TEST REPORT # EMCC-091067BB, 2012-03-08

This Test Report substitutes Test Report # EMCC-091067B, 2012-03-05

EQUIPMENT UNDER TEST:

Trade Name:	Position detection sensor
Model:	LPR-1DHP
Serial No:	AX00M9126
Equipment Category:	Transponder system / Field disturbance sensor
Manufacturer:	Symeo GmbH
Address:	Professor-Messerschmitt-Straße 3 85579 Neubiberg / Muenchen Germany
Applicant:	as manufacturer
Phone:	+49 89 6607796-0
E-mail	info@symeo.com

RELEVANT STANDARD(S): FCC Part 15 C

MEASUREMENT PROCEDURE USED:

☒ ANSI C63.4-2003 ☐ RSS-Gen Issue 3 ☒ Other: ANSI C63.10-2009

TEST REPORT PREPARED BY:

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TEST PERSONNEL: **HEAD OF ISM, ITE & RFE GROUP:**

Reinhard Sauerschell / Zakaria Khalek / Karlheinz Kraft / Wolfgang Döring

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1 GENERAL INFORMATION

1.1 Purpose

The purpose of this report is to show compliance to the FCC regulations for unlicensed devices operating under section 15 part C § 15.255 of the Code of Federal Regulations title 47.

1.2 Limits and Reservations

The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in this report. This test report shall not be reproduced, except in full without the written permission of EMCCons DR. RAŠEK GmbH & Co. KG.

1.3 Test Location

Company Name:	EMCCons DR. RAŠEK GmbH & Co. KG
Street:	Moggast, Boelwiese 8
City:	91320 Ebermannstadt
Country:	Germany
Address of Labs I, II, III and Head Office:	EMCCons DR. RAŠEK GmbH & Co. KG Moggast, Boelwiese 8 91320 Ebermannstadt Germany
Address of Labs IV and V:	EMCCons DR. RAŠEK GmbH & Co. KG Stoernhofer Berg 15 91364 Unterleinleiter Germany
Test Laboratory:	EMCCons DR. RAŠEK GmbH & Co. KG, Test Laboratory IV located at Stoernhofer Berg 15, 91364 Unterleinleiter, Germany the 3m & 10m semi-anechoic chamber site has been fully described in a report submitted to the FCC, and accepted in the letter dated December 22, 2010, Registration Number 878769.
Name for contact purposes:	Mr Reinhard Sauerschell / Zakaria Khalek / Karlheinz Kraft
Phone:	+49 9194 9016
Fax:	+49 9194 8125
E-Mail:	emc.cons@emcc.de
Web:	www.emcc.de

1.4 Manufacturer

Company Name:	Symeo GmbH
Street:	Professor-Messerschmitt-Straße 3
City:	85579 Neubiberg / Muenchen
Country:	Germany
Name for contact purposes:	Mr Dirk Becker
Phone:	+49 89 6607796-320
E-Mail:	dirk.becker@symeo.com

1.5 Applicant

same as manufacturer

1.6 Dates

Date of receipt of EUT: CW 51/2011
Test date: CW 51/2011, CW 01/2012, CW 02/2012, 06/2012

1.7 Ordering Information

Purchase Order and Date: Order per e-mail dated 2011-12-14
Vendor Number: none

1.8 Climatic Conditions

Date	Temperature [°C]	Relative Humidity [%]	Air Pressure [hPa]	Lab	Customer attended tests
2011-12-22	24.00	30.00	978.00	IV	no
2011-12-23	24.10	32.00	978.00	IV	no
2012-01-02	24.10	35.00	964.00	IV	no
2012-01-03	24.30	34.00	975.00	IV	no
2012-01-04	24.30	33.00	971.00	IV	no
2012-01-05	24.00	32.00	946.00	IV	no
2012-01-10	24.20	32.00	987.00	IV	no
2012-02-02	22.90	19.00	983.00	IV	yes
2012-02-09	22.30	19.00	986.00	IV	no

2 PRODUCT DESCRIPTION

2.1 Equipment Under Test (EUT)

Trade Name:	Position detection sensor
Model:	LPR-1DHP
Serial Number:	AX00M9126
FCC ID	W5ILPR-1DHP
Application:	Transponder system / Field disturbance sensor
Power supply:	24 VDC (range from 10 to 36 VDC)
Frequency range:	61.0 to 61.5 GHz
RF power:	20 dBm EIRP, fixed power
Modulation:	FM CW sweep
Antenna:	Integral lens antenna, 25 - 27 dBi, linear polarized
Internal frequencies:	32.768 kHz (clock), 400 kHz (DC/DC converter), 10 MHz (TCXO), 25 MHz (LAN), 150 MHz (TCXO), 400 MHz (Linux controller), 20.4 GHz (LO)
Operation modes:	a) Point to point operation (two units together, group master and slave unit, facing each other) b) single radar operation
Interface ports:	USB (used for service purposes, only) LAN Ethernet
Temperature range:	- 40 °C to + 75 °C
Variants:	none
Remarks:	None

2.2 EUT Peripherals

None.

2.3 Mode of Operation during Testing

The Position detection sensor was tested both in typical operation modes and in CW mode.
The sensor was configured via USB or LAN interface by software, which was delivered by the manufacturer.
Typical operation modes or configurations are:
- Group master, with min, mid or max bandwidth sweep, measuring rate around 40 Hz,
- Slave mode, with min, mid or max bandwidth sweep, measuring rate around 40 Hz,
- Single Radar station, with min, mid or max bandwidth sweep, measuring rate around 30 Hz.

Bandwidth sweep min = 154 MHz, center frequency = 61.418 GHz,
bandwidth sweep mid = 319 MHz, center frequency = 61.335 GHz,
bandwidth sweep max = 485 MHz, center frequency = 61.253 GHz.
There are eight up and down sweeps (one sweep lasts ca. 1 ms) followed by CW pause of ca. 15 ms.
CW frequency is at the lower band edge at 61.005 GHz.

2.4 Modifications required for Compliance

Modifications were required to limit the conducted emissions on the power line and the radiated emissions below 1 GHz.
Modifications were performed by the manufacturer in the power supply section and in the LAN interface circuit.

3 TEST RESULTS SUMMARY

Summary of Test Results for the following EUT:

Manufacturer: Symeo GmbH
Device: Position detection sensor
Model No.: LPR-1DHP
Serial Number: AX00M9126

Requirement	47 CFR Section	Report Section	Test Result
Spurious emissions conducted	15.207	4	Compliant
Power density	15.255(b)(2)	5	Compliant
Spurious emissions radiated f<40GHz	15.255(c)(2) 15.209	6	Compliant
Spurious emissions radiated f>40GHz	15.255(c)(3)	6	Compliant
Total peak transmitter output power	15.255(e)	7	Compliant
Fundamental emissions within band under temperature and input voltage variation	15.255(f)	8	Compliant
Transmitter identification	15.255(i)	9	Compliant
RF radiation exposure	15.255(g) 1.1310	10	Compliant

The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are factored into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the procedure ANSI C63.4 - 2003, ANSI C63.10-2009 and all applicable Public Notices received prior to the date of testing. All emissions from the device were found to be within the limits outlined in this report.

The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in this report.

Test Personnel: Reinhard Sauerschell / Zakaria Khalek / Karlheinz Kraft
Issuance Date: 2012-03-08

4 POWER LINE CONDUCTED EMISSIONS TEST

Test Requirement: FCC 47 CFR, Part 15C
Test Procedure: ANSI C63.4-2003

4.1 Regulation

Section 15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak (QP)	Average (AV)
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Section 15.207 (c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

4.2 Test Equipment

Type	**Manufacturer Model No.**	**EMCC Ident No.**	**Last Calibration**	**Next Calibration**
EMI Test Receiver	Rohde & Schwarz ESS	303	2011-03	2013-10
V-LISN	Rohde & Schwarz ESH2-Z5	1901	2011-10	2013-10
Protector Limiter	Rohde & Schwarz ESH3-Z2 357.8810.52	1519	N.A	N.A
Standard power supply 115 VACin / 24 VDCout	VERO, 136-104832B	N.A	N.A	N.A
115 VAC 60 Hz power source	Elgar, 251	29	N.A	N.A
Digital Multimeter	Agilent U1241A	2718	2010-06	2012-06

4.3 Test Procedure

The EUT was placed on a wooden table of nominal size 1m by 1.5m, raised 80 cm above the reference groundplane. The vertical conducting wall of the screened room was located 40 cm to the rear of the EUT. The voltage of 24 VDC was delivered from a standard 115 VAC 60 Hz power supply.
The excess length of the power cord of the AC power supply to the EUT was folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
LISN housing, measuring instrument case, reference ground plane and the vertical conducting wall of the screened room were bonded together.

4.4 Test Results

EMCCons DR. RASEK

09. Feb 12 15:47

Conducted Interference TEST

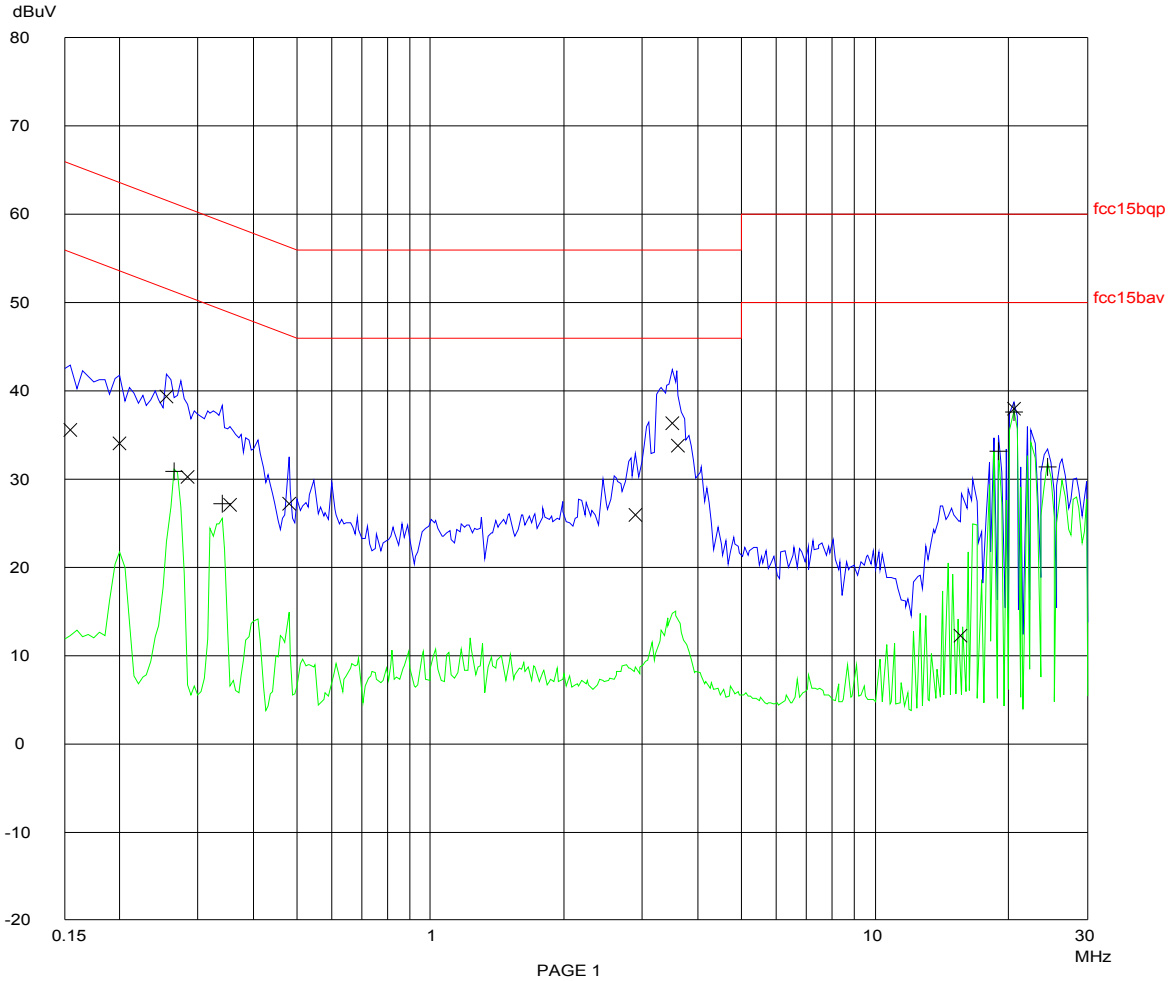
EUT:	LPR-1DHP
Manuf:	Symeo GmbH
Op Cond:	high BW radar passive
Operator:	K.Kraft
Test Spec:	FCC Part15
Comment:	115 V 60 Hz, test on line L
	Limit according to FCC 15 Sub C

Scan Settings (1 Range)

Frequencies			Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten Preamp OpRge
150k	30M	5k	10k	PK+AV	10ms AUTO LN OFF	60dB

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 25dB

Transducer No.	Start	Stop	Name
1	150k	30M	esh3z2



EMCCons DR. RASEK

09. Feb 12 15:47

Conducted Interference TEST

EUT: LPR-1DHP
Manuf: Symeo GmbH
Op Cond: high BW radar passive
Operator: K.Kraft
Test Spec: FCC Part15
Comment: 115 V 60 Hz, test on line L
Limit according to FCC 15 Sub C

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	10k	PK+AV	10ms	AUTO	LN OFF	60dB

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
0.15500	35.6	65.7
0.20000	34.0	63.6
0.25500	39.3	61.6
0.28500	30.2	60.7
0.35500	27.0	58.8
0.48000	27.2	56.4
2.89500	25.9	56.0
3.49500	36.3	56.0
3.60500	33.8	56.0
15.58500	12.3	60.0
20.49500	37.9	60.0

Frequency MHz	AV Level dBuV	AV Limit dBuV
0.26500	30.9	51.3
0.34000	27.2	49.2
18.92000	33.1	50.0
20.49500	37.6	50.0
24.43500	31.3	50.0

* limit exceeded

EMCCons DR. RASEK

09. Feb 12 15:59

Conducted Interference TEST

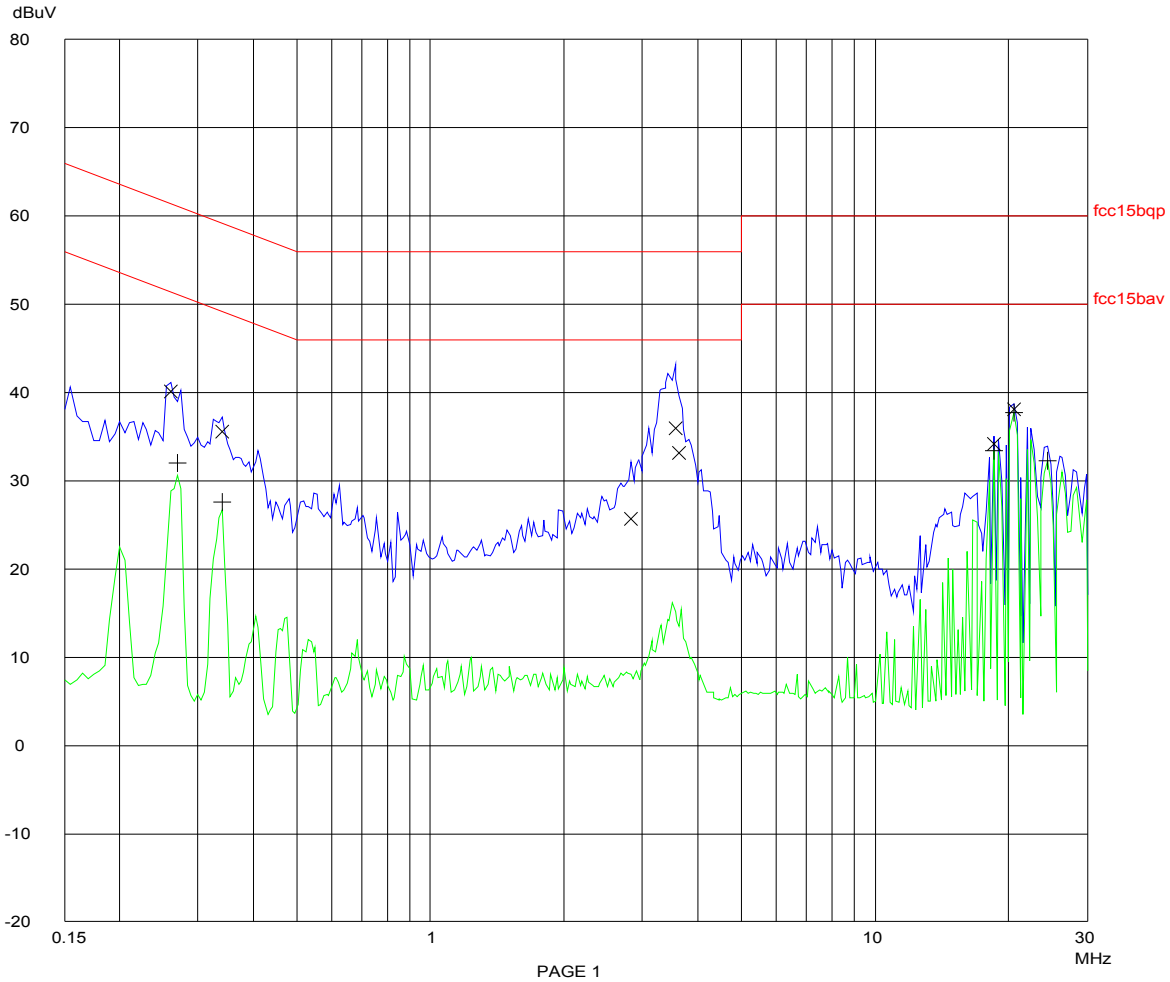
EUT:	LPR-1DHP
Manuf:	Symeo GmbH
Op Cond:	high BW radar passive
Operator:	K.Kraft
Test Spec:	FCC Part15
Comment:	115 V 60 Hz, test on line N
	Limit according to FCC 15 Sub C

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	10k	PK+AV	10ms	AUTO	LN OFF	60dB

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 25dB

Transducer No.	Start	Stop	Name
1	150k	30M	esh3z2



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EMCCons DR. RASEK 09. Feb 12 15:59

Conducted Interference TEST

EUT: LPR-1DHP
Manuf: Symeo GmbH
Op Cond: high BW radar passive
Operator: K.Kraft
Test Spec: FCC Part15
Comment: 115 V 60 Hz, test on line N
Limit according to FCC 15 Sub C

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	10k	PK+AV	10ms	AUTO	LN OFF	60dB

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
0.26000	40.1	61.4
0.34000	35.5	59.2
2.82000	25.6	56.0
3.55500	36.0	56.0
3.61500	33.1	56.0
18.52000	34.2	60.0
20.49000	38.1	60.0

Frequency MHz	AV Level dBuV	AV Limit dBuV
0.27000	32.0	51.1
0.34000	27.5	49.2
18.52000	33.4	50.0
20.49000	37.7	50.0
24.43000	32.2	50.0

* limit exceeded

Modification required for compliance: power supply section was modified by the manufacturer.

The EUT meets the requirements of this section.

Test Personnel: Karlheinz Kraft
Test Date: 2012-02-09

5 POWER DENSITY OF FUNDAMENTAL EMISSION

Test Requirement: FCC §15.255
Test Procedure: ANSI C63.10-2009, § 7.8

5.1 Regulation

§ 15.255 Operation within the band 57–64 GHz
(b) Within the 57–64 GHz band, emission levels shall not exceed the following:
(1) For products other than fixed field disturbance sensors, the average power density of any emission, measured during the transmit interval, shall not exceed 9 μW/cm^2 , as measured 3 meters from the radiating structure, and the peak power density of any emission shall not exceed 18 μW/cm^2 , as measured 3 meters from the radiating structure.
(2) For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0–61.5 GHz, the average power density of any emission, measured during the transmit interval, shall not exceed 9 μW/cm² , as measured 3 meters from the radiating structure, and the peak power density of any emission shall not exceed 18 μW/cm², as measured 3 meters from the radiating structure. In addition, the average power density of any emission outside of the 61–61.5 GHz band, measured during the transmit interval, but still within the 57–64 GHz band, shall not exceed 9 nW/cm² , as measured 3 meters from the radiating structure, and the peak power density of any emission shall not exceed 18 nW/cm² , as measured three meters from the radiating structure.

5.2 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
EMI Test Receiver	Rohde & Schwarz ESIB	516	2010-02	2012-02
Ext mixer	Rohde & Schwarz FS-Z75/WM782V	1548	n.a. (1)	n.a. (1)
Horn antenna	Electrof./Tho, WG25-25	2591	n.a.	n.a.
Power sensor reference	Militech, THM-15-RF000	2597	2008-02	2012-02
RF Power Meter	Hewlett-Packard, 432 A	2112	n.a. (1)	n.a. (1)
Waveguide attenuator	Militech, DRA-15-R0000	2595	n.a. (1)	n.a. (1)
Tripler 60...90 GHz	Spacek Labs, AE-3X	1799	n.a. (1)	n.a. (1)
Digital Multimeter	Agilent	2718	2010-06	2012-06
Power supply	Rohde & Schwarz, NGPE40	340	n.a.	n.a.
Signal Generator	Wiltron, Anritsu, 68369B	2286	2011-04	2013-04

(1) Reference test equipment is calibrated power sensor

5.3 Test Procedure

Test Procedure: ANSI C63.10-2009 § 7.8

The EUT was placed in a distance of 3 meters away from the receiving antenna with external mixer and spectrum analyzer measuring the signals in the frequency band 57 - 64 GHz. The external mixer was directly mounted on the receiving antenna w/o any additional wave guide sections in between.
In ANSI C63.10-2009 § 7.8.1 is written: *If the EUT is capable of disabling the modulation, such that it transmits an unmodulated carrier, then measurements for peak output power and peak power density should be made in this mode.*
The EUT was able to operate in unmodulated mode. Therefore it was set both into sweep modes and into CW mode (sweep disabled, three frequencies used for testing: Flow, Fmid, Fmax) and the amplitudes were investigated and compared.
EUT was rotated over 360° to get the maximum reading. Maximum reading was achieved in main beam direction and in co-polarized condition.

The following spectrum analyzer settings were used:
Resolution Bandwidth (RBW) = 1 MHz.
Video Bandwidth (VBW) = 10 MHz (≥ RBW).
Sweep = auto (CW mode) or ≥10 sec (sweep mode)
Detector function = peak
Trace = max hold

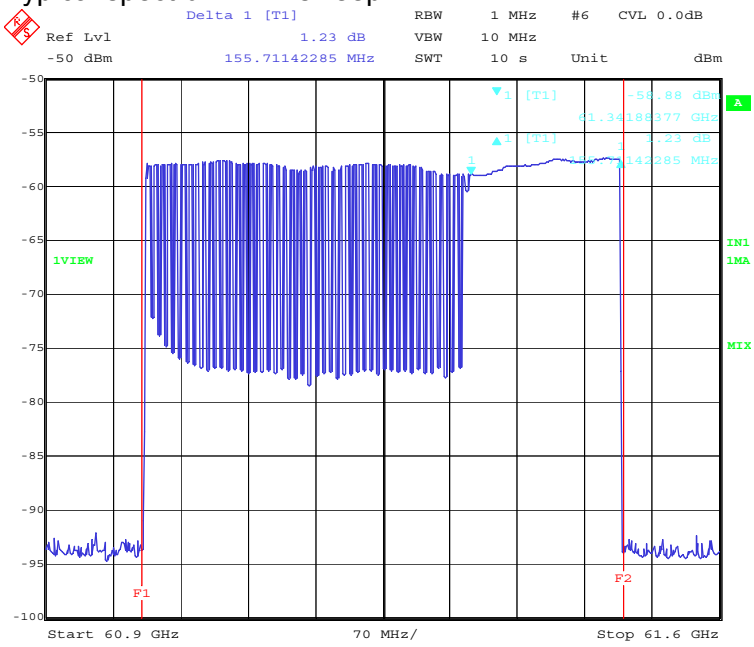
Reading was in dBm. The field strength (dBµV/m) was calculated by converting dBm into dBµV (0 dBm = 107 dBµV) and adding mixer conversion loss (dB) and antenna factor (dB/m).
The power density was calculated by converting the field strength into linear terms and further calculation with formula

$$P_d = E^2 / Z$$

P_d = power density (W/m²),
E = field strength (V/m),
Z = wave impedance of free space (120 π Ω = 377 Ω).

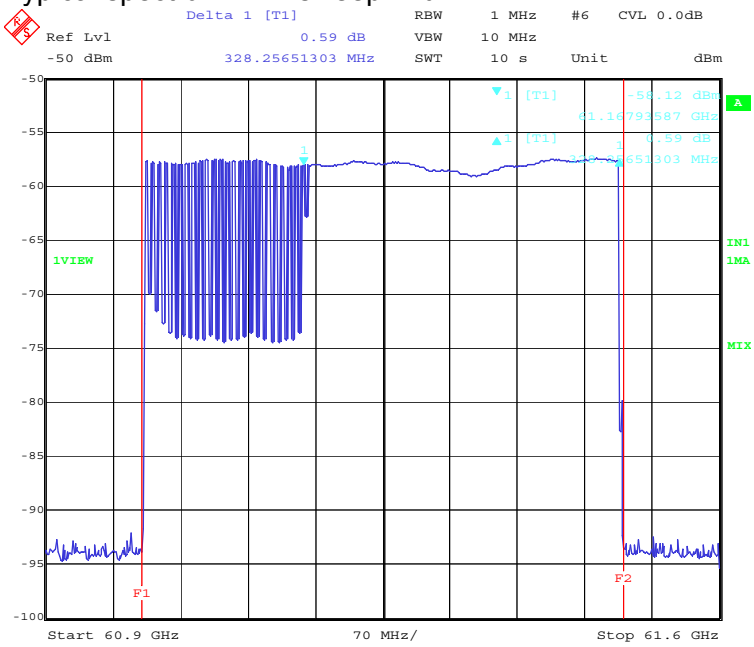
5.4 Test Results

Typical spectrum: BW sweep min



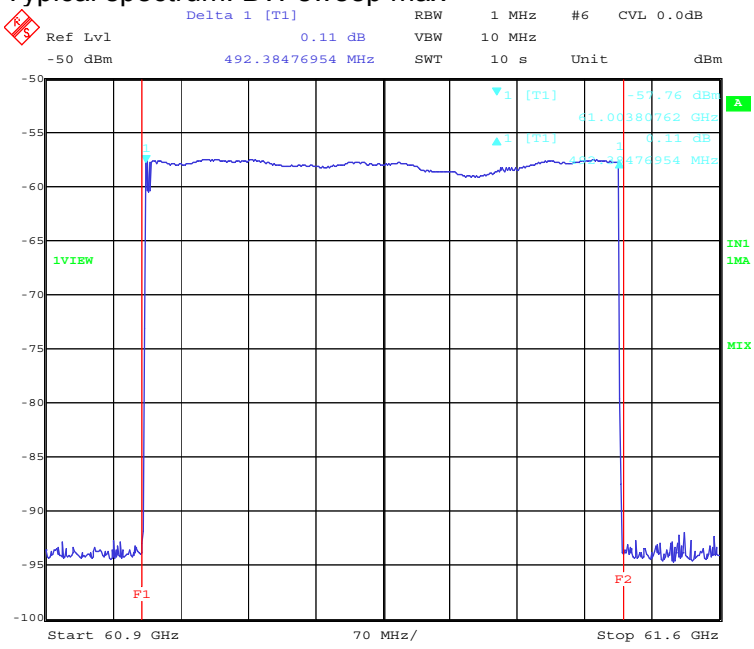
Title: Carrier Sweep, Symeo LPR-1DHP
Comment A: B min BS

Typical spectrum: BW sweep mid



Title: Carrier Sweep, Symeo LPR-1DHP
Comment A: B mid BS

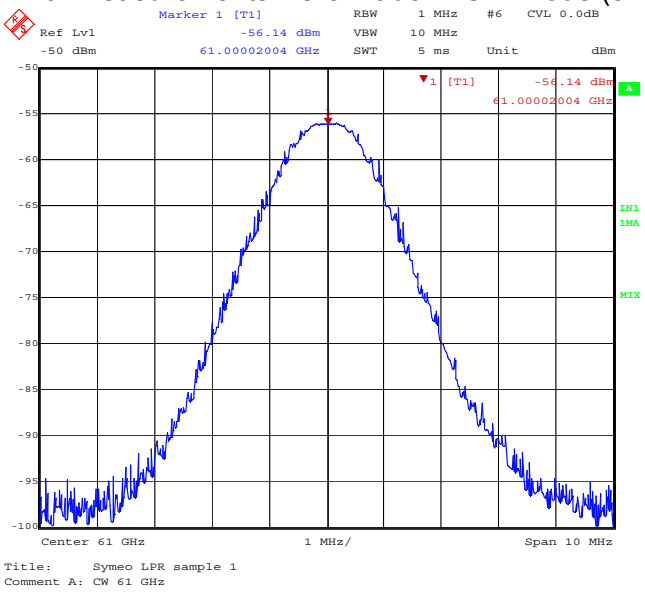
Typical spectrum: BW sweep max



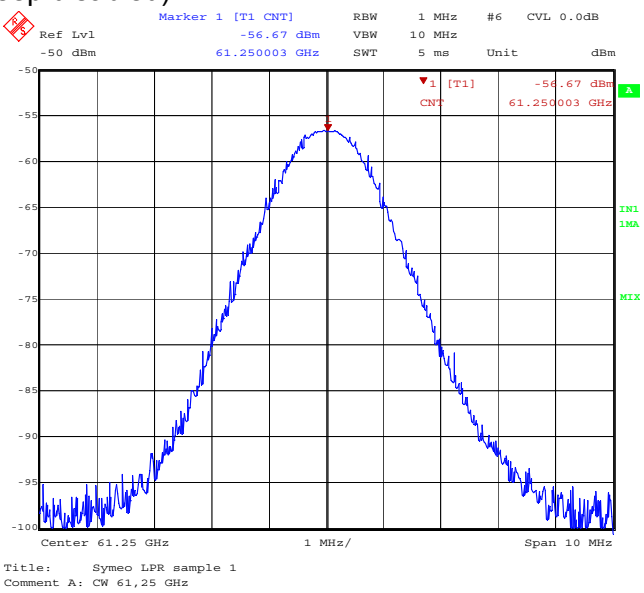
Note: Frequency line F1 = 61.0 GHz, F2 = 61.5 GHz

The typical spectrum was identical in all the three configurations: group master, slave mode and single radar station.

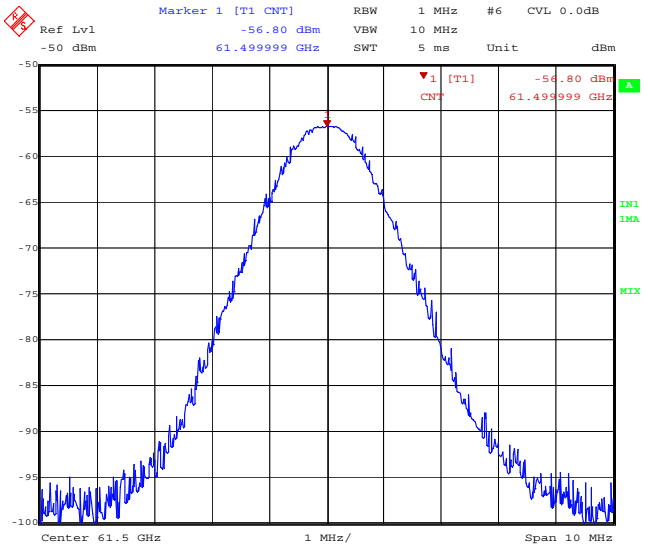
Final measurements were made in CW mode (sweep disabled)



Flow = 61.0 GHz



Fmid = 61.25 GHz



Fmax = 61.5 GHz

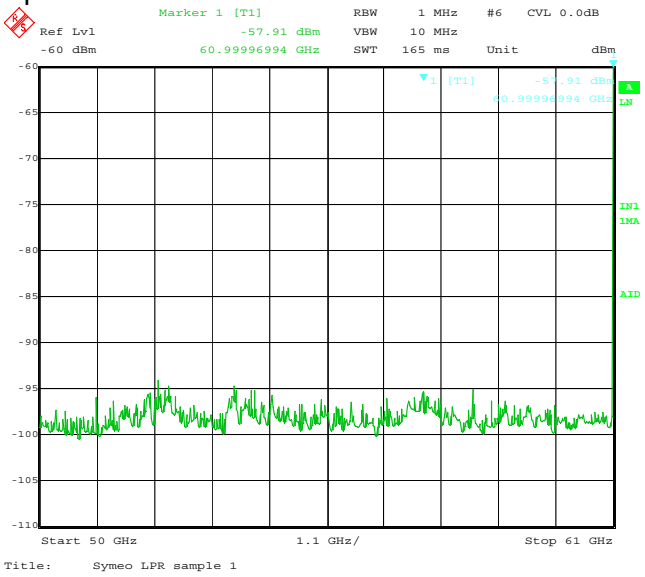
Duty cycle is 100 %. Carrier is continuously on, no TX OFF gaps present. Therefore no duty cycle correction is applicable.

Frequency GHz	Reading dBm	Reading dBµV	Mixer loss dB	Antenna factor dB/m	E Result dB(µV/m)	P_d (1) nW/cm²	P_d Limit AV µW/cm²	P_d Limit PK µW/cm²
61.0	-56.14	50.86	24.8	40.95	116.61	121.5	9	18
61.25	-56.67	50.33	24.8	40.99	116.12	108.6	9	18
61.5	-56.8	50.20	24.8	41.02	116.02	106.1	9	18

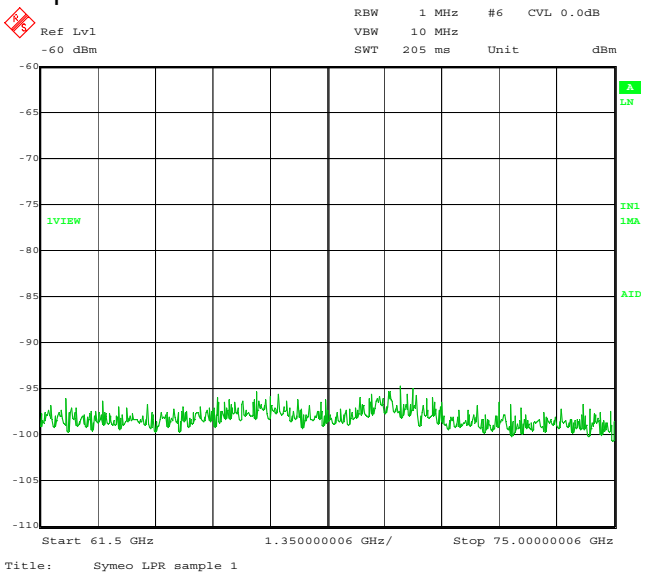
(1) calculated using the equation in § 5.3.

Emissions below 61.0 GHz and above 61.5 GHz
Operation mode of EUT: Group master, BW max, and CW

Spectrum below 61.0 GHz



Spectrum above 61.5 GHz



Emissions below 61.0 GHz and above 61.5 GHz:

Frequency GHz	Reading dBm	Reading dBµV	Mixer loss dB	Antenna factor dB/m	E Result dB(µV/m)	P_d (1) nW/cm²	P_d Limit AV nW/cm²	P_d Limit PK nW/cm²
57 - 61.0	≤ -95	≤ 12	24.8	≤ 40.95	≤ 77.75	≤ 0.016	9	18
61.5 - 64	≤ -95	≤ 12	24.8	≤ 41.37	≤ 78.17	≤ 0.017	9	18

(1) calculated using the equation in § 5.3.

The EUT meets the requirements of this section.

Test Personnel: Reinhard Sauerschell
Test Date: 2011-12-22/-23, 2012-01-02/-03

6 RADIATED SPURIOUS EMISSION

Test Requirement: FCC 47 CFR, Part 15 §255; §15.209
Test Procedure: ANSI C63.4-2003

6.1 Regulation

§ 15.255 Operation within the band 57–64 GHz
(c) Limits on spurious emissions:
(1) The power density of any emissions outside the 57–64 GHz band shall consist solely of spurious emissions.
(2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.
(3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.
(4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

Section 15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency	Field Strength	Measurement distance
(MHz)	(microvolts/meter)	(meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100	3
88–216	150	3
216–960	200	3
Above 960	500	3

(b) In the emission table above, the tighter limit applies at the band edges.
(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
(e) The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.
(f) In accordance with Section 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in Section 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in Section 15.205, the limit on spurious emissions specified for the

intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in Section 15.109 that are applicable to the incorporated digital device.

§ 15.31 Measurement standards
(1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).
(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

6.2 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. The basic equation with a sample calculation is as follows:
FS = RA + AF + CF
where
FS = Field Strength in dBµV/m
RA = Receiver Amplitude in dBµV
AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB
Assume a receiver reading of 23.5 dBµV is obtained. The Antenna Factor of 7.4 dB(1/m) and a Cable Factor of 1.1 dB are added, giving a field strength of 32 dBµV/m. The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.
FS = 23.5 + 7.4 + 1.1 = 32 [dBµV/m]
Level in µV/m = Common Antilogarithm (32/20) = 39.8

Note: In the result tables below the Antenna Factor already includes the cable attenuation.

For test distance other than what is specified, but fulfilling the requirements of Section 15.31 (f)(1) the field strength is calculated by adding additionally an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements). The basic equation with a sample calculation is as follows:
FS = FST + DF
where
FS = Field Strength in dBµV/m
FST = Field Strength at test distance in dBµV/m
DF = Distance Extrapolation Factor in dB,
where DF = 20 log (Dtest/Dspec) where Dtest = Test Distance and Dspec = Specified Distance
Assume the tests performed at a reduced Test Distance of 1.5 m instead of the Specified Distance of 3 m giving a Distance Extrapolation Factor of DF = 20 log(1.5m/3m) = -6 dB.

Assuming a measured field strength level of 32 dBµV/m is obtained. The Distance Factor of -6 dB is added, giving a field strength of 26 dBµV/m. The 26 dBµV/m value can be mathematically converted to its corresponding level in µV/m.
FS = 23.5 + 7.4 + 1.1 - 6 = 26 [dBµV/m]
Level in µV/m = Common Antilogarithm (26/20) = 20

Same calculation is used accordingly with an inverse linear distance extrapolation factor of 40 dB/decade to Section 15.31 (f)(2) for frequencies below 30 MHz.

6.3 Frequency range up to 30 MHz (H-field)

6.3.1 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
Receiver (9 kHz - 30 MHz)	Rohde & Schwarz ESS	303	2011-03	2012-09
Loop Antenna (9 kHz - 30 MHz)	Rohde & Schwarz HFH2-Z2	374	2011-04	2014-04

6.3.2 Test Procedures

ANSI C63.4-2003 §8.2.1 Magnetic field radiated emissions below 30 MHz
Magnetic field measurements are made in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna as specified in 4.5.1, positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. This method is applicable for radiated radio-noise measurements from all units, cables, power cords, and interconnect cabling or wiring. For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT.

The EUT was tested on a 0.8 meter high support.

With the EUT operating in a fixed transmitting mode, emissions from the unit are maximized by rotating the receive loop antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions. All tests performed with the EUT placed on the nonconductive platform. Worst case emissions are listed under chapter: test results.

Radiated spurious emissions test characteristics	
Frequency range	9 kHz – 30MHz
Operating mode	Group master, BW max
Test distance	3 m
Test instrumentation resolution bandwidth	200 Hz (f < 150 kHz) 10 kHz (f > 150 kHz)
Receive antenna scan height	n.a., fixed height 1 m
Receive antenna polarization	n.a.

6.3.3 Test Results

EMCCons DR. RASEK 03. Jan 12 17:14

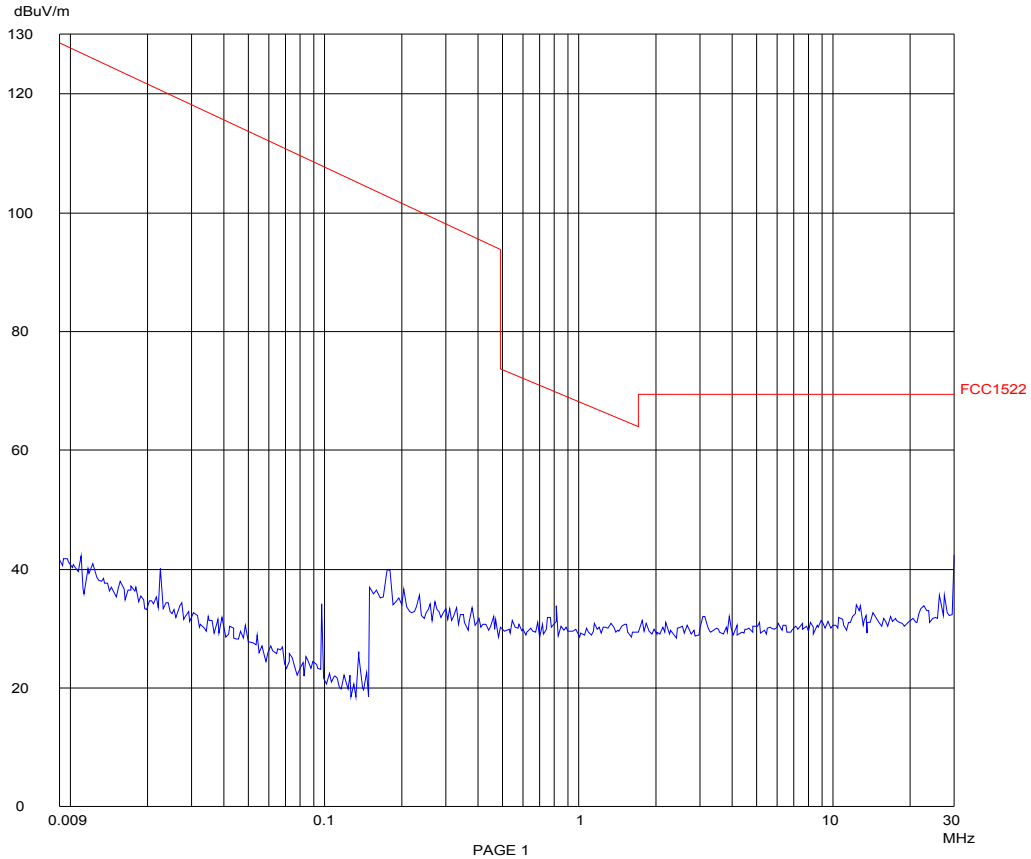
Radiated Emissions H Field in SAR, d=3m

EUT: LPR-1DHP
Manuf: SYMEO
Op Cond: BS high BW
Operator: Sauerschell
Test Spec: FCC 15
Comment: 4 sides, ant: I, _
S/M: MTE803-338

Scan Settings (2 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
9k	150k	100Hz	200Hz	PK	10ms AUTO	LN OFF	60dB	
150k	30M	5k	10k	PK	5ms AUTO	LD OFF	30dB	

Final Measurement: x Hor-Max / + Vert-Max
Meas Time: 1 s
Subranges: 25
Acc Margin: 30dB



No main emissions detected. Noise more than 30 dB below limit.

The EUT meets the requirements of this section.

Test Personnel: Reinhard Sauerschell
Test Date: 2012-01-03

6.4 Frequency range 30 MHz to 1 GHz

6.4.1 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
Receiver (30 MHz - 1 GHz)	Rohde & Schwarz ESS	303	2011-03	2012-09
Antenna (30 MHz - 1 GHz)	EMCO Model 3143	898	2011-05	2013-05

6.4.2 Test Procedures

ANSI C63.4-2003 §8.2.3 Electric field radiated emissions (30 MHz to 1 GHz)
Electric field measurements are made in the frequency range of 30 MHz to 1000 MHz using a calibrated linearly polarized antenna as specified in 4.5.3, which shall be positioned at the specified distance from the periphery of the EUT. The specified distance is the distance between the horizontal projection onto the ground plane of the closest periphery of the EUT and the projection onto the ground plane of the center of the axis of the elements of the receiving antenna. However, if the receiving antenna is a log-periodic dipole array antenna, the specified distance shall be the distance between the closest periphery of the EUT and the front-to-back center (midpoint along boom/feeder transmission line) of the array of elements.
Measurements shall be made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna shall be varied in height above the reference ground plane to obtain the maximum signal strength. Unless otherwise specified, the measurement distance shall be 3 m or 10 m. At either measurement distance, the antenna height shall be varied from 1 m to 4 m.
These height scans apply for both horizontal and vertical polarizations, except that for vertical polarization, the minimum height of the center of the antenna shall be increased so that the lowest point of the bottom of the lowest antenna element clears the site reference ground plane by at least 25 cm. For a tuned dipole, the minimum heights as measured from the center of the antenna are shown in Table D.3.

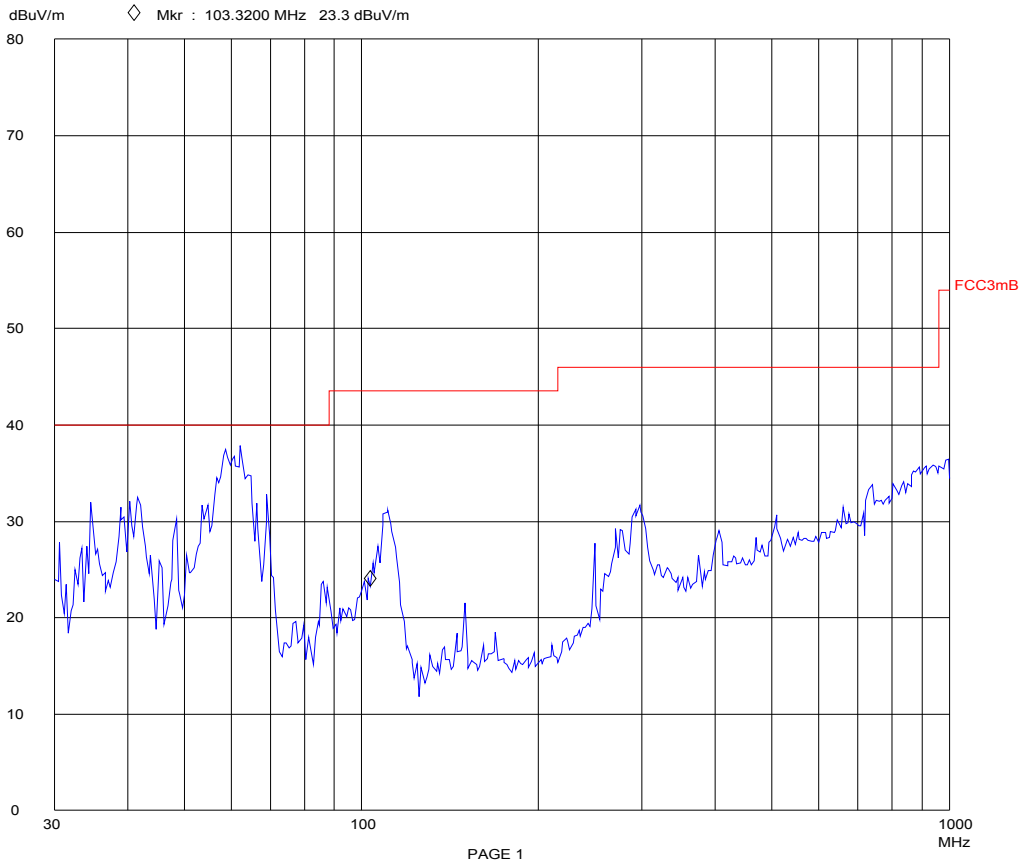
The EUT was tested on a 0.8 meter high support.

With the EUT operating in a fixed transmitting mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions. All tests performed with the EUT placed on the nonconductive platform. Worst case emissions are listed under chapter: test results.

Radiated spurious emissions test characteristics	
Frequency range	30 MHz – 1 GHz
Operating mode	Group master, BW max
Test distance	3 m
Test instrumentation resolution bandwidth	120 kHz
Receive antenna scan height	1 m to 4 m
Receive antenna polarization	Vertical/Horizontal

6.4.3 Test Results

Prescan plot:



FINAL RESULTS: SPURIOUS EMISSIONS											
No	Emission Frequency [MHz]	Receiver Mode and Bandwidth [kHz]	Test Distance [m]	Receiver Reading RA [dB(µV)]	Correction Factor AF+CF [dB(1/m)]	DF [dB]	Result = Corrected Reading FS [dB(µV/m)]	Spec Limit [dB(µV/m)]	Polarization Antenna	Margin [dB]	Notes
1	35.066	120, QP	3	14.7	11.5	0	26.2	40 QP	v	13.8	
2	58.69	120, QP	3	27.2	6.7	0	33.9	40 QP	v	6.1	
3	62.28	120, QP	3	25.2	6.8	0	32.0	40 QP	v	8.0	
4	110.76	120, QP	3	18.5	7.4	0	25.9	43.5 QP	v	17.6	

Modification required for compliance: LAN interface circuit was modified by the manufacturer.

The EUT meets the requirements of this section.

Test Personnel: Karlheinz Kraft
Test Date: 2012-02-02

6.5 Frequency range 1 GHz to 40 GHz

6.5.1 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
EMI Test Receiver	Rohde & Schwarz ESIB	516	2010-02	2012-02
Double Ridged Guide Ant.	Schwarzbeck BBHA 9120D	3235	2009-12	2012-12
Standard Gain Horn Ant.	Mid Century, MC 20/31B	1300	n.a.	n.a.
Standard Gain Horn Ant.	Mid Century, MC 22/31B	894	n.a.	n.a.

6.5.2 Test Procedures

ANSI C63.4-2003 §8.2.4 Electric field radiated emissions (1 GHz to 40 GHz)

Radiated emission measurements above 1 GHz are made using calibrated linearly polarized antennas as specified in 4.5.4, which may have a smaller beamwidth (main lobe) than do the antennas used for frequencies below 1 GHz. Because some EUTs may have a size larger than the beamwidth of the antenna at the specified measurement distance, and because the source of emissions is generally limited to relatively small-angle cones of radiation, the antenna beamwidth shall be known so that when emissions from large EUTs are measured, the area of coverage of the EUT can be determined. Moving the measurement antenna over the surfaces of the four sides of the EUT or another method of scanning of the EUT is required when the EUT is larger than the beamwidth of the measuring antenna. When radiated measurements are made at the measurement distance and the measurement antenna does not completely encompass a large EUT at that distance, additional measurements at a greater distance may be necessary to demonstrate that emissions were at maximum at the limit distance.

For any EUT, the frequencies of emission should first be detected. Then the amplitudes of the emissions are measured at the specified measurement distance using the required antenna height, polarization, and detector characteristics.

In performing these measurements, the sensitivity of the complete measurement system relative to the limit shall be determined before the test. If the overall measurement sensitivity is inadequate, then low-noise preamplifiers, closer measurement distances, higher gain antennas, or narrower bandwidths may be used. If closer measurement distances or higher gain antennas are used, then the beamwidth versus size of the EUT shall be taken into account. Also, measurement system overload levels shall be determined to be adequate when preamplifiers are used. The effects of using bandwidths different from those specified shall also be determined. Any changes from the specific measurement conditions shall be described in the report of the measurements. (See also 10.2.4 and 10.2.9.)

The EUT was tested on a 0.8 meter high support.

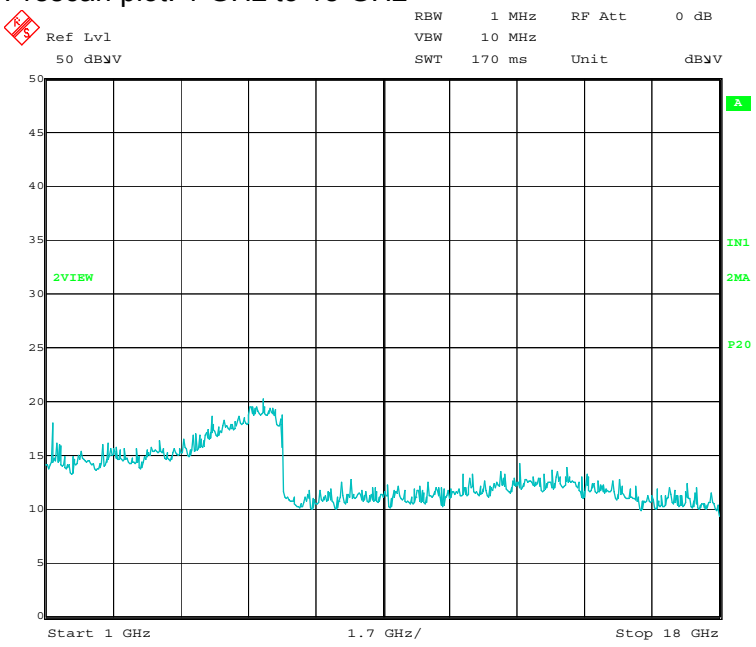
With the EUT operating in a fixed transmitting mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions. All tests performed with the EUT placed on the nonconductive platform.

Prescans were performed in close distances of some 0.1 m to detect emissions accordingly. Final results were taken in distances listed below (3m or 1 m). Worst case emissions are listed under chapter: test results.

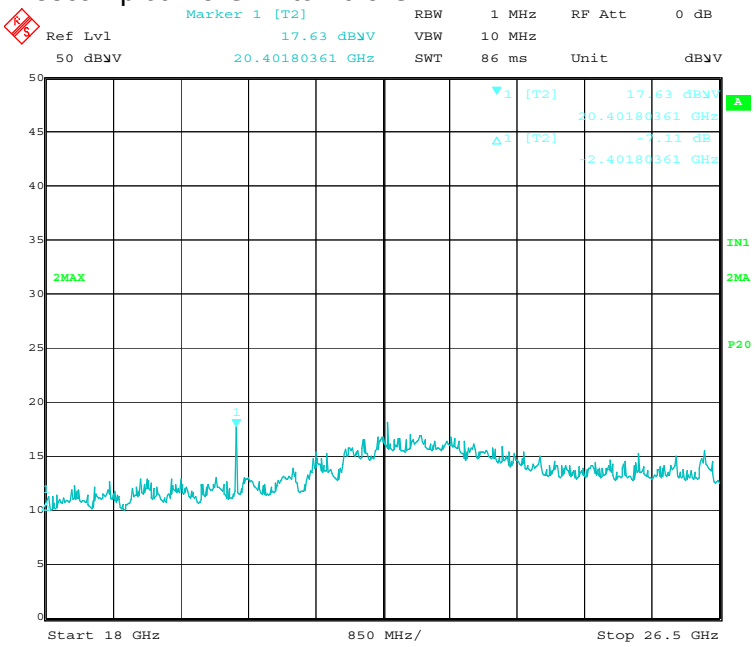
Radiated spurious emissions test characteristics	
Frequency range	1 GHz – 40 GHz
Operating mode	Group master, BW max, and CW mode
Test distances	prescan: 0.1 m, final test: 3 m / 1 m
Test instrumentation resolution bandwidth	1 MHz
Receive antenna scan height	1 m to 1.5 m
Receive antenna polarization	Vertical/Horizontal

6.5.3 Test Results

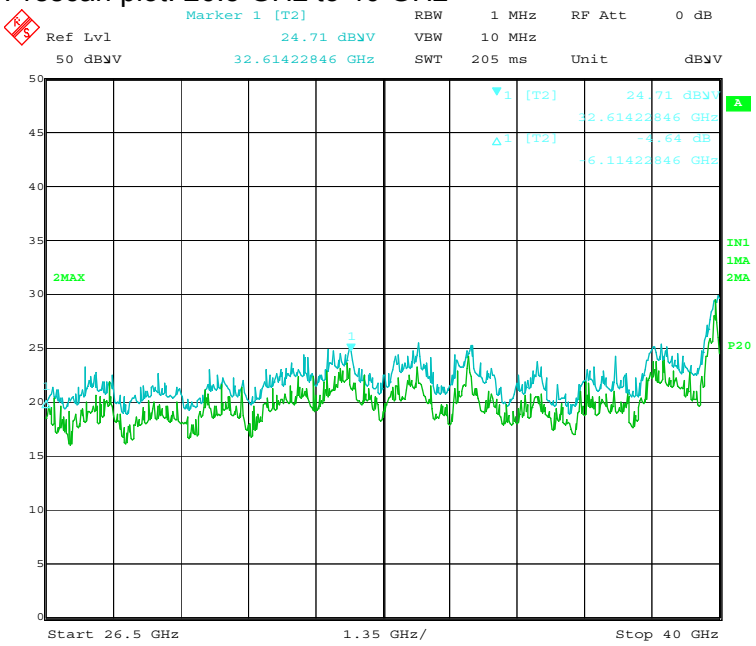
Prescan plot: 1 GHz to 18 GHz



Prescan plot: 18 GHz to 26.5 GHz



Prescan plot: 26.5 GHz to 40 GHz



FINAL RESULTS: SPURIOUS EMISSIONS											
No	Emission Frequency MHz	Receiver Mode and Bandwidth kHz	Test Distance m	Receiver Reading RA dB(µV)	Correction Factor AF+CF dB(1/m)	 DF dB	Result = Corrected Reading FS dB(µV/m)	Spec Limit dB(µV/m)	Polarization Antenna	Margin dB	Notes
1	1404	1000 PK	3	20.1	27.1	0	47.2	54 (AV)	v	6.8	
2	20400	1000 PK	1	23.9	38.1	-9.5	52.5	54 (AV)	v	1.5	

The EUT meets the requirements of this section.

Test Personnel: Zakaria Khalek, Karlheinz Kraft, Reinhard Sauerschell
Test Date: 2012-01-05, 2012-02-02

6.6 Frequency range 40 GHz to 200 GHz

6.6.1 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
EMI Test Receiver	Rohde & Schwarz ESIB	516	2010-02	2012-02
Ext mixer	Rohde & Schwarz FS-Z75/WM782V	1548	n.a. (1)	n.a. (1)
Horn antenna	Electrof./Tho, WG25-25	2591	n.a.	n.a.
Power sensor, reference	Millitech, THM-15-RF000	2597	2008-02	2012-02
RF Power Meter	Hewlett-Packard, 432 A	2112	n.a. (1)	n.a. (1)
Waveguide attenuator	Millitech, DRA-15-R0000	2595	n.a. (1)	n.a. (1)
Tripler 60...90 GHz	Spacek Labs, AE-3X	1799	n.a. (1)	n.a. (1)
Digital Multimeter	Agilent	2718	2010-06	2012-06
Power supply	Rohde & Schwarz, NGPE40	340	n.a.	n.a.
Ext mixer	Rohde & Schwarz FS-Z60/WM782U	1547	n.a. (1)	n.a. (1)
Standard Gain Horn Ant.	FMI/Pro NOVA, 2424-25	1333	n.a.	n.a.
Power sensor, reference	Millitech, THM-22-RF000	2110	2010-09	2014-09
Power sensor, reference	Millitech, THM-10-RF000	2596	2008-02	2012-02
Signal Generator	Wiltron, Anritsu, 68369B	2286	2011-04	2013-04
Ext mixer	Rohde & Schwarz FS-Z110/WM782W	1546	n.a. (1)	n.a. (1)
Standard Gain Horn Ant.	Electrof./Tho, Electrof./Tho	2600	n.a.	n.a.
Waveguide attenuator	Millitech, DRA-10-R0000	2594	n.a. (1)	n.a. (1)
Tripler 90...120 GHz	VDI Virginia Diodes, WR9.3x3	1798	n.a. (1)	n.a. (1)
Standard Gain Horn Ant.	FMI/Pro NOVA, 2824-25	3157	n.a.	n.a.
Waveguide Mixer	Tektronix, WM 490 F	3128	n.a.	n.a.
Waveguide Mixer	Tektronix, WM 490 G	-	n.a.	n.a.
Standard Gain Horn Ant.	FMI/Pro NOVA, 3024-25	-	n.a.	n.a.

(1) Instruments referenced on calibrated power sensors
Calibrations above 110 GHz not available.

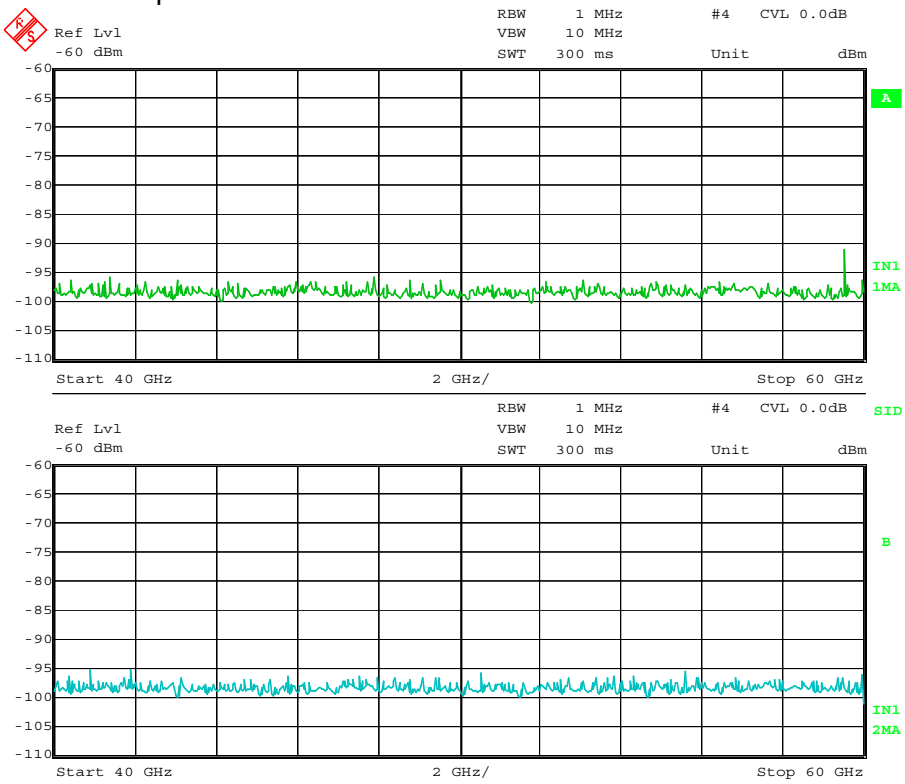
6.6.2 Test Procedures

The basics of the tests are equal or similar as described above. External mixers were used, which were mounted directly on the horn antennas. The EUT was scanned in very close distances (ca. 1 cm) to the surface to get spurious signals. There were made broadband scans and narrowband scans on potential frequencies, i.e. harmonics of carrier and LO (20.4 GHz). During the tests the EUT was operating in CW mode.

Radiated spurious emissions test characteristics	
Frequency range	40 GHz to 200 GHz
Operating mode	CW
Test distance	1 cm to 100 cm
Test instrumentation resolution bandwidth	1 MHz
Receive antenna scan height	n.a.
Receive antenna polarization	Vertical/Horizontal

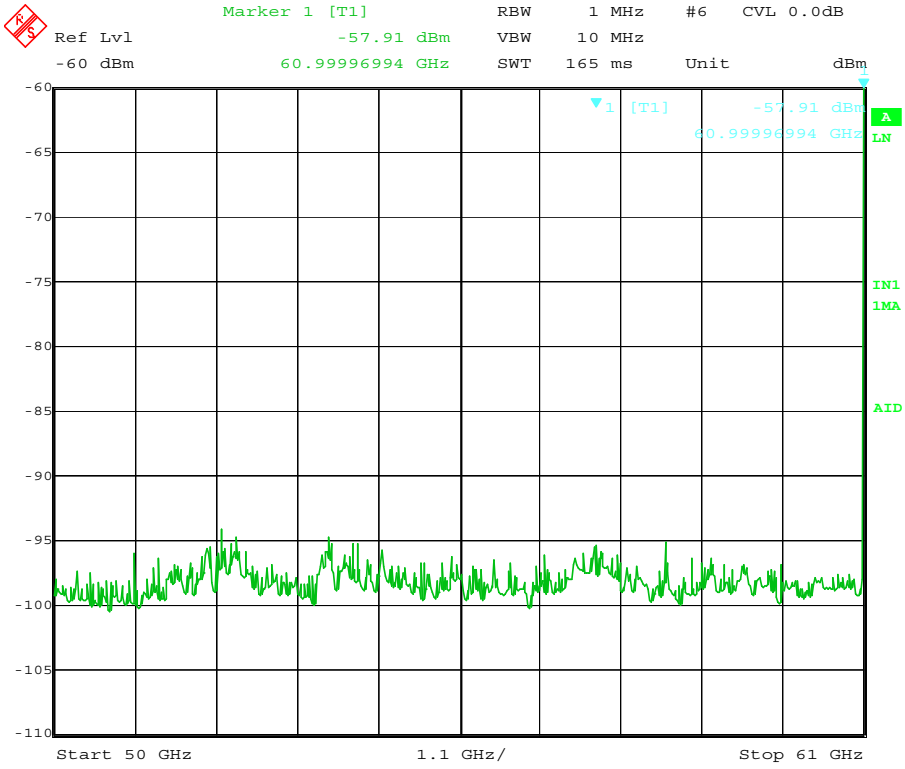
6.6.3 Test Results

Broadband plots:

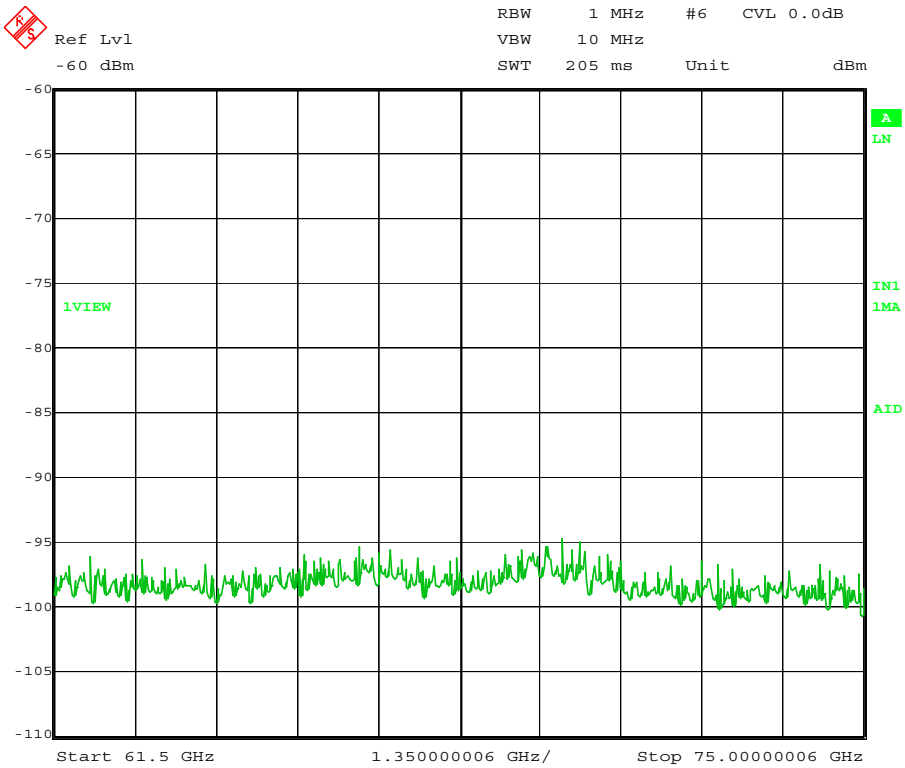


Title: Symeo LPR sample 1
Comment A: CW 61 GHz

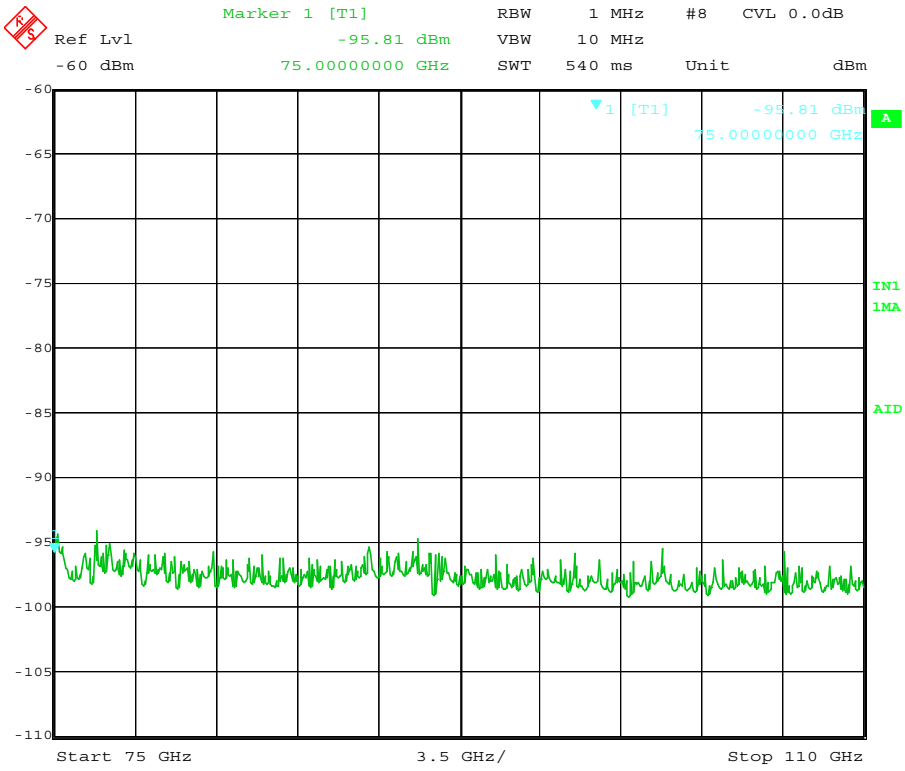
Note: two spectra due to signal identification feature of spectrum analyzer



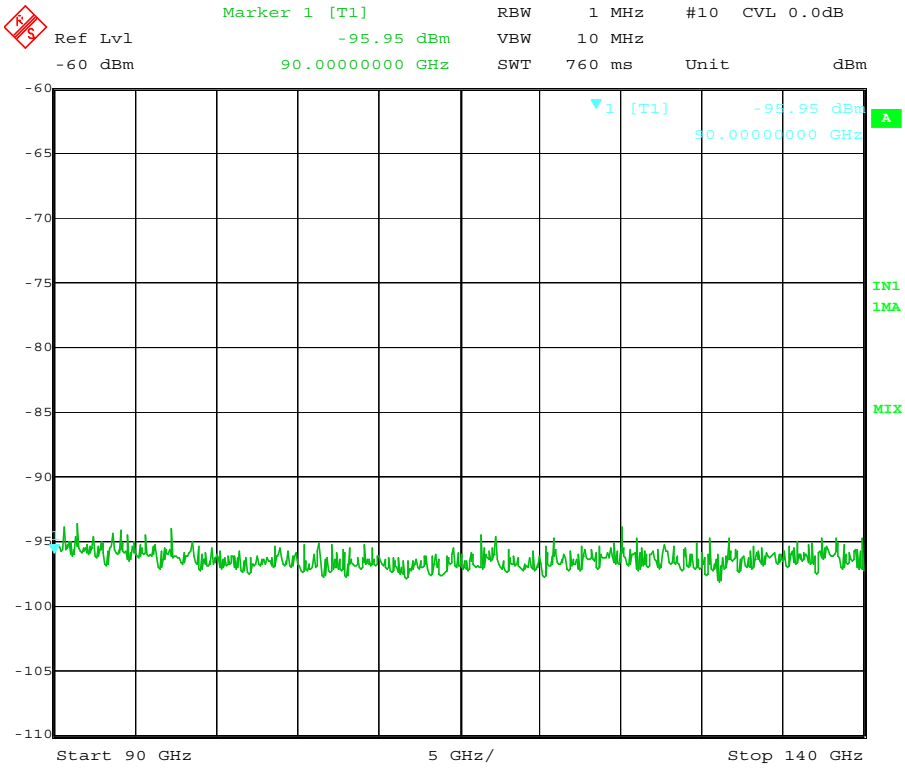
Title: Symeo LPR sample 1
Comment A: CW 61 GHz
Date: 2.JAN.2012 16:12:01



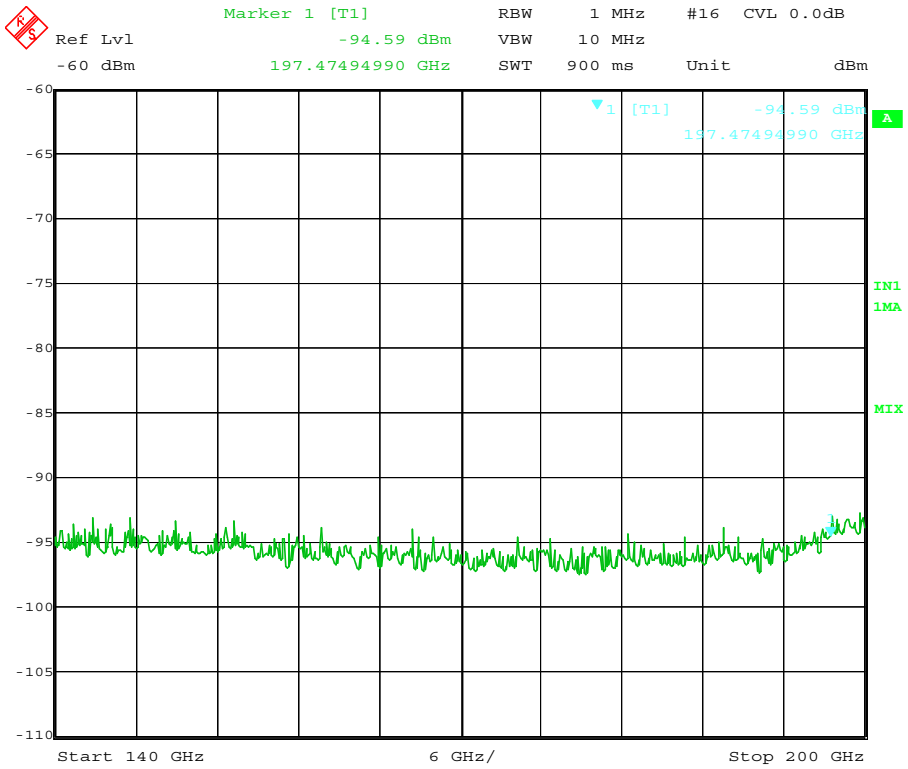
Title: Symeo LPR sample 1
Comment A: CW 61 GHz
Date: 2.JAN.2012 16:16:20



Title: Symeo LPR sample 1
Comment A: CW 61 GHz
Date: 2.JAN.2012 18:15:49



Title: Symeo LPR sample 1
Comment A: CW 61 GHz
Date: 2.JAN.2012 18:41:07



Title: Symeo LPR sample 1
Comment A: CW 61 GHz
Date: 2.JAN.2012 18:52:14

Freq. GHz	Reading dBm	Reading dBµV	Mixer loss dB	Antenna Factor dB/m	Result dBµV/m @ test distance	P_d pW/cm^2 @ test distance	Test distance m	P_d pW/cm^2 @ 3 meters	Remarks
40.8	-96	11	20	37.5	68.5	1.8	1	0.2	ambient noise
81.6	-96	11	40	43.5	94.5	744	0.2	3.3	ambient noise
102	-96	11	48	45.4	104.4	7337	0.1	8.1	ambient noise
122	-95	12	53	47	112	41787	0.01	0.46	ambient noise
122.4	-95	12	53	47	112	42062	0.01	0.47	ambient noise
142.8	-93	14	60	48.3	122.3	454760	0.01	5.05	ambient noise
163.2	-95	12	60	49.5	121.5	374771	0.01	4.16	ambient noise
183	-96	11	60	50.5	121.5	374307	0.01	4.16	ambient noise
Limit is 90 pW/cm² in a distance of 3 meters									

The EUT meets the requirements of this section.

Test Personnel: Reinhard Sauerschell
Test Date: 2012-01-02

7 TOTAL PEAK TRANSMITTER OUTPUT POWER TEST

Test Requirement: FCC 47 CFR, Part 15C
Test Procedure: ANSI C63.10-2009

7.1 Regulation

Section 15.255
(e) Except as specified elsewhere in this paragraph (e), the total peak transmitter output power shall not exceed 500 mW.
(2) Peak transmitter output power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57–64 GHz band and that has a video bandwidth of at least 10 MHz, or using an equivalent measurement method.
(3) For purposes of demonstrating compliance with this paragraph (e), corrections to the transmitter output power may be made due to the antenna and circuit loss.

7.2 Test Equipment

Refer to chapter 5.2 of this test report.

7.3 Test Procedure

ANSI C63.10-2009 §7.8.2 Calculation of the peak output power of the EUT
The peak output power of the EUT may be calculated from the measured peak field strength, if the gain of the EUT radiating element is known, using following equation.

$$P = (E * d)^2 / (30 * G)$$

where
P is the power, in W
E is the measured peak field strength, in V/m
d is the distance at which the measurement was made, in m
G is the numeric gain of the radiating element

Taking the peak field strength results from chapter 5 of this test report the peak output power can be calculated.

7.4 Test Results

Field strength results taken from chapter 5.4 of this test report.
Antenna gain of EUT = 25 dBi (= numeric gain of 316), test distance = 3 meters

Frequency GHz	E Result dB(µV/m)	E V/m	P mW	Limit P mW	Remarks
61.0	116.61	0.677	0.435	500	
61.25	116.12	0.64	0.388	500	
61.5	116.02	0.632	0.38	500	

The EUT meets the requirements of this section.

Test Personnel: Reinhard Sauerschell
Test Date: 2011-12-22/-23, 2012-01-02/-03

8 EMISSIONS WITHIN BAND UNDER TEMPERATURE AND INPUT VOLTAGE VARIATION TEST

Test Requirement: FCC 47 CFR, Part 15C
Test Procedure: ANSI C63.10-2009

8.1 Regulation

Section 15.255 (f) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range −20 to +50 degrees celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

8.2 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
EMI Test Receiver	Rohde & Schwarz ESIB	516	2010-02	2012-02
Ext mixer	Rohde & Schwarz FS-Z75/WM782V	1548	n.a.	n.a.
Horn antenna	Electrof./Tho, WG25-25	2591	n.a.	n.a.
Digital Multimeter	Agilent	2718	2010-06	2012-06
Power supply	Rohde & Schwarz, NGPE40	340	n.a.	n.a.

8.3 Test Procedure

ANSI C63.10-2009 §7.8.7 Frequency stability instrumentation and measurement procedures for millimeter wave devices
The following procedure shall be used for determining frequency stability of millimeter wave systems:
a) Arrange EUT and test equipment as shown in Figure 12. The external mixer may be placed inside the temperature chamber if its frequency drift characteristics vs. temperature are known and can be accounted for during the final reported measurements; otherwise, the mixer should be placed outside the chamber in front of the temperature chamber door, and the chamber door opened for each reading.
b) With the EUT at ambient temperature (approximately 25 °C) and voltage source set to the EUT nominal operating voltage (100 %), record the spectrum mask of the EUT emission on the spectrum analyzer.
c) Vary EUT power supply between 85 % to 115 % of nominal and record the frequency excursion of the EUT emission mask.
d) Set the power supply to 100 % nominal setting, raise EUT operating temperature to 50 °C. Record the frequency excursion of the EUT emission mask.
e) Repeat step d) at each 10 °C increment down to –20 °C.

The test setup during the tests was as following: the EUT was placed inside the temperature chamber facing to the receiving test antenna located outside. Power supply was also located outside. Temperature and voltage was varied over the entire range as specified by the manufacturer.

8.4 Test Results

The band edges to be investigated were chosen as the equivalent level of spurious emissions outside the 61 to 61.5 GHz band as demanded in § 15.255 (b): ... In addition, the average power density of any emission outside of the 61–61.5 GHz band, measured during the transmit interval, but still within the 57–64 GHz band, shall not exceed 9 nW/cm², as measured 3 meters from the radiating structure, and the peak power density of any emission shall not exceed 18 nW/cm², as measured three meters from the radiating structure.

Taking the results from chapter 5.4 of this test report for calculating the relative decreasing of the level for the band edge definition:

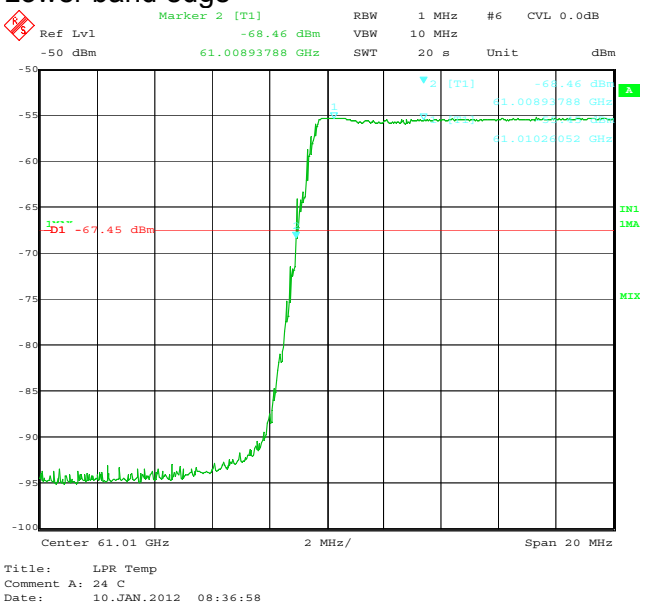
Frequency GHz	P_d nW/cm²	P_d dB(nW/cm²)	Limit of spur. emissions nW/cm²	Limit of spur. emissions dB(nW/cm²)	N dB down	Remarks
61.0	121.5	20.8	9	9.5	11.3	
61.5	106.1	20.3	9	9.5	10.8	

The EUT was set into the mode "single radar operation, bandwidth sweep max" and the lower and upper band edge was investigated.

Under normal temperature (24 °C) the "N dB down" value was set at the lower and upper band edge. A value of 12 dB was chosen instead of the calculated 11.3 dB or 10.8 dB. The settings were held over the complete temperature drift regardless of any amplitude drifts of the carrier.

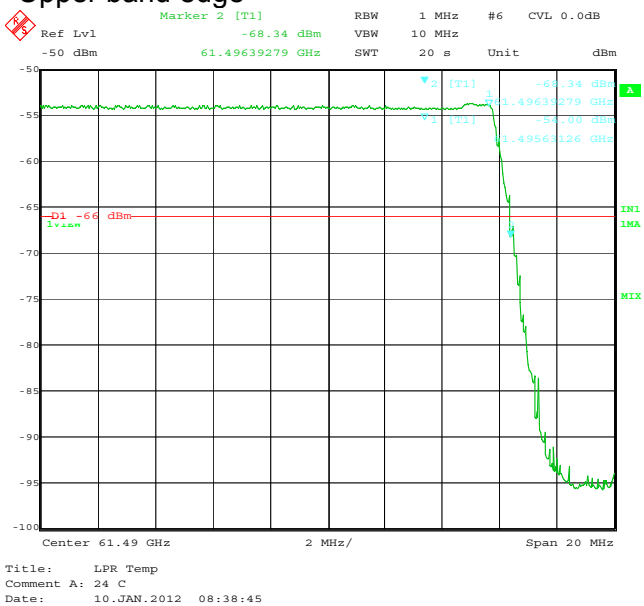
Plots of spectra

Lower band edge



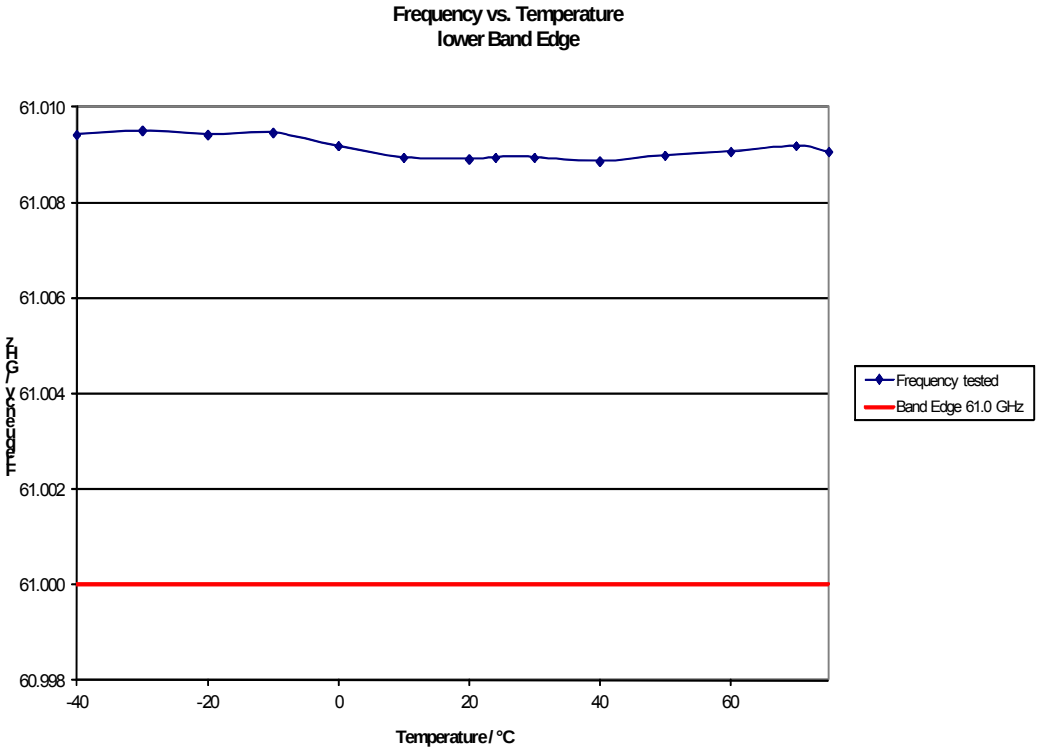
Title: LPR Temp
Comment A: 24 C
Date: 10.JAN.2012 08:36:58

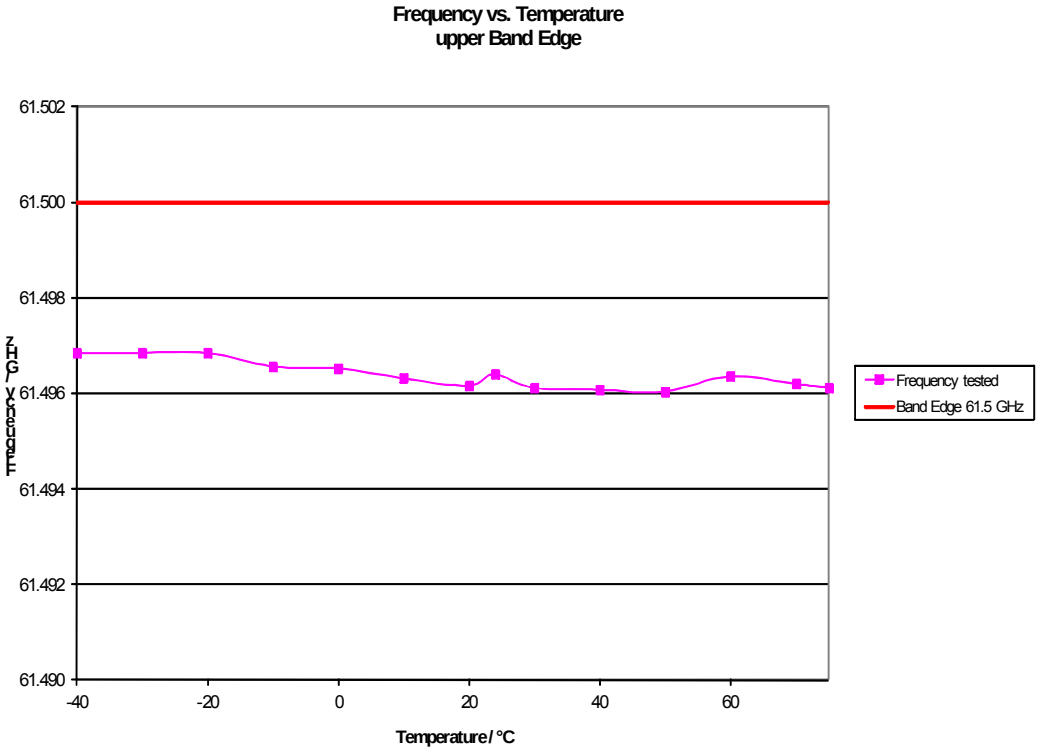
Upper band edge



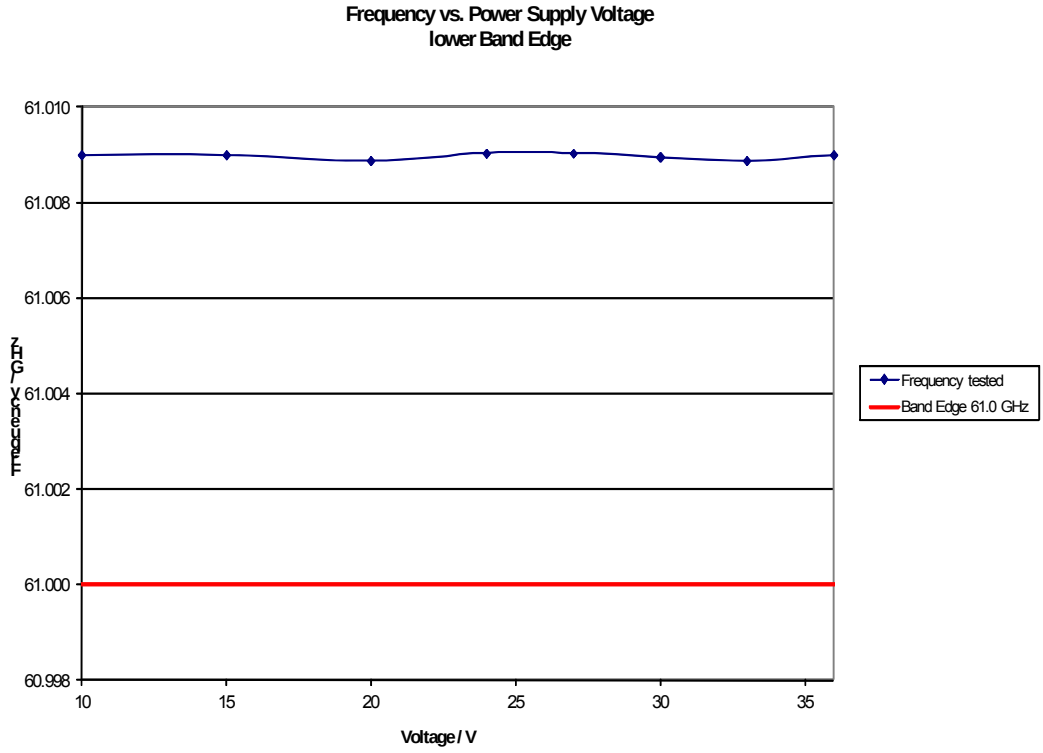
Title: LPR Temp
Comment A: 24 C
Date: 10.JAN.2012 08:38:45

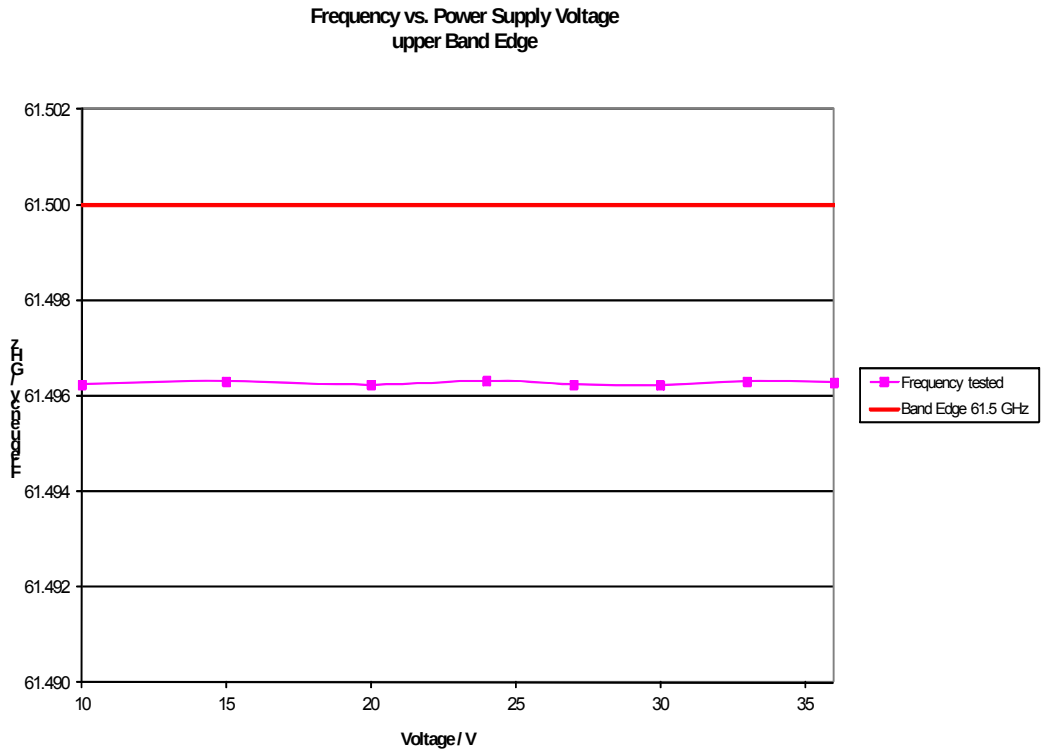
Temperature drift -40°C to +75°C:





Voltage drift 10 VDC to 36 VDC:





The EUT meets the requirements of this section.

Test Personnel: Reinhard Sauerschell
Test Date: 2012-01-11

9 TRANSMITTER IDENTIFICATION

Test Requirement: FCC 47 CFR, Part 15C

9.1 Regulation

Section 15.255 (i) For all transmissions that emanate from inside of a building, within any one second interval of signal transmission, each transmitter with a peak output power equal to or greater than 0.1 mW or a peak power density equal to or greater than 3 nW/cm2 , as measured 3 meters from the radiating structure, must transmit a transmitter identification at least once. Each application for equipment authorization for equipment that will be used inside of a building must declare that the equipment contains the required transmitter identification feature and must specify a method whereby interested parties can obtain sufficient information, at no cost, to enable them to fully detect and decode this transmitter identification information. Upon the completion of decoding, the transmitter identification data block must provide the following fields:

(1) FCC Identifier, which shall be programmed at the factory.

(2) Manufacturer's serial number, which shall be programmed at the factory.

(3) Provision for at least 24 bytes of data relevant to the specific device, which shall be field programmable. The grantee must implement a method that makes it possible for users to specify and update this data. The recommended content of this field is information to assist in contacting the operator.

9.2 Result

Information as received from the manufacturer, refer to document "LPR-1DHP_FCC_Identifier_XMit.pdf". The Symeo LPR-1DHP System transmits its FCC Identifier Block by means of an FSK modulation. The FCC Identifier block consists of 61 Bytes of data.

Byte No	0 1 2 3 4 5
	12345678901234567890123456789012345678901234567890123456789012345678901
Data	-----FCC-ID------++++S/N+++*********USER-DATA******

FCC Identifier Block

The user data block consists of 24 Bytes. This data can be programmed by the user from the main menu. The recommended use of the user data is to enter data for contacting the operator of the LPR 1DHP system.
The FCC identifier data is transmitted by the following FSK modulation scheme:
-Carrier frequency: 61.006 GHz
-Deviation: ±2 MHz
-Signal duration: approx. 500 µs / Bit
-Transmitted frequency (space / bit = 0): 61.008 GHz
-Transmitted frequency (mark / bit = 1): 61.004 GHz
The symbols are transmitted when the LPR-1DHPs signal generator is not used for generating the measurement sweeps. 2 symbols can be transmitted in each measurement cycle. Thus, at a measurement rate of 40Hz up to 80 symbols can be transmitted per second.

In order to receive the FCC identifier block the FSK modulation described above must be decoded. This can be done with another LPR-1DHP station. The FCC identifier block cannot be received during normal operation. The receive mode must be enabled explicitly from the main menu.
For customers which only buy one LPR-1DHP device, Symeo provides a second LPR-1DHP device upon request at no cost for receiving and decoding the FCC transmitter.

Detailed information is contained in the manufacturer's document "LPR-1DHP_FCC_Identifier_XMit.pdf".

The EUT meets the requirements of this section.

10 RF RADIATION EXPOSURE

Test Requirement: FCC 47 CFR, Part 15C
Test Procedure: C63.10-2009, § 7.8

10.1 Regulation

Section 15.255 (g) Regardless of the power density levels permitted under this section, devices operating under the provisions of this section are subject to the radiofrequency radiation exposure requirements specified in §§1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

Section 1.1307(b) (1) The appropriate exposure limits in §§ 1.1310 and 2.1093 of this chapter are generally applicable to all facilities, operations and transmitters regulated by the Commission.

Section 1.1310 Radiofrequency radiation exposure limits.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)
(B) Limits for General Population/Uncontrolled Exposure

Frequency range (MHz)	Power density (mW/cm^2)	Averaging time (minutes)
1500–100,000	1.0	30

10.2 Test Equipment

Refer to chapter 5.2 of this test report.

10.3 Procedure

The test results from chapter 5 of this test report are used to calculate the power density in a closer distance where persons can be exposed by the RF energy.
Refer to chapter 5.3 of this test report for the test procedure.
Since the RF signal is a FM CW modulated signal, the used PK detector above is sufficient.

10.4 Results, Calculation

ANSI C63.10-2009, §7.8.3:
The peak power density of an emission may be calculated from its measured peak EIRP using following equation:

$P_d = P_t / (4 * \pi * d^2)$

where
P_d is the power density, in W/m^2
P_t is the EIRP, in W
d is the measurement distance, in m

Since the EIRP is a constant value independent from the distance, the power density can be calculated for different distances with the equation:

$P_{d1} * d_1^2 = P_{d2} * d_2^2$

or

$P_{d2} = P_{d1} * d_1^2 / d_2^2$

where
P_{d1} is the power density in a distance of 3 meters, in W/m^2
d_1 is the measurement distance (here 3 meters), in m
P_{d2} is the power density in a different distance, in W/m^2
d_2 is the different distance, in m

Worst case condition for RF exposure may occur in a point to point test system, where two transmitters face each other. The minimum distance of a point to point test system is 2 meters.
Two conditions for RF exposure will be examined:

- the computation point in the middle of the line, $d_{2a} = d_{2b} = 1$ m,
- the computation point close at one transmitter of the line, $d_{2a} = 0.2$ m, $d_{2b} = 1.8$ m.

The power of the two transmitters is additive, hence the two resulting power densities will be added to get the final result.
Worst case power density in chapter 5.4 is 121.5 nW/cm² at 61.0 GHz measured in a distance of 3 meters.

Frequency GHz	P_{d1} nW/cm²	Distance d_1 m	Distance d_{2a} m	P_{d2a} µW/cm²	Distance d_{2b} m	P_{d2b} µW/cm²	$P_{d2a} + P_{d2b}$ µW/cm²	Limit µW/cm²
61.0	121.5	3	1	1.094	1	1.094	2.188	1000
61.0	121.5	3	0.2	27.34	1.8	0.34	23.68	1000

The EUT meets the requirements of this section.

Test Personnel: Reinhard Sauerschell
Test Date: 2011-12-22/-23, 2012-01-02/-03

11 MISCELLANEOUS COMMENTS AND NOTES

None.

12 LIST OF ANNEXES

The following annexes are separated parts to this test report. These annexes may be file attachments for electronic filing.

Annex	Description	Pages
Annex 1	Photographs of test setups	9
Annex 2	Photographs of equipment under test (EUT); external views	4
Annex 3	Photographs of equipment under test (EUT); internal views	13