REPORT ON THE CERTIFICATION TESTING OF AN EMS GLOBAL TRACKING LIMITED SAT-232 WITH RESPECT TO FCC RULES CFR 47, PART 25 AND FCC RULES CFR 47, PART 15

TEST REPORT NO: 9F2888WUS1

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FCC ID: X38SAT-232

REPORT ON THE CERTIFICATION TESTING OF AN
EMS GLOBAL TRACKING LIMITED
SAT-232
WITH RESPECT TO
FCC RULES CFR 47, PART 25
AND
FCC RULES CFR 47, PART 15

TEST DATE: 12th January – 18th February 2010

APPROVED BY: ..... J CHARTERS
RADIO PRODUCT MANAGER

DATE: 23rd April 2010

Distribution:

Copy Nos:
1. EMS Global Tracking Limited
2. TCB: TRaC EMC & Safety
3. TRaC Telecoms & Radio

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Notes:

1. Component failure during test No [X] Yes [ ]
2. If Yes, details of failure:
3. The facilities used for the testing of the product contain in this report are FCC Listed.

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY:	X38SAT-232
PURPOSE OF TEST:	Certification
TEST SPECIFICATION:	FCC Rules CFR 47, Part 25 & Part 15
TEST RESULT:	Compliant to Specification
ITU EMISSIONS DESIGNATOR	2K5Q7W
EQUIPMENT UNDER TEST:	SAT-232
OUTPUT POWER:	33.23dBm, 3.23 dBW, 2.12 Watts
CHANNEL SPACING:	2.5 kHz
MODULATION TYPE:	Q7W
POWER SOURCE(s):	+3.7 Vdc
TEST DATE(s):	12th January – 18th February 2010
APPLICANT:	EMS Global Tracking Limited
ADDRESS:	Miller Court Severn Drive Tewkesbury Business Drive Tewkesbury Gloucestershire GL20 5TT United Kingdom
TESTED BY:	D WINSTANLEY

APPROVED BY: ..... J CHARTERS
RADIO
PRODUCT
MANAGER

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	SAT-232
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC Rules CFR 47, Part 25 & Part 15
TEST RESULT:	COMPLIANT Yes [X] No [ ]
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]
APPLICANT'S CONTACT PERSON(s):	Mr M Barker
E-mail address:	mick.barker@satamatics.com
APPLICANT:	EMS Global Tracking Limited
ADDRESS:	Miller Court Severn Drive Tewkesbury Business Drive Tewkesbury Gloucestershire GL20 5TT United Kingdom
TEL:	+44 (0) 1684 278610
FAX:	+44 (0) 1684 278611
EUT(s) COUNTRY OF ORIGIN:	United Kingdom
TEST LABORATORY:	TRaC Telecoms & Radio
UKAS ACCREDITATION No:	0971
TEST DATE(s):	12th January – 18th February 2010
TEST REPORT No:	9F2888WUS1

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.

TEST/EXAMINATION	FCC Part 2	FCC Part 25	APPLICABILITY	RESULT
RF Power Output	-	25.204 (a)	YES	PASS
Emissions Limitations	-	25.202 (f)	YES	PASS
Spurious Emissions at Antenna Terminals	2.1051	25.202 (f) 25.213	NO	N/A
Protection of the Radio Navigation Satellite Service	-	25.216(c) 25.216(f)	YES	PASS
Spurious Emissions Radiated	2.1053	25.202 (f) 25.213	YES	PASS
Frequency Stability Temperature	2.1055	25.202 (d)	YES	PASS
Frequency Stability Voltage	2.1055	25.202 (d)	YES	PASS

Note: The SAT-232 is subject to FCC Part 25 & Part 2 for FCC Certification for units marketed within the United States. The above tests, as specified in FCC Part 2, with limits as defined in FCC Part 25 were performed on the SAT-232.

2. Product Use: Satellite Data Communications

3. Emission Designator: 2k5Q7W

4. Temperatures: Ambient (Tnom) 18°C

5. Supply Voltages: Vnom +3.7 Vdc

Note: Vnom voltages are as stated above unless otherwise shown on the test report page

6. Equipment Category:
   - Single channel [ ]
   - Two channel [ ]
   - Multi-channel [X]

7. Channel spacing:
   - Narrowband [X] 2.5 kHz
   - Wideband [ ]

8. Test Location: TRaC telecoms & Radio
   - Up Holland [X]
   - Hull [ ]

9. Modifications made during test program: No modifications were performed.

Product Description

The SAT-232 is a terminal for tracking, communicating and managing personnel in remote and dangerous locations. Using the Inmarsat satellite constellation, the SAT-232 enables two-way communication, tracking and alerting for individuals and fleets across the globe.

Standard References

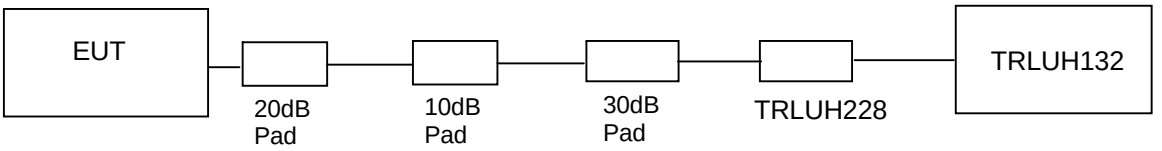
47 CFR 2 Matters; 10-1-03 Edition	Code of Federal Regulations, Title 47, Part 2, “Frequency allocations and Radio Telemetry General Rules and Regulations”
47 CFR 25 10-1-03 Edition	Code of Federal Regulations, Title 47, Part 25,”Satellite Communications” Subpart C, “Technical Matters”
47 CFR 15 10-07-08 Edition	Code of Federal Regulations, Title 47, Part 15,”Radio Frequency Devices” Subpart B, “Unintentional Radiators”
C63.4-2003	American National Standards Institute (ANSI), “Methods of Measurement of Radio Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range 9 kHz to 40 GHz”

COMPLIANCE TESTS

TRANSMITTER TESTS

RF OUTPUT POWER – CONDUCTED – PART 25.204 (a)

Ambient temperature	=	18^{o}C	Radio Laboratory
Relative humidity	=	51%	
Supply voltage	=	+3.7 Vdc	
Channel number	=	See test results	



See Annex C for full list of test equipment

The test setup was as per the above diagram. The unit was tested on bottom, middle and top operating channels. The unit was put into test mode and set to operate at maximum power and with a random modulating signal using test commands sent from a PC via a USB connection. The antenna gain, included in the table below, represents gain of the antenna integral to this system.

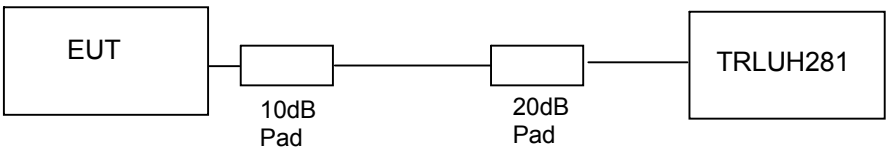
Channel	Attenuator and cable loss dB	Level at Power Meter dBm	Antenna Gain dB	Carrier power dBm	Carrier power dBW	Limit dBW
Channel 6001	60.80	-31.52	4	33.28	3.28	40
Channel 12800	60.80	-31.57	4	33.23	3.23	40
Channel 19599	60.80	-31.74	4	33.06	3.06	40

Notes: 1. Correction Factor for dBm to dBW = -30dB
2. Antenna gain of 4dBi is the worst case gain over an isotropic antenna
3. EUT transmitting permanently, No duty cycle correction performed

TRANSMITTER TESTS

EMISSIONS LIMITATIONS – CONDUCTED – PART 25.202 (f)

Ambient temperature	=	18^{o}C	Radio Laboratory
Relative humidity	=	51%	
Supply voltage	=	+3.7 Vdc	



See Annex C for full list of test equipment

The test setup was as per the above diagram. The unit was tested on bottom, middle and top operating channels. The unit was put into test mode and set to operate at maximum power and with a random modulating signal using test commands sent from a PC via a USB connection. The antenna gain and cable and attenuator losses are included in the spectrum analyser reference level offset.

The Spurious limit is as follows:

On any frequency removed from the assigned frequency by the following percentage of the authorised bandwidth

±50%	-	100%	-25 dBc
±100%	-	250 %	-35 dBc
> ±250%			At least -43 + 10 log P dBc

P dBm – (43+10log (P_{watts} * 1000)) = LIMIT = -13 dBm

Where the Authorised Bandwidth = 2.5 kHz

Note

1. The 4 kHz bandwidth specified is greater than the channel spacing of this device.
2. The measurement bandwidth used was approx 1% of the specified measurement bandwidth.
3. 1% of 4kHz = 40Hz, as a 40 Hz bandwidth is not available 50 Hz measurement bandwidth was utilised.

RESULTS

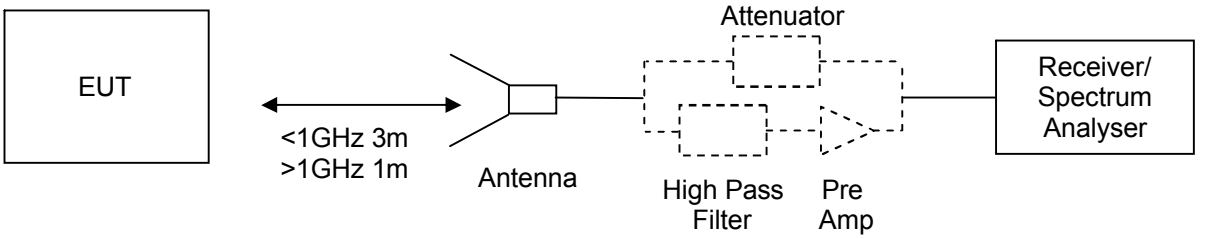
The SAT-232 was found to comply with the limits

See plots in Annex F.

TRANSMITTER TESTS

SPURIOUS EMISSIONS – RADIATED – PART 25.202 (f) & 25.216

Ambient temperature = 15°C
Relative humidity = 68%
Conditions = Anechoic Chamber
Supply voltage = +3.7 Vdc
Supply Frequency = N/A



See Annex C for full list of test equipment

The test setup was as per the above diagram. The unit was tested on bottom, middle and top operating channels. The unit was put into test mode and set to operate at maximum power and with a tone modulating signal using test commands sent from a PC via a USB connection.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more that 250% of the authorised bandwidth

At least 43 + 10 log PdB

$(10\log P_{watts}) – (43+10\log (P_{watts} * 1000)) = LIMIT = -13$ dBm

RESULTS

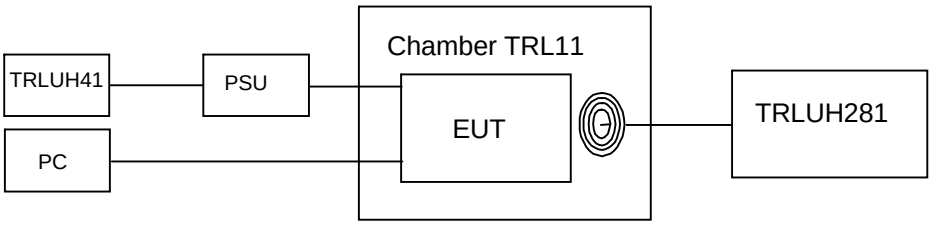
FREQUENCY RANGE	FREQ. (MHz)	CHANNEL NUMBER	ERP/EIRP (dBm)	LIMIT (dBm)
30 MHz – 1559 MHz	No Significant Emissions within 20 dBs of the Limit			-13
1559 MHz – 1605 MHz	No Significant Emissions within 20 dBs of the Limit			-40
1605 MHz – 1610 MHz	No Significant Emissions within 20 dBs of the Limit			-40 to 10 Note 4
1610 MHz – 1626.5 MHz	No Significant Emissions within 20 dBs of the Limit			-13
1660.5 MHz – 16605 MHz	3253.005 MHz	6001	-20.15	-13
	4879.505 MHz	6001	-23.90	-13
	6506.006 MHz	6001	-27.91	-13
	8132.501 MHz	6001	-32.85	-13
	3287.001 MHz	12800	-19.70	-13
	4930.501 MHz	12800	-30.60	-13
	3320.992 MHz	19599	-20.75	-13
	8302.495 MHz	19599	-32.50	-13

Notes :
1. Emissions Checked up to 10 times Fc.
2. Scan plots of channels 6001 & 19599 with receive antenna in vertical polarization in annex G.
3. The unit was mounted on a turntable and rotated through 360^0 and in 3 orthogonal planes to find the worst case emission.
4. -40 to -10 Linearly interpolated in dBm Vs frequency offset.
5. Correction Factor for dBm to dBW = -30dB.
6. Fully charged batteries were used for each channel.
7. Phihong PSB05R-050Q Connected during testing.

TRANSMITTER TESTS

FREQUENCY STABILITY – CONDUCTED – TEMPERATURE – PART 25.202 (d)

Ambient temperature = 20°C Radio Laboratory
Relative humidity = 58%
Supply voltage = +3.7 Vdc



See Annex C for full list of test equipment

The test setup was as per the above diagram. The unit was tested on bottom, middle and top operating channels. The unit was put into test mode and set to operate at maximum power and with a tone modulating signal using test commands sent from a PC via a USB connection.

RESULTS

TEMP	Channel		
^{0}C	Channel 6001	Channel 12800	Channel 19599
+60	1626.502798 MHz	1643.500245 MHz	1660.497704 MHz
+50	1626.502664 MHz	1643.500147 MHz	1660.497621 MHz
+40	1626.502486 MHz	1643.500006 MHz	1660.497545 MHz
+30	1626.502481 MHz	1643.499965 MHz	1660.497454 MHz
+20	1626.502810 MHz	1643.500309 MHz	1660.497809 MHz
+10	1626.502279 MHz	1643.500310 MHz	1660.497825 MHz
0	1626.502817 MHz	1643.500324 MHz	1660.498029 MHz
-10	1626.502822 MHz	1643.500442 MHz	1660.498037 MHz
-20	1626.503007 MHz	1643.500303 MHz	1660.497692 MHz
-30	1626.502636 MHz	1643.500131 MHz	1660.497655 MHz

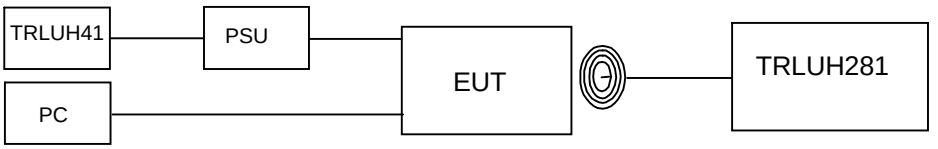
Notes: 1.Limit ± 10ppm (See Annex H for frequency stability plots verses limit)

TheSAT-232 was found to comply with the limits

TRANSMITTER TESTS

FREQUENCY STABILITY – CONDUCTED – VOLTAGE – PART 25.202 (d)

Ambient temperature	=	20°C	Radio Laboratory
Relative humidity	=	62%	
Supply voltage	=	+3.7 Vdc	



See Annex C for full list of test equipment

The test setup was as per the above diagram. The unit was tested on bottom, middle and top operating channels. The unit was put into test mode and set to operate at maximum power and with a tone modulating signal using test commands sent from a PC via a USB connection.

RESULTS

VOLTAGE	Channel		
%	Channel 6001	Channel 12800	Channel 19599
85	EUT Ceases transmission below 95 % of Vnom		
90			
95	1626.500347 MHz	1643.500141 MHz	1660.497754 MHz
100	1626.502663 MHz	1643.500224 MHz	1660.497724 MHz
105	1626.502712 MHz	1643.500237 MHz	1660.497712 MHz
110	1626.502705 MHz	1643.500250 MHz	1660.497701 MHz
115	1626.502705 MHz	1643.500255 MHz	1660.499410 MHz

Notes: 1.Limit ± 10ppm (See Annex I for plots verses limit)

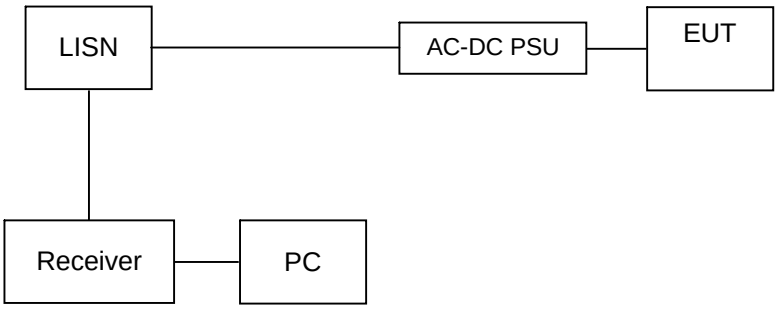
The SAT-232 was found to comply with the limits

UNINTENTIONAL TRANSMITTER TESTS

AC POWER LINE CONDUCTION

Ambient temperature = 17°C
Relative humidity = 41%
Supply voltage = +110 Vac

Radio Laboratory



SIGNIFICANT EMISSIONS – RECEIVE MODE

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dBµV)
0.67	37.70	Quasi Peak	Neutral	56.00
0.17	51.14	Quasi Peak	Live	64.96
0.19	36.65	Average	Live	54.04
0.30	30.40	Average	Neutral	50.24
0.34	30.30	Average	Live	49.20
0.43	32.99	Average	Live	47.25
0.48	32.80	Average	Live	46.43
0.49	29.67	Average	Neutral	46.17
0.61	33.40	Average	Live	46.00
0.67	30.39	Average	Neutral	46.00
0.75	31.35	Average	Live	46.00
0.78	37.86	Quasi Peak	Live	56.00
0.84	29.24	Average	Live	46.00
1.54	28.33	Average	Live	46.00
1.80	31.49	Average	Live	46.00
1.87	36.35	Quasi Peak	Live	56.00
1.92	36.35	Quasi Peak	Live	56.00
1.96	30.92	Average	Live	46.00
2.41	26.47	Average	Neutral	46.00
2.52	29.58	Average	Live	46.00
3.13	29.28	Average	Live	46.00
3.83	26.72	Average	Live	46.00

SIGNIFICANT EMISSIONS – TRANSMIT MODE

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dBµV)
0.17	38.46	Average	Neutral	55.21
0.18	44.87	Quasi Peak	Live	64.49
0.26	33.82	Average	Live	51.43
0.34	30.87	Average	Neutral	49.33
0.40	31.74	Average	Neutral	47.96
0.47	32.97	Average	Neutral	46.60
0.49	29.90	Average	Live	46.17
0.60	32.34	Average	Neutral	46.00
0.72	30.84	Average	Live	46.00
0.74	31.67	Average	Neutral	46.00
0.82	28.84	Average	Live	46.00
0.85	30.58	Average	Neutral	46.00
1.10	28.50	Average	Neutral	46.00
1.32	26.34	Average	Live	46.00
1.50	27.44	Average	Neutral	46.00
1.91	33.95	Average	Neutral	46.00
2.10	32.15	Average	Neutral	46.00
2.37	27.35	Average	Live	46.00
3.12	32.11	Average	Live	46.00
3.17	37.43	Quasi Peak	Live	56.00
3.30	30.19	Average	Neutral	46.00
4.01	26.45	Average	Live	46.00

Notes:
1 See plot in Annex J
2 EUT Tested in normal operating mode (receive Mode)
3 EUT was tested permanently transmitting on Channel 12800
4 Phihong PSB05R-050Q supplied by manufacturer for AC power line conduction tests.

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

UNINTENTIONAL TRANSMITTER TESTS

UNINTENTIONAL TRANSMITTER SPURIOUS EMISSIONS – RADIATED – PART 15.109

Ambient temperature	=	17°C(<1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	66% (<1GHz),	3m measurements >1GHz	[ ]
Conditions	=	Open Area Test Site (OATS)	3m extrapolated from 1m	[ ]
Supply voltage	=	+3.7Vdc		

	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
30MHz - 88MHz									**Note 4**
88MHz - 216MHz	192.00	14.5	2.8	8.8	-	26.1	-	20.18	150
	194.40	13.8	2.8	9.0	-	25.6	-	19.05	150
	203.35	18.0	2.9	8.9	-	29.8	-	30.90	150
	204.60	14.0	2.9	8.8	-	25.6	-	19.05	150
	206.25	17.0	2.9	8.8	-	28.7	-	27.23	150
	211.05	18.0	3.0	8.3	-	29.3	-	29.17	150
	211.75	13.4	3.0	8.3	-	24.7	-	17.18	150
216MHz - 960MHz	216.95	14.4	3.1	8.5	-	26.0	-	19.95	200
	217.25	15.1	3.1	8.5	-	26.7	-	21.63	200
960MHz - 1GHz									
1GHz - 17GHz	1617.025	47.96	2.6	26.16	36.9	39.82	-	97.95	500
	3234.054	42.79	3.7	31.35	36.5	41.34	-	116.68	500
	1634.024	46.01	2.7	26.20	36.9	38.01	-	79.52	500
	3268.016	44.04	4.0	31.45	36.5	42.99	-	141.09	500
	1651.019	45.79	2.9	26.40	36.9	38.19	-	81.19	500
	3302.041	44.43	4.1	31.49	36.5	43.52	-	149.97	500

Limits		
	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 17GHz	500µV/m @ 3m

Notes:
1 Emissions were searched to: (**x**) 1000MHz inclusive, as per Part 15.33a
2 Receiver detector <1GHz = CISPR, Quasi-Peak, 120kHz bandwidth
3 Receiver detector >1GHz = Average, 1MHz resolution bandwidth
4 Only emissions within 20 dB of the limit are recoded.
5 See annex K for emissions plots
6 Phihong PSB05R-050Q Connected during testing.

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 orthagonal planes.
Maximum results recorded.

ANNEX A

PHOTOGRAPHS

PHOTOGRAPH 1. **RADIATED TEST SETUP**

PHOTOGRAPH 2. **FRONT OVERVIEW**

PHOTOGRAPH 3. **REAR OVERVIEW**

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)	-		[ ]
e.	LABELLING	-	PHOTOGRAPHS	[ ]
		-	DECLARATION	[ ]
		-	DRAWINGS	[ ]
f.	TECHNICAL DESCRIPTION	-		[X]
g.	BLOCK DIAGRAMS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
h.	CIRCUIT DIAGRAMS	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
i.	COMPONENT LOCATION	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
j.	PCB TRACK LAYOUT	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
k.	BILL OF MATERIALS	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]

ANNEX C

TEST EQUIPMENT LIST

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No
ENVIRONMENTAL CHAMBER	SHARTREE	TCC 125-815P	CS 203	11
10dB ATTENUATOR	BIRD	8308-200	N/A	103
HORN	EMCO	3115	9010-3580	138
HORN	EMCO	3115	9010-3581	139
10 dB ATTENUATOR	BIRD	8304-100-N	N/A	222
6 dB ATTENUATOR	BIRD	8304-0600-N	N/A	246
TEMPERATURE INDICATOR	FLUKE	52 SERIES II	74700044	426
RECEIVER	R&S	ESVS 20	838804/005	415
BILOG ANTENNA	CHASE	CBL6112B	2761	431
PRE AMPLIFIER	AGILENT	8449B	2118	572
MULTIMETER	AVOMeter	M3004	M3270006	UH41
PSU	THANDOR	PL320QMD	044749	UH100
BILOG ANTENNA	CHASE	CBL6111	1618	UH191
CABLE	TRaC	N/A	N/A	UH269
CABLE	TRaC	N/A	N/A	UH272
SPECTRUM ANALYSER	R&S	FSU 46	200034	UH281
CABLE	SUCOFLEX	N/A	35226/4	UH291
ATTENUATOR	JFW	50PF-030	N/A	UH301
CABLE	TRaC	N/A	N/A	UH358
PRE AMP	WATTKINS JOHNSON	6021-69	2740	UH372
HIGH PASS FILTER	BSC	SH4141	1470301	N/A

ANNEX D

TEST EQUIPMENT CALIBRATION

REF Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH06/07	IC OATS Submission	TRL	02/07/2009	24	02/07/2011
UH06/07	NSA Calibration	TRL	19/06/2009	12	19/06/2010
UH028	Log Periodic Ant	Schwarbeck	14/08/2009	24	14/08/2011
UH029	Bicone Antenna	Schwarbeck	13/08/2009	24	13/08/2011
UH041	Multimeter	AVOmeter	25/01/2010	12	25/01/2011
UH129	Power Sensor	Marconi	28/01/2010	12	28/01/2011
UH132	Power meter	Marconi	27/01/2010	12	27/01/2011
UH228	Power Sensor	Marconi	28/01/2010	12	28/01/2011
UH253	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH254	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH269	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH270	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH271	1.5m Cable N type	TRL	15/07/2009	12	15/07/2010
UH272	1.5m Cable N type	TRL	15/07/2009	12	15/07/2010
UH273	2m Cable N type	TRL	15/07/2009	12	15/07/2010
UH274	2m Cable N type	TRL	15/07/2009	12	15/07/2010
UH281	Spectrum Analyser	R&S	29/01/2010	12	29/01/2011
UH288	1m Cable N type		15/07/2009	12	15/07/2010
UH291	K-Type Cable	Succoflex	15/07/2009	12	15/07/2010
L005	CMTA	R&S	03/02/2010	12	03/02/2011
L103	Attenuator	Bird	Calibrate In Use		
L138	1-18GHz Horn	EMCO	10/09/2009	24	10/09/2011
L139	1-18GHz Horn	EMCO	17/08/2009	24	17/08/2011
L222	Attenuator	Bird	Calibrate In Use		
L246	Attenuator	Bird	Calibrate In Use		
L426	Temperature Indicator	Fluke	25/01/2010	12	25/01/2011
L415	Receiver	R&S	02/04/2009	12	02/04/2010
L431	Antenna	Chase	16/12/2009	24	16/12/2011
L572	Pre Amp	Agilent	15/07/2009	12	15/07/2010
N/A	High Pass Filter	BSC	04/12/2009	12	04/12/2010

,

ANNEX E

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

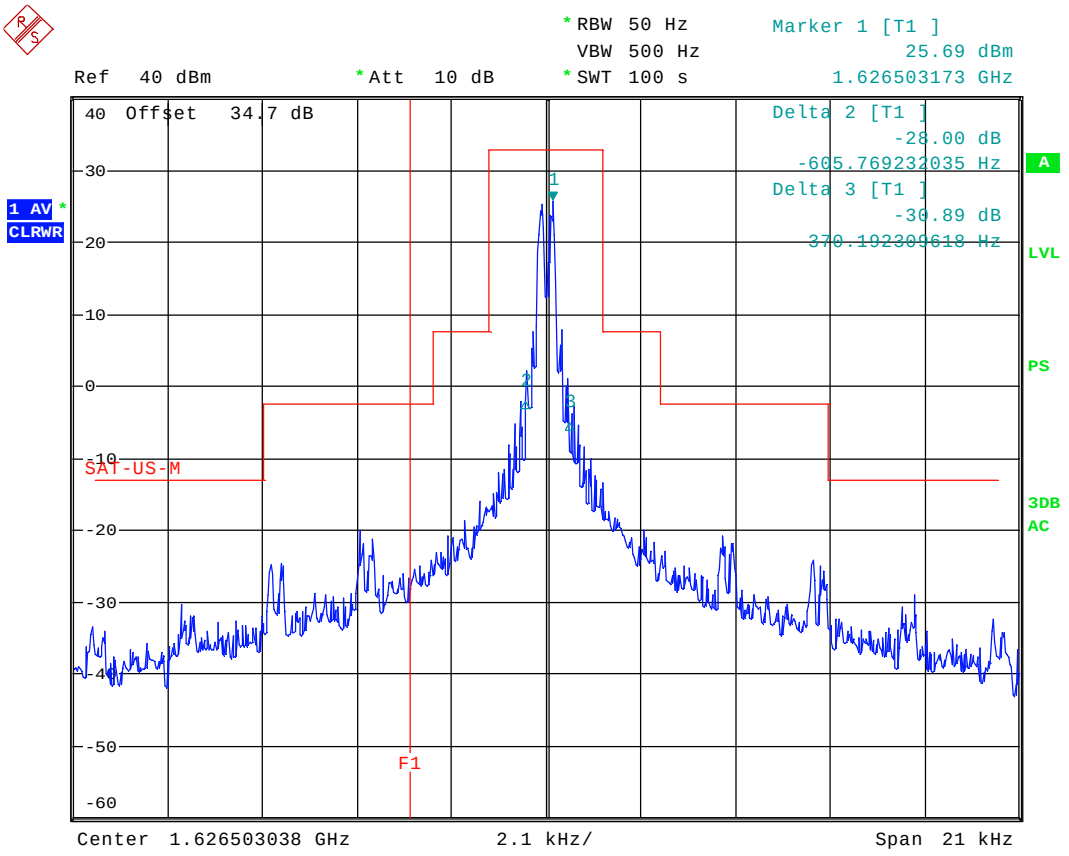
Uncertainty in test result = **3.23dB**

[18] Transmission Time Measurement

Uncertainty in test result = **7.98%**

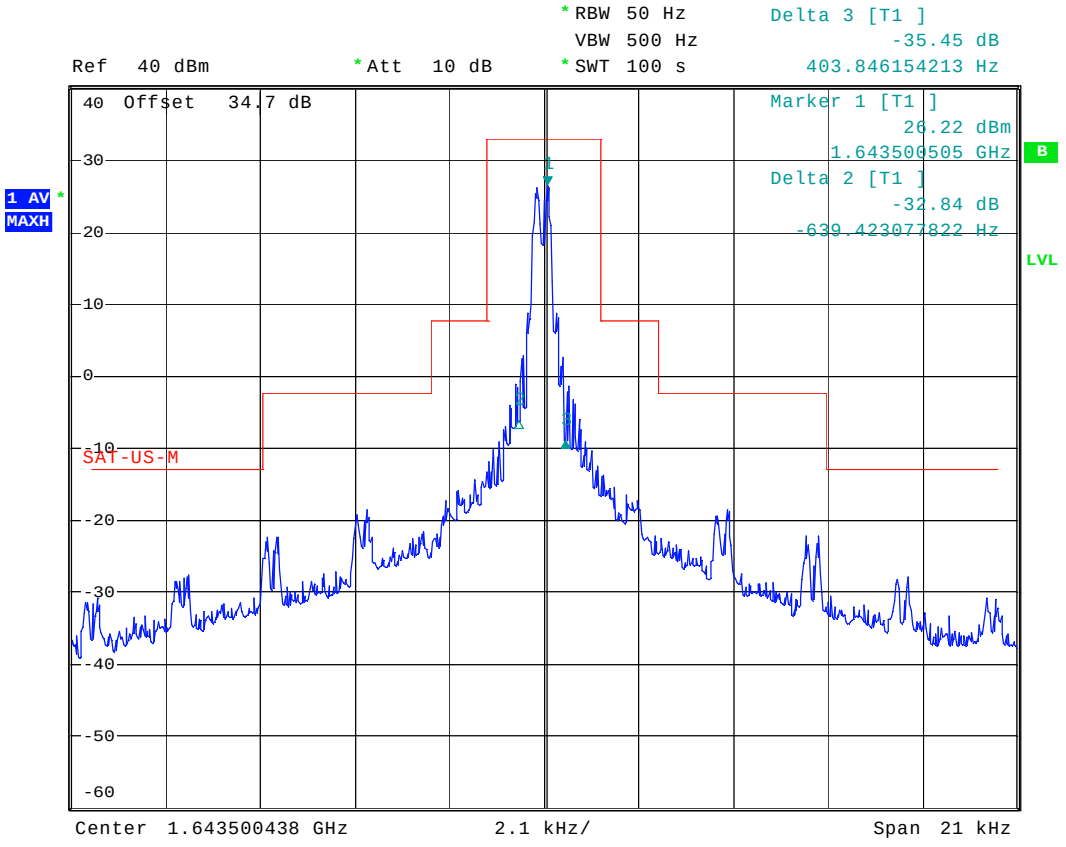
ANNEX F

EMISSIONS LIMITATIONS



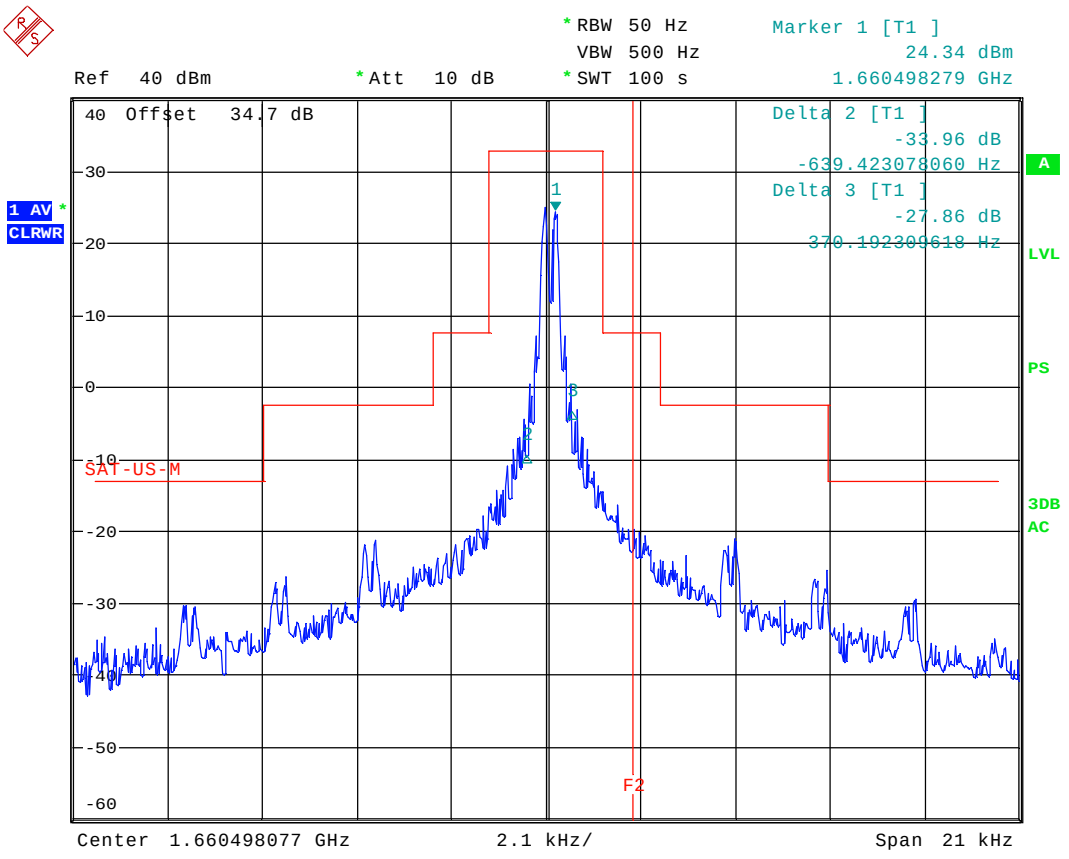
Date: 14.JAN.2010 12:47:12

Channel 6001



Date: 12.JAN.2010 14:42:59

Channel 12800

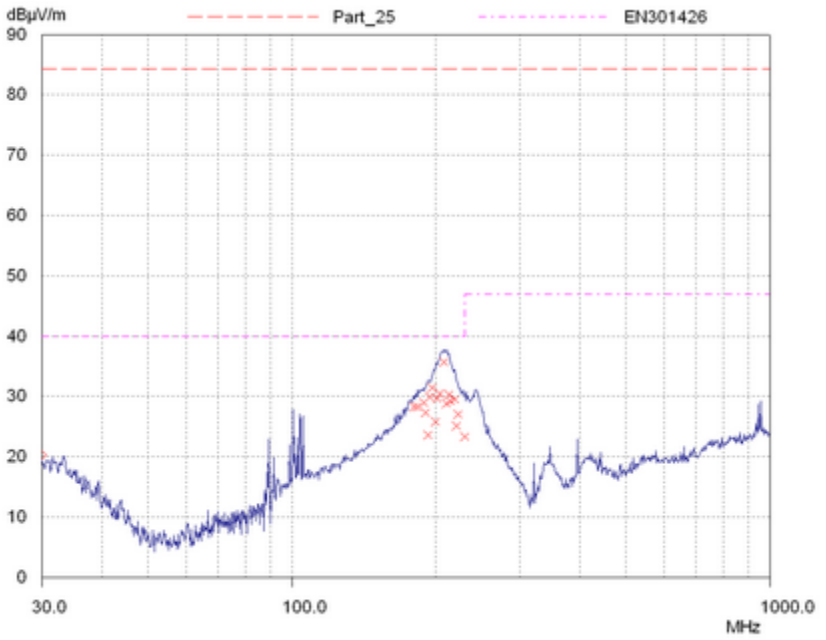


Date: 14.JAN.2010 12:42:22

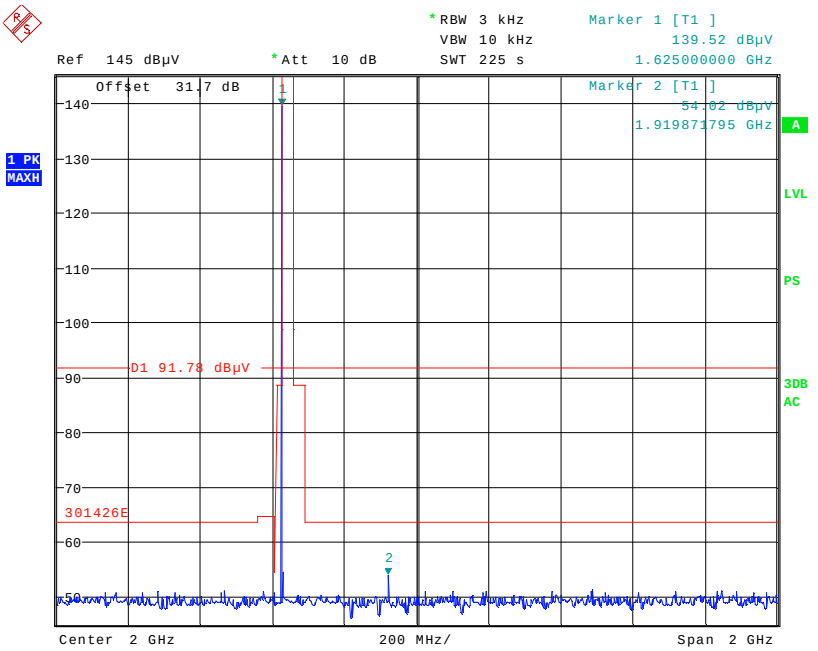
Channel 19599

ANNEX G

TRANSMITTER SPURIOUS EMISSIONS – Radiated

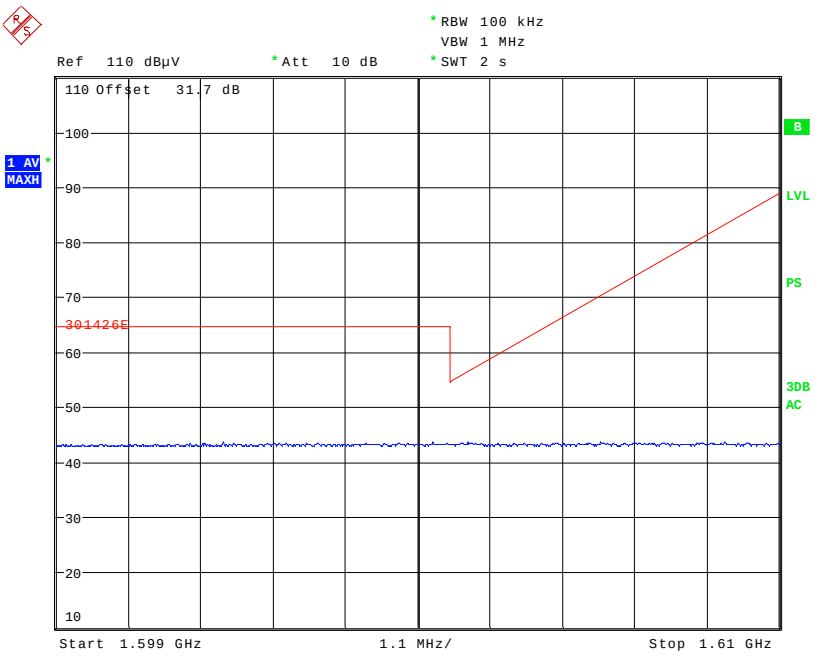


30MHz – 1000MHz



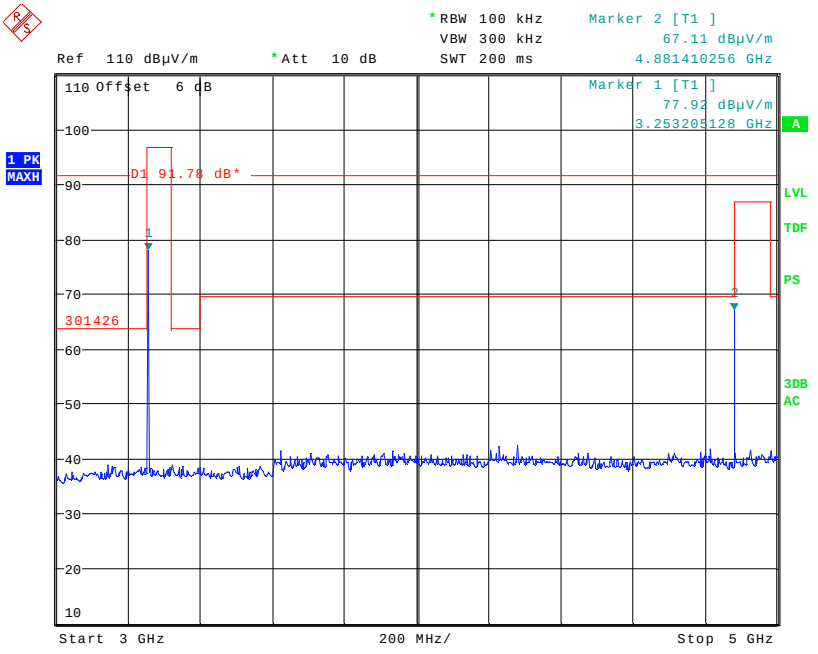
Date: 15.JAN.2010 10:02:24

1000MHz – 3000MHz



Date: 15.JAN.2010 10:03:51

1559MHz – 1610MHz



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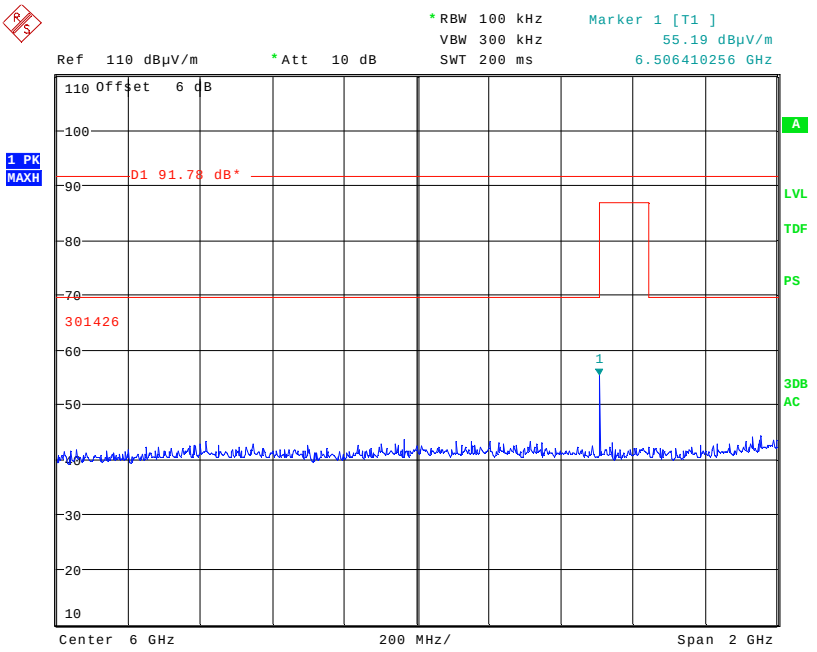
3GHz – 5GHz



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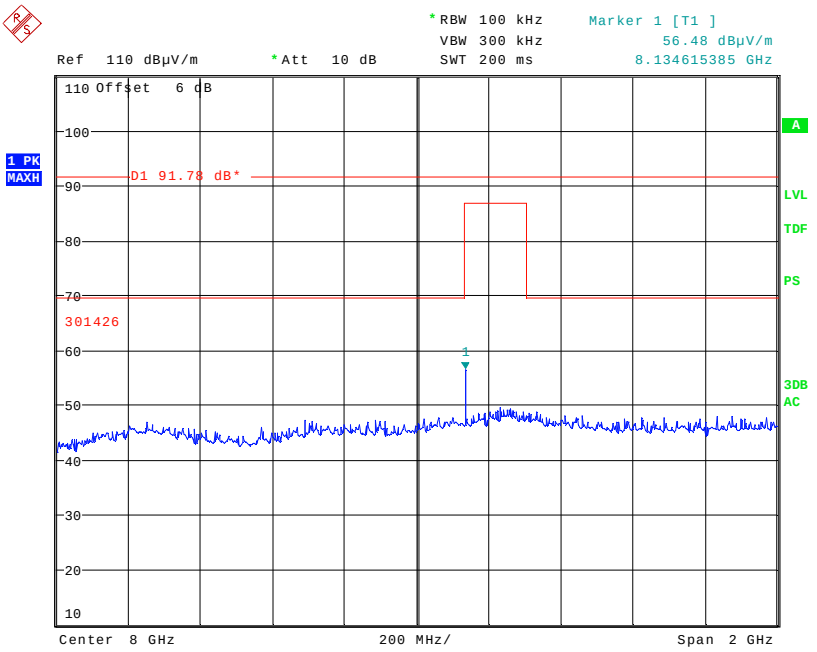
5GHz – 7GHz



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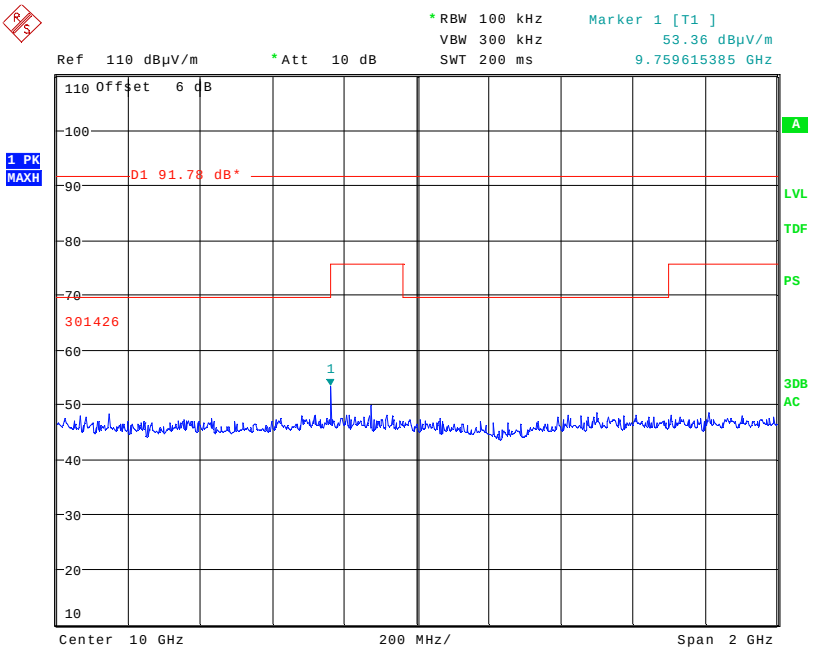
7GHz – 9GHz



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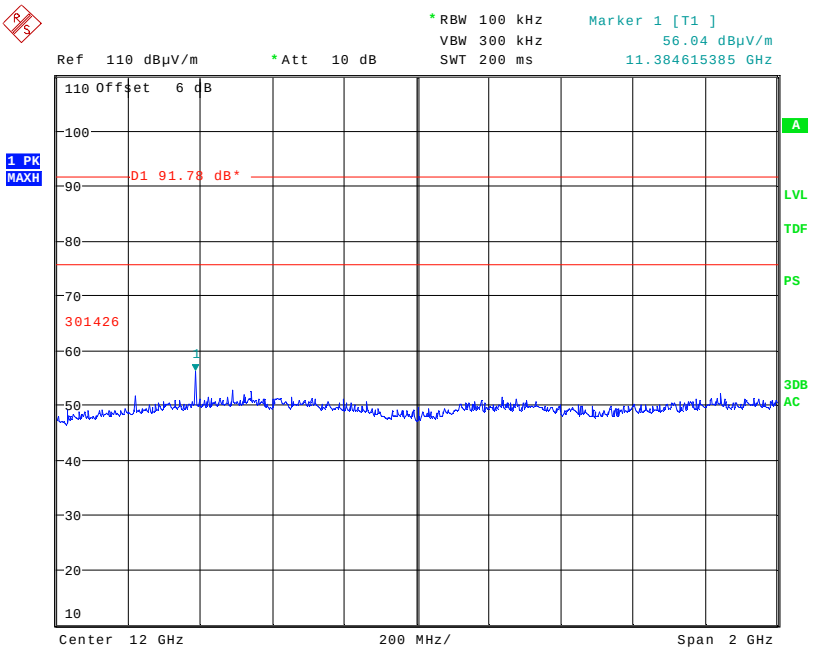
9GHz – 11GHz



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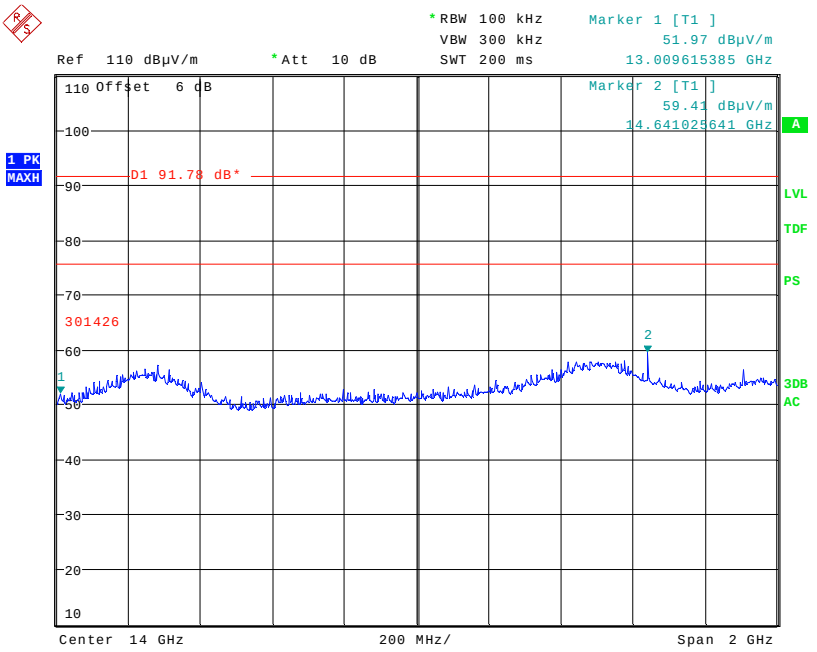
11GHz – 13GHz



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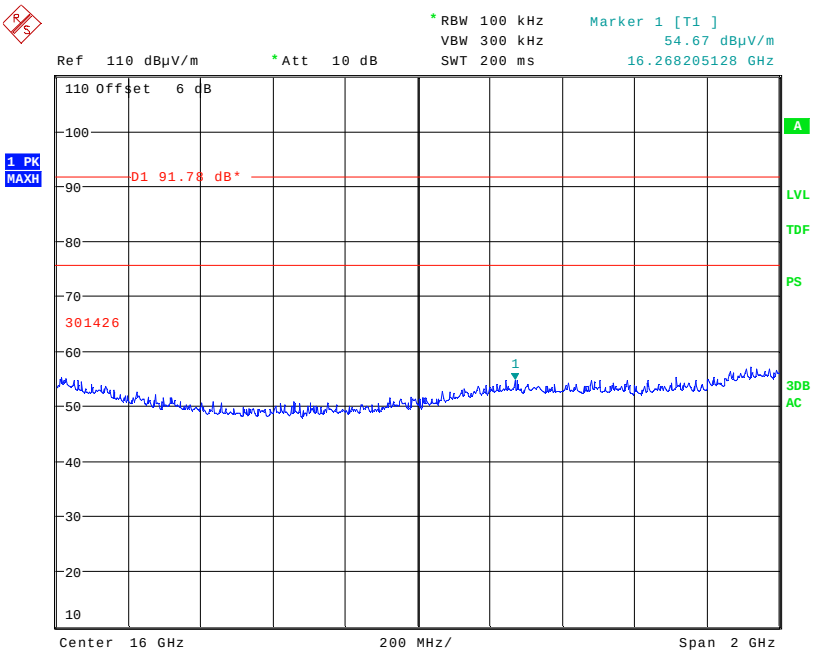
13GHz – 15GHz



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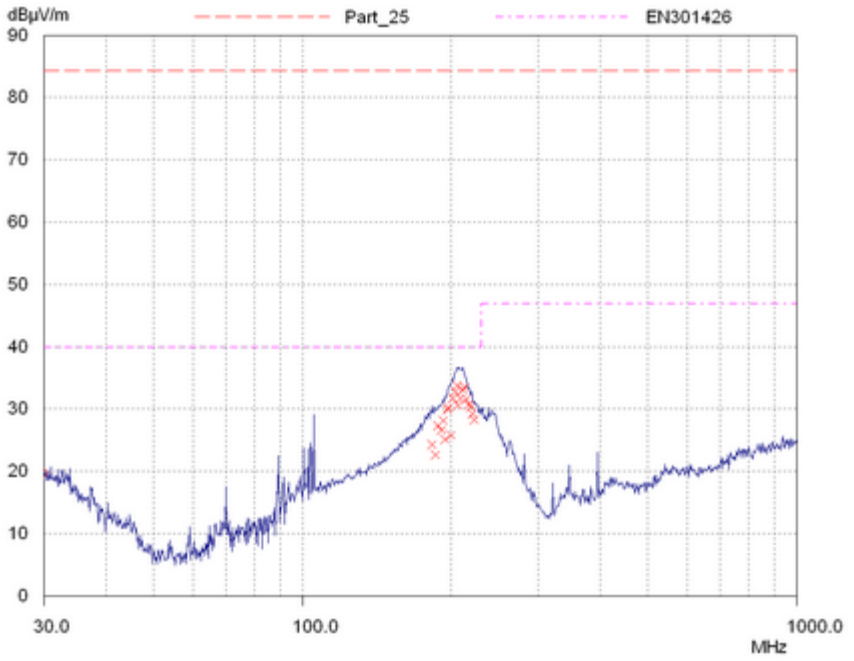
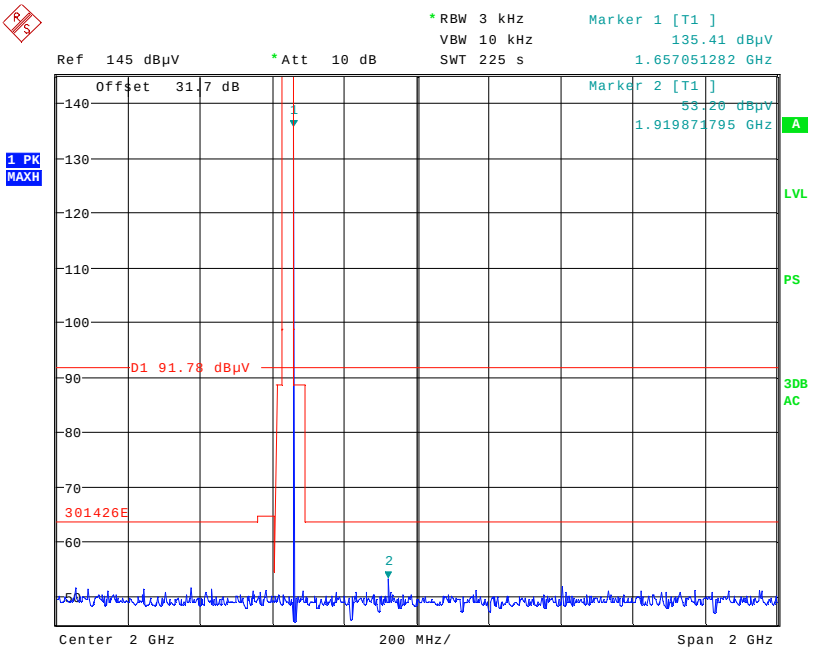
15GHz – 17GHz



30MHz – 1000MHz



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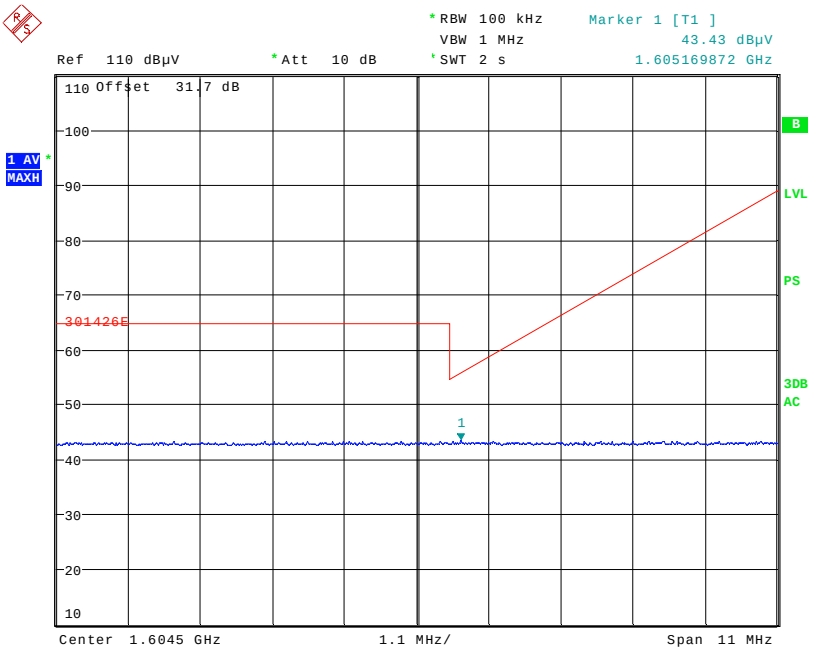
1000MHz – 3000MHz



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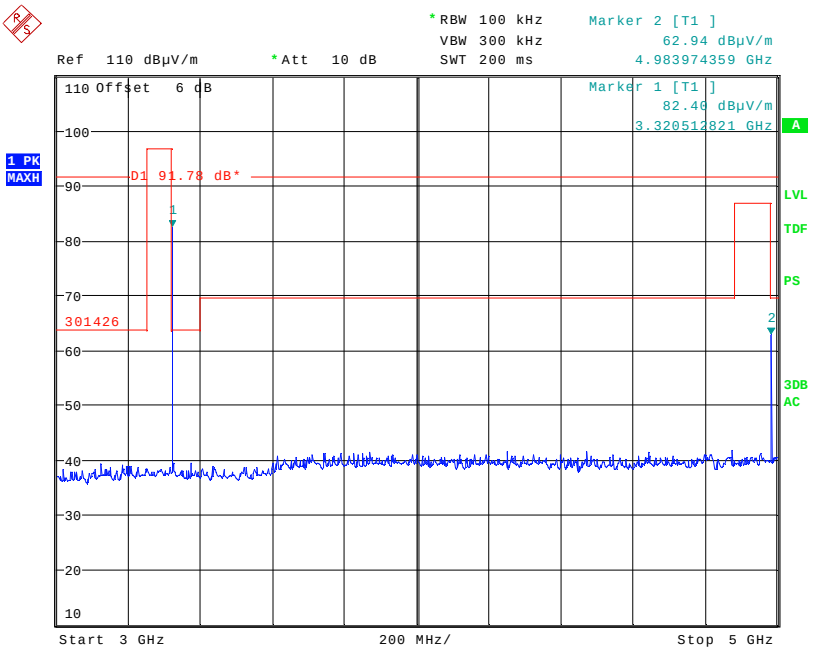
1559MHz – 1610MHz



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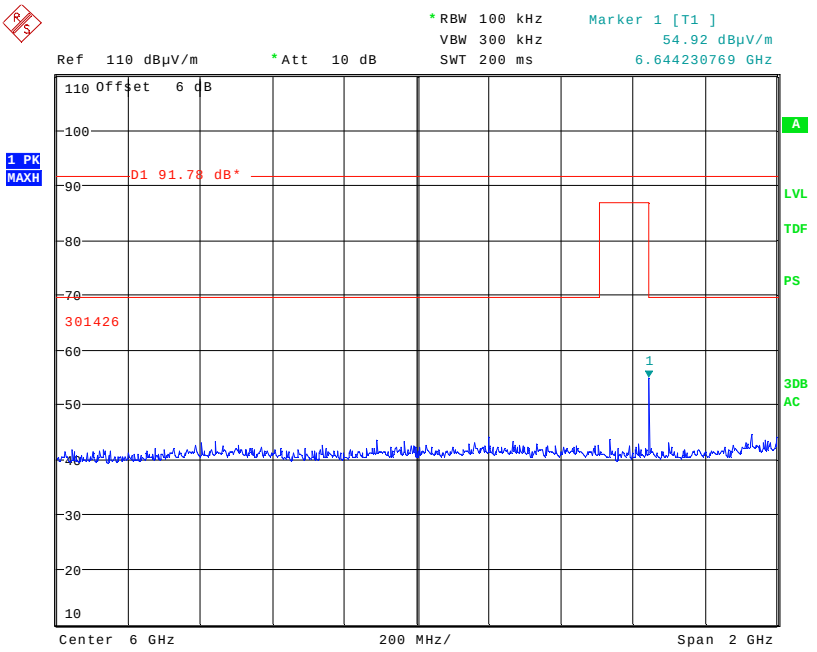
3GHz – 5GHz



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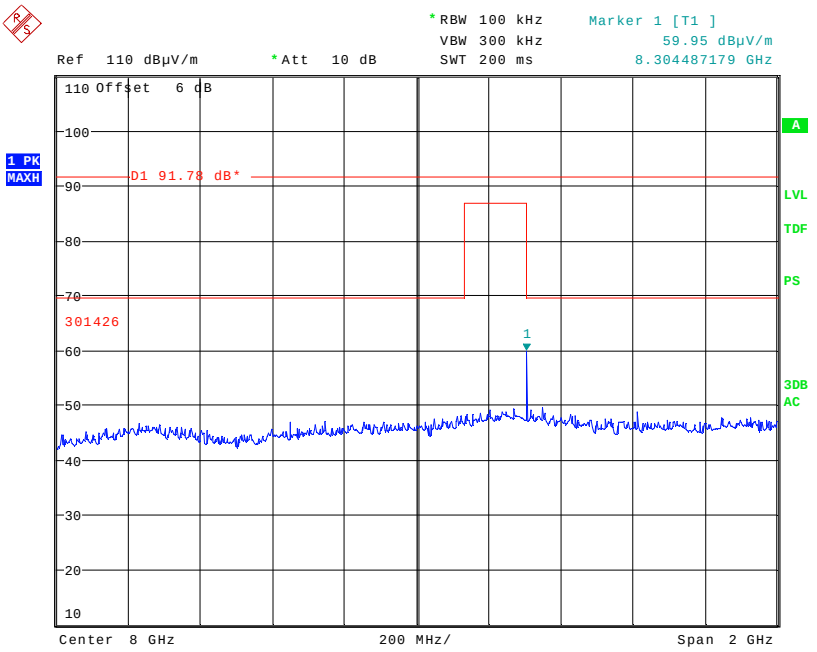
5GHz – 7GHz



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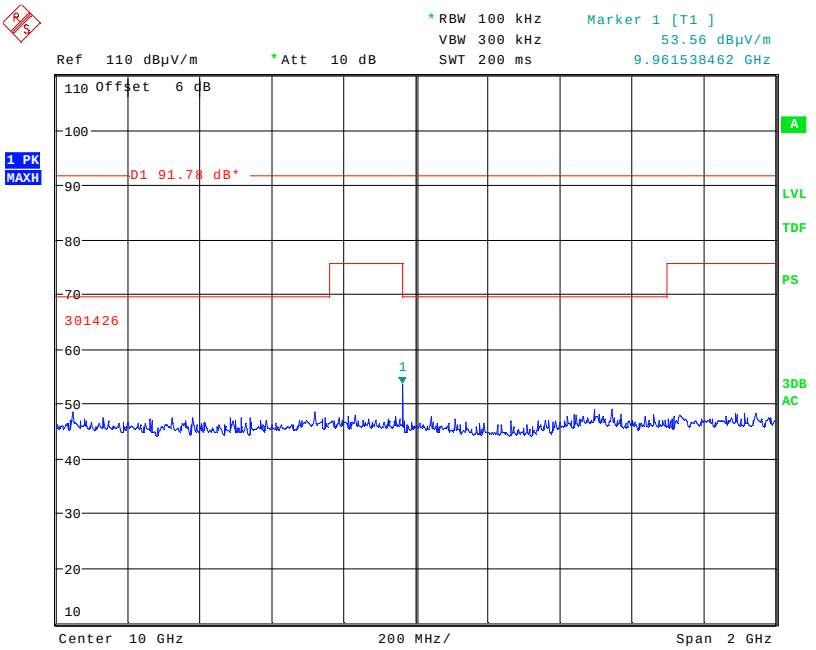
7GHz – 9GHz



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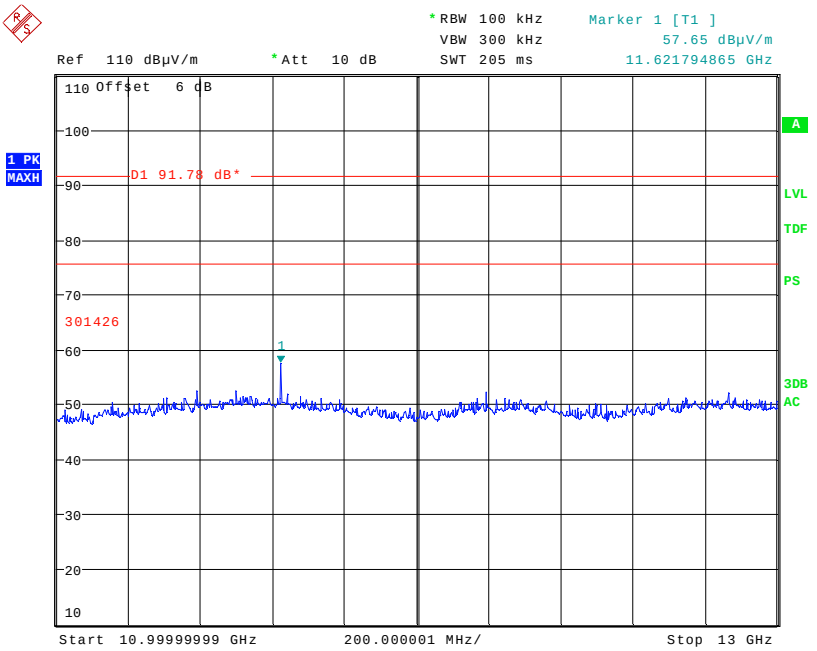
9GHz – 11GHz



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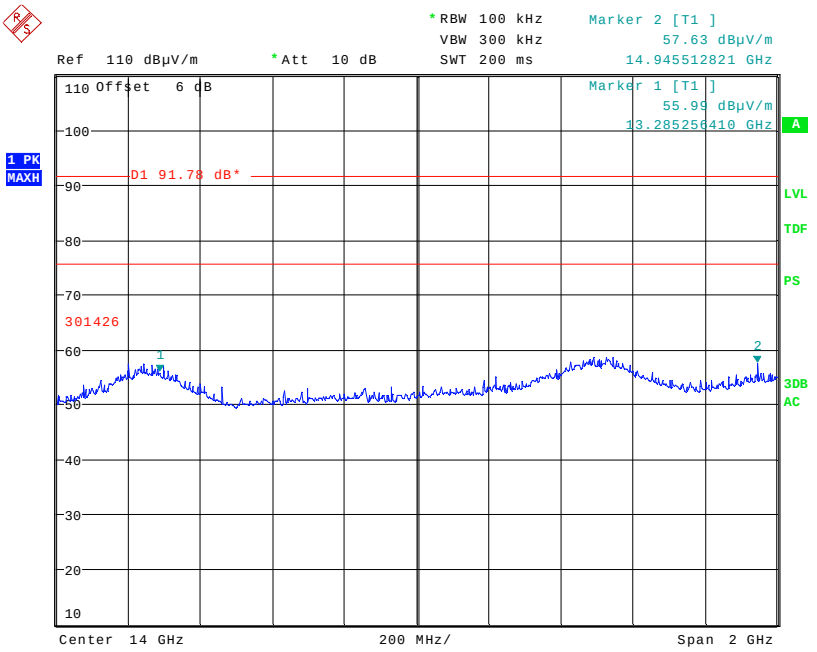
11GHz – 13GHz



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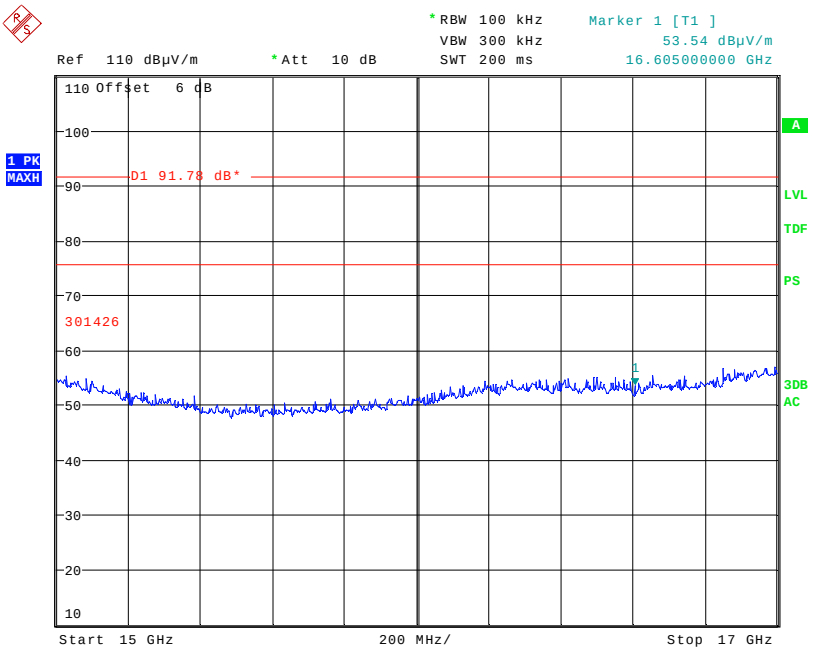
13GHz – 15GHz



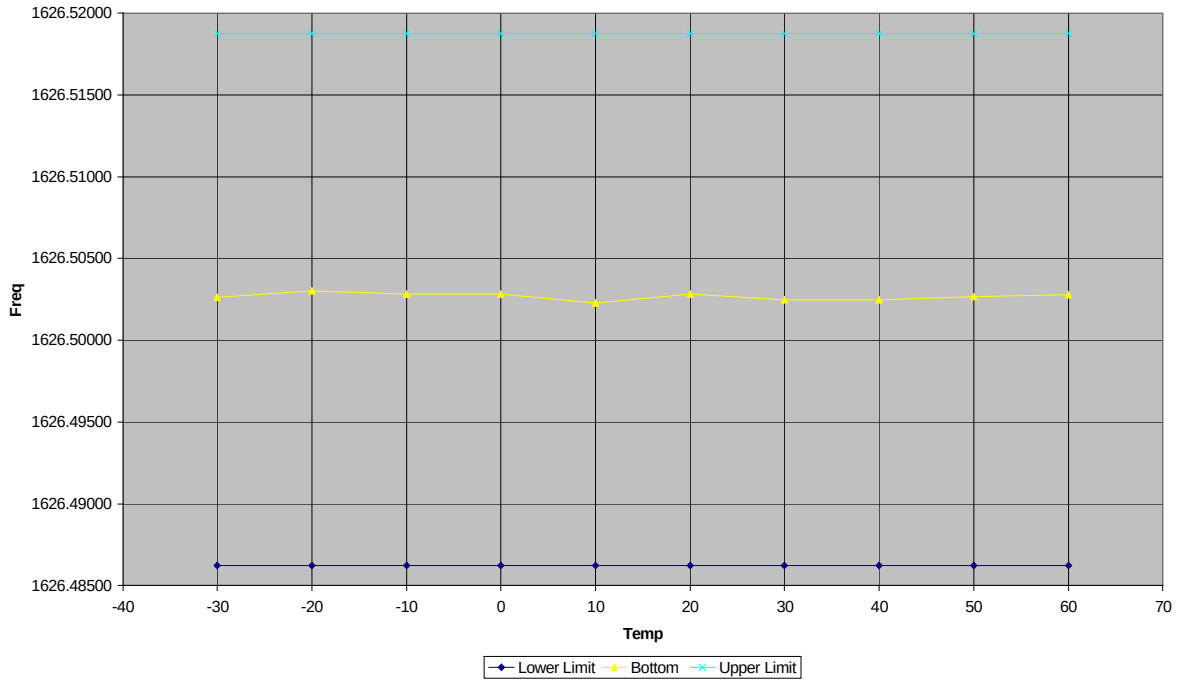
Date: 14.JAN.2010 12:02:57

15GHz – 17GHz

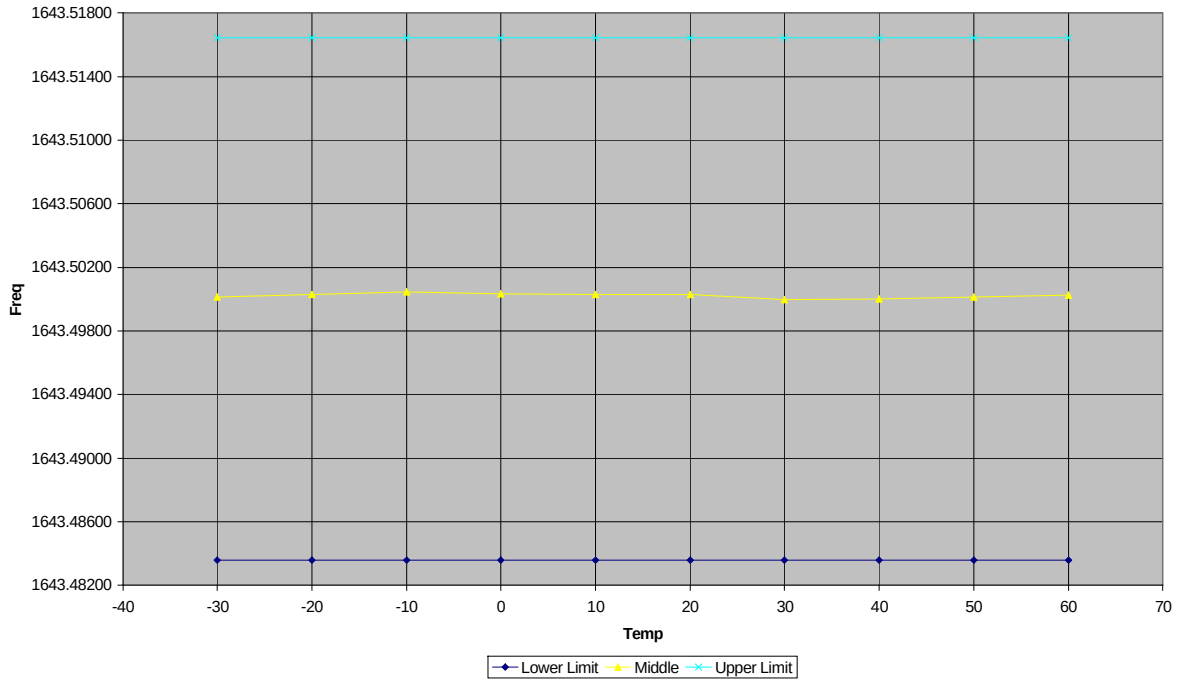
ANNEX H

FREQUENCY STABILITY – Temperature

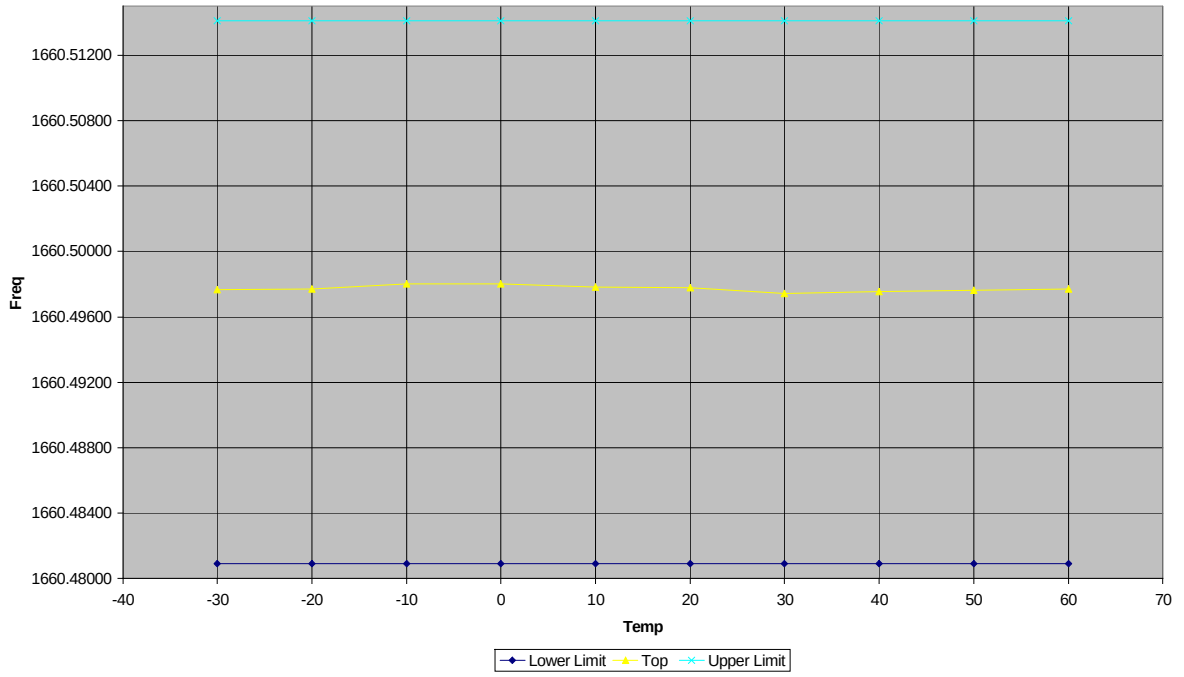
Channel 6001 Frequency Stability - Temperature



Channel 12800 Frequency Stability - Temperature

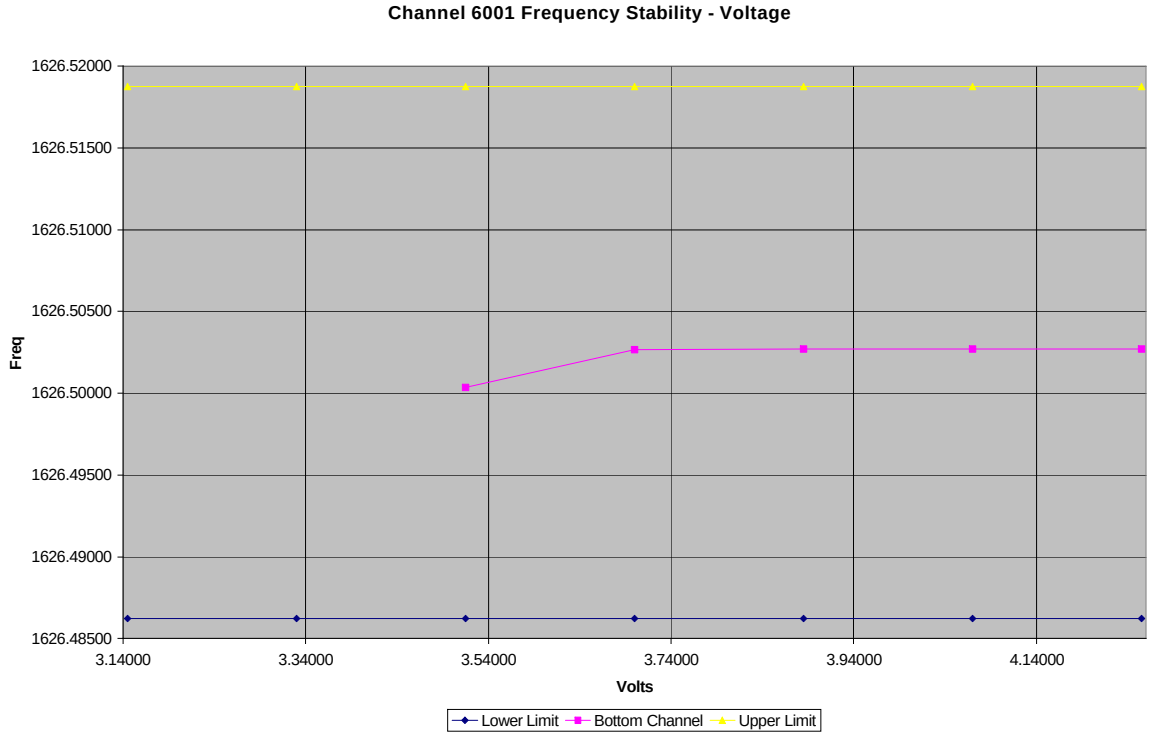


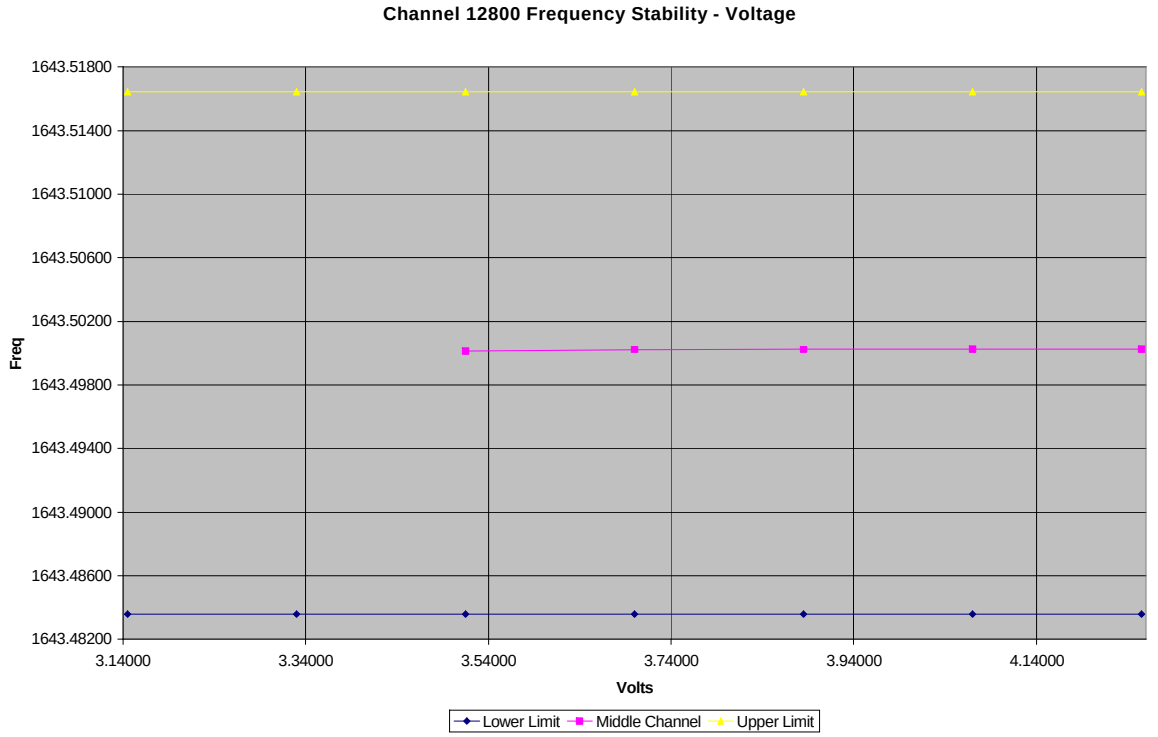
Channel 19599 Frequency Stability - Temperature

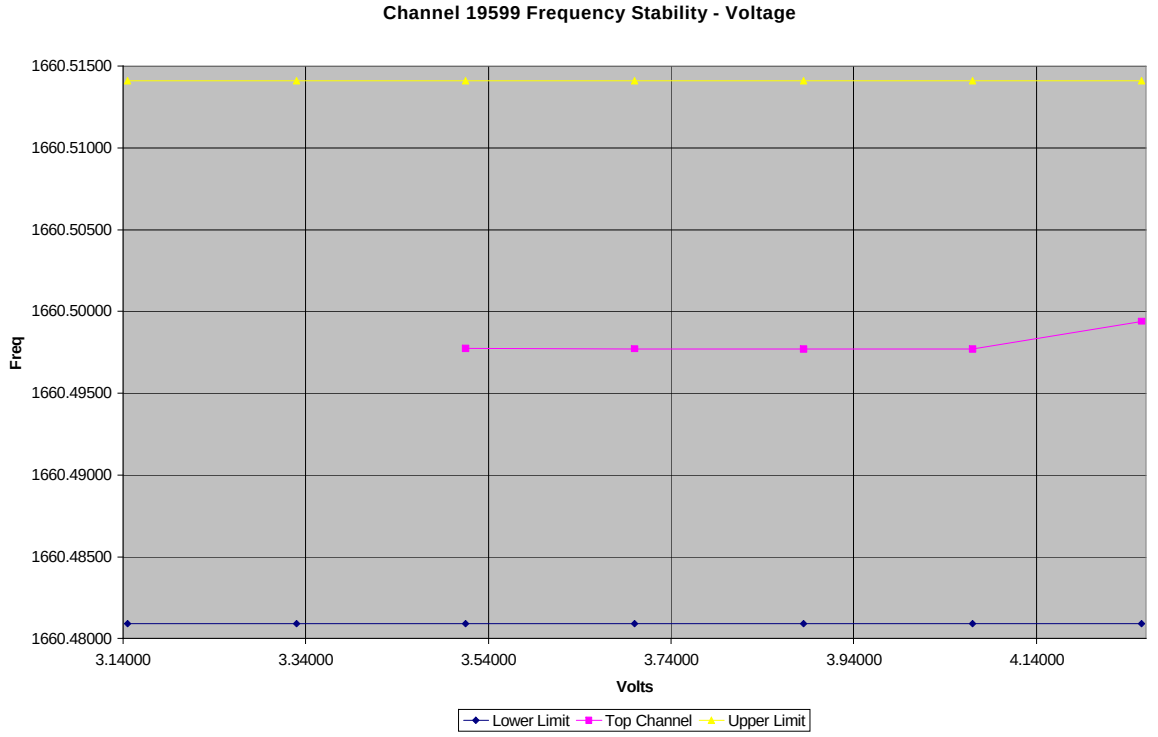


ANNEX I

FREQUENCY STABILITY – Voltage

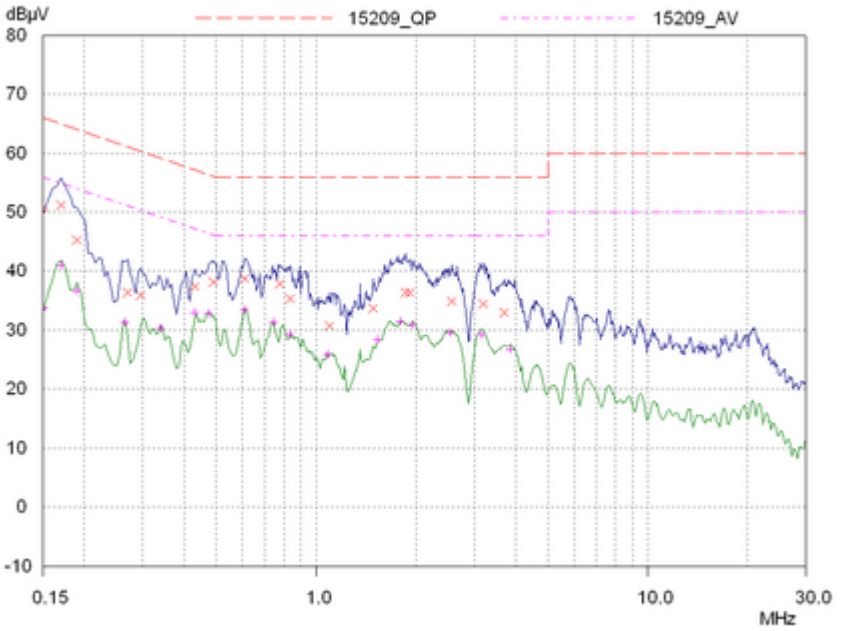

Channel 6001 Frequency Stability - Voltage
1626.52000
1626.51500
1626.51000
1626.50500
1626.50000
1626.49500
1626.49000
1626.48500
Freq
3.14000
3.34000
3.54000
3.74000
3.94000
4.14000
Volts
Lower Limit
Bottom Channel
Upper Limit


Channel 12800 Frequency Stability - Voltage
1643.51800
1643.51400
1643.51000
1643.50600
1643.50200
1643.49800
1643.49400
1643.49000
1643.48600
1643.48200
Freq
3.14000
3.34000
3.54000
3.74000
3.94000
4.14000
Volts
Lower Limit
Middle Channel
Upper Limit

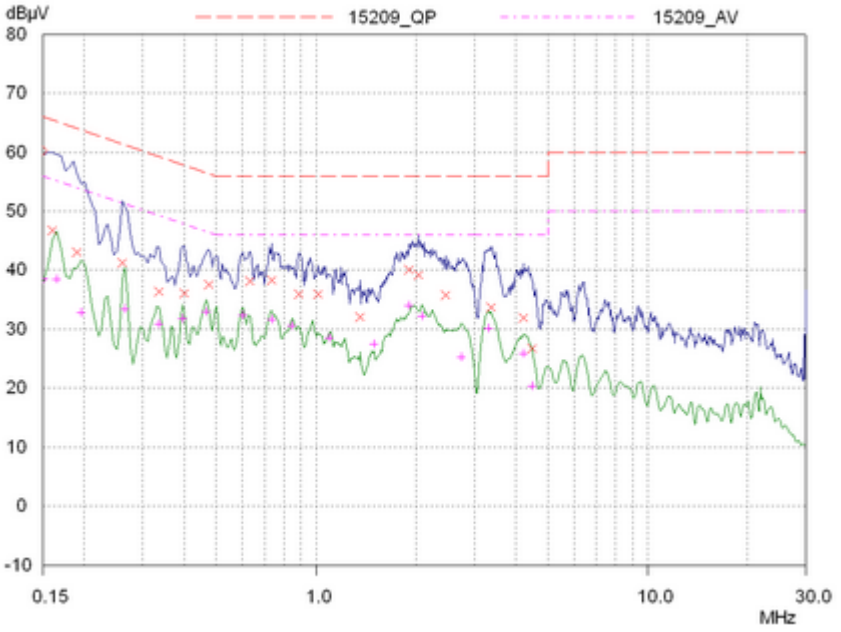

Channel 19599 Frequency Stability - Voltage
1660.51500
1660.51000
1660.50500
1660.50000
1660.49500
1660.49000
1660.48500
1660.48000
Freq
3.14000
3.34000
3.54000
3.74000
3.94000
4.14000
Volts
Lower Limit
Top Channel
Upper Limit

ANNEX J

AC POWERLINE CONDUCTION



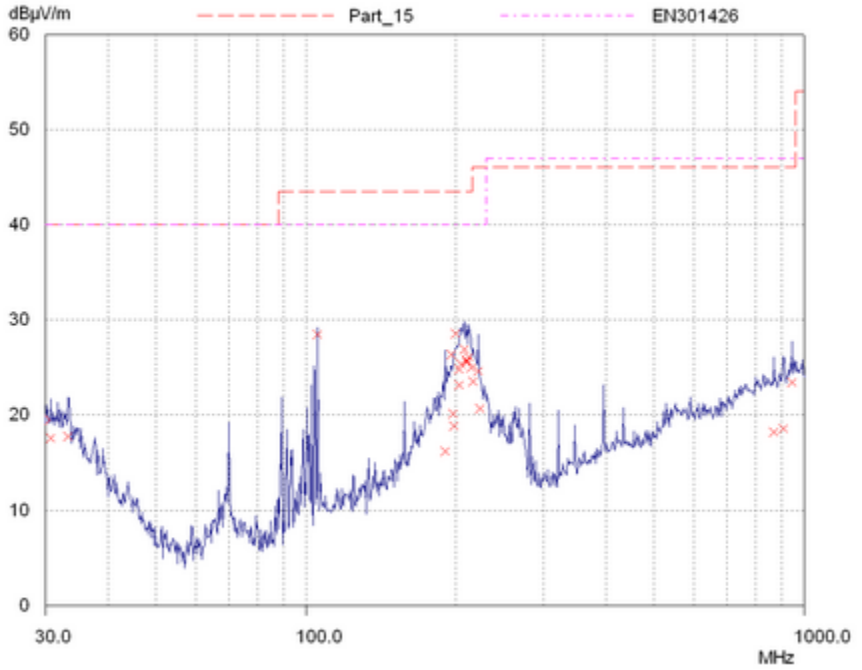
Receive Mode



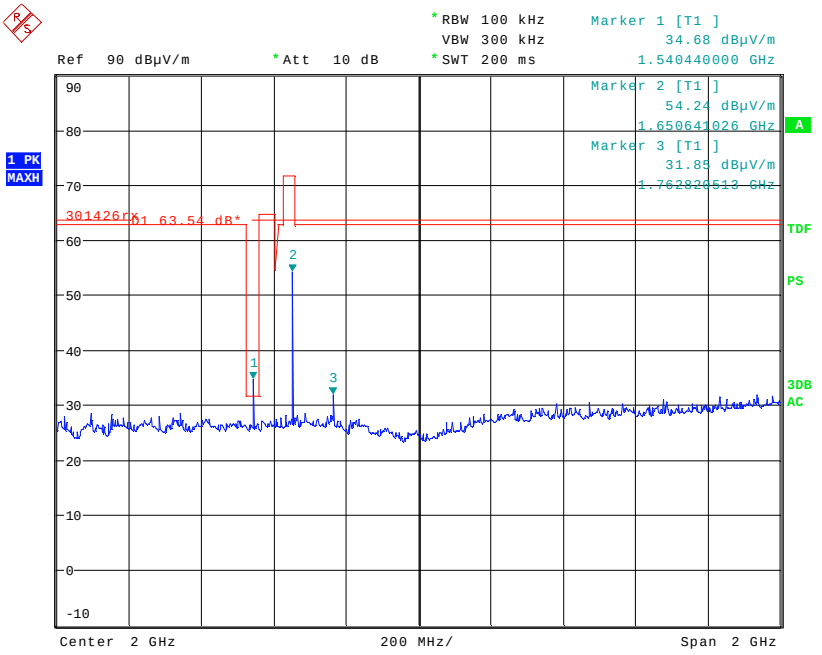
Transmit Mode

ANNEX K

UNINTENTIONAL TRANSMITTER SPURIOUS EMISSIONS – Radiated

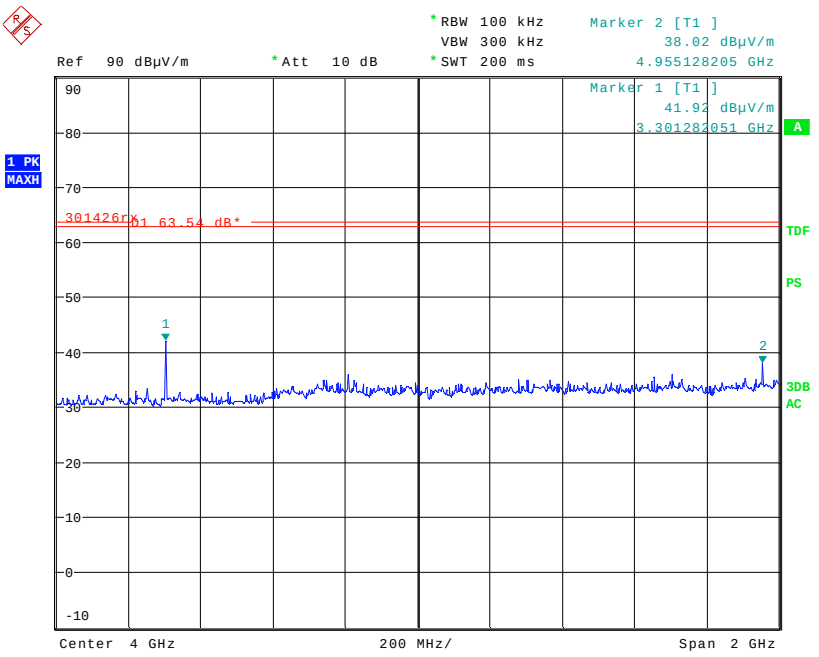


30MHz – 1000MHz



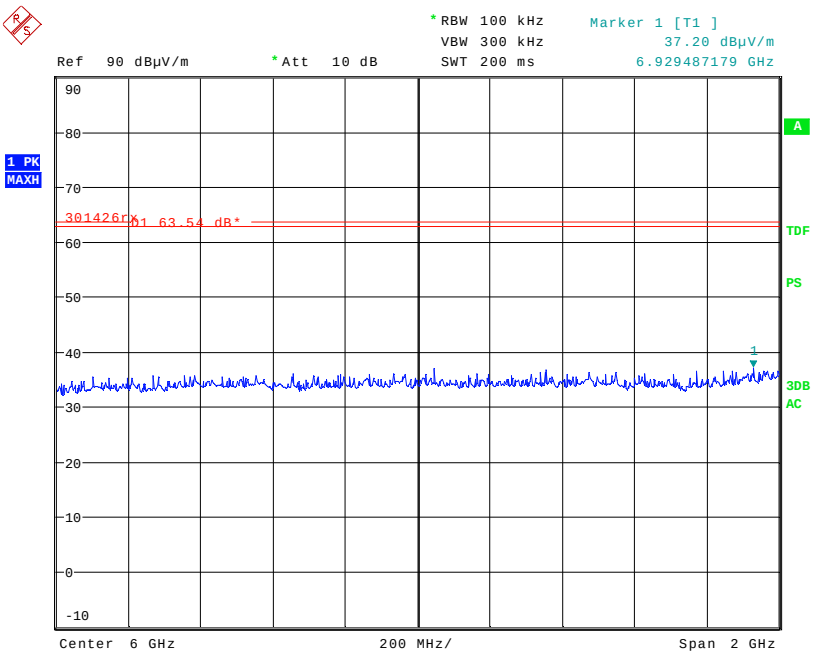
Date: 14.JAN.2010 16:35:33

1GHz – 3GHz



Date: 14.JAN.2010 16:36:28

3GHz – 5GHz



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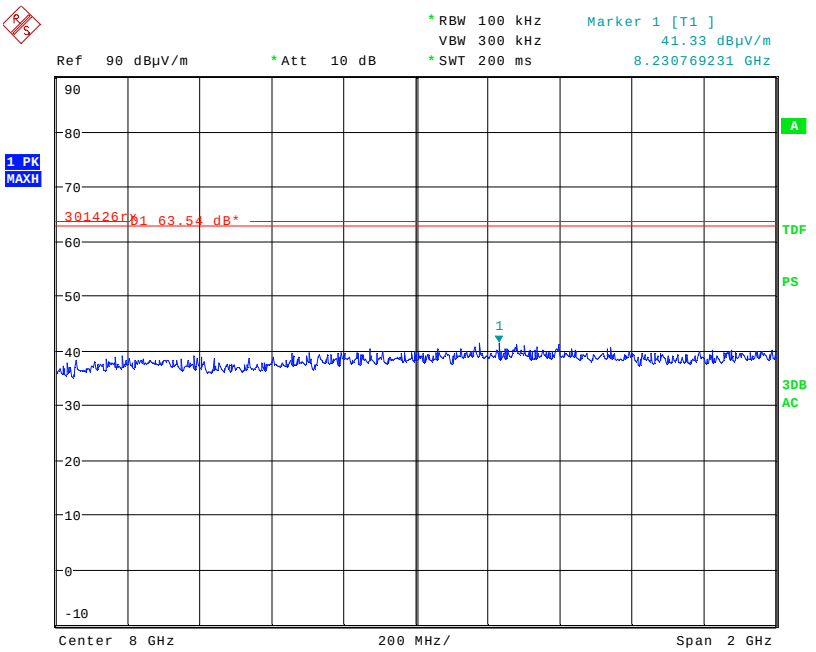
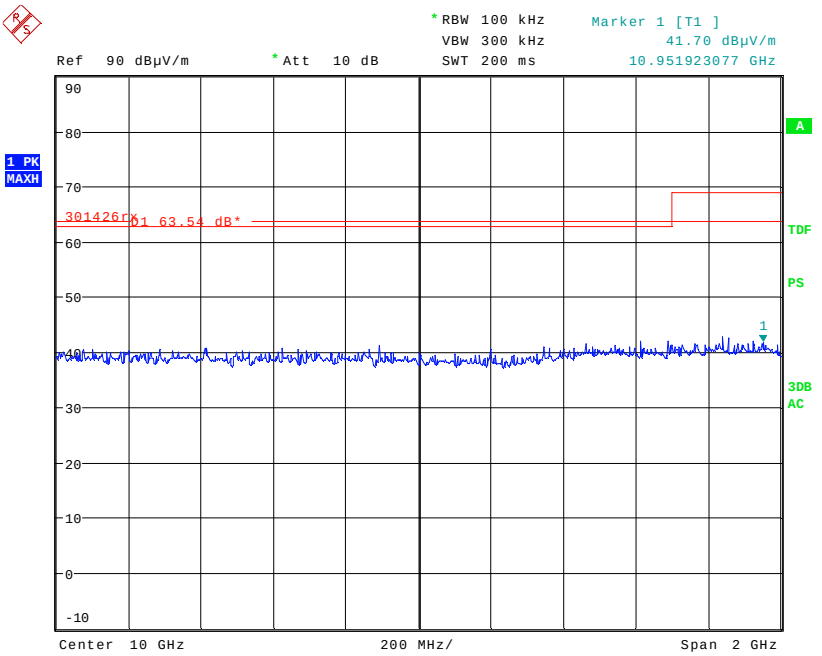
5GHz – 7GHz



Date: 14.JAN.2010 16:36:53

7GHz – 9GHz



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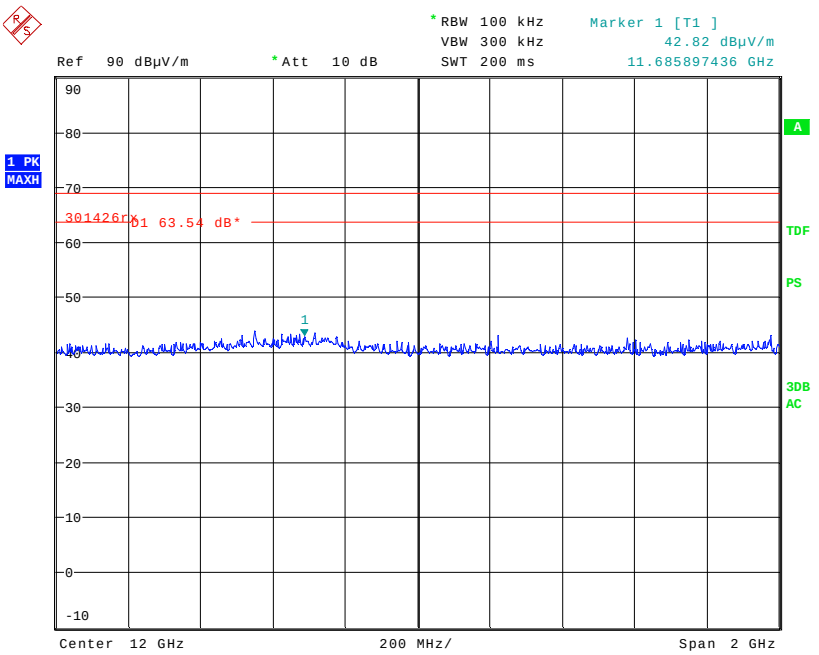
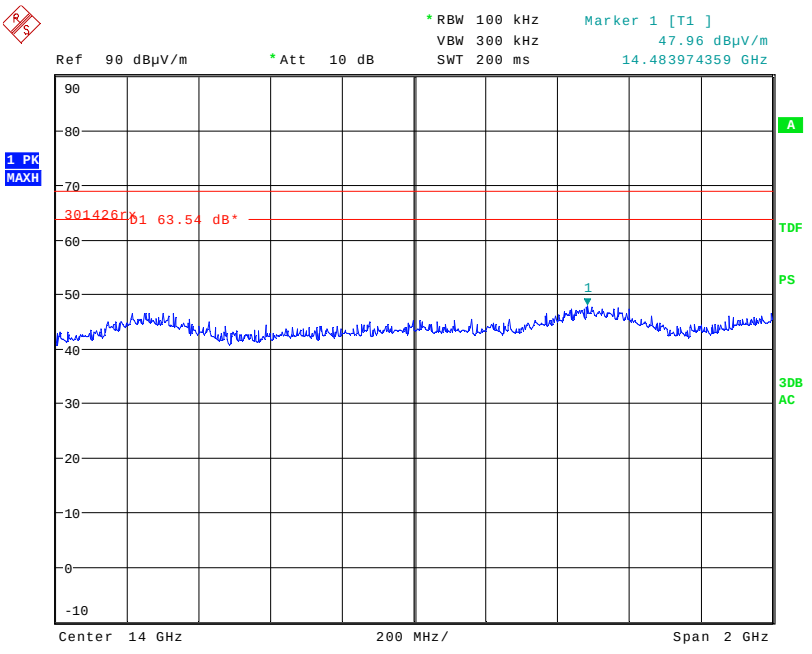
9GHz – 11GHz



Date: 14.JAN.2010 16:37:26

11GHz – 13GHz



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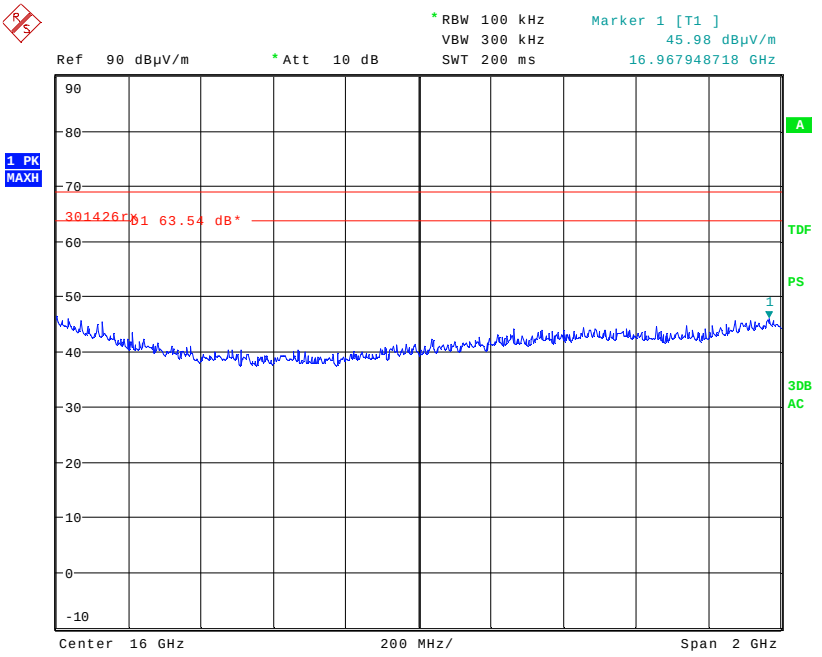
13GHz – 15GHz



Date: 14.JAN.2010 16:46:30

15GHz – 17GHz