



Test Report for RAY240 Radio

CFR 47 Part 80: Conducted Emissions from Antenna Port

Test Report Number: 552/1041

Approved	Adil Abbas International Compliance Manager		02/06/2004
Technical Check	Peter Bowen Senior EMC Test Engineer		11/03/2004
Administrative Check	Chris Bird Approvals Manager		02/06/2004
Report	Andy Little EMC Engineer		04/03/04
Report Date	04/03/04	Test Date	04/03/04

The test data and results contained within this report relate only to the items tested.

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Any reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%. Any uncertainty evaluation has been carried out with reference to CISPR16-4:2002.

1 Purpose of Tests

Initial FCC compliance test of the RAY 240 Radio, in accordance with 47 CFR Parts 80.211, 2.1051

2 Description of Equipment under Test (EUT)

(To include all equipment being tested)

Date of Receipt:	23 rd February 2004
Client:	Raymarine Communications group
Brand Name:	Raymarine
Product Range:	Communications
Country of Manufacture:	England
Operational voltage range:	10.8 to 15.6V (Tolerant of 24V but will not transmit or receive)

Unit 1

Model Name or Number:	RAY240 VHF Transceiver (US Version)	
Unique Type Identification:	R49129	
FCC ID Number	PJ5RAY240	
Serial Number:	EMC230204a	
Circuit Diagram Number(s) & Issue:	Processor Board	4552-007 Issue Y
	Interconnect Board	4552-022 Issue F
	RF Board	4552-039 Issue G
PCB Assembly Number(s) & Issue:	Processor Board	3015-291 Issue C
	Interconnect Board	3015-295 Issue D
	RF Board	4552-001 Issue D
Software Version:	V0.13	
Modifications to Unit:	None	

Unit 2

Model Name or Number:	RAY240 Handset (US Version)	
Unique Type Identification:	E45009	
Serial Number:	EMC230204b	
Circuit Diagram Number(s) & Issue:	4552-008 Issue s	
PCB Assembly Number(s) & Issue:	3015-292 Issue e	
Software Version:	H0.06	
Modifications to Unit:	None	

Unit 3

Model Name or Number:	RAY240 Active Speaker	
Unique Type Identification:	E45003	
Serial Number:	EMC230204c	
Circuit Diagram Number(s) & Issue:	4552-009j	
PCB Assembly Number(s) & Issue:	3015-294a	
Software Version:	N/A	
Modifications to Unit:	None	

3 Description of Auxiliary Equipment

(To include all equipment associated with the EUT(s) which are NOT directly subjected to the test)

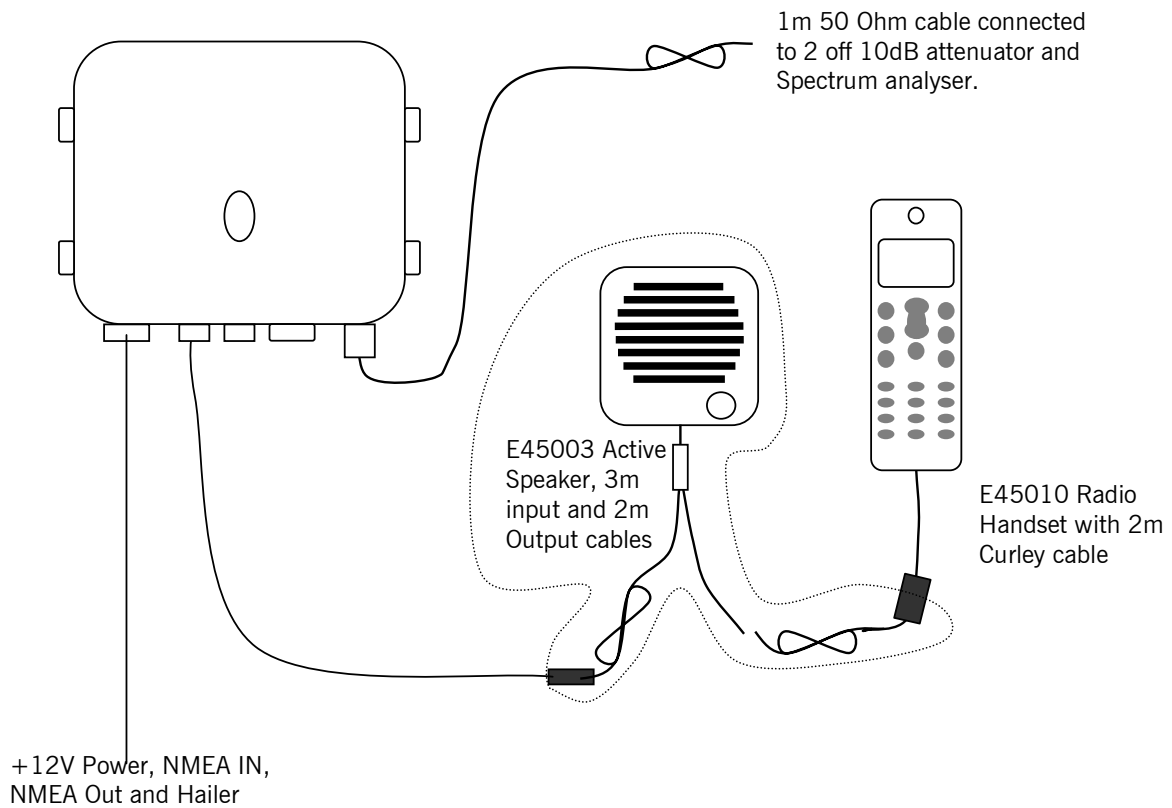
Item	Unique Type Identification & Serial Number
	None

4 General

Supply Voltage	Ambient Temperature	Relative Humidity
12V	24°C	25%

5 Test Configuration

(See Section 2 Description of Equipment under Test (EUT) and Section 2 Description of Auxiliary Equipment for Description of Equipment)



Title	Description
Test Setup and Operating Mode	Setup as per diagram Section 5 Operating mode of the radio was standard transmit at 25W on channel 68 (156.425MHz).

6 Transmit Mode Limit Line Calculation

Centre Frequency 156.425MHz
Declared Bandwidth 16kHz

Test frequency Range 9kHz to 1.56425GHz (Tested to 2GHz)

Mean power of Transmitter 23.4W

Therefore limit (dBc) = $43 + 10\log_{10}(\text{Mean Power}) = 56.69\text{dBc}$

Frequency (Band start)	Frequency (Band stop)	Limit (dBc)	Limit (dBm)
9kHz	156.385MHz	56.2dBc	-13dBm
156.385MHz	156.409MHz	35dBc	8.69dBm
156.409MHz	156.417MHz	25dBc	18.69dBm
156.417MHz	156.433MHz	Carrier	Carrier
156.433MHz	156.441MHz	25dBc	18.69dBm
156.441MHz	156.465MHz	35dBc	8.69dBm
156.465MHz	2GHz	56.2dBc	-13dBm

7 Test Results

Test Description	See Page	Result
9kHz to 2GHz FCC CFR47 Part 80.211 and Part 2.1051		
Graph of peak emissions and table of peak measurements	5	PASS

Resolution Bandwidths Used

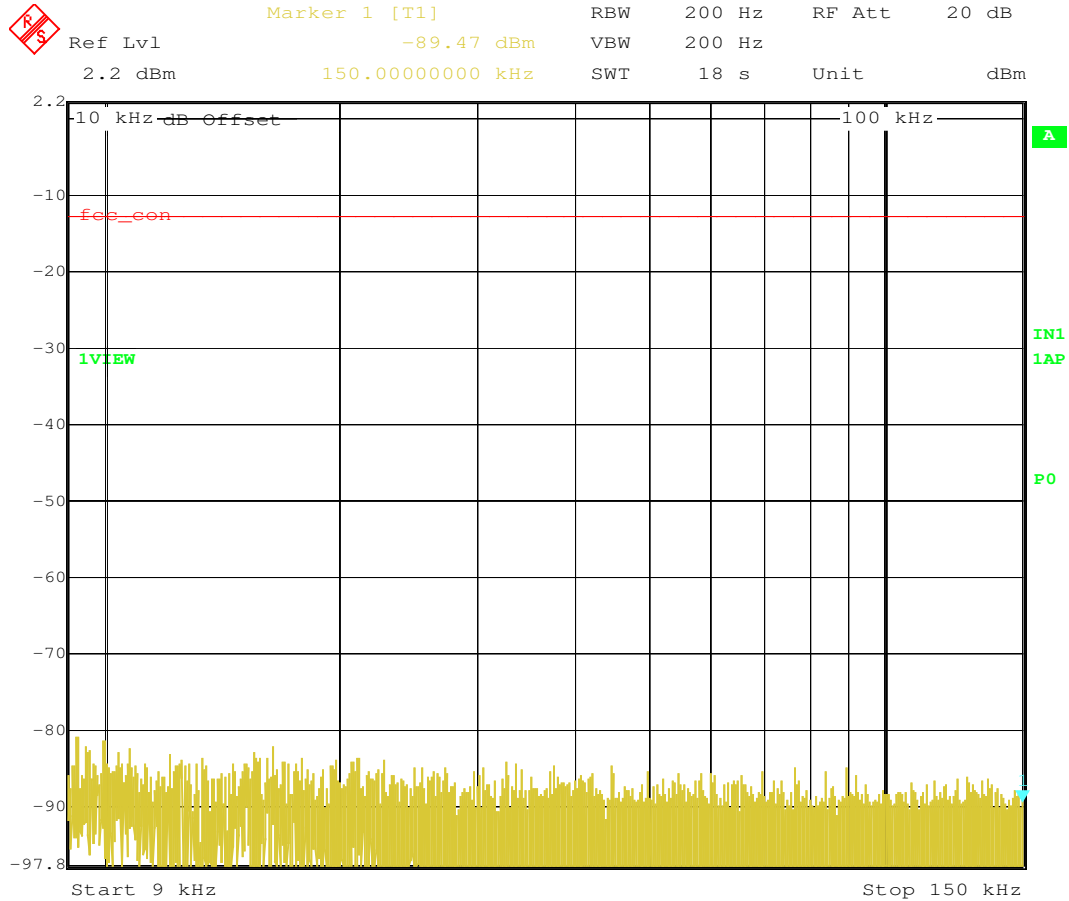
9kHz to 150kHz	200Hz
150kHz to 30MHz	10kHz
30MHz to 1GHz	100kHz
1 to 2 GHz	1MHz
150 to 160MHz	3kHz
156.425MHz Span 200kHz	3kHz

8 Comments and Circuit Modifications

The conducted emissions were measured over the band 9kHz to 2GHz; all emissions from the unit were greater than 20dB below the limit. The unit is therefore considered to meet the requirements of the standard.

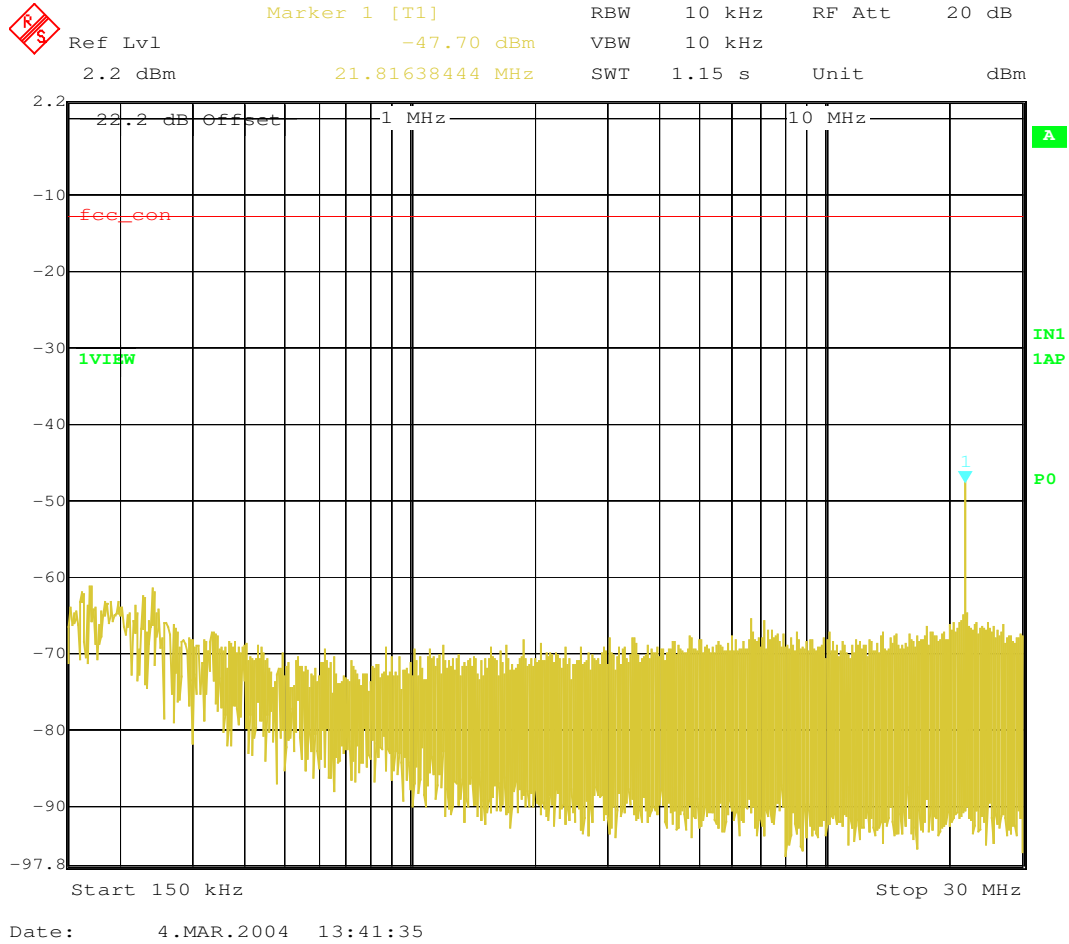
9 Conducted Emissions Graphs

9.1 9kHz to 150kHz

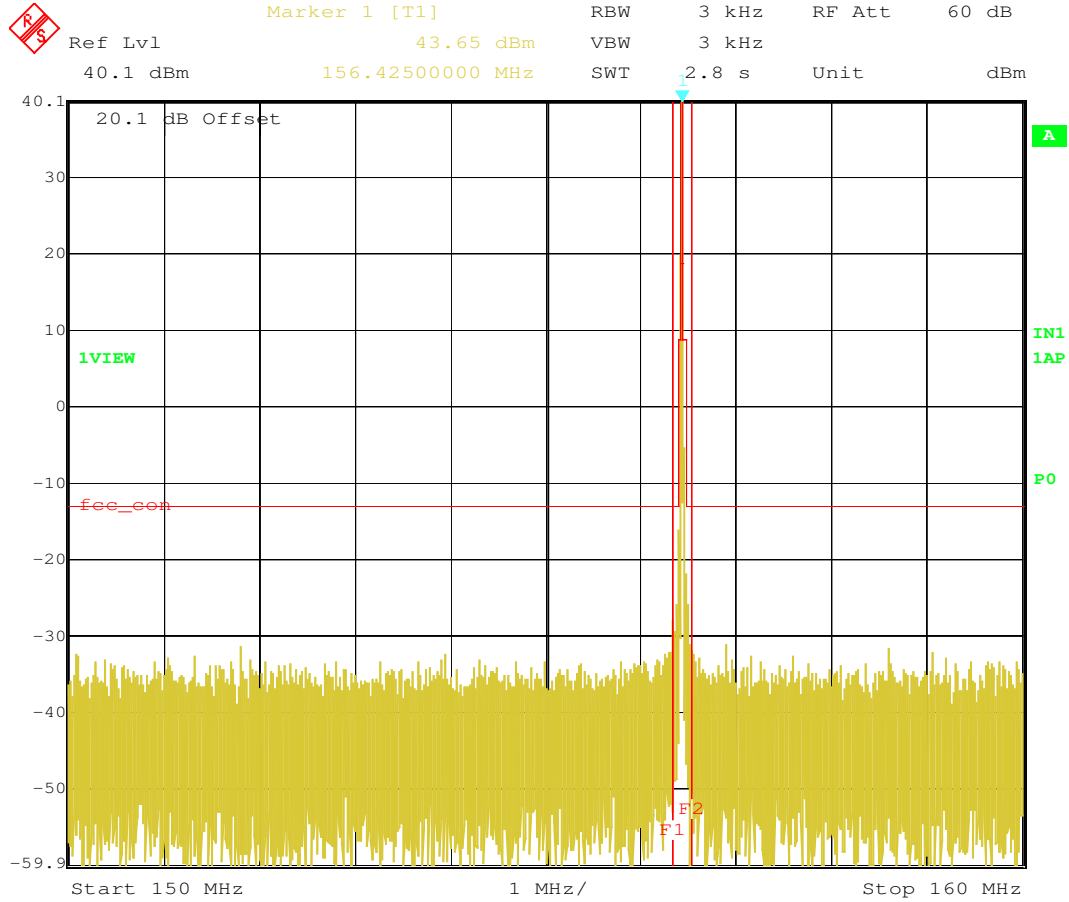


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9.2 150kHz to 30MHz

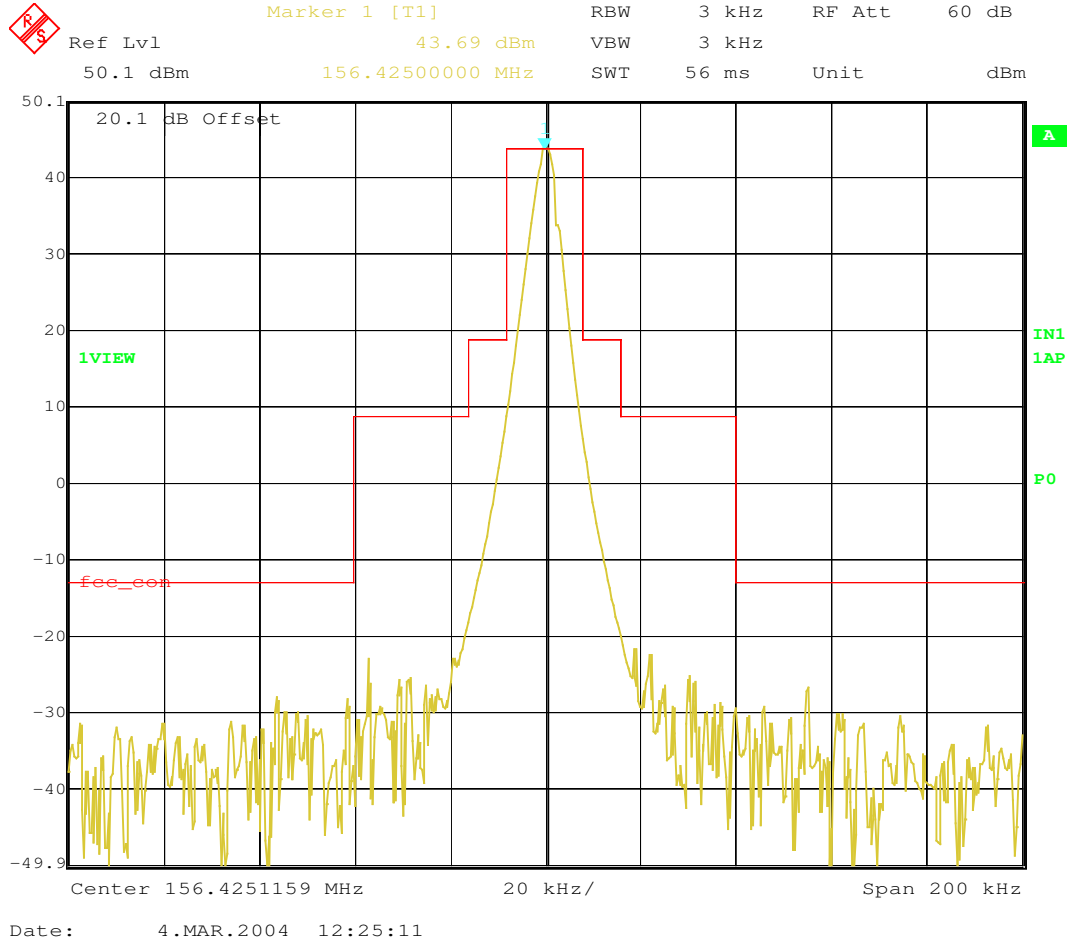


9.3 150 to 160MHz

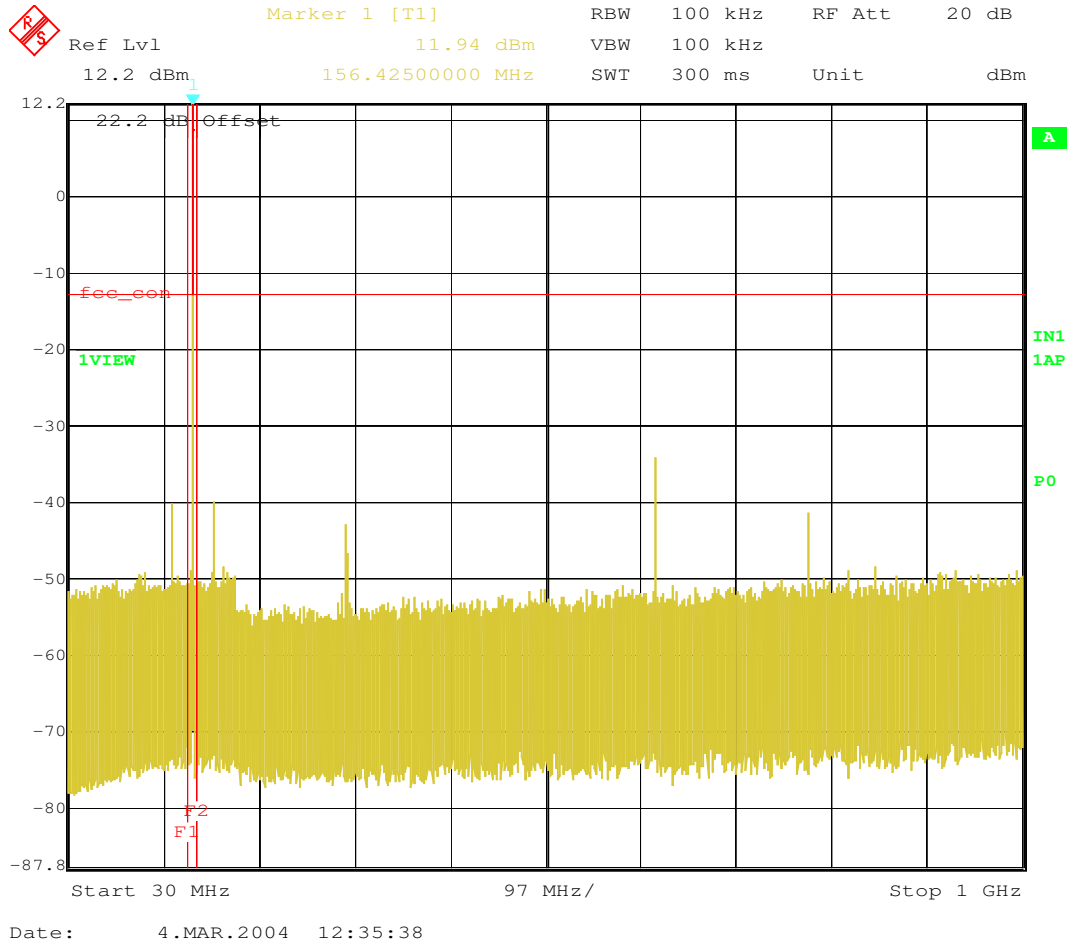


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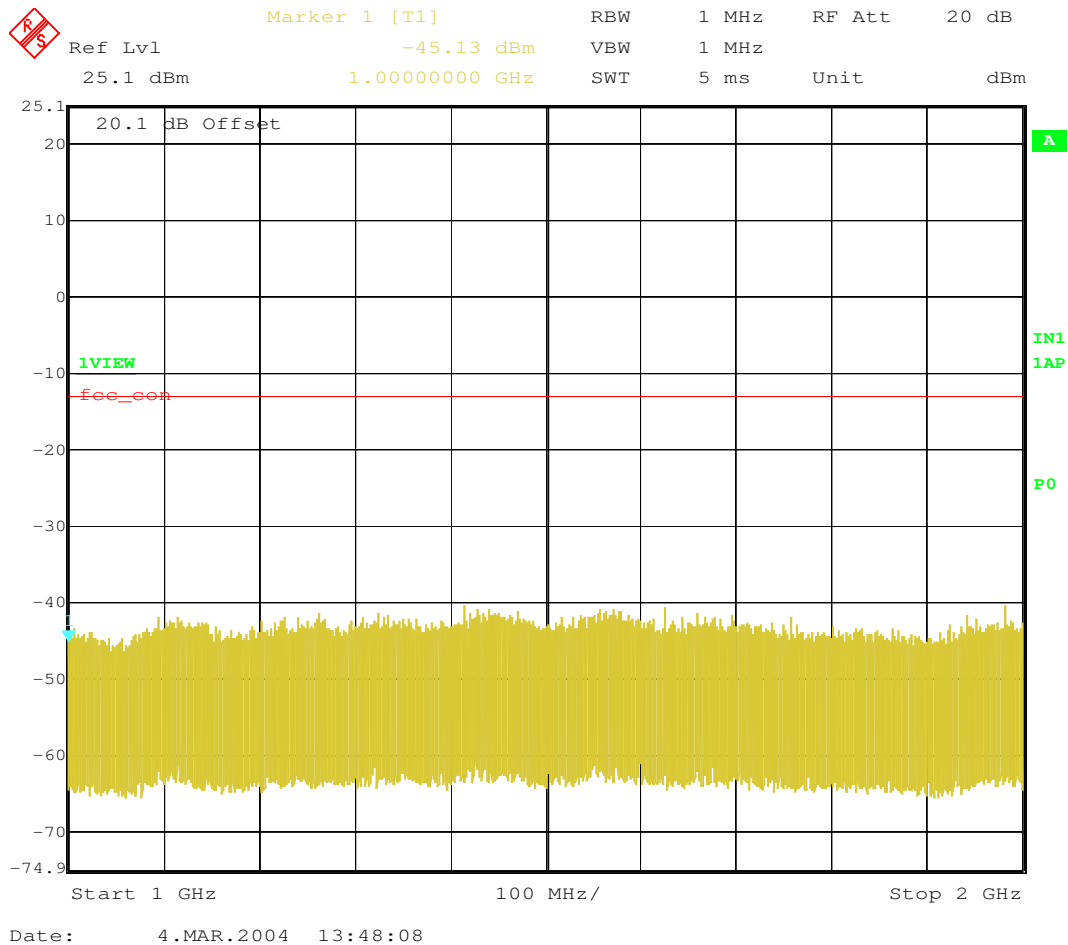
9.4 156.425MHz Span 200kHz



9.5 30MHz to 1GHz



9.6 1GHz to 2GHz



10 List of Test Equipment

Test Equipment Type	Manufacturer and Type Number	Serial Number	TE No.
EMI Test Receiver 20Hz to 26.5GHz	Rohde & Schwarz ESI	832692/006	886
DVM	Fluke Model 83	63550394	1420
Power Supply	Palstar PS30M	520350607	1238
Attenuator 1 (25W, 10dB)	Inmet Corp FSC64671 6N25W-10dB	Supplied by Customer, Combined Calibration results for both attenuators held on file	
Attenuator 2 (25W, 10dB)	Bird Electronics Corp Mod 25-A-MFW-10 0121		
Notch Filter	VHF Notch filter	Supplied by Customer, Calibration results held on file	

In accordance with UKAS requirements, all measuring equipment is on a calibration cycle.