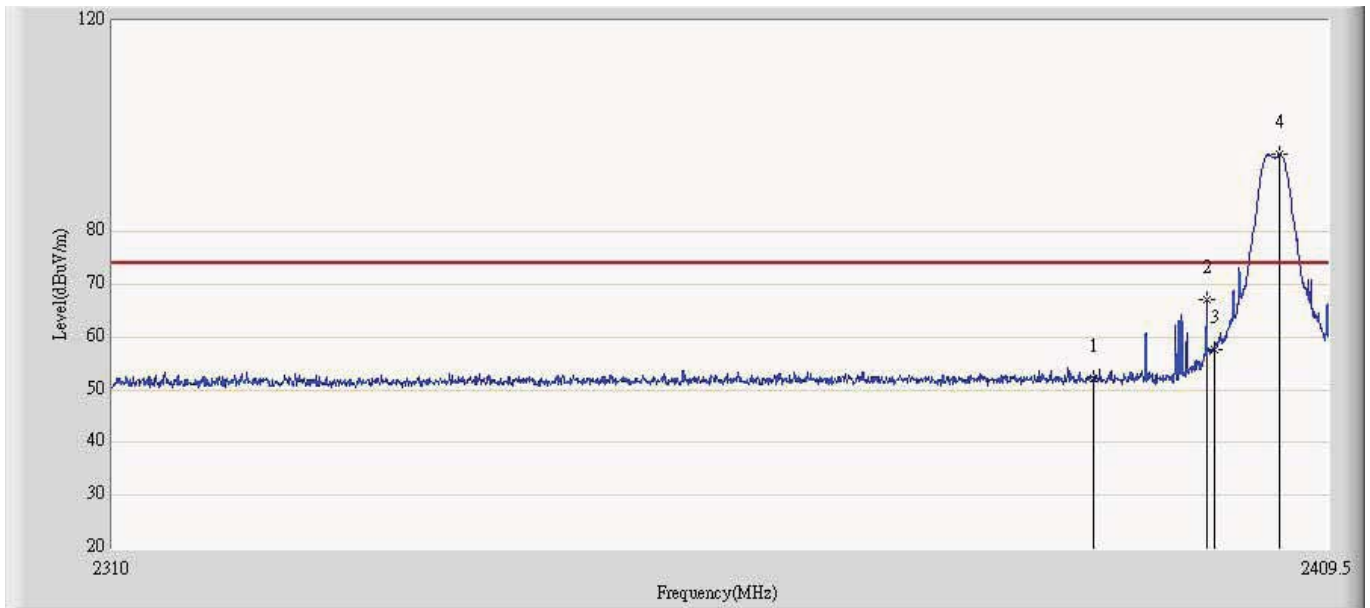


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2387.859	60.242	22.009	-13.758	74.000	38.233	PK
2			2398.157	66.359	28.033	-7.641	74.000	38.326	PK
3			2400.000	59.140	20.798	-14.860	74.000	38.342	PK
4		*	2404.426	97.821	59.439	-16.179	114.000	38.382	PK

No	Flag	Mark	Frequency (MHz)	Peak Measure Level (dBuV/m)	Average Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Cycle Correction Factor	Type
5			2387.859	60.242	21.582	-32.418	54.000	-38.66	AV
6			2398.157	66.359	27.699	-26.301	54.000	-38.66	AV
7			2400.000	59.140	20.48	-33.52	54.000	-38.66	AV
8		*	2404.426	97.821	59.161	-34.839	94.000	-38.66	AV

Note: Average Measure Level = Peak Measure Level + Duty Cycle Correct Factor.

Engineer: Cloud	
Site: AC5	Time: 2014/07/22 - 21:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Sensor	Power: by battery
Note: Mode 1 transmit at channel 0	

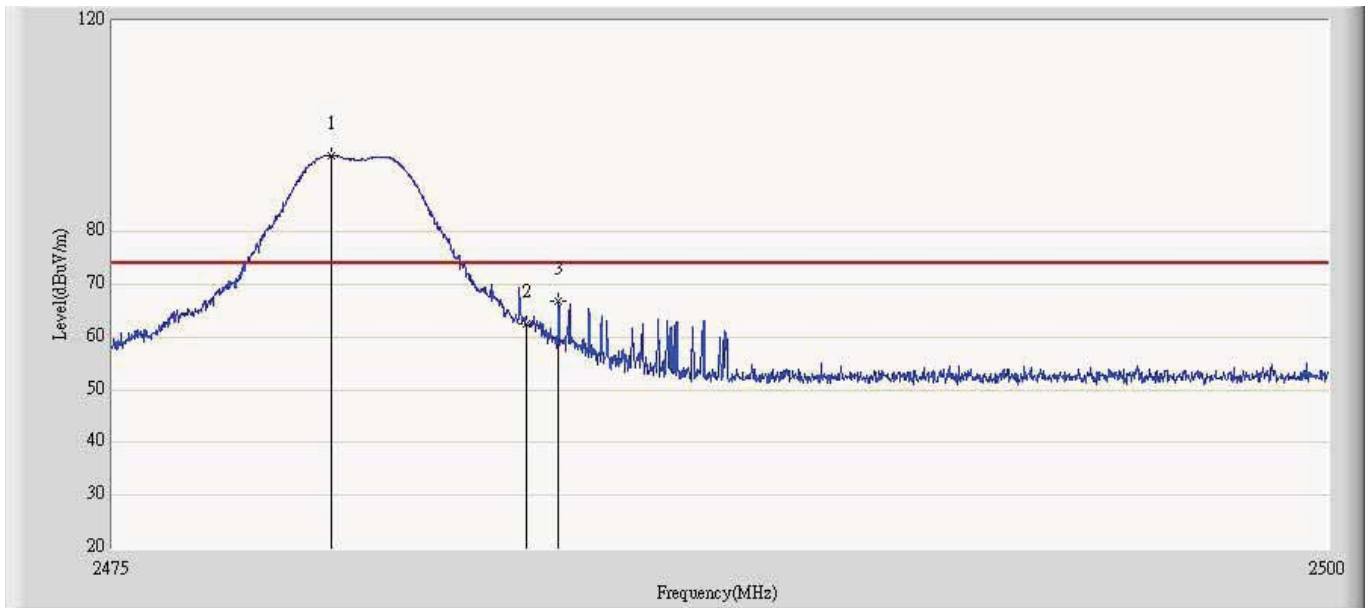


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	52.237	14.644	-21.763	74.000	37.593	PK
2			2399.401	67.152	29.513	-6.848	74.000	37.639	PK
3			2400.000	57.786	20.144	-16.214	74.000	37.642	PK
4		*	2405.420	94.712	57.042	-19.228	114.000	37.670	PK

No	Flag	Mark	Frequency (MHz)	Peak Measure Level (dBuV/m)	Average Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Cycle Correction Factor	Type
1			2390.000	52.237	13.577	-40.423	54.000	-38.66	AV
2			2399.401	67.152	28.492	-25.508	54.000	-38.66	AV
3			2400.000	57.786	19.126	-34.874	54.000	-38.66	AV
4		*	2405.420	94.712	56.052	-37.948	94.000	-38.66	AV

Note: Average Measure Level = Peak Measure Level + Duty Cycle Correct Factor.

Engineer: Cloud	
Site: AC5	Time: 2014/07/22 - 21:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: MAG2/GR Sensor	Power: by battery
Note: Mode 1 transmit at channel 15	

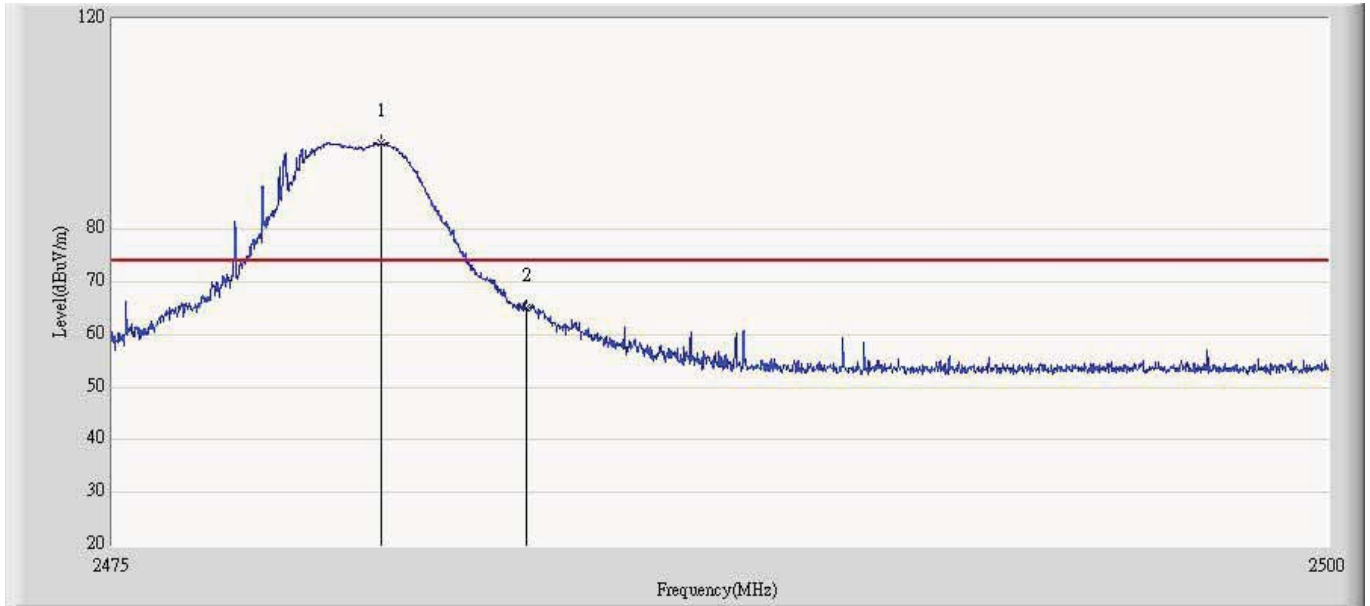


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.475	94.496	55.446	-19.504	114.000	39.050	PK
2			2483.500	62.564	23.48	-11.436	74.000	39.084	PK
3			2484.150	66.793	27.703	-7.207	74.000	39.090	PK

No	Flag	Mark	Frequency (MHz)	Peak Measure Level (dBuV/m)	Average Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Cycle Correction Factor	Type
4		*	2479.475	94.496	55.836	-38.164	94.000	-38.66	AV
5			2483.500	62.564	23.904	-30.096	54.000	-38.66	AV
6			2484.150	66.793	28.133	-25.867	54.000	-38.66	AV

Note: Average Measure Level = Peak Measure Level + Duty Cycle Correct Factor.

Engineer: Cloud	
Site: AC5	Time: 2014/07/22 - 21:58
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: MAG2/GR Sensor	Power: by battery
Note: Mode 1 transmit at channel 15	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.500	96.325	57.267	-17.675	114.000	39.058	PK
2			2483.500	65.236	26.152	-8.764	74.000	39.084	PK

No	Flag	Mark	Frequency (MHz)	Peak Measure Level (dBuV/m)	Average Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Cycle Correction Factor	Type
3		*	2480.500	96.325	57.665	-36.335	94.000	-38.66	AV
4			2483.500	65.236	26.576	-27.424	54.000	-38.66	AV

Note: Average Measure Level = Peak Measure Level + Duty Cycle Correct Factor.

6. Band-edge Compliance of RF Conducted Emissions

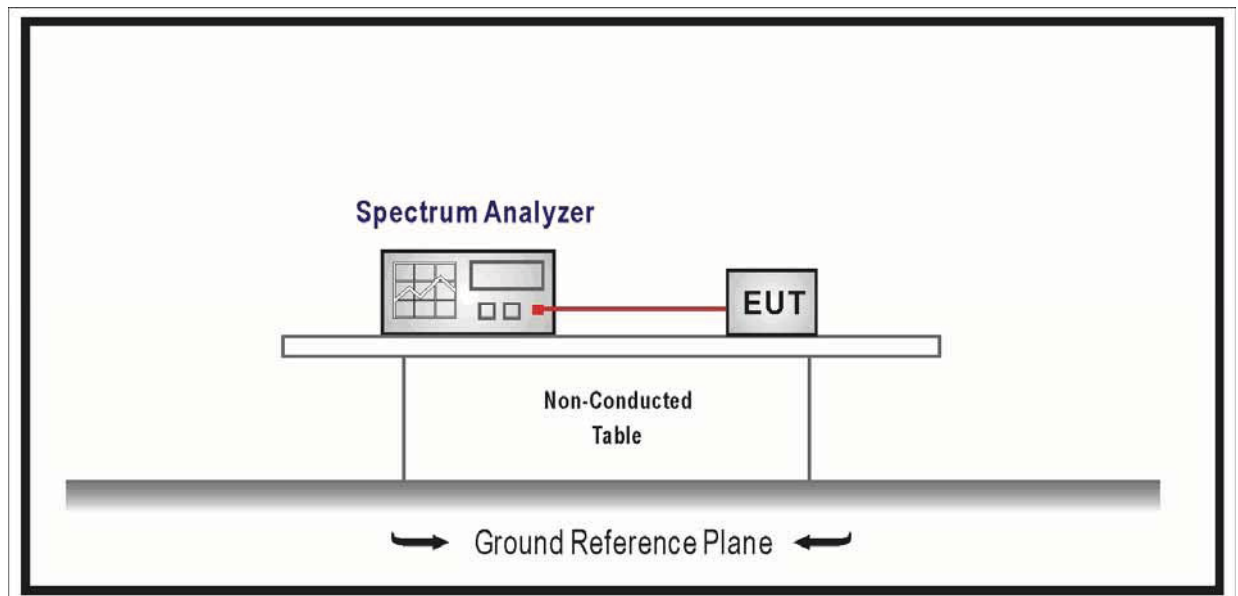
6.1. Test Equipment

Band-edge Compliance of RF Conducted Emissions / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

6.2. Test Setup



6.3. Limit

- FCC Part 15.215 (c), Intentional radiators operating under the alternative provisions to the general emission limits as contained in 15.217 through 15.257 and in Subpart E of FCC part 15, must be designed to ensure that 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

6.4. Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation.

RBW \geq 1% of the span

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge.

Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section.

Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

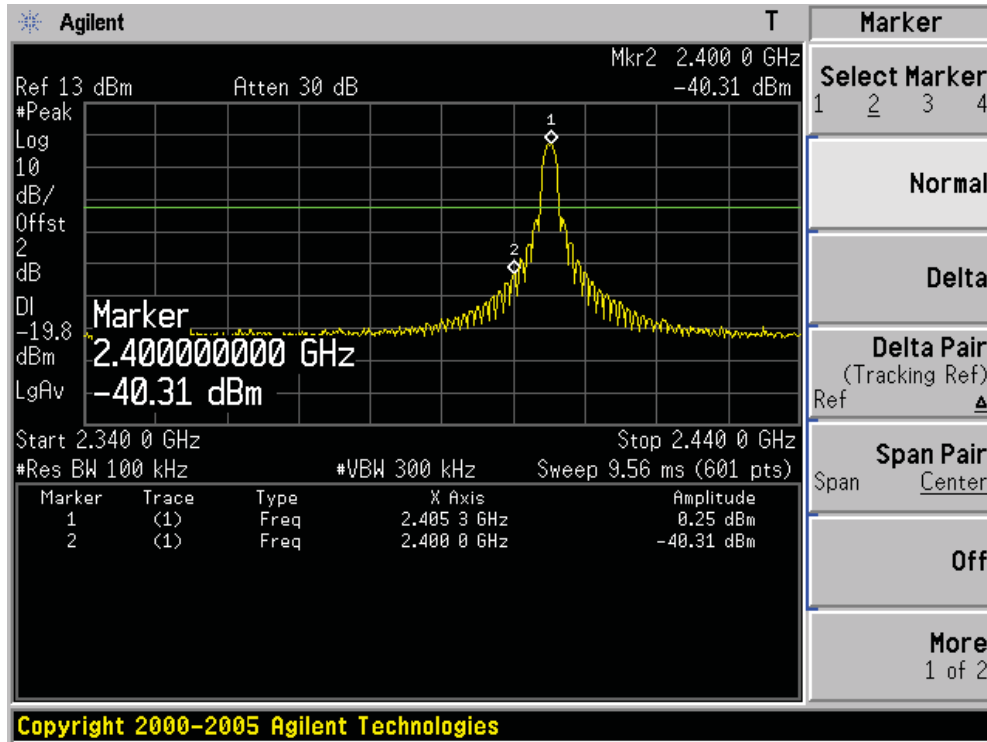
6.5. Uncertainty

The measurement uncertainty is defined as ± 1.0 dB

6.6. Test Result

Product	: MAG2/GR Sensor
Test Item	: Band-edge Compliance of RF Conducted Emissions for FCC Part15.215
Test Mode	: Mode 1: Transmit

Channel 00 (2405MHz)



Channel 15 (2480MHz)

