



**REPORT ON THE CERTIFICATION TESTING OF A
PROMETHEAN LIMITED
ACTIVEXPRESSION
MODEL NUMBER PRM-AE1-01
WITH RESPECT TO
THE FCC RULES CFR 47, PART 15.247 May 2007
INTENTIONAL RADIATOR SPECIFICATION**



TEST REPORT NO: RU1375/8105

COPY NO: 2

ISSUE NO: 1

FCC ID: QAM011

**REPORT ON THE CERTIFICATION TESTING OF A
PROMETHEAN LIMITED
ACTIVEXPRESSION
MODEL NUMBER PRM-AE1-01
WITH RESPECT TO
THE FCC RULES CFR 47, PART 15.247 May 2007
INTENTIONAL RADIATOR SPECIFICATION**

TEST DATE: 30th August – 7th September 2007

TESTED BY: _____ D WINSTANLEY

APPROVED BY: _____ J CHARTERS
RADIO SECTION
LEADER

DATE: 28th September 2007 _____

Distribution:

Copy Nos: 1. Promethean Limited
2. FCC EVALUATION LABORATORIES
3. TRL Compliance Ltd

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

CONTENTS

	PAGE
CERTIFICATE OF CONFORMITY & COMPLIANCE	4
APPLICANT'S SUMMARY	5
EQUIPMENT TEST CONDITIONS	6
TESTS REQUIRED	6
TEST RESULTS	7 - 17
 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: RF Close Up Can Removed	
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST	B
TEST EQUIPMENT CALIBRATION	C
CARRIER FREQUENCY SEPARATION	D
NUMBER OF HOPPING CHANNEL	E
20dB BANDWIDTH	F
AVERAGE TIME OF OCCUPANCY	G
PEAK POWER CONDUCTED	H
CONDUCTED BANDEDGE COMPLIANCE	I
CONDUCTED SPURIOUS EMISSIONS	J
RADIATED BANDEDGE COMPLIANCE	K
MEASUREMENT UNCERTAINTY	L

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.		



TRL Compliance
part of TRAC global

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY: QAM011
PURPOSE OF TEST: Certification
TEST SPECIFICATION: FCC RULES CFR 47, Part 15.247 May 2007
TEST RESULT: Compliant to Specification
EQUIPMENT UNDER TEST: Activexpression
ITU: EMISSION CODE: 1M43F7D
EQUIPMENT TYPE: Learner response system
PRODUCT USE: Wireless LAN
CARRIER EMISSION: 0.00403 W e.i.r.p.
ANTENNA TYPE: Integral
ALTERNATIVE ANTENNA: Not Applicable
BAND OF OPERATION: 2400 MHz – 2483.5 MHz
CHANNEL SPACING: 1.73 MHz
NUMBER OF CHANNELS: 46
FREQUENCY GENERATION: SAW Resonator [] Crystal [] Synthesiser [X]
MODULATION METHOD: FHSS [X] DSSS [] Other []
POWER SOURCE(s): +4.5Vdc
TEST DATE(s): 30th August – 7th September 2007
ORDER No(s): PG0000643
APPLICANT: Promethean Limited
ADDRESS: Promethean House
Lower Philips Road
Blackburn
BB1 5TH

TESTED BY:

D WINSTANLEY

APPROVED BY:

J CHARTERS
RADIO SECTION
LEADER

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT): Activexpression

EQUIPMENT TYPE: Learner response system

PURPOSE OF TEST: Certification

TEST SPECIFICATION(s): FCC RULES CFR 47, Part 15.247 May 2007

TEST RESULT: COMPLIANT Yes [X]
No []

APPLICANT'S CATEGORY: MANUFACTURER [X]
IMPORTER []
DISTRIBUTOR []
TEST HOUSE []
AGENT []

APPLICANT'S ORDER No(s): PG0000643

APPLICANT'S CONTACT PERSON(s): Mr Bryan Lofthouse

E-mail address: Bryan.Lofthouse@prometheanworld.com

APPLICANT: Promethean Limited

ADDRESS: Promethean House
Lower Philips Road
Blackburn
BB1 5TH

TEL: +44(0)1254 298598

FAX: +44(0)1254 581574

EUT(s) COUNTRY OF ORIGIN: United Kingdom

TEST LABORATORY: TRL Compliance Ltd

UKAS ACCREDITATION No: 0728

TEST DATE(s): 30th August – 7th September 2007

TEST REPORT No: RU1375/8105

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1. TEST/EXAMINATION	RULE PART	DETECTOR	APPLICABILITY
Intentional Emission Frequency:	15.247	Peak	Yes
Intentional Emission Field Strength:	-	-	No
Intentional Emission Band Occupancy:	15.247(a)1	Peak	Yes
Intentional Emission EIRP (W):	15.247(b)1	Peak	Yes
Spurious Emissions – Conducted:	-	-	No
Spurious Emissions – Conducted:	15.247	Peak	Yes
Spurious Emissions – Radiated <1000MHz:	15.209 ,15.247	Quasi Peak	Yes
Spurious Emissions – Radiated >1000MHz:	15.247 15.209	Peak average	Yes
Transmitter Carrier Frequency Separation:	15.247(a)(1)	Peak	Yes
Transmitter Maximum Peak Power Output Power:	15.247(b)(1)	Peak	Yes
Transmitter Band Edge Conducted Emissions:	15.247(c)	Peak	Yes
Transmitter Band Edge Radiated Emission:	15.247(c)	Peak	Yes
Extrapolation Factor:	15.31(f)	-	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

2. Product Description : Learner response system

3. Temperatures: Ambient (T_{nom}) 22°C

4. Supply Voltages: V_{nom} +4.5Vdc

Note: +4.5Vdc voltages are as stated above unless otherwise shown on the test report page

5. Equipment Category: Single channel []

Multi-channel [X]

6. Channel spacing: Narrowband []

Wideband [X]

TRANSMITTER TESTS

TRANSMITTER CARRIER FREQUENCY SEPARATION – CONDUCTED – Part 15.247(a)(1)

Ambient temperature = 17°C
Relative humidity = 67%
Conditions = Conducted –Radio Lab
Supply voltage = +4.5Vdc

Transmitter Carrier Frequency Separation (MHz)	
1.73 MHz	
Limit The channels should be separated by at least 25kHz or $\frac{2}{3}$ the 20dB bandwidth which ever is greater.	

See spectrum analyser plot – Annex D
See note 1

Notes:

- 1 20dB Bandwidth of one carrier is 1429.487 kHz therefore carrier frequency separation must be greater than 952.991 kHz.
- 2 Conducted measurements were performed with a temporary antenna connector provided by the client.
- 3 For analyser setting see scan data annex F.

Test Method:

- 1 Test method as per 15.247 and public notice DA 00-705.
- 2 With the unit operating in hopping mode with maximum data rate a graphical plot of two adjacent channels was taken.
- 3 Delta marker function was used to measure the difference between the peak emissions of each channel.

The test equipment used for the tests is shown below:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU 46	200034	UH281	X
ATTENUATOR	BIRD	8304-0600N	N/A	246	X
CABLE	TRL	N/A	N/A	UH358	X

TRANSMITTER TESTS

TRANSMITTER 20dB BANDWIDTH – CONDUCTED – Part 15.247(a)(1)

Ambient temperature = 19°C
Relative humidity = 67%
Conditions = Conducted –Radio Lab
Supply voltage = +4.5Vdc

20dB Bandwidth (kHz)
1429.487 kHz
Limit >500kHz

See spectrum analyser plot – Annex F

Notes:

- 1 The EUT has 46 hopping channels see annex E.
- 2 Conducted measurements were performed with a temporary antenna connector provided by the client.
- 3 For analyser setting see scan data annex F.

Test Method:

- 1 Test method as per 15.247 and public notice DA 00-705.
- 2 With the unit operating in hopping mode with maximum data rate.
- 3 The analyser was centre frequency was tuned to the centre of a hopping channel.
- 4 The peak hold function was used to establish a 20dB band width level.

The test equipment used for the tests is shown below:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU 46	200034	UH281	X
ATTENUATOR	BIRD	8304-0600N	N/A	246	X
CABLE	TRL	N/A	N/A	UH358	X

TRANSMITTER TESTS

TRANSMITTER AVERAGE TIME OF OCCUPANCY – CONDUCTED – Part 15.247(a)(1)(iii)

Ambient temperature = 18°C
 Relative humidity = 67%
 Conditions = Conducted –Radio Lab
 Supply voltage = +4.5Vdc

Packet Width (μ s)	Number of Transmissions in 18.4 seconds	Average time of Occupancy (s)
532.61 μ s	48	0.0255
Limit 0.4 seconds		

See spectrum analyser plot – Annex G

Notes:

- 1 Conducted measurements were performed with a temporary antenna connector provided by the client.
- 2 For analyser setting see scan data annex G.
- 3 Average time of occupancy within a period of 0.4 * number of hopping channels
- 4 Number of hopping channels = 46
- 5 0.4 * 46 = 18.4 seconds

Test Method:

- 1 As per 15.247 and Public Notice DA 00-705.
- 2 The analyser was tuned to the centre frequency of the hopping channel
- 3 With the analyser set to zero span a sweep of 18.4 seconds was performed. The number of transmission was recorded.
- 4 The sweep time was reduced to show the length of one transmission.
 The time occupancy of the system was tested on a single carrier. The maximum packet length was measured and multiplied by the number of transmissions within a 18.4 second period. The result was noted as being the average time of occupancy.

The test equipment used for the tests is shown below:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU 46	200034	UH281	X
ATTENUATOR	BIRD	8304-0600N	N/A	246	X
CABLE	TRL	N/A	N/A	UH358	X

TRANSMITTER TESTS

TRANSMITTER PEAK OUTPUT POWER – CONDUCTED – Part 15.247(b)(1)

Ambient temperature = 20°C
 Relative humidity = 65%
 Conditions = Conducted –Radio Lab
 Supply voltage = +4.5Vdc

Channel Frequency	Measured Level (dBm)	Cable & Attenuator Loss (dB)	Antenna Gain (dBi)	Transmitter Peak Power Output (dBm)	Transmitter Peak Power Output (Watts)	Limit (Watts)
Bottom	-0.60	6.65	0	6.05	0.00403	0.125
Middle	-0.85	6.65	0	5.80	0.00380	0.125
Top	-1.17	6.65	0	5.48	0.00353	0.125

See spectrum analyser plot – Annex I

Notes:

- 1 Number of hopping channels employed is 46 see annex E.
- 2 Conducted measurements were performed with a temporary antenna connector provided by the client.
- 3 For analyser setting see scan data annex H.

Test Method:

- 1 As per 15.247 and Public Notice DA 00-705.
- 2 The analyser was centered on a hopping channel with peak hold enabled.
- 3 Marker to peak function was used to find the peak emission.

The test equipment used for the tests is shown below:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU 46	200034	UH281	<input checked="" type="checkbox"/>
ATTENUATOR	BIRD	8304-0600N	N/A	246	<input checked="" type="checkbox"/>
CABLE	TRL	N/A	N/A	UH358	<input checked="" type="checkbox"/>

TRANSMITTER TESTS

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

Ambient temperature = 22°C
 Relative humidity = 58%
 Conditions = Conducted –Radio Lab
 Supply voltage = +4.5Vdc

Test Result

Measured as compliant see analyser plots

Channel Frequency	EUT Operation	Emission Frequency (MHz)	Emission Level (dBc)	Limit (dBc)
Bottom	Modulated Carrier	2399.326 MHz	40.39	20
All	Hopping	2399.295 MHz	40.75	20
Top	Modulated Carrier	2483.933 MHz	40.79	20
All	Hopping	2483.964 MHz	41.33	20

See spectrum analyser scan plots – Annex J

Notes:

- 1 The EUT was set to bottom operating frequency only with a modulated carrier.
- 2 The EUT was set to top operating frequency only with a modulated carrier.
- 3 The EUT was set in a hopping mode using all hopping channels.
- 4 A temporary antenna connector was used to take the measurement.
- 5 See Annex I for analysers plots.

Test Method:

- 1 As per section 15.247 and Public Notice DA 00-705.
- 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
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU 46	200034	UH281	X
ATTENUATOR	BIRD	8304-0600N	N/A	246	X
CABLE	TRL	N/A	N/A	UH358	X

TRANSMITTER TESTS

TRANSMITTER CONDUCTED SPURIOUS EMISSIONS – CONDUCTED – Part 15.247(c)

Ambient temperature = 21°C
 Relative humidity = 62%
 Conditions = Conducted –Radio Lab
 Supply voltage = +4.5Vdc

Bottom Channel

Frequency Range	Emission Frequency (MHz)	Emission Level	Cable loss	Level (dBm)	Limit (dBm)
30MHz – 25GHz	No Significant Emissions Within 20 dB of the Limit				-14.73

See spectrum analyser scan plots – Annex J

Middle Channel

Frequency Range	Emission Frequency (MHz)	Emission Level	Cable loss	Level (dBm)	Limit (dBm)
30MHz – 25GHz	No Significant Emissions Within 20 dB of the Limit				-14.73

See spectrum analyser scan plots – Annex J

Top Channel

Frequency Range	Emission Frequency (MHz)	Emission Level	Cable loss	Level (dBm)	Limit (dBm)
30MHz – 25GHz	No Significant Emissions Within 20 dB of the Limit				-14.73

See spectrum analyser scan plots – Annex J

Notes:

- 1 During the scans the unit was operated in the following modes:
 Hopping stopped unit operating on lowest channel
 Hopping stopped unit operating on middle channel
 Hopping stopped unit operating on highest channel
- 2 Section 15.247(c) states that all spurious emissions measured within a 100kHz bandwidth shall be attenuated by at least 20dB below the level of the highest fundamental level measured within a 100kHz bandwidth.
- 3 Only emissions within 20dB of limit are recorded.

Test Method:

- 1 As per section 15.247 and Public Notice DA 00-705.
- 2 Frequency sweeps were performed to check for spurious emissions.
- 3 Any emissions discovered were checked for compliance with the limit.

The test equipment used for the tests is shown below:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU 46	200034	UH281	X
ATTENUATOR	BIRD	8304-100-N	N/A	222	X
CABLE	TRL	N/A	N/A	UH358	X

TRANSMITTER TESTS

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

Ambient temperature = 24°C
 Relative humidity = 68%
 Conditions = Radiated OATS
 Supply voltage = +4.5Vdc

Bottom Channel 30MHz -25000MHz

	Emission Freq (MHz)	Meas Rx. (dBuV)	Cable loss (dB)	Ant. Factor (dB/m)	Pre Amp Gain (dB)	Field Strength (dB μ V/m)	Extrap. Factor (dB)	Result (μ V/m)	Limit (μ V/m)
30MHz – 88MHz Restricted bands								Note 6	100
88MHz – 216MHz Restricted bands								Note 6	150
216MHz – 960MHz Restricted bands								Note 6	200
960MHz – 1GHz Restricted bands								Note 6	500
1GHz – 25GHz Restricted bands	2255.863 4805.538	40.74 53.62	1.7 1.9	28.0 32.7	35.0 35.7	35.44 52.52	- -	59.15 422.67	500
30MHz -25GHz								Note 6	1810

Middle Channel 30MHz -25000MHz

	Emission Freq (MHz)	Meas Rx. (dBuV)	Cable loss (dB)	Ant. Factor (dB/m)	Pre Amp Gain (dB)	Field Strength (dB μ V/m)	Extrap. Factor (dB)	Result (μ V/m)	Limit (μ V/m)
30MHz – 88MHz Restricted bands								Note 6	100
88MHz – 216MHz Restricted bands								Note 6	150
216MHz – 960MHz Restricted bands								Note 6	200
960MHz – 1GHz Restricted bands								Note 6	500
1GHz – 25GHz Restricted bands	2316.674 4881.563 7322.334	47.34 53.67 35.14	1.7 1.9 2.2	28.0 32.7 35.9	35.0 35.7 36.2	42.04 52.57 37.04	- - -	126.47 425.11 71.12	500
30MHz -25GHz								Note 6	1810

TRANSMITTER TESTS

TRANSMITTER EMISSIONS cont. – RADIATED – Part 15.247(c) and 15.209

Top Channel 30MHz -25000MHz

	Emission Freq (MHz)	Meas Rx. (dBuV)	Cable loss (dB)	Ant. Factor (dB/m)	Pre Amp Gain (dB)	Field Strength (dB μ V/m)	Extrap. Factor (dB)	Result (μ V/m)	Limit (μ V/m)
30MHz – 88MHz Restricted bands								Note 6	100
88MHz – 216MHz Restricted bands								Note 6	150
216MHz – 960MHz Restricted bands								Note 6	200
960MHz – 1GHz Restricted bands								Note 6	500
1GHz – 25GHz Restricted bands	2483.964 4961.060 7441.590	53.00 51.07 34.98	2.56 2.20 1.90	28.48 33.23 36.35	35.0 35.6 35.9	49.04 50.90 37.33	- - -	283.14 319.52 73.53	500
30MHz -25GHz								Note 6	1810

Notes:

- 1 During the scans the unit was operated in the following modes:
Hopping stopped unit operating on lowest channel
Hopping stopped unit operating on middle channel
Hopping stopped unit operating on highest channel
- 2 Initial pre scans were performed see Annex L for plots.
- 3 Emissions above 1GHz were measured with both a peak and average detectors.
- 4 Measurements <1GHz were performed at 3 meters.
- 5 Measurements >1GHz were initial performed at 3 metres.
- 6 Only emissions with in 20dB of limit are recorded.
- 7 Average emissions recorded.

Test Method:

- 1 As per section 15.247 and Public Notice DA 00-705.
- 2 Measuring distances as Notes 5 to 6 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 >30MHz.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthogonal planes. Maximum results recorded.

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	X
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU46	200034	UH281	X
RANGE 1	TRL	3 METRE	N/A	UH06	X
BILOG ANTENNA	CHASE	CBL6112B	2803	UH93	X
HORN ANTENNA	EMCO	3115	9010-3580	138	X
PRE APMLIFIER	AGILENT	8449B	3008A016	572	X

TRANSMITTER TESTS

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

Ambient temperature = 24°C
Relative humidity = 68%
Conditions = Radiated OATS
Supply voltage = +4.5Vdc

Test Result

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 and Public Notice DA 00-705.
- 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

RECEIVER TESTS

RECEIVER EMISSIONS RADIATED – Part 15.109

Ambient temperature = 24°C
 Relative humidity = 68%
 Conditions = Radiated OATS
 Supply voltage = +4.5Vdc

Bottom Channel 30MHz -25000MHz

	Emission Freq (MHz)	Meas Rx. (dBuV)	Cable loss (dB)	Ant. Factor (dB/m)	Pre Amp Gain (dB)	Field Strength (dB μ V/m)	Extrap. Factor (dB)	Result (μ V/m)	Limit (μ V/m)
30MHz – 88MHz								Note 5	100
88MHz – 216MHz								Note 5	150
216MHz – 960MHz								Note 5	200
960MHz – 1GHz								Note 5	500
1GHz – 25GHz	4807.243 9614.552	43.67 41.77	1.9 3.0	32.7 37.9	35.7 36.6	42.57 46.07	- -	134.43 201.14	500

Middle Channel 30MHz -25000MHz

	Emission Freq (MHz)	Meas Rx. (dBuV)	Cable loss (dB)	Ant. Factor (dB/m)	Pre Amp Gain (dB)	Field Strength (dB μ V/m)	Extrap. Factor (dB)	Result (μ V/m)	Limit (μ V/m)
30MHz – 88MHz								Note 5	100
88MHz – 216MHz								Note 5	150
216MHz – 960MHz								Note 5	200
960MHz – 1GHz								Note 5	500
1GHz – 25GHz	4883.314 9766.604	44.06 44.23	1.9 3.0	32.7 37.0	35.7 36.7	42.96 47.53	- -	140.60 237.95	500

Top Channel 30MHz -25000MHz

	Emission Freq (MHz)	Meas Rx. (dBuV)	Cable loss (dB)	Ant. Factor (dB/m)	Pre Amp Gain (dB)	Field Strength (dB μ V/m)	Extrap. Factor (dB)	Result (μ V/m)	Limit (μ V/m)
30MHz – 88MHz								Note 5	100
88MHz – 216MHz								Note 5	150
216MHz – 960MHz								Note 5	200
960MHz – 1GHz								Note 5	500
1GHz – 25GHz	4962.798 9925.593	42.39 41.96	2.20 3.00	33.23 38.23	35.6 36.8	42.22 46.39	- -	129.12 208.68	500

Notes:

- 1 During the scans the unit was operated in the following modes:
Hopping stopped unit operating on lowest channel
Hopping stopped unit operating on middle channel
Hopping stopped unit operating on highest channel
- 2 Emissions above 1GHz were measured with both a peak and average detectors.
- 3 Measurements <1GHz were performed at 3 meters.
- 4 Measurements >1GHz were initially performed at 3 metres.
- 5 Only emissions with in 20dB of limit are recorded.
- 6 Peak emissions recorded, peak emissions meet the average limit.

Test Method:

- 1 As per section 15.247 and Public Notice DA 00-705.
- 2 Measuring distances as Notes 3 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 >30MHz.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthogonal planes. Maximum results recorded.

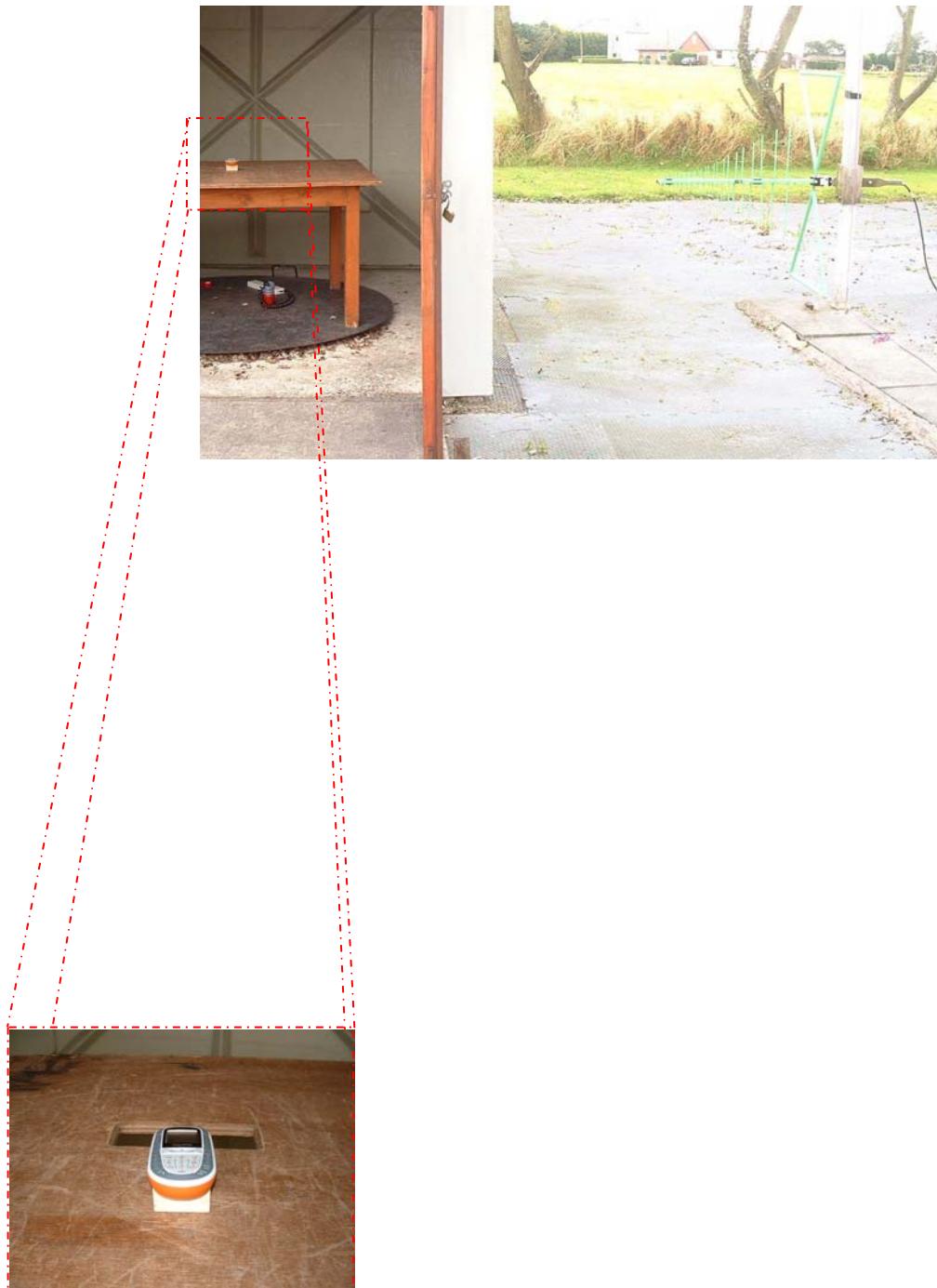
The test equipment used for the tests is shown below:

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

ANNEX A
PHOTOGRAPHS

PHOTOGRAPH No. 1

TEST SETUP



PHOTOGRAPH No. 2

FRONT VIEW



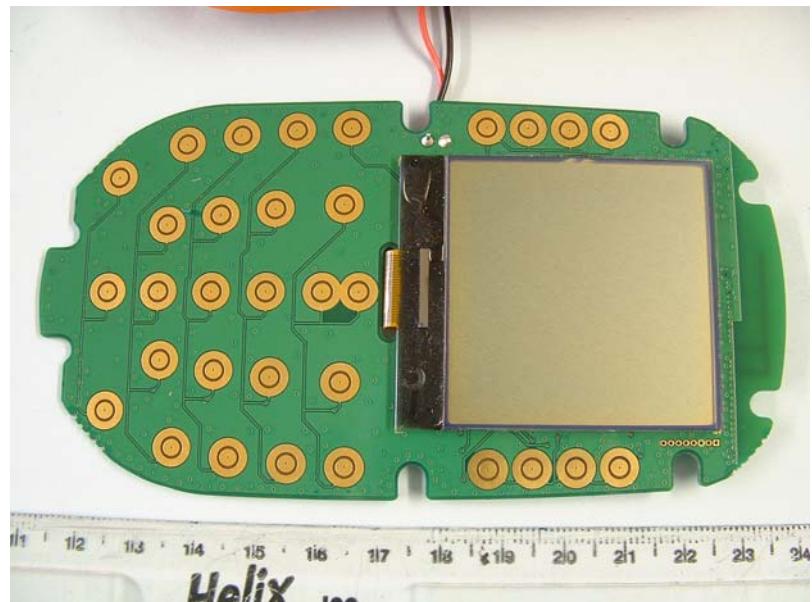
PHOTOGRAPH No. 3

BACK VIEW



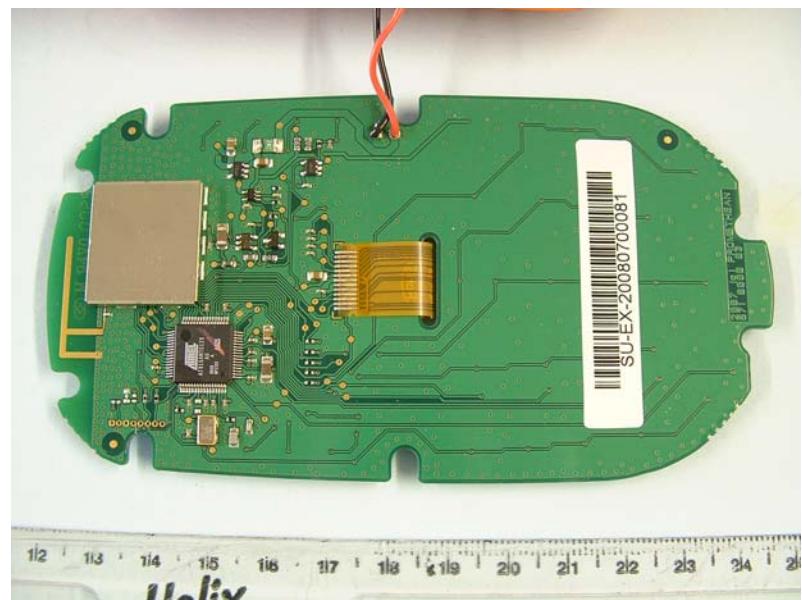
PHOTOGRAPH No. 4

TRANSMITTER PCB TRACK SIDE



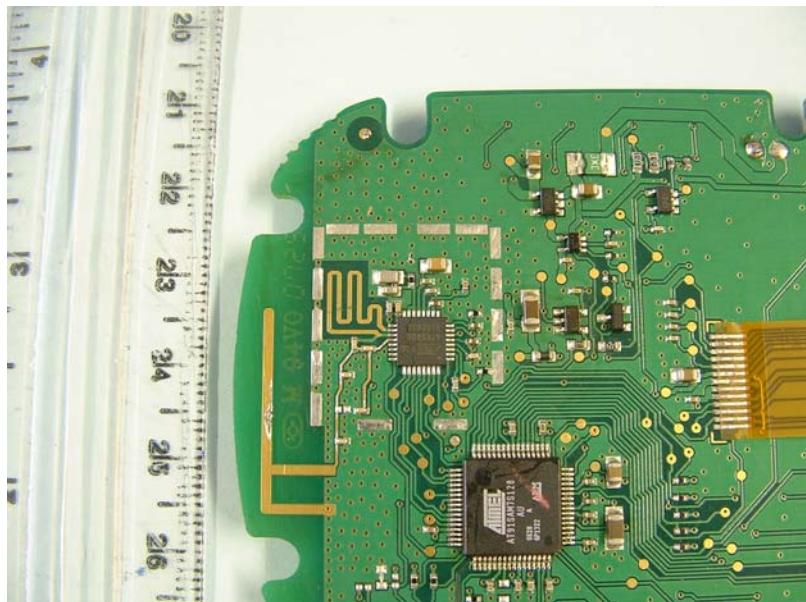
PHOTOGRAPH No. 5

TRANSMITTER PCB COMPONENT SIDE



PHOTOGRAPH No. 5

RF CLOSE UP CAN REMOVED



ANNEX B
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

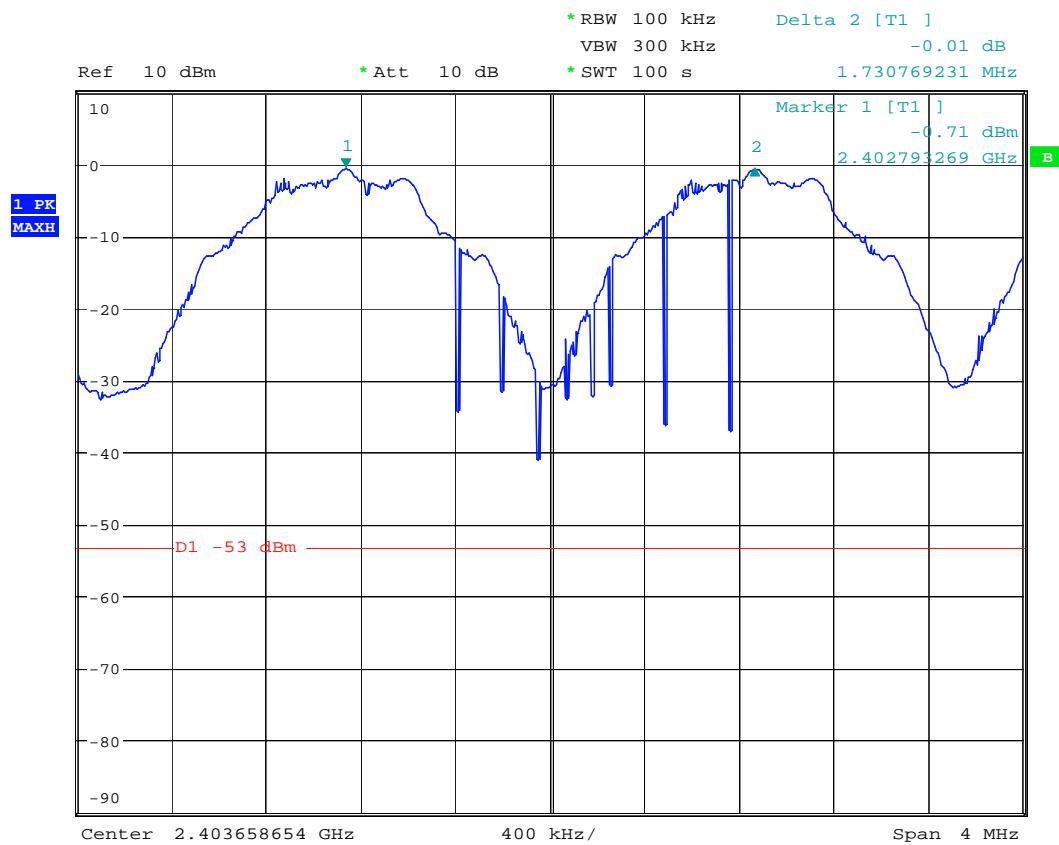
a.	TCB	-	APPLICATION	[X]
		-	FEE	[X]
b.	AGENT'S LETTER OF AUTHORISATION	-		[X]
c.	MODEL(s) vs IDENTITY	-		[]
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		[X]
e.	LABELLING	-	PHOTOGRAPHS	[X]
		-	DECLARATION	[]
		-	DRAWINGS	[X]
f.	TECHNICAL DESCRIPTION	-		[X]
g.	BLOCK DIAGRAMS	-	Tx	[X]
		-	Rx	[]
		-	PSU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

ANNEX C
EQUIPMENT CALIBRATION DETAILS

TRL Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH003	Receiver	R&S	24/07/2006	12	24/07/2007
UH004	Receiver	R&S			
UH005	LISN	R&S	11/04/2006	12	11/04/2007
UH006	3m Range ERP CAL	TRL	06/01/2006	12	06/01/2007
UH028	Log Periodic Ant	Schwarbeck	28/04/2005	24	28/04/2007
UH029	Bicone Antenna	Schwarbeck	27/04/2005	24	27/04/2007
UH041	Multimeter	AVOMeter	20/12/2005	12	20/12/2006
UH093	Bilog Antenna	Chase			
UH122	Oscilloscope	Tektronix	07/06/2005	24	07/06/2007
UH132	Power meter	Marconi	03/01/2006	12	03/01/2007
UH162	ERP Cable Cal	TRL	06/01/2006	12	06/01/2007
UH187	Receiver	R&S	01/02/2006	12	01/02/2007
UH228	Power Sensor	Marconi	03/01/2006	12	03/01/2007
UH253	1m Cable N type	TRL	23/02/2006	12	23/02/2007
UH254	1m Cable N type	TRL	05/01/2006	12	05/01/2007
UH265	Notch filer	Telonic	24/06/2005	12	24/06/2006
UH271	1m Cable N type	TRL	23/02/2006	12	23/02/2007
UH273	1m Cable N type	TRL	23/02/2006	12	23/02/2007
UH281	Spectrum Analyser	R&S	24/07/2006	12	24/07/2007
UH358	Cable	TRL		Calibrate in use	
L005	CMTA	R&S	05/12/2005	12	05/12/2006
L007	Loop Antenna	R&S	29/03/2005	24	29/03/2007
L138	1-18GHz Horn	EMCO	15/04/2005	24	15/04/2007
L139	1-18GHz Horn	EMCO	03/05/2005	24	03/05/2007
L176	Signal Generator	Marconi	15/02/2006	12	15/02/2007
L193	Bicone Antenna	Chase	12/10/2003	24	12/10/2005
L203	Log Periodic Ant	Chase	21/10/2003	24	21/10/2005
L222	Attenuator	Bird		Calibrate in use	
L280	18GHz Cable	Rosenberger	05/01/2006	12	05/01/2007
L290	Bilog Antenna	Chase	20/10/2005	24	20/10/2007
L343	CCIR Noise Filter	TRL	20/09/2006	12	20/09/2007
L426	Temperature Indicator	Fluke	04/01/2006	12	04/01/2007
L479	Analyser	Anritsu	18/11/2005	12	18/11/2006
L552	Signal Generator	Agilent	24/07/2006	12	24/07/2007
L572	Pre Amp	Agilent	03/02/2006	12	03/02/2007
N/A	High Pass Filter	AFL	23/02/2006	12	23/02/2007

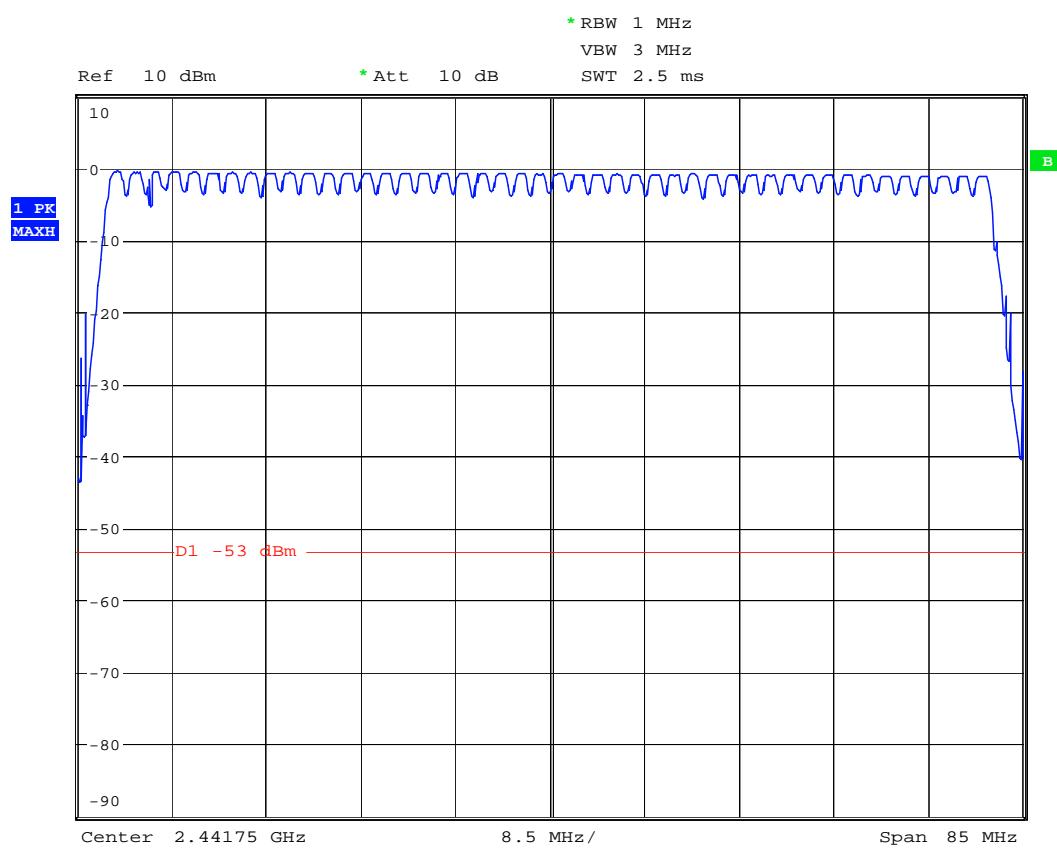
ANNEX D

CARRIER FREQUENCY SEPARATION



Date: 4.SEP.2007 10:32:46

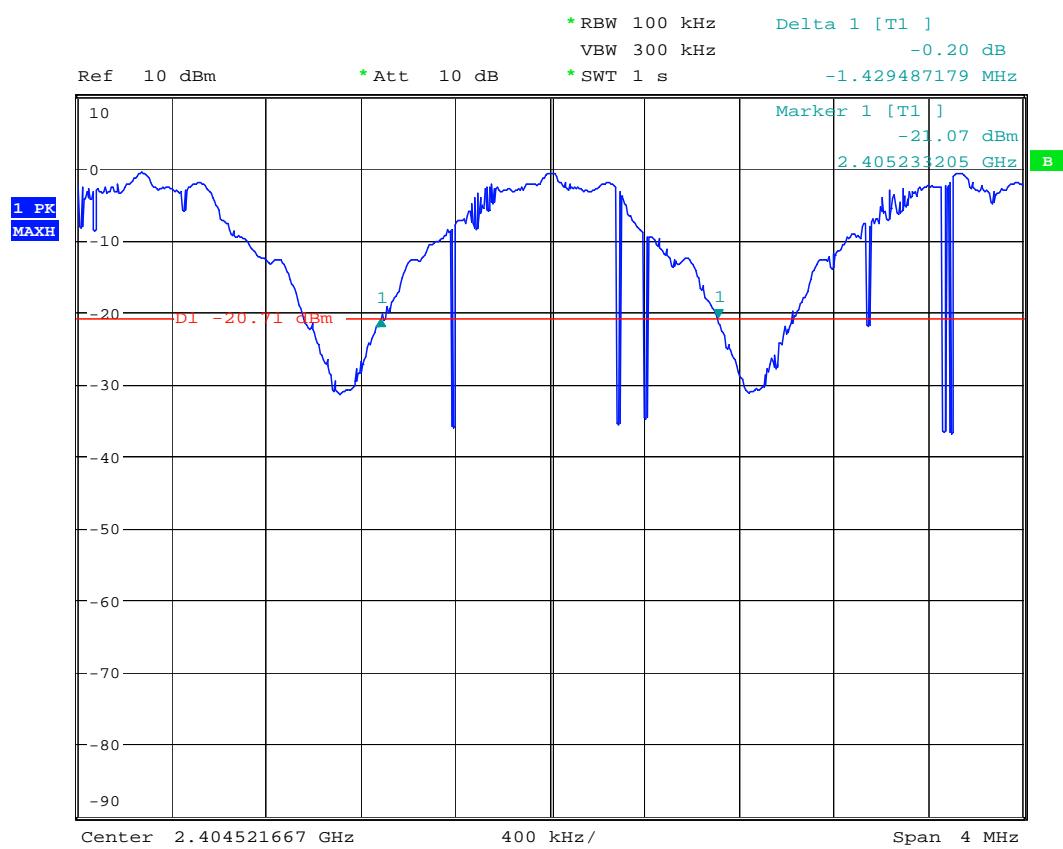
ANNEX E
NUMBER OF HOPPING CHANNELS



Date: 4.SEP.2007 10:35:59

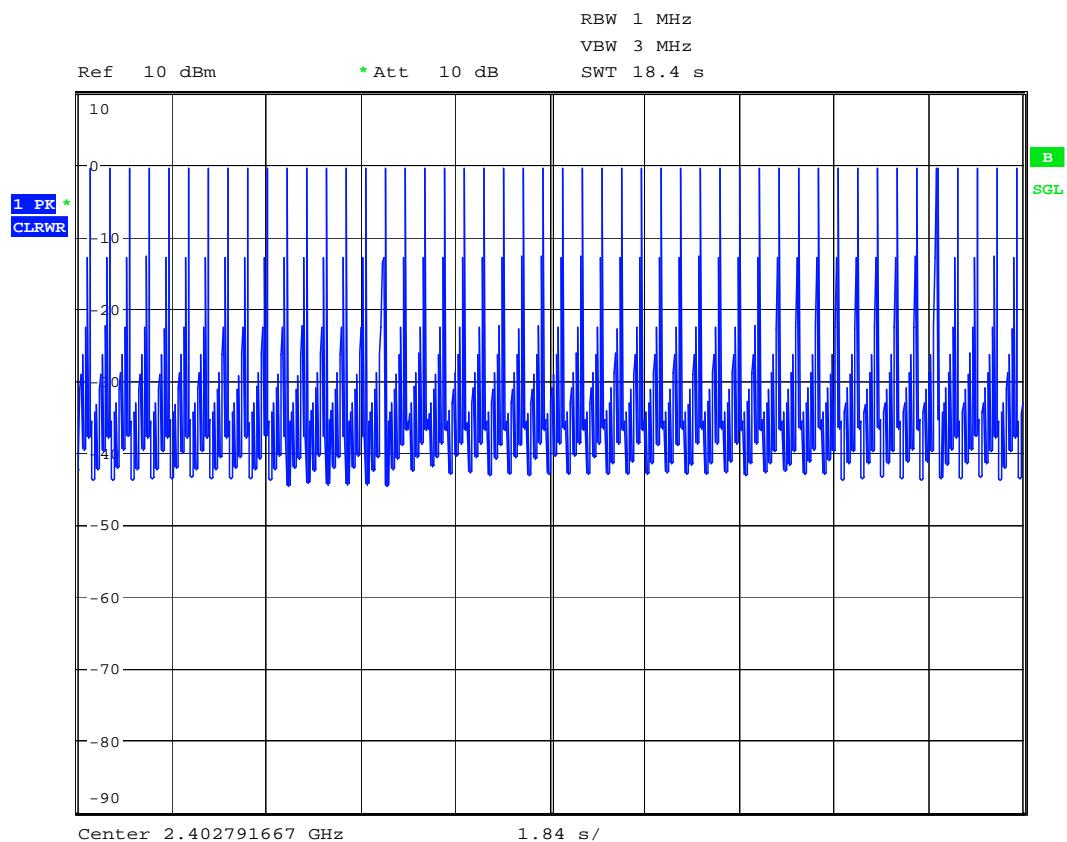
ANNEX F

20dB BANDWIDTH



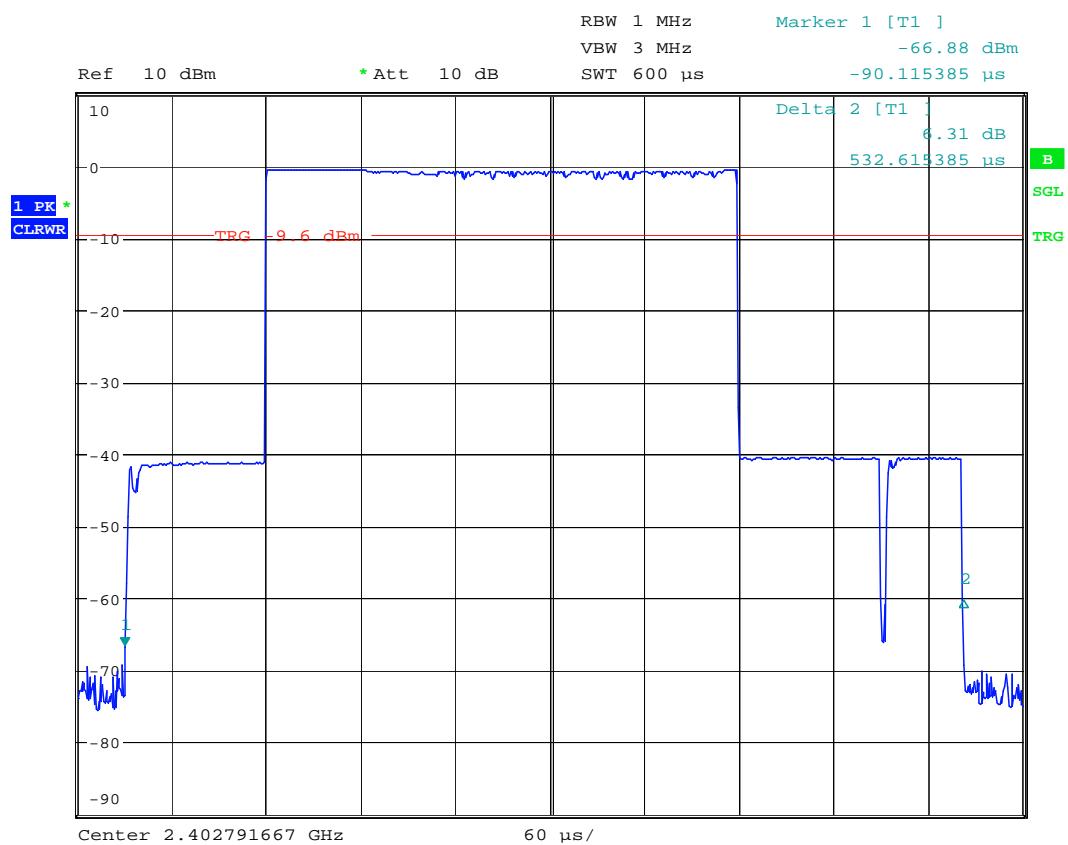
Date: 4.SEP.2007 11:05:16

ANNEX G
AVERAGE TIME OF OCCUPANCY



Date: 4.SEP.2007 10:41:17

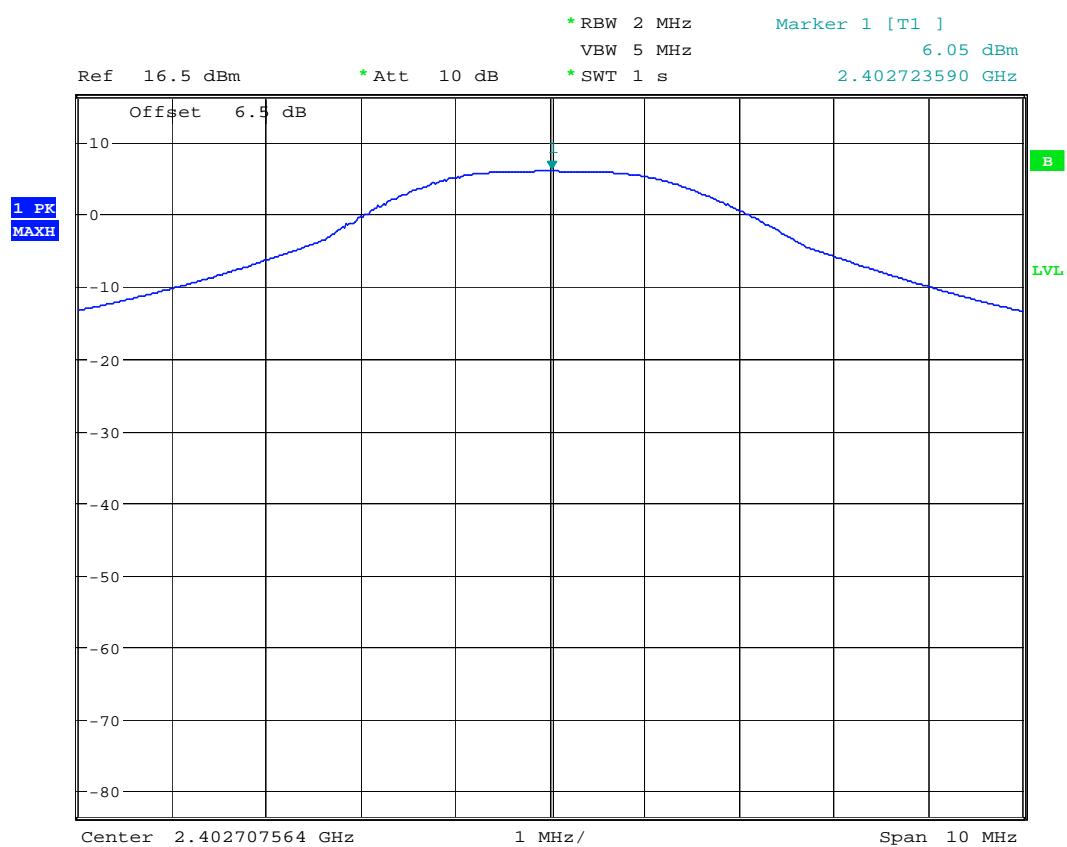
Number of transmissions made within 18.4 seconds



Date: 4.SEP.2007 10:38:37

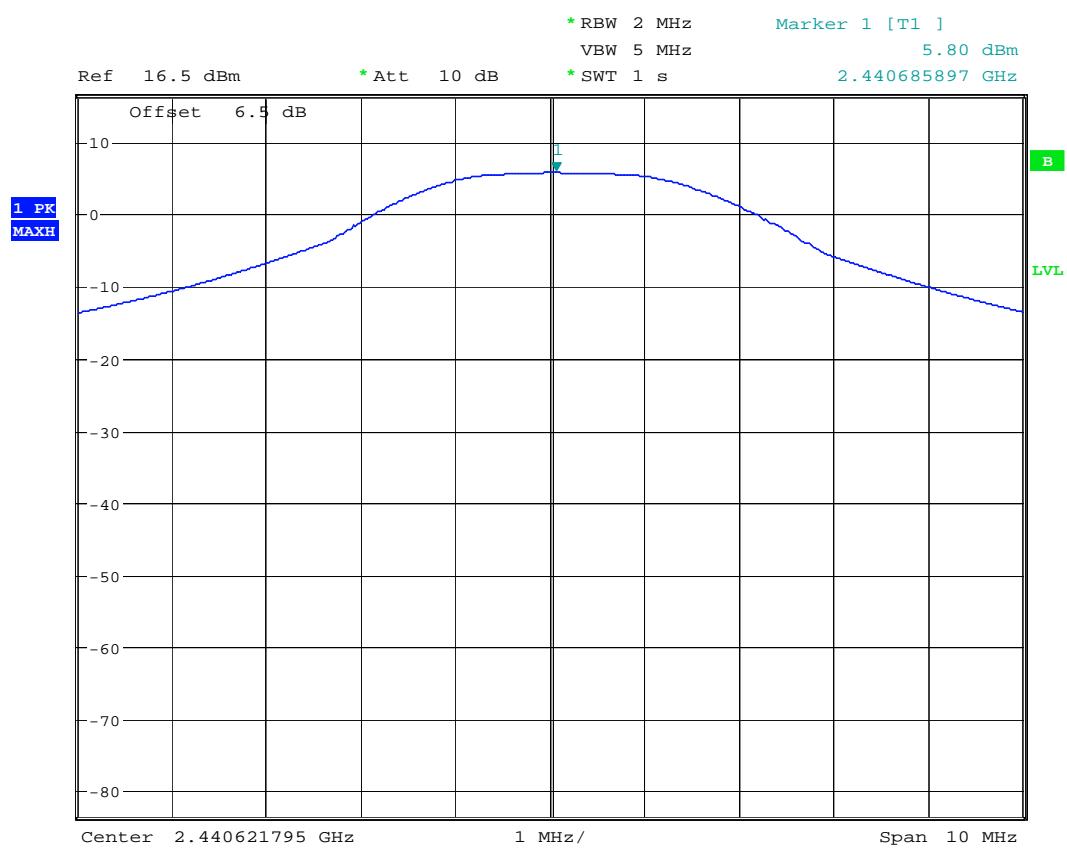
Length of one packet

ANNEX H
PEAK POWER CONDUCTED



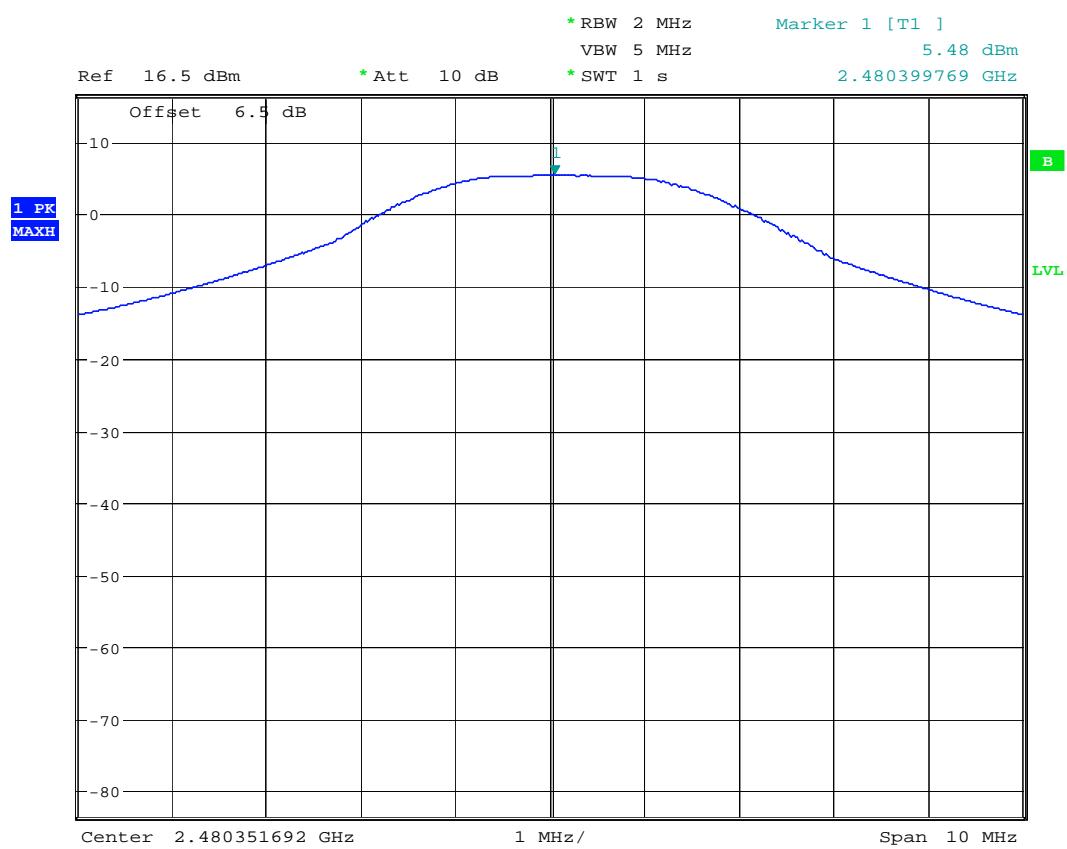
Date: 4.SEP.2007 11:16:42

PEAK POWER LOW CHANNEL



Date: 4.SEP.2007 11:27:07

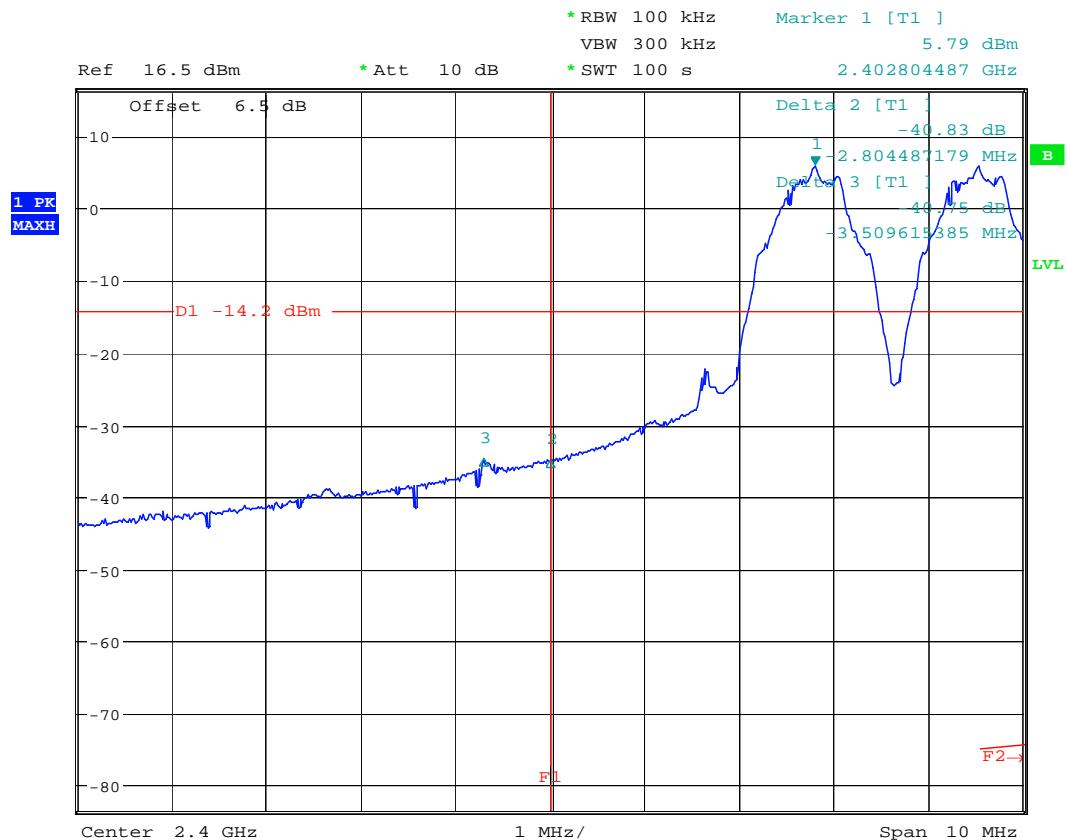
PEAK POWER MID CHANNEL



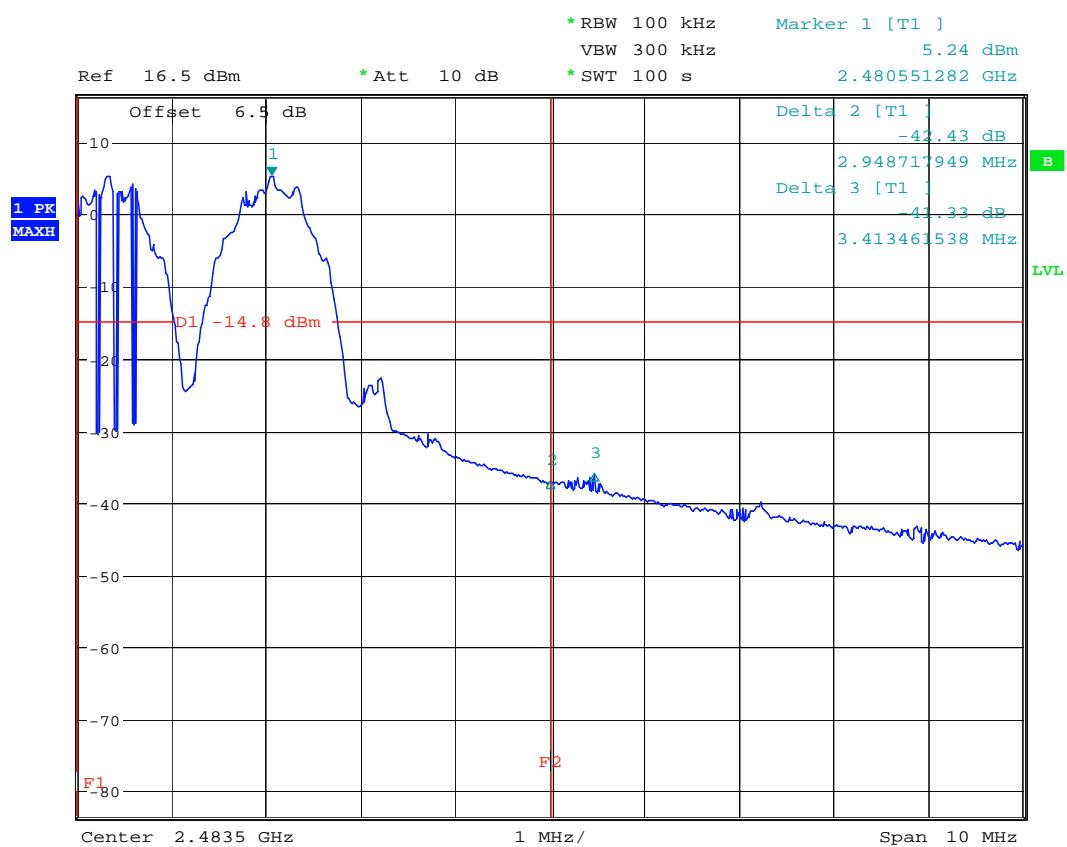
Date: 4.SEP.2007 11:29:47

PEAK POWER HIGH CHANNEL

ANNEX I
BAND EDGE CONDUCTED EMISSION



Date: 4.SEP.2007 12:27:51

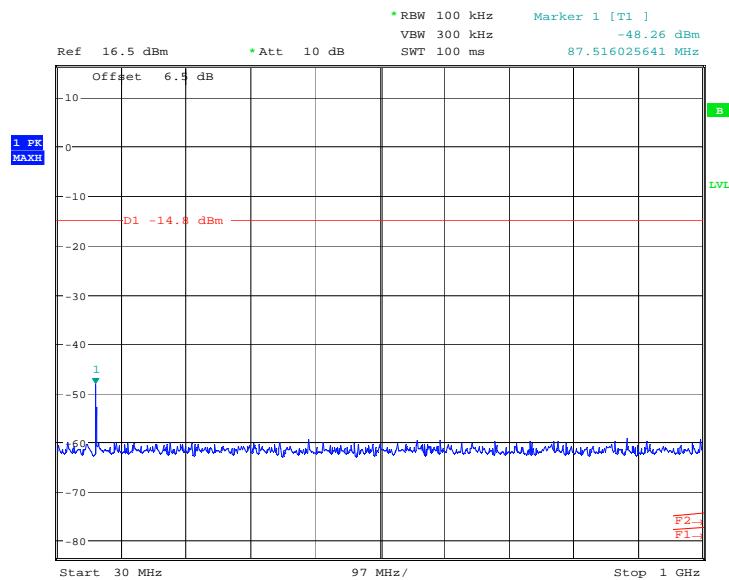


Date: 4.SEP.2007 12:00:51

ANNEX J
CONDUCTED SPURIOUS EMISSION

Bottom Channel

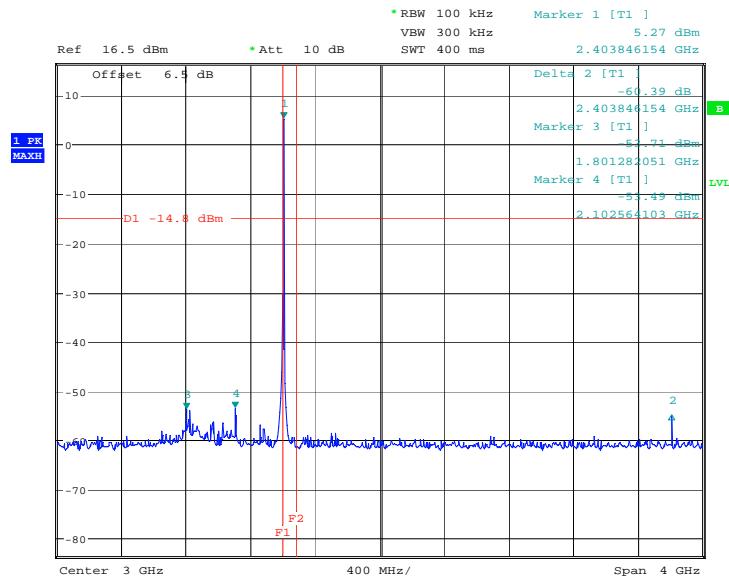
30 MHz – 1 GHz



Date: 4.SEP.2007 12:45:42

Bottom Channel

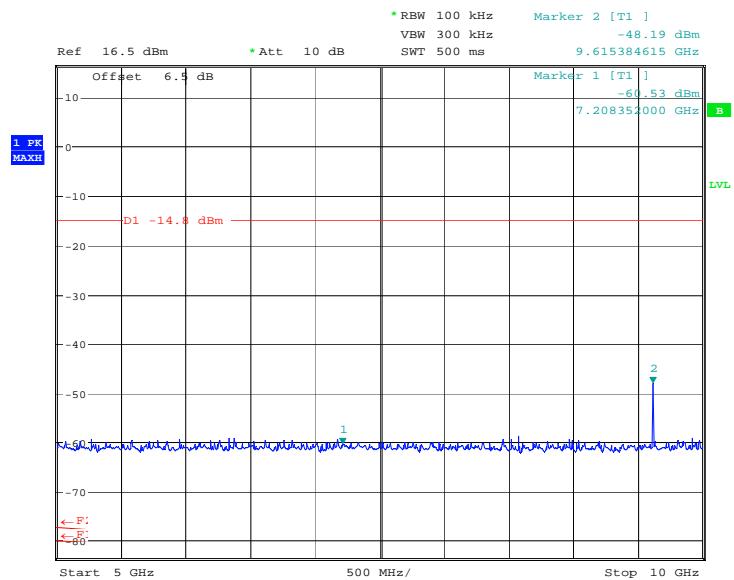
1 GHz – 5 GHz



Date: 4.SEP.2007 12:45:22

Bottom Channel

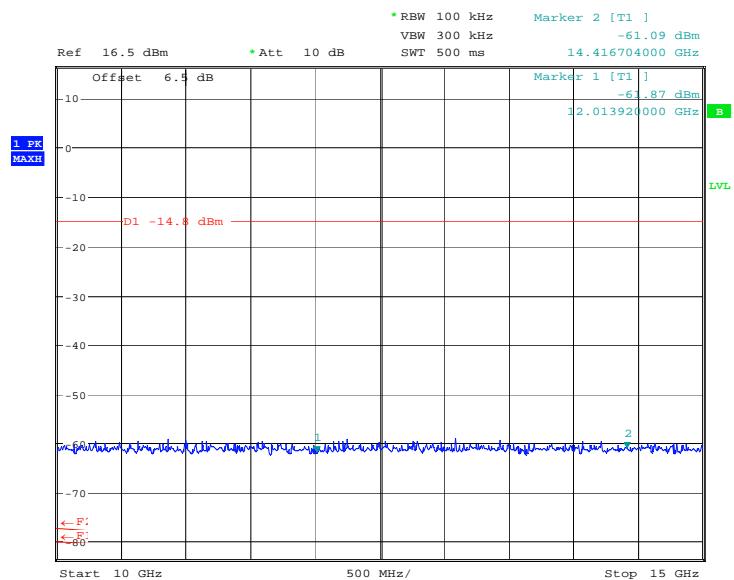
5 GHz – 10 GHz



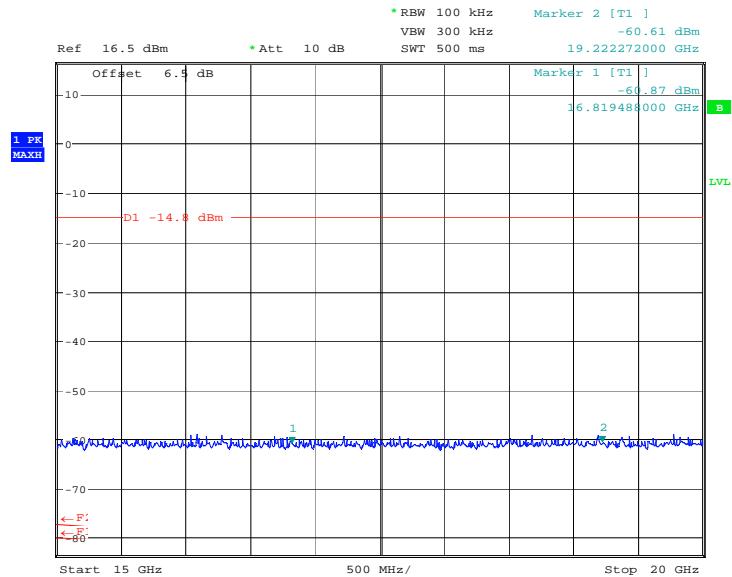
Date: 4.SEP.2007 12:46:36

Bottom Channel

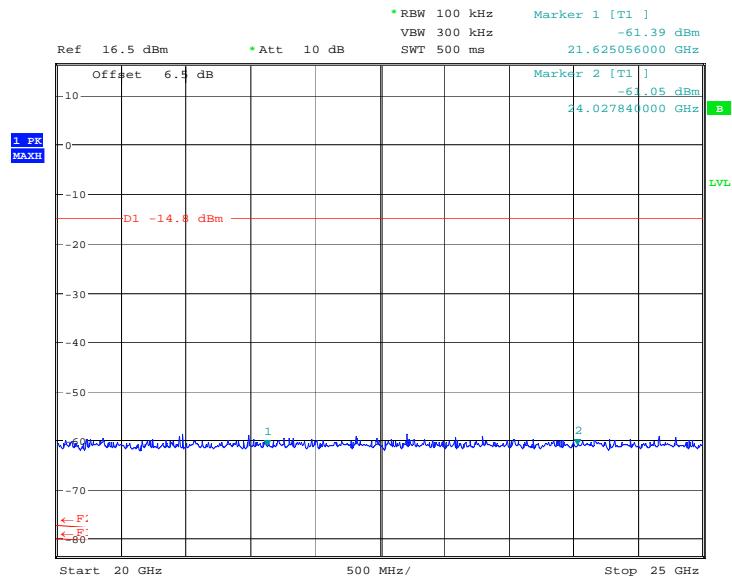
10 GHz – 15 GHz



Date: 4.SEP.2007 12:47:16

Bottom Channel**15 GHz – 20 GHz**

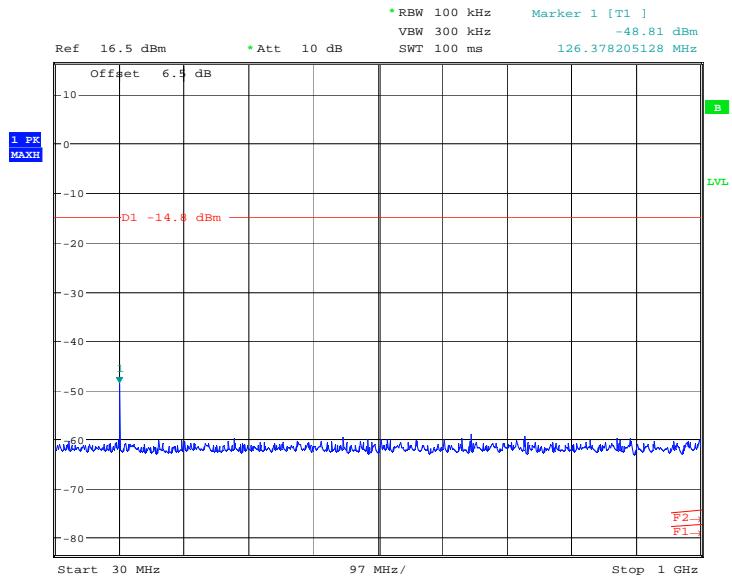
Date: 4.SEP.2007 12:47:57

Bottom Channel**20 GHz – 25 GHz**

Date: 4.SEP.2007 12:48:45

Middle Channel

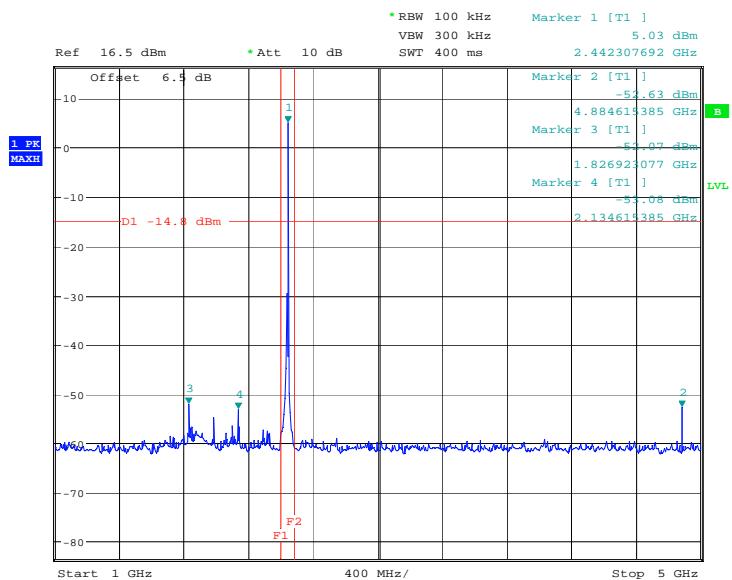
30 MHz – 1 GHz



Date: 4.SEP.2007 12:50:31

Middle Channel

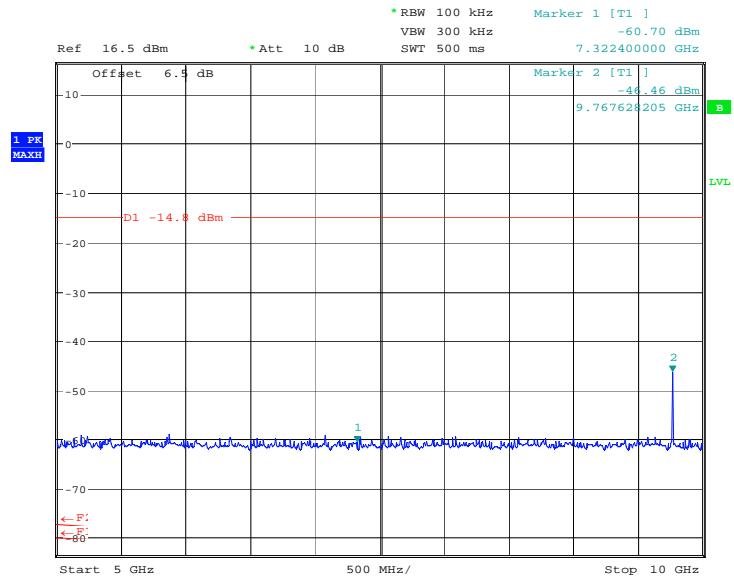
1 GHz – 5 GHz



Date: 4.SEP.2007 12:50:10

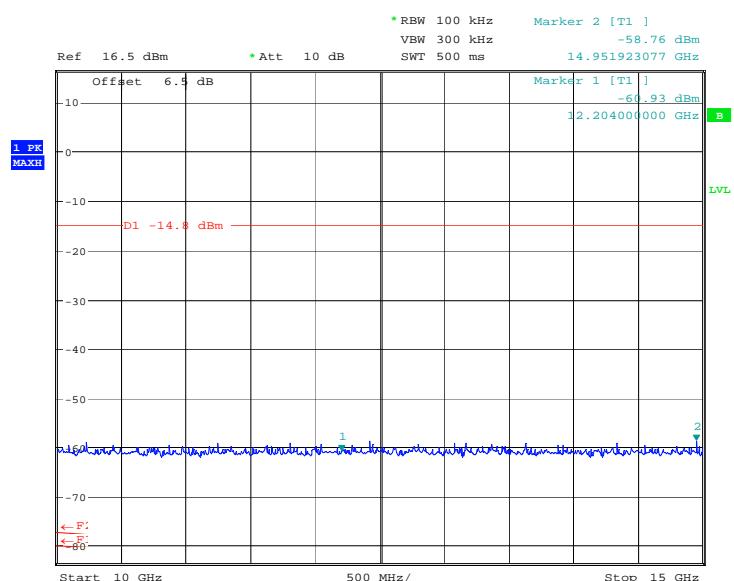
Middle Channel

5 GHz – 10 GHz



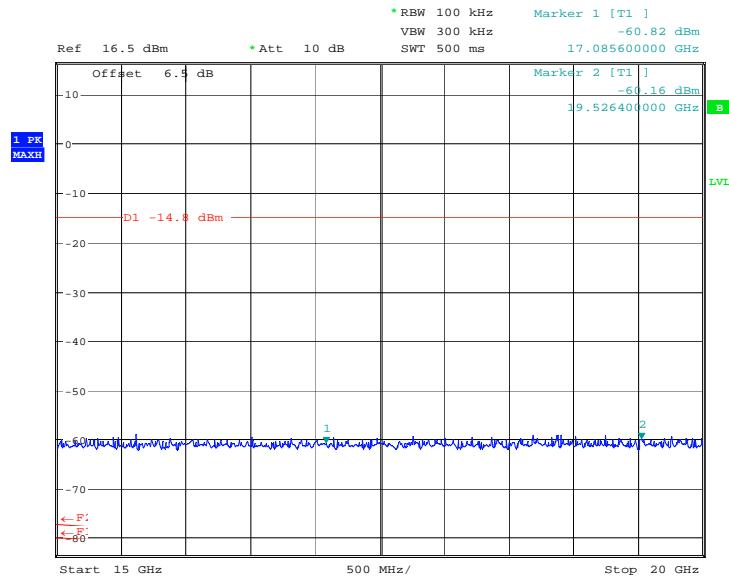
Middle Channel

10 GHz – 15 GHz



Middle Channel

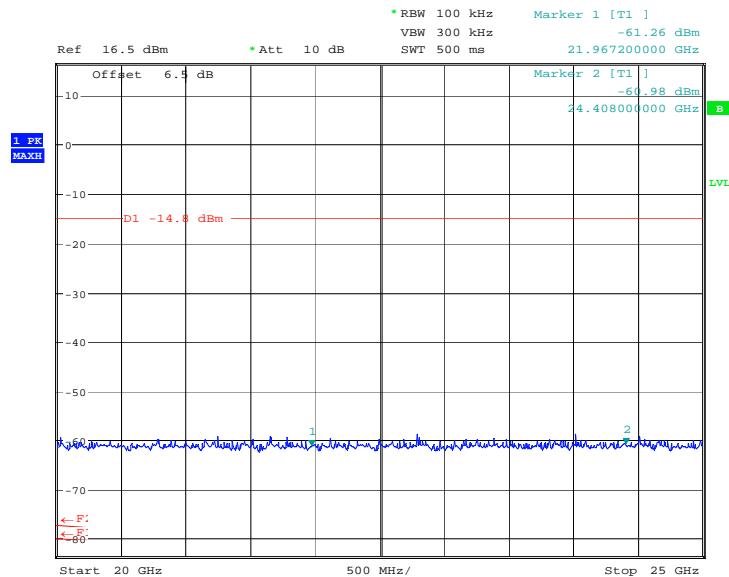
15 GHz – 20 GHz



Date: 4.SEP.2007 12:52:52

Middle Channel

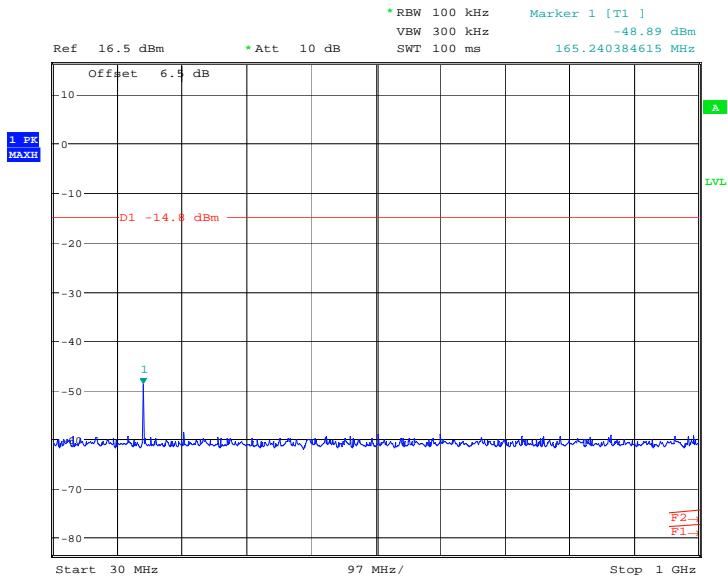
20 GHz – 25 GHz



Date: 4.SEP.2007 12:53:28

Top Channel

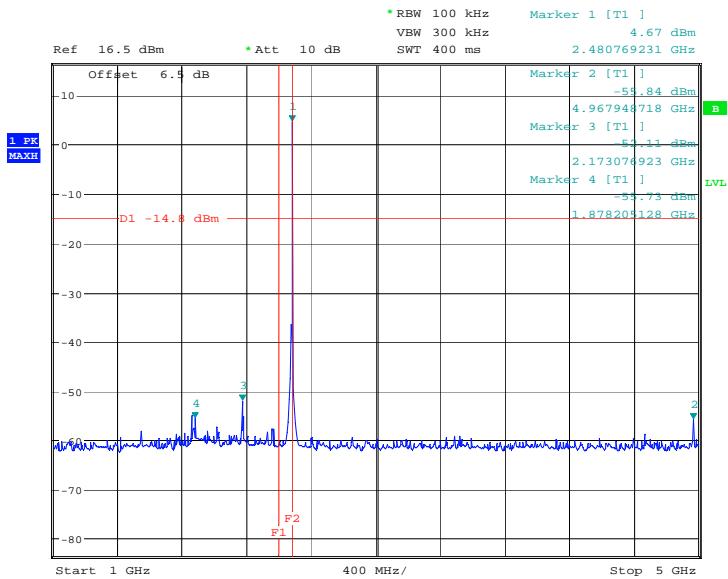
30 MHz – 1 GHz



Date: 14.SEP.2007 15:14:41

Top Channel

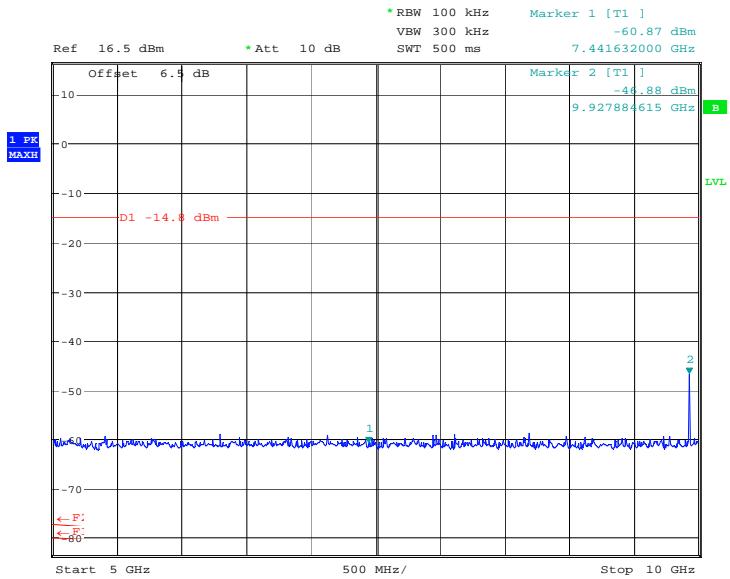
1 GHz – 5 GHz



Date: 4.SEP.2007 12:54:23

Top Channel

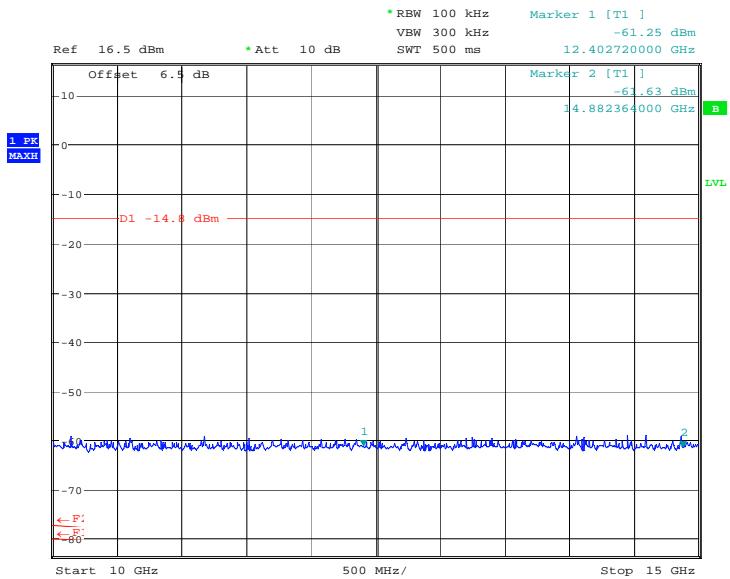
5 GHz – 10 GHz



Date: 4.SEP.2007 12:55:19

Top Channel

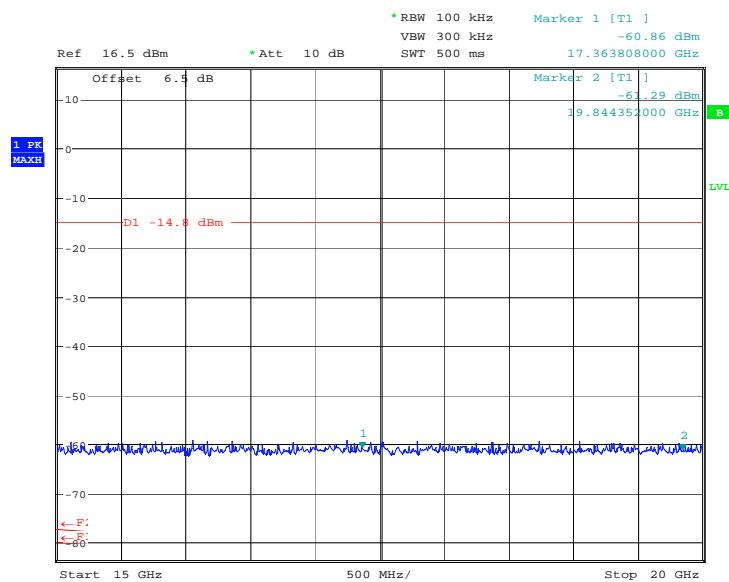
10 GHz – 15 GHz



Date: 4.SEP.2007 12:55:54

Top Channel

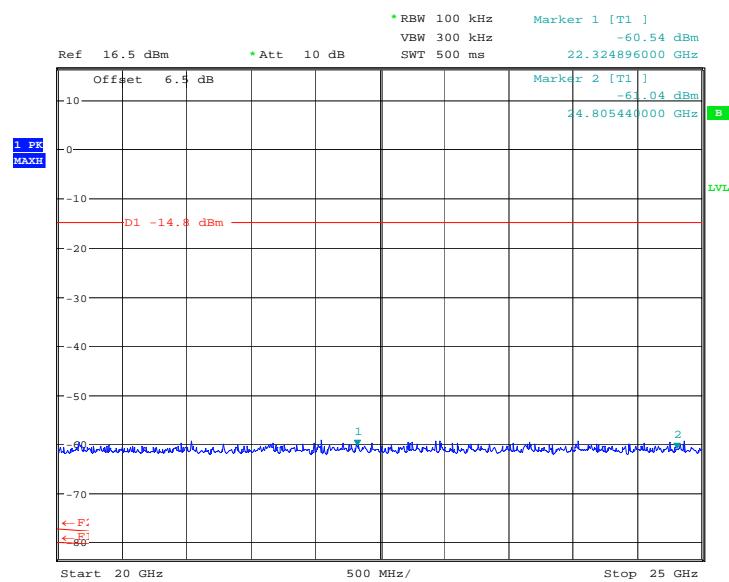
15 GHz – 20 GHz



Date: 4.SEP.2007 12:56:30

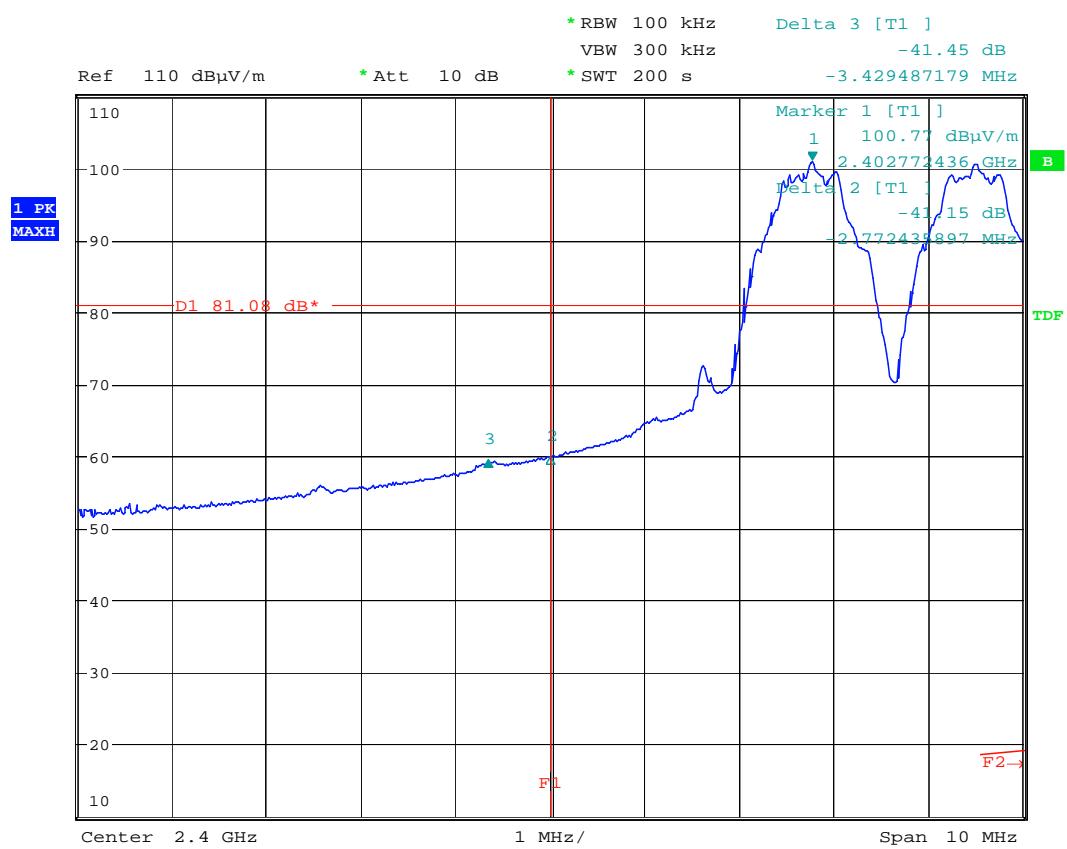
Top Channel

20 GHz – 25 GHz

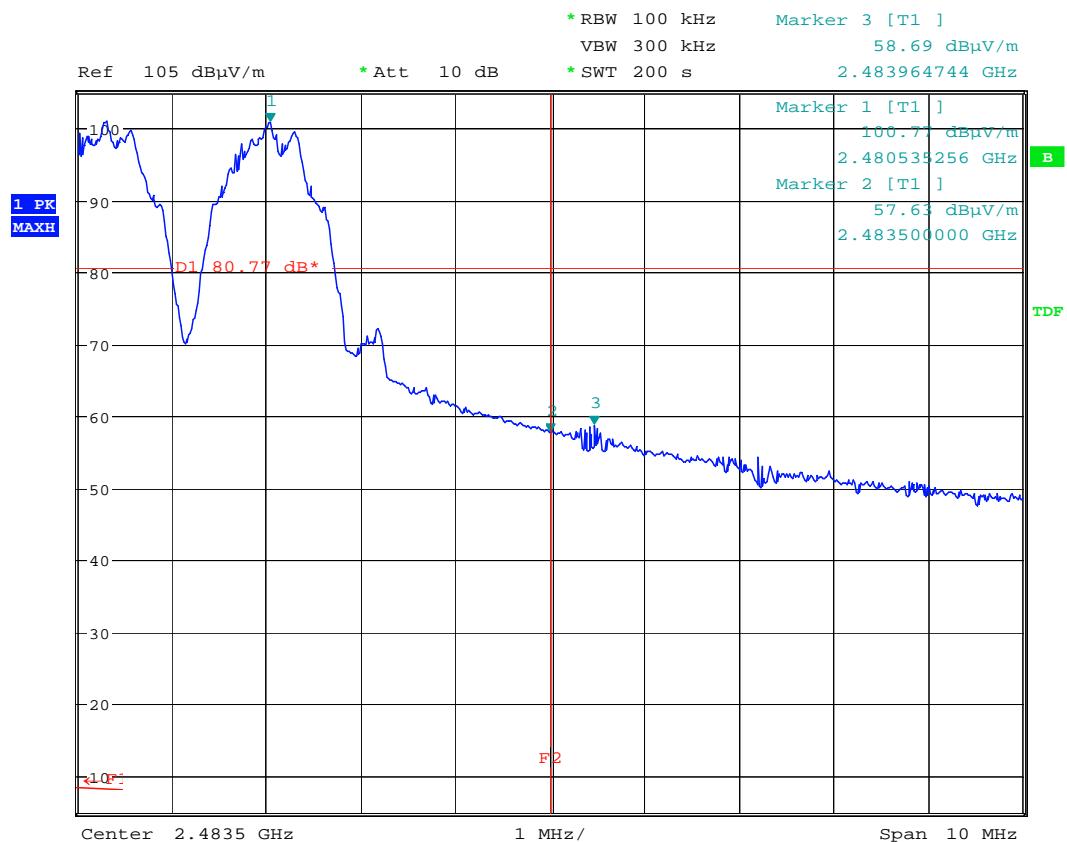


Date: 4.SEP.2007 12:57:04

ANNEX K
BAND EDGE EMISSIONS RADIATED



Date: 6.SEP.2007 15:10:59



Date: 6.SEP.2007 15:45:19

ANNEX L
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%**