DAT-P-002/91-02

Center for Quality Engineering

Test Report No.: D0390001

Order No.: D039	**Pages:** 37	**Munich,** Mar 01, 2010

Client:	Rohde & Schwarz GmbH & Co. KG
Equipment Under Test:	SCV8302E TV Transmitter (MediaFLO, ATSC)
Manufacturer:	Rohde & Schwarz GmbH & Co. KG
Task:	Conformance test according to the test specifications mentioned below
Test Specifications: [covered by accreditation]	• FCC 47 CFR Part 15, Subpart B (informative) • FCC 47 CFR Part 2 • FCC 47 CFR Part 27
Result:	The EUT complies with the requirements of the specification. See summary

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

	Date	**Signature**
Dollinger Qualification Engineer	Mar 01, 2010	
approved by:	**Date**	**Signature**
Neuhäusler Lab Manager Wireless & Software	Mar 01, 2010	
Bauer Lab Manager EMC	Mar 01, 2010	

This document was signed electronically.

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

November 12, 2008

Registration Number: 90932

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

Attention: Josef Bauer.

Re: Measurement facility located at Munich
Anechoic chamber No 1 (10 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	FCC Part 27 §27.53 43+10log(P)	**passed**
6.1.3	Radiated 1 GHz-10 GHz Test Distance: 3 meters	FCC Part 2 §2.1053, §2.1057	FCC Part 27 §27.53 43+10log(P)	**passed**

1.1.2 Antenna terminals

Conducted emission tests				
Chapter	**Test**	**Specification**	**Limits**	**Result**
6.2.1	Spurious Emissions at Antenna Terminals	FCC Part 2 §2.1051 §2.1057	FCC Part 27 §27.53 43+10log(P)	**passed**
6.2.2	Occupied Bandwidth	FCC Part 2 §2.1049	FCC Part 27 §27.5 6 MHz	**passed**
6.2.3	RF Power Output	FCC Part 2 §2.1046 (a) (c)	FCC Part 27 §27.50 1000W/MHz ERP	MediaFLO: 543.25W ATSC: 767.36W (with BPF)

1.1.3 Power Port

Conducted emission tests				
Chapter	**Test**	**Specification**	**Limits**	**Result**
6.2.4	Conducted 230 V AC	FCC Part 15 §15.107	Class A	**passed**

2 References

2.1 Specifications

[1]	FCC 47 CFR Part 2, 15 and 27	Code of Federal Regulations, Title 47: Telecommunication Part 2: Frequency Allocations and Radio Treaty Matters; General Rules and Regulations Part 15: Radio Frequency Devices Part 27: Miscellaneous Wireless Communications Services	2009-10

2.2 Glossary of Terms

AC	Alternating Current
AM	Amplitude Modulation
BPF	Band Pass Filter
cal	calibrated
CBN	Combined Bonding Network
CE	CE-Conformity
chk	checked against a calibrated reference
CM	Common Mode Coupling
cnn	calibration not necessary
CR	Customer requirement
DC	Direct Current
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
IEC	International Electrotechnical Commission
LISN	Line Impedance Stabilization Network
LtG	Line to Ground coupling
LtL	Line to Line coupling
SW	Software

3 General Information

3.1 Identification of Client

Rohde & Schwarz GmbH & Co. KG
Mühldorfstraße 15
81671 München
Josef Hupfauer

3.2 Test Laboratory

Center for Quality Engineering
SGS Germany GmbH
Hofmannstraße 50
81379 München

3.3 Time Schedule

Delivery of EUT: Feb 03, 2010
Start of test: Feb 03, 2010
End of test: Feb 04, 2010

3.4 Participants

Name	Function	Phone	E-Mail
André Stéphane Nakpane	Accredited testing Editor	+49 89 787475-213	andre.nakpane@sgs.com
Rudolf Dollinger	Accredited testing, Editor	+49 (89) 787475-441	rudolf.dollinger@sgs.com

4 Equipment Under Test

4.1 Description of EUT

The R&S SCx8000 transmitter family covers the analog TV standards as well as the ATSC, ATSC Mobile DTV, DVB-T, DVB-H and MediaFLO digital TV standards. The transmitters can be switched from analog to digital transmission.

With output powers from 200 W to 600 W for DVB-T/DVB-H, the R&S SCx8000 can be used for expanding existing transmitter networks and filling coverage gaps.

The use of large-scale integrated components that combine various classic transmitter functions results in a highly compact design. The R&S SX801 exciter provides signal processing and transmitter control functionality at the same time.

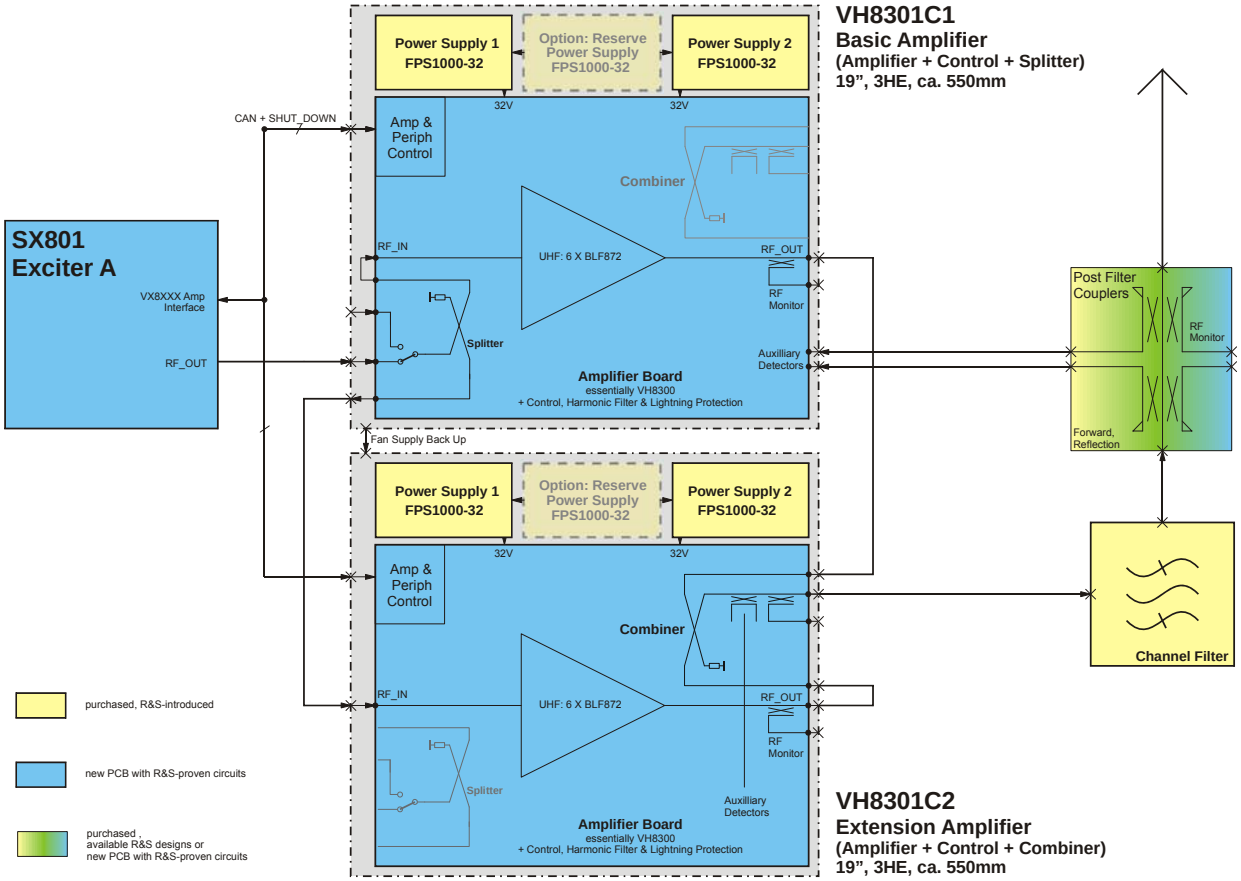
The base amplifier includes the amplifier unit, an exciter switch and a signal splitter. In systems with two amplifiers, an expansion amplifier with an internal power combiner is added. Both the base and the expansion amplifier come with an integrated cooling system. Each featuring two fans for redundancy.

	Exciter SX801		VH8201C1 Basic Amplifier	VH8201C2 Extension Amplifier		VH8301C1 Basic Amplifier	VH8301C2 Extension Amplifier		SCX8X01 Senderkit (200/300 W)	SCX8X02 Senderkit (400/600 W)	SCX8000R Backup Exciter Kit
SCV8201E (200 W)	1		1	-		-	-		1	-	-
SCV8202E (400 W)	1		1	1		-	-		-	1	-
SCV8301E (300 W)	1		-	-		1	-		1	-	-
SCV8302E (600 W)	1		-	-		1	1		-	1	-
SCV8201R (200 W)	2		1	-		-	-		1	-	1
SCV8202R (400 W)	2		1	1		-	-		-	1	1
SCV8301R (300 W)	2		-	-		1	-		1	-	1
SCV8302R (600 W)	2		-	-		1	1		-	1	1

Note: Tested units are highlighted

Table 4-1: SCx8000-Variants

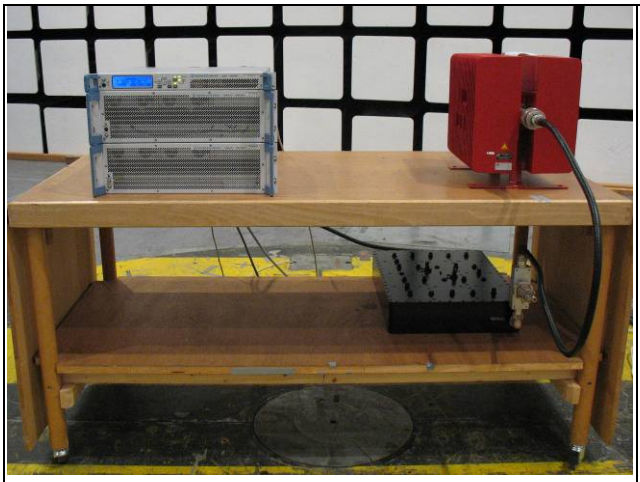
Figure 4-1: Picture of EUT SCV8302E

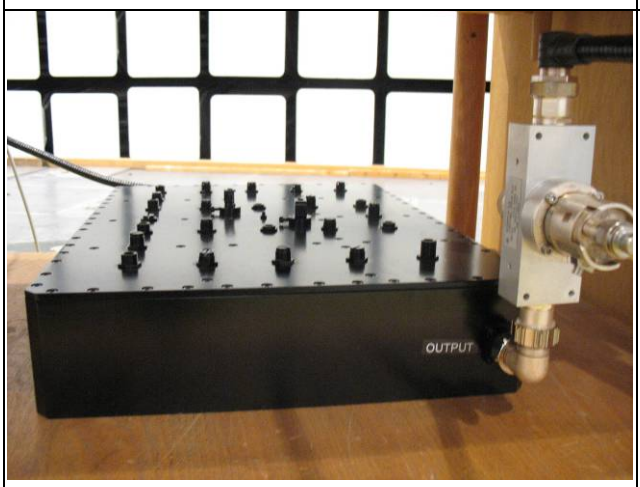


SCV8302E - 600W DVB-T Compact Transmitter UHF

Figure 4-2: System Diagram

4.2 Photos of EUT





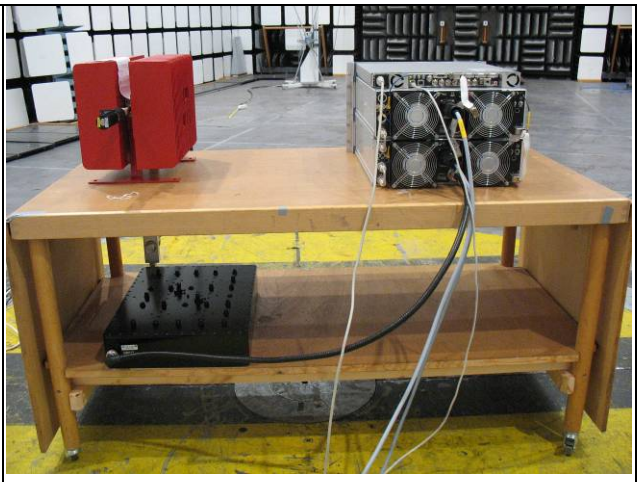


Figure 4-3: Photos of EUT

4.3 Configuration of EUT

The used EUT configurations are shown by the following tables:

Transmitter Type	**SCV8302E**
Frequency Bands (Block D)	716-722 MHz (§27.5,c,2)
Carrier Frequency	719.0 MHz
Channel Bandwidth	6MHz
Operation Mode	MediaFLO and ATSC
Maximum Output Power	600W (MediaFLO); 900W (ATSC)
Number of Antenna Ports	1

Table 4-2: Overview of EUT Configuration

The conducted RF tests were performed with one EUT at the antenna port.

A listing of all hardware components including the serial numbers is shown in by the following table. This set up is the maximum stage of extension for this transmitter acc. to [1] §2.1033 (c), (6), (7), (9).

Module Name	Serial-No.	Module Type
2104.8000.10 R&S VH8301C1	101023 (Bas.)	Amplifier
2104.8000.20 R&S VH8301C2	101021 (Erw.)	Amplifier
2104.4504.02 R&S SX801	101307	Exciter ATV/DTV
2104.6659.02 R&S SCX8X02 Senderkit[1]	---	Kabelsatz (400/600W)
BN616503 Spinner Bandpass	S79840	Bandpass 719.0 MHz

1) Comprises following parts:
-CAN-Bus-cables between Sx801 and Basic/Extension-Amplifier *(W51111)*
-RF-cable between Sx801 and Basic Amplifier *(W6010)*

Table 4-3: Configuration of EUT

4.4 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 230V AC and activated with it´s rated output power.

4.5 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 50, 81379 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) - NSA acc. to: ・ EN 55022 / 2006 ・ CISPR 16-1-4 / 2008 ・ ANSI C63.4 / 2003 - Site VSWR 1 – 18GHz acc. to ・ CISPR 16-1-4 / 2008 - FCC-listed until Nov. 2011, 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) - NSA acc. to: ・ EN 55022 / 2006 ・ CISPR 16-1-4 / 2008 ・ ANSI C63.4 / 2003 - Site VSWR 1 – 18GHz acc. to: ・ CISPR 16-1-4 / 2008 - FCC-listed until Nov. 2011, Reg. Nr.: 97242 - VCCI-listed until Nov. 2011, 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) - NSA acc. to: ・ EN 55022 / 2006 ・ CISPR 16-1-4 / 2008 ・ ANSI C63.4 / 2003 - Site VSWR 1 – 18GHz acc. to: ・ CISPR 16-1-4 / 2008 - FCC-listed until Nov. 2011, 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. 1

5.2 Environmental conditions

Temperature:	23.5°C
Rel. humidity:	38.1 %

5.3 Measuring Equipment

No.	Test Equipment	Type (Manufacturer)	Identification No.	Calibration date	Calibration due
1	Spectrum Analyzer	FSU 26 (R&S)	F0366	11/2009	11/2011
2	Network Analyzer	ZVM (R&S)	F0092	10/2009	10/2011
3	Notebook	Lifebook (F&S)	F1093	cnn	cnn
4	Highpass	800MHz (Wainwright)	WHJS800-10EE	cnn	cnn
5	Directional Coupler[1]	GD100 (R&S)	350632/025	cnn	cnn

1) Customer equipment

Table 5-2: RF Measurement Test Equipment

For EMC test equipment see relevant test cases of chapter 6.

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.

All relevant test equipment has a valid calibration from an external calibration laboratory. Additionally the signal analyzer has a built-in self-calibration procedure. This calibration procedure was activated prior to the measurements so that the analyzer is deemed accurate. High quality cables were used to connect the measurement equipment to the EUT. The actual loss of the attenuator and the cables was measured with a high precision network/signal analyzer and taken into account for all RF measurements.

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 chapter 6.1.2

Measurement Equipment

ID. No.	Equipment	(Type)	Manufacturer	(Specification)	Status	Last Cal.	Next Cal.
P0336	test chamber 1		Siemens	20.3 x 13.2 x 8.0 m; 1 m pyramid absorbers + ferrite tiles	chk	Feb 01, 2010	Feb 28, 2011
P1352	antenna, Ultralog	HL562	R&S	30 MHz - 3000 MHz	cal	Apr 14, 2009	Oct 31, 2010
P1139	Mast	MA 4000	innco GmbH	1 - 4m, hor./vert.	cnn		
P1192	EMI receiver	ESIB26	R&S	20 Hz - 26.5 GHz	cal	Mar 05, 2009	Mar 31, 2011
P1140	Controller	CO 2000	innco GmbH		cnn		

6.1.1.1 Operating Mode ATSC:

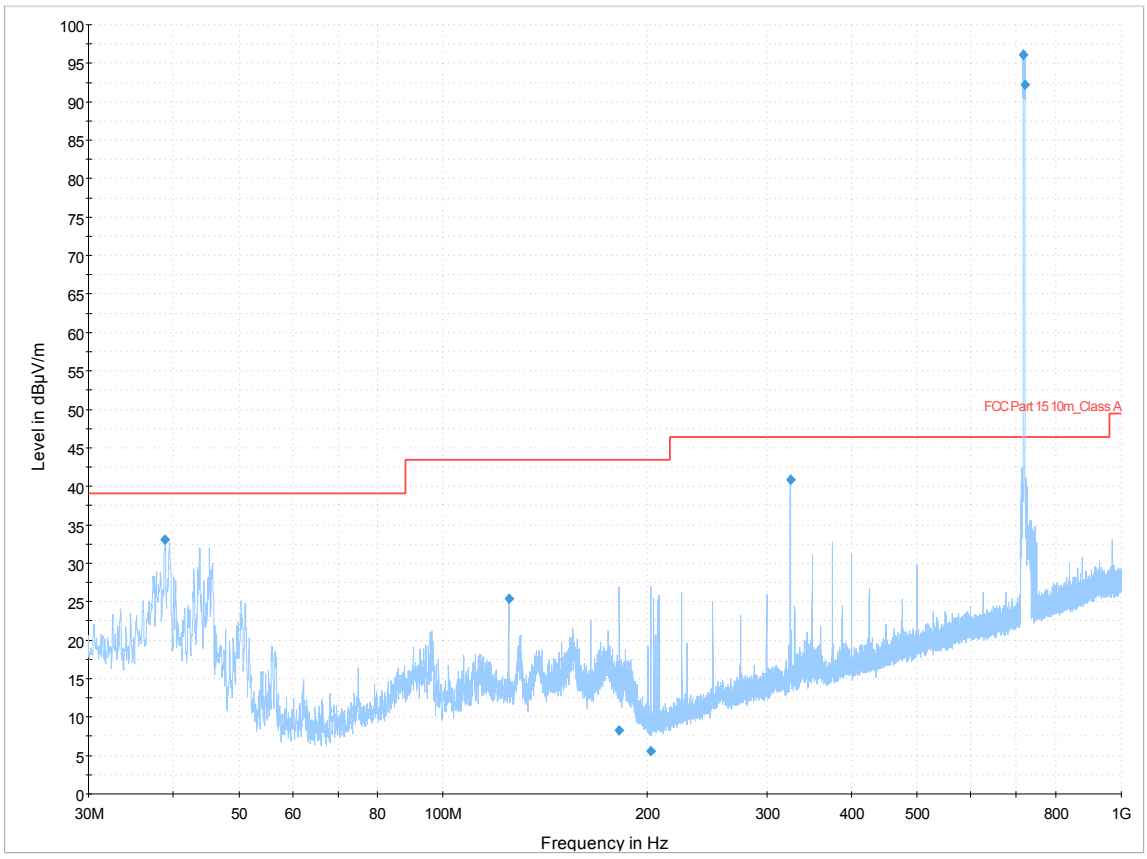


Figure 6-1: Radiated emission, 30 – 1000 MHz, ATSC

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
38.920000	33.1	1000.0	100.0	V	273.0	14.9	6.00	39.10
125.000000	25.4	1000.0	122.0	V	280.0	10.2	18.10	43.50
181.960000	8.3	1000.0	100.0	V	232.0	8.7	35.20	43.50
202.200000	5.5	1000.0	325.0	V	280.0	8.4	38.00	43.50
324.960000	40.9	1000.0	100.0	V	269.0	13.2	5.50	46.40
716.280000	96.1	1000.0	310.0	H	138.0	21.1	-49.70	46.40
720.960000	92.2	1000.0	300.0	H	126.0	21.2	-45.80	46.40

Table 6-1: Highest values, Quasi peak detection

6.1.1.2 Operating Mode MediaFLO:

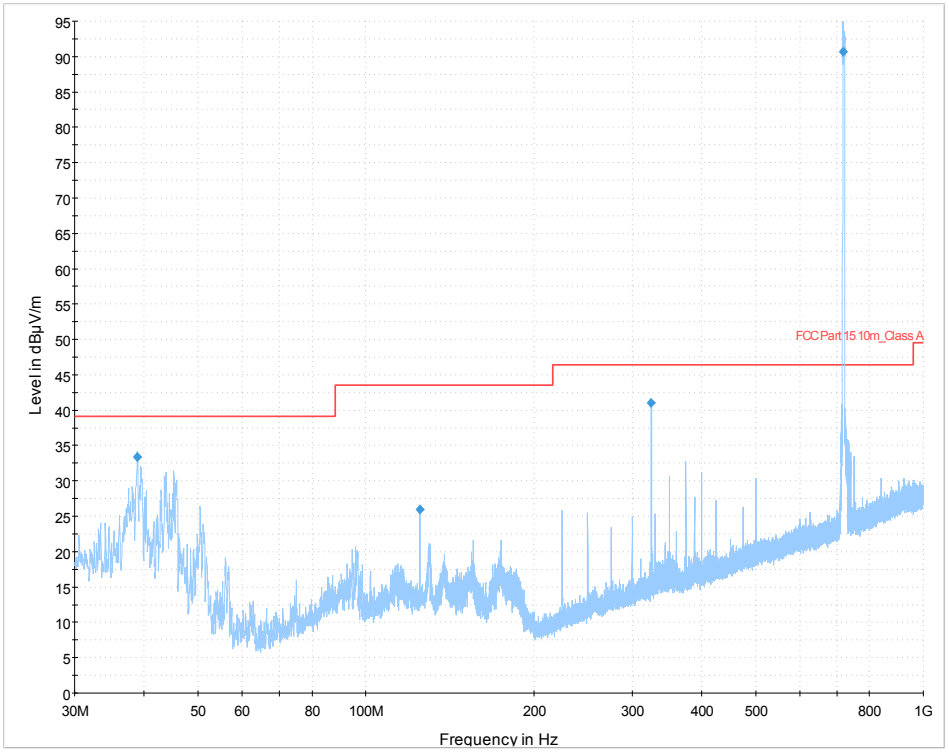


Figure 6-2: Radiated emission, 30 – 1000 MHz, MediaFLO

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
38.920000	33.4	1000.0	100.0	V	244.0	14.9	5.70	39.10
124.960000	26.0	1000.0	150.0	V	292.0	10.2	17.50	43.50
324.960000	41.0	1000.0	100.0	V	269.0	13.2	5.40	46.40
716.840000	90.7	1000.0	100.0	H	125.0	21.1	-44.30	46.40

Table 6-2: Highest values, Quasi peak detection

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 polarization. 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 polarization. The measuring distance was 10 m. The test set-up of Figure 6-3 was used.

Setup REE 30MHz – 1GHz

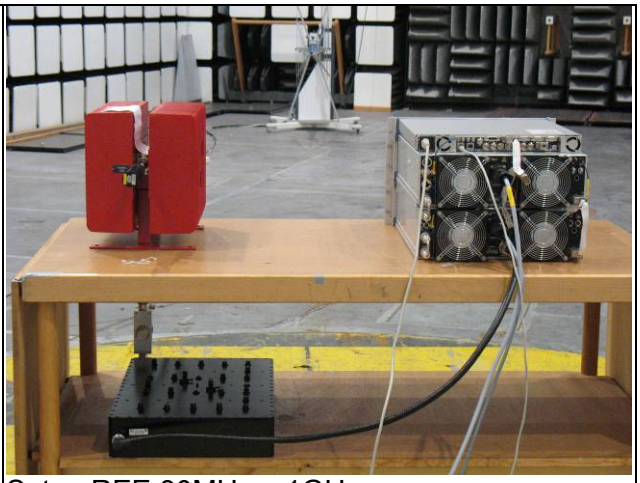

Setup REE 30MHz – 1GHz

Figure 6-3: 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 6-3: Resolution bandwidth in the range 30 MHz to 1 GHz

6.1.2.1 Operating Mode ATSC:

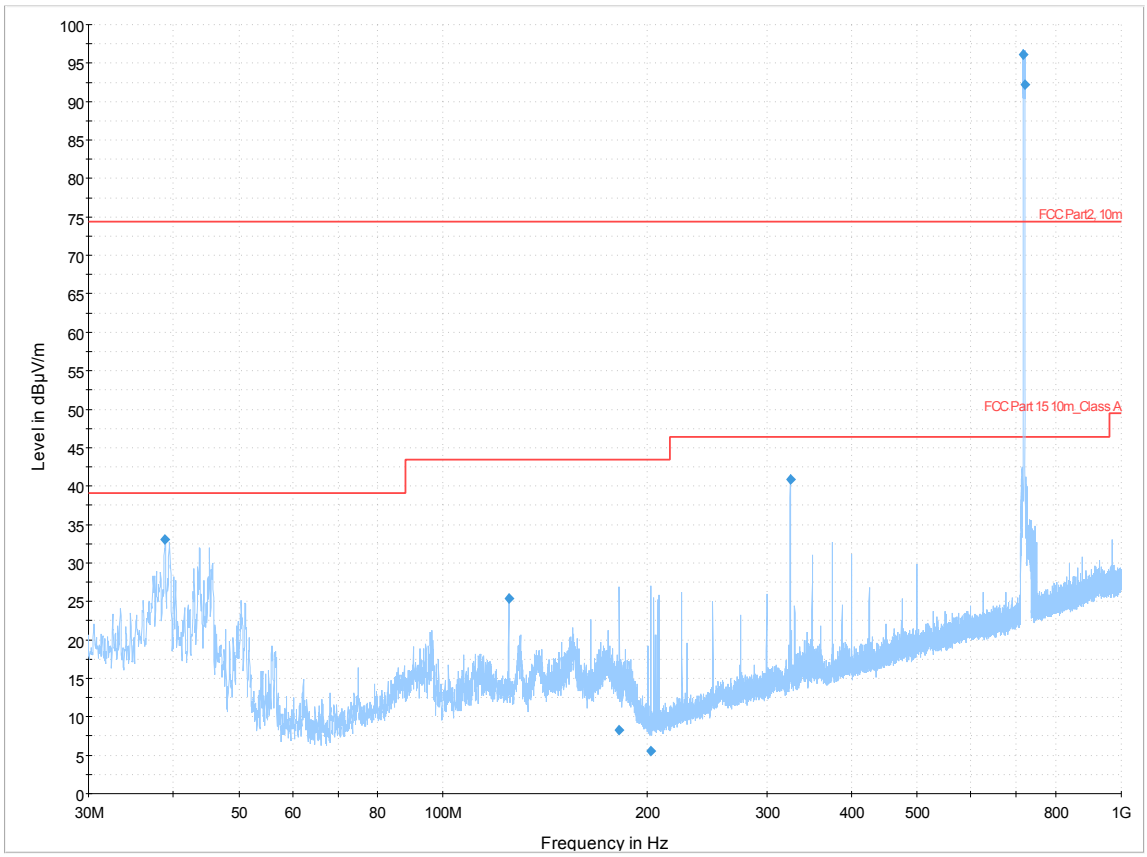


Figure 6-4: Radiated emission, 30 – 1000 MHz, ATSC

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
38.92	33.1	1000	100	V	273	14.9	41.3	74.4
125	25.4	1000	122	V	280	10.2	49	74.4
181.96	8.3	1000	100	V	232	8.7	66.1	74.4
202.2	5.5	1000	325	V	280	8.4	68.9	74.4
324.96	40.9	1000	100	V	269	13.2	33.5	74.4
716.28	96.1	1000	310	H	138	21.1	-21.7	74.4
720.96	92.2	1000	300	H	126	21.2	-17.8	74.4

Table 6-4: Highest values, Quasi peak detection

6.1.2.2 Operating Mode MediaFLO:

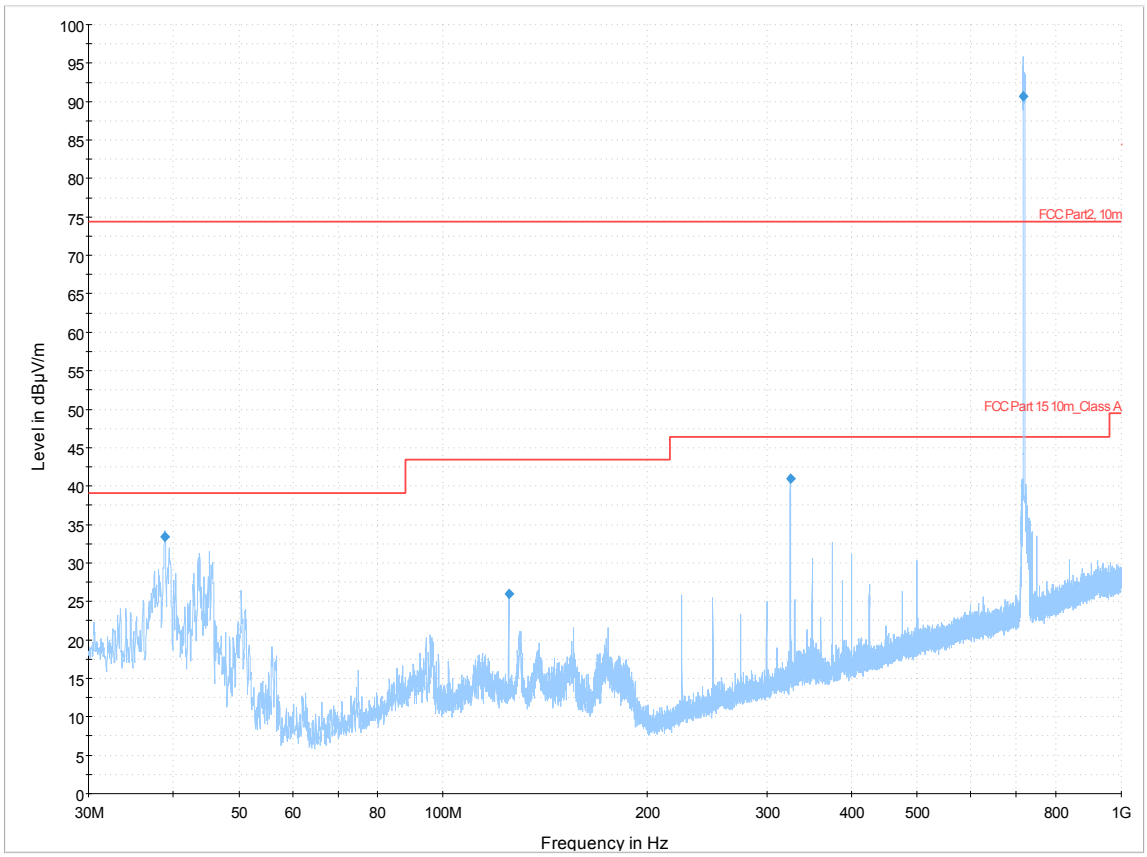


Figure 6-5: Radiated emission, 30 – 1000 MHz, MediaFLO

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
38.92	33.4	1000	100	V	244	14.9	41	74.4
124.96	26	1000	150	V	292	10.2	48.4	74.4
324.96	41	1000	100	V	269	13.2	33.4	74.4
716.84	90.7	1000	100	H	125	21.1	-16.3	74.4

Table 6-5: Highest values, Quasi peak detection

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.

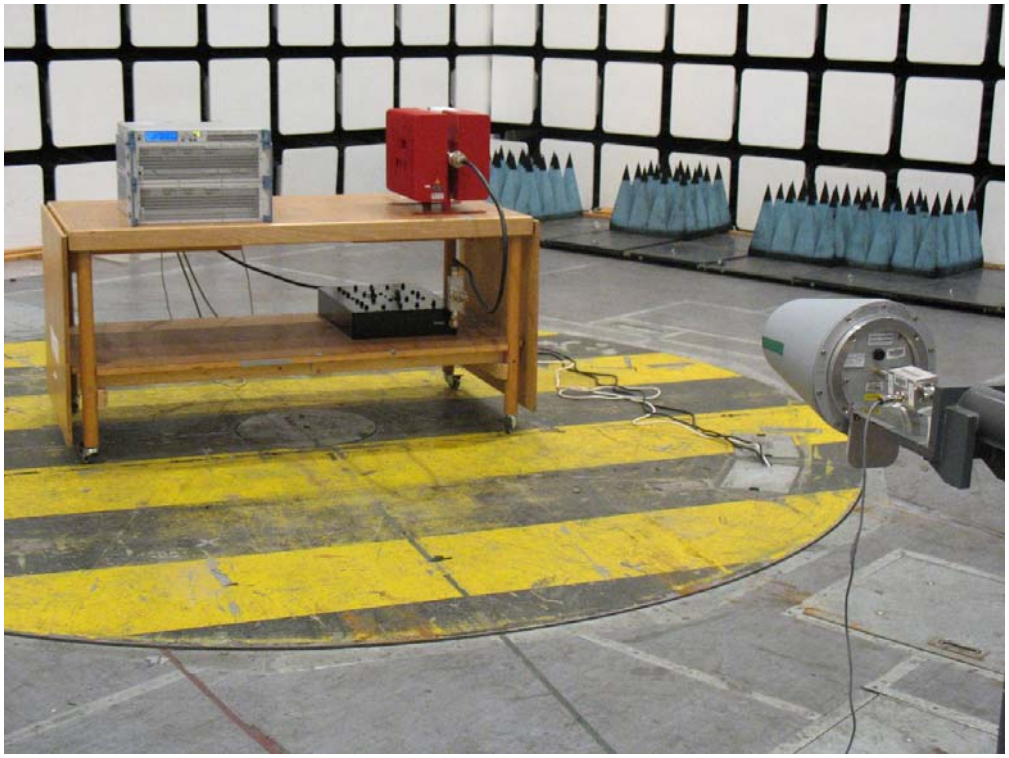


Figure 6-6: Test setup for radiated emission measurement, 1 - 10GHz

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

Measurement Equipment

ID. No.	Equipment	(Type)	Manufacturer	(Specification)	Status	Last Cal.	Next Cal.
P0336	test chamber 1		Siemens	20.3 x 13.2 x 8.0 m; 1 m pyramid absorbers + ferrite tiles	chk	Feb 01, 2010	Feb 28, 2011
P1354	antenna	HL050	R&S	0,85 GHz bis 26,5 GHz	cal	Nov 04, 2008	Nov 30, 2010
P1314	Mast	MA 4000	innco GmbH	1 - 4m, hor./vert.	cnn		
P1083	preamplifier (MZ1)	AFS4-00101800-35-S-4-L	miteq	0.1 - 18GHz, 25dB	chk	Dec 07, 2009	Dec 31, 2010
P0492	relais-matrix	RSU 17	R&S		cnn		
P1192	EMI receiver	ESIB26	R&S	20 Hz - 26.5 GHz	cal	Mar 05, 2009	Mar 31, 2011

Result for 1 – 10 GHz

6.1.3.1 Operating Mode MediaFLO:

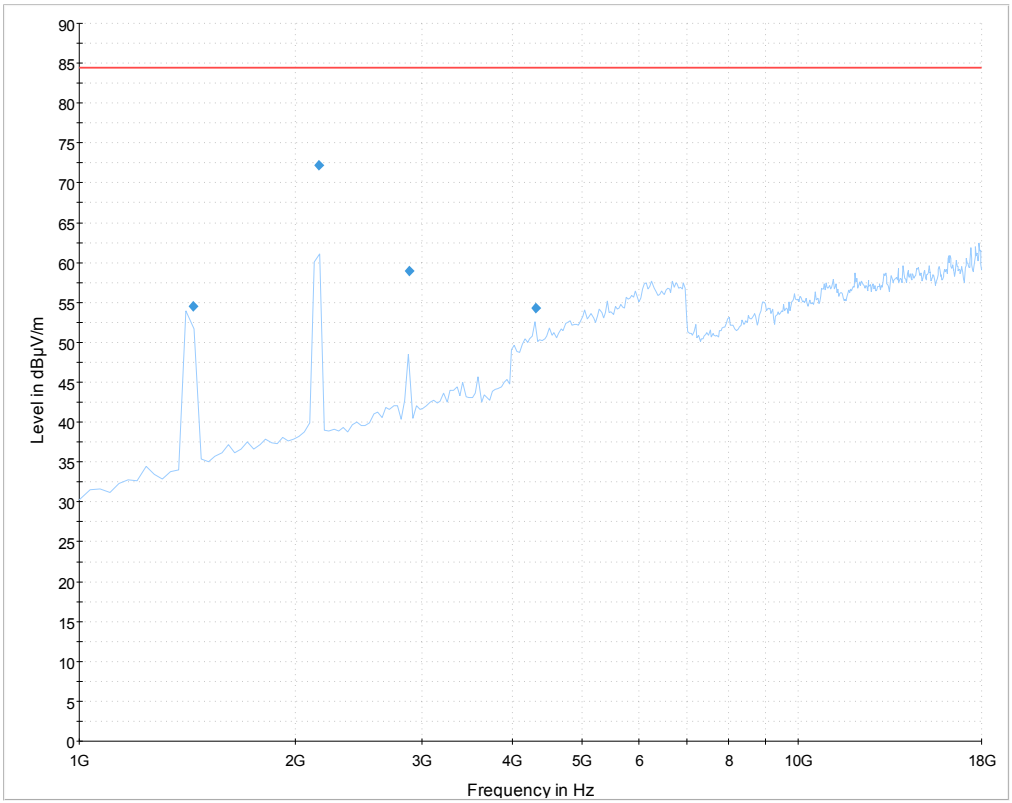


Figure 6-7: Radiated emission, 1 GHz - 10 GHz

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1438.817635	54.5	1000.0	1000.000	100.0	H	170.0	25.9	29.9	84.4
2155.716633	72.2	1000.0	1000.000	100.0	H	166.0	29.5	12.2	84.4
2879.547495	58.9	1000.0	1000.000	100.0	V	329.0	32.4	25.5	84.4
4319.209218	54.3	1000.0	1000.000	114.0	H	333.0	36.1	30.1	84.4

Table 6-7: Highest values, PK detection

6.1.3.2 Operating Mode ATSC:

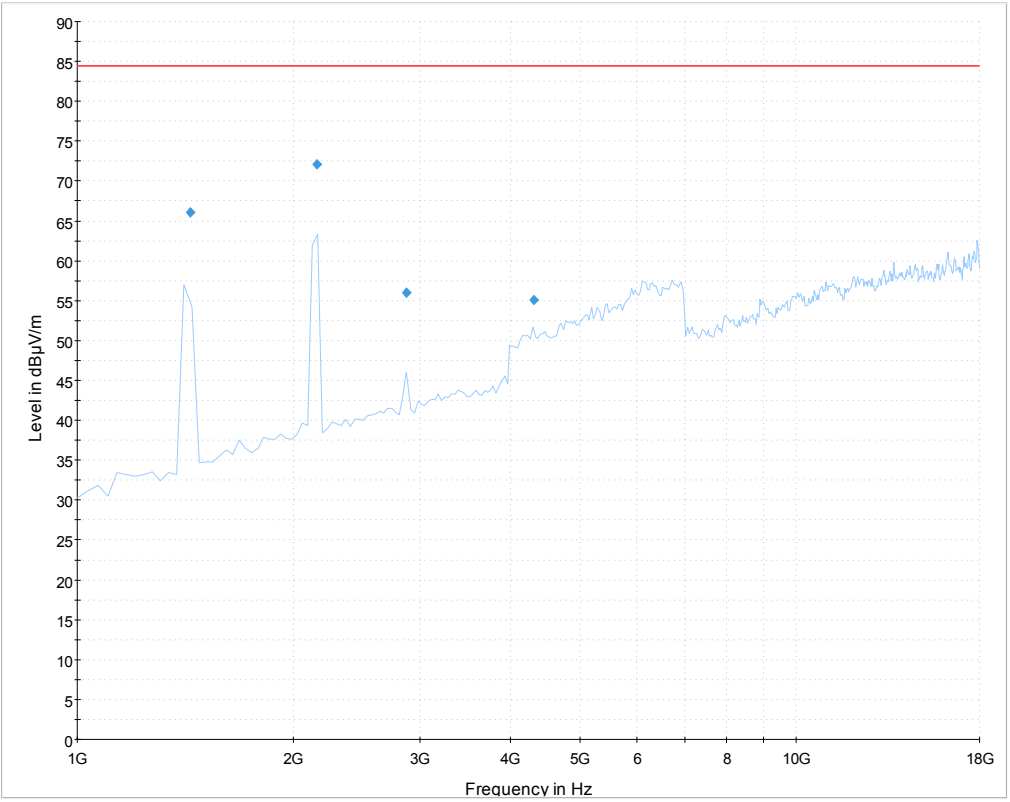


Figure 6-8: Radiated emission, 1 GHz - 10 GHz

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1437.085772	66.1	1000.0	1000.000	100.0	H	155.0	26.1	18.3	84.4
2156.516633	72.1	1000.0	1000.000	100.0	H	171.0	29.5	12.3	84.4
2871.547495	56.0	1000.0	1000.000	100.0	H	166.0	32.4	28.4	84.4
4311.209218	55.1	1000.0	1000.000	100.0	H	328.0	36.1	29.3	84.4

Table 6-8: Highest values, PK detection

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.

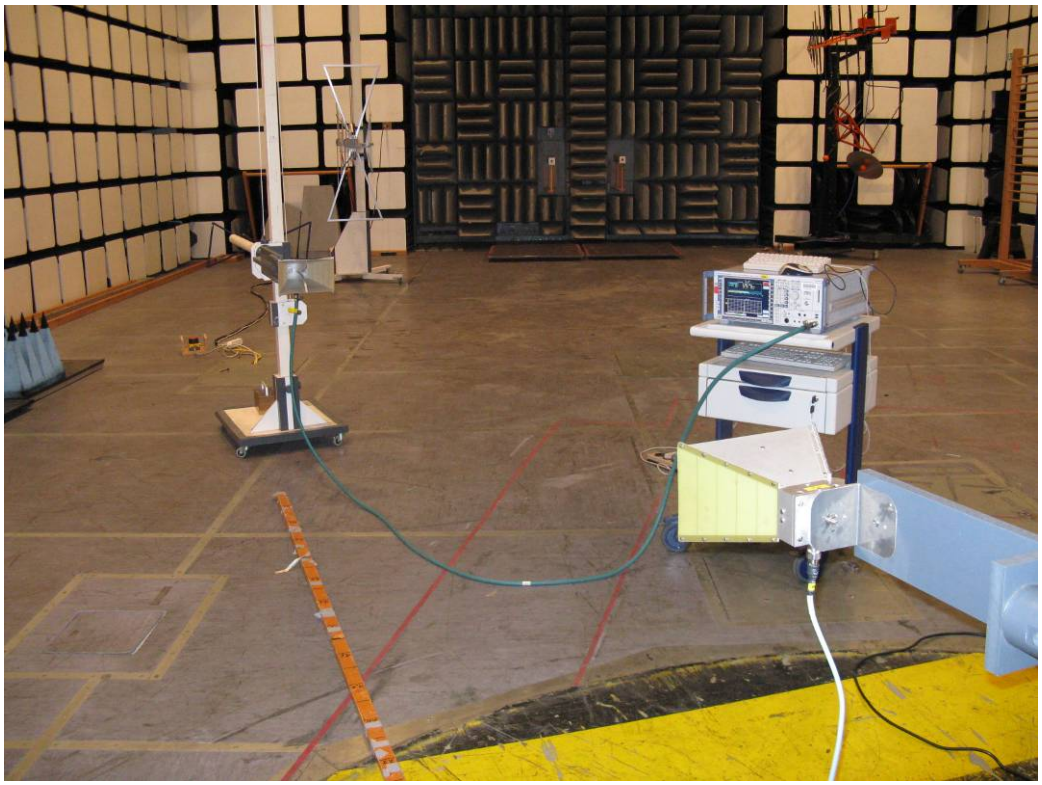


Figure 6-9: Test set-up for the Dipole substitution

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

Measurement Equipment

ID. No.	Equipment	(Type)	Manufacturer	(Specification)	Status	Last Cal.	Next Cal.
P0336	test chamber 1		Siemens	20.3 x 13.2 x 8.0 m; 1 m pyramid absorbers + ferrite tiles	chk	Feb 01, 2010	Feb 28, 2011
P1354	antenna	HL050	R&S	0,85 GHz bis 26,5 GHz	cal	Nov 04, 2008	Nov 30, 2010
P0961	antenna (MZ2)	3115	Emco	1 - 18 GHz	cal	Apr 02, 2008	Apr 30, 2010
P0567	signal generator	SMR 20	R&S	10 MHz - 20 GHz	chk	May 07, 2009	May 31, 2011
P1314	Mast	MA 4000	innco GmbH	1 - 4m, hor./vert.	cnn		
P1083	preamplifier (MZ1)	AFS4-00101800-35-S-4-L	miteq	0.1 - 18GHz, 25dB	chk	Dec 07, 2009	Dec 31, 2010
P0492	relais-matrix	RSU 17	R&S		cnn		
P1192	EMI receiver	ESIB26	R&S	20 Hz - 26.5 GHz	cal	Mar 05, 2009	Mar 31, 2011

Result for the dipole substitution (ATSC, 900W)

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]	
1438	66	-38.2	1.81	5.6	-34.4	-13	passed
2157	72	-32.1	2.07	6.54	-27.6	-13	passed
2876	56	-32.88	2.48	7.26	-28.1	-13	passed
3595	55	-32.78	2.69	7.17	-28.3	-13	passed
4314	55	-34.61	3.03	7.84	-29.8	-13	passed
5033	52.5	-34.74	3.31	7.15	-30.9	-13	passed
6471	57	-33.76	3.73	9.09	-28.4	-13	passed
7190	51.5	-36.59	3.93	8.32	-32.2	-13	passed

Table 6-9: Results for the dipole substitution

According to FCC Part 2 §2.1053, §2.1057 Class B this measurement is **passed**.

6.2 Conducted Emission

6.2.1 Spurious Emission at the antenna terminals

The measurements of the spurious emissions at the EUT output terminals were performed pursuant to §2.1051 in order to verify that all emissions are below the limits given by §27.53.

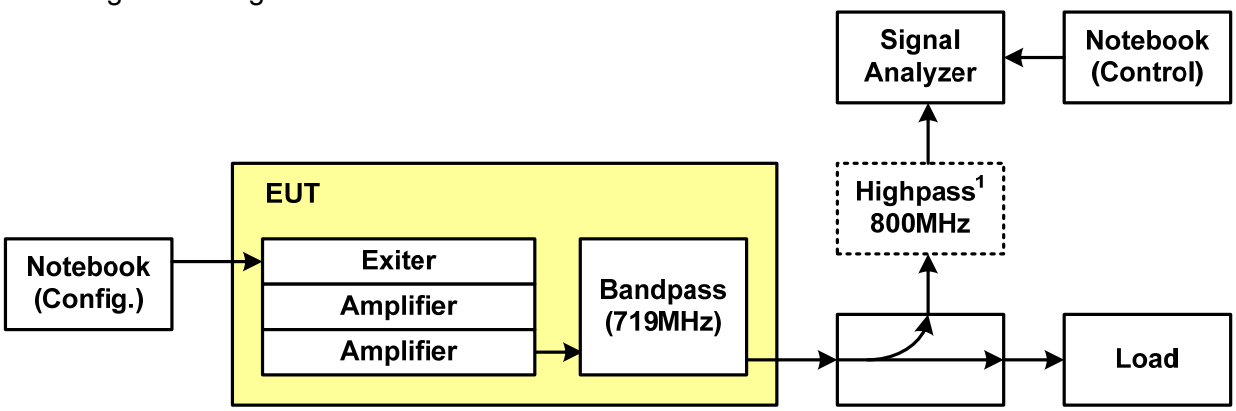
Compliance with §27.53 requires that any emission be attenuated below the transmitter power by at least 43 + 10 $\log_{10}$ P (P = transmitter power in Watts).

The compliance limit was calculated in the following way:

Maximum transmitter output power [W]: P
Maximum transmitter output power [dBm]: 30 + 10 $\log_{10}$ P (conversion from W to dBm)
Attenuation required by FCC: 43 + 10 $\log_{10}$ P

Compliance limit = Maximum transmitter output power - Required attenuation
= 30 + 10 $\log_{10}$ P - (43 + 10 $\log_{10}$ P) = -13 dBm

Following test configuration was used:



1) In the frequency range 1GHz-7.3GHz an 800 MHz highpass was used to suppress the carrier frequency

Figure 6-10: Test Configuration – Spurious Emissions

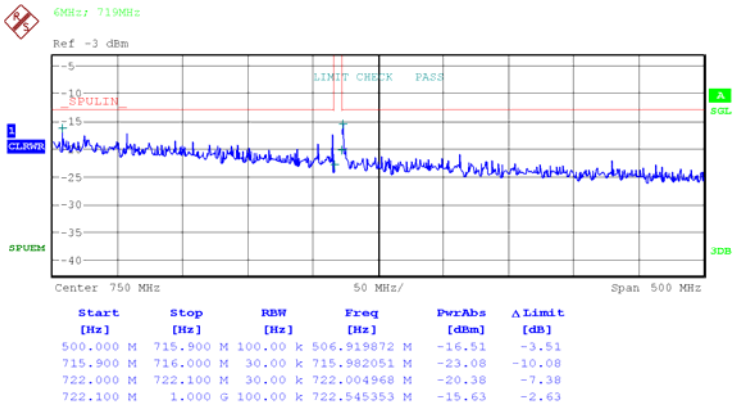
The tests were carried out in accordance with §27.53. For the frequency range below 1GHz a resolution bandwidth of 100kHz was used except two sub-ranges (the one immediately below and the one immediately above the carrier frequency block). In this 100 kHz frequency bands immediately outside and adjacent to the carrier frequency block a resolution bandwidth of 30 kHz was employed.
For the frequency ranges above 1GHz a 1MHz resolution bandwidth was used for the measurements.

According to §2.1057, all emission including the fundamental frequency of the transceiver and all frequencies up to the 10th harmonic were investigated.

The following tables summarize the worst case detected emission levels. The external attenuation (loss of the set up) is already added in the results.

Carrier Frequency: 719 MHz			
Frequency Range [MHz]	**Emission Frequency [MHz]**	**Maximum Emission Level [dBm]**	**Result**
MediaFLO Mode:			
500.0-715.9	506.91	-16.5	compliant
715.9-716.0	715.98	-23.1	compliant
722.0.-722.1	722.00	-20.4	compliant
722.1-1000.0	722.54	-15.6	compliant
1000.0-3000.0	1019.23	-23.5	compliant
3000.0-5000.0	4679.49	-25.9	compliant
5000.0-7300.0	5726.12	-34.3	compliant
ATSC Mode:			
500.0-715.9	715.90	-14.9	compliant
715.9-716.0	715.99	-19.4	compliant
722.0.-722.1	722.00	-13.9	compliant
722.1-1000.0	722.54	-14.6	compliant
1000.0-3000.0	1035.26	-23.4	compliant
3000.0-5000.0	4685.90	-25.5	compliant
5000.0-7300.0	5722.44	-34.5	compliant
Measurement Uncertainty:			f < 3.6 GHz: ±0.5dB 3.6GHz ≤ f < 8GHz: ±1.2dB

Table 6-10: Results - Spurious Emissions



Spurious Emission at antenna terminal

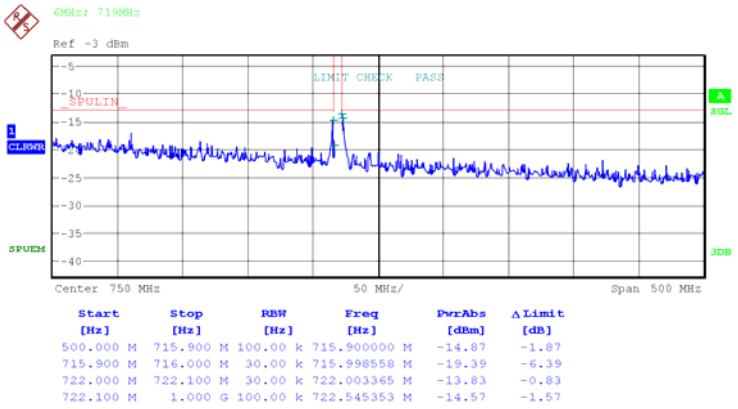
Date: 4.FEB.2010 15:53:51

Figure 6-11: Spurious Emissions below 1GHz (MediaFLO)

Spurious Emission at antenna terminal

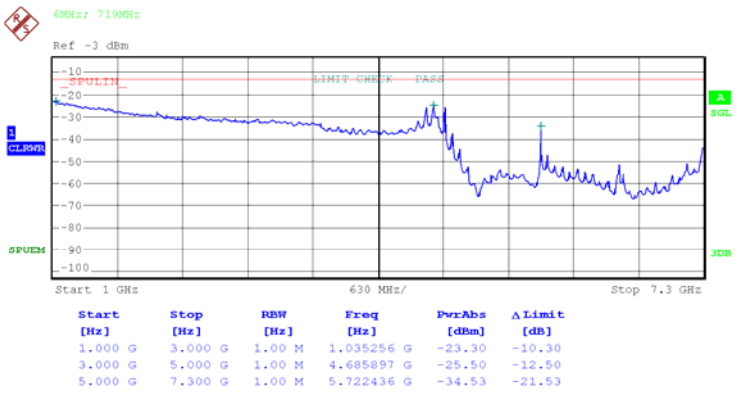
Date: 4.FEB.2010 16:13:21

Figure 6-12: Spurious Emissions above 1GHz (MediaFLO)



Spurious Emission at antenna terminal
Date: 4.FEB.2010 16:49:06

Figure 6-13: Spurious Emissions below 1GHz (ATSC)



Spurious Emission at antenna terminal
Date: 4.FEB.2010 16:33:29

Figure 6-14: Spurious Emissions above 1GHz (ATSC)

The measured conducted emission levels were found to be compliant with the manufacturer's specifications and with all requirements of the FCC rules.

6.2.2 Occupied bandwidth

The measurements are performed to determine the occupied bandwidth of the EUT pursuant to §2.1049.

According to §2.1049 the 99% occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5% of the emitted power.

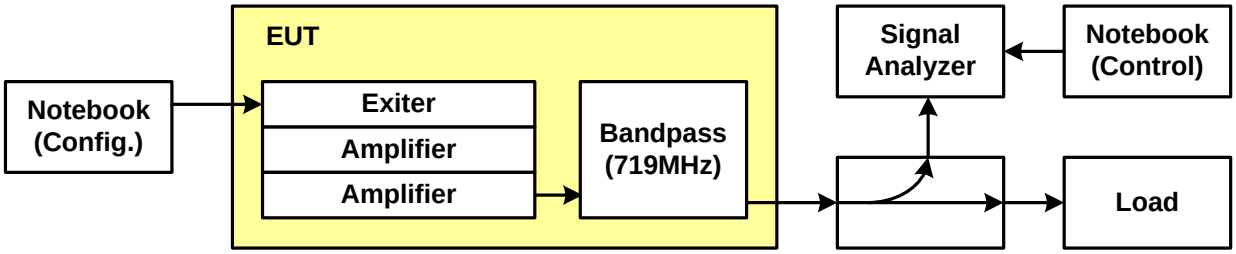


Figure 6-15: Test Configuration – Occupied Bandwidth

The 99% occupied bandwidth of the carrier emission is measured using a signal analyzer with Resolution Bandwidth set to 5% of the necessary bandwidth of the transmitted carrier. The following table summarizes the results. Screenshots of the measurements are shown below.

Carrier Frequency [MHz]	Occupied Bandwidth [MHz]	Result
MediaFLO Mode:		
719.0	5.57	compliant
ATSC Mode:		
719.0	5.68	compliant
Measurement Uncertainty:		±38kHz

Table 6-11: Results – Occupied Bandwidth

The value ‘OBW’ is the measured occupied bandwidth.

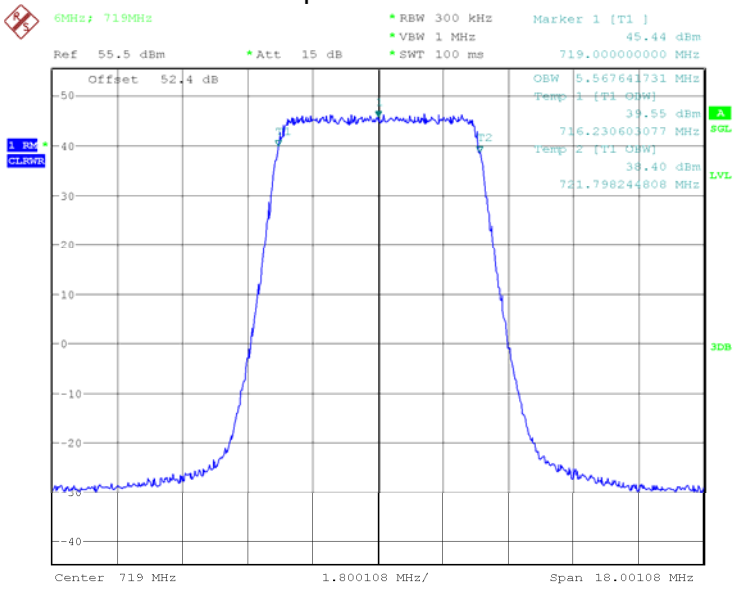


Figure 6-16: Occupied Bandwidth (MediaFLO)

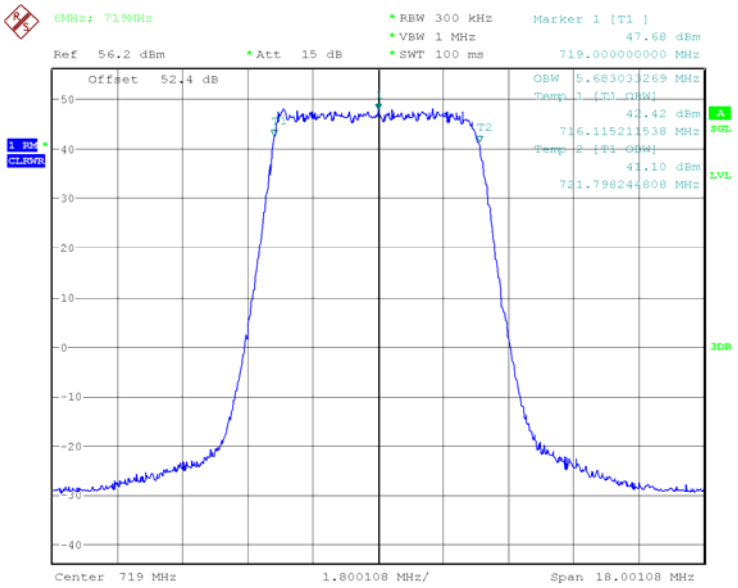


Figure 6-17: Occupied Bandwidth (ATSC)

The occupied bandwidth was found to be compliant with the manufacturer’s specifications and with all requirements of the FCC rules.

6.2.3 RF Power Output

The RF power output measurements were performed pursuant to §2.1046 in order to determine the maximum RF output power of the EUT.

According to §27.50, transmitters are limited to 1000 watts/MHz ERP. Due to the possibility to equip the EUT with different antenna types no comparison of the measured RF power output against the specified limit is possible.

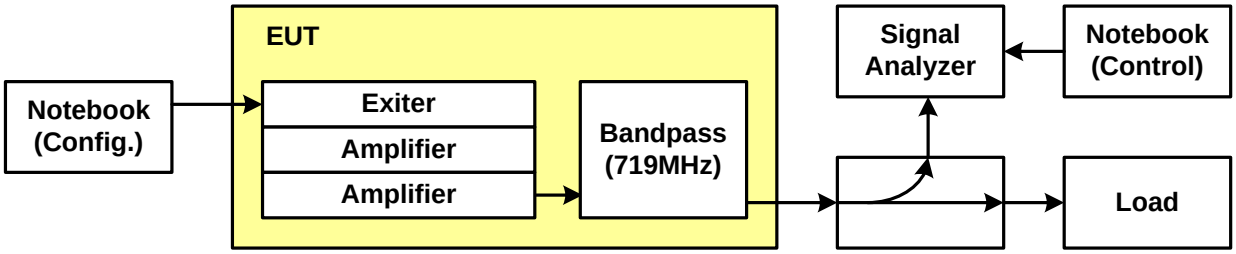


Figure 6-18: Test Configuration – RF Power Output

The peak power at antenna terminals is measured using a signal analyzer.

The RF power is measured with a frequency sweep across the carrier. The carrier power is calculated from the signal analyzer by integration over the result. The maximum output power of the EUT is the sum of the measured carrier power and the external attenuation (cable loss of the test set up).

The following table shows the measured output powers at the antenna connector. Screenshots of the measurements are shown below.

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
MediaFLO Mode:			
719.0	57.35[1]	543.25W	compliant
ATSC Mode:			
719.0	58.85[1]	767.36W	compliant
Measurement Uncertainty:		±0.5dB	

1) Insertion loss of 719MHz band-pass approx. 0.5dB

Table 6-12: Results – RF Power Output

The value ‘Power’ is the carrier power measured by the signal analyzer. ‘Offset’ is the external attenuation (loss of the test set up).

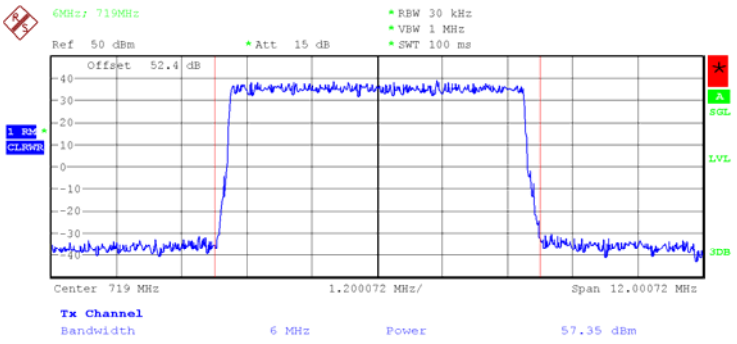


Figure 6-19: RF Power Output at the Antenna Connector (MediaFLO)

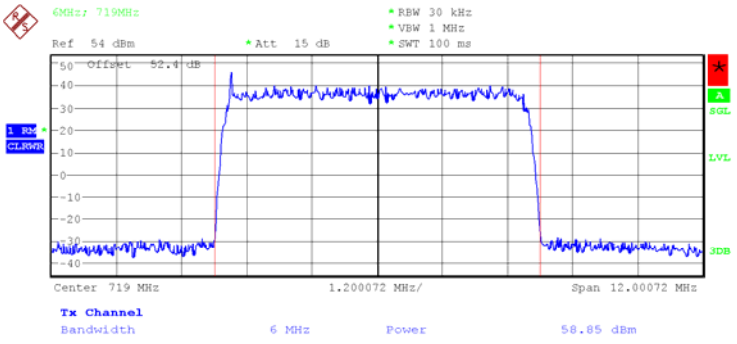


Figure 6-20: RF Power Output at the Antenna Connector (ATSC)

The maximum output power of the EUT was found to be compliant with the manufacturer’s specifications.

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

Specification:
- FCC Part 15§ 15.107

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.

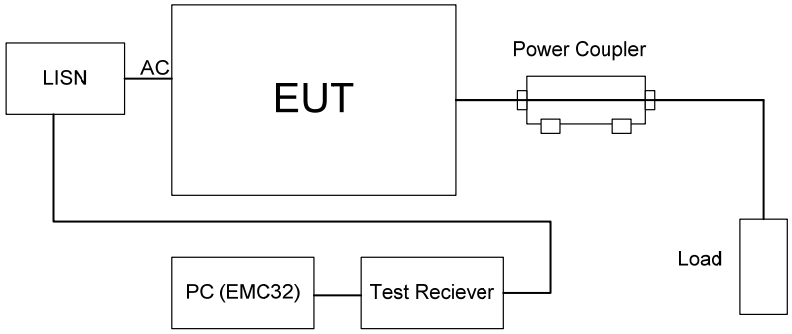


Figure 6-21: Test setup for conducted emissions measurement

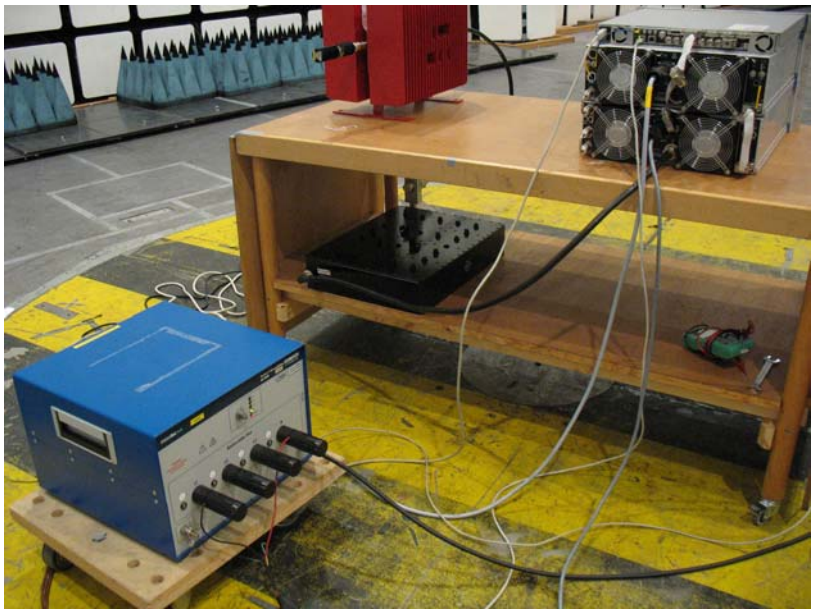


Figure 6-22: Test setup for conducted emissions measurement

Result:
According to FCC Part 15§ 15.107 this measurement is **passed (Class A).**

Results in detail:

Only ATSC-mode was tested according information from customer, as this is assumed to be worst-case because of 900W comparing to the 600W of operation state MediaFLO.

6.2.4.1 Lower amplifier, ATSC mode (900W):

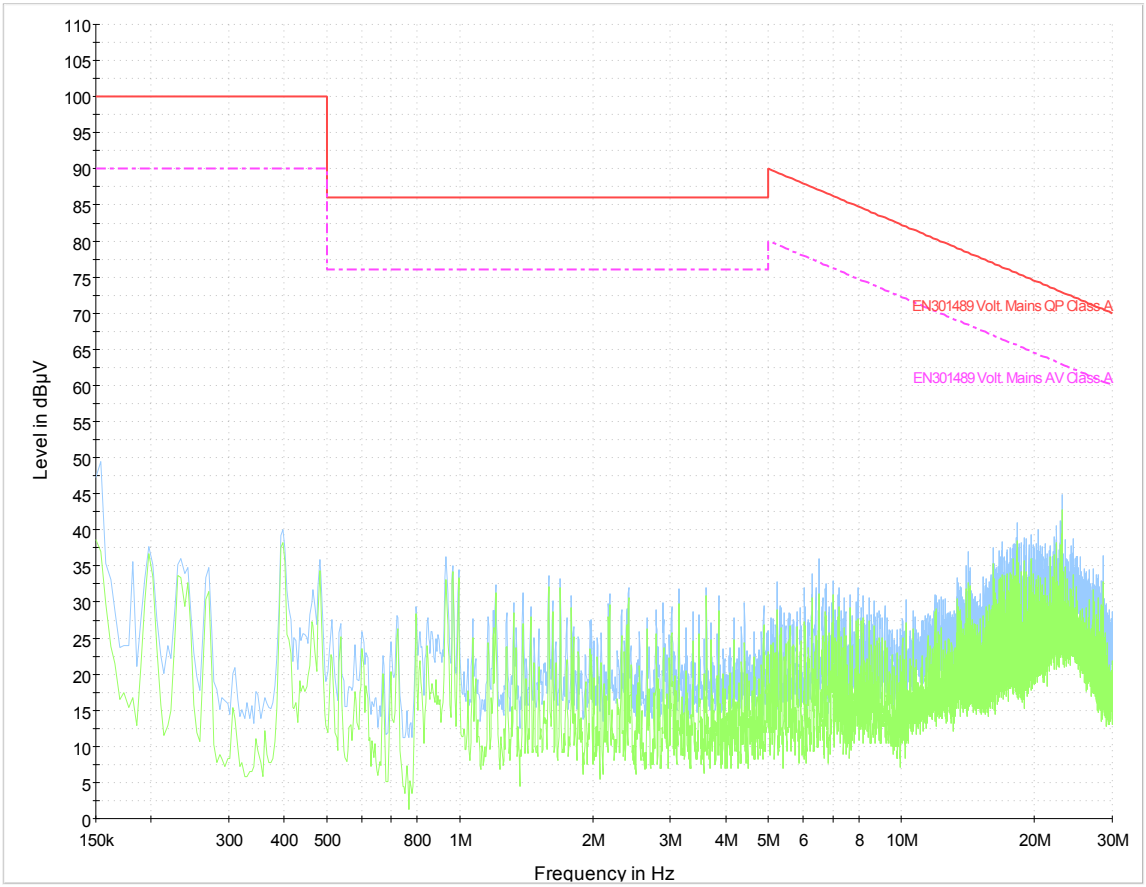


Figure 6-23: Conducted Emission, 0.15 – 30 MHz, lower amplifier, ATSC

6.2.4.2 Upper amplifier, ATSC mode (900W):

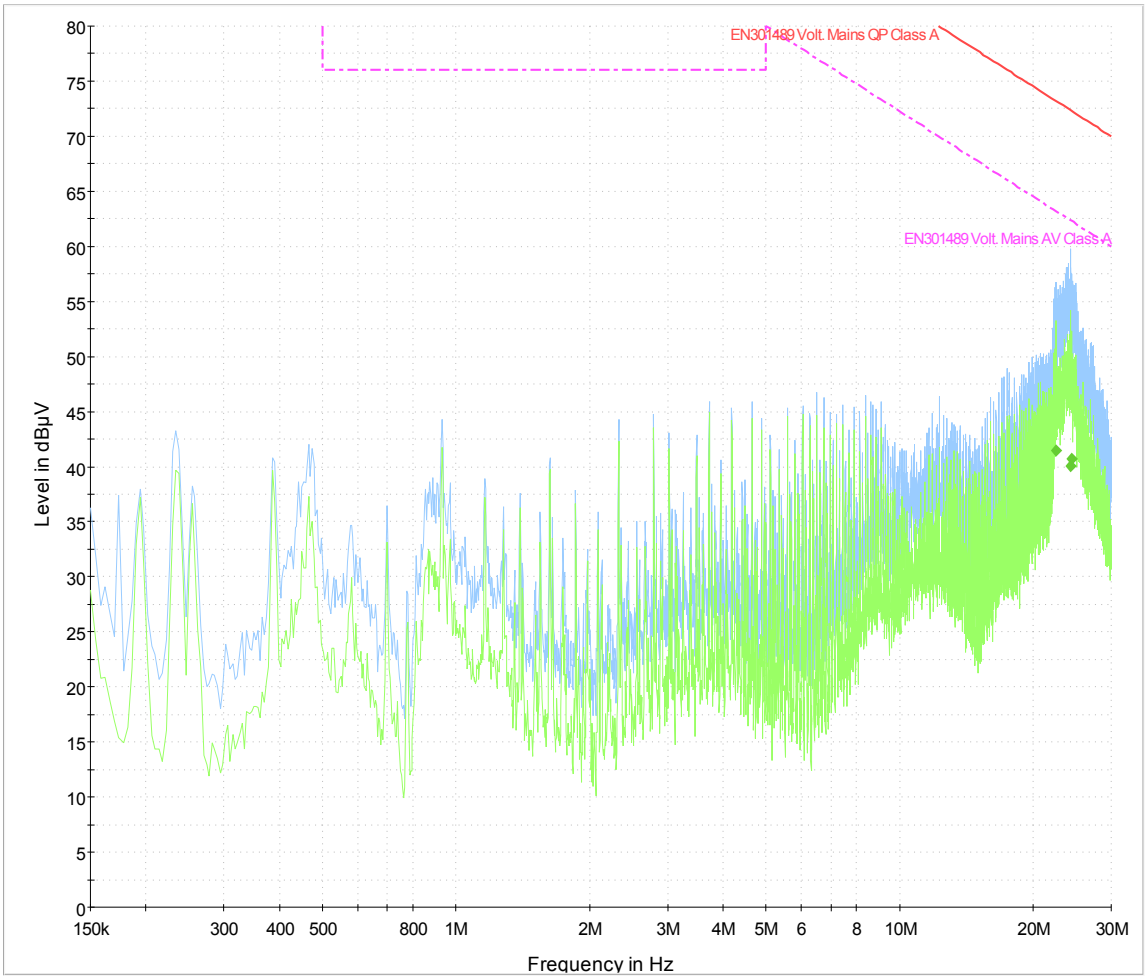


Figure 6-24: Conducted Emission, 0.15 – 30 MHz, upper amplifier, ATSC

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
22.566000	41.5	1000.0	9.000	GN	N	10.4	21.7	63.2	
24.310000	40.0	1000.0	9.000	GN	N	10.4	22.3	62.3	
24.426000	40.7	1000.0	9.000	GN	N	10.4	21.6	62.3	

Table 6-13: Highest values, QP detection

6.2.4.3 Exciter, ATSC mode (900W):

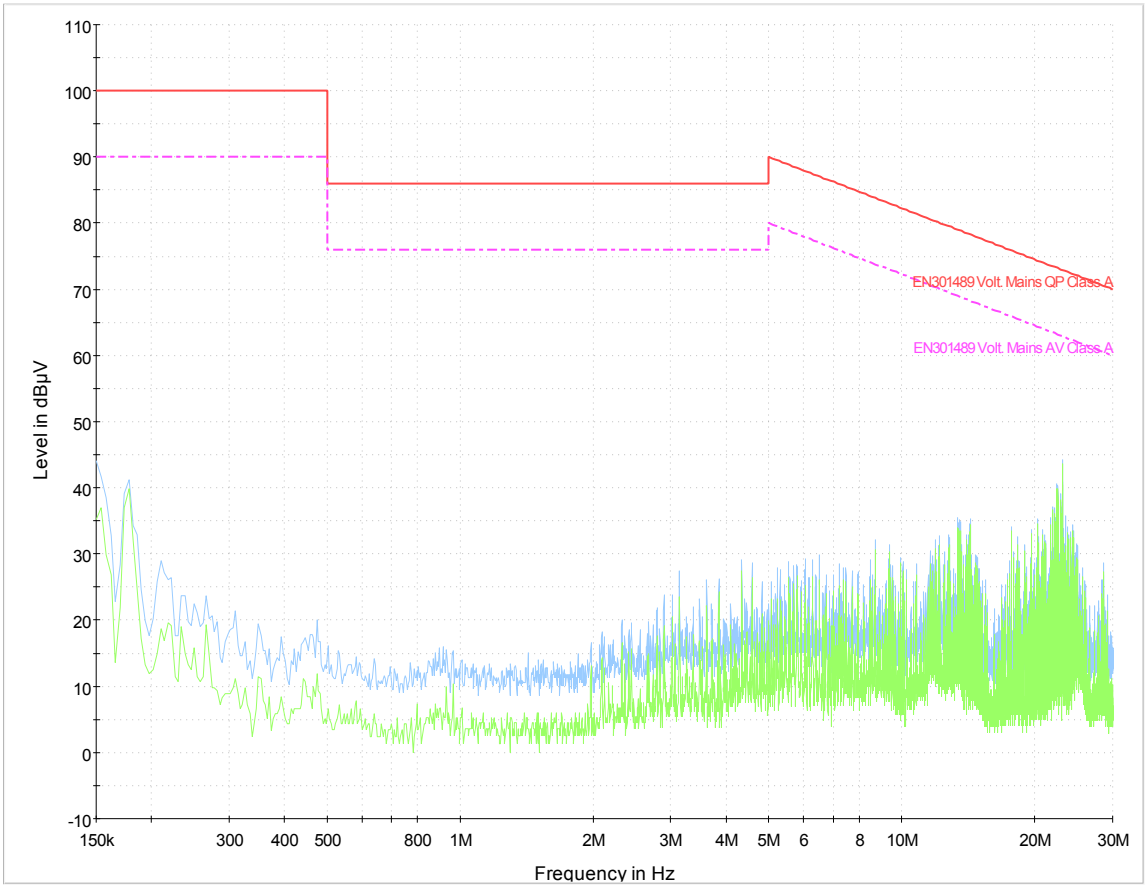


Figure 6-25: Conducted Emission, 0.15 – 30 MHz, Exciter, ATSC