

**REPORT ON THE CERTIFICATION TESTING OF A
COMARK Ltd
RF516
WITH RESPECT TO
THE FCC RULES CFR 47, PART 15.247 July 2008
INTENTIONAL RADIATOR SPECIFICATION**

TEST REPORT NO: 8F2026Q2WRP2

COPY NO: 1

ISSUE NO: 1

FCC ID: TVHFR516

**REPORT ON THE CERTIFICATION TESTING OF A
COMARK Ltd
RF516
WITH RESPECT TO
THE FCC RULES CFR 47, PART 15.247 July 2008
INTENTIONAL RADIATOR SPECIFICATION**

TRAC
TEST DATE: 6th – 9th April 2009
testing regulatory and compliance


TESTED BY: _____ D WINSTANLEY

APPROVED BY: _____ J CHARTERS
RADIO PRODUCT
MANAGER

DATE: _____

Distribution:

Copy Nos: 1. Comark Ltd
2. FCC EVALUATION LABORATORIES
3. TRAC Telecoms & Radio

THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE

The results herein relate only to the sample tested. Full results are contained in the relevant works order file.

CONTENTS

	PAGE
CERTIFICATE OF CONFORMITY & COMPLIANCE	4
APPLICANT'S SUMMARY	5
EQUIPMENT TEST CONDITIONS	6
TESTS REQUIRED	6
TEST RESULTS	7 - 16
 ANNEX	
PHOTOGRAPHS	A
PHOTOGRAPH No. 1: Test setup	
PHOTOGRAPH No. 2: Transmitter front view	
PHOTOGRAPH No. 3: Transmitter rear view	
PHOTOGRAPH No. 4: Transmitter PCB track side	
PHOTOGRAPH No. 5: Transmitter PCB component side	
PHOTOGRAPH No. 6: Control PCB LCD side	
PHOTOGRAPH No. 7: Control PCB component side	
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST	B
MEASUREMENT UNCERTAINTY	C
TEST EQUIPMENT CALIBRATION	D
BAND OCCUPANCY PLOT	E
CONDUCTED OUTPUT POWER	F
CONDUCTED POWER SPECTRAL DENSITY	G
EMISSIONS GRAPH(s)	H
RADIATED BANDEDGE COMPLIANCE	I
AC POWERLINE CONDUCTION GRAPH(s)	J
UNINTENTIONAL RADIATED EMISSIONS	K
 Notes:	
1. Component failure during test	YES <input type="checkbox"/>
	NO <input checked="" type="checkbox"/>
2. If Yes, details of failure:	
3. The facilities used for the testing of the product contain in this report are FCC Listed.	
4. The contents of the attached applicants declarations and other supplied information are not covered by the scope of this laboratory's UKAS or FCC accreditations' and is provided in good faith.	

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY:	TVHFR516
PURPOSE OF TEST:	Class II Permissive Change
TEST SPECIFICATION:	FCC RULES CFR 47, Part 15.247 July 2008
TEST RESULT:	Compliant to Specification
EQUIPMENT UNDER TEST:	RF516
EQUIPMENT TYPE:	Digital Spread Spectrum Transmitter
PRODUCT USE:	Temperature Monitor
CARRIER EMISSION:	0.00132 Watts
ANTENNA TYPE:	Unique Antenna Connector
ANTENNA GAIN:	2.1 dBi Maximum Gain Antenna
FREQUENCY OF OPERATION:	2405 MHz
CHANNEL SPACING:	N/A Wideband Channel
NUMBER OF CHANNELS:	1
FREQUENCY GENERATION:	SAW Resonator <input type="checkbox"/> Crystal <input type="checkbox"/> Synthesiser <input checked="" type="checkbox"/>
MODULATION METHOD:	FHSS <input type="checkbox"/> DSSS <input checked="" type="checkbox"/> Other <input type="checkbox"/>
POWER SOURCE(s):	1.5Vdc or 110Vac
TEST DATE(s):	6 th – 9 th April 2009
ORDER No(s):	SO6735
APPLICANT:	Comark Ltd
ADDRESS:	Comark House Gunnels Wood Park Gunnels Wood Road Stevenage Hertfordshire SG1 2TS United Kingdom

TESTED BY:

D WINSTANLEY

APPROVED BY:

J CHARTERS
RADIO
PRODUCT
MANAGER

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT): RF516

EQUIPMENT TYPE: Digital Spread Spectrum Transmitter

PURPOSE OF TEST: Certification

TEST SPECIFICATION(s): FCC RULES CFR 47, Part 15.247 July 2008

TEST RESULT: COMPLIANT Yes No

APPLICANT'S CATEGORY: MANUFACTURER
IMPORTER
DISTRIBUTOR
TEST HOUSE
AGENT

APPLICANT'S ORDER No(s): SO6735

APPLICANT'S CONTACT PERSON(s): Mr P Morrison

E-mail address: paulmorrison@comarkltd.com

APPLICANT: Comark Ltd

ADDRESS: Comark House
Gunnels Wood Park
Gunnels Wood Road
Stevenage
Hertfordshire
SG1 2TS
United Kingdom

TEL: +44 (0) 1483 367367

FAX: +44 (0) 1483 367400

EUT(s) COUNTRY OF ORIGIN: United Kingdom

TEST LABORATORY: TRaC Telecoms & Radio

UKAS ACCREDITATION No: 0728

TEST DATE(s): 6th – 9th April 2009

TEST REPORT No: 8F2026Q2WRP2

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1. TEST/EXAMINATION	RULE PART	DETECTOR	APPLICABILITY
Intentional Emission Frequency:	15.247(b)	Peak	Yes
Intentional Emission Field Strength:	-	-	No
Intentional Emission Band Occupancy:	15.247(a)	Peak	Yes
Intentional Emission ERP (mW):	15.247(b)	Peak	Yes
Spurious Emissions – Conducted:	15.247(b)	Peak	Yes
Spurious Emissions – Radiated <1000MHz:	15.209	Quasi Peak	Yes (Note 1)
Spurious Emissions – Radiated >1000MHz:	15.209	Average	Yes (Note 1)
Spectral power Density	15.247(e)	Peak	Yes
Spurious Emission – Power Line TX	15.207	Quasi Peak Average	Yes
Spurious Emission – Power Line TX	15.107	Quasi Peak Average	Yes
Maximum Frequency of Search:	15.33	-	Yes
Antenna Arrangements Integral:	15.203	-	Yes
Antenna Arrangements External Connector:	15.204	-	Yes
Restricted Bands	15.205	-	Yes
Extrapolation Factor	15.31(f)	-	Yes

Note 1: The Manufacturer States that this unit is not intended to be operated within 20cm of the body.

2. Product Use: Temperature Monitor

3. Emission Designator: 1M64F1D

4. Duty Cycle: <100%

5. Transmitter bit or pulse rate and level: 250Kbps

6. Temperatures: Ambient (T_{nom}) 20°C

7. Supply Voltages: V_{nom} +1.5Vdc
+110Vac

Note: V_{nom} voltages are as stated above unless otherwise shown on the test report page

8. Equipment Category: Single channel [X]
Multi-channel []

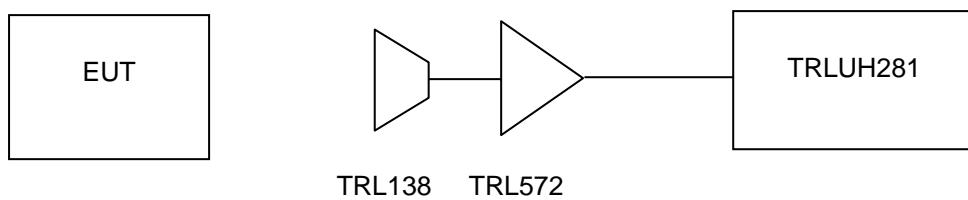
9. Channel spacing: Narrowband []
Wideband [X]

TRANSMITTER TESTS

TRANSMITTER 6dB BANDWIDTH – RADIATED – PART 15.247(a)(2)

Ambient temperature	= 20 ⁰ C(<1GHz)	3m measurements	[X]
Relative humidity	= 48% (<1GHz),	1m measurements	[]
Conditions	= Open Area Test Site (OATS)		
Supply voltage	= +110Vac		
Channel number	= 1		

Diagram



Frequency (MHz)	F_{LOWER} (MHz)	F_{HIGHER} (MHz)	Occupied Bandwidth (MHz)	Limits (kHz)
2405 MHz	2404.169872	2405.812500	1.64	>500 kHz

Notes: 1 See Annex E for Emissions Graph(s)

Test Method: 1 The 6db bandwidth was recorded with the EUT Actively Transmitting Data

The test equipment used for the Transmitter Spurious Emissions – Radiated – Part 15.209 tests is shown below:

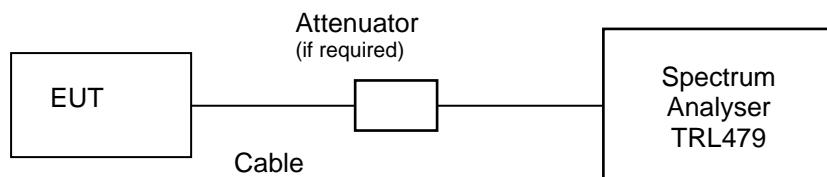
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	EQUIPMENT USED
HORN ANTENNA	EMCO	3115	9010 - 3580	138	X
PRE AMPLIFIER	AGILENT	8449B	3008A016	572	X
SPECTRUM ANALYSER	R & S	FSU	200034	UH281	X

TRANSMITTER TESTS

TRANSMITTER - MAXIMUM PEAK POWER - CONDUCTED - PART 15.247(B)(3)

Ambient temperature = 20°C
 Relative humidity = 48%
 Conditions = Radio Lab
 Supply voltage = +110vac

Diagram



Frequency MHz	Peak Power dBm	Peak Power Watts	Antenna Gain dBi	Average Power Watts	Limit Watts
2404.310	-0.89	0.00122	2.1	0.00132	1

Notes:

- 1 Gain of antenna 2.1dBi, maximum gain antenna supplied by manufacturer.
- 2 For analyser plots see annex F.

Test Method:

- 1 The EUT was connected to the spectrum analyser via the unique antenna connector a cable and attenuator - if applicable.
- 2 The EUT was operated in transmit mode with modulation.
- 3 The level on the analyser was recorded.
- 4 The resolution bandwidth of the analyser was set to > than the 6dB bandwidth

Test equipment used for Peak Power measurement:

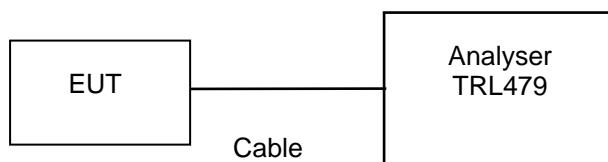
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X

TRANSMITTER TESTS

TRANSMITTER POWER SPECTRAL DENSITY – CONDUCTED - PART 15.247(E)

Ambient temperature = 20°C
 Relative humidity = 48%
 Conditions = Radio Lab
 Supply voltage = +110Vac

Diagram



Frequency	Measured Power Spectral Density	Limit
2404.618 MHz	-7.66 dBm	+8 dBm

Notes: 1 For analyser plots see annex G.

Test Method:

- 1 The EUT was connected to the analyser via the unique antenna connector & a cable
- 2 The resolution bandwidth on the analyser was set to 3kHz and trace set to max hold.
- 3 The span is set to 3MHz
- 4 The sweep time is 1000 seconds (Span/3kHz).
- 5 The analyser level is offset to take the antenna gain (2.1dBi) & cable loss into account.

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS – RADIATED – Part 15.247(c) and 15.209

Ambient temperature	=	18°C(<1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	58% (<1GHz),	3m measurements >1GHz	[X]
Conditions	=	Open Area Test Site (OATS)	3m extrapolated from 1m	[]
Supply voltage	=	+110Vac		

Bottom Channel	FREQ. (MHz)	MEAS Rx (dB μ V)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dB μ V/m)	EXTRAP FACT (dB)	FIELD ST'GH (μ V/m)	LIMIT (μ V/m)
0.009MHz - 0.49MHz									Note 8
0.49MHz - 1.705MHz									Note 8
1.705MHz - 30MHz									Note 8
30MHz - 88MHz									Note 8
88MHz - 216MHz									Note 8
216MHz - 960MHz									Note 8
960MHz - 1GHz									Note 8
1GHz - 25GHz	4810.871 7214.576	42.01 39.57	1.80 2.10	32.70 35.80	34.90 35.10	41.61 42.37	- -	120.36 131.37	500 500
Limits	0.009 MHz to 0.49 MHz			2400/f(kHz) μ V/m @ 300m					
	0.49 MHz to 1.705 MHz			24000/f(kHz) μ V/m @ 30m					
	1.705MHz to 30MHz			30 μ V/m @ 30m					
	30MHz to 88MHz			100 μ V/m @ 3m					
	88MHz to 216MHz			150 μ V/m @ 3m					
	216MHz to 960MHz			200 μ V/m @ 3m					
	960MHz to 1GHz			500 μ V/m @ 3m					
	1GHz to 25GHz			500 μ V/m @ 3m					

Notes:

- 1 Results quoted are extrapolated as indicated.
- 2 Emissions were searched to: (x) 1000MHz inclusive, as per Part 15.33a.
- 3 Measurements >1GHz @ 3m as per Part 15.31f(1).
- 4 Receiver detector >1GHz = CISPR, Quasi-Peak, 120kHz bandwidth.
- 5 Receiver detector >1GHz = Average, 1MHz resolution bandwidth, Peak for scans.
- 6 New batteries used for battery-powered products.
- 7 Initial pre scans were performed see Annex H for plots.
- 8 Only emissions with in 20dB of limit are recorded.
- 9 Emissions not directly related to the transmitter are reported under receiver tests.
- 10 Peak Measurements taken and were not more than 20 dB above the average limit.

Test Method:

- 1 As per Radio – Noise Emissions, ANSI C63.4: 2003
- 2 Measuring distances as Notes 1 to 4 above
- 3 EUT 0.8 metre above ground plane
- 4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthogonal planes.
Maximum results recorded.

The test equipment used for the Transmitter Spurious Emissions – Radiated – Part 15.209 tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	EQUIPMENT USED
HORN ANTENNA	EMCO	3115	9010 - 3580	138	X
HORN ANTENNA	EMCO	3115	9010 - 3581	139	
RECEIVER	R & S	ESVS 10	855594/003	352	X
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	
PRE AMPLIFIER	AGILENT	8449B	3008A016	572	X
RECEIVER	R & S	ESHS 10	830051/001	UH03	
RECEIVER	R & S	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	X
BILOG ANTENNA	YORK	CBL6111	1519	UH70	X
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
RECEIVER	R & S	ESVS 10	841431/014	UH186	
RECEIVER	R & S	ESHS 10	841429/012	UH187	
BILOG ANTENNA	YORK	CBL611/A	1618	UH191	
SPECTRUM ANALYSER	R & S	FSU	200034	UH281	X
30 MHz – 1GHz PRE-AMPLIFIER	WATKINS JOHNSON	6201-69	2740	UH372	X

TRANSMITTER TESTS

TRANSMITTER BAND EDGE EMISSIONS – RADIATED – Part 15.247(c)

Ambient temperature = 18°C
 Relative humidity = 48%
 Conditions = Radiated OATS
 Supply voltage = +1.5Vdc

Test Result

Channel Frequency	Emission Frequency (MHz)	Emission Level	Limit
Bottom	2399.858 MHz	-37.63 dBc	-20 dBc
Top	No Significant Emissions Within 20 dB of Limit		54 dB μ V/m @3m

See spectrum analyser scan plots – Annex J

Measure as compliant see analyser plots

Notes:

- 1 The EUT was set in a hopping mode using all hopping channels.
- 2 See Annex K for analysers plots.

Test Method:

- 1 As per section 15.247
- 2 A plot covering the lowest channel and band edge was taken. A marker was set on the peak emission of the lowest channel. The delta marker function was then used to measure the highest out of band emissions. (If no peaks exist outside the band the level is taken at the band edge).
- 3 A plot covering the highest channel and band edge was taken. A marker was set on the peak emission of the highest channel. The delta marker function was then used to measure the highest out of band emissions. (If no peaks exist outside the band the level is taken at the band edge).

The test equipment used for the tests is shown below:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
RECEIVER	ROHDE & SCHWARZ	ESHS 10	825892/006	UH04	
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU46	200034	UH281	X
RANGE 1	TRL	3 METRE	N/A	UH06	
BILOG ANTENNA	CHASE	CBL6112B	2803	UH93	
HORN ANTENNA	EMCO	3115	9010-3580	138	X
PRE AMPLIFIER	AGILENT	8449B	3008A016	572	X

TRANSMITTER and RECEIVER TESTS**CONDUCTED EMISSIONS – AC POWER LINE Parts 15.207 & 15.107****SIGNIFICANT EMISSIONS**

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dB μ V)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dB μ V)
0.205	34.79	Average	Neutral	53.41
0.240	40.64	Average	Live	52.10

Notes:

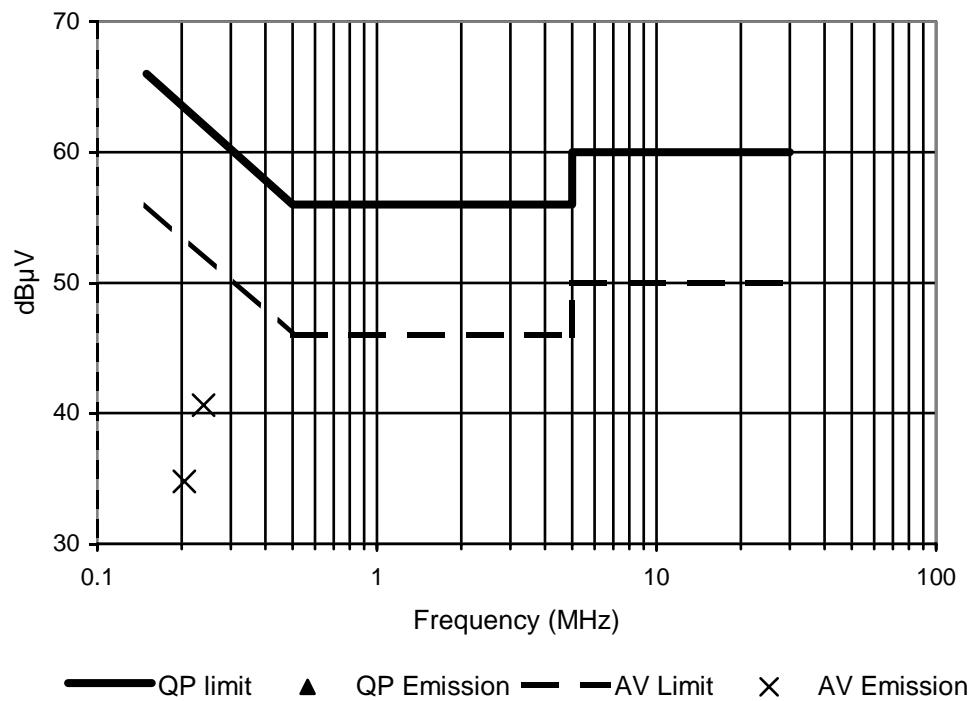
- 1 See attached plot annex J.
- 2 EUT transmitting Carrier 1 per second and in permanent RX mode.
- 3 Worst-case result recorded.

Test Method: 1 As per Radio – Noise Emissions, ANSI C63.4: 2003

The test equipment used for the Transmitter Conducted Emissions – AC Power Line Part 15.207 test was:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
LISN/AMN	ROHDE & SCHWARZ	ESH3-Z5	863906/018	UH05	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	841429/012	UH187	X
LISN/AMN	ROHDE & SCHWARZ	ESH3-Z5	8407 31/015	UH195	X

POWER LINE CONDUCTION EMISSIONS



RECEIVER TESTS

UNINTENTIONAL RADIATED EMISSIONS– Part 15.109

Ambient temperature	=	17°C(<1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	62% (<1GHz),	3m measurements >1GHz	[X]
Conditions	=	Open Area Test Site (OATS)	3m extrapolated from 1m	[]
Supply voltage	=	+1.5Vdc		

Bottom Channel	FREQ. (MHz)	MEAS Rx (dB μ V)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dB μ V/m)	EXTRAP FACT (dB)	FIELD ST'GH (μ V/m)	LIMIT (μ V/m)
0.009MHz - 0.49MHz									Note 6
0.49MHz - 1.705MHz									Note 6
1.705MHz - 30MHz									Note 6
30MHz - 88MHz									Note 6
88MHz - 216MHz									Note 6
216MHz - 960MHz									Note 6
960MHz - 1GHz									Note 6
1GHz - 16.3GHz									Note 6
Limits	0.009 MHz to 0.49 MHz				2400/f(kHz) μ V/m	@ 300m			
	0.49 MHz to 1.705 MHz				24000/f(kHz) μ V/m	@ 30m			
	1.705MHz to 30MHz				30 μ V/m	@ 30m			
	30MHz to 88MHz				100 μ V/m	@ 3m			
	88MHz to 216MHz				150 μ V/m	@ 3m			
	216MHz to 960MHz				200 μ V/m	@ 3m			
	960MHz to 1GHz				500 μ V/m	@ 3m			
	1GHz to 16.3GHz				500 μ V/m	@ 3m			

Notes:

- 1 Results quoted are extrapolated as indicated.
- 2 Emissions were searched to: (x) 1000MHz inclusive, as per Part 15.33a.
- 3 Receiver detector <1GHz = CISPR, Quasi-Peak, 120kHz bandwidth.
- 4 Receiver detector >1GHz = Average, 1MHz resolution bandwidth.
- 5 New batteries used for battery-powered products.
- 6 Only emissions within 20 dB of the limit are recorded.
- 7 See Annex K for emissions plots.

Test Method:

- 1 As per Radio – Noise Emissions, ANSI C63.4: 2003
- 2 Measuring distances as Notes 1 to 4 above
- 3 EUT 0.8 metre above ground plane
- 4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthogonal planes.
Maximum results recorded.

The test equipment used for the Transmitter Spurious Emissions – Radiated – Part 15.209 tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	EQUIPMENT USED
HORN ANTENNA	EMCO	3115	9010 - 3580	138	X
HORN ANTENNA	EMCO	3115	9010 - 3581	139	
RECEIVER	R & S	ESVS 10	855594/003	352	X
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	
PRE AMPLIFIER	AGILENT	8449B	3008A016	572	X
RECEIVER	R & S	ESHS 10	830051/001	UH03	
RECEIVER	R & S	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	X
BILOG ANTENNA	YORK	CBL6111	1519	UH70	X
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
RECEIVER	R & S	ESVS 10	841431/014	UH186	
RECEIVER	R & S	ESHS 10	841429/012	UH187	
BILOG ANTENNA	YORK	CBL611/A	1618	UH191	
SPECTRUM ANALYSER	R & S	FSU	200034	UH281	X
30 MHz – 1GHz PRE-AMPLIFIER	WATKINS JOHNSON	6201-69	2740	UH372	X

ANNEX A
PHOTOGRAPHS

PHOTOGRAPH No. 1

TEST SETUP



PHOTOGRAPH No. 2

TRANSMITTER FRONT VIEW



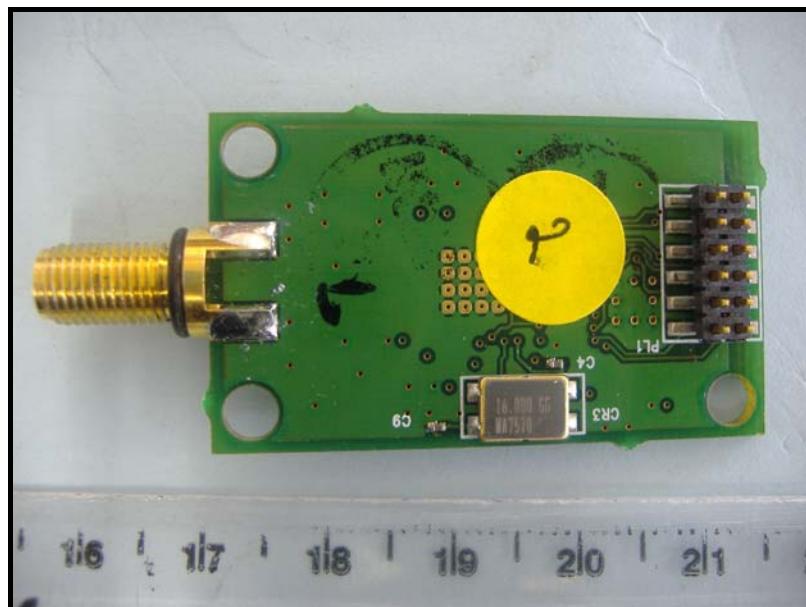
PHOTOGRAPH No. 3

TRANSMITTER REAR VIEW



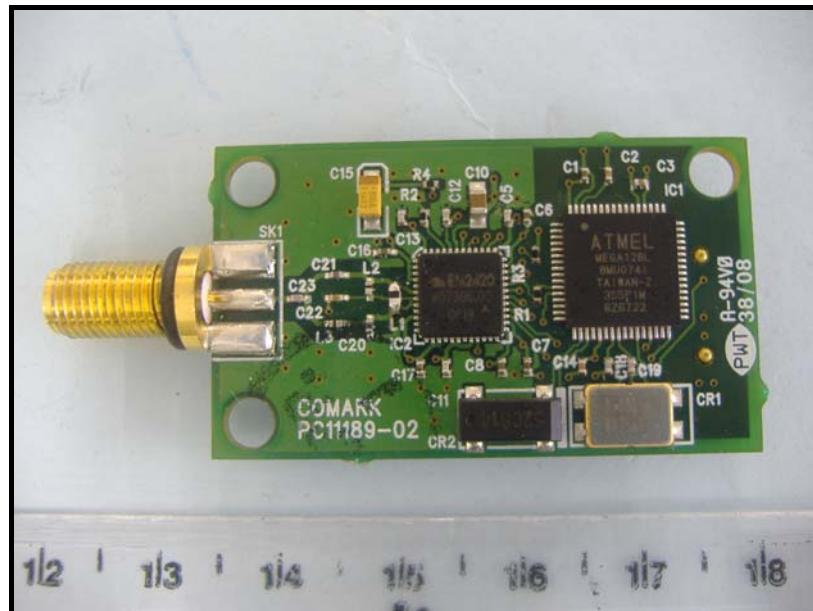
PHOTOGRAPH No. 4

TRANSMITTER PCB TRACK SIDE



PHOTOGRAPH No. 5

TRANSMITTER PCB COMPONENT SIDE



PHOTOGRAPH No. 6

CONTROL PCB LCD SIDE



PHOTOGRAPH No. 7

CONTROL PCB TRACK SIDE



ANNEX B
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

a.	TCB	-	APPLICATION	[X]
		-	FEE	[X]
b.	AGENT'S LETTER OF AUTHORISATION	-		[X]
c.	MODEL(s) vs IDENTITY	-		[X]
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		[X]
e.	LABELLING	-	PHOTOGRAPHS	[X]
		-	DECLARATION	[]
		-	DRAWINGS	[]
f.	TECHNICAL DESCRIPTION	-		[X]
g.	BLOCK DIAGRAMS	-	Tx	[X]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
h.	CIRCUIT DIAGRAMS	-	Tx	[X]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
i.	COMPONENT LOCATION	-	Tx	[X]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
j.	PCB TRACK LAYOUT	-	Tx	[X]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
k.	BILL OF MATERIALS	-	Tx	[]
		-	Rx	[X]
		-	PSU	[]
		-	AUX	[]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]

ANNEX C
MEASUREMENT UNCERTAINTY

Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Equipment - TRLUH120) = **2.18dB**
Uncertainty in test result (Equipment – TRL05) = **1.08dB**
Uncertainty in test result (Equipment – TRL479) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Equipment - TRLUH120) = **119ppm**
Uncertainty in test result (Equipment – TRL05) = **0.113ppm**
Uncertainty in test result (Equipment – TRL479) = **0.265ppm**

[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**, Uncertainty in test result (30MHz – 1GHz) = **4.6dB**,
Uncertainty in test result (1GHz-18GHz) = **4.7dB**

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious

Uncertainty in test result (Equipment TRL479) Up to 8.1GHz = **3.31dB**
Uncertainty in test result (Equipment TRL479) 8.1GHz – 15.3GHz = **4.43dB**
Uncertainty in test result (Equipment TRL479) 15.3GHz – 21GHz = **5.34dB**
Uncertainty in test result (Equipment TRLUH120) Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

Uncertainty in overall test level = **2.1dB**, Uncertainty in time measurement = **0.59%**, Uncertainty in Amplitude measurement = **0.82%**

[11] Power Line Conduction

Uncertainty in test result = **3.4dB**

[12] Spectrum Mask Measurements

Uncertainty in test result = **2.59% (frequency)**
Uncertainty in test result = **1.32dB (amplitude)**

[13] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[14] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[15] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[16] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[17] Receiver Threshold

Uncertainty in test result = **3.23dB**

[18] Transmission Time Measurement

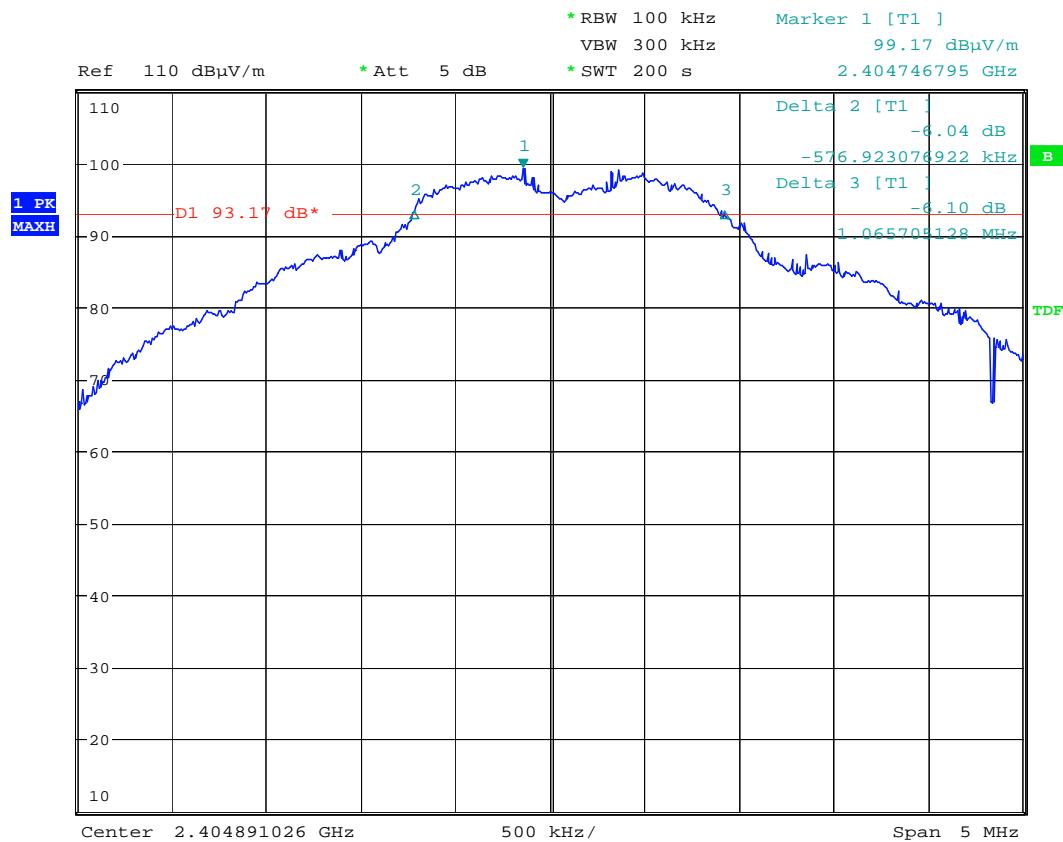
Uncertainty in test result = **7.98%**

ANNEX D
TEST EQUIPMENT CALIBRATION

TRL Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH06/07	IC OATS Submission	TRaC	01/06/2007	24	01/06/2009
UH070	Bilog Antenna	York	13/12/2007	24	13/12/2009
UH187	Receiver	R&S	09/12/2008	12	09/12/2009
UH191	Bilog Antenna	York	01/10/2008	24	01/10/2010
UH195	LISN	R&S	19/01/2009	12	19/01/2010
UH281	Spectrum Analyser	R&S	28/10/2008	12	28/10/2009
UH372	Pre Amp	Watkins Johnson	27/11/2008	12	27/11/2009
L138	1-18GHz Horn	EMCO	23/05/2007	24	23/05/2009
L139	1-18GHz Horn	EMCO	23/05/2007	24	23/05/2009
L352	Receiver	R&S	09/12/2008	12	09/12/2009
L479	Analysyer	Anritsu	22/09/2008	12	22/09/2009
L572	Pre Amplifier	Agilent	04/07/2008	12	04/07/2009

ANNEX E
6dB BANDWIDTH PLOT

BANDWIDTH PLOT



Date: 7.APR.2009 10:08:56

f_{Lower} f_{Higher}

f_{Lower} = 2404.169872 MHz
 f_{Higher} = 2405.812500 MHz
 Occupied Bandwidth = 1.64 MHz

ANNEX F

PEAK OUTPUT POWER

OUTPUT POWER

MKR: 2.40431GHz

1.21dBm

RB 3MHz#

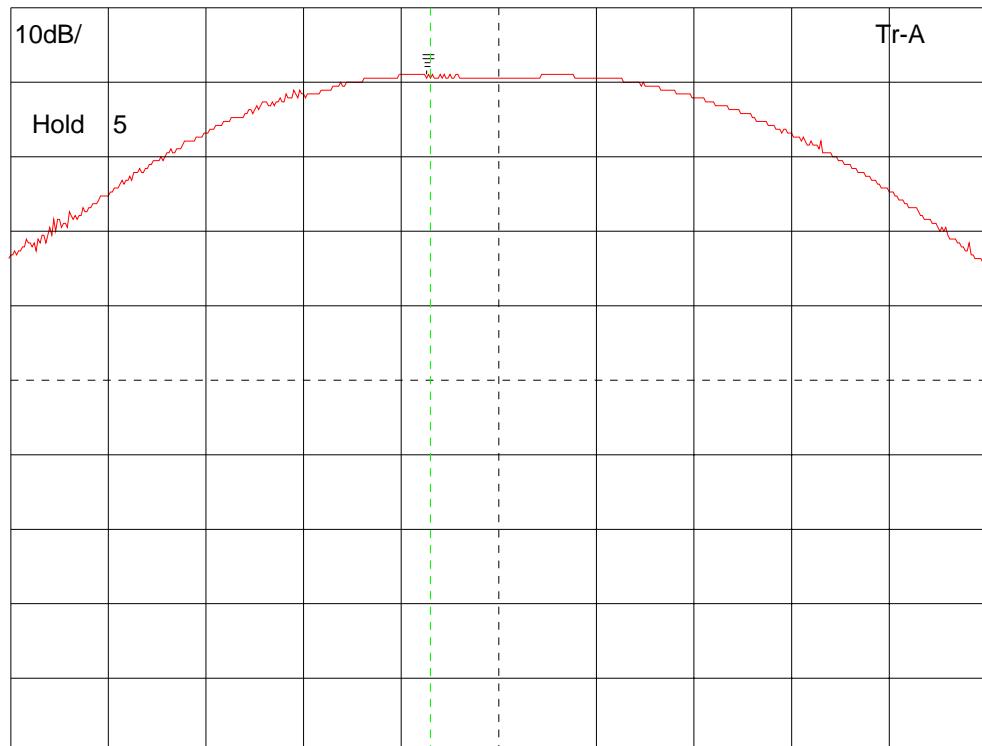
AT 20dB#

Band auto

RLV: 10.50dBm#

VB 3MHz#

ST 50s#



CF:2.40501GHz

Span:10.0MHz

ANNEX G
POWER SPECTRAL DENSITY

POWER SPECTRAL DENSITY

MKR: 2.404618GHz

-7.66dBm

RB 3kHz#

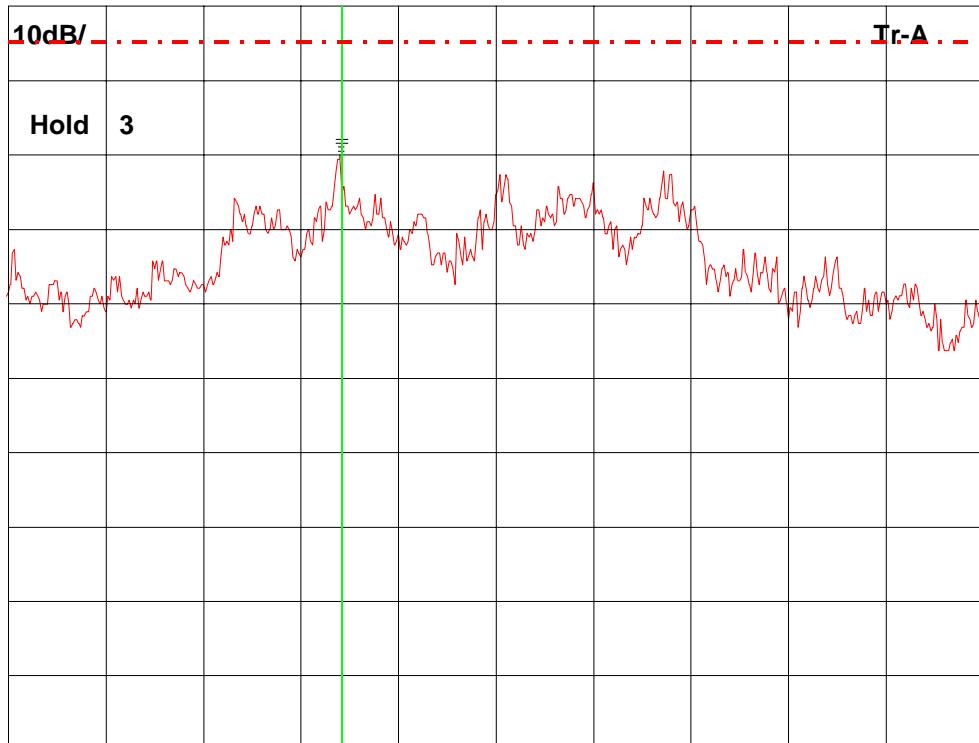
AT 20dB#

Band auto

RLV: 13.20dBm#

VB 10kHz

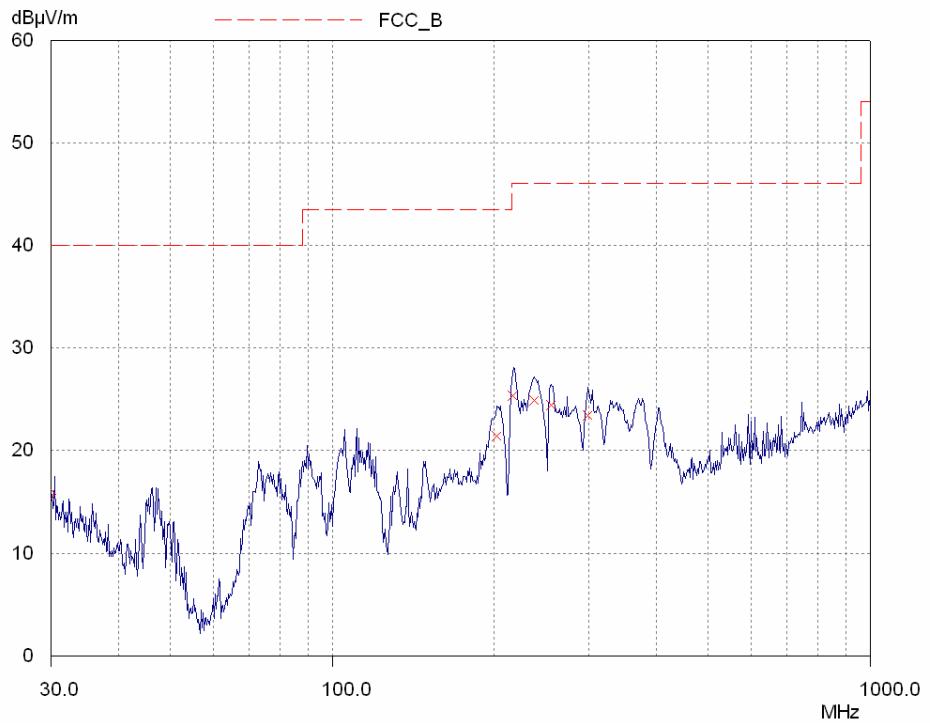
ST 1000s#



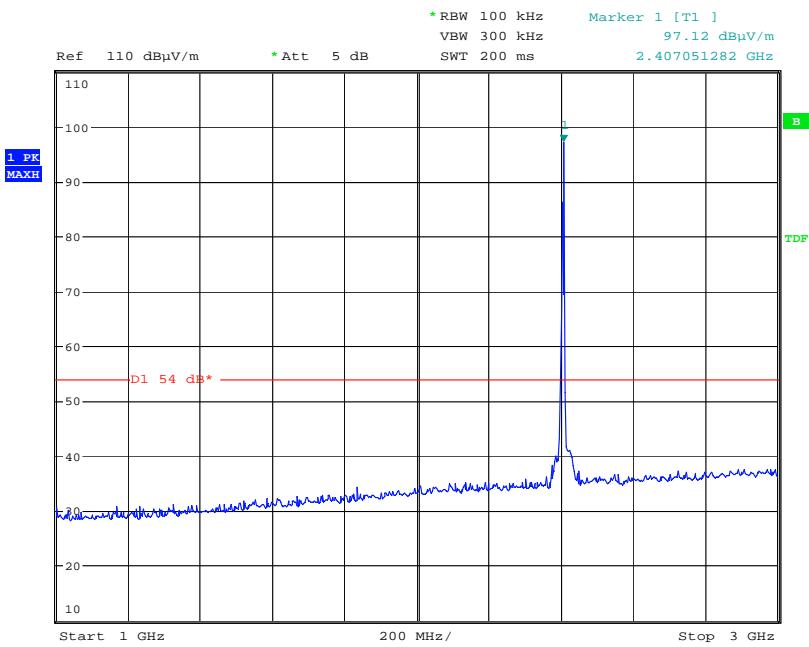
CF:2.405092GHz

Span:3.00MHz

ANNEX H
INTENTIONAL RADIATED EMISSIONS

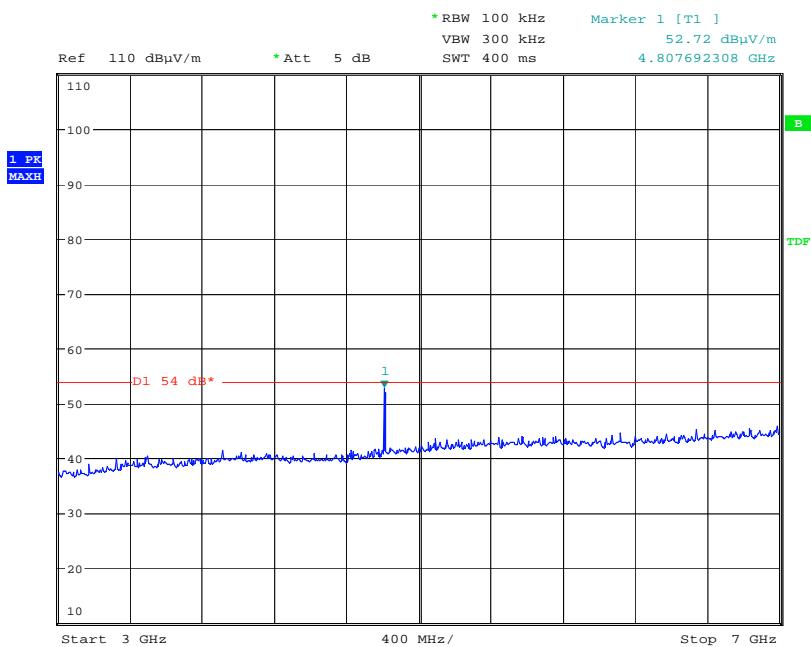


30 MHz – 1 GHz



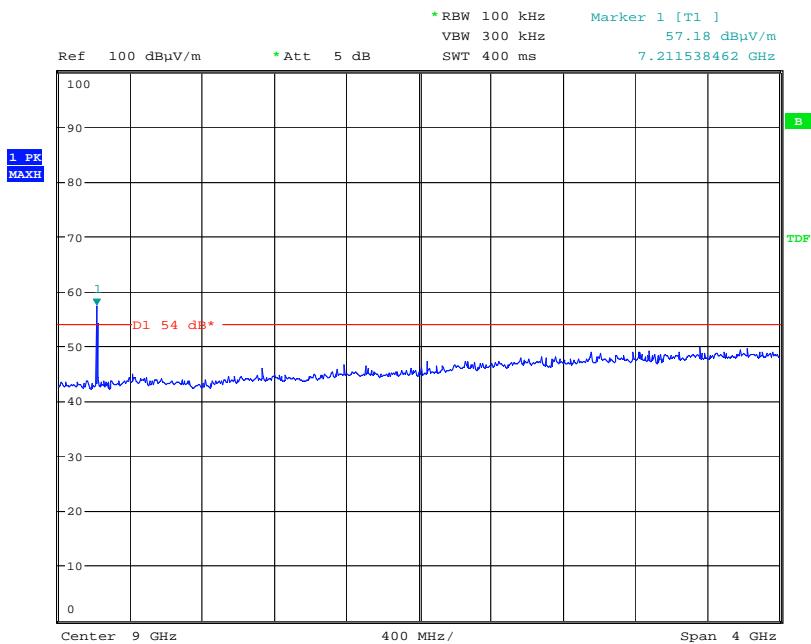
Date: 6.APR.2009 13:15:52

1 GHz – 3 GHz



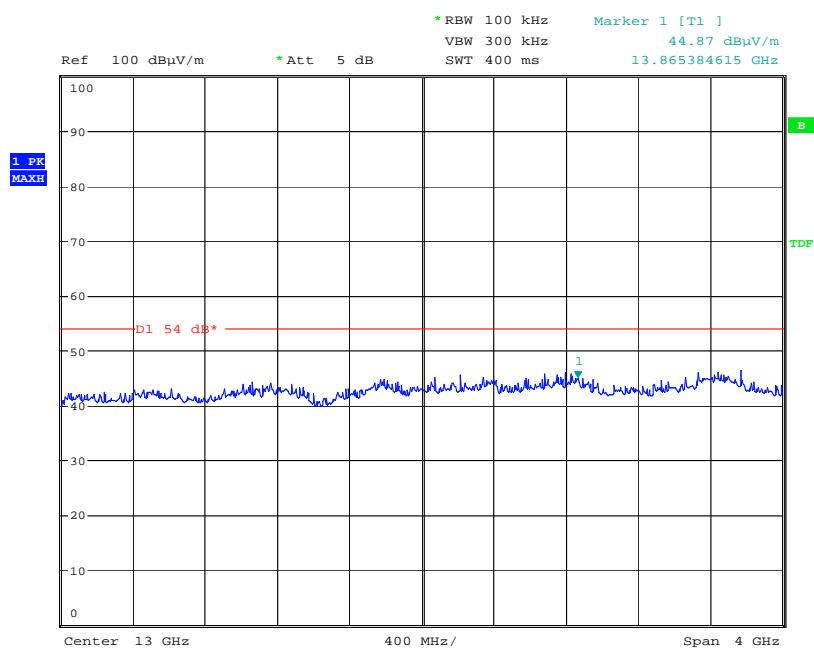
Date: 6.APR.2009 13:22:54

3 GHz – 7 GHz



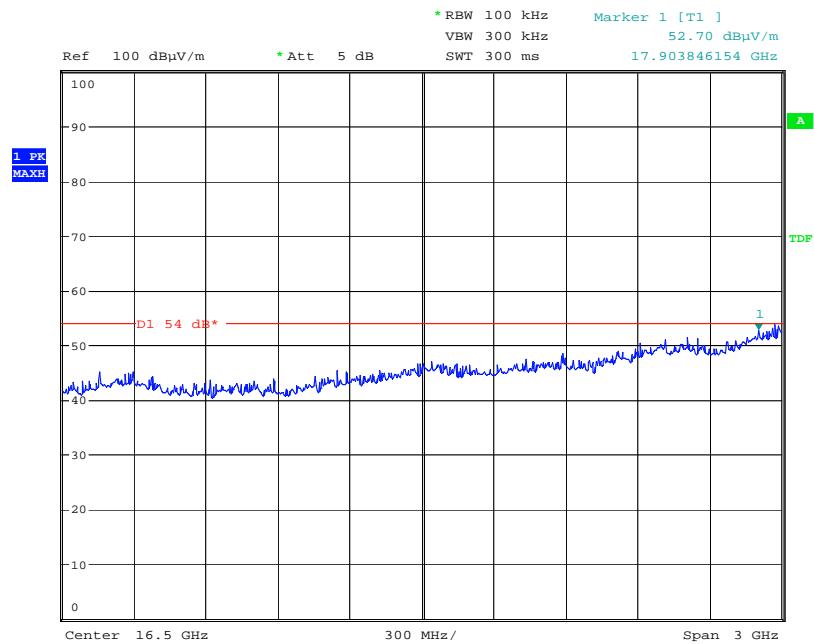
Date: 7.APR.2009 09:29:54

7 GHz – 11 GHz



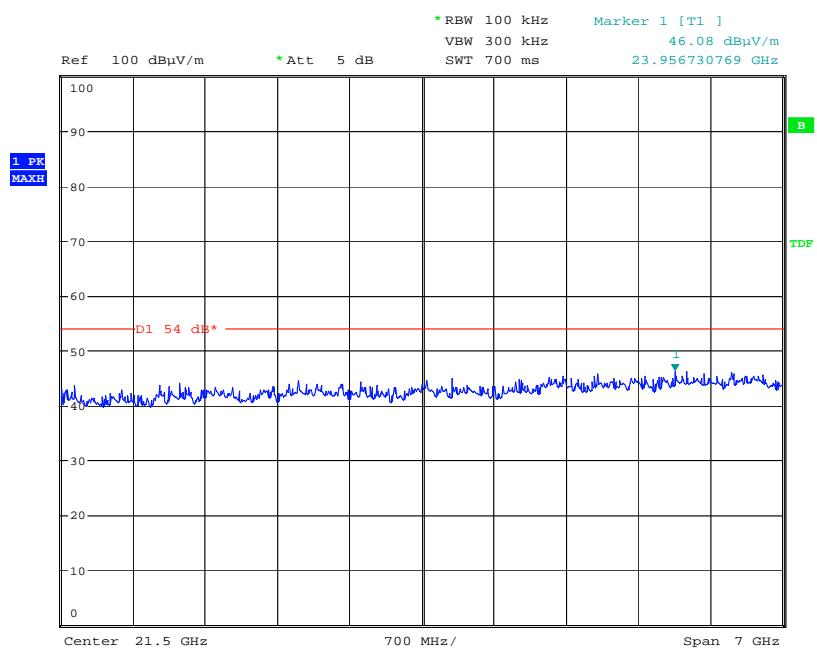
Date: 9.APR.2009 09:47:00

11 GHz – 15 GHz



Date: 9.APR.2009 09:47:21

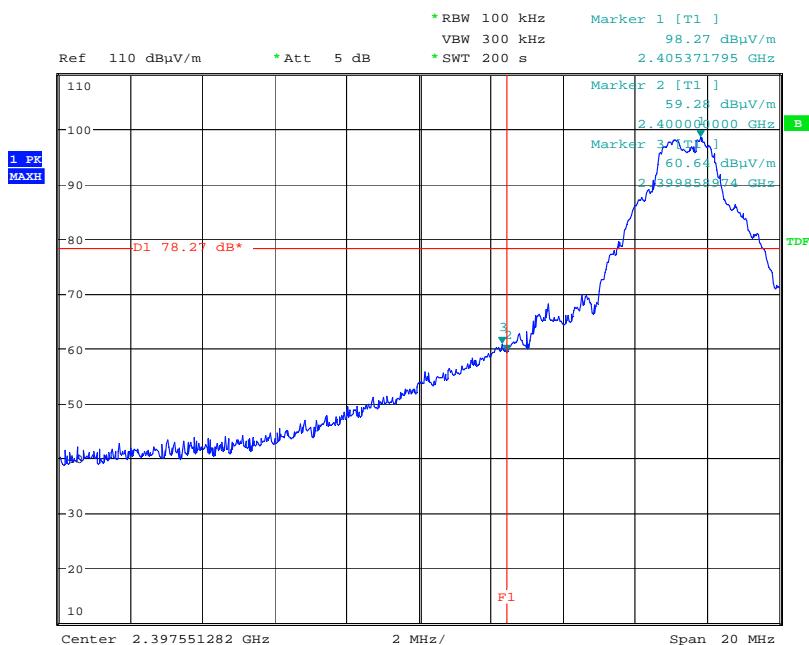
15 GHz – 18 GHz



Date: 9.APR.2009 10:05:55

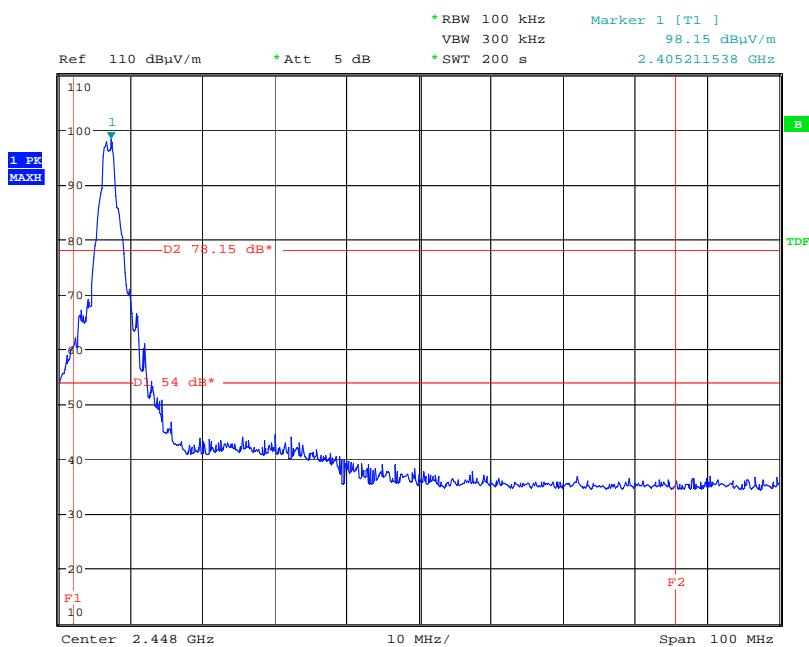
18 GHz – 25 GHz

ANNEX I
RADIATED BANDEdge COMPLIANCE



Date: 7.APR.2009 09:45:04

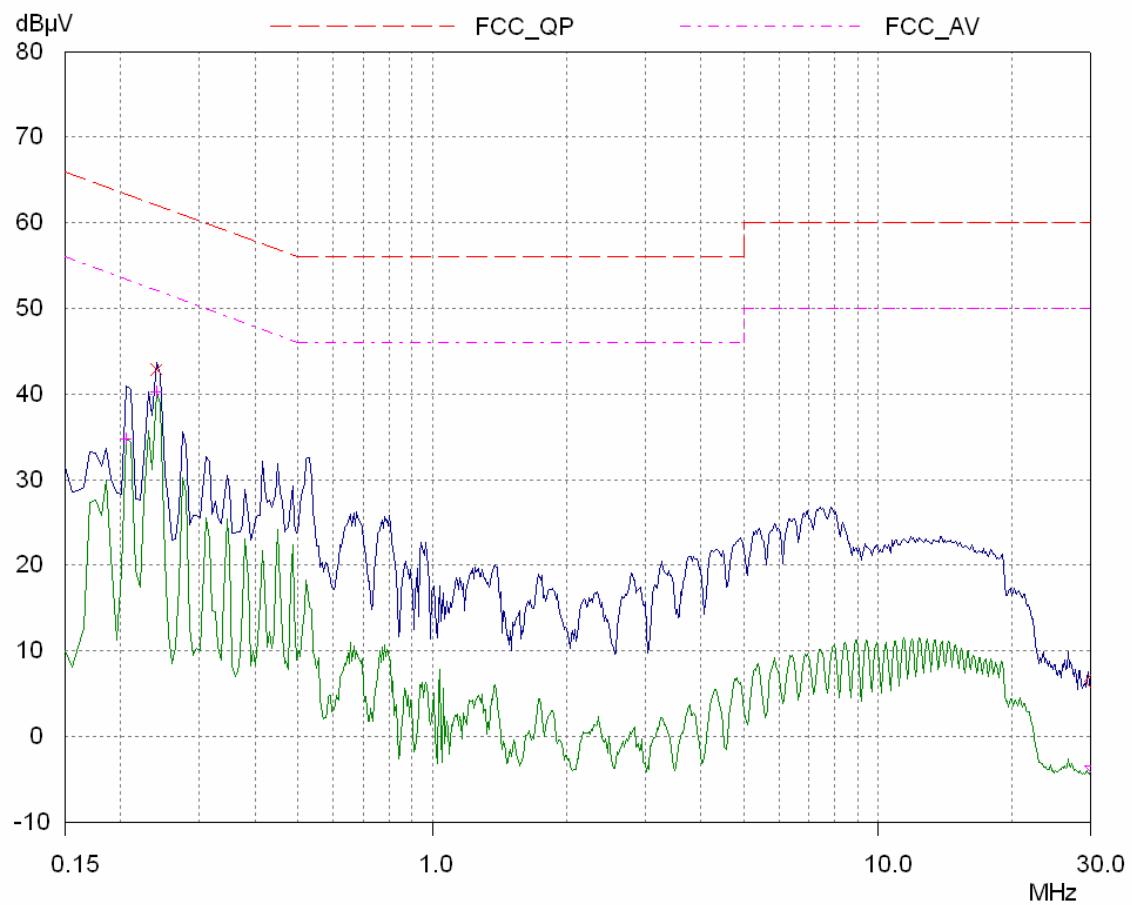
Lower bandedge Compliance



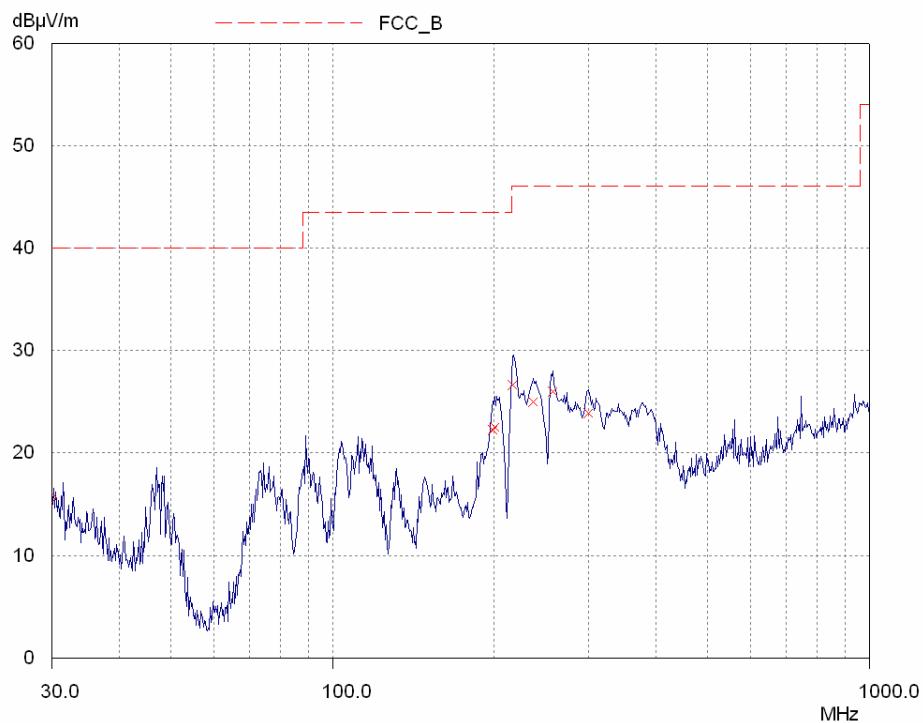
Date: 7.APR.2009 09:51:31

Upper bandedge Compliance

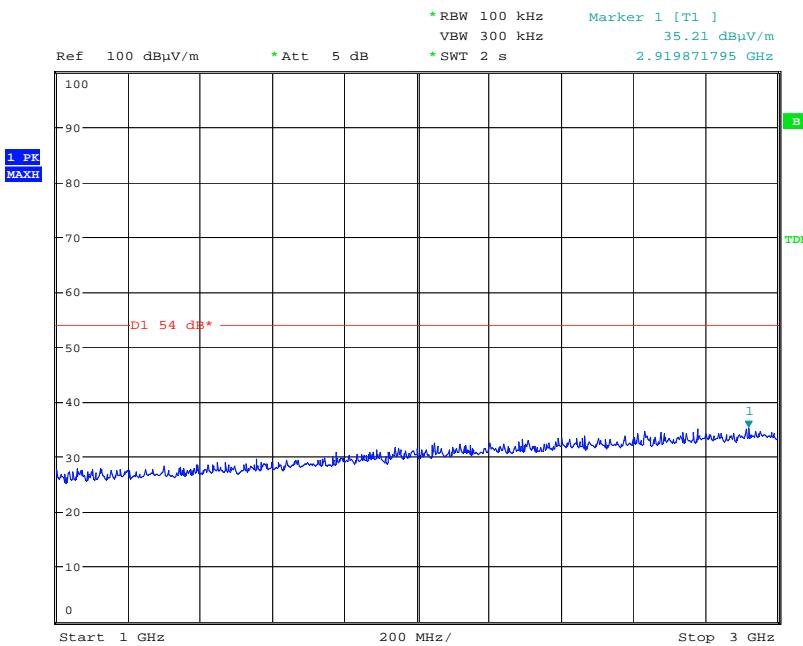
ANNEX J
POWER LINE CONDUCTION



ANNEX K
UNINTENTIONAL RADIATED EMISSIONS

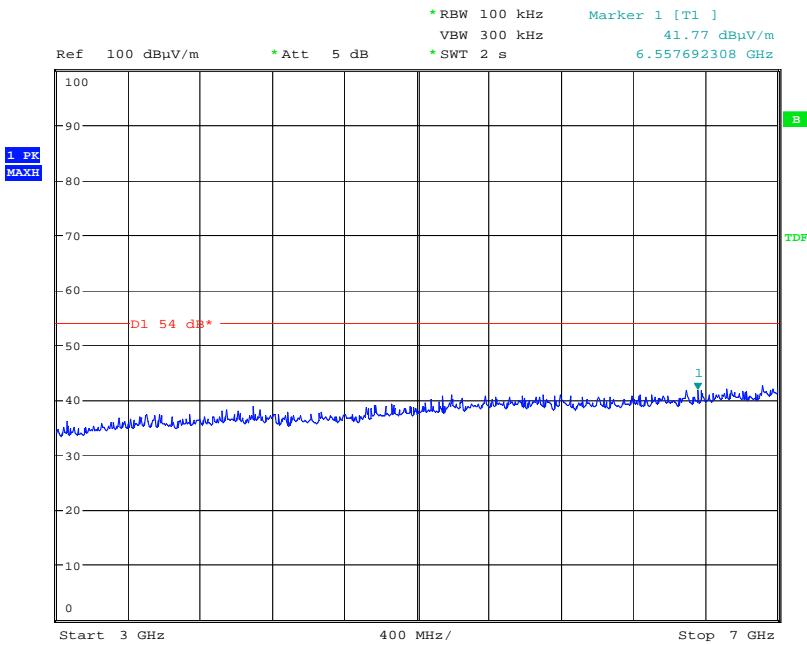


30 MHz – 1 GHz



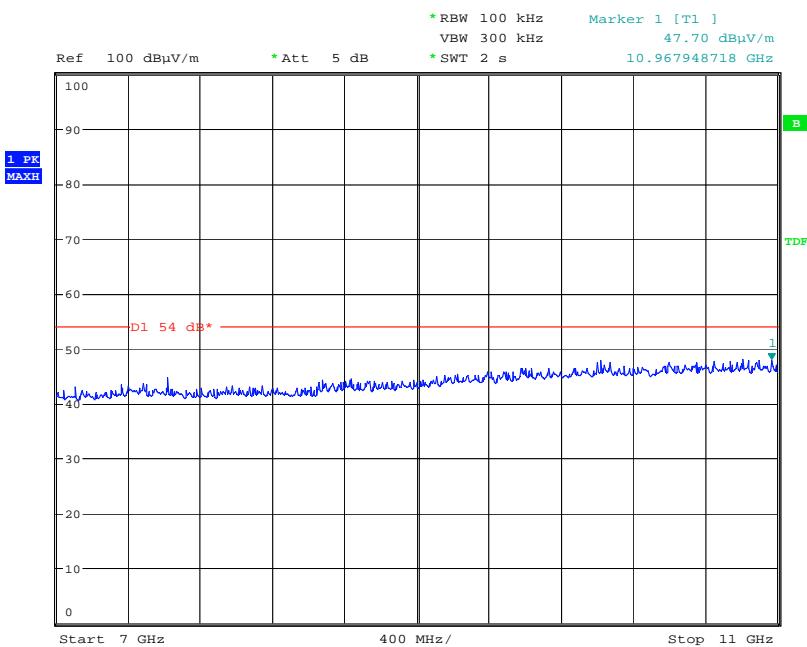
Date: 6.APR.2009 13:00:40

1 GHz – 3 GHz



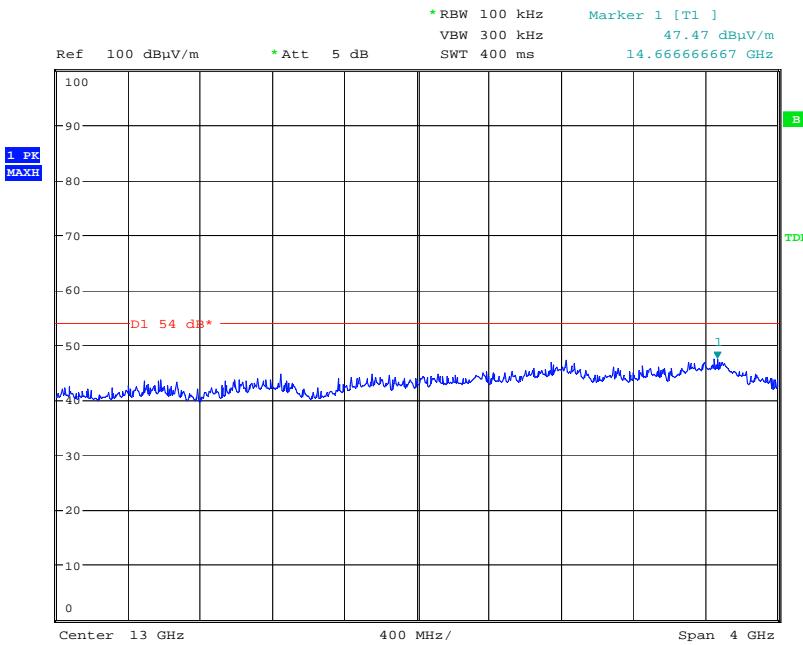
Date: 6.APR.2009 13:00:25

3 GHz – 7 GHz



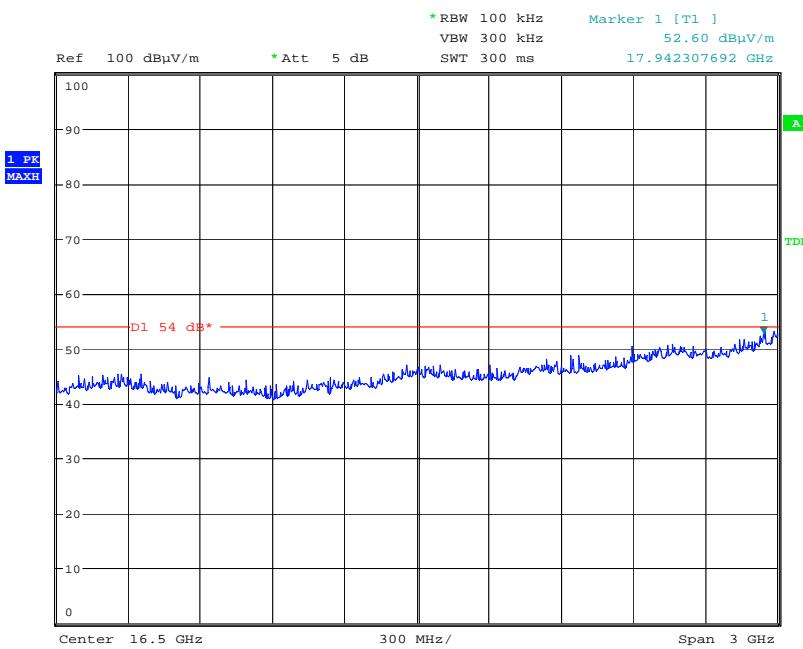
Date: 6.APR.2009 12:59:56

7 GHz – 11 GHz



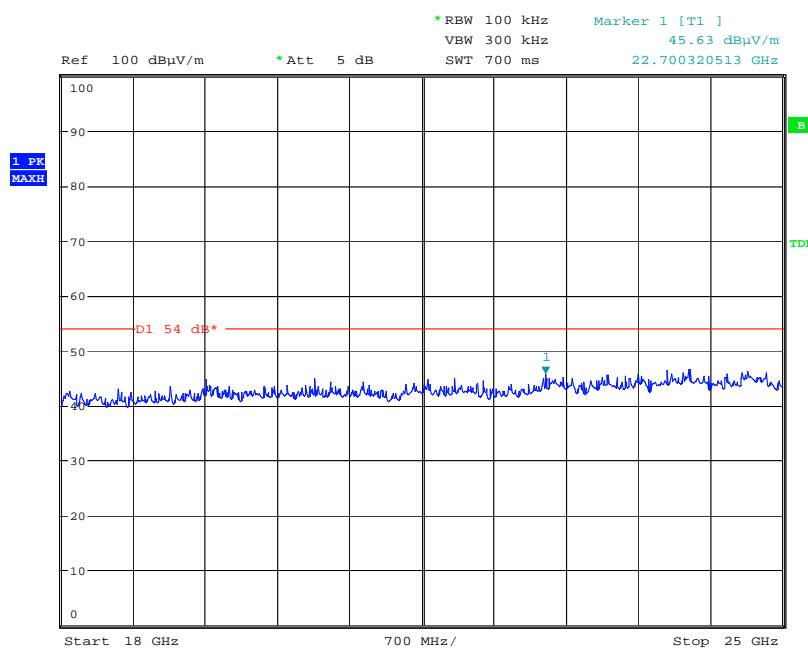
Date: 9.APR.2009 09:50:16

11 GHz – 15 GHz



Date: 9.APR.2009 09:50:03

15 GHz – 18 GHz



Date: 9.APR.2009 10:11:24

18 GHz – 25 GHz