

ETSI EN 300 440 V2.1.1: 2017 Final Draft

TEST REPORT

For

AIS Class B Transponder

Trade Name: AMEC

Model: WideLink B600W, WideLink B600

Issued to

Alltek Marine Electronics Corp.
14F-2, No.237, Sec. 1, Datong Rd., Xizhi District, New Taipei City, Taiwan, R.O.C.

Issued by

Compliance Certification Services Inc.

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Testing Laboratory
1309

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	May 4, 2016	Initial Issue	ALL	Doris Chu

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1. TEST RESULT CERTIFICATION

Applicant: Alltek Marine Electronics Corp.
 14F-2, No.237, Sec. 1, Datong Rd., Xizhi District, New Taipei City, Taiwan, R.O.C.

Equipment Under Test: AIS Class B Transponder

Trade Name: AMEC

Model: WideLink B600W, WideLink B600

Date of Test: April 22, 2016

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
ETSI EN 300 440 V2.1.1: 2017 Final Draft	Pass

The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements set forth in ETSI EN 300 440. The results of testing in this report apply only to the product /system, which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:



Sam Chuang
 Manager
 Compliance Certification Services Inc.

Tested by:



Zeus Chen
 Engineer
 Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	AIS Class B Transponder
Trade Name	AMEC
Model Number	WideLink B600W, WideLink B600
Model Discrepancy	WideLink B600 without Wi-Fi WideLink B600W with Wi-Fi
Received Date	February 22, 2016
EUT Power Rating	Power from power supply: DC 12/24V
Frequency Range	1575 MHz
Number of Channels	1 Channel
Temperature Range	-15°C ~ +55°C
Hardware	M-PCB-B601MBV2
Software	V1.1.5

Remark: for more details, please refer to the User's manual of the EUT.

3. TEST METHODOLOGY

3.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:

ETSI EN 300 440: Short Range Devices (SRD);

Radio equipment to be used in

the 1 GHz to 40 GHz frequency range;

Harmonised Standard covering the essential requirements
of article 3.2 of Directive 2014/53/EU

3.2 DESCRIPTION OF TEST MODES

The EUT (model: WideLink B600W) had been tested under typical operation.

All the test modes were carried out with the EUT in normal operation.

4. INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

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

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: Each piece of equipment is scheduled for calibration once a year and Precision Dipole is scheduled for calibration once three years.

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
DC Power Supplies	GW Instek	SPS-3610	GPE880163	01/19/2016	01/18/2017
Digital Thermo-Hygro Meter	WISEWIND	1110	D03	03/07/2016	03/06/2017
Power Meter	Anritsu	ML2495A	1012009	07/08/2015	07/07/2016
Power Sensor	Anritsu	MA2411B	917072	07/08/2015	07/07/2016
PSA Series Spectrum Analyzer	Agilent	E4445A	MY48250198	08/10/2015	08/09/2016
Signal Analyzer	R&S	FSV 40	101073	07/20/2015	07/19/2016
Spectrum Analyzer	Agilent	E4446A	US42510268	02/15/2016	02/14/2017
Thermostatic/Hygrosatic Chamber	TAICHY	MHG-150LF	930619	10/08/2015	10/07/2016
USB Wideband Power Sensor	AGILENT	U2021XA	MY54250027	06/16/2015	06/15/2016
USB Wideband Power Sensor	AGILENT	U2021XA	MY54260016	06/16/2015	06/15/2016
USB Wideband Power Sensor	AGILENT	U2021XA	MY54260020	06/16/2015	06/15/2016
USB Wideband Power Sensor	AGILENT	U2021XA	MY54260007	10/26/2015	10/25/2016
Vector Signal Generator	R&S	SMU 200A	102239	03/10/2016	03/09/2017
AC Power Source	EXTECH	6205	1140845	N.C.R	N.C.R

4.3 MEASUREMENT UNCERTAINTY

For the test methods, according to the present document (ETSI EN 300 440) the uncertainty figures shall be calculated according to the methods described in the ETR 028 [4] and shall correspond to an expansion factor (coverage factor) $k = 1,96$ or $k = 2$ (which provide confidence levels of respectively 95 % and 95,45 % in case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Table 3 is based on such expansion factors.

Table 3: Measurement uncertainty

Parameter	Uncertainty
Frequency	$\pm 1 \cdot 10^{-7}$
RF power, conducted	± 4 dB
Adjacent channel power	± 3 dB
Conducted emission of transmitter, valid up to 12.75 GHz	± 4 dB
Conducted emission of receivers	± 3 dB
Radiated emission of transmitter, valid up to 12.75 GHz	± 6 dB
Radiated emission of receiver, valid up to 12.75 GHz	± 6 dB

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

- No. 199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029
- No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045
- No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

5.2 EQUIPMENT




Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	 FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12.2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method –47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	 IC 2324G-1 IC 2324G-2

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1.	GPS Simulator	Spectracom	GSG-5	200370	N/A	N/A	N/A
2.	GPS antenna	AMEC	ANT-21 (AGGRESSOR-21) (AGGRESSOR-111-C) (AMEC P/N:M-ANT-C1283-570001-A)	N/A	N/A	Shielded, 10m	N/A

Remark:

1. *All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

7. ETSI EN 300 440 REQUIREMENTS

7.1 EQUIVALENT ISOTROPICALLY RADIATED POWER (EIRP)

DEFINITION

ETSI EN 300 440 clause 4.2.2.2

The eirp is defined as the peak power of the transmitter and calculated according to the procedure given in the following clause. See clause 5 for the test conditions.

LIMIT

ETSI EN 300 440 clause 4.2.2.4

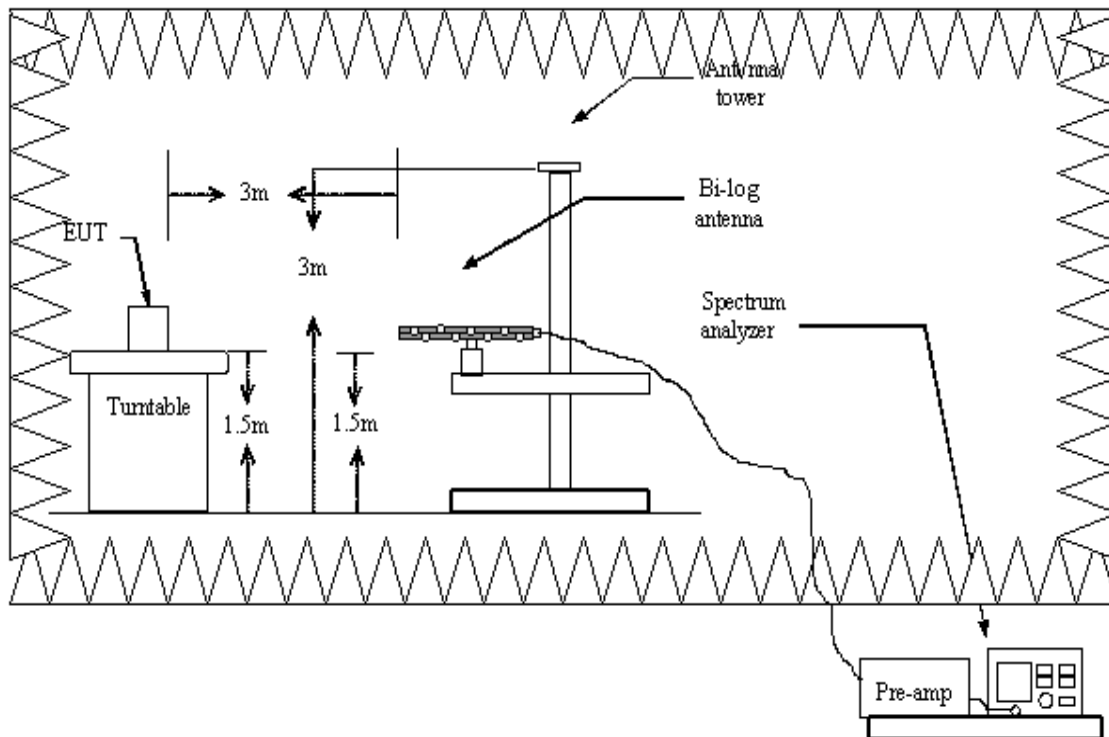
The transmitter maximum e.i.r.p. under normal and extreme test conditions is provided in table 2.

Table 2: Maximum radiated peak power (e.i.r.p.)

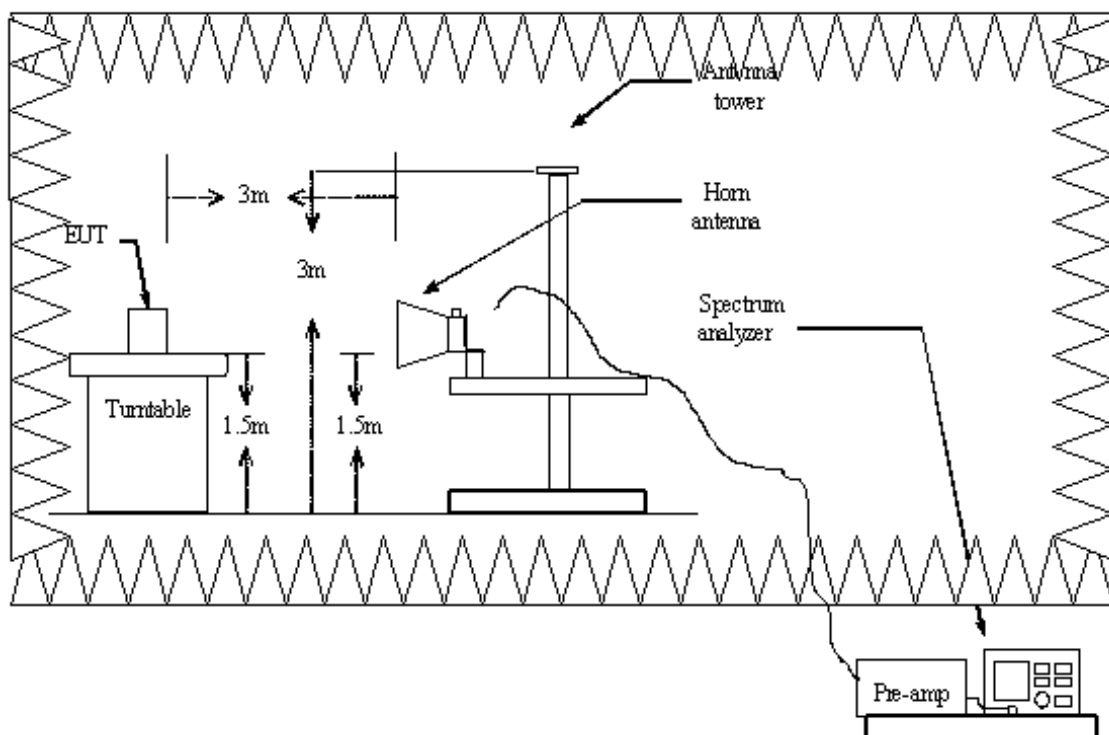
Frequency Bands	Power	Application	Notes
2 400 MHz to 2 483,5 MHz	10 mW e.i.r.p.	Non-specific short range devices	
2 400 MHz to 2 483,5 MHz	25 mW e.i.r.p.	Radio determination devices	
(a) 2 446 MHz to 2 454 MHz	500 mW e.i.r.p.	Radio Frequency Identification (RFID) devices	See also table 4 and annex D
(b) 2 446 MHz to 2 454 MHz	4 W e.i.r.p.	Radio Frequency Identification (RFID) devices	See also table 4 and annex D
5 725 MHz to 5 875 MHz	25 mW e.i.r.p.	Non-specific short range devices	
9 200 MHz to 9 500 MHz	25 mW e.i.r.p.	Radio determination devices	
9 500 MHz to 9 975 MHz	25 mW e.i.r.p.	Radio determination devices	
10,5 GHz to 10,6 GHz	500 mW e.i.r.p.	Radio determination devices	
13,4 GHz to 14,0 GHz	25 mW e.i.r.p.	Radio determination devices	
17,1 GHz to 17,3 GHz	400 mW e.i.r.p.	Radio determination devices	See annex F
24,00 GHz to 24,25 GHz	100 mW e.i.r.p.	Non-specific short range devices and Radio determination devices	

Test Configuration

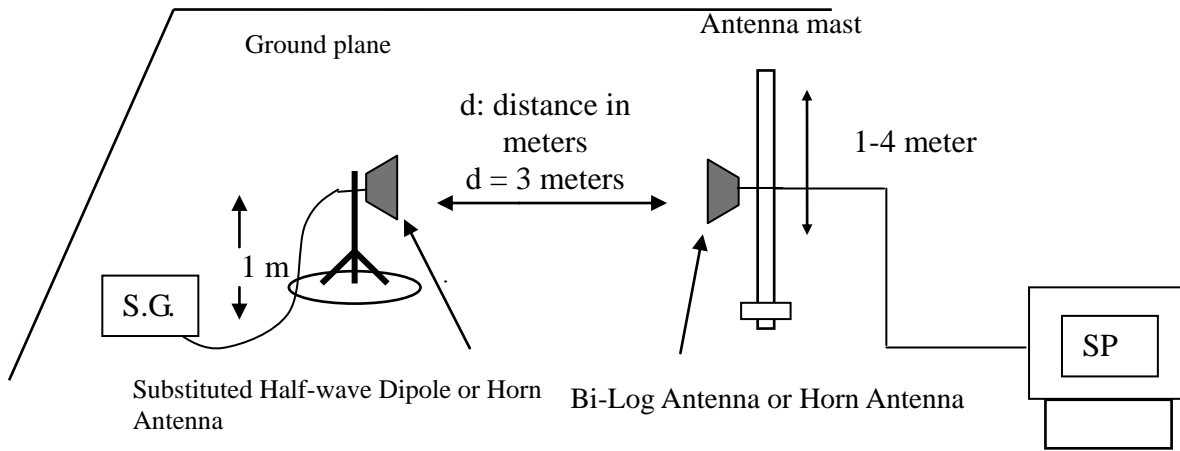
Below 1GHz



Above 1GHz



Substituted Method Test Set-up



TEST PROCEDURE

1. Please refer to ETSI EN 300 440 clause 5 for the test conditions, power sources and ambient.
2. Please refer to ETSI EN 300 440 clause 4.2.2.3 for the measurement method.

Measurement Uncertainty

The measurement uncertainty of the test is $\pm 2.65\text{dB}$.

TEST RESULTS

As GPS module is installed at EUT, the EUT only uses GPS for its application. There is no GPS transmit issue. This test item is not required, no test was done

7.2 PERMITTED RANGE OF OPERATING FREQUENCIES

DEFINITION

ETSI EN 300 440 clause 4.2.3.2

The permitted range of operating frequencies includes all frequencies on which the equipment may operate within an assigned frequency band. The operating frequency range shall be declared by the manufacturer.

The range of frequencies, determined by clause 7.2, shall be specified in the test report.

LIMIT

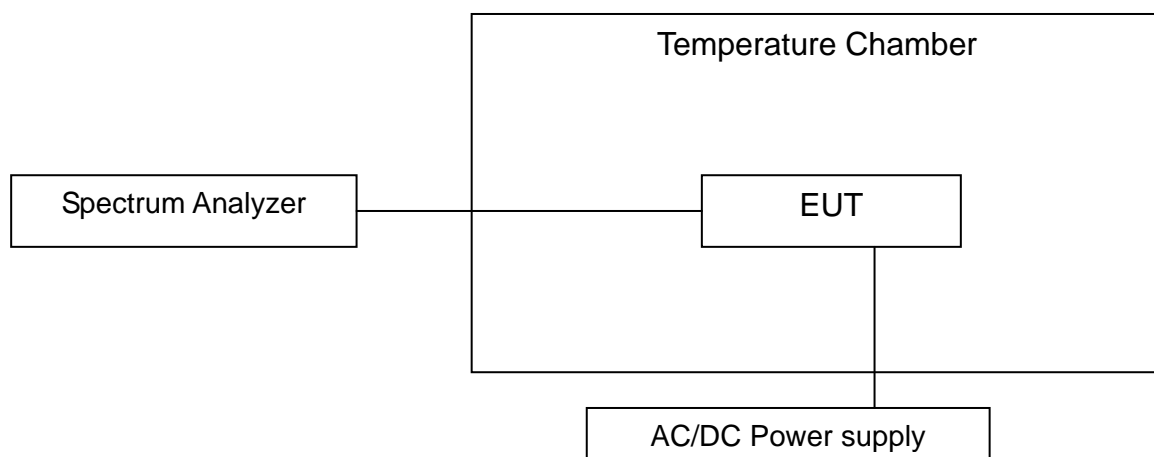
ETSI EN 300 440 clause 4.2.3.5

The width of the power envelope is $f_H - f_L$ for a given operating frequency. In equipment that allows adjustment or selection of different operating frequencies, the power envelope takes up different positions in the allowed band. The frequency range is determined by the lowest value of f_L and the highest value of f_H resulting from the adjustment of the equipment to the lowest and highest operating frequencies.

For all equipment the frequency range shall lie within the frequency band allocated for use as recommended in CEPT/ERC Recommendation 70-03 [1] and ERC Decisions. For non-harmonized frequency bands the available frequency range may differ between national administrations.

Test Configuration

Temperature and Voltage Measurement (under normal and extreme test conditions)



TEST PROCEDURE

1. Please refer to ETSI EN 300 440 clause 5 for the test conditions, power sources and ambient.
2. Please refer to ETSI EN 300 440 clause 4.2.3.3 and ETSI EN 300 440 clause 4.2.3.4 for FHSS for the Method of measurement for equipment using FHSS modulation.

TEST RESULTS

As GPS module is installed at EUT, the EUT only uses GPS for its application. There is no GPS transmit issue. This test item is not required, no test was done

7.3 TRANSMITTER SPURIOUS EMISSIONS

DEFINITION

ETSI EN 300 440 clause 4.2.4.3.0

Spurious emissions are emissions at frequencies, other than those of the carrier and sidebands associated with normal modulation. The level of spurious emissions shall be measured as either:

- a)
 - i) their power level in a specified load (conducted emission); and
 - ii) their effective radiated power when radiated by the cabinet and structure of the equipment (cabinet radiation);
- b) their effective radiated power when radiated by the cabinet and the integral or dedicated antenna, in the case of equipment fitted with such an antenna and no permanent RF connector.

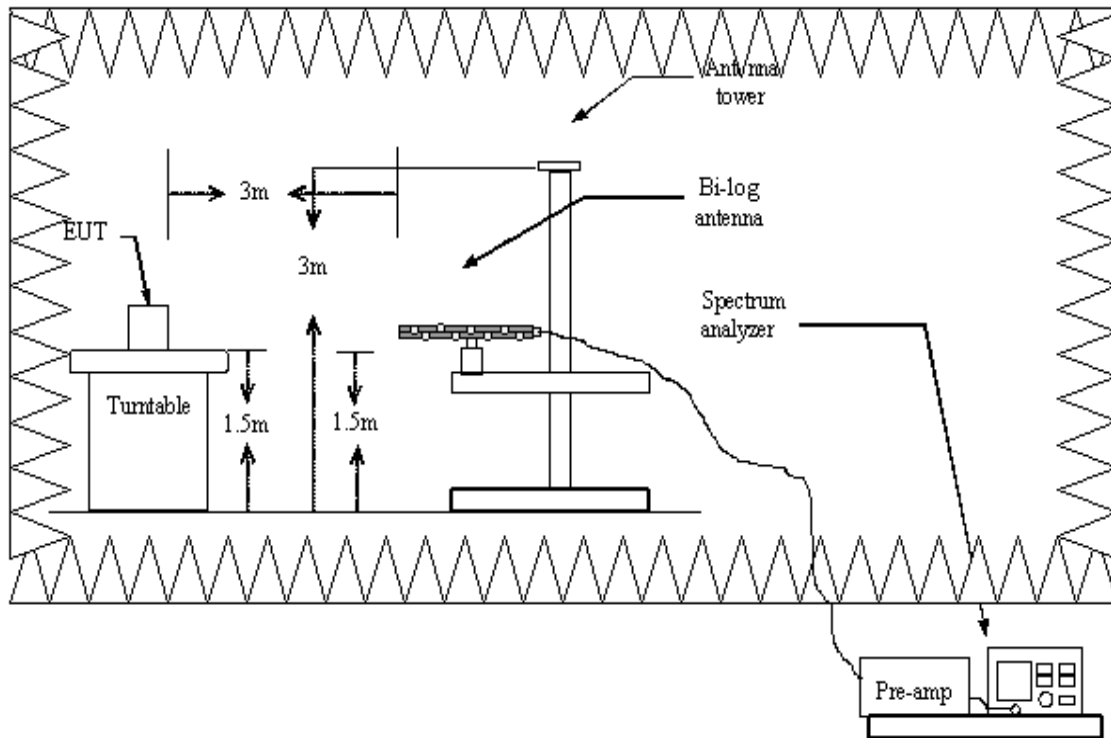
LIMIT

The power of any spurious emission shall not exceed the following values given in table:

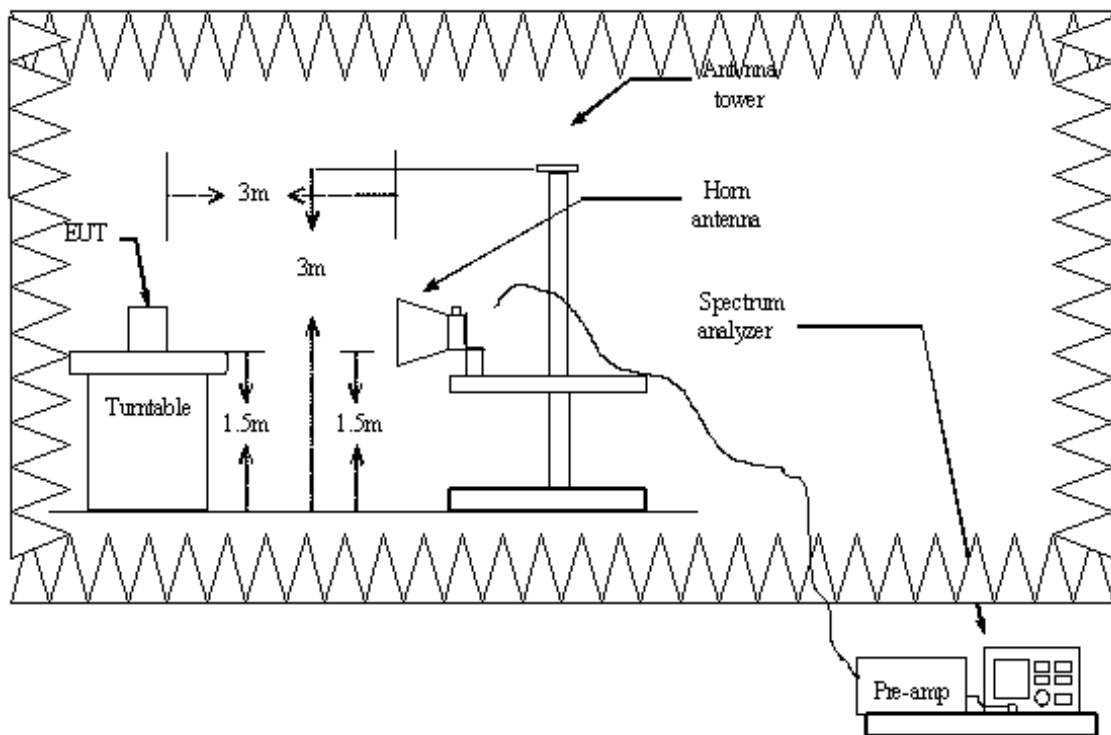
Radiated spurious emissions			
State	47 MHz to 74 MHz 87.5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other frequencies ≤ 1000 MHz	Frequencies > 1000 MHz
Operating	4 nW -54dBm	250 nW -36 dBm	1 μW -30dBm
Standby	2 nW -57dBm	2 nW -57dBm	20 nW -47dBm

Test Configuration

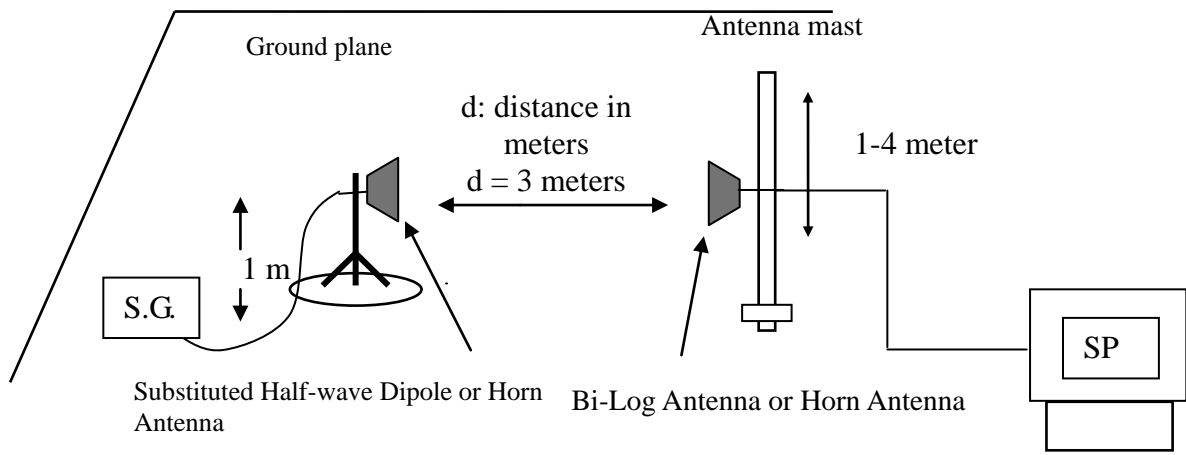
Below 1GHz



Above 1GHz



Substituted Method Test Set-up



TEST PROCEDURE

1. Please refer to ETSI EN 300 440 clause 5 for the test conditions.
2. Please refer to ETSI EN 300 440 clause 4.2.4.3 for the measurement method.

Measurement Uncertainty

The measurement uncertainty of the test is $\pm 2.65\text{dB}$.

TEST RESULTS

As GPS module is installed at EUT, the EUT only uses GPS for its application. There is no GPS transmit issue. This test item is not required, no test was done

7.4 DUTY CYCLE

LIMIT

ETSI EN 300 440 clause 4.2.5.4

For the purpose of the present document the term duty cycle refers to the ratio of the total on time of the "message" to the total off-time in any one hour period. The device may be triggered either automatically or manually and depending on how the device is triggered will also depend on whether the duty cycle is fixed or random.

Table 4 defines the maximum duty cycle within a 1 hour period.

Table 4: Duty cycle limits

Frequency Bands	Duty cycle	Application	Notes
2 400 MHz to 2 483,5 MHz	No Restriction	Generic use	
2 400 MHz to 2 483,5 MHz	No Restriction	Detection, movement and alert applications	
(a) 2 446 MHz to 2 454 MHz	No Restriction	RFID	Limits shown in annex D shall apply
(b) 2 446 MHz to 2 454 MHz	≤ 15 %	RFID	Limits shown in annex D shall apply
5 725 MHz to 5 875 MHz	No Restriction	Generic use	
9 200 MHz to 9 500 MHz	No Restriction	Radiodetermination: radar, detection, movement and alert applications	
9 500 MHz to 9 975 MHz	No Restriction	Radiodetermination: radar, detection, movement and alert applications	
10,5 GHz to 10,6 GHz	No Restriction	Radiodetermination: radar, detection, movement and alert applications	
13,4 GHz to 14,0 GHz	No Restriction	Radiodetermination: radar, detection, movement and alert applications	
17,1 GHz to 17,3 GHz	DAA or equivalent techniques	Radiodetermination: GBSAR detecting and movement and alert applications	Limits shown in annex F shall apply
24,00 GHz to 24,25 GHz	No Restriction	Generic use and for Radiodetermination: radar, detection, movement and alert applications	

For devices with a 100 % duty cycle transmitting an unmodulated carrier most of the time, a time-out shut-off facility shall be implemented in order to improve the efficient use of spectrum. The method of implementation shall be declared by the manufacturer.

TEST PROCEDURE

Please refer to ETSI EN 300 440 clause 5 for the test conditions.

TEST RESULTS

As GPS module is installed at EUT, the EUT only uses GPS for its application.
There is no GPS transmit issue. This test item is not required, no test was done

7.5 RECEIVER SPURIOUS EMISSIONS

LIMIT

ETSI EN 300 440 clause 4.3.5.4

The power of any spurious emission shall not exceed 2nW in the range 25 MHz to 1 GHz and shall not exceed 20nW on frequencies above 1 GHz.

Mode	25 MHz - 1 GHz	Above1 GHz
Operating	2nW -57dBm	20nW -47dBm

Remark: The limits are applicable to all receiver classes.

Test Configuration

Radiated Spurious Emissions:

(Same as section 7.3 in this test report)

TEST PROCEDURE

1. Please refer to ETSI EN 300 440 clause 5 for the test conditions.
2. Please refer to ETSI EN 300 440 clause 4.3.5.3 for the measurement method.

Measurement Uncertainty

The measurement uncertainty of the test is ± 2.65 dB.

TEST RESULTS

Pass.

Below 1 GHzTest Mode: RXTested by: Jason LuAmbient temperature: 22.6°C Relative humidity: 57.2 % RHDate: April 22, 2016

Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
75.5900	-51.03	-21.31	-72.34	-57.00	-15.34	V
98.8700	-47.19	-23.13	-70.32	-57.00	-13.32	V
193.9300	-49.81	-18.24	-68.05	-57.00	-11.05	V
330.7000	-57.67	-17.68	-75.35	-57.00	-18.35	V
384.0500	-58.67	-16.91	-75.58	-57.00	-18.58	V
500.4500	-64.48	-13.52	-78.00	-57.00	-21.00	V
61.0400	-46.83	-15.37	-62.20	-57.00	-5.20	H
90.1400	-40.66	-19.73	-60.39	-57.00	-3.39	H
107.6000	-42.74	-16.47	-59.21	-57.00	-2.21	H
183.2600	-53.15	-13.85	-67.00	-57.00	-10.00	H
400.5400	-58.84	-11.87	-70.71	-57.00	-13.71	H
600.3600	-64.21	-8.43	-72.64	-57.00	-15.64	H

Remark:

1. The emission behaviour belongs to narrowband spurious emission.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

Above 1GHzTest Mode: RXTested by: Jason LuAmbient temperature: 22.6°C Relative humidity: 57.2 % RHDate: April 22, 2016

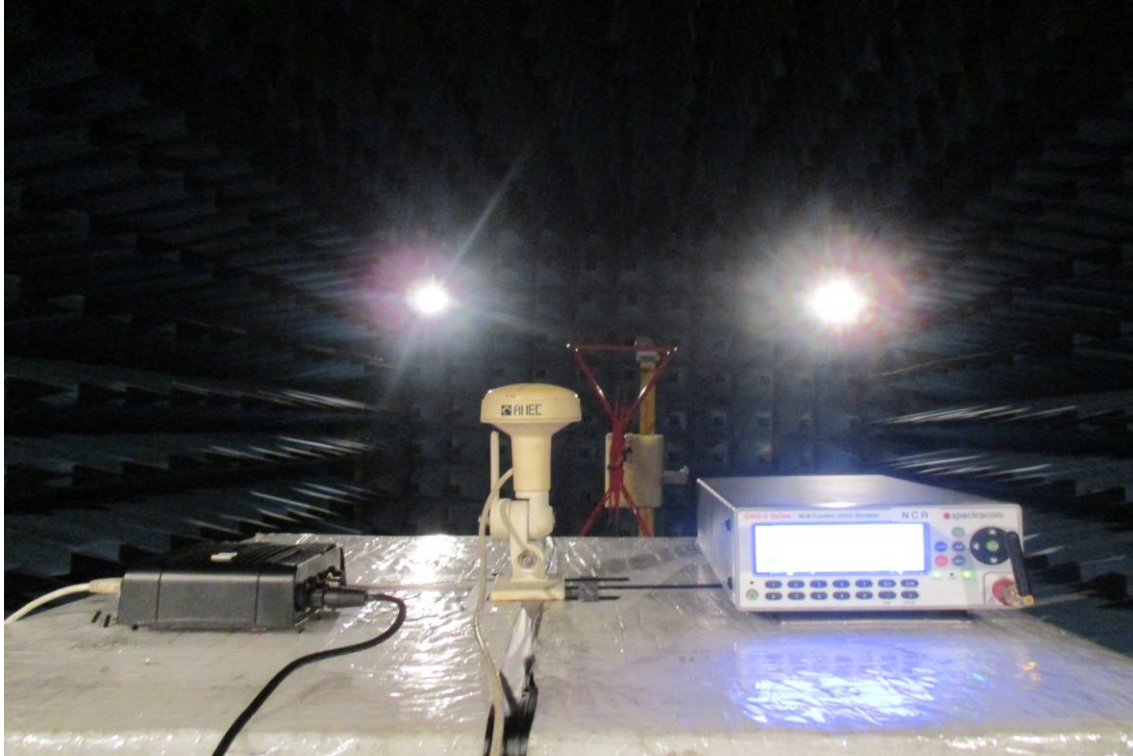
Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3107.000	-66.94	5.06	-61.88	-47.00	-14.88	V
4507.000	-67.98	8.35	-59.63	-47.00	-12.63	V
N/A						
3107.000	-67.14	5.06	-62.08	-47.00	-15.08	H
4507.000	-67.40	8.35	-59.05	-47.00	-12.05	H
N/A						

Remark:

1. The emission behaviour belongs to narrowband spurious emission.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

APPENDIX I PHOTOGRAPHS OF TEST SETUP

Below 1GHz



Above 1GHz

