Product Service

Choose certainty.
Add value.

Technical Report No.

713005266A

dated
2012-08-14

Client:	REEL Reinheimer Elektronik GmbH Felsweg 6a 35435 Wettenberg
Manufacturer and / or location of manufacturing:	see client
Unit/s under test (UUT):	Planar Combination Antenna
Test specification:	Vibration test in accordance to ISO16750-3:2006 Shock test in accordance to IEC60068-2-27:2008 Temperature test in accordance to IEC68-2-14Na:2009 and IECE69968-2-2:2007 Temperature shock test in accordance to IEC68-2-14Na:2009 Climatic test in accordance to IEC68-2-30Db variant 2:2005 Fluid resistance test according to customer specification
Test scope:	Verification of suitability for intended application according the under position 3 detailed test specification.
Test result:	The units under test were not opened. The visual inspection showed some broken cable after vibration (see notes Appendix A). Function tests of the customer at his location showed a short circuit on some of these energized UUT, so GPS/GNSS was not in function. All UUT without broken cable were in complete function after the test (see notes Appendix B). The presented unit met the requirements.

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Product Service

Table of content

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1 Unit/s under test (UUT)

The units under test were planar combination antennas

	REEL No.	REEL Type	Material	Function		
UUT 1	SC1	K70ZAR_0030_00_03_03_CL5	Ultr/lifo	GSM	GPS	
UUT 2	SC2	K70ZAR_0030_00_03_03_CL5	Ultr/lifo	GSM	GPS	
UUT 3	SC3	K70ZAR_0030_00_03_03_CL5	Ultr/lifo	GSM	GPS	
UUT 4	1.1	C70ZAR_0030_00_03_03_CL5	Ultr/lifo	GSM	GPS/GNSS	WLAN
UUT 5	1.2	C70ZGAR_0030_00_03_03_CL5	Ultr/lifo	GSM	GPS/GNSS	WLAN
UUT 6	2.1	C70ZAR_0030_00_03_03_XX	Ultr/lifo	GSM	GPS/GNSS	WLAN
UUT 7	2.2	C70ZGAR_0030_00_03_03_XX	Ultr/lifo	GSM	GPS/GNSS	WLAN
UUT 8	1	K60ZGAR_0030_00_03_WP	PA 6.6	GSM	GPS	
UUT 9	2	K60ZGAR_0030_00_03_WP	PA 6.6	GSM	GPS	
UUT 10	3	K60ZGAD_0100_89_88_XX	PC	GSM	GPS	
UUT 11	4	K60ZGAD_0100_89_88_XX	PC	GSM	GPS	
UUT 12	5	K60ZAD_0100_89_88_XX	PC	GSM	GPS	
UUT 13	6	K60ZAD_0100_89_88_XX	PC	GSM	GPS	
UUT 14	7	K60ZAD_0100_89_88_XX	PC	GSM	GPS	
UUT 15	8	K70ZAR_0100_89_88_AW	Ultr/lifo	GSM	GPS	
UUT 16	9	K70ZAR_0100_89_88_AW	Ultr/lifo	GSM	GPS	
UUT 17	10	K70ZAR_0100_89_88_AW	Ultr/lifo	GSM	GPS	
UUT 18	11	K60ZAD_0030_00_03_WP	PA 6.6	GSM	GPS	
UUT 19	12	K60ZAD_0030_00_03_WP	PA 6.6	GSM	GPS	
UUT 20	13	K60ZAD_0030_00_03_WP	PA 6.6	GSM	GPS	
UUT 21	14	F70ZFR_0030_00_03_03_AW40	Ultr/lifo	GSM		WLAN
UUT 22	15	F70ZFR_0030_00_03_03_AW40	Ultr/lifo	GSM		WLAN
UUT 23	cable	RG174_0510_0005_0311_CL5				
UUT 24	cable	RG174_0510_0005_0311_CL5				
UUT 25	cable	RG174_0510_0005_0311_CL5				
UUT 26	cable	RG174_0510_0005_0311_CL5				
UUT 27 – UUT 30		GEH_006_G2CL23_0	*Housing cover only for fluid resistance test*			

During climatic and temperature test a constant voltage was applied and withstand measurement was performed on UUT 4 – UUT 11, UUT 21 and UUT 22.

During vibration test a constant voltage was applied to the UUT.

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2 Order

2.1 Date of order, initial of client

Company REEL Reinheimer Elektronik GmbH ordered from TÜV SÜD Product Service GmbH by fax dated 2012-04-05, to test the a.m. UUT.

2.2 Receipt of UUT

The samples were delivered by the client on 2012-05-02.

2.3 Reconsignment of UUT

The samples were taken by the client on 2012-07-26.

3 Test specification

3.1 Vibration test, random

Frequency range: 10 Hz - 2000 Hz
Acceleration: 10 Hz, 0,02 g^2/Hz
20 Hz, 0,036 g^2/Hz
30 Hz, 0,036 g^2/Hz
180 Hz, 0,1 g^2/Hz
2000 Hz, 0,1 g^2/Hz
Acceleration: 5,79g_{rms}
Test duration: 32 h / axis, in 3 axes

Temperature overlay

Temp. [°C]	Change + value	25	↘	-40	→	-40	↗	+85	→	+85	↘	+25
Time [h:min]		0:0	1:00		3:00		2:05		1:25		0:30	

Test duration: 8h

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3.2 Shock test, endurance

Type of shock: half sine
Acceleration: 30 g
Shock duration: 18 ms
Number of shocks: 1000 shocks each in both directions on three mutually perpendicular axes

3.3 Climatic tests

3.3.1 Damp heat, cyclic

Humidity [% r.h.]	Change + Value	60	↗	95	→	95	→	95	→	95	↘	60
Time [h:min]		0:0	3:00		9:00		3:00		9:00		0:30	

Temp. [°C]	Change + value	25	↗	53	→	53	↘	25	→	25	→	25
Time [h:min]		0:0	3:00		9:00		3:00		9:00		2:00	

(Figures in grey are repeated as a loop 4 -times)

Test duration: 50h

3.4 Temperature test – heat constant

Temperature: +85 °C
Test duration: 21 d

3.5 Temperature change test

High temperature: +85 °C
Dwell time: 3 h
Low temperature: -40 °C
Dwell time: 3 h
Transition: 1 K/min
Cycle time: 10,5 h
Test duration: 13d 3 h (30 cycles)

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3.6 Temperature shock test

High temperature:	-40 °C
Dwell time:	30 min
Low temperature:	+105 °C
Dwell time:	20 min
Test duration:	30 h (30 cycles)

3.7 Fluid resistance test

The UUT was coated with test fluid at room temperature. Then a dry time of 24h at 20 °C followed. This procedure was done for 3 times. Then the surface was cleaned with a damp cloth and a visual control was realized.

4 Test equipment

Equipment	Type	Ser.-No.	Manufacturer
Shaker:	SA 30-R 16 A		Unholtz-Dickie
	TV 59410/AIT-440-3 TGT MOH 36 XXL-3		Tira GmbH
	V Win		Ling Dynamic Systems
Vibration control system	V Win		Unholtz-Dickie
	VipPilot VP8		Mahrenholz & Partner
Signal conditioner:	133	AE 48	Endevco
		AE 99	
		AG 94	
Accelerometer:	4382	30555 30556 11053 11054	Brüel & Kjaer
Climatic chamber:	HCV 4100-10/S TCC 7100-10-ESS	 63072	Heraeus-Vötsch Tira
Temperature shock chamber:	TSA-201 S		Espec
Recording instrument:	4103 M	H272100010 .....1053798 2053798	Eurotherm Chessell

The measuring equipment is calibrated regularly according to the calibration instructions of TÜV SÜD PRODUCT SERVICE GmbH. All calibrations are traced back to national standards.

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5 Test sequence

5.1 Vibration tests

Test date: from 2012-06-26 to 2012-07-06

No.	Test	Run	Axis	Notes
1	Vibration, random	26-1	z	**On UUT 2, UUT 4 – UUT 12, UUT 16 – UUT 18, and UUT 21** UUT in active mode. Receiving test **before** vibration passed. Receiving test **after** vibration see appendix A.
2	Shocks 1000 +	26-2		
	Shocks 1000 -	26-3		
3	Vibration, random	26-4	x	**On UUT 2, UUT 4 – UUT 9, UUT 11 – UUT 12, UUT 16 – UUT 18 and UUT 20 – UUT 21** UUT in active mode. Receiving test **before** vibration see appendix A.
4	Shocks 1000 +/-	26-5		
5	Vibration, random	26-6	y	**On UUT 2, UUT 4 – UUT 9, UUT 11 – UUT 12, UUT 16 – UUT 18 and UUT 20 – UUT 21** UUT in active mode. Receiving test **after** vibration see appendix A.
6	Shocks 1000 +/-	26-7		

5.2 Climatic and temperature tests

Test date: from 2012-05-28 to 2012-06-22

No.	Test	Period	Notes
1	Temperature change test	2012-05-08 to 2012-05-25	**On UUT 1 – UUT 22,** in active mode. Voltage withstand constant. Receiving tests before, during and after the test passed, **UUT 23 – UUT 26,** passive.
2	Climatic test - cyclic	2012-05-25 to 2012-05-29	**On UUT 1 – UUT 22,** in active mode. Voltage withstand constant. Receiving tests before, during and after the test passed, **UUT 23 – UUT 26,** passive.
3	Temperature test – heat constant	2012-05-29 to 2012-06-20	**On UUT 1 – UUT 22,** in active mode. Voltage withstand constant. Receiving tests before, during and after the test passed, **UUT 23 – UUT 26,** passive.
4	Temperature shock test	2012-06-20 to 2012-06-22	**On UUT 1 – UUT 26** UUT in passive mode. Receiving tests before and after the test passed.

5.3 Fluid resistance tests

Test date: from 2012-06-20 to 2012-06-26

No.	Test fluid	Notes
1	**Urea nitrogen**. saturated solution	**UUT 1 – 4**, Ultramid B3S, **grey**, Lififlex UV58.01B045-3, **UUT 27 – 30**, Ultramid B3S, **yellow**, Lififlex UV58.01B045-3, **UUT 6 + 7, UUT 15 +16**, Ultramid B3S, **black**, Lififlex UV58.01B045-3, **UUT 4 – 7**, Polycarbonat, **black**, not waterproof **UUT 4 – 7**, Polyamide 6.6, **grey**, waterproof **There was no change or damage on surface and seal visible.**
2	**Liquid lime**, 10 %	
3	**NPK fertiliser**, saturated solution	
4	**Ammonium hydroxide**, 20% aqueous solution	
5	**Diesel fuel**	
6	**Hydraulic oil**	
7	**Ethylenglycole,** 20% aqueous solution	

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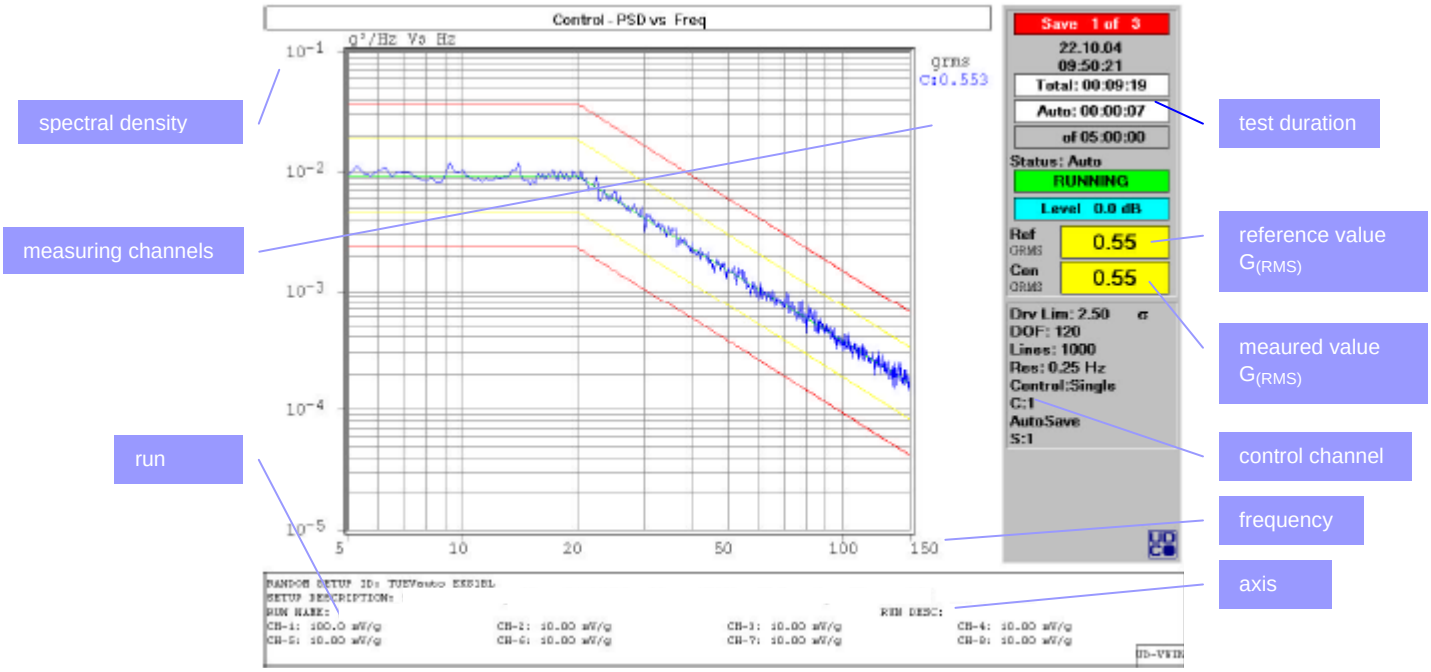
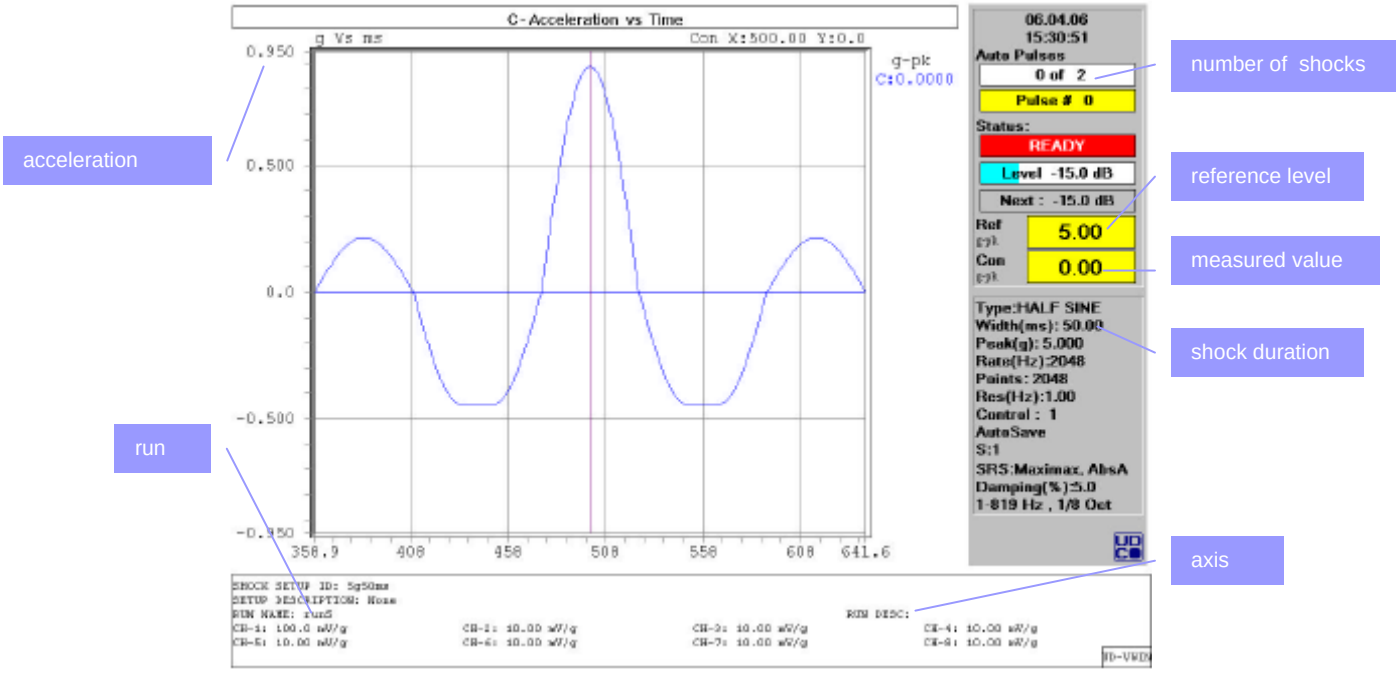
6 Legend of measuring diagrams

6.1 Vibration test random



6.2 Shock test



acceleration

run

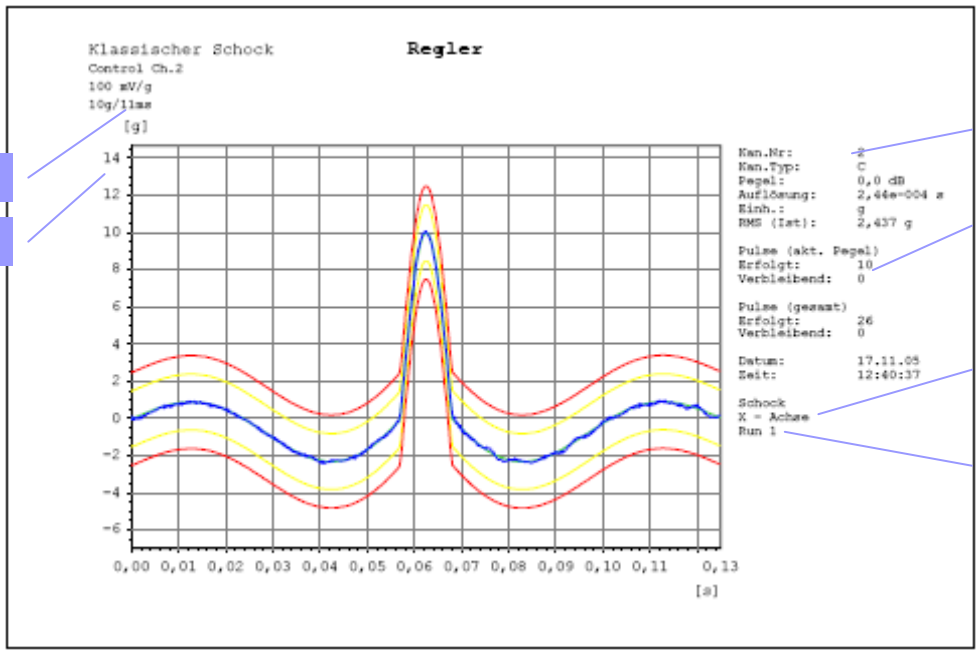
number of shocks

reference level

measured value

shock duration

axis



shock duration

acceleration

control channel

number of shocks

axis

run

Note: Before applying the test shocks several reference shocks of a lower level (50%, 75%)) were applied as equipment test. This explains the different number of shocks in the measuring diagrams.

6.3 Climatic tests

1	Temperature in	°C
2	Humidity in	% relative humidity
3	Forward feed in	mm/h

6.4 Temperature and temperature shock tests

1	Temperature	°C
2	Forward feed in	mm/h

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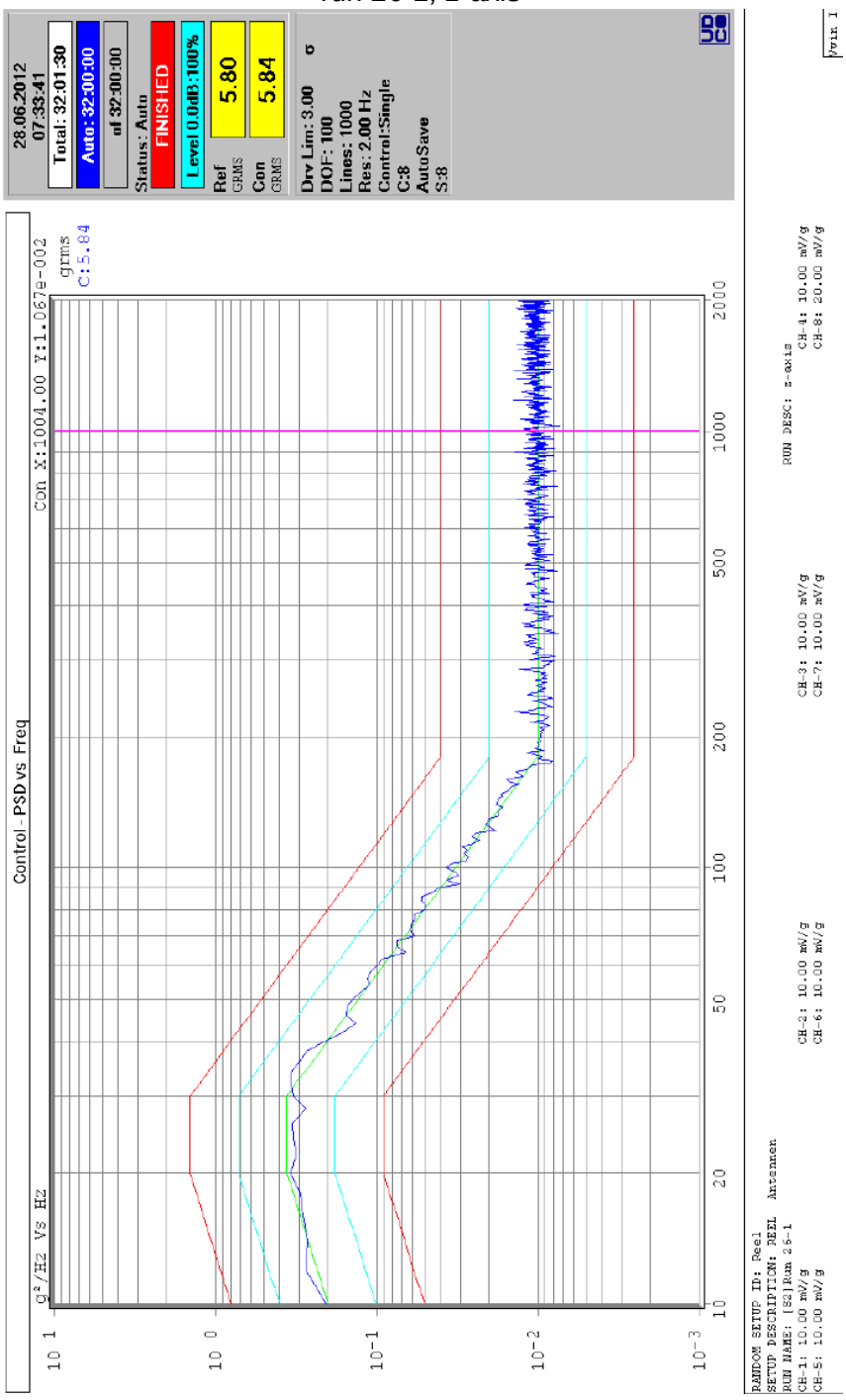
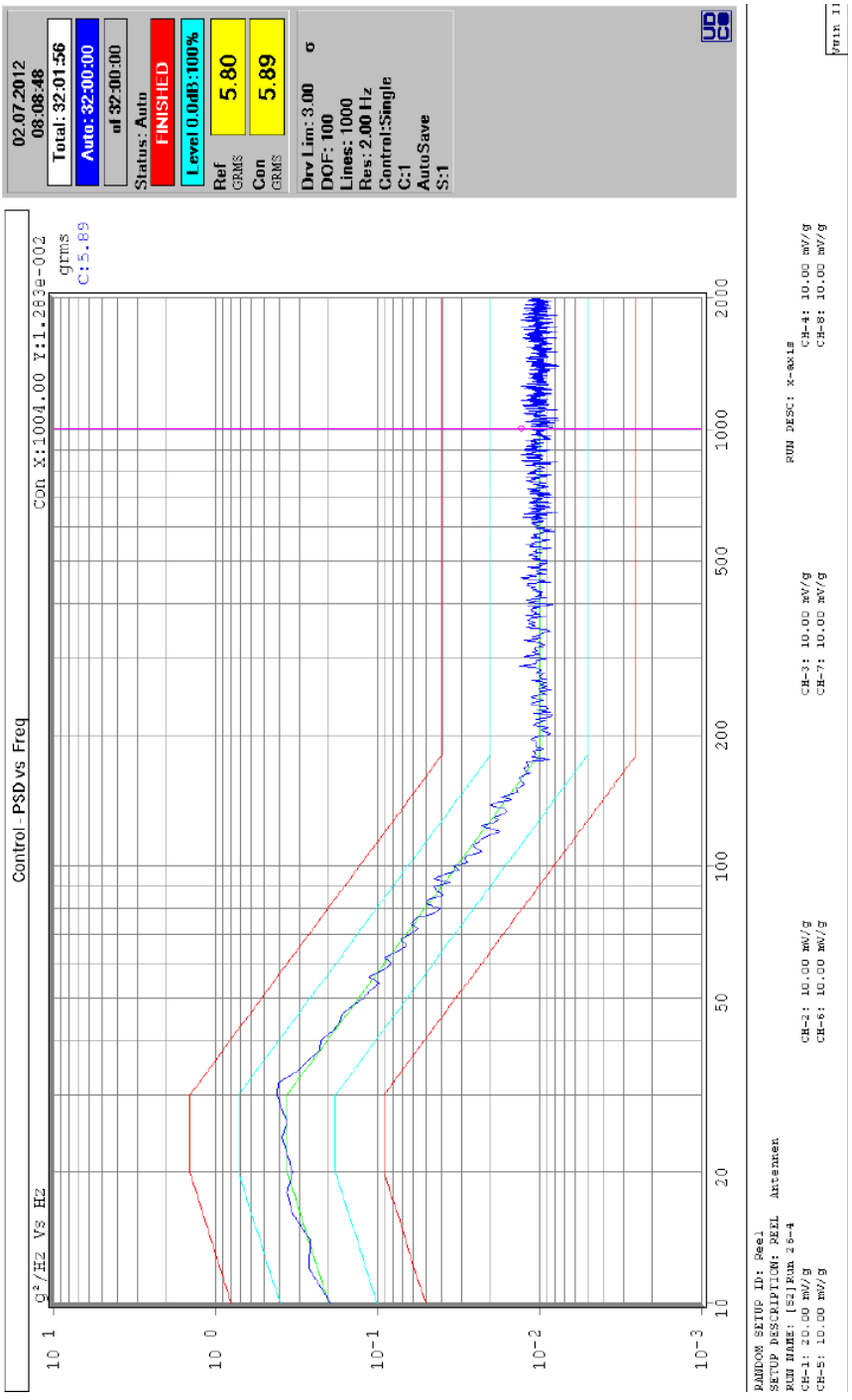
7 Test documentation

7.1 measuring diagrams of the vibration test, random

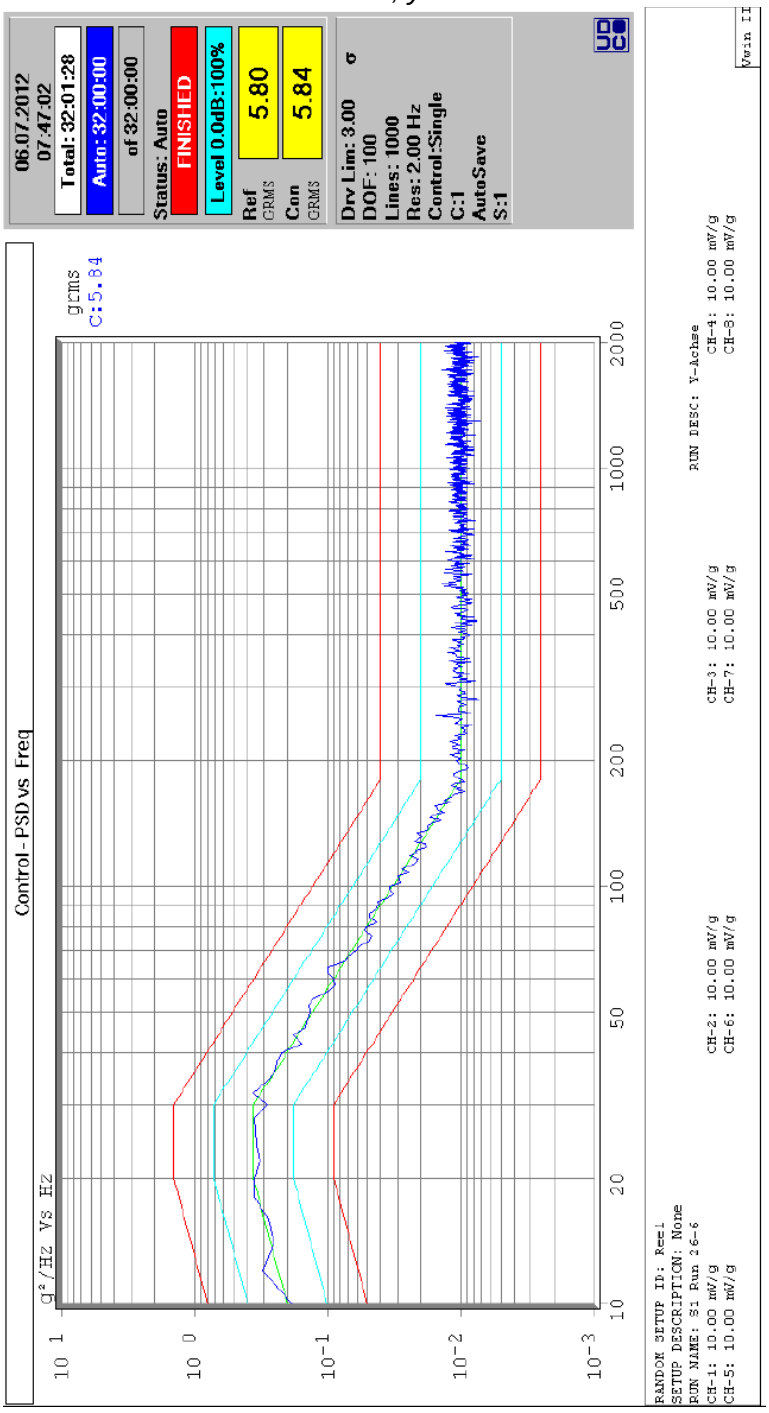
run 26-1, z-axis



run 26-4, x-axis

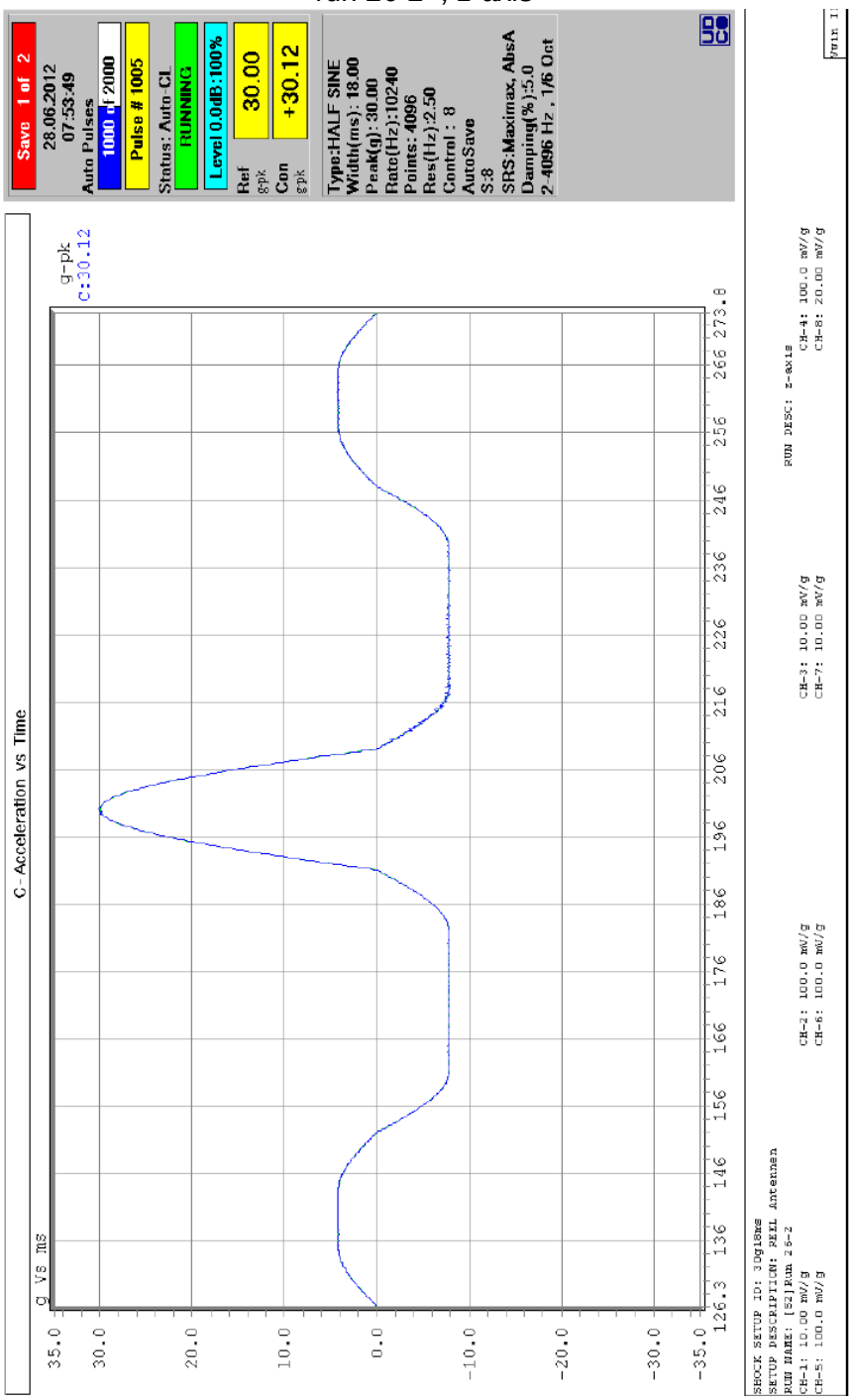


run 26-6, y-axis

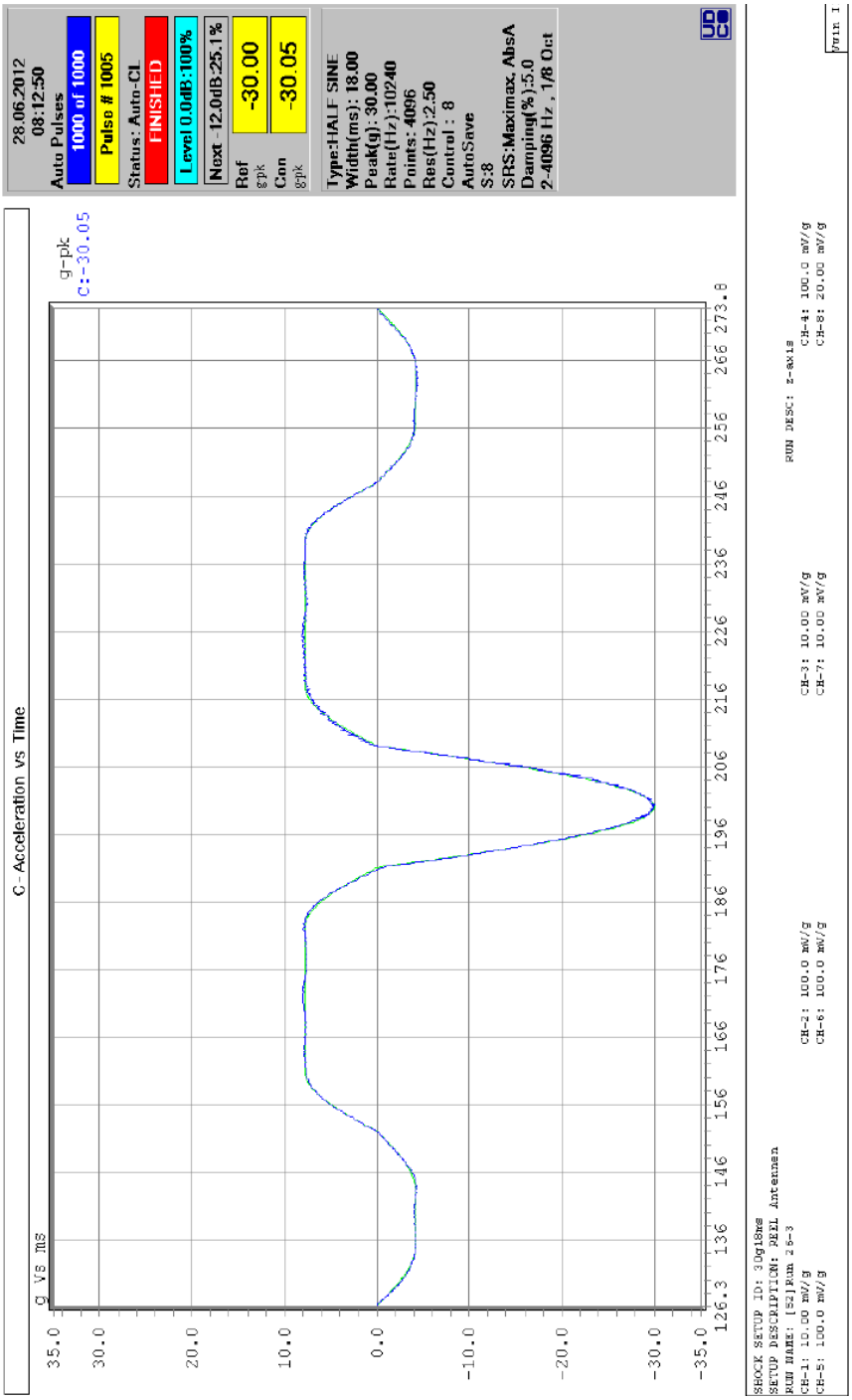


7.2 measuring diagrams of the shock test

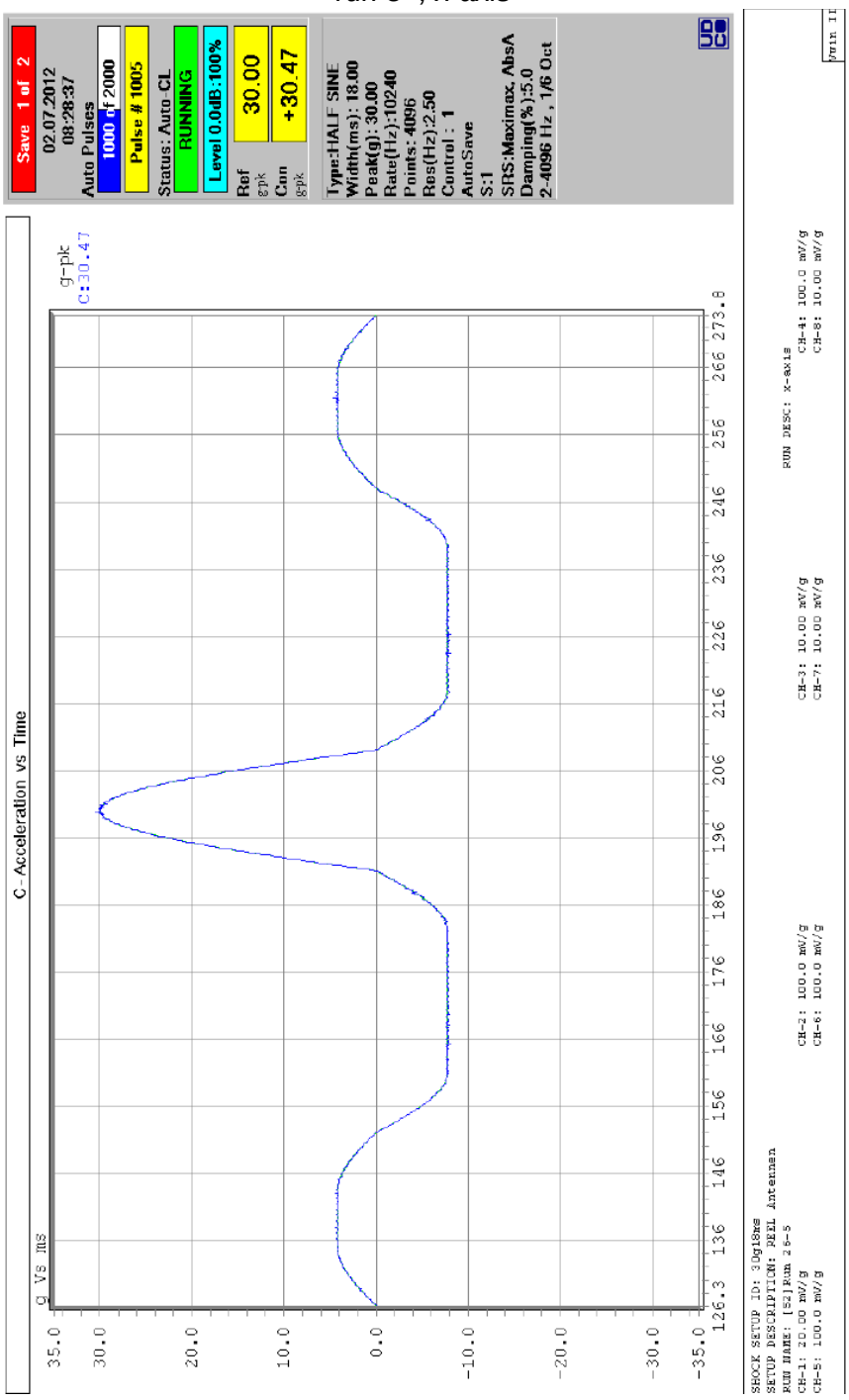
run 26-2+, z-axis



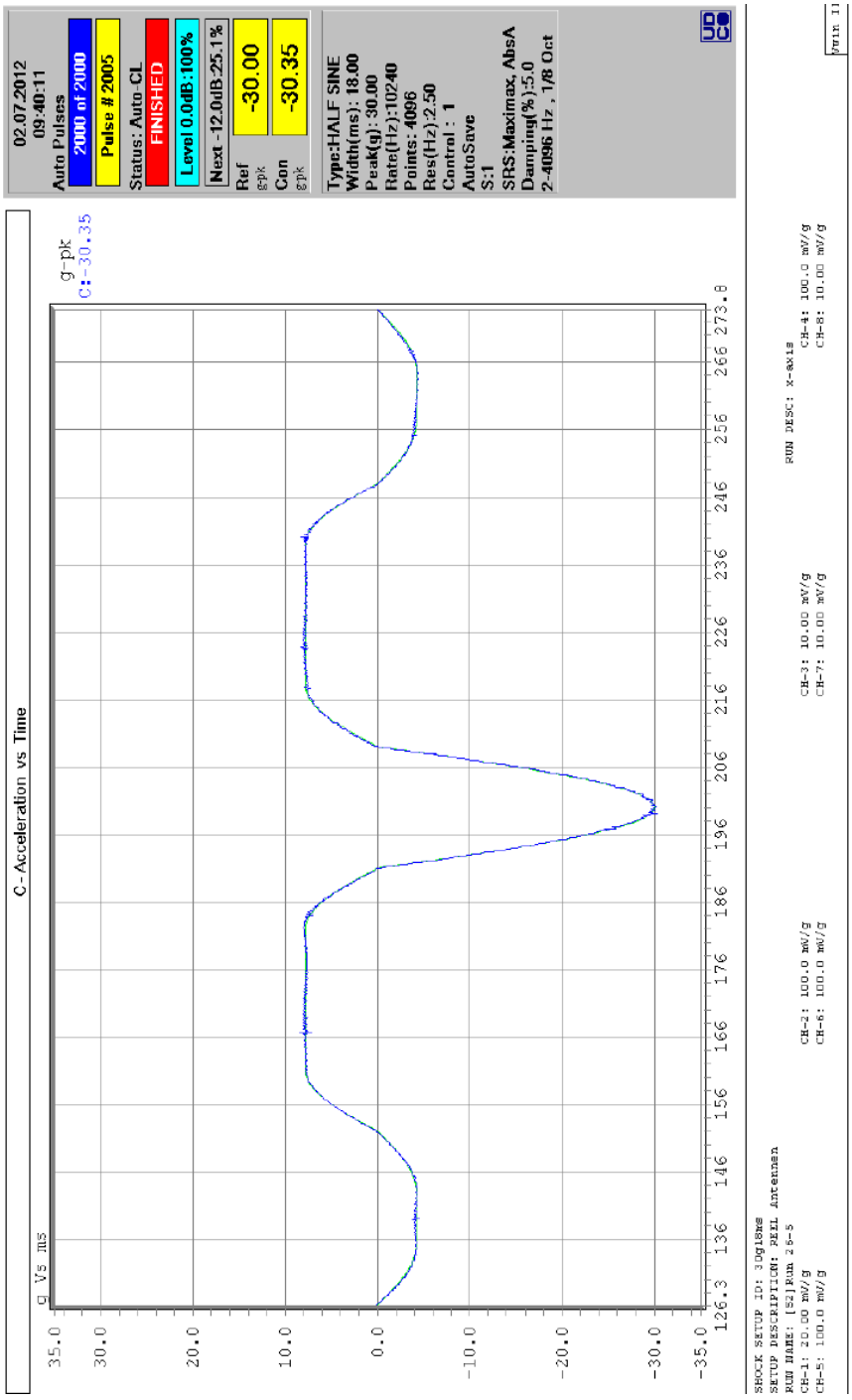
run 26-3-, z-axis



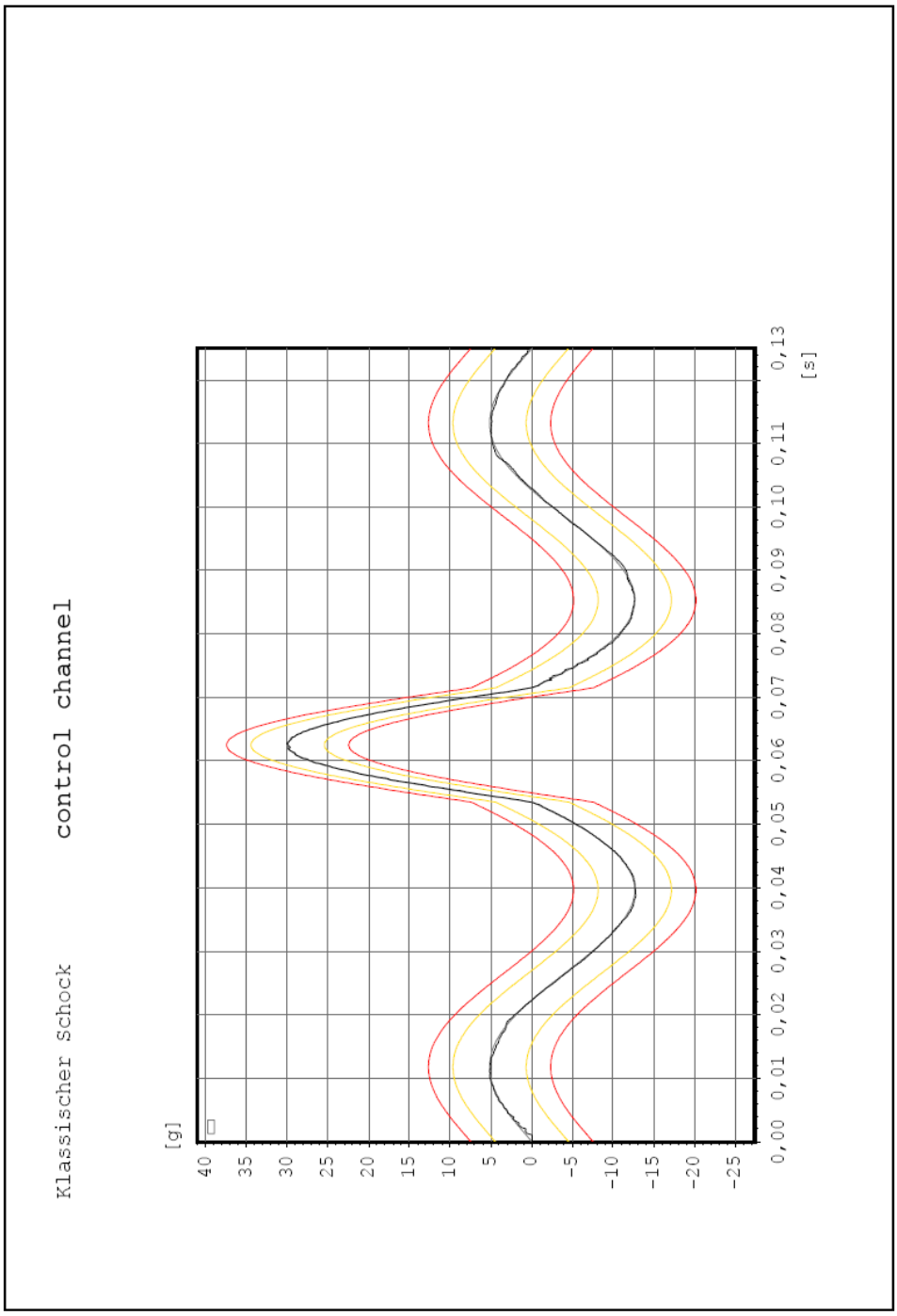
run 5+, x-axis


Save 1 of 2
02.07.2012
08:28:37
Auto Pulses
1000 of 2000
Pulse # 1005
Status: Auto-CL
RUNNING
Level 0.0dB:100%
Ref 30.00
gpk
Can +30.47
gpk
Type:HALF SINE
Width(ms): 18.00
Peak(g): 30.00
Rate(Hz):10240
Points: 4096
Res(Hz):2.50
Control : 1
AutoSave
S:1
SRS:Maximax, AbsA
Damping(%):5.0
2-4096 Hz , 1/6 Oct
C - Acceleration vs Time
g Vs ms
g-pk
C:30.47
35.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-35.0
126.3
136
146
156
166
176
186
196
206
216
226
236
246
256
266
273.8
SHOCK SETUP ID: 30g18ms
SETUP DESCRIPTION: PEIL Antennen
RUN NAME: [52]Run 28-5
CH-1: 20.00 mV/g
CH-5: 100.0 mV/g
CH-2: 100.0 mV/g
CH-6: 100.0 mV/g
CH-3: 10.00 mV/g
CH-7: 10.00 mV/g
RUN DESC: x-axis
CH-4: 100.0 mV/g
CH-8: 10.00 mV/g

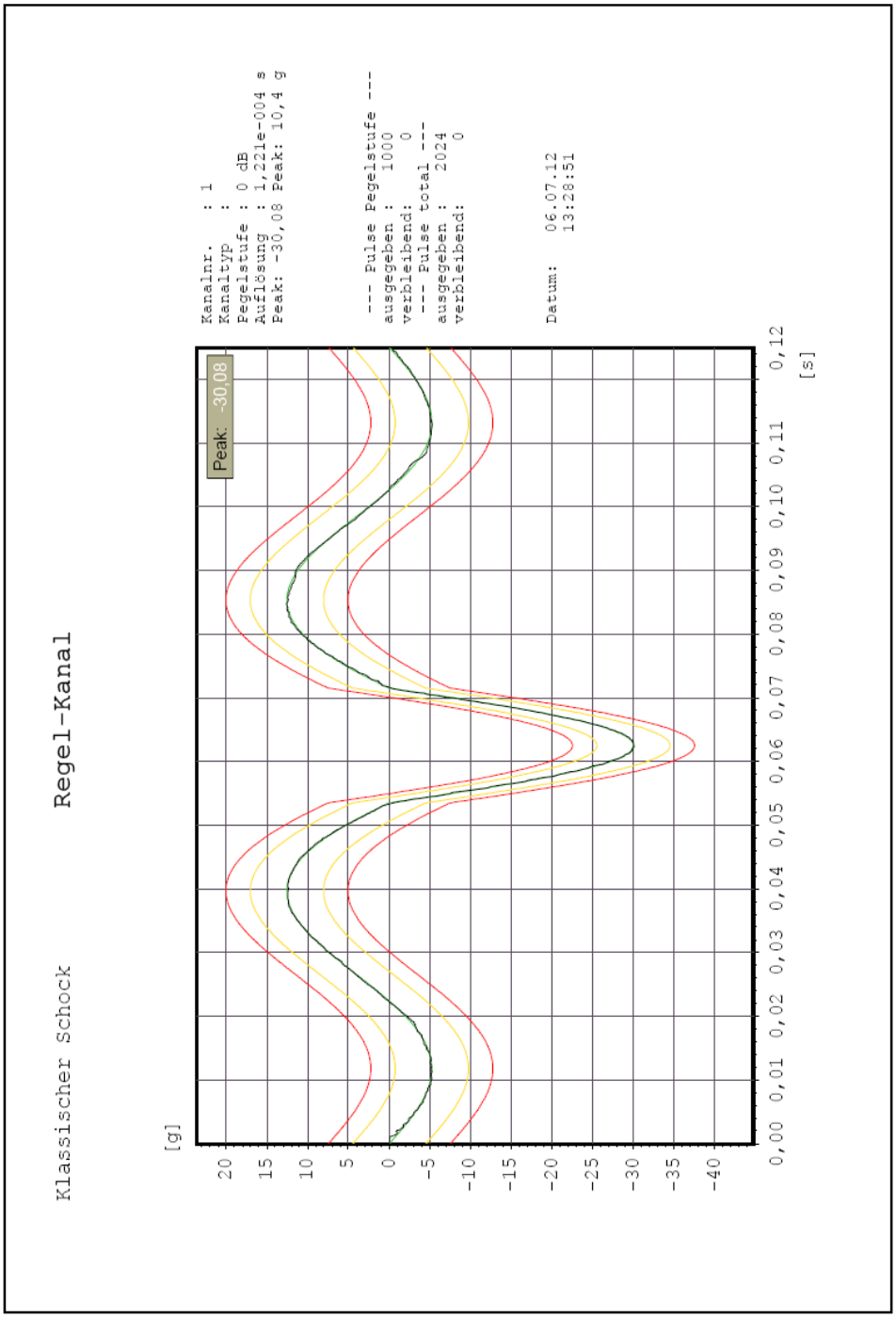
run 5-, x-axis


02.07.2012
09:40:11
Auto Pulses
2000 of 2000
Pulse # 2005
Status: Auto-CL
FINISHED
Level 0.0dB:100%
Next -12.0dB:25.1%
Ref gpk -30.00
Con gpk -30.35
Type:HALF SINE
Width(ms): 18.00
Peak(g): 30.00
Rate(Hz):10240
Points: 4096
Res(Hz):2.50
Control : 1
AutoSave
S:1
SRS:Maximax, AbsA
Damping(%):5.0
2-4096 Hz , 1/8 Oct
C-Acceleration vs Time
g-pk
C: 30.35
g Vs ms
35.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-35.0
126.3
136
146
156
166
176
186
196
206
216
226
236
246
256
266
273.8
SHOCK SETUP ID: Doglegs
SETUP DESCRIPTION: REL Antennas
RUN NAME: [52]Run 25-5
CH-1: 20.00 mV/g
CH-5: 100.0 mV/g
CH-2: 100.0 mV/g
CH-6: 100.0 mV/g
CH-3: 10.00 mV/g
CH-7: 10.00 mV/g
RUN DESC: x-axis
CH-4: 100.0 mV/g
CH-8: 10.00 mV/g

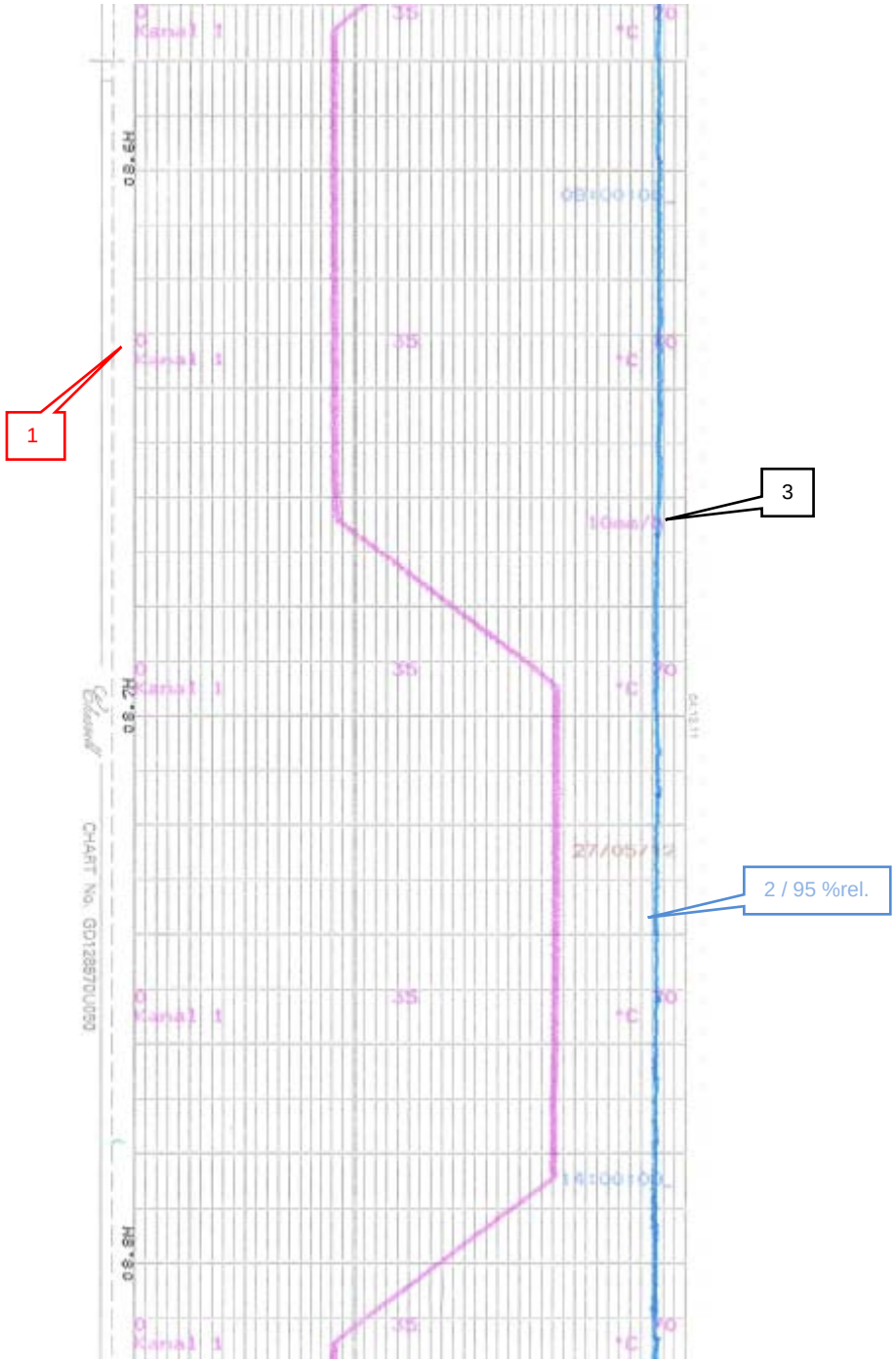
run 5+, y-axis


control channel
Klassischer Schock
[g]
40
35
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
0,00 0,01 0,02 0,03 0,04 0,05 0,06 0,07 0,08 0,09 0,10 0,11 0,13
[s]
D:\Kundendaten\Reel\30g18ms_006.rcs

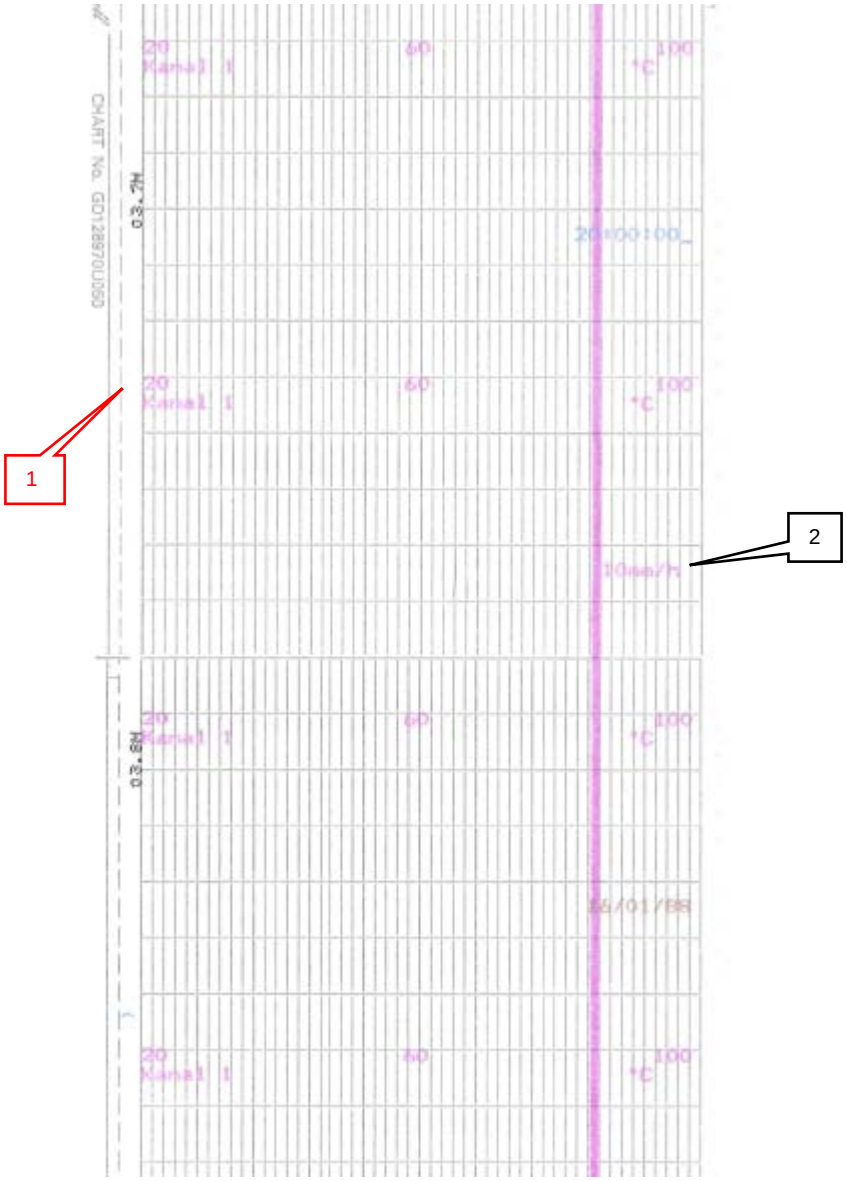
run 5-, y-axis


Regel-Kanal
Klassischer Schock
Kanalnr. : 1
Kanaltyp : 0 dB
Pegelstufe : 1,221e-004 s
Auflösung : 10,4 g
Peak: -30,08 Peak:
--- Pulse Pegelstufe ---
ausgegeben : 1000
verbleibend: 0
--- Pulse total ---
ausgegeben : 2024
verbleibend: 0
Datum: 06.07.12
13:28:51
Peak: -30,08
[g]
[s]
D:\Kundendaten\Reel\30g18ms.tcs

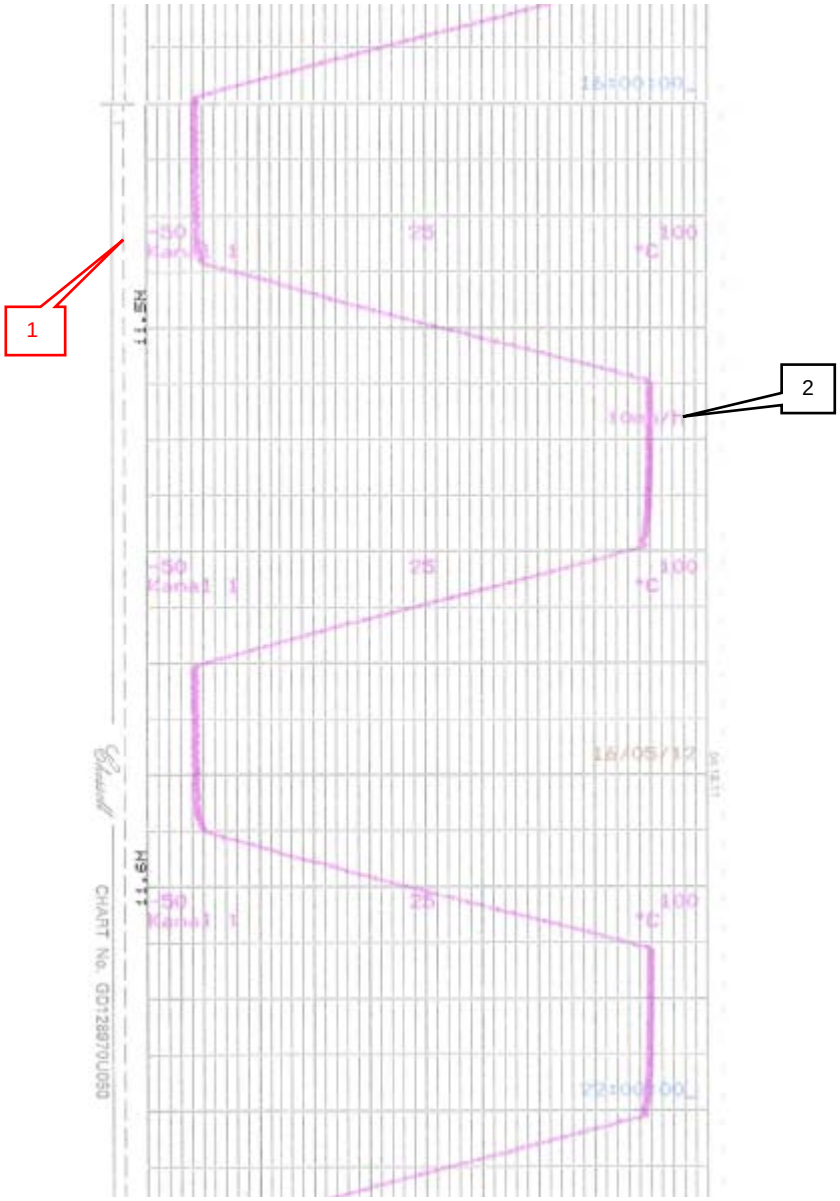
7.3 measuring diagrams of the climatic test



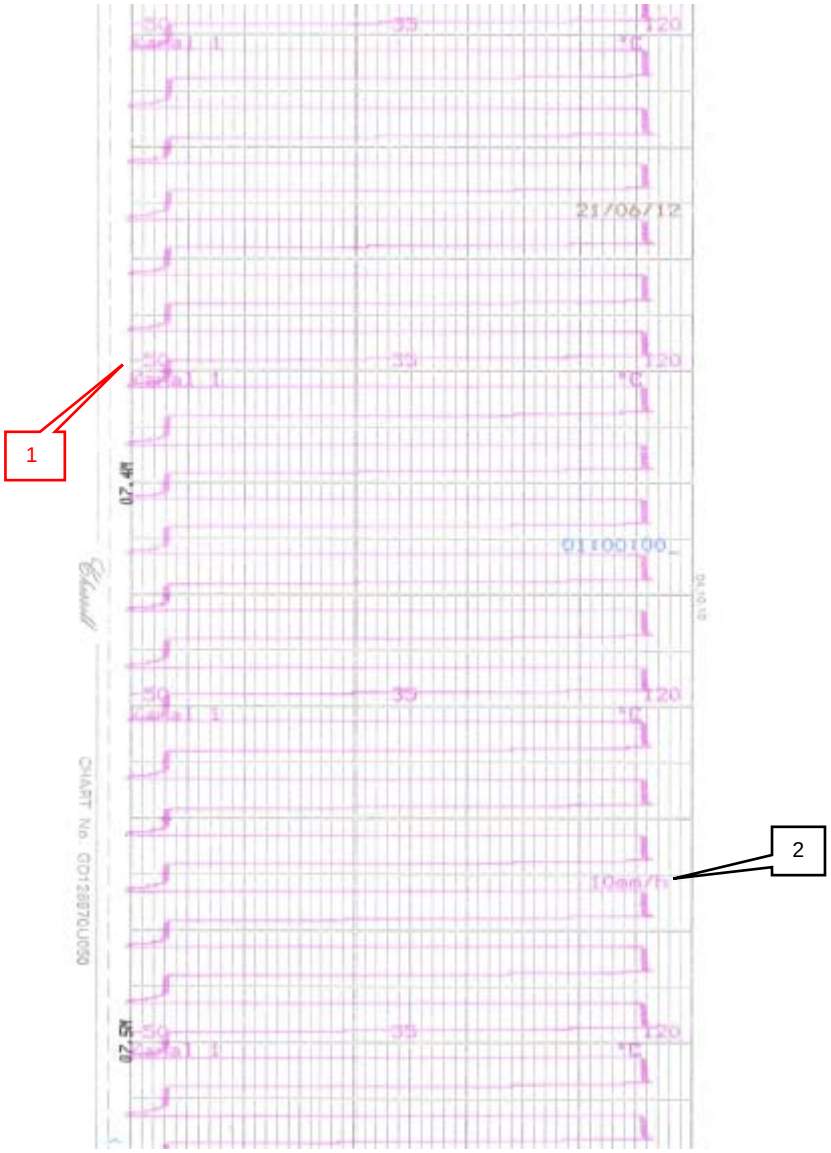
7.4 measuring diagrams of the temperature test – heat constant



7.5 measuring diagrams of the temperature change test

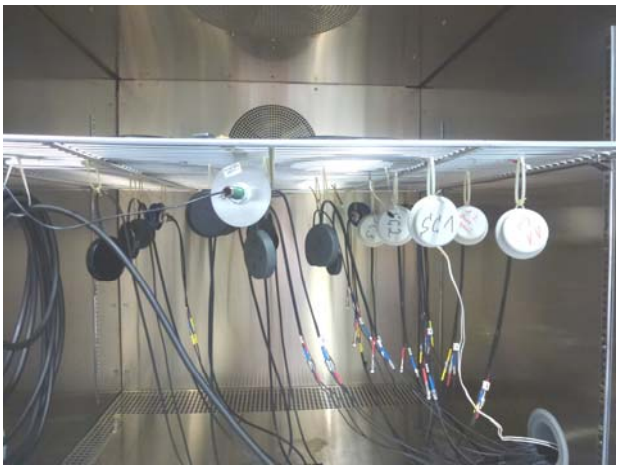


7.6 measuring diagrams of the temperature shock test



7.7 measuring diagrams of the temperature overlay during random

8 Photo documentation

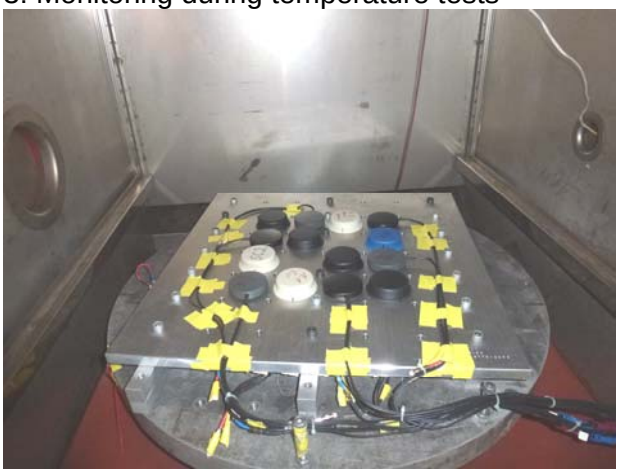


1: Planar Combination Antenna in the climatic chamber

2: Cables in the climatic chamber

3: Monitoring during temperature tests

4: UUT in the temperature shock chamber



5: UUT in z-axis on head-expander

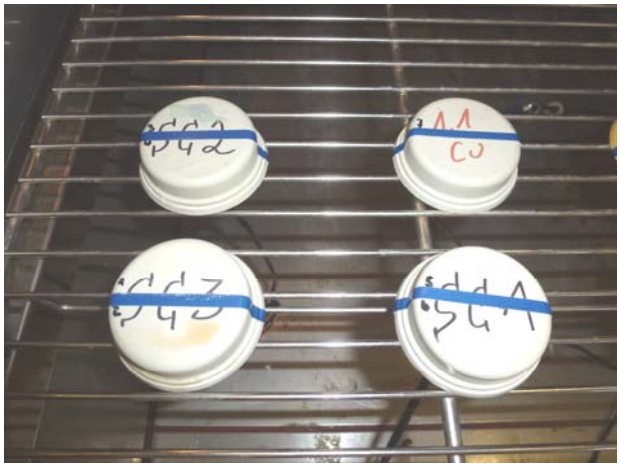
6: UUT in x-axis on slip-table

7: UUT in y-axis on slip-table

8: UUT during fluid resistance test

9: Broken connector on UUT 2 after vibration

10: Broken cable on UUT 9 after vibration



11:Fluid resistance test “start coating”

12: Fluid resistance test “end coating”

13: Fluid resistance test “start coating”

14: Fluid resistance test “end coating”

15: Fluid resistance test “start coating”

16: Fluid resistance test “end coating”

17: Fluid resistance test “start coating”

18: Fluid resistance test “end coating”

19: Fluid resistance test “start coating”

20: Fluid resistance test “end coating”

Verified
Signature

Hari Mountogianakis
Dept. Vice-Manager

Edited
Signature

Norbert Drescher
Test Engineer

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Fax: + 49 621 395-604

E-Mail: norbert.drescher@tuev-sued.de

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Germany

Appendix A – Function test of the customer

Function test after climatic and temperature tests

	REEL No.	REEL Type	Function tests		
			GSM / UMTS	GPS / GNSS	WLAN
UUT 1	SC1	K70ZAR_0030_00_03_03_CL5	in function	in function	--
UUT 2	SC2	K70ZAR_0030_00_03_03_CL5	in function	in function	--
UUT 3	SC3	K70ZAR_0030_00_03_03_CL5	in function	in function	--
UUT 4	1.1	C70ZAR_0030_00_03_03_CL5	in function	in function	in function
UUT 5	1.2	C70ZGAR_0030_00_03_03_CL5	in function	in function	in function
UUT 6	2.1	C70ZAR_0030_00_03_03_XX	in function	in function	in function
UUT 7	2.2	C70ZGAR_0030_00_03_03_XX	in function	in function	in function
UUT 8	1	K60ZGAR_0030_00_03_WP	in function	in function	--
UUT 9	2	K60ZGAR_0030_00_03_WP	in function	in function	--
UUT 10	3	K60ZGAD_0100_89_88_XX	in function	in function	--
UUT 11	4	K60ZGAD_0100_89_88_XX	in function	in function	--
UUT 12	5	K60ZAD_0100_89_88_XX	in function	in function	--
UUT 13	6	K60ZAD_0100_89_88_XX	in function	in function	--
UUT 14	7	K60ZAD_0100_89_88_XX	in function	in function	--
UUT 15	8	K70ZAR_0100_89_88_AW	in function	in function	--
UUT 16	9	K70ZAR_0100_89_88_AW	in function	in function	--
UUT 17	10	K70ZAR_0100_89_88_AW	in function	in function	--
UUT 18	11	K60ZAD_0030_00_03_WP	in function	in function	--
UUT 19	12	K60ZAD_0030_00_03_WP	in function	in function	--
UUT 20	13	K60ZAD_0030_00_03_WP	in function	in function	--
UUT 21	14	F70ZFR_0030_00_03_03_AW40	in function	--	in function
UUT 22	15	F70ZFR_0030_00_03_03_AW40	in function	--	in function

Function test after vibration random and shocks in z-axis

	REEL No.	REEL Type	Function tests		
			GSM / UMTS	GPS / GNSS	WLAN
UUT 2	SC2	K70ZAR_0030_00_03_03_CL5	*cable broken**	in function	--
UUT 4	1.1	C70ZAR_0030_00_03_03_CL5	in function	in function	*cable broken**
UUT 5	1.2	C70ZGAR_0030_00_03_03_CL5	in function	in function	in function
UUT 6	2.1	C70ZAR_0030_00_03_03_XX	in function	in function	in function
UUT 7	2.2	C70ZGAR_0030_00_03_03_XX	in function	in function	in function
UUT 8	1	K60ZGAR_0030_00_03_WP	in function	in function	--
UUT 9	2	K60ZGAR_0030_00_03_WP	in function	in function	--
UUT 10	3	K60ZGAD_0100_89_88_XX	in function	*Error***	--
UUT 11	4	K60ZGAD_0100_89_88_XX	in function	*Error***	--
UUT 12	5	K60ZAD_0100_89_88_XX	in function	in function	--
UUT 16	9	K70ZAR_0100_89_88_AW	in function	in function	--
UUT 17	10	K70ZAR_0100_89_88_AW	in function	in function	--
UUT 18	11	K60ZAD_0030_00_03_WP	in function	in function	--
UUT 21	14	F70ZFR_0030_00_03_03_AW40	in function	--	in function

***) Signal Cable of the UUT was fixed with temperature resistant tape. On UUT 2 and 4, tape got loose, so cable were broken by vibration on connector or on cable output. A short circuit on the energized UUT could be possible. For further tests, fixture must be modified by screws and cable ties.**

**) amplifier in function, but signal to low

UUT 10 was removed for investigation after the test.
Test was continued with UUT 20.

Function test after vibration random and shocks in x- and y-axis

	REEL No.	REEL Type	Function tests		
			GSM / UMTS	GPS / GNSS	WLAN
UUT 2	SC2	K70ZAR_0030_00_03_03_CL5	*cable broken**	in function	--
UUT 4	1.1	C70ZAR_0030_00_03_03_CL5	in function	in function	*cable broken**
UUT 5	1.2	C70ZGAR_0030_00_03_03_CL5	*cable broken**	*cable broken**	*cable broken**
UUT 6	2.1	C70ZAR_0030_00_03_03_XX	*cable broken**	*cable broken**	*cable broken**
UUT 7	2.2	C70ZGAR_0030_00_03_03_XX	*cable broken**	*cable broken**	*cable broken**
UUT 8	1	K60ZGAR_0030_00_03_WP	in function	in function	--
UUT 9	2	K60ZGAR_0030_00_03_WP	in function	*cable broken**	--
UUT 11	4	K60ZGAD_0100_89_88_XX	in function	in function	--
UUT 12	5	K60ZAD_0100_89_88_XX	in function	in function	--
UUT 16	9	K70ZAR_0100_89_88_AW	in function	in function	--
UUT 17	10	K70ZAR_0100_89_88_AW	in function	in function	--
UUT 18	11	K60ZAD_0030_00_03_WP	in function	*cable broken**	--
UUT 20	13	K60ZAD_0030_00_03_WP	in function	in function	--
UUT 21	14	F70ZFR_0030_00_03_03_AW40	in function	--	in function

***) Signal Cable of the UUT was fixed with temperature resistant tape. On UUT 2 – UUT 7, UUT 9 and UUT 18, tape got loose, so cable were broken by vibration on connector or on cable output. A short circuit on the energized UUT could be possible. For further tests, fixture must be modified by screws and cable ties.**

Appendix B – Function tests of the customer at his location and assessment

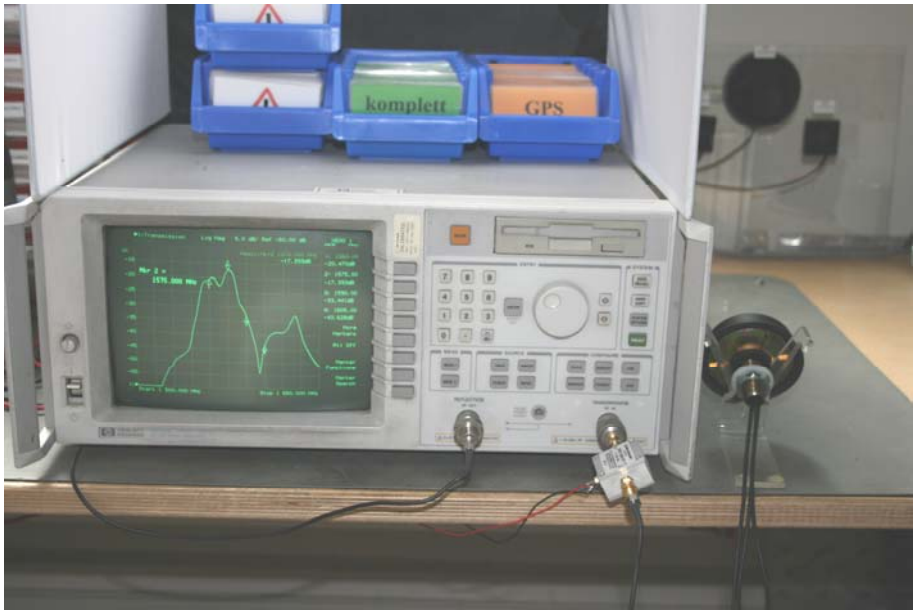
List of tested antennas by REEL, Wettenberg after TüV tests
30.07.2012

UUT	REEL-Nr	REEL-Typ	GPS GNSS	GSM UMTS	WLAN 2400	replaced parts before test			material	short circuit amplifier	test-axis
						GPS/GNSS	GSM/UMTS	WLAN 2400			
1	SC1	K70ZAR_0030_00_03_03_CL5	GPS OK	OK					Ultr/lifo		not tested
2	SC2	K70ZAR_0030_00_03_03_CL5	GPS OK	OK			S		Ultr/lifo		X,Y,Z
3	SC3	K70ZAR_0030_00_03_03_CL5	GPS OK	Ok			S	S	Ultr/lifo		not tested
4	1.1	C70ZAR_0030_00_03_03_CL5	GPS OK	OK	OK		S	S	Ultr/lifo		X,Y,Z
5	1.2	C70ZGAR_0030_00_03_03_CL5	GPS/GNSS OK	OK	OK	C	C	C	Ultr/lifo		X,Y,Z
6	2.1	C70ZAR_0030_00_03_03_XX	no funktion	OK	OK	C	C	C	Ultr/lifo	Yes	X,Y,Z
7	2.2	C70ZGAR_0030_00_03_03_XX	no funktion	OK	OK	C	C	C	Ultr/lifo	yes	X,Y,Z
8	1	K60ZGAR_0030_00_03_WP	GPS/GNSS OK	OK					PA 6.6		X,Y,Z
9	2	K60ZGAR_0030_00_03_WP	no funktion	OK		C			PA 6.6	Yes	X,Y,Z
10	3	K60ZGAD_0100_89_88_XX	no funktion	OK		changed wizh UUT 20 after x-axis			PC	Yes	Z
11	4	K60ZGAD_0100_89_88_XX	GPS/GNSS OK	OK		C			PC	Yes	X,Y,Z
12	5	K60ZAD_0100_89_88_XX	GPS OK	OK		C			PC	Yes	X,Y,Z
13	6	K60ZAD_0100_89_88_XX	GPS OK	OK					PC		not tested
14	7	K60ZAD_0100_89_88_XX	GPS OK	OK					PC		not tested
15	8	K70ZAR_0100_89_88_AW	GPS OK	OK					Ultr/lifo		not tested
16	9	K70ZAR_0100_89_88_AW	GPS OK	OK		C			Ultr/lifo		X,Y,Z
17	10	K70ZAR_0100_89_88_AW	GPS OK	OK		C			Ultr/lifo		X,Y,Z
18	11	K60ZAD_0030_00_03_WP	no funktion	OK		C			PA 6.6	Yes	X,Y,Z
19	12	K60ZAD_0030_00_03_WP	GPS OK	OK					PA 6.6		not tested
20	13	K60ZAD_0030_00_03_WP	GPS OK	OK					PA 6.6		Y,Z
21	14	F70ZFR_0030_00_03_03_AW40	ohne GPS	OK	2 x OK				Ultr/lifo		X,Y,Z
22	15	F70ZFR_0030_00_03_03_AW40	ohne GPS	OK	2 x OK				Ultr/lifo		not tested
23	cable	RG174_0510_0005_0311_CL5	OK								
24	cable	RG174_0510_0005_0311_CL5	OK		**Replaced parts before endtest**				S= Connector		
25	cable	RG174_0510_0005_0311_CL5	OK						C= Cable		
26	cable	RG174_0510_0005_0311_CL5	OK								

Following function test were carried out:

GPS Glonas test is a transmission measurement: we send a broadband signal to the UUT. The received signal will be shown on the spectrum analyser.

GPS Glonas test:



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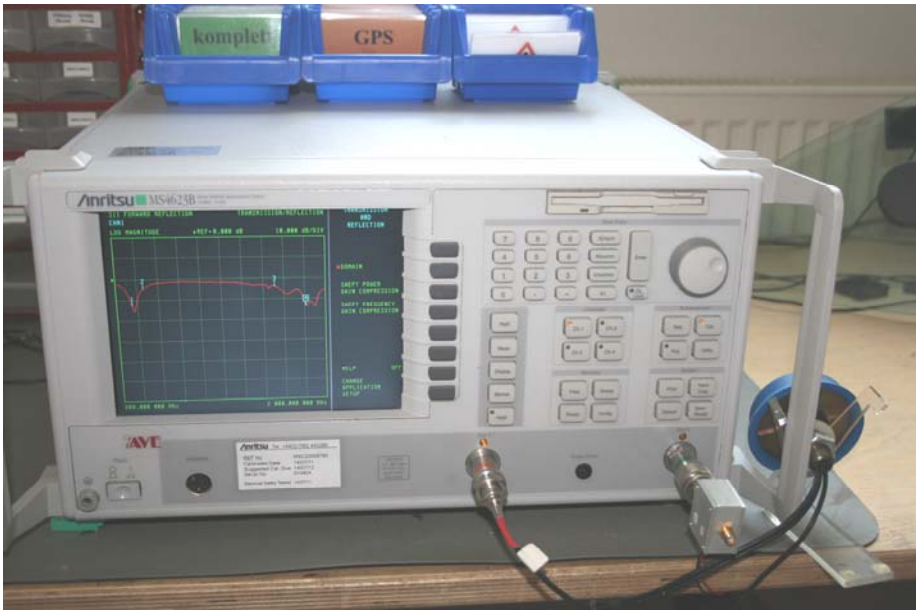
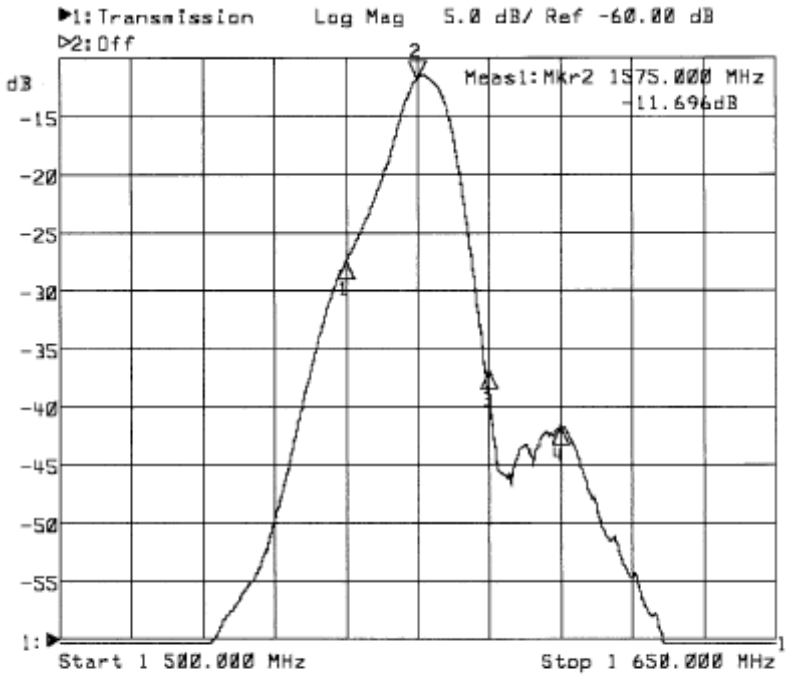
For GSM/UMTS and WLAN we will measure the refexion, S11

GSM/UMTS test:



WLAN test:

GPS test UUT 1



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1560.0000	-27.417		
2› 1575.0000	-11.696		
3: 1590.0000	-36.897		
4: 1605.0000	-41.659		

GSM test UUT 1

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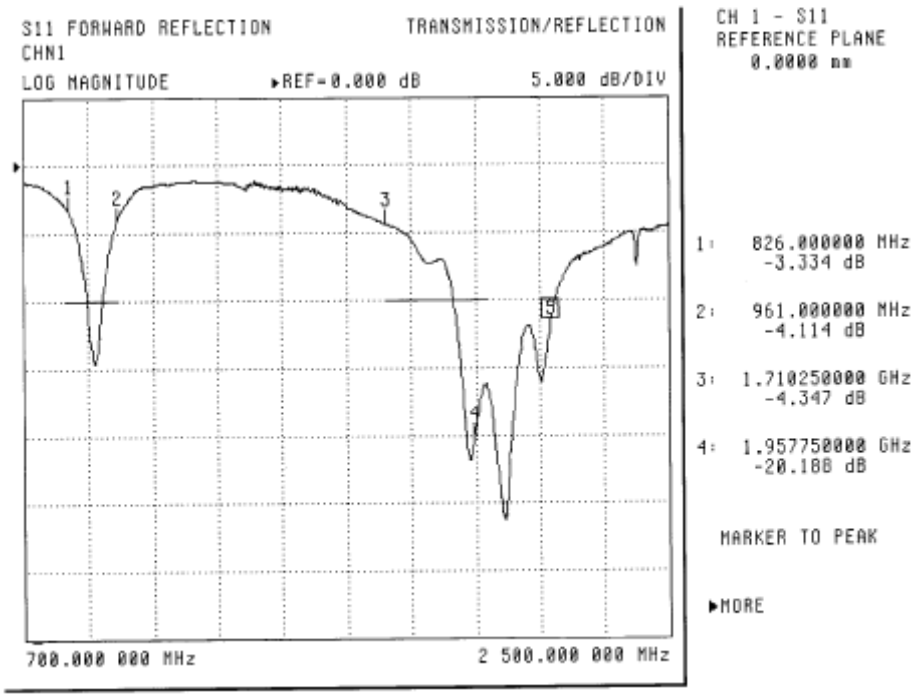
MS4623B

MODEL: DATE: 07/26/12 11:21 Page 1
DEVICE ID: OPERATOR:

START: 0.700000000 GHz GATE START: - ERROR CORR: REFL PORT1
STOP: 2.500000000 GHz GATE STOP: - AVERAGING: 1 PT
STEP: 0.002250000 GHz GATE: - IF BNDWDTH: 1 KHz
WINDOW: -

----------CH1----------
PARAMETER: -S11-
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -



CH 1 - S11
REFERENCE PLANE
0.0000 mm

1: 826.000000 MHz
-3.334 dB

2: 961.000000 MHz
-4.114 dB

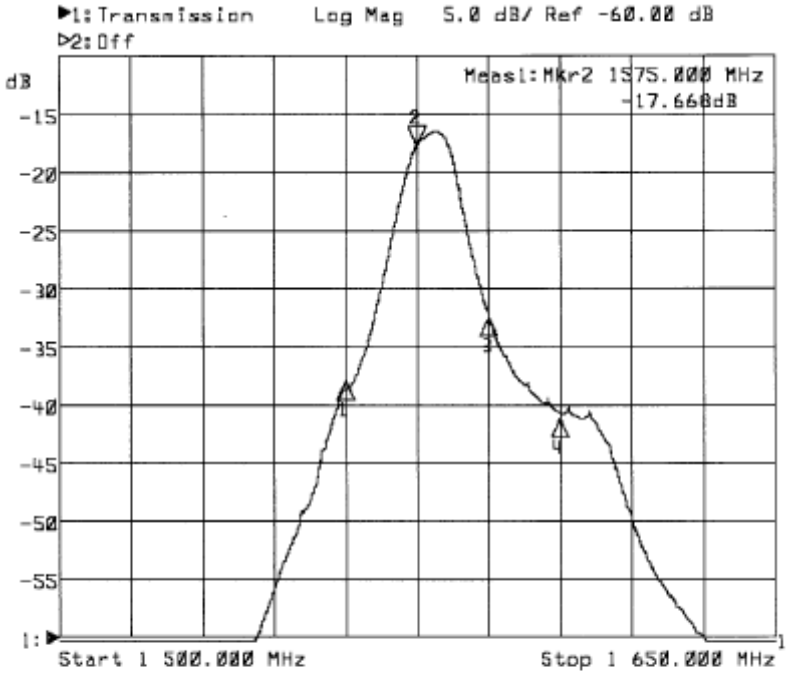
3: 1.710250000 GHz
-4.347 dB

4: 1.957750000 GHz
-20.188 dB

MARKER TO PEAK

▸MORE

GPS test UUT 2



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1560.0000	-37.844		
2› 1575.0000	-17.668		
3: 1590.0000	-32.388		
4: 1605.0000	-41.143		

GSM test UUT 2

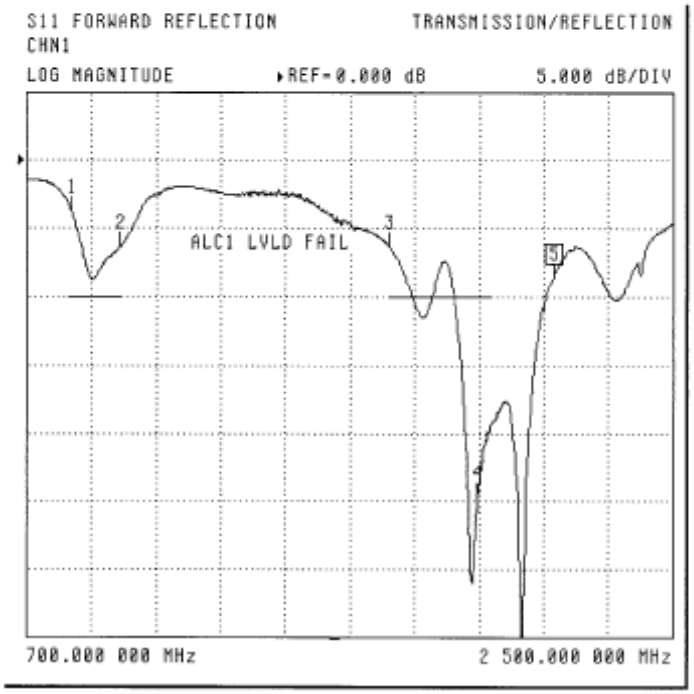
Anritsu

MB4623B

MODEL:		DATE:	07/26/12	12:06	Page 1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



TRANSMISSION
AND
REFLECTION

▸DOMAIN

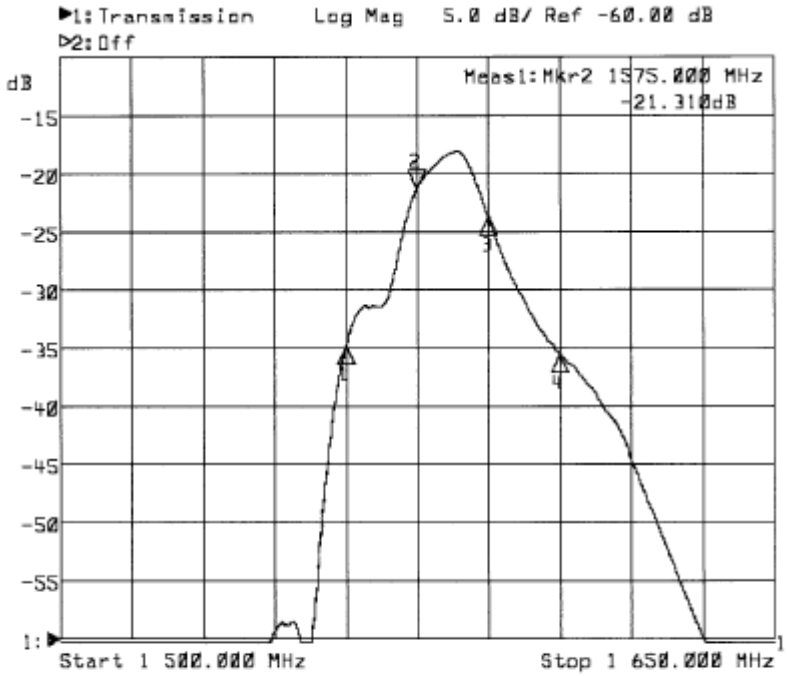
SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

GPS test UUT 3



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1560.0000	-34.731		
2› 1575.0000	-21.310		
3: 1590.0000	-23.646		
4: 1605.0000	-35.532		

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68167 Mannheim
Germany

GSM test UUT 3

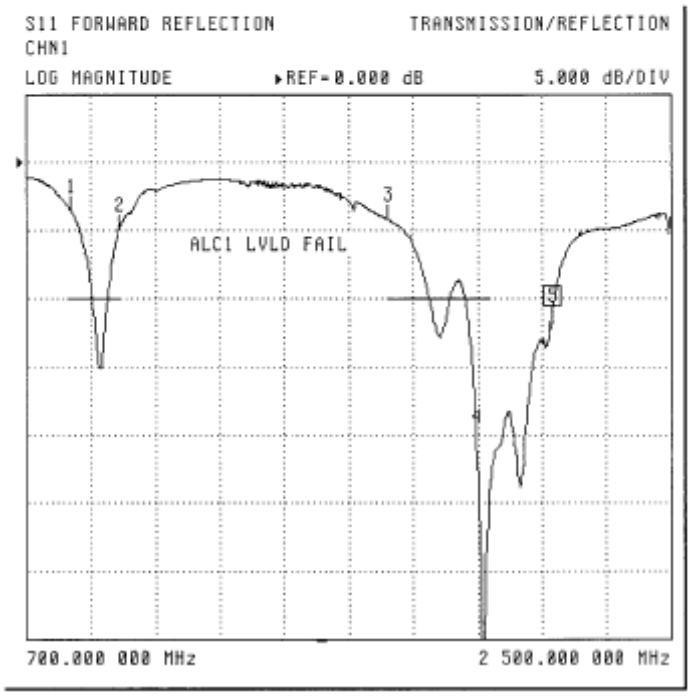
Anritsu

M84623B

MODEL:		DATE:	07/26/12 11:26	Page	1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



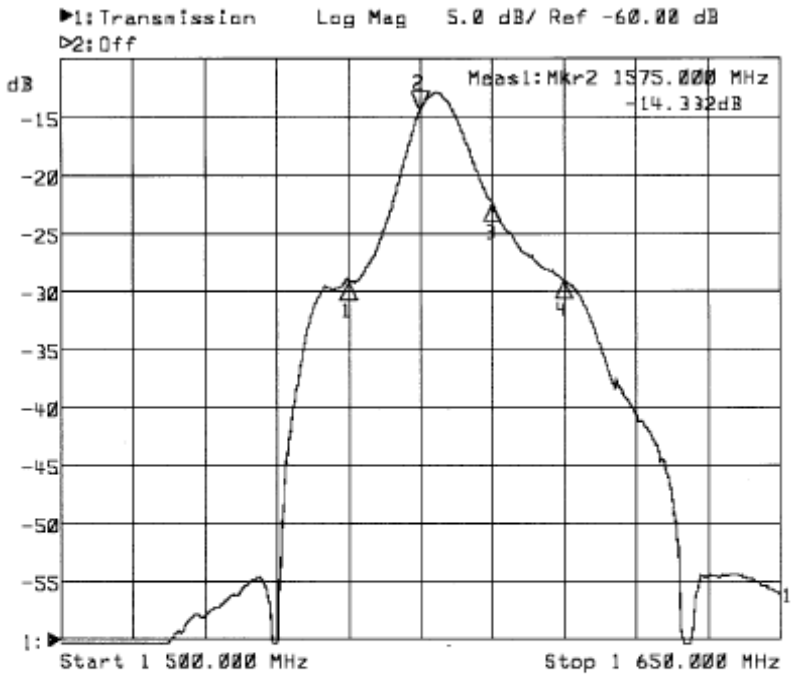
CH 1 - S11
REFERENCE PLANE
0.0000 mm

1:	826.000000 MHz	-3.551 dB
2:	961.000000 MHz	-4.848 dB
3:	1.710250000 GHz	-4.193 dB
4:	1.957750000 GHz	-20.535 dB

MARKER TO PEAK

▸MORE

GPS / GNSS test UUT 4



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1560.0000	-29.135		
2› 1575.0000	-14.332		
3: 1590.0000	-22.367		
4: 1605.0000	-29.058		

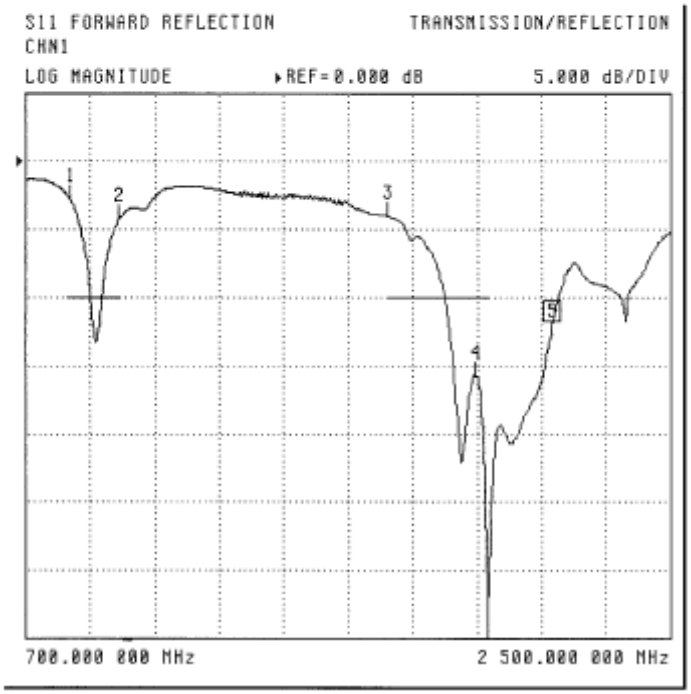
GSM test UUT 4

Anritsu

MS4623B

MODEL:		DATE:	07/26/12	12:08 Page	1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

	CH1
PARAMETER:	S11
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



TRANSMISSION
AND
REFLECTION

▸DOMAIN

SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

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WLAN test UUT 4

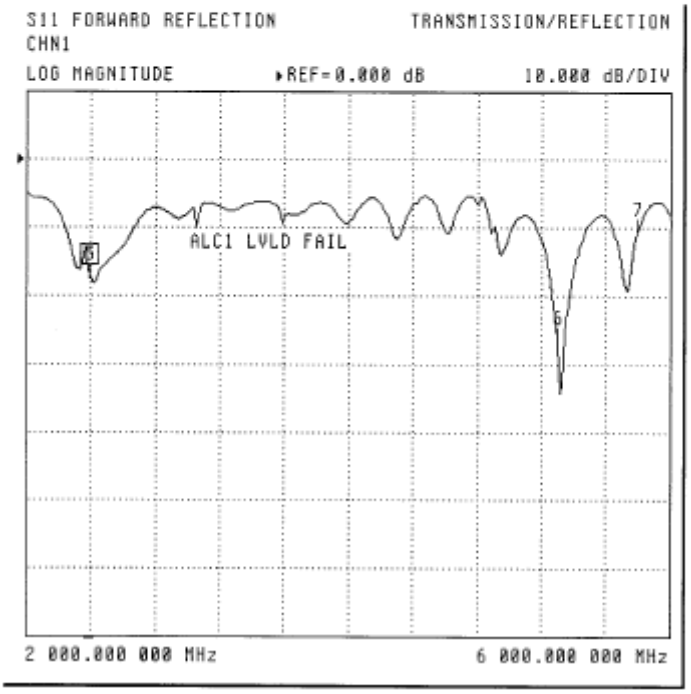
Anritsu

M84623B

MODEL: DATE: 07/26/12 12:15 Page 1
DEVICE ID: OPERATOR:

START: 2.000000000 GHz GATE START: - ERROR CORR: REFL PORT1
STOP: 6.000000000 GHz GATE STOP: - AVERAGING: 1 PT
STEP: 0.010000000 GHz GATE: - IF BNDWDTH: 1 KHz
WINDOW: -

----------CH1----------
PARAMETER: -S11-
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -



TRANSMISSION
AND
REFLECTION

▸DOMAIN

SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
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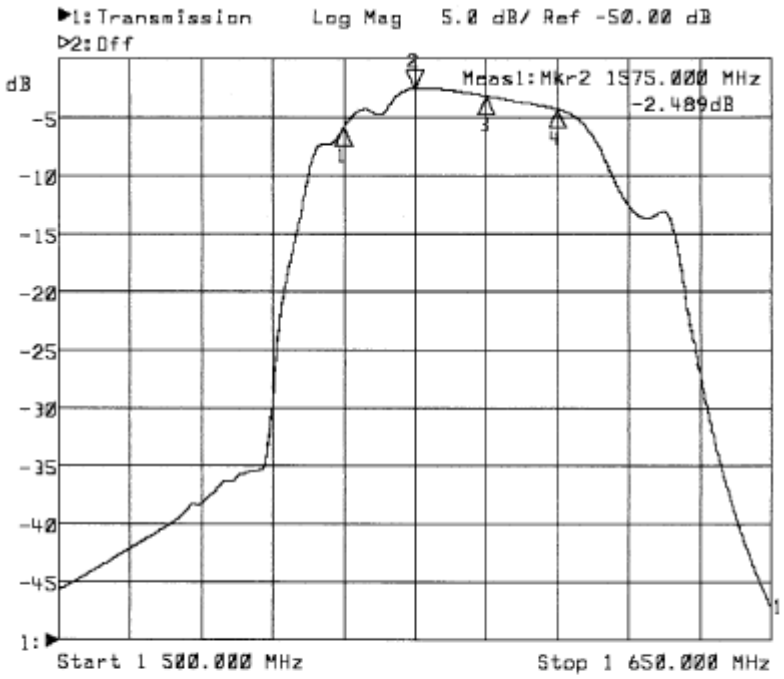
GPS / GNSS test UUT 5



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1560.0000	-5.744		
2› 1575.0000	-2.489		
3: 1590.0000	-3.158		
4: 1605.0000	-4.253		

GSM test UUT 5

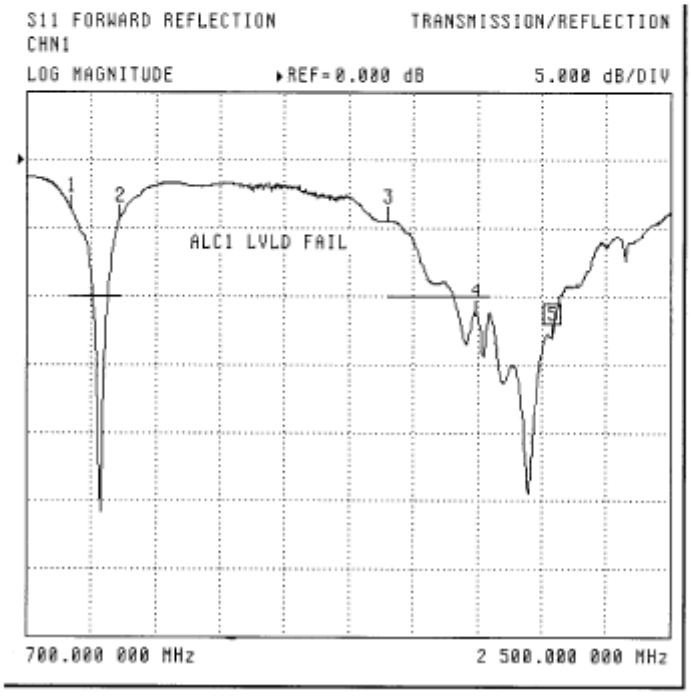
Anritsu

MS4613B

MODEL:		DATE:	07/26/12	12:28 Page	1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



WLAN test UUT 5

Anritsu

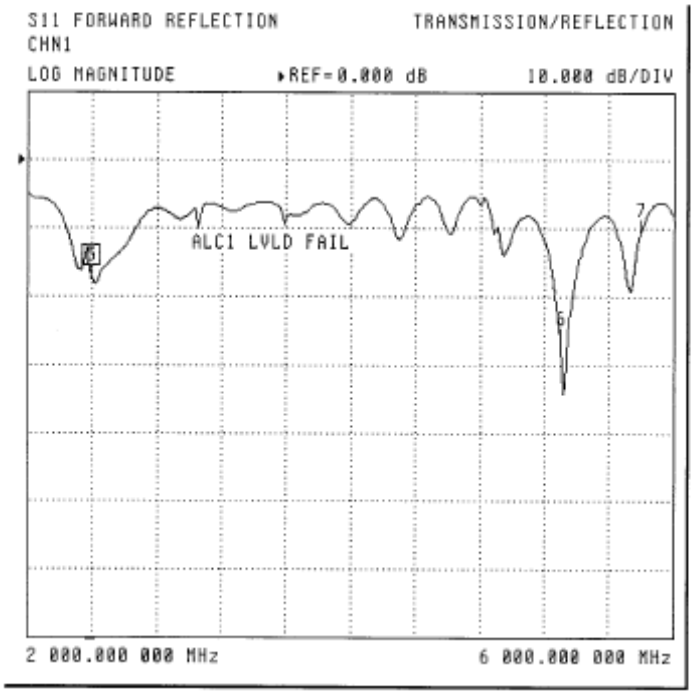
MS4623B

MODEL: DATE: 07/26/12 12:15 Page 1
DEVICE ID: OPERATOR:

START:	2.000000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	6.000000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.010000000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



TRANSMISSION
AND
REFLECTION

▸DOMAIN

SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

GSM test UUT 6

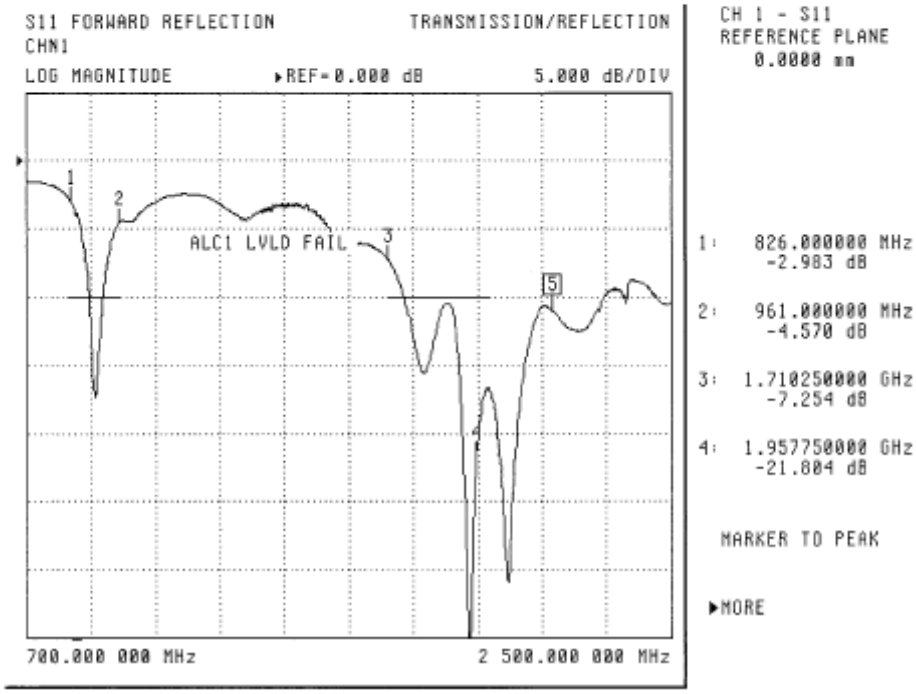
Anritsu

MB4623B

MODEL:		DATE:	07/26/12	11:29	Page 1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



WLAN test UUT 6

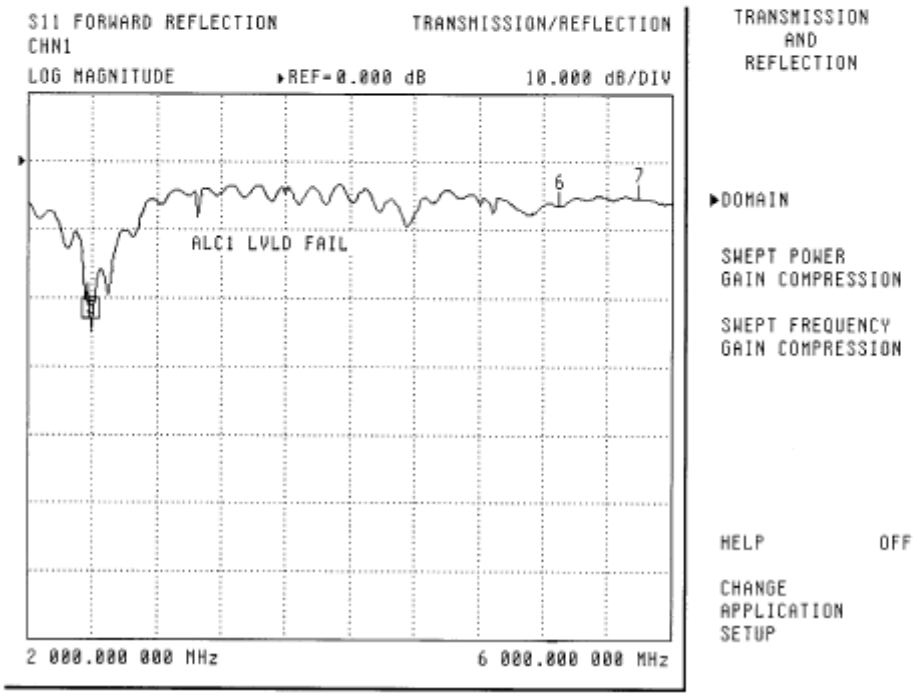
Anritsu

MS4623B

MODEL: DATE: 07/26/12 12:35 Page 1
DEVICE ID: OPERATOR:

START: 2.000000000 GHz GATE START: - ERROR CORR: REFL PORT1
STOP: 6.000000000 GHz GATE STOP: - AVERAGING: 1 PT
STEP: 0.010000000 GHz GATE: - IF BNDWDTH: 1 KHz
WINDOW: -

----------CH1----------
PARAMETER: -S11-
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -



GSM test UUT 7

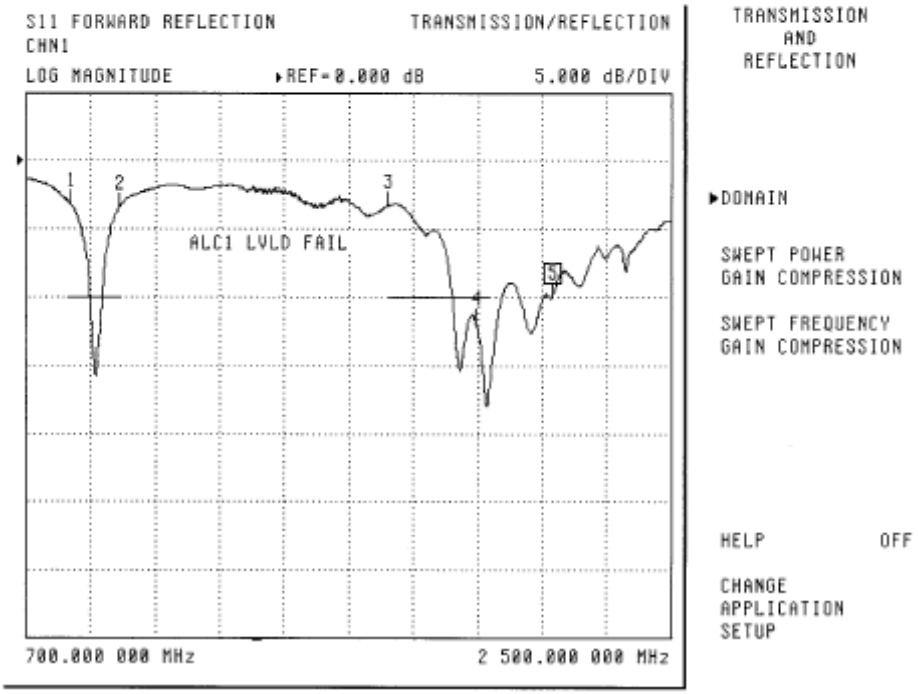
Anritsu

MS4623B

MODEL: DATE: 07/26/12 12:49 Page 1
DEVICE ID: OPERATOR:

START: 0.700000000 GHz GATE START: - ERROR CORR: REFL PORT1
STOP: 2.500000000 GHz GATE STOP: - AVERAGING: 1 PT
STEP: 0.002250000 GHz GATE: - IF BNDWDTH: 1 KHz
WINDOW: -

----------CH1----------
PARAMETER: -S11-
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -



WLAN test UUT 7

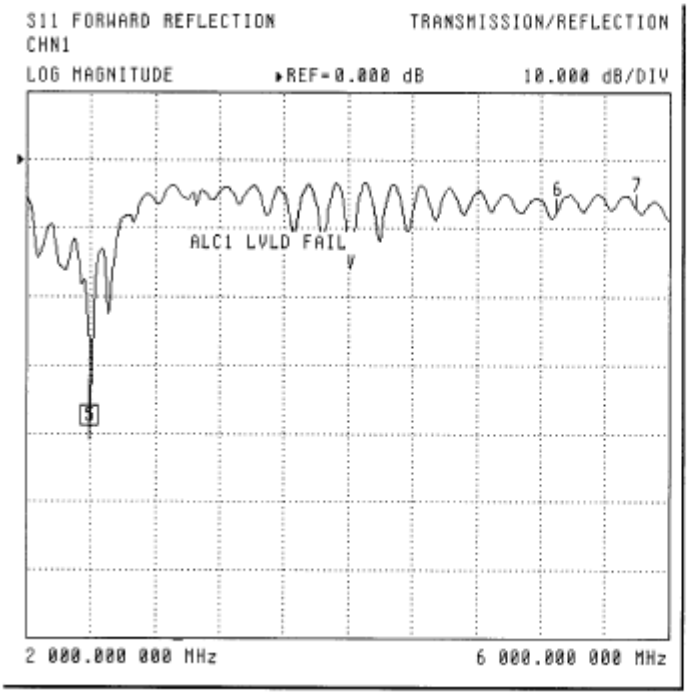
Anritsu

MS4623B

MODEL: DATE: 07/26/12 12:48 Page 1
DEVICE ID: OPERATOR:

START: 2.000000000 GHz GATE START: - ERROR CORR: REFL PORT1
STOP: 6.000000000 GHz GATE STOP: - AVERAGING: 1 PT
STEP: 0.010000000 GHz GATE: - IF BNDWDTH: 1 KHz
WINDOW: -

----------CH1----------
PARAMETER: -S11-
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -



TRANSMISSION
AND
REFLECTION

▸DOMAIN

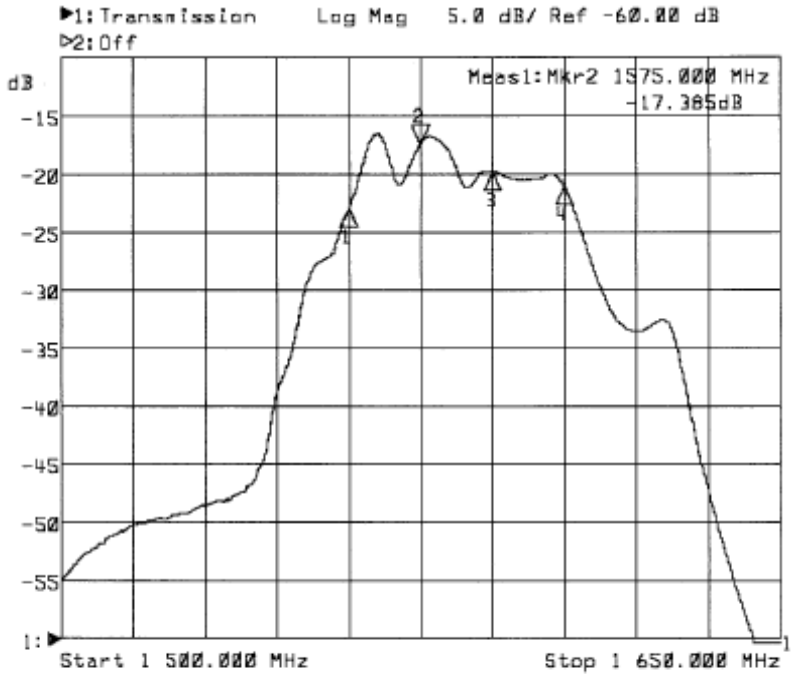
SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

GPS / GNSS test UUT 8



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1560.0000	-22.924		
2› 1575.0000	-17.385		
3: 1590.0000	-19.745		
4: 1605.0000	-21.019		

GSM test UUT 8

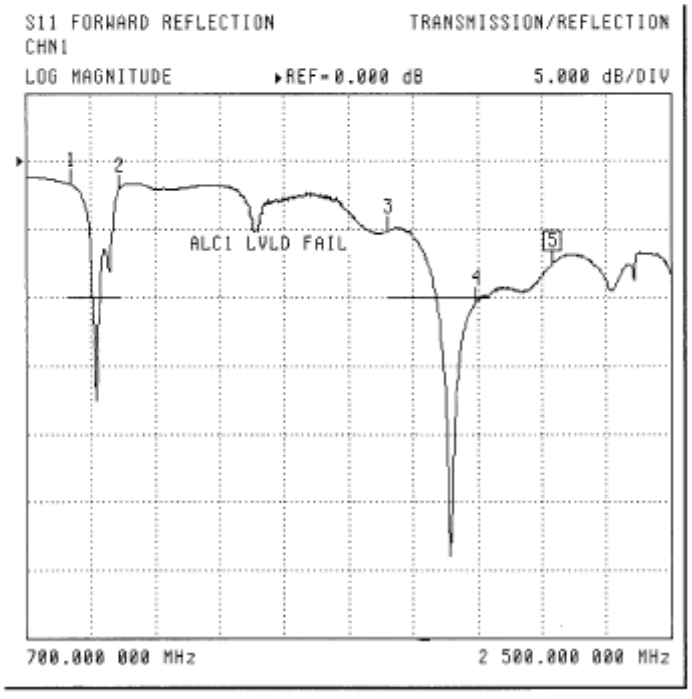
Anritsu

MS4623B

MODEL: DATE: 07/26/12 11:32 Page 1
DEVICE ID: OPERATOR:

START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------
PARAMETER: -S11-
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -



TRANSMISSION
AND
REFLECTION

▸DOMAIN

SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

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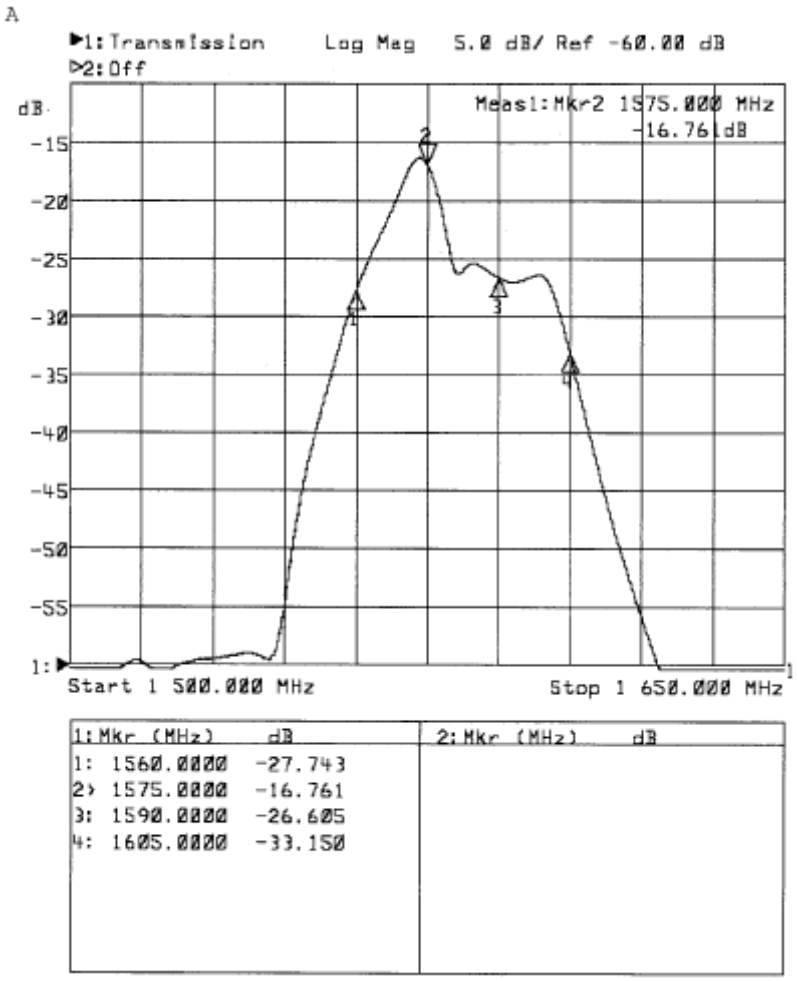
Germany

GPS test UUT 9



GSM test UUT 9

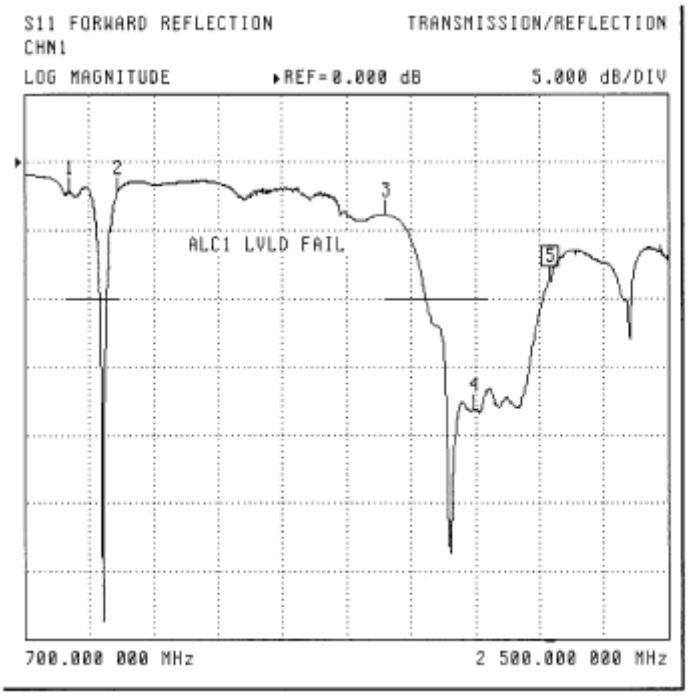
Anritsu

MS4623B

MODEL:		DATE:	07/26/12	11:34	Page 1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



TRANSMISSION
AND
REFLECTION

▸DOMAIN

SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

GSM test UUT 10

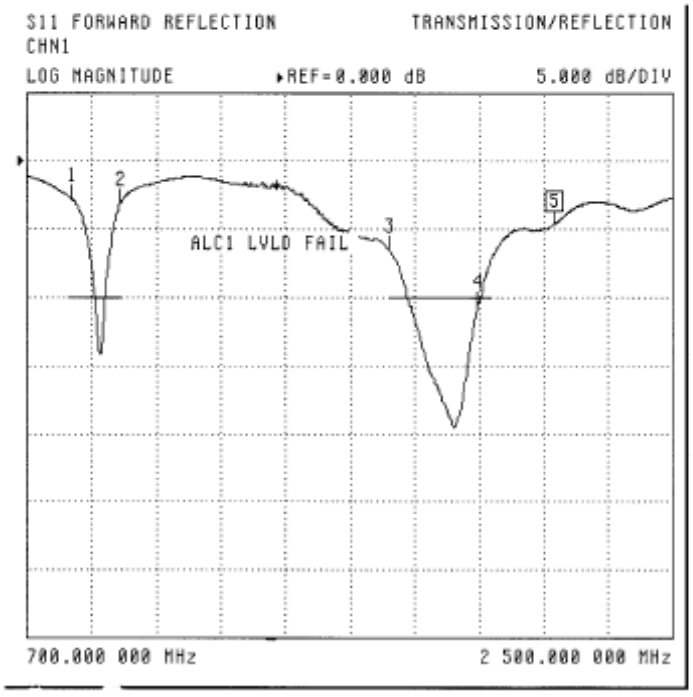
Anritsu

MS4623B

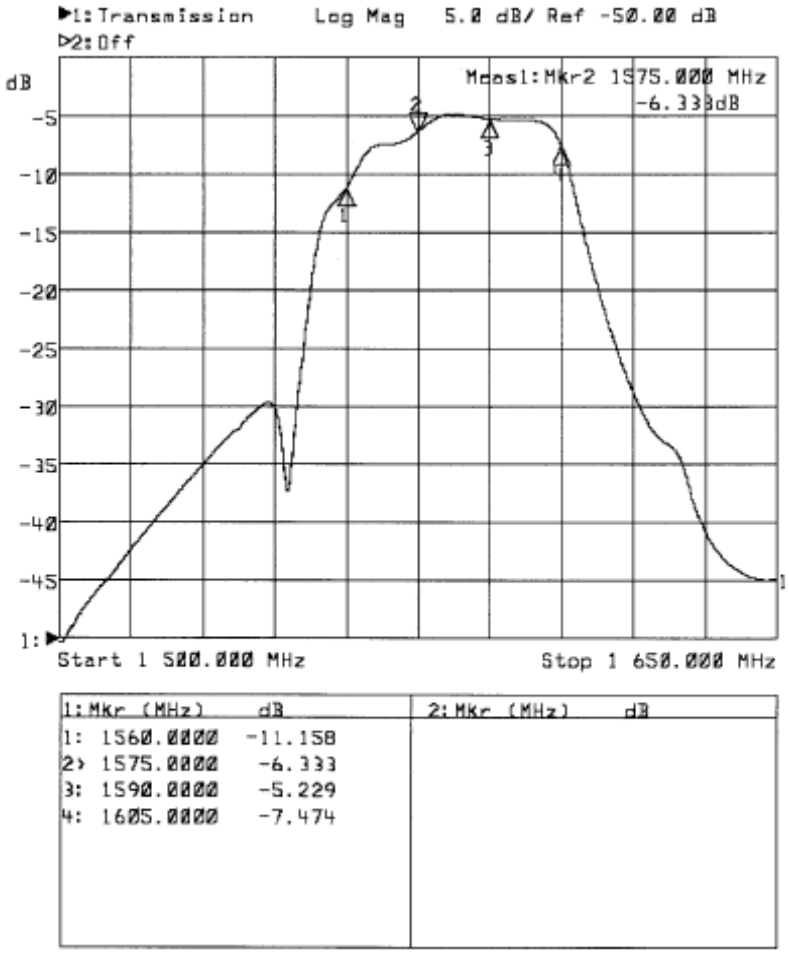
MODEL:		DATE:	07/26/12 14:07	Page	1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



GPS / GNSS test UUT 11



GSM test UUT 11

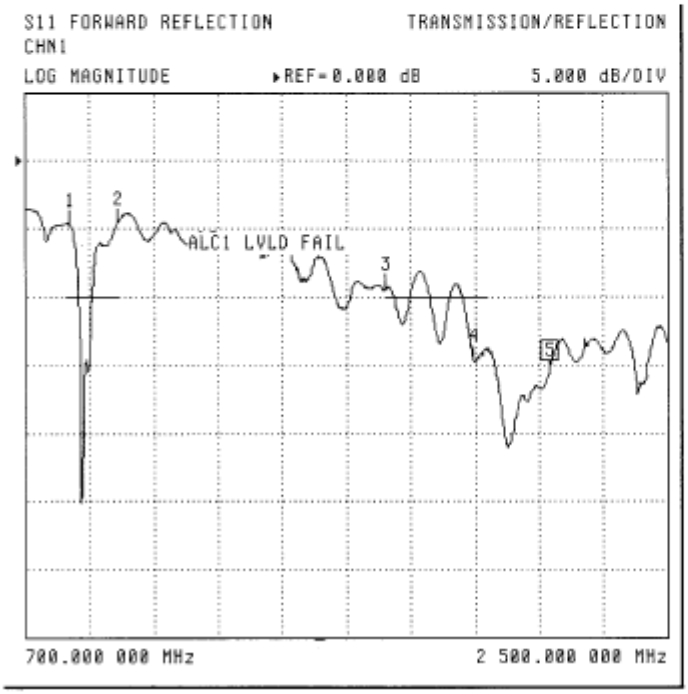
Anritsu

MS4623B

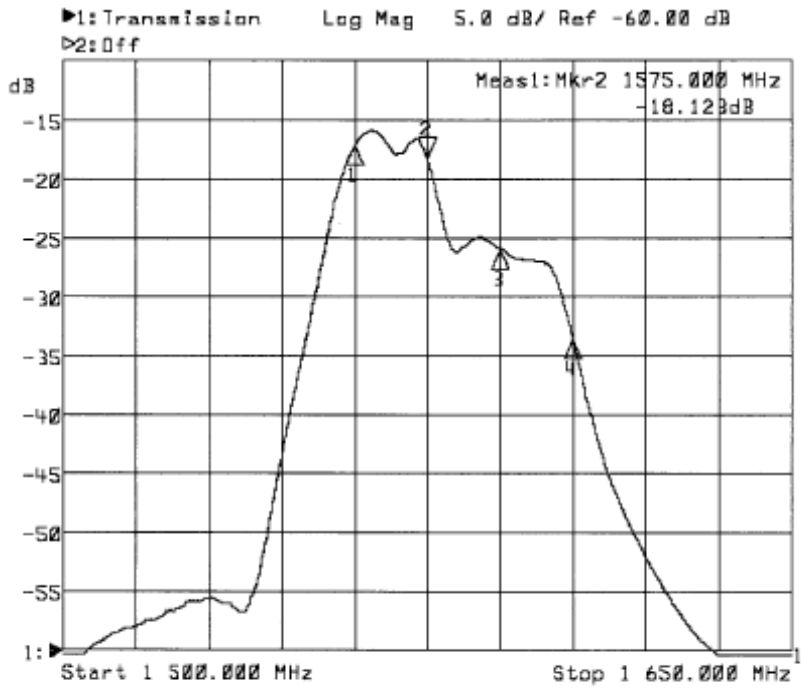
MODEL:		DATE:	07/26/12	11:41	Page 1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



GPS test UUT 12



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1560.0000	-17.102		
2› 1575.0000	-18.123		
3: 1590.0000	-26.034		
4: 1605.0000	-33.632		

GSM test UUT 12

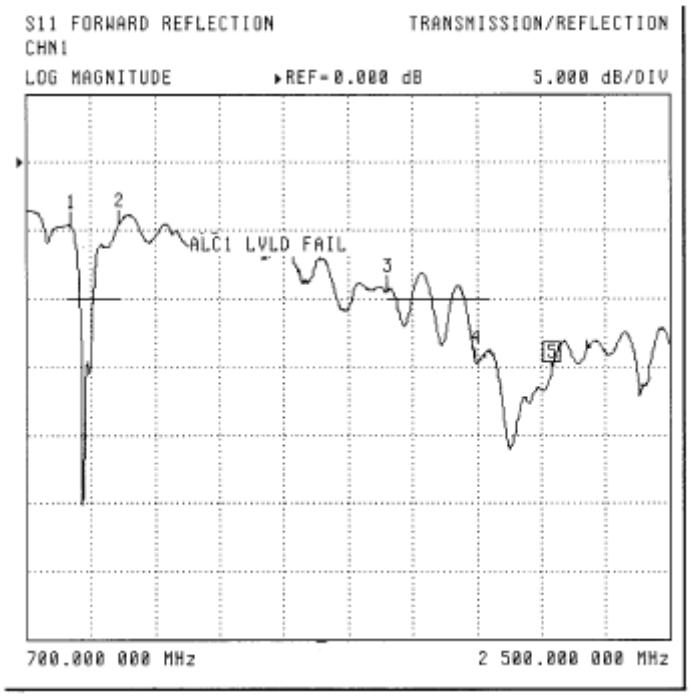
Anritsu

MS4623B

MODEL:		DATE:	07/26/12 11:41	Page	1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



TRANSMISSION
AND
REFLECTION

▸DOMAIN

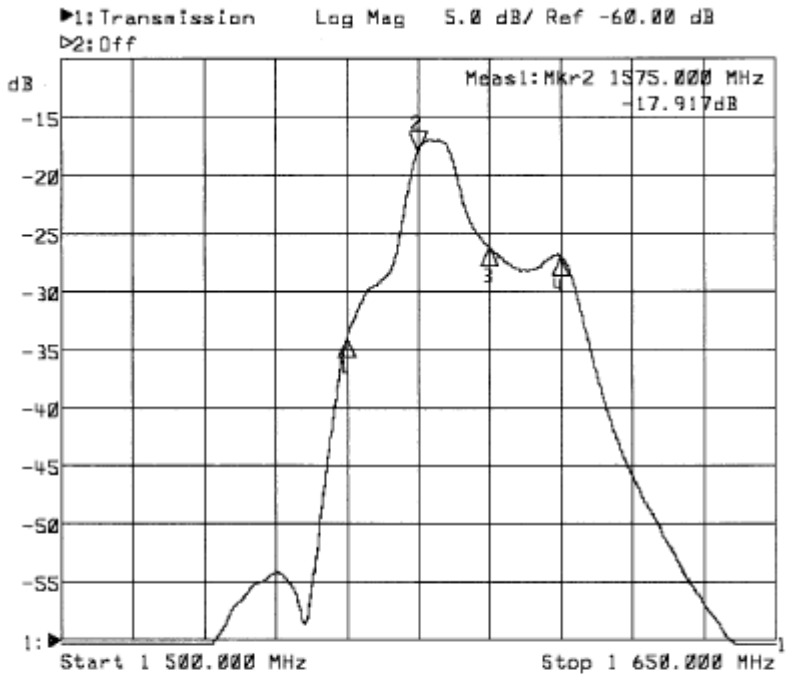
SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

GPS test UUT 13



1:Mkr (MHz)	dB	2:Mkr (MHz)	dB
1: 1560.0000	-33.996		
2› 1575.0000	-17.917		
3: 1590.0000	-26.114		
4: 1605.0000	-27.009		

GSM test UUT 13

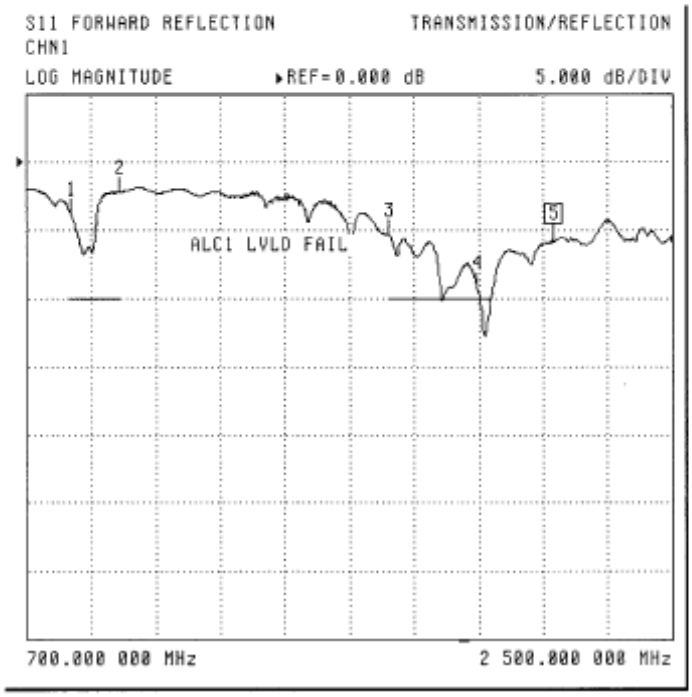
Anritsu

MS4623B

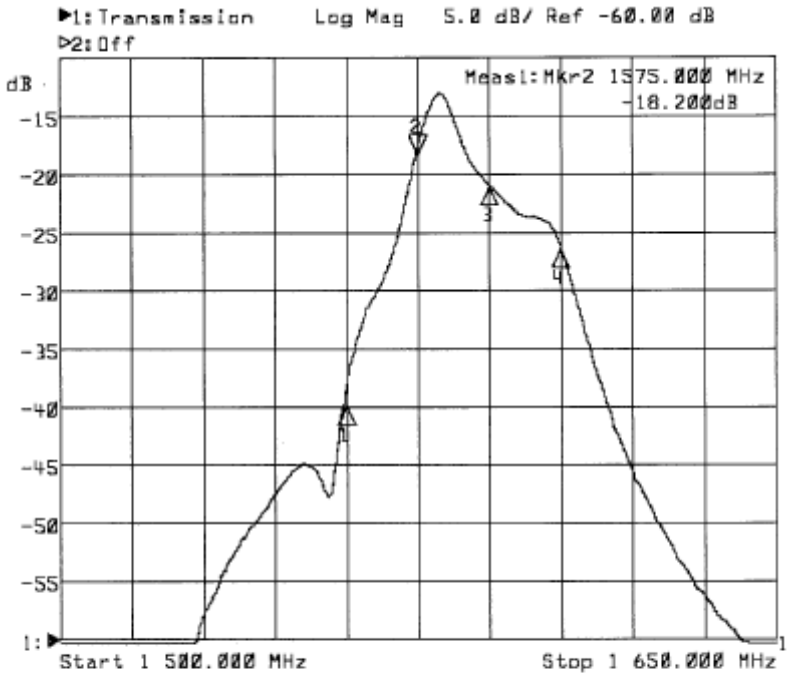
MODEL: DATE: 07/26/12 11:43 Page 1
DEVICE ID: OPERATOR:

START: 0.700000000 GHz GATE START: - ERROR CORR: REFL PORT
STOP: 2.500000000 GHz GATE STOP: - AVERAGING: 1 PT
STEP: 0.002250000 GHz GATE: - IF BNDWDTH: 1 KHz
WINDOW: -

----------CH1----------
PARAMETER: -S11-
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -



GPS test UUT 14



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1560.0000	-39.935		
2› 1575.0000	-18.200		
3: 1590.0000	-21.051		
4: 1605.0000	-26.319		

GSM test UUT 14

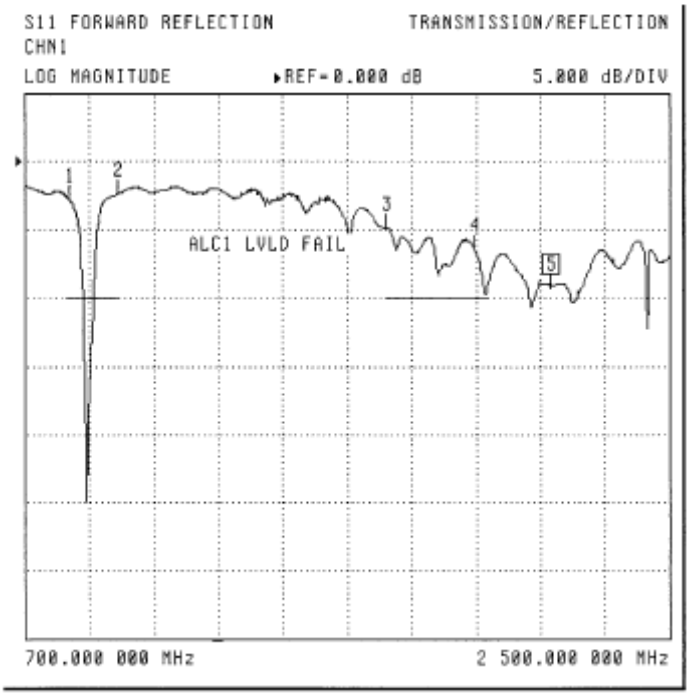
Anritsu

MB4623B

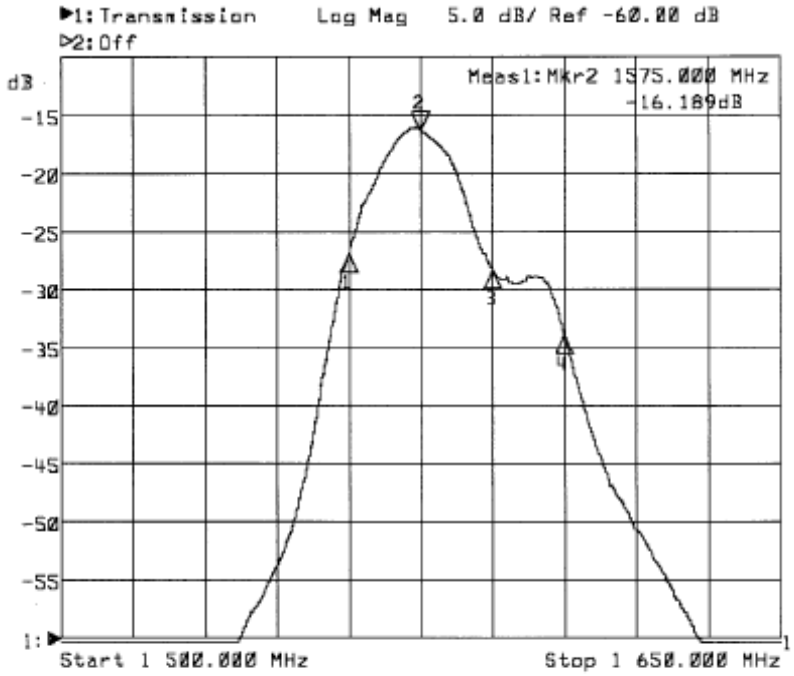
MODEL:		DATE:	07/26/12	11:45	Page 1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



GPS test UUT 15



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1560.0000	-26.813		
2› 1575.0000	-16.189		
3: 1590.0000	-28.195		
4: 1605.0000	-33.829		

GSM test UUT 15

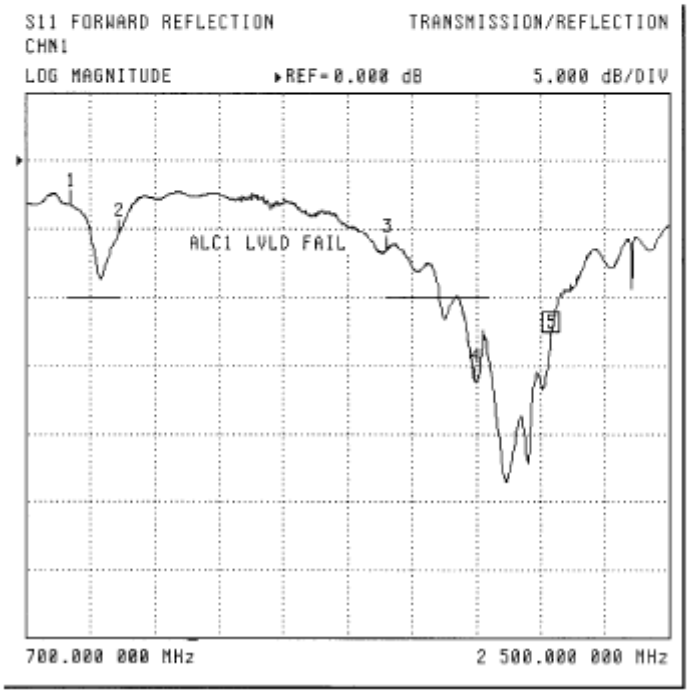
Anritsu

MS4623B

MODEL:		DATE:	07/26/12	11:47 Page	1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



TRANSMISSION
AND
REFLECTION

▸DOMAIN

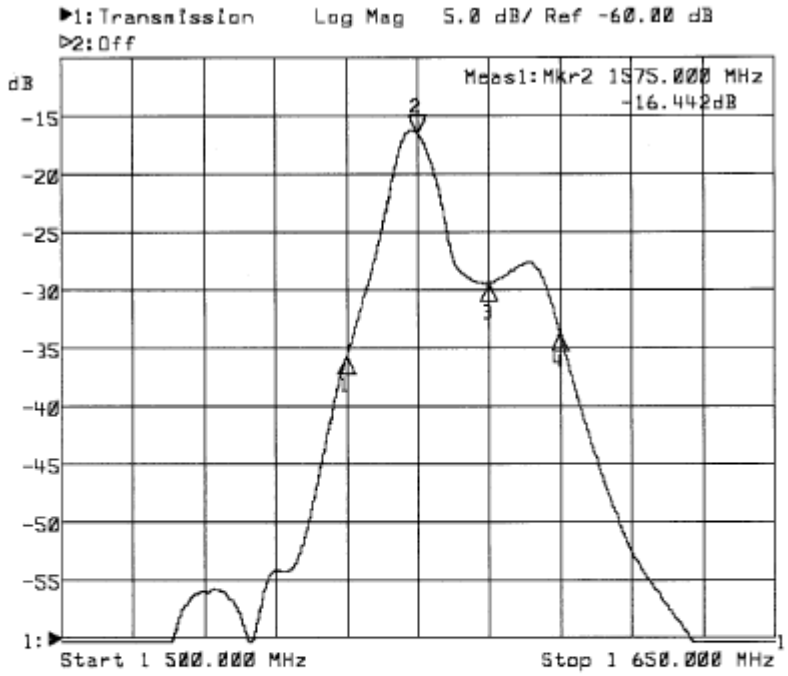
SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

GPS test UUT 16



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1560.0000	-35.679		
2› 1575.0000	-16.442		
3: 1590.0000	-29.338		
4: 1605.0000	-33.656		

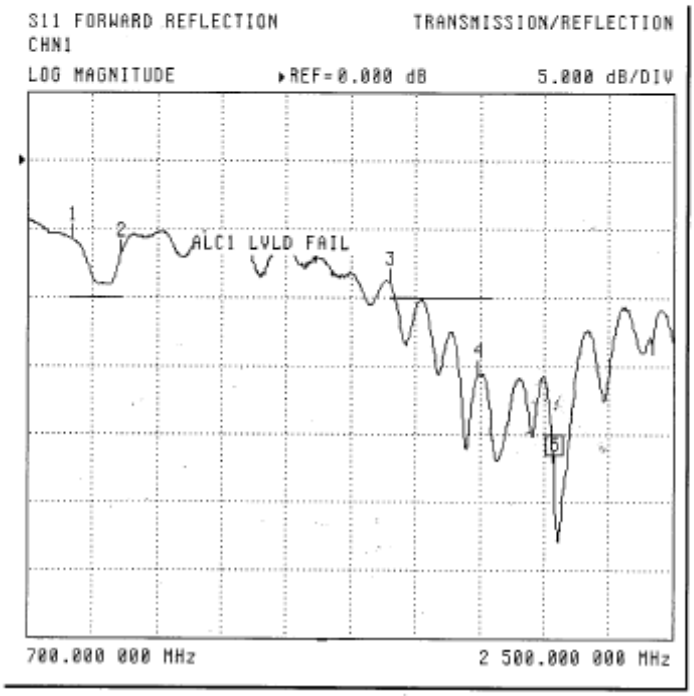
Anritsu

MS4623B

MODEL: DATE: 07/26/12 11:48 Page 1
DEVICE ID: OPERATOR:

START: 0.700000000 GHz GATE START: - ERROR CORR: REFL PORT1
STOP: 2.500000000 GHz GATE STOP: - AVERAGING: 1 PT
STEP: 0.002250000 GHz GATE: - IF BNDWDTH: 1 KHz
WINDOW: -

----------CH1----------
PARAMETER: -S11-
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -



TRANSMISSION
AND
REFLECTION

▸DOMAIN

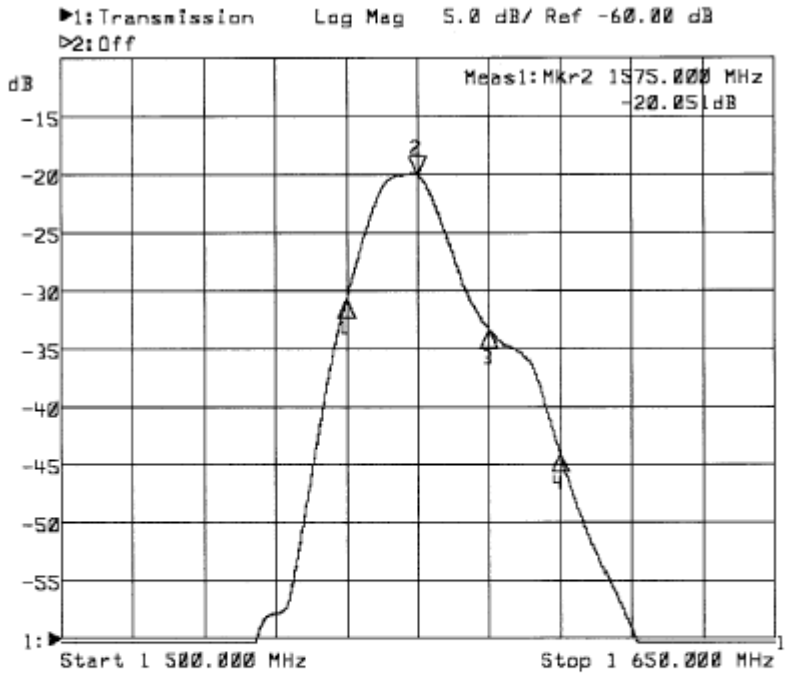
SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

GPS test UUT 17



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1560.0000	-30.661		
2› 1575.0000	-20.051		
3: 1590.0000	-33.207		
4: 1605.0000	-44.006		

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GSM test UUT 17

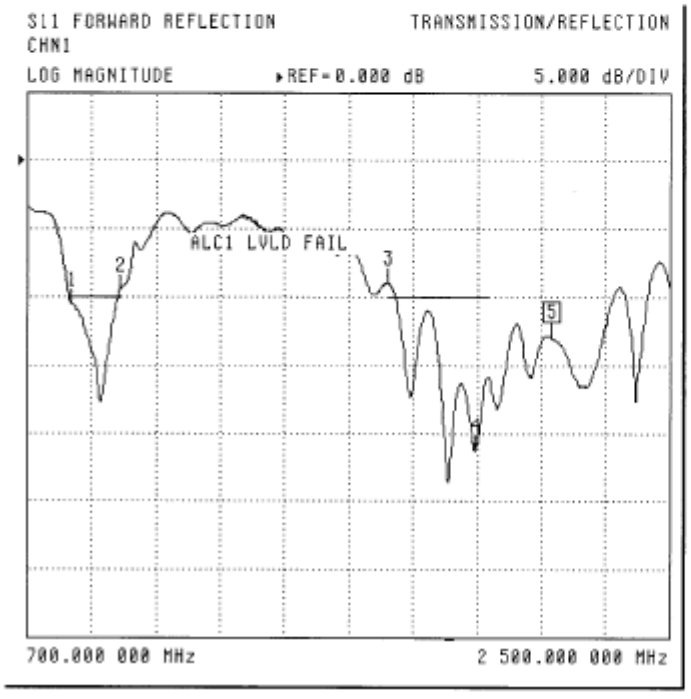
Anritsu

MS4623B

MODEL:		DATE:	07/26/12	11:49	Page 1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



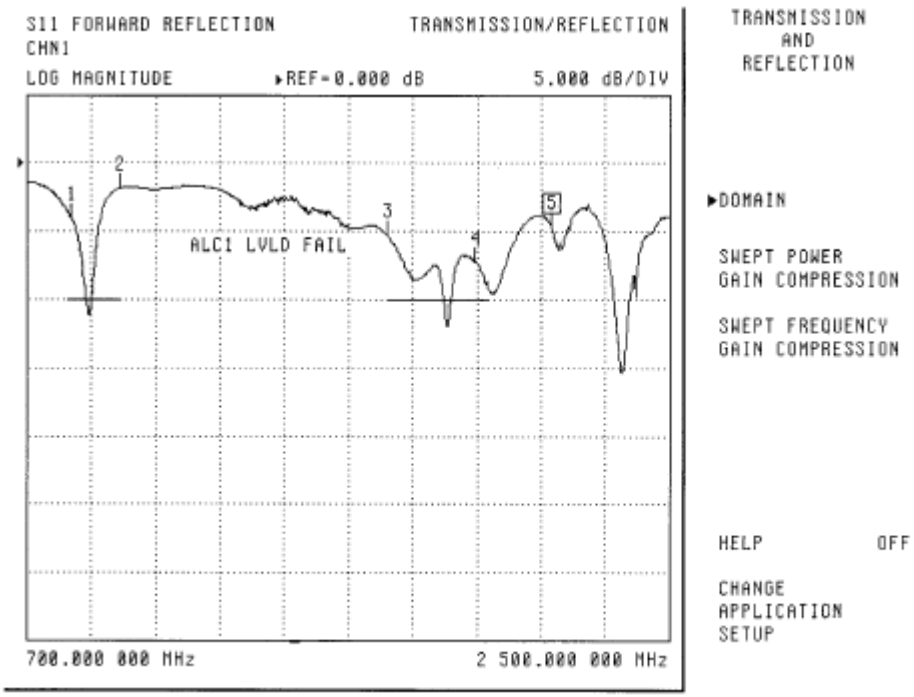
Anritsu

MS4623B

MODEL: DATE: 07/26/12 11:50 Page 1
DEVICE ID: OPERATOR:

START: 0.700000000 GHz GATE START: - ERROR CORR: REFL PORT1
STOP: 2.500000000 GHz GATE STOP: - AVERAGING: 1 PT
STEP: 0.002250000 GHz GATE: - IF BNDWDTH: 1 KHz
WINDOW: -

----------CH1----------
PARAMETER: -S11-
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -



TRANSMISSION
AND
REFLECTION

▸DOMAIN

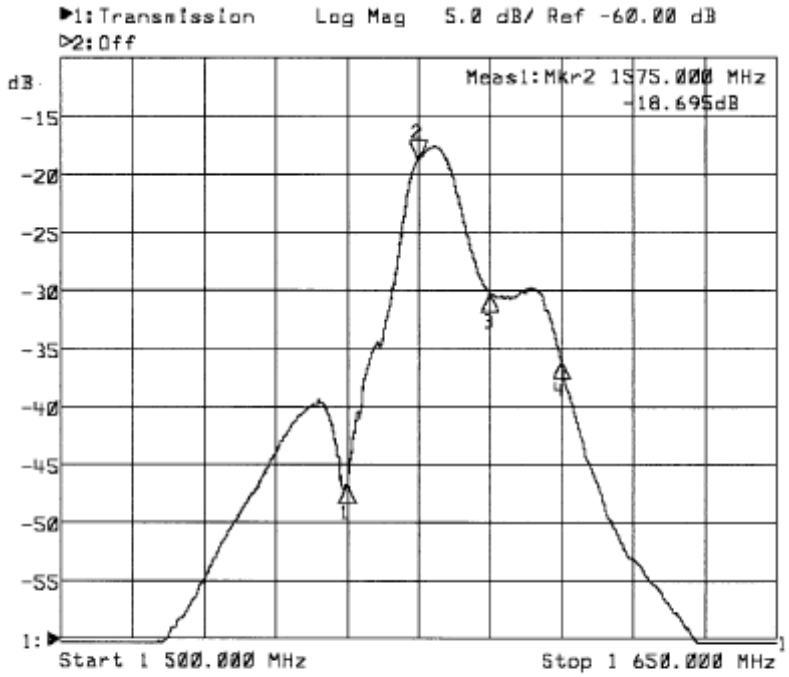
SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

GPS test UUT 19



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1: 1560.0000	-46.567		
2› 1575.0000	-18.695		
3: 1590.0000	-30.156		
4: 1605.0000	-36.002		

GSM test UUT 19

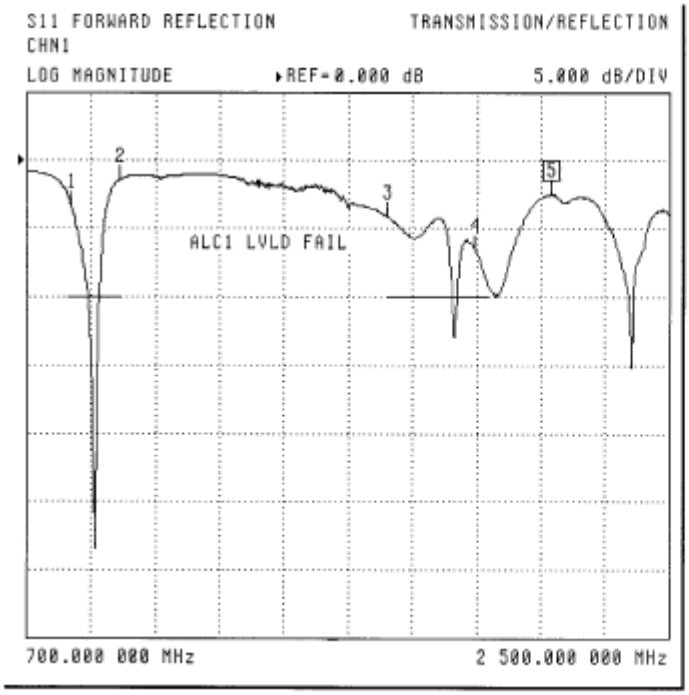
Anritsu

MS4623B

MODEL:		DATE:	07/26/12	11:54	Page 1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



TRANSMISSION
AND
REFLECTION

▸DOMAIN

SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

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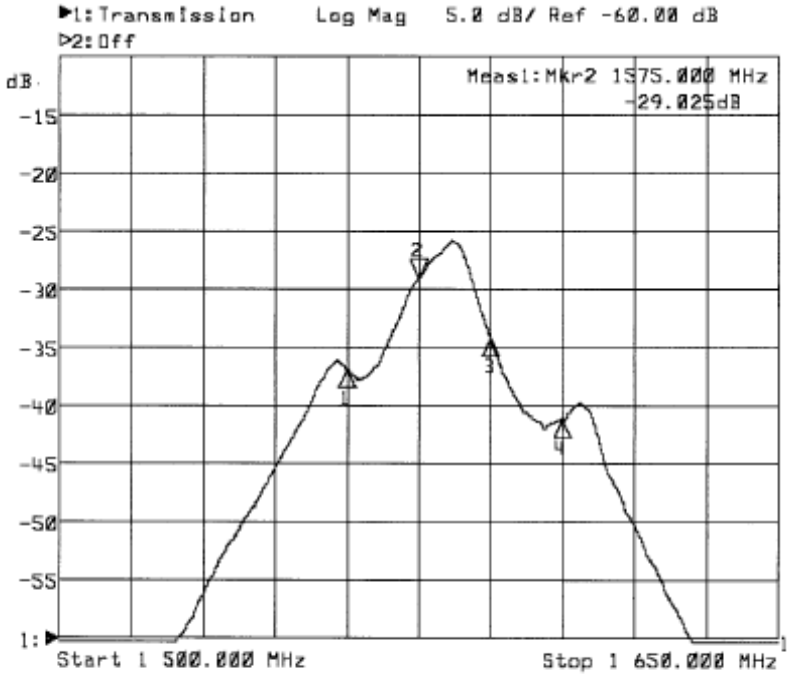
Germany

GPS test UUT 20



1:Mkr (MHz)	dB	2:Mkr (MHz)	dB
1: 1560.0000	-36.872		
2› 1575.0000	-29.025		
3: 1590.0000	-34.156		
4: 1605.0000	-41.089		

GSM test UUT 20

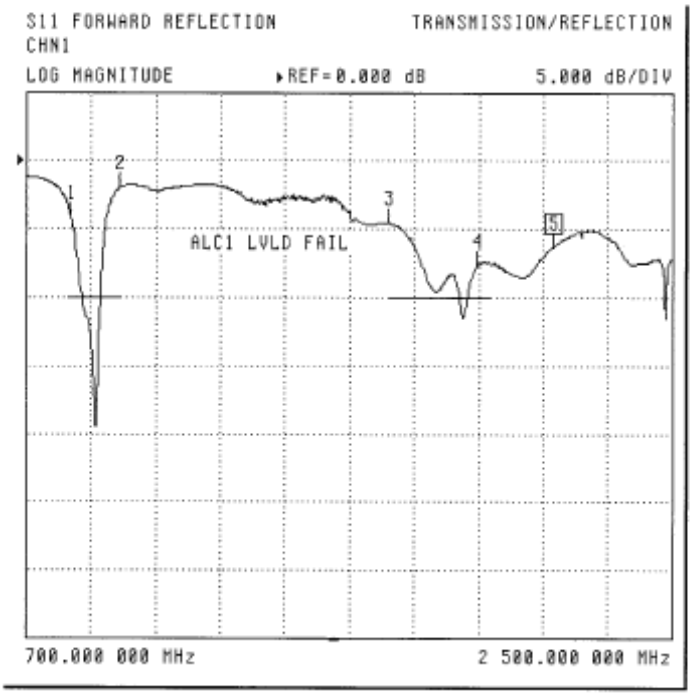
Anritsu

MS4623B

MODEL:		DATE:	07/26/12	11:56	Page 1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



TRANSMISSION
AND
REFLECTION

▸DOMAIN

SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

GSM test UUT 21

Anritsu

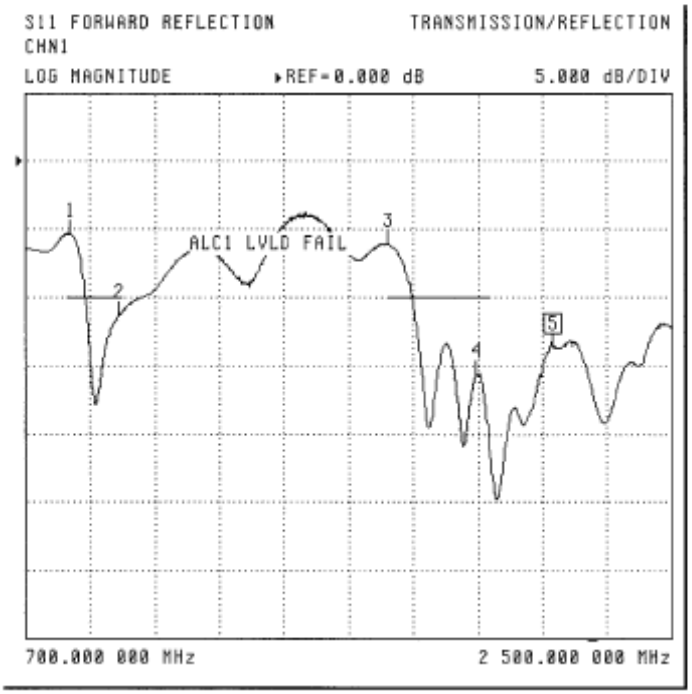
MS4623B

MODEL: DATE: 07/26/12 12:02 Page 1
DEVICE ID: OPERATOR:

START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



TRANSMISSION
AND
REFLECTION

▸DOMAIN

SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

WLAN test 1 UUT 21

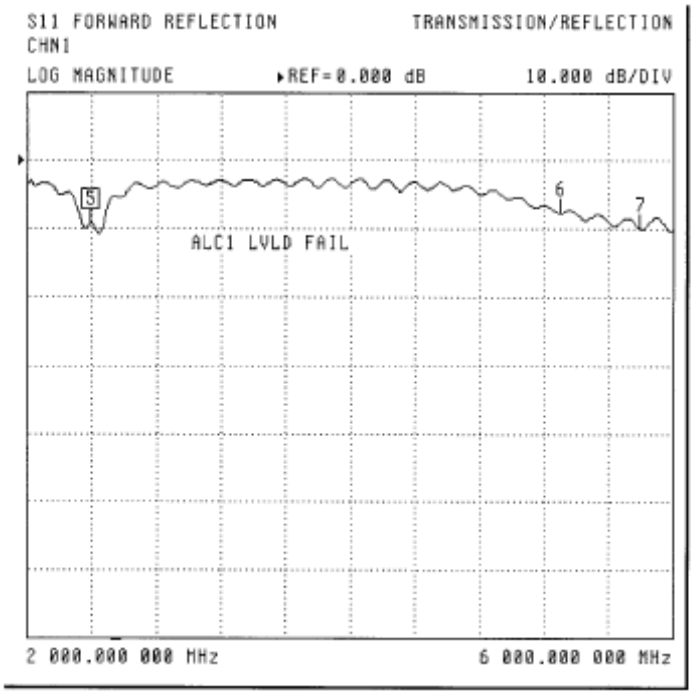
Anritsu

MS4623B

MODEL: DATE: 07/26/12 13:59 Page 1
DEVICE ID: OPERATOR:

START: 2.000000000 GHz GATE START: - ERROR CORR: REFL PORT1
STOP: 6.000000000 GHz GATE STOP: - AVERAGING: 1 PT
STEP: 0.010000000 GHz GATE: - IF BNDWDTH: 1 KHz
WINDOW: -

----------CH1----------
PARAMETER: -S11-
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -



SELECT FILE
TO READ

▸SERVICE CAL

WLAN CAL

GSM CAL

WMAX CAL

PREVIOUS PAGE

NEXT PAGE

RETURN

WLAN test 2 UUT 21

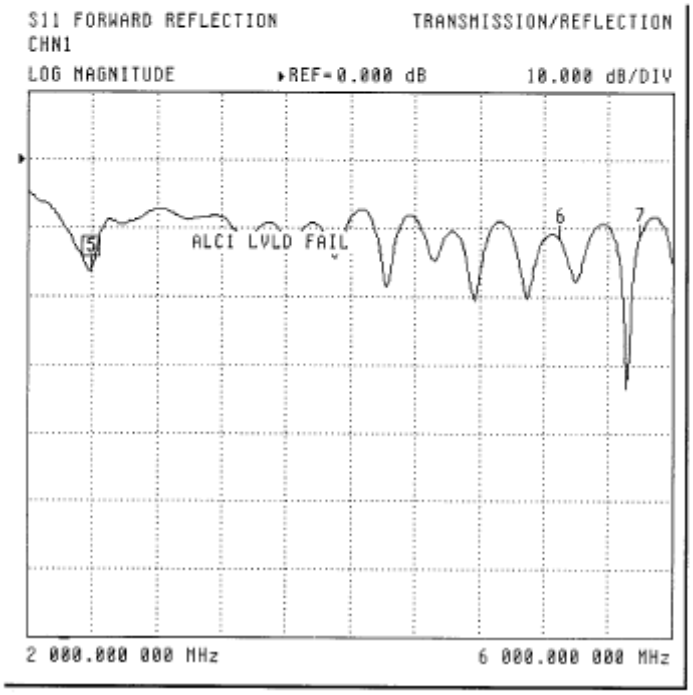
Anritsu

MS4623B

MODEL: DATE: 07/26/12 12:01 Page 1
DEVICE ID: OPERATOR:

START: 2.000000000 GHz GATE START: - ERROR CORR: REFL PORT1
STOP: 6.000000000 GHz GATE STOP: - AVERAGING: 1 PT
STEP: 0.010000000 GHz GATE: - IF BNDWDTH: 1 KHz
WINDOW: -

----------CH1----------
PARAMETER: -S11-
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -



TRANSMISSION
AND
REFLECTION

▸DOMAIN

SWEPT POWER
GAIN COMPRESSION

SWEPT FREQUENCY
GAIN COMPRESSION

HELP OFF

CHANGE
APPLICATION
SETUP

GSM test UUT 21

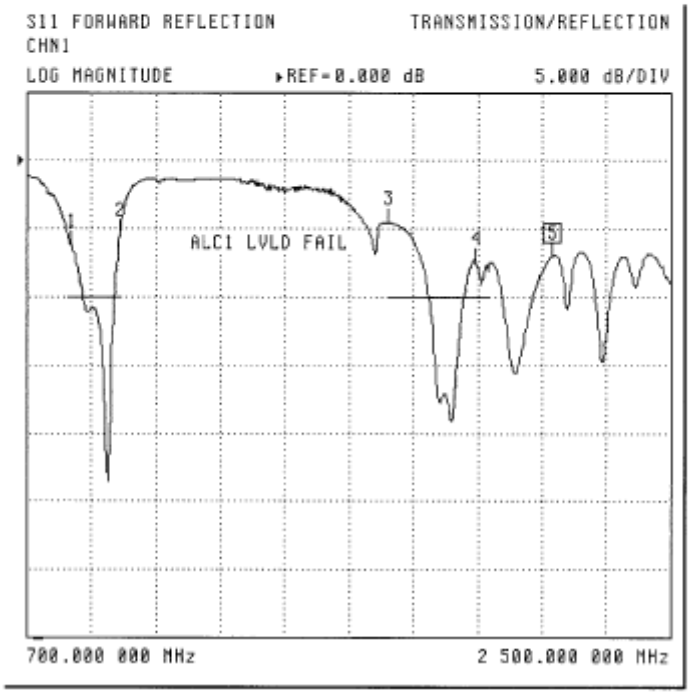
Anritsu

MS4623B

MODEL:		DATE:	07/26/12	11:58	Page 1
DEVICE ID:		OPERATOR:			
START:	0.700000000 GHz	GATE START:	-	ERROR CORR:	REFL PORT1
STOP:	2.500000000 GHz	GATE STOP:	-	AVERAGING:	1 PT
STEP:	0.002250000 GHz	GATE:	-	IF BNDWDTH:	1 KHz
		WINDOW:	-		

----------CH1----------

PARAMETER:	-S11-
NORMALIZATION:	OFF
REFERENCE PLANE:	0.0000 mm
SMOOTHING:	0.0 PERCENT
DELAY APERTURE:	-



WLAN test 1 UUT 22

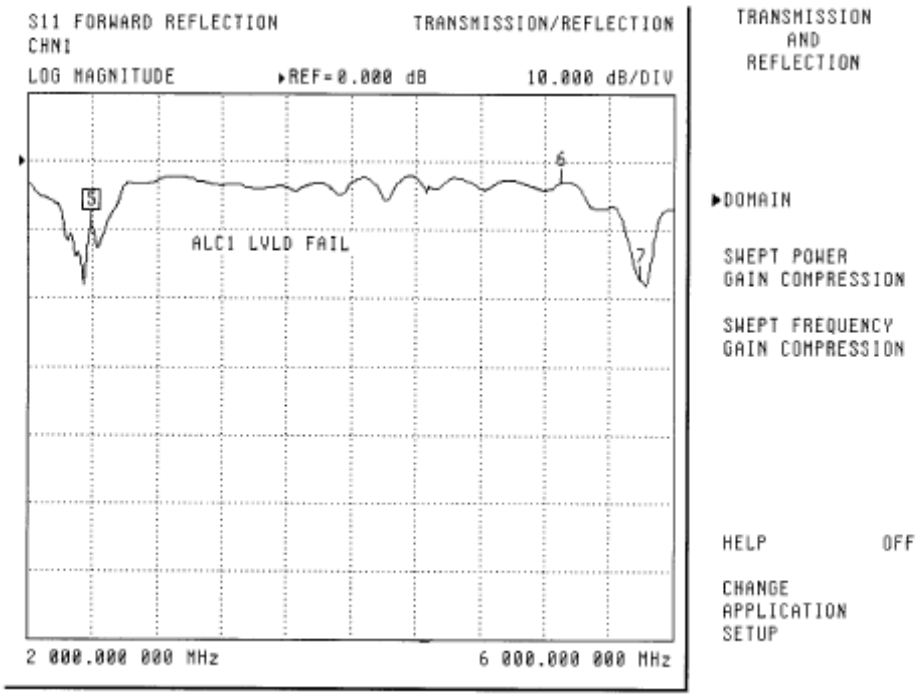
Anritsu

MS4623B

```
MODEL:                          DATE:     07/26/12    12:00    Page      1
DEVICE ID:                      OPERATOR:

START:       2.000000000 GHz    GATE START:        -        ERROR CORR: REFL PORT1
STOP:        6.000000000 GHz    GATE STOP:         -        AVERAGING:   1 PT
STEP:        0.010000000 GHz    GATE:              -        IF BNDWDTH: 1 KHz
                                WINDOW:            -

                      ----------CH1----------
PARAMETER:                        -S11-
NORMALIZATION:                    OFF
REFERENCE PLANE:                0.0000     mm
SMOOTHING:                      0.0 PERCENT
DELAY APERTURE:                   -
```



WLAN test 2 UUT 22

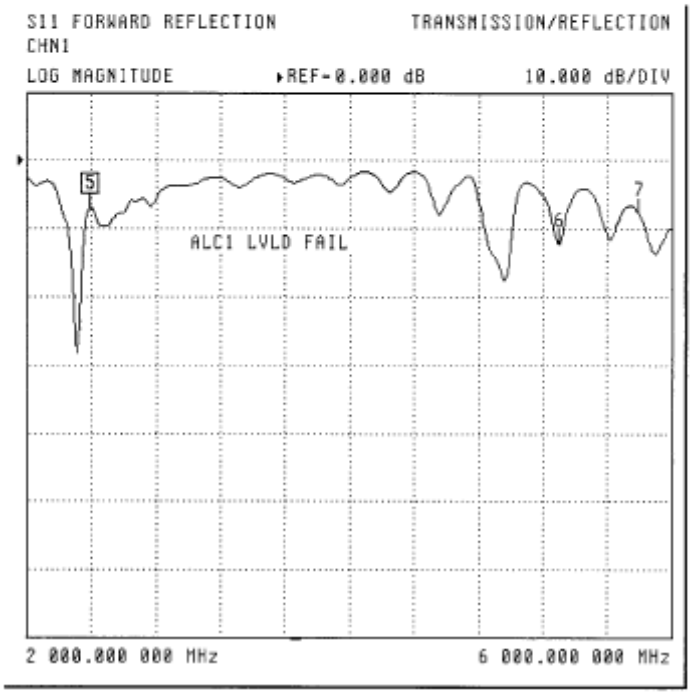
Anritsu

MS4623B

MODEL: DATE: 07/26/12 11:59 Page 1
DEVICE ID: OPERATOR:

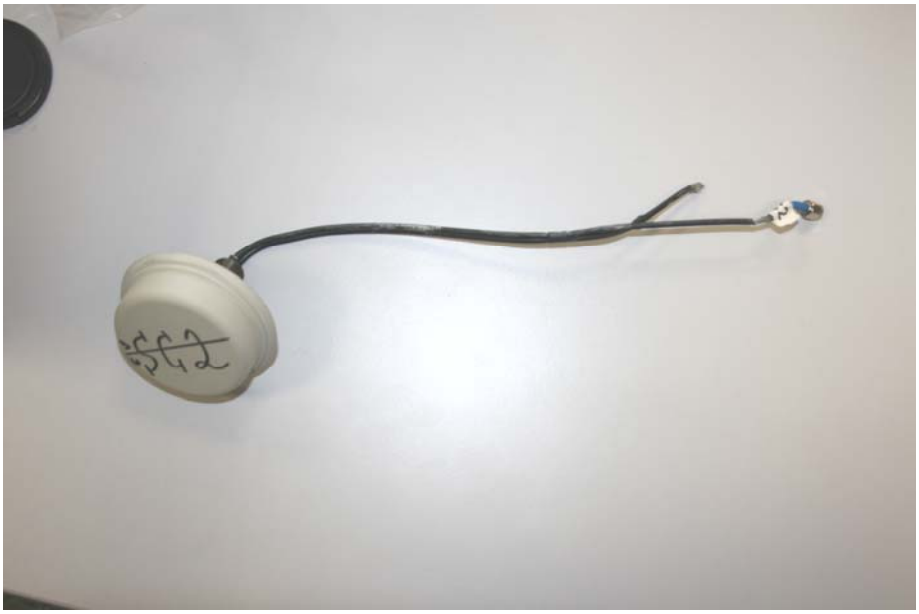
START: 2.000000000 GHz GATE START: - ERROR CORR: REFL PORT1
STOP: 6.000000000 GHz GATE STOP: - AVERAGING: 1 PT
STEP: 0.010000000 GHz GATE: - IF BNDWDTH: 1 KHz
WINDOW: -

----------CH1----------
PARAMETER: -S11-
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -



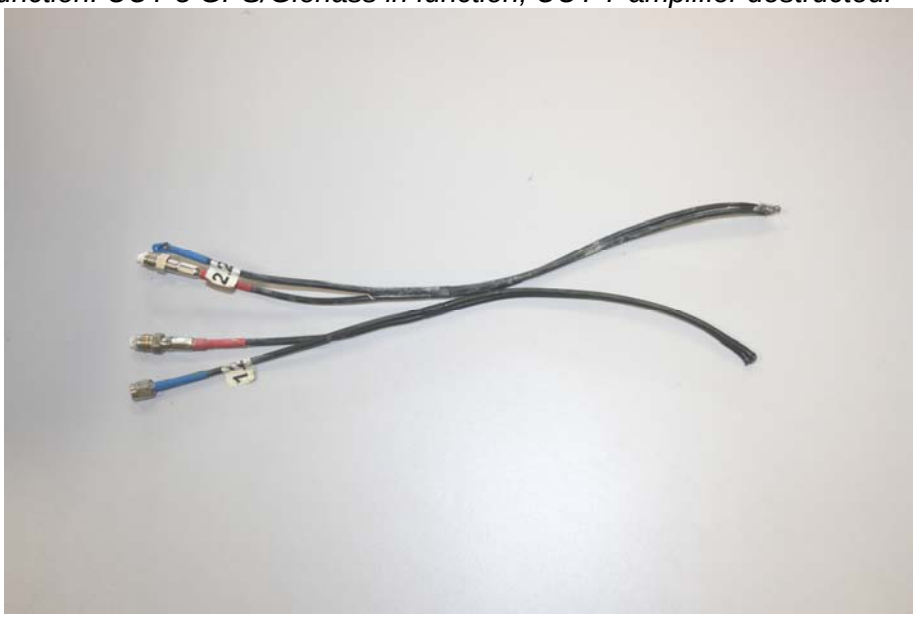
Broken signal cable and connectors:

UUT 2 - REEL No. SC2, connector broken, after removing GSM/UMTS in function



UUT 4 - REEL No. 1.1, GSM/UMTS connector broken, WLAN cable short circuit, after removing UUT complete in function.

UUT 5 and UUT 7 - REEL No. 1.2 and 2.2, cable complete broken, after removing GSM, UMTS + WLAN in function. UUT 5 GPS/Glonass in function, UUT 7 amplifier destructed.



UUT 6 - REEL No. 2.1, antenna cable broken, short circuit, after removing GSM, UMTS + WLAN in function, GPS/Glonass amplifier destructed.

Phone: + 49 621 395-844
Fax: + 49 621 395-604

E-Mail: norbert.drescher@tuev-sued.de

TÜV®

TÜV SÜD Product Service GmbH

Mannheim Branch
Dudenstraße 28
68167 Mannheim
Germany

UUT 7 - REEL No. 2.2, compleze cable broken, short circuit, after removing GSM, UMTS + WLAN in function, GPS/Glonass amplifier destructed.

UUT 9 - REEL No. 2, GPS cable short circuit, amplifier destructed.

Phone: + 49 621 395-844
Fax: + 49 621 395-604

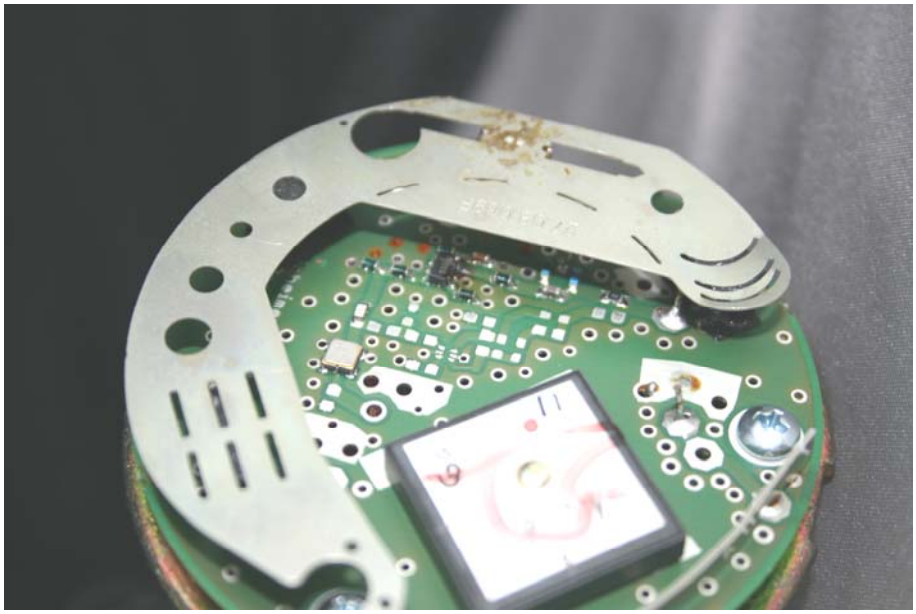
E-Mail: norbert.drescher@tuev-sued.de

TÜV SÜD Product Service GmbH

Mannheim Branch
Dudenstraße 28
68167 Mannheim
Germany

UUT 18 - REEL No. 11, GPS cable short circuit, amplifier destructed.

Example for a burnt amplifier GPS/ Glonass, roofmount housing after short circuit on cable side



Example for a burnt amplifier GPS, desk mount housing waterproof after short circuit on cable side.

Example for a burnt amplifier GPS, roof mount housing, after short circuit on cable side.

Appendix C – Test fluids

1 Urea nitrogen

Certificate of Analysis

8.18710.1000 Urea for synthesis
Batch S5592610

	Batch Values	
Assay (ex N)	100.1	%
Melting range		
lower value	133.2	°C
upper value	134.3	°C
Identity (IR)	passes test	

Date of examination (DD.MM.YYYY): 17.08.2011
Minimum shelf life (DD.MM.YYYY): 31.08.2016

Dr. Oliver Schramel

responsible laboratory manager quality control

This document has been produced electronically and is valid without a signature

Merck KGaA, Frankfurter Straße 250, 64293 Darmstadt (Germany): +49 6151 72-0 Page 1 of 1
SA-T 22979608187100000/000000 V. 999 Date: 18.11.2011

2 Liquid lime

3 NPK fertiliser

4 Ammonium hydroxide

HEDINGER
A pure decision.

Version 015 | **Sicherheitsdatenblatt** gemäß Verordnung (EU) Nr. 453/2010 | Seite 1 von 13

Ersetzt Version 014 | **AMMONIAKLÖSUNG 25 %** | überarbeitet am: 25.11.2011 Gültig ab: 02.12.2011

1. Bezeichnung des Stoffs bzw. des Gemischs und des Unternehmens

1.1 Produktidentifikator

Stoffname / Handelsname:	**Ammoniaklösung 25 %**
Index-Nr.:	007-001-01-2
EG-Nr.:	215-647-6
CAS-Nr.:	1336-21-6
REACH-Registrierungsnr.:	01-2119488876-14-XXXX
Andere Bezeichnungen:	Ammoniak 25 %, Ammoniakwasser, Ammoniaklauge, kaustischer Ammoniak, ätzendes Ammoniak, Salmiakgeist, Hirschhorngeist, Ätzammoniak, Ammoniumhydroxid, Ammoniumhydrat

1.2 Relevante identifizierte Verwendungen des Stoffs oder Gemischs und Verwendungen, von denen abgeraten wird

1.2.1 Identifizierte Verwendungen

Industrielle Verwendung der Substanz als solche oder in einer Mischung, zur Behandlung von Oberflächen/Erzeugnissen (z.B. Metall, Leder/Textilien, Kunststoffen, Holz, Elektronik und Halbleitern, Isolierungen, Härter, Ätzmedien)
Industrielle Verwendung als Teil von Spezialchemikalien / anderen Produkten (z.B. Klebstoffe, Biozide, Katalysatoren, Reinigungsmittel, Korrosionsschutz, Kosmetika, Lacke/Farben, Frostschutz-/Enteisungsmittel, Isolierungen, Tinten, Fotochemikalien, Polymerzubereitungen)
Industrielle Verwendung zur Herstellung von Spezialchemikalien / anderen Produkten (z.B. Klebstoffe, Biozide, Katalysatoren, Reinigungsmittel, Kosmetika, Lacke/Farben, Bauchemikalien, Korrosionsschutz, Isolierungen, Tinten, Pharmazeutika, Polymerzubereitungen)

Industrielle Verteilung der Substanz.
Industrielle Verwendung der Substanz zur Formulierung chemischer Produktmischungen
Industrielle Verwendung der Substanz zur Reduktion von NOx / SOx in Abgasen
Industrielle Verwendung der Substanz als Wärmeübertragungsmittel (z.B. für Gefrier-/Kühl- und Heizsysteme)
Verwendung der Substanz als chemischer Nährstoff / Prozessnährstoff (z.B. Pharmazeutika, Lebensmittel, Bio-Kraftstoffe)

Industrielle Verwendung als chemische Zwischensubstanz
Industrielle Herstellung / Import - Kontinuierliche Synthese der Substanz
Industrielle Herstellung / Import - Chargenweise Synthese der Substanz
Industrielle Herstellung / Import - Bulktransfer der Substanz

Gewerbliche Verwendung der Substanz zur Formulierung von Mischungen
Verwendung der Substanz als chemischer Nährstoff / Prozessnährstoff (z.B. Düngemittel, Pharmazeutika, Lebensmittel)
Gewerbliche Verwendung der Substanz als solche oder in einer Mischung, als Reaktions-/Prozesshilfsmittel und für generelle chemische Anwendungen (z.B. Korrosionsschutzmittel, pH-Einstellungs-/Neutralisierungsmittel, Verarbeitung von Mist/Gülle zu Düngemitteln, Wasserbehandlung).
Gewerbliche Verwendung der Substanz als Laborchemikalie oder für Forschungszwecke.
Gewerbliche Verwendung der Substanz als solche oder in einer Mischung als Wärmeübertragungsmittel (z.B. für Gefrier-/Kühl- und Heizsysteme).
Gewerbliche Verwendung der Substanz als solche oder in einer Mischung, zur Behandlung von Oberflächen/Erzeugnissen (z.B. Metall, Leder/Textilien, Kunststoffen, Holz, Ätzmittel).
Gewerbliche Verwendung als Teil von Spezialchemikalien / anderen chemischen Produkten (z.B. Klebstoffe, Biozide, Reinigungsmittel, Korrosionsschutz, Kosmetika, La-

5 Diesel fuel

SICHERHEITSDATENBLATT

1. Stoff-/Zubereitungs- und Firmenbezeichnung

Produktname	**Aral Diesel, Aral SuperDiesel, Aral LKW-Diesel gemäß DIN EN 590 oder DIN 51628 in der jeweils aktuellen Fassung**
SDS-Nr.	SGY2181
Historische SDS-Nr.:	SGY2151
Verwendung des Stoffes/der Zubereitung	Kraftstoff für Dieselmotoren. Für spezifische Anwendungshinweise siehe das entsprechende technische Datenblatt oder wenden Sie sich an einen Vertreter des Unternehmens.
Lieferant	Aral Aktiengesellschaft Wittener Str. 45 44789 Bochum Telefon: +49 (0) 234 315-0
NOTRUFNUMMER	+49 (0) 30 19240 (Giftnotruf Berlin)
E-Mail-Adresse	MSDSadvice@bp.com

2. Mögliche Gefahren

Die Zubereitung ist gemäß Richtlinie 1999/45/EC in ihrer geänderten und angepassten Fassung als gefährlich eingestuft.

Gesundheitsrisiken	Verdacht auf krebserzeugende Wirkung. Gesundheitsschädlich: kann beim Verschlucken Lungenschäden verursachen. Wiederholter Kontakt kann zu spröder oder rissiger Haut führen.
Gefahren für die Umwelt	Giftig für Wasserorganismen, kann in Gewässern längerfristig schädliche Wirkungen haben.
Zusätzliche Gefahren	Hinweis: Hochdruckanwendungen Einspritzung durch die Haut aufgrund von Kontakt mit einem unter hohem Druck stehenden Produkt ist ein größerer medizinischer Notfall. Siehe Hinweise für Ärzte im Abschnitt "Maßnahmen in Notfällen" auf diesem Sicherheitsdatenblatt.

Abschnitte 11 und 12 enthalten genauere Informationen zu Gesundheitsgefahren, Symptomen und Umweltrisiken.

3. Zusammensetzung/Angaben zu Bestandteilen

Kohlenwasserstoffgemisch aus Mitteldestillaten mit C-Zahl 10 - 28. Könnte auch geringe Additivmengen enthalten. Kann Fettsäuremethylester (FAME) enthalten, die den Anforderungen nach EN 14214 genügen.

Chemische Bezeichnung	CAS-Nr.	%	EINECS / ELINCS.	Einstufung	
Brennstoffe, Diesel-	68334-30-5	50 - 100	269-822-7	Carc. Cat. 3; R40 Xn; R65 R66 N; R51/53	[1]
Alkane, C12-26-verzweigt und linear	90622-53-0	0 - <20	292-454-3	Xn; R65	[1]

Siehe Abschnitt 16 für den vollständigen Wortlaut der oben angegebenen R-Sätze

[1] Stoff eingestuft als gesundheitsgefährdend oder umweltgefährlich

[2] Stoff mit einem Arbeitsplatzgrenzwert

[3] PBT-Stoff

[4] vPvB-Stoff

Die Grenzwerte für die Exposition am Arbeitsplatz sind, wenn verfügbar, in Abschnitt 8 wiedergegeben.

4. Erste-Hilfe-Maßnahmen

Augenkontakt	Bei Berührung die Augen sofort mindestens 15 Minuten lang mit viel Wasser spülen. Die Augenlider sollten vom Augapfel ferngehalten werden, damit ein gründliches Ausspülen gewährleistet ist. Kontaktlinsen entfernen falls vorhanden und leicht möglich. Bei Reizung einen Arzt hinzuziehen.
Hautkontakt	Haut schnellstmöglich mit Wasser und Seife waschen. Stark verschmutzte Kleidung wechseln und Haut waschen.
Einatmen	Falls eingeatmet, an die frische Luft bringen. Bei Beschwerden Arzt hinzuziehen.
Verschlucken	Bei Verschlucken kein Erbrechen auslösen. Niemals einer bewußtlosen Person etwas durch den Mund verabreichen. Aspirationsgefahr beim Verschlucken. Kann in die Lunge gelangen und diese schädigen. Sofort einen Arzt verständigen.

6 Hydraulic oil

Liebherr-Schmierstoffe
Technisches Datenblatt

ISO VG 46 (32-68)

Liebherr Hydraulic Plus

Verwendung / Beschreibung

Liebherr Hydraulic Plus ist ein aschefreies, biologisch schnell/leicht (gemäß CEC-L-33-A-93) abbaubares Hochleistungs-Hydraulikfluid auf der Basis von Polyalphaolefinen (PAO).

Durch die speziell abgestimmte Additivtechnologie in Verbindung mit der Grundflüssigkeit werden die hervorragenden Eigenschaften erzielt. Die Kombination aus gutem Tief- als auch Hochtemperaturverhalten gepaart mit exzellenter Alterungsstabilität sowie detergierende und dispergierende Eigenschaften prädestinieren Liebherr Hydraulic Plus als Hydraulikflüssigkeit mit verlängerten Ölwechselintervallen. Das Wirkstoffsystem von Liebherr Hydraulic Plus gewährleisten dauerhaft einen sehr guten Korrosionsschutz, geringe Schaumneigung, gutes Luftabscheidevermögen sowie Dichtungsverträglichkeit. Das exzellente Tieftemperaturverhalten bietet Ihnen die Möglichkeit, eine höhere Geräteverfügbarkeit ohne Warmlaufphase auch bei tiefen Temperaturen zu erreichen.

Einsatztemperatur, siehe Betriebsanleitung

-25 °C bis +45 °C Außentemperatur

Qualifikation

HVLPD HC	DIN 51 524 / T 3
HEPR	VDMA 24568 / ISO 6743 Teil 4

Technische Daten

Chem. und physik. Kenndaten		Prüfverfahren	Liebherr Hydraulic Plus
Dichte bei 15 °C	kg/m³	DIN 51 757	838
Viskositätsklasse	ISO VG	DIN 51 519	46 (32-68)
Kinematische Viskosität bei 40 °C 100 °C	mm²/s	DIN 51 562	 46 9,5
Pourpoint	°C	DIN ISO 3016	< - 42

Gebindeeinheiten / Identnummern

Gebindegröße	Identnummer
5 Liter Kanister	10 29 64 80
20 Liter Kanister	10 33 02 72
210 Liter Fass	10 33 02 76
1.000 Liter Container	10 29 64 81

Nachbestellungen unter Angabe der Identnummer bei Ihrem Liebherr-Partner.
Alle Informationen nach bestem Wissen, jedoch ohne Gewähr. Technische Daten sind Durchschnittswerte und unterliegen den üblichen Produktionsschwankungen. Datenveränderungen durch Innovation von Produkt und Umstellung bleiben vorbehalten.

Noch Fragen ?

Stets für Sie erreichbar: Ihr technischer Berater gibt Ihnen gerne weitere Informationen.

Liebherr-Lubricant-Hotline: + 49 (0) 7354/80-6060
lubricants@liebherr.com

Liebherr-Hydraulikbagger GmbH
Liebherrstraße 12, D-88457 Kirchdorf/Iller
☎ +49 7354 80-0, Fax +49 7354 80-7294
www.liebherr.com, E-Mail: info.hb@liebherr.com

LIEBHERR

7 Ethylenglykole

Certificate of Specification

Material : 24407.292 Ethylene glycol TECHNICAL
Batch :

CHARACTERISTICS	SPECIFICATIONS
Assay (on anhydrous substance)	Min. 98,0 %
Appearance of solution (50 % V/V; water)	Passes test

We certify that this batch conforms to the specifications listed above.
BDL : Below detected limit.

Isabelle Gullpain Head of laboratory - Briare
VWR International
Document printed on 27.07.2012

This document has been produced electronically and is valid without a signature.

VWR International bvba/sprl
Haasrode Research Park Zone 3
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B-3001 Leuven
Tel: + 32 (0)16 385 011