

EMI – TEST REPORT

- FCC Part 15.249, RSS210 -

Test Report No. : T36955-00-00HS	13. November 2013 Date of issue
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Type / Model Name : A39M01

Product Description : Sport Performance Monitor

Applicant : Under Armour Inc.

Address : Tide Point, 1020 Hull Street, Baltimore, MD 21230

Manufacturer : IDT Technology Limited

Address : Block C, 9/F., Kaiser Estate, Phase 1, 41 Man Yue Street,
Hunghom, Kowloon, Hong Kong

Licence holder : Under Armour Inc.

Address : Tide Point, 1020 Hull Street, Baltimore, MD 21230

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

Contents

1	<u>TEST STANDARDS</u>	3
2	<u>SUMMARY</u>	4
2.1	GENERAL REMARKS:	4
2.2	Test result summary	5
2.3	FINAL ASSESSMENT:	5
3	<u>EQUIPMENT UNDER TEST</u>	6
3.1	Photo documentation of the EUT	6
3.2	Power supply system utilised	9
3.3	Short description of the equipment under test (EUT)	9
4	<u>TEST ENVIRONMENT</u>	10
4.1	Address of the test laboratory	10
4.2	Environmental conditions	10
4.3	Statement of the measurement uncertainty	10
4.4	Measurement protocol for FCC and IC	11
4.5	Determination of worst case measurement conditions	11
5	<u>TEST CONDITIONS AND RESULTS</u>	12
5.1	Conducted emissions	12
5.2	Radiated emission of the fundamental wave	12
5.3	Spurious emissions radiated	15
5.4	EBW and OBW	21
5.5	Correction for pulse operation (duty cycle)	24
5.6	Antenna application	24
6	<u>USED TEST EQUIPMENT AND ACCESSORIES</u>	25

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September, 2012)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September, 2012)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.249	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz
ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C95.1:2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement
CISPR 22: 2005 EN 55022: 2006	Information technology equipment

2 SUMMARY

2.1 GENERAL REMARKS:

The EUT is a Bluetooth BLE – transceiver for low power data transmission in 40 channels of the operating band of 2.4 GHz to 2.4835 GHz. The EUT has an integrated antenna. Special test software is used for setting the test modes.

Variants of the EUT

No variants.

Antennas

The following integrated antennas are used with the EUT:

- PCB antenna.

The antennas cannot be unattached by the user.

Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402	15	2430	29	2458
2	2404	16	2432	30	2460
3	2406	17	2434	31	2462
4	2408	18	2436	32	2464
5	2410	19	2438	33	2466
6	2412	20	2440	34	2468
7	2414	21	2442	35	2470
8	2416	22	2444	36	2472
9	2418	23	2446	37	2474
10	2420	24	2448	38	2476
11	2422	25	2450	39	2478
12	2424	26	2452	40	2480
13	2426	27	2454		
14	2428	28	2456		

Transmit operating modes

The EUT use GFSK and provide following data rate:

1 Mbps

(Mbps = Megabits per second)

2.2 Test result summery

Operating in the 2400 MHz – 2483.5 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.35(c)	RSS-Gen, 4.5	Pulsed operation	passed
15.203	RSS Gen, 7.1.2	Antenna requirement	passed
15.204	RSS Gen, 7.1.1	External radio frequency power amplifiers	passed
15.205(a)	RSS-Gen, 7.2.2	Emissions in restricted bands	passed
15.207(a)	RSS Gen, 7.2.4	AC power line conducted emissions	passed
15.215(c)		-20 dBc EBW	passed
	RSS-Gen, 4.6.1	99 % Bandwidth	passed
15.249(a)	RSS-210, A2.9(a)	Field strength of fundamental	passed
15.249(d)	RSS Gen, 7.2.5	Out-of-band emission, radiated	passed
	RSS-Gen, 7.2.6	Transmitter frequency stability	not applicable

The mentioned RSS Rule Parts in the above table are related to:

RSS Gen, Issue 3, December 2010

RSS 210, Issue 8, December 2010

RSS 102, Issue 4, March 2010

2.3 FINAL ASSESSMENT:

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 25 June 2013

Testing concluded on : 26 June 2013

Checked by:

Tested by:

Klaus Gegenfurtner
Dipl.-Ing.(FH)
Manager: Radio Group

Hermann Smetana
Dipl.-Ing.(FH)
Radio Senior Expert

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT

External view:



FCC ID: SHI-A39M01

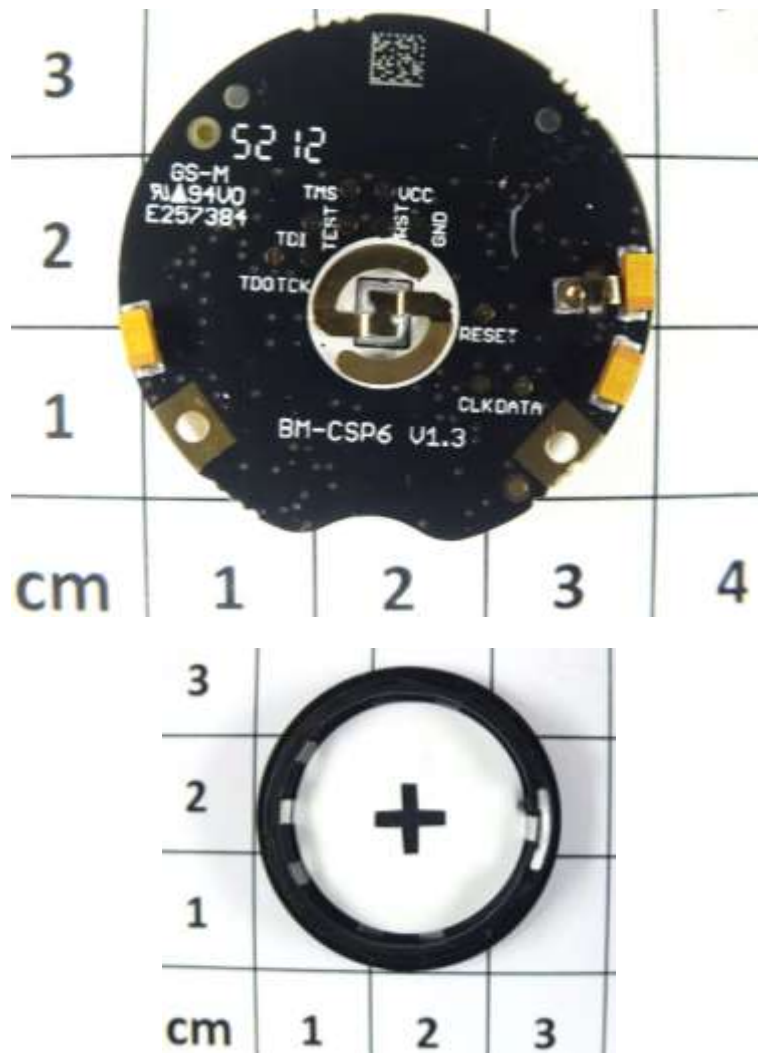
IC ID: 10833A-A39M01

Internal view:



FCC ID: SHI-A39M01

IC ID: 10833A-A39M01



3.2 Power supply system utilised

Power supply voltage : 3 VDC Lithium ion battery

3.3 Short description of the equipment under test (EUT)

The EUT is a radio self examination monitor for puls frequency. The heart frequency is taken from 2 sensors which are conducted by a burst belt. The EUT is able to transmit the data via Bluetooth BLE to an appropriate device can connect to.

Number of tested samples: 5

Serial number: BLE Low, BLE middle, BLE High, BLE All, BLE

EUT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- TX continuous mode

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

- _____ Model : _____

- _____ Model : _____

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY**

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the CSA Group Bayern GmbH quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component diversity and modifications in production processes may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests. The manufacturer has the sole responsibility of continued compliance of the EUT.

4.4 Measurement protocol for FCC and IC

4.4.1 General information

4.4.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

The Open Area test site is a listed Open Site under the Canadian Test-Sites File-No:

IC 3009A-1

In compliance with RSS 210 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.4.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.1.3 Details of test procedures

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.5 Determination of worst case measurement conditions

Measurements have been made in all three orthogonal axes and the settings of the EUT were changed to locate at which position and at what setting of the EUT produce the maximum of the emissions. For the further measurement the EUT is set in Y position.

5 TEST CONDITIONS AND RESULTS

5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: NONE

Remarks: Not applicable, the EUT is battery powered.

5.2 Radiated emission of the fundamental wave

For test instruments and accessories used see section 6 Part CPR 3.

5.2.1 Description of the test location

Test location: Anechoic chamber 2

Test distance: 3 m

5.2.2 Photo documentation of the test set-up





5.2.1 Applicable standard

According to FCC Part 15C, Section 15.249(a):

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the effective limits.

5.2.2 Description of Measurement

The radiated emission of the fundamental wave from the EUT is measured using a spectrum analyser and appropriate linear polarized antennas. The set up of the EUT and the measurement procedure is in accordance to ANSI C63.4. The EUT is measured in TX continuous mode unmodulated under normal conditions.

Analyser settings:

Peak measurement: RBW: 1 MHz

VBW: 3 MHz

Detector: Max peak

AV measurement: RBW: 1 MHz

VBW: 10 Hz

Detector: Max peak

5.2.3 Test result

Frequency (MHz)	Level PK dB(μV/m)	Limit PK dB(μV/m)	Margin PK (dB)	Level AV dB(μV/m)	Limit AV dB(μV/m)	Margin AV (dB)
2402	76.9	114.0	-37.1	-	94.0	-
2440	77.5	114.0	-36.5	-	94.0	-
2480	74.2	114.0	-39.8	-	94.0	-

Note: Due the extremely low level of the EUT no average level is measured.

FCC ID: SHI-A39M01

IC ID: 10833A-A39M01

Average-Limit according to FCC Part 15C, Section 15.249(a):

Frequency (MHz)	Field strength of fundamental	
	(mV/m)	dB(μ V/m)
902 - 928	50	94
2400 - 2483.5	50	94
5725-5875	50	94
24000 - 24250	250	108

Peak-Limit according to FCC Part 15C, Section 15.249(e):

However the peak fieldstrength shall not exceed the maximum permitted average limit by more than 20 dB.

The requirements are **FULFILLED**.

Remarks:

5.3 Spurious emissions radiated

For test instruments and accessories used see section 6 Part SER 1, SER 2, SER 3.

5.3.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 2

Test distance: 3 m

5.3.2 Photo documentation of the test set-up

Test setup 30 MHz – 1000 MHz:



Test setup 1 GHz – 18 GHz:



5.3.3 Applicable standard

According to FCC Part 15C, Section 15.249 (d):

Emission radiated outside of the specified frequency bands, except harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated limit in FCC Part 15C, Section 15.209, whichever is the lesser attenuation.

5.3.4 Description of Measurement

The radiated emissions from the EUT are measured in the frequency range of 9 kHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. The setup of the EUT and the measurement procedure is in accordance to ANSI C63.4, Item 8.3. In the frequency range above 1 GHz a spectrum analyser is used with appropriate linear polarized antennas. If the emission level in peak mode complies with the average limit testing is stopped and peak values will be reported, otherwise, the emission is measured in average mode again and reported. The EUT is measured in TX continuous mode unmodulated under normal conditions.

Instrument settings:

9 kHz – 150 kHz	RBW:	200 Hz
150 kHz - 30 MHz	RBW:	9 kHz
30 MHz – 1000 MHz:	RBW:	120 kHz
1000 MHz – 25 GHz	RBW:	1 MHz

5.3.1 Test result $f < 30$ MHz

Note: In the frequency range 9 kHz to 30 MHz no emission could be detected.

5.3.2 Test result $f < 1$ GHz

Note: In the frequency range 30 MHz to 1000 MHz no emission could be detected.

5.3.3 Test result $f > 1$ GHz
Channel 1

Frequency (MHz)	Level PK dB(μ V/m)	Level AV dB(μ V/m)	Limit PK dB(μ V/m)	Margin PK (dB)	Limit AV dB(μ V/m)	Margin AV (dB)
1299	44.4	-	74.0	-29.6	54.0	-
2390	42.0	-	74.0	-32.0	54.0	-
3007	46.3	-	74.0	-27.7	54.0	-
11810	49.7	-	74.0	-24.3	54.0	-
13136	49.1	-	74.0	-24.9	54.0	-
17354	51.6	-	74.0	-22.4	54.0	-

Channel 20

Frequency (MHz)	Level PK dB(μ V/m)	Level AV dB(μ V/m)	Limit PK dB(μ V/m)	Margin PK (dB)	Limit AV dB(μ V/m)	Margin AV (dB)
1246	45.1	-	74.0	-28.9	54.0	-
2394	43.0	-	74.0	-31.0	54.0	-
3171	46.4	-	74.0	-27.6	54.0	-
4880	41.8	-	74.0	-32.2	54.0	-
11849	49.5	-	74.0	-24.5	54.0	-
17861	51.8	-	74.0	-22.2	54.0	-

Channel 40

Frequency (MHz)	Level PK dB(μ V/m)	Level AV dB(μ V/m)	Limit PK dB(μ V/m)	Margin PK (dB)	Limit AV dB(μ V/m)	Margin AV (dB)
1997	46.6	-	74.0	-27.4	54.0	-
2486	46.3	-	74.0	-27.7	54.0	-
3387	46.3	-	74.0	-27.7	54.0	-
11893	49.1	-	74.0	-24.9	54.0	-
17868	51.8	-	74.0	-22.2	54.0	-

Note: All values in the tables are less than 6 dB over the noise level and means to be noise level. No emission could be found.

Limit according to FCC Part 15C, Section 15.209:

Frequency (MHz)	15.209 Limits (μ V/m)	Measurement distance (m)
0.009 - -0.49	2400/f(kHz)	300
0.49 – 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

Average limit according to FCC Part 15C, Section 15.249(a):

Fundamental frequency (MHz)	Field strength of harmonics	
	($\mu\text{V/m}$)	$\text{dB}(\mu\text{V/m})$
902 - 928	500	54
2400 - 2483.5	500	54
5725 - 5875	500	54
24000 - 24250	2500	68

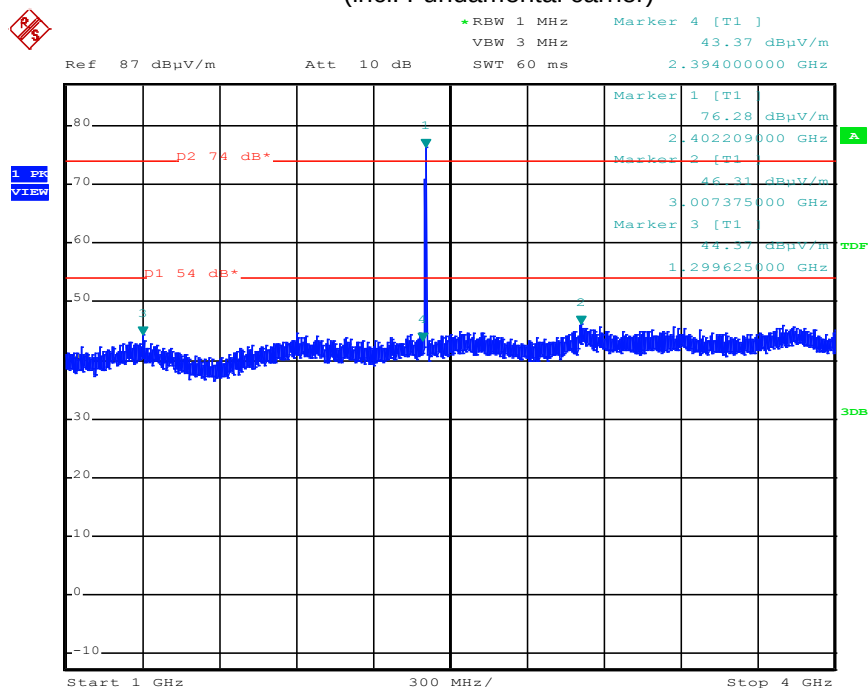
The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocols. Only the worst case plots are listed.

5.3.4 Test protocols

CH1:

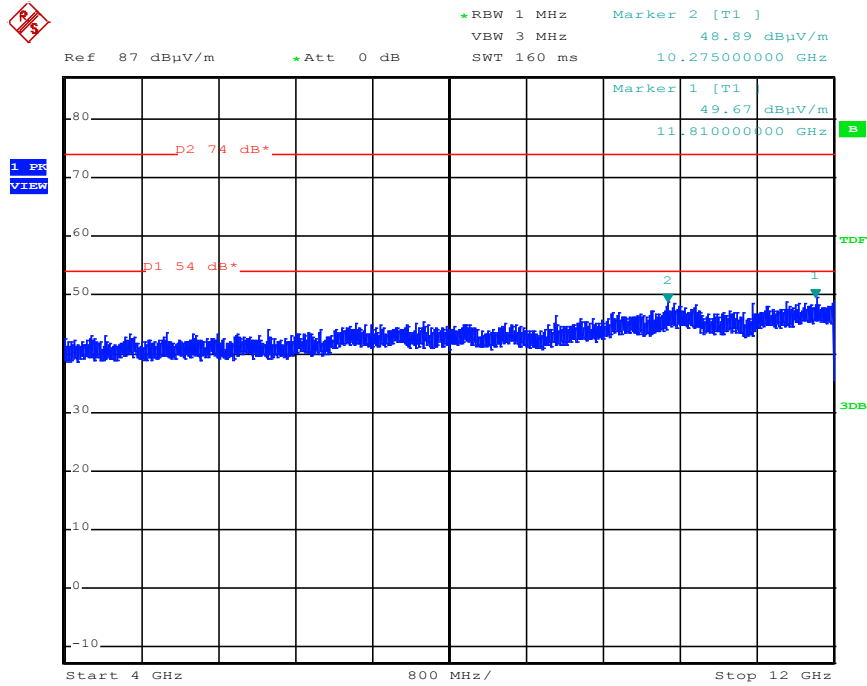
Spurious emissions from 1 to 4 GHz
(incl. Fundamental carrier)



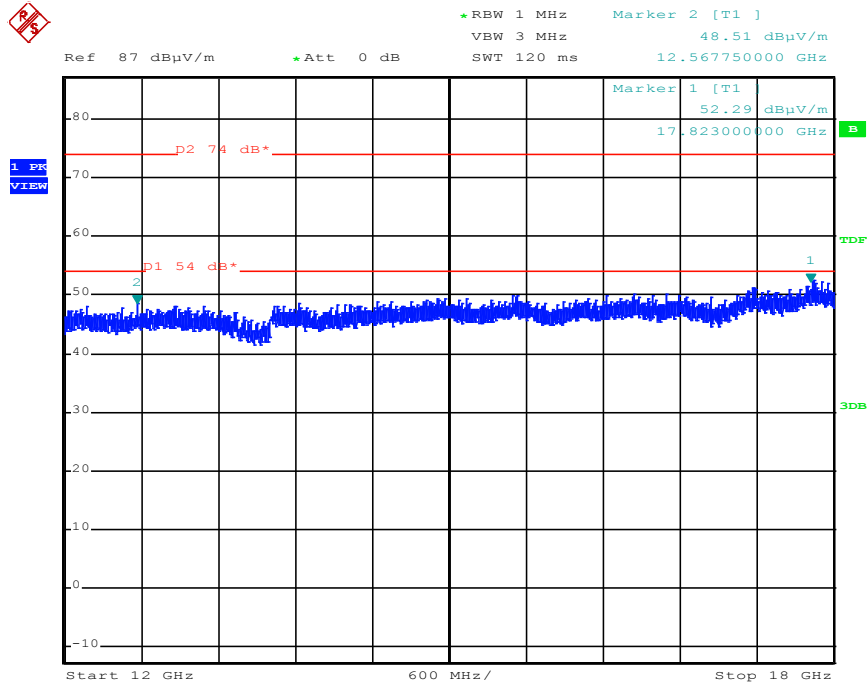
FCC ID: SHI-A39M01

IC ID: 10833A-A39M01

Spurious emissions from 4 to 12 GHz



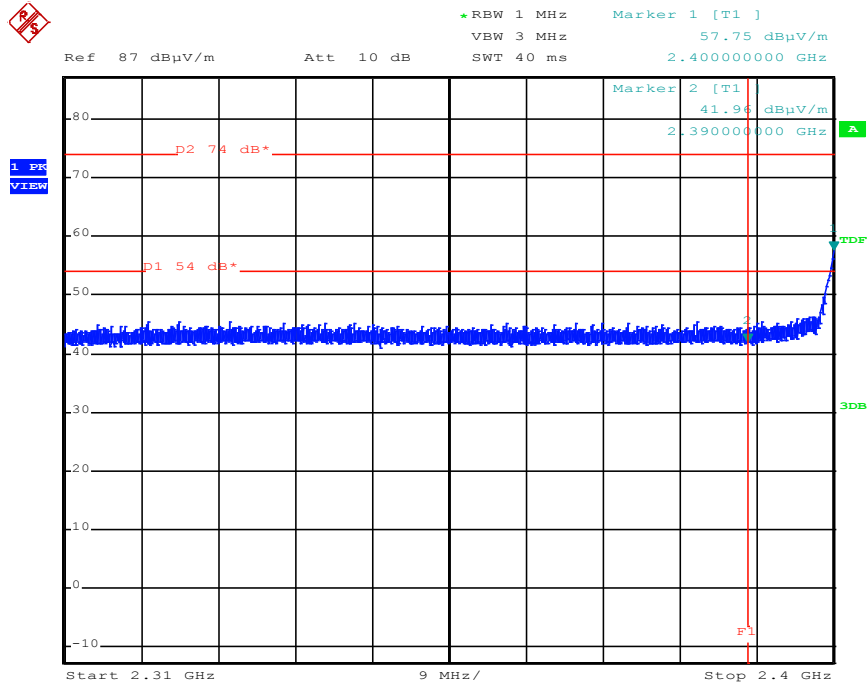
Spurious emissions from 12 to 18 GHz



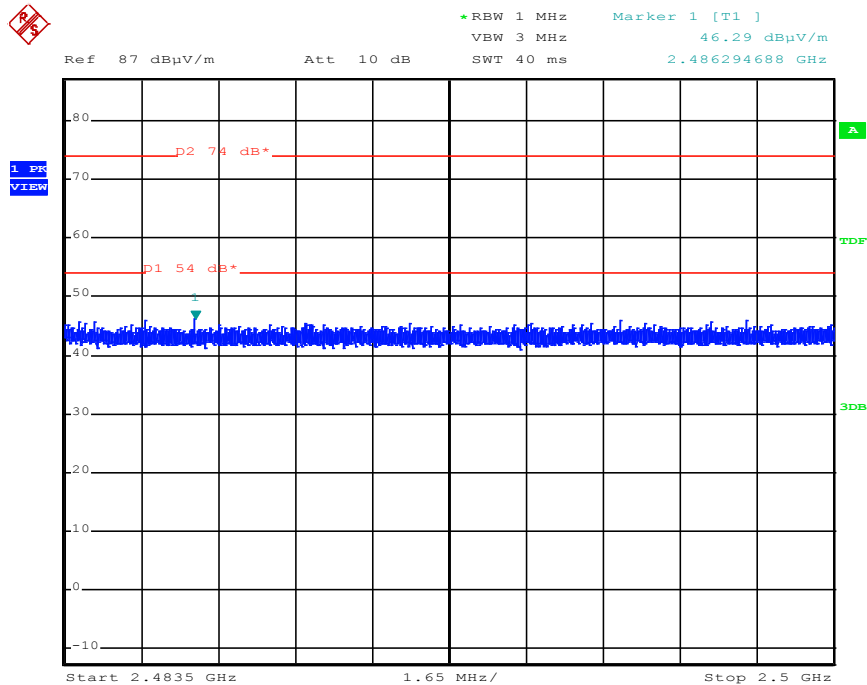
FCC ID: SHI-A39M01

IC ID: 10833A-A39M01

Spurious emissions in restricted band 2300 – 2390 MHz, CH1



Spurious emissions in restricted band 2483.5 – 2500 MHz, CH40



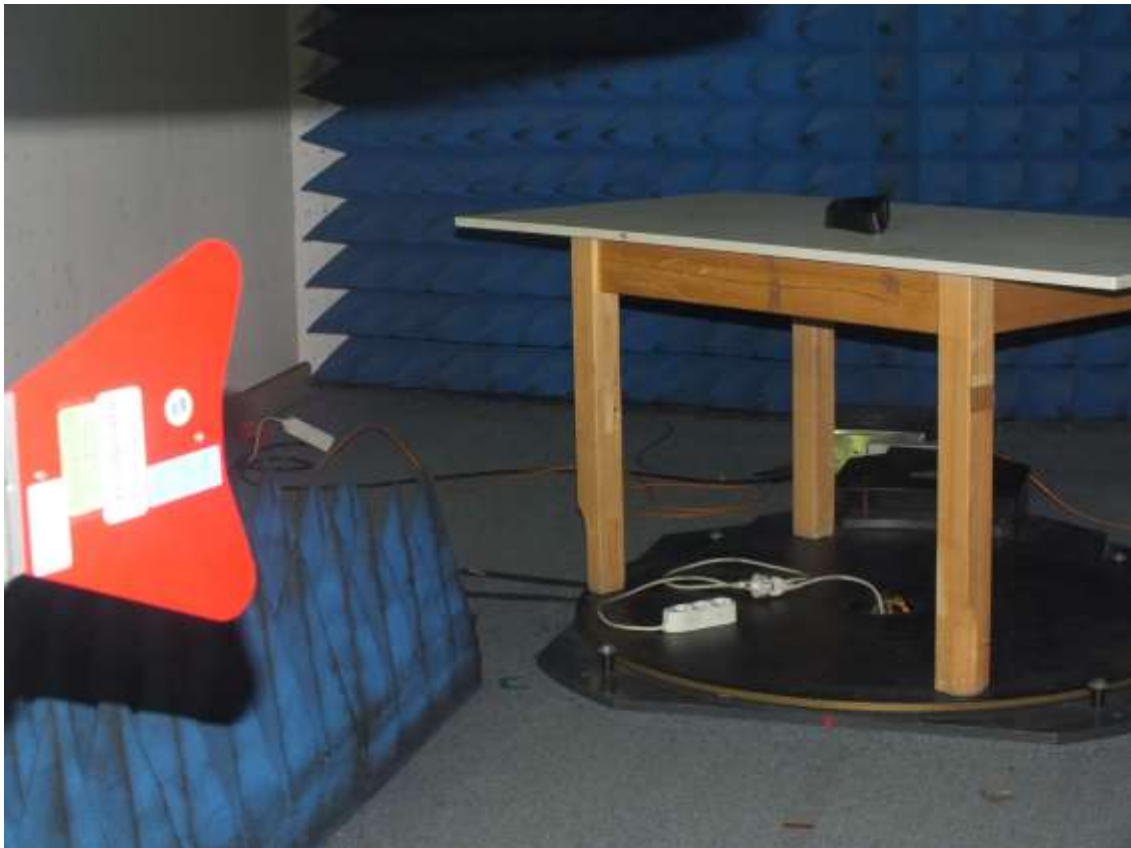
5.4 EBW and OBW

For test instruments and accessories used see section 6 Part MB.

5.4.1 Description of the test location

Test location: AREA4

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to FCC Part 15, Section 15.215(c):

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Section 15.217 through Section 15.257, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated.

5.4.4 Description of Measurement

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio of -20 dB (99%). The x-dB-down (OBW) function of the analyser is used. The measurement is performed with normal modulation in TX continuous mode.

Spectrum analyser settings:

RBW: 30 kHz, VBW: 100 kHz, Span: 6 MHz, Trace mode: max. hold, Detector: max. peak;

5.4.5 Test result

Operating frequency band (MHz)	20 dB Bandwidth (MHz)
$f_{low} > 2400$	$f_{low} = 2401.500$
$f_{high} < 2483.5$	$f_{high} = 2480.544$

Centre f (MHz)	99% bandwidth f_1	99% bandwidth f_2	Measured OBW (MHz)
2402.020000	2401.5	2402.540000	1.040000
2439.988000	2439.46	2440.516000	1.056000
2480.020000	2479.496	2480.544000	1.048000

Limit according to FCC Part 15C, Section 15.215(c):

If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Due to the channelising of the operating band into 79 channels with channel bandwidth of 1 MHz the limit central 80% of the permitted band can not be applied. Therefore the stability of the EUT will be shown staying within the mentioned operating band.

The requirements are **FULFILLED**.

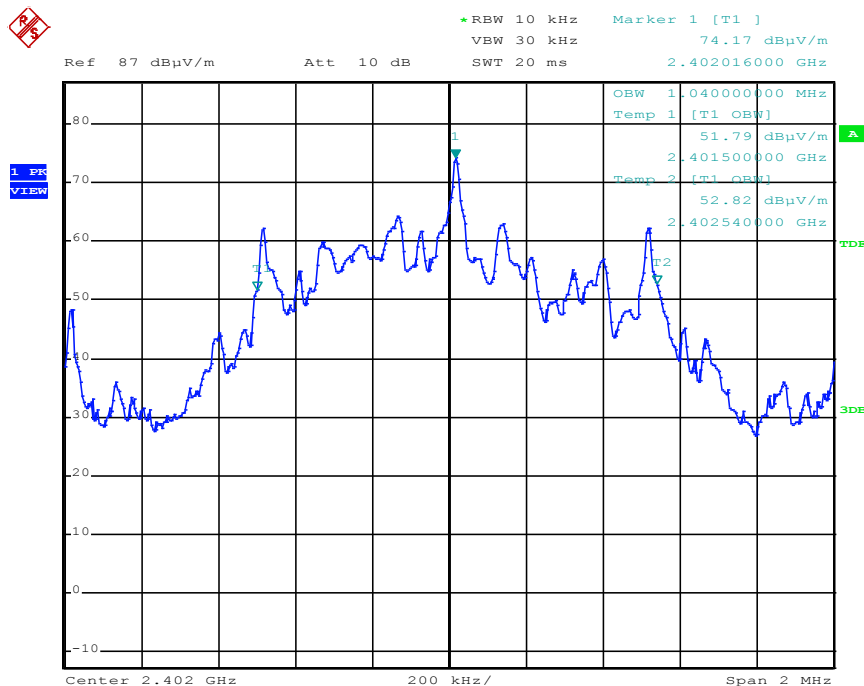
Remarks: For detailed test result please refer to following test protocols.

The OBW99 is measured for RSS only.

5.4.6 Test protocols

OBW 99%

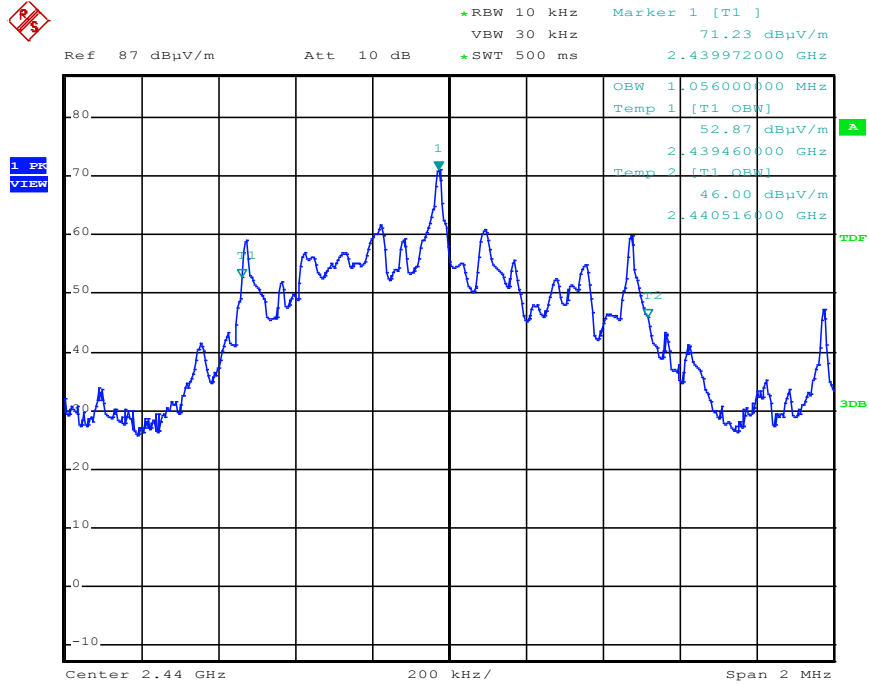
CH1:



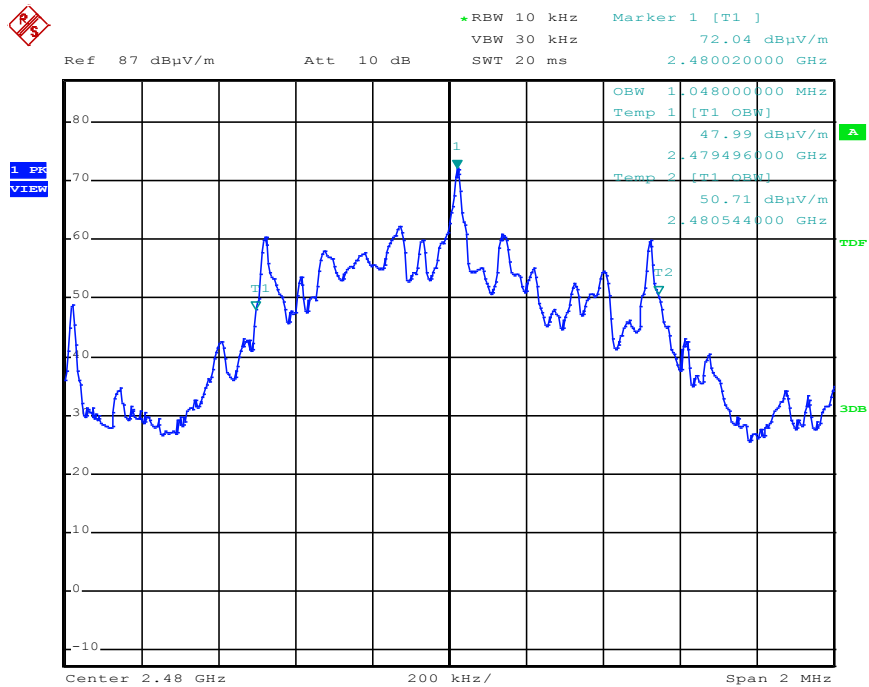
FCC ID: SHI-A39M01

IC ID: 10833A-A39M01

CH20:



CH40:



5.5 Correction for pulse operation (duty cycle)

For test instruments and accessories used see section 6 Part DC.

5.5.1 Description of the test location

Test location: NONE

Remarks: Not applicable, the EUT has very low output power.

5.6 Antenna application

5.6.1 Applicable standard

According to FCC Part 15C, Section 15.203(a):

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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.

5.6.2 Result

The EUT use an integrated PCB antenna. No other antenna than that furnished by the responsible party or external power amplifier can be applied by a customer.

The antenna of the EUT meets the requirement of FCC Part 15C, Section 15.203 and 15.204.

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 3	FSP 40	02-02/11-11-001	30/09/2014	30/09/2013		
	AMF-4F-04001200-15-10P	02-02/17-05-004				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	3117	02-02/24-05-009	04/04/2014	04/04/2013		
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				
MB	FSP 40	02-02/11-11-001	30/09/2014	30/09/2013		
	AMF-4F-04001200-15-10P	02-02/17-05-004				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	3117	02-02/24-05-009	04/04/2014	04/04/2013		
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				
SER 1	FMZB 1516	01-02/24-01-018			14/02/2014	14/02/2013
	ESCI	02-02/03-05-005	03/12/2013	03/12/2012		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 2	ESVS 30	02-02/03-05-006	28/06/2014	28/06/2013		
	VULB 9168	02-02/24-05-005	11/04/2014	11/04/2013	04/03/2014	04/09/2013
	S10162-B	02-02/50-05-031				
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
SER 3	FSP 40	02-02/11-11-001	30/09/2014	30/09/2013		
	AMF-4F-04001200-15-10P	02-02/17-05-004				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	3117	02-02/24-05-009	04/04/2014	04/04/2013		
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				