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**REPORT ON THE CERTIFICATION TESTING OF A
InfoClip LLC
BT3 RFID reader
WITH RESPECT TO
THE FCC RULES CFR 47, PART 15.209 and 15.247
INTENTIONAL RADIATOR SPECIFICATION
ON BEHALF OF
Brainboxes Ltd**

TEST DATE: 11th August – 10th September 2004

TESTED BY: J CHARTERS

APPROVED BY: P GREEN
PRODUCT MANAGER

DATE: 8th October 2004

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TRL COMPLIANCE SERVICES LTD EMC DIVISION
MOSS VIEW NIPE LANE UP HOLLAND WEST LANCASHIRE WN8 9PY UNITED KINGDOM
TELEPHONE +44 (0)1695 556666 FAX +44 (0)1695 557077
E-MAIL test@trl-emc.co.uk www.trlcompliance.com



FS 21805



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Notes:

- | | | | |
|----|--|-----|-----|
| 1. | Component failure during test | YES | [] |
| | | NO | [X] |
| 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: ON2BT3READER01

PURPOSE OF TEST: CERTIFICATION

TEST SPECIFICATION: FCC RULES CFR 47, Part 15.209 & 15.247

TEST RESULT: Compliant to Specification

EQUIPMENT UNDER TEST: BT3 RFID reader

EQUIPMENT SERIAL No: Engineering sample

EQUIPMENT TYPE: RFID reader with Bluetooth interface

PRODUCT USE: Wireless tag reader

CARRIER EMISSION: Bluetooth: 0.019 W EIRP
RFID: 1.93µV/m @ 300m

ANTENNA TYPE: Bluetooth: Integral
RFID: Integral

ALTERNATIVE ANTENNA: Not applicable

CHANNEL SPACING: Not applicable.
Both the RFID and Bluetooth are wideband application.

FREQUENCY GENERATION.: RFID SAW Resonator [] Crystal [X] Synthesiser []

FREQUENCY GENERATION.: BLUETOOTH SAW Resonator [] Crystal [] Synthesiser [X]

MODULATION METHOD: RFID Amplitude [] Digital [] Angle [X]

MODULATION METHOD: BLUETOOTH Amplitude [] Digital [X] Angle []

POWER SOURCE(s): 9.6Volts dc

TEST DATE(s): 11th August – 10th September 2004

ORDER No(s): R&D10031

APPLICANT: Brainboxes Ltd

ADDRESS: Unit 3 Wavertree Boulevard South
Wavertree Technology Park
Liverpool
L7 9PF

TESTED BY: ----- J Charters

APPROVED BY: ----- P Green
Product manager

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	BT3 RFID reader
EQUIPMENT TYPE:	RFID reader with Bluetooth interface
SERIAL NUMBER OF EUT:	Engineering sample
PURPOSE OF TEST:	CERTIFICATION
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 15.209 & 15.247
TEST RESULT:	COMPLIANT Yes ☒ No ☐
APPLICANT'S CATEGORY:	MANUFACTURER ☐ IMPORTER ☐ DISTRIBUTOR ☐ TEST HOUSE ☐ AGENT ☒
APPLICANT'S ORDER No(s):	R&D10031
APPLICANT'S CONTACT PERSON(s):	Mr J Kaye
E-mail address:	JK@brainboxes.com
APPLICANT:	Brainboxes Ltd
ADDRESS:	Unit 3 Wavertree South Boulevard Wavertree Technolgy Park Liverpool L7 9PF
TEL:	0151 220 2500
FAX:	0151 252 0446
MANUFACTURER:	InfoClip LLC
ADDRESS:	1860 Lefthand Circle Suite G Longmont Colorado 80501
TEL:	303 682 9898
EUT(s) COUNTRY OF ORIGIN:	United Sates of America
TEST LABORATORY:	TRL EMC
UKAS ACCREDITATION No:	0728
TEST DATE(s)	11 th August – 10 th September 2004
TEST REPORT No:	RU1121/6781

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.

TEST/EXAMINATION	RULE PART	DETECTOR	APPLICABILITY
Intentional Emission Frequency:	15.209	Average	RFID
	15.247	Peak	Bluetooth
Intentional Emission Field Strength:	15.209	Average	RFID
	-	-	Bluetooth not applicable
Intentional Emission Band Occupancy:	15.35	Peak	RFID
	15.247(a)1	Peak	Bluetooth
Intentional Emission EIRP (mW):	-	-	RFID not applicable
	15.247(b)1	Peak	Bluetooth
Spurious Emissions – Conducted:	15.207	-	RFID not applicable
	15.207	-	Bluetooth not applicable
Spurious Emissions – Conducted:	-	-	RFID not applicable
	15.247	Peak	Bluetooth
Spurious Emissions – Radiated <1000MHz:	15.209	Quasi peak	RFID
	15.209 ,15.247	Quasi Peak	Bluetooth
Spurious Emissions – Radiated >1000MHz:	-	-	RFID not applicable
	15.247 15.209	Peak average	Bluetooth
Transmitter Carrier Frequency Separation	-	-	RFID not applicable
	15.247(a)(1)	Peak	Bluetooth
Transmitter Maximum Peak Power Output Power	-	-	RFID not applicable
	15.247(b)(1)	Peak	Bluetooth
Transmitter Band Edge Conducted Emissions	-	-	RFID not applicable
	15.247(c)	Peak	Bluetooth
Transmitter Band Edge Radiated Emission	-	-	RFID not applicable
	15.247(c)	Peak	Bluetooth
Extrapolation Factor	15.31(f)	-	Both RFID and Bluetooth
Maximum Frequency of Search:	15.33	-	Both RFID and Bluetooth
Antenna Arrangements Integral:	15.203	-	Both RFID and Bluetooth
Antenna Arrangements External Connector:	15.204	-	Both RFID and Bluetooth
Restricted Bands	15.205	-	Both RFID and Bluetooth

2. Product Description :

The BT3 RFID reader is a wireless radio frequency identification (RFID) device. The unit reads the data store on ISO11784 RFID tags using a transceiver operating on 134.2kHz. The data from the data is transmitted to the a laptop/PDA using a Bluetooth module operating in the 2.4GHz ISM frequency band.

- | | | | |
|--|---------------------|----------------|-------------------------------------|
| 3. | Temperatures: | Ambient (Tnom) | 25°C |
| 4. | Supply Voltages: | Vnom | +9.6Vdc |
| Note: Vnom voltages are as stated above unless otherwise shown on the test report page | | | |
| 5. | Equipment Category: | Single channel | ☐ |
| | | Two channel | ☐ |
| | | Multi-channel | ☒ |
| 6. | Channel spacing: | Narrowband | ☐ |
| | | Wideband | ☒ |

TRANSMITTER TESTS RFID UNIT

TRANSMITTER SPURIOUS EMISSIONS – RADIATED – PART 15.209

Ambient temperature	=	25°C(<1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	57% (<1GHz),	1m measurements >1GHz	[X]
Conditions	=	Open Area Test Site (OATS)	30m extrapolated from 10m	[X]
Supply voltage	=	+9.6Vdc		

	FREQ. (MHz)	MEAS. Rx. (dBμV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBμV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (μV/m)
	0.009MHz - 0.490MHz	No significant emissions within 20dB's of the limit					
	0.490MHz - 1.705MHz	No significant emissions within 20dB's of the limit.					
	1.705MHz - 30MHz	No significant emissions within 20dB's of the limit.					
	30MHz - 88MHz	No significant emissions within 20dB's of the limit.					
	88MHz - 216MHz	No significant emissions within 20dB's of the limit.					
	216MHz - 960MHz	No significant emissions within 20dB's of the limit.					
	960MHz - 1GHz	No significant emissions within 20dB's of the limit.					
	1GHz - 5GHz	No significant emissions within 20dB's of the limit.					
Limits	0.009MHz to 0.490MHz		2400/F(kHz) @ 300m				
	0.490MHz to 1.705MHz		24000/F (kHz) @ 30m				
	1.705MHz to 30MHz		30μV/m @ 30m				
	30MHz to 88MHz		100μV/m @ 3m				
	88MHz to 216MHz		150μV/m @ 3m				
	216MHz to 960MHz		200μV/m @ 3m				
	960MHz to 1GHz		500μV/m @ 3m				
	1GHz to 5GHz		500μV/m @ 3m				

Notes:

- 1 Results quoted are extrapolated as indicated.
- 2 Emissions were searched to: (x) 1000MHz inclusive, as per Part 15.33a.
- 3 Extrapolation factor 9.5dB from 1m to 3m, as per Part 15.31f.
- 4 Extrapolation factor 80dB from 3m to 300m as per Part 15.31f..
- 5 Extrapolation factor 40dB from 3m to 30m as per Part 15.31f.
- 6 Measurements >1GHz @ 1m as per Part 15.31f(1).
- 7 Receiver detector 9kHz – 30MHz CISPR, Quasi-Peak, 10kHz bandwidth.
Apart from the bands 9kHz-90kHz and 110kHz-490kHz where an Average detector is used.
- 8 Receiver detector 30MHz<1GHz = CISPR, Quasi-Peak, 120kHz bandwidth.
- 9 Receiver detector >1GHz = Average, 1MHz resolution bandwidth.
- 10 New batteries used for battery powered products.
- 11 Emissions 20dB's below the limit are not recorded.
- 12 For emissions below 30MHz, the measuring receiver automatically compensates for the loss due to the antenna factor of the loop antenna. This loss is 20dB's across the measurement range 9kHz to 30MHz.
- 13 For emissions below 30MHz the cable losses are assumed to be negligible.
- 14 F(kHz) is the frequency of operation.
- 15 See Annex E for 150 kHz – 30MHz scan plot and Annex F for 30MHz – 1000MHz scan plot.

Test Method:

- 1 As per Radio – Noise Emissions, ANSI C63.4: 2001.
- 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 >30MHz.
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 below:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
HORN ANTENNA	EMCO	3115	9010-3580	138	
BICONE ANTENNA	CHASE	BBA9106	N/A	193	
ANTENNA, LOG PERIODIC 300MHz – 1GHz	CHASE	UPA6108	1061	203	
BILOG ANTENNA	CHASE	CBL6112	20038	274	
BILOG ANTENNA	SCHAFFNER	CBL6112B	2761	431	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	X
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	X
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

TRANSMITTER TESTS RFID UNIT

TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.209

Ambient temperature	=	25°C	3m measurements @ fc	[X]
Relative humidity	=	55%	10m measurements @ fc	[X]
Conditions	=	Open Area Test Site (OATS)	30m measurements @ fc	[]
Supply voltage	=	+9.4Vdc	300m extrapolated from 3m	[X]
Channel number	=	1	300m extrapolated from 10m	[X]

FREQ. (kHz)	MEASUREMENT DISTANCE (Metres)	MEASUREMENT Rx. READING (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)
134.22	3	95.1	89.3	1.9
134.22	10	64.8	59.08	1.9
Limit value @ fc		17.9µV/m @ 300m		
Band occupancy @ 20dB Bandwidth value		f lower	f higher	
		130.420kHz See note Annex C	137.140 See note Annex C	

See spectrum analyser plot – Annex C

Notes:

- Results quoted are extrapolated as indicated.
- Receiver detector @ fc = Average 200Hz bandwidth, measurement time 1s.
- When battery powered the EUT was powered with new batteries.
- For emissions below 30MHz the measuring receiver automatically compensates for the loss due to the antenna factor of the loop antenna. This loss is 20dB's across the measurement range 9kHz to 30MHz.
- For emissions below 30MHz the cable losses are assumed to be negligible.
- Peak emissions were found to be less than 20 dB greater then or equal to the average emission therefore deemed to comply with 15.35(b). See scan data Annex E.
- The test results quoted are the maximum seen after the supply voltage was varied between 85% and 115% of Vnom.
- Extrapolation 10 to 300m 59.08 as per 15.31F.
- Extrapolation 3 to 10 30.1 from result above.

Test Method:

- As per Radio – Noise Emissions, ANSI C63.4: 2001.
- Measuring distances 3m.
- EUT 0.8 metre above ground plane.
- 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 Transmitter Intentional Emission – Radiated – Part 15.209 tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
RECEIVER	ROHDE & SCHWARZ	ESVS10	844594/003	352	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
V / UHF RECEIVER 20MHz - 1GHz	ROHDE & SCHWARZ	ESVS 20	838804 / 005	415	
BILOG ANTENNA	SCHAFFNER	CBL6112B	2761	431	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	X
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	X
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

TRANSMITTER TESTS BLUETOOTH UNIT

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

Ambient temperature = 25°C
Relative humidity = 55%
Conditions = Conducted –Radio Lab
Supply voltage = +9.6Vdc

Transmitter Carrier Frequency Separation (MHz)
1.014MHz
LIMIT SPECIFIED IN 15.247 (A)(1): The channels should be separated by at least 25kHz or the 20dB bandwidth which ever is greater.

See spectrum analyser plot – Annex F
See note 1

- Notes:**
- 1 20dB Bandwidth of one carrier is 714kHz therefore carrier frequency separation must be greater than 714kHz.
 - 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 emission 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
RECEIVER	ROHDE & SCHWARZ	ESIB 7	100182	630	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

TRANSMITTER TESTS BLUETOOTH UNIT

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

Ambient temperature	=	25°C
Relative humidity	=	55%
Conditions	=	Conducted –Radio Lab
Supply voltage	=	+9.6Vdc

20dB Bandwidth (kHz)
781.5
Limit 500kHz

See spectrum analyser plot – Annex H

- Notes:**
- 1 The EUT has 79 hopping channels see annex G.
 - 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 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
RECEIVER	ROHDE & SCHWARZ	ESIB 7	100182	630	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	X
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	X
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

TRANSMITTER TESTS BLUETOOTH UNIT

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

Ambient temperature	=	25°C
Relative humidity	=	55%
Conditions	=	Conducted –Radio Lab
Supply voltage	=	+9.6Vdc

Packet Width (µs)	Number of Transmissions in 30 Seconds	Average time of Occupancy (s)
526.85	200	0.105
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 H.

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 30 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 30 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
RECEIVER	ROHDE & SCHWARZ	ESIB 7	100182	630	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

TRANSMITTER TESTS BLUETOOTH UNIT

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

Ambient temperature = 25°C
Relative humidity = 55%
Conditions = Conducted –Radio Lab
Supply voltage = +9.6Vdc

Channel Frequency (MHz)	Input voltage (Volts)	Transmitter Peak Power Output (dBm)	Transmitter Peak Power Output (Watts)	Limit (Watts)
2402	6.0	12.38	0.017	1.0
2402	9.6	12.98	0.019	1.0
2402	11.04	12.3	0.016	1.0
2441	6	11.82	0.015	1.0
2441	9.6	11.72	0.014	1.0
2441	11.04	11.77	0.014	1.0
2480	6	11.53	0.014	1.0
2480	9.6	11.53	0.014	1.0
2480	11.04	11.53	0.014	1.0

See spectrum analyser plot – Annex J

Notes:

- 1 Number of hopping channels employed is 79 see annex G.
- 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
RECEIVER	ROHDE & SCHWARZ	ESIB 7	100182	630	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	

TRANSMITTER TESTS BLUETOOTH UNIT

TRANSMITTER PEAK OUTPUT POWER EIRP – RADIATED – Part 15.247(b)(1)

Ambient temperature = 25°C(<1GHz),
Relative humidity = 55%(<1GHz),
Conditions = OATS –Radio Lab
Supply voltage = +7.2Vdc

Channel Frequency (MHz)	Input voltage (Volts)	Transmitter Peak Power Output (dBm)	Transmitter Peak Power Output (mW)	Limit (Watts)
2402	9.6	-7.7	0.17	1.0
2441	9.6	-7.2	0.19	1.0
2480	9.6	-7.6	0.19	1.0

Notes: 1 Number of hopping channels employed is 79 see annex H.

Test Method:

- 1 As per Public Notice DA 00-705
- 2 Measuring distances 3m.
- 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.
- 5 EUT was replaced by antenna and signal generator to produce EIRP 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
RECEIVER	ROHDE & SCHWARZ	ESIB 7	100182	630	X
ANTENNA	EMCO	3115	9010-35810	138	X
RANGE 1	TRL	3 METRE	N/A	UH06	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X
ANTENNA	EMCO	3115	9010-3581	139	X

TRANSMITTER TESTS BLUETOOTH UNIT

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

Ambient temperature = 25°C
Relative humidity = 55%
Conditions = Conducted –Radio Lab
Supply voltage = +9.6Vdc

Top Channel

Range Frequency (MHz)	Emission Frequency (MHz)	Emission Level	Cable loss	Level (dBm)	Limit (dBm)
30 – 26000	Note 3		-	<30.9	-10.9

See spectrum analyser scan plots – Annex K

Middle Channel

Range Frequency (MHz)	Emission Frequency (MHz)	Emission Level	Cable loss	Level (dBm)	Limit (dBm)
30 – 26000	Note3		-	<30.9	-10.9

See spectrum analyser scan plots – Annex K

Bottom Channel

Range Frequency (MHz)	Emission Frequency (MHz)	Emission Level	Cable loss	Level (dBm)	Limit (dBm)
30 – 26000	Note 3		-	<30.9	-10.9

See spectrum analyser scan plots – Annex K

Hopping at maximum data rate

Range Frequency (MHz)	Emission Frequency (MHz)	Emission Level	Cable loss	Level (dBm)	Limit (dBm)
30 – 26000	Note 3		-	<30.9	-10.9

See spectrum analyser scan plots – Annex K

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 mid channel
Hopping stopped unit operating on highest channel
Hopping over all frequencies.
- 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 An 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
RECEIVER	ROHDE & SCHWARZ	ESIB 7	100182	630	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

TRANSMITTER TESTS BLUETOOTH UNIT

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

Ambient temperature = 25°C
 Relative humidity = 55%
 Conditions = Radiated OATS
 Supply voltage = +9.6Vdc

Bottom Channel 30MHz -26000MHz

	Emission Frequency (MHz)	Meas. Rx. (dBuV)	Cable loss (dB)	Ant. Factor	Field Strength (dBuV/m)	Extrap. Factor (dB)	Result (uV/m)	Limit (uV/m)
30MHz – 88MHz Restricted band	Note 7							100
88MHz – 216MHz Restricted band	Note 7							150
216MHz – 960MHz Restricted band	Note 7							200
960MHz – 1GHz Restricted band	Note 7							500
1GHz – 26GHz Restricted band	Note 7							500
30MHz -26GHz	Note 7							-20dBc
See annex L for initial pre scan results.								

Middle Channel 30MHz -26000MHz

	Emission Frequency (MHz)	Meas. Rx. (dBuV)	Cable loss (dB)	Ant. Factor	Field Strength (dBuV/m)	Extrap. Factor (dB)	Result (uV/m)	Limit (uV/m)
30MHz – 88MHz Restricted band	Note 7							100
88MHz – 216MHz Restricted band	Note 7							150
216MHz – 960MHz Restricted band	Note 7							200
960MHz – 1GHz Restricted band	Note 7							500
1GHz – 26GHz Restricted band	Note 7							500
30MHz -26GHz	Note 7							-20dBc
See annex L for initial pre scan results.								

TRANSMITTER TESTS BLUETOOTH UNIT**TRANSMITTER EMISSIONS cont. – RADIATED – Part 15.247(c) and 15.209****Top Channel 30MHz -26000MHz**

	Emission Frequency (MHz)	Meas. Rx. (dBuV)	Cable loss (dB)	Ant. Factor	Field Strength (dBuV/m)	Extrap. Factor (dB)	Result (uV/m)	Limit (uV/m)
30MHz – 88MHz Restricted band	Note 7							100
88MHz – 216MHz Restricted band	Note 7							150
216MHz – 960MHz Restricted band	Note 7							200
960MHz – 1GHz Restricted band	Note 7							500
1GHz – 26GHz Restricted band	Note 7							500
30MHz -26GHz	Note 7							-20dBc

See annex L for initial pre scan results.

Hopping at maximum data rate 30MHz -26000MHz

	Emission Frequency (MHz)	Meas. Rx. (dBuV)	Cable loss (dB)	Ant. Factor	Field Strength (dBuV/m)	Extrap. Factor (dB)	Result (uV/m)	Limit (uV/m)
30MHz – 88MHz Restricted band	Note 7							100
88MHz – 216MHz Restricted band	Note 7							150
216MHz – 960MHz Restricted band	Note 7							200
960MHz – 1GHz Restricted band	Note 7							500
1GHz – 26GHz Restricted band	Note 7							500
30MHz -26GHz	Note 7							-20dBc

See annex L for initial pre scan results.

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 mid channel
Hopping stopped unit operating on highest channel
Hopping over all frequencies,
- 2 R indicates frequency with a restricted band.
- 3 Initial pre scans were performed see Annex L for plots.
- 4 Emissions above 1GHz were measured with both a peak and average detectors.
- 5 Measurements <1GHz were performed at 3 meters.
- 6 Measurements >1GHz were initial performed at 0.3metres. This distance was increased if sensitivity of analyser allowed.
- 7 Only emissions with in 20dB of limit are 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	830051/001	UH03	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	X
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

TRANSMITTER TESTS BLUETOOTH UNIT

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

Ambient temperature = 25°C
Relative humidity = 55%
Conditions = Conducted –Radio Lab
Supply voltage = +9.6Vdc

Test Result

Measure as compliant see analyser plots

Notes:

- 1 The EUT was set in a hopping mode using all hopping channels.
- 2 A temporary antenna connector was used to take the measurement.
- 3 See Annex M 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	830051/001	UH03	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	X
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

TRANSMITTER TESTS BLUETOOTH UNIT

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

Ambient temperature	=	25°C
Relative humidity	=	55%
Conditions	=	Conducted –Radio Lab
Supply voltage	=	+9.6Vdc

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 M 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	830051/001	UH03	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	X
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

ANNEX A
PHOTOGRAPHS

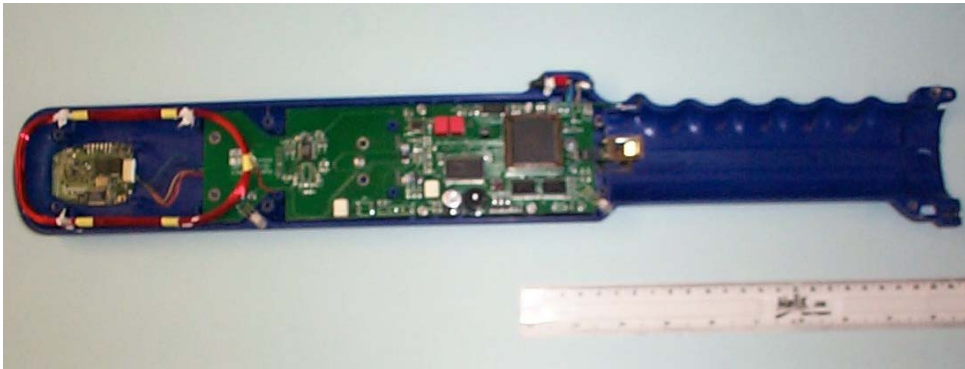


PHOTOGRAPH No. 2 **FRONT VIEW**



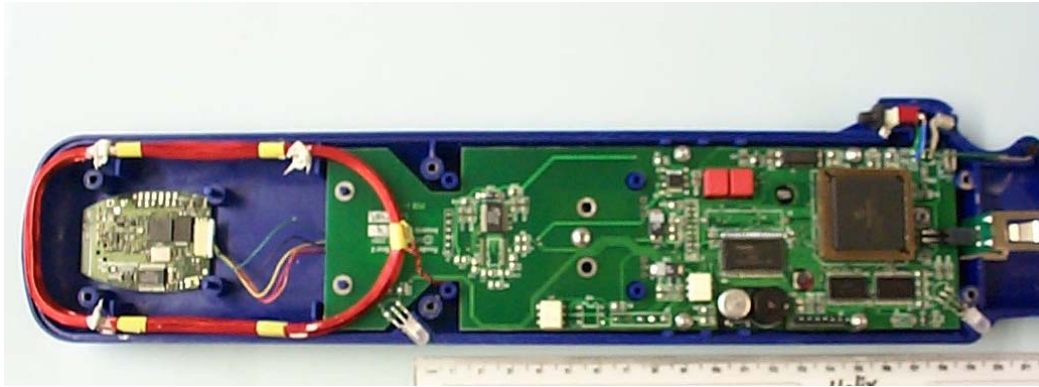
PHOTOGRAPH No. 3

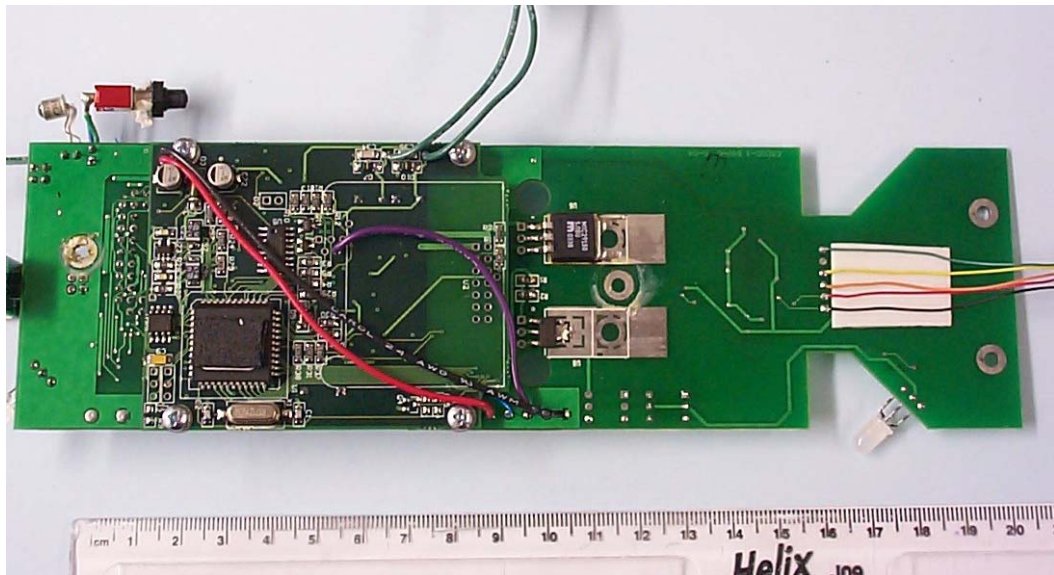
LID REMOVED



PHOTOGRAPH No. 4

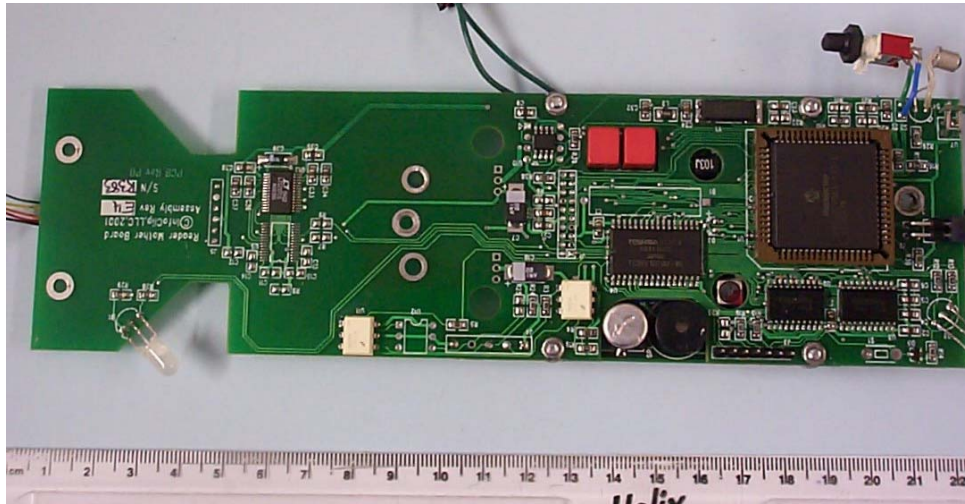
LID CLOSE UP





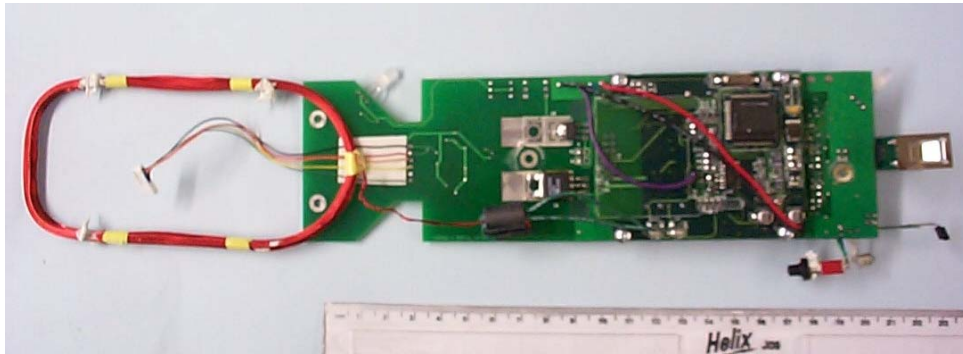
PHOTOGRAPH No. 6

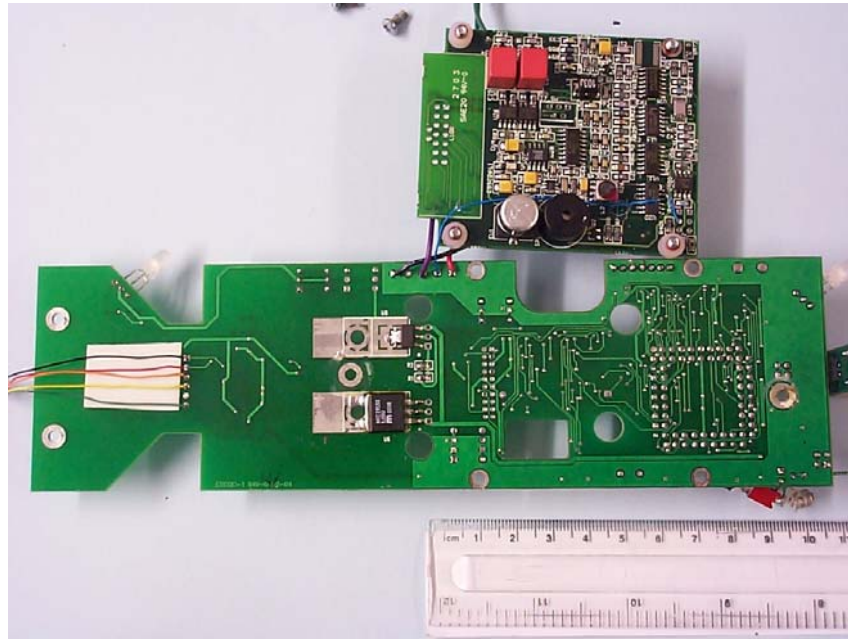
PCB COMPONENT SIDE

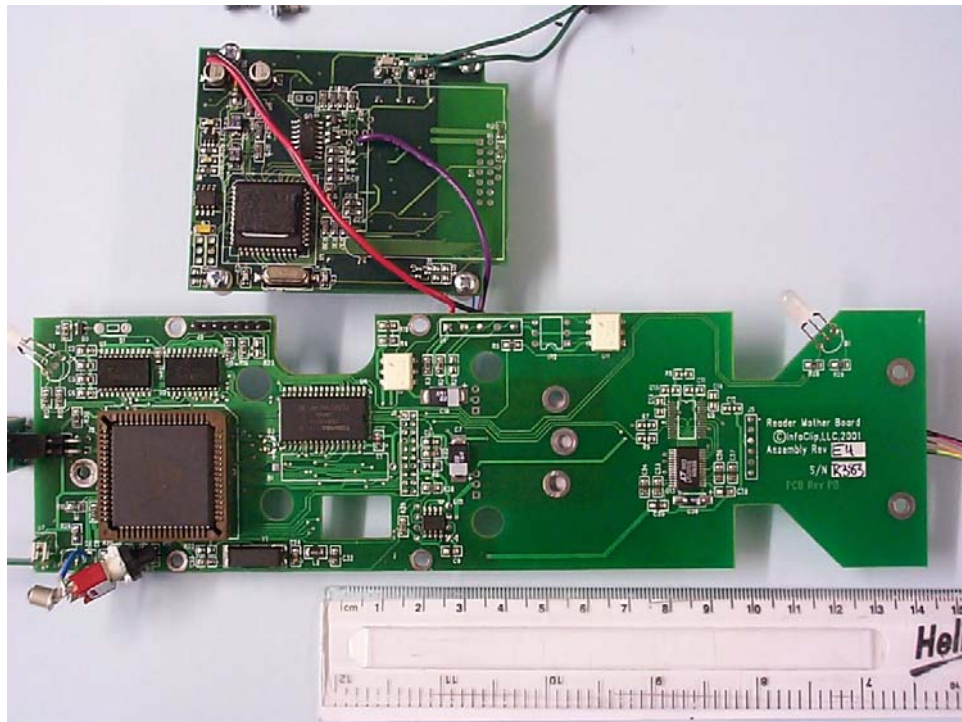


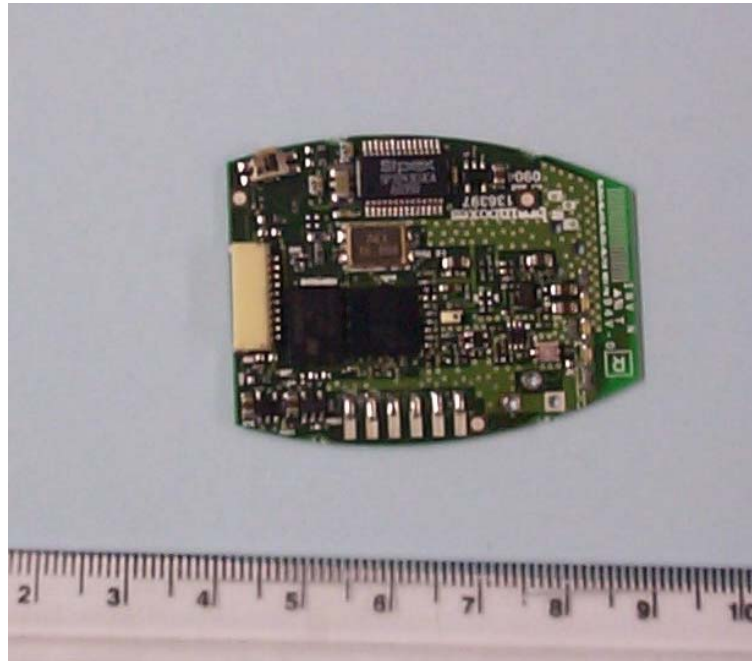
PHOTOGRAPH No. 7

ANTENNA COIL



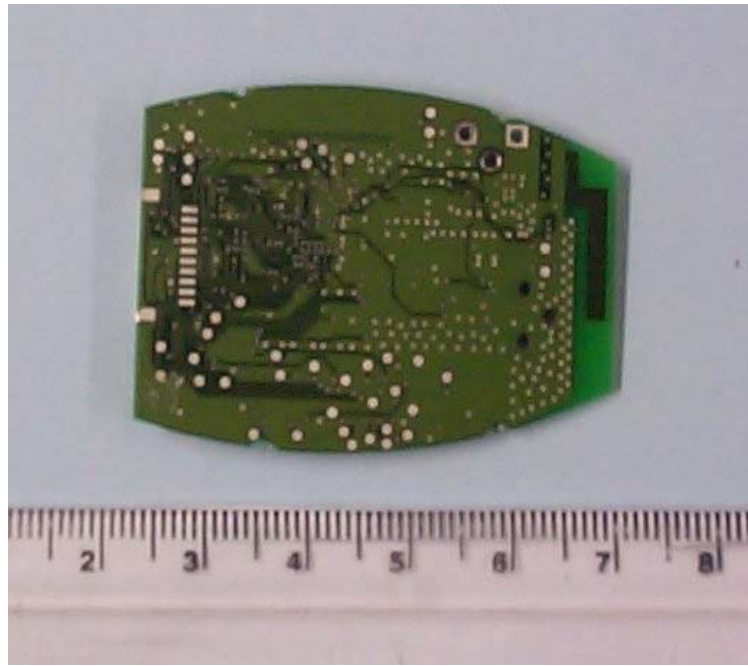






PHOTOGRAPH No. 11

BLUETOOTH PCB COMPONENT SIDE



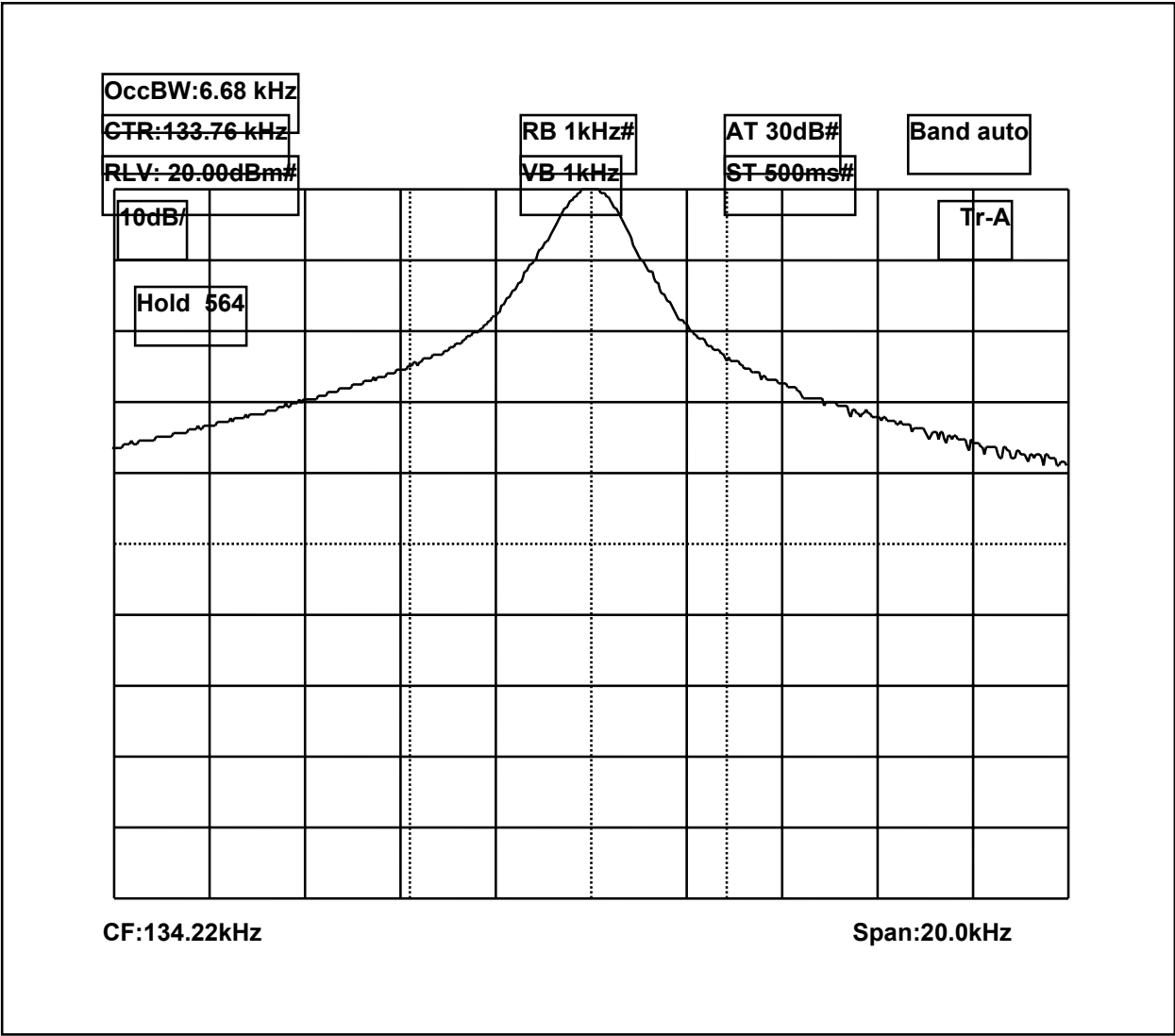
ANNEX B
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

a.	TCB	-	APPLICATION	[X]
		-	FEE	[X]
b.	AGENT'S LETTER OF AUTHORISATION	-		[X]
c.	MODEL(s) vs IDENTITY	-		[]
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
BANDWIDTH PLOT RFID

BANDWIDTH PLOT



ANNEX D
SCAN DATA RFID
150kHz - 30MHz

ANNEX E
RFID SCAN DATA
30MHz – 1GHz

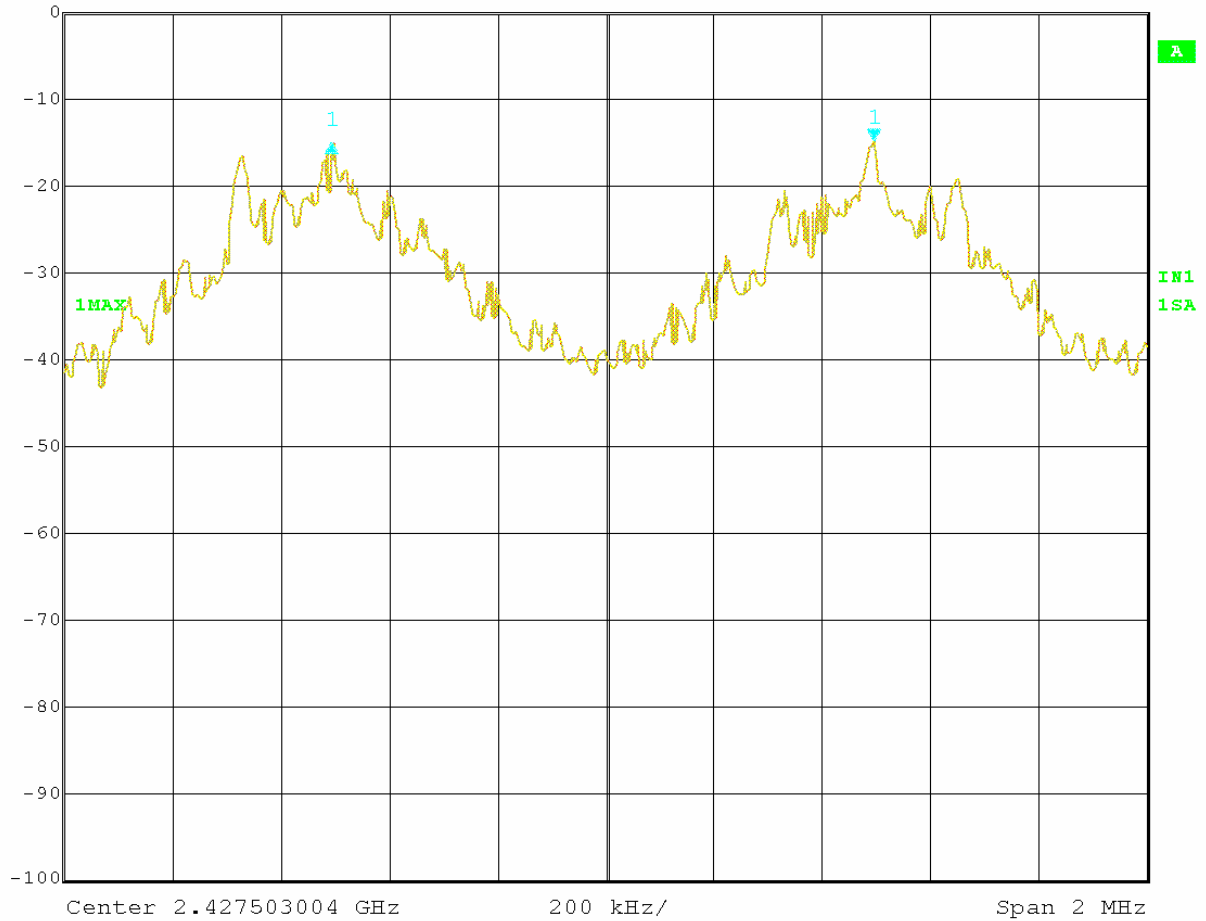
ANNEX F

CARRIER FREQUENCY SEPARATION

BLUETOOTH



Delta 1 [T1] RBW 20 kHz RF Att 30 dB
Ref Lvl -0.20 dB VBW 20 kHz
0 dBm -1.00200401 MHz SWT 12.5 ms Unit dBm

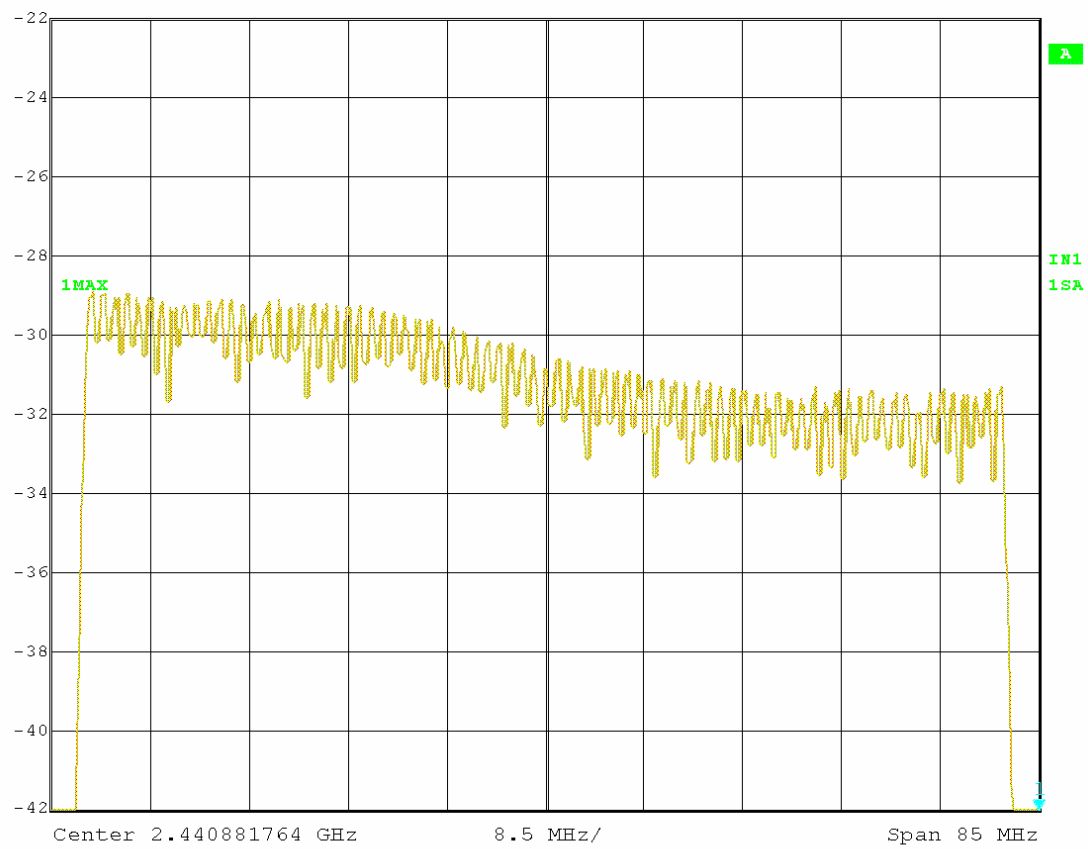


Date: 2.SEP.2004 16:05:39

ANNEX G
NUMBER OF HOPPING CHANNEL
BLUETOOTH



Marker 1 [T1] RBW 1 MHz RF Att 10 dB
Ref Lvl -75.80 dBm VBW 1 MHz
-22 dBm 2.48338176 GHz SWT 5 ms Unit dBm

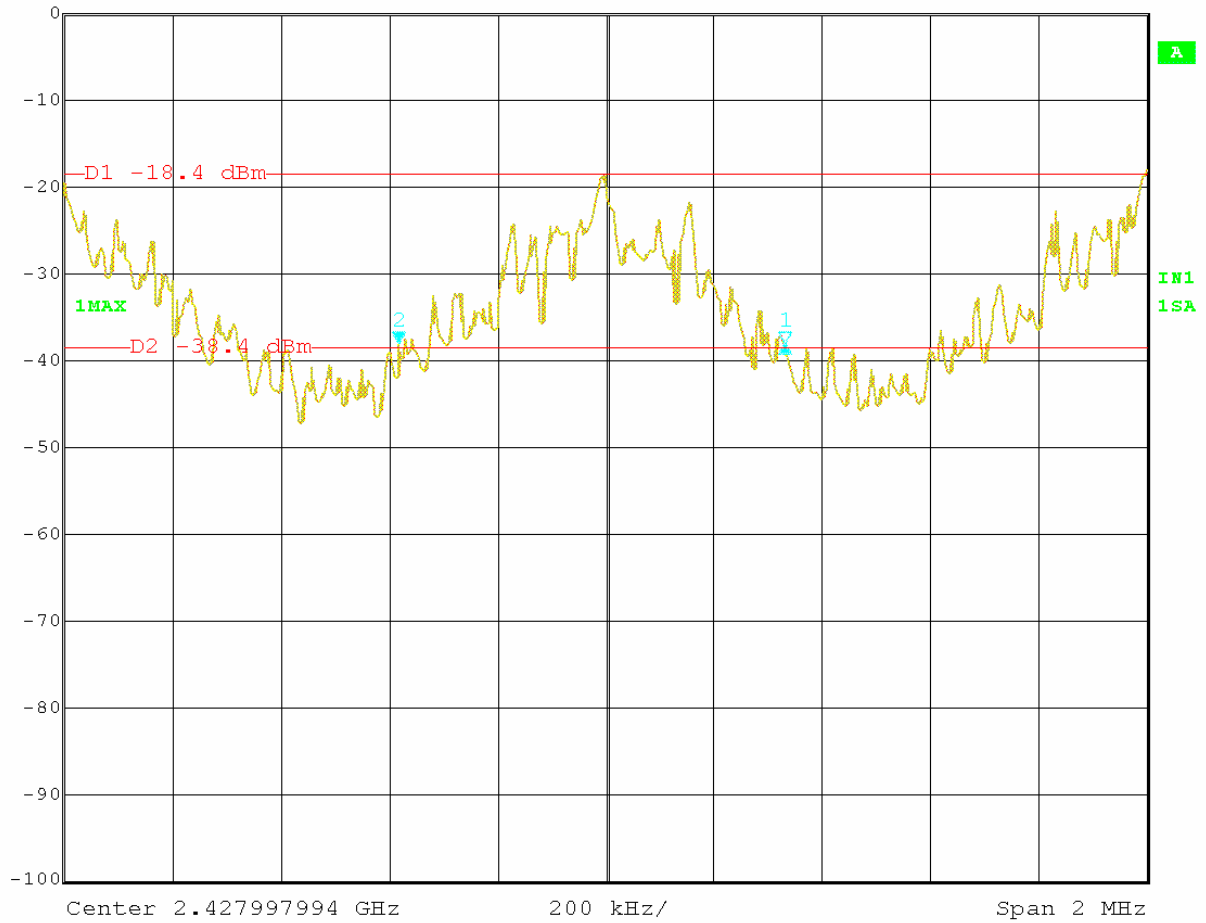


Date: 2.SEP.2004 13:59:44

ANNEX H
20dB BANDWIDTH



Delta 1 [T1] RBW 10 kHz RF Att 20 dB
Ref Lvl 0.14 dB VBW 10 kHz
0 dBm 713.42685371 kHz SWT 50 ms Unit dBm

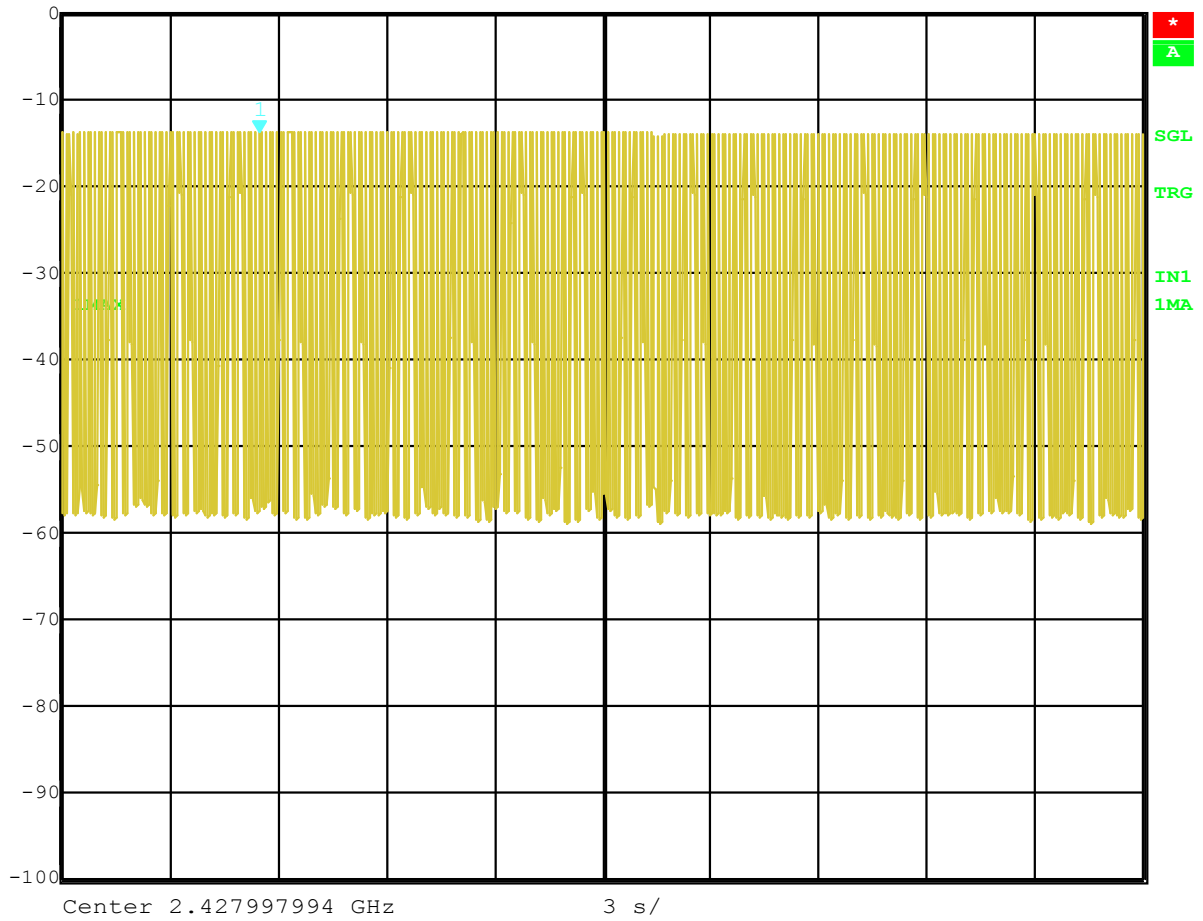


Date: 2.SEP.2004 16:25:11

ANNEX G
AVERAGE TIME OF OCCUPANCY

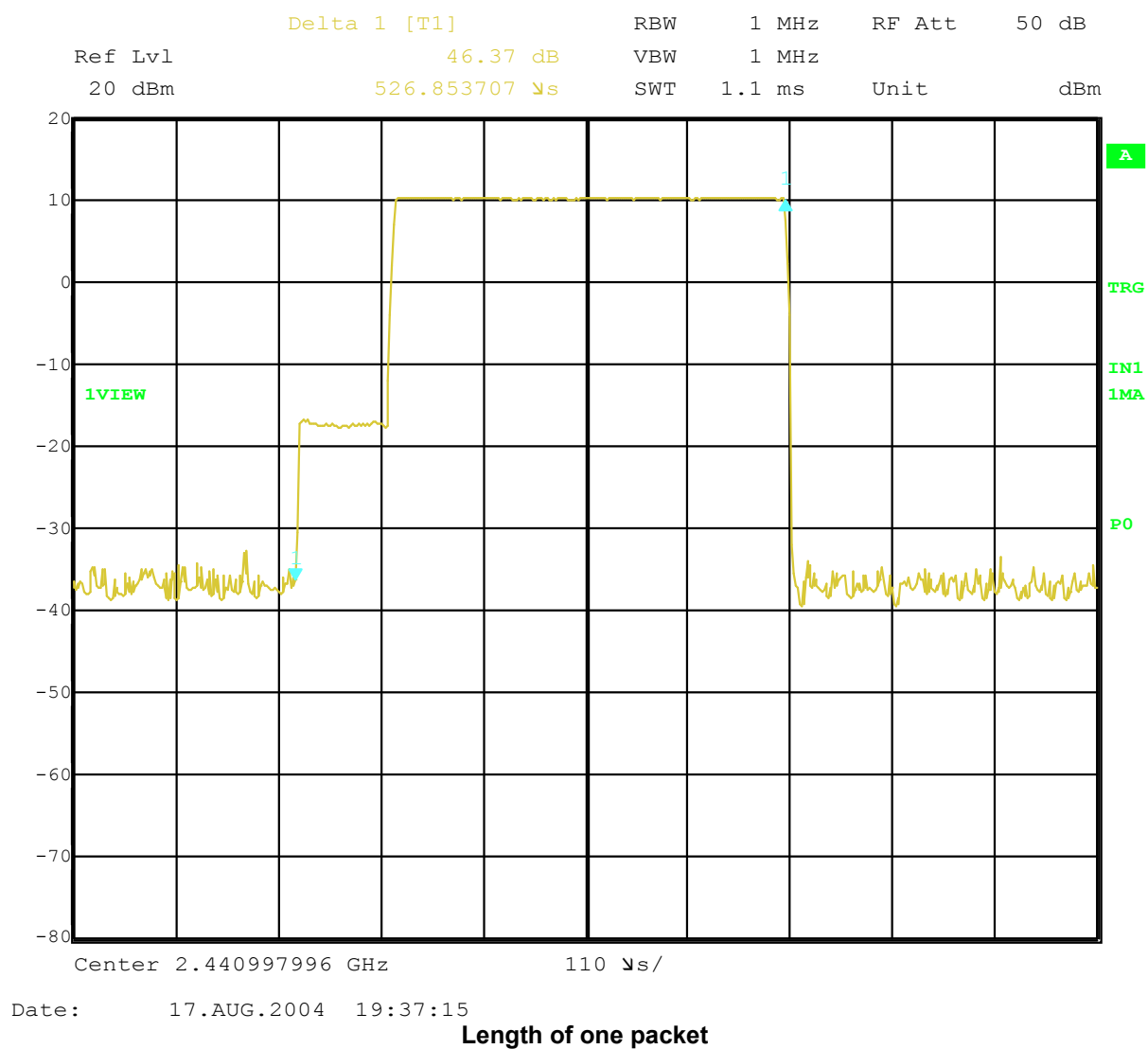


Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 20 dB
0 dBm -13.89 dBm VBW 1 MHz
5.470942 s SWT 30 s Unit dBm

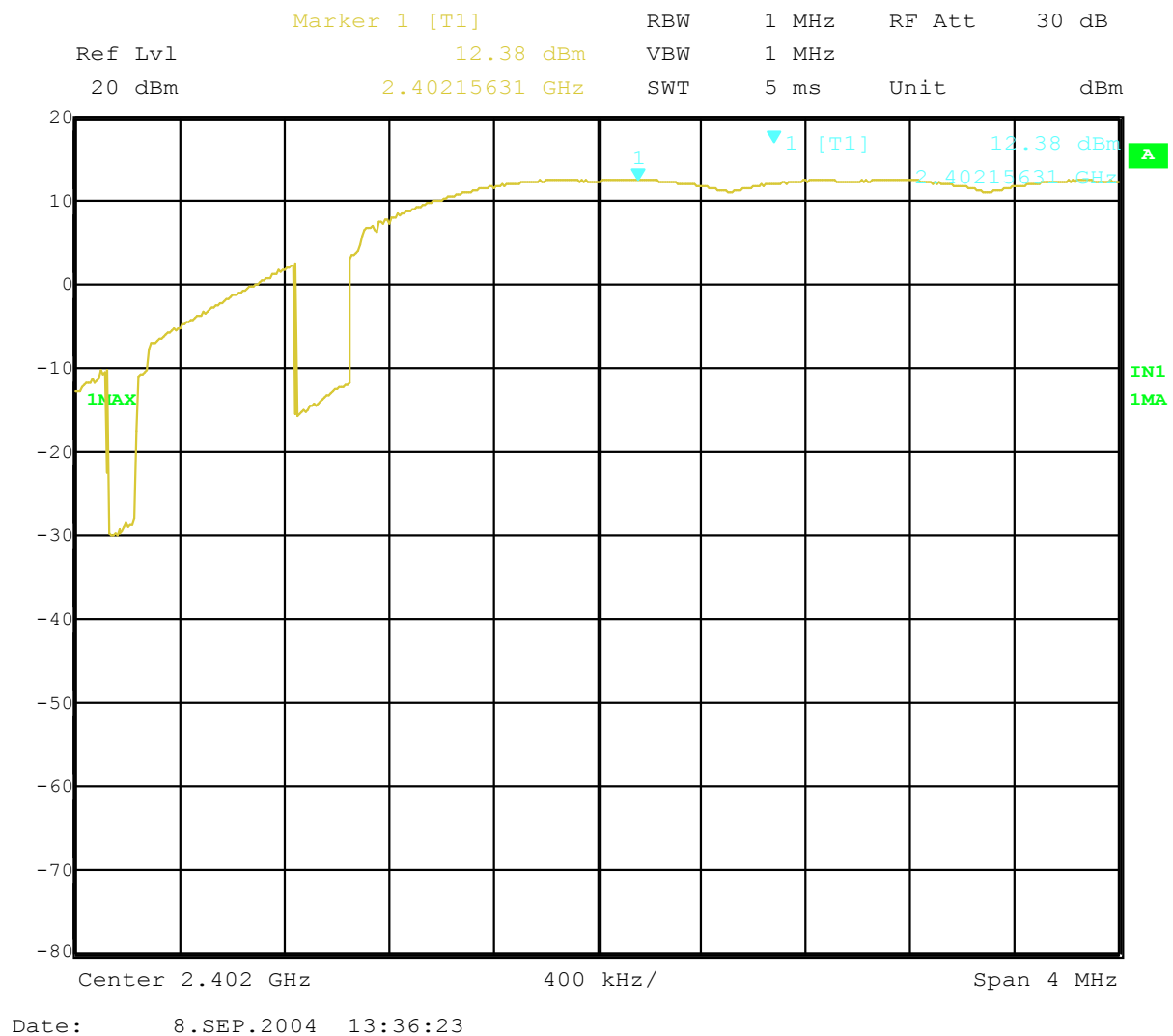


Date: 2.SEP.2004 16:59:36

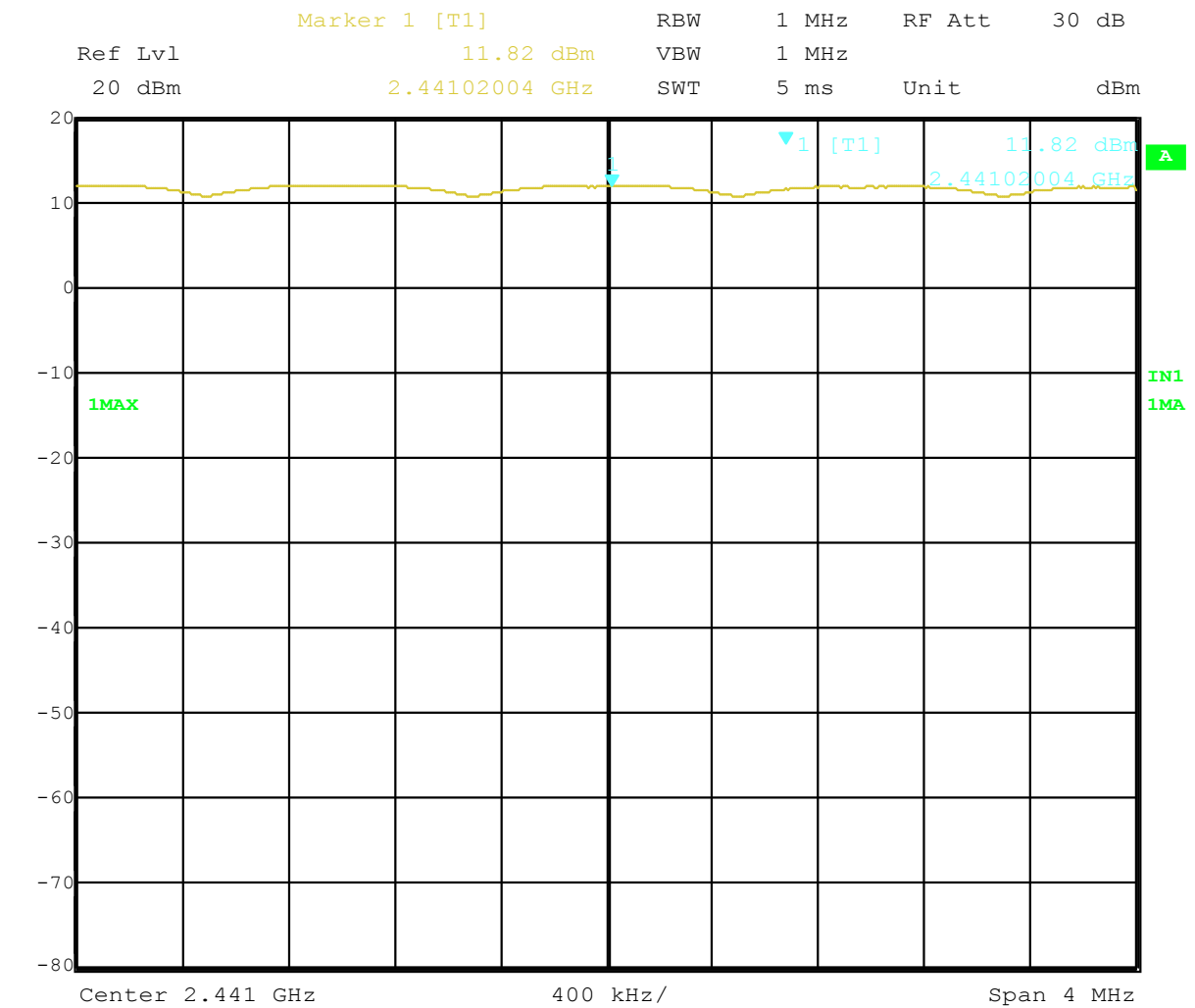
Number of transmissions made within 30 seconds



ANNEX J
PEAK POWER CONDUCTED
BLUETOOTH

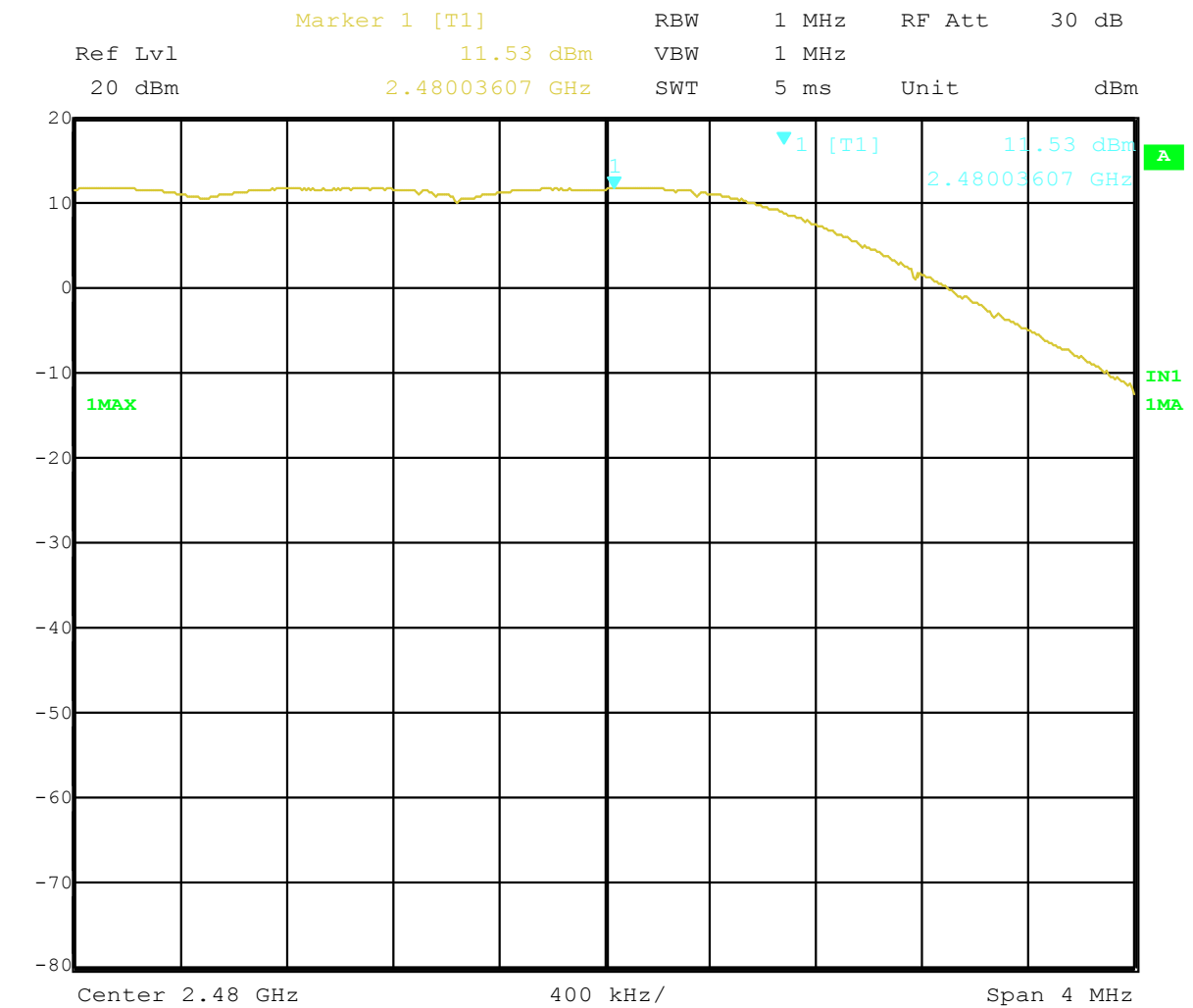


PEAK POWER LOW CHANNEL



Date: 8.SEP.2004 13:47:57

PEAK POWER MID CHANNEL



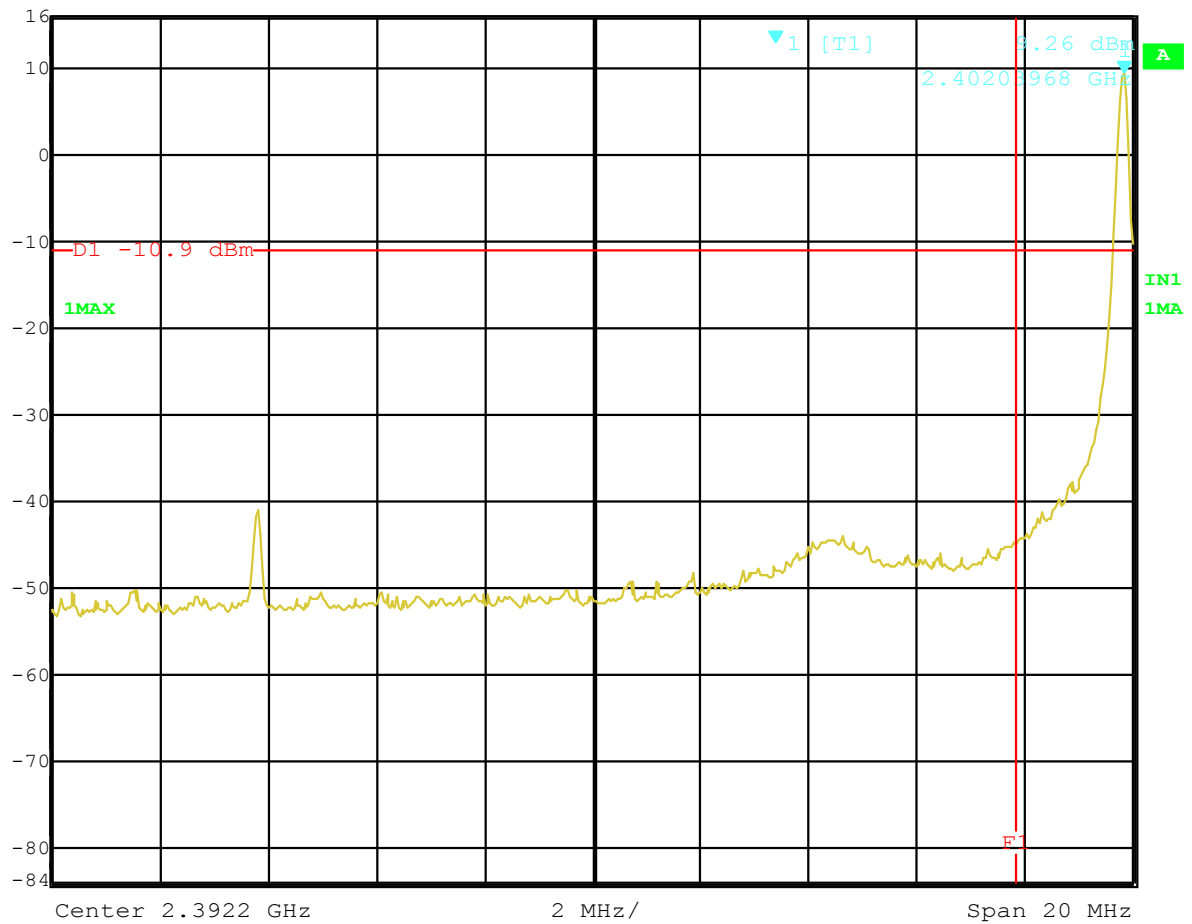
Date: 8.SEP.2004 14:01:49

PEAK POWER HIGH CHANNEL

ANNEX K
CONDUCTED SPURIOUS EMISSIONS
BLUETOOTH



Marker 1 [T1] RBW 100 kHz RF Att 30 dB
Ref Lvl 9.26 dBm VBW 100 kHz
16 dBm 2.40203968 GHz SWT 5 ms Unit dBm

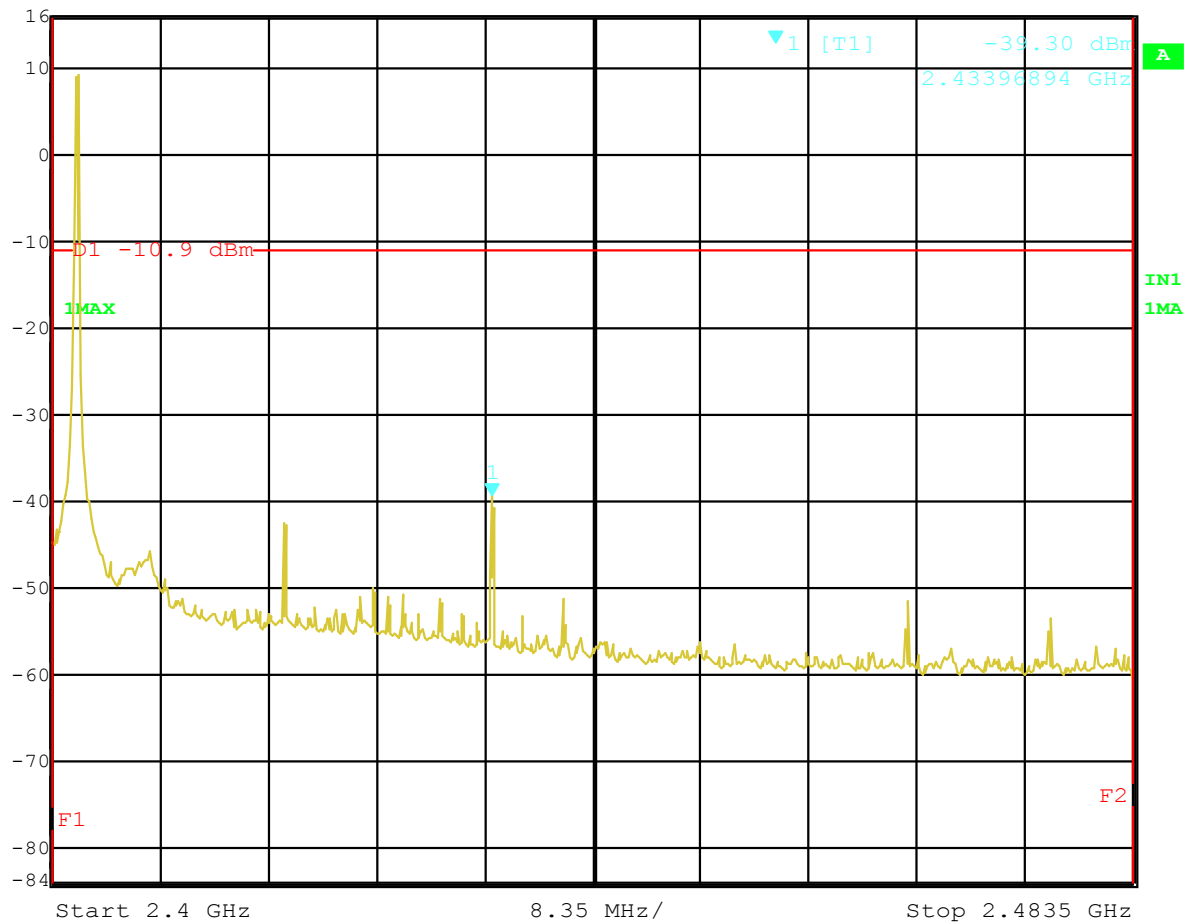


Date: 6.SEP.2004 16:29:12

Spurious Emissions Bottom Channel CW Band-edge



Marker 1 [T1] RBW 100 kHz RF Att 30 dB
Ref Lvl -39.30 dBm VBW 100 kHz
16 dBm 2.43396894 GHz SWT 21 ms Unit dBm

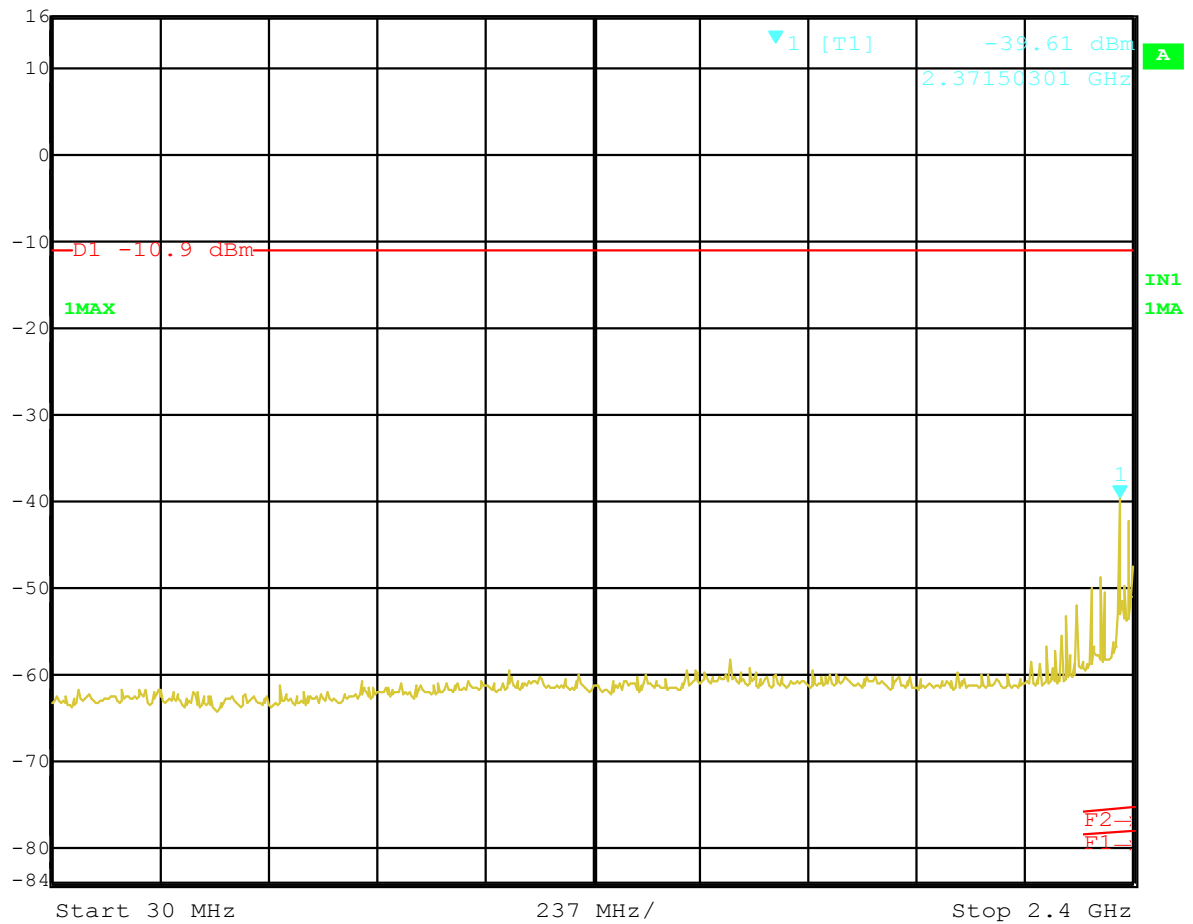


Date: 6.SEP.2004 16:43:41

Spurious Emissions Bottom Channel CW in Band



Marker 1 [T1] RBW 100 kHz RF Att 30 dB
Ref Lvl -39.61 dBm VBW 100 kHz
16 dBm 2.37150301 GHz SWT 600 ms Unit dBm

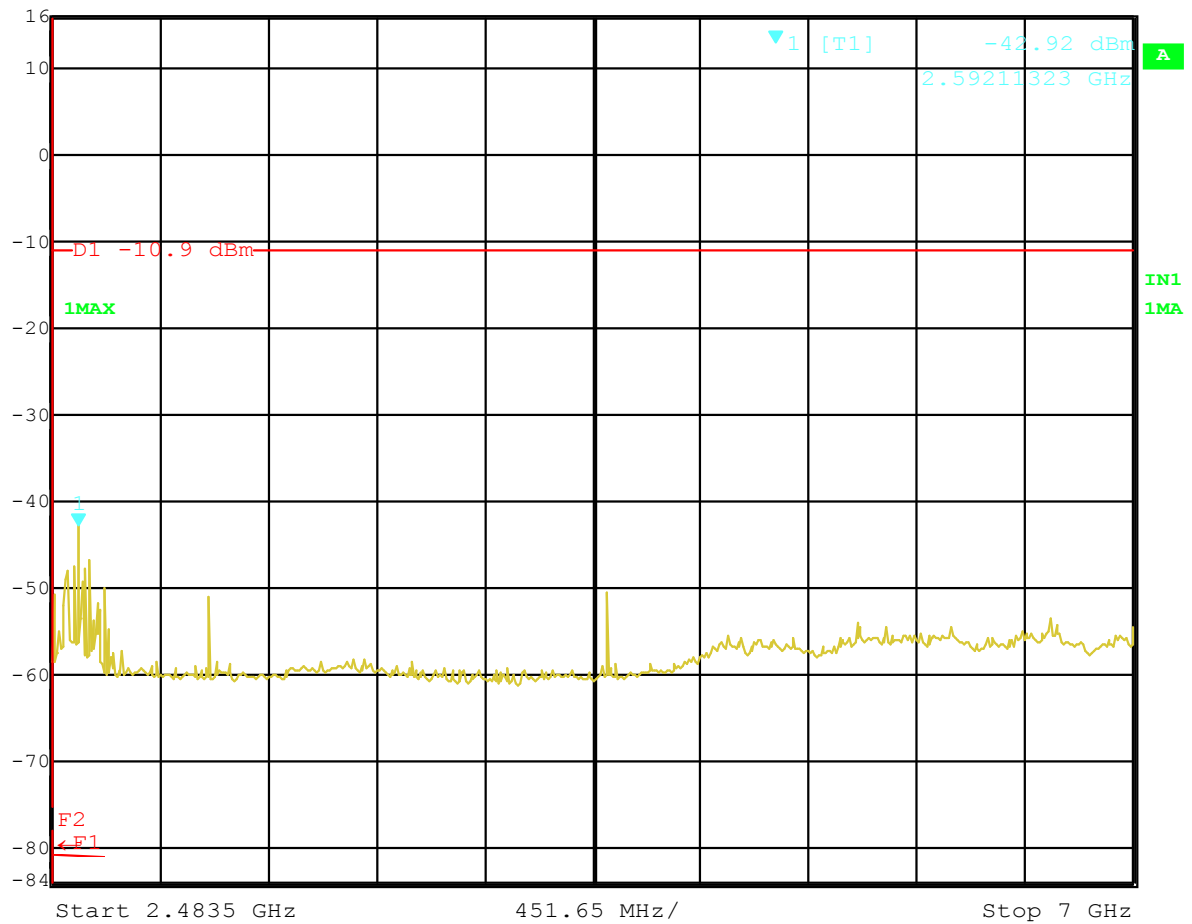


Date: 6.SEP.2004 16:42:05

Spurious Emissions Bottom Channel 30MHz - 2.4GHz

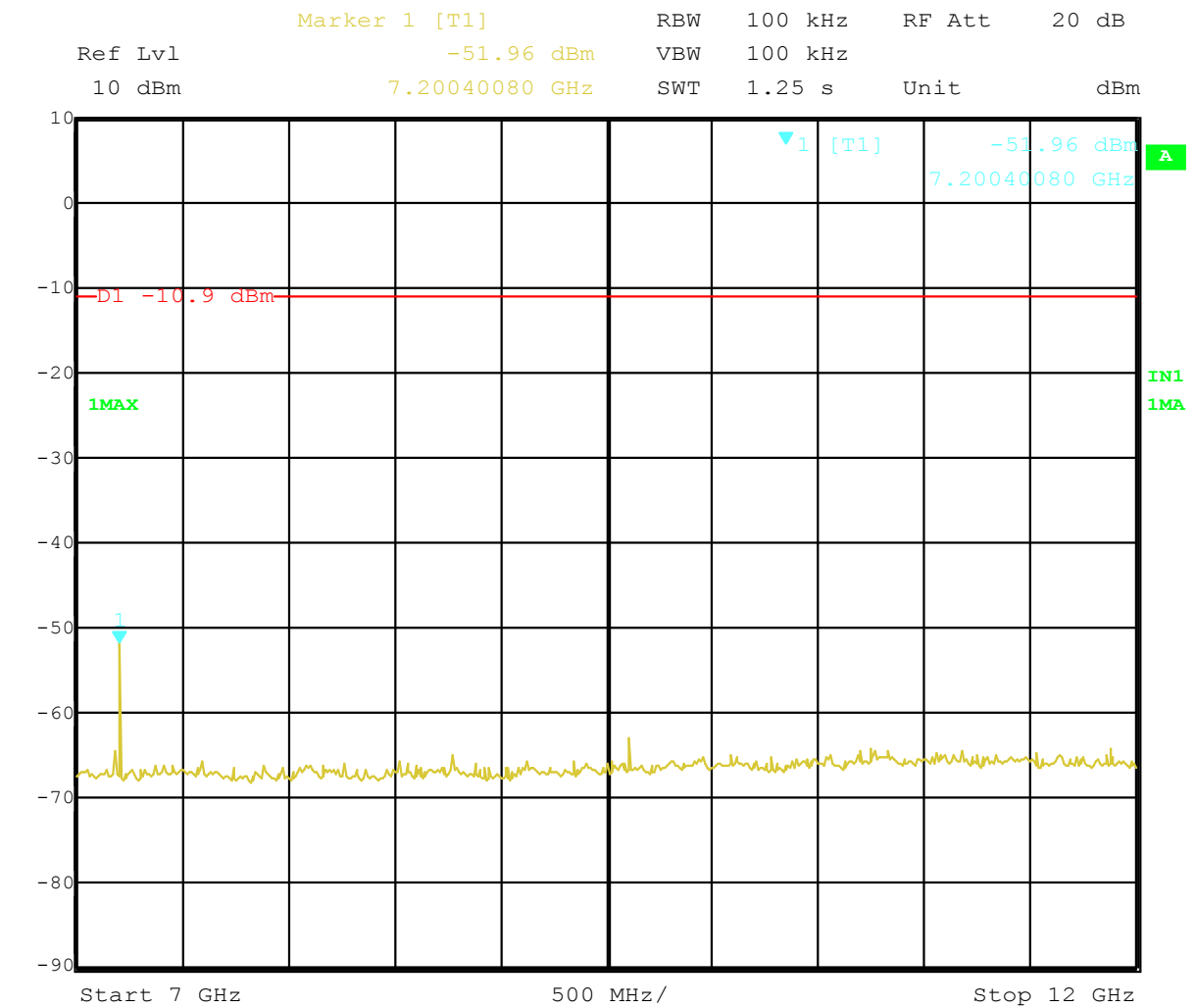


Ref Lvl 16 dBm
Marker 1 [T1] -42.92 dBm
2.59211323 GHz
RBW 100 kHz RF Att 30 dB
VBW 100 kHz
SWT 1.15 s Unit dBm



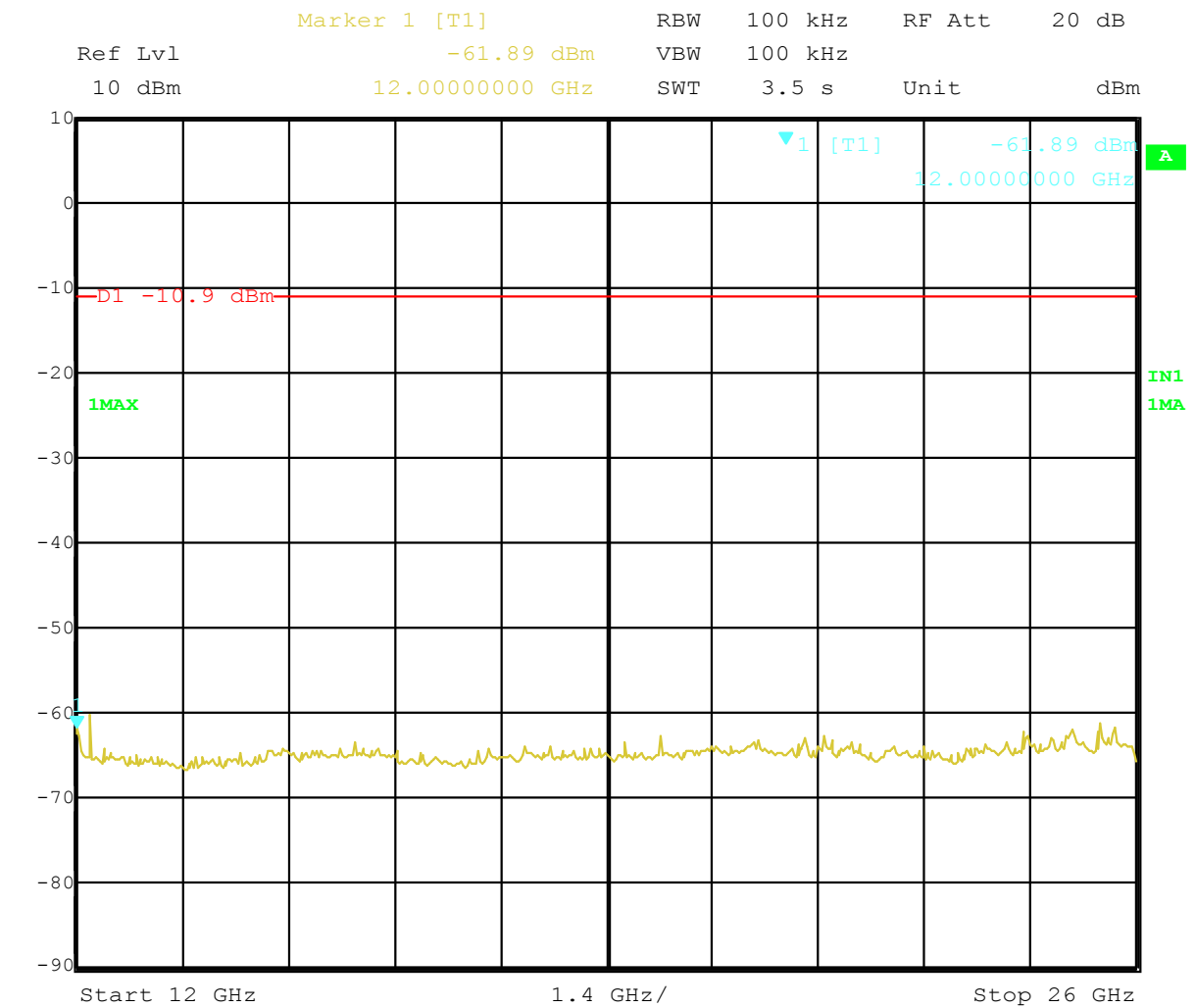
Date: 6.SEP.2004 16:41:20

Spurious Emissions Bottom Channel 2.4835GHz – 7GHz



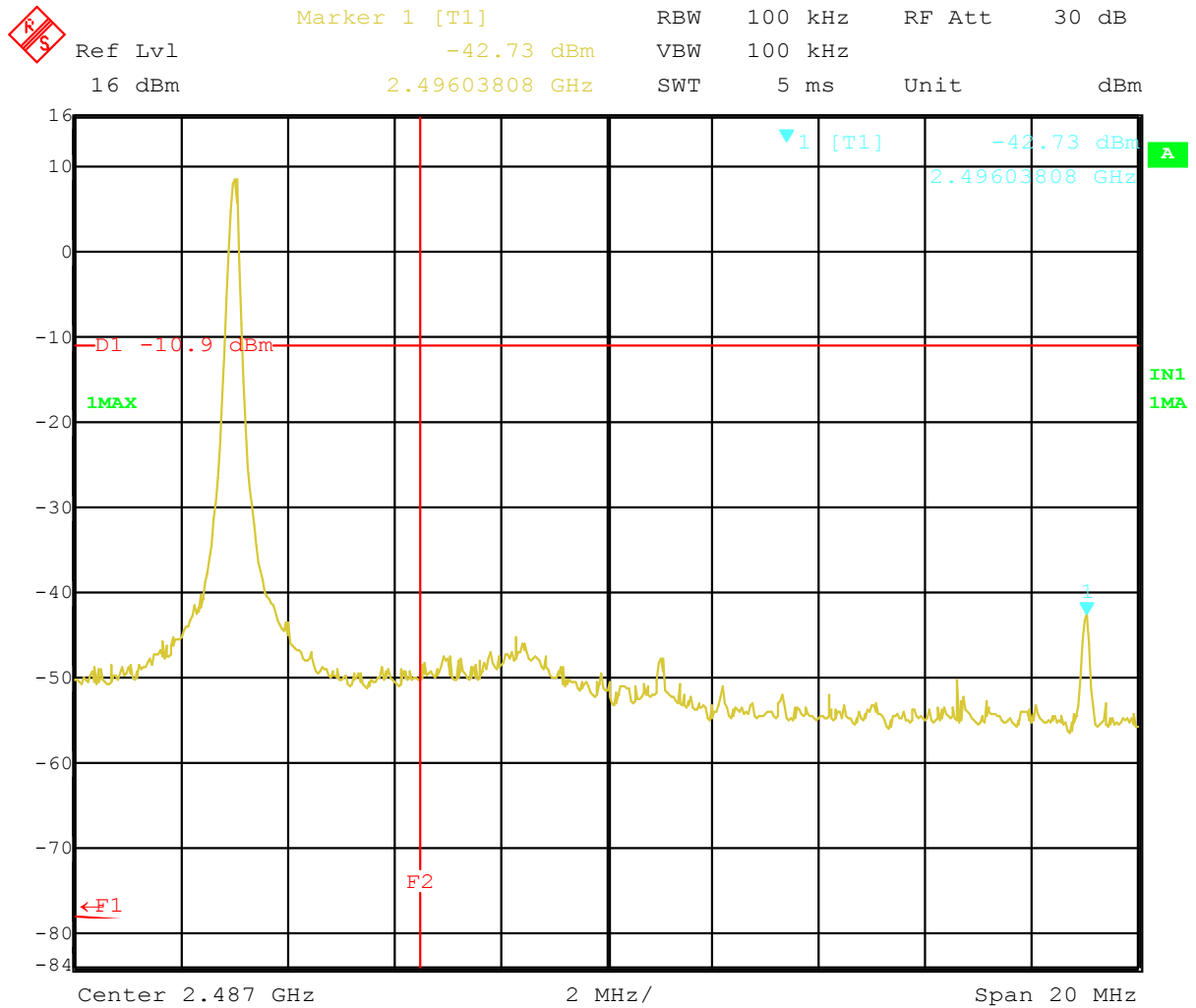
Date: 6.SEP.2004 17:10:56

Spurious Emissions Bottom Channel CW 7GHz – 12GHz



Date: 6.SEP.2004 17:09:47

Spurious Emissions Bottom Channel CW 12GHz -26GHz

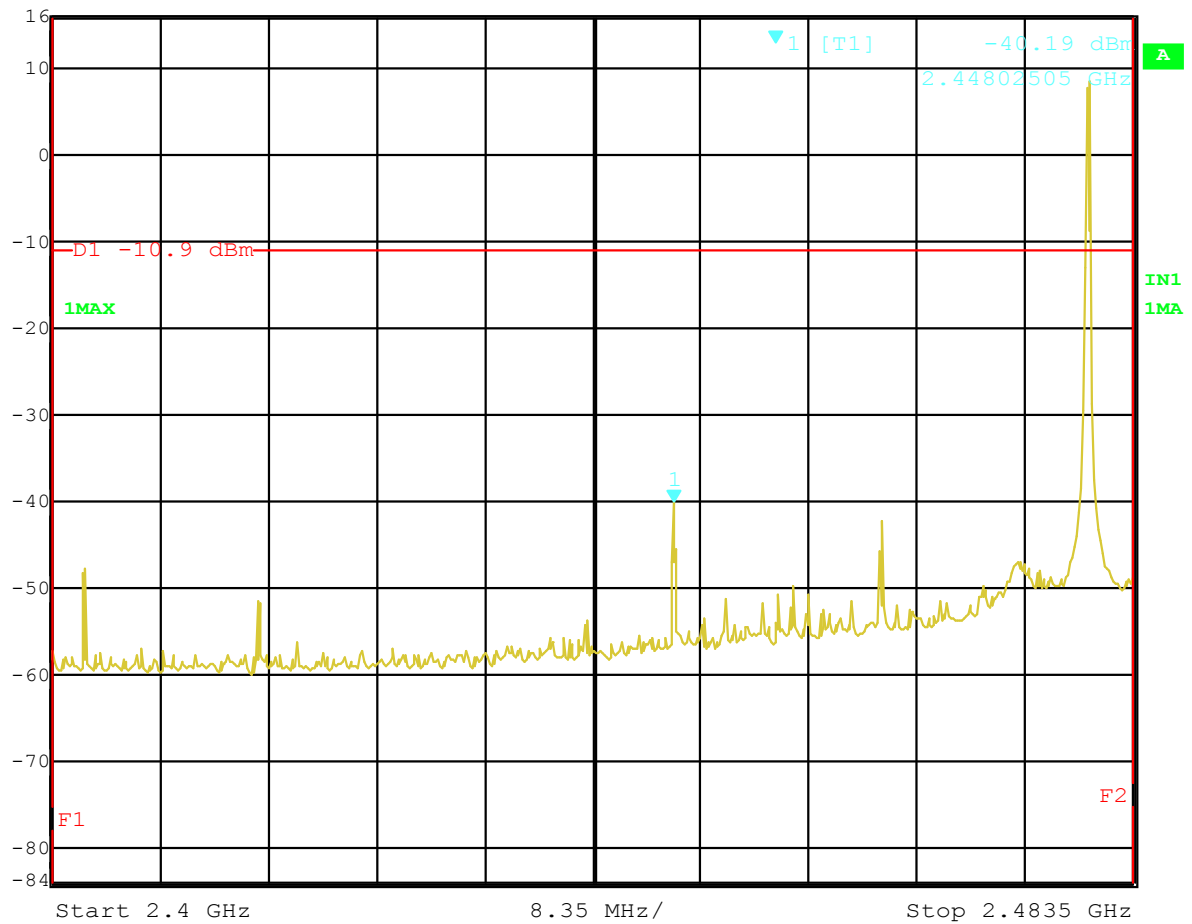


Date: 6.SEP.2004 16:46:51

Spurious Emissions Top Channel CW Band-edge



Ref Lvl 16 dBm
Marker 1 [T1] -40.19 dBm
2.44802505 GHz
RBW 100 kHz
RF Att 30 dB
VBW 100 kHz
SWT 21 ms
Unit dBm

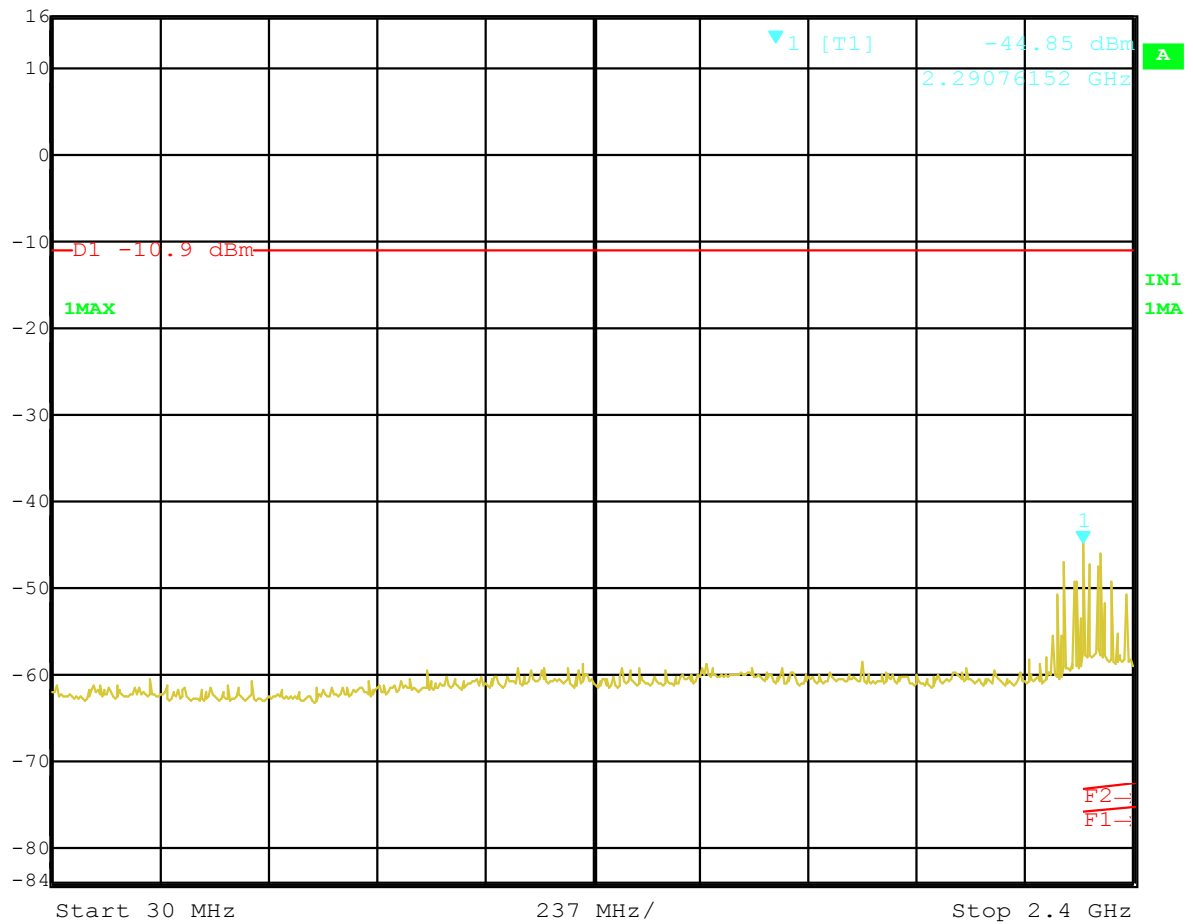


Date: 6.SEP.2004 16:48:58

Spurious Emissions Top Channel CW In Band



Marker 1 [T1] RBW 100 kHz RF Att 30 dB
Ref Lvl -44.85 dBm VBW 100 kHz
16 dBm 2.29076152 GHz SWT 600 ms Unit dBm

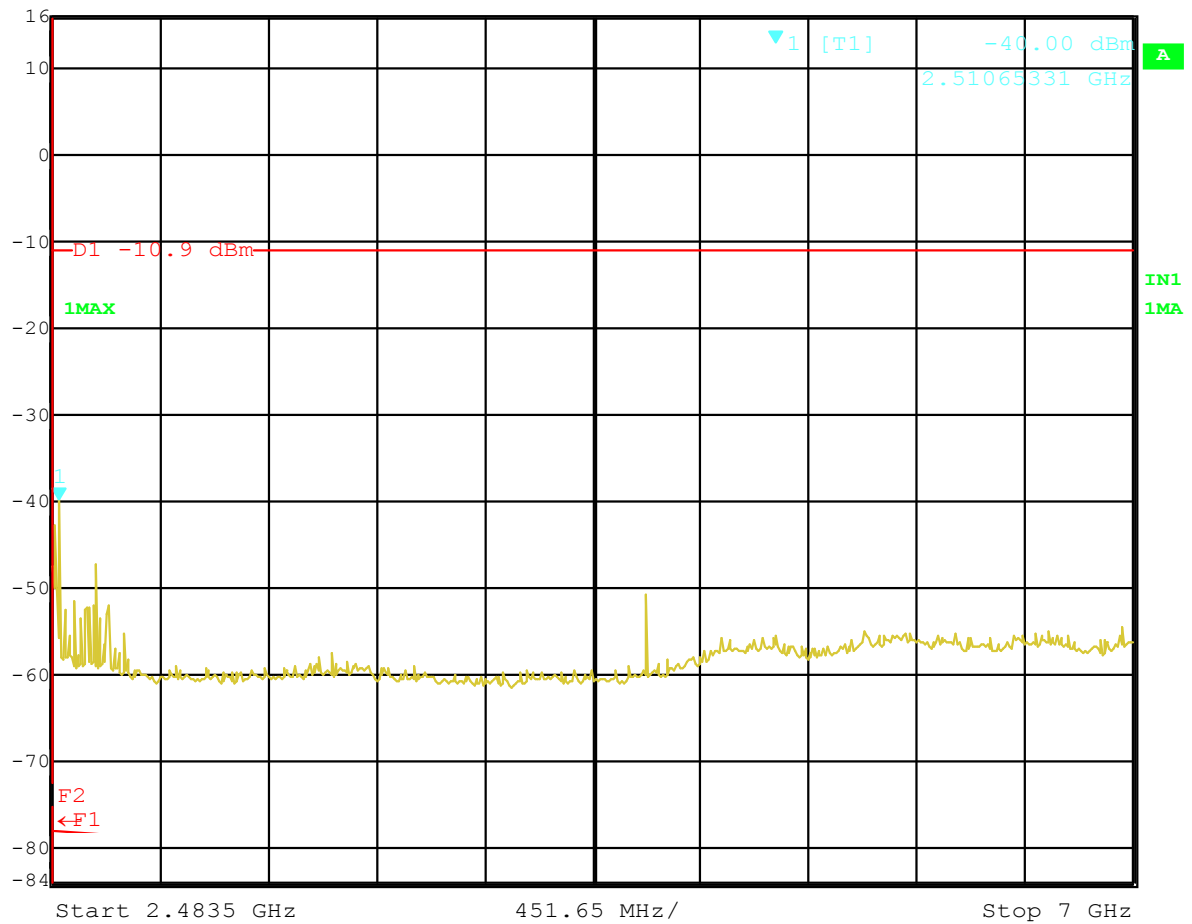


Date: 6.SEP.2004 16:50:32

Spurious Emissions Top Channel CW 30MHz – 2.4GHz

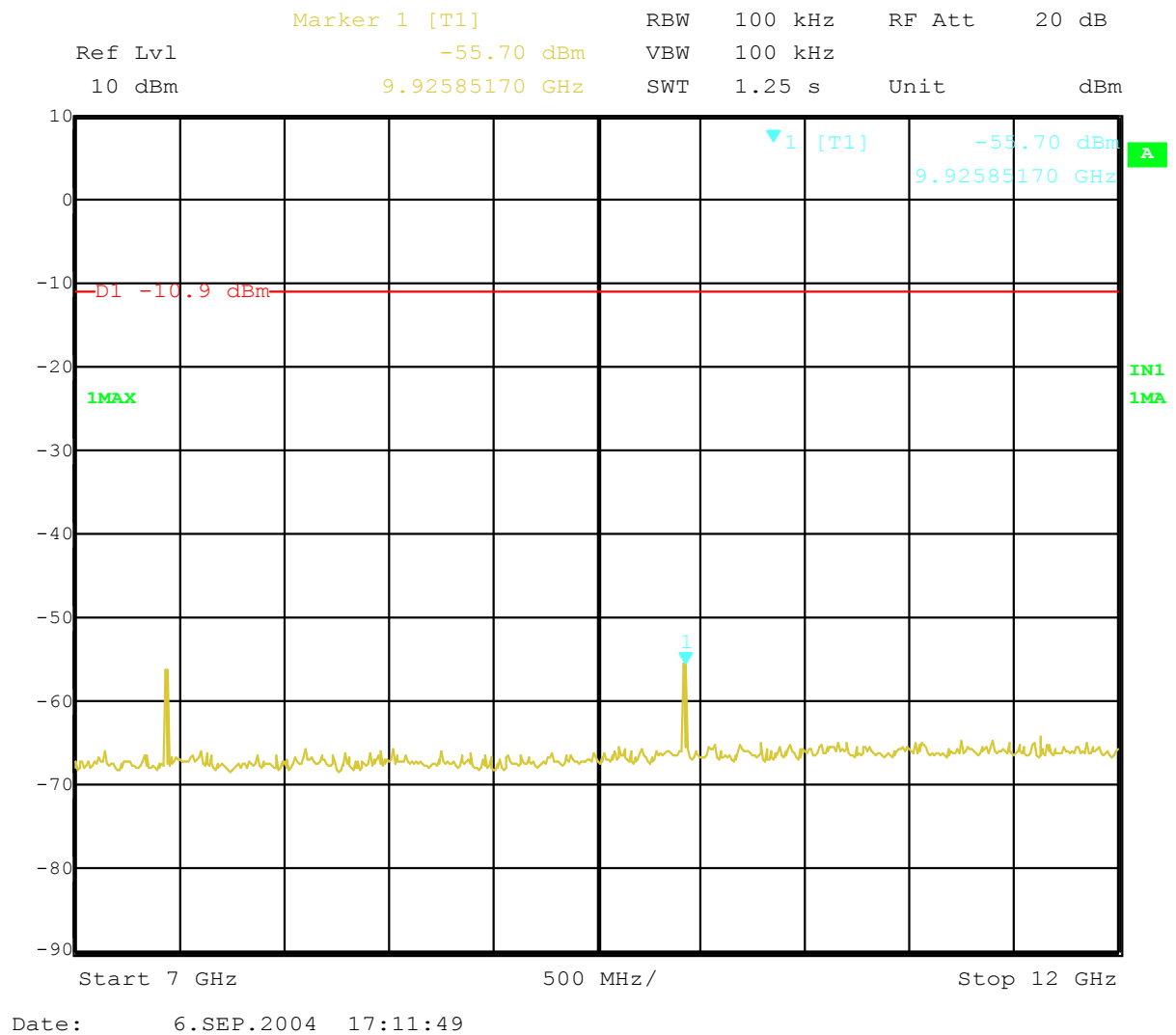


Ref Lvl 16 dBm
Marker 1 [T1] -40.00 dBm
2.51065331 GHz
RBW 100 kHz RF Att 30 dB
VBW 100 kHz
SWT 1.15 s Unit dBm

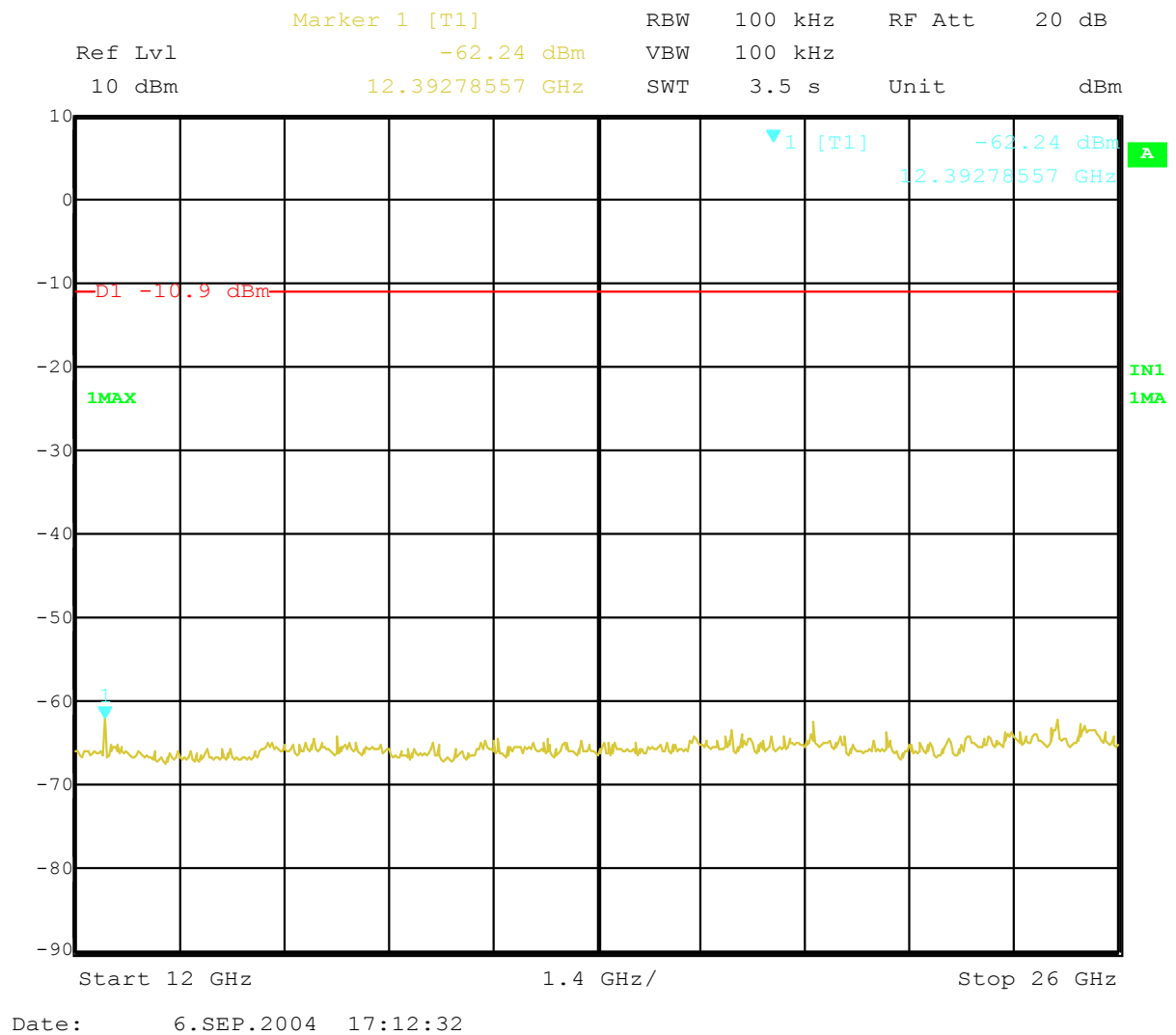


Date: 6.SEP.2004 16:52:50

Spurious Emissions Top Channel CW 2.4835GHz – 7GHz



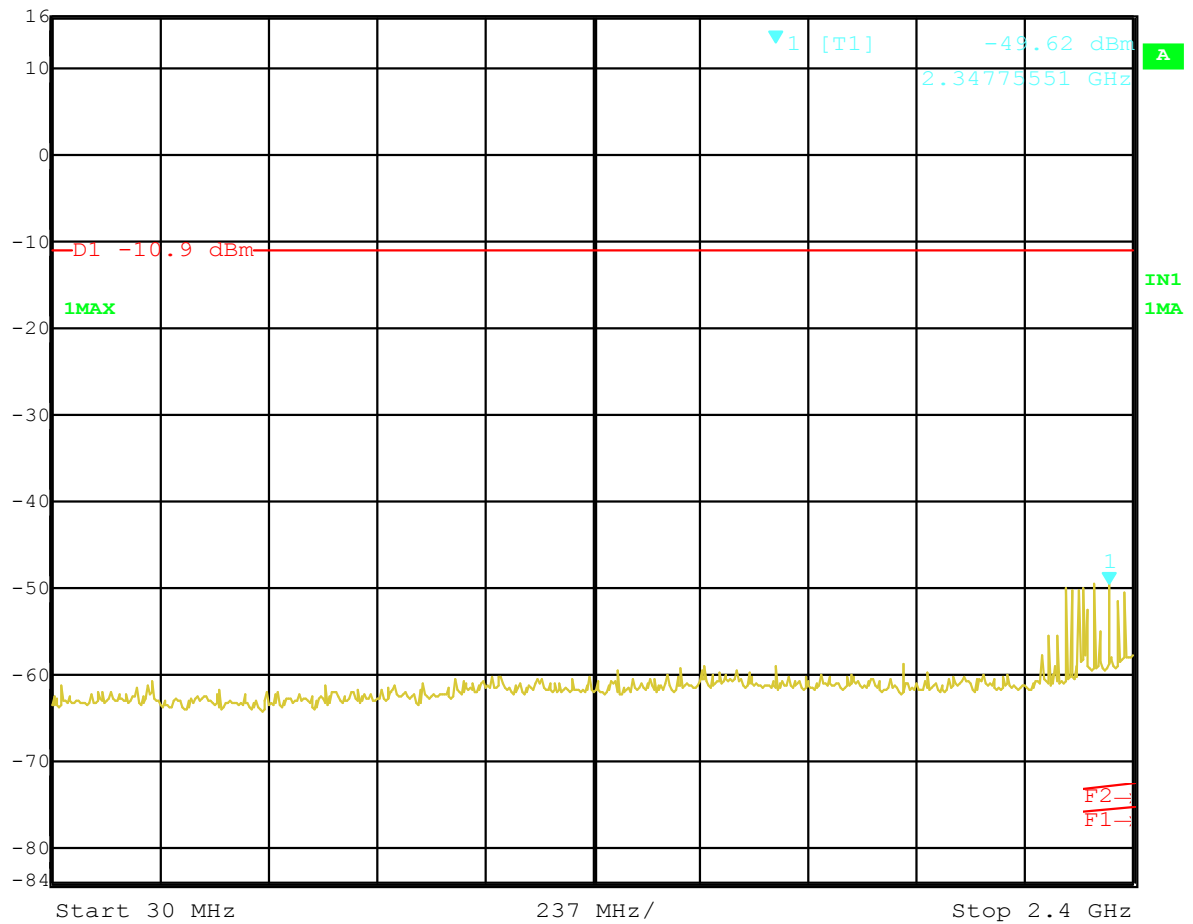
Spurious Emissions Top Channel CW 7GHz – 12GHz



Spurious Emissions Top Channel CW 12GHz – 26GHz



Marker 1 [T1] RBW 100 kHz RF Att 30 dB
Ref Lvl -49.62 dBm VBW 100 kHz
16 dBm 2.34775551 GHz SWT 600 ms Unit dBm

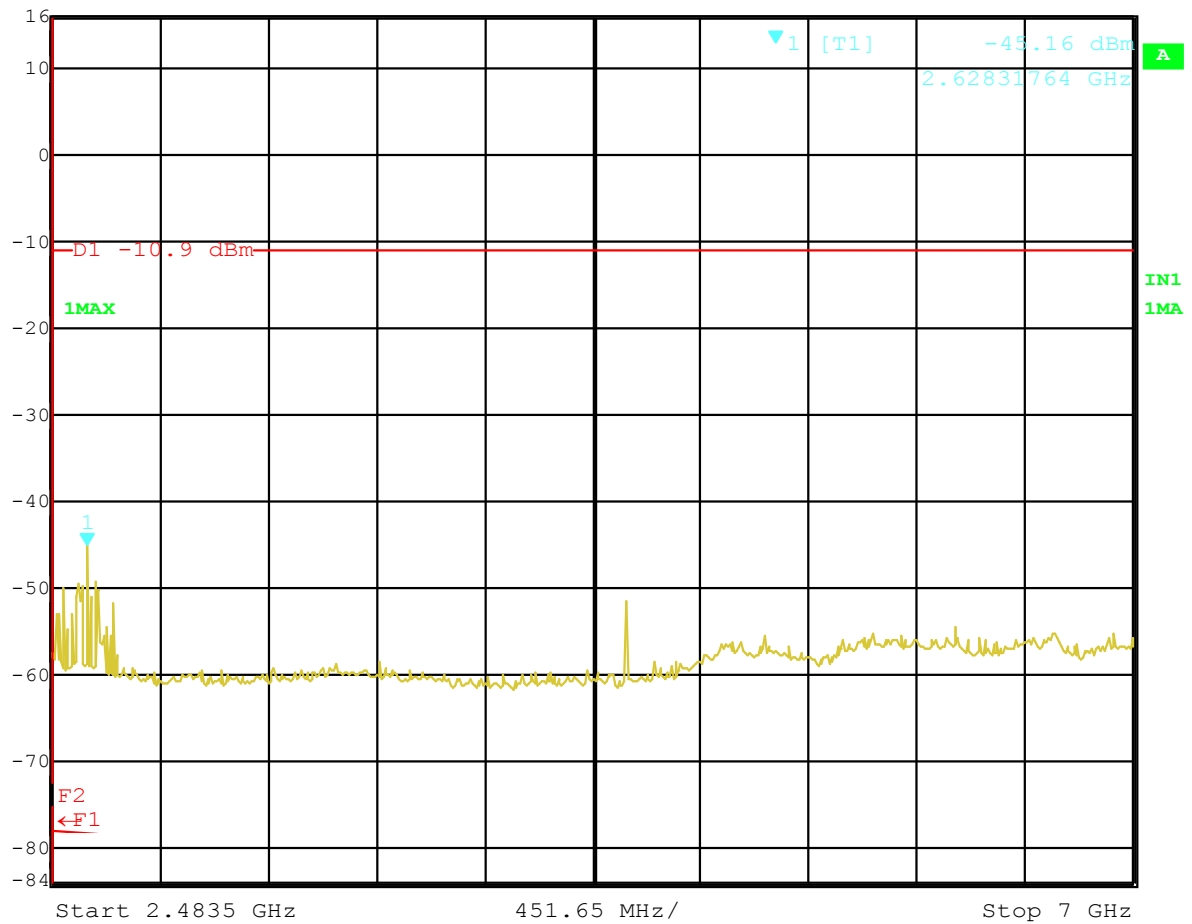


Date: 6.SEP.2004 16:58:20

Spurious Emissions Middle Channel CW 30MHz - 2.4GHz

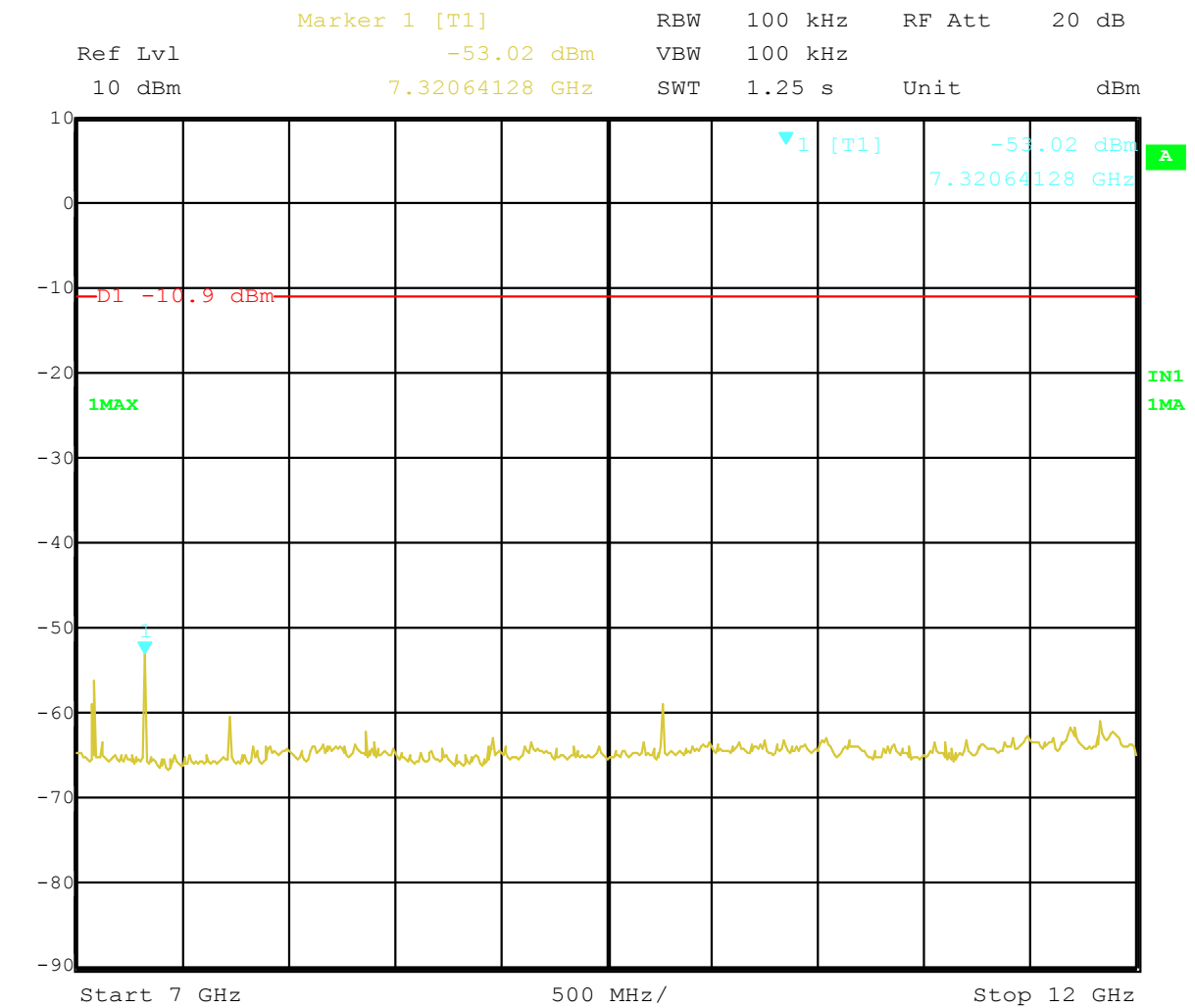


Ref Lvl 16 dBm
Marker 1 [T1] -45.16 dBm
2.62831764 GHz
RBW 100 kHz RF Att 30 dB
VBW 100 kHz
SWT 1.15 s Unit dBm



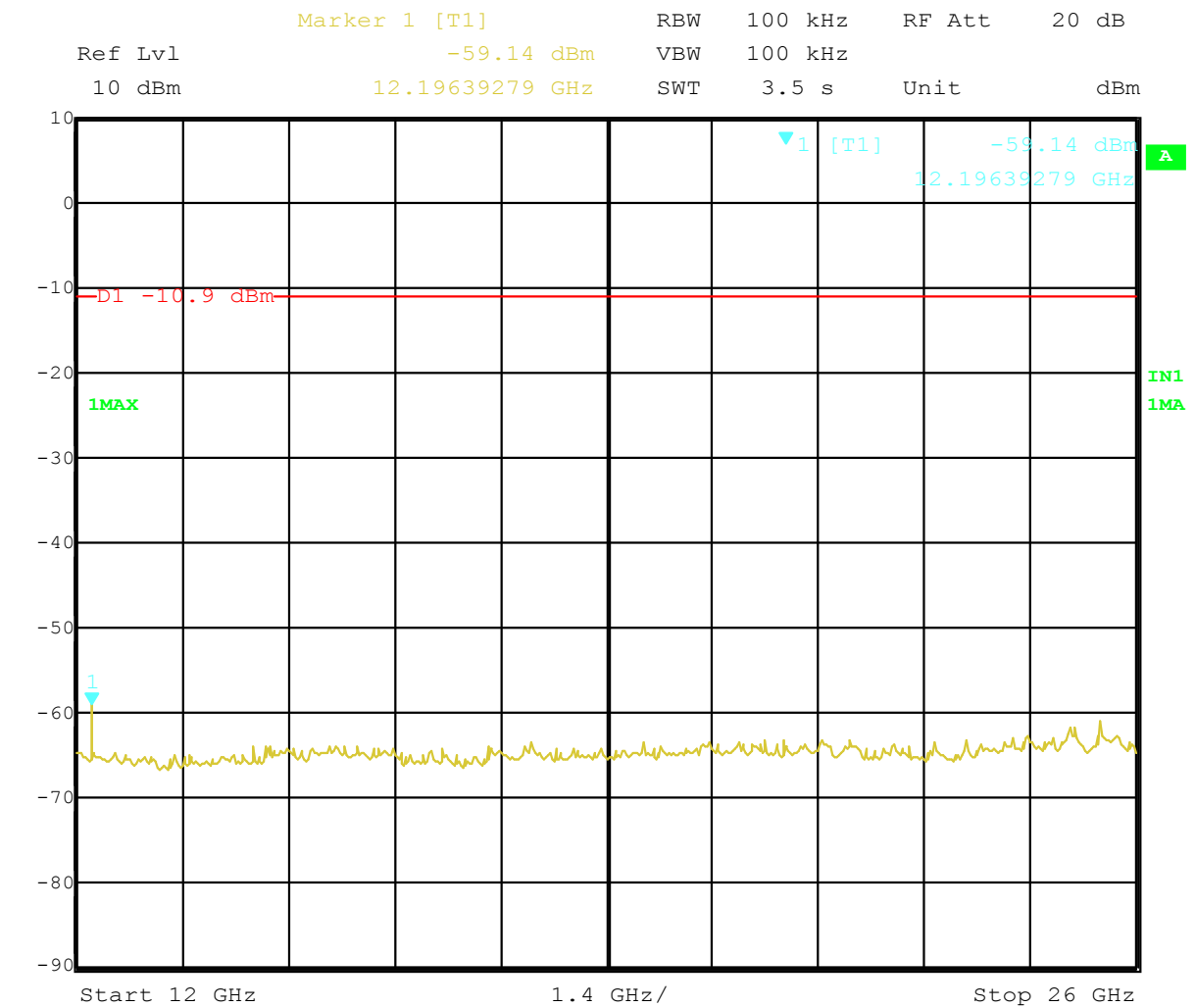
Date: 6.SEP.2004 17:00:27

Spurious Emissions Middle Channel CW 2.4835MHz – 7 GHz



Date: 6.SEP.2004 17:17:50

Spurious Emissions Middle Channel CW 7GHz – 12GHz

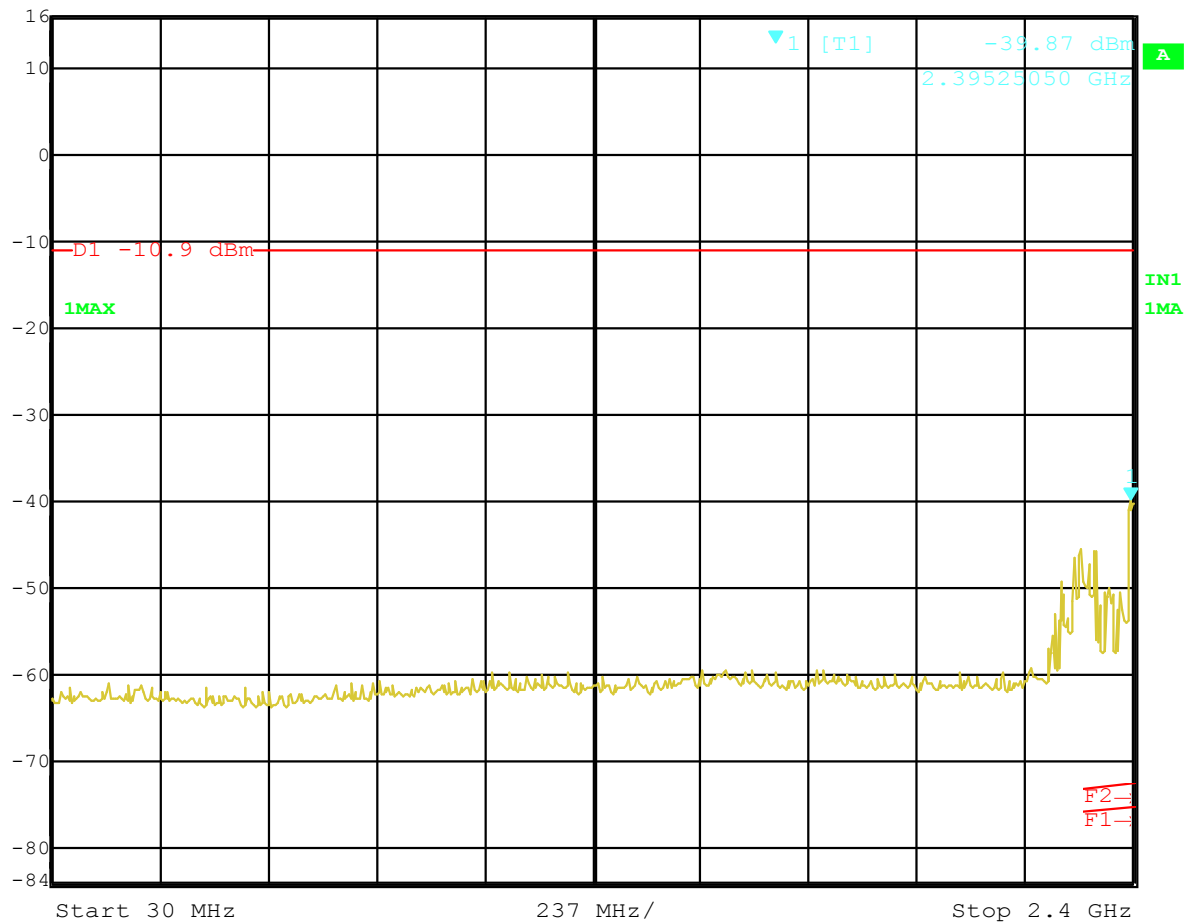


Date: 6.SEP.2004 17:15:49

Spurious Emissions Middle Channel CW 12GHz - 26GHz



Marker 1 [T1] RBW 100 kHz RF Att 30 dB
Ref Lvl -39.87 dBm VBW 100 kHz
16 dBm 2.39525050 GHz SWT 600 ms Unit dBm

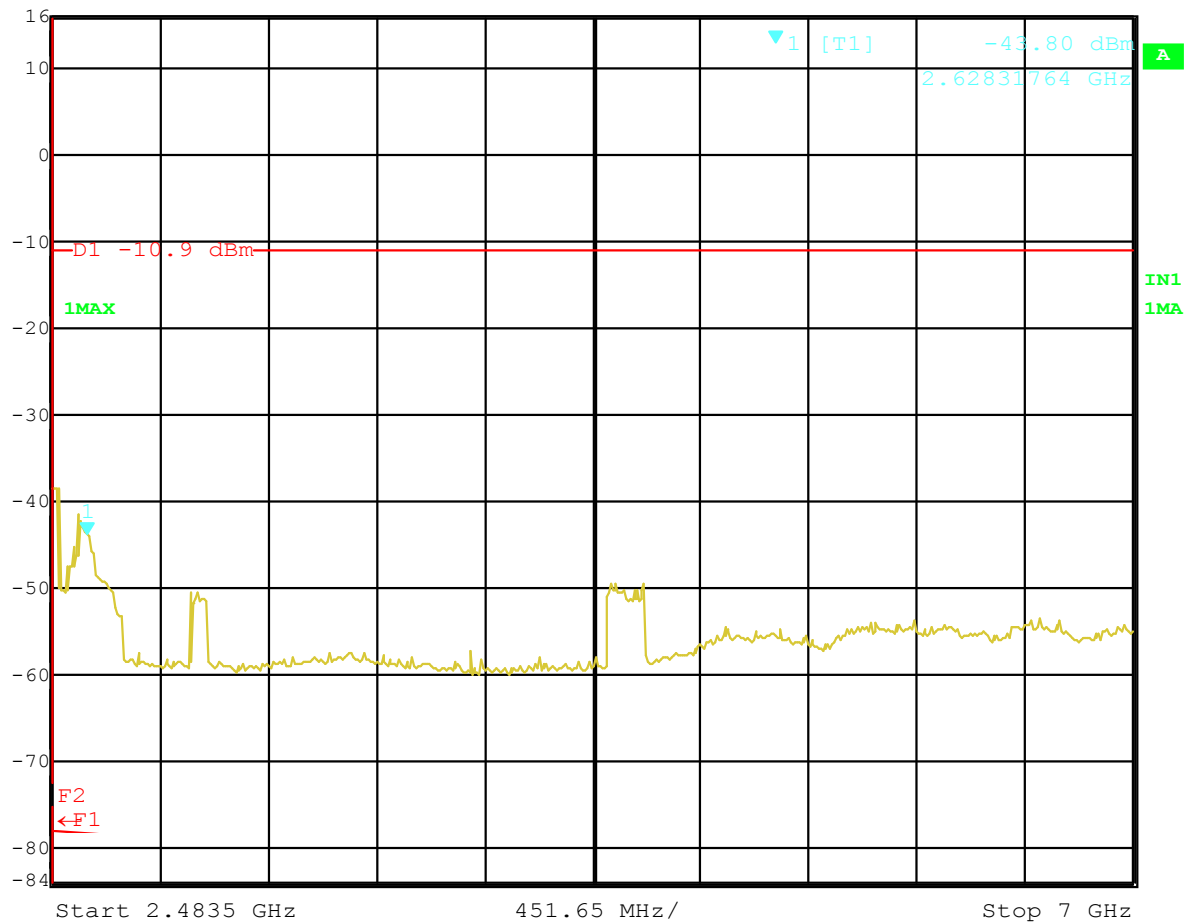


Date: 6.SEP.2004 17:53:03

Spurious Emissions Hopping All Channels 30MHz -2.4GHz



Ref Lvl 16 dBm
Marker 1 [T1] -43.80 dBm
2.62831764 GHz
RBW 100 kHz RF Att 30 dB
VBW 100 kHz
SWT 1.15 s Unit dBm

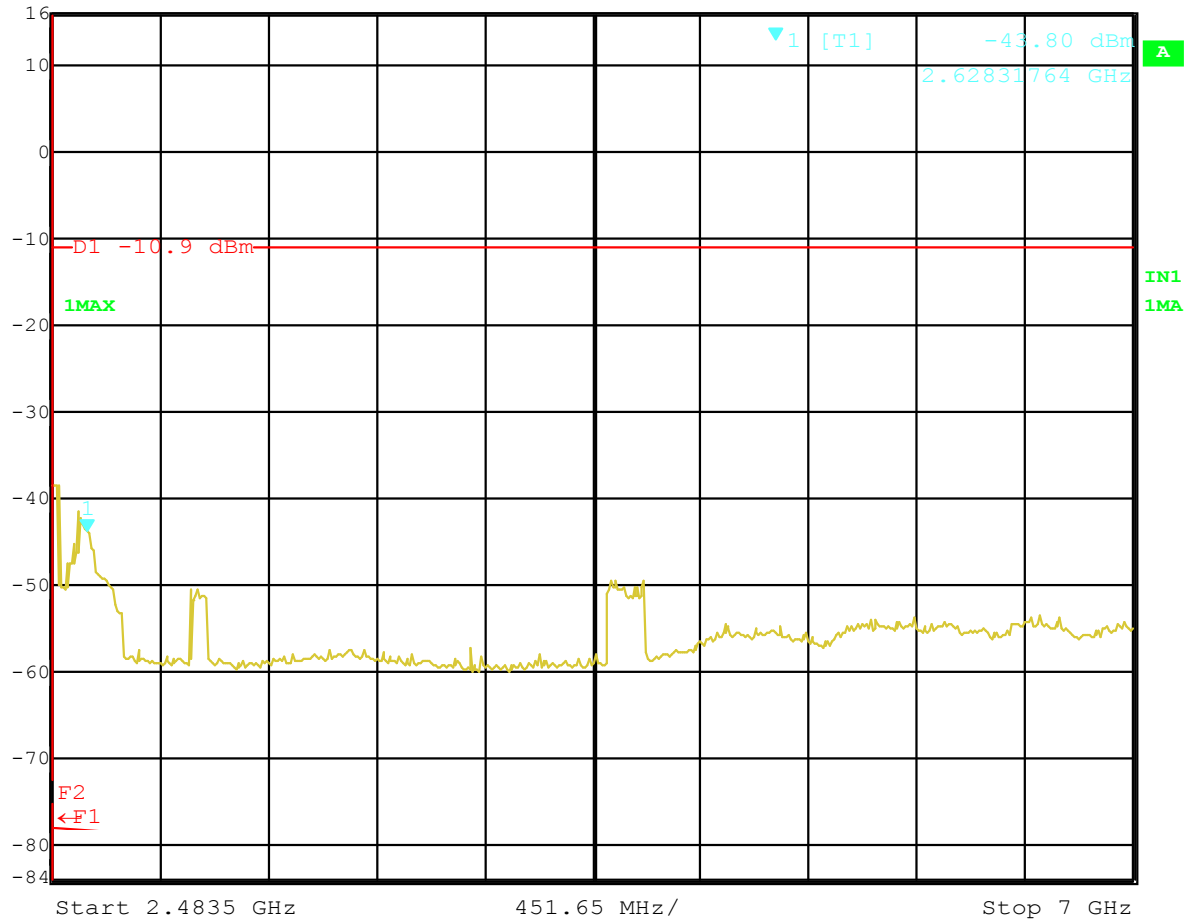


Date: 6.SEP.2004 17:52:07

Spurious Emissions Hopping All Channels 2.4835GHz - 7GHz

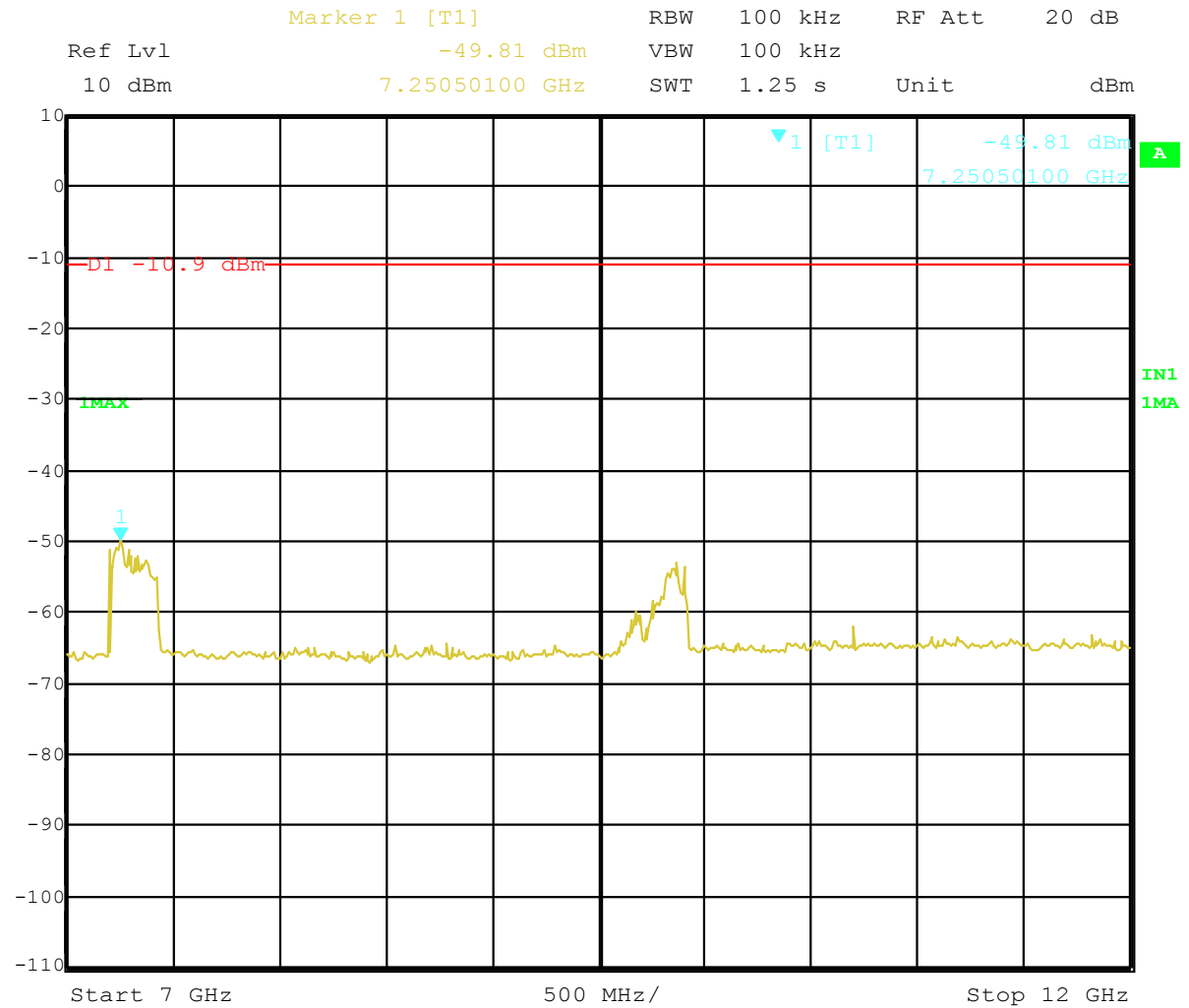


Ref Lvl 16 dBm
Marker 1 [T1] -43.80 dBm
2.62831764 GHz
RBW 100 kHz RF Att 30 dB
VBW 100 kHz
SWT 1.15 s Unit dBm



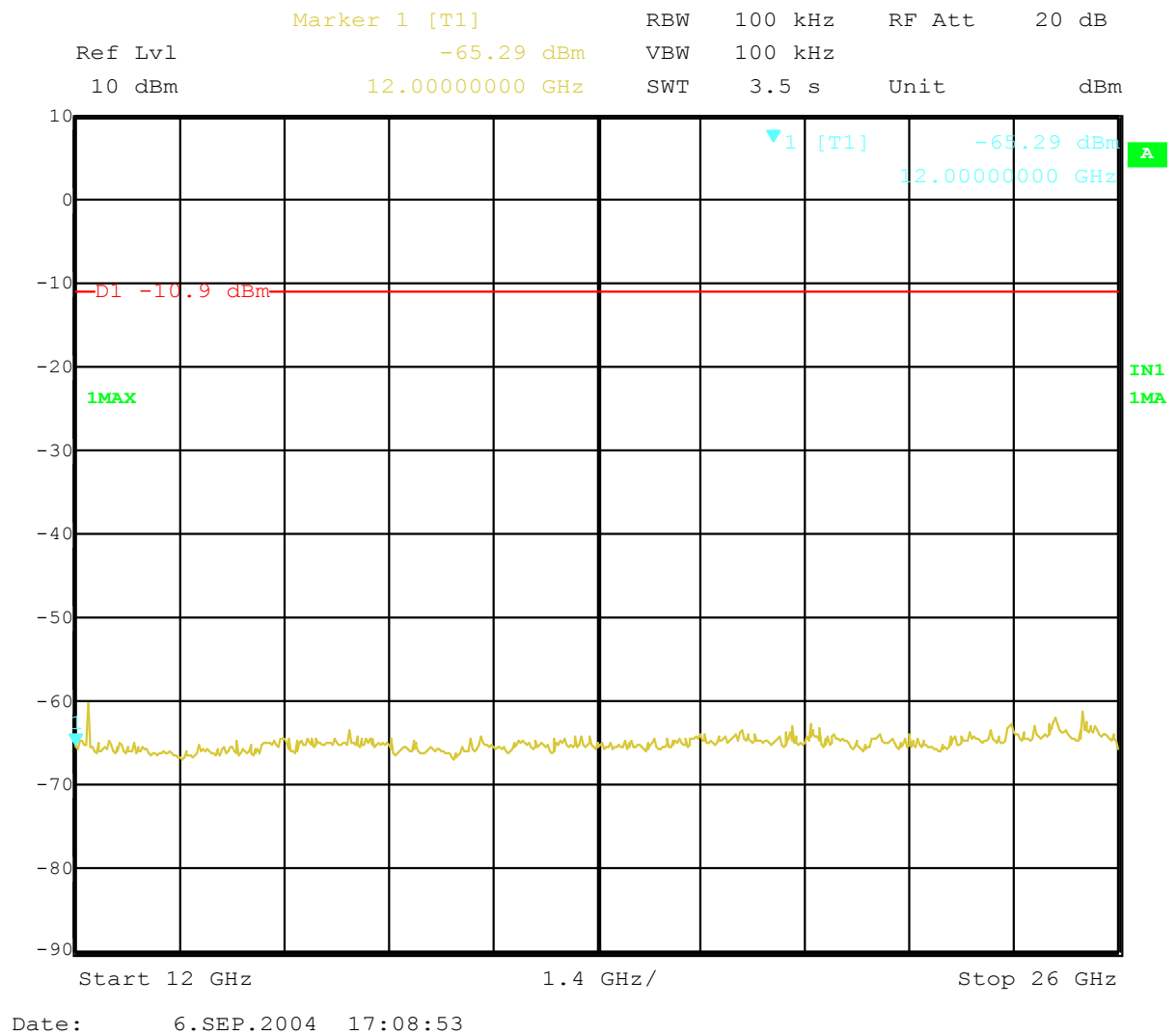
Date: 6.SEP.2004 17:52:07

Spurious Emissions Hopping All Channels 7GHz - 12GHz



Date: 6.SEP.2004 17:07:06

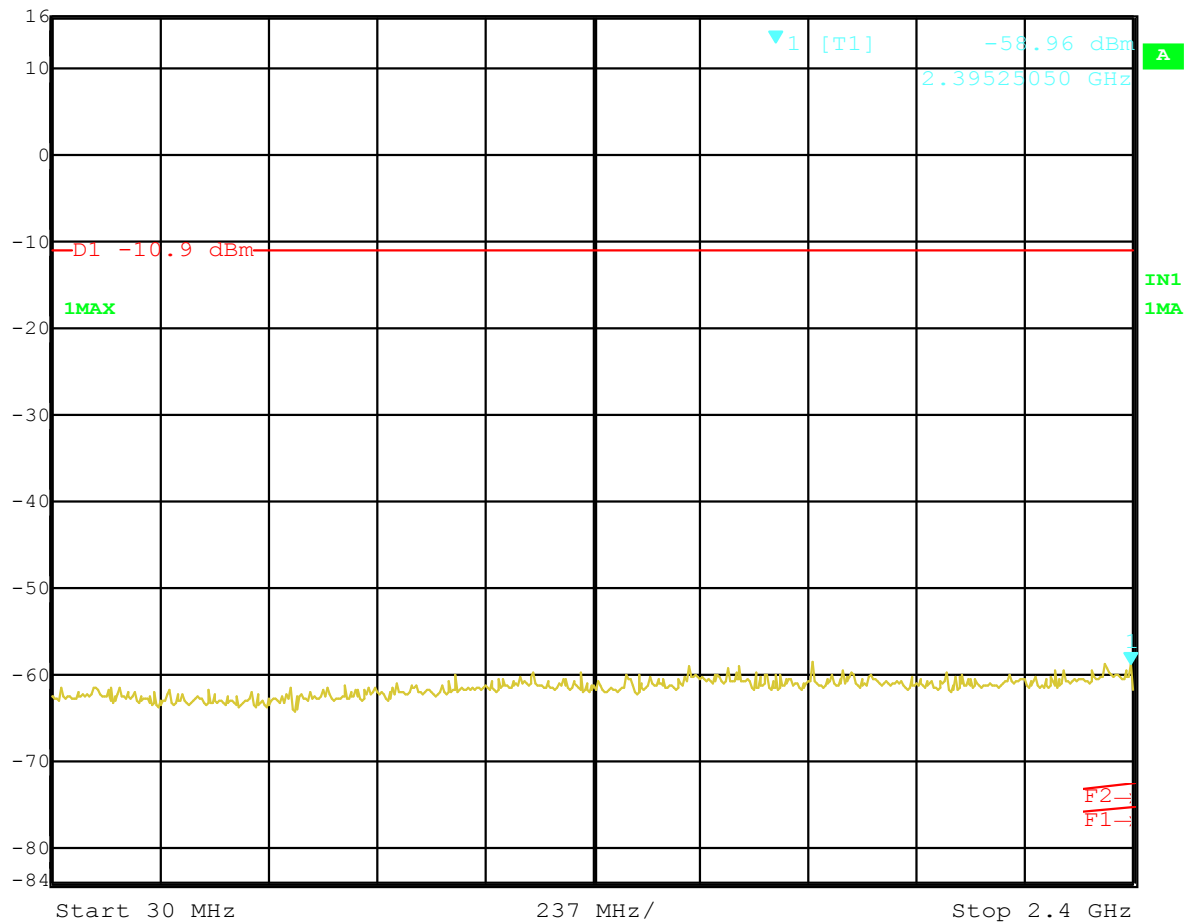
Spurious Emissions Hopping All Channels 7GHz – 12GHz



Spurious Emissions Hopping All Channels 12GHz – 26GHz



Marker 1 [T1] RBW 100 kHz RF Att 30 dB
Ref Lvl -58.96 dBm VBW 100 kHz
16 dBm 2.39525050 GHz SWT 600 ms Unit dBm

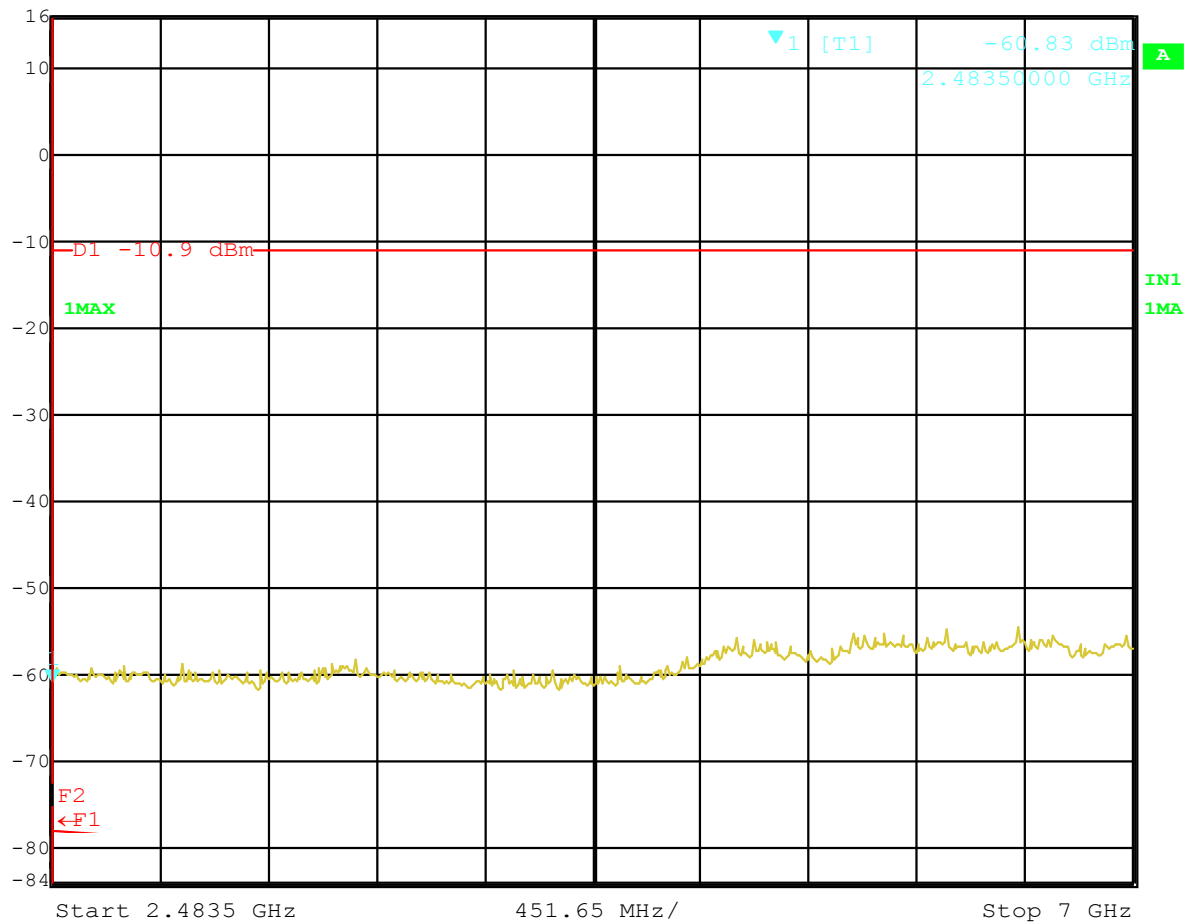


Date: 6.SEP.2004 17:55:14

Spurious Emissions Receiver Operating 30MHz – 2.4GHz

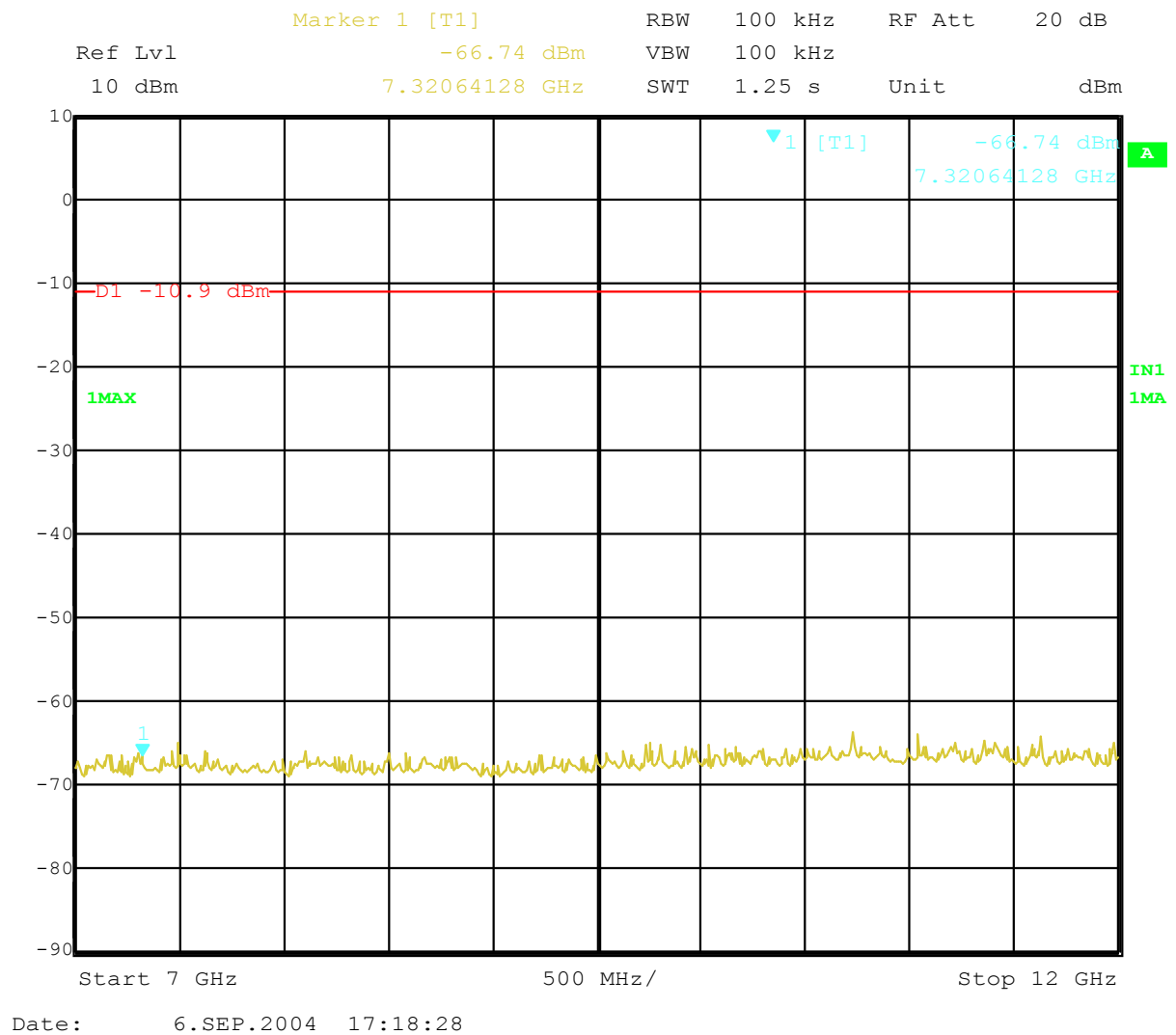


Ref Lvl 16 dBm
Marker 1 [T1] -60.83 dBm
2.48350000 GHz
RBW 100 kHz
RF Att 30 dB
VBW 100 kHz
SWT 1.15 s
Unit dBm

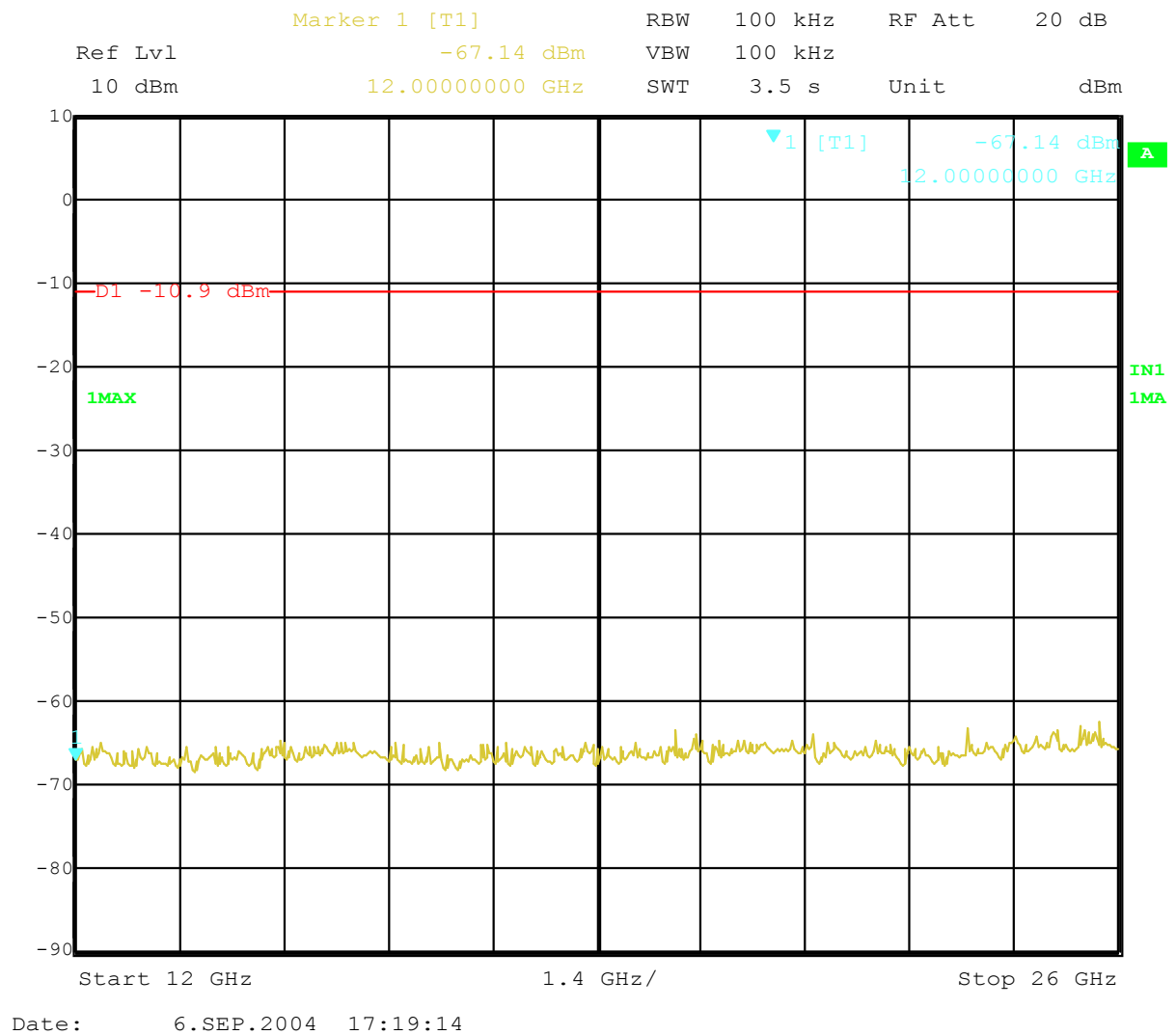


Date: 6.SEP.2004 17:56:28

Spurious Emissions Receiver Operating 2.4835GHz – 7GHz



Spurious Emissions Receiver Operating 7GHz – 12GHz

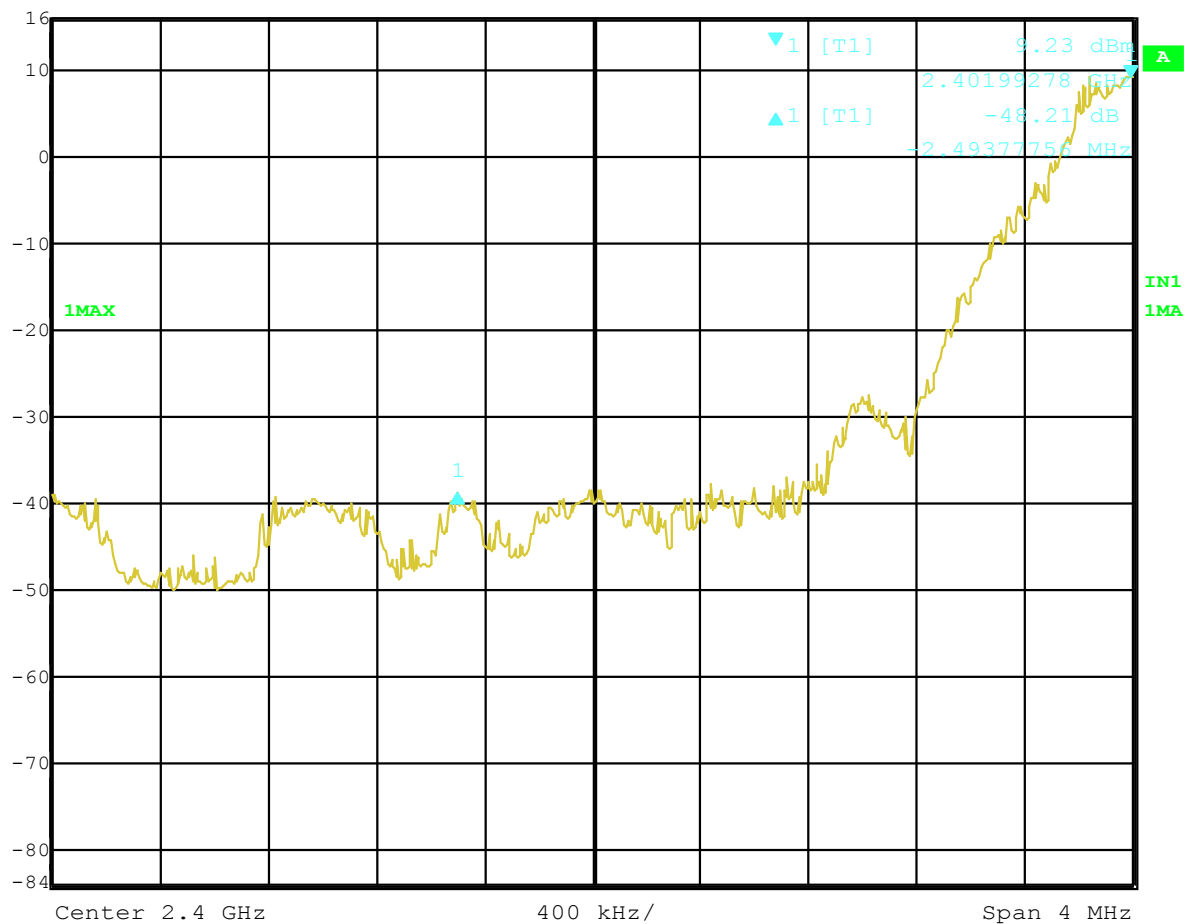


Spurious Emissions Receiver Operating 12GHz – 26GHz

ANNEX L
BAND EDGE CONDUCTED EMISSION
BLUETOOTH



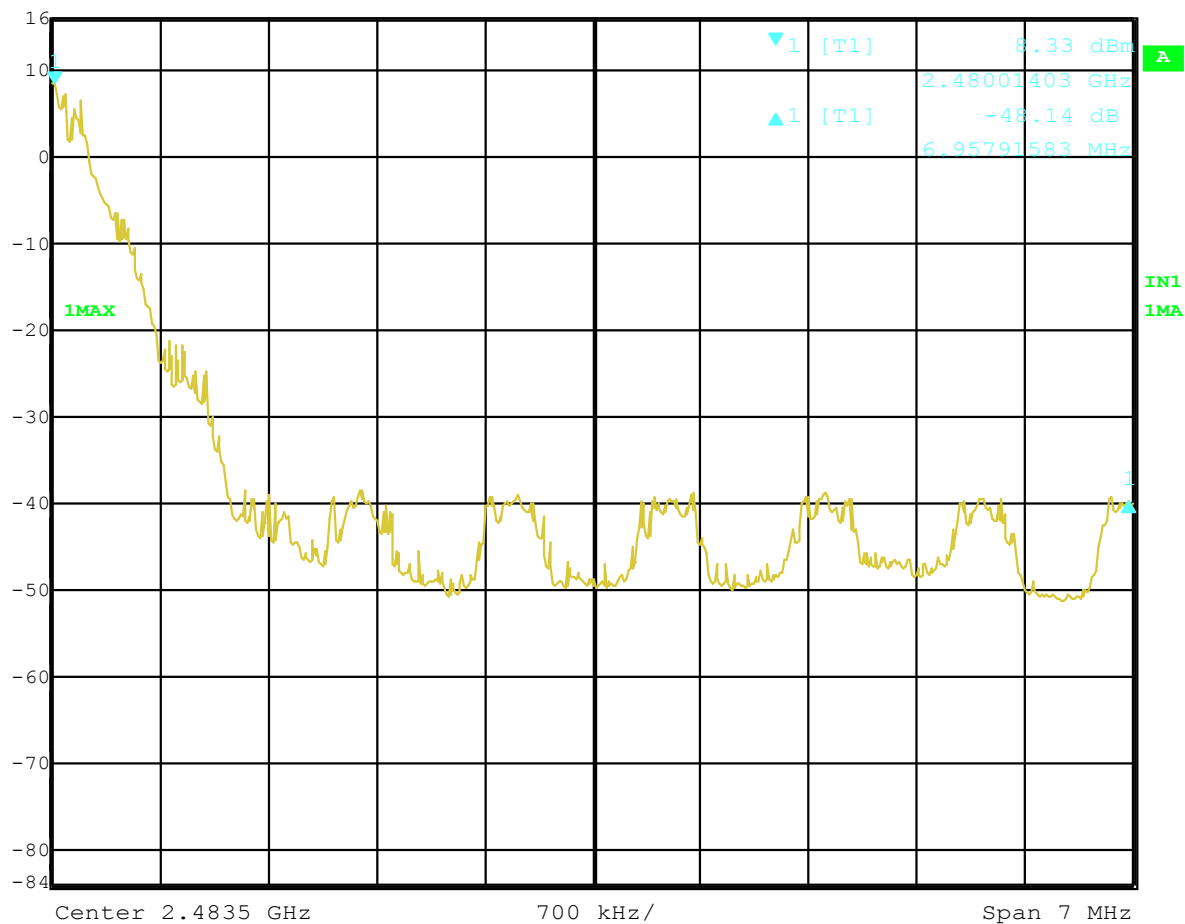
Ref Lvl 16 dBm
Delta 1 [T1] -48.21 dB
-2.49377756 MHz
RBW 100 kHz
VBW 100 kHz
SWT 5 ms
RF Att 30 dB
Unit dBm



Date: 6.SEP.2004 13:23:51

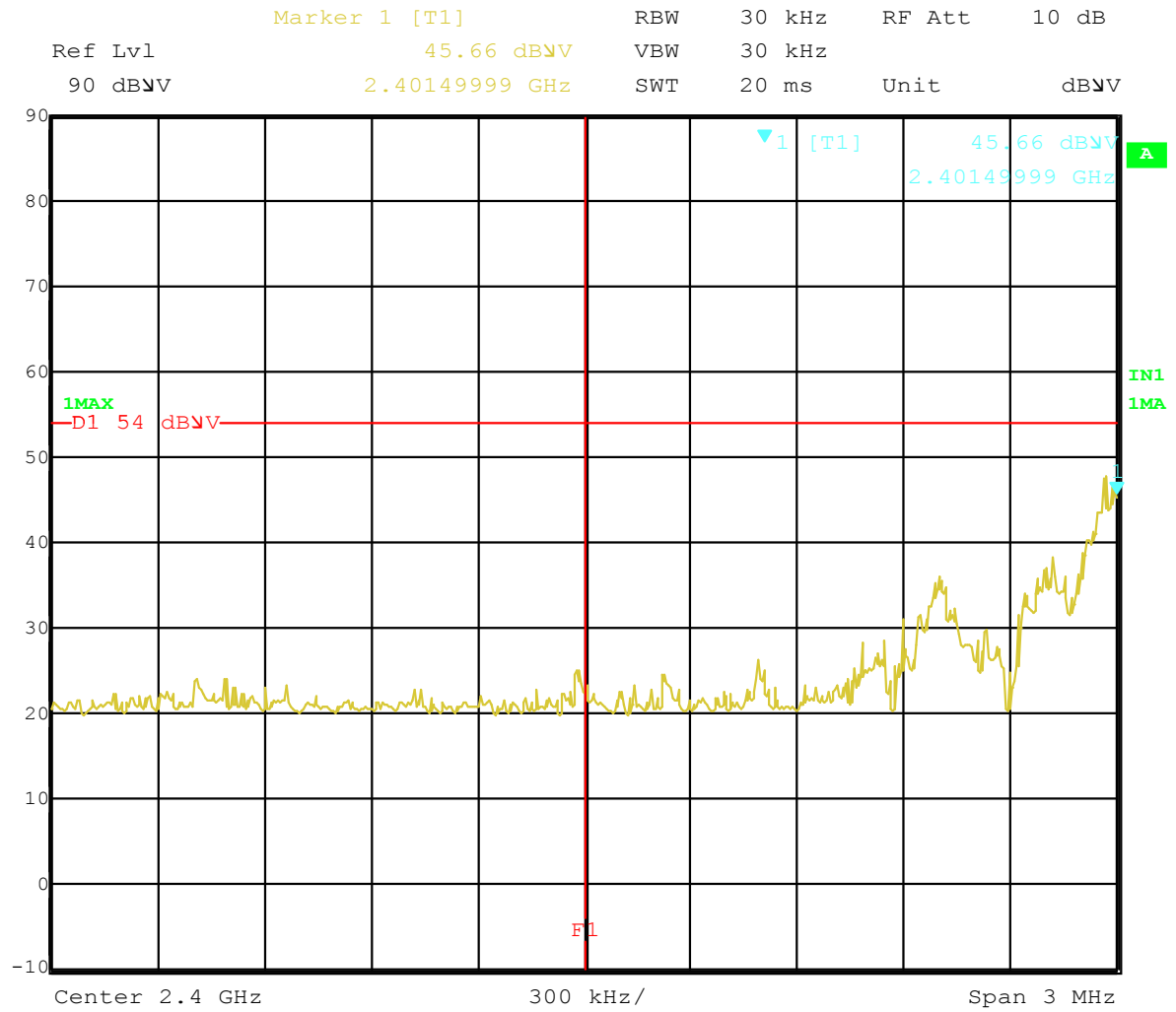


Ref Lvl 16 dBm
Delta 1 [T1] -48.14 dB
6.95791583 MHz
RBW 100 kHz
RF Att 30 dB
VBW 100 kHz
SWT 5 ms
Unit dBm



Date: 6.SEP.2004 13:46:25

ANNEX M
BAND EDGE EMISSIONS RADIATED
BLUETOOTH



Date: 9.SEP.2004 10:05:21

