SIEMENS

Deutscher Akkreditierungs Rat

DAT-P-002/91-02

Center for Quality Engineering

Test Report No.: U0TG0004

Order No.: U0TG	**Pages:** 26	**Munich,** Jul 21, 2006

Client:	Rohde & Schwarz GmbH & Co. KG
Equipment Under Test:	DMQ-T Transmitter 10 kW rms / NV7930E
Manufacturer:	Rohde & Schwarz
Task:	Customer selected test according to the below mentioned test specification
Test Specification(s): [covered by accreditation]	• FCC 47 CFR Part 2
Result:	see summary

The results relate only to the items tested as described in this test report.

approved by:	**Date**	**Signature**
Steinmüller Test Engineer	Aug 07, 2006	
Bauer Director 'EMC'	Aug 08, 2006	

This document was signed electronically.

Address: Siemens AG, Com CTO CQE, Hofmannstr. 51, D-81359 München, Phone +49 89-722-48793, Fax +49 89-722-22648, Internet http://www.pruefinstitut.de

FEDERAL COMMUNICATIONS COMMISSION
Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

June 27, 2003

Registration Number: 90932

Siemens AG
Hofmannstrasse 50
81359 Munich,
Germany
Attention: Josef Bauer

Re: Measurement facility located at Munich
Anechoic chamber No. 1 (10 meters)
Date of Renewal: June 27, 2003

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Phyllis Parrish
Information Technician

CONTENTS

Summary

A summary of the measurements results will be found in the following tables. The results refer solely to the EUT as described in chapter 4.

1.1 Tables of Results

1.1.1 Enclosure Port

Radiated emission tests				
Chapter	**Test**	**Specification**	**Limits**	**Result**
5.1.1	Radiated 30 MHz-1 GHz Test Distance: 10 meters	FCC Part 2 §2.1053, §2.1057	Class B	**passed**
5.1.2	Radiated 1 GHz-10 GHz Test Distance: 3 meters	FCC Part 2 §2.1053, §2.1057	Class B	**passed**[1]

1.1.2 Antenna terminals

Conducted emission tests				
Chapter	**Test**	**Specification**	**Limits**	**Result**
5.2.1	Spurious Emissions	FCC Part 2 §2.1051 / 2.1057	-	**passed**
5.2.2	Occupied Bandwith	FCC Part 2 §2.1047 / 2.1049 with limit of Part 27.53	-	**passed**

[1] The amplifier modules were modified to actual series standard.

References

1.2 Specifications

- 47 CFR Code of Federal Regulations Title 47 – Telecommunication
- FCC Part 2, § 2.1049,
- FCC Part 2, §2.1051, §2.1053, §2.1055, §2.1057 Field strength of spurious radiation, Frequency spectrum to be investigated

1.3 Glossary of Terms

EMC specific Abbreviations

AC	Alternating Current
AM	Amplitude Modulation
CBN	Combined Bonding Network
CE	CE-Conformity
CM	Common Mode Coupling
CO+No.	Conditional Objective Requirement No. of GR-1089-CORE
CR	Customer requirement
DC	Direct Current
DM	Differential Mode coupling
DTAG	Deutsche Telekom AG
EFT	Electrical Fast Transient
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EN	European Standard
ES	ETSI Standard
ESD	Electro Static Discharge
ETS	European Telecommunication Standard
EUT	Equipment Under Test
FW	Firmware
HW	Hardware
IBN	Isolated Bonding Network
IEC	International Electrotechnical Commission
ITU-T	International Telecommunication Union- Telecommunications sector
L > XX m	Line Length > XX m (Test applicable for lines with length > XX m)
LFC	Loss of Function Customer reset (performance criterion)
LFO	Loss of Function Operator reset (performance criterion)
LFS	Loss of Function Self recovery (performance criterion)
LISN	Line Impedance Stabilization Network
Loc	Location of the EUT, can be TC or OTC
LtG	Line to Ground coupling
LtL	Line to Line coupling
LVDS	Low Voltage Differential Signal
NP	Normal Performance (performance criterion)
O+No.	Objective Requirement No. of GR-1089-CORE
OTC	Other than Telecommunication Center
PC	Power Contact
PF	Power Fault
PIL	Power Induction Long term
PIS	Power Induction Short term
PP	External Port to external Port test as defined in ITU-T K.44
propOJEC	proposed to publish in the Official Journal of the European Communities for CE Marking
R	Ring
R+No.	Requirement No. of GR-1089-CORE
RP	Reduced Performance (performance criterion)
SC	Short-Circuit
SW	Software
T	Tip
TC / ITC	Telecommunication Center
UL	Underwriter Laboratories
with p	with primary protection
without p	without primary protection

2 General Information

2.1 Identification of Client

Rohde & Schwarz GmbH & Co. KG
Mühldorfstraße 15
81671 München
Reinhard Scheide

2.2 Test Laboratory

Center for Quality Engineering
Siemens AG
Hofmannstraße 51
81359 München

2.3 Time Schedule

Delivery of EUT:	May 04, 2006
Start of test:	May 11, 2006
End of test:	May 17, 2006

2.4 Participants

Name	Function	Phone	E-Mail
Michael Steinmüller	Accredited testing, Editor	+49 89 722 25262	michael.steinmueller@siemens.com
Markus Plangger	Supervision of EUT-functionality	089 4129-12451	markus.plangger@rsd.rohde-schwarz.com

3 Equipment Under Test

3.1 Description of EUT

NV7930E

DMQ-T Transmitter10 kW $_{rms}$
Band IV/V
solid state
Single transmitter
with single exciter or optional dual drive

frequency range	UHF
channels	21 to 69
prepared for extension to	remote control remote monitoring
RF power	9510 W $_{rms}$ with shoulder distance of –37 dB 9760 W $_{rms}$ with shoulder distance of –36 dB 10000 W $_{rms}$ with shoulder distance of –35 dB 11130 W $_{rms}$ with shoulder distance of –32 dB (at F_o ±4.3 MHz) without insertion loss for optional band-pass filter
MER (at 35 dB shoulder)	≥35 dB
amplifier	fully solid state LDMOS broadband class AB 24 amplifiers incl. power supply accommodated in each amplifier
AC supply	230/400 V ±15% 3-phase N, 50 Hz ±2%
power consumption pump assembly, heat exchanger	approx. 57 kW (w/o cooling system) approx. 7.2 kW
cooling coolant room	liquid cooling, (approx. 3x 60 l/min), Antifrogen N (-40 to +170°C) approx. 4.0 kW heat dissipation into operating approx. 44 kW guided outside
RF connector	3-1/8” EIA
dimensions	(w x h x d) 1890 x 2200 x 1200 mm
weight	approx. 2000 kg (w/o cooling system)

Scope of delivery:

- all necessary parts for the operating channel
- exciter SV700 incl. OFDM modulator (optional dual drive)

to be offered separately:
- 3x pump assembly ZK610
- 3x accessories for one rack ZK610Z1
- 3x heat exchanger 30 kW (outdoor unit)

Accessories:

- ASI distribution amplifier
- installation material
- GPS receiver
- DMQ band pass filter
- external equipment for remote control and monitoring
- dummy load

3.2 Configuration of EUT

A listing of all hardware components including serial numbers and software release is shown in Table 3-1.

Number of Colli	*Type of package*	*Dimensions cm*	*Quantity of Equipm.*	*Type*	*Stock-No.*	*Designation*	*Contract Item*	*Serial-Nos.*
			1	**NV7930V**	**2065.8550.05**	**DMQ-T Transmitter 9,3kW band 4/5 Station: QUALCOMM49**		**100004**
			1	**NV7930X**	**2087.3900.50**	**DTV Basic Transmitter**		
1	Case	241x144x95	1	KG610H1	2080.8506.02	Rack for NV/NH6000, 7000		101138
1	Case	241x144x95	1	KG610H1	2080.8506.02	Rack for NV/NH6000, 7000		101140
			1	NETCCU700	2094.0002.02	NetCCU Basic Unit		100594
1	Case	241x144x95	1	KG610H1	2080.8506.02	Rack for NV/NH6000, 7000		101137
			2	SV700	2083.4501.97	Set of modules exciter DMQ-T		100035, 100038
			1	IZ701	2092.5507.12	Uninterrupted power supply for 2 exciter		100098

			10	VH602A2	2082.9000.02	TV Amplifier BD.4/5 Vision Amplifier		106720, 107452, 107462, 107499, 107135, 107377, 107392, 107466, 107491, 107453, 107463, 107476, 107480, 107519, 107508, 107517, 107520, 107522, 107526, 107378, 107404, 107411, 107448, 107449
1	Case	217x92x98	1	ZK610	2079.0257.42	Pump Assembly		100735
1	Case	217x92x98	1	ZK610	2079.0257.42	Pump Assembly		100736
1	Case	334x83x144	1	KL7030	2092.1501.30	Heat exchanger axial 30kW		100117
1	Case	334x83x144	1	KL7030	2092.1501.30	Heat exchanger axial 30kW		100119
					P/N-005A76501	Band Pass Filter W/O-2916060		S/N-3038

Table 3-1: Configuration of NV7930E

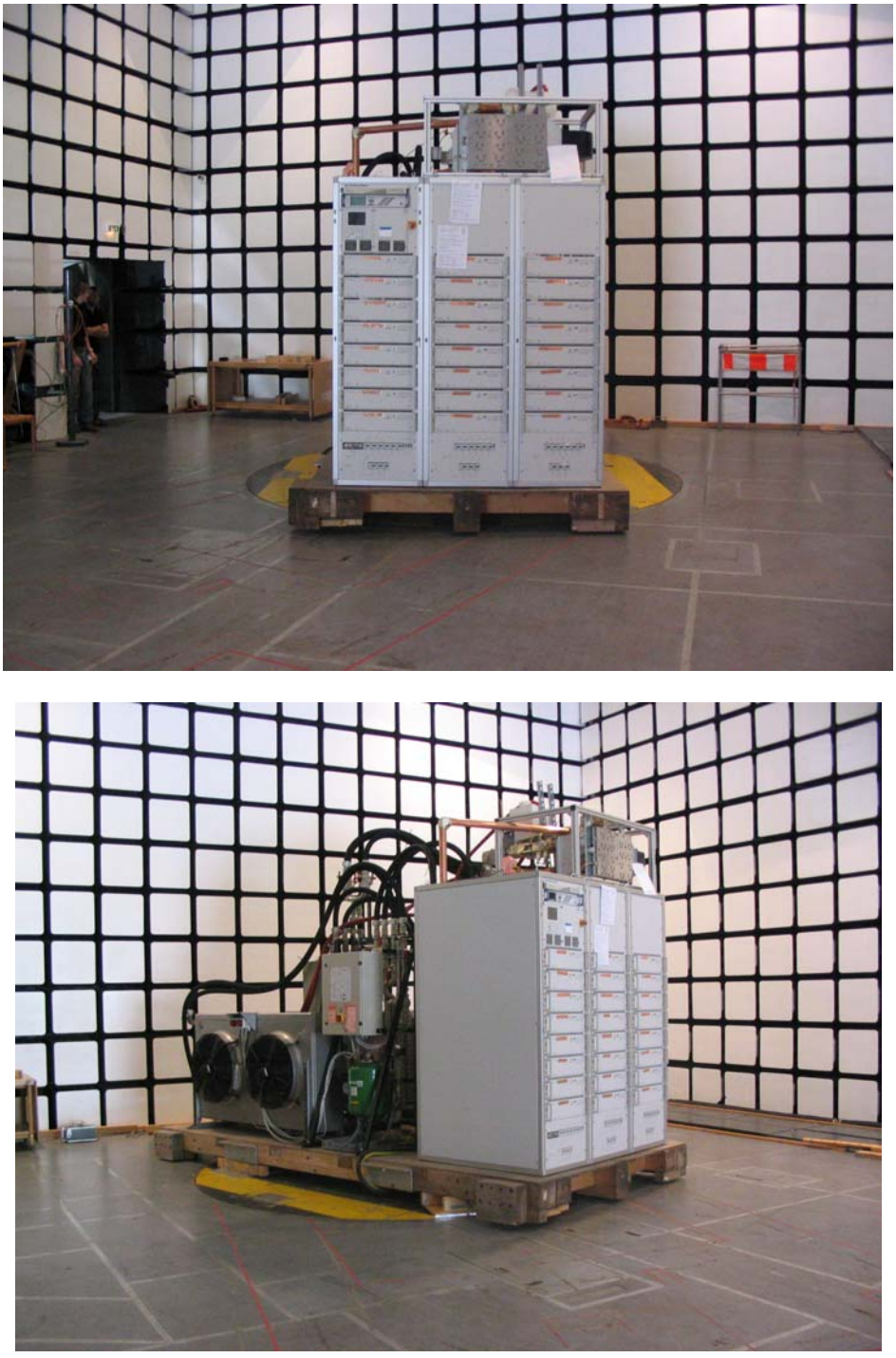


Figure 3-1: NV7930E in the EMC chamber for Emission Tests

3.3 Operating Conditions

The emission tests were executed in an anechoic test chamber equipped with RF absorbers. The measurement, simulation and control equipment was located outside of the chamber. The EUT was placed on a metallic turntable in order to test radiated emission automatically around 360°.
During the measurement the EUT was grounded to the groundplane via a 1-wire cable with a length of 3 m. The EUT was powered via a fixed installed powerline cable.

The EUT was operated with 400V AC.

3.4 Failure Criteria

No entry, because only emission tests were performed.

4 Test Equipment

Test Facility

The radiated tests are carried out in the shielded rooms of the Center for Quality Engineering of the Siemens Communications Group, Com CTO CQE, Hofmannstraße 51, 81359 München, Germany.

Chamber	**1**	**2**	**3**	**4 / 5**	**6**
Dimensions (net)	17.70*10.85*6.84m	9.63*8.49*5.28m	6.59*5.81*4.78m	4.1*3.53*3.5m	6.4*4.3*4.35m
Max. Door Exit	5.0*3.86m	3.9*4.0m	1.4*2.23m	0.9*2.25m	1.8*3.0mm
Shielding material	Sheet steel (Thickness:1.5mm on floor, 1.0mm on walls and ceiling)	Sheet steel	Sheet steel	Sheet steel	Sheet steel
Absorbers	• hybrid absorbers on walls and ceiling (TDK), length 1m	• hybrid absorbers on walls and ceiling (E+C), length 0.5m	• pyramid absorbers on walls and ceiling (E+C), length 0.76m	• without absorbers	• without absorbers
Floor	• metallic ground plane • floor load: 12 t/m²	• metallic ground plane • floor load: 1.5 t/m²	• metallic ground plane • floor load: 1 t/m²		
Specials	• measuring distance of max. 10m • turntable ∅ 4m/ 6t **Test chamber no. 1 complies with:** ***Emission*** (10m distance and frequency range 30-1000MHz) - DIN EN 55022 / 2003-09 - CISPR 16-1-4, Ed. 1.1 / 2004-05 - ANSI C63.4 / 2003 - FCC-listed in June 2003 Reg. Nr.: 90932 ***Immunity*** (field uniformity in the frequency range 27-1000MHz) - EN 61000-4-3 / 2001	• measuring distance of 3m (max 5m) • turntable ∅ 3.2m/ 1.5t **Test chamber no. 2 complies with:** ***Emission*** (3m distance and frequency range 30-1000MHz) - DIN EN 55022 / 2003-09 - CISPR 16-1-4, Ed. 1.1 / 2004-05 - ANSI C63.4 / 2003 - FCC-listed in March 2006 Reg. Nr.: 97242 ***Immunity*** (field uniformity in the frequency range 27-1000MHz) - EN 61000-4-3 / 2001	• measuring distance of max. 3m • turntable ∅ 1.20m/ 0.5t **Test chamber no. 3 complies with:** ***Emission*** (3m distance and frequency range 80-1000MHz) - DIN EN 55022 / 2003-09 - CISPR 16-1-4, Ed. 1.1 / 2004-05 - ANSI C63.4 / 2003 ***Immunity*** (field uniformity in the frequency range 27-1000MHz) - EN 61000-4-3 / 2001		

4.1 Measuring Equipment

ID No.	Equipment	Type	Manufacturer	Specification	Status	Last Cal.	Next Cal.
P1054	coax cable	UFB293C	Rosenberger Micro-Coax	DC - 18 GHz, 1.56dB@18GHz	cnn		
P0033	antenna	3140	Emco		cnn		
P0336	test chamber 1		Siemens	20.3 • 13.2 • 8.0 m; 1 m pyramid absorbers + ferrite tiles	chk	Jan 31, 2006	Jan 2007
P0326	EMI receiver	ESVS30	R&S	20 MHz - 1 GHz	cal	Mar 08, 2006	Mar 2008
P0150	ESMI display section	ESAI-D	R&S		cal	Mar 09, 2005	Mar 2007
P0153	ESMI RF section	ESMI-RF	R&S	20 Hz - 26.5 GHz	cal	Mar 09, 2005	Mar 2007
P0492	relais-matrix	RSU 17	R&S		cnn		
P0567	signal generator	SMR 20	R&S	10 MHz - 20 GHz	cal	Mar 09, 2005	Mar 2007
P0029	antenna	3105	Emco	1 - 12.4 GHz	chk	Apr 03, 2006	Apr 2008
P0040	antenna	12-18	SCIEN	18 - 26.5 GHz	cpu		
P0961	antenna	3115	Emco	1 - 18 GHz	chk	Apr 03, 2006	Apr 2008
P1192	EMI receiver	ESIB26	R&S	20 Hz - 26.5 GHz	cal	Sep 14, 2005	Sep 2007

cal = Calibration, car = Calibration restricted use, chk = Check, chr = Check restricted use, cpu = Check prior to use, cnn = Calibration not necessary, ind = for indication only

4.2 Measurement Uncertainty

As far as the underlying standards include requirements concerning the uncertainty of measuring instruments or measuring methods, they are met.

The expanded measurement uncertainty of the measuring chain was calculated for all tests according to the “ISO Guide to the expression of uncertainty in measurement (GUM)”. The results are documented in an “internal controlled document” at Com CTO CQE archives.

The measuring accuracy for all measuring devices is given in their technical description. The measuring instruments, including any accessories, are calibrated respectively verified to ensure the necessary accuracy. Depending on the kind of measuring equipment it is checked within regular intervals or directly before the measurement is performed. Adjustments are made and correction factors applied to measured data in accordance with the specifications of the specific instrument.

The expanded measurement instrumentation uncertainty of our Test Laboratory meets the requirements of IEC CISPR 16-4 Ed. 1.0 “Specification for radio disturbance and immunity measuring apparatus and methods - Part 4: Uncertainty in EMC Measurements” for all listed Tests.

5 Test Specifications and Results

5.1 Radiated Emission Tests

The test results in the report refer exclusively to the test object described in section 3 and the test period in section 2.3.

5.1.1 Radiated Emission FCC Part 2, Range 30 – 1000 MHz

The purpose of this test is to evaluate the electrical component of the electromagnetic field radiated by the EUT between 30MHz and 1000MHz.
The EUT was placed on a turntable in order to determine the direction of maximum field strength for each predominant emission around 360 degrees (step = 45 degrees). At each azimuth step, the antenna was raised from the height of 1 to 4m (step = 1m) with both, horizontal and vertical planes of polarisation. This measurement was made with an automatic test set. Pre-Scans were made with peak-detection with variation of turntable angle, antenna height and polarisation. The measuring distance was 10 m. The test set-up of Figure 5-4 was used.

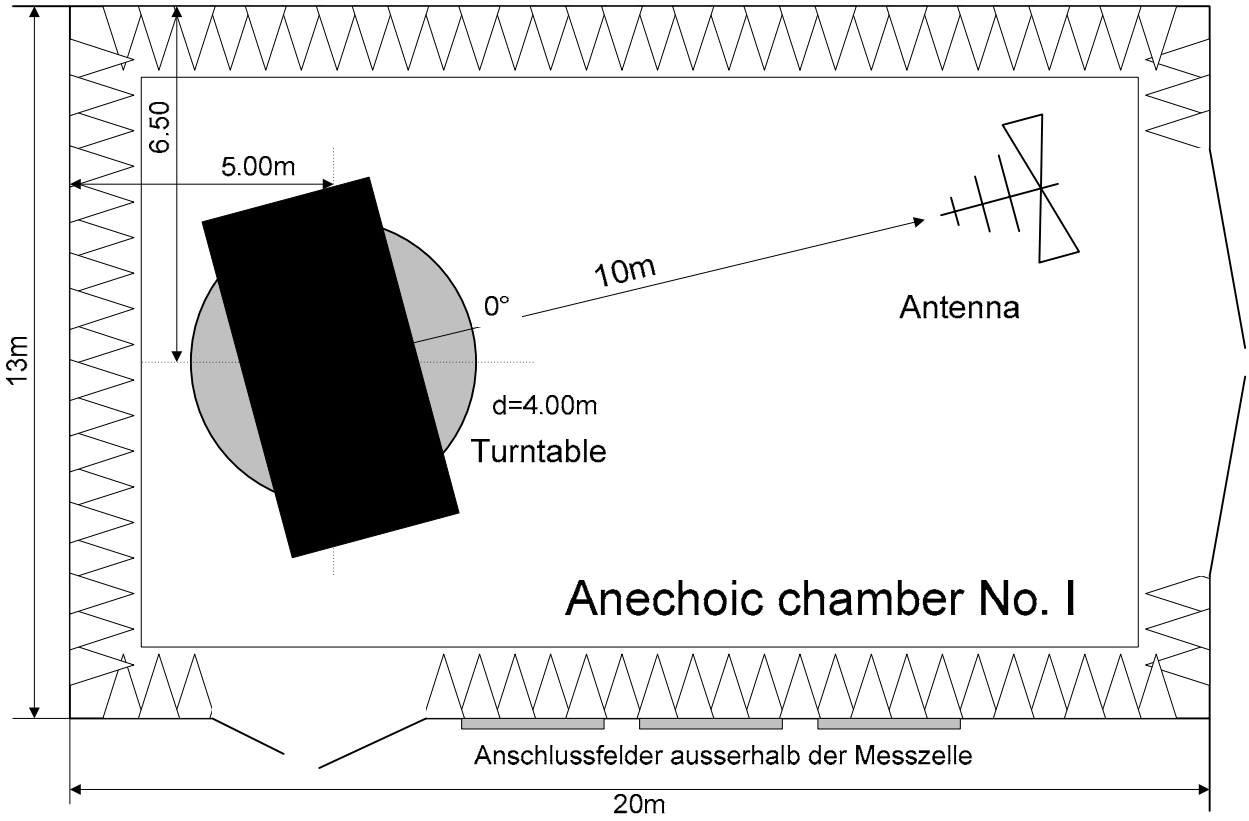


Figure 5-1:Test setup for radiated emissions measurement

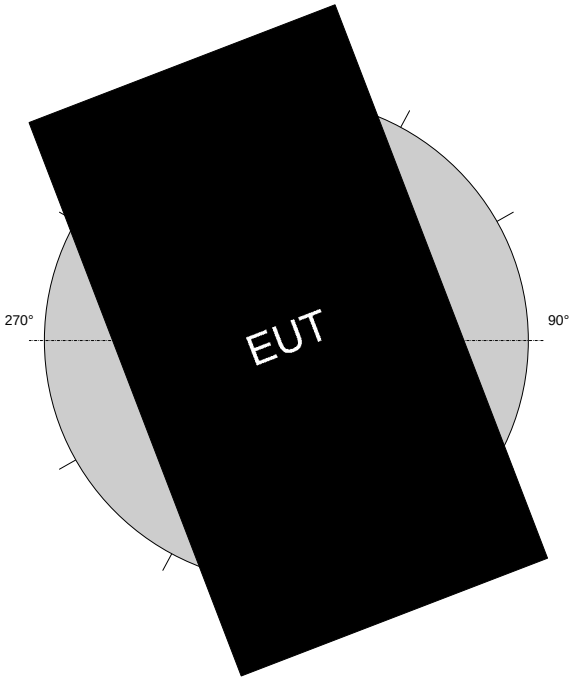


Figure 5-2: EUT-Placement on the table

Figure 5-3: Test setup for radiated emission measurement, 30 MHz to 1000 MHz

Result for 30 - 1000 MHz:

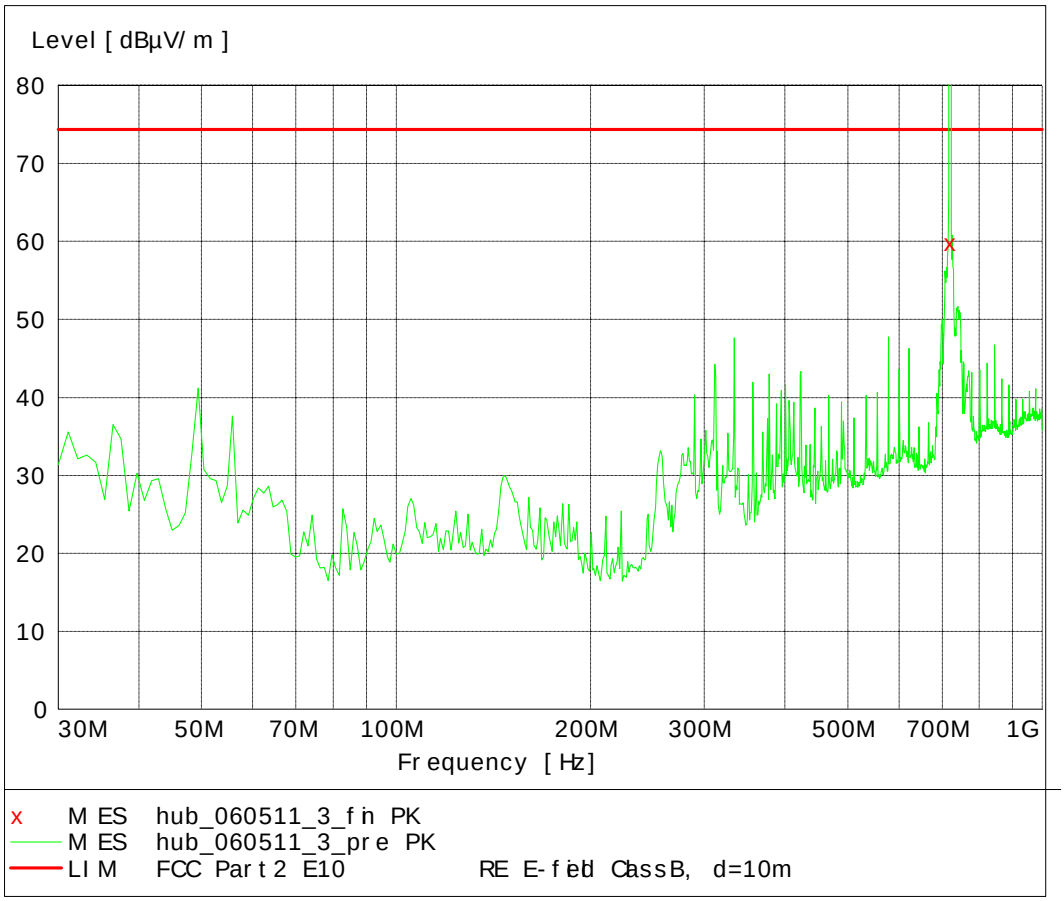


Figure 5-4: Radiated emission, 30 MHz - 1 GHz

Frequency Band	BW
30 MHz to 715 MHz	100 kHz
715 MHz to 723 MHz	licensee frequency block
723 MHz to 1000 MHz	100 kHz

Table 5-1: Resolution bandwidth in the range 30 MHz to 1 GHz

Result for 30 - 1000 MHz:

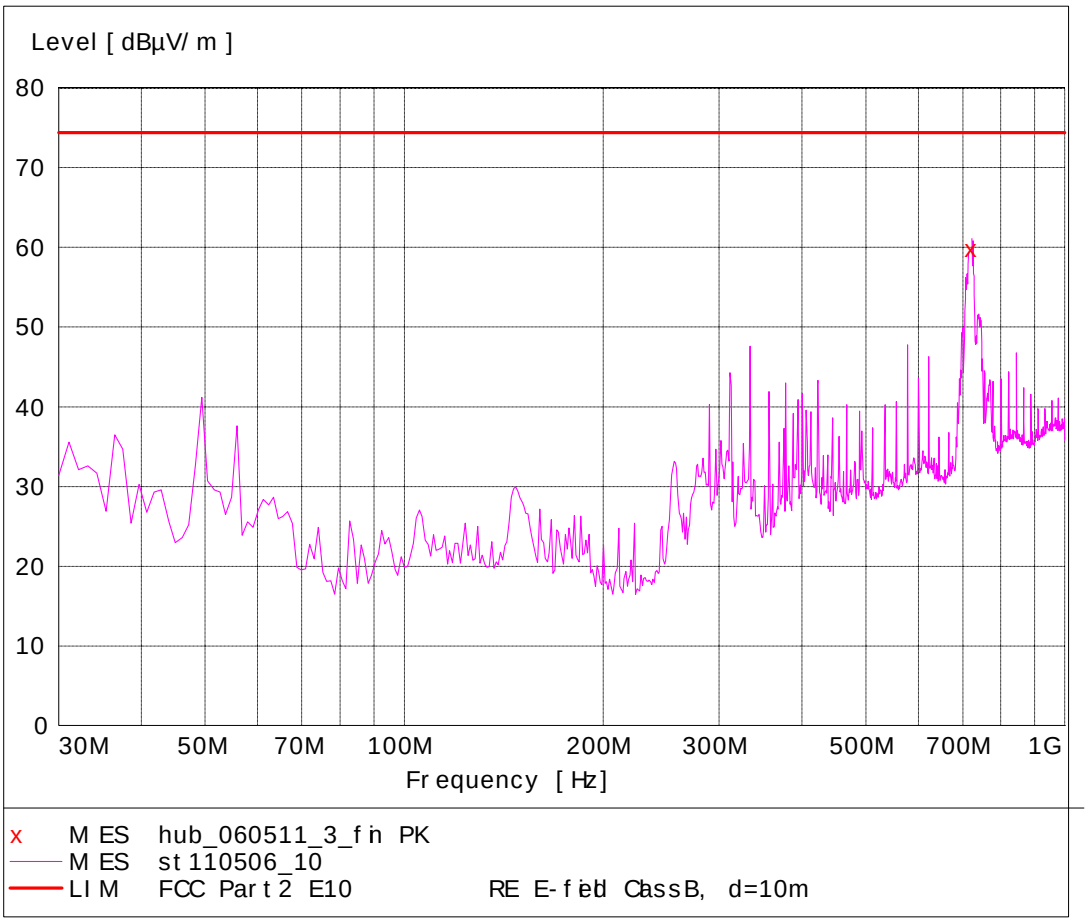


Figure 5-5: Radiated emission, 30 MHz - 1 GHz with licensed frequency block

5.1.2 Radiated Emission FCC Part 2, Range 1 GHz – 10 GHz

The electric field strength was measured in the frequency range 1 GHz to 10 GHz using a horn antenna and a test receiver. The test was performed using a computer-controlled testset, controlling the test receivers, the turntable (0-360°) and the polarization (hor/vert) of the antenna (h=1-4m). The measuring distance was 3 m. The amplifier modules were modified to actual series standard.

Figure 5-6: Test setup for radiated emission measurement, 1 - 10GHz

The detector function was set to peak, the measuring bandwidth was selected according to the following table:

Frequency Band	BW required
1000 MHz to 10000 MHz	100 kHz

Table 5-2: Resolution bandwidth in the range 1 GHz to 10 GHz

Result for 1 - 10 GHz:

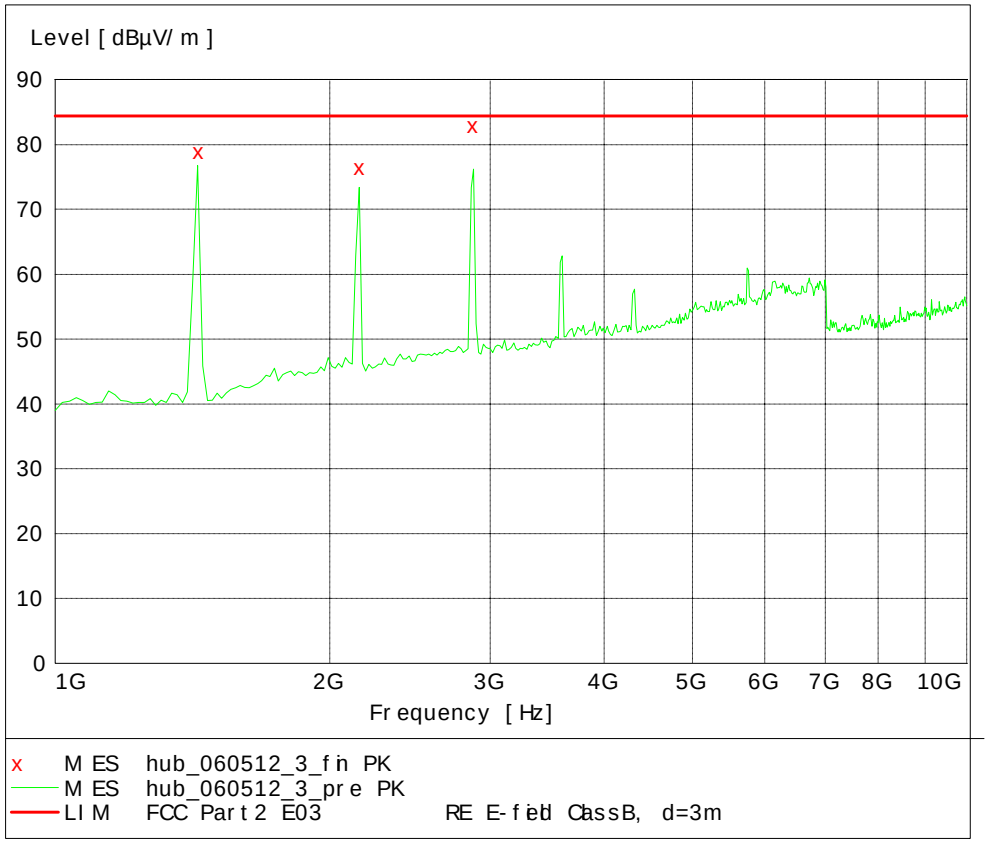


Figure 5-7: Radiated emission, 1 GHz - 1 GHz

Frequency	Level	Transd	Limit	Margin	Height	Azimuth	Polarisation
MHz	dBµV/m	dB	dBµV/m	dB	cm	deg	
1436.000000	79.00	25.60	84.40	5.40	100.0	248.00	VERTICAL
2156.500000	76.60	29.90	84.40	7.80	141.0	180.00	VERTICAL
2872.000000	83.00	32.40	84.40	1.40	208.0	314.00	VERTICAL

Table 5-3: Highest values, PK detection

5.1.2.1 Dipole substitution

Specification:

- ANSI / TIA / EIA-603-A-2001 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

The EUT was removed, and replaced by a horn antenna. Afterwards the performance at the antenna was increased with a signal generator, until the same field strength was achieved, as with the preceding measurements. The measuring distance was 3 m.

Figure 5-8: Test set-up for the Dipole substitution

For ideal half wave dipole the power can be calculated by:

P_d(dBm) = P_g(dBm) - cable loss (dB) + antenna gain (dB)

P_d is the dipole equivalent power
P_g is the generator output power into the substitution antenna

Result for the dipole substitution:

Spurious Emission Frequency	Spurious Emission Reference Field Strength	Signal Generator Output	Cable loss	Antenna Gain	Calc. Result	Limit	Result
[MHz]	[dBµV/m]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	
1436.000000	79.00	-23	1.83	5.59	**-19.24**	-13	**passed**
2156.500000	76.60	-27	2.0	6.53	**-22.54**	-13	**passed**
2872.000000	83.00	-19.5	2.48	7.27	**-14.71**	-13	**passed**

Table 5-4: Results

5.2 Conducted Emission

5.2.1 Conducted Emission to FCC Part 2 on the antenna terminals

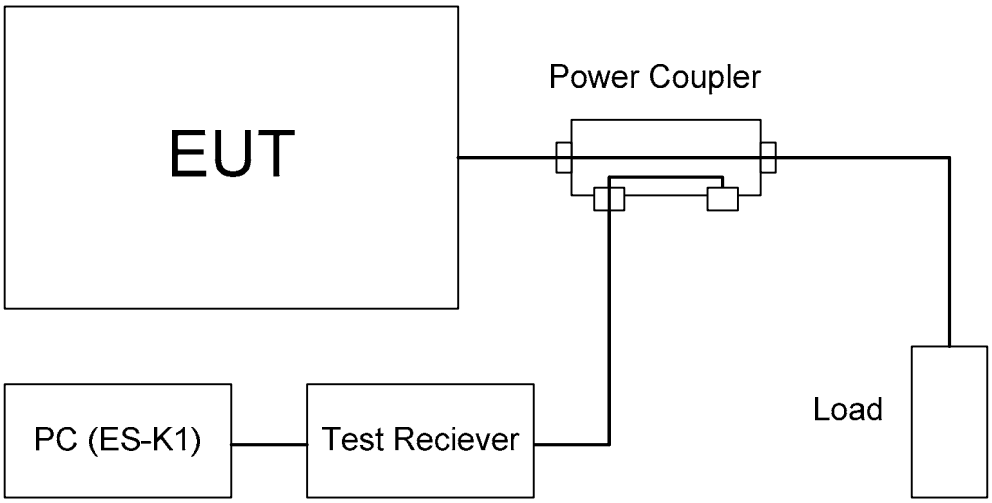


Figure 5-9: Test setup for conducted emissions measurement

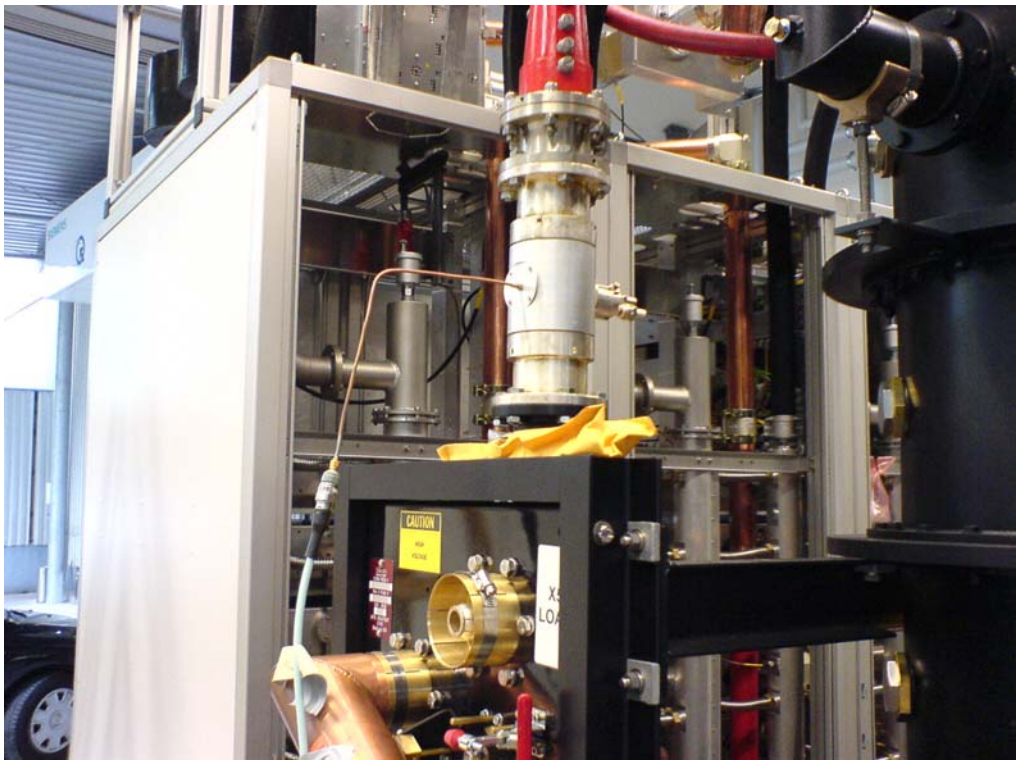


Figure 5-10: Conducted Emission on the Antenna Port with power coupler

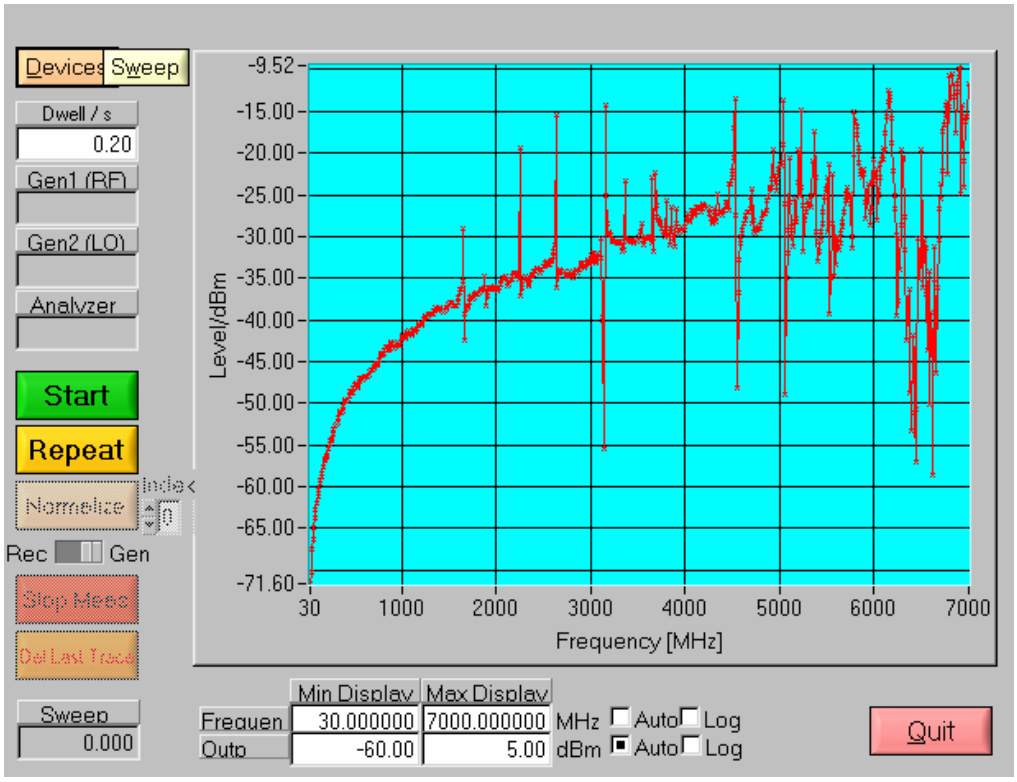


Figure 5-11: Coupling Faktor of the Power Coupler

Frequency	Level	Spurios emissions
MHz	dBc	
719.000000	0	0 Carrier Reference
1438.000000	-85.24	<-70 dB 2nd Harmonic
2157.000000	-79.66	<-70 dB 3th Harmonic
2876.000000	-78.37	<-70 dB 4th Harmonic
3595.000000	-73.3	<-70 dB 5th Harmonic
4314.000000	-71.4	<-70 dB 6th Harmonic
5033.000000	-58.25	Below the Noise-Sensetivity Level of the Spectrum Analysator
5752.000000	-68.61	Below the Noise-Sensetivity Level of the Spectrum Analysator
6471.000000	-72.87	Below the Noise-Sensetivity Level of the Spectrum Analysator

Table 5-5: Spurios Emissions

5.2.2 Occupied bandwith

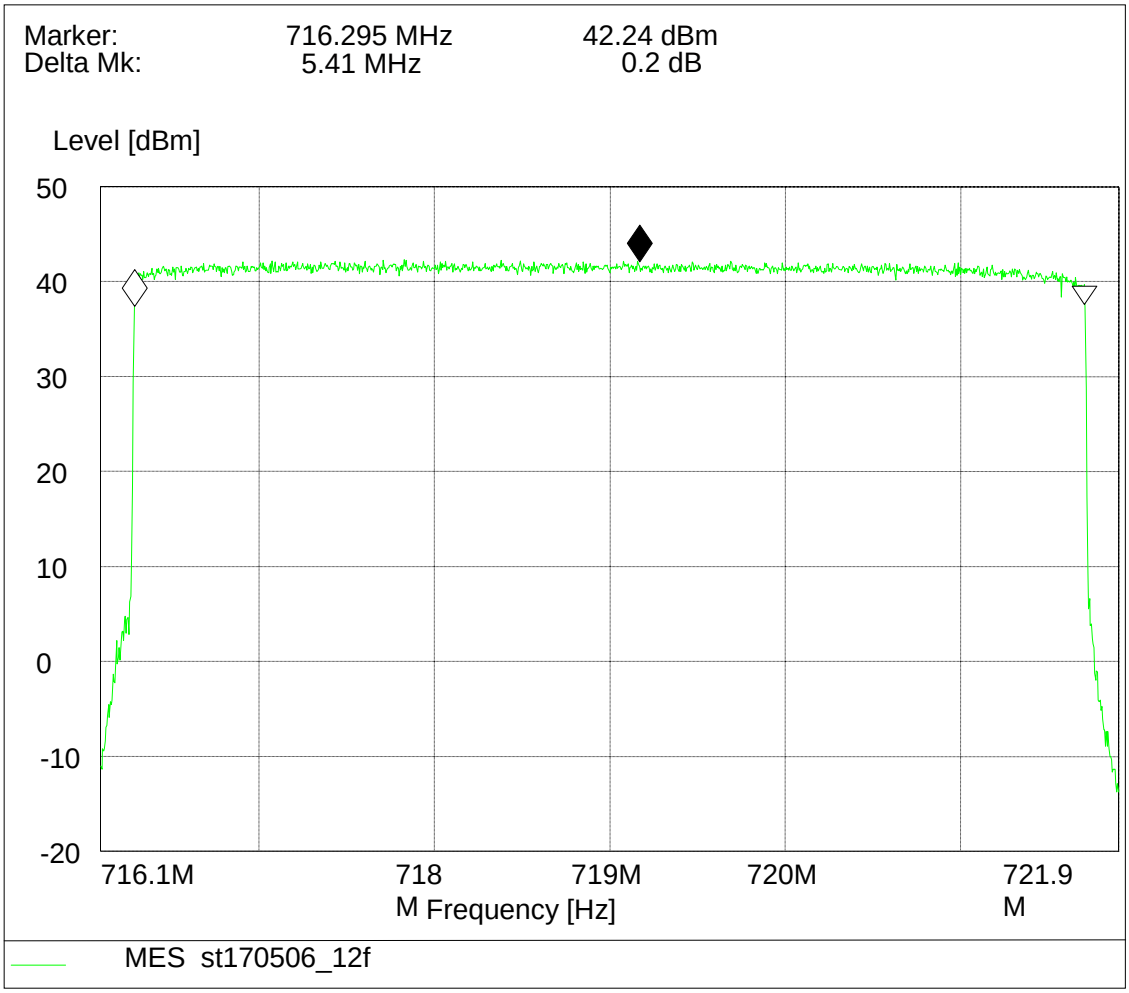
Average Output Power: 9300 W

Type of Modulation:

Transmitter Frequency: 719MHz

Reciever Setting: RSB 10kHz, detector peak

Figure 5-12: Bandwith of the DMQ-T transmitter



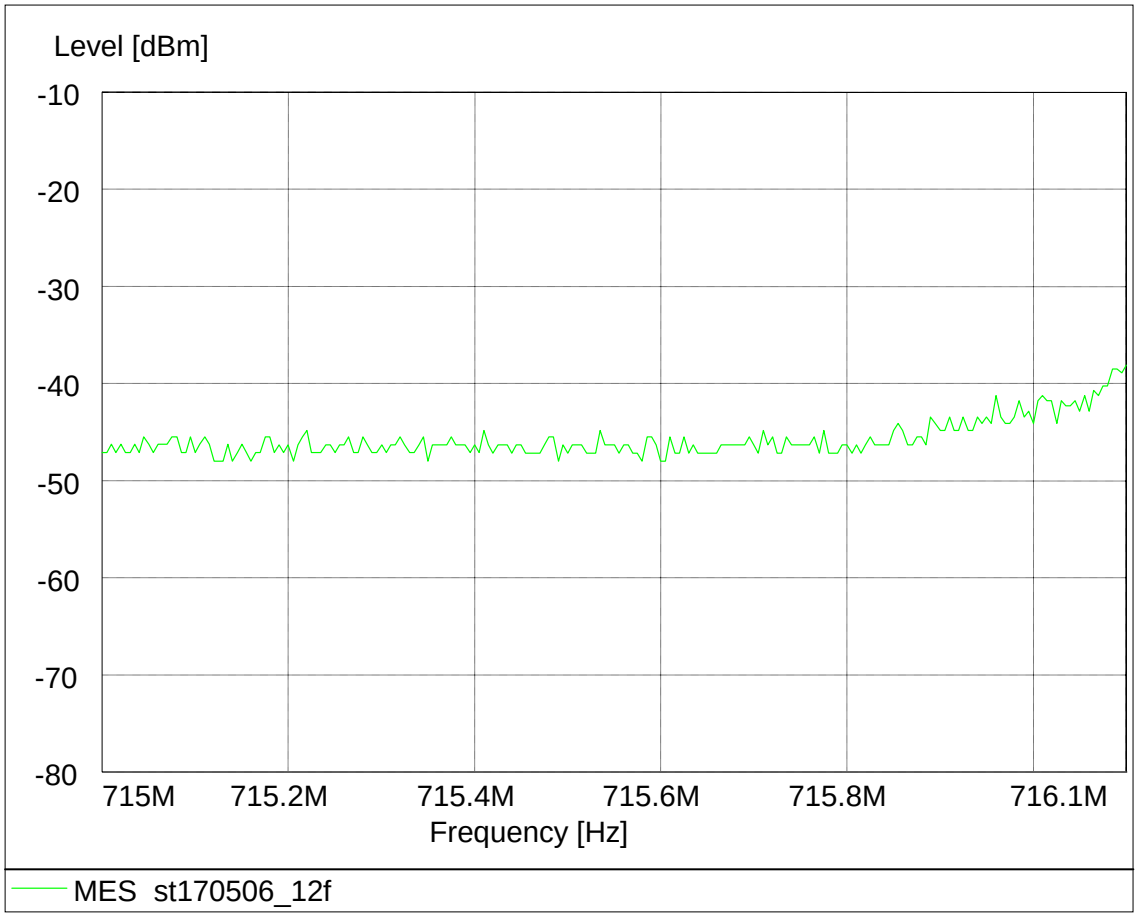
Occupied Bandwith: 5.41MHz
Measured with 10kHz RBW, 45.2dB transducer for the coupler and 30dB attenuator

$$A_{BW} = 10 * \log(\frac{P_{BW}}{P_{RBW}}) \hat{=} 10 * \log(\frac{BW}{RBW})$$

$$A_{BW} = 10 * \log(\frac{5410kHz}{10kHz}) = 27{,}33dB$$

$$P = A_{BW} + P_{Messure}$$
$$P = 27{,}33dB + 42{,}24dBm = 69{,}57dBm$$

Figure 5-13:



Measured with 10kHz RBW and 45.2dB transducer for the coupler

The power of any emission outside the occupied bandwith is below the noisefloor. The level is more than 83dB below the carrier power. So the limit of 47CFR27.53 f is fulfilled.

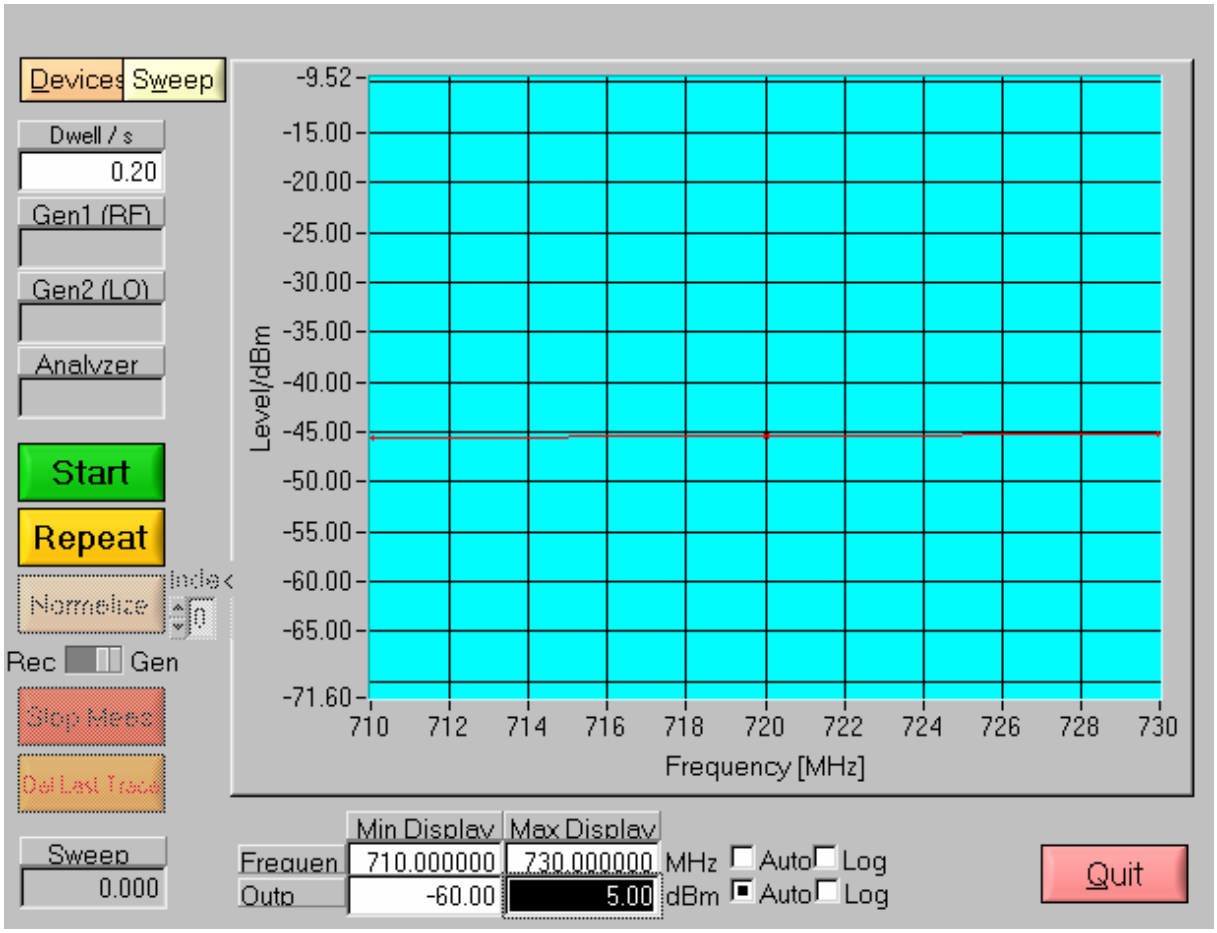


Figure 5-14: Coupling faktor of the Power Coupler (zoom)