FCC Test Report

Test report no.: EMC_856FCC15.247_2005_Collocation

FCC Part 15.247 / CANADA RSS-210
Model: PCG-4E1L
FCC ID: AK8PCG4E1L
IC: 409B-PCG4E1L

Deutscher Akkreditierungs Rat DAR

TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**

Bluetooth

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Test Lab
LAB CODE 20020328-00

FCC listed # 101450

IC recognized # 3925

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

Table of Contents

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. USA 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 USA.

TEST REPORT PREPARED BY:
EMC Engineer: Harpreet Sidhu

1.2 Testing laboratory

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1.3 Details of applicant

Name	**:**	**SONY CORPORATION**
Street	**:**	**6-7-35, Kitashinagawa, Shinagawa-Ku**
City / Zip Code	**:**	**Tokyo 141-0001**
Country	**:**	**Japan**
Contact	**:**	**Takumi Ozawa**
Telephone	**:**	**+81-3-5795-8716**
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e-mail	**:**	**ozawa@sm.sony.co.jp**

1.4 Application details

Date of receipt test item	:	2005-02-22
Date of test	:	2005-02-22/23/24/25, 2005-03-03

1.5 Test item

Marketing Name	:	PCG-4E1L
Model No.	:	PCG-4E1L
Description	:	Laptop computer with GSM, WLAN & BT radios.
HW / SW version	:	FP1 / P1A41
FCC-ID	:	AK8PCG4E1L
IC ID	:	409B-PCG4E1L

Additional information

Test Sample ID	:	#23
Frequency	:	2412 – 2462MHz for WLAN 2402MHz – 2480MHz for BT 824.2MHz – 848.8MHz for GSM 850, 1850.2MHz – 1909.8MHz for PCS 1900
Type of modulation	:	FHSS, DSSS & OFDM, GFSK
Power supply	:	via host Tablet PC

1.6 Test standards: FCC Part 15 §15.247 (DA00-705) / RSS 210

SUMMARY OF TEST REPORT

This test report is valid for collocation combination of different radios.

- **WLAN & BT**
- **GSM & BT**

***In this case both WLAN and GSM modules can not transmit simultaneously.**

Testing is done against FCC15.247 limits. GSM mode was tested in both 850 & 1900 bands along with BT respectively. Test report carries only worst case plots.

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”)	**Passed**

Technical responsibility for area of testing:

Date	Section	Name	Signature
2005-03-21	EMC & Radio	Lothar Schmidt (Manager)	

Responsible for test report and project leader:

Date	Section	Name	Signature
2005-03-21	EMC & Radio	Harpreet Sidhu (EMC Engineer)	

2.2 Test report

TEST REPORT

Test report no.: EMC_856FCC15.247_2005_Collocation

TEST REPORT REFERENCE

EMISSION LIMITATIONS **§ 15.247 (c) (1)**
Transmitter (Radiated)

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)).

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 26.5 GHz very short cable connections to the antenna was used to minimize the noise level.

2. Frequency resolution is not fine enough to show the exact frequency of the carrier, refer to plots under EIRP.

3. All measurements are done in peak mode unless specified with plots.

Results for the radiated measurements below 30MHz according § 15.33

Frequency	Measured values	Remarks
9KHz – 30MHz	No emissions found, caused by the EUT	This is valid for all the tested channels

EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

Transmit at Lowest channel Frequency			
Frequency (MHz)	**Level (dBµV/m)**		
	Peak	**Quasi-Peak**	**Average**
See plots			

Transmit at Middle channel Frequency			
Frequency (MHz)	**Level (dBµV/m)**		
	Peak	**Quasi-Peak**	**Average**
See plots			

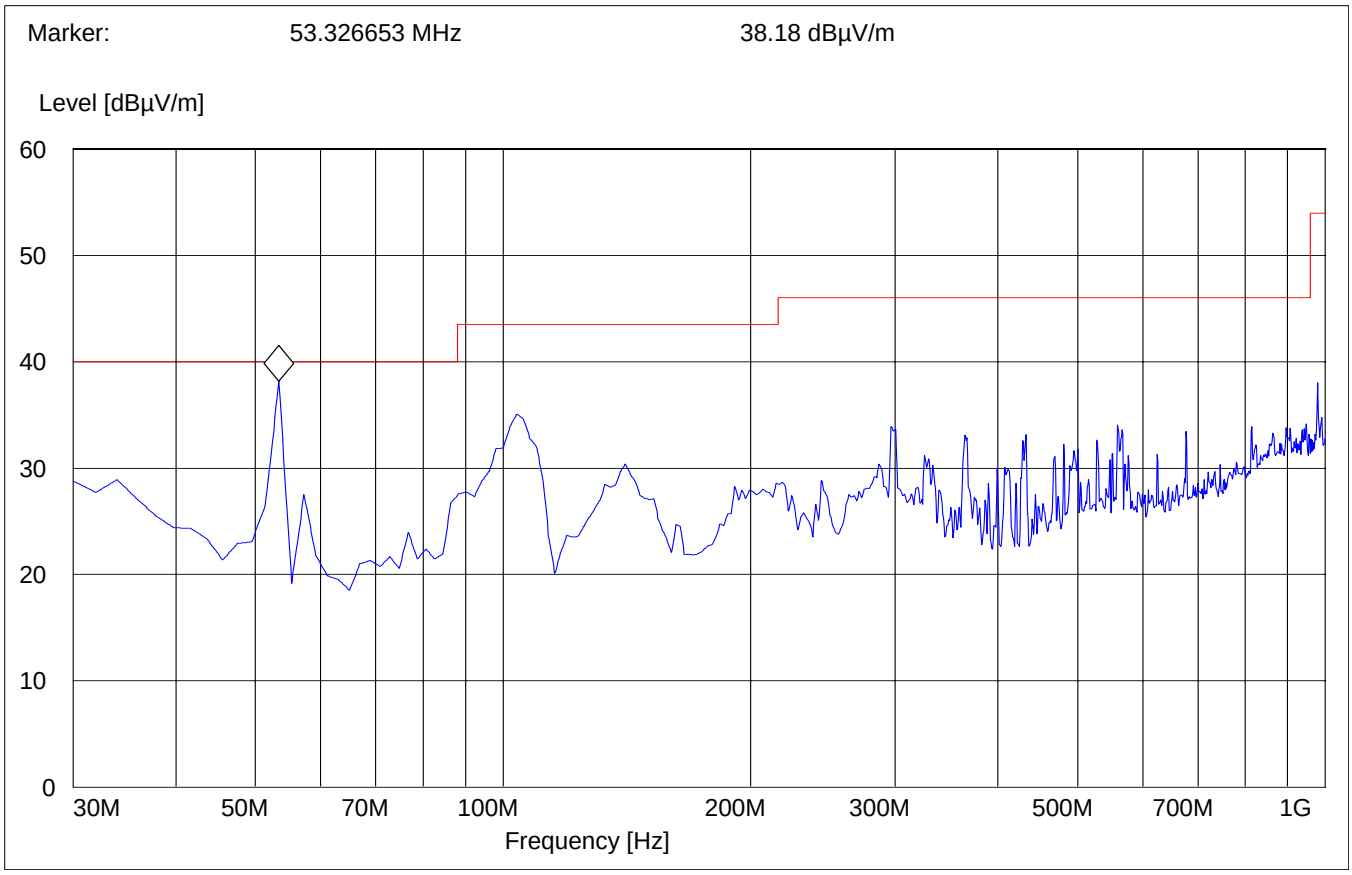
Transmit at Highest channel Frequency			
Frequency (MHz)	**Level (dBµV/m)**		
	Peak	**Quasi-Peak**	**Average**
See plots			

EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
30MHz – 1GHz
Antenna: vertical

This plot is valid for Collocation of both GSM & BT and WLAN & BT combinations. (Worst-case plot)

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

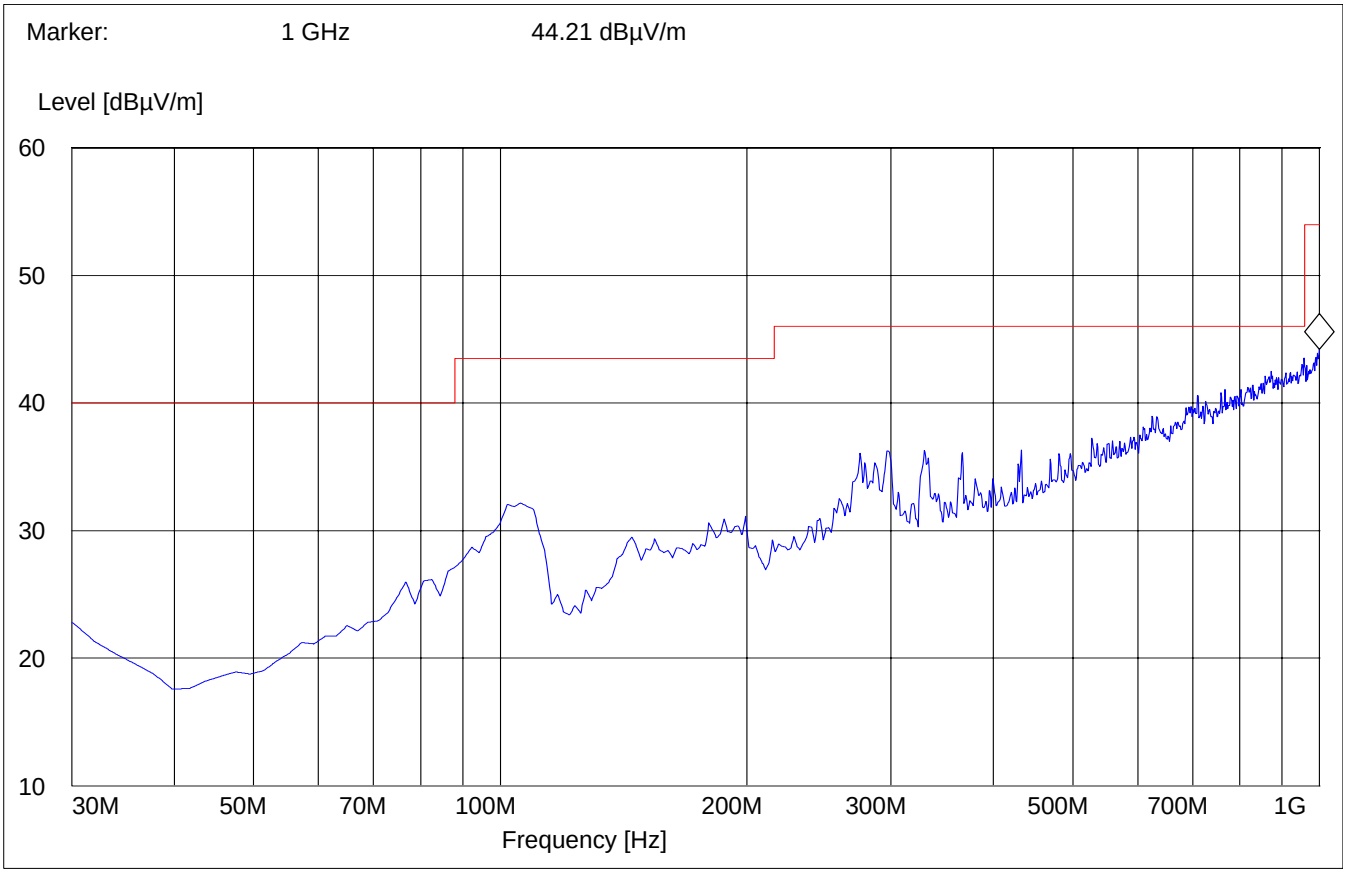
Start Frequency	Stop Frequency	Detector	Meas. Time	RBW VBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
30MHz – 1GHz
Antenna: horizontal
This plot is valid for Collocation of both GSM & BT and WLAN & BT combinations. (Worst-case plot)

SWEEP TABLE:	"Spuri hi 30-1G"				
Short Description:	30MHz-1GHz				
Start Frequency	Stop Frequency	Detector	Meas. Time	RBW VBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186

Operating Mode: TX @ 1909.8 MHz (GSM) AND TX @ 2402 MHz (BLUETOOTH)



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
1GHz – 3GHz

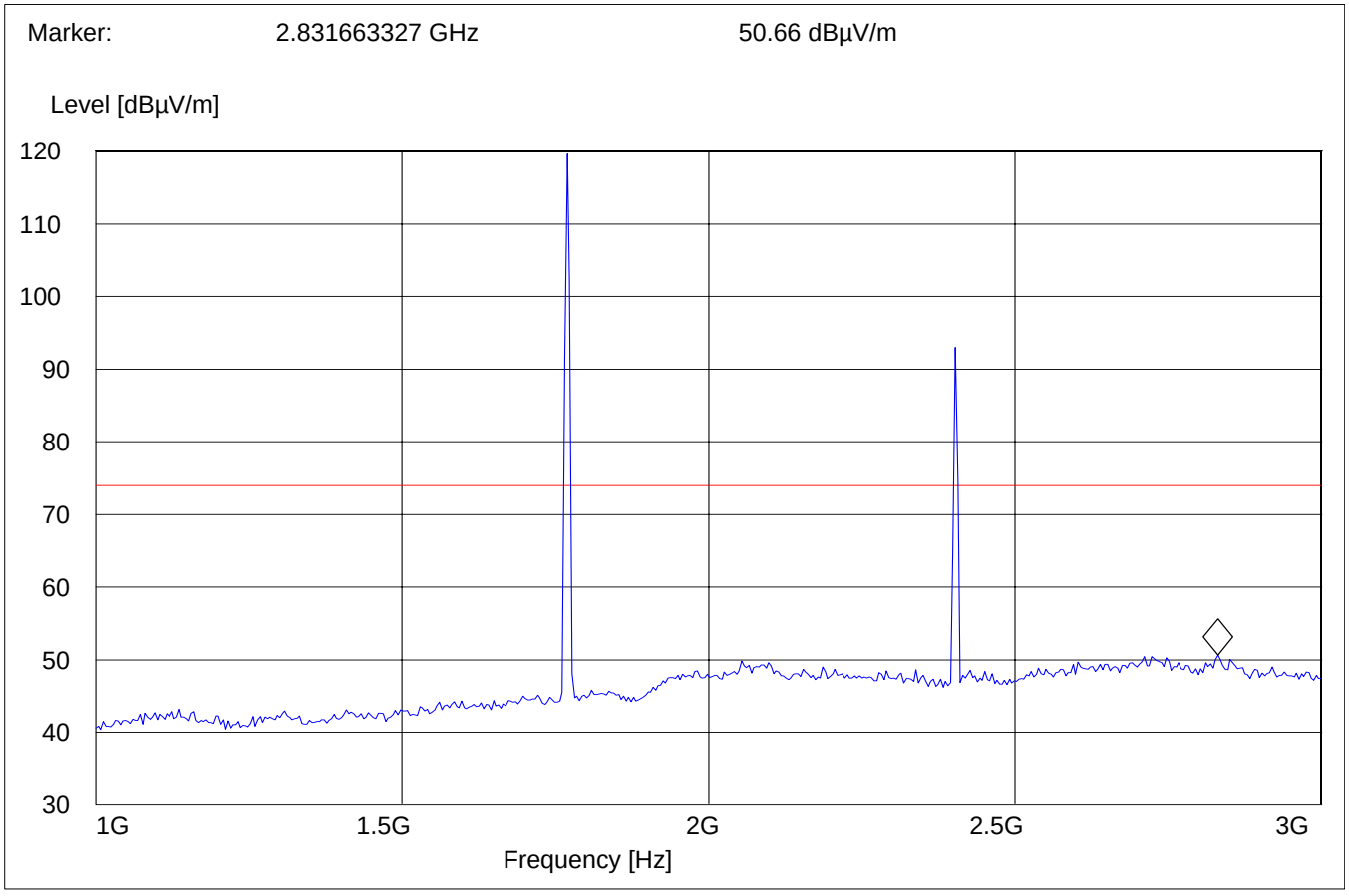
GSM1900+BT

Note: Peaks above the limit line are GSM & BT carrier freq.'s respectively.

SWEEP TABLE: "Spuri hi 1-3G"
Short Description: 1-3GHz

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

Operating Mode: TX @ 1909.8MHz (GSM) AND TX @ 2402 MHz (BLUETOOTH)



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
3GHz – 18GHz

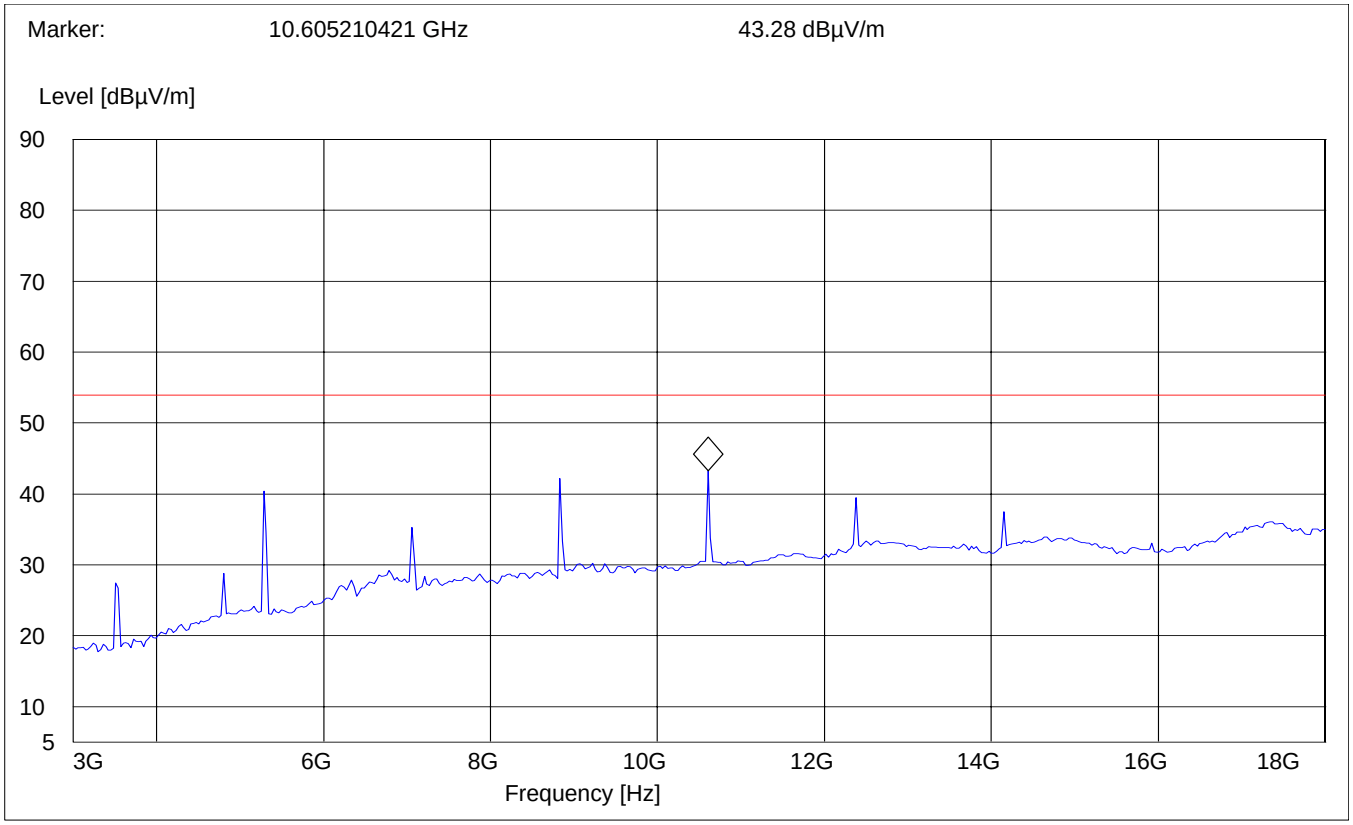
GSM1900+BT

(Average measurement)

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

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)

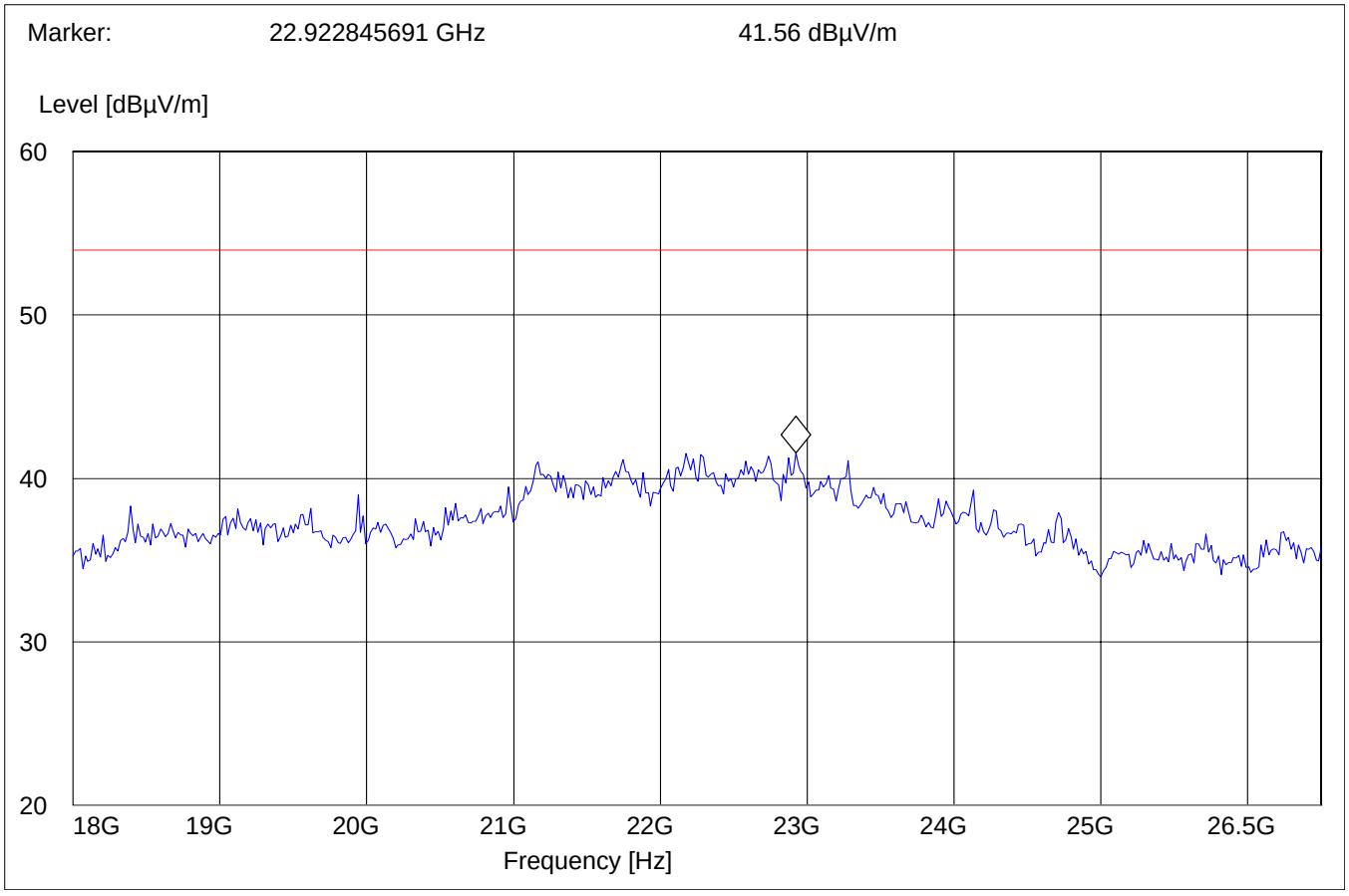
Operating Mode: TX @ 1909.8MHz (GSM) AND TX @ 2402 MHz (BLUETOOTH)



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
18GHz – 26.5GHz
This plot is valid for Collocation of both GSM & BT and WLAN & BT combinations. (Worst-case plot)

SWEEP TABLE:		"Spuri hi 18-26.5G"			
Short Description:		Spurious 18-26.5GHz			
Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer
18 GHz	26.5 GHz	MaxPeak	Coupled	1 MHz	#141 horn (dBi)

Operating Mode: TX @ 1909.8MHz (GSM) AND TX @ 2402 MHz (BLUETOOTH)



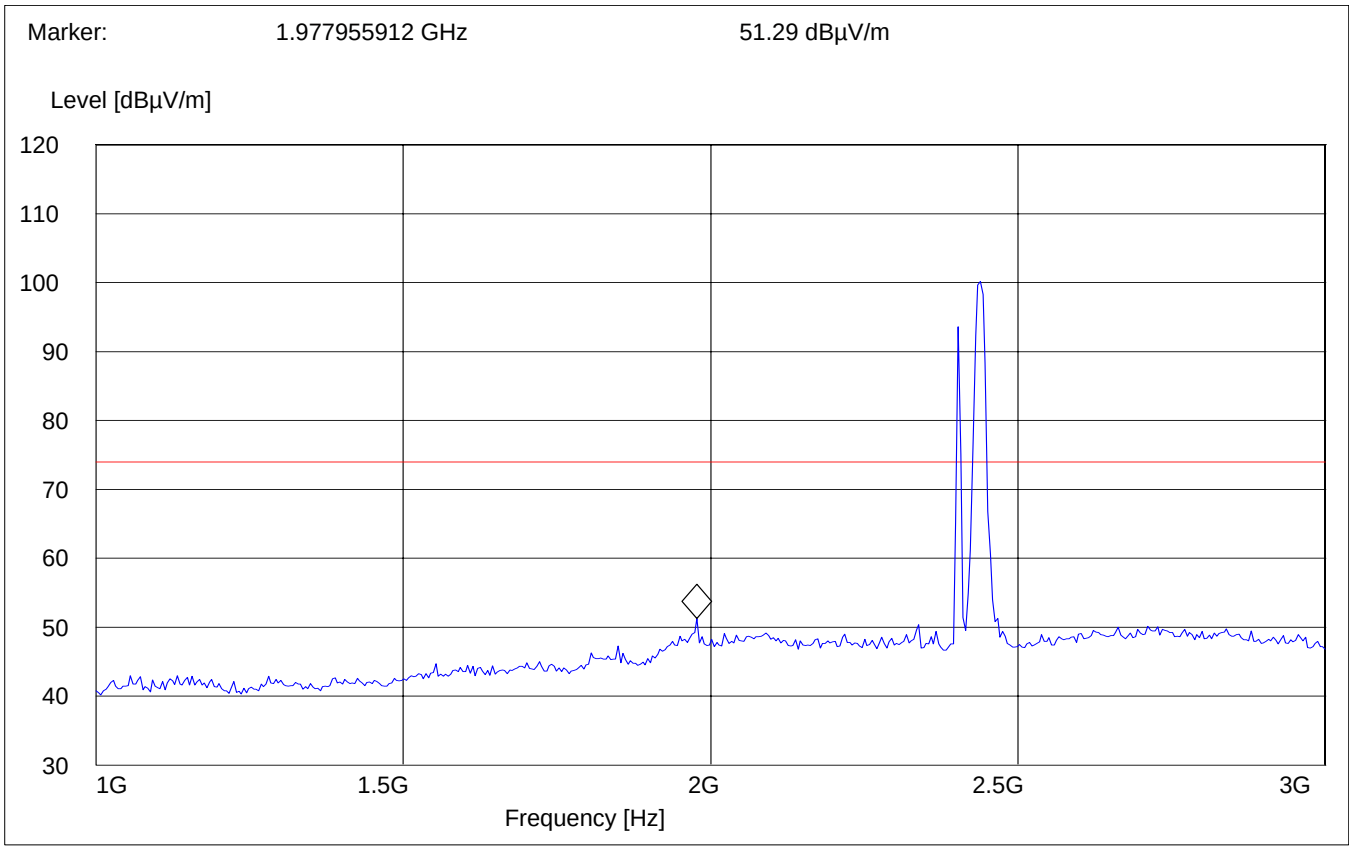
EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
1GHz – 3GHz

WLAN+BT

Note: Peaks above the limit line are BT & WLAN carrier freq.'s respectively.

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

Operating Mode: TX @ 2412MHz (WLAN) AND TX @ 2402 MHz (BLUETOOTH)



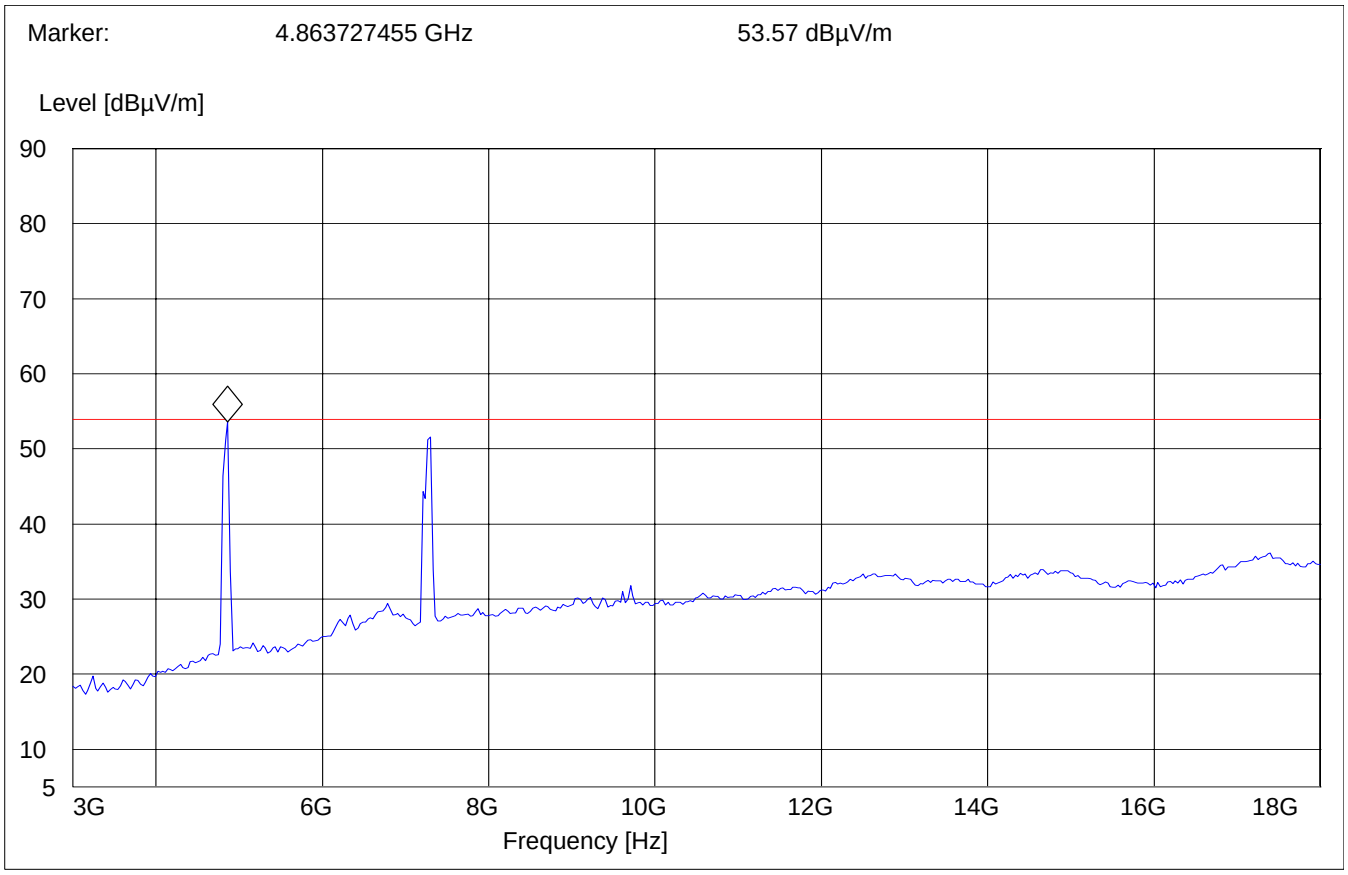
EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
3GHz – 18GHz

WLAN+BT

(Average measurement)

SWEEP TABLE:	"Spuri hi 3-18G"					
Short Description:	Spurious 3-18 GHz					
Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)

Operating Mode: TX @ 2412MHz (WLAN) AND TX @ 2402 MHz (BLUETOOTH)



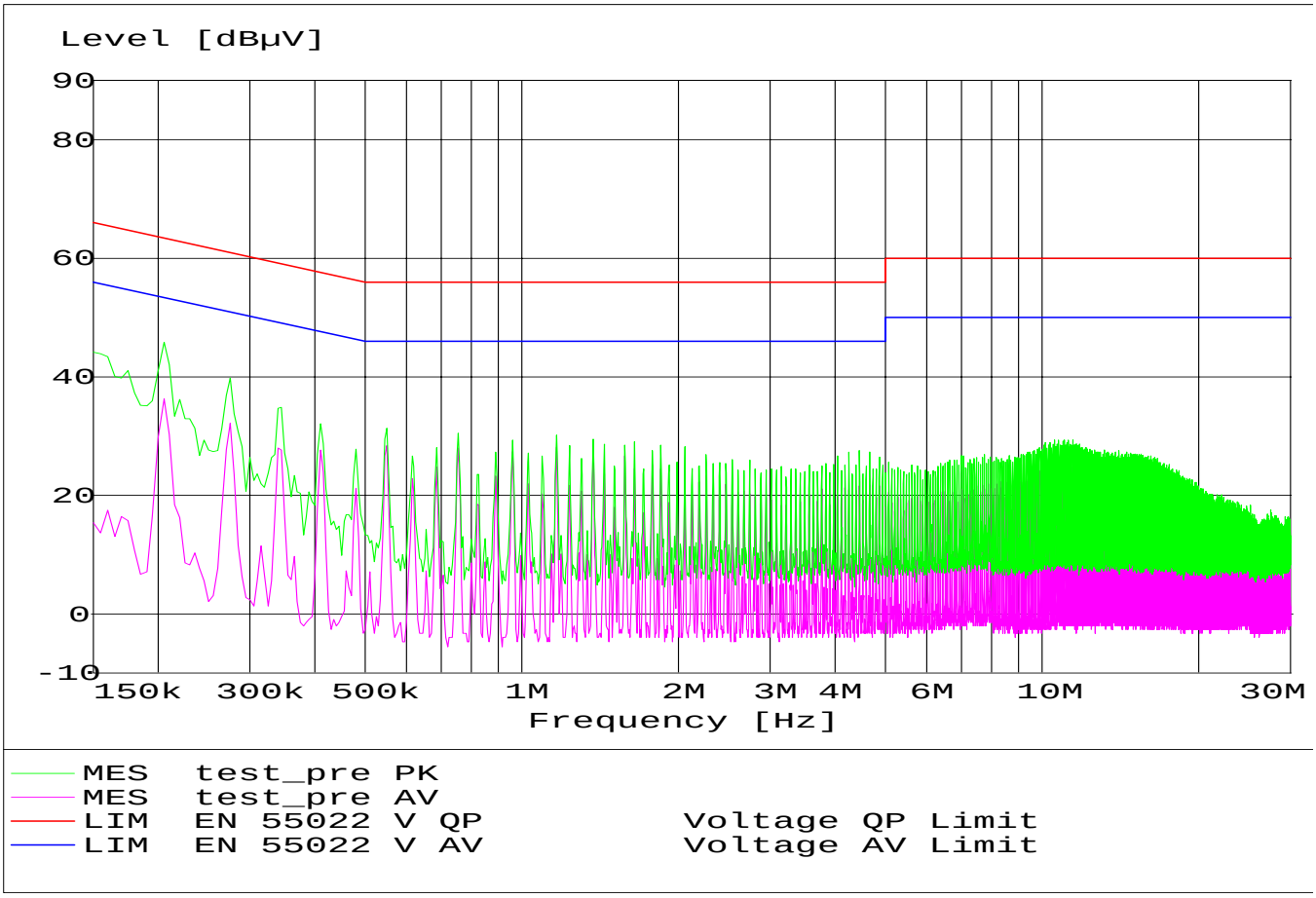
CONDUCTED EMISSIONS § 15.107/207

This plot is valid for Collocation of both GSM & BT and WLAN & BT combinations. (Worst-case plot)

Technical specification: 15.107 / 15.207 (Revised as of August 20, 2002)
Limit

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50
* Decreases with logarithm of the frequency		

ANALYZER SETTINGS: RBW = 10KHz VBW = 10KHz



TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

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 (700M-18GHz)	SAS-200/571	AH Systems	325
05	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240
06	2-3GHz Band reject filter	BRM50701	Microtronics	6
07	Pre-Amplifier	TS-ANA	Rohde & Schwarz	--
08	Pre-Amplifier	JS4-00102600	Miteq	00616

BLOCK DIAGRAMS
Radiated Testing