



# BLUETOOTH TEST REPORT

**Test report no.: EMC\_397\_BT\_2002**  
**Bluetooth RF Provisional Spec. Rev. 0.91**

**EUT:      Bluetooth Headset**  
**Model:      PHS12101**



**TTI-P-G 081/94-A0**

Accredited according to **ISO/IEC 17025**



**FCC listed # 101450**

**IC recognized # 3925**

## **CETECOM Inc.**

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Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May

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**1 General Information****1.1 Notes**

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM Inc. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc..

**TEST REPORT PREPARED BY:**  
**EMC & Radio Engineer: Harpreet Sidhu**

**1.2 Testing laboratory****CETECOM Inc.**

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E-mail: [lothar.schmidt@cetecomusa.com](mailto:lothar.schmidt@cetecomusa.com)  
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**1.3 Details of applicant**

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Street : 9-21, Samsung-dong, Gangnam-gu  
City / Zip Code : Seoul 135-090  
Country : Korea  
Contact : Gi-Young Kim  
Telephone : +82 2 334 9751  
Telefax : +82 2 320 1119  
e-mail : [kgyoung@primenet21.com](mailto:kgyoung@primenet21.com)

**1.4 Application details**

Date of receipt of application : 2002-12-02  
Date of receipt test item : 2002-12-19  
Date of test : 2002-12-19

**1.5 Test item**

Manufacturer : Applicant  
Marketing Name of EUT : Bluetooth™ Headset  
**Description** : Bluetooth Headset  
Model No. : PHS12101  
HW / SW : 1.0 / 1.0

**Additional information**

Frequency : 2402MHz – 2480MHz  
Type of modulation : FHSS / GFSK  
Antenna Type : Integrated  
Power Supply : 4.2VDC  
Number of channels : 79  
Output Power : Power Class 2  
Extreme Vol. Limits : 3.8VDC – 4.5VDC  
Extreme Temp. Tolerance : -10°C to +50°C

**1.6 Test standards**

: Bluetooth RF Provisional Spec. Ver. 0.91 July 2001 and addendum Jan. 2002

**Note: This test report only focus on Radiated spurious emissions as per specification mentioned under 1.6**

**2      Technical test****2.1      Summary of test results**

No deviations from the technical specification(s) were ascertained in the course of the tests  
Performed

Final Verdict: (Only "passed" if all single measurements are "passed")	<b>Passed</b>
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**Technical responsibility for area of testing:**

2003-03-06    EMC & Radio    Lothar Schmidt (Manager)



Date

Section

Name

Signature

**Responsible for test report and project leader:**

2003-03-06    EMC & Radio    Harpreet Sidhu (EMC Engineer)



Date

Section

Name

Signature

**2.2 Test report**

**TEST REPORT**

**Test report no.: EMC\_397\_BT\_2002**

**EUT: Bluetooth Headset**  
**Model: PHS12101**

**TEST REPORT REFERENCE****LIST OF MEASUREMENTS**

<b>OUT-OF-BAND SPURIOUS EMISSIONS</b>	<b>SUBCLAUSE § TRC/CA/01/E</b>	<b>7</b>
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**OUT-OF-BAND SPURIOUS EMISSIONS  
FCC****SUBCLAUSE § TRC/CA/01/E****LIMITS**

**In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions that fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).**

**Limits****SUBCLAUSE § 15.209**

Frequency (MHz)	Field strength ( $\mu$ V/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 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

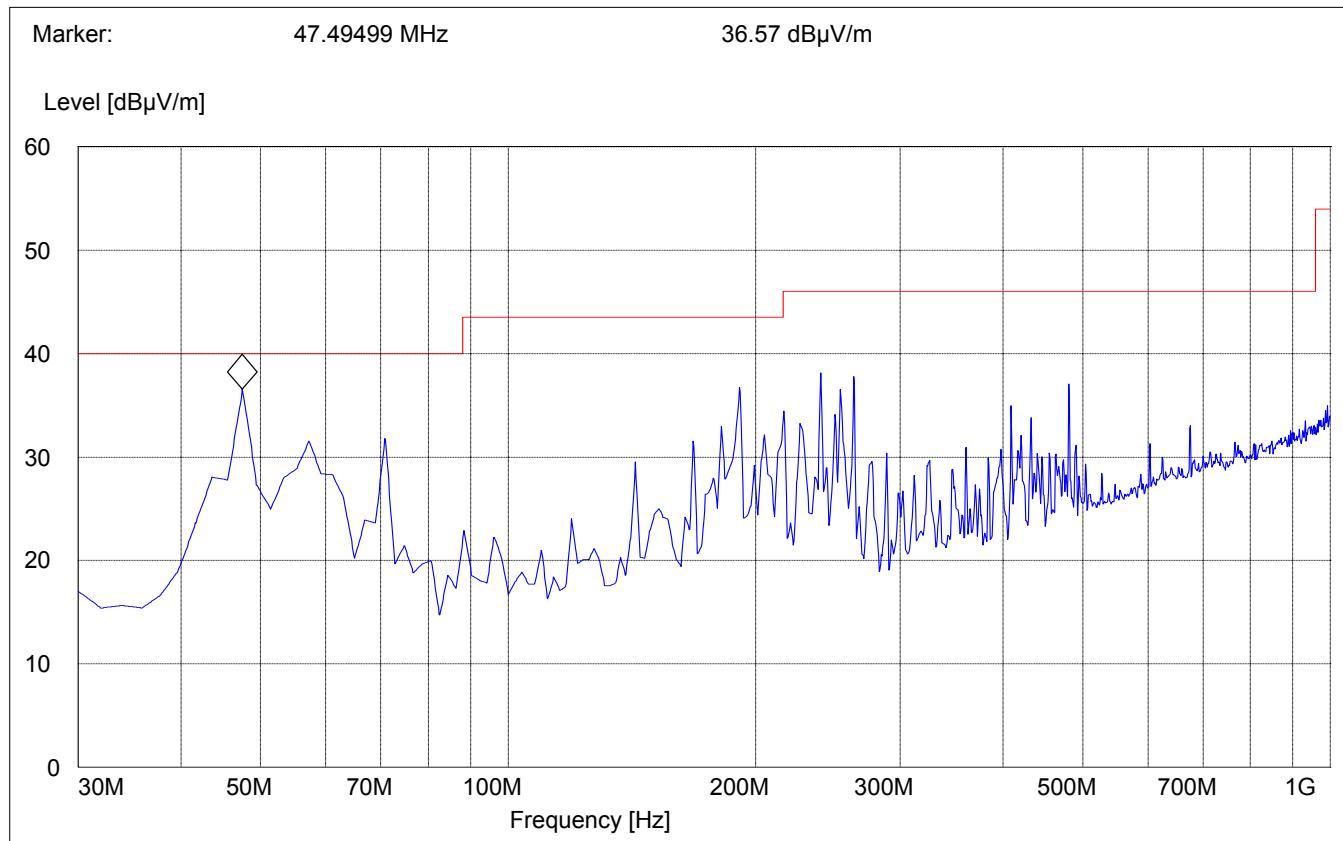
**NOTE:**

1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 25 GHz very short cable connections to the antenna was used to minimize the noise level.
2. All measurements were done in peak mode, unless specified with the plots.

**Out-of-Band Spurious Emissions  
FCC 15.209(Radiated)****SUBCLAUSE § TRC/CA/01/E****Lowest Channel: 2402MHz  
(30MHz – 1GHz)****Note: This plot is valid for all three channels (worst case)**

**SWEEP TABLE:** "BT Spuri hi 30-1G"  
**Short Description:** Bluetooth 30MHz-1GHz

Start Frequency	Stop Frequency	Detector	Meas.	RBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Time	VBW	
			Coupled	100 kHz	3141-#1186

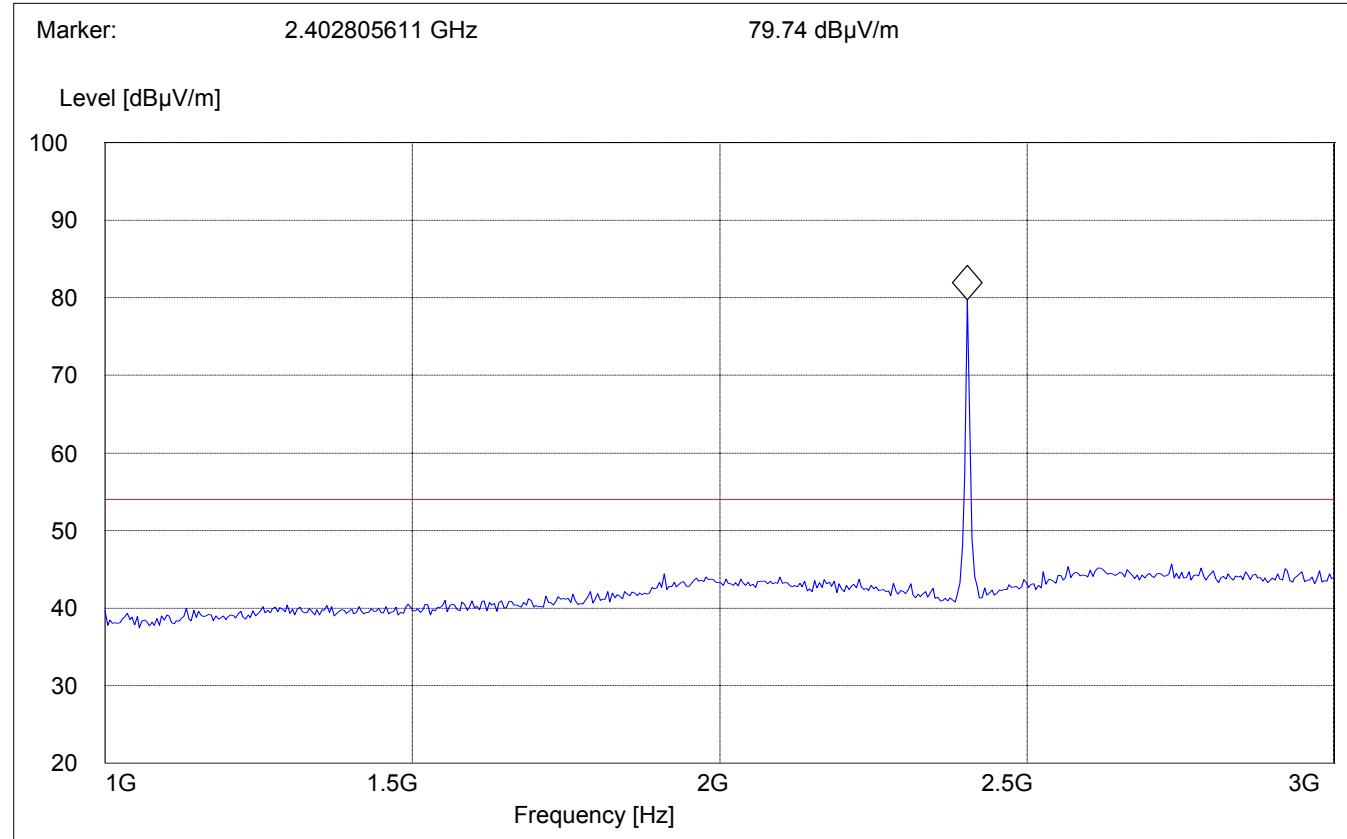


**Out-of-Band Spurious Emissions  
FCC 15.209(Radiated)****SUBCLAUSE § TRC/CA/01/E****Lowest Channel: 2402MHz****(1GHz – 3GHz)****NOTE: The marked peak above the limit is the carrier frequency.**

SWEEP TABLE: "BT Spuri hi 1-3G"

Short Description: Bluetooth Spurious 1-3 GHz

Start Frequency	Stop Frequency	Detector	Meas.	RBW	Transducer
1.0 GHz	3.0 GHz	Time	Bandw.	VBW	
		MaxPeak	Coupled	1 MHz	#326 horn (dBi)

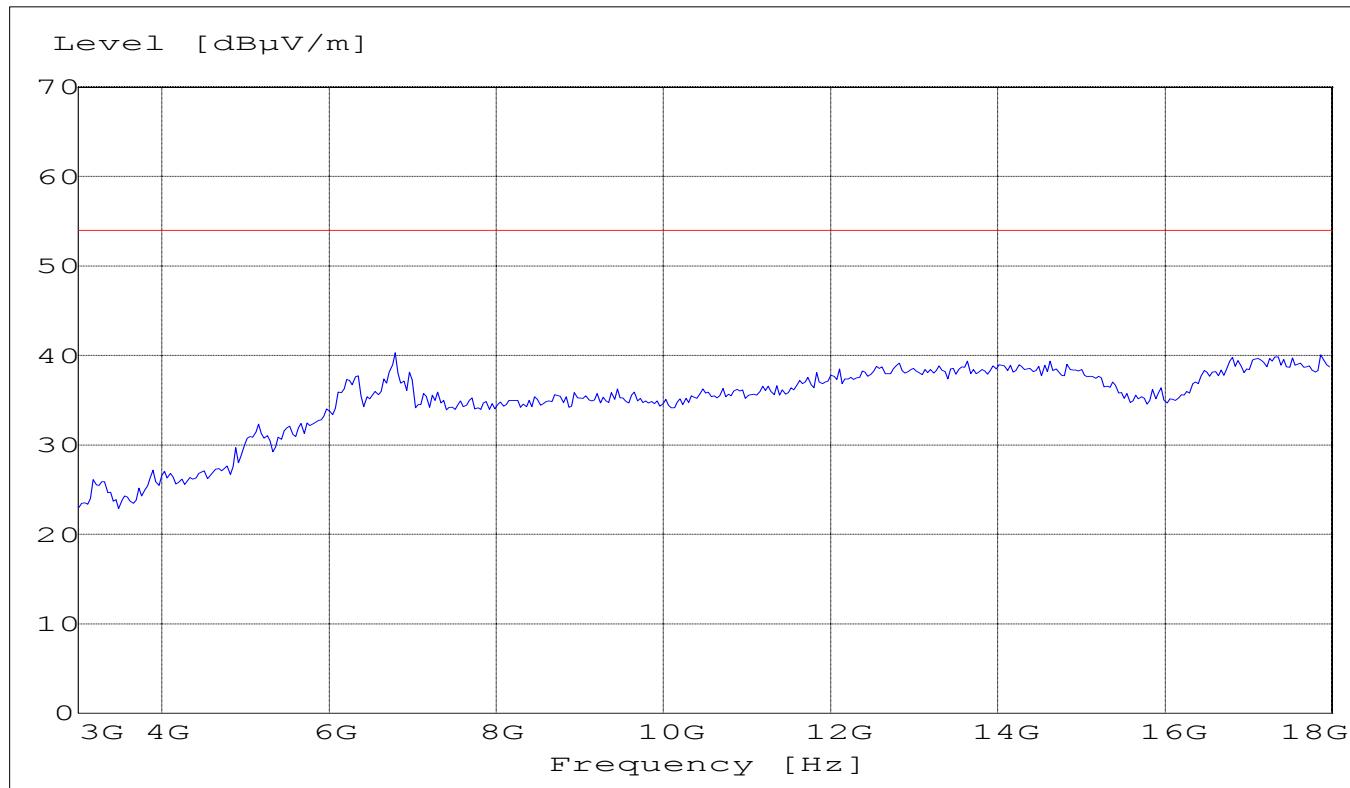


**Out-of-Band Spurious Emissions  
FCC 15.209(Radiated)****SUBCLAUSE § TRC/CA/01/E****Lowest Channel: 2402MHz  
(3GHz – 18GHz)**

SWEEP TABLE: "BT Spuri hi 3-18G"

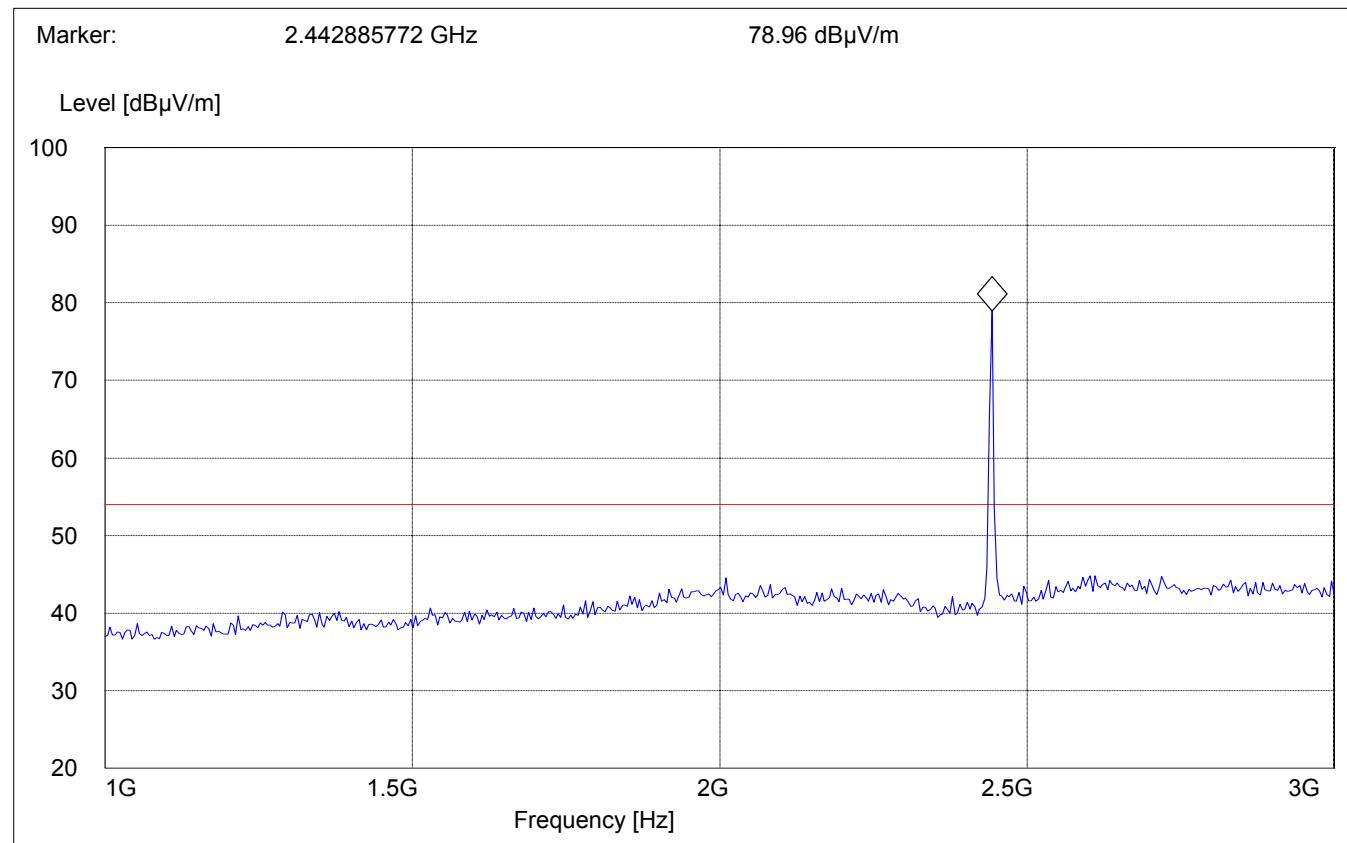
Short Description: Bluetooth Spurious 3-18GHz

Start Frequency	Stop Frequency	Detector	Meas.	RBW	Transducer
3.0 GHz	18.0 GHz	Time	Bandw.	VBW	
		MaxPeak	Coupled	1 MHz	#326 horn (dBi)



**Out-of-Band Spurious Emissions  
FCC 15.209(Radiated)****SUBCLAUSE § TRC/CA/01/E****Mid Channel: 2441MHz****(1GHz – 3GHz)****NOTE: The marked peak above the limit is the carrier frequency.**

SWEET TABLE: "BT Spuri hi 1-3G"  
Short Description: Bluetooth Spurious 1-3 GHz  
Start Stop Detector Meas. RBW Transducer  
Frequency Frequency Time Bandw. VBW  
1.0 GHz 3.0 GHz MaxPeak Coupled 1 MHz #326 horn (dBi)

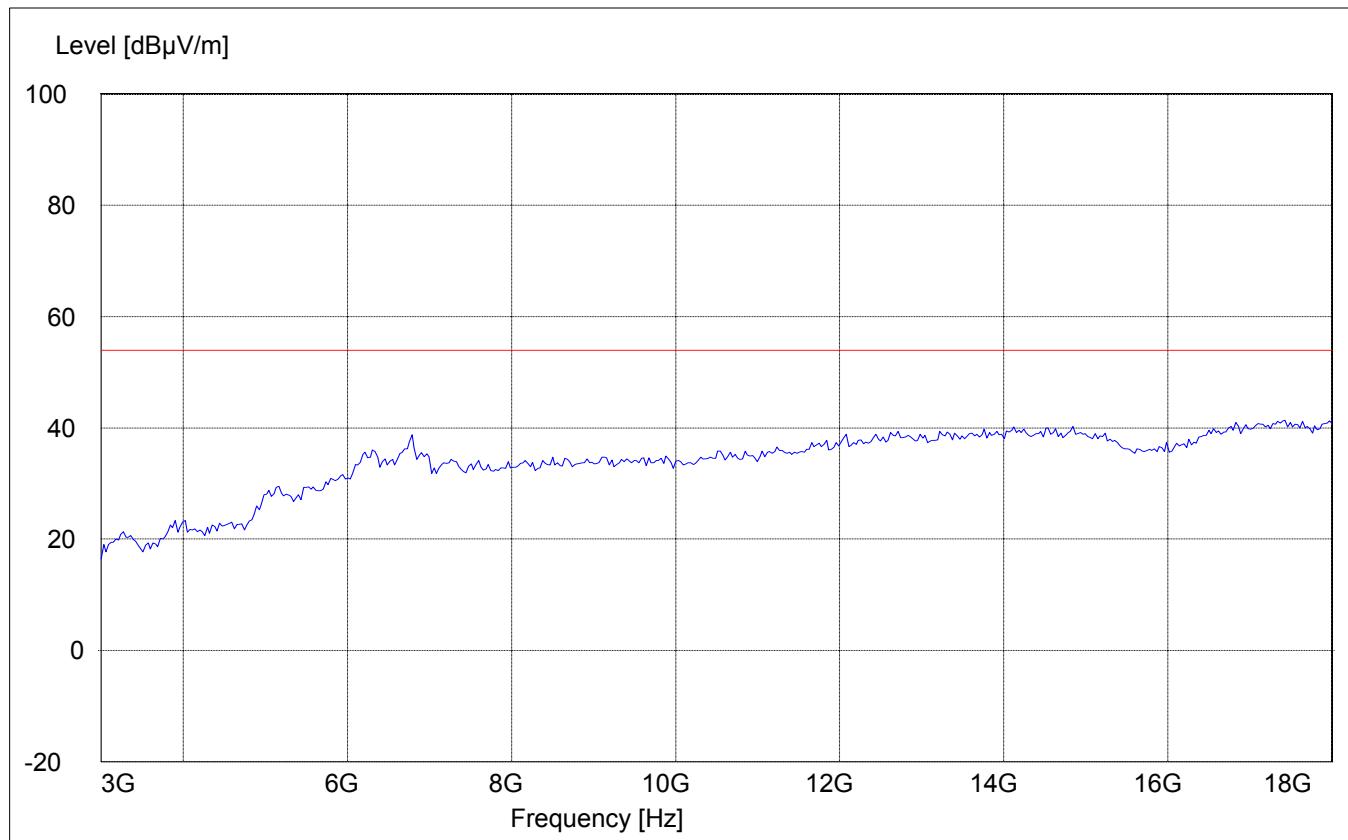


**Out-of-Band Spurious Emissions  
FCC 15.209(Radiated)****SUBCLAUSE § TRC/CA/01/E****Mid Channel: 2441MHz  
(3GHz – 18GHz)**

SWEEP TABLE: "BT Spuri hi 3-18G"

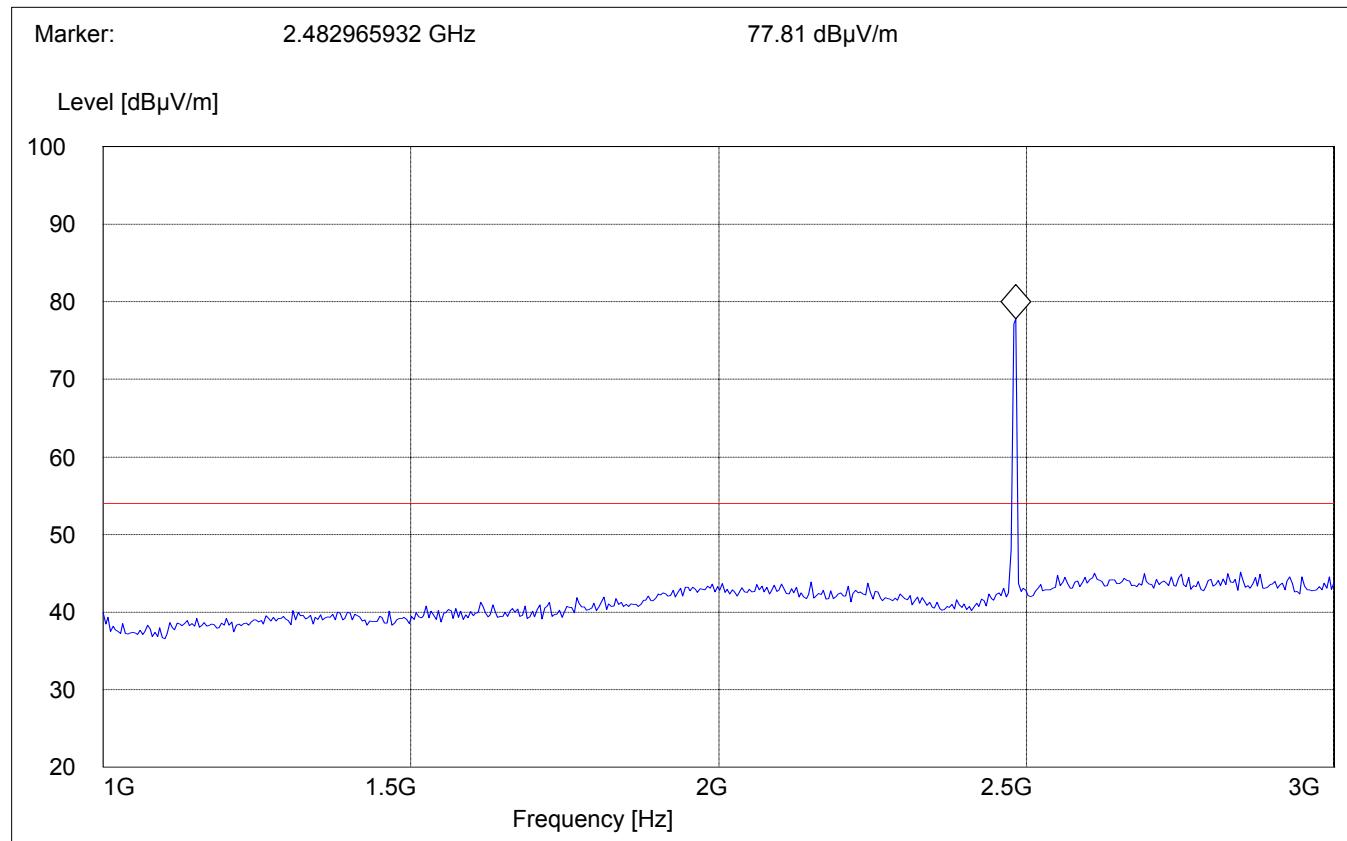
Short Description: Bluetooth Spurious 3-18GHz

Start Frequency	Stop Frequency	Detector	Meas.	RBW	Transducer
3.0 GHz	18.0 GHz	Time	Bandw.	VBW	
		MaxPeak	Coupled	1 MHz	#326 horn (dBi)



**Out-of-Band Spurious Emissions  
FCC 15.209(Radiated)****SUBCLAUSE § TRC/CA/01/E****Highest Channel: 2480MHz****(1GHz – 3GHz)****NOTE: The marked peak above the limit is the carrier frequency.**

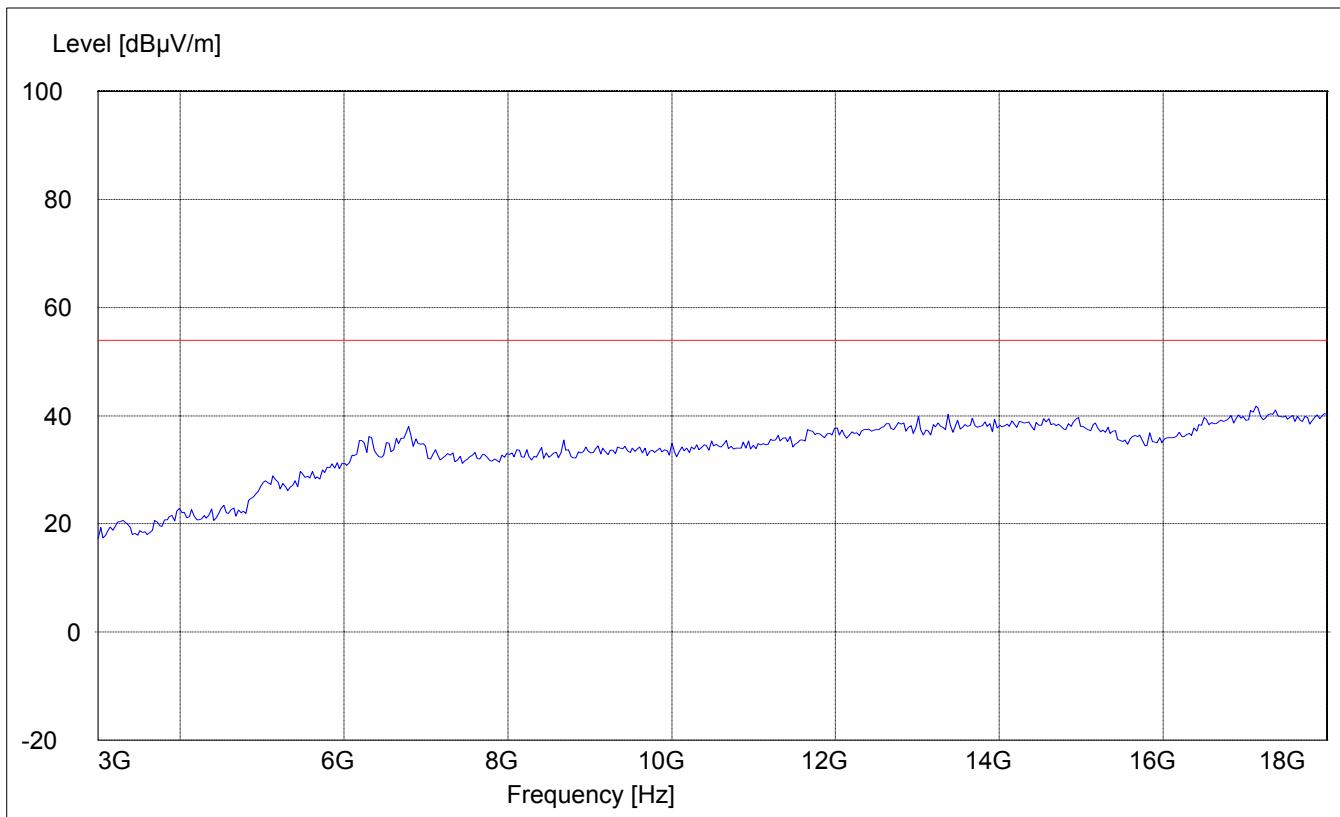
SWEET TABLE: "BT Spuri hi 1-3G"  
Short Description: Bluetooth Spurious 1-3 GHz  
Start Stop Detector Meas. RBW Transducer  
Frequency Frequency Time Bandw. VBW  
1.0 GHz 3.0 GHz MaxPeak Coupled 1 MHz #326 horn (dBi)



**Out-of-Band Spurious Emissions  
FCC 15.209(Radiated)****SUBCLAUSE § TRC/CA/01/E****Highest Channel: 2480MHz  
(3GHz – 18GHz)**

**SWEEP TABLE:** "BT Spuri hi 3-18G"  
**Short Description:** Bluetooth Spurious 3-18GHz

Start Frequency	Stop Frequency	Detector	Meas.	RBW	Transducer
3.0 GHz	18.0 GHz	Time	Bandw.	VBW	
		MaxPeak	Coupled	1 MHz	#326 horn (dBi)

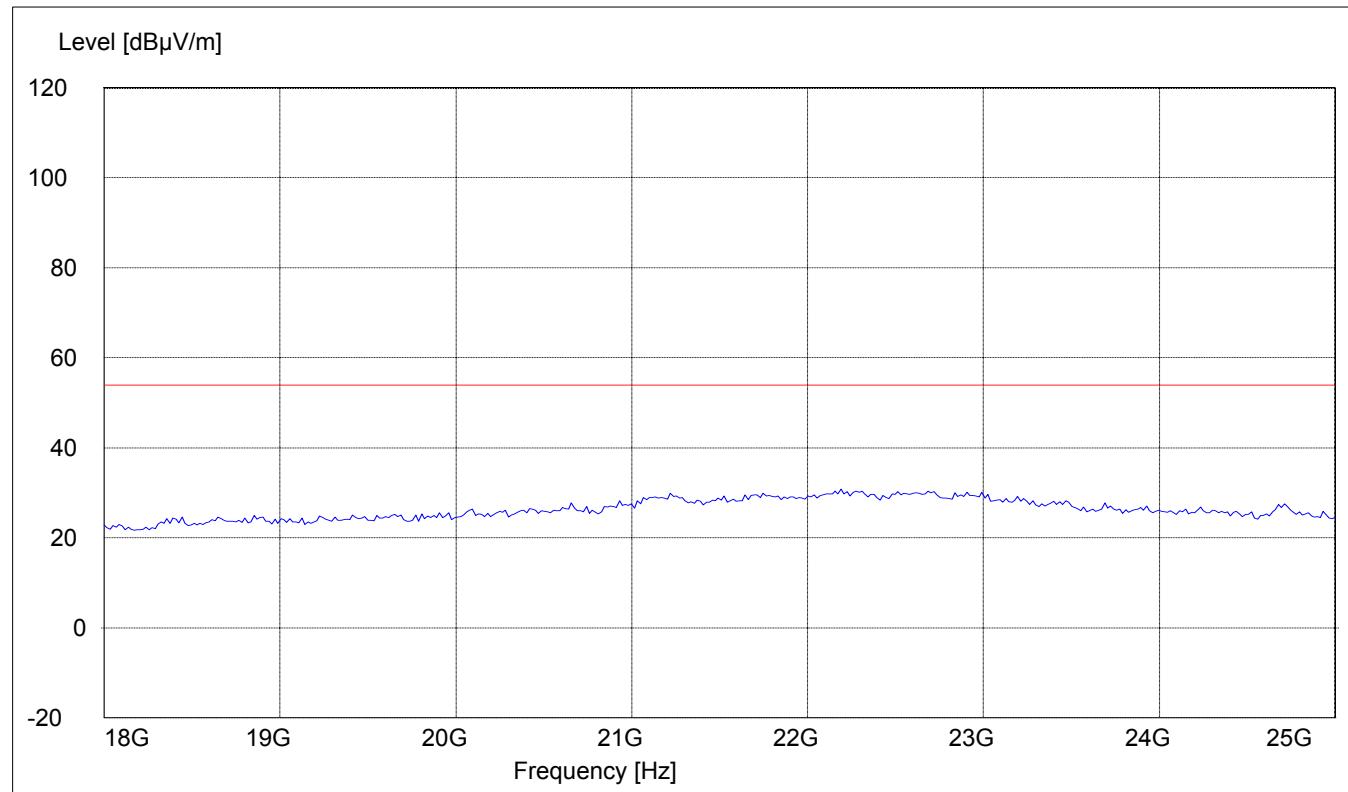


**Out-of-Band Spurious Emissions****SUBCLAUSE § TRC/CA/01/E****FCC 15.209(Radiated)****Lowest Channel: 2402MHz****(18GHz – 25GHz)****Note: This plot is valid for all three channels (worst case)**

SWEEP TABLE: "BT Spuri 18 - 25G"

Short Description: Bluetooth 18 - 25 GHz

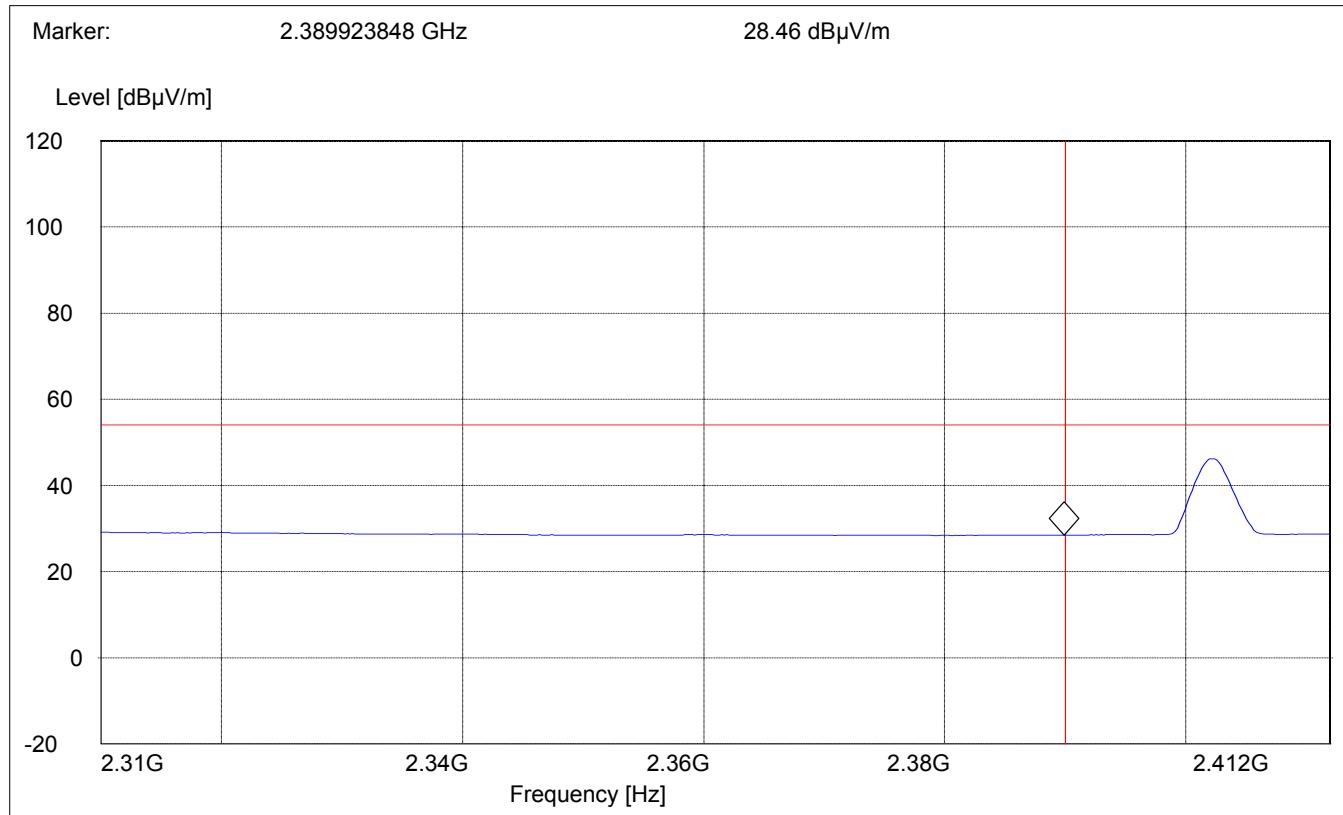
Start Frequency	Stop Frequency	Detector	Meas.	IF	Transducer
18.0 GHz	25 GHz	MaxPeak	2.0 s	1 MHz	3160 Horn 18-26.5G



**Out-of-Band Spurious Emissions  
FCC 15.247(c)(Radiated)****SUBCLAUSE § TRC/CA/01/E****Low frequency section (spurious in the restricted band 2310 – 2390 MHz)  
(Hopping – OFF, Average measurement)**

Operating condition : Tx at 2402MHz  
SWEEP TABLE : "FCC15.247 LBE\_AVG"  
Short Description : FCC15.247 BT Low-band-edge  
Limit Line : 54dB $\mu$ V

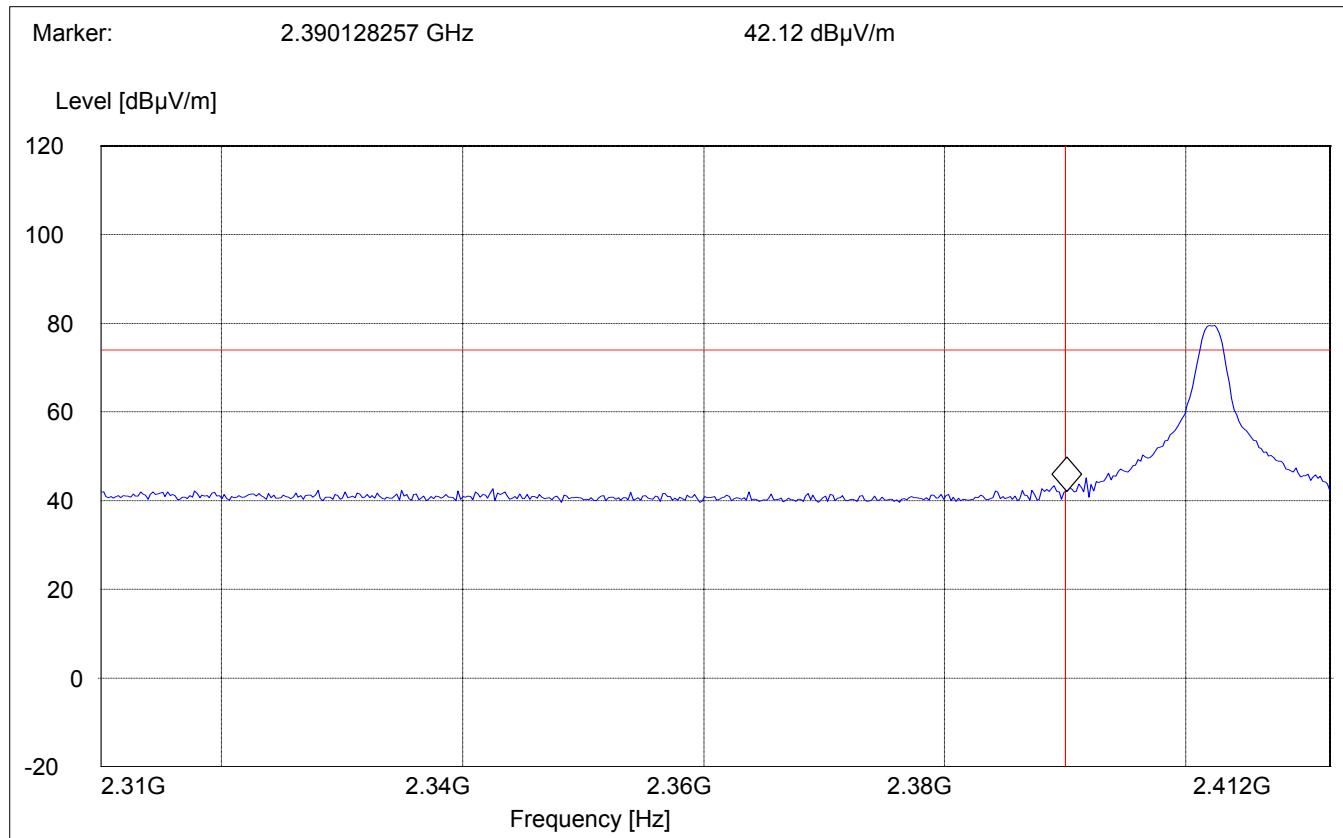
Start Frequency	Stop Frequency	Detector	Meas.	RBW	VBW	Transducer
2.31 GHz	2.412 GHz	Time	Bandw.	1 MHz	10Hz	#326 horn (dBi)
		MaxPeak	Coupled			



**Out-of-Band Spurious Emissions  
FCC 15.247(c)(Radiated)****SUBCLAUSE § TRC/CA/01/E****Low frequency section (spurious in the restricted band 2310 – 2390 MHz)  
(Hopping – OFF, Peak measurement)**

Operating condition : Tx at 2402MHz  
SWEEP TABLE : "FCC15.247 LBE\_Pk"  
Short Description : FCC15.247 BT Low-band-edge  
Limit Line : 74dB $\mu$ V

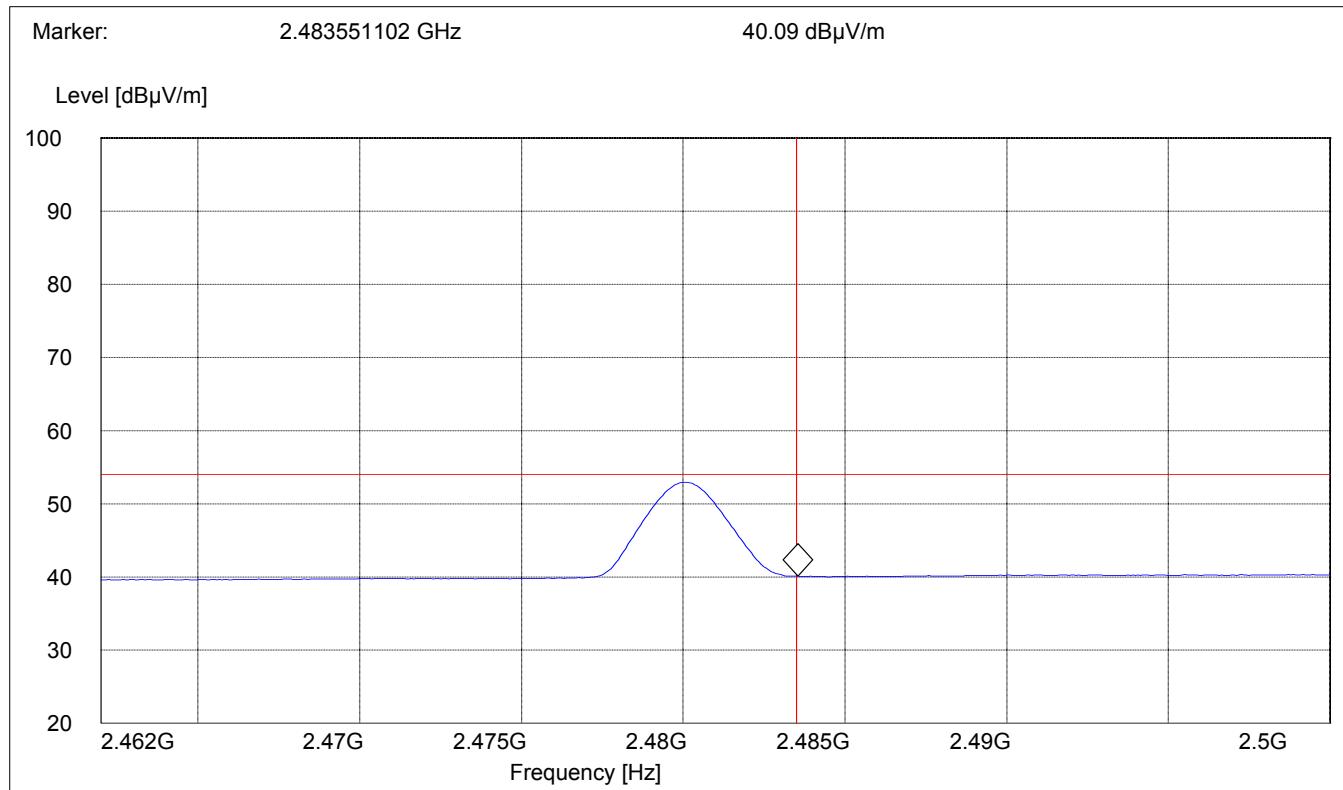
Start Frequency	Stop Frequency	Detector	Meas.	RBW	VBW	Transducer
2.31 GHz	2.412 GHz	Time	Bandw.	1 MHz	1MHz	#326 horn (dBi)
		MaxPeak	Coupled			



**Out-of-Band Spurious Emissions  
FCC 15.247(c)(Radiated)****SUBCLAUSE § TRC/CA/01/E****High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)  
(Hopping – OFF, Average measurement)**

Operating condition : Tx at 2480MHz  
SWEEP TABLE : "FCC15.247 HBE\_AVG"  
Short Description : FCC15.247 BT High-band-edge  
Limit Line : 54dB $\mu$ V

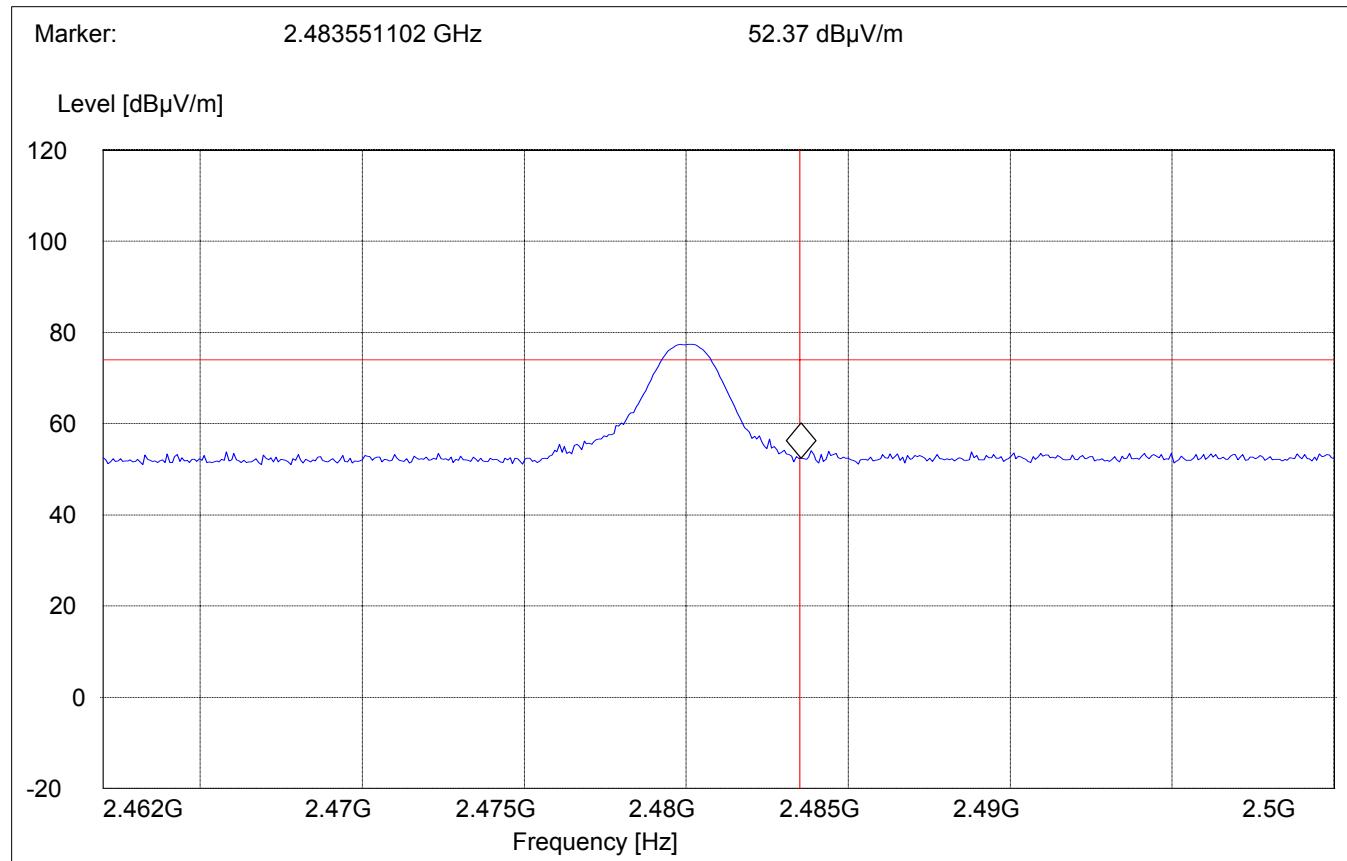
Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
2.462 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



**Out-of-Band Spurious Emissions  
FCC 15.247(c)(Radiated)****SUBCLAUSE § TRC/CA/01/E****High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)  
(Hopping – OFF, Peak measurement)**

Operating condition : Tx at 2480MHz  
SWEEP TABLE : "FCC15.247 HBE\_PK"  
Short Description : FCC15.247 BT High-band-edge  
Limit Line : 74dB $\mu$ V

Start Frequency	Stop Frequency	Detector	Meas.	RBW	VBW	Transducer
2.462 GHz	2.5 GHz	Time	Bandw.	1 MHz	1MHz	#326 horn (dBi)
		MaxPeak	Coupled			



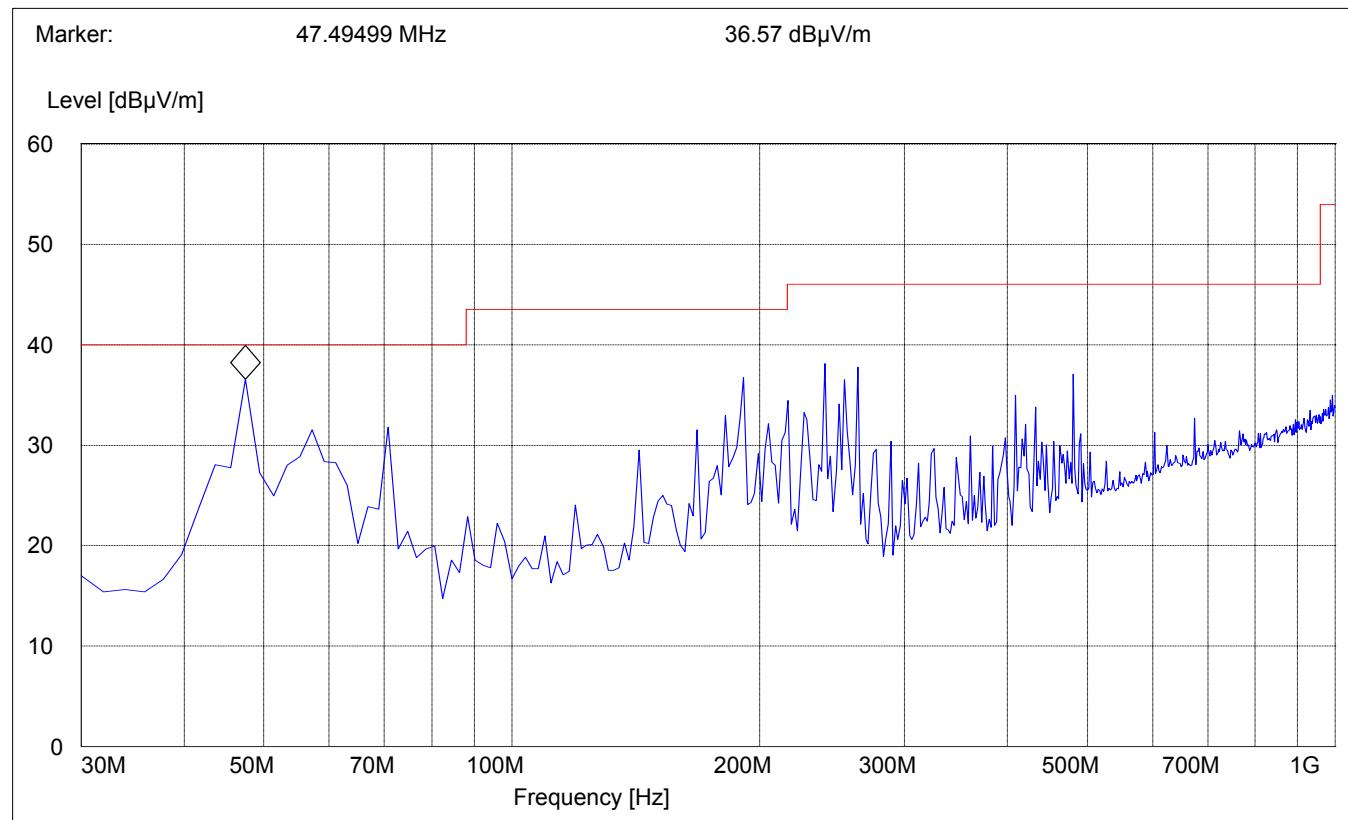
**Out-of-Band Spurious Emissions**  
**ETSI EN 300 328 (Transmitter)****SUBCLAUSE § TRC/CA/01/E****LIMITS: Clause 5.2.4**

<b>Frequency Range</b>	<b>Narrowband spurious emissions</b>		<b>Wideband spurious emissions</b>	
	<b>Limit when operating</b>	<b>Limit when in standby</b>	<b>Limit when operating</b>	<b>Limit when in standby</b>
<b>30 MHz - 1 GHz</b>	<b>-36 dBm</b>	<b>-57 dBm</b>	<b>-86 dBm/Hz</b>	<b>-107 dBm/Hz</b>
<b>above 1 GHz - 12,75 GHz</b>	<b>-30 dBm</b>	<b>-47 dBm</b>	<b>-80 dBm/Hz</b>	<b>-97 dBm/Hz</b>
<b>1,8 - 1,9 GHz</b> <b>5,15 - 5,3 GHz</b>	<b>-47 dBm</b>	<b>-47 dBm</b>	<b>-97 dBm/Hz</b>	<b>-97 dBm/Hz</b>

**Out-of-Band Spurious Emissions  
ETSI EN 300 328 (Transmitter)****SUBCLAUSE § TRC/CA/01/E****Lowest Channel: 2402MHz****30MHz – 1GHz (Radiated)****Note: This plot is valid for all three channels (worst case)**

SWEEP TABLE: "ETS 328 30M-1GTx"

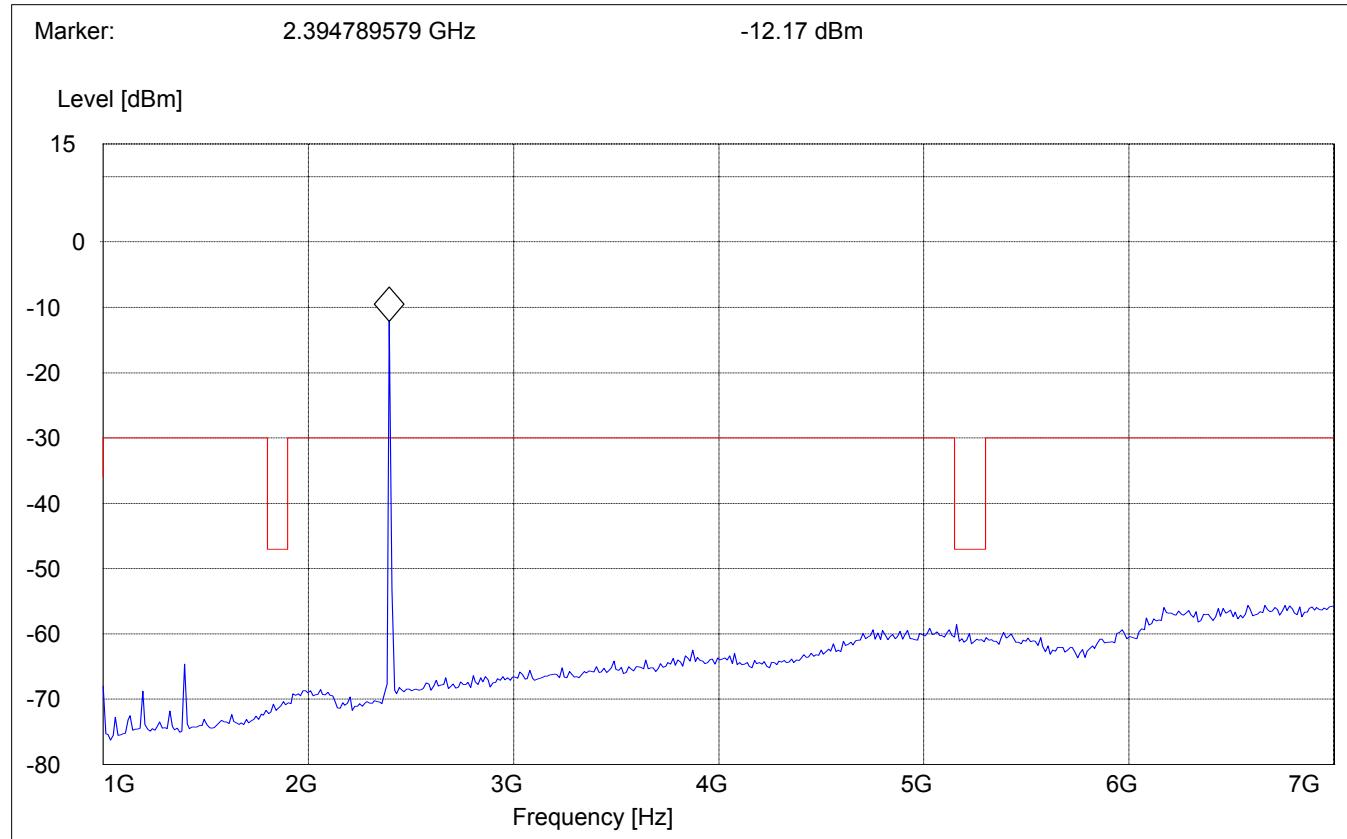
Short Description:		ETS 300 328 30MHz-1GHz TX mode			
Start Frequency	Stop Frequency	Detector	Meas.	IF	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	DUMMY-DBM



**Out-of-Band Spurious Emissions  
ETSI EN 300 328 (Transmitter)****SUBCLAUSE § TRC/CA/01/E****Lowest Channel: 2402MHz****1GHz – 7GHz (Radiated)****Note: The peak above the limit line is the carrier freq.**

SWEEP TABLE: "ETS Spuri 1-7G"

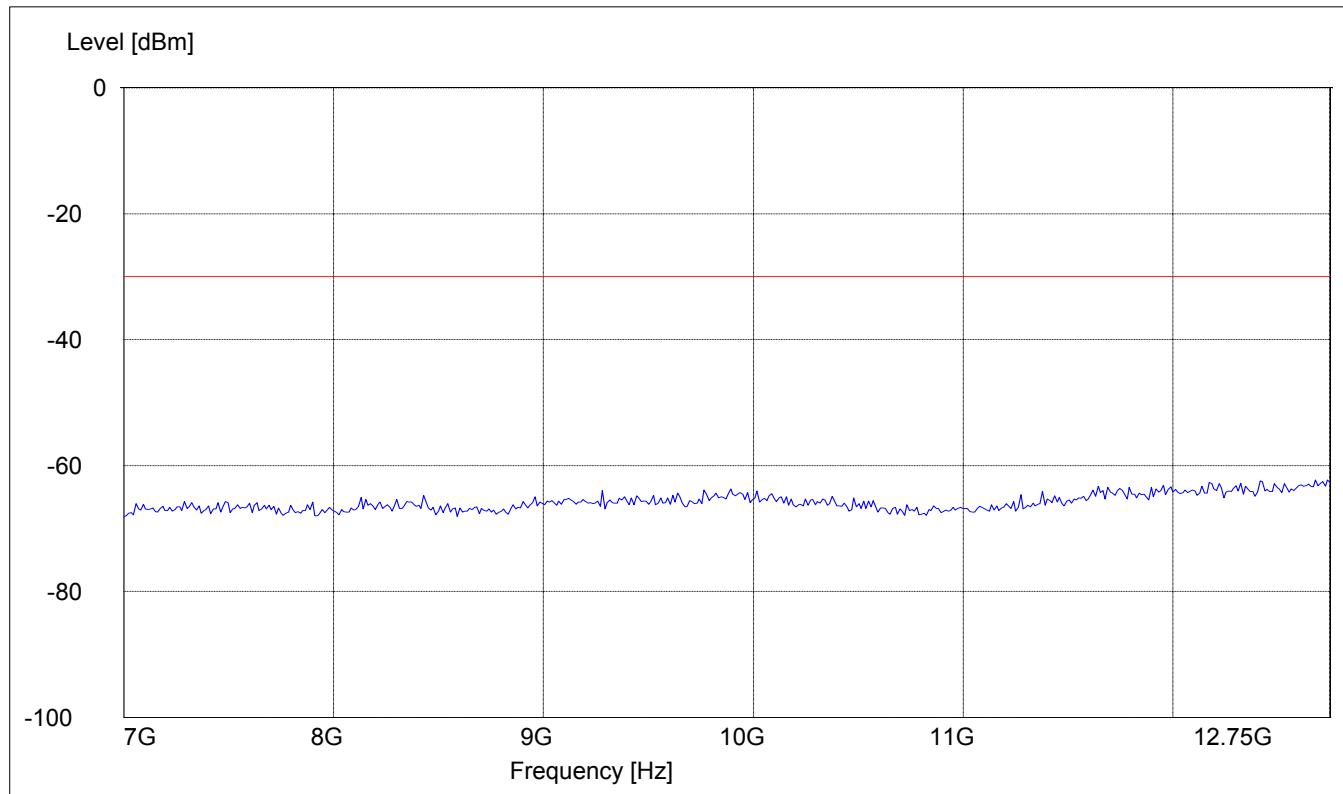
Short Description:		ETS 328 1GHz-7GHz TX mode			
Start Frequency	Stop Frequency	Detector	Meas.	IF	Transducer
1.0 GHz	7.0 GHz	MaxPeak	Coupled	100 kHz	DUMMY-DBM



**Out-of-Band Spurious Emissions  
ETSI EN 300 328 (Transmitter)****SUBCLAUSE § TRC/CA/01/E****Lowest Channel: 2402MHz  
7GHz – 12.75GHz (Radiated)**

SWEEP TABLE: "ETS Spuri 3-7G"

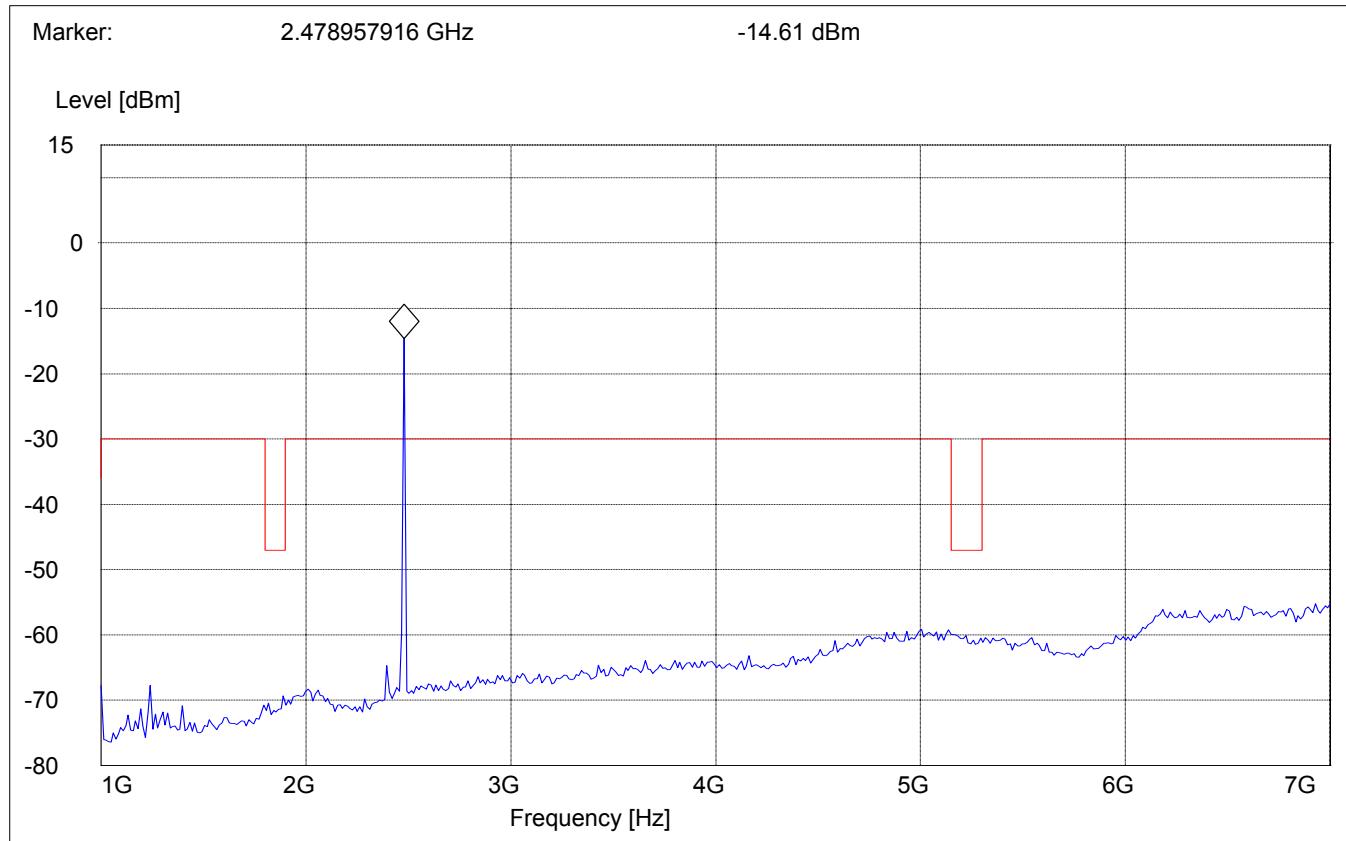
Short Description:		ETS 328 3GHz-7GHz TX mode		
Start Frequency	Stop Frequency	Detector	Meas.	IF Transducer
3.0 GHz	7.0 GHz	MaxPeak	Coupled	100 kHz DUMMY-DBM



**Out-of-Band Spurious Emissions  
ETSI EN 300 328 (Transmitter)****SUBCLAUSE § TRC/CA/01/E****Highest Channel: 2480MHz****1GHz – 7GHz (Radiated)****Note: The peak above the limit line is the carrier freq.**

SWEEP TABLE: "ETS Spuri 1-7G"

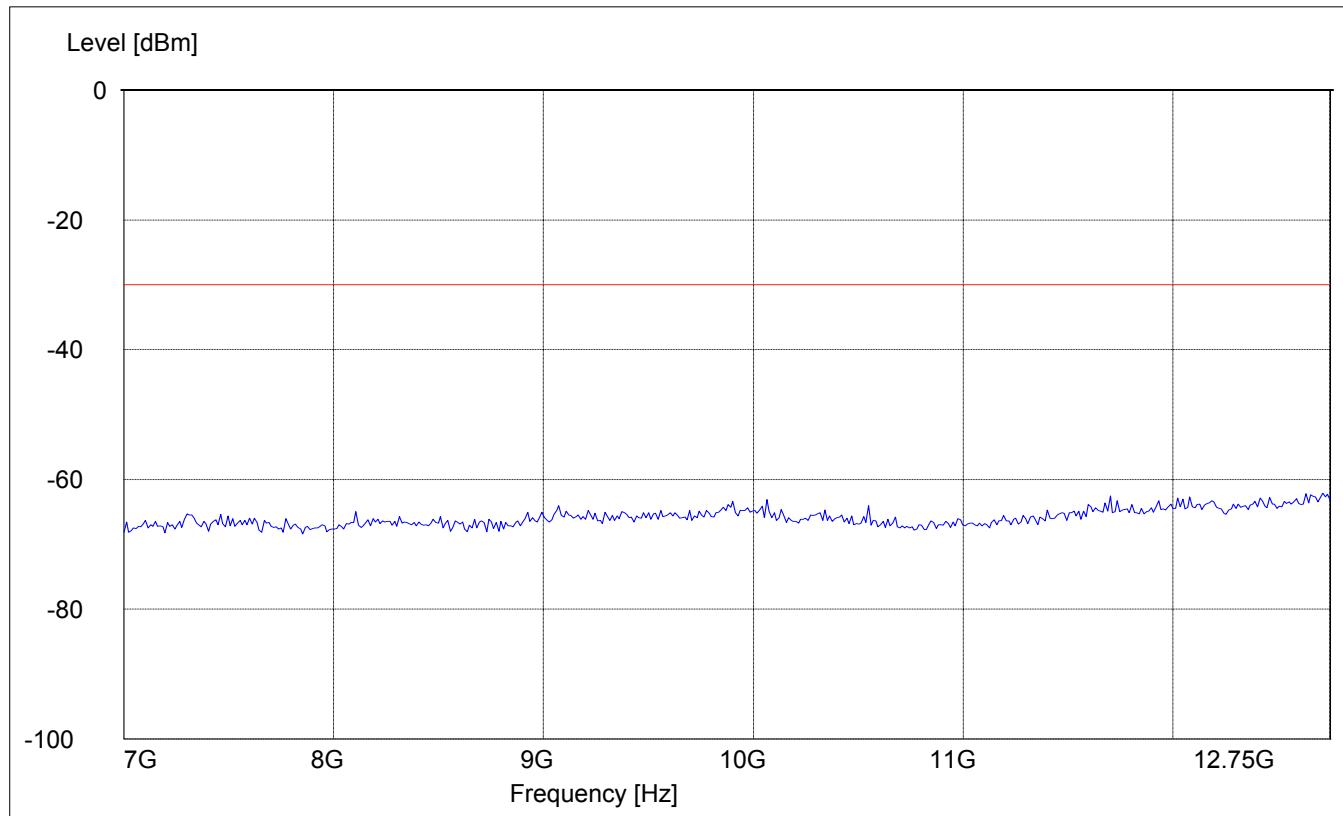
Short Description:		ETS 328 1GHz-7GHz TX mode			
Start Frequency	Stop Frequency	Detector	Meas.	IF	Transducer
1.0 GHz	7.0 GHz	MaxPeak	Coupled	100 kHz	DUMMY-DBM



**Out-of-Band Spurious Emissions  
ETSI EN 300 328 (Transmitter)****SUBCLAUSE § TRC/CA/01/E****Highest Channel: 2480MHz  
7GHz – 12.75GHz (Radiated)**

SWEEP TABLE: "ETS Spuri 3-7G"

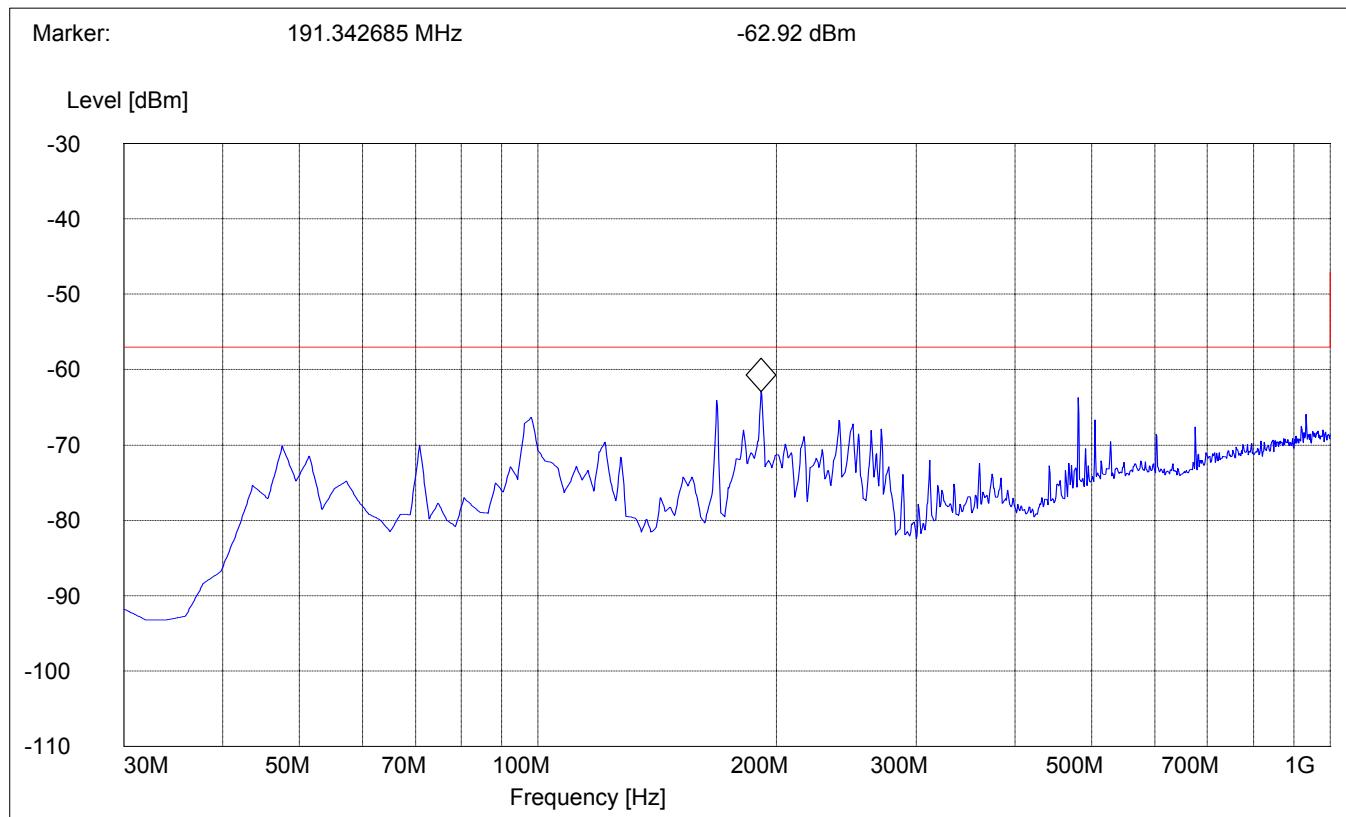
Short Description:		ETS 328 3GHz-7GHz TX mode		
Start Frequency	Stop Frequency	Detector	Meas.	IF Transducer
3.0 GHz	7.0 GHz	MaxPeak	Coupled	100 kHz DUMMY-DBM



**Out-of-Band Spurious Emissions  
ETSI EN 300 328 (Receiver)****SUBCLAUSE § TRC/CA/01/E****30MHz – 1GHz (Radiated)**

SWEEP TABLE: "ETS 328 30M-1GTX"

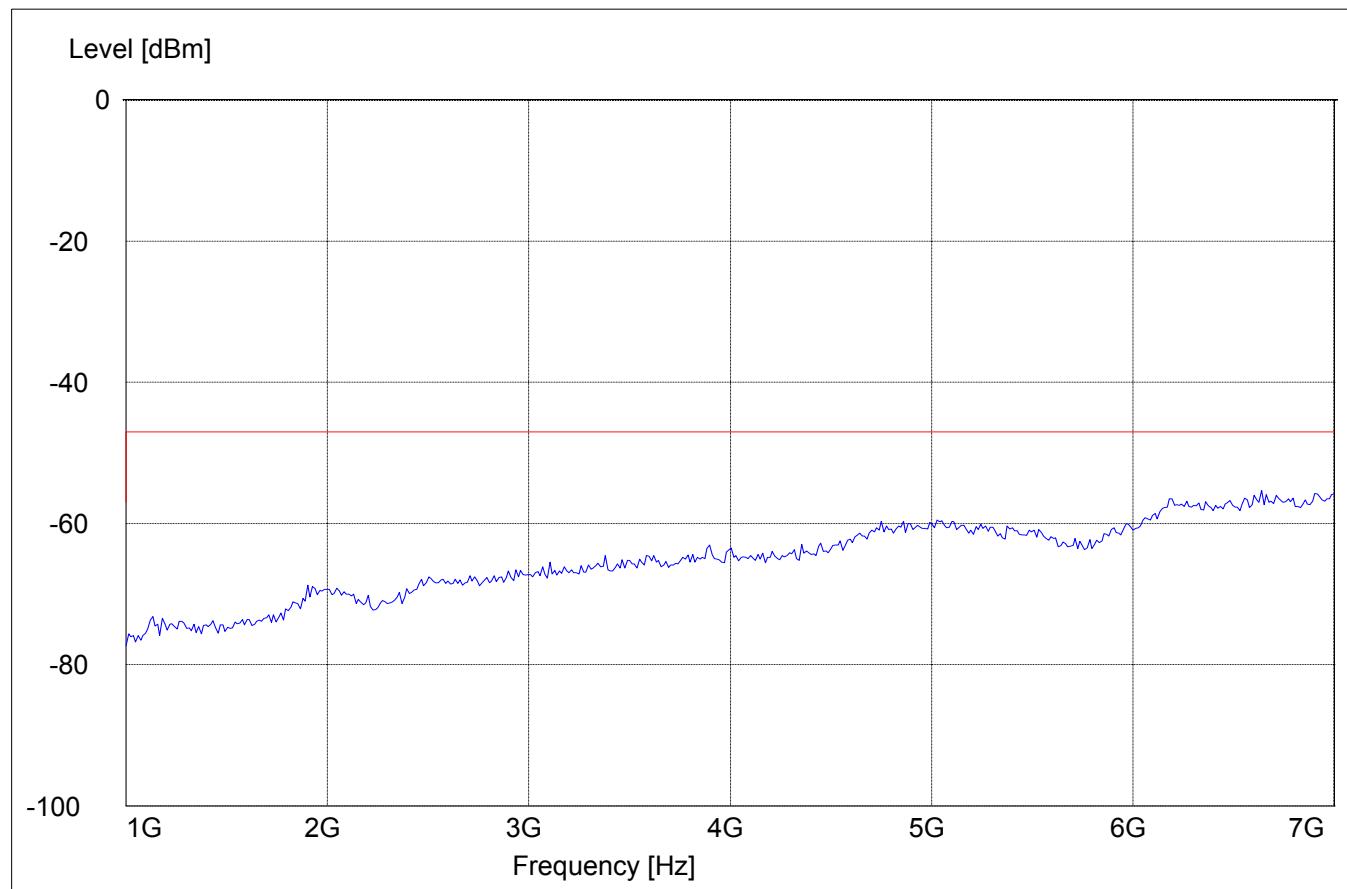
Short Description:	ETS 300 328 30MHz-1GHz TX mode				
Start Frequency	Stop Frequency	Detector	Meas.	IF	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	DUMMY-DBM



**Out-of-Band Spurious Emissions  
ETSI EN 300 328 (Receiver)****SUBCLAUSE § TRC/CA/01/E****1GHz – 7GHz (Radiated)**

SWEEP TABLE: "ETS Spuri 1-7G"

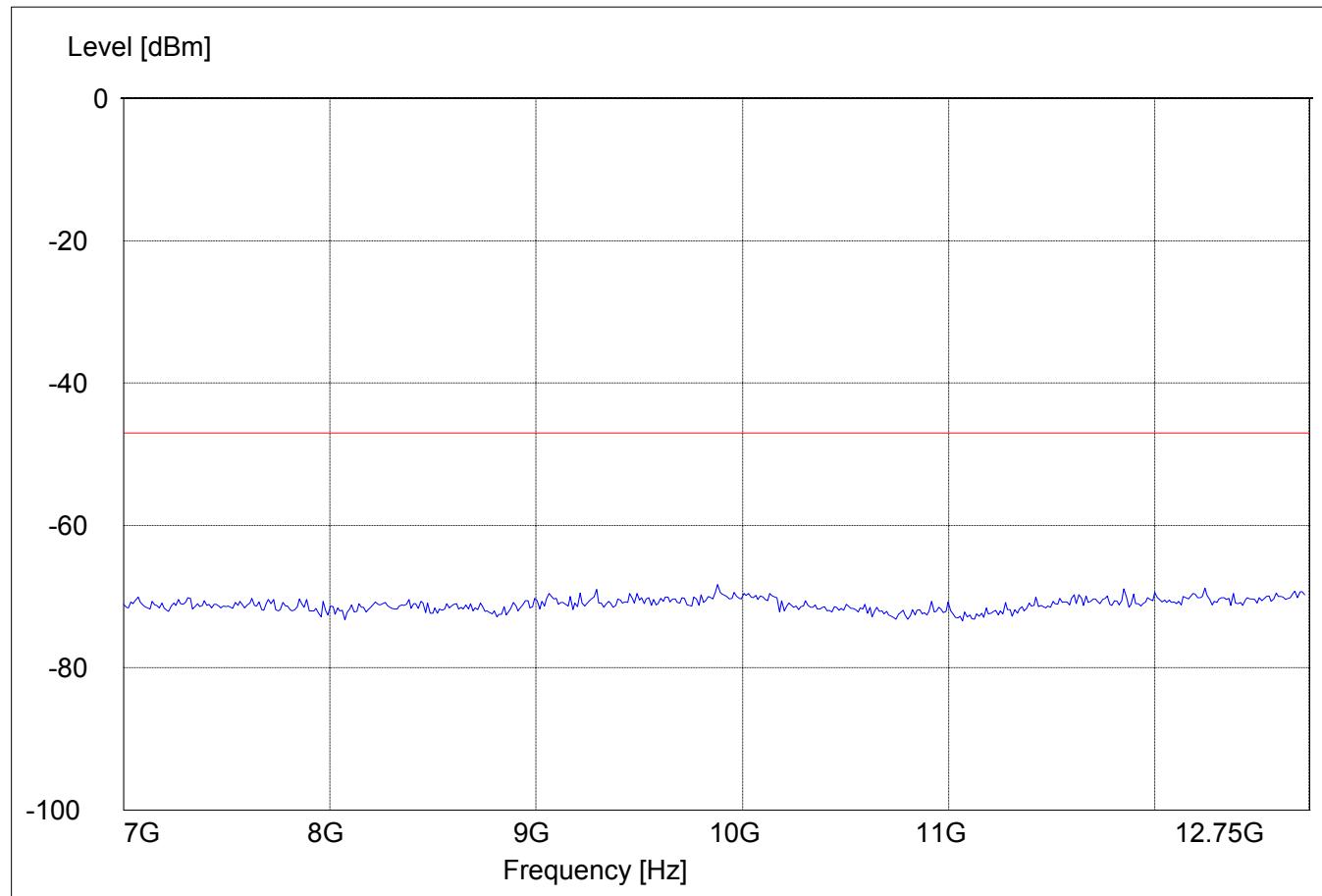
Short Description:		ETS 328 1GHz-7GHz TX mode		
Start Frequency	Stop Frequency	Detector	Meas.	IF
1.0 GHz	7.0 GHz	MaxPeak	Coupled	100 kHz
Transducer DUMMY-DBM				



**Out-of-Band Spurious Emissions  
ETSI EN 300 328 (Receiver)****SUBCLAUSE § TRC/CA/01/E****7GHz – 12.75GHz (Radiated)**

SWEEP TABLE: "ETS Spuri 3-7G"

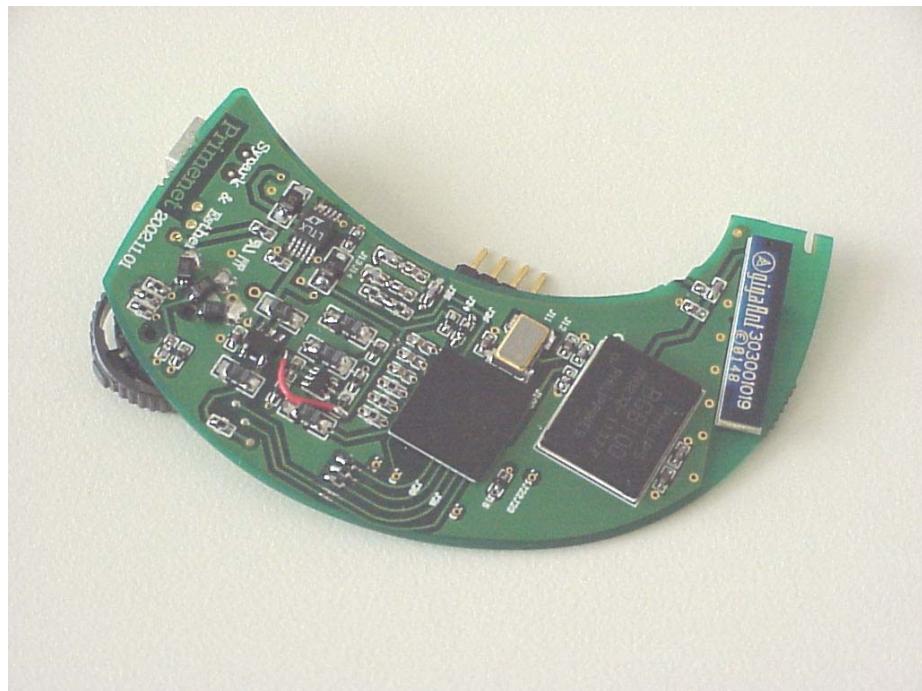
Short Description:	ETS 328 3GHz-7GHz TX mode				
Start Frequency	Stop Frequency	Detector	Meas.	IF	Transducer
3.0 GHz	7.0 GHz	MaxPeak	Coupled	100 kHz	DUMMY-DBM



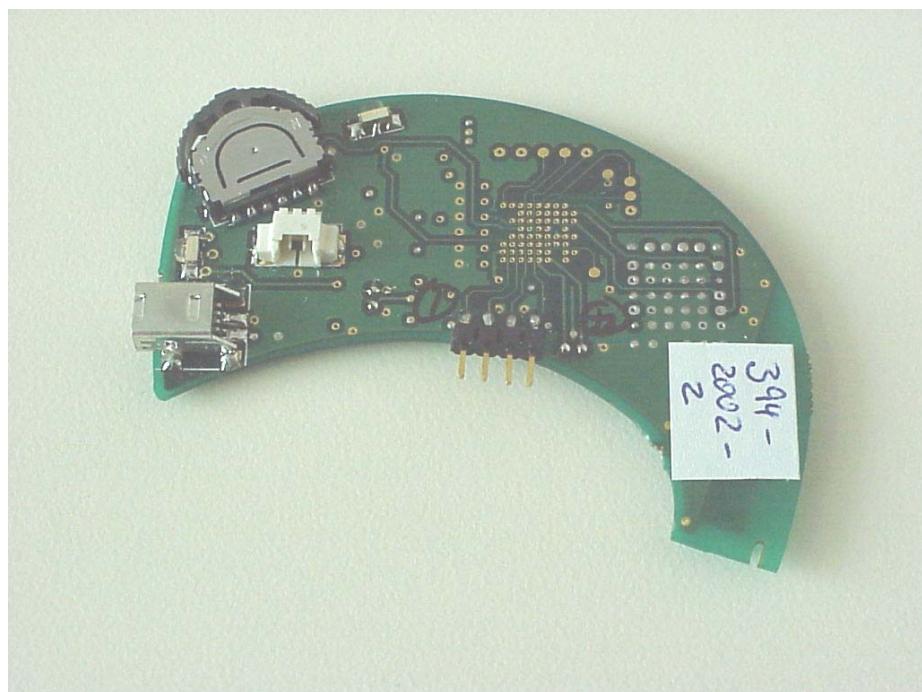
**TEST EQUIPMENT LISTING**

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	826880/010
03	Biconilog Antenna	3141	EMCO	0005-1186
04	Horn Antenna	SAS-200/571	AH Systems	325
05	Digital Radio Communication tester	CMU-200	Rhode & Schwarz	101821
06	Pre-Amplifier	JS4-00102600	Miteq	00616

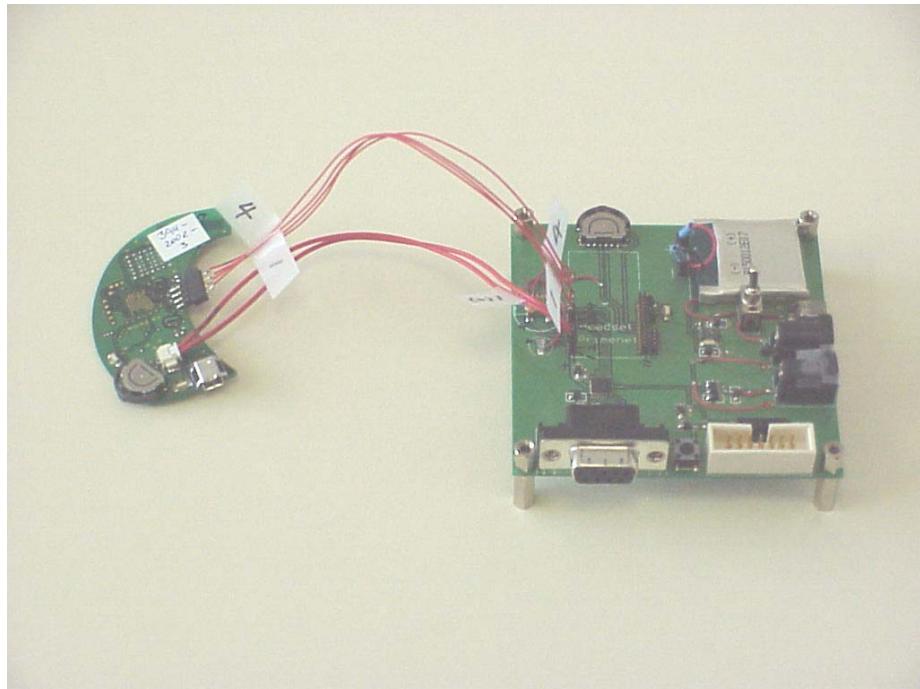
**PHOTOGRAPHS**



**EUT – Top view**



**EUT – Bottom view**



**EUT with Test fixture**

**BLOCK DIAGRAM**  
**Radiated Measurements**