DAT-P-002/91-02

Center for Quality Engineering

Test Report No.: B0YX0001

Order No.: B0YX	**Pages:** 26	**Munich,** Dec 18, 2008

Client:	Rohde & Schwarz GmbH & Co. KG
Equipment Under Test:	SLV8100A TV Transmitter ATSC
Manufacturer:	Rohde & Schwarz GmbH & Co. KG
Task:	Identification of compliance with the requirements mentioned below:
Test Specifications: [covered by accreditation]	• FCC 47 CFR Ch.1, Part 15, Subpart B (informative) • FCC 47 CFR Ch.1, Part 2 • EN 301 489, Part 1 & 11
Result:	Requirements of the before mentioned Specification(s) are fulfilled.

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

edited by:	**Date**	**Signature**
Huber Qualification Engineer	Dec 18, 2008	

approved by:	**Date**	**Signature**
Bauer Manager EMC	Dec 18, 2008	

This document was signed electronically.

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

November 12, 2008

Registration Number: 97242

SGS Germany GmbH
Center for Quality Engineering,
Hofmannstrasse 50,
81379 Munich
Germany

Attention: Josef Bauer

Re: Measurement facility located at Munich
Anechoic chamber No. 2 (3 m)
Date of Renewal: November 12, 2008

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
Industry Analyst

CONTENTS

1 Summary

A summary of the measurements results will be found in the following tables. The results refer only 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**
6.1.1	Radiated 30 MHz-1000 MHz Test Distance: 3 meters	FCC Part 15 § 15.109	Class A	**passed**
6.1.2	Radiated 30 MHz-1 GHz Test Distance: 3 meters	FCC Part 2 §2.1053, §2.1057	43+10log(P)	**passed**
6.1.3	Radiated 1 GHz-10 GHz Test Distance: 3 meters	FCC Part 2 §2.1053, §2.1057	43+10log(P)	**passed**

1.1.2 Antenna terminals

Conducted emission tests				
Chapter	**Test**	**Specification**	**Limits**	**Result**
6.2.1	Spurious Emissions	FCC Part 2 §2.1051 / 2.1057	43+10log(P)	**passed**
6.2.2	Occupied Bandwidth	FCC Part 2 §2.1047 / 2.1049	with limit of FCC Part 27.53 6 MHz	**passed**

1.1.3 Power Port

Conducted emission tests				
Chapter	**Test**	**Specification**	**Limits**	**Result**
6.3	Conducted 120 V AC	EN 301 489 - 11	EN 301 489 - 11	**passed**

2 References

2.1 Specifications

- 47 CFR Code of Federal Regulations Title 47 – Telecommunication
- FCC Part 15, § 15.109, Radiated Emission, Class A
- FCC Part 15, § 15.107, Conducted Emission
- 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
  Customer selected tests acc.
- EN 301 489, Part 1 & 11

2.2 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
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

3 General Information

3.1 Identification of Client

Rohde & Schwarz GmbH & Co. KG
Mühldorfstraße 15
81671 München
Uwe Dalisda

3.2 Test Laboratory

Center for Quality Engineering
SGS Germany GmbH
Hofmannstraße 51
81359 München

3.3 Time Schedule

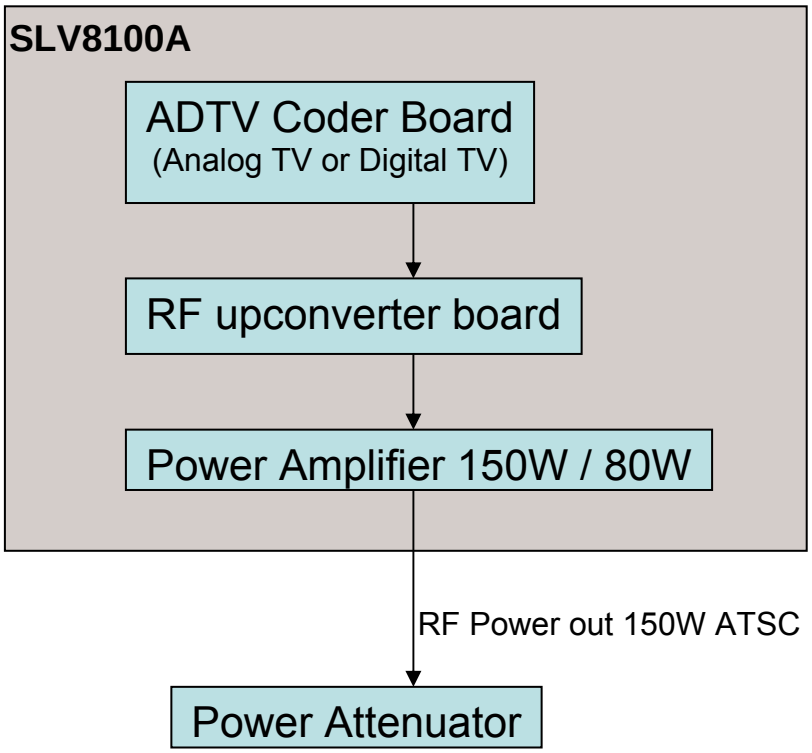
Delivery of EUT: Nov 20, 2008
Start of test: Nov 20, 2008
End of test: Nov 21, 2008

3.4 Participants

Name	Function	Phone	E-Mail
Jan Huber	Accredited testing, Editor	+49 89 722 25434	jan.huber@sgs.com

4 Equipment Under Test

4.1 Transmitter - technical data type based



4.2 Configuration of EUT

A listing of all hardware components including serial numbers and software release is shown following table.

Description	Serial-No.:	Ident-No.:
SLX8000B11	100128	2100.1000K31
SLX8000B47	100010	2100.1217.02
SLX8000B11	100062	2100.4045.02

Figure 4-1: Label with Serial No. of EUT

Figure 4-1: SLV8100A in the EMC chamber for Emission Tests front view

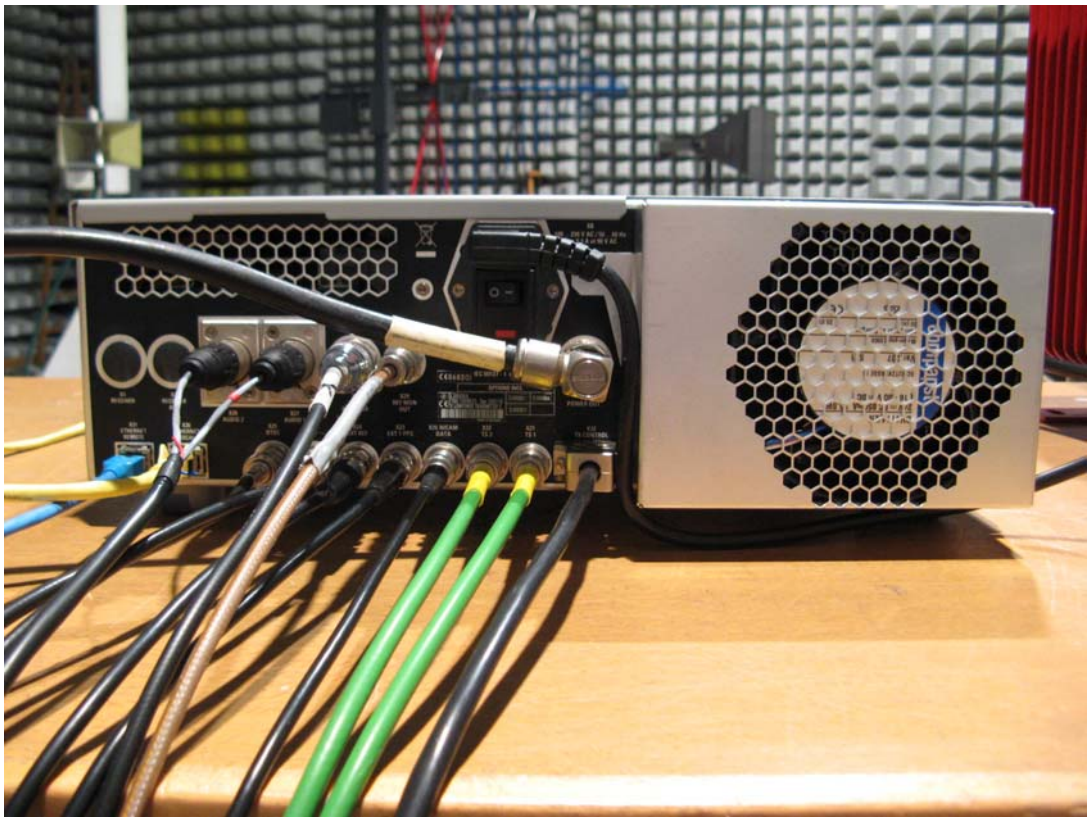


Figure 4-2: SLV8100A in the EMC chamber for Emission Tests rear view

4.3 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 1x 120V AC and activated with it´s rated output power.

4.4 Failure Criteria

No entry, because only emission tests were performed.

5 Test Equipment

5.1 Test Facility

The EMC-tests were carried out in the shielded rooms of the Center for Quality Engineering, Hofmannstraße 51, 81359 München, Germany.

Chamber	1	2	3	4 / 5	6
Dimensions (net)	17.7 * 10.8 * 6.8m	9.6 * 8.5 * 5.3m	7.4 * 6.6 * 5.2m	4.1 * 3.5 * 3.5m	6.4 * 4.3 * 4.3m
Max. Door Exit	5.0 * 3.86m	3.9 * 4.0m	2.0 * 2.7m	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	• hybrid absorbers on walls and ceiling (E+C), length 0.3m	• 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) - EN 55022 / 2006 - ANSI C63.4 / 2003 - NSA 30 – 1000 MHz & Site VSWR 1 – 18GHz acc. CISPR 16-1-4 (2007) - FCC-listed until June 2009, Reg. Nr.: 90932 ***Immunity*** (field uniformity in the frequency range 27-3000MHz) - EN 61000-4-3:2006	• 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) - EN 55022 / 2006 - ANSI C63.4 / 2003 - FCC-listed until March 2009, Reg. Nr.: 97242 - NSA 30 – 1000 MHz & Site VSWR 1 – 18GHz acc. CISPR 16-1-4 (2007) - VCCI-listed until Oct. 2010, Reg. No. R-2623 ***Immunity*** (field uniformity in the frequency range 80-3000MHz) - EN 61000-4-3:2006	• measuring distance of max. 3m • turntable ∅ 2.0m / 1t **Test chamber no. 3 complies with:** ***Emission*** (3m distance and frequency range 30-1000MHz) - EN 55022 / 2006 - ANSI C63.4 / 2003 - NSA 30 – 1000 MHz & Site VSWR 1 – 18GHz acc. CISPR 16-1-4 (2007) - FCC-listed until March 2010, Reg. Nr.: 299569 ***Immunity*** (field uniformity in the frequency range 80-3000MHz) - EN 61000-4-3:2006		- VCCI-listed until Oct. 2010, Reg. No. C-2866 & No. T-326

Table 5-1: Anechoic chamber No. 2

5.2 Environmental conditions

45% rel. humidity, 23°C temperature

5.3 Measuring Equipment

ID. No.	Equipment	Type	Manufacturer	Specification	Status	Last Cal.	Next Cal.
P0337	test chamber 2		Siemens	11.0 • 10.0 • 6.0 m; 0.5 m pyramid absorbers + ferrite tiles	chk	Jan 28, 2008	Jan 31, 2009
P1327	EMI receiver	ESU40	R&S	20Hz - 40GHz, FFT-Scan, Preamplifier 100kHz - 40GHz, 30dB	cal	Sep 04, 2007	Sep 30, 2009
O0251	Variable transformer	2422530-07401	Philips	220 V; 50-400 Hz; S: 0-260 V, 20 A	ind		
P0961	antenna (MZ2)	3115	Emco	1 - 18 GHz	cal	Apr 02, 2008	Apr 30, 2010
P0490	pulse limiter	ESH3-Z2	R&S	10 dB	cal	Mar 19, 2008	Mar 31, 2010
P0018	antenna	CBL6111	Chase	30 - 1000 MHz E	cal	Mar 27, 2008	Mar 31, 2009
P0568	signal generator	SMR 20	R&S	10 MHz - 20 GHz	chk	Jul 22, 2008	Jul 31, 2010
P0030	antenna (MZ3)	96001	Ailtech	1 - 18 GHz	cal	Mar 14, 2007	Mar 31, 2009
P1271	coax cable	FB311AF040005050	Rosenberger Micro-Coax	DC - 18 GHz, 2.61dB@18GHz	cnn		
P1284	Controller	CO 2000	innco GmbH		cnn		
P1283	Mast	MA 4000	innco GmbH	1 - 4m, hor./vert.	cnn		
P0439	LISN	ESH3-Z5	R&S	2 x 10 A; 50 Ohm	cal	Apr 14, 2008	Apr 30, 2010
F0928	Hochfrequenz Filter	Tunable Band Reject Filter WRCT 824/894-5/40-8SSK (Notch FDD V)	Wainwright		ind		

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

Table 5-2: Measuring Equipment for EMC tests

5.4 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 CQE archives.

The measuring accuracy for all measuring devices is provided in their technical description. The measuring instruments, including any accessories, are calibrated correspondingly and 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 corresponding instrument.

The expanded measurement instrumentation uncertainty of our Test Laboratory meets the requirements of IEC CISPR 16-4-2 (2003-11) “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modeling – Uncertainty in EMC measurements” for all listed Tests.

6 Test Specifications and Results

6.1 Radiated Emission Tests

The test results in the report refer exclusively to the test object described in section 4 and the test period in section 3.3.

6.1.1 Radiated Emission Tests FCC Part 15 class A (informative measurement)

Test procedures see 6.1.2

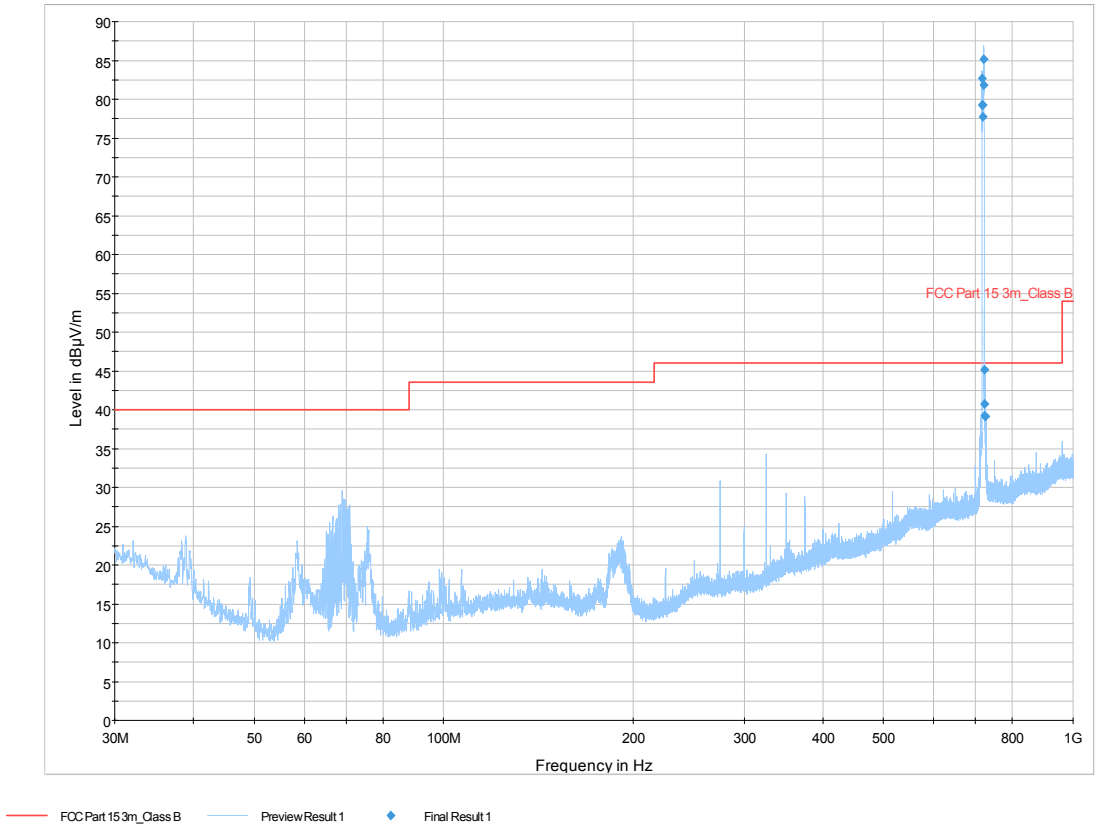


Figure 6-1: Radiated emission, 30 – 1000 MHz

Final result (quasipeak)

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
716.320000	82.7	1000.000	100.0	V	183.0	23.3	RF carrier ATSC	
716.920000	79.3	1000.000	100.0	V	273.0	23.4		
718.560000	77.7	1000.000	100.0	V	275.0	23.4		
718.880000	79.2	1000.000	100.0	V	267.0	23.5		
720.960000	81.9	1000.000	100.0	V	2.0	23.6		
721.480000	85.1	1000.000	107.0	V	185.0	23.6		
722.360000	45.2	1000.000	100.0	V	1.0	23.6	11.70	56.90
723.280000	40.8	1000.000	100.0	V	2.0	23.7	16.10	56.90
723.920000	39.2	1000.000	100.0	V	8.0	23.7	17.70	56.90
724.120000	39.1	1000.000	100.0	V	6.0	23.7	17.80	56.90

6.1.2 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 (continuous sweeps). 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 and average detection with variation of turntable angle, antenna height and polarisation. The measuring distance was 3 m. The test set-up of Figure 6-2 was used.

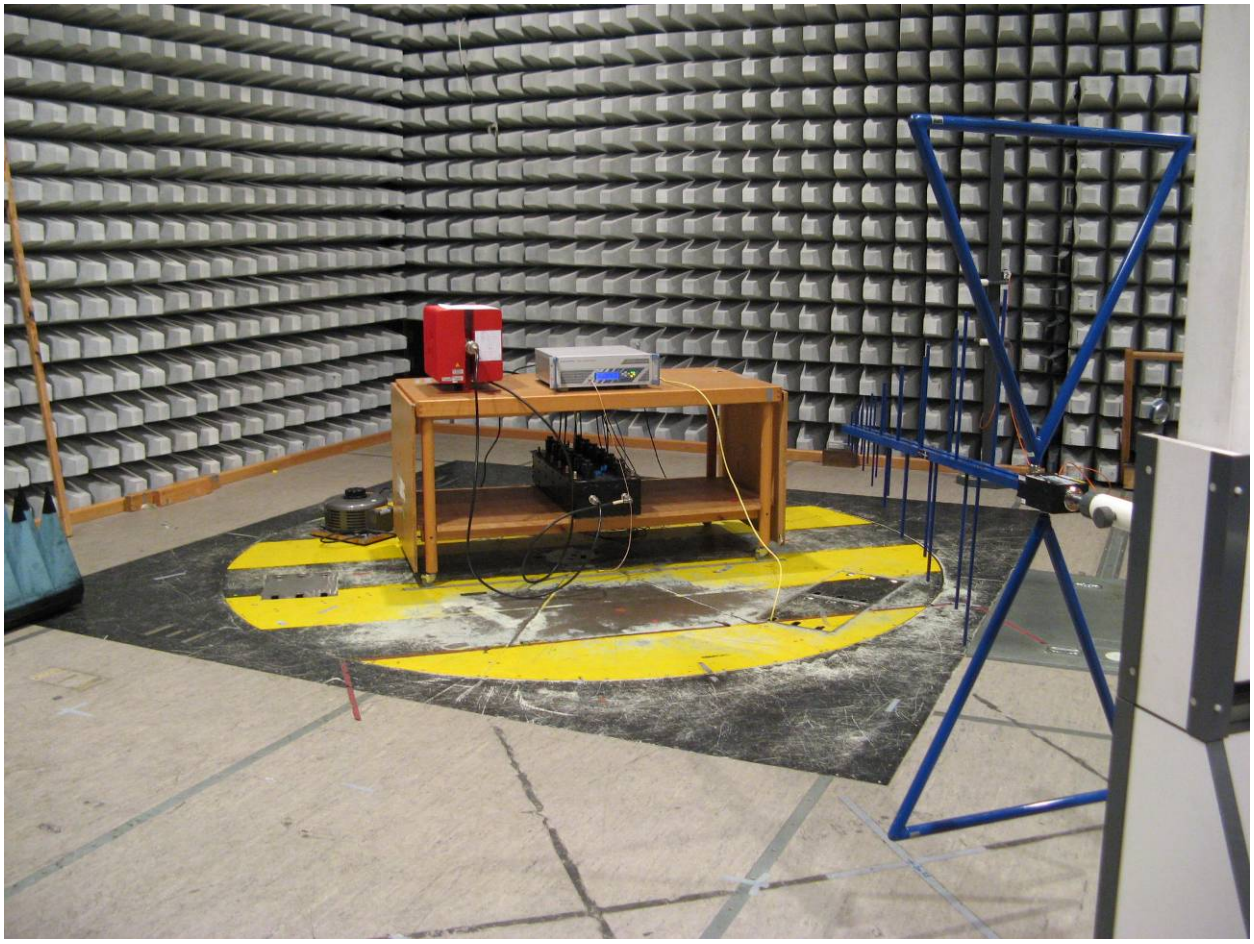


Figure 6-2: Test setup for radiated emissions measurement

Result for 30 - 1000 MHz:

Frequency Band	BW
30 MHz to 716 MHz	100 kHz
716 MHz to 722 MHz	licensee frequency block
722 MHz to 1000 MHz	100 kHz

Table 6-1: Resolution bandwidth in the range 30 MHz to 1 GHz

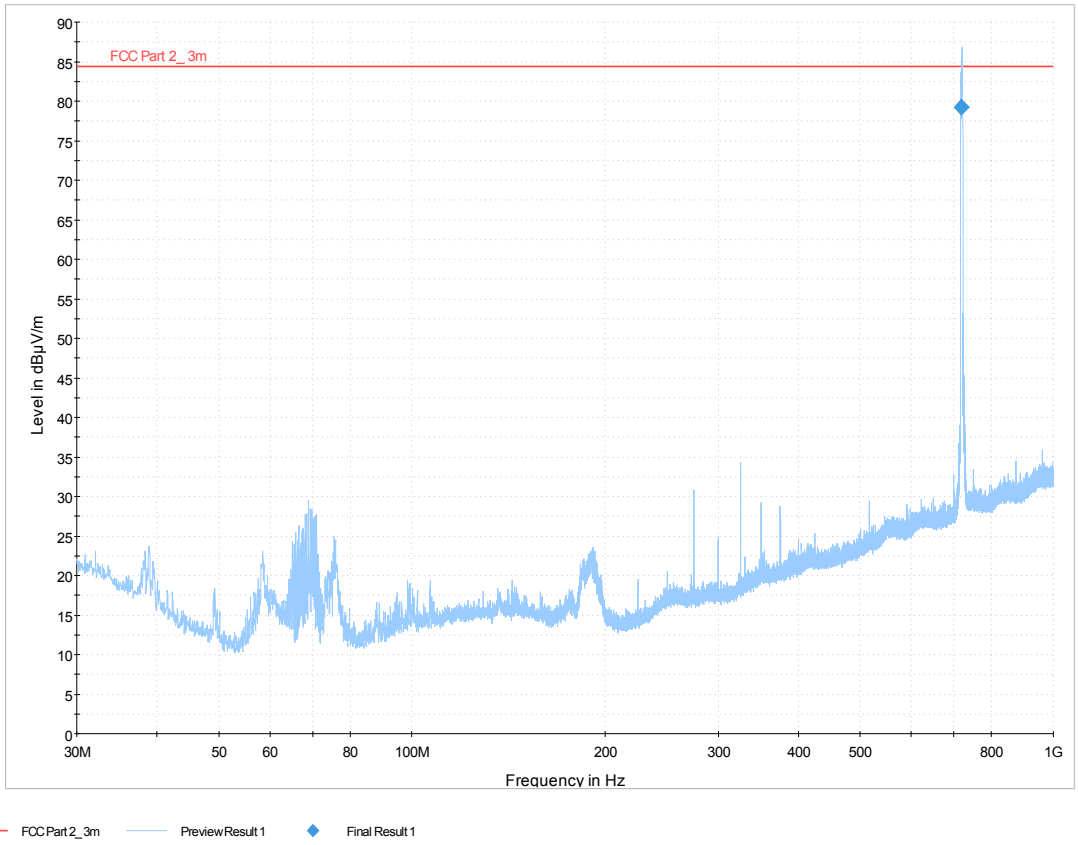


Figure 6-3: Radiated emission, 30 MHz - 1 GHz

Final result (peak)

Frequency (MHz)	Peak (dBµV/m)	Meas. Time (ms)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
716.320000	76.7	1000.000	100.0	V	183.0	23.3	RF carrier ATSC	

6.1.3 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.

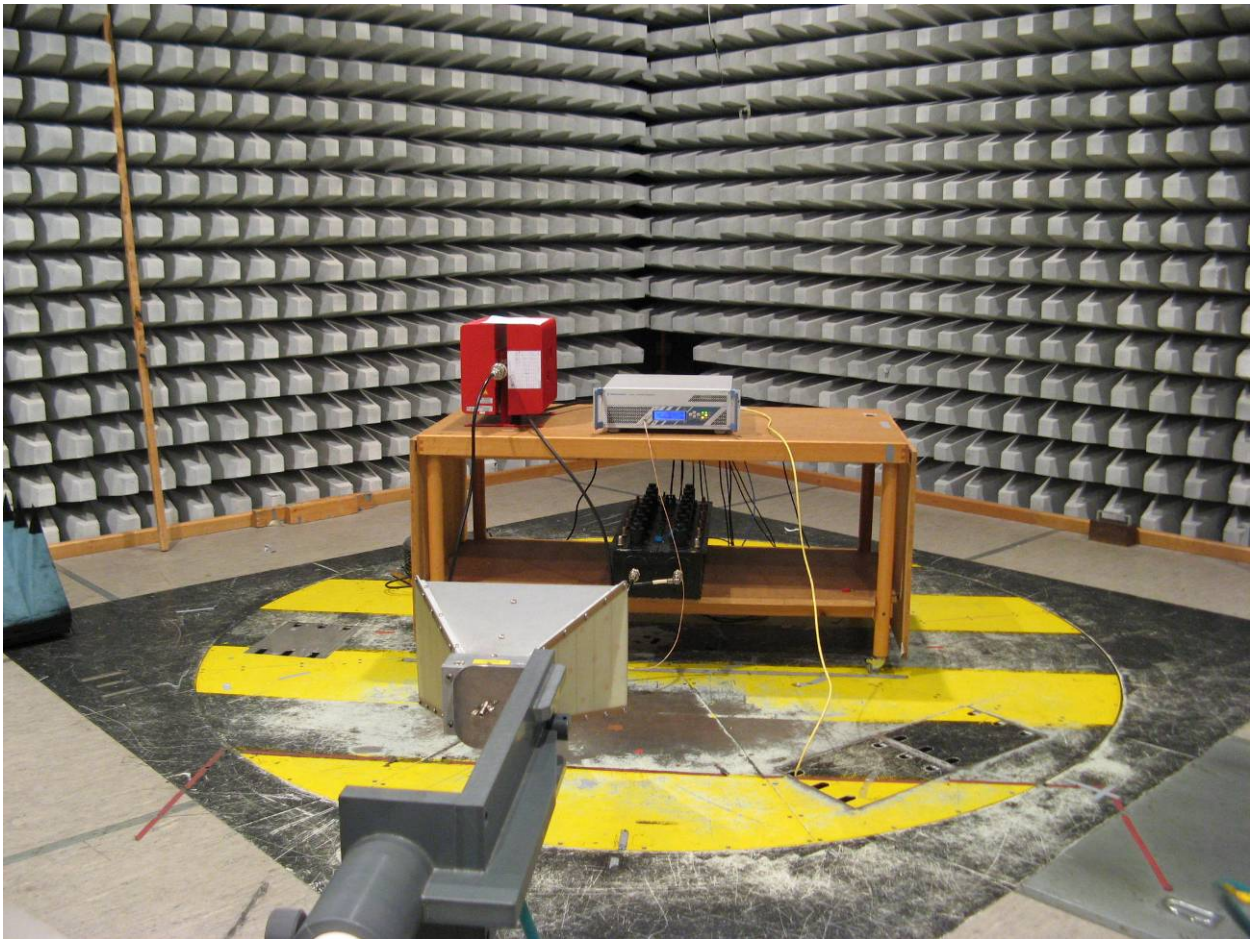


Figure 6-4: Test setup for radiated emission measurement, 1 - 10GHz

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	1 MHz

Table 6-2: Resolution bandwidth in the range 1 GHz to 10 GHz

Result for 1 - 10 GHz:

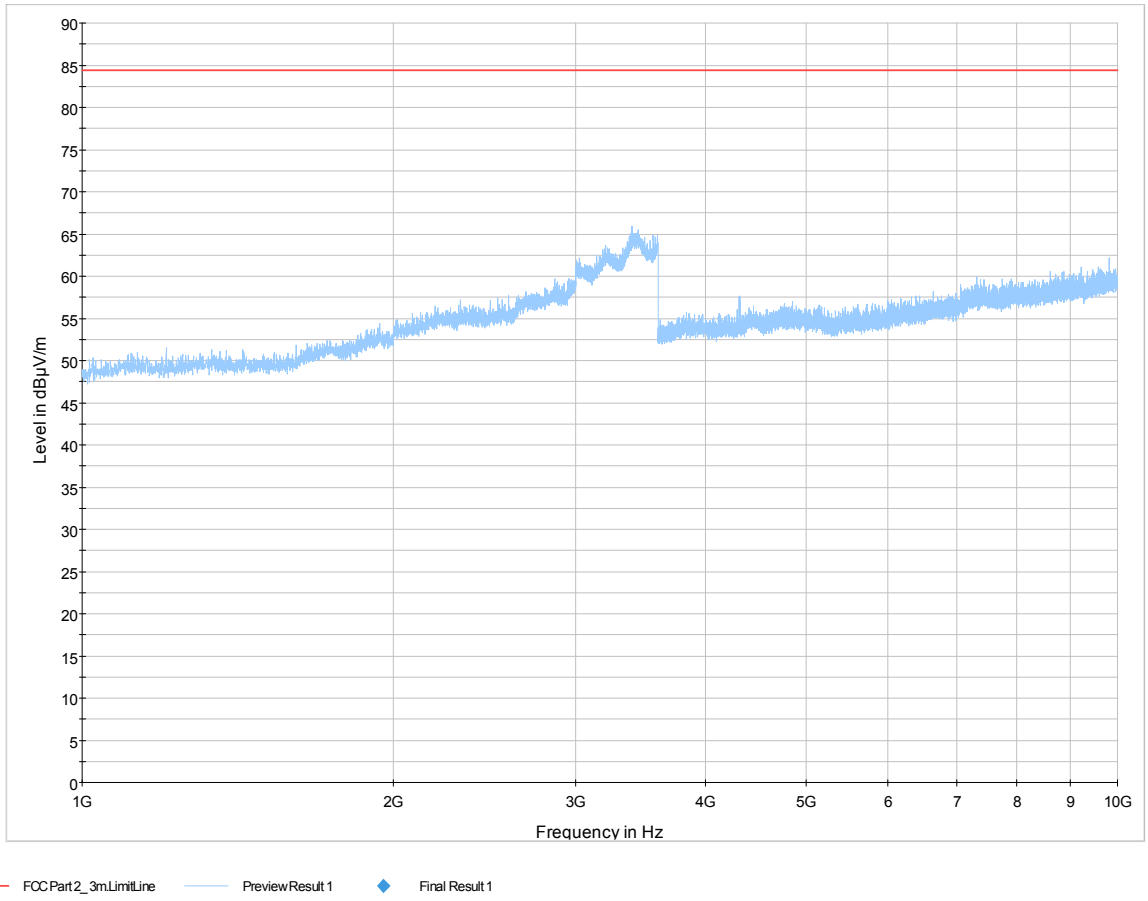


Figure 6-5: Radiated emission, 1 GHz - 10 GHz

No measurements with the dipole substitution are necessary because the distance to the Limit Line is larger than 20 dBµV/m.

The performance requirements according to FCC Part 22, §22.917 and FCC Part 24, §24.238 According to FCC Part 2 §2.1053, §2.1057 Class B this measurement is **passed**.

6.2 Conducted Emission

6.2.1 Spurious Emission to FCC Part 2 on the antenna terminals

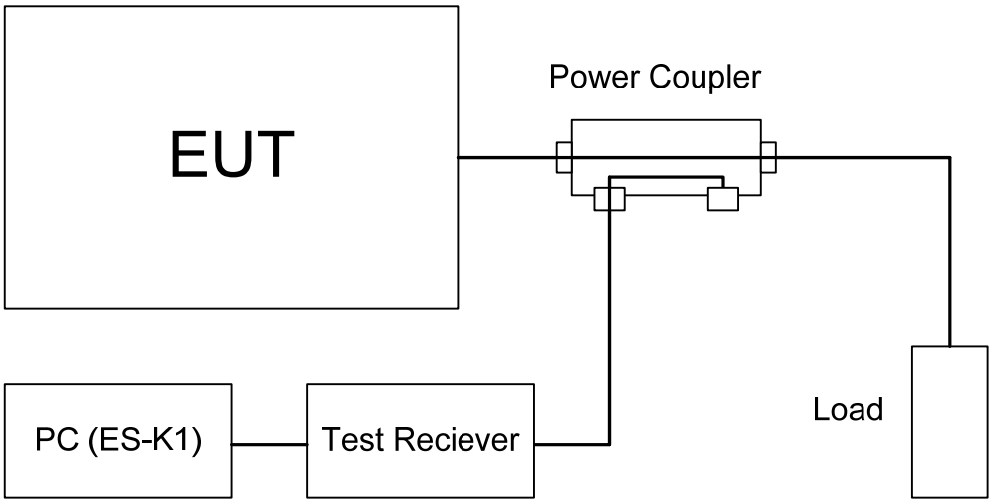


Figure 6-6: Test setup for conducted emissions measurement

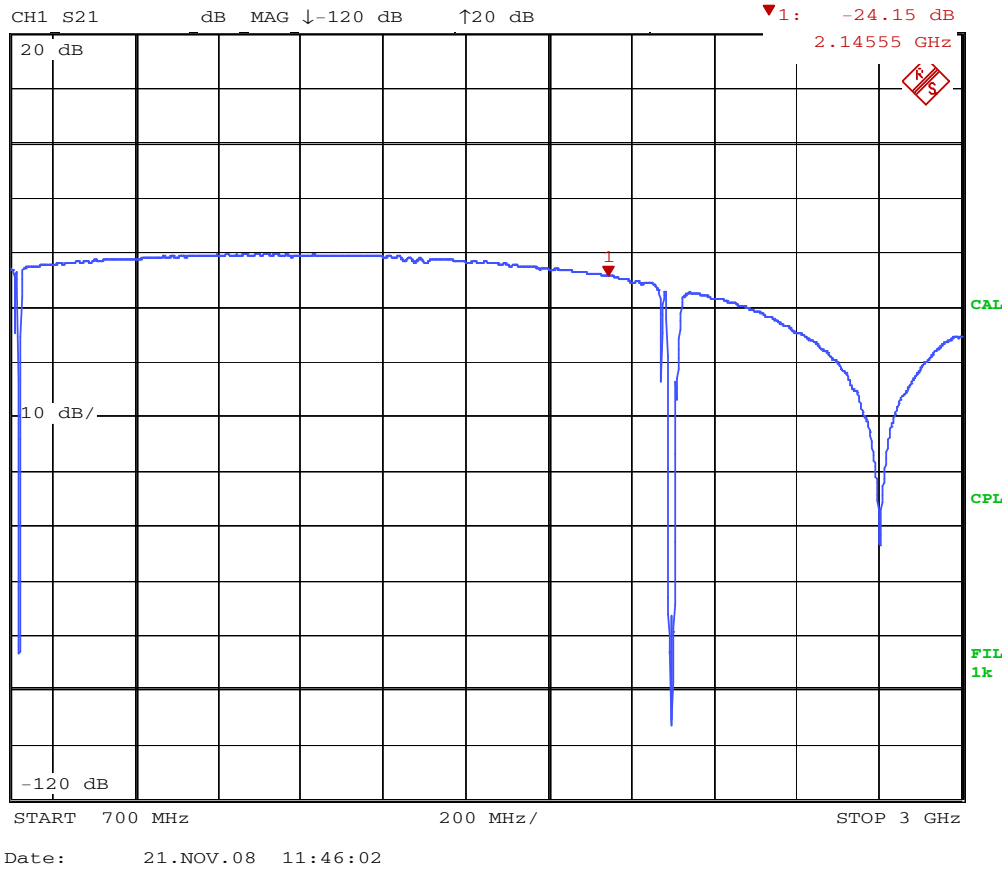


Figure 6-7: Coupling Factor of the Power Coupler 700MHz – 3 GHz

Result for the conducted spurious emission:

Limit: 43+10log(P) = 43+10log(150W) ≈ 65 dB

Harmonics	Frequency	Spurious emission	Level	Result
Order	MHz	dBm	dBc	
Carrier (reference)	719	51,76	0	passed
1st Harmonic	1438	Below the Noise-Sensitivity Level of the Spectrum Analyzer	> 76 dB	passed
2nd Harmonic	2157	Below the Noise-Sensitivity Level of the Spectrum Analyzer	> 76 dB	passed
3rd Harmonic	2876	Below the Noise-Sensitivity Level of the Spectrum Analyzer	> 76 dB	passed
4th Harmonic	3595	Below the Noise-Sensitivity Level of the Spectrum Analyzer	> 76 dB	passed
5th Harmonic	4314	Below the Noise-Sensitivity Level of the Spectrum Analyzer	> 76 dB	passed
6th Harmonic	5033	Below the Noise-Sensitivity Level of the Spectrum Analyzer	> 76 dB	passed
7th Harmonic	5752	Below the Noise-Sensitivity Level of the Spectrum Analyzer	> 76 dB	passed
8th Harmonic	6471	Below the Noise-Sensitivity Level of the Spectrum Analyzer	> 76 dB	passed
9th Harmonic	7190	Below the Noise-Sensitivity Level of the Spectrum Analyzer	> 76 dB	passed

Table 6-3: Spurious Emissions

According to FCC Part 2 §2.1051 / 2.1057 this measurement is **passed**.

6.2.2 Occupied bandwidth

Transmitter Frequency: 719 MHz

Receiver Setting: RSB 500 kHz, detector average

Limit: 6.0 MHz

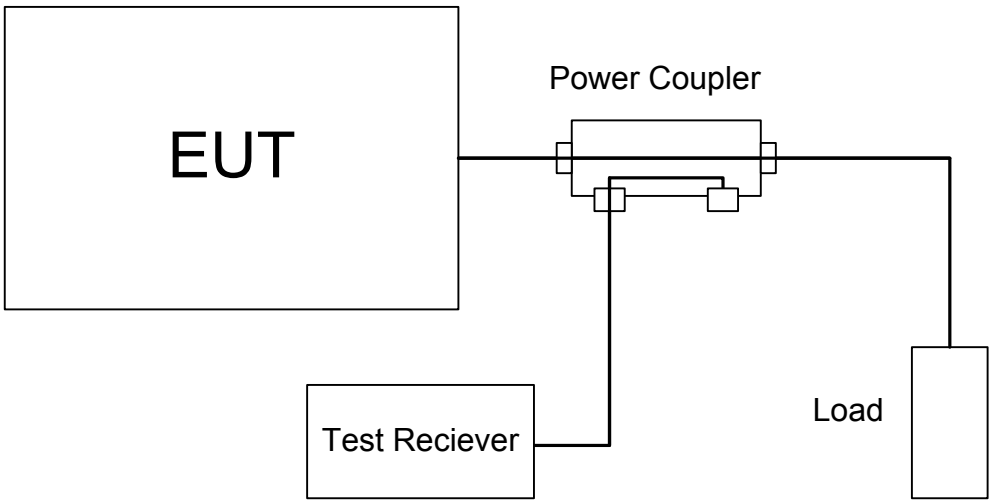


Figure 6-8: Test setup for occupied bandwidth measurement

Result for the Occupied bandwidth:

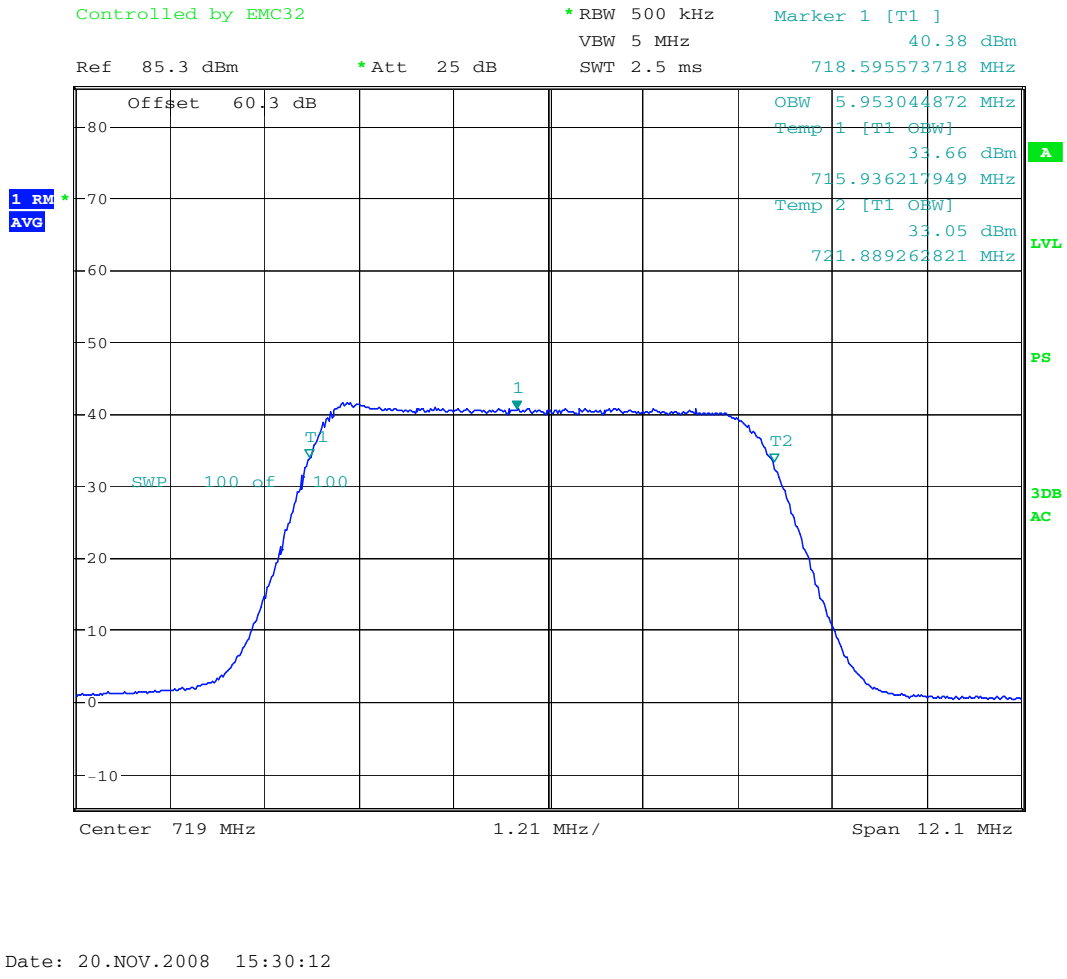


Figure 6-9 Bandwidth of the ATSC transmitter

Occupied Bandwidth: 5.95MHz
Measured with 500 kHz RBW

According to FCC Part 2 §2.1049 / 2.1047 this measurement is **passed**.

6.2.3 Average Output Power

Average Output Power: 150 W

Transmitter Frequency: 716 MHz

Receiver Setting: RSB 500 kHz, detector average

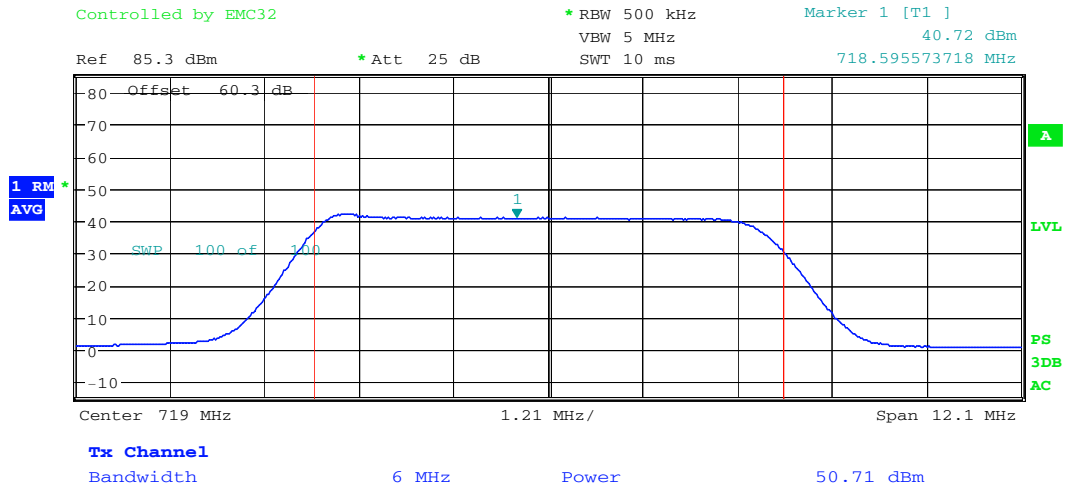


Figure 6-10: Power of the ATSC transmitter

Measurement average output power: 50.71 dBm
Corrector factor for cable: 1.06 dB

Result: 50.71 dBm + 1.06 dB = **51.76 dBm**.

The average output power was 51.76 dBm.

6.3 Conducted Emission to FCC Part 15 on the AC Power port

Specification:
- FCC Part 15 § 15.107
- EN 301489-11

The test is designed to evaluate the RF signals conducted on the AC power interface of the EUT and to confirm that there is no major spurious signal feedback between items of the equipment. The measurement method was as described in FCC Part 15.
The EUT was connected to the mains power supply inside the test chamber via a LISN. The interference voltage on the AC power interface was measured separately on each power phase (L1, N) with PE grounded. The measurement results were combined to one test sheet by a peak hold function and the highest values were taken for examination with AV- and QP-detection. The resulting plot shows a worst case envelope of the measured spectrum. The test set-up of the following figures was used.

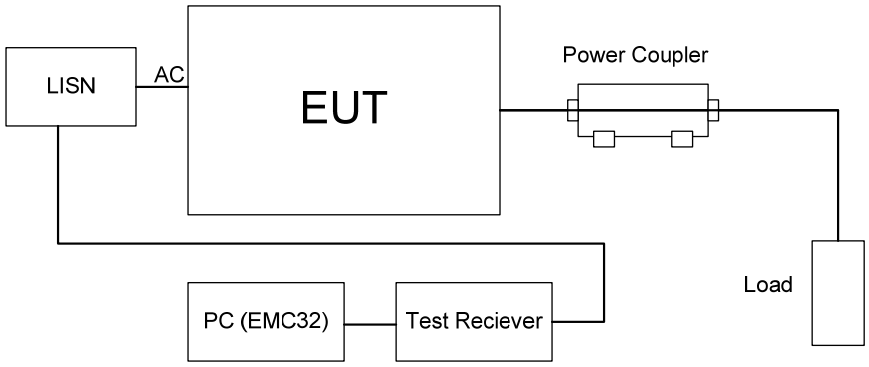


Figure 6-11: Test setup for conducted emissions measurement

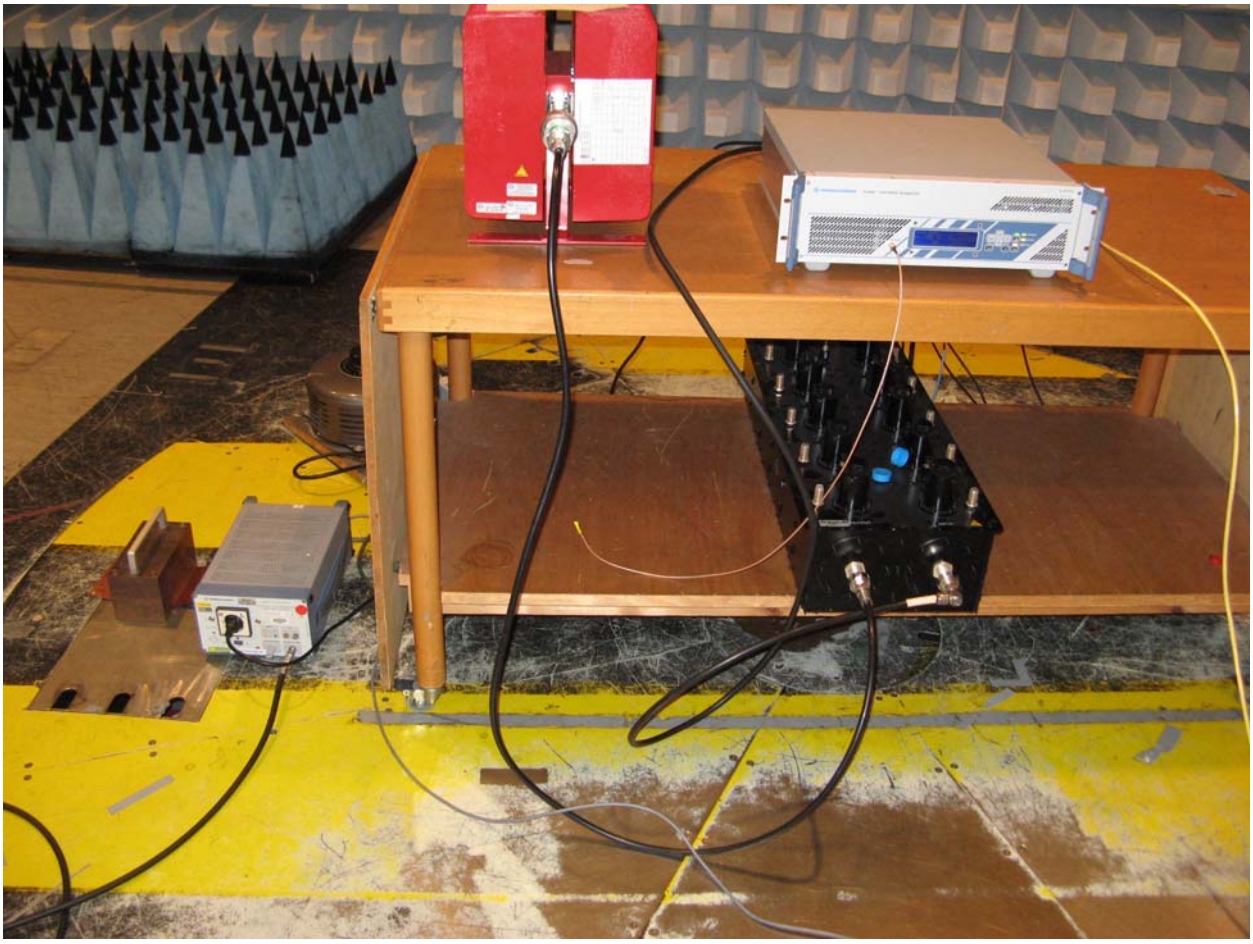


Figure 6-12: Test setup for conducted emissions measurement

Results in detail:

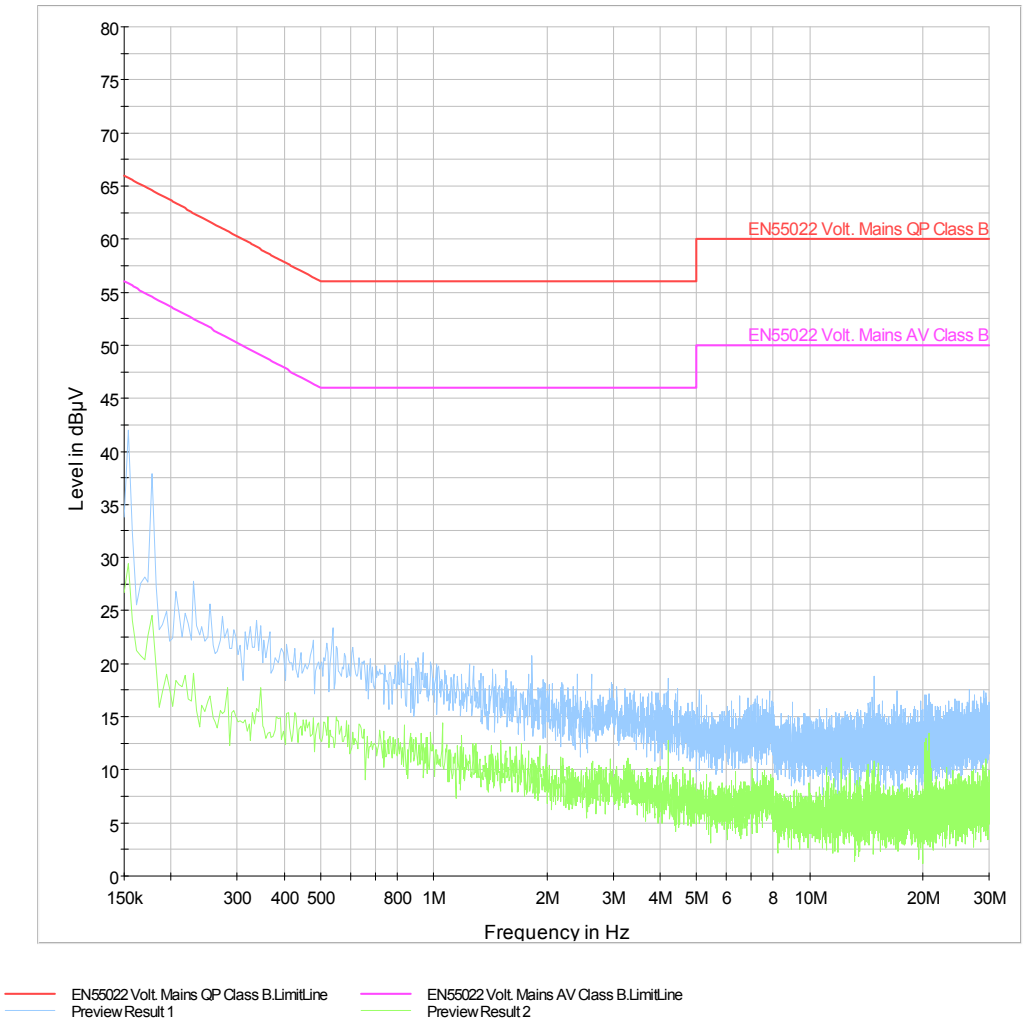


Figure 6-13: Conducted Emission, 0.15 – 30 MHz

According to EN 301489-11, Class B this measurement is **passed.**
According to FCC Part 15 §15.107, Class B this measurement is **passed.**