



Unit Data

Item Spectrum analyzer 20 Hz - 50 GHz, -145 - 30 dBm

Manufacturer ROHDE & SCHWARZ

Type FSU50

Material No. 1166.1660K50 Serial No. 200061

This certificate documents the calibration of the indicated item. Calibration is performed with standards traceable to national/international standards, which realize the physical units of measurement according to the International System of Units (SI). Measurement results are located within the corresponding uncertainty with a probability of approximately 95% (coverage factor k=2). Unless otherwise specified, verification is against manufacturer's specifications.

Order Data

Customer University of California Santa Barbara
 Department of Electrical &
 Computer Engineering
 Harold Frank Hall, Rm 1160
 SANTA BARBARA CA 93106-9560

Order No. UC-102913163351

Date of Receipt 2013-11-08

For results in the measurement uncertainty guard band (UGB), it is not possible to state compliance with specification based on the 95% level of confidence. However, a within-specification result indicates compliance is more probable than noncompliance and an out-of-specification result indicates noncompliance is more probable than compliance. Policies and procedures for Standard Calibrations are based on ISO/IEC 17025:2005, ANSI/NCSL Z540.3-2006, and ANSI/NCSL Z540.1-1994 (R2002). The ISO 9001 Calibration is based on the manufacturer's procedure. The quality management system is certified to ISO9001:2008.

The calibration certificate may not be reproduced other than in full. Calibration certificates without signatures are not valid.

Performance

Place and Date of Calibration COLUMBIA, MD, 2013-12-03

Scope of Calibration Standard Calibration

Statement of Compliance (Incoming) One or more measured values are outside the data sheet specifications, marked as FAIL.

Statement of Compliance (Outgoing) All measured values are within the data sheet specifications.

Extent of Calibration 2 Pages Calibration Certificate
 18 Pages Outgoing Results
 9 Pages Incoming Results

Date of Issue (YYYY-MM-DD)

Head of Laboratory

Person Responsible

2013-12-03

Phillip Winn

Paul Ungureanu

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PT 3583.9833.00

Ambient Temperature 25.0 °C

Relative Humidity 41 %

Calibration Method UCS2120 Ver. 01.06.05 TM-G5 Ver. 07.27

Working standards used (having a significant effect on the accuracy)

Item	Type	Serial No.	Calibration Certificate No.	Cal. Due
Signal generator 1GHz - 60 GHz	SMR60	100024	0316_D-K-15195-01-00_2013-09	2014-09-20
GPS-Controlled Rubidium Frequency Stand	910R	SM927827	5000-16215/2006 (GPSDO)	2013-12-21
Thermal power sensor,	NRP-Z55	140014	0173_D-K-15195-01-00_2013-05	2014-05-08
Average power sensor,	NRP-Z91	200044	0326_D-K-15195-01-00_2013-05	2014-05-16
Thermal Power Sensor	NRP-Z56	101673	0129_D-K-15195-01-00_2013-05	2014-05-06
SWR bridge 50 Ohm, 40 kHz -4 GHz	ZRC	100089	0334_D-K-15195-01-00_2013-07	2014-07-25
Step attenuator,	RSC	101290	0475_D-K-15195-01-00_2013-06	2014-06-25
Average power sensor,	NRP-Z91	200045	0327_D-K-15195-01-00_2013-05	2014-05-16
Vector Network Analyzer,	ZVA40	100343	0136_D-K-15195-01-00_2013-05	2014-05-10
Calibration kit N-type, 0 Hz to 18GHz,	ZV-Z270	101555	0318_D-K-15195-01-00_2013-07	2014-07-17
Calibration kit 2.92mm, 0Hz to 40GHz,	ZV-Z229	101215	0319_D-K-15195-01-00_2013-07	2014-07-17
Signal analyzer 20Hz to 26.5GHz;	FSQ26	101230	0372_D-K-15195-01-00_2013-05	2014-05-22

Notes

The user is obliged to have the item recalibrated at appropriate intervals.
Depending on installed options, test report page numbers may not be consecutive.
Serial numbers with xxxxxx/xxx format are shown with a leading zero after the slash: xxxxxx/0xxx.

Incoming Remarks:

Unit found to be operating out of specifications for the following tests: 7, 11, 12, 21 and 22. Test: Third Order Intercept Point (TOI) < 8GHz has Invalid result. Please see incoming test data for details.

Outgoing Remarks:

Unit is operating in compliance with specifications.

Outgoing Results

Designation:	Spectrum Analyzer
Type:	FSU-50
Material No.:	1166.1660K50
Serial No.:	200061
Referring to Test Documentation:	1129.9003.01-PB-01.52 1157.2100.01-PB-01.08
Reference No.:	5000-309019956

Test Department:	Rohde & Schwarz USA, Inc.
Name:	Uchenna Asiegbu
Date:	2013-12-03



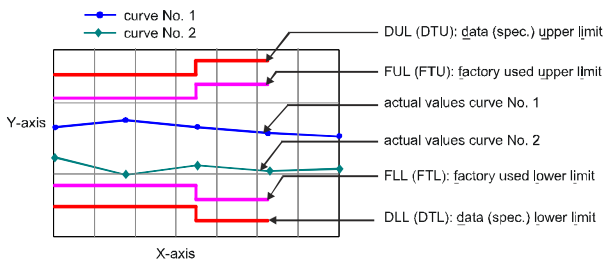
The following abbreviations may be used in this document

{a}	No measurement uncertainty stated because the errors always add together. So it is sure that a measurement result evaluated as "PASS" is pass.
{b}	The measurement uncertainty depends on the measurement result. The stated measurement uncertainty is valid for the close area around the specification. Measurement results outside the close area have a higher measurement uncertainty but are within the specification.
{c}	Functional test, therefore no measurement uncertainty is stated.
{d}	Typical value, refer to performance test.
{e}	The measurement uncertainty is taken into account when setting the measuring system.
DL or DT	Data Limit for symmetrical tolerance limits
DLL	Datasheet Lower Limit
DUL	Datasheet Upper Limit
MU	Symmetrical Measurement Uncertainty
MLL or MLV	Measurement Uncertainty Lower Value
MUL or MUV	Measurement Uncertainty Upper Value
Nom.	Nominal Value
Dev.	Deviation
MErr.	Measurement Error
Act.	Actual Value
UGB	Uncertainty Guard Band: Measuring uncertainty violates the data (spec.) limit.
UGB1	Measurement results marked as UGB1 show conformity with a probability of >50 % and <95 %.
UGB2	Measurement results marked as UGB2 show non-conformity with a probability of >50 % and <95 %.
DU	Datasheet Uncertainty

Explanation of charts

1. In case uncertainties are part of the appendix

factory used limit = data specification - uncertainty of actual value



2. In case uncertainties are part of the respective graphic

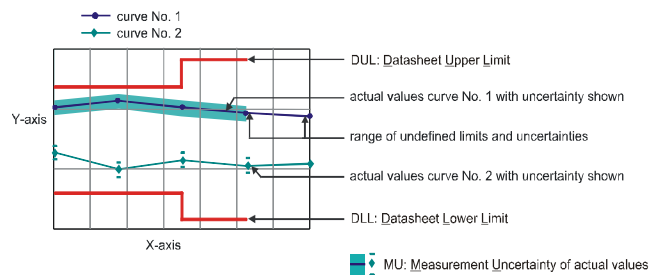


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Type FSU-50
Test System UCSX0177_3553.1786.02_100013
Temperature (23 -3/+7)°C
File (Outgoing) 1166.1660K50_200061_102.MF
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Serial No. 200061
Material No. 1166.1660K50
Date 2013-12-03



Software used for measurement			
Item	Type	Version	Remark
Factory/Service Edition	Setup	V07.27	Test Management Software G5
Test Program (7010.2181.00)	Component	V01.06.05	

1. Checking the reference frequency accuracy

Option B4 not installed

	DL	Actual	MU
Error of internal 10 MHz	+1.00 Hz.. -1.00 Hz	-0.0433 Hz	0.0019 Hz

2. Immunity to interference

Listing of measurement uncertainties:

range	fc	value range of actual	uncertainty
1	0.01 to 3.6 GHz	70 dB to 90 dB	0.59 dB
1	0.01 to 3.6 GHz	90 dB to 96 dB	0.74 dB
1	0.01 to 3.6 GHz	96 dB to 103 dB	0.83 dB
1	0.01 to 3.6 GHz	103 dB to 106 dB	1.04 dB
1	0.01 to 3.6 GHz	106 dB and higher	3.05 dB

2	3.60 to 8.0 GHz	70 dB to 90 dB	0.59 dB
2	3.60 to 8.0 GHz	90 dB to 96 dB	0.75 dB
2	3.60 to 8.0 GHz	96 dB to 103 dB	1.04 dB
2	3.60 to 8.0 GHz	103 dB to 106 dB	1.58 dB
2	3.60 to 8.0 GHz	106 dB and higher	3.05 dB

fc	IF	Type	DLL	Actual	MU
11.0 MHz	4628.4 MHz	1st image	90 dB	110.26 dB	3.05 dB
101.0 MHz	4628.4 MHz	1st image	90 dB	110.69 dB	3.05 dB
501.0 MHz	4628.4 MHz	1st image	90 dB	107.51 dB	3.05 dB
901.0 MHz	4628.4 MHz	1st image	90 dB	108.63 dB	3.05 dB
1301.0 MHz	4628.4 MHz	1st image	90 dB	108.68 dB	3.05 dB
1701.0 MHz	4628.4 MHz	1st image	90 dB	107.51 dB	3.05 dB
2101.0 MHz	4628.4 MHz	1st image	90 dB	107.13 dB	3.05 dB
2501.0 MHz	4628.4 MHz	1st image	90 dB	105.12 dB	1.04 dB
3101.0 MHz	4628.4 MHz	1st image	90 dB	104.93 dB	1.04 dB
3599.0 MHz	4628.4 MHz	1st image	90 dB	104.06 dB	1.04 dB
101.0 MHz	404.4 MHz	2nd image	90 dB	108.53 dB	3.05 dB
4199.0 MHz	404.4 MHz	2nd image	70 dB	92.34 dB	0.75 dB
5501.0 MHz	404.4 MHz	2nd image	70 dB	90.04 dB	0.75 dB
7999.0 MHz	-404.4 MHz	2nd image	70 dB	106.00 dB	1.58 dB
101.0 MHz	20.4 MHz	3rd image	90 dB	108.78 dB	3.05 dB
3799.0 MHz	20.4 MHz	3rd image	70 dB	92.31 dB	0.75 dB
11.0 MHz	4628.4 MHz	1st IF	90 dB	110.26 dB	3.05 dB
101.0 MHz	4628.4 MHz	1st IF	90 dB	110.38 dB	3.05 dB
701.0 MHz	4628.4 MHz	1st IF	90 dB	108.58 dB	3.05 dB
1799.0 MHz	4628.4 MHz	1st IF	90 dB	107.13 dB	3.05 dB
2501.0 MHz	4628.4 MHz	1st IF	90 dB	104.86 dB	1.04 dB
3599.0 MHz	4628.4 MHz	1st IF	90 dB	104.49 dB	1.04 dB
101.0 MHz	404.4 MHz	2nd IF	90 dB	105.09 dB	1.04 dB
5501.0 MHz	404.4 MHz	2nd IF	70 dB	106.00 dB	1.58 dB
7999.0 MHz	404.4 MHz	2nd IF	70 dB	106.84 dB	3.05 dB
1001.0 MHz	20.4 MHz	3rd IF	90 dB	109.63 dB	3.05 dB

3. Immunity to interference (part 2)

Listing of measurement uncertainties:

range	fc	value range of actual	uncertainty
1	7.0 to 18.0 GHz	70 dB to 85 dB	0.73 dB
1	7.0 to 18.0 GHz	85 dB to 90 dB	0.74 dB
1	7.0 to 18.0 GHz	90 dB to 96 dB	0.77 dB
1	7.0 to 18.0 GHz	96 dB to 100 dB	0.94 dB
1	7.0 to 18.0 GHz	100 dB and higher	3.05 dB
2	18.0 to 26.5 GHz	70 dB to 80 dB	0.73 dB
2	18.0 to 26.5 GHz	80 dB to 90 dB	0.74 dB
2	18.0 to 26.5 GHz	90 dB to 95 dB	0.83 dB
2	18.0 to 26.5 GHz	95 dB and higher	3.05 dB
3	26.5 to 50.0 GHz	70 dB to 80 dB	0.60 dB
3	26.5 to 50.0 GHz	80 dB to 85 dB	0.83 dB
3	26.5 to 50.0 GHz	85 dB to 90 dB	1.35 dB
3	26.5 to 50.0 GHz	90 dB and higher	3.05 dB

fc	f of interfer signal	DLL	Actual	MU
7001.0 MHz	404.4 MHz (2nd image)	70 dB	87.43 dB	0.74 dB
9100.0 MHz	404.4 MHz (2nd image)	70 dB	90.01 dB	0.77 dB
11200.0 MHz	404.4 MHz (2nd image)	70 dB	92.67 dB	0.77 dB
13599.0 MHz	404.4 MHz (2nd image)	70 dB	89.71 dB	0.74 dB
13601.0 MHz	404.4 MHz (2nd image)	70 dB	89.09 dB	0.74 dB
18201.0 MHz	404.4 MHz (2nd image)	70 dB	89.61 dB	0.74 dB
25301.0 MHz	-404.4 MHz (2nd image)	70 dB	91.88 dB	0.83 dB
26499.0 MHz	-404.4 MHz (2nd image)	70 dB	95.63 dB	3.05 dB
30001.0 MHz	404.4 MHz (2nd image)	70 dB	87.19 dB	1.35 dB
31200.0 MHz	404.4 MHz (2nd image)	70 dB	87.89 dB	1.35 dB
38991.0 MHz	-404.4 MHz (2nd image)	70 dB	98.37 dB	3.05 dB
27000.0 MHz	4628.4 MHz 1st IF	70 dB	90.61 dB	3.05 dB
7001.0 MHz	20.4 MHz (3rd image)	70 dB	89.40 dB	0.74 dB
13599.0 MHz	20.4 MHz (3rd image)	70 dB	97.84 dB	0.94 dB
26499.0 MHz	20.4 MHz (3rd image)	70 dB	102.18 dB	3.05 dB
31200.0 MHz	20.4 MHz (3rd image)	70 dB	97.16 dB	3.05 dB
38991.0 MHz	20.4 MHz (3rd image)	70 dB	96.15 dB	3.05 dB

4. Residual response

range	fc	value range of actual	uncertainty
1	0 to 3.6 GHz	-103 dBm to -106 dBm	0.4 dB
1	0 to 3.6 GHz	-106 dBm to -110 dBm	0.4 dB
1	0 to 3.6 GHz	-110 dBm to -116 dBm	0.8 dB
1	0 to 3.6 GHz	-116 dBm to -120 dBm	1.6 dB
1	0 to 3.6 GHz	-120 dBm and lower	2.7 dB

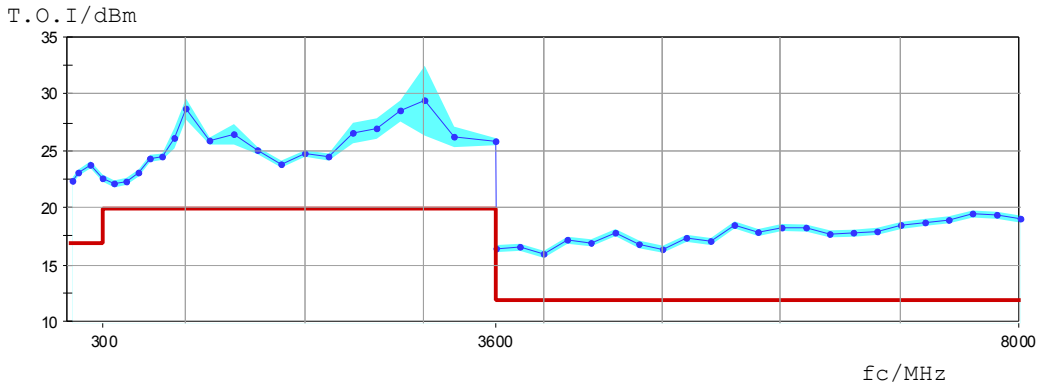
fc	DL	Actual	MU
25.175 MHz (LCD-display)	-103 dBm	-119 dBm	1.6 dB
50.350 MHz (LCD-display)	-103 dBm	-119 dBm	1.6 dB
75.525 MHz (LCD-display)	-103 dBm	-118 dBm	1.6 dB
32.000 MHz (reference/4)	-103 dBm	-119 dBm	1.6 dB
64.000 MHz (reference/2)	-103 dBm	-119 dBm	1.6 dB
128.000 MHz (reference)	-103 dBm	-117 dBm	1.6 dB
384.000 MHz (reference)	-103 dBm	-118 dBm	1.6 dB
768.000 MHz (384 MHz*2)	-103 dBm	-118 dBm	1.6 dB
1152.000 MHz (384 MHz*3)	-103 dBm	-116 dBm	1.6 dB
1536.000 MHz (384 MHz*4)	-103 dBm	-115 dBm	0.8 dB
1920.000 MHz (384 MHz*5)	-103 dBm	-115 dBm	0.8 dB
2304.000 MHz (384 MHz*6)	-103 dBm	-114 dBm	0.8 dB
2688.000 MHz (384 MHz*7)	-103 dBm	-113 dBm	0.8 dB
548.100 MHz (5*1.LO-4*2.LO)	-103 dBm	-117 dBm	1.6 dB
550.500 MHz	-103 dBm	-116 dBm	0.8 dB
750.300 MHz (4*2.LO-5*1.LO)	-103 dBm	-117 dBm	1.6 dB
752.700 MHz	-103 dBm	-118 dBm	1.6 dB
865.600 MHz (4*1.LO-3*2.LO)	-103 dBm	-117 dBm	1.6 dB
868.800 MHz	-103 dBm	-116 dBm	1.6 dB
1135.200 MHz (3*2.LO-4*1.LO)	-103 dBm	-119 dBm	1.6 dB
1138.400 MHz	-103 dBm	-117 dBm	1.6 dB
1500.600 MHz (3*1.LO-2*2.LO)	-103 dBm	-116 dBm	1.6 dB
1505.400 MHz	-103 dBm	-115 dBm	0.8 dB
1905.000 MHz (2*2.LO-3*1.LO)	-103 dBm	-117 dBm	1.6 dB
1909.800 MHz	-103 dBm	-116 dBm	1.6 dB
2270.400 MHz (5*1.LO-3*2.LO)	-103 dBm	-117 dBm	1.6 dB
2276.800 MHz	-103 dBm	-114 dBm	0.8 dB
2540.000 MHz (3*2.LO-5*1.LO)	-103 dBm	-114 dBm	0.8 dB
2546.400 MHz	-103 dBm	-109 dBm	0.4 dB
3405.600 MHz (2*1.LO-1*2.LO)	-103 dBm	-113 dBm	0.8 dB
3415.200 MHz	-103 dBm	-113 dBm	0.8 dB

5. Third-order intercept point (TOI) < 8 GHz

Listing of measurement uncertainties:

range	fc	value range of T.O.I	uncertainty
1	0.01 to 3.6 GHz	+4 dBm to +16 dBm	0.28 dB
1	0.01 to 3.6 GHz	+16 dBm to +26 dBm	0.30 dB
1	0.01 to 3.6 GHz	+26 dBm to +29 dBm	0.90 dB
1	0.01 to 3.6 GHz	+29 dBm and higher	3.06 dB
2	3.60 to 8.0 GHz	+4 dBm to +16 dBm	0.28 dB
2	3.60 to 8.0 GHz	+16 dBm to +26 dBm	0.31 dB
2	3.60 to 8.0 GHz	+26 dBm to +29 dBm	0.91 dB
2	3.60 to 8.0 GHz	+29 dBm and higher	3.06 dB

F_s1	F_s2	DL	Actual	MU
10.15 MHz	10.25 MHz	+17.0 dBm	19.1 dBm	0.3 dB

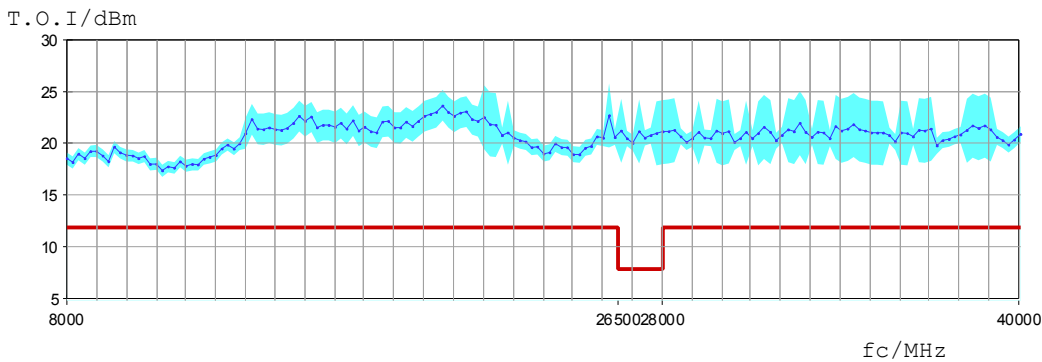


6. Third-order intercept point (TOI) > 8 GHz

Listing of measurement uncertainties:

range	fc	value range of T.O.I	uncertainty
1	7.0 to 13.6 GHz	+4.0 dBm to +16.0 dBm	0.56 dB
1	7.0 to 13.6 GHz	+16.0 dBm to +24.0 dBm	0.57 dB
1	7.0 to 13.6 GHz	+24.0 dBm to +26.0 dBm	1.00 dB
1	7.0 to 13.6 GHz	+26.0 dBm to +29.0 dBm	1.22 dB
1	7.0 to 13.6 GHz	+29.0 dBm and higher	3.08 dB
2	13.6 to 22.0 GHz	+4.0 dBm to +16.0 dBm	0.56 dB
2	13.6 to 22.0 GHz	+16.0 dBm to +21.0 dBm	0.60 dB
2	13.6 to 22.0 GHz	+21.0 dBm to +26.0 dBm	1.48 dB
2	13.6 to 22.0 GHz	+26.0 dBm and higher	3.08 dB
3	22.0 to 30.0 GHz	+4.0 dBm to +16.0 dBm	0.56 dB
3	22.0 to 30.0 GHz	+16.0 dBm to +21.0 dBm	0.76 dB
3	22.0 to 30.0 GHz	+21.0 dBm and higher	3.08 dB
4	30.0 to 40.0 GHz	+4.0 dBm to +16.0 dBm	0.56 dB
4	30.0 to 40.0 GHz	+16.0 dBm to +21.0 dBm	0.76 dB
4	30.0 to 40.0 GHz	+21.0 dBm and higher	3.08 dB

level of the 2 interfer signals is -16 dBm



7. Second harmonic intercept (SHI)

Listing of measurement uncertainties:

range	fc / GHz	f_ip2 / GHz	value range of IP2	uncertainty
1	0.01 to 3.6	0.01 to 3.6	+20 dBm to +60 dBm	0.6 dB
1	0.01 to 3.6	0.01 to 3.6	+60 dBm to +80 dBm	0.6 dB
1	0.01 to 3.6	0.01 to 3.6	+80 dBm and higher	1.5 dB
2	0.01 to 3.6	3.60 to 8.0	+20 dBm to +60 dBm	1.9 dB
2	0.01 to 3.6	3.60 to 8.0	+60 dBm to +80 dBm	1.9 dB
2	0.01 to 3.6	3.60 to 8.0	+80 dBm and higher	2.3 dB
3	3.60 to 8.0	3.60 to 8.0	+20 dBm to +60 dBm	2.5 dB
3	3.60 to 8.0	3.60 to 8.0	+60 dBm to +80 dBm	2.5 dB
3	3.60 to 8.0	3.60 to 8.0	+80 dBm and higher	2.7 dB

fc	DLL	Actual	MU
10.1 MHz	35.0 dBm	51.2 dBm	0.6 dB
49.1 MHz	35.0 dBm	49.8 dBm	0.6 dB
99.0 MHz	35.0 dBm	52.7 dBm	0.6 dB
106.0 MHz	45.0 dBm	52.8 dBm	0.6 dB
274.9 MHz	45.0 dBm	57.0 dBm	0.6 dB
449.9 MHz	52.0 dBm	57.4 dBm	0.6 dB
699.9 MHz	45.0 dBm	55.1 dBm	0.6 dB
999.9 MHz	45.0 dBm	56.4 dBm	0.6 dB
1499.9 MHz	35.0 dBm	60.4 dBm	0.6 dB
1749.9 MHz	35.0 dBm	50.0 dBm	0.6 dB

8. Resolution Bandwidths

8.1 Bandwidth switching error

reference is 10.0 kHz RBW

Bandwidth	DL	Actual	MU
50.0 MHz	0.5 dB	0.06 dB	0.03
20.0 MHz	0.5 dB	0.03 dB	0.03
10.0 MHz	0.5 dB	0.06 dB	0.03
5.0 MHz	0.5 dB	0.07 dB	0.03
3.0 MHz	0.2 dB	0.09 dB	0.03
2.0 MHz	0.2 dB	0.10 dB	0.03
1.0 MHz	0.2 dB	0.09 dB	0.03
300 kHz	0.2 dB	0.08 dB	0.03
200 kHz	0.2 dB	0.06 dB	0.03
100 kHz	0.1 dB	-0.01 dB	0.03
10 kHz	0.1 dB	0.00 dB	0.03
1 kHz	0.1 dB	-0.01 dB	0.03
100 Hz	0.1 dB	0.02 dB	0.03

8.2 Bandwidth error (-3 dB)

Bandwidth	DL	Actual	MU
50.0 MHz	+20 % .. -20 %	3.8 %	0.61 %
20.0 MHz	+20 % .. -20 %	-4.3 %	0.86 %
10.0 MHz	+10 % .. -30 %	-3.8 %	0.49 %
5.0 MHz	+10 % .. -10 %	-1.4 %	1.72 %
3.0 MHz	+10 % .. -10 %	-1.0 %	1.72 %
2.0 MHz	+10 % .. -10 %	0.5 %	1.84 %
1.0 MHz	+10 % .. -10 %	2.4 %	1.72 %
500 kHz	+10 % .. -10 %	-0.5 %	1.96 %
300 kHz	+10 % .. -10 %	1.4 %	1.96 %
200 kHz	+10 % .. -10 %	-1.4 %	1.96 %
100 kHz	+3 % .. -3 %	0.5 %	0.37 %
10 kHz	+3 % .. -3 %	-0.5 %	0.40 %
1 kHz	+3 % .. -3 %	0.0 %	0.37 %
100 Hz	+3 % .. -3 %	0.5 %	0.37 %

8.3 Shapefaktor (-60 dB / -3 dB)

		DUL	Actual	MU
10.0 MHz	shapefaktor	7	3.4	0.87 %
5.0 MHz	shapefaktor	7	3.9	0.49 %
3.0 MHz	shapefaktor	7	5.1	1.75 %
2.0 MHz	shapefaktor	12	6.6	1.75 %
1.0 MHz	shapefaktor	12	8.7	1.87 %
500 kHz	shapefaktor	12	9.6	1.75 %
300 kHz	shapefaktor	12	9.2	2.00 %
200 kHz	shapefaktor	12	9.6	2.00 %
100 kHz	shapefaktor	6	4.5	2.00 %
10 kHz	shapefaktor	6	5.5	0.37 %
1 kHz	shapefaktor	6	4.8	0.40 %
100 Hz	shapefaktor	6	4.5	0.37 %

9. FFT filters

9.1 FFT Bandwidth switching error

reference is 10.0 kHz RBW (normal)

Bandwidth	DL	Actual	MU
3 kHz	0.2 dB	0.02 dB	0.03 dB
1 kHz	0.2 dB	0.02 dB	0.03 dB
100 Hz	0.2 dB	0.02 dB	0.03 dB

9.2 Functional test video bandwidth

	Rated	Actual
function	pass	pass

10. Displayed averaged noise level (DANL)

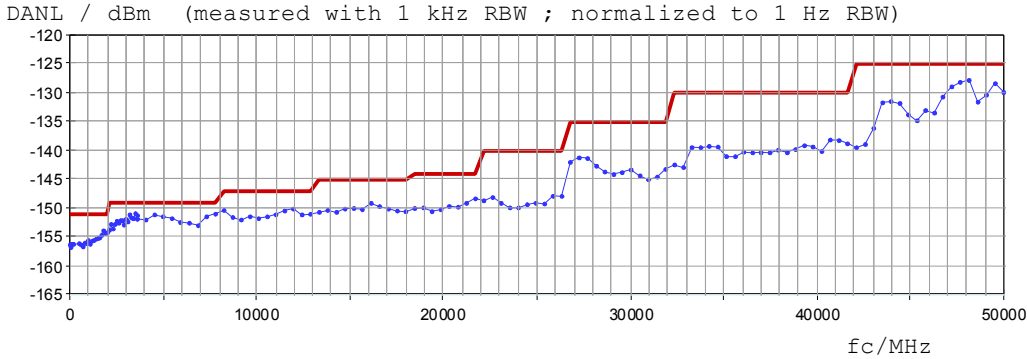
fc	RBW-Type	DUL	Actual	MU
20 Hz	(1 Hz BW) FFT	- 90 dBm	-104 dBm	0.70 dB
90 Hz	(1 Hz BW) FFT	-110 dBm	-114 dBm	0.70 dB

Type FSU-50
 Test System UCSX0177_3553.1786.02_100013
 Temperature (23 -3/+7)°C
 File (Outgoing) 1166.1660K50_200061_102.MF
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Serial No. 200061
 Material No. 1166.1660K50
 Date 2013-12-03



900 Hz	(1 Hz BW)	NORM	-120 dBm	-135 dBm	0.70 dB
9 kHz	(1 Hz BW)	NORM	-130 dBm	-138 dBm	0.70 dB
99 kHz	(1 Hz BW)	NORM	-130 dBm	-138 dBm	0.70 dB
999 kHz	(1 Hz BW)	NORM	-140 dBm	-152 dBm	0.70 dB



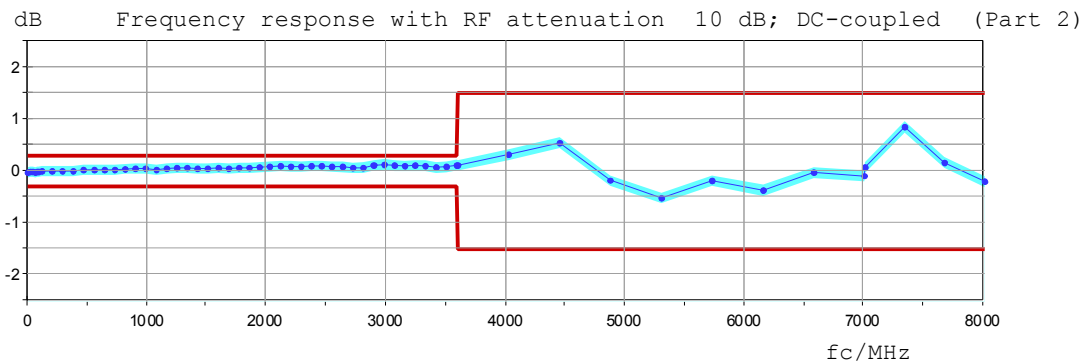
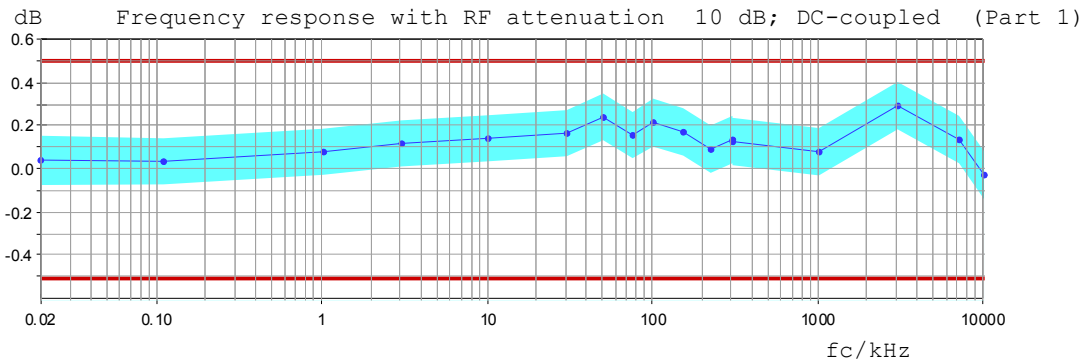
* Measurement uncertainty = 0.70 dB

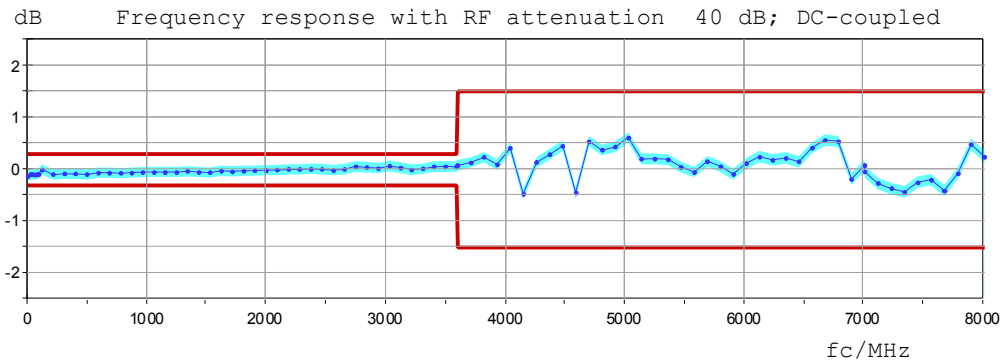
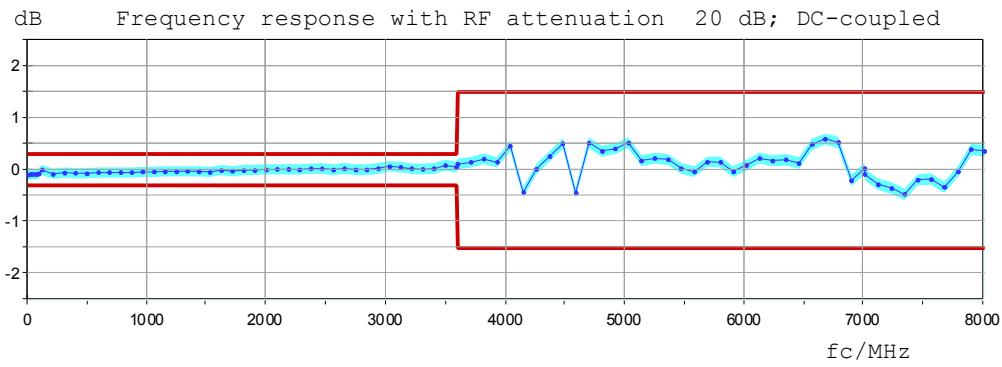
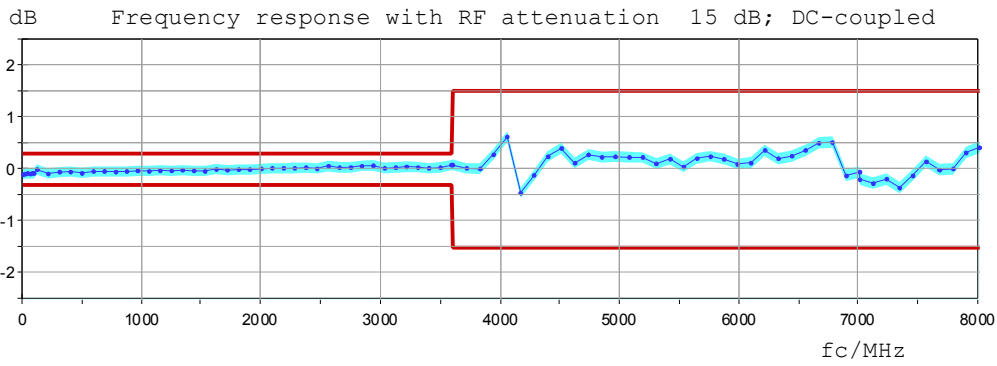
11. Reference error at 128 MHz and frequency response < 8 GHz

11.1 Reference error at 128 MHz

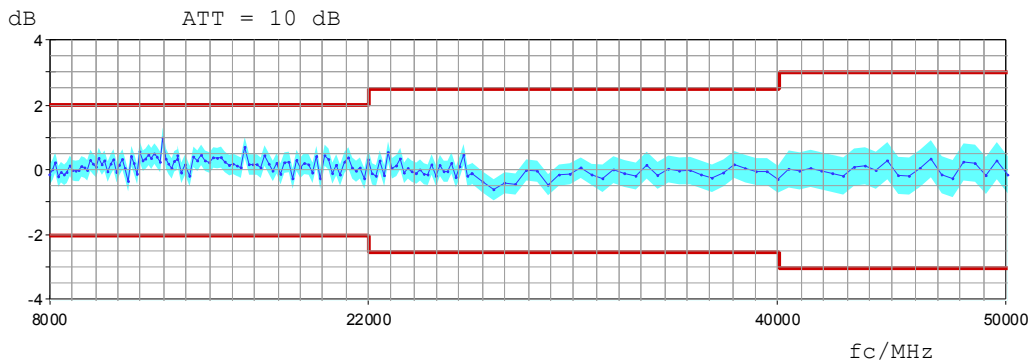
fc	DL	Actual	MU
128 MHz	0.20 dB	-0.07 dB	0.072 dB

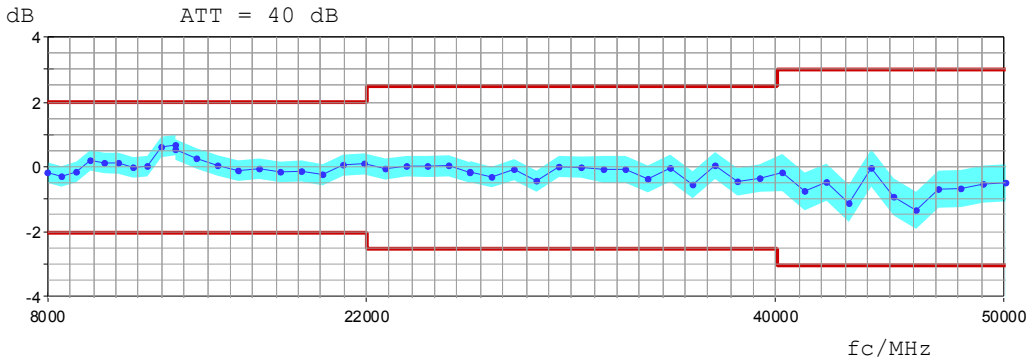
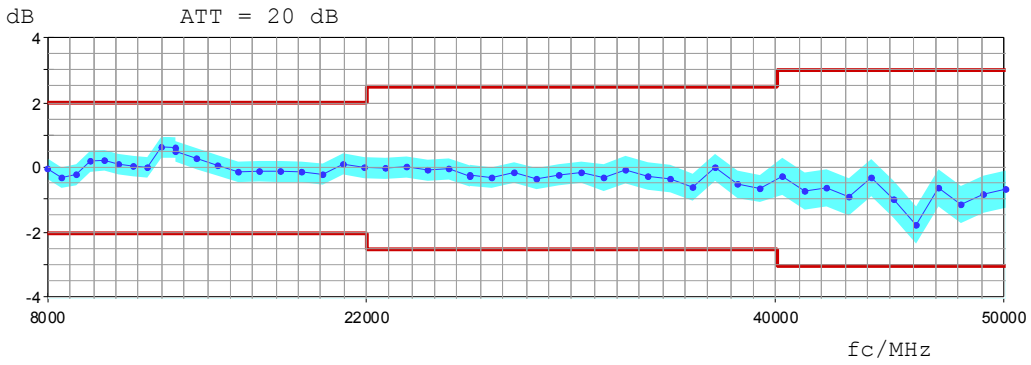
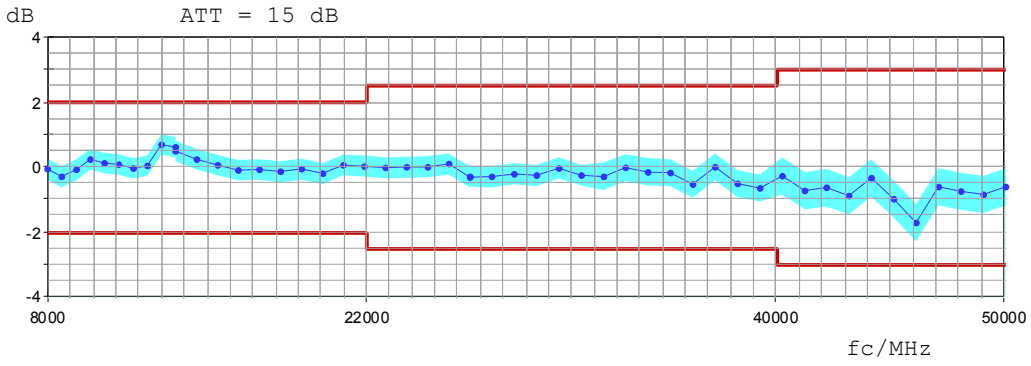
11.2 Frequency response



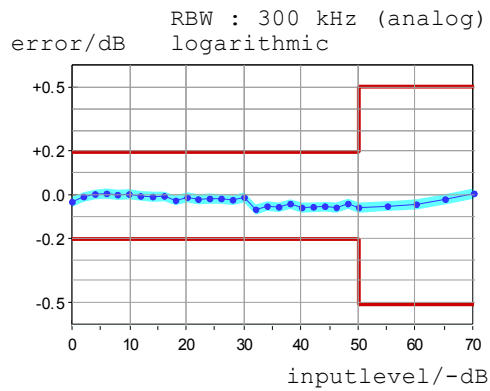
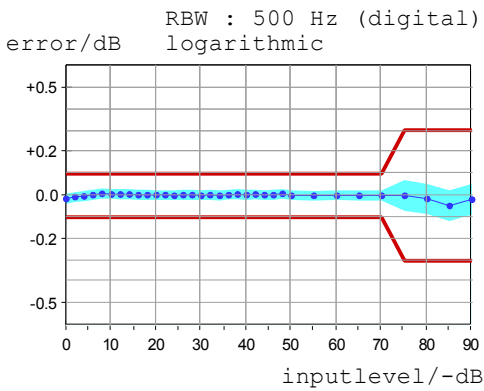


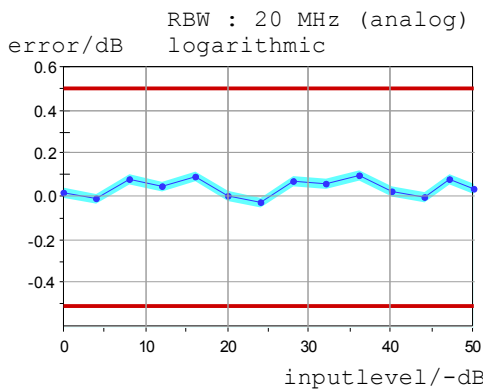
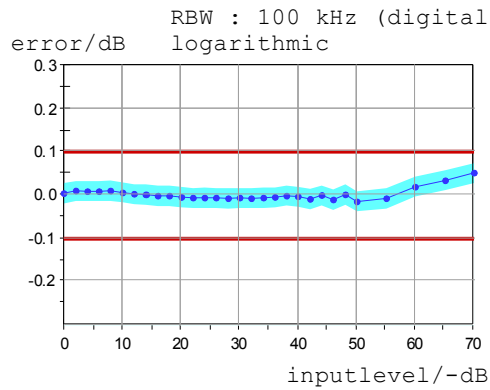
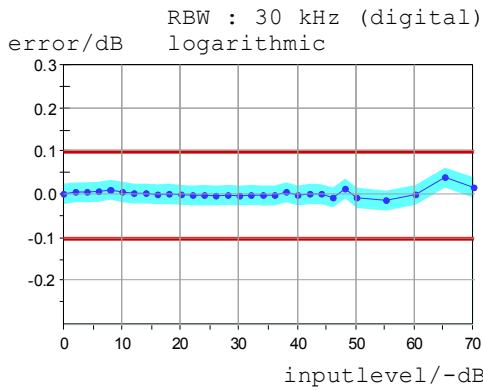
12. Frequency response > 8 GHz



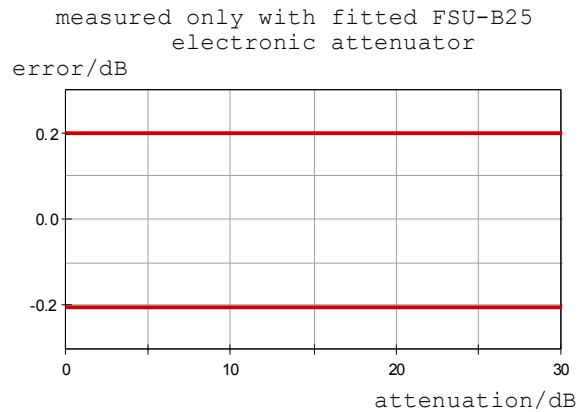
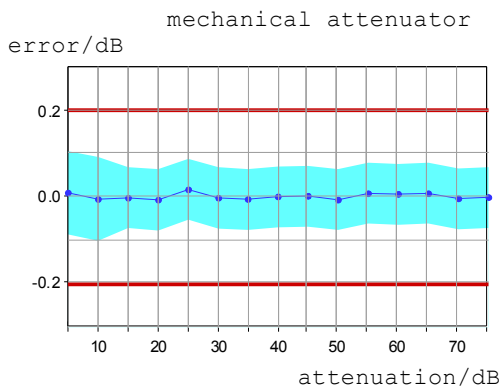


13. Display non linearity

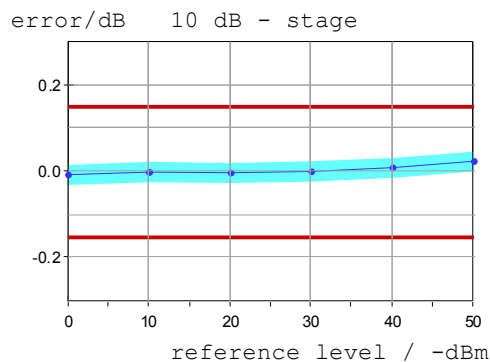
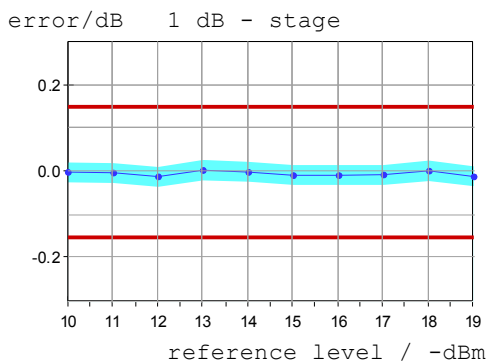




14. Attenuator switching uncertainty



15. Uncertainty of reference level setting

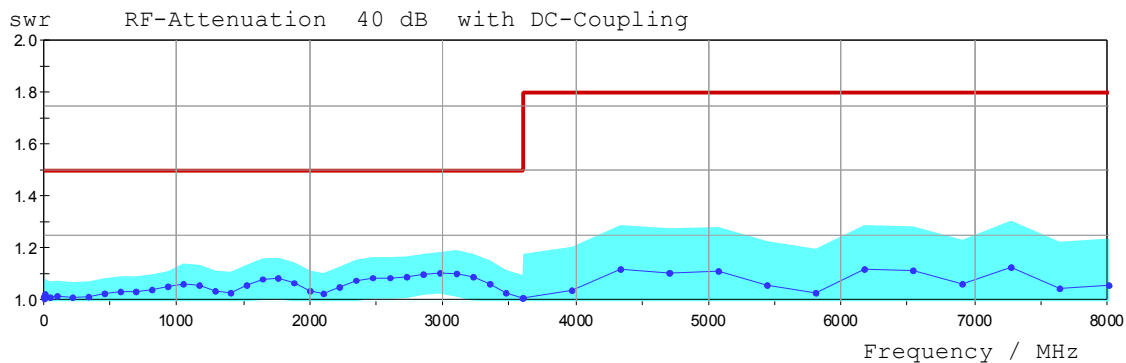
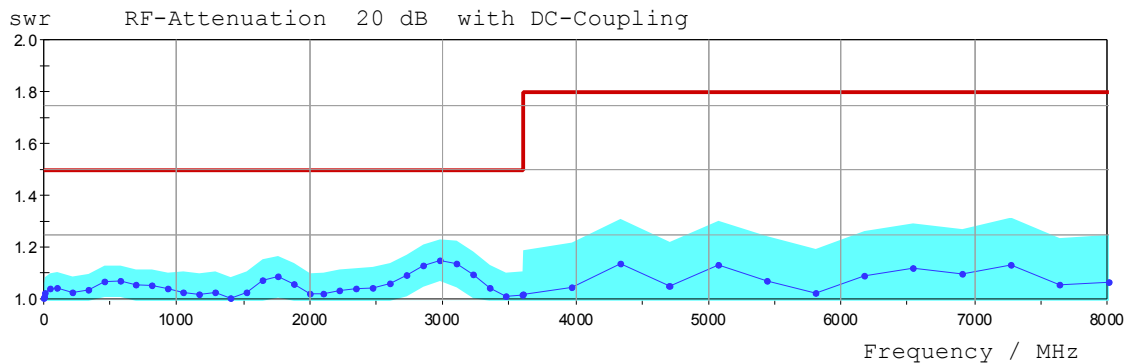
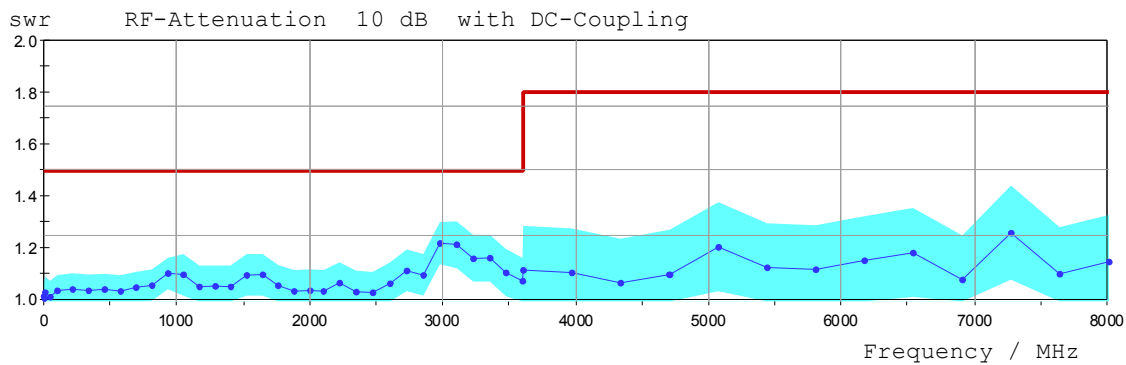


16. Spectral purity (SSB phase noise)

Option B4 not installed

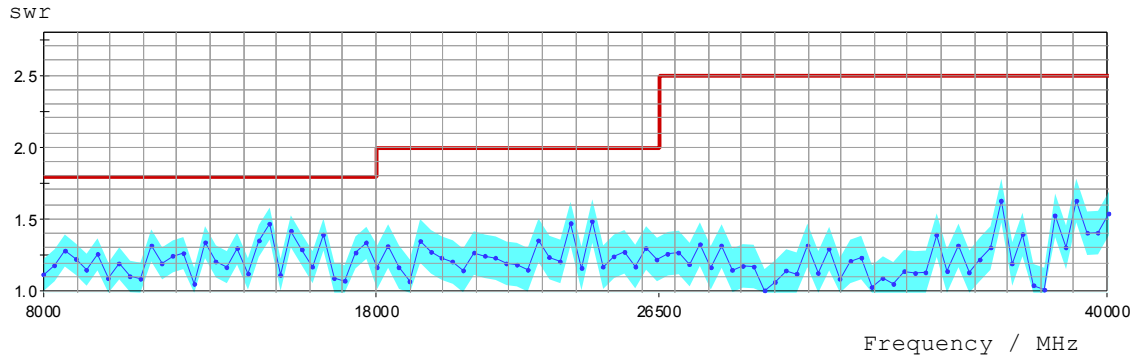
carrier	carrier offset	DUL / dBc (1Hz)	Actual/ dBc (1Hz)	MU/ dB
640.0 MHz	1.0 MHz	-140	-144.19	0.28
640.0 MHz	99.0 kHz	-128	-130.40	0.27
640.0 MHz	10.0 kHz	-128	-130.39	0.37
640.0 MHz	1.0 kHz	-116	-118.78	0.37
640.0 MHz	90 Hz	- 98	-106.72	0.37

17. VSWR at RF input < 8 GHz

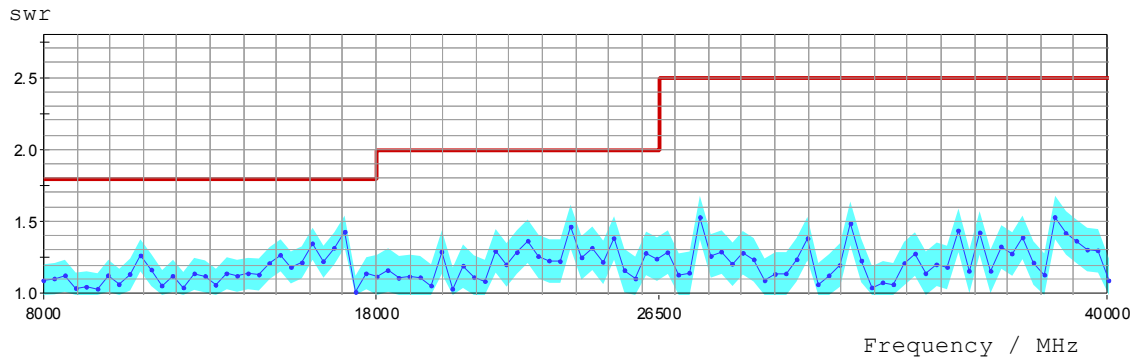


18. VSWR at RF input > 8 GHz

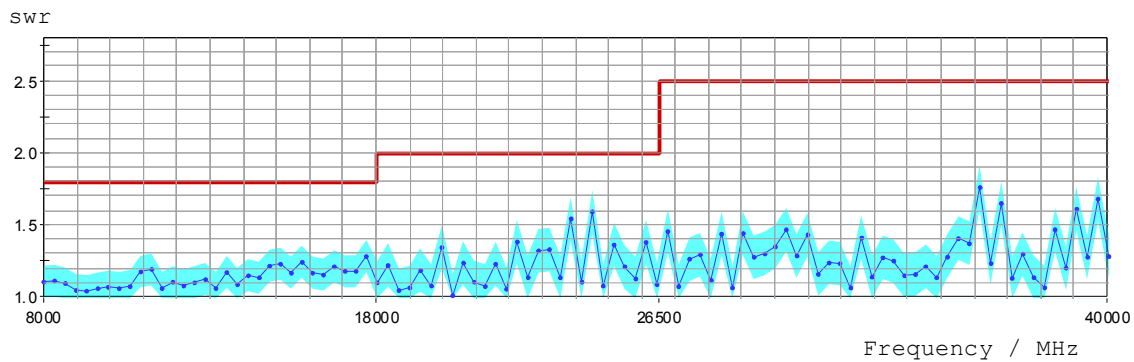
18.1 RF attenuation 10 dB, DC coupled



18.2 RF attenuation 20 dB, DC coupled



18.3 RF attenuation 40 dB, DC coupled



19. General function tests

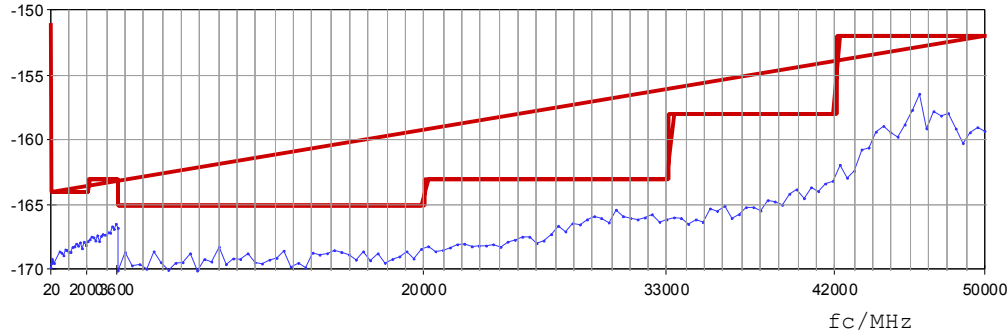
selftest successful	pass	pass
calibration successful	pass	pass

20. Displayed averaged noise level (DANL) (FSU-B24)

fc	RBW-Type	DUL	Actual	MU
0.1 MHz	(1 Hz BW)	NORM	-140 dBm	-150.85 dBm 1.10 dB
1 MHz	(1 Hz BW)	NORM	-150 dBm	-161.62 dBm 1.10 dB
10.1 MHz	(1 Hz BW)	NORM	-163 dBm	-170.42 dBm 1.10 dB

Preamplifier = ON

DANL / dBm (measured with 1 kHz RBW ; normalized to 1 Hz RBW)



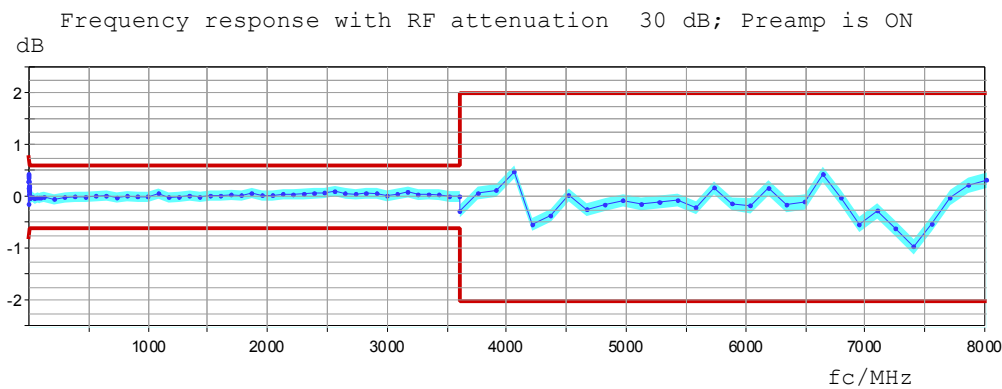
* Measurement uncertainty = 1.10 dB

21. Reference error at 128 MHz and Frequency response (FSU-B24) f < 8 GHz

21.1 Reference error at 128 MHz, Preselector OFF

fc	DL	Actual	MU
128 MHz	0.30 dB	-0.01 dB	0.072 dB

21.2 Frequency response Preamp ON



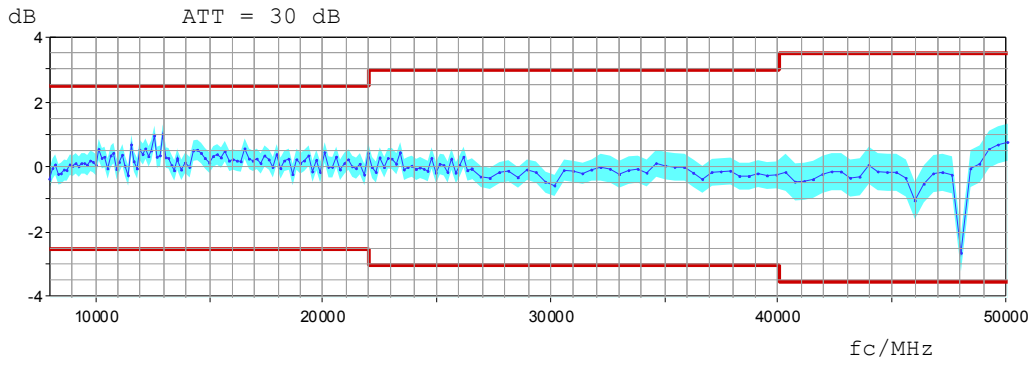
Type FSU-50
Test System UCSX0177_3553.1786.02_100013
Temperature (23 -3/+7)°C
File (Outgoing) 1166.1660K50_200061_102.MF
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Material No. 1166.1660K50
Date 2013-12-03



22. Frequency response (FSU-B24) $f > 8.0$ GHz

Preamplifier = ON



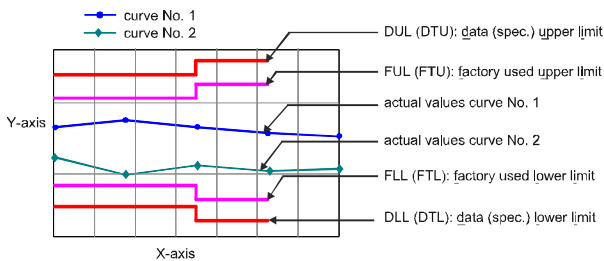
The following abbreviations may be used in this document

- {a} No measurement uncertainty stated because the errors always add together. So it is sure that a measurement result evaluated as "PASS" is pass.
- {b} The measurement uncertainty depends on the measurement result. The stated measurement uncertainty is valid for the close area around the specification. Measurement results outside the close area have a higher measurement uncertainty but are within the specification.
- {c} Functional test, therefore no measurement uncertainty is stated.
- {d} Typical value, refer to performance test.
- {e} The measurement uncertainty is taken into account when setting the measuring system.
- DL or DT Data Limit for symmetrical tolerance limits
- DLL Datasheet Lower Limit
- DUL Datasheet Upper Limit
- MU Symmetrical Measurement Uncertainty
- MLL or MLV Measurement Uncertainty Lower Value
- MUL or MUV Measurement Uncertainty Upper Value
- Nom. Nominal Value
- Dev. Deviation
- MErr. Measurement Error
- Act. Actual Value
- UGB Uncertainty Guard Band: Measuring uncertainty violates the data (spec.) limit.
- UGB1 Measurement results marked as UGB1 show conformity with a probability of >50 % and <95 %.
- UGB2 Measurement results marked as UGB2 show non-conformity with a probability of >50 % and <95 %.
- DU Datasheet Uncertainty

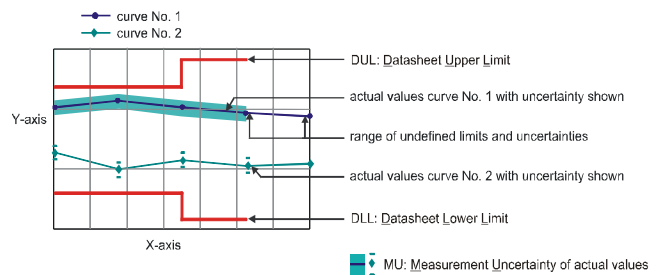
Explanation of charts

1. In case uncertainties are part of the appendix

factory used limit = data specification - uncertainty of actual value



2. In case uncertainties are part of the respective graphic



4. Residual response

range	fc	value range of actual	uncertainty
1	0 to 3.6 GHz	-103 dBm to -106 dBm	0.4 dB
1	0 to 3.6 GHz	-106 dBm to -110 dBm	0.4 dB
1	0 to 3.6 GHz	-110 dBm to -116 dBm	0.8 dB
1	0 to 3.6 GHz	-116 dBm to -120 dBm	1.6 dB
1	0 to 3.6 GHz	-120 dBm and lower	2.7 dB

fc	DL	Actual	MU
25.175 MHz (LCD-display)	-103 dBm	-116 dBm	1.6 dB
50.350 MHz (LCD-display)	-103 dBm	-118 dBm	1.6 dB
75.525 MHz (LCD-display)	-103 dBm	-119 dBm	1.6 dB
32.000 MHz (reference/4)	-103 dBm	-119 dBm	1.6 dB
64.000 MHz (reference/2)	-103 dBm	-118 dBm	1.6 dB
128.000 MHz (reference)	-103 dBm	-119 dBm	1.6 dB
384.000 MHz (reference)	-103 dBm	-116 dBm	1.6 dB
768.000 MHz (384 MHz*2)	-103 dBm	-119 dBm	1.6 dB
1152.000 MHz (384 MHz*3)	-103 dBm	-115 dBm	0.8 dB
1536.000 MHz (384 MHz*4)	-103 dBm	-116 dBm	1.6 dB
1920.000 MHz (384 MHz*5)	-103 dBm	-117 dBm	1.6 dB
2304.000 MHz (384 MHz*6)	-103 dBm	-115 dBm	0.8 dB
2688.000 MHz (384 MHz*7)	-103 dBm	-115 dBm	0.8 dB
548.100 MHz (5*1.LO-4*2.LO)	-103 dBm	-117 dBm	1.6 dB
550.500 MHz	-103 dBm	-117 dBm	1.6 dB
750.300 MHz (4*2.LO-5*1.LO)	-103 dBm	-118 dBm	1.6 dB
752.700 MHz	-103 dBm	-117 dBm	1.6 dB
865.600 MHz (4*1.LO-3*2.LO)	-103 dBm	-116 dBm	0.8 dB
868.800 MHz	-103 dBm	-118 dBm	1.6 dB
1135.200 MHz (3*2.LO-4*1.LO)	-103 dBm	-117 dBm	1.6 dB
1138.400 MHz	-103 dBm	-117 dBm	1.6 dB
1500.600 MHz (3*1.LO-2*2.LO)	-103 dBm	-117 dBm	1.6 dB
1505.400 MHz	-103 dBm	-115 dBm	0.8 dB
1905.000 MHz (2*2.LO-3*1.LO)	-103 dBm	-114 dBm	0.8 dB
1909.800 MHz	-103 dBm	-116 dBm	1.6 dB
2270.400 MHz (5*1.LO-3*2.LO)	-103 dBm	-116 dBm	0.8 dB
2276.800 MHz	-103 dBm	-113 dBm	0.8 dB
2540.000 MHz (3*2.LO-5*1.LO)	-103 dBm	-111 dBm	0.8 dB
2546.400 MHz	-103 dBm	-113 dBm	0.8 dB
3405.600 MHz (2*1.LO-1*2.LO)	-103 dBm	-112 dBm	0.8 dB
3415.200 MHz	-103 dBm	-114 dBm	0.8 dB

Incoming Results

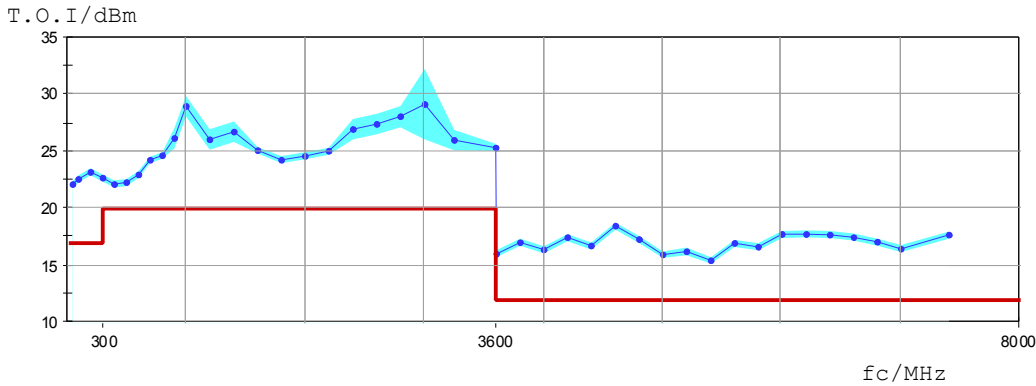
5. Third-order intercept point (TOI) < 8 GHz

Listing of measurement uncertainties:

INVALID

range	fc	value range of T.O.I	uncertainty
1	0.01 to 3.6 GHz	+4 dBm to +16 dBm	0.28 dB
1	0.01 to 3.6 GHz	+16 dBm to +26 dBm	0.30 dB
1	0.01 to 3.6 GHz	+26 dBm to +29 dBm	0.90 dB
1	0.01 to 3.6 GHz	+29 dBm and higher	3.06 dB
2	3.60 to 8.0 GHz	+4 dBm to +16 dBm	0.28 dB
2	3.60 to 8.0 GHz	+16 dBm to +26 dBm	0.31 dB
2	3.60 to 8.0 GHz	+26 dBm to +29 dBm	0.91 dB
2	3.60 to 8.0 GHz	+29 dBm and higher	3.06 dB

F_s1	F_s2	DL	Actual	MU
10.15 MHz	10.25 MHz	+17.0 dBm	18.9 dBm	0.3 dB

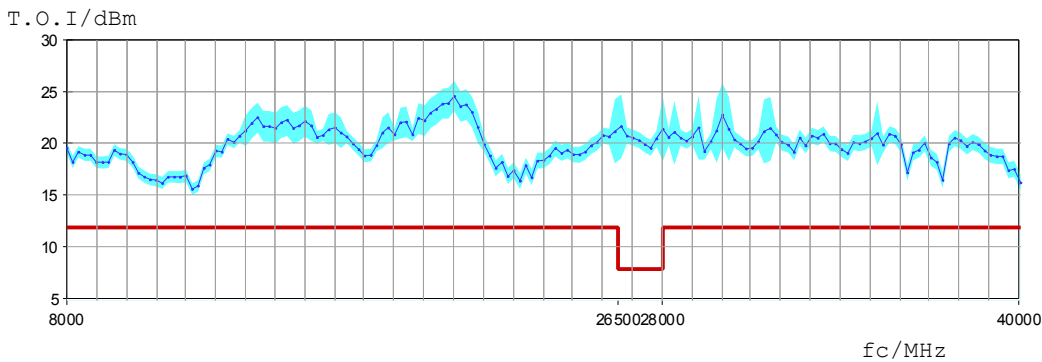


6. Third-order intercept point (TOI) > 8 GHz

Listing of measurement uncertainties:

range	fc	value range of T.O.I	uncertainty
1	7.0 to 13.6 GHz	+4.0 dBm to +16.0 dBm	0.56 dB
1	7.0 to 13.6 GHz	+16.0 dBm to +24.0 dBm	0.57 dB
1	7.0 to 13.6 GHz	+24.0 dBm to +26.0 dBm	1.00 dB
1	7.0 to 13.6 GHz	+26.0 dBm to +29.0 dBm	1.22 dB
1	7.0 to 13.6 GHz	+29.0 dBm and higher	3.08 dB
2	13.6 to 22.0 GHz	+4.0 dBm to +16.0 dBm	0.56 dB
2	13.6 to 22.0 GHz	+16.0 dBm to +21.0 dBm	0.60 dB
2	13.6 to 22.0 GHz	+21.0 dBm to +26.0 dBm	1.48 dB
2	13.6 to 22.0 GHz	+26.0 dBm and higher	3.08 dB
3	22.0 to 30.0 GHz	+4.0 dBm to +16.0 dBm	0.56 dB
3	22.0 to 30.0 GHz	+16.0 dBm to +21.0 dBm	0.76 dB
3	22.0 to 30.0 GHz	+21.0 dBm and higher	3.08 dB
4	30.0 to 40.0 GHz	+4.0 dBm to +16.0 dBm	0.56 dB
4	30.0 to 40.0 GHz	+16.0 dBm to +21.0 dBm	0.76 dB
4	30.0 to 40.0 GHz	+21.0 dBm and higher	3.08 dB

level of the 2 interfer signals is -16 dBm



7. Second harmonic intercept (SHI)

Listing of measurement uncertainties:

range	fc / GHz	f_ip2 / GHz	value range of IP2	uncertainty
1	0.01 to 3.6	0.01 to 3.6	+20 dBm to +60 dBm	0.6 dB
1	0.01 to 3.6	0.01 to 3.6	+60 dBm to +80 dBm	0.6 dB
1	0.01 to 3.6	0.01 to 3.6	+80 dBm and higher	1.5 dB
2	0.01 to 3.6	3.60 to 8.0	+20 dBm to +60 dBm	1.9 dB
2	0.01 to 3.6	3.60 to 8.0	+60 dBm to +80 dBm	1.9 dB
2	0.01 to 3.6	3.60 to 8.0	+80 dBm and higher	2.3 dB
3	3.60 to 8.0	3.60 to 8.0	+20 dBm to +60 dBm	2.5 dB
3	3.60 to 8.0	3.60 to 8.0	+60 dBm to +80 dBm	2.5 dB
3	3.60 to 8.0	3.60 to 8.0	+80 dBm and higher	2.7 dB

fc	DLL	Actual	MU
10.1 MHz	35.0 dBm	51.3 dBm	0.6 dB
49.1 MHz	35.0 dBm	44.9 dBm	0.6 dB
99.0 MHz	35.0 dBm	45.8 dBm	0.6 dB
106.0 MHz	45.0 dBm	46.3 dBm	0.6 dB
274.9 MHz	45.0 dBm	50.7 dBm	0.6 dB
449.9 MHz	52.0 dBm	50.6 dBm	0.6 dB
699.9 MHz	45.0 dBm	51.9 dBm	0.6 dB
999.9 MHz	45.0 dBm	52.5 dBm	0.6 dB
1499.9 MHz	35.0 dBm	59.0 dBm	0.6 dB
1749.9 MHz	35.0 dBm	51.4 dBm	0.6 dB

FAIL

Incoming Results

8. Resolution Bandwidths

8.1 Bandwidth switching error

reference is 10.0 kHz RBW

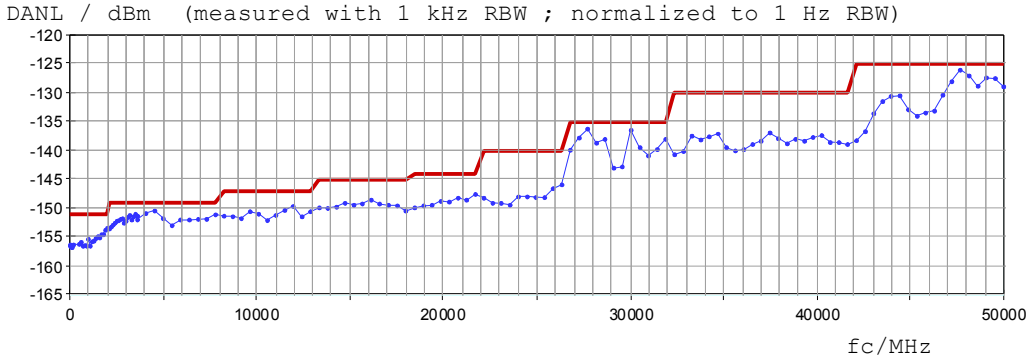
Bandwidth	DL	Actual	MU
50.0 MHz	0.5 dB	0.06 dB	0.03
20.0 MHz	0.5 dB	0.08 dB	0.03
10.0 MHz	0.5 dB	0.12 dB	0.03
5.0 MHz	0.5 dB	0.10 dB	0.03
3.0 MHz	0.2 dB	0.12 dB	0.03
2.0 MHz	0.2 dB	0.11 dB	0.03
1.0 MHz	0.2 dB	0.12 dB	0.03
300 kHz	0.2 dB	0.11 dB	0.03
200 kHz	0.2 dB	0.11 dB	0.03
100 kHz	0.1 dB	-0.01 dB	0.03
10 kHz	0.1 dB	0.00 dB	0.03
1 kHz	0.1 dB	-0.01 dB	0.03
100 Hz	0.1 dB	0.00 dB	0.03

Type FSU-50
 Test System UCSX0177_3553.1786.02_100013
 Temperature (23 -3/+7)°C
 File (Incoming) 1166.1660K50_200061_101.MF
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Serial No. 200061
 Material No. 1166.1660K50
 Date 2013-11-08



900 Hz	(1 Hz BW)	NORM	-120 dBm	-126 dBm 0.70 dB
9 kHz	(1 Hz BW)	NORM	-130 dBm	-141 dBm 0.70 dB
99 kHz	(1 Hz BW)	NORM	-130 dBm	-140 dBm 0.70 dB
999 kHz	(1 Hz BW)	NORM	-140 dBm	-147 dBm 0.70 dB



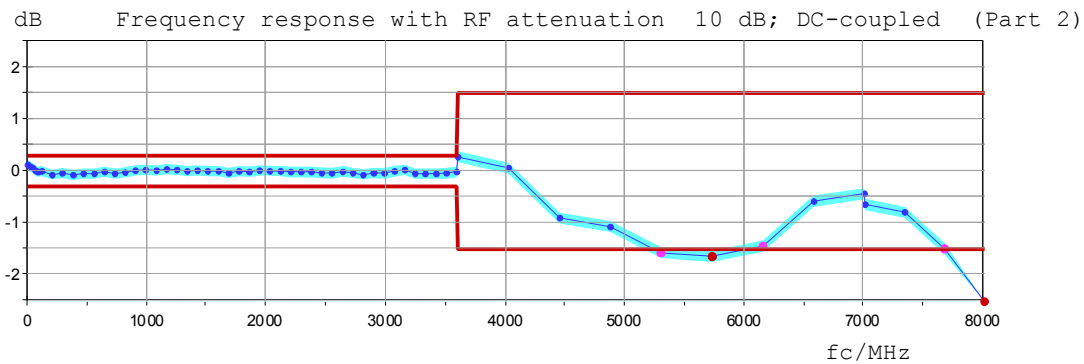
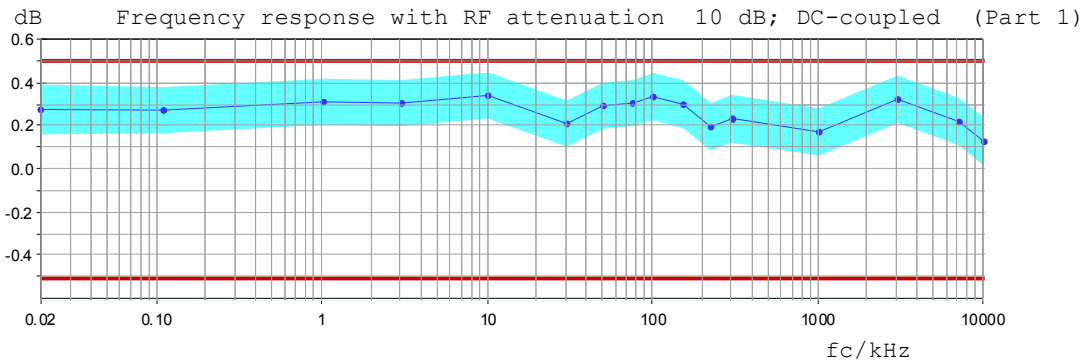
* Measurement uncertainty = 0.70 dB

11. Reference error at 128 MHz and frequency response < 8 GHz

11.1 Reference error at 128 MHz

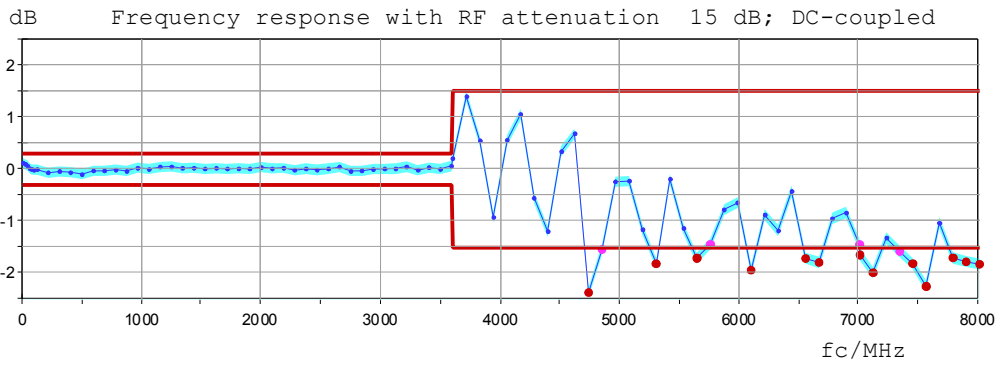
fc	DL	Actual	MU
128 MHz	0.20 dB	-0.07 dB	0.072 dB

11.2 Frequency response

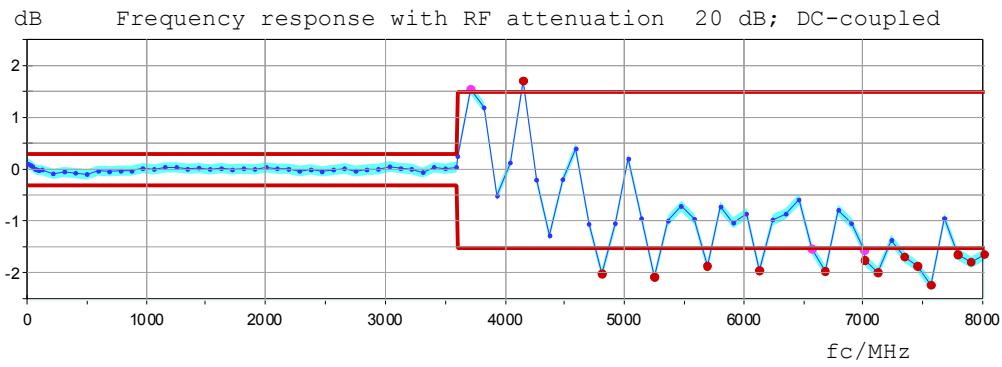


FAIL (2)
 UGB2 (1)
 UGB1 (2)

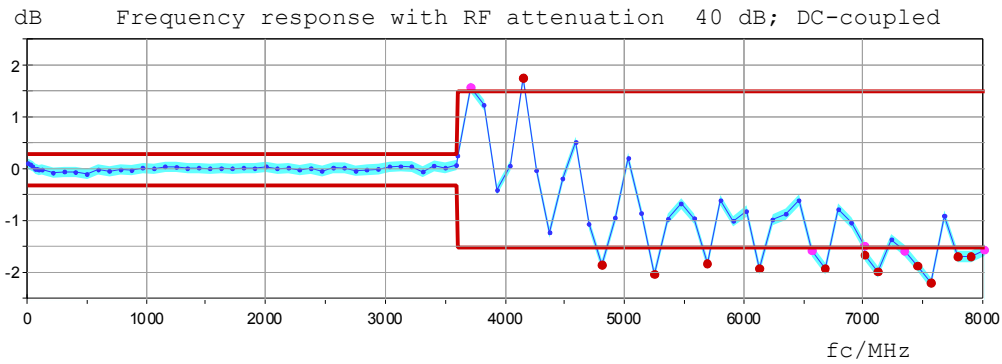
Incoming Results



FAIL (13)
 UGB2 (2)
 UGB1 (2)



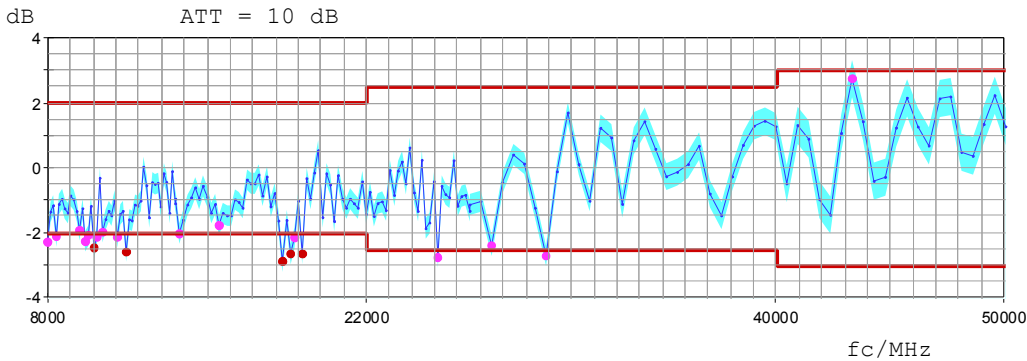
FAIL (14)
 UGB2 (3)



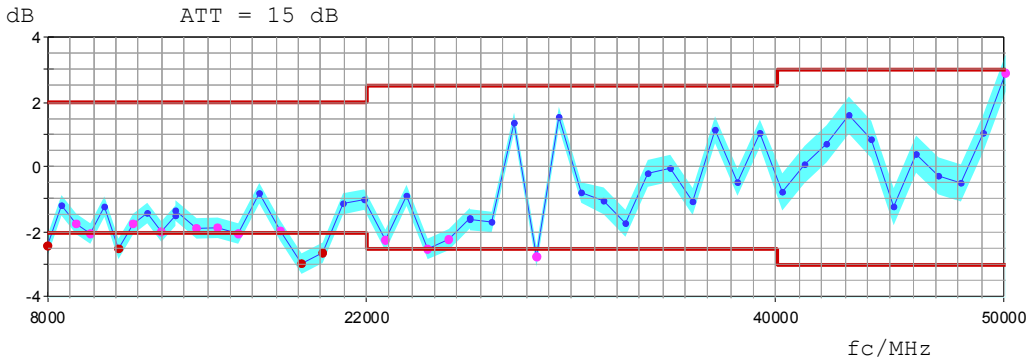
FAIL (12)
 UGB2 (4)
 UGB1 (1)

Incoming Results

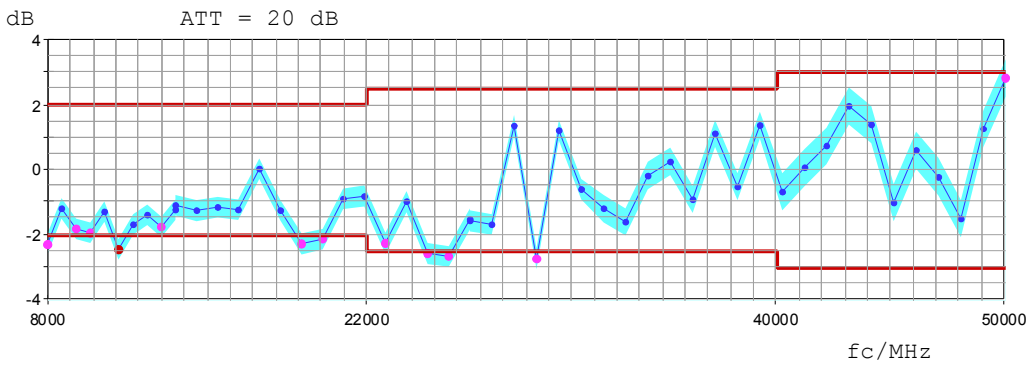
12. Frequency response > 8 GHz



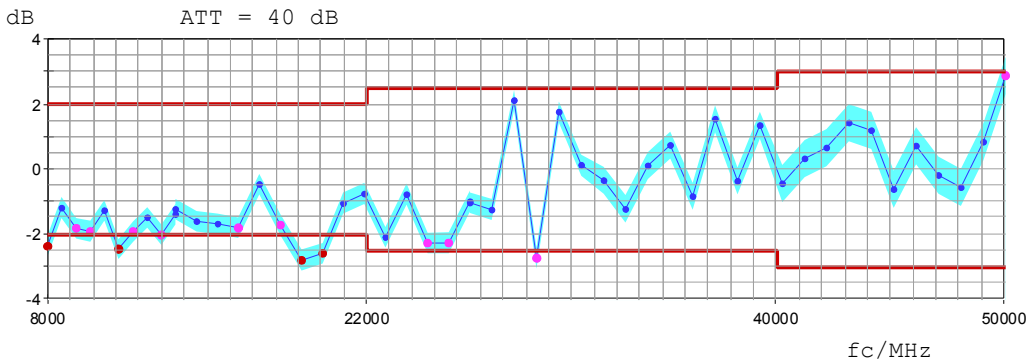
FAIL (5)
 UGB2 (9)
 UGB1 (6)



FAIL (4)
 UGB2 (3)
 UGB1 (10)



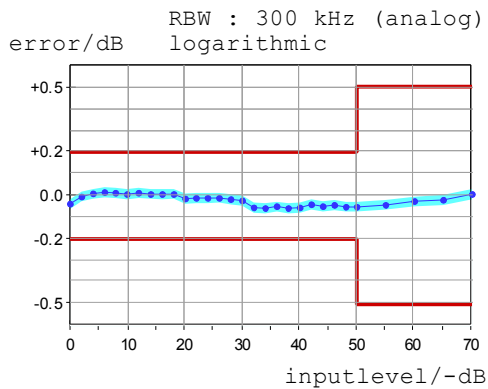
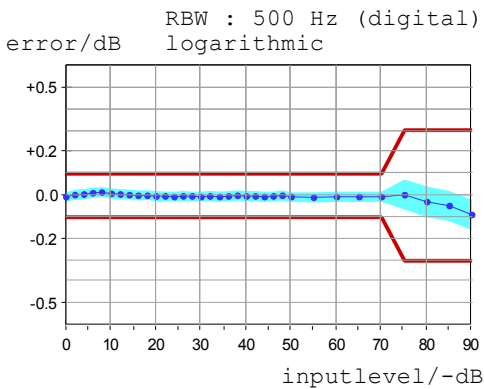
FAIL (1)
 UGB2 (6)
 UGB1 (5)



FAIL (4)
 UGB2 (2)
 UGB1 (8)

Incoming Results

13. Display non linearity

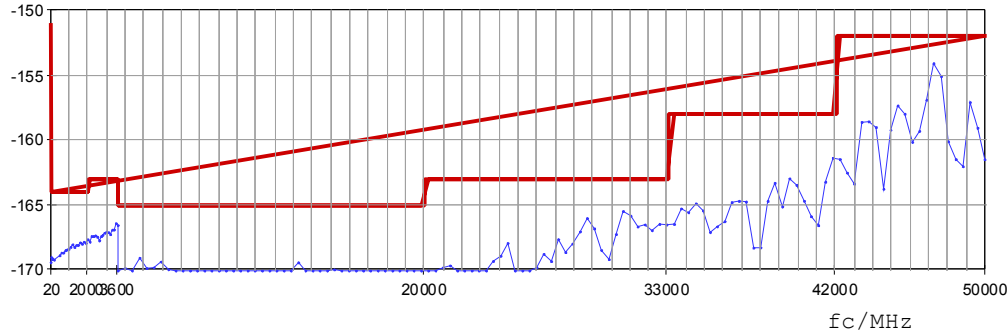


20. Displayed averaged noise level (DANL) (FSU-B24)

fc	RBW-Type	DUL	Actual	MU
0.1 MHz	(1 Hz BW)	NORM	-140 dBm	-154.34 dBm 1.10 dB
1 MHz	(1 Hz BW)	NORM	-150 dBm	-161.23 dBm 1.10 dB
10.1 MHz	(1 Hz BW)	NORM	-163 dBm	-168.27 dBm 1.10 dB

Preamplifier = ON

DANL / dBm (measured with 1 kHz RBW ; normalized to 1 Hz RBW)



* Measurement uncertainty = 1.10 dB

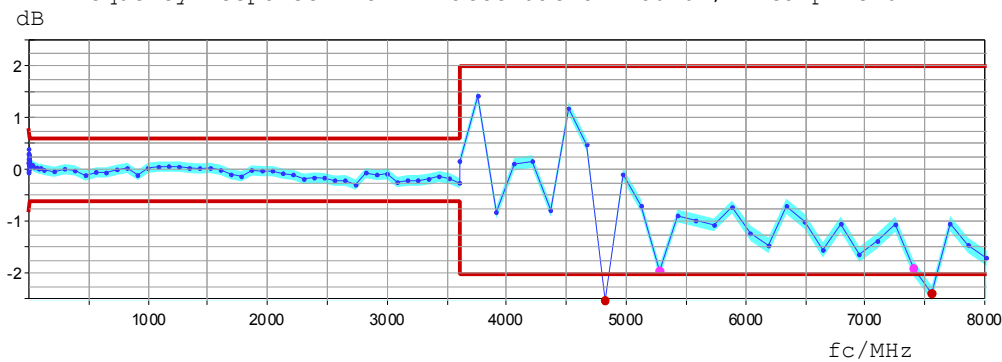
21. Reference error at 128 MHz and Frequency response (FSU-B24) f < 8 GHz

21.1 Reference error at 128 MHz, Preselector OFF

fc	DL	Actual	MU
128 MHz	0.30 dB	-0.08 dB	0.072 dB

21.2 Frequency response Preamp ON

Frequency response with RF attenuation 30 dB; Preamp is ON



FAIL (2)

UGB1 (2)

Type FSU-50
Test System UCSX0177_3553.1786.02_100013
Temperature (23 -3/+7)°C
File (Incoming) 1166.1660K50_200061_101.MF
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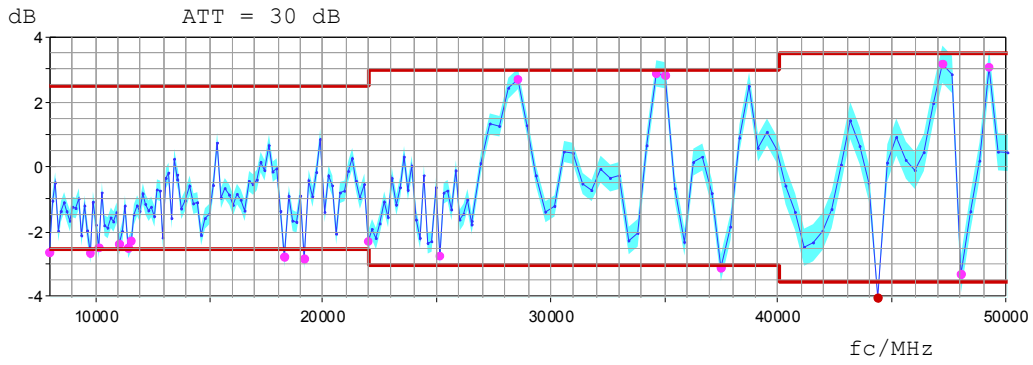
Serial No. 200061
Material No. 1166.1660K50
Date 2013-11-08



22. Frequency response (FSU-B24) f > 8.0 GHz

Preamplifier = ON

FAIL (1)
UGB2 (5)
UGB1 (12)



Incoming Results