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FCC–Identification Number
TCB ID: DE0001



Accredited by the
German Accreditation Council
DAR–Registration Number
DGA-PL-176/94-D1



Accredited Bluetooth® Test Facility [BQTF]

Test report No. 1-2258-01-02/10-A
Applicant: Becker Flugfunkwerk GmbH
AR6201-(000)
FCC Part 87

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1 General information

1.1 Notes

The test result of this test report relate exclusively to the test item specified in 1.5 .

CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test result with regard to other specimens or samples of the type of the equipment represented by the test item.

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Test Laboratory Manager :

2011-01-11

Date

Meheza Walla

Name



Signature

Technical responsibility for area of testing :

2011-01-11

Date

Karsten Geraldly

Name



Signature



1.2 Testing laboratory

CETECOM ICT Services GmbH
Untertürkheimerstraße 6–10
66117 Saarbrücken
Germany

CETECOM ICT Services GmbH
P.O. – Box 10 04 45
66004 Saarbrücken
Germany

Telephone : + 49 [0] 681 598–0
Telefax : + 49 [0] 681 598–9075

State of accreditation:

The test laboratory is accredited according to DIN EN ISO/IEC 17025.

DAR-registration number: DGA-PL-176/94-D1

Testing location, if different from 1.2 : Not applicable

1.3 Details of applicant

Name : Becker Flugfunkwerk GmbH
Street : Baden Airpark Gebäude B 108
Town : 77836 Rheinmünster
Country : Germany
Phone : +49 (0) 7229 305 0
Fax : +49 (0) 7229 305 269

Contact person

Name : Detlev Töpler
Phone : +49 (0) 7229 305 192
Fax : +49 (0) 7229 305 269
E-Mail : Toepler@becker-avionics.de

1.4 Application details

Date of receipt of application : 2010-05-05
Date of receipt of test item : 2010-05-18
Date of test : 2010-05-18 to 2010-05-19
Person[s] who have been present during the test : Mr. Töpler

1.5 Test item [EUT]

Description	:	VHF – Transceiver for voice communication Aircraft Station
Type designation	:	AR6201-(000)
Manufacturer	:	Becker Flugfunkwerk GmbH Baden Airpark Gebäude B 108 77836 Rheinmünster Germany

Technical data

Frequency range	:	118.000 MHz – 136.975 MHz
Test operation frequency	:	118.000 MHz; 127.500 MHz; 136.795 MHz
Channel spacing	:	8.33 kHz / 25 kHz
Number of channels	:	2256 / 759
Modulation depth max.	:	78.0 %
Type of modulation	:	AM
Emission designator	:	5K60A3E / 6K00A3E
Output Power (conducted)	:	42.9 dBm = 19.5 W
Power supply	:	12.0 V DC; 28.0 V DC

1.5.1 Operation conditions	:	Normal and extreme temperature Normal and extreme voltage
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1.5.2 Equipment under test

P/N	:	AR6201-(000)
S/N	:	0026

1.6 Test standards

FCC Section(s)	Test Requirements
2.1046 & 87.131	RF Power Output
2.1047(a) & 87.141(f)	Modulation Characteristics - Audio Frequency Response of Lowpass Filter
2.1047(b) & 87.141(a)	Modulation Characteristics - Modulation Limiting
2.1049 & 87.135	Occupied Bandwidth
2.1051 & 87.139(a)	Emission Mask
2.1051 & 87.139(a)	Spurious Emissions at Antenna Terminal
2.1053 & 87.139(a)	Field Strength of Spurious Emissions
2.1055 & 87.133(5)	Frequency Stability

2 Technical test

2.1 Summary of test result

- ☒ No deviations from the technical specification[s] were ascertained in the course of the performed tests.
- ☐ The deviations as specified in 2.5 were ascertained in the course of the performed tests.

This test report :

- ☒ describes the first test
- ☐ describes an additional test
- ☐ is a verification of documents
- ☐ is only valid with the test report no.:

2.2 Test environment

Extreme environmental conditions are documented especially for each test.

Normal conditions : Temperature 23.0 °C
 Humidity 50.0 %

2.3 Measurement uncertainties

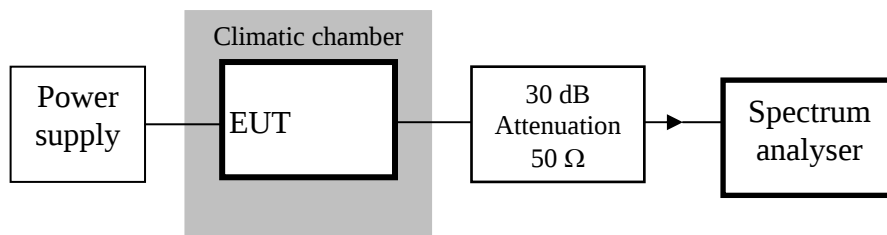
Power	± 1.9 dB
Frequency	± 0.01ppm
Spectrum masks	± 1.9 dB
Spurious emissions	± 1.9 dB

2.4 Test equipment utilized and test set-up

2.4.1 Transmitter tests for conducted measurement

Transmitter tests

Set-up 1 for conducted measurements



Test-RX for EUT transmitter tests:

Test equipment	Manufacturer	Type	Serial No.
Spectrum analyser	Agilent	MXA	US46220229
30 dB attenuation	HP	HP 8498A	1801A02445
Power supply	HP	HP 6032A	2848A07227
Climatic chamber	CTS	T40/50	064023
RF-cable	Huber & Suhner	diverse	-/-

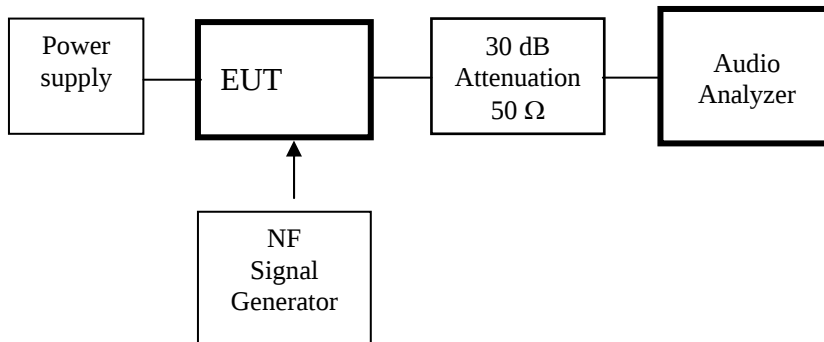
Measurement uncertainties

Performance	Uncertainty
Input power (DC)	±0.1 V
Temperature	±0.2 °C
Frequency	±0.01 ppm
RF-power	±1.9 dB

Test equipment and test set-up

Transmitter tests

Set-up 2 for conducted intermodulation measurements



Test equipment for EUT transmitter tests:

Test equipment	Manufacturer	Type	Serial No.
Audio Analyser	Rohde & Schwarz	CMTA	834 0000 54
NF Signal generator	Rohde & Schwarz	CMTA	834 0000 54
Power supply	HP	HP 6032A	2848A07227
RF-cable	HP	5061-5359	P36303

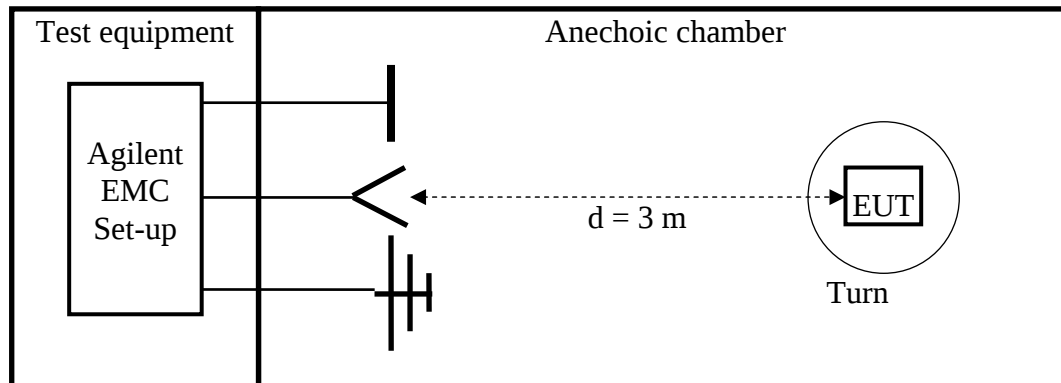
Measurement uncertainties

Performance	Uncertainty
Input power (DC)	±0.1 V
Temperature	±0.2 °C
Frequency	±0.01 ppm
RF-power	±1.9 dB

Test equipment and test set-up

Transmitter tests

Set-up 3 for radiated measurements



No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Anechoic chamber	MWB	87400/02	300000996	Monthly verification		
2	System-Rack 85900	HP I.V.	*	300000222	n.a.		
3	Measurement System 1						
4	PSA-Spektrumanalysator 3 Hz - 26.5 GHz (E4440A)	Agilent	MY48250080	300003812	05.08.2008	24	05.08.2010
5	EMI Preselector 9 kHz - 1 GHz (N9039A)	Agilent	MY48260003	300003825	19.08.2008	24	19.08.2010
6	Microwave Analog Signal Generator (N5183A)	Agilent	MY47420220	300003813	06.08.2008	24	06.08.2010
7	PC	F+W			n.a.		
8	TILE	TILE			n.a.		
9	TRILOG Super Broadband Antenna (VULB9163)	Schwarzbeck	371	300003854	Monthly verification (System cal.)		
10	Double Ridged Antenna 3115	EMCO	3088	300001032	Monthly verification (System cal.)		
11	Active Loop Antenna 6502	EMCO	2210	300001015	Monthly verification (System cal.)		
12	Switch / Control Unit 3488A	HP	2719A15013	300001156	n.a.		
13	Power Supply 6032A	HP	2818A03450	300001040	08.01.2009	36	08.01.2012
14	Busisolator	Kontron		300001056	n.a.		
15	Leitungsteiler 11850C	HP		300000997	Monthly verification (System cal.)		
16	Power attenuator 8325	Byrd	1530	300001595	Monthly verification (System cal.)		
17	Band reject filter WRCG1855/1910	Wainwright	7	300003350	Monthly verification (System cal.)		
18	Band reject filter WRCG2400/2483	Wainwright	11	300003351	Monthly verification (System cal.)		
19	Hochpassfilter WHK1.1/15G-10SS	Wainwright	3	300003255	Monthly verification (System cal.)		
20	Hochpassfilter WHKX2.9/18G-12SS	Wainwright	1	300003492	Monthly verification (System cal.)		
21	Hochpassfilter WHKX7.0/18G-8SS	Wainwright	18	300003789	Monthly verification (System cal.)		
22	Switch / Control Unit 3488A	HP	2605e08770	300001443	n.a.		
23	Trenntrafo RT5A	Grundig	9242	300001263	n.a.		
24	Relais Matrix PSU	R&S	890167/024	300001168	n.a.		
25	Netznachbildung ESH3-Z5	R&S	828576/020	300001210	n.a.		

2.5 Test result

2.5.1 Test result overview Transmitter

FCC Section(s)	Test Requirements	Applicability (Yes/No)
2.1046 & 87.131	RF Power Output	Yes
2.1047(a) & 87.141(f)	Modulation Characteristics - Audio Frequency Response of Lowpass Filter	Yes
2.1047(b) & 87.141(a)	Modulation Characteristics - Modulation Limiting	Yes
2.1049 & 87.135	Occupied Bandwidth	Yes
2.1051 & 87.139(a)	Emission Mask	Yes
2.1051 & 87.139(a)	Spurious Emissions at Antenna Terminal	Yes
2.1053 & 87.139(a)	Field Strength of Spurious Emissions	Yes
2.1055 & 87.133(5)	Frequency Stability	Yes

RF Power Output

§ 2.1046 & 87.131

Test conditions: TX frequencies f = 118.000 / 127.500 / 136.975 MHz
Modulation m = Modulation on
Normal power supply U DC = 12.0 V
Extreme power supply U DC = 28.0 V
Normal temperature t n = 23.0 °C
Extreme temperature t min = -20.0 °C
Extreme temperature t max = 55.0 °C
Test set-up: 1

FCC Limit § 2.1046 & 87.131: 55 W (Aircraft (Communication), VHF, A3E)

Test result

TX-frequency (MHz)	Temperature (°C)	Output power p (dBm)
118.000 000	-20°C	42.9
118.000 000	+23°C	42.2
118.000 000	+55°C	41.8
127.500 000	-20°C	42.2
127.500 000	+23°C	41.9
127.500 000	+55°C	42.1
136.975 000	-20°C	42.0
136.975 000	+23°C	41.8
136.975 000	+55°C	42.1

Modulation Characteristics

§ 2.1047(a) & 87.141(f)

Test conditions: TX frequencies f = 118.000 / 127.500 / 136.975 MHz
Modulation frequency f_m = 1 000 Hz
Modulation depth m = 76.0 %
Normal power supply U_{DC} = 12.0 V
Normal temperature t_n = 23.0 °C
Test set-up: 1

FCC Limit § 2.1047(a) & 87.141(f)

Test result

Frequency (kHz)	Attenuation wrt. 1 kHz (dB)	Recommended Attenuation (dB)
	(dB)	(dB)
0.1	- 19.2	--
0.2	- 11.7	--
0.4	- 6.1	--
0.6	- 2.3	--
0.8	- 0.3	--
1.0	± 0	--
1.5	- 1.4	--
2.0	- 3.0	--
2.5	- 5.7	--
3.0	- 55.2	0
3.5	< -70.0	-3
4.0	< -70.0	-5
4.5	< -70.0	-7
5.0	< -70.0	-9
6.0	< -70.0	-12
7.0	< -70.0	-15
8.0	< -70.0	-17
9.0	< -70.0	-19
10.0	< -70.0	-21
12.0	< -70.0	-24
14.0	< -70.0	-27
16.0	< -70.0	-28
18.0	< -70.0	-28
20.0	< -70.0	-28
25.0	< -70.0	-28
30.0	< -70.0	-28
35.0	< -70.0	-28
40.0	< -70.0	-28
45.0	< -70.0	-28
50.0	< -70.0	-28

Modulation Characteristics

§ 2.1047(b) & 87.141(a)

Test conditions: TX frequencies f = 118.000 / 127.500 / 136.975 MHz
Normal power supply U DC = 12.0 V
Normal temperature t n = 23.0 °C
Test set-up: 2

FCC Limit § 2.1047(b) & 87.141(a): 100%

Test result

MODULATING SIGNAL LEVEL	Modulation (%) at following modulating frequencies					MODULATION LIMIT (%)
(mV rms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(%)
1	3.1	9.1	9.0	0.3	0.3	100
2	4.3	16.6	16.0	0.3	0.3	100
3	5.6	24.0	23.0	0.3	0.3	100
4	6.8	31.3	30.0	0.3	0.3	100
5	8.1	38.8	37.0	0.3	0.3	100
6	9.5	46.0	43.8	0.3	0.3	100
7	10.7	53.0	50.7	0.3	0.3	100
8	11.9	60.4	57.6	0.3	0.3	100
9	13.2	67.4	64.4	0.3	0.3	100
10	14.6	75.2	72.0	0.3	0.3	100
15	15.8	77.9	76.0	0.3	0.3	100
20	15.5	76.9	75.0	0.3	0.3	100
50	14.5	77.0	75.0	0.3	0.3	100
100	14.4	76.2	74.3	0.3	0.3	100
200	14.4	75.9	74.0	0.3	0.3	100
500	26.4	65.0	73.1	0.3	0.3	100
1000	30.0	64.1	72.0	0.3	0.3	100

Test result Mod input – 120mV (20 dB over normal)

MODULATING FREQUENCY (KHz)	MODULATION (%)	MODULATION LIMIT (%)
0.1	14.6	100
0.2	42.8	100
0.4	76.2	100
0.6	77.9	100
0.8	77.1	100
1.0	75.2	100
1.2	73.9	100
1.4	70.2	100
1.6	66.0	100
1.8	63.8	100
2.0	60.3	100
2.5	45.2	100
3.0	0.3	100
3.5	0.3	100
4.0	0.3	100
4.5	0.3	100
5.0	0.3	100
6.0	0.3	100
7.0	0.3	100
8.0	0.3	100
9.0	0.3	100
10.0	0.3	100

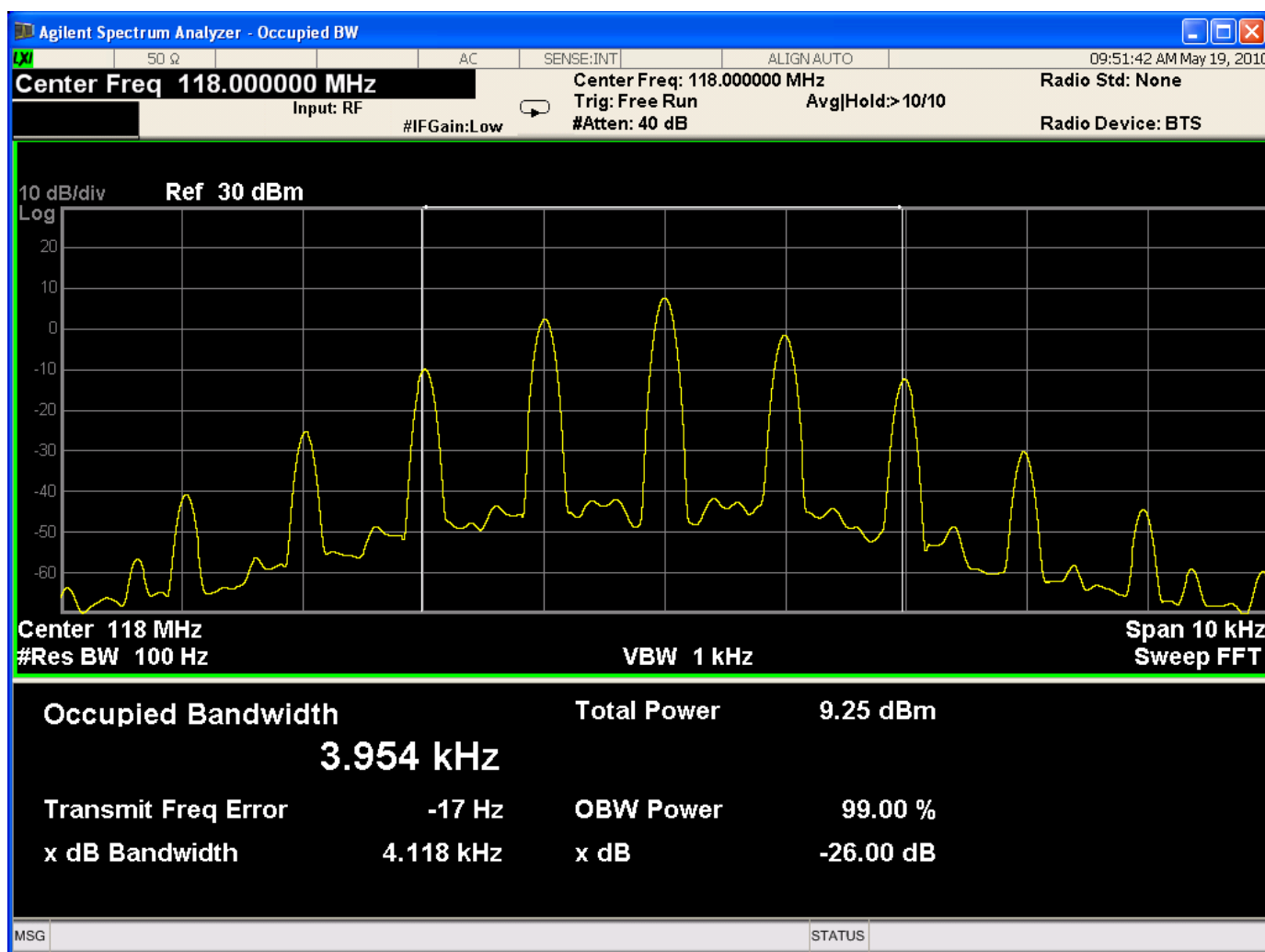
Occupied Bandwidth

§ 2.1049 & 87.135

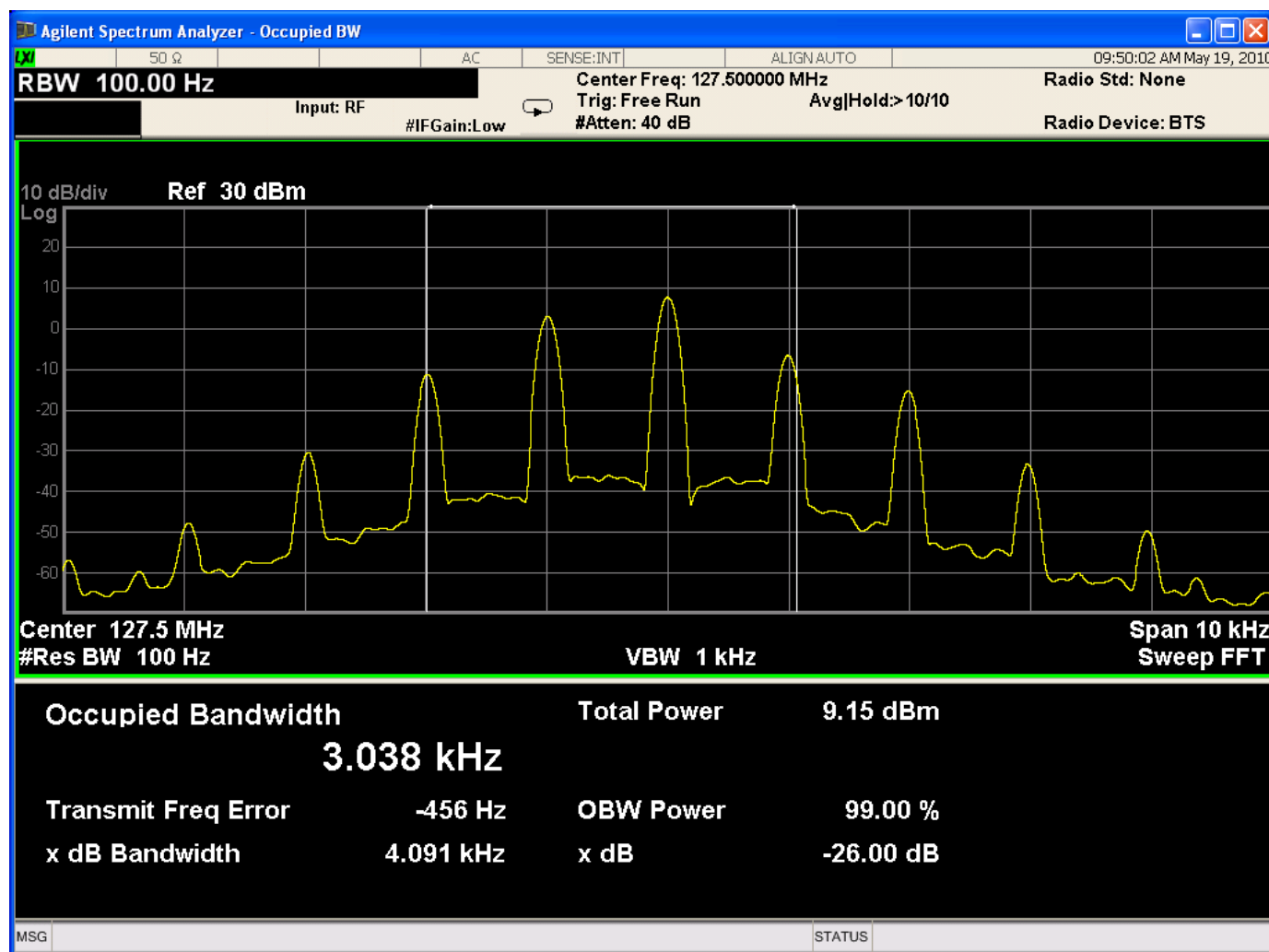
Test conditions:	TX frequencies	f	=	118.000 / 127.500 / 136.975 MHz
	Modulation frequency	f m	=	1000 Hz
	Modulation depth	m	=	75 %
	Normal power supply	U AC	=	12.0 V
	Normal temperature	t n	=	23.0 °C
	Test set-up:	1		

FCC Limit § 2.1049 & 87.135: 99% bandwidth

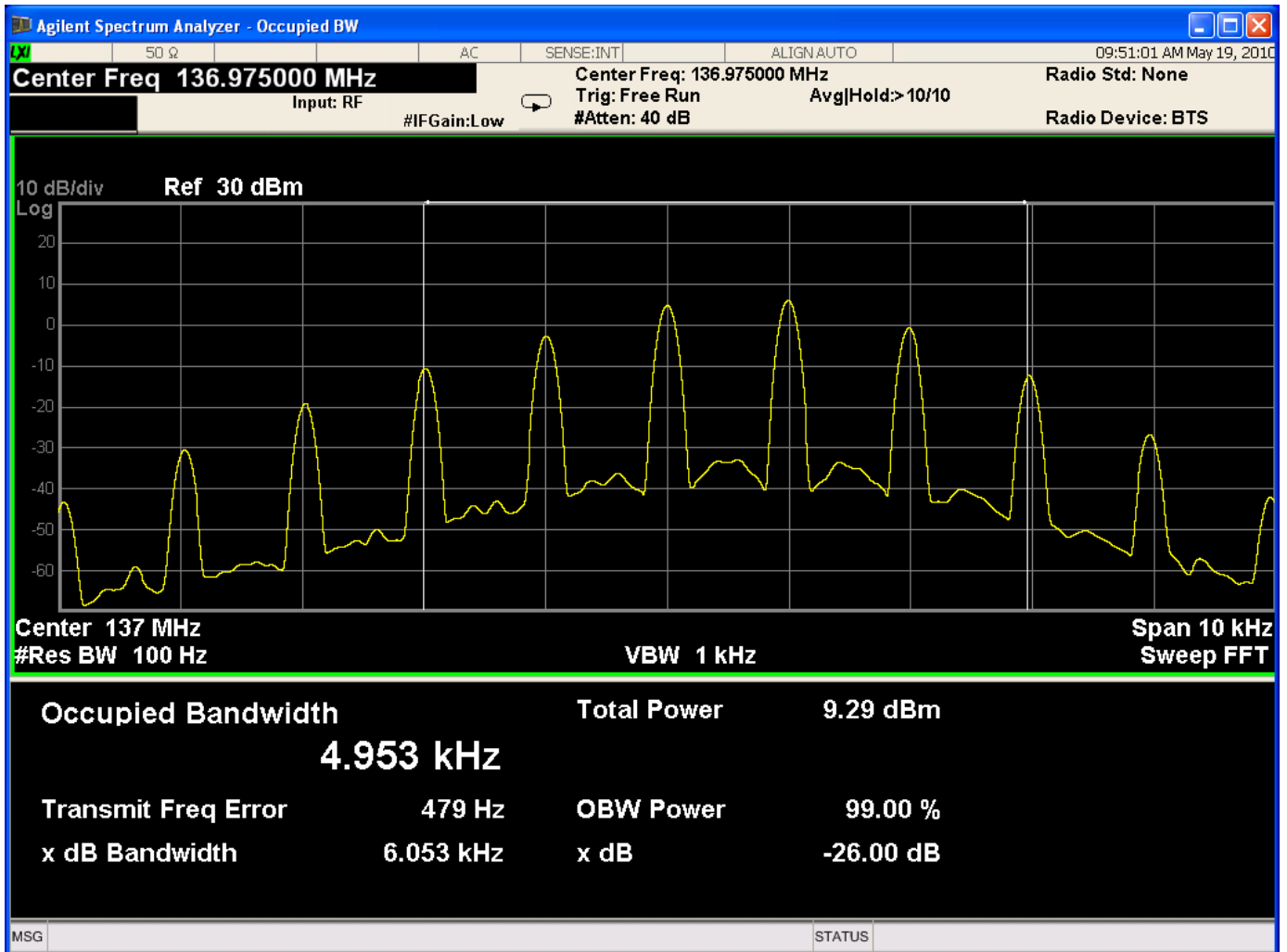
Plot 1: 118 MHz



Plot 2: 127.5 MHz



Plot 3: 136.975 MHz



Frequency (MHz)	OBW (kHz)	Result
118.000	3.954	Pass
127.500	3.038	Pass
136.975	4.953	Pass

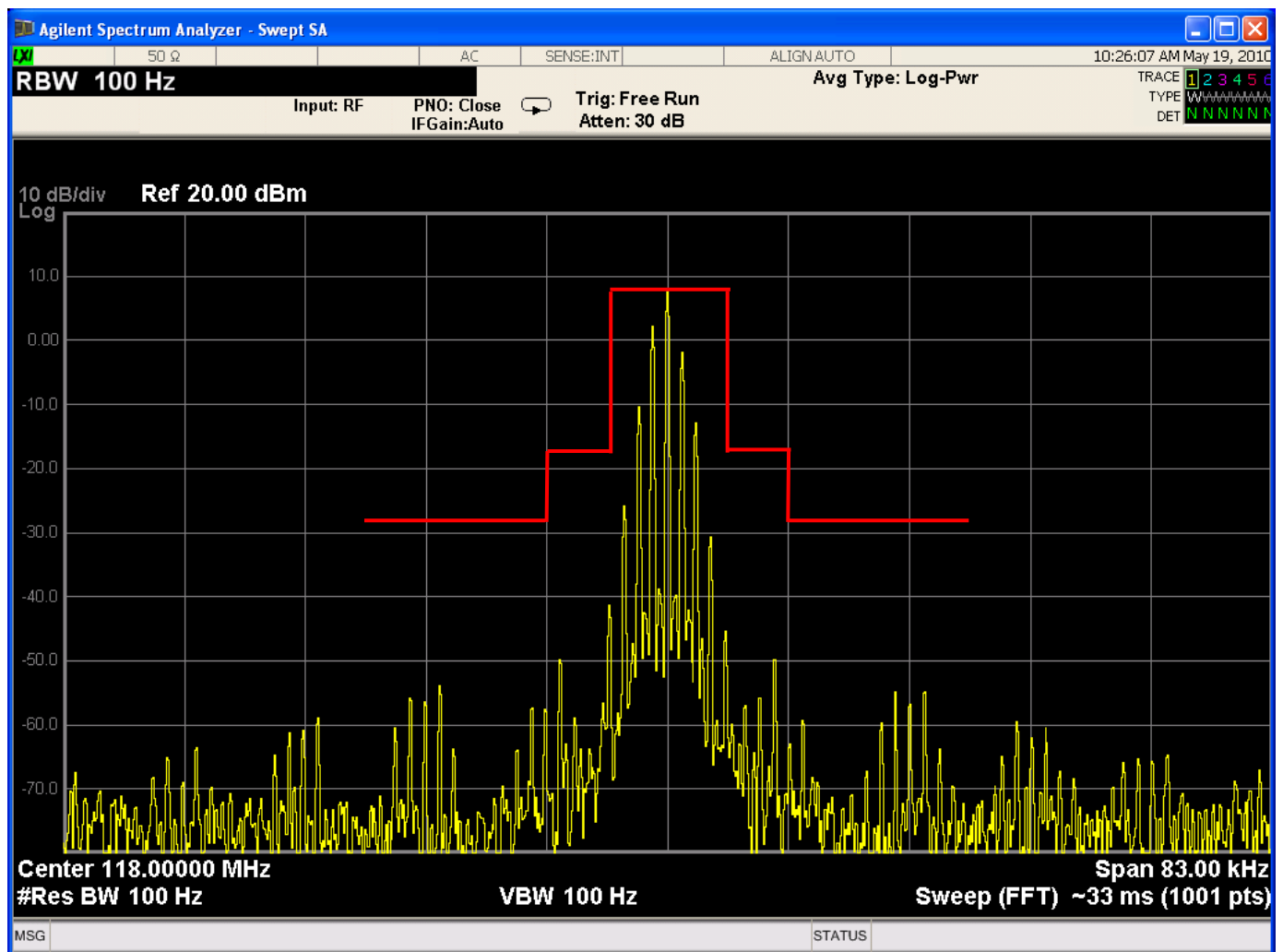
Emission Mask

§ 2.1051 & 87.139(a)

Test conditions:	TX frequencies	f	=	118.000 / 127.500 / 136.975 MHz
	Modulation frequency	f m	=	1000 Hz
	Modulation depth	m	=	75 %
	Normal power supply	U AC	=	12.0 V
	Normal temperature	t n	=	23.0 °C
	Test set-up:	1		

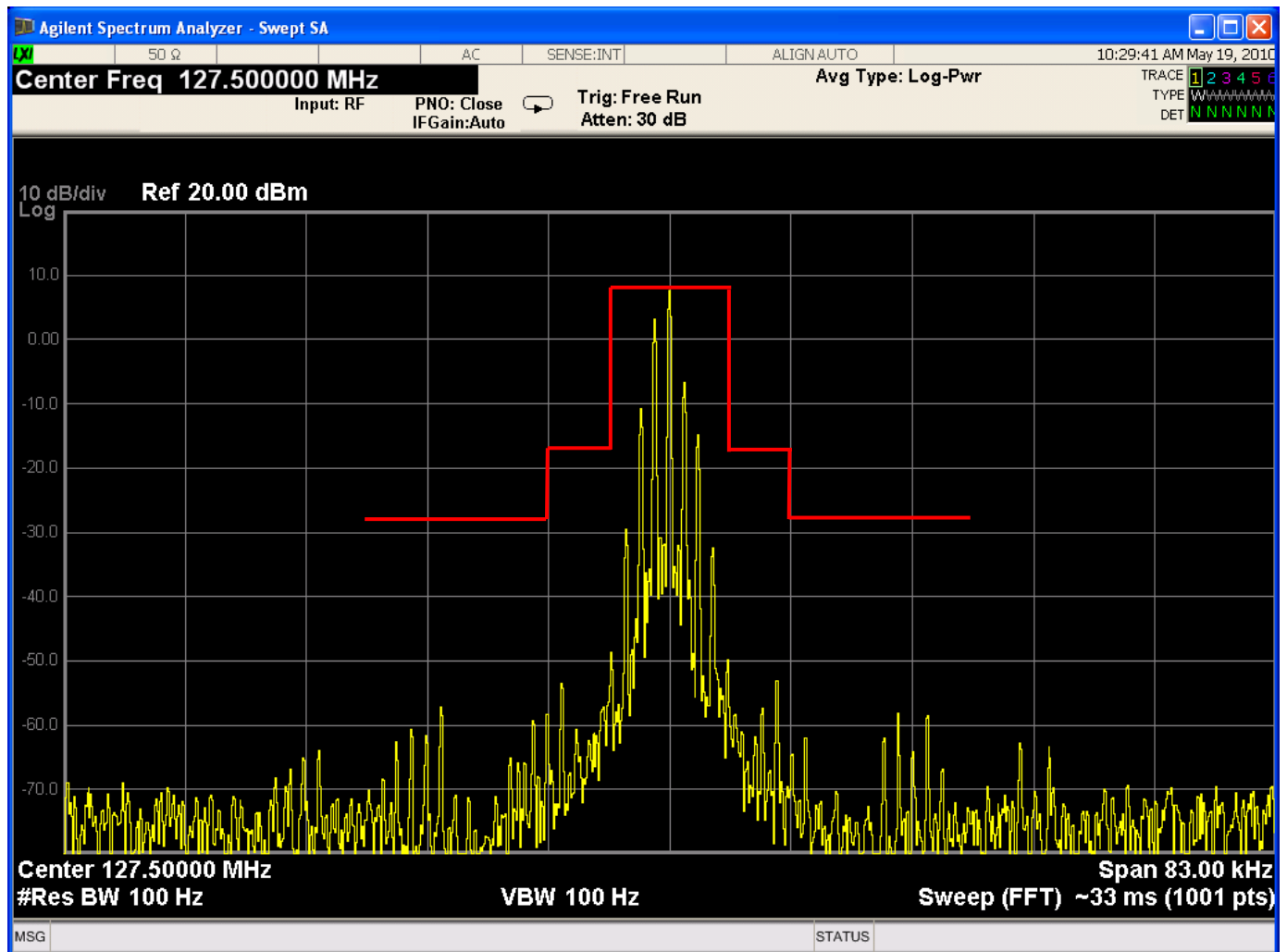
FCC Limit § 2.1049 & 87.139(a)

Plot 4: 118 MHz



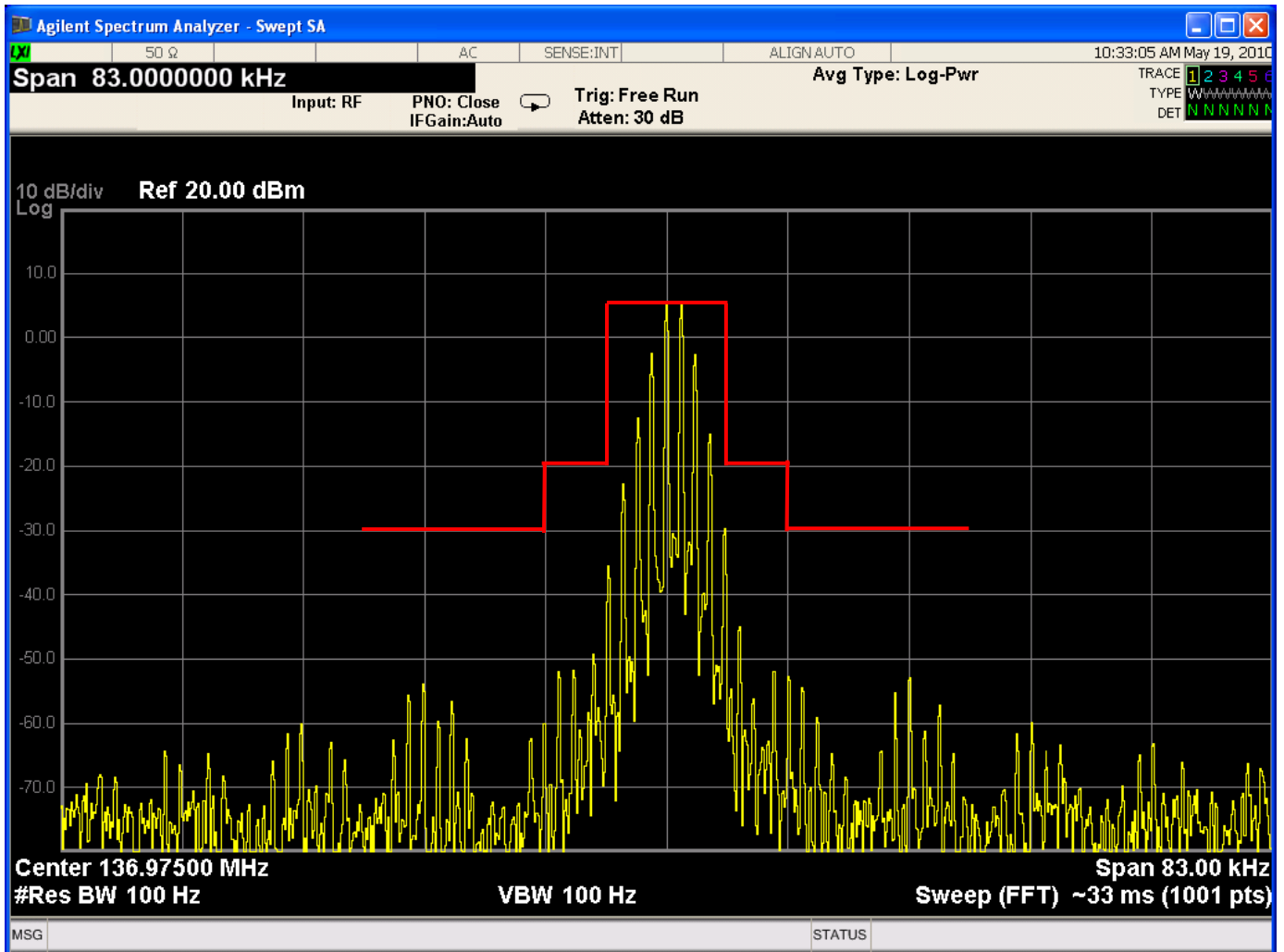
The red limit line shows the requirements of the test standard. The sample fulfils all these requirements.

Plot 5: 127.5 MHz



The red limit line shows the requirements of the test standard. The sample fulfils all these requirements.

Plot 6: 136.975 MHz



The red limit line shows the requirements of the test standard. The sample fulfils all these requirements.

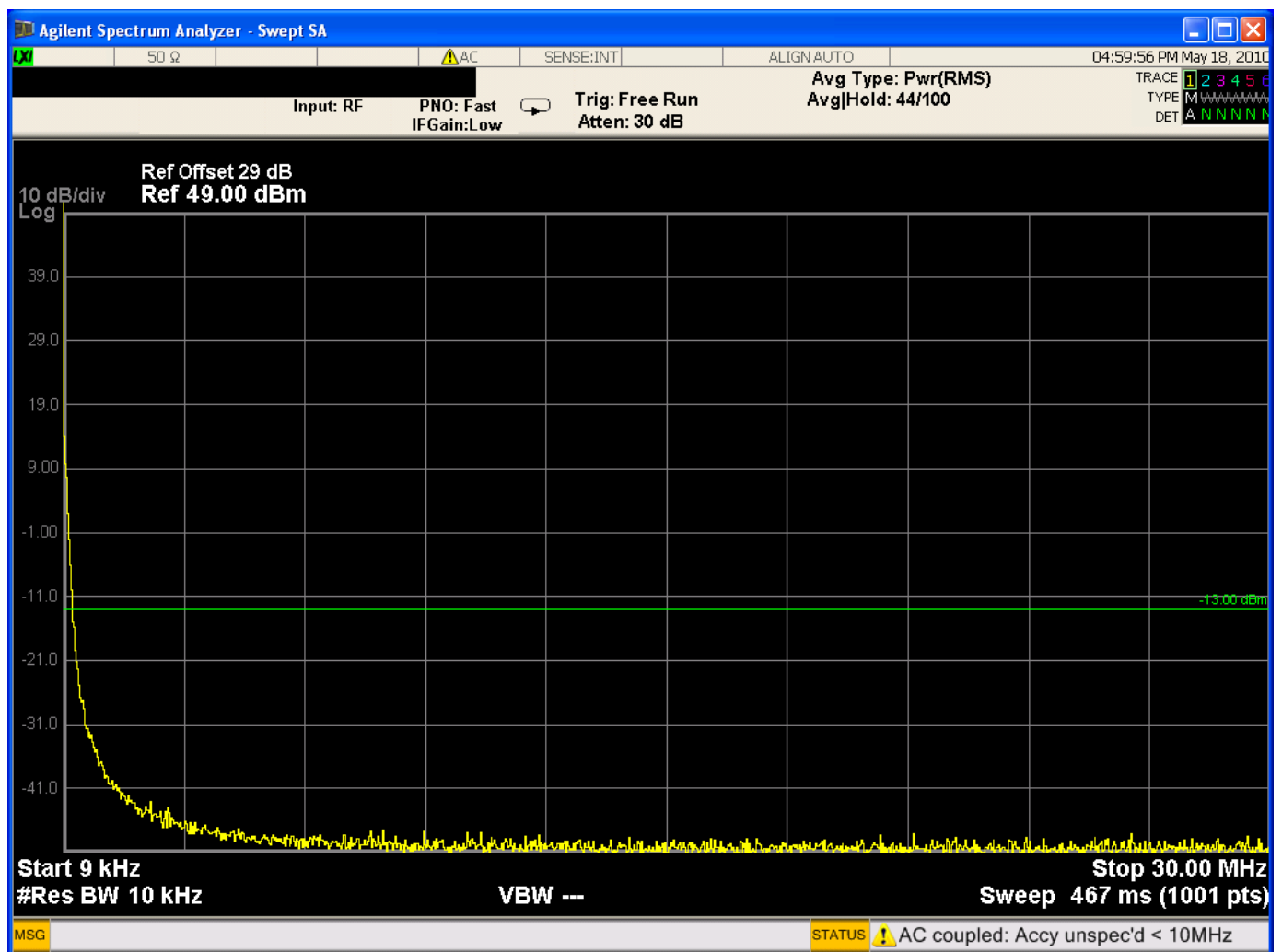
Spurious Emissions at Antenna Terminal

§ 2.1051 & 87.139(a)

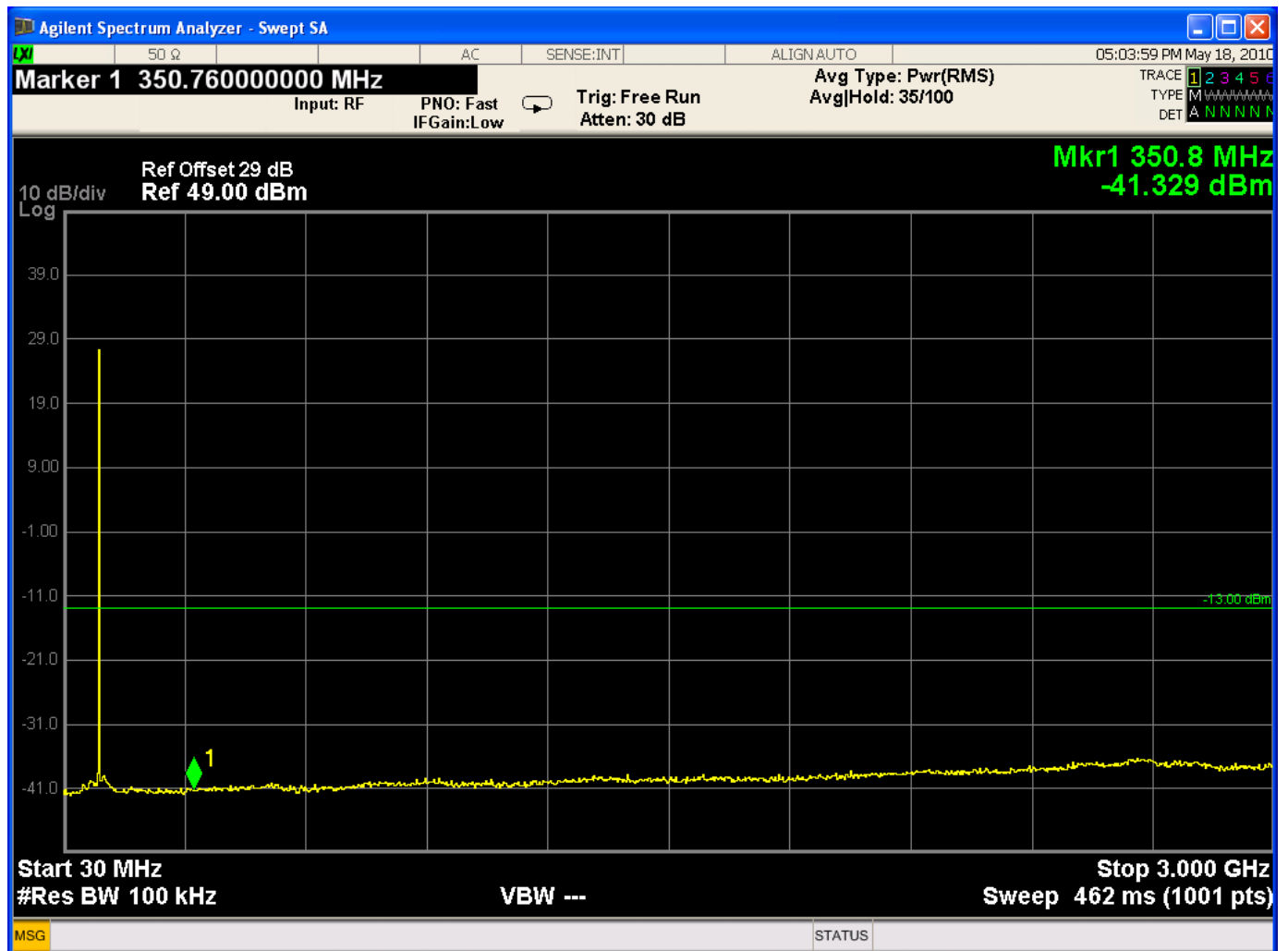
Test conditions:	TX frequencies	f	=	118.000 / 127.500 / 136.975	MHz
	Normal power supply	U AC	=	12.0	V
	Extreme power supply	U AC	=	28.0	V
	Normal temperature	t n	=	23.0	°C
	Extreme temperature	t min	=	-20.0	°C
	Extreme temperature	t max	=	55.0	°C
	Test set-up: 1				

FCC Limit § 2.1051 & 87.139(a): (-13 dBm)

Plot 7: 118.000 MHz

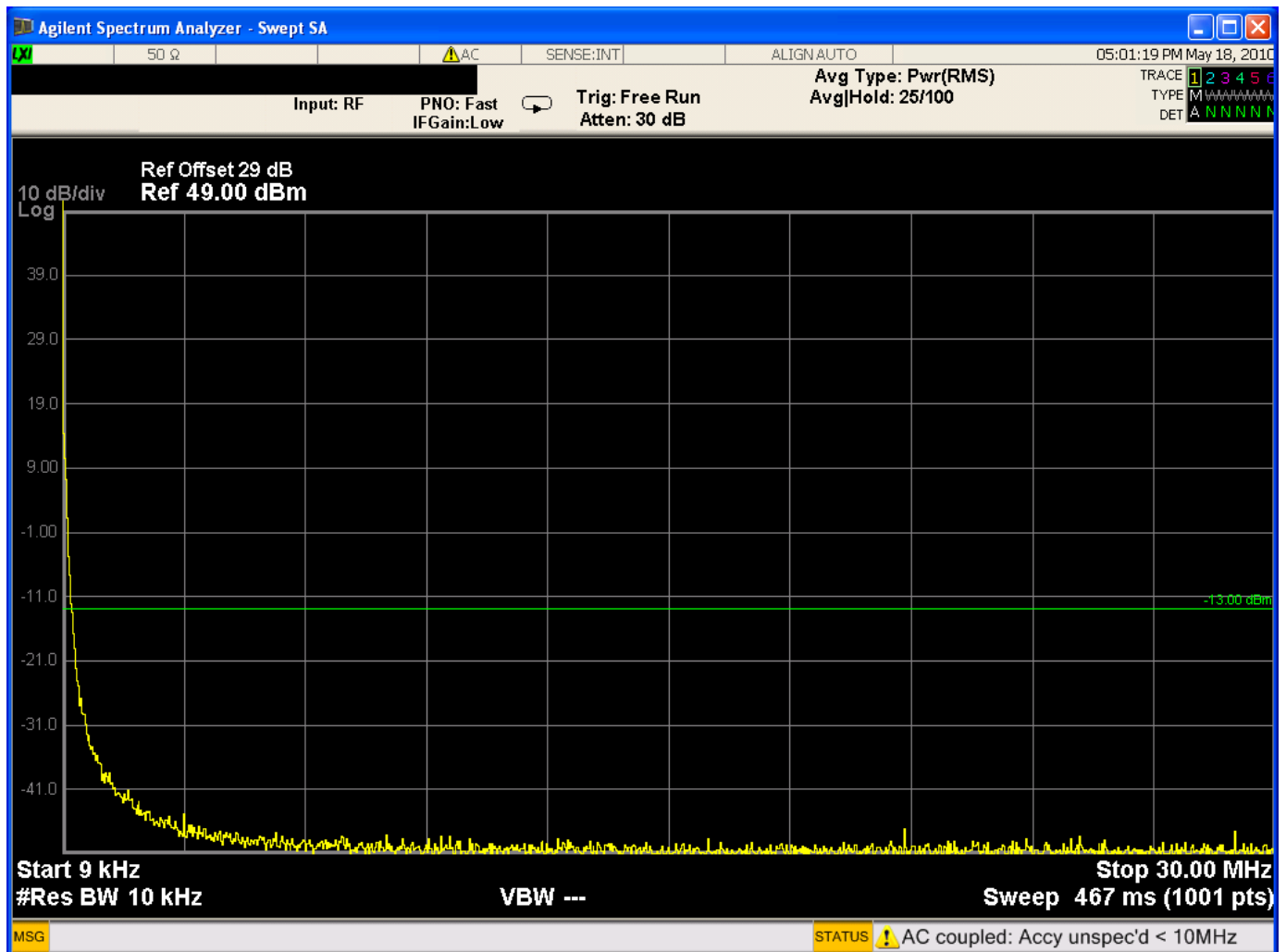


Plot 8: 118.000 MHz

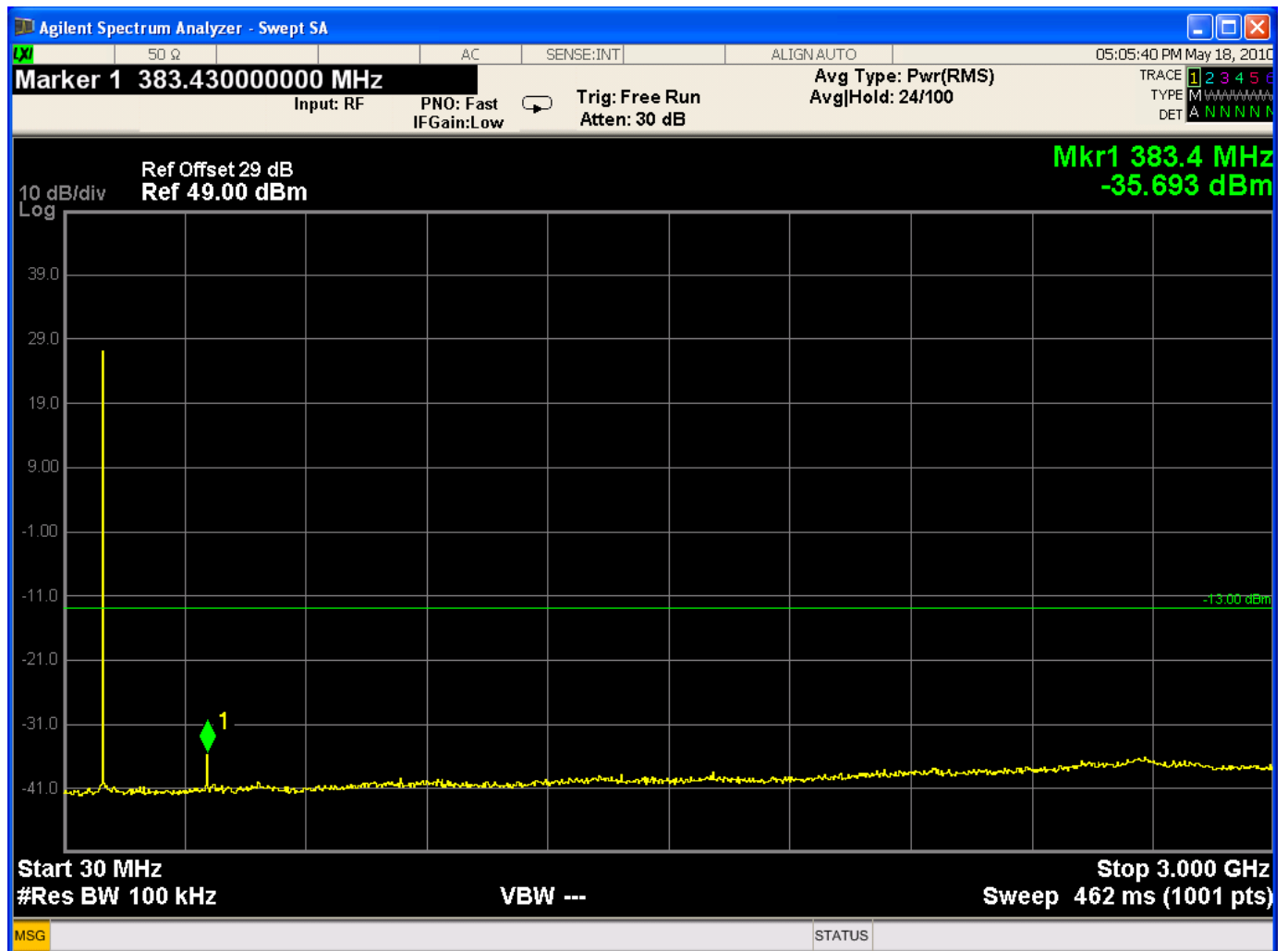


The peak at 118 MHz shows the carrier frequency

Plot 9: 127.500 MHz

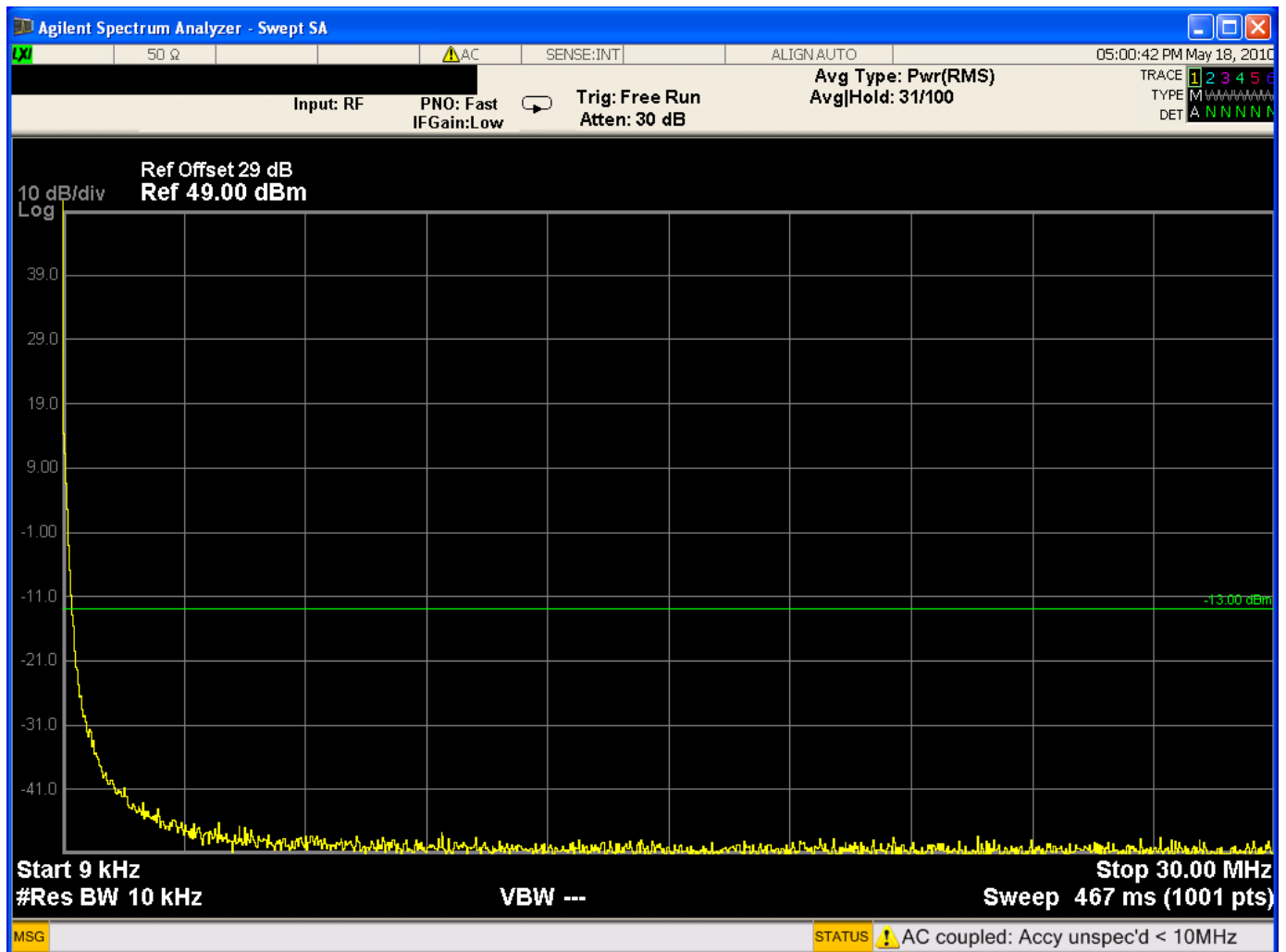


Plot 10: 127.500 MHz

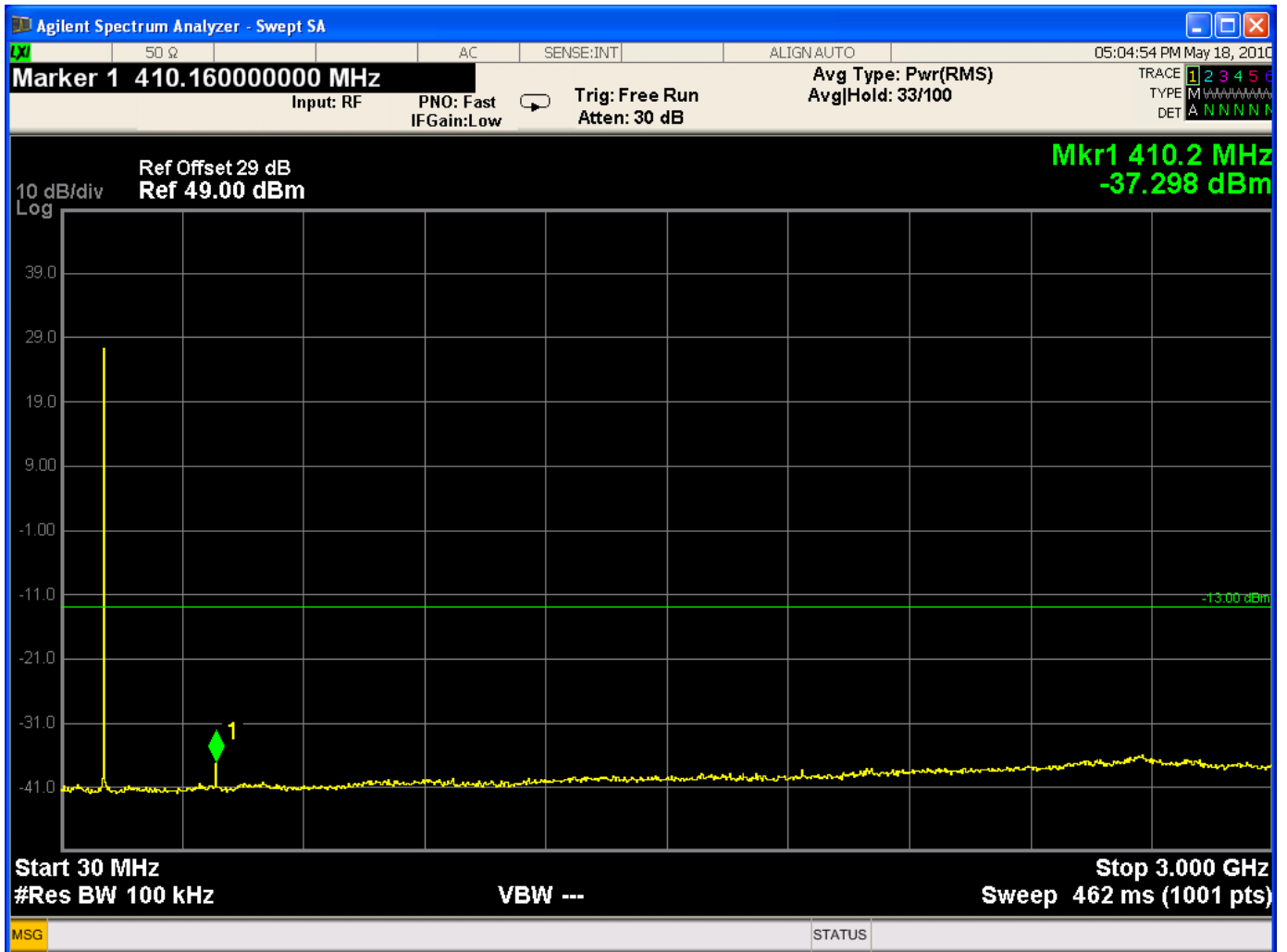


The peak at 127.5 MHz shows the carrier frequency

Plot 11: 136.975 MHz

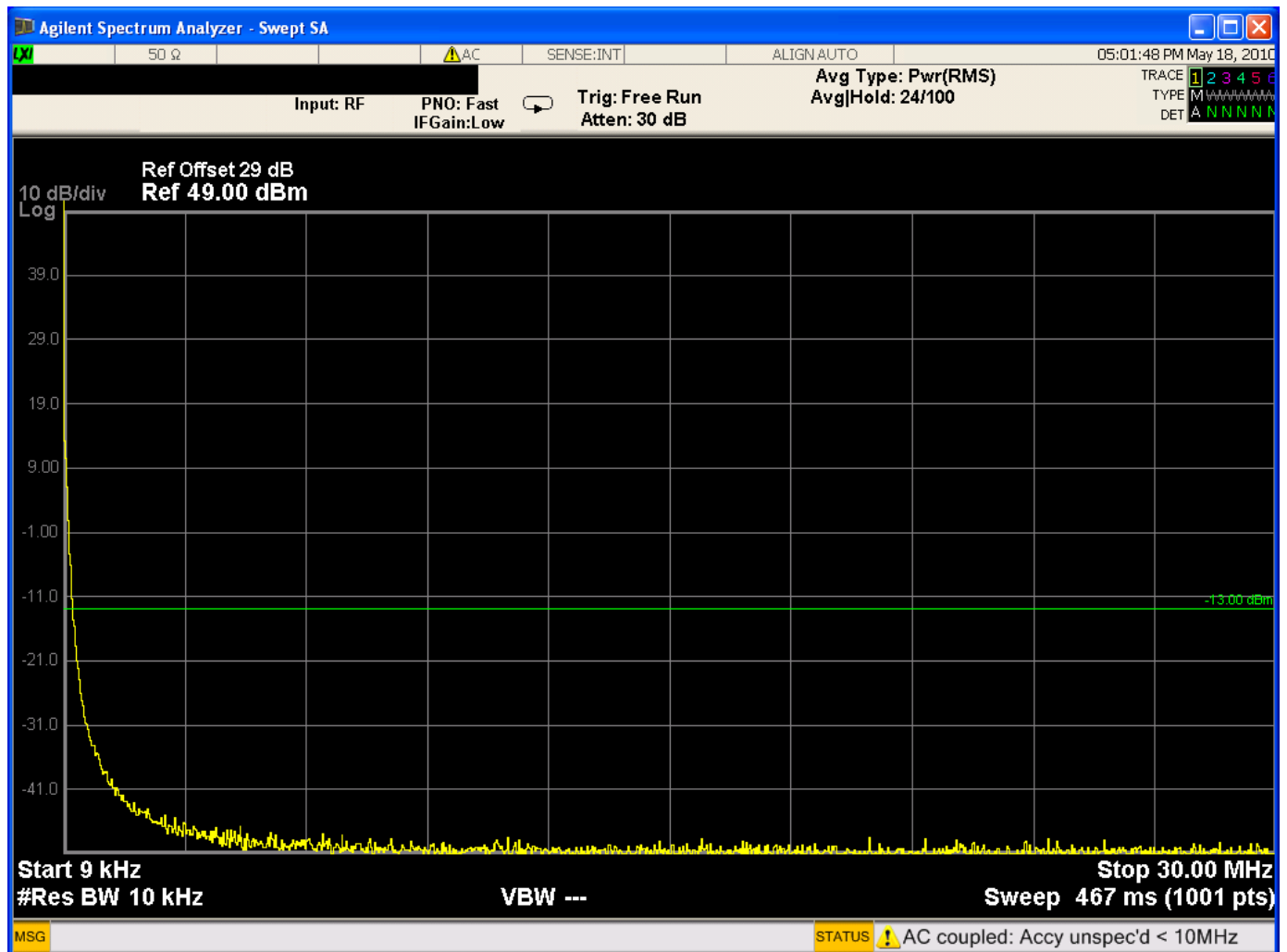


Plot 12: 136.975 MHz



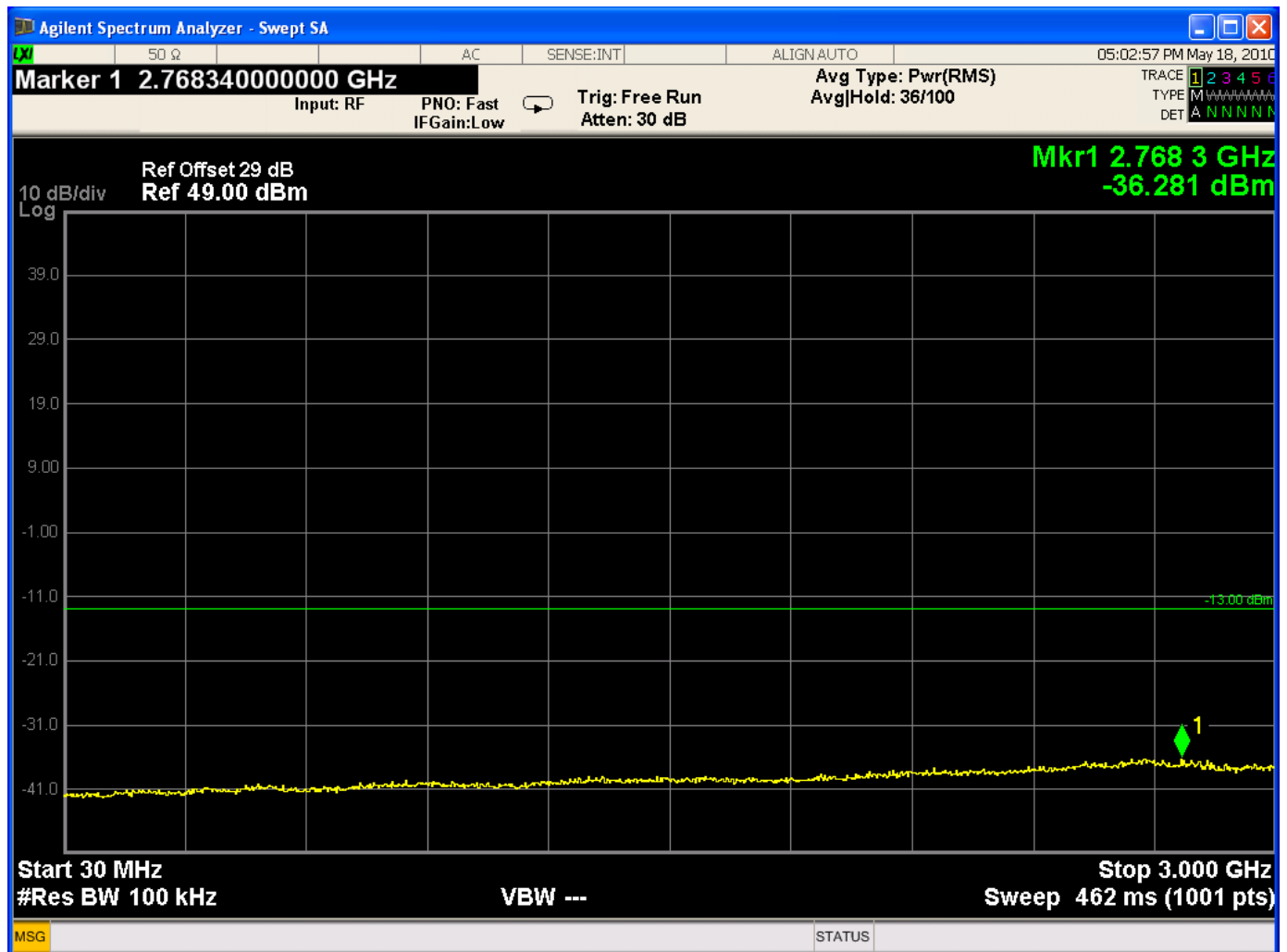
The peak at 136.975 MHz shows the carrier frequency

Plot 13: RX Spurious Emissions (conducted)



The plot shows that during RX – mode there are no emissions on the antenna port.

Plot 14: RX Spurious Emissions (conducted)



The plot shows that during RX – mode there are no emissions on the antenna port.

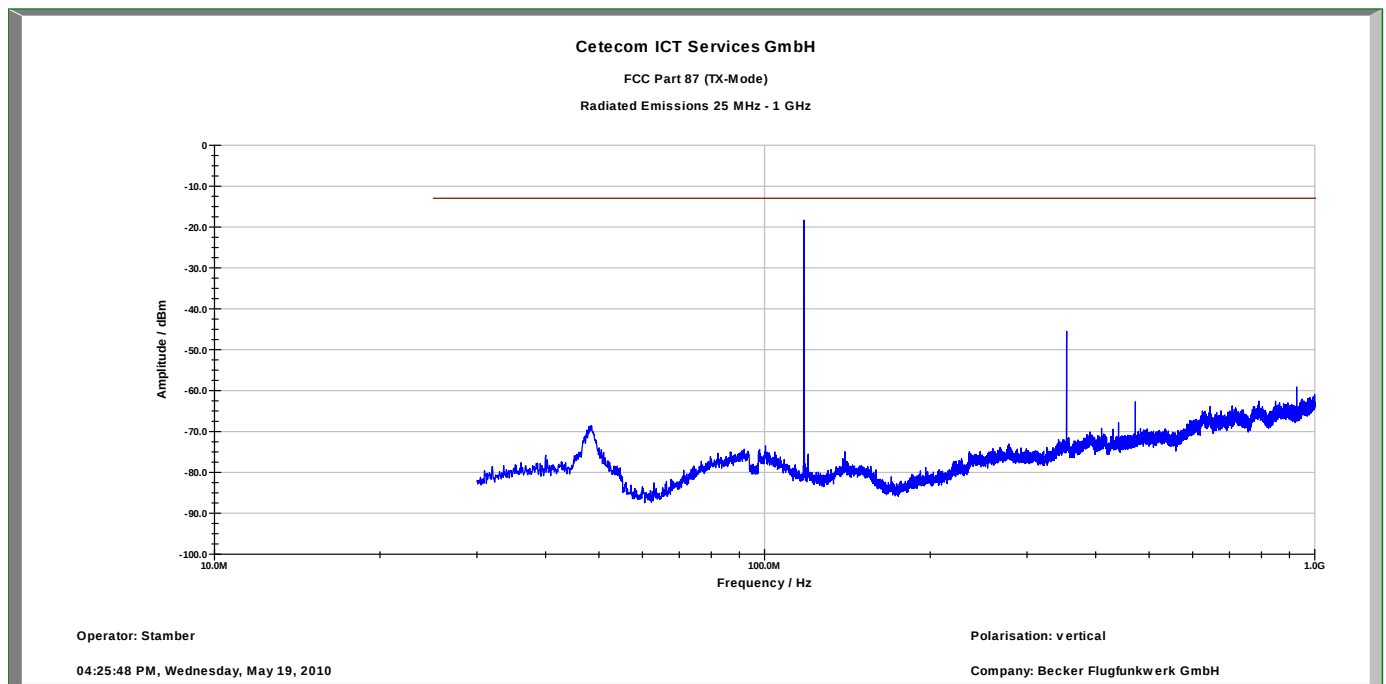
Field Strength of Spurious Emissions

§ 2.1053 & 87.139(a)

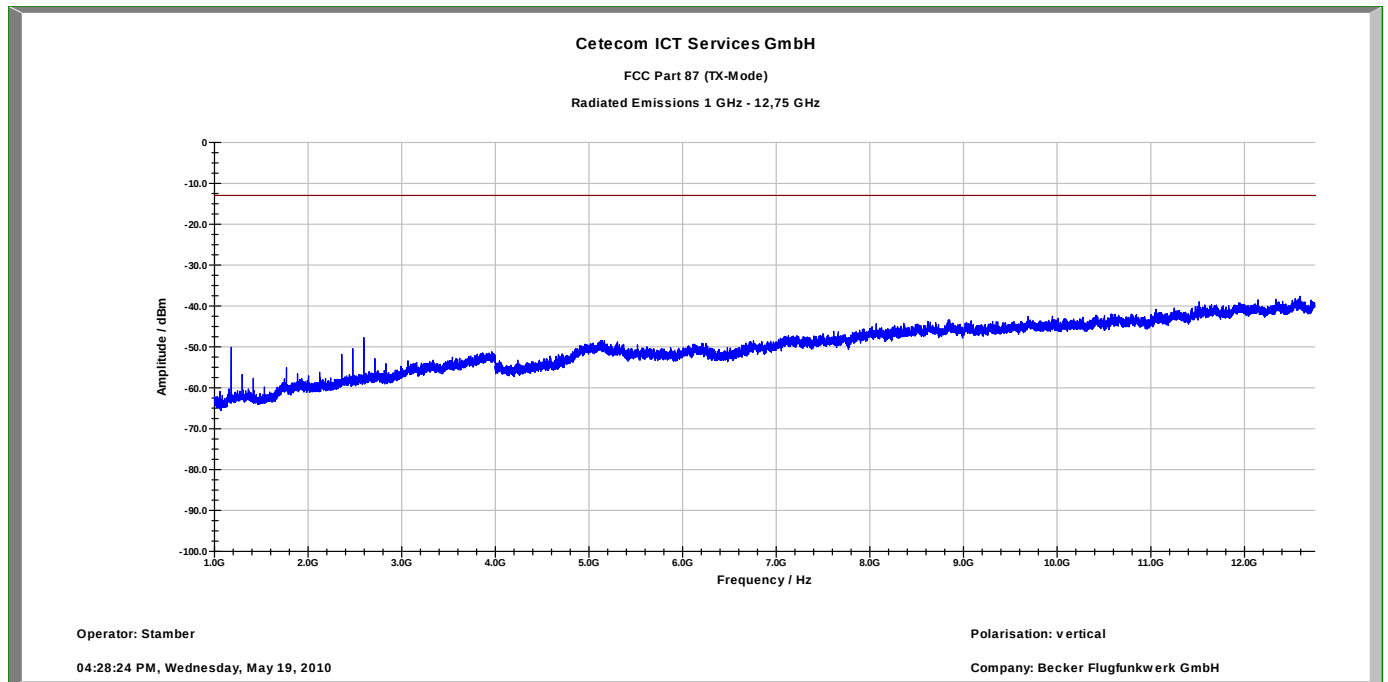
Test conditions:	TX frequencies	f	=	118.000 / 127.500 / 136.975 MHz
	Normal power supply	U DC	=	12.0 V
	Normal temperature	t n	=	23.0 °C
	Test set-up:	1		

FCC Limit § 2.1053 & 87.139(a): (-13 dBm)

Plot 15: Spurious emission radiated (TX – mode) 118 MHz

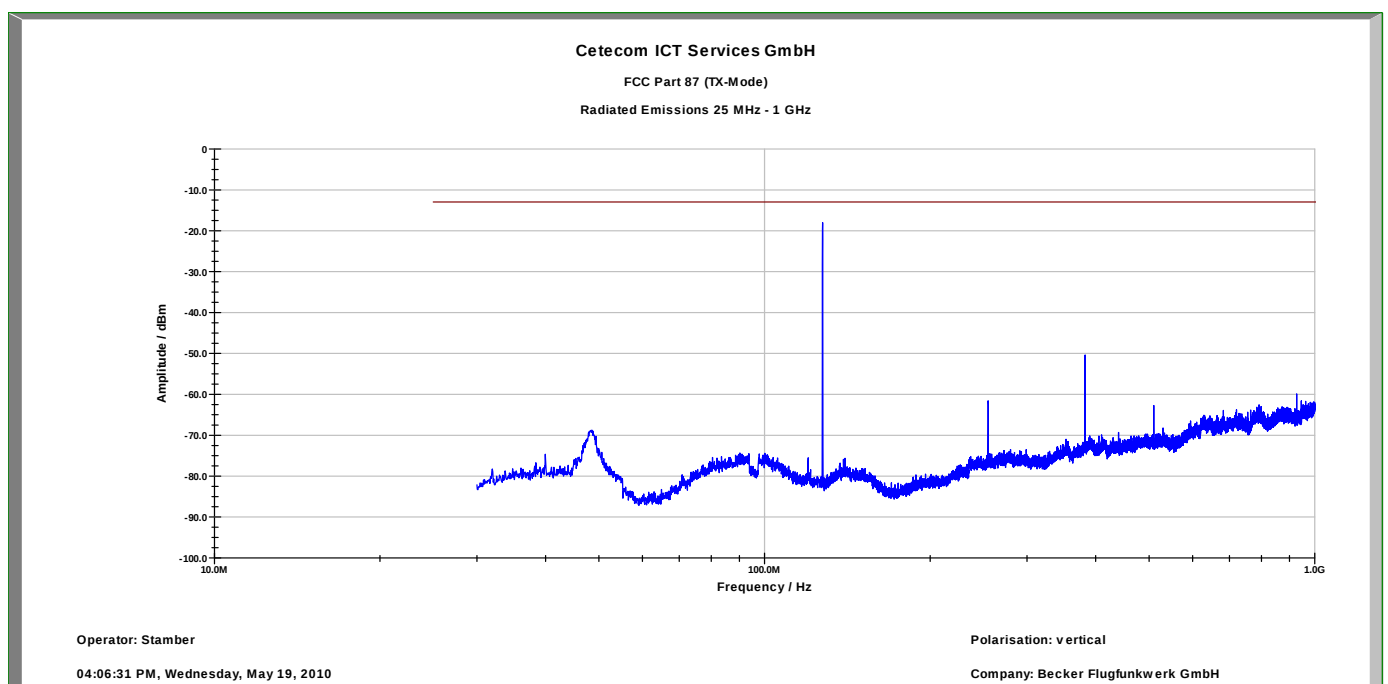


Plot 16: Spurious emission radiated (TX – mode) 118 MHz



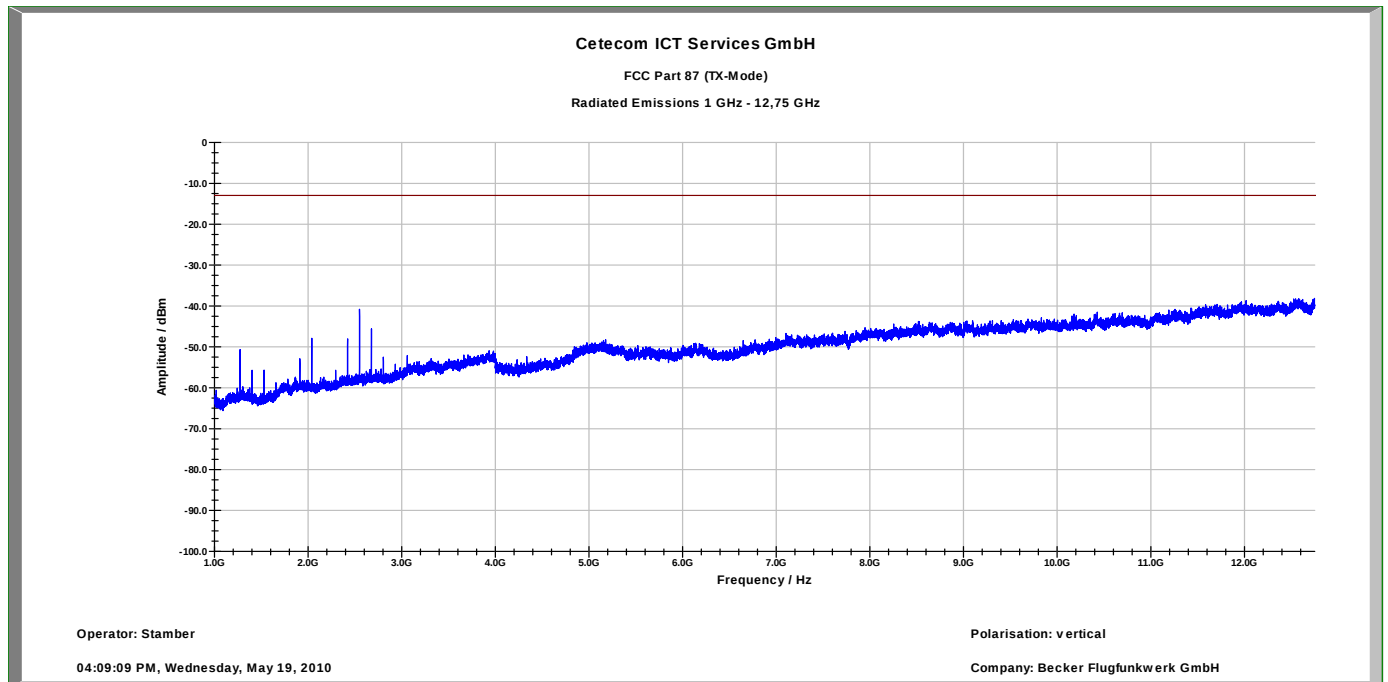
Antenna port closed with dummy load. (Housing radiation only)

Plot 17: Spurious emission radiated (TX – mode) 127.5 MHz



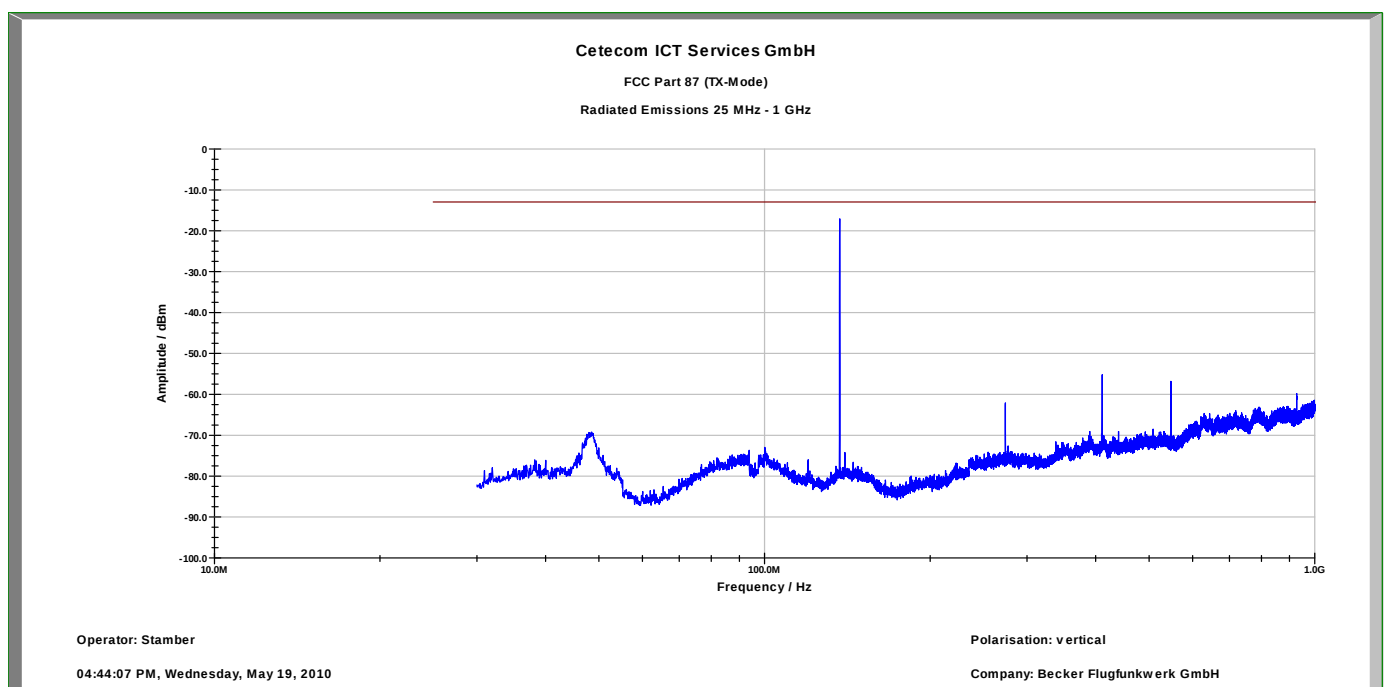
Antenna port closed with dummy load. (Housing radiation only)

Plot 18: Spurious emission radiated (TX – mode) 127.5 MHz



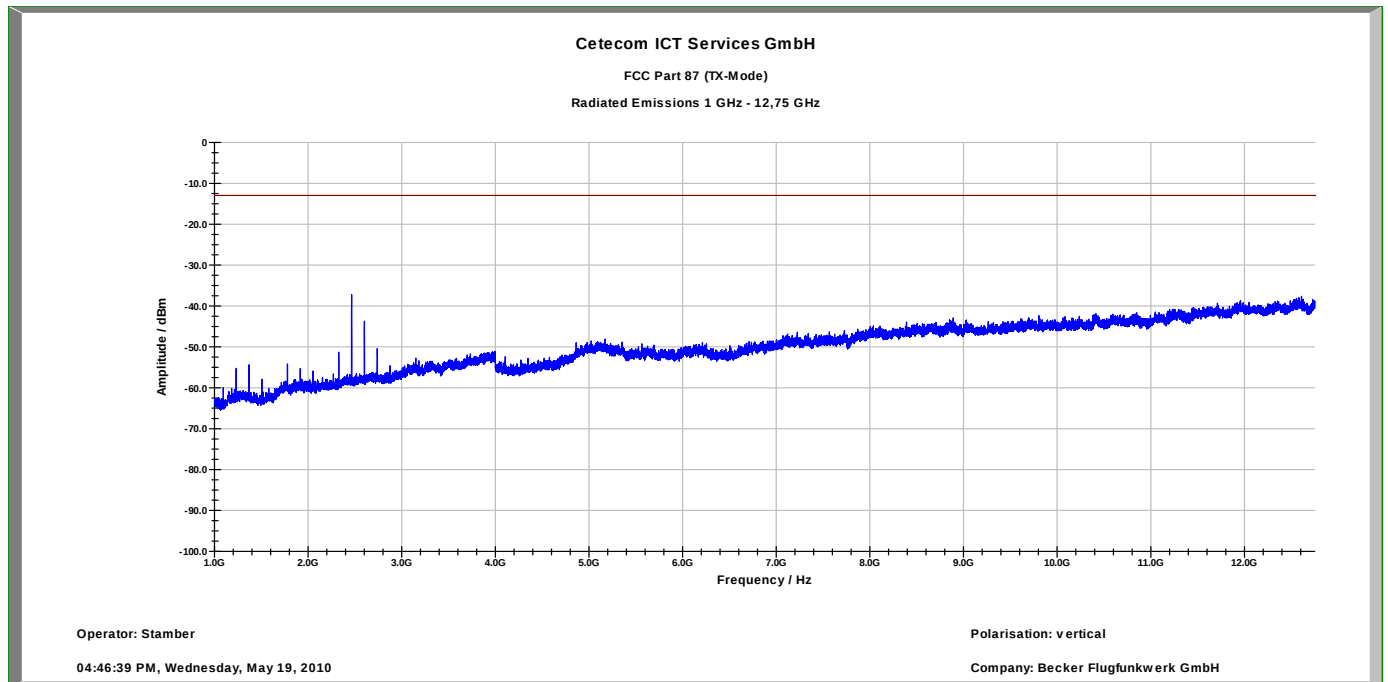
Antenna port closed with dummy load. (Housing radiation only)

Plot 19: Spurious emission radiated (TX – mode) 136.975 MHz



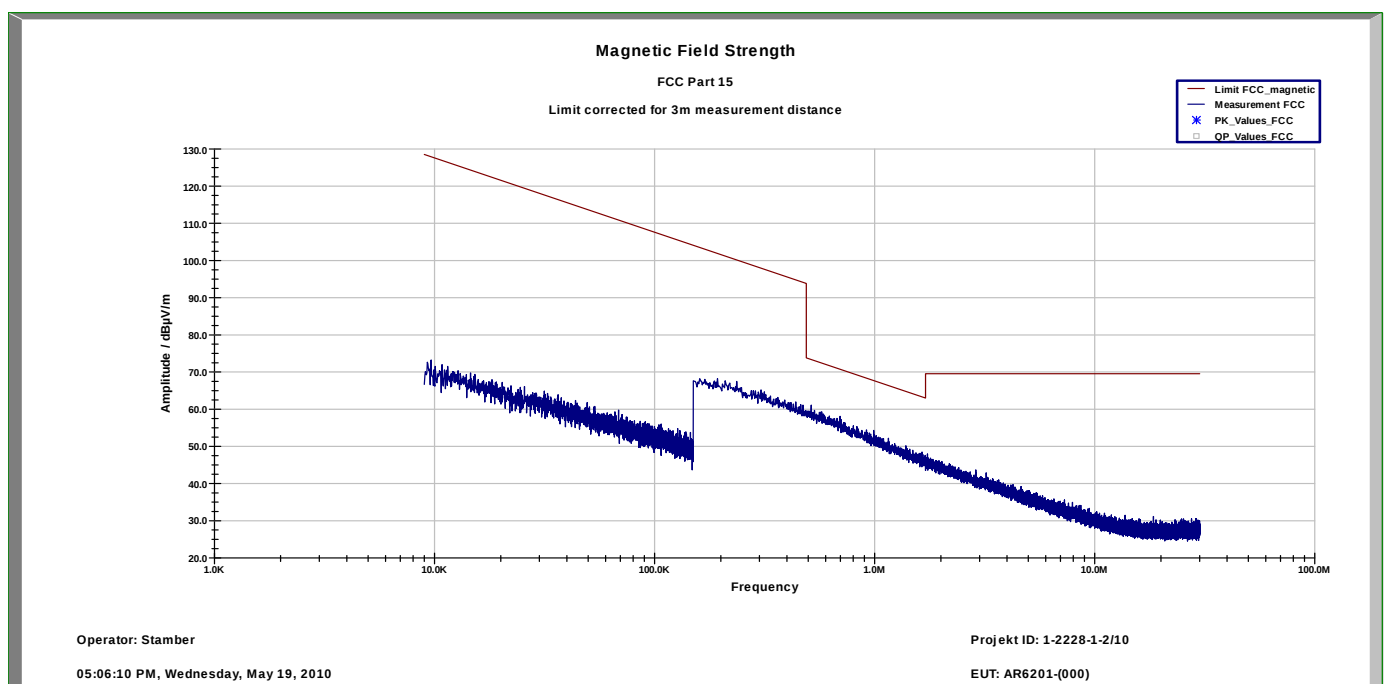
Antenna port closed with dummy load. (Housing radiation only)

Plot 20: Spurious emission radiated (TX – mode) 136.975 MHz



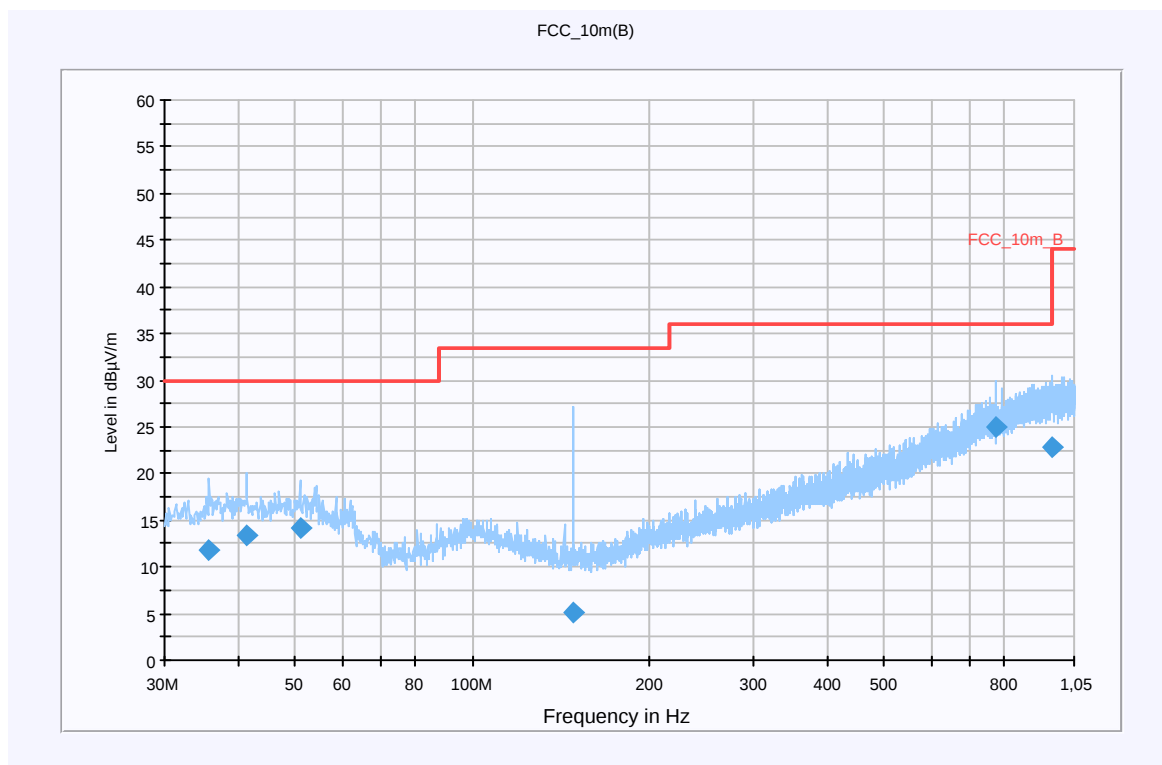
Antenna port closed with dummy load. (Housing radiation only)

Plot 21: Spurious emission radiated (RX – mode)



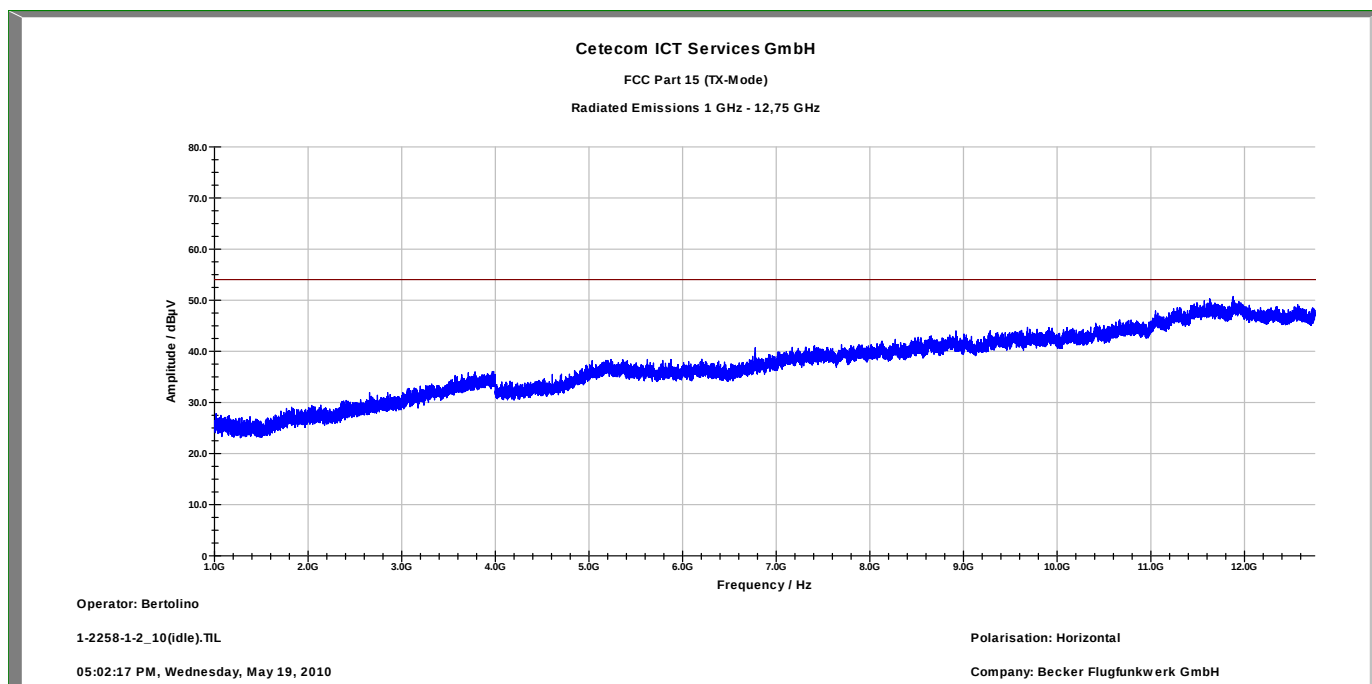
Antenna port closed with dummy load. (Housing radiation only)

Plot 22: Spurious emission radiated (RX – mode)



Antenna port closed with dummy load. (Housing radiation only)

Plot 23: Spurious emission radiated (RX – mode)



Antenna port closed with dummy load. (Housing radiation only)

Frequency Stability

§ 2.1055 & 87.133(5)

Test conditions: TX frequencies f = 118.000 / 127.500 / 136.975 MHz
 Normal power supply U DC = 12.0 V
 Extreme power supply U DC = 28.0 V
 Normal temperature t n = 23.0 °C
 Extreme temperature t min = -20.0 °C
 Extreme temperature t max = 55.0 °C
 Test set-up: 1

FCC Limit § 2.1055 & 87.133(5): 20 ppm

Test result

TX-frequency (MHz)	T (° C)	Measured frequency (MHz)	Frequency Error (Hz)	Frequency error (ppm)
118.000 000	+ 55	118.000 000	±0.0	< 0.1
127.500 000		127.499 999	- 1.0	< 0.1
136.975 000		136.974 999	- 1.0	< 0.1
118.000 000	+ 50	118.000 002	+ 2.0	< 0.1
127.500 000		127.500 003	+ 3.0	< 0.1
136.975 000		136.975 002	+ 2.0	< 0.1
118.000 000	+ 40	118.000 004	+ 4.0	< 0.1
127.500 000		127.500 005	+ 5.0	< 0.1
136.975 000		136.975 005	+ 5.0	< 0.1
118.000 000	+ 30	118.000 011	+ 11.0	0.1
127.500 000		127.500 012	+ 12.0	0.1
136.975 000		136.975 013	+ 13.0	0.1
118.000 000	+ 20	118.000 025	+ 25.0	0.2
127.500 000		127.500 027	+ 27.0	0.2
136.975 000		136.975 029	+ 29.0	0.2
118.000 000	+ 10	118.000 027	+ 27.0	0.2
127.500 000		127.500 030	+ 30.0	0.2
136.975 000		136.975 032	+ 32.0	0.2
118.000 000	0	118.000 022	+ 22.0	0.2
127.500 000		127.500 023	+ 23.0	0.2
136.975 000		136.975 024	+ 24.0	0.2
118.000 000	- 10	118.000 027	+ 27.0	0.2
127.500 000		127.500 028	+ 28.0	0.2
136.975 000		136.975 030	+ 30.0	0.2
118.000 000	- 20	118.000 049	+ 49.0	0.4
127.500 000		127.500 054	+ 54.0	0.4
136.975 000		136.975 057	+ 57.0	0.4

3 Photos













