



**Telecommunications & Telematics  
for Transports Lab.**

# TEST REPORT

Ref. No. ARSK00185

Date: 2010-12-03

Measurements performed in accordance with:



**FCC Rules : Code of Federal Regulations (CFR) no. 47  
PART 15 – RADIO FREQUENCY DEVICES**

PRODUCT : WIRELESS AUXILIARY SENSOR FOR EMG SYSTEM

TESTED MODEL : BTSWAUX

FCC ID : YQH-BTSWAUX

APPLICANT : BTS S.p.A. – Viale Forlanini, 40 – I-20024 Garbagnate Milanese (MI)

MANUFACTURER : BTS S.p.A. – Viale Forlanini, 40 – I-20024 Garbagnate Milanese (MI)

TRADEMARK : BTS BIOENGINEERING

SERIAL NUMBER : /

OTHER INFORMATION      Testing dates : 2010-09-14 - 2010-09-18 - IMQ BEM: 55886

                                    Tested samples No. : 1

                                    Testing Laboratory : IMQ S.p.A. Via Quintiliano, 43 I-20138 MILANO

Tested by : R. Torri	Signature: <i>Roberto Torri</i>	Date : 2010-12-03
Checked by: M. De Angelis	Signature: <i>Marco De Angelis</i>	Date : 2010-12-03

## Revision Sheet

Release No.	Date	Revision Description
Rev. 1	2010-12-03	Adjustment pag. 5, 11, 21, 22 and 23
Rev. 0	2010-11-19	Test Results and Evaluation Report

NOTICE: The results of tests and checks reported in this Test Report refer exclusively to the samples tested and described in the Report itself.  
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**IMQ S.p.A. - Via Quintiliano, 43 – I-20138 MILANO**

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# 1 GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST

## 1.1 APPLICANT

NAME	BTS S.p.A.
ADDRESS	Viale Forlanini, 40 – 20024 Garbagnate Milanese (MI)
COUNTRY	ITALY

## 1.2 MANUFACTURER

NAME	BTS S.p.A.
ADDRESS	Viale Forlanini, 40 – 20024 Garbagnate Milanese (MI)
COUNTRY	ITALY

## 1.3 EQUIPMENT CLASSIFICATION

According to the definition 15.3 (o) EUT is a **Intentional Radiator operating within the bands 2400-2483,5 MHz** so it shall fulfil provisions of 47CFR Part 15 Subpart C – Intentional radiators – and Section 15.247.

## 1.4 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Parameters	Value
Type of equipment :	WIRELESS AUXILIARY SENSOR FOR EMG SYSTEM
Model:	BTSWAUX
FCC ID. :	YQH-BTSWAUX
Trade Name:	BTS BIOENGINEERING
Data cable :	/
Telecom cable :	/
Power supply type :	dedicated Li-Ion battery pack
AC power input cable :	/
DC power input cable :	/

Model tested	Description
BTSWAUX	Portable wireless sensor
Derivate model	Description
N.A.	N.A.

## 1.5 FEATURE OF EQUIPMENT UNDER TEST

Power specification	/
Operating frequency:	2405 ÷ 2480 MHz
Maximum RF radiated power:	+2.41 dBm
Modulation:	DTS
Channel Spacing:	5 MHz
Antenna:	Integral antenna
RX sensitivity:	/
Main SW identification	/
Main HW Board identification	/
Peripherals included (for system application)	None
Interfaces :	None
Integrated interfaces :	None
AC adapter:	None

## CHANNEL CONFIGURATION

Channel (No.)	Frequency (MHz)
11	2405
12	2410
13	2415
14	2420
15	2425
16	2430
17	2435
18	2440
19	2445
20	2450
21	2455
22	2460
23	2465
24	2470
25	2475
26	2480

## 2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST

### 2.1 ENVIRONMENTAL CONDITIONS

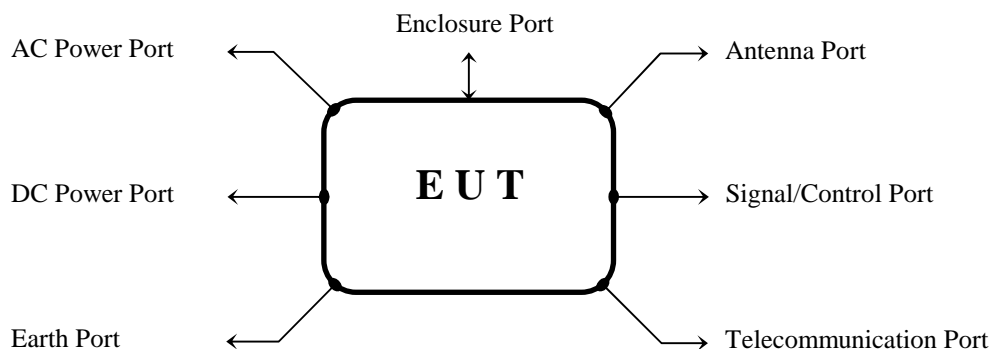
TEST CONDITIONS	MEASURED
Ambient Temperature	20 ÷ 25 °C
Relative Humidity	50 ÷ 60 %
Atmospheric Pressure	900 ÷ 1000 mbar

### 2.2 DESCRIPTION OF SUPPORT EQUIPMENT

Here following the details concerning equipment needed for correct operation or loading of the EUT:

EQUIPMENT	MANUFACTURER	MODEL
Acquisition Unit	BTS	FREEEMG 300

## 2.3 INTERFACE IDENTIFICATION AND CONNECTION DIAGRAM OF TEST SYSTEM



#	Port	Description	Max length	Ref. Document
1	Enclosure	Plastic case	/	/
2	AC power input	dedicated Li-Ion battery pack	/	/
2	AC power output	Not present	/	/
3	DC power input	Not present	/	/
4	Earth	Non present	/	/
5	Telecommunication	Non present	/	/
6	Signal	Wireless network	/	/
6	Control	Non present	/	/
7	Antenna	Integral antenna	/	/



### 3 OPERATION OF EQUIPMENT UNDER TEST

#### 3.1 OPERATING TEST CONDITIONS

Ref.	Description
#1	Continuous transmission (single channel transmission)

## 4 TESTS IDENTIFICATION AND RESULTS

**TABLE 1 : SUMMARY OF TESTS**

CFR47 Part 15 Section	Title	Operating condition	Result	Test No.
<b>15.203</b> <b>15.247 (b)(4)(i)</b>	<b>Antenna Requirements</b>	/	PASS	1
15.207 (a)	Conducted Emission	Not applicable		
<b>15.209 (a) (f)</b>	<b>Radiated Emission</b>	#1	PASS	2
<b>15.247 (a)</b>	<b>Frequency Hopping Spread Spectrum Specifications</b>			
15.247(a)	20 dB Bandwidth	Not applicable		
15.247(a)(1)	Carrier frequency (Hopping Channel) Separation	Not applicable		
15.247(a)(1)(iii)	Number of Hopping Channels Used	Not applicable		
15.247(a)(1)(iii)	Time occupancy (Dwell Time) of Each Channel (ch) within a $0,4 \times N_{ch}$ (sec) Period	Not applicable		
<b>15.247(a)(2)</b>	<b>6dB Minimum Bandwidth</b>	#1	PASS	3
<b>15.247(b)</b>	<b>Maximum Peak Output Power</b>			
15.247(b) (1)	Peak Output Power	Not applicable		
<b>15.247(b) (3)</b>	<b>RF power output, radiated (EIRP)</b>	#1	PASS	4
15.247(b) (4)	Antenna gain	Not applicable		
15.247(c)	Operation with directional antenna gains greater than 6 dBi	Not applicable		
<b>15.247 (d)</b>	<b>100 kHz Bandwidth of Frequency Band Edges</b>	#1	PASS	5
<b>15.247 (d)</b>	<b>Radiated Emission</b>	#1	PASS	6
<b>15.247 (e)</b>	<b>Power Spectral Density</b>	#1	PASS	7
15.247 (f)	Hybrid systems	Not applicable		
15.247 (g)	FHSS Transmission characteristics	Not applicable		
15.247 (h)	Recognition of occupied channel and multiple transmission system	Not applicable		
<b>15.247(i)</b> <b>(§ 47CFR 1.1307(b)(1))</b>	<b>RF humane exposure</b>	#1	PASS	8

The uncertainties for the tests and measurements are those listed in IMQ Operational Instruction IO-80-U01.

## 4.1 METHODS OF MEASUREMENT

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All compliance measurements have been carried out using the procedures described in the standard ANSI C63.4-2009, ANSI C64.10-2009 and Section 15.31 of CFR47 Part 15 – Subpart A (General).

Additional test requirements have been adopted according to the reference Section indicated in the Test Table 1.

## 4.2 FREQUENCY RANGE INVESTIGATED

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Radiated emission tests: from 9 kHz to tenth harmonic of fundamental.

## 5 MEASUREMENTS AND TESTS DATA

TEST No. 1	Title "Antenna Requirements"	47CFR Part 15 Ref. Section <b>15.203 / 15.204</b>
<b>TEST REQUIREMENTS</b>	<p>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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.</p>	

Antenna specifications	
N° of authorized antenna types	Not Applicable
Antenna type	Integral antenna
Maximum total gain	---
External power amplifiers	Not present

### Test Result:

The transmitter meets the requirements of section 15.203 and 15.204

TEST No. 2	Title "Radiated disturbances"	47CFR Part 15 Ref. Section
		15.209
TEST REQUIREMENTS	Test setup	ANSI C63.4
	Test facility	Semi-anechoic chamber
	Test distance	3 m
	Limits for radiated disturbances	15.209 (a)
	Frequency range	9 kHz to tenth harmonic of fundamental
	IF bandwidth (below 30 MHz)	9 kHz
	IF bandwidth (below 1,000 MHz)	120 kHz
	IF bandwidth (above 1,000 MHz)	1 MHz
	EMC class	B
	(*) In accordance with part 15.31 (f) (2), where the measurement distance was specified to be 30 or 300 meters, a correction factor was applied in order to permit measurement to be performed at a separation distance. The applied formula for limits at 3 meter is: Extrapolation (dB) = $40\log(300\text{meter} / 3\text{meter}) = +80\text{db}$ Extrapolation (dB) = $40\log(30\text{meter} / 3\text{meter}) = +40\text{db}$	

- 1) The EUT was placed on turntable which is 0.8 m above the ground plane
- 2) The turntable shall rotate from 0° to 360° degrees to determine the position of maximum emission level.
- 3) The EUT is positioned 3 m away from the receiving antenna which varied from 1 to 4 m to find the highest emission.
- 4) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 100 kHz below 1000 MHz and 1 MHz above 1000 MHz.
- 5) The receiving antenna was positioned in both horizontal and vertical polarization.
- 6) The measurements with Quasi-Peak detector, below 1000 MHz are performed only for frequencies for which the Peak values are  $\geq$  (Q.P. limit - 6 dB).

#### LIMITS FOR SPURIOUS

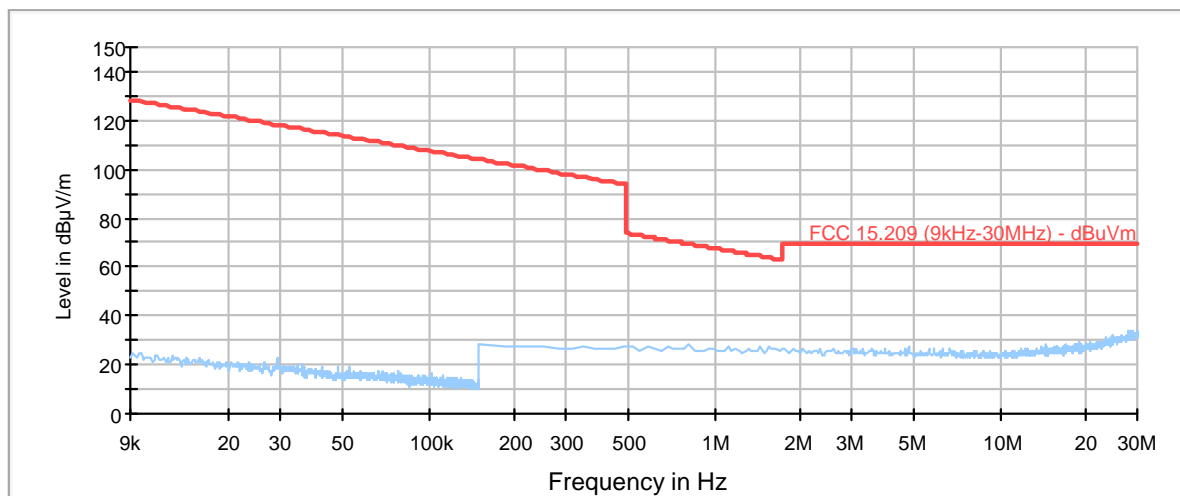
Band of operations	Peak (dBμV/m)	Average Limit (dBμV/m)
Restricted bands (par. 15.205)	74	54
Other bands	According to 15.209 or fundamental -20dB (which is greater)	According to 15.209 or fundamental -20dB (which is greater)

#### Tested samples

SAMPLE
BTSWAUX

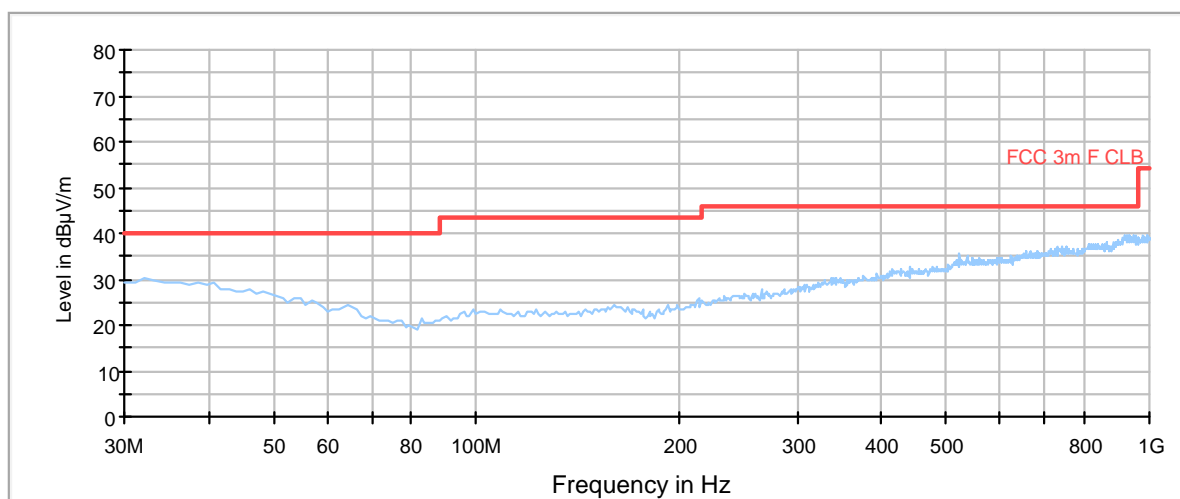
## MEASUREMENTS RESULTS (9kHz÷30 MHz)

AUTOTEST 3m with Scans LOOP HFH2-Z2 ESMI 9kHz 30MHz (ris in dBuV/m)



## MEASUREMENTS RESULTS (30÷1,000 MHz)

FCC part15 CLB 3m with Scans ARA ESMI



**MEASUREMENTS RESULTS (1000 MHz to 24800 MHz)**

Channel n°11 : 2,405 MHz

**PEAK RESULT (RBW=1MHz; VBW=1MHz)**

Frequency (MHz)	Measured Level (dBμV/m)	Limit (μV/meter)	Limit (dBμV/m)	Margin(dB)
2,405 (fundamental)	93.47	---	---	---
4,808	50.62	5000	74.00	-23.38
7,214	53.95	5000	74.00	-20.05
9,621	54.77	5000	74.00	-19.23
12,025	54.88	5000	74.00	-19.12
f>12,026	No spurious detected	5000	74.00	---

**AVERAGE FACTOR**

T. Pulse (ms)	TX on + TX off (ms)	Duty cycle	Average Factor (dB)
---	---	100%	---

**AVERAGE RESULT (RBW=1MHz; VBW=10Hz)**

Frequency (MHz)	Measured Level (dBμV/m)	Limit (μVolt/meter)	Limit (dBμV/m)	Margin (dB)
2,405 (fundamental)	83.59	---	---	---
4,808	42.06	500	54	-11.94
7,214	41.87	500	54	-12.13
9,607	42.63	500	54	-11.37
12,028	43.28	500	54	-10.17
f>12,024	No spurious detected	500	54	---

**Channel n°26 : 2.480 MHz**
**PEAK RESULT (RBW=1MHz; VBW=1MHz)**

Frequency (MHz)	Measured Level (dBμV/m)	Limit (μV/meter)	Limit (dBμV/m)	Margin(dB)
2,480 (fundamental)	97.81	---	---	---
4,960	57.69	5000	74	-16.31
7,438	51.44	5000	74	-22.56
9,919	54.72	5000	74	-19.28
12,401	54.74	5000	74	-19.26
f>12,402	No spurious detected	5000	74	---

**AVERAGE FACTOR**

T. Pulse (ms)	TX on + TX off (ms)	Duty cycle	Average Factor (dB)
---	---	100%	---

**AVERAGE RESULT (RBW=1MHz; VBW=10Hz)**

Frequency (MHz)	Measured Level (dBμV/m)	Limit (μVolt/meter)	Limit (dBμV/m)	Margin (dB)
2.480 (fundamental)	93.59	---	---	---
4,960	50.41	500	54	-3.59
7,438	41.91	500	54	-12.09
9,921	42.73	500	54	-11.27
12,401	41.85	500	54	-12.15
f>12,402	No spurious detected	500	54	---



TEST No.3	Title “6 dB Bandwidth”	47CFR Part 15 Ref. Section
		15.247 (a) (2)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings	
	Span	2 MHz
	Resolution (or IF) Bandwidth (RBW)	100 kHz
	Video (or Average) Bandwidth (VBW)	300 kHz
	Sweep time	2,5 ms
	Detector function	Peak
	Trace	max hold
	Attenuator	/
	LIMIT	---

The EUT is set to transmit has its maximum data rate.

The transmitter output was connected to the spectrum analyzer through a temporary FR 50Ω connector type SMA.

The Channel bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.

#### Test Result:

Channel (No.)	Frequency (MHz)	Channel Bandwidth (MHz)
11	2,405	1.584
18	2,440	1.593
26	2,480	1.620

#### Tested samples

SAMPLE
BTSWAUX

TEST No.4	Title	47CFR Part 15 Ref. Section
	“ Maximum Peak Output Power with External Antenna (De Facto EIRP) ”	15.247 (b) (3)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings	
	Span	/
	Resolution (or IF) Bandwidth (RBW)	10 MHz
	Video (or Average) Bandwidth (VBW)	10 MHz
	Sweep time	2,5 ms
	Detector function	Peak
	Trace	max hold
	Attenuator	/
	LIMIT	1 Watt (30dBm)

#### Conducted measurements:

The transmitter output was connected to the spectrum analyzer through a temporary RF 50Ω connector type SMA.

#### Radiated measurements:

As the EUT is supplied with a dedicated antenna, the effective radiated power is measured in a 3 m anechoic chamber with the substitution antenna method.

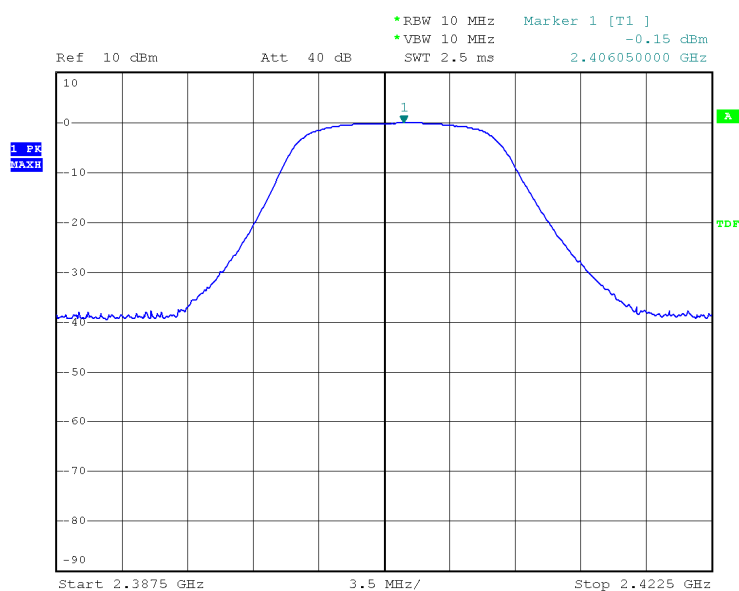
#### Tested samples

SAMPLE
BTSWAUX

## Test Result

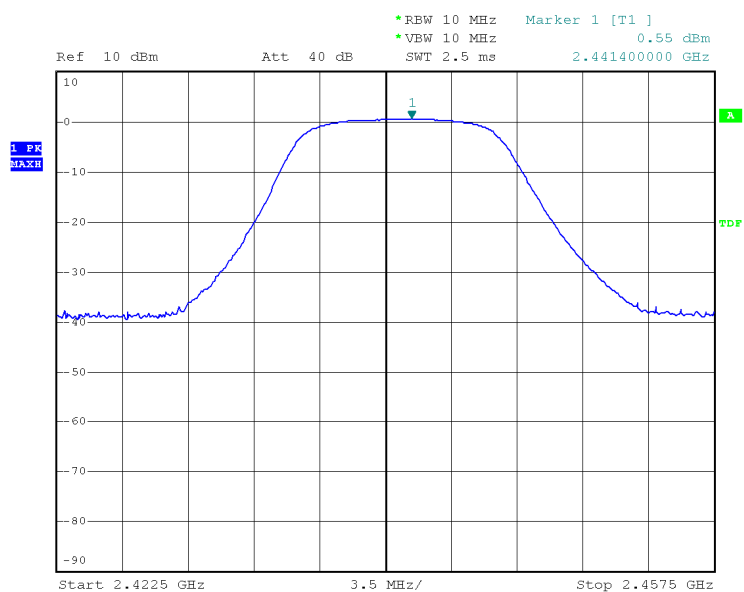
### Radiated measure (Peak detector)

Channel (No.)	Frequency (MHz)	Measured Output Power (dBm)	Max. Antenna Gain (dB)	Radiated Output Power (dBm)
11	2,405	---	---	-0.15
18	2,445	---		+0.55
26	2,480	---		+2.41



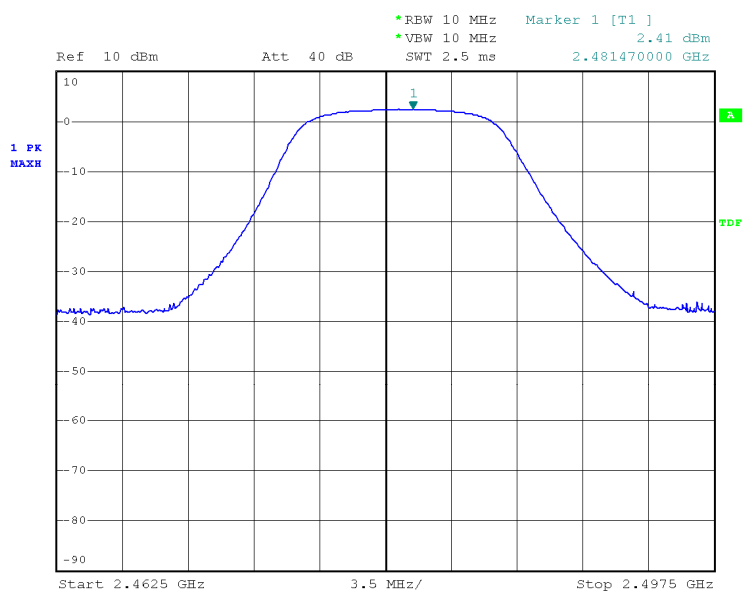
TLP-NT2

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TLP-NT2

Date: 17.SEP.2010 09:51:51



TLP-NT2

Date: 17.SEP.2010 09:44:15

TEST No. 5	Title	47CFR Part 15 Ref. Section
	“Band-edge Compliance of RF Radiated Emissions “	15.247 (d)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings	
	Span	Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation
	Resolution (or IF) Bandwidth (RBW)	1 MHz (100 kHz band-edge)
	Video (or Average) Bandwidth (VBW)	1 MHz (100 kHz band-edge)
	Sweep time	Auto
	Detector function	Peak
	Trace	Max hold
	Attenuator	/
	LIMIT	-20 dB below peak output power
	NOTE: Duty cycle approx. 100%	

Only for measuring emissions up to 2 MHz removed from the band-edge the "delta" technique for Radiated emissions was used.

Delta technique: The transmitter output was connected to the spectrum analyzer through a test fixture (radio frequency coupling device associated with the dedicated antenna of the equipment under test) Once the trace is stabilized, by the marker the emission at the band edge (or on the highest modulation product outside of the band, if this level is greater than that at the band edge) was set. The “n” by the marker-delta function and the marker-to-peak function the peak of the in-band emission was selected. The marker-delta value displayed was compared with the limit specified in this Section.

### Tested samples

SAMPLE
BTSWAUX

## Test Result:

### Band-edge compliance, lower band edge

All out of band spurious emissions are more 20 dB below the in band power of the fundamental.

Band-edge compliance to radiated emission test – Lower 2.405 MHz					
Mode	Measured power (dBμV/m)	Measured power at the band edge (dBμV/m)	Difference Peak – band edge (dBμV/m)	Peak Limit at PK power –20 dB (dBμV/m)	Margin (dBμV/m)
Peak	89.26	47.29	-41.97	69.26	-21.97
Average	88.31	47.29	-41.02	68.31	-23.02
Within the limit					

### Spurious Emission in restricted band near 2400-2483.5 MHz

Band-edge compliance to radiated emission test – Lower 2.405 MHz				
Mode	Measured Level (dBμV/m)	Limit (μVolt/meter)	Limit (dBμV/m)	Margin (dB)
Peak	48.19	5000	74.00	-25.81
Average	32.05	500	54.00	-21.95
Within the limit				

### Band-edge compliance, upper band edge

All out of band spurious emissions are more 20 dB below the in band power of the fundamental.

Band-edge compliance to radiated emission test – Lower 2.480 MHz					
Mode	Measured power (dBμV/m)	Measured power at the band edge (dBμV/m)	Difference Peak – band edge (dBμV/m)	Peak Limit at PK power –20 dB (dBμV/m)	Margin (dBμV/m)
Peak	86.93	53.87	-33.06	66.93	-13.06
Average	85.58	52.97	-32.61	65.58	-14.61
Within the limit					

### Spurious Emission in restricted band near 2400-2483.5 MHz

Band-edge compliance to radiated emission test – Upper 2.480 MHz				
Mode	Measured Level (dBμV/m)	Limit (μVolt/meter)	Limit (dBμV/m)	Margin (dB)
Peak	53.72	5000	74.00	-20.28
Average	52.25	500	54.00	-1.75
Within the limit				

TEST No.6	Title “Conducted Emissions outside the band 2,400-2,483.5 MHz”	47CFR Part 15 Ref. Section
		15.247 (d)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings	
	Span	/
	Resolution (or IF) Bandwidth (RBW)	100 kHz
	Video (or Average) Bandwidth (VBW)	300 kHz
	Sweep time	as necessary to capture the entire dwell time
	Detector function	Peak
	Trace	max hold
	Attenuator	/
	<b>LIMIT</b>	<b>-20 dB below peak output power</b>

The transmitter output was connected to the spectrum analyzer through a temporary FR 50Ω connector type SMA.

The measure has been executed with the lowest transmit channel, the highest transmit channel and one located somewhere in the middle of the band.

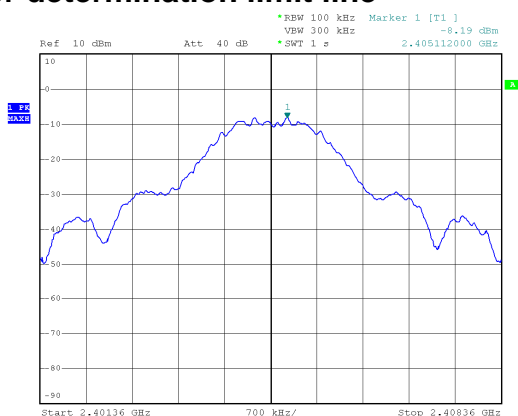
### Tested samples

SAMPLE
BTSWAUX

### Test Result:

Within the specifications

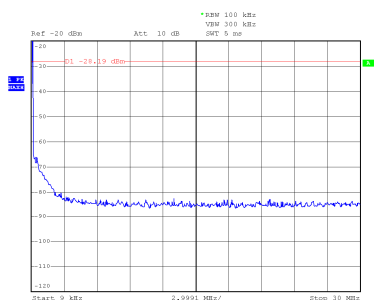
### Channel 11 : Power for determination limit line



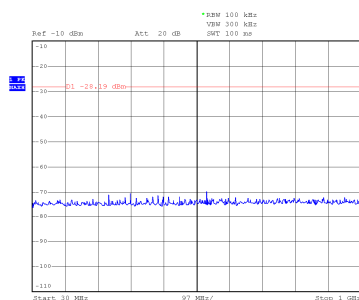
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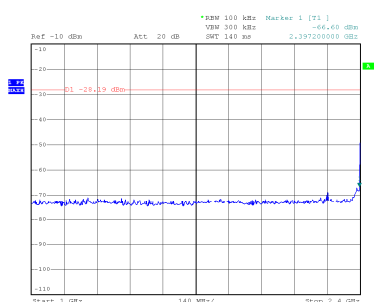
## Test Result: Conducted measure (channel 11)



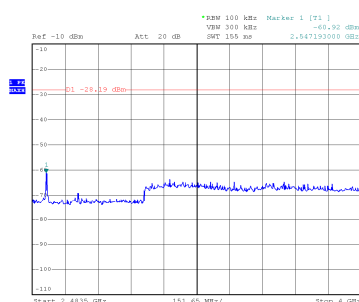
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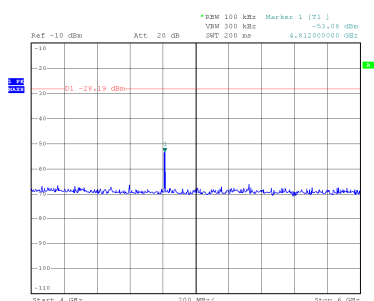
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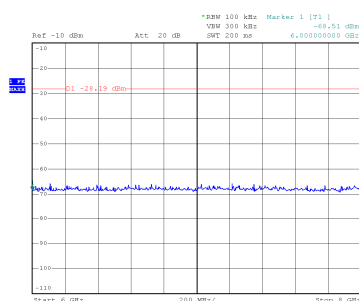
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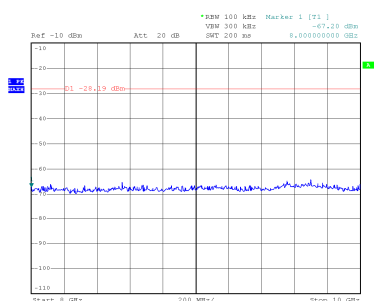
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Date: 16.SEP.2010 17:23:22



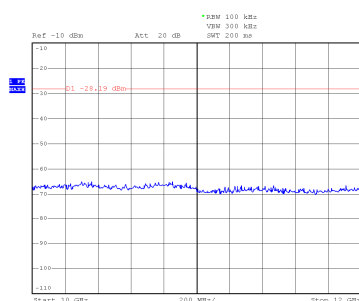
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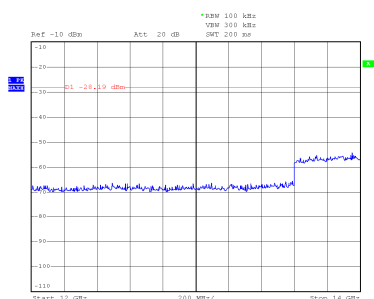
TLP-NT2  
Date: 16.SEP.2010 17:28:20



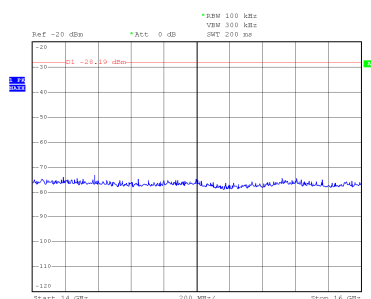
TLP-NT2  
Date: 16.SEP.2010 17:30:06



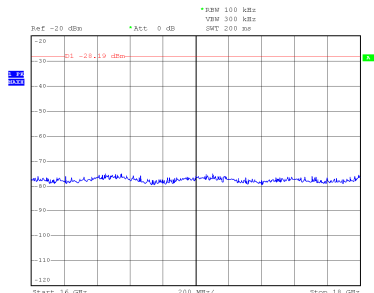
TLP-NT2  
Date: 16.SEP.2010 17:30:42



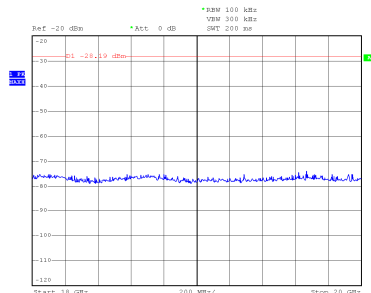
TLP-NT2  
Date: 16.SEP.2010 17:31:00



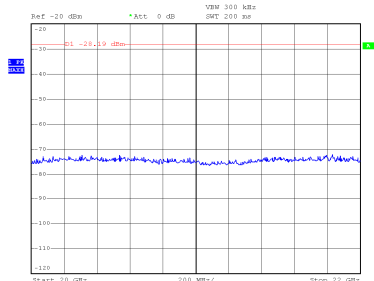
TLP-NT2  
Date: 16.SEP.2010 17:31:39



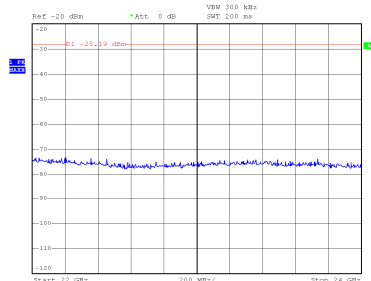
TLP-NT2  
Date: 16.SEP.2010 17:31:57



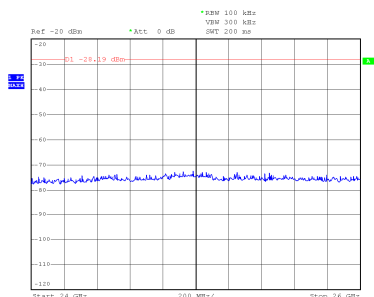
TLP-NT2  
Date: 16.SEP.2010 17:32:23



TLP-NT2  
Date: 16.SEP.2010 17:32:45



TLP-NT2  
Date: 16.SEP.2010 17:33:07



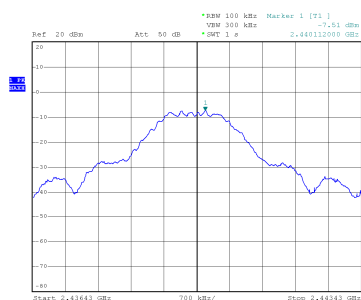
TLP-NT2  
Date: 16.SEP.2010 17:33:27

All out of band spurious emissions are more 20dB below the in band power of the fundamental.

#### PEAK RESULT Channel n°1: 2,405.00 MHz

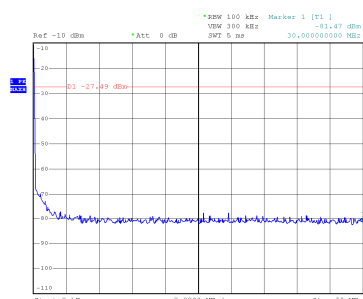
Frequency (MHz)	Measured Level (dBm)	Limit (dBm) Fundamental value – 20dB	Limit (dBm) Restricted band -33dBm	Margin (dB)
2,397.20	-66.60	-28.19	---	-38.41
2,405 (fundamental)	-8.19	---	---	---
2,547.19	-60.92	-28.19	---	-32.73
4,812.00	-53.08	---	-33	-20.08
6,000.00	-68.51	-28.19	---	-40.32
8,000.00	-67.20	-28.19		-30.01

## Channel 18 : Power for determination limit line

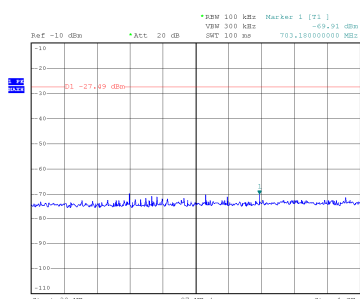


TLP-NT2  
Date: 16.SEP.2010 17:09:30

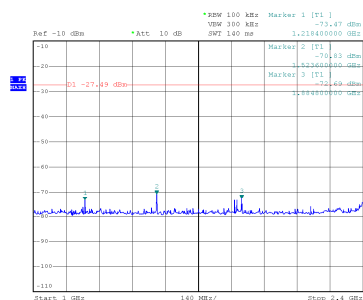
## Conducted measure (channel 18)



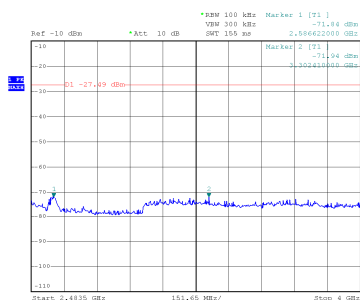
TLP-NT2  
Date: 16.SEP.2010 17:10:24



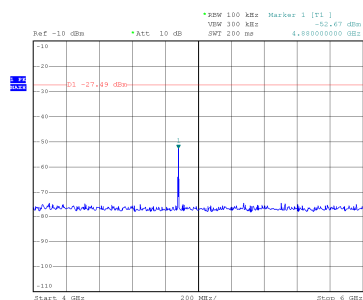
TLP-NT2  
Date: 16.SEP.2010 17:11:02



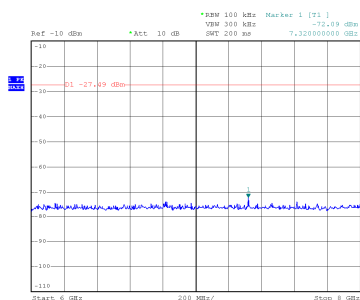
TLP-NT2  
Date: 16.SEP.2010 17:12:01



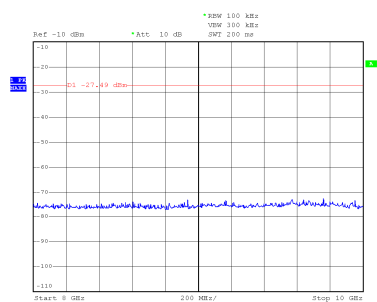
TLP-NT2  
Date: 16.SEP.2010 17:12:50



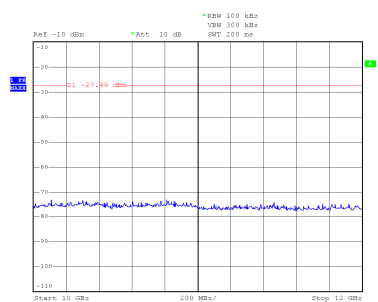
TLP-NT2  
Date: 16.SEP.2010 17:13:14



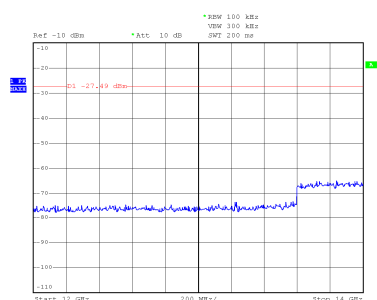
TLP-NT2  
Date: 16.SEP.2010 17:13:42



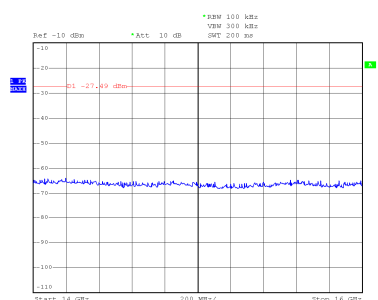
TLP-NT2  
Date: 16.SEP.2010 17:14:06



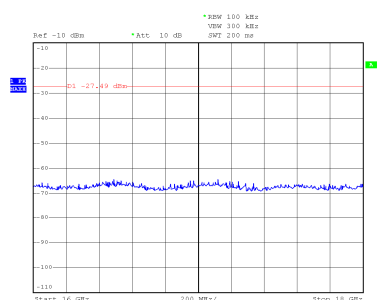
TLP-NT2  
Date: 16.SEP.2010 17:14:32



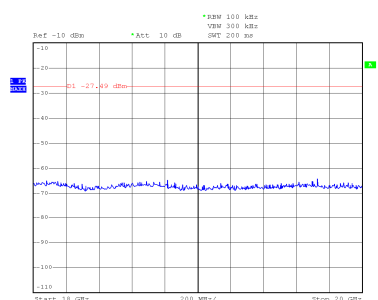
TLP-NT2  
Date: 16.SEP.2010 17:14:50



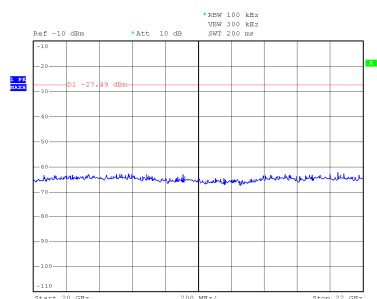
TLP-NT2  
Date: 16.SEP.2010 17:15:21



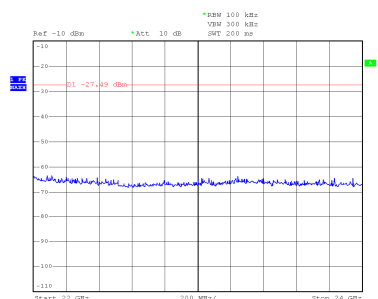
TLP-NT2  
Date: 16.SEP.2010 17:15:41



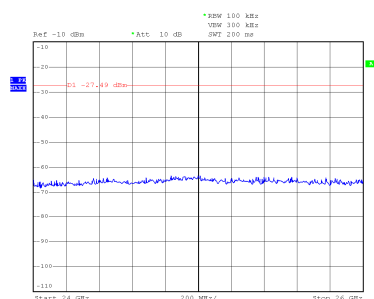
TLP-NT2  
Date: 16.SEP.2010 17:16:04



TLP-NT2  
Date: 16.SEP.2010 17:16:22



TLP-NT2  
Date: 16.SEP.2010 17:16:41



TLP-HR2  
Date: 16,SEP,2010 17:17:01

All out of band spurious emissions are more 20dB below the in band power of the fundamental.

### PEAK RESULT Channel n°18: 2445.00 MHz

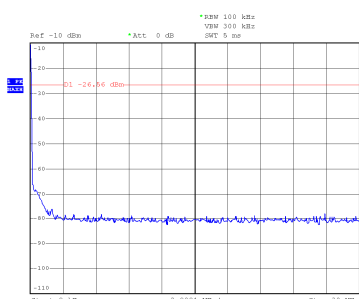
Frequency (MHz)	Measured Level (dBm)	Limit (dBm) Fundamental value – 20dB	Limit (dBm) Restricted band -33dBm	Margin (dB)
30.00	-81.47	-27.49	---	-53.98
703.18	-69.91	-27.49	---	-42.42
1,218.40	-73.47	---	-33	-40.47
1,523.60	-70.83	---	-33	-37.83
1,884.80	-72.69	-27.49	---	-45.20
2,445 (fundamental)	-7.51	---	---	---
2,586.62	-71.84	-18.24	---	-53.60
3,302.41	-71.94	-18.24	---	-53.70
4,880.00	-42.69	---	-33	-9.69
7,320.00	-72.09	---	-33	-39.09

## Channel 26 : Power for determination limit line

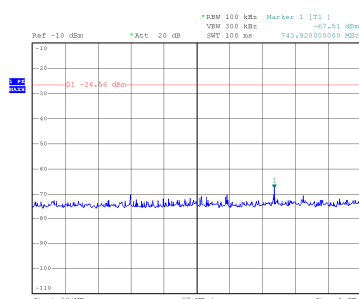


TLP-NT2  
Date: 16.SEP.2010 16:46:05

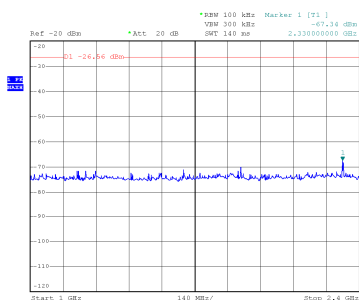
## Conducted measure (channel 26)



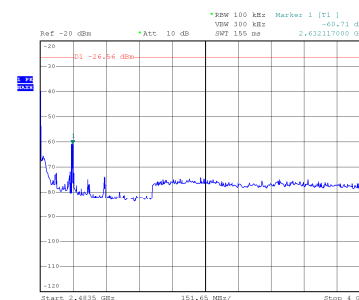
TLP-NT2  
Date: 16.SEP.2010 16:47:22



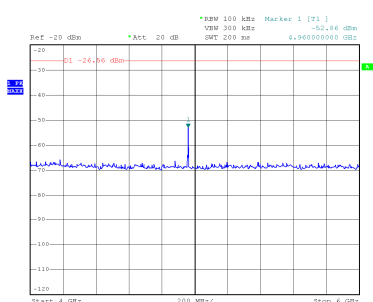
TLP-NT2  
Date: 16.SEP.2010 16:47:51



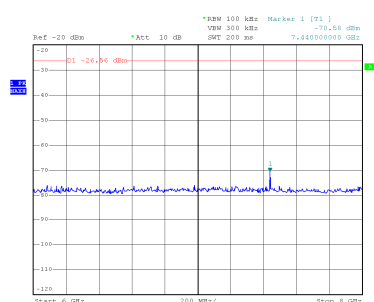
TLP-NT2  
Date: 16.SEP.2010 16:48:10



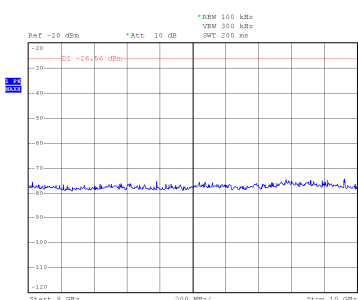
TLP-NT2  
Date: 16.SEP.2010 16:48:52



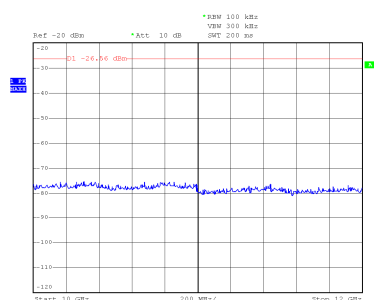
TLP-INT2  
Date: 16.SEP.2010 16:51:04



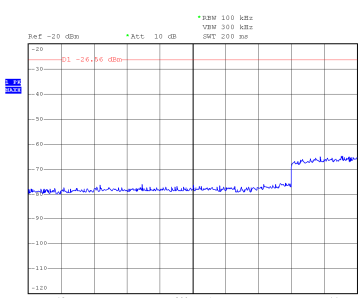
TLP-INT2  
Date: 16.SEP.2010 16:52:03



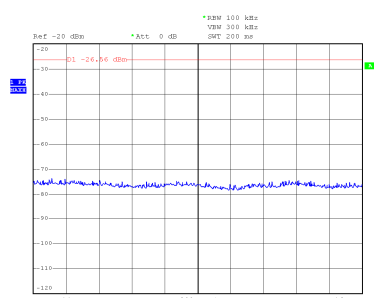
TLP-INT2  
Date: 16.SEP.2010 16:52:28



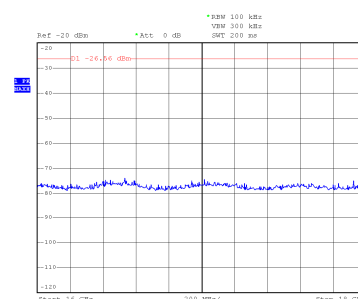
TLP-INT2  
Date: 16.SEP.2010 16:52:56



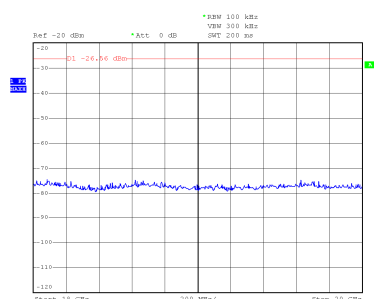
TLP-INT2  
Date: 16.SEP.2010 16:54:06



TLP-INT2  
Date: 16.SEP.2010 16:54:49

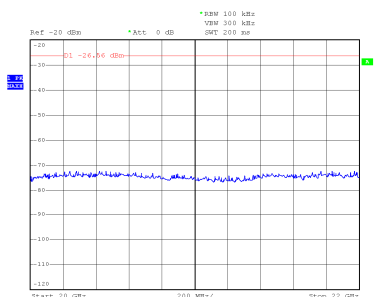


TLP-INT2  
Date: 16.SEP.2010 16:55:14

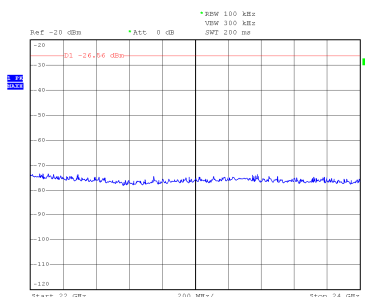


TLP-INT2  
Date: 16.SEP.2010 16:55:26

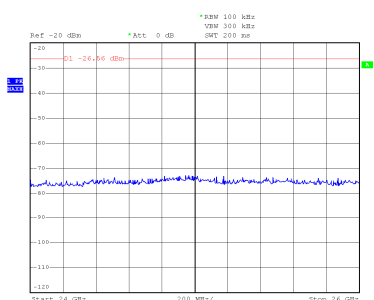




TLP-NT2  
Date: 16.SEP.2010 16:55:56



TLP-NT2  
Date: 16.SEP.2010 16:56:17



TLP-NT2  
Date: 16.SEP.2010 16:56:39

All out of band spurious emissions are more 20dB below the in band power of the fundamental.

#### PEAK RESULT Channel n°26: 2,480.00 MHz

Frequency (MHz)	Measured Level (dBm)	Limit (dBm) Fundamental value – 20dB	Limit (dBm) Restricted band -33dBm	Margin (dB)
743.92	-67.51	-26.56	---	-40.95
2,330.00	-67.34	---	-33	-34.34
2,480 (fundamental)	+1.22	---	---	---
2,632.11	-60.71	-26.56	---	-34.15
4,960.00	-52.86	---	-33	-19.86
7,440.00	-70.58	---	-33	-37.58

TEST No.7	Title	47CFR Part 15 Ref. Section
	“ Transmitter Power Spectral Density”	15.247 (e)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings	
	Span	1.5 MHz
	Resolution (or IF) Bandwidth (RBW)	3 kHz
	Video (or Average) Bandwidth (VBW)	10 kHz
	Sweep time	500 s
	Detector function	Peak
	Trace	max hold
	Attenuator	/
	LIMIT	8 dBm

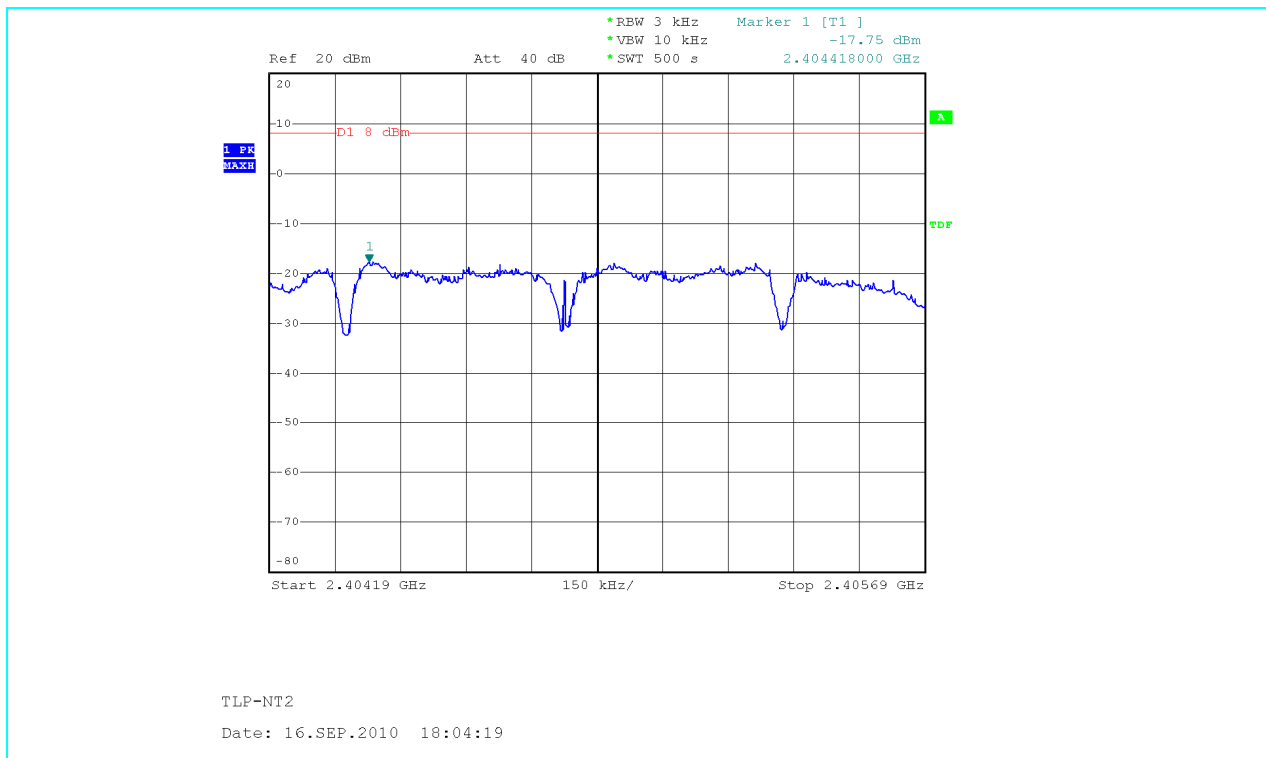
After trace stabilisation the marker shall be set on the signal peak. The indicated level is the power spectral density.

#### Test Result:

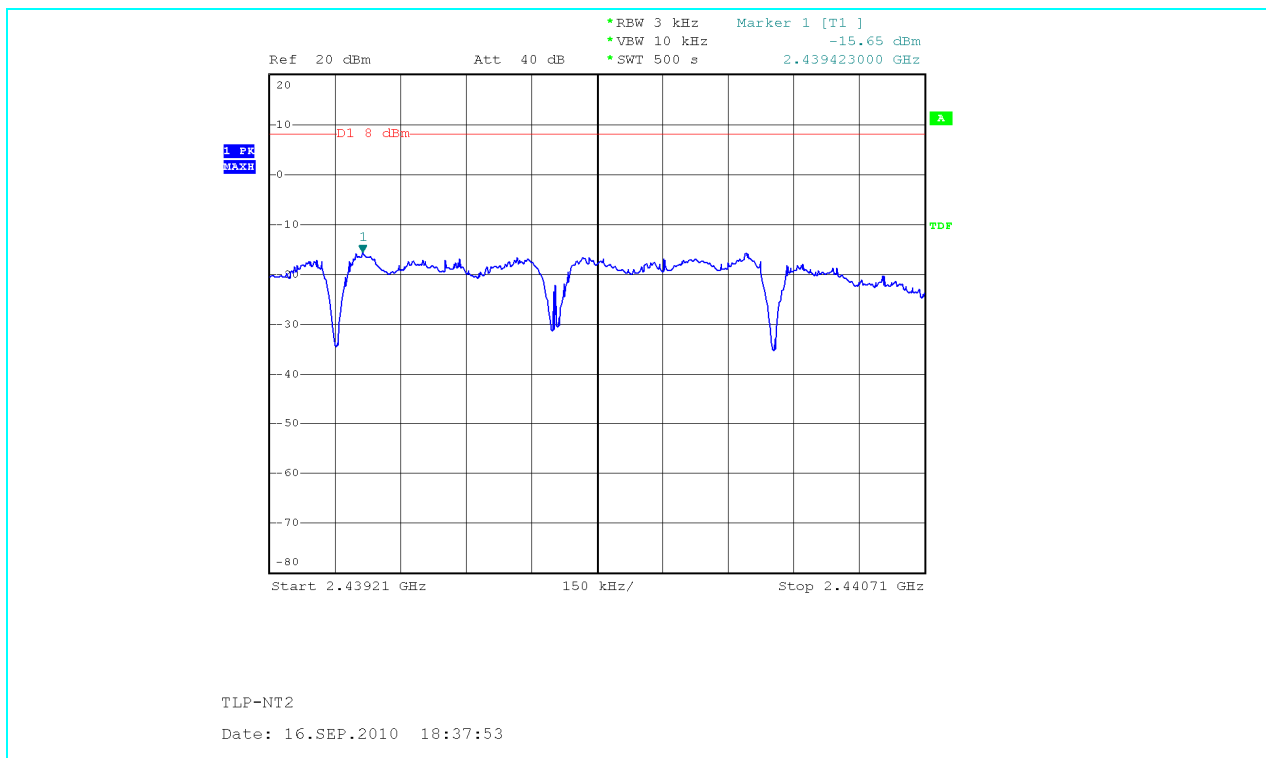
Channel (No.)	Transmitter power on 3 kHz band (dBm)	Plot (No.)
11	-17.75	1
18	-15.65	2
26	-15.65	3

Within the specifications

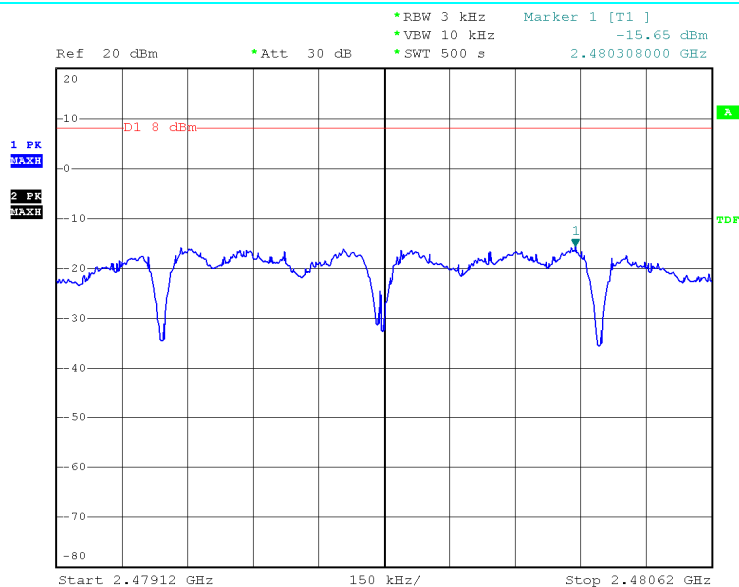
**Plot No. 1:**



**Plot No. 2:**



**Plot No. 3:**



TLP-NT2

Date: 16.SEP.2010 19:00:00

TEST No.8	Title “RF Exposure Evaluation”	47CFR Part 15 Ref. Section
		15.247 (i)
TEST SET-UP & REQUIREMENTS	Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this Chapter.	
	EUT classification (fixed, mobile or portable devices)	Fixed, mobile or portable
	LIMITS	See table below

#### Limit for maximum permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Average Time (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3÷3.0	614	1.63	(100)*	6
3.0÷30	1842/f	4.89/f	(900/f <sup>2</sup> )*	6
30÷300	61.4	0.163	1.0	6
300÷1500	--	--	f/300	6
1500÷100,000	--	--	5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3÷3.0	614	1.63	(100)*	30
3.0÷30	824/f	2.19/f	(180/f <sup>2</sup> )*	30
30÷300	27.5	0.073	0.2	30
300÷1500	--	--	f/1500	30
1500÷100,000	--	--	1.0	30

F = Frequency in MHz

\*Plane-wave equivalent power density

The distance from the device's transmitting antenna where the exposure level reaches the maximum permitted limit is calculated using the general equation:

$$S = P \cdot G / 4\pi R^2$$

Where:

S = Power Density (mW/cm<sup>2</sup>)

P = Conducted power (mW)

G = Linear power gain relative to isotropic radiator (numeric gain)

R = Distance (cm)

**RF Exposure evaluation Distance:**

Channel	Frequency	Output power to antenna	Power density @ 20 cm	Distance where the exposure level reaches the limit	Limits
(No.)	(MHz)	(dBm)	(mW/cm <sup>2</sup> )	(cm)	(mW/cm <sup>2</sup> )
11	2,405	-0.15	0.0008	0.277	1.0
18	2,445	+0.55	0.0007	0.301	1.0
26	2,480	+2.41	0.0007	0.372	1.0

**Test Result:**

The EUT operates at low power level so it does not exceed the Commission's RF exposure guidelines limits; furthermore, Spread spectrum transmitters operate according to the Section 15.247 are categorically excluded from routine environmental evaluation. RF exposure limit warning or SAR test are not required.

## 6 ADDITIONAL TECHNICAL INFORMATION

### 6.1 ELECTROMAGNETICALLY RELEVANT COMPONENTS:

Components	N°	Manufacturer	Type – Technical data
Radio Module			
Host Equipment			
---	---	---	/

### 6.2 RFI SUPPRESSION DEVICES:

Components	N°	Manufacturer	Type – Technical data
None			

### 6.3 EMI PROTECTION DEVICES:

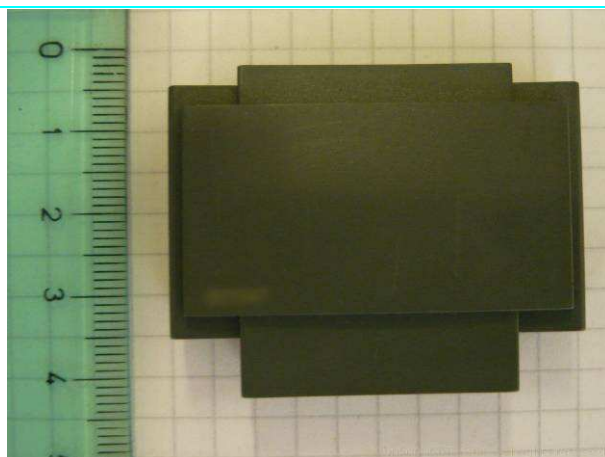
Components	N°	Manufacturer	Type – Technical data
None			

## 7 TECHNICAL DOCUMENTATION

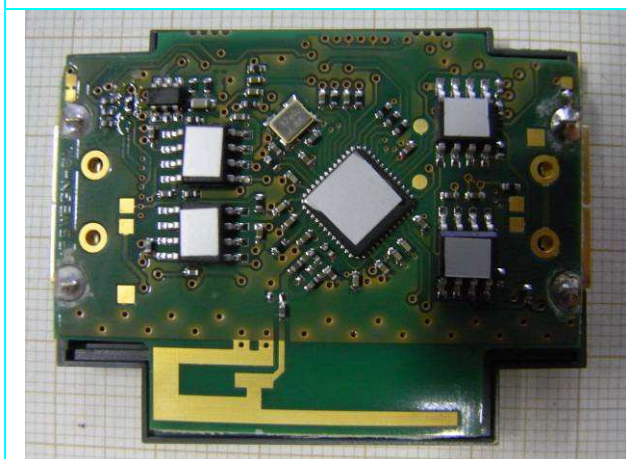
DOCUMENT. Marking label
See document no ERFNC-00836-00 dated 2010/08/01 "BTSWAUX Regulatory Label"

## 8 PHOTOGRAPHIC DOCUMENTATION

### 8.1 EUT IDENTIFICATION



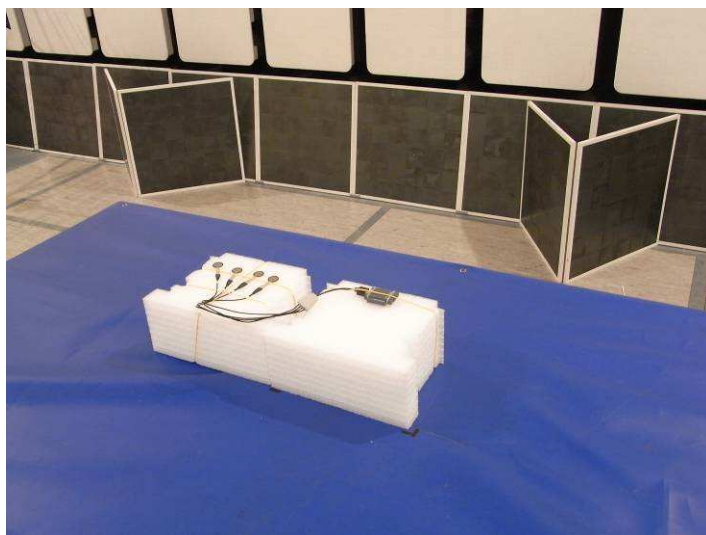
External view of EUT



Internal view of EUT



## 8.2 TEST SET-UP



Set up of Radiated emission test

## 9 MEASUREMENT AND TEST EQUIPMENT INSTRUMENTATION

Instruments	Manufacturer	Model	IMQ serial number	Calibration data	Calibration interval (Month)
Emi Receiver	Rohde & Schwarz	ESCI	S-04355	12/2009	12
Emi Receiver	Rohde & Schwarz	ESVS	S-04197	12/2008	18
Spectrum Analyzer	Rohde & Schwarz	FSP40	S-03629	11/2009	24
Loop Antenna	Rohde & Schwarz	HFH2-Z2	S-02508	12/2008	24
Antenna Bilog	ARA	LPD-2513	S-02385	07/2009	24
Antenna ridged horn 1÷18 GHz	Schwarzbeck	BBHA9120D	S-03464	02/2009	24
Antenna ridged horn 15÷40 GHz	Schwarzbeck	BBHA9170	S-03668	05/2010	24
Digital Oscilloscope	Yokogawa	DL7200	S-03745	05/2010	12
Pre-amplifier 1-26.5 GHz	HP	HP 8449 B	S-03542	/	/
Pre-amplifier 30-1000 MHz	BONN ELEKTRONIK	BLNA	S-04193	/	/
Band Reject Filter 2400÷2483 MHz	Wainwright	WRCG2400 / 2483	S-04308	/	/
Highpass Filter 3.4÷18 GHz	Wainwright	WHK3.4/18	S-04309	/	/
Crystal Detector	Agilent	8472B	S-04467	/	/
Software for test automation	Rohde & Schwarz	ES-K1 V.1.60	/	/	/