
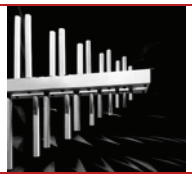
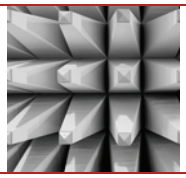

CETECOM™
CETECOM ICT Services
consulting - testing - certification

TEST REPORT

Test report no.: 1-6215/13-01-02-B

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

Testing laboratory

CETECOM ICT Services GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.cetecom.com
e-mail: ict@cetecom.com

Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01
Area of Testing: Radio/Satellite Communications

Applicant

Robert Bosch Car Multimedia GmbH
Robert-Bosch-Straße 200
31139 Hildesheim / GERMANY
Contact: Manfred Aufzug
e-mail: Manfred.Aufzug@de.bosch.com
Phone: +49 5121 49-2608

Manufacturer

Robert Bosch Car Multimedia GmbH
Robert-Bosch-Straße 200
31139 Hildesheim / GERMANY

Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS - 210 Issue 8	Spectrum Management and Telecommunications - Radio Standards Specification Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**Radio-Navigation-System**
Model name:	**LCN2K58A00**
FCC ID:	**YBN-LCN2K58A00**
IC:	**9595A-LCN2K58A00**
Frequency:	ISM band 2400 MHz to 2483.5 MHz (lowest channel 00 – 2402, highest channel 78 – 2480 MHz)
Technology tested:	Bluetooth®, +EDR
Antenna:	Integrated antenna
Power Supply:	13.2V DC by car battery
Temperature Range:	-20°C to +55°C

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorised:

cn=Joerg Warken, o=CETECOM ICT Services GmbH, ou=WAK-111223, email=Joerg.Warken@cetecom.com, c=DE
2013.06.28 12:53:34 +02'00'

Joerg Warken
Senior Testing Manager

Test performed:

cn=Tobias Wittenmeier, o=CETECOM ICT Services GmbH, ou=WIT-111222, email=tobias.wittenmeier@cetecom.com, c=DE
2013.06.28 11:35:18 +02'00'

Tobias Wittenmeier
Expert

1 Table of contents

2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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2.2 Application details

Date of receipt of order:	2013-04-16
Date of receipt of test item:	2013-05-31
Start of test:	2013-06-03
End of test:	2013-06-07
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	01.10.2010	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS - 210 Issue 8	01.12.2010	Spectrum Management and Telecommunications - Radio Standards Specification Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

4 Test environment

Temperature:	T_{nom}	+22 °C	during room temperature tests
	T_{max}	+55 °C	during high temperature tests
	T_{min}	-20 °C	during low temperature tests
Relative humidity content:		55 %	
Barometric pressure:		not relevant for this kind of testing	
Power supply:	V_{nom}	13.2 V	DC by car battery
	V_{max}	-/- V	
	V_{min}	-/- V	

5 Test item

Kind of test item	**:**	**Radio-Navigation-System**
Type identification	**:**	**LCN2K58A00**
S/N serial number	**:**	**Rad. 0000013** **Cond. 0000047**
HW hardware status	**:**	**025**
SW software status	**:**	**0794_130426**
Frequency band [MHz]	**:**	**ISM band 2400 MHz to 2483.5 MHz** **(lowest channel 00 – 2402, highest channel 78 – 2480 MHz)**
Type of radio transmission **Use of frequency spectrum**	**:** **:**	**FHSS**
Type of modulation	**:**	**GFSK, Pi/4 DQPSK and 8 DPSK**
Number of channels	**:**	
Antenna	**:**	**Integrated antenna**
Power supply	**:**	**13.2 V DC by car battery**
Temperature range	**:**	**-20°C to +55 °C**

6 Test laboratories sub-contracted

None

7 Summary of measurement results

☒ **No deviations from the technical specifications were ascertained**

☐ There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210, Issue 8, Annex 8	Passed	2013-06-28	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Remark
§15.247(b)(4) RSS 210 / A8.4(2)	Antenna gain	Nominal	Nominal	GFSK	☒	☐	☐	☐	complies
§15.247(e) RSS 210 / A8.2(b)	Power spectral density	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	☐	☐	☒	☐	Not applicable for FHSS!
§15.247(a)(1) RSS 210 / A8.1(b)	Carrier frequency separation	Nominal	Nominal	GFSK	☒	☐	☐	☐	complies
§15.247(a)(1) RSS 210 / A8.1(d)	Number of hopping channels	Nominal	Nominal	GFSK	☒	☐	☐	☐	complies
§15.247(a)(1) (iii) RSS 210 / A8.3(1)	Time of occupancy (dwell time)	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	☒	☐	☐	☐	complies
§15.247(a)(1) RSS 210 / A8.2(a)	Spectrum bandwidth of a FHSS system 20dB bandwidth	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	☒ ☒ ☒	☐ ☐ ☐	☐ ☐ ☐	☐ ☐ ☐	complies
§15.247(b)(1) RSS-210 / A8.4(2)	Maximum output power	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	☒ ☒ ☒	☐ ☐ ☐	☐ ☐ ☐	☐ ☐ ☐	complies
§15.247(d) RSS-210 / A8.5	Band edge compliance conducted	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	☒ ☒ ☒	☐ ☐ ☐	☐ ☐ ☐	☐ ☐ ☐	complies
§15.205 RSS-210 / A8.5	Band edge compliance radiated	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	☒ ☒ ☒	☐ ☐ ☐	☐ ☐ ☐	☐ ☐ ☐	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions conducted	Nominal	Nominal	GFSK Pi/4 DQPSK 8 DPSK	☒ ☒ ☒	☐ ☐ ☐	☐ ☐ ☐	☐ ☐ ☐	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions radiated	Nominal	Nominal	GFSK	☒	☐	☐	☐	complies
§15.109 RSS-Gen	RX spurious emissions radiated	Nominal	Nominal	-/-	☒	☐	☐	☐	complies
§15.209(a) RSS-Gen	TX spurious emissions radiated < 30 MHz	Nominal	Nominal	GFSK	☒	☐	☐	☐	complies
§15.107(a)	Conducted emissions < 30 MHz	Nominal	Nominal	GFSK	☒	☐	☐	☐	complies

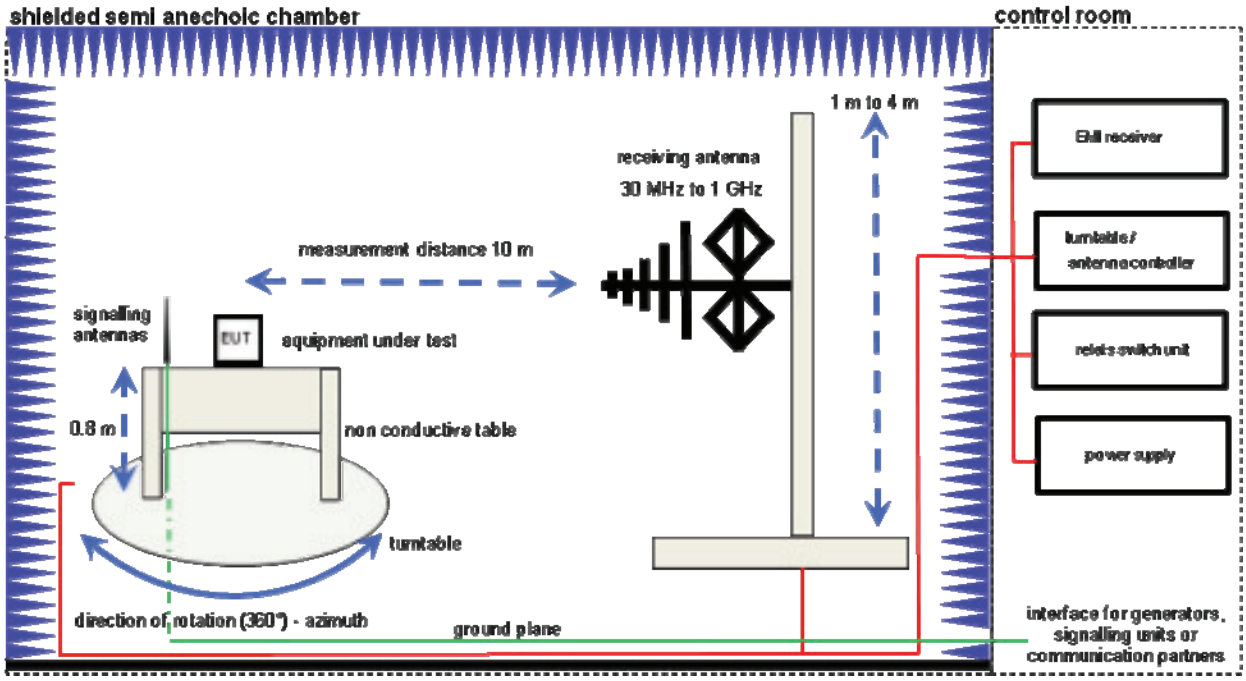
Note: NA = Not Applicable; NP = Not Performed

8 RF measurements

8.1 Description of the test setup (BT FCC)

8.1.1 Radiated measurements chamber F

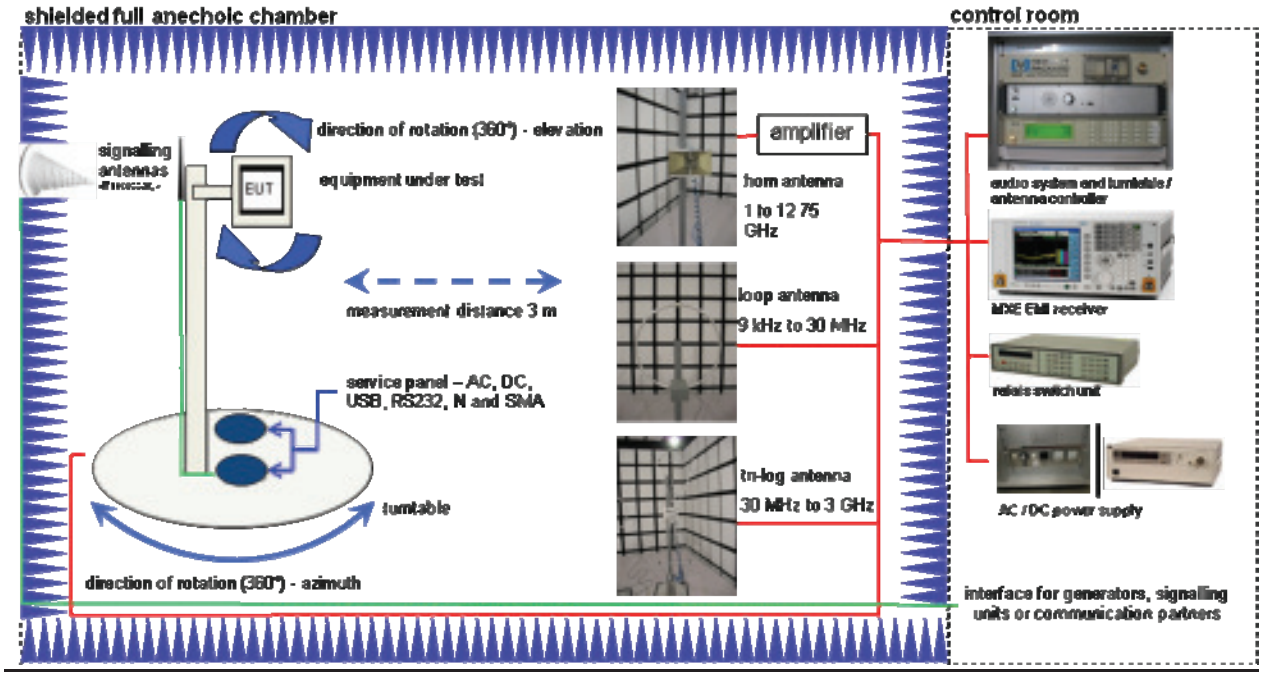
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368
DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580
EMI Test Receiver	ESCI 3	R&S	100083	300003312
Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379
Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745
Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746
Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747
TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787
CBT (Bluetooth Tester + EDR Signalling)	CBT 1153.9000K35, CBT-B55, CBT-K55	R&S	100313	300003516

8.1.2 Radiated measurements chamber C



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854
Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351
Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789
Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032
Active Loop Antenna	6502	EMCO	2210	300001015
Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156
Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155
Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997
Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143
CBT (Bluetooth Tester + EDR Signalling)	CBT 1153.9000K35, CBT-B55, CBT-K55	R&S	100313	300003516

8.1.3 Radiated measurements 12.75 GHz to 40 GHz

Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda		300000786
Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda		300000486
Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268
Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443
Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517
CBT (Bluetooth Tester + EDR Signalling)	CBT 1153.9000K35, CBT-B55, CBT-K55	R&S	100313	300003516

8.2 Additional comments

The Bluetooth® word mark and logos are owned by the Bluetooth SIG Inc. and any use of such marks by Cetecom ICT Services GmbH is under license.

Reference documents: None

Special test descriptions: None

Configuration descriptions: TX tests: were performed with x-DH5 packets and static PRBS pattern payload.
RX/Standby tests: BT test mode enabled, scan enabled, TX Idle

Test mode:

☒ Bluetooth Test mode loop back enabled
(EUT is controlled over CBT/CMU)

☒ Special software is used.
EUT is transmitting pseudo random data by itself

8.3 RSP100 test report cover sheet / performance test data

Test report number	:	**1-6215/13-01-02-B**
Equipment model number	:	**LCN2K58A00**
Certification number	:	**9595A-LCN2K58A00**
Manufacturer (complete address)	:	**Robert Bosch Car Multimedia GmbH Robert-Bosch-Straße 200 31139 Hildesheim / GERMANY**
Tested to radio standards specification no.	:	**RSS 210, Issue 8, Annex 8**
Open area test site IC No.	:	**IC 3462C-1**
Frequency range	:	**lowest channel 2402 MHz, highest channel 2480 MHz**
RF-power [W] (max.)	:	**Cond.: 0.82 mW (GFSK modulation) EIRP: 0.98 mW (GFSK modulation) Cond.: 1.12 mW (Pi/4-DQPSK modulation) EIRP: 1.34 mW (Pi/4-DQPSK modulation) Cond.: 1.20 mW (8DPSK modulation) EIRP: 1.41 mW (8DPSK modulation)**
Occupied bandwidth (99%-BW) [kHz]	:	**956 (GFSK modulation) 1299 (Pi/4-DQPSK modulation) 1299 (8DPSK modulation)**
Type of modulation	:	**FHSS technology with GFSK, Pi/4 DQPSK and 8 DPSK modulation.**
Emission designator (TRC-43)	:	**956KFXD (GFSK modulation) 1M29GXD (Pi/4-DQPSK modulation) 1M29GXD (8DPSK modulation)**
Antenna information	:	**Integrated antenna**
Transmitter spurious (worst case) [dBµV/m @ 3m]:		**40.2 @ 24 GHz (noise floor)**

ATTESTATION:
DECLARATION OF COMPLIANCE:

I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Laboratory manager:

cn=Tobias Wittenmeier, o=CETECOM ICT Services GmbH, ou=WIT-111222, email=tobias.wittenmeier@cetecom.com, c=DE
2013.06.28 11:36:25 +02'00'

2013-06-28	Tobias Wittenmeier	
Date	Name	Signature

9 Measurement results

9.1 Antenna gain

Measurement:

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal Bluetooth® devices, the GFSK modulation is used.

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3 MHz
Resolution bandwidth:	3 MHz
Span:	5 MHz
Trace-Mode:	Max hold

Limits:

FCC	IC
Antenna Gain	
6 dBi	

Results:

T_{nom}	V_{nom}	lowest channel 2402 MHz	middle channel 2441 MHz	highest channel 2480 MHz
Conducted power [dBm] Measured with GFSK modulation		-1.40	-0.86	-1.38
Radiated power [dBm] Measured with GFSK modulation		-2.28	-1.15	-0.09
Gain [dBi] Calculated		-0.88	-0.29	+1.29

Result: Passed

9.2 Power spectral density

Description:

Measurement of the power spectral density of a digital modulated system. This requirement is only valid for digitally modulated systems without hopping functionality.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	500 s
Video bandwidth:	3 kHz
Resolution bandwidth:	3 kHz
Span:	150 kHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Power Spectral Density	
For digitally modulated systems the transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0-second duration.	

Results:

Modulation	Power spectral density [dBm/3kHz]		
Frequency	2412 MHz	2437 MHz	2462 MHz
GFSK	Not required for hopping systems!		
Pi/4 DQPSK			
8DPSK			
Measurement uncertainty	± 1.5 dB		

9.3 Carrier frequency separation

Description:

Measurement of the carrier frequency separation of a hopping system. The carrier frequency separation is constant for all modulation-modes. We use GFSK-modulation to show compliance. EUT in hopping mode.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	4 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Carrier Frequency Separation	
Minimum 25 kHz or two-thirds of the 20 dB bandwidth of the hopping system whichever is greater.	

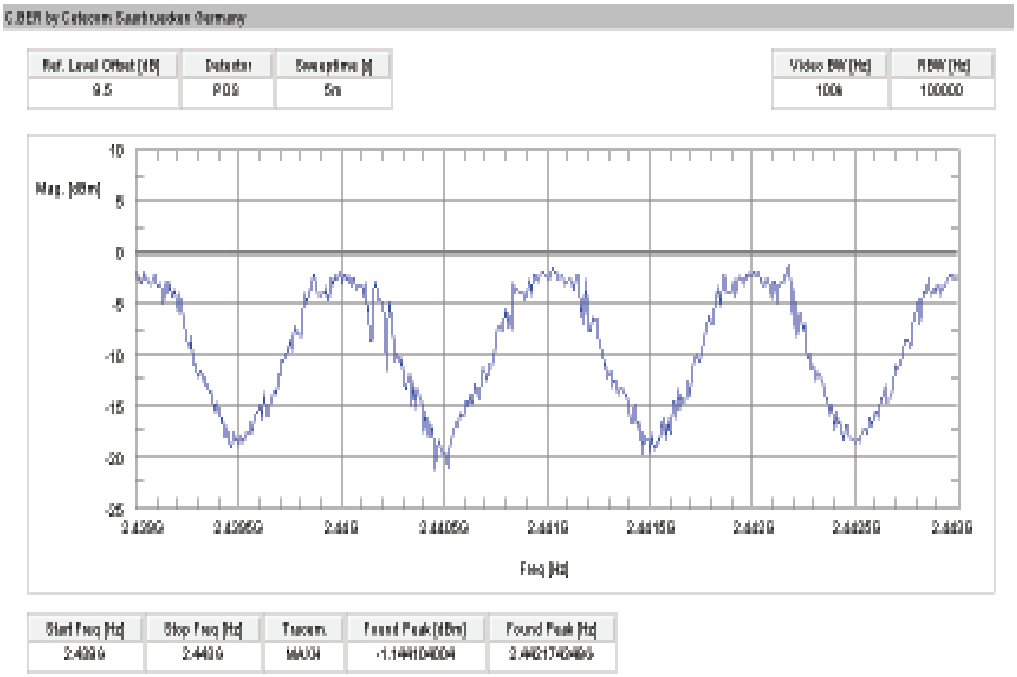
Result:

Carrier frequency separation	~ 1 MHz

Result: Passed

Plot:

Plot 1: Carrier frequency separation (GFSK modulation)



9.4 Number of hopping channels

Description:

Measurement of the total number of used hopping channels. The number of hopping channels is constant for all modulation-modes. We use GFSK-modulation to show compliance. EUT in hopping mode.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	500 kHz
Resolution bandwidth:	500 kHz
Span:	Plot 1: 2400 – 2445 MHz Plot 2: 2445 – 2485 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Number of hopping channels	
At least 15 non overlapping hopping channels	

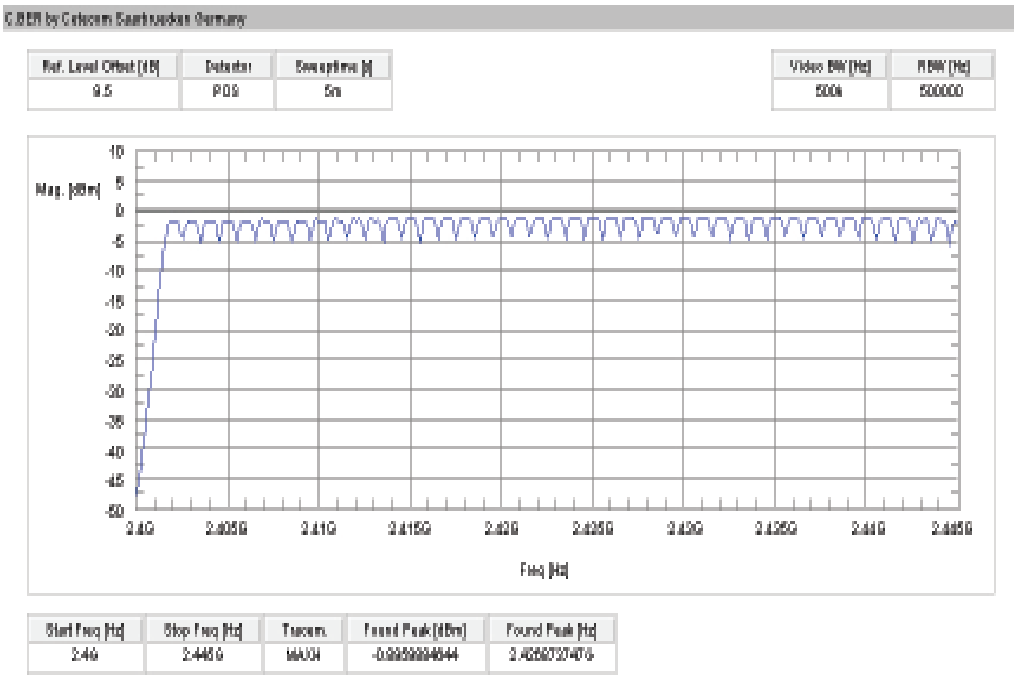
Result:

Number of hopping channels	79

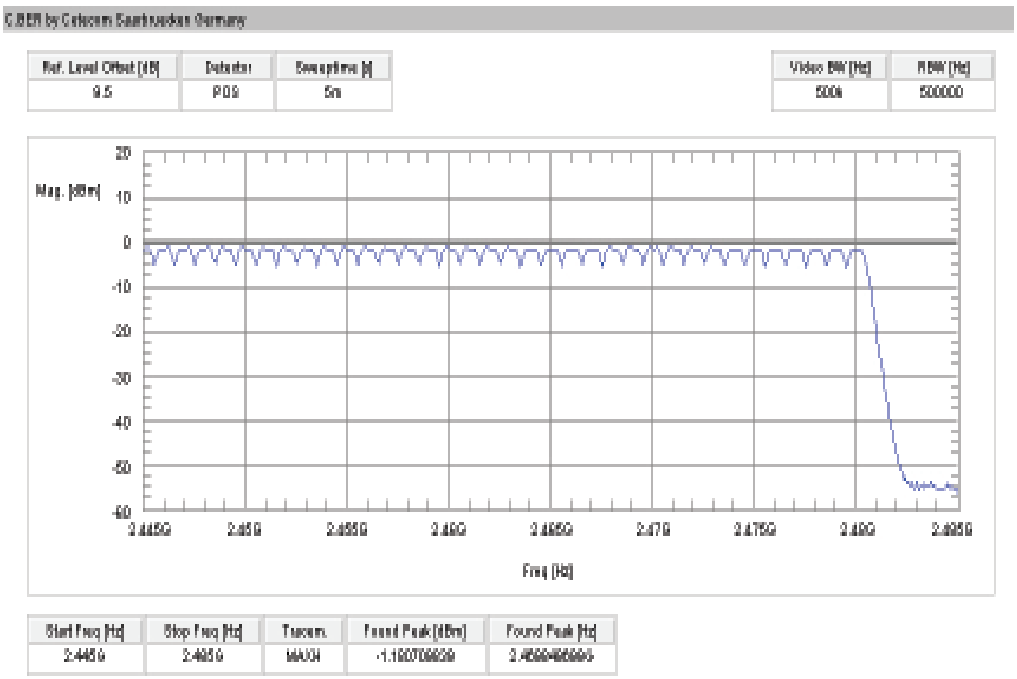
Result: Passed

Plots:

Plot 1: Number of hopping channels (GFSK modulation)



Plot 2: Number of hopping channels (GFSK modulation)



9.5 Time of occupancy (dwell time)

Measurement:

For Bluetooth® devices no measurements mandatory depending on the fixed requirements according to the Bluetooth® Core Specifications!

For Bluetooth® devices:

The channel staying time of 0.4 s within a 31.6 second period in data mode is constant for Bluetooth® devices and independent from the packet type (packet length). The calculation for a 31.6 second period is a follows:

Channel staying time = time slot length * hop rate / number of hopping channels * 31.6 s

Example for a DH1 packet (with a maximum length of one time slot)
Channel staying time = 625 µs * 1600*1/s / 79 * 31.6 s = 0.4 s (in a 31.6 s period)

For multi-slot packets the hopping is reduced according to the length of the packet.

Example for a DH3 packet (with a maximum length of three time slots)
Channel staying time = 3 * 625 µs * 1600/3 *1/s / 79 * 31.6 s = 0.4 s (in a 31.6 s period)

Example for a DH5 packet (with a maximum length of five time slots)
Channel staying time = 5 * 625 µs * 1600/5 *1/s / 79 * 31.6 s = 0.4 s (in a 31.6 s period)

This is according the Bluetooth® Core Specification V2.0 & V2.1 & V3.0 & V4.0 (+ critical errata) for all Bluetooth® devices.

The following table shows the relations:

Packet Size	Pulse Width [ms] *	Max. number of transmissions per channel in 31.6 sec
DH1	0.366	640
DH3	1.622	214
DH5	2.870	128

* according Bluetooth® specification

Results:

Packet Size	Pulse Width [ms]*	Max. number of transmissions in 31.6 sec	Dwell time [Pulse width * Number of transmissions]
DH1	0.366	640	234.2 ms
DH3	1.622	214	347.1 ms
DH5	2.870	128	367.4 ms

Limits:

FCC	IC
Time of occupancy (dwell time)	
The frequency hopping operation shall have an average time of occupancy on any frequency not exceeding 0.4 seconds within a duration in seconds equal to the number of hopping frequencies multiplied by 0.4.	

Result: Passed

9.6 Spectrum bandwidth of a FHSS system – 20 dB bandwidth

Description:

Measurement of the 20dB bandwidth of the modulated signal. The measurement is performed according to the "Measurement Guidelines" (DA 00-705, March 30, 2000). EUT in single channel mode.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	2 s
Video bandwidth:	30 kHz
Resolution bandwidth:	10 kHz
Span:	3 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Spectrum bandwidth of a FHSS system – 20 dB bandwidth	
GFSK < 1500 kHz Pi/4 DQPSK < 1500 kHz 8DPSK < 1500 kHz	

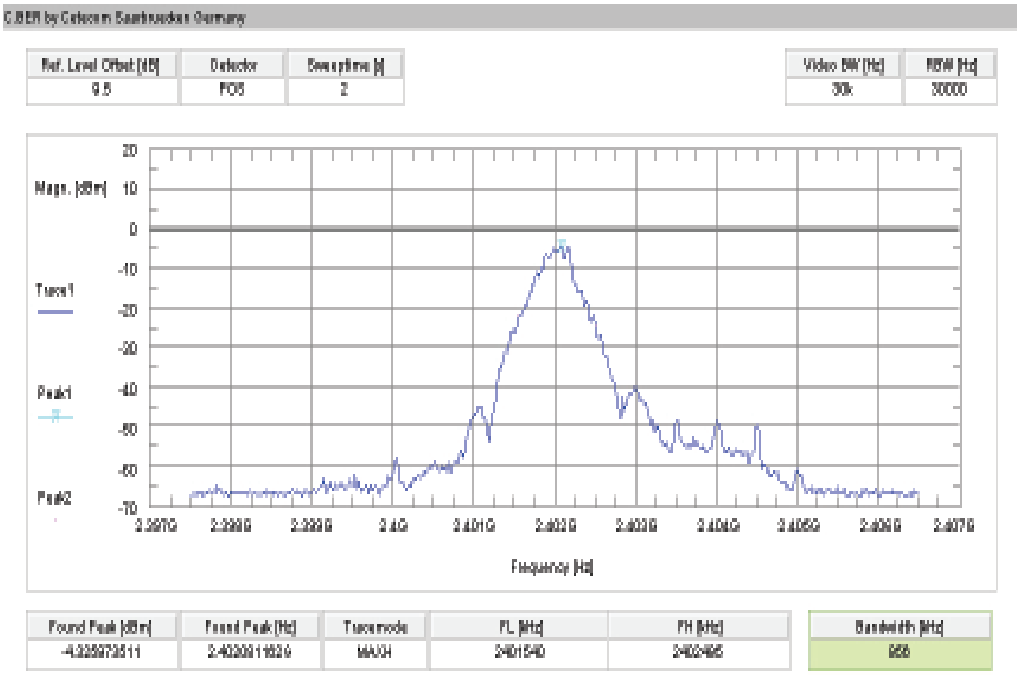
Results:

Modulation	20 dB BANDWIDTH [kHz]		
Frequency	2402 MHz	2441 MHz	2480 MHz
GFSK	956	938	938
Pi/4 DQPSK	1299	1299	1299
8DPSK	1299	1281	1281
Measurement uncertainty	± 10 kHz		

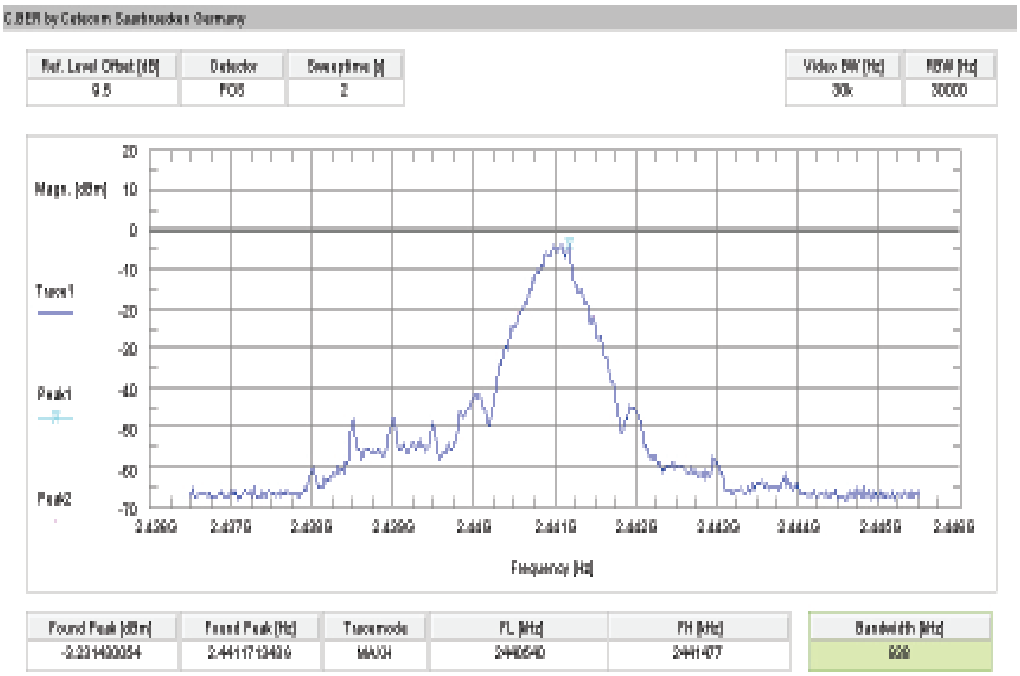
Result: Passed

Plots:

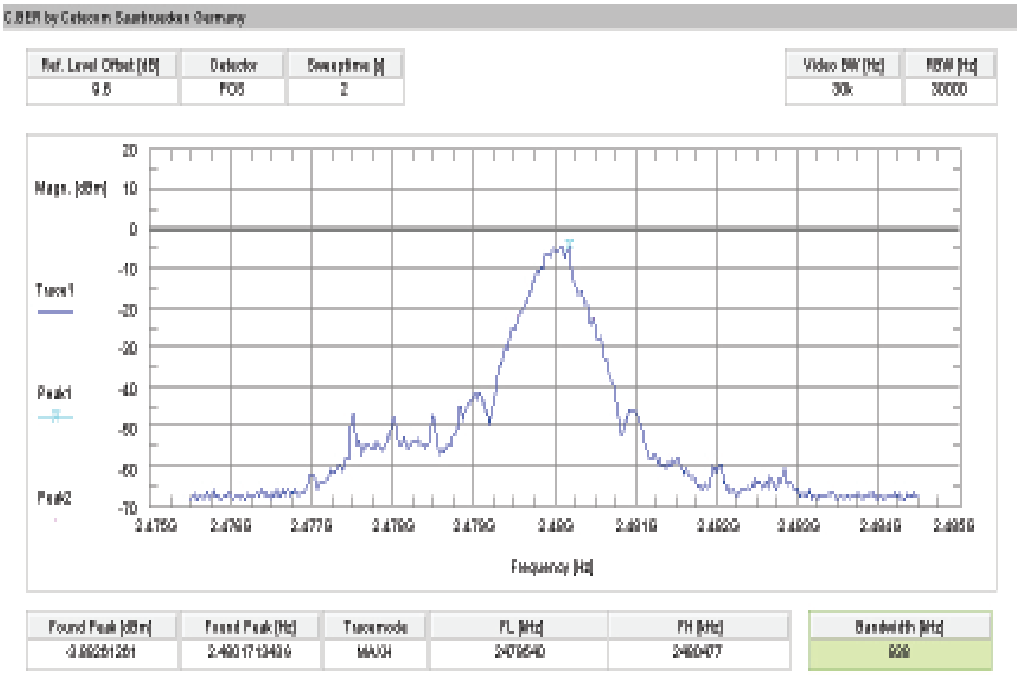
Plot 1: lowest channel – 2402 MHz, GFSK modulation



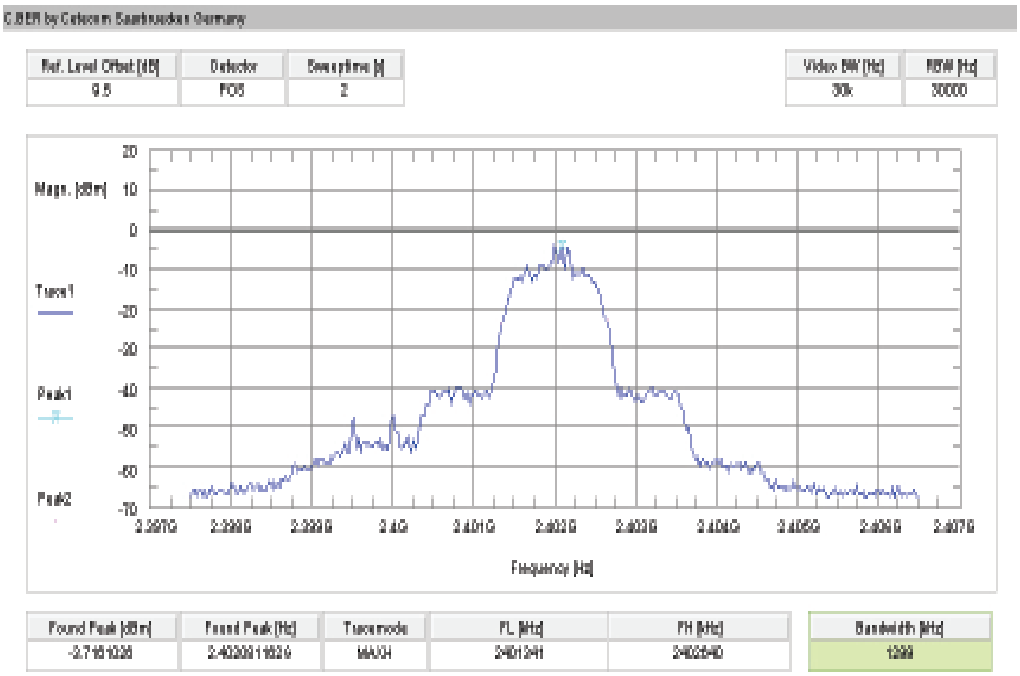
Plot 2: middle channel – 2441 MHz, GFSK modulation



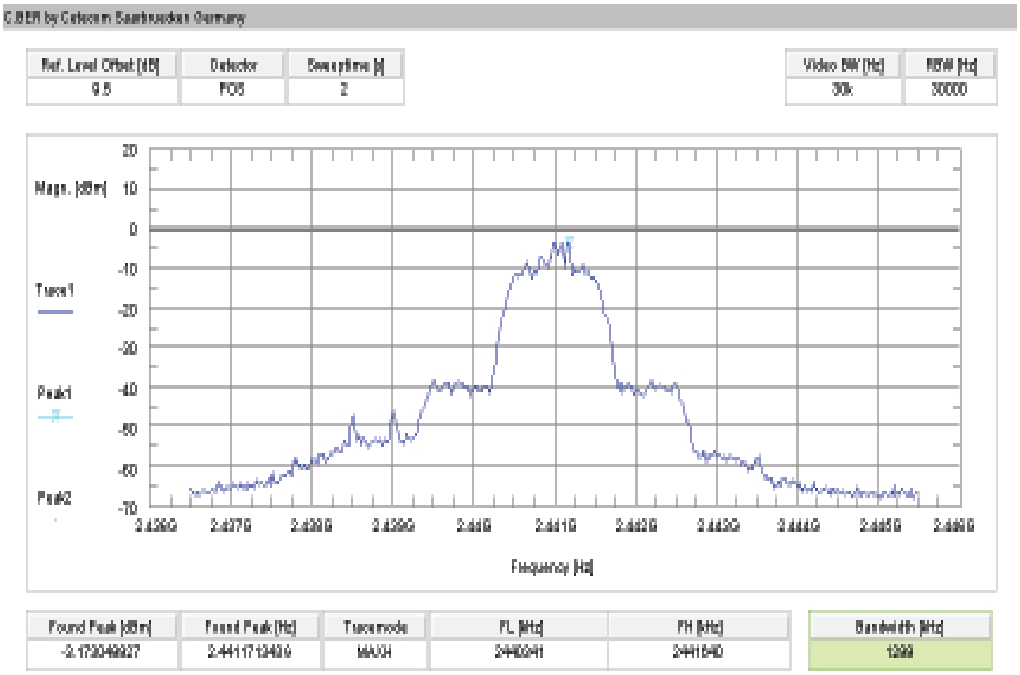
Plot 3: highest channel – 2480 MHz, GFSK modulation



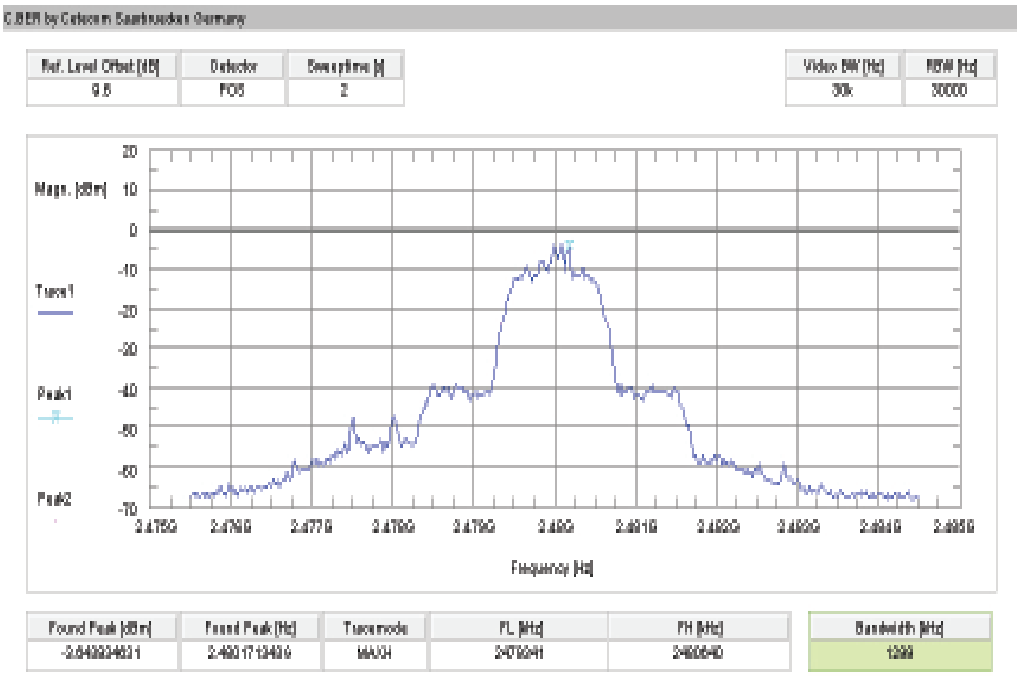
Plot 4: lowest channel – 2402 MHz, Pi/4 DQPSK modulation



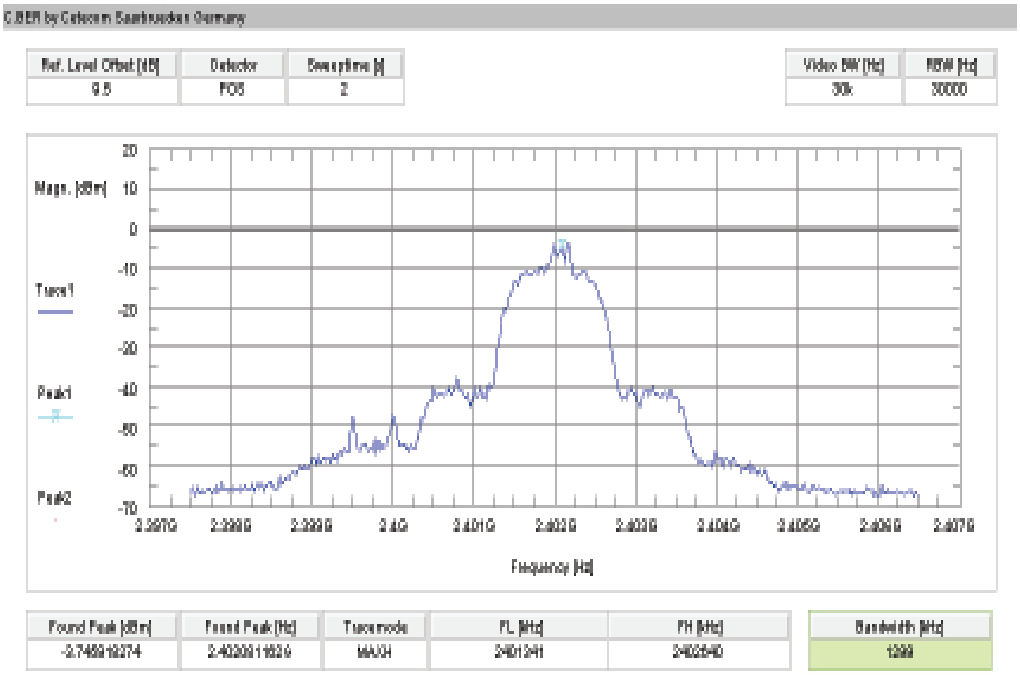
Plot 5: middle channel – 2441 MHz, Pi/4 DQPSK modulation



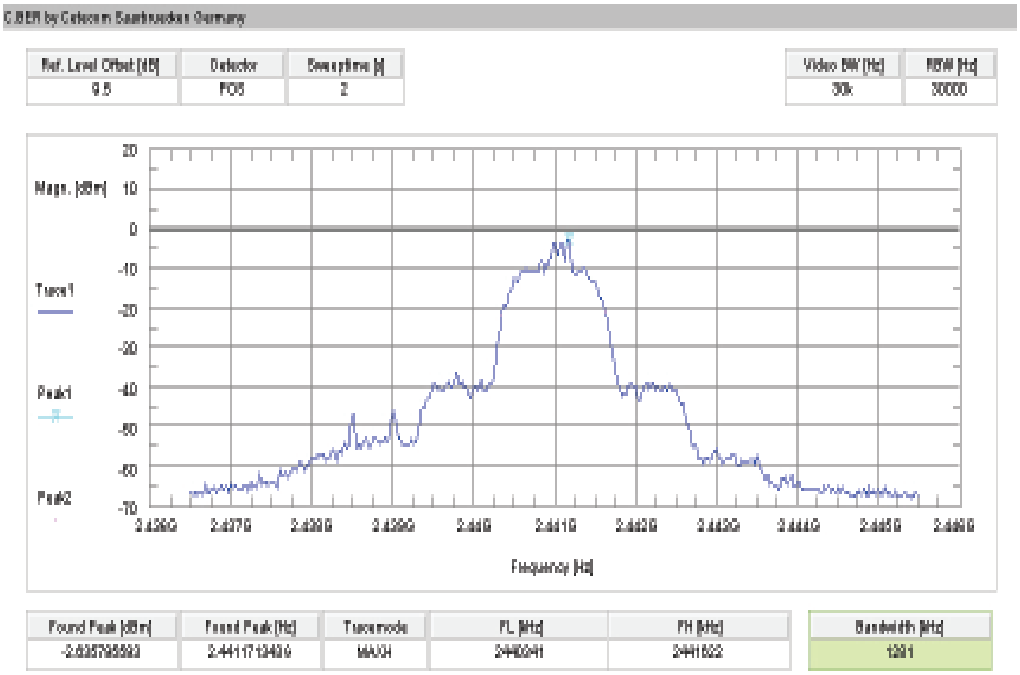
Plot 6: highest channel – 2480 MHz, Pi/4 DQPSK modulation



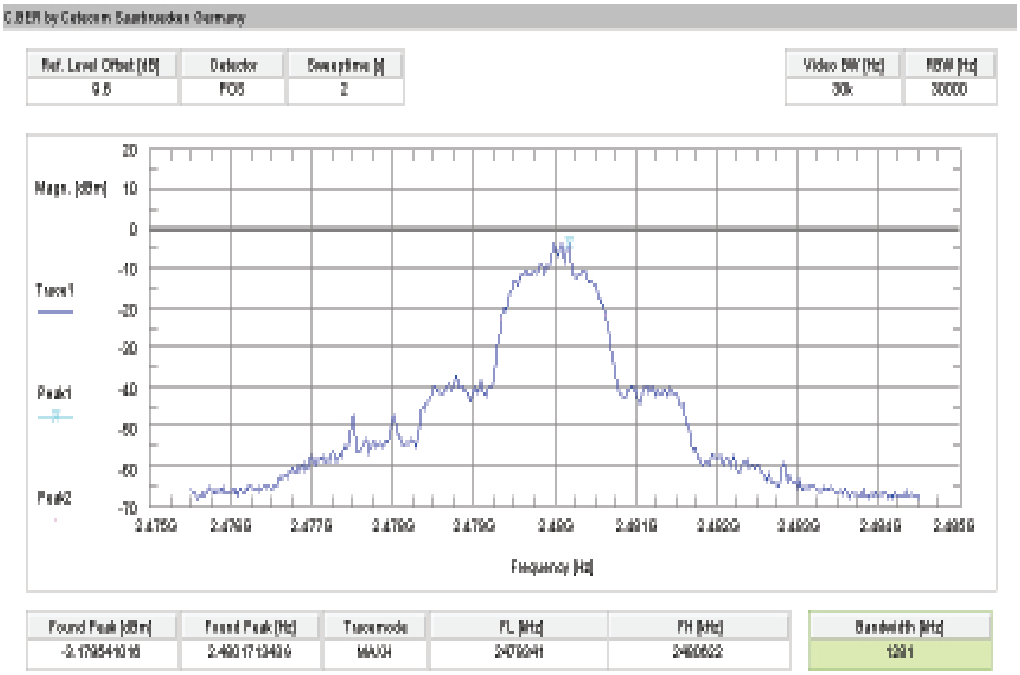
Plot 7: lowest channel – 2402 MHz, 8 DPSK modulation



Plot 8: middle channel – 2441 MHz, 8 DPSK modulation



Plot 9: highest channel – 2480 MHz, 8 DPSK modulation



9.7 Maximum output power

Description:

Measurement of the maximum output power conducted and radiated. EUT in single channel mode.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3 MHz
Resolution bandwidth:	3 MHz
Span:	5 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Maximum output power	
[Conducted: 0.125 W – antenna gain max. 6 dBi] Systems using more than 75 hopping channels: Conducted: 1.0 W – antenna gain max. 6 dBi	

Results:

Modulation / Frequency	Maximum output power conducted [dBm]		
	2402 MHz	2441 MHz	2480 MHz
GFSK	-1.40	-0.86	-1.38
Pi/4 DQPSK	+0.03	+0.51	-0.03
8DPSK	+0.37	+0.78	+0.21
Measurement uncertainty	± 1 dB		

Result: Passed

Results:

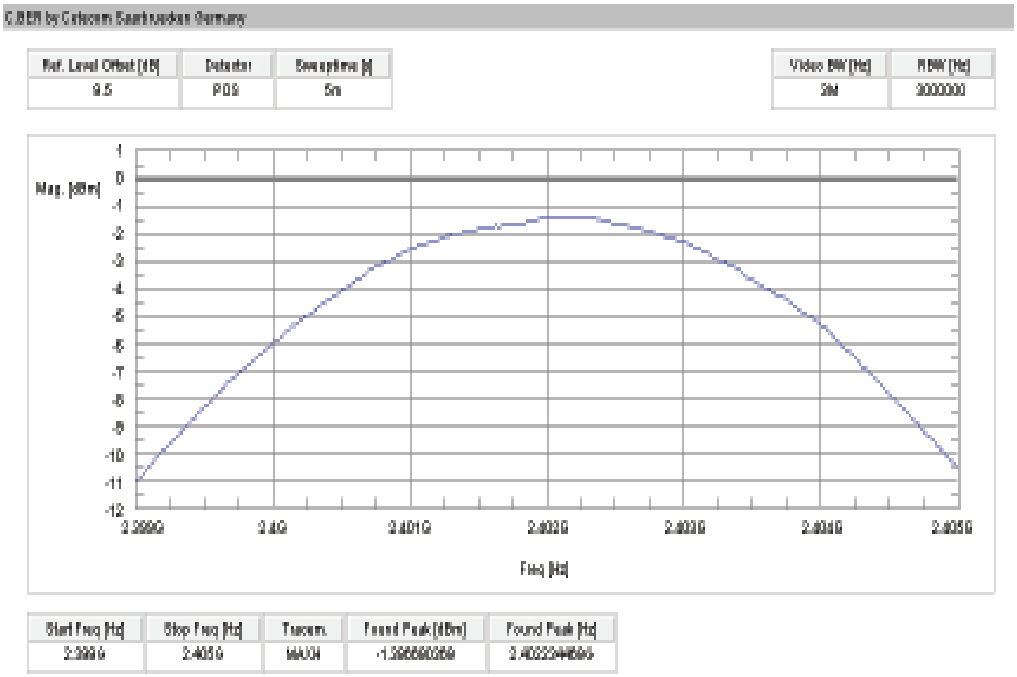
Modulation / Frequency	Maximum output power radiated - EIRP [dBm]		
	2402 MHz	2441 MHz	2480 MHz
GFSK	-2.28	-1.15	-0.09
Pi/4 DQPSK *)	-0.85	+0.22	+1.26
8DPSK *)	-0.51	+0.49	+1.50
Measurement uncertainty	± 3 dB		

*) - Values calculated with antenna gain

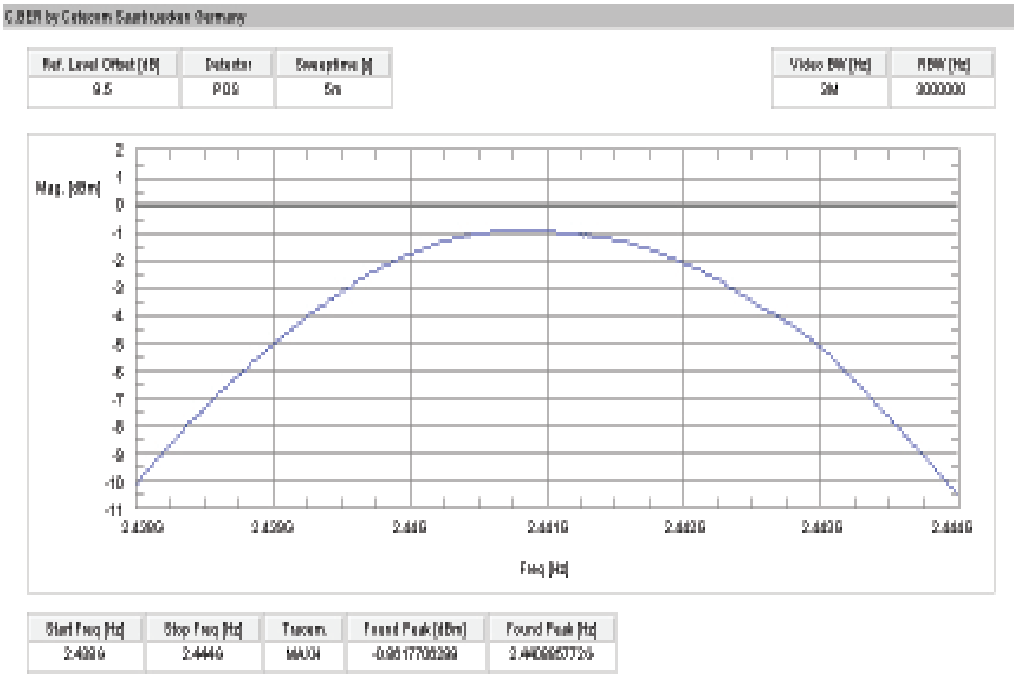
Result: Passed

Plots:

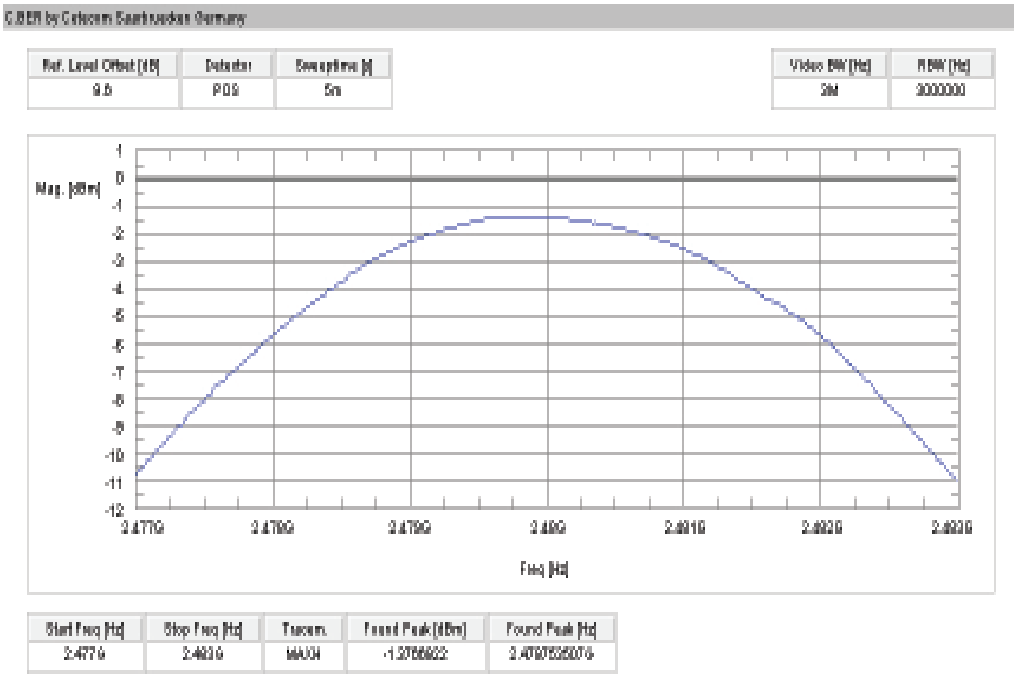
Plot 1: lowest channel – 2402 MHz, GFSK modulation



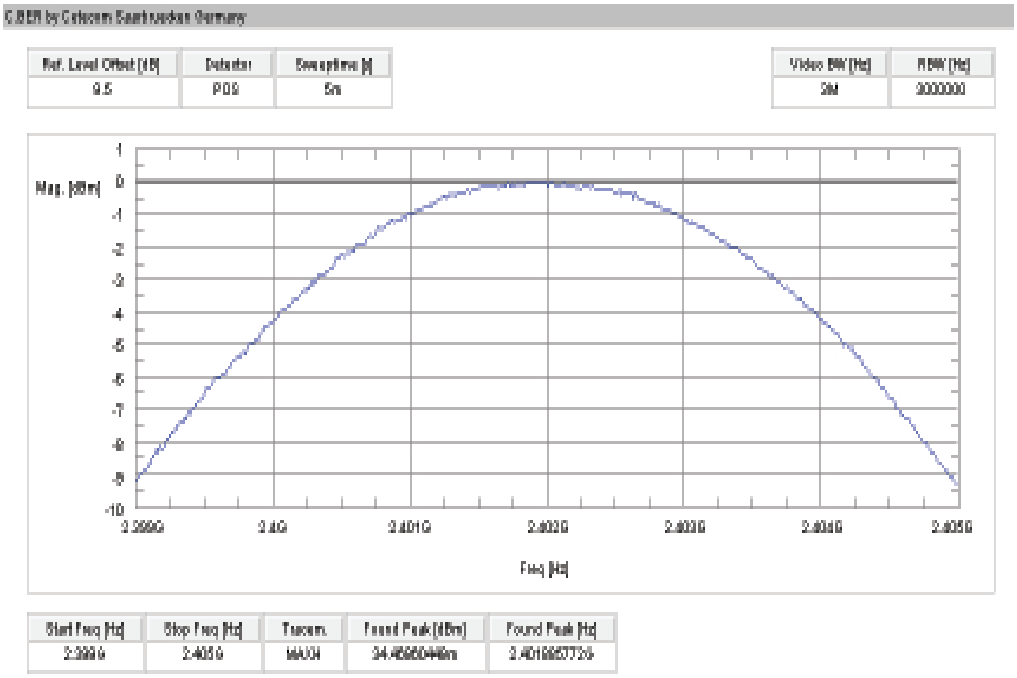
Plot 2: middle channel – 2441 MHz, GFSK modulation



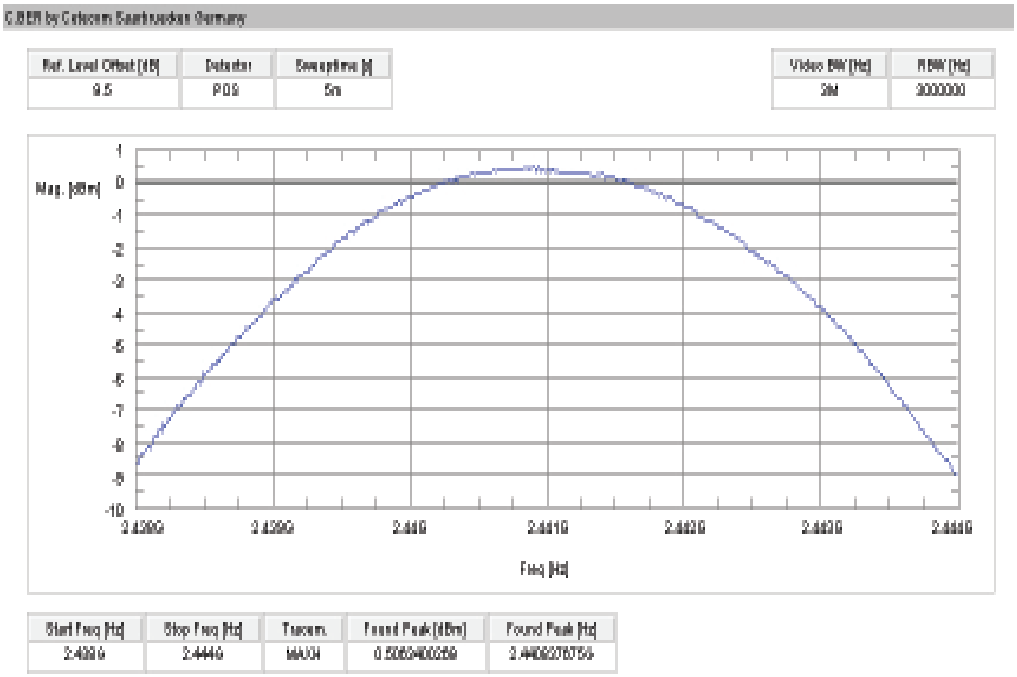
Plot 3: highest channel – 2480 MHz, GFSK modulation



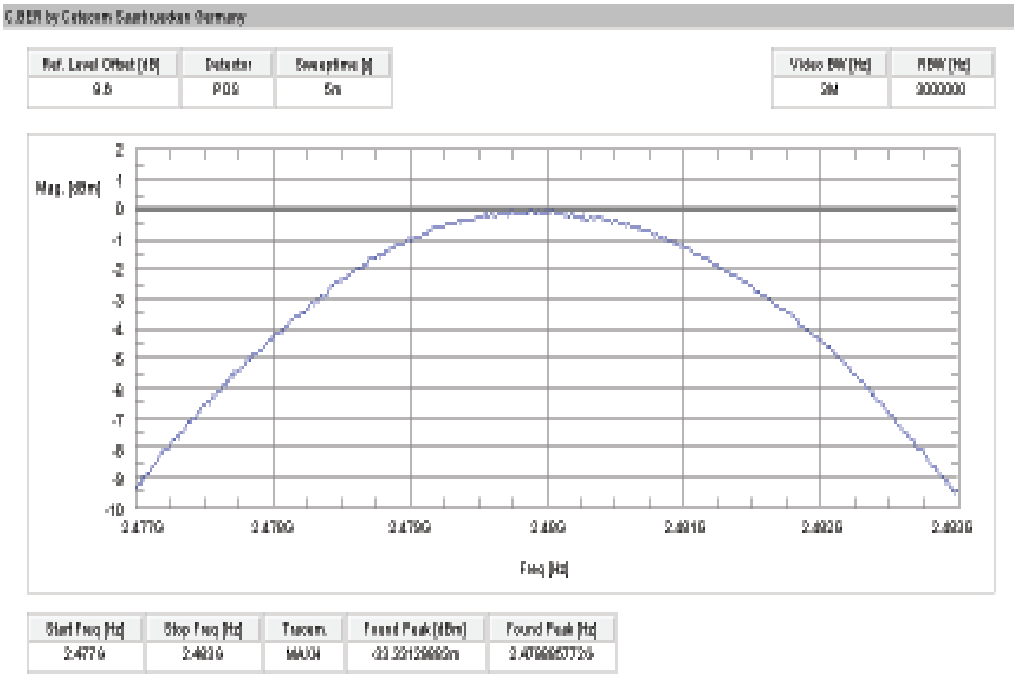
Plot 4: lowest channel – 2402 MHz, Pi/4 DQPSK modulation



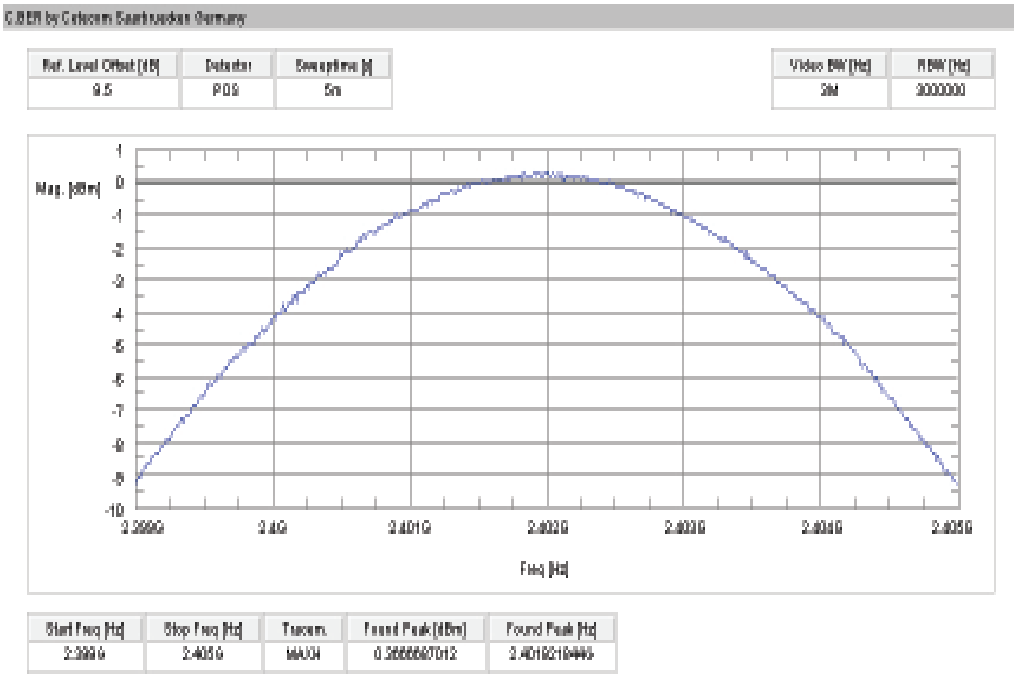
Plot 5: middle channel – 2441 MHz, Pi/4 DQPSK modulation



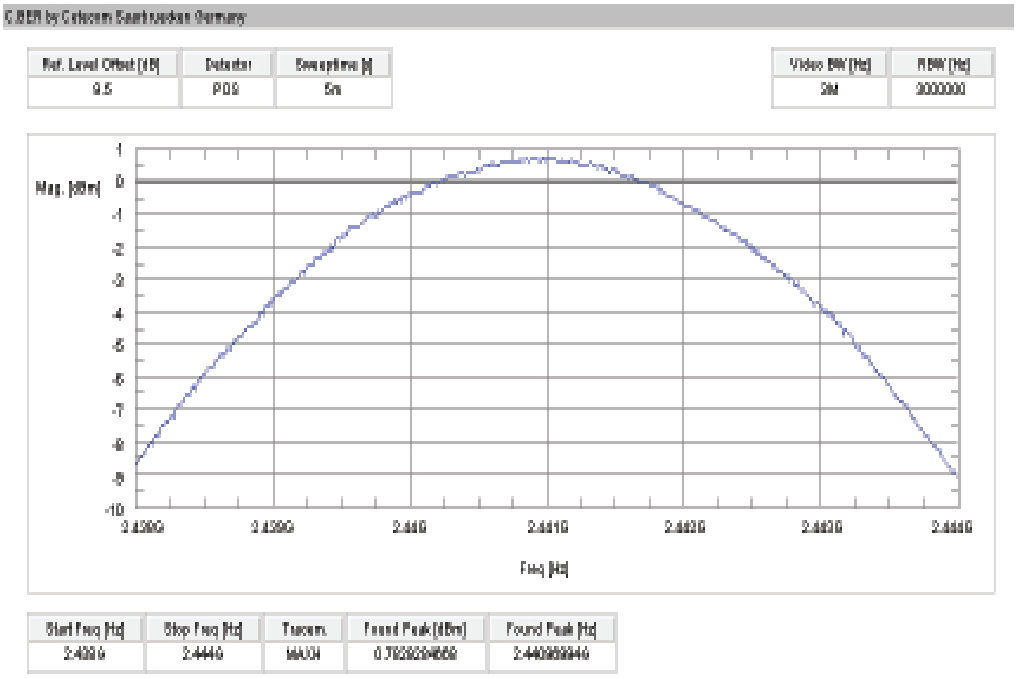
Plot 6: highest channel – 2480 MHz, Pi/4 DQPSK modulation



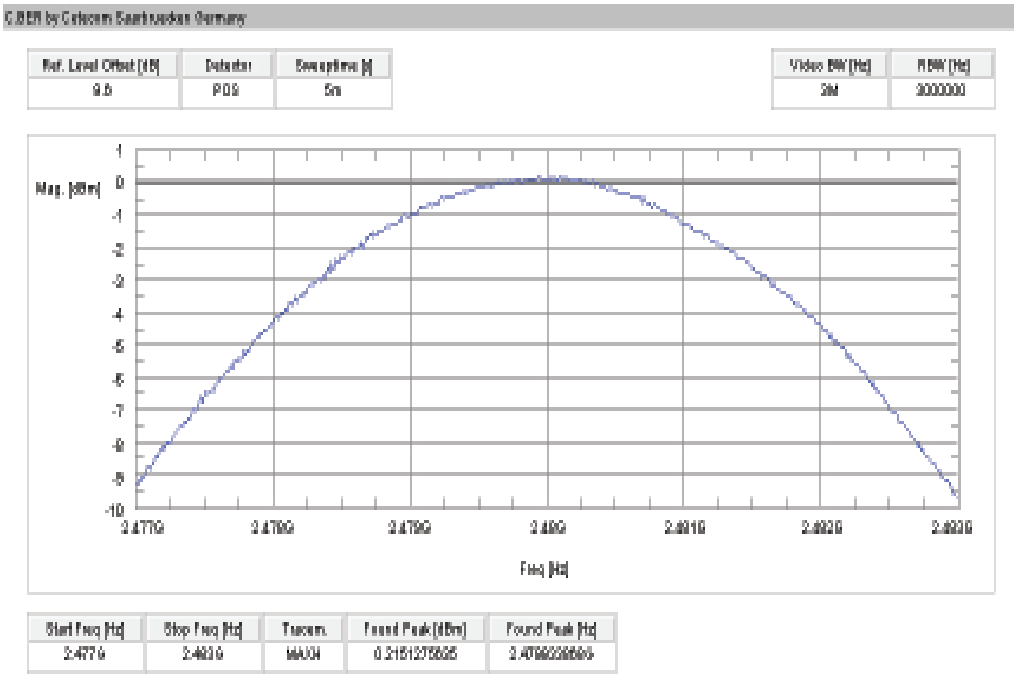
Plot 7: lowest channel – 2402 MHz, 8 DPSK modulation



Plot 8: middle channel – 2441 MHz, 8 DPSK modulation



Plot 9: highest channel – 2480 MHz, 8 DPSK modulation



9.8 Band edge compliance conducted

Description:

Measurement of the conducted band edge compliance. EUT is measured at the lower and upper band edge in single channel and hopping mode. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	Lower Band Edge: 2395 – 2405 MHz higher Band Edge: 2478 – 2489 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Band edge compliance conducted	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.	

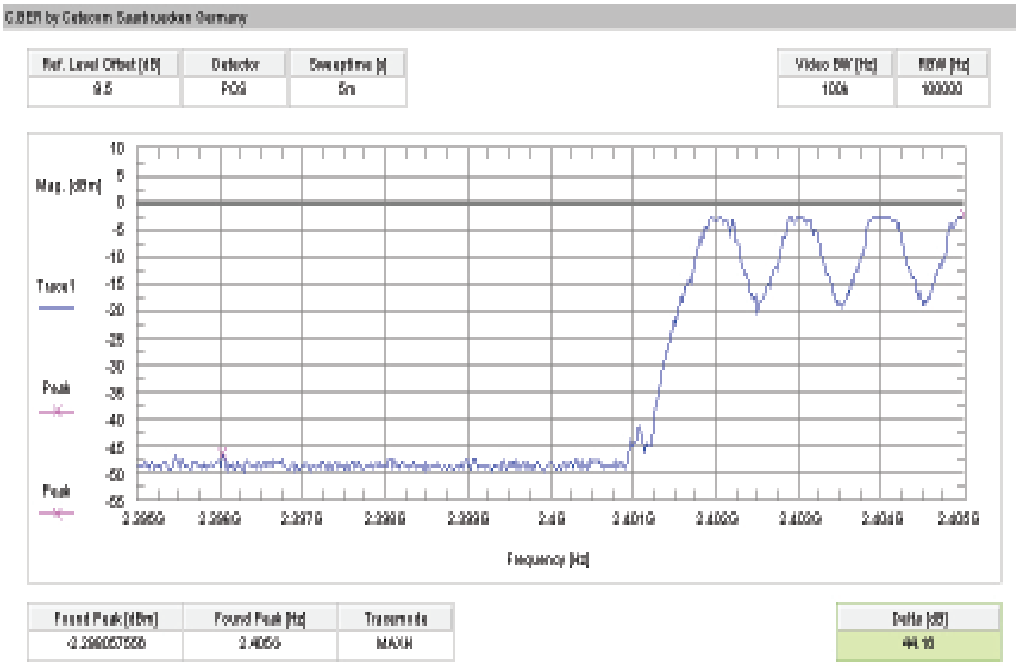
Results:

Scenario	Band edge compliance conducted [dB]		
Modulation	GFSK	Pi/4 DQPSK	8DPSK
Lower band edge – hopping off	> 20 dB	> 20 dB	> 20 dB
Lower band edge – hopping on	> 20 dB	> 20 dB	> 20 dB
Upper band edge – hopping off	> 20 dB	> 20 dB	> 20 dB
Upper band edge – hopping on	> 20 dB	> 20 dB	> 20 dB
Measurement uncertainty	± 1.5 dB		

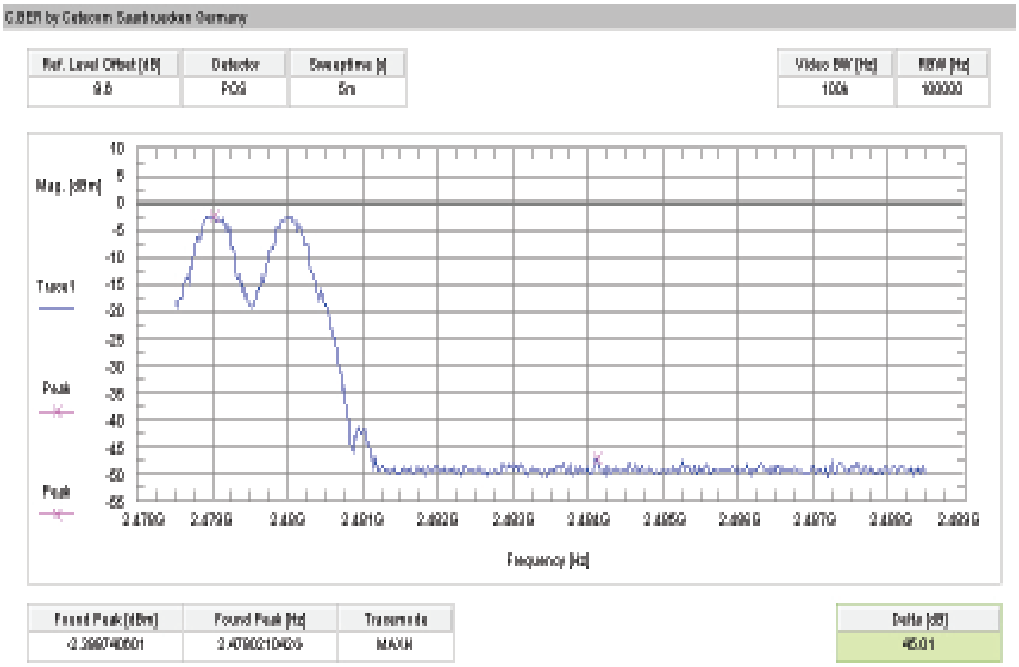
Result: Passed

Plots:

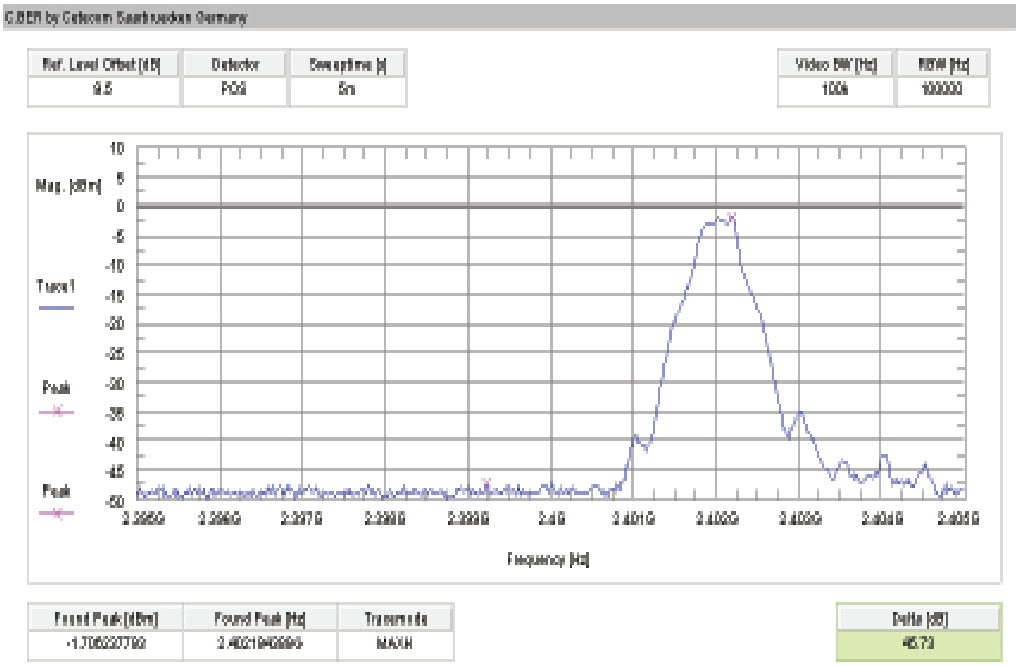
Plot 1: Lower band edge – hopping on, GFSK modulation



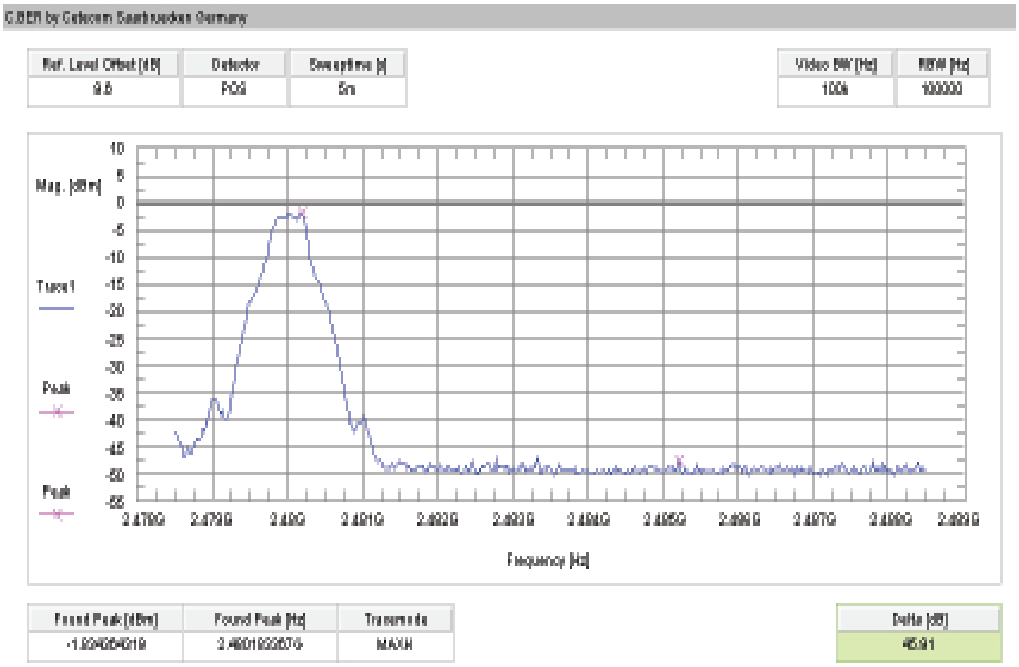
Plot 2: Upper band edge – hopping on, GFSK modulation



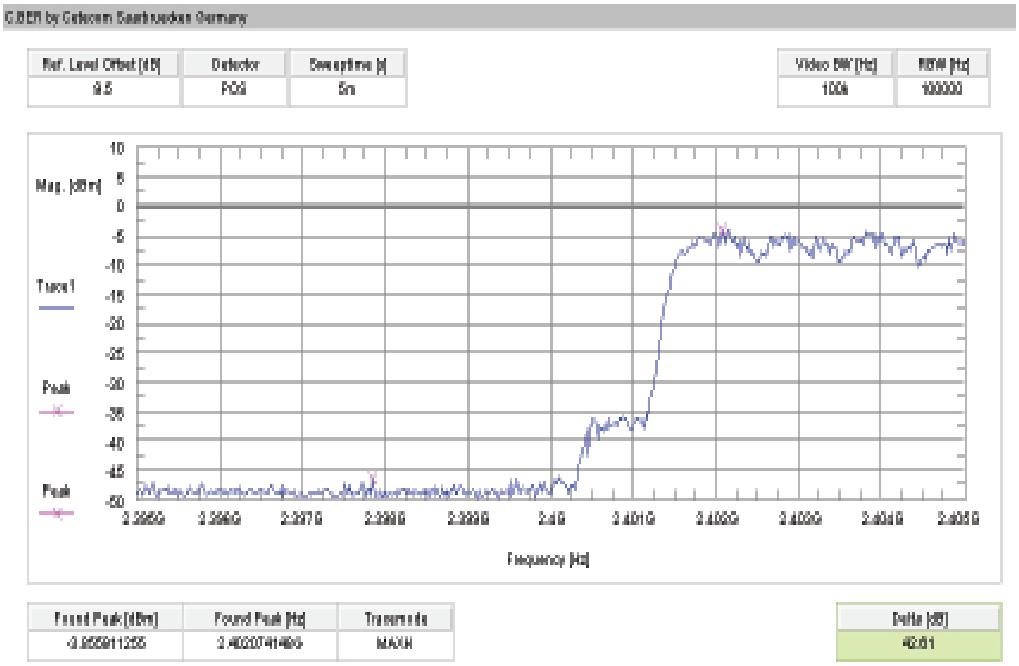
Plot 3: Lower band edge – hopping off, GFSK modulation



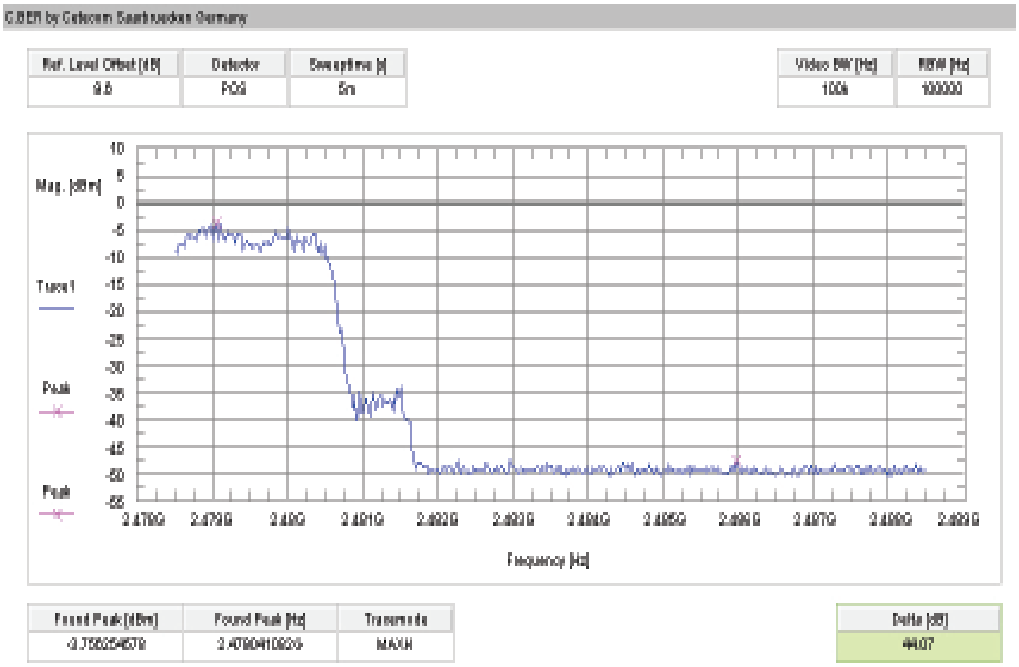
Plot 4: Upper band edge – hopping off, GFSK modulation



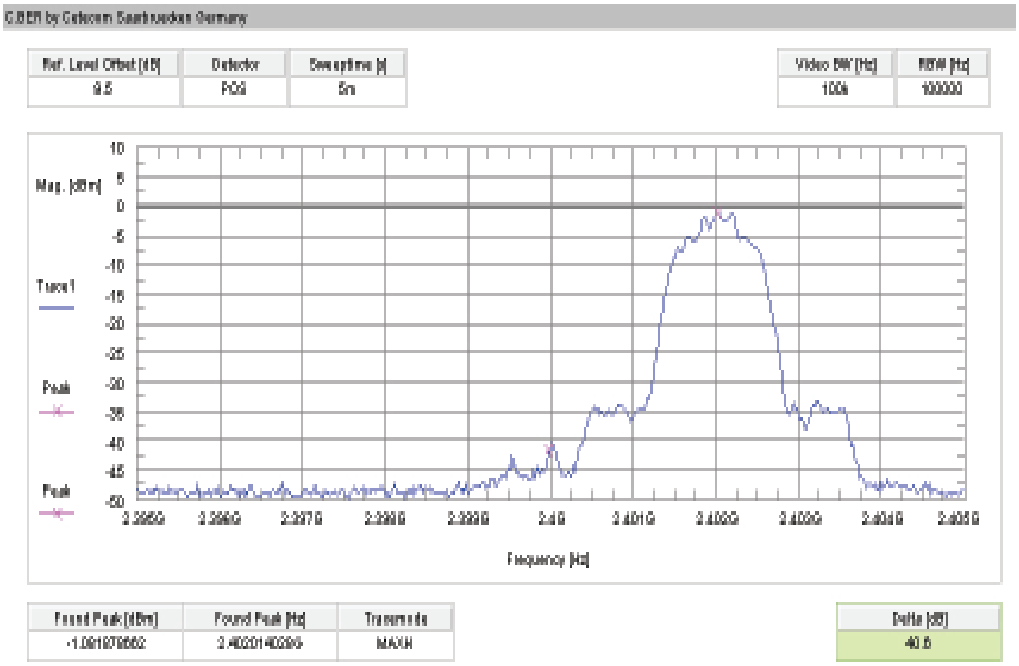
Plot 5: Lower band edge – hopping on, Pi/4 DQPSK modulation



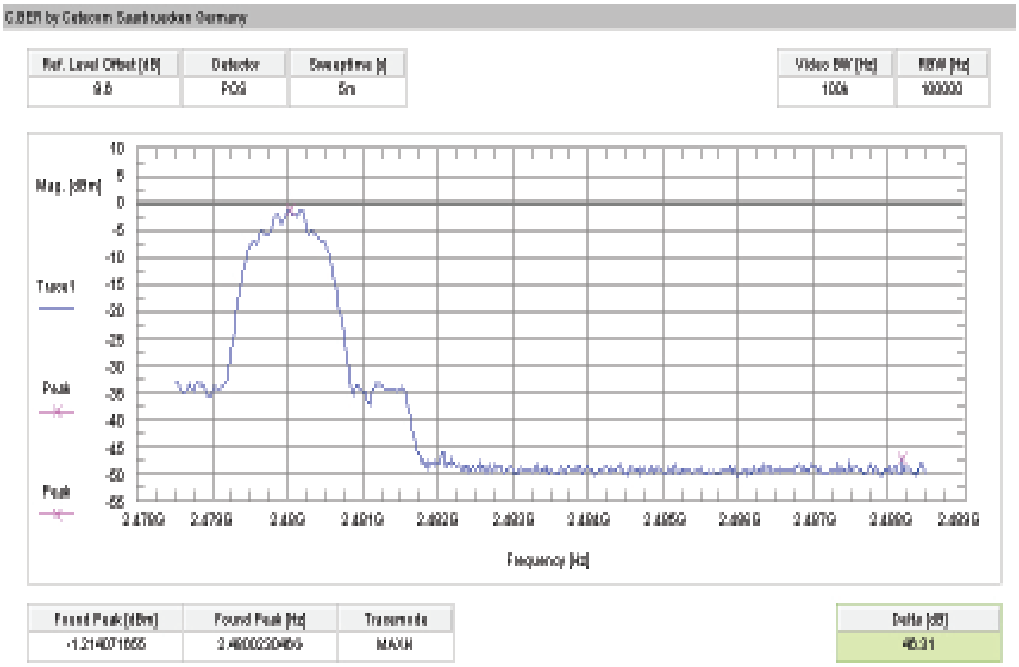
Plot 6: Upper band edge – hopping on, Pi/4 DQPSK modulation



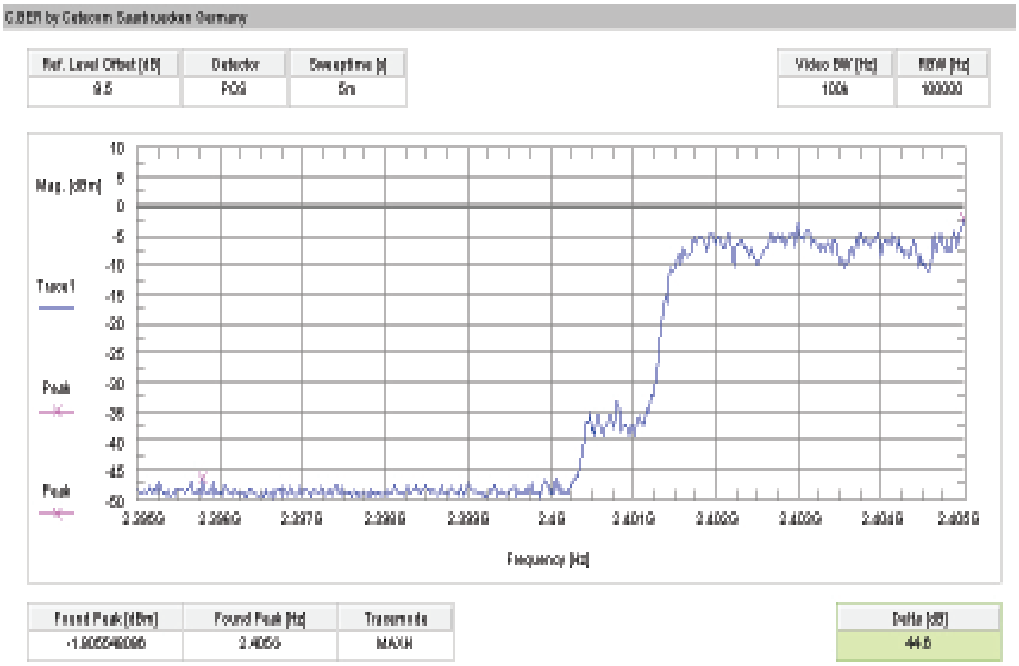
Plot 7: Lower band edge – hopping off, Pi/4 DQPSK modulation



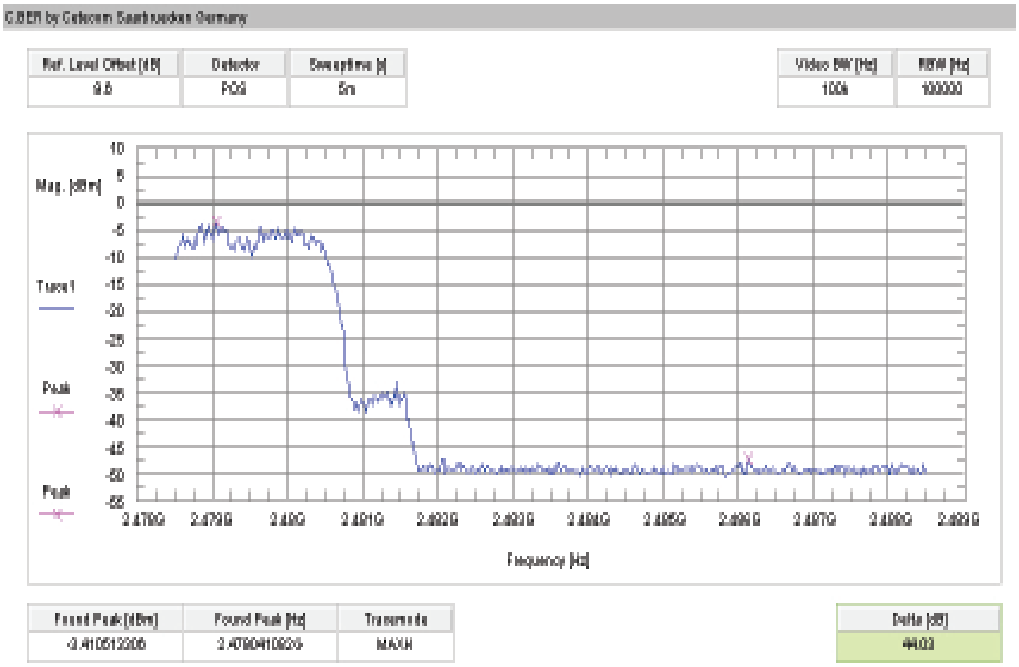
Plot 8: Upper band edge – hopping off, Pi/4 DQPSK modulation



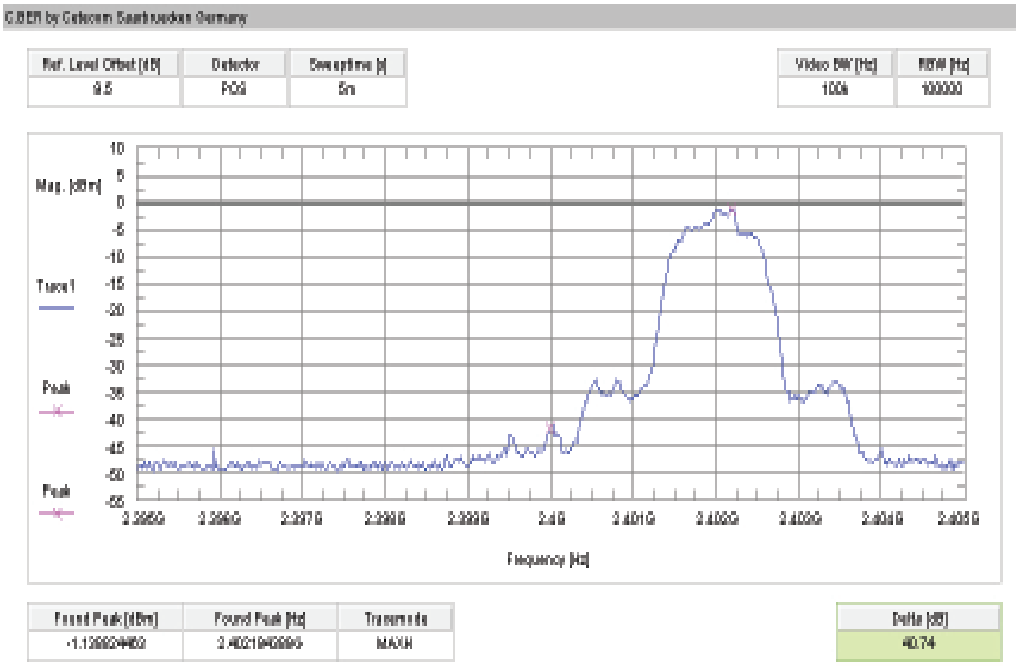
Plot 9: Lower band edge – hopping on, 8DPSK modulation



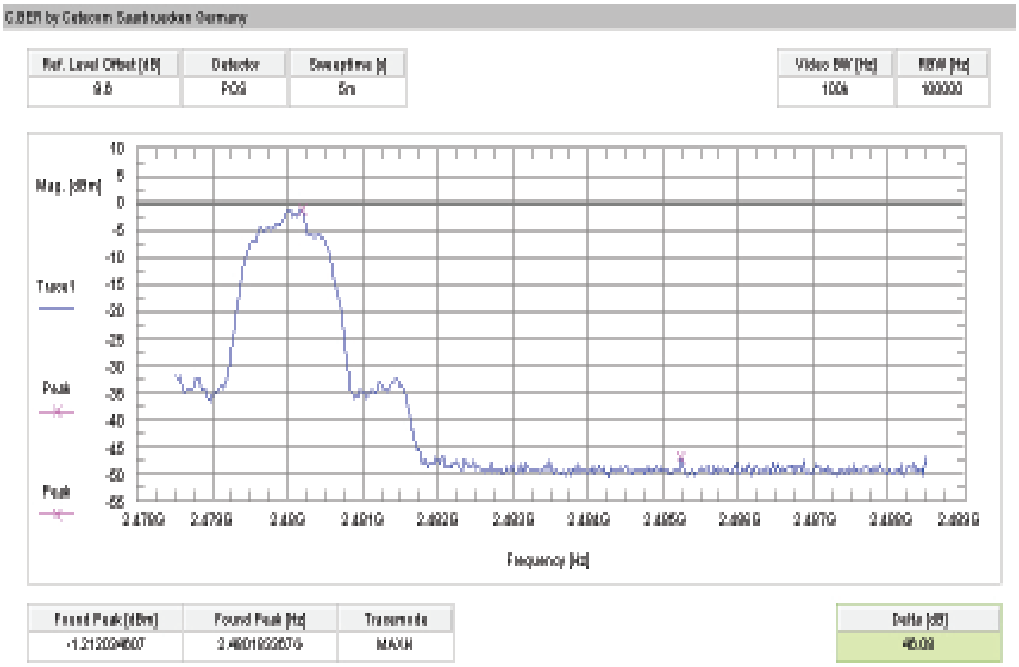
Plot 10: Upper band edge – hopping on, 8DPSK modulation



Plot 11: Lower band edge – hopping off, 8DPSK modulation



Plot 12: Upper band edge – hopping off, 8DPSK modulation



9.9 Band edge compliance radiated

Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to single channel mode and the transmit channel is channel 00 for the lower restricted band and channel 78 for the upper restricted band. The measurement is repeated for all modulations. Measurement distance is 3m.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	1 MHz Peak / 10 Hz AVG
Resolution bandwidth:	1 MHz
Span:	Lower Band: 2370 – 2400 MHz higher Band: 2480 – 2500 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Band edge compliance radiated	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).	
54 dBµV/m AVG 74 dBµV/m Peak	

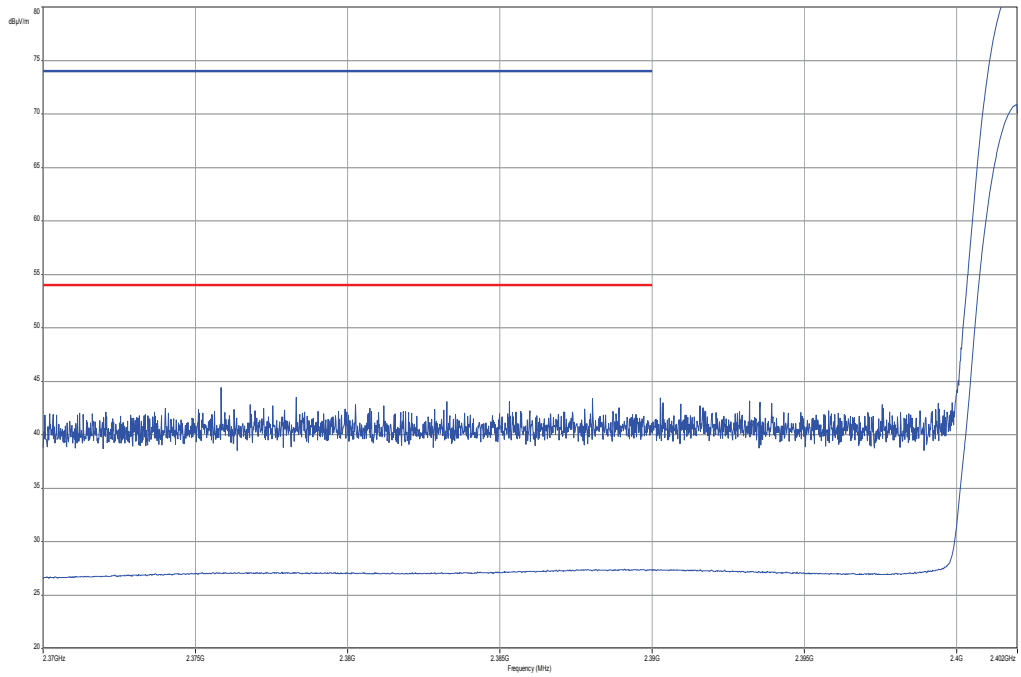
Results:

Scenario	Band edge compliance radiated [dBµV/m]		
Modulation	GFSK	Pi/4 DQPSK	8DPSK
Lower restricted band	< 54 AVG / < 74 PP	< 54 AVG / < 74 PP	< 54 AVG / < 74 PP
Upper restricted band	< 54 AVG / < 74 PP	< 54 AVG / < 74 PP	< 54 AVG / < 74 PP
Measurement uncertainty	± 3 dB		

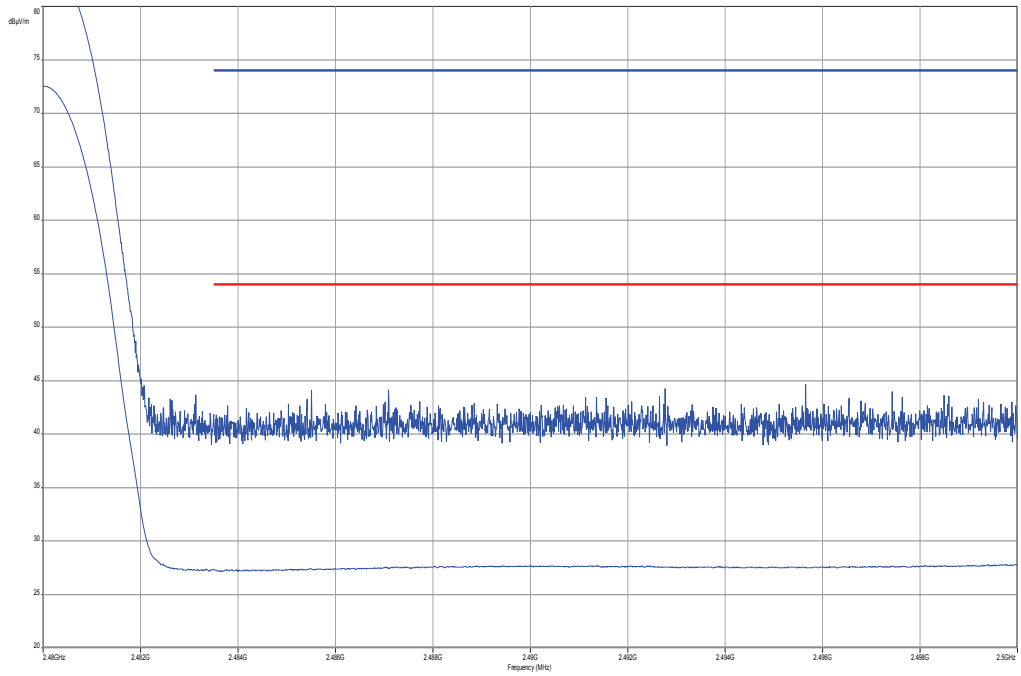
Result: Passed

Plots:

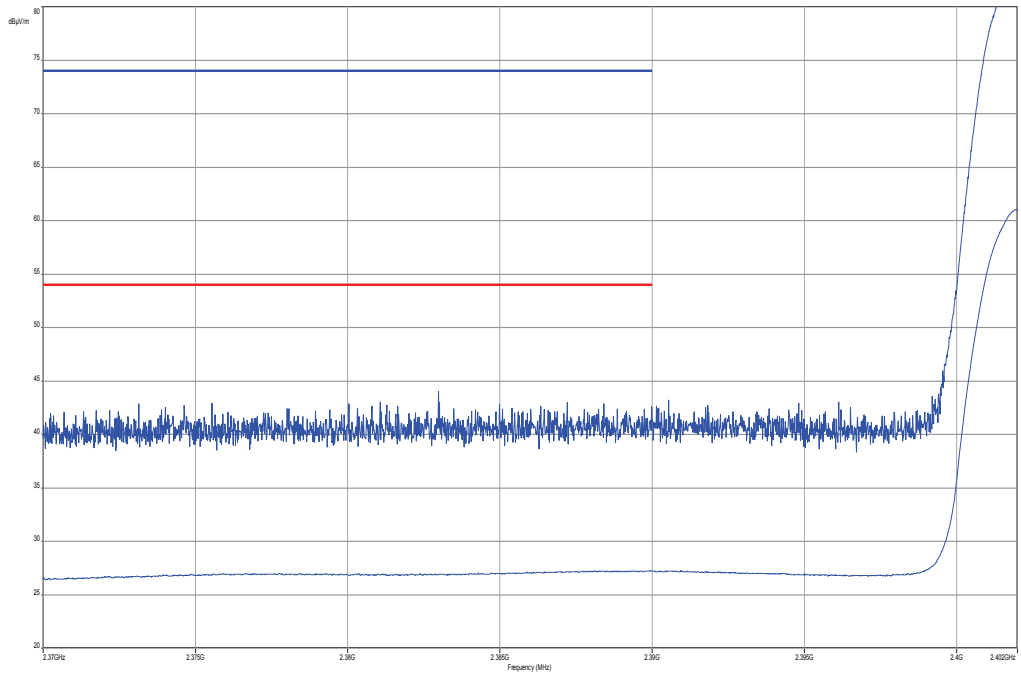
Plot 1: Lower band edge, GFSK modulation, vertical & horizontal polarization



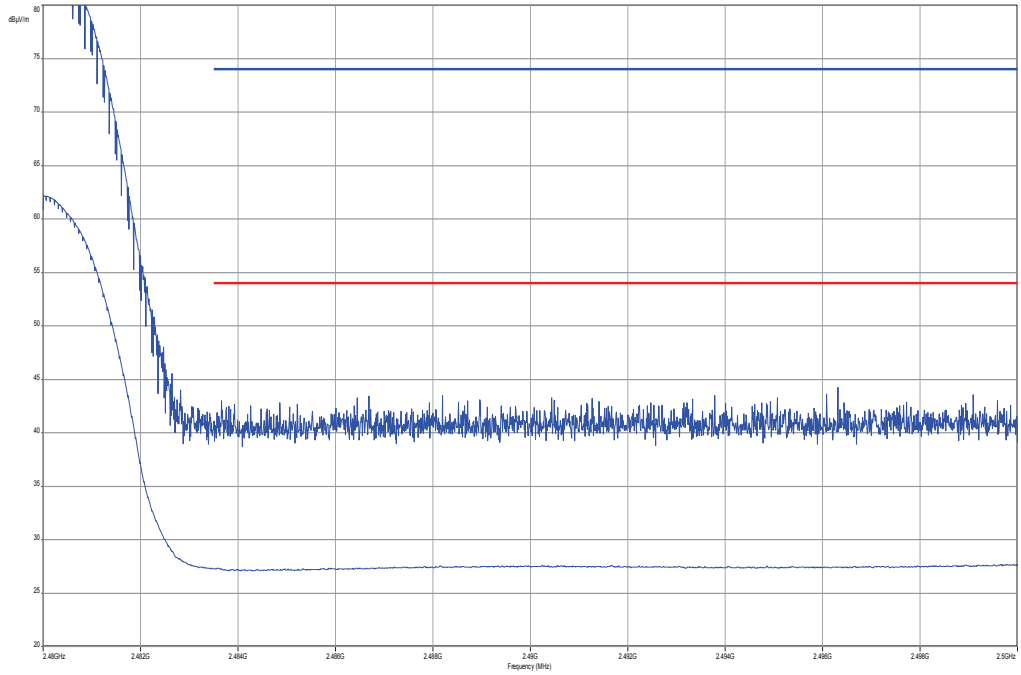
Plot 2: Upper band edge, GFSK modulation, vertical & horizontal polarization



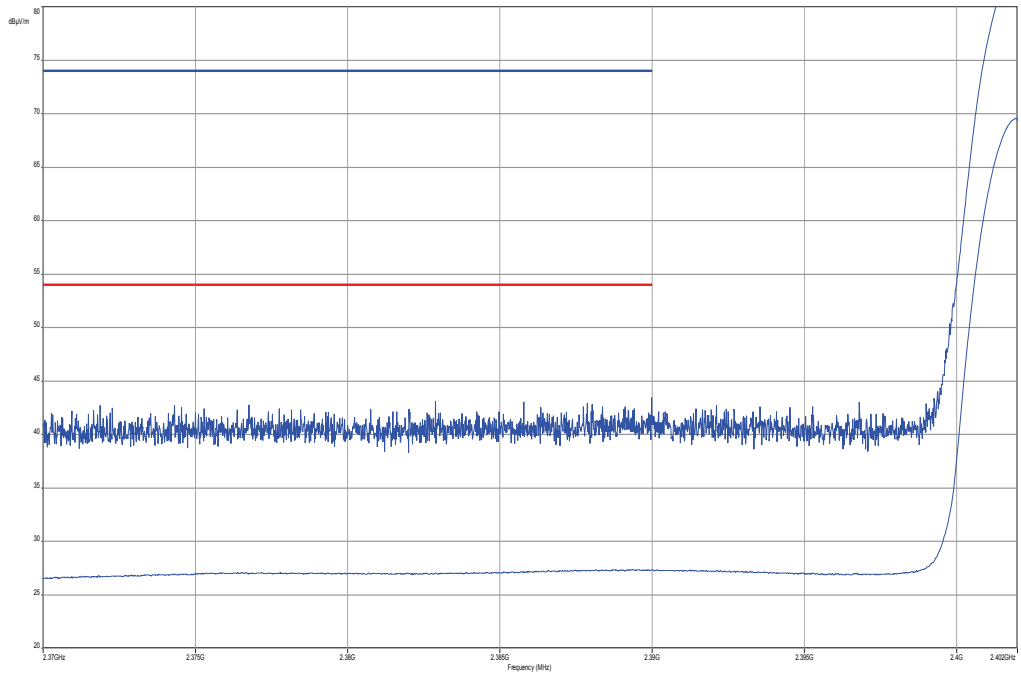
Plot 3: Lower band edge, Pi/4 DQPSK modulation, vertical & horizontal polarization



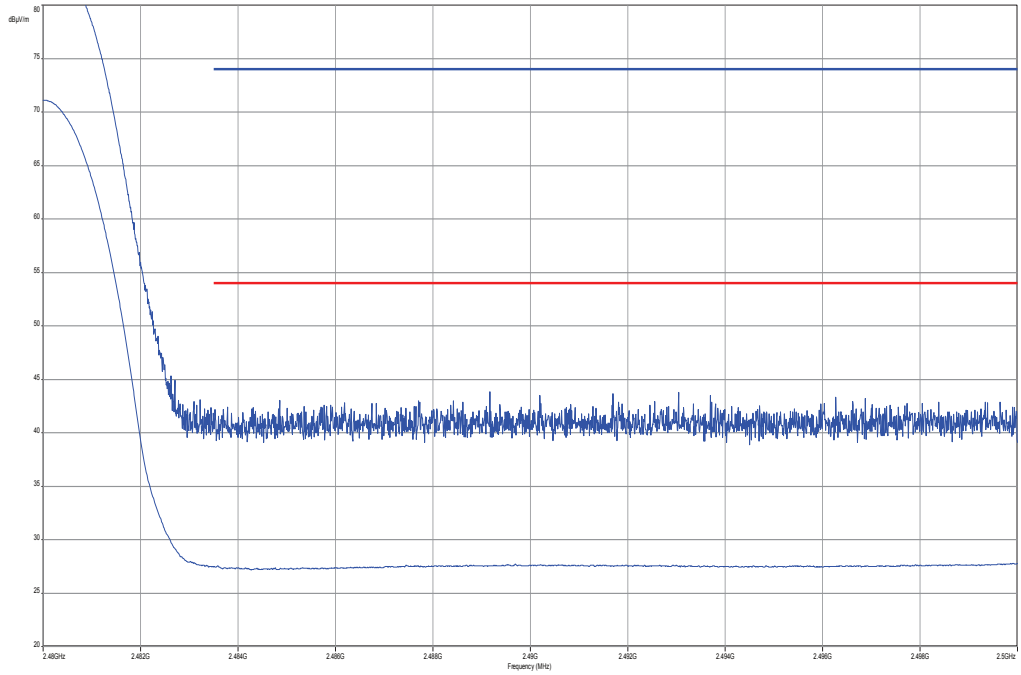
Plot 4: Upper band edge, Pi/4 DQPSK modulation, vertical & horizontal polarization



Plot 5: Lower band edge, 8 DPSK modulation, vertical & horizontal polarization



Plot 6: Upper band edge, 8 DPSK modulation, vertical & horizontal polarization



9.10 TX spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode. The EUT is set to single channel mode and the transmit channel is channel 00, channel 39 and channel 78. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	F < 1 GHz: 500 kHz F > 1 GHz: 500 kHz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 100 kHz
Span:	9 kHz to 25 GHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
TX spurious emissions conducted	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required	

Results:

TX spurious emissions conducted					
GFSK - mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2402			30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
2441			30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
2480			30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
Measurement uncertainty		± 3 dB			

Result: Passed

Results:

TX spurious emissions conducted					
Pi/4-DQPSK - mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2402			30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
2441			30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
2480			30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
Measurement uncertainty		± 3dB			

Result: Passed

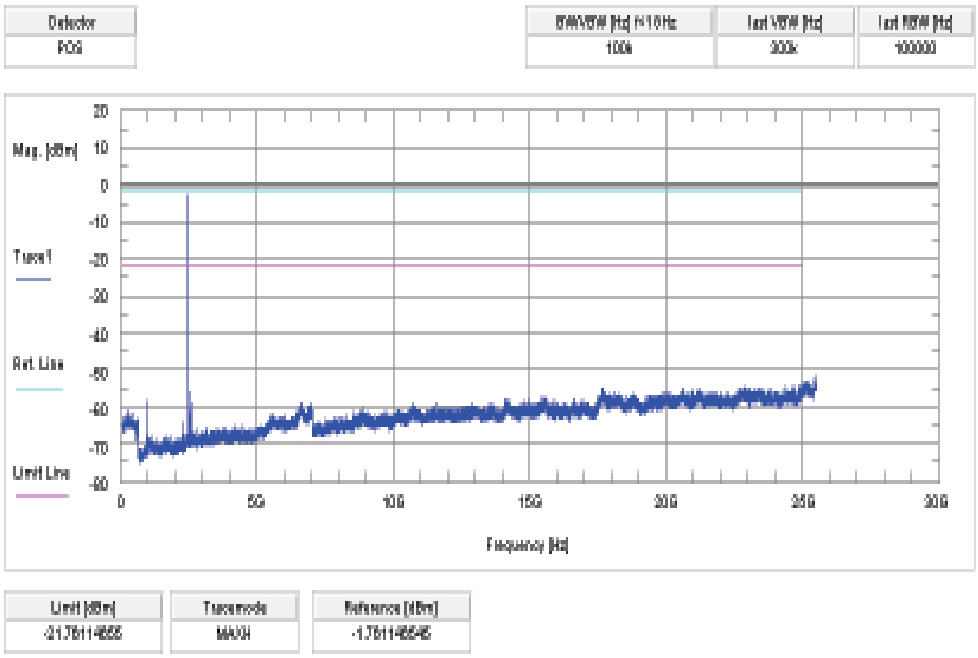
Results:

TX spurious emissions conducted					
8DPSK - mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2402			30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
2441			30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
2480			30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
Measurement uncertainty		± 3dB			

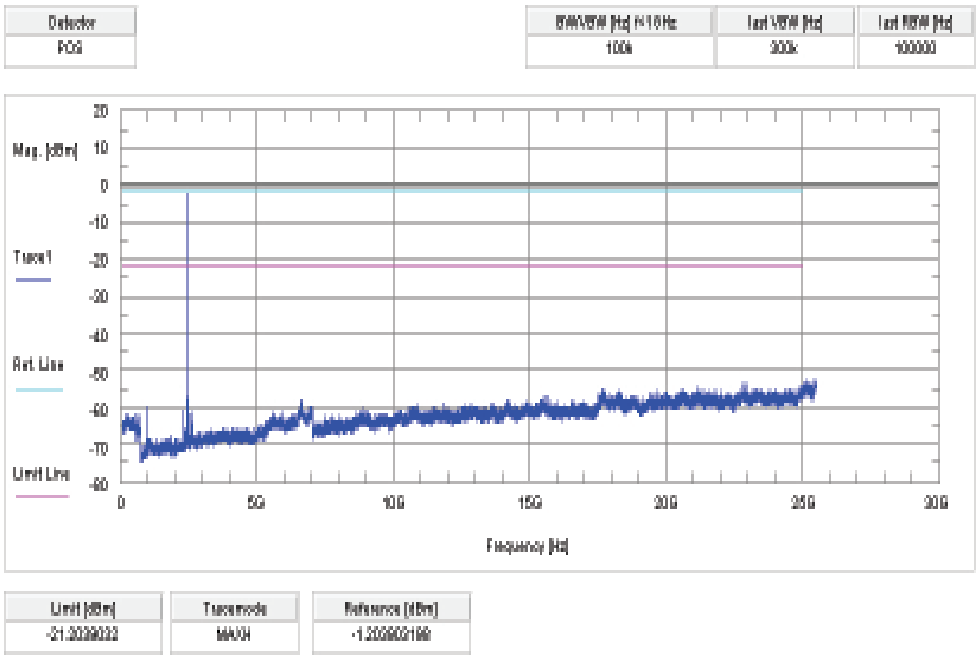
Result: **Passed**

Plots:

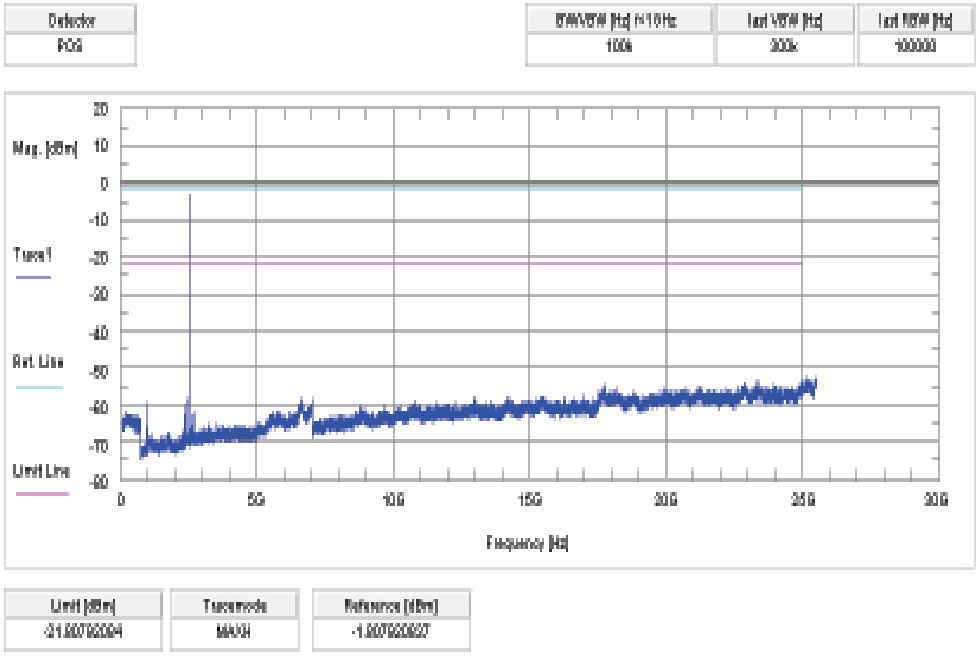
Plot 1: lowest channel – 2402 MHz, GFSK modulation



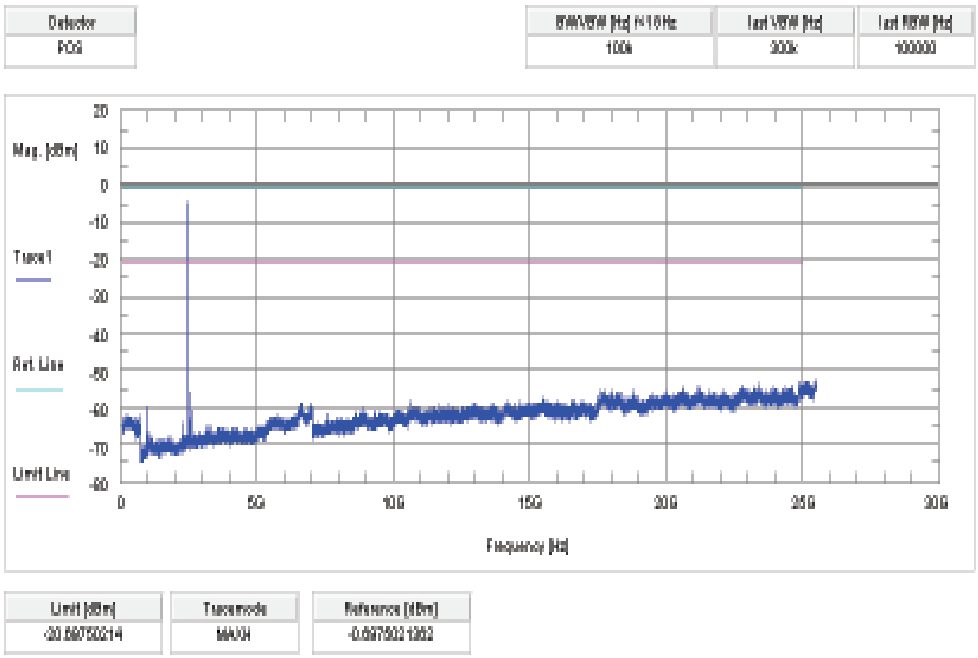
Plot 2: middle channel – 2441 MHz, GFSK modulation



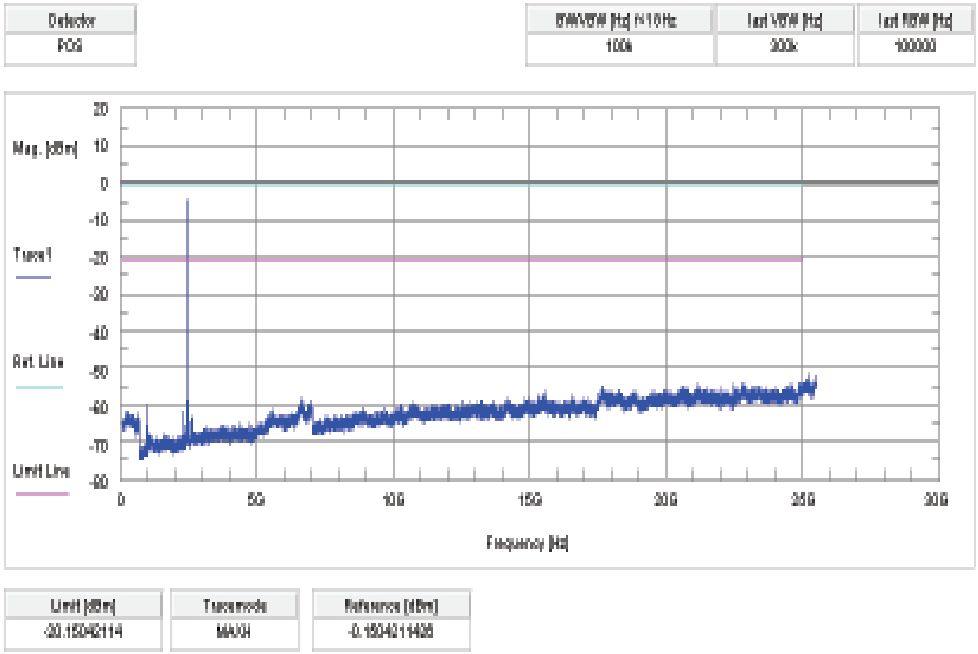
Plot 3: highest channel – 2480 MHz, GFSK modulation



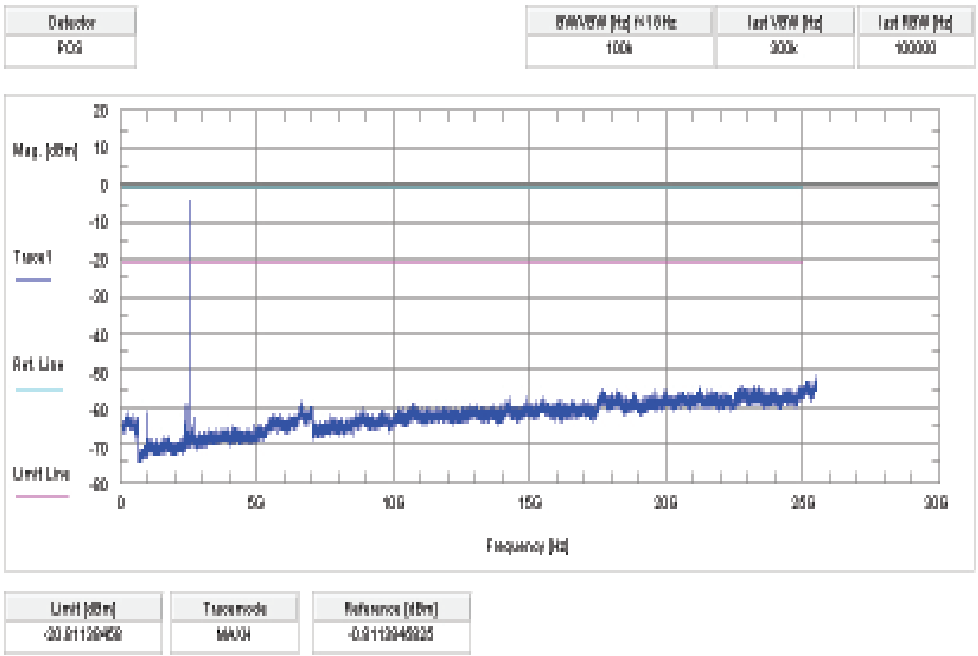
Plot 4: lowest channel – 2402 MHz, Pi/4 DQPSK modulation



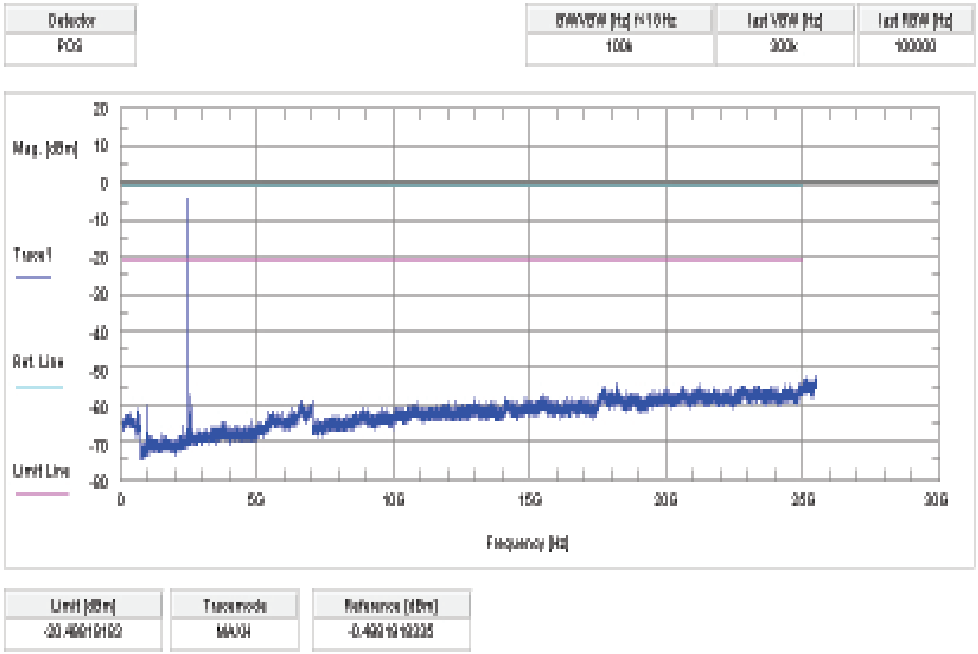
Plot 5: middle channel – 2441 MHz, Pi/4 DQPSK modulation



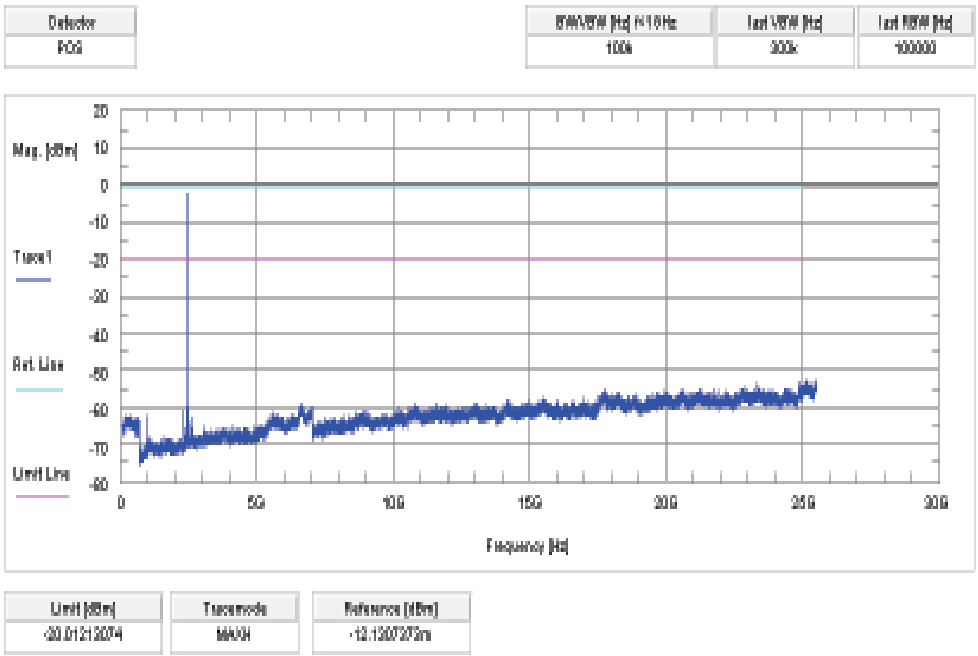
Plot 6: highest channel – 2480 MHz, Pi/4 DQPSK modulation



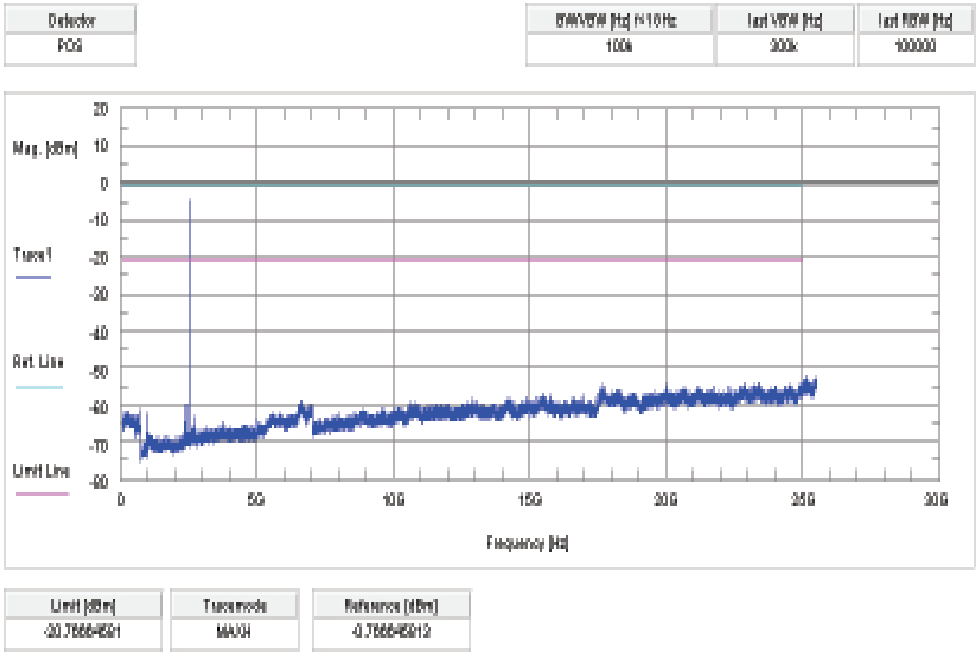
Plot 7: lowest channel – 2402 MHz, 8 DPSK modulation



Plot 8: middle channel – 2441 MHz, 8 DPSK modulation



Plot 9: highest channel – 2480 MHz, 8 DPSK modulation



9.11 TX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode. The EUT is set to single channel mode and the transmit channel is channel 00, channel 39 and channel 78. The measurement is performed in the mode with the highest output power.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	Sweep: 100 kHz Remeasurement: 10 Hz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Span:	30 MHz to 25 GHz
Trace-Mode:	Max Hold
Measured Modulation:	☐ GFSK ☐ Pi/4 DQPSK ☒ 8DPSK

The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

Limits:

FCC	IC	
TX spurious emissions radiated		
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
§15.209		
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

TX spurious emissions radiated [dBµV/m]								
2402 MHz			2441 MHz			2480 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
No traceable peaks detected			No traceable peaks detected			No traceable peaks detected		
Measurement uncertainty			± 3 dB					

Result: Passed

Plots:

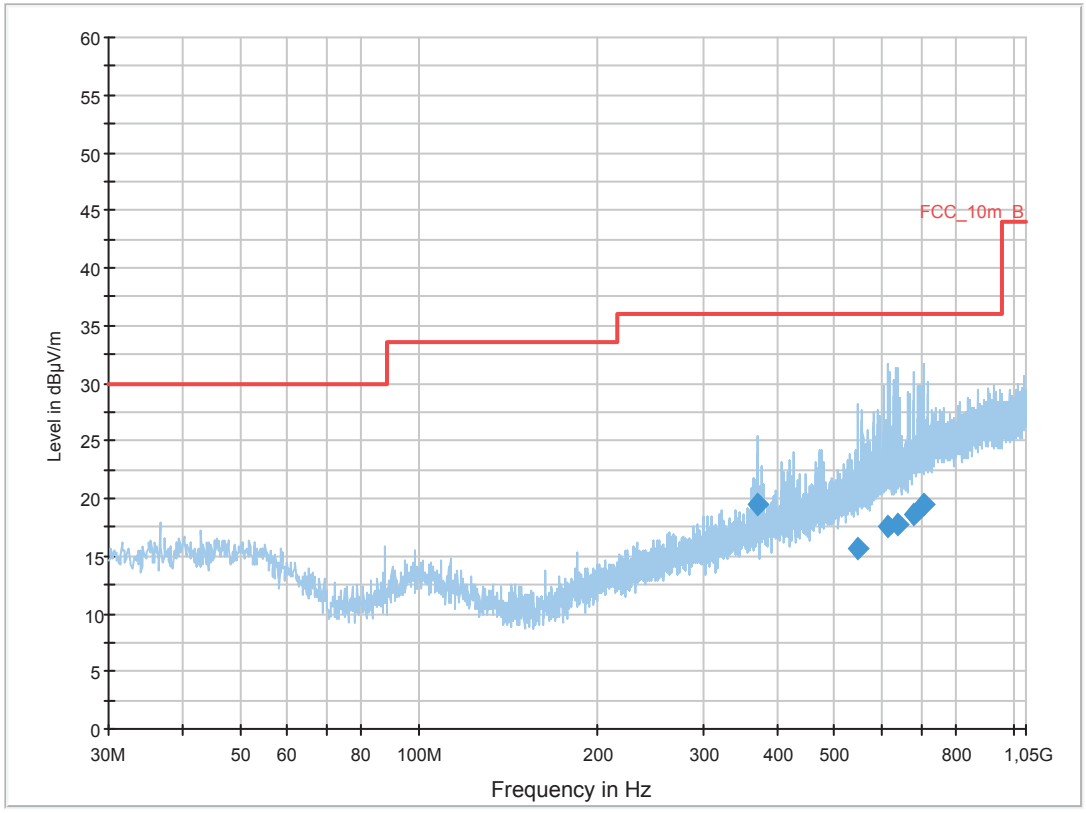
Common Information

EUT:	LCN2K25A00
Serial Number:	PD: 04.2013
Test Description:	FCC part 15 C class B @ 10 m
Operating Conditions:	BT TX Ch. 0 (2402 MHz)
Operator Name:	Hennemann
Comment:	DC: 13,5 V

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Receiver:	[ESCI 3]
Level Unit:	dBµV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
370.159500	19.5	1000.0	120.000	98.0	V	10.0	16.4	16.5	36.0	
545.685900	15.7	1000.0	120.000	170.0	H	190.0	19.3	20.3	36.0	
615.614250	17.5	1000.0	120.000	170.0	H	90.0	20.9	18.5	36.0	
640.675200	17.7	1000.0	120.000	122.0	H	100.0	21.0	18.3	36.0	
678.241800	18.5	1000.0	120.000	170.0	H	81.0	21.9	17.5	36.0	
706.804800	19.4	1000.0	120.000	113.0	H	100.0	22.7	16.6	36.0	

Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

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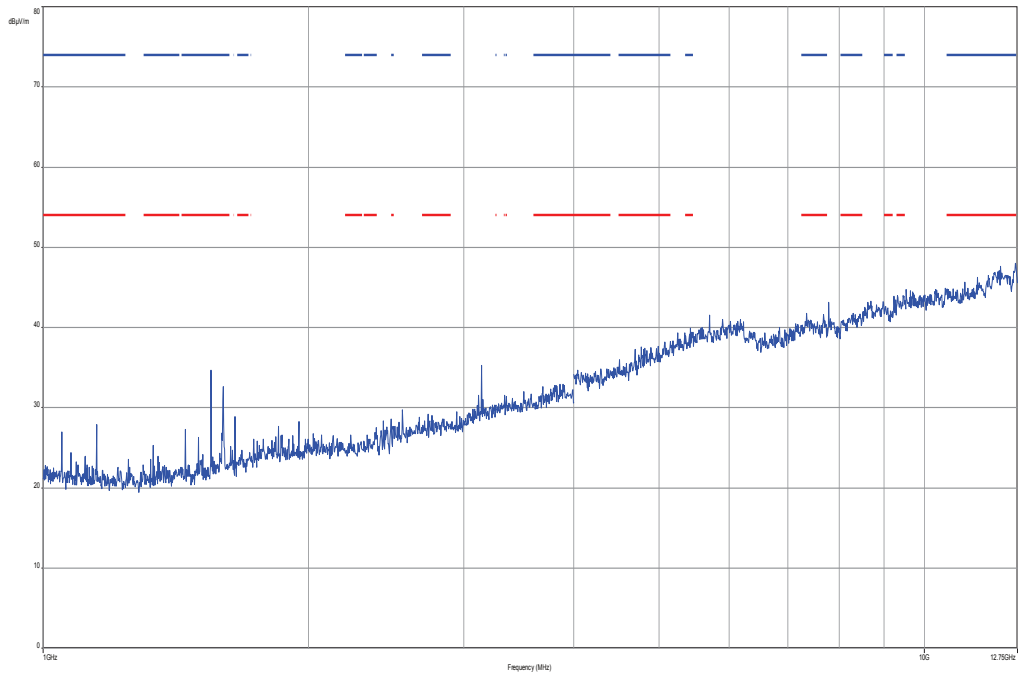
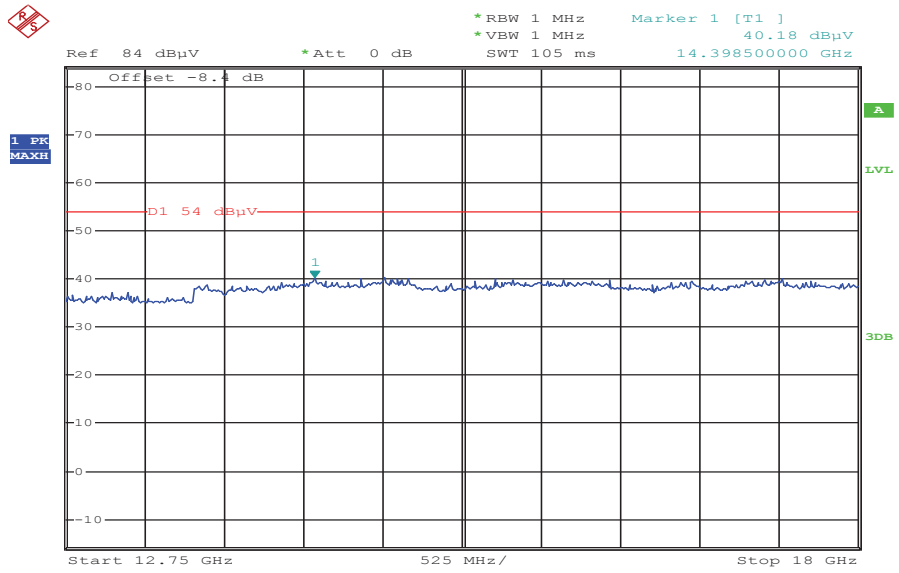
Plot 2: 1 GHz to 12.75 GHz, TX mode, channel 00, vertical & horizontal polarization



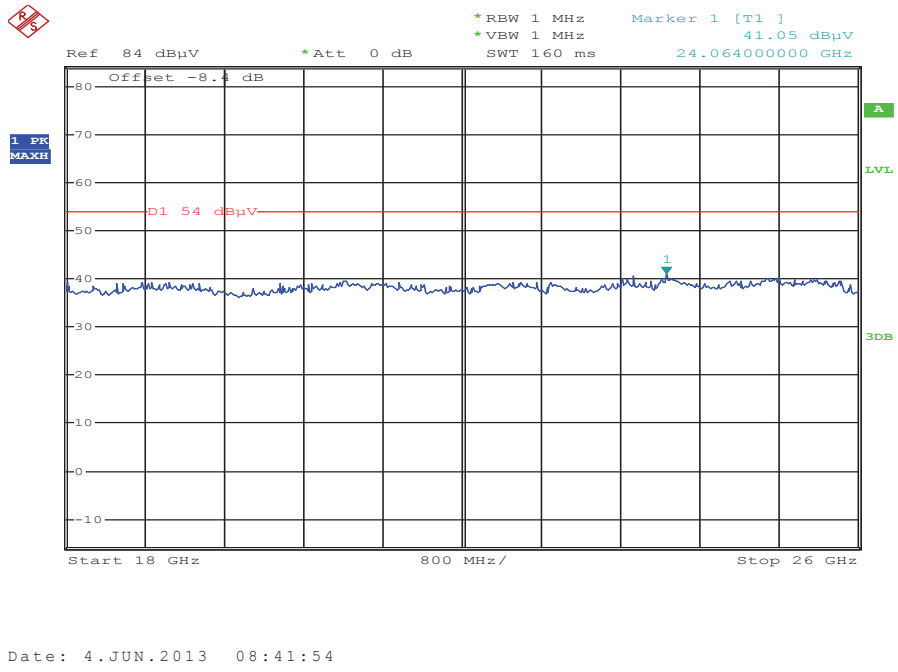
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 3: 12.75 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization



Date: 4.JUN.2013 08:33:18

Plot 4: 18 GHz to 26 GHz, TX mode, channel 00, vertical & horizontal polarization



Plot 5: 30 MHz to 1 GHz, TX mode, channel 39, vertical & horizontal polarization

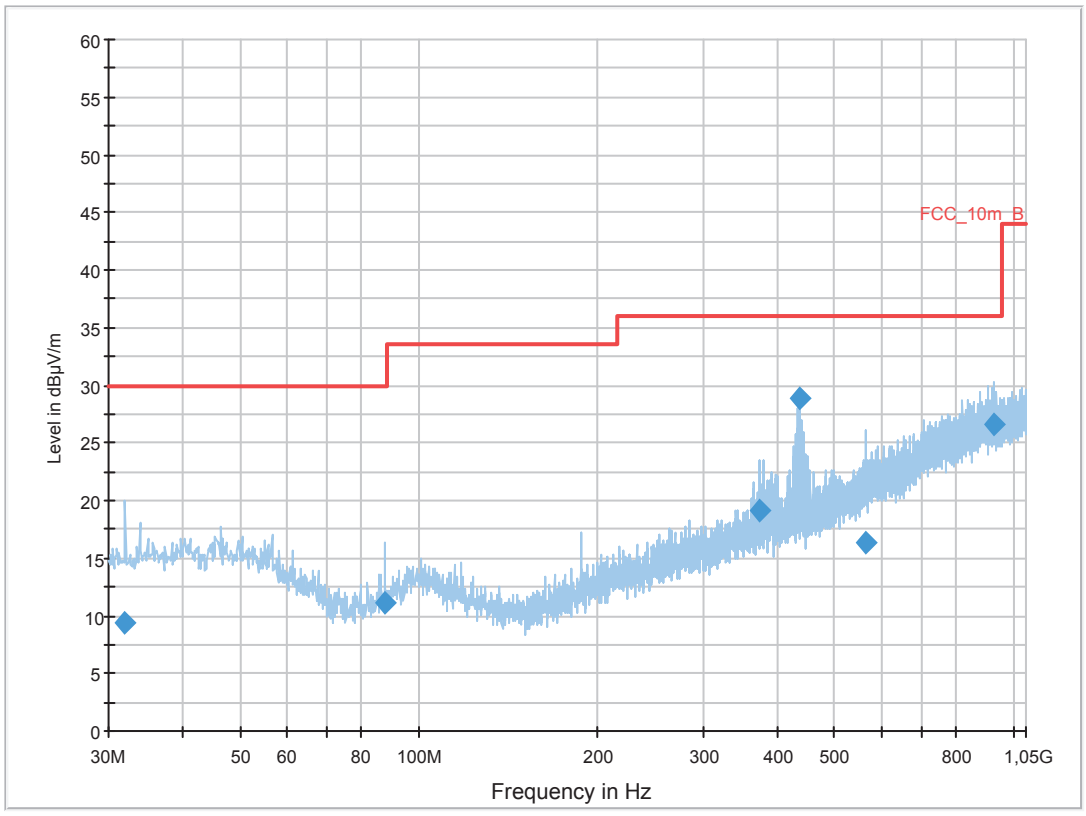
Common Information

EUT:	LCN2K25A00
Serial Number:	PD: 04.2013
Test Description:	FCC part 15 C class B @ 10 m
Operating Conditions:	BT TX Ch. 39 (2441 MHz)
Operator Name:	Hennemann
Comment:	DC: 13,5 V

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Receiver:	[ESCI 3]
Level Unit:	dBµV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
31.872600	9.4	1000.0	120.000	153.0	H	176.0	12.7	20.6	30.0	
87.526650	11.2	1000.0	120.000	98.0	V	10.0	10.2	18.8	30.0	
373.924800	19.1	1000.0	120.000	105.0	V	10.0	16.5	16.9	36.0	
435.617850	28.9	1000.0	120.000	98.0	V	10.0	17.4	7.1	36.0	
562.472850	16.4	1000.0	120.000	161.0	H	280.0	19.7	19.6	36.0	
927.368700	26.7	1000.0	120.000	170.0	V	80.0	25.3	9.3	36.0	

Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

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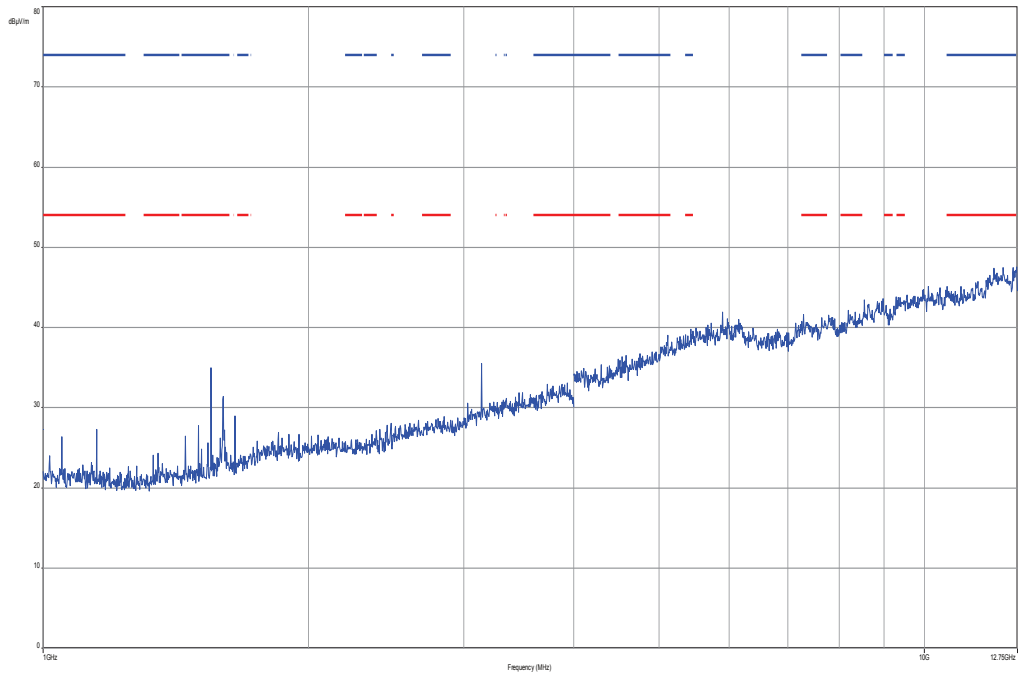
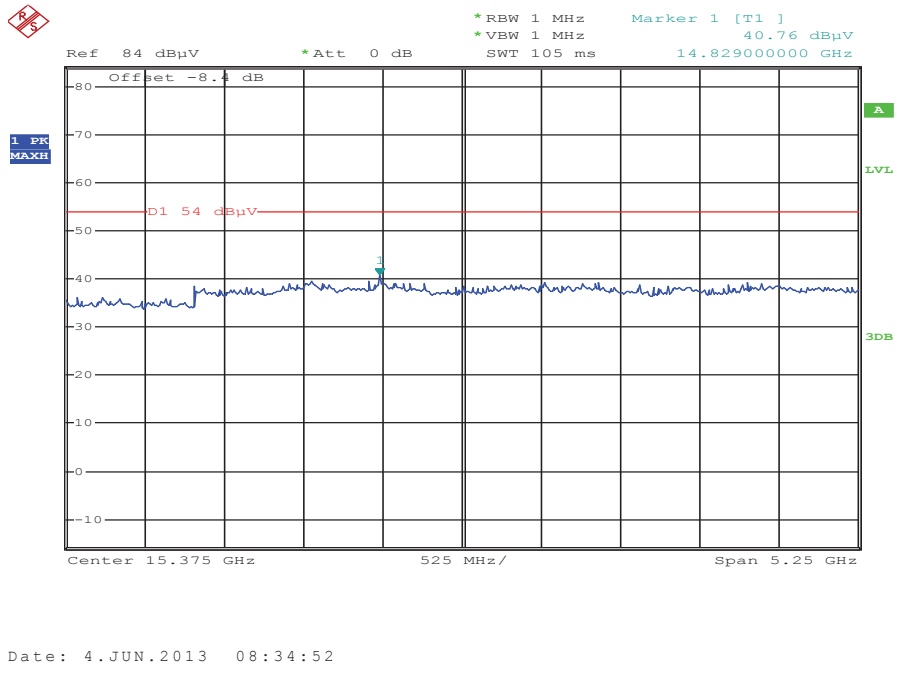
Plot 6: 1 GHz to 12.75 GHz, TX mode, channel 39, vertical & horizontal polarization



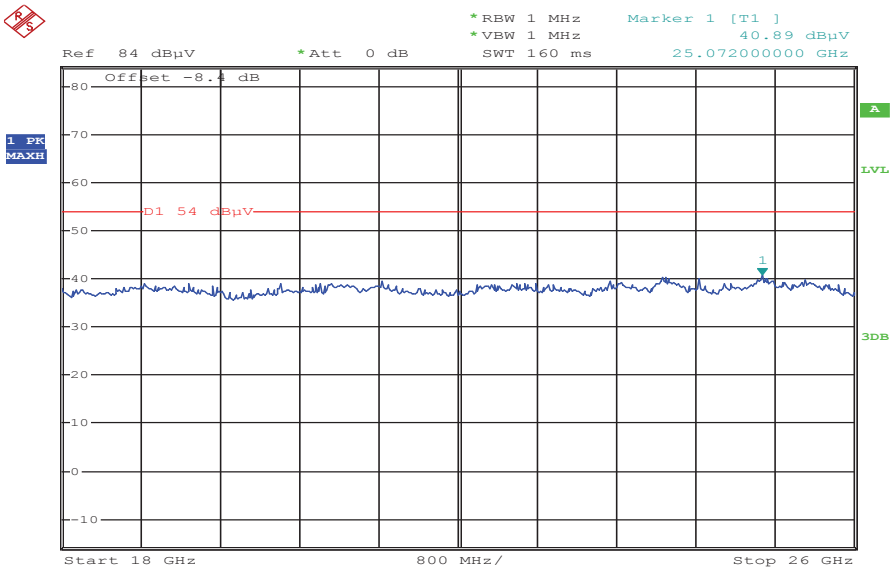
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 7: 12.75 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization



Date: 4.JUN.2013 08:34:52

Plot 8: 18 GHz to 26 GHz, TX mode, channel 39, vertical & horizontal polarization



Date: 4.JUN.2013 08:43:36

Plot 9: 30 MHz to 1 GHz, TX mode, channel 78, vertical & horizontal polarization

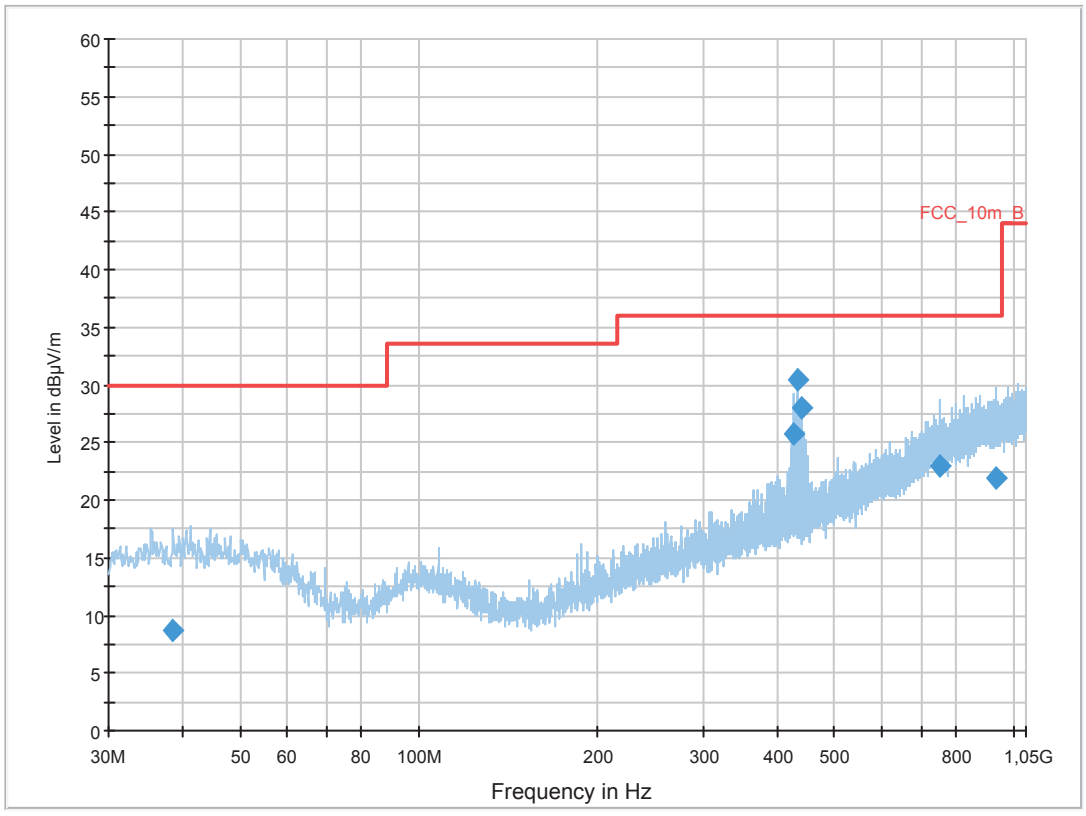
Common Information

EUT:	LCN2K25A00
Serial Number:	PD: 04.2013
Test Description:	FCC part 15 C class B @ 10 m
Operating Conditions:	BT TX Ch. 78 (2480 MHz)
Operator Name:	Hennemann
Comment:	DC: 13,5 V

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Receiver:	[ESCI 3]
Level Unit:	dBµV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
38.492550	8.6	1000.0	120.000	170.0	H	260.0	13.3	21.4	30.0	
426.444600	25.8	1000.0	120.000	98.0	V	-10.0	17.3	10.2	36.0	
432.019200	30.4	1000.0	120.000	98.0	V	10.0	17.4	5.6	36.0	
441.107700	28.0	1000.0	120.000	98.0	V	10.0	17.5	8.0	36.0	
750.028350	23.0	1000.0	120.000	146.0	H	273.0	23.7	13.0	36.0	
936.676950	21.9	1000.0	120.000	105.0	H	190.0	25.3	14.1	36.0	

Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

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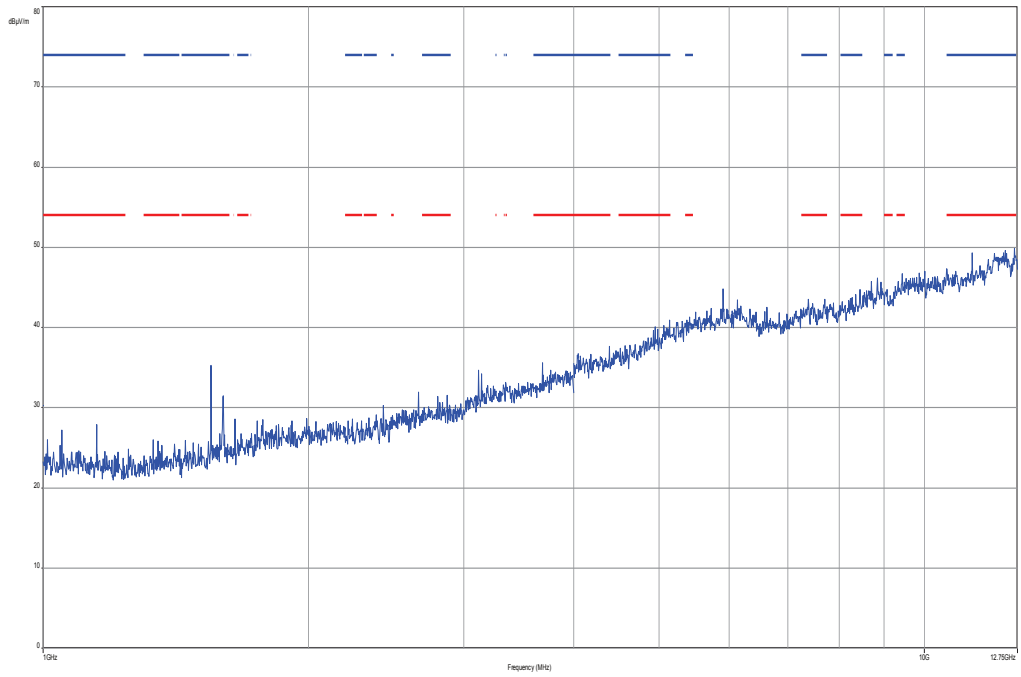
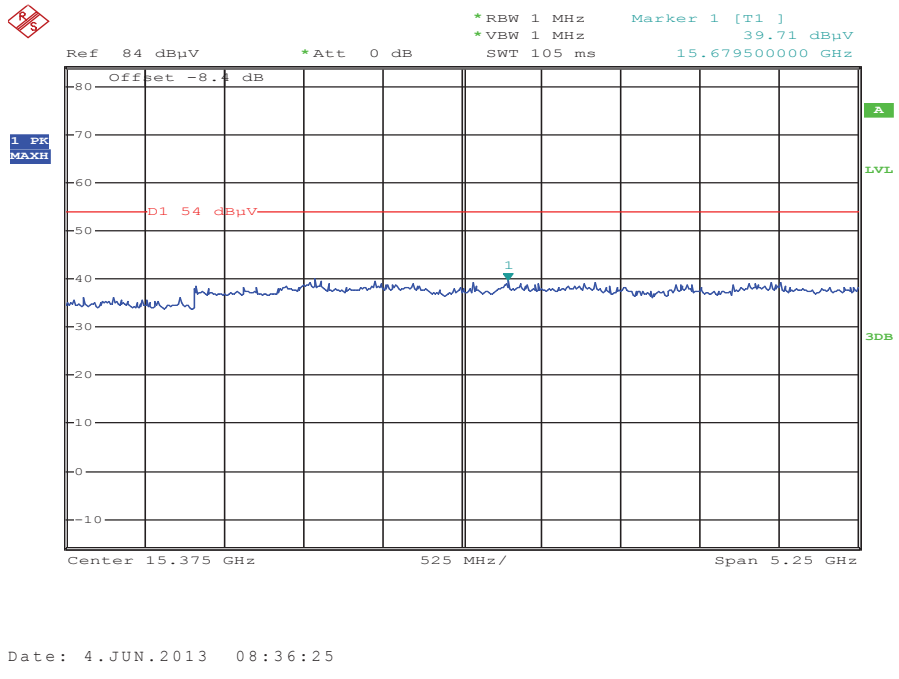
Plot 10: 1 GHz to 12.75 GHz, TX mode, channel 78, vertical & horizontal polarization

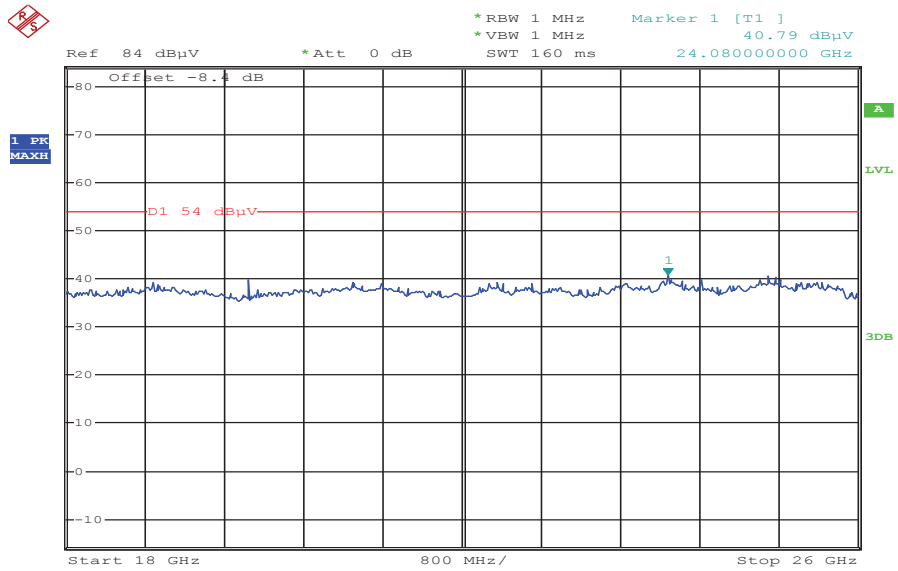


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 11: 12.75 GHz to 18 GHz, TX mode, channel 78, vertical & horizontal polarization



Plot 12: 18 GHz to 26 GHz, TX mode, channel 78, vertical & horizontal polarization



Date: 4.JUN.2013 08:45:00

9.12 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in idle/receive mode. The EUT is detached so all oscillators are active.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi peak
Sweep time:	Auto
Video bandwidth:	Sweep: 100 kHz Remeasurement: 10 Hz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Span:	30 MHz to 25 GHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
RX Spurious Emissions Radiated		
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

RX spurious emissions radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
No traceable peaks detected		
Measurement uncertainty	±3 dB	

Result: Passed

Plots:

Plot 1: 30 MHz to 1 GHz, RX mode, vertical & horizontal polarization

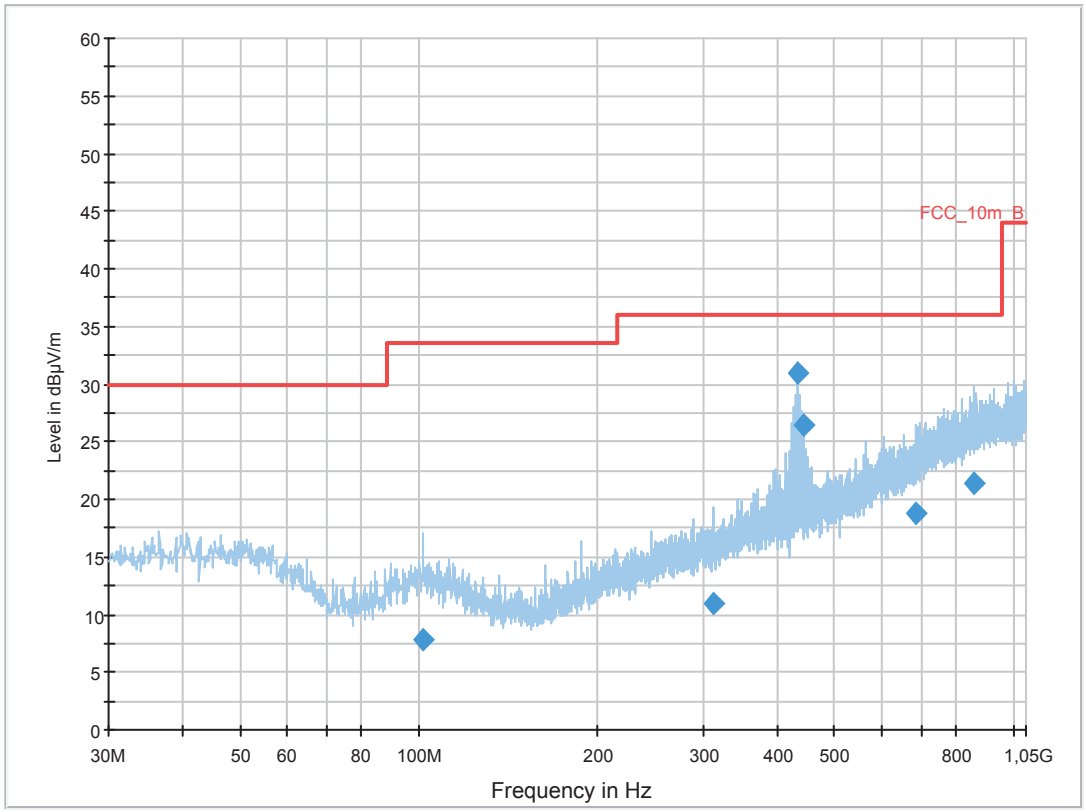
Common Information

EUT:	LCN2K25A00
Serial Number:	PD: 04.2013
Test Description:	FCC part 15 C class B @ 10 m
Operating Conditions:	BT RX
Operator Name:	Hennemann
Comment:	DC: 13,5 V

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Receiver:	[ESCI 3]
Level Unit:	dBµV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
101.610750	7.8	1000.0	120.000	170.0	V	280.0	11.8	25.7	33.5	
312.748800	11.0	1000.0	120.000	170.0	V	81.0	14.9	25.0	36.0	
432.049800	30.9	1000.0	120.000	98.0	V	-2.0	17.4	5.1	36.0	
444.782100	26.5	1000.0	120.000	98.0	V	88.0	17.6	9.5	36.0	
684.765600	18.8	1000.0	120.000	170.0	V	280.0	22.1	17.2	36.0	
860.592150	21.4	1000.0	120.000	170.0	H	93.0	24.7	14.6	36.0	

Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

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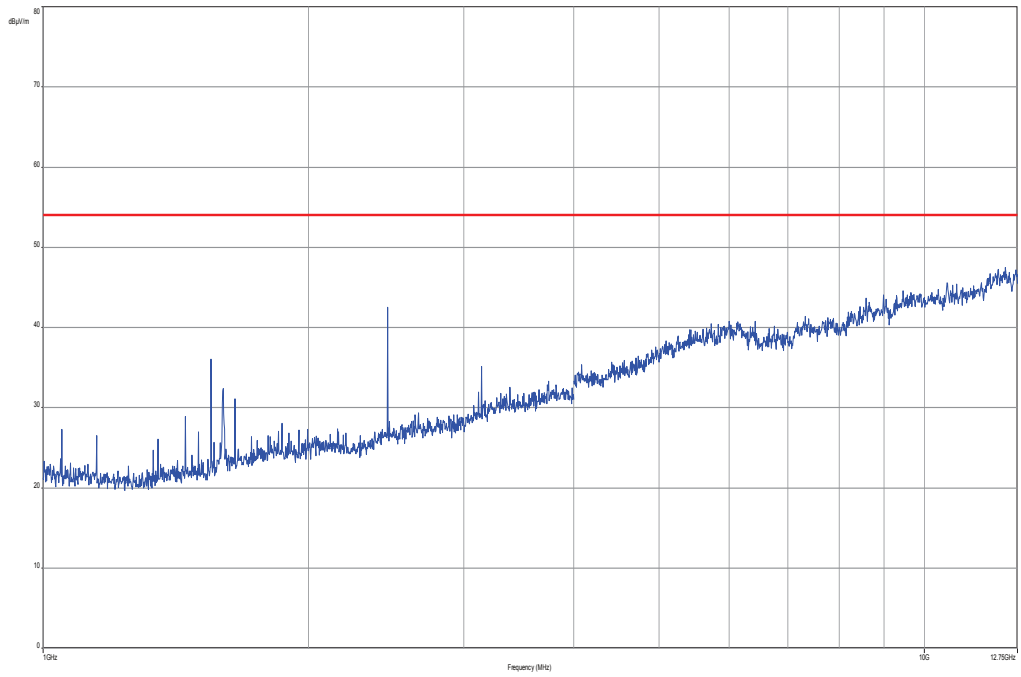
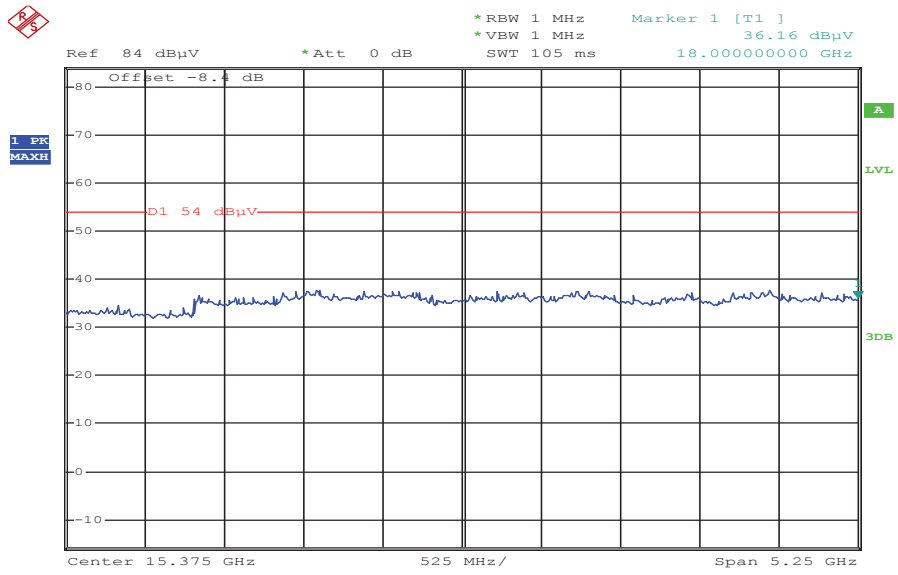
Plot 2: 1 GHz to 12.75 GHz, RX mode, vertical & horizontal polarization

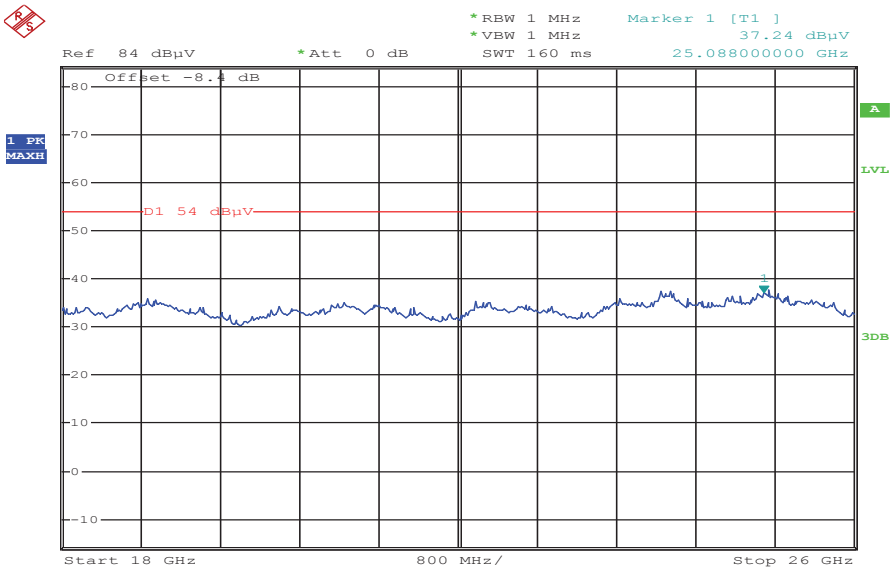


Plot 3: 12.75 GHz to 18 GHz, RX mode, vertical & horizontal polarization



Date: 4.JUN.2013 09:46:25

Plot 4: 18 GHz to 26 GHz, RX mode, vertical & horizontal polarization



9.13 Spurious emissions radiated < 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to single channel mode and the transmit channel is channel 39. This measurement is representative for all channels and modes. If critical peaks are found channel 00 and channel 78 will be measured too. The measurement is performed in the mode with the highest output power. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi peak
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
TX spurious emissions radiated < 30 MHz		
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

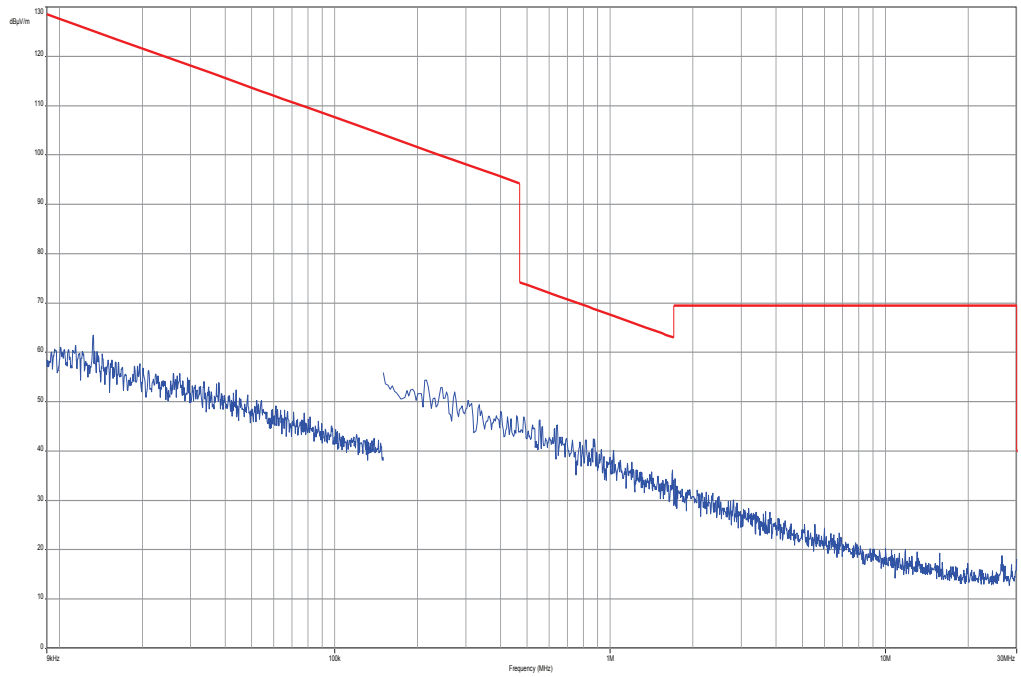
Results:

TX spurious emissions radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
No traceable peaks detected		
Measurement uncertainty	± 3 dB	

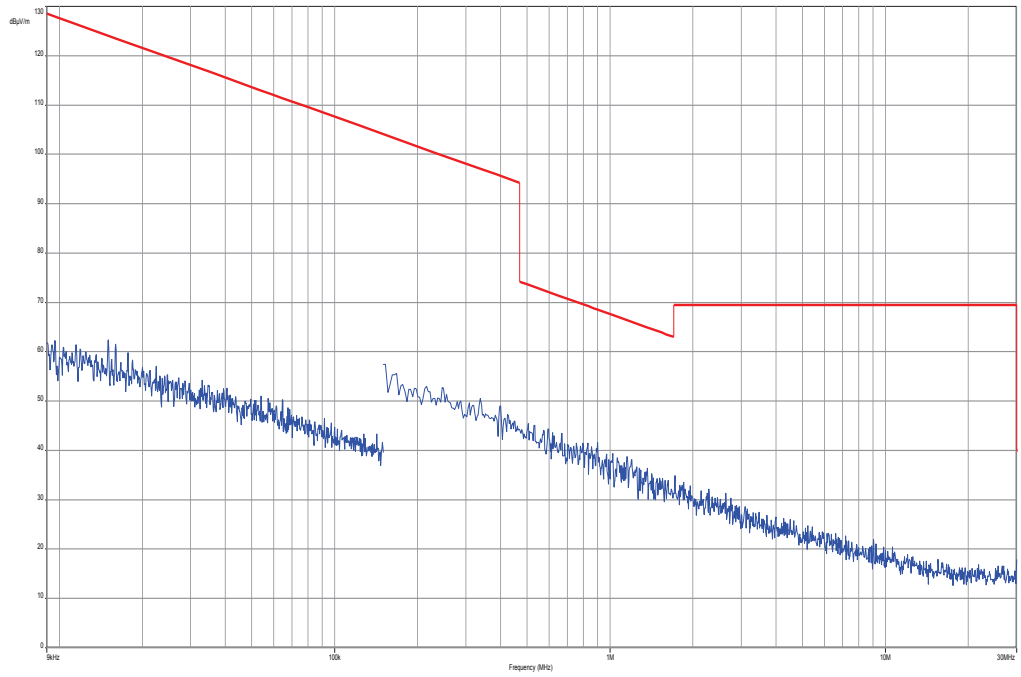
Result: Passed

Plots:

Plot 1: 9 kHz to 30 MHz, TX mode, channel 39



Plot 4: 9 kHz to 30 MHz, RX mode



9.14 Spurious emissions conducted < 30 MHz

Not applicable; powered by car battery

10 Test equipment and ancillaries used for tests

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Labor/Item).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	12.01.2012	12.01.2015
2	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKl!	08.05.2013	08.05.2015
3	n. a.	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO	2210	300001015	vIKl!	13.06.2013	13.06.2015
4	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
5	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
6	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2012	06.01.2014
7	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156	ne		
8	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
9	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
10	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
11	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
12	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
13	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIKl!	14.10.2011	14.10.2014
14	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	21.02.2013	21.02.2014
15	n. a.	Power Supply	LA30/5GA	Zentro Elektronik	2046	300000711	NK!		
16	n. a.	Spectrum Analyzer 9kHz to 30GHz - 140..+30dBm	FSP30	R&S	100886	300003575	k	22.08.2012	22.08.2014
17	n. a.	Switch / Control Unit	3488A	HP Meßtechnik		300001691	ne		
18	n. a.	Power Supply DC	NGPE 40/40	R&S	388	400000078	vIKl!	21.08.2012	21.08.2014
19	n. a.	Power Sensor 50 Ohms, 10 MHz - 18 GHz, 1 nW - 20 mW	NRV-Z1	R&S	833894/011	300002681-0010	k	22.08.2012	22.08.2014
20	n. a.	Hygro-Thermometer	-/-, 5-45°C, 20-100%rF	Thies Clima	-/-	400000080	k	24.09.2012	24.09.2013
21	n. a.	Vector Signal Generator, 300 kHz to 2.2 GHz	SMIQ03B	R&S	835541/055	300002681-0001	k	18.08.2011	18.08.2014

22	n. a.	Signal Generator 0.01/2 - 20 GHz, Frequ. Resol. 0.1Hz	SMP02	R&S	835133/011	300002681-0003	k	12.08.2011	12.08.2014
23	n. a.	Dual Channel Power Meter	NRVD	R&S	835430/044	300002681-0004	k	22.08.2012	22.08.2014
24	n. a.	Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM	FSIQ26	R&S	835540/018	300002681-0005	k	01.02.2012	01.02.2014
25	n. a.	Frequency Standard (Rubidium Frequency Standard)	MFS (Rubidium)	R&S (Datum)	002	300002681-0009	Ve	21.08.2012	21.08.2014
26	n. a.	Directional Coupler	101020010	Krytar	70215	300002840	ev		
27	n. a.	DC-Blocker	8143	Inmet Corp.	none	300002842	ne		
28	n. a.	Powersplitter	6005-3	Inmet Corp.		300002841	ev		
29	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	58566046820010	300003019	Ve	20.09.2011	20.09.2013
30	n. a.	CBT (Bluetooth Tester + EDR Signalling)	CBT 1153.9000 K35	R&S	100185	300003416	vlKl!	21.08.2012	21.08.2014
31	n. a.	CBT-K57 Software-Option for CBT/CBT32	CBT-K57	R&S	101051	300003910	ne		
32	11b	Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268	ev		
33	A025	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda		300000786	ne		
34	A027	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda		300000486	ne		

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

11 Observations

No observations exceeding those reported with the single test cases have been made.

Annex A Photographs of the test setup

Photo documentation:

Photo 1:

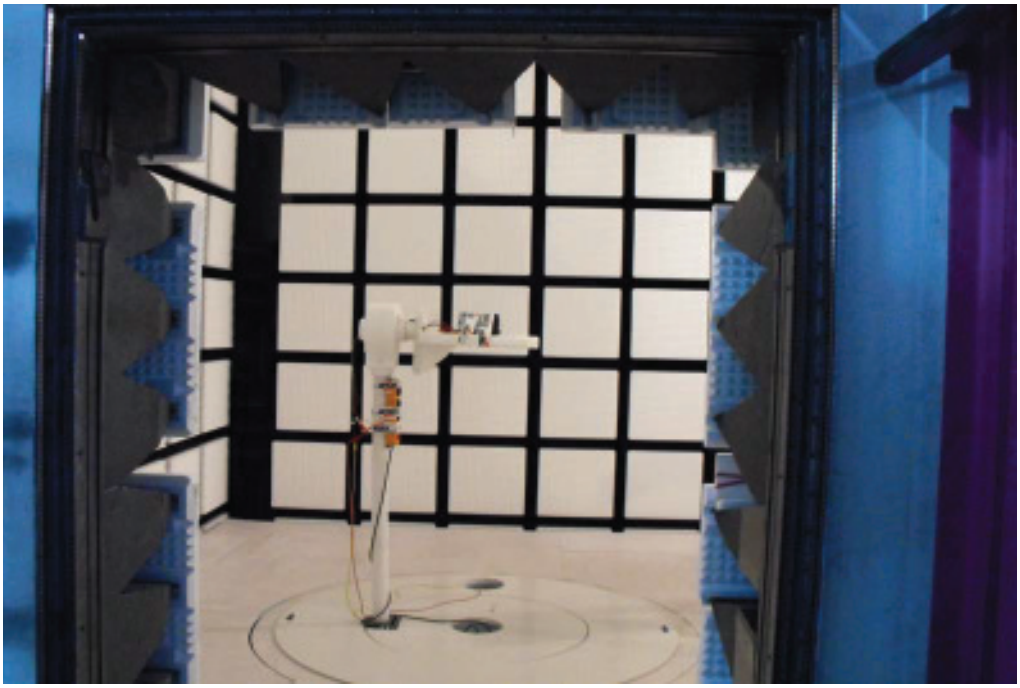
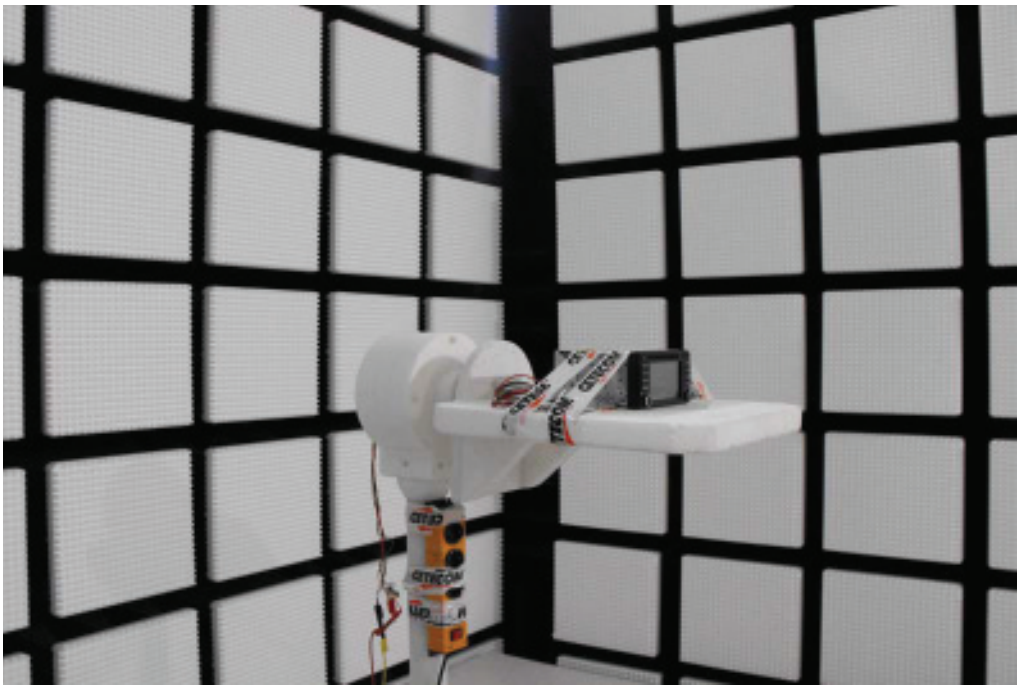


Photo 2:



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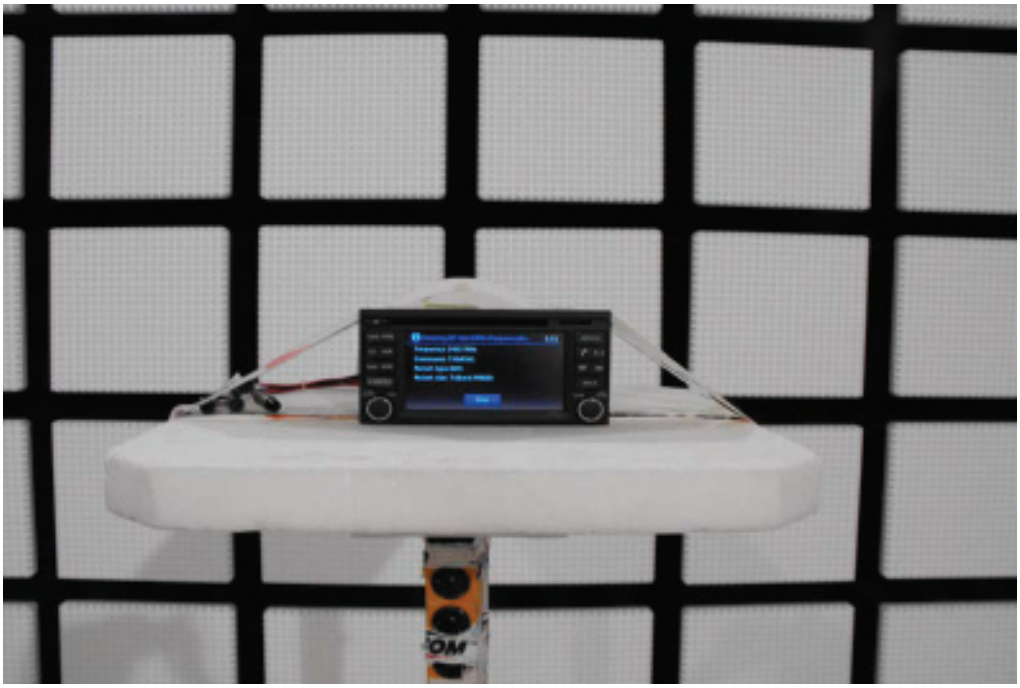


Photo 4:

Photo 5:

Photo 6:

Photo 7:

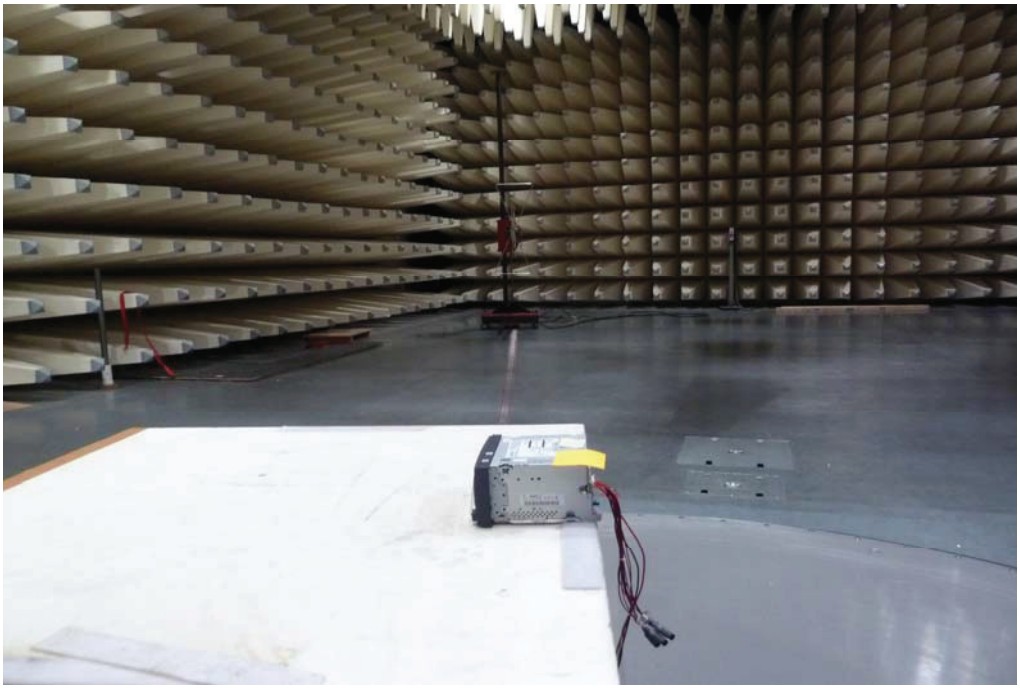


Photo 8:

Annex B External photographs of the EUT

Photo documentation:

Photo 1:

Photo 2:

Photo 3:

Photo 4:

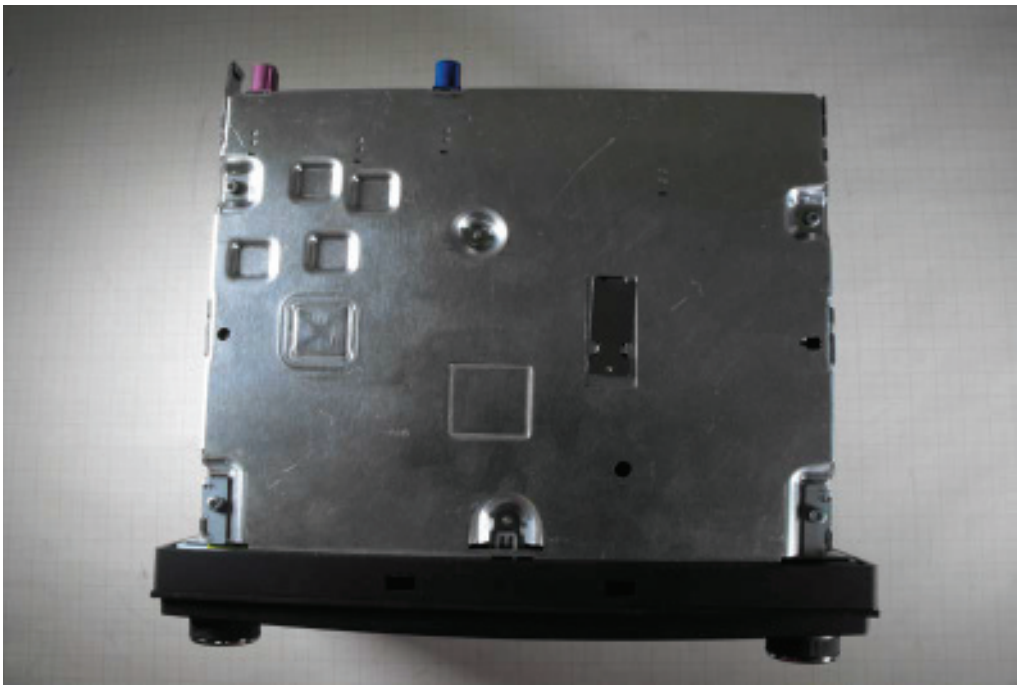


Photo 5:

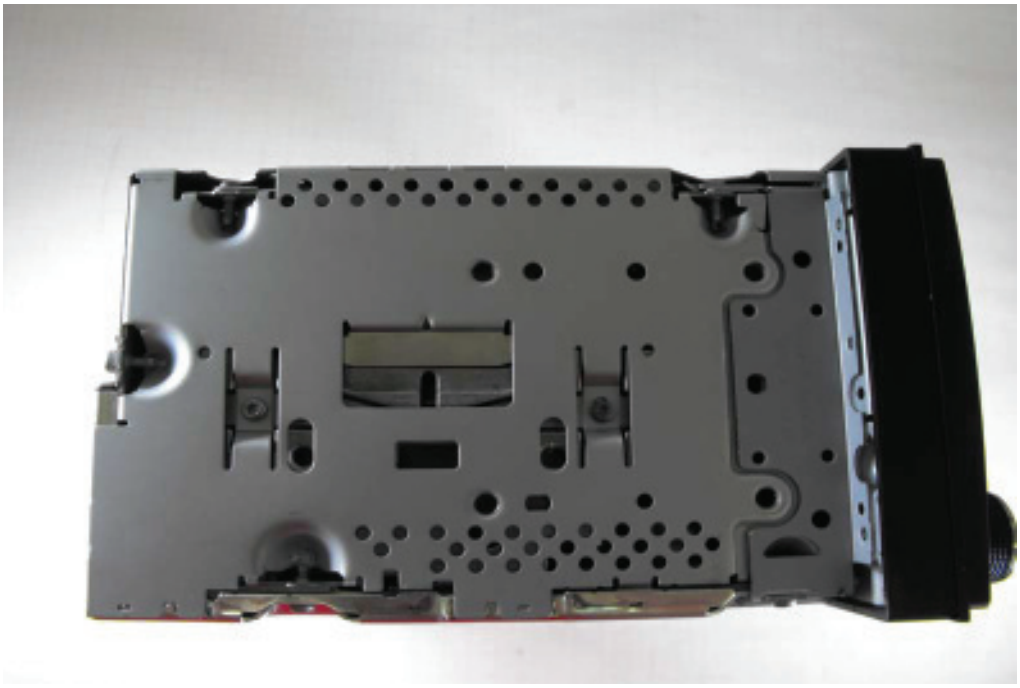


Photo 6:

Annex C Internal photographs of the EUT

Photo documentation:

Photo 1:

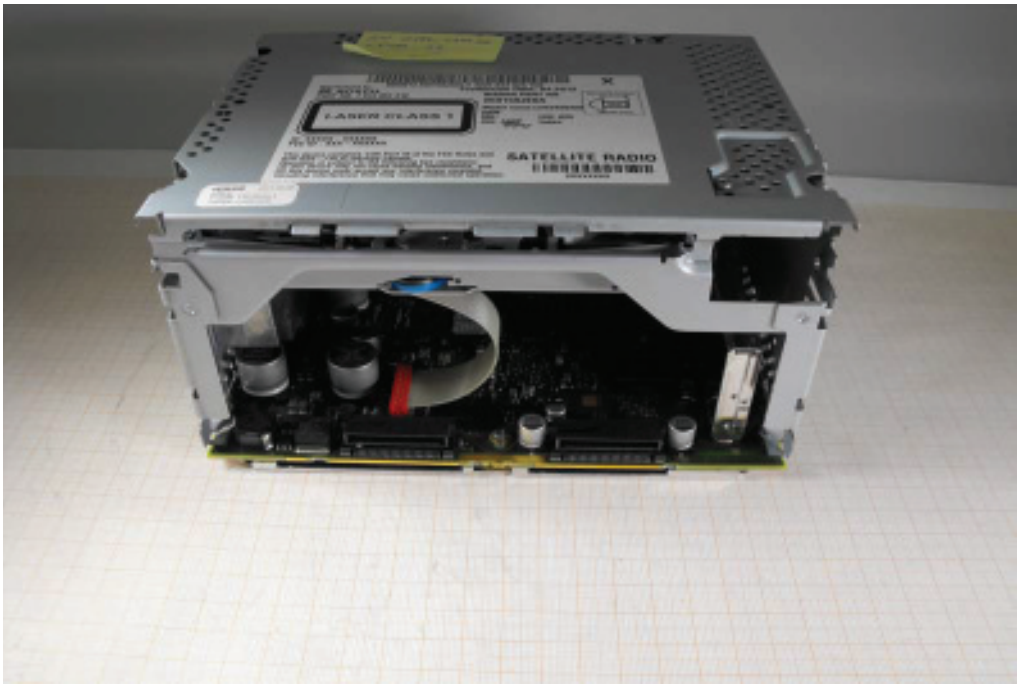


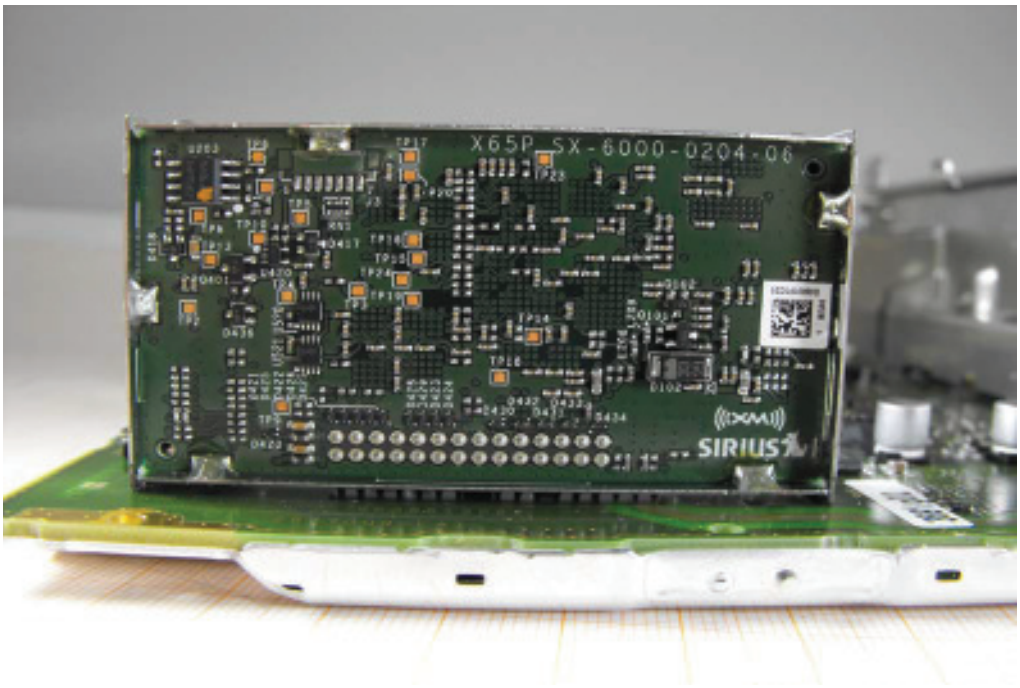
Photo 2:

Photo 3:

Photo 4:

Photo 5:

Photo 6:



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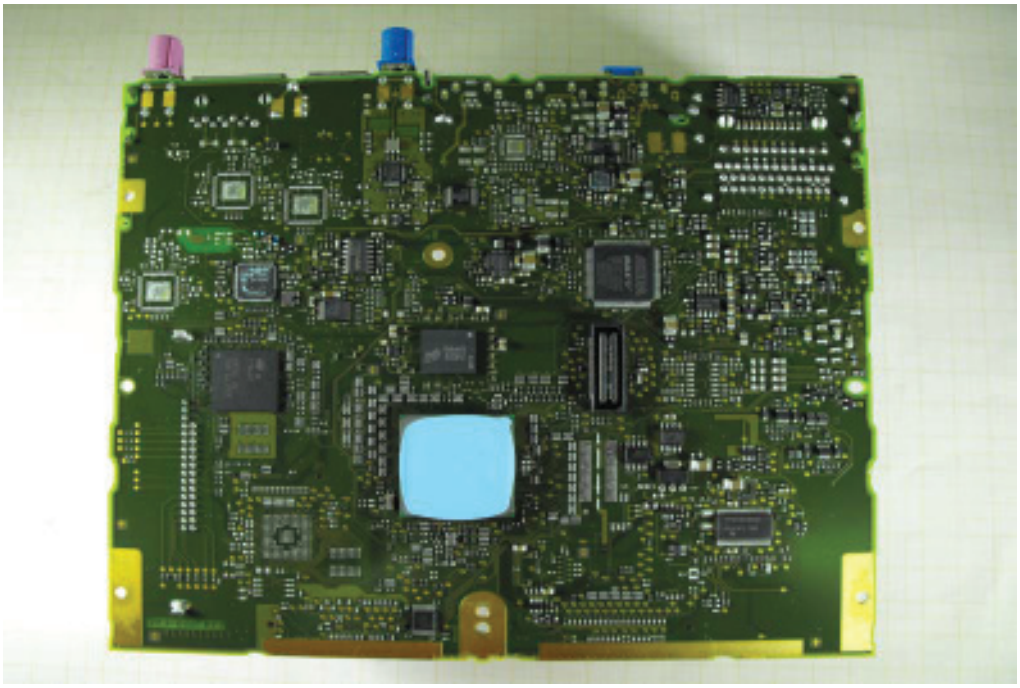


Photo 8:

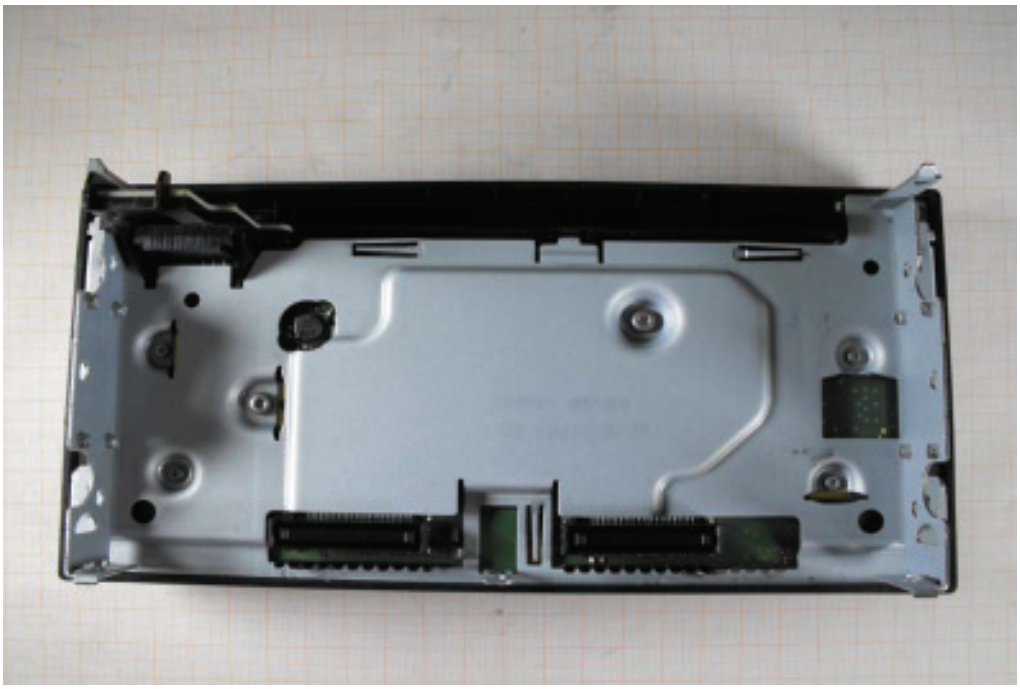


Photo 9:

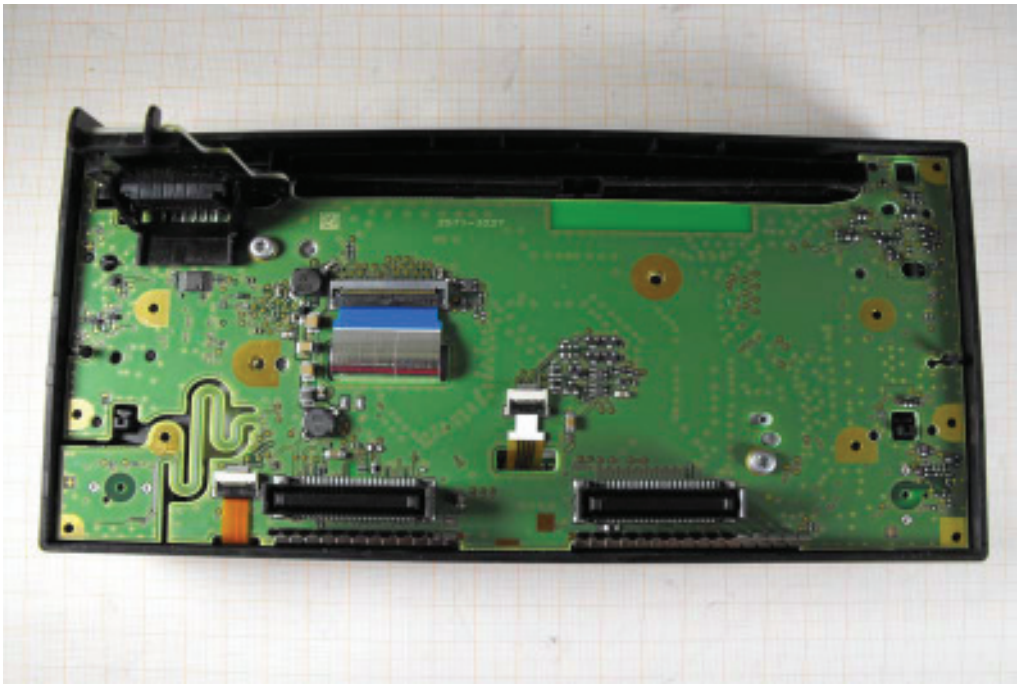


Photo 10:

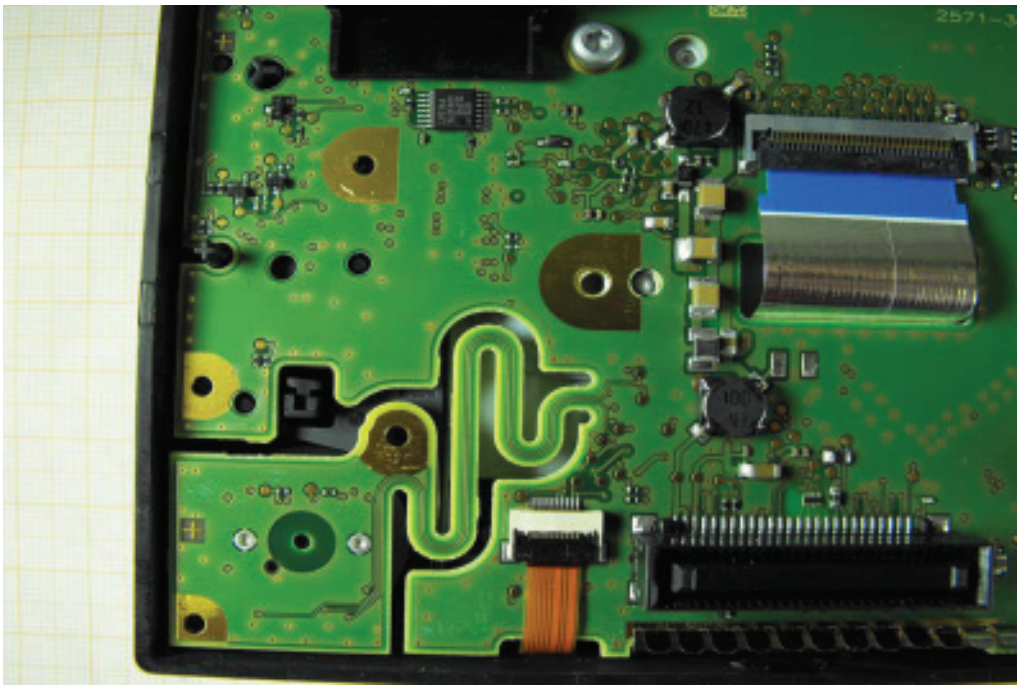


Photo 11:

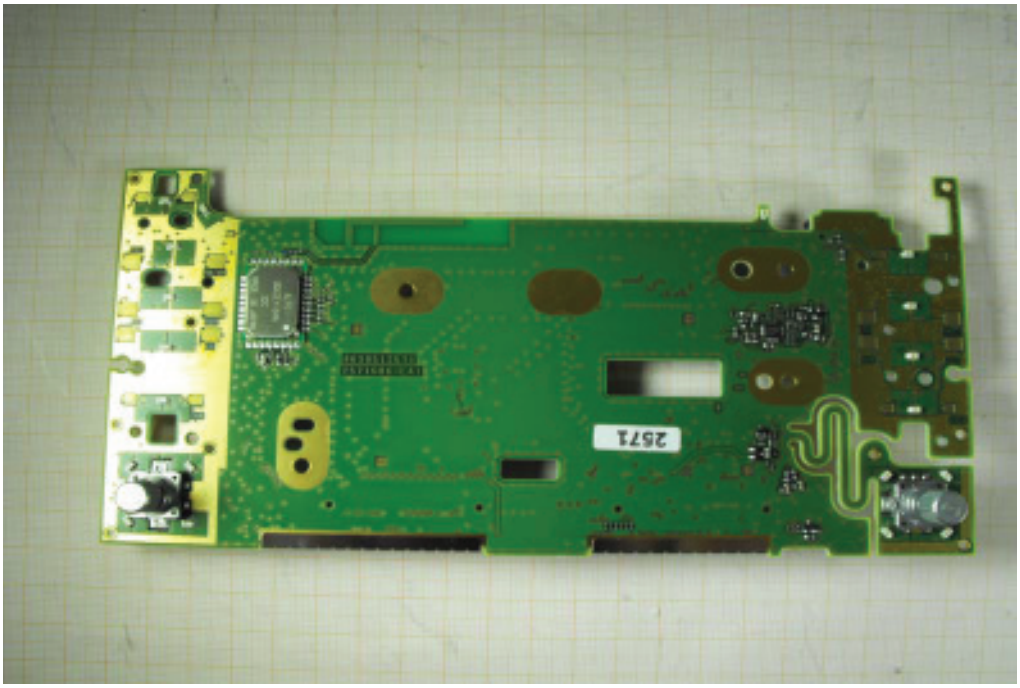
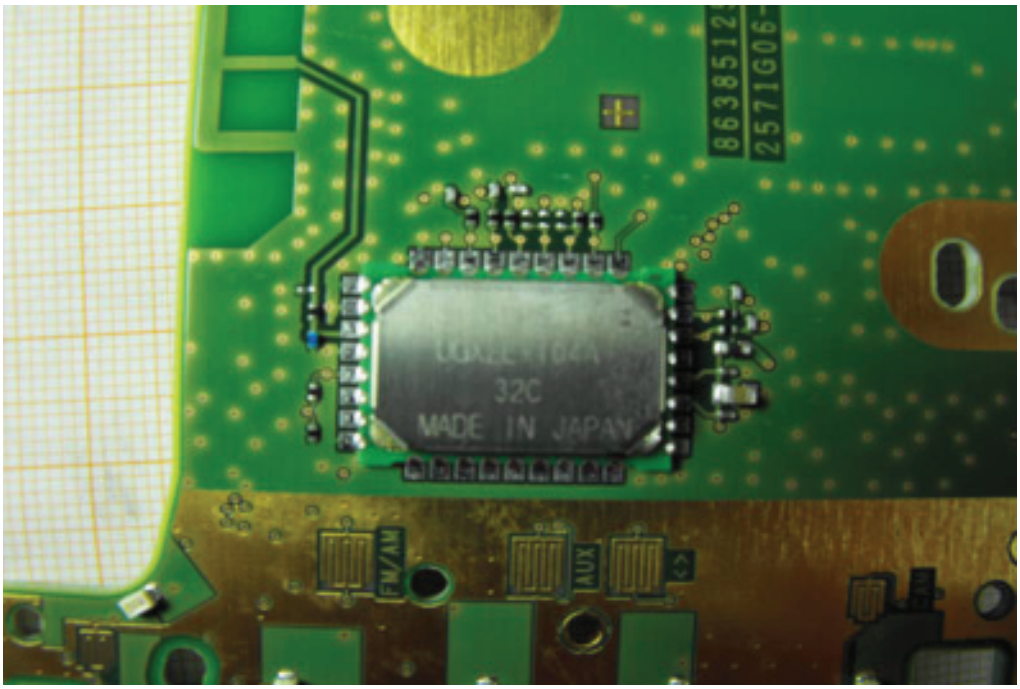


Photo 12:



Annex D Document history

Version	Applied changes	Date of release
1.0	Initial release	2013-06-14
-A	Editorial changings	2013-06-25

Annex E Further information

Glossary

AVG - Average
DUT - Device under test
EMC - Electromagnetic Compatibility
EN - European Standard
EUT - Equipment under test
ETSI - European Telecommunications Standard Institute
FCC - Federal Communication Commission
FCC ID - Company Identifier at FCC
HW - Hardware
IC - Industry Canada
Inv. No. - Inventory number
N/A - Not applicable
PP - Positive peak
QP - Quasi peak
S/N - Serial number
SW - Software

Annex F Accreditation Certificate

Front side of certificate

DAkkS Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Beliehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
Unterzeichnerin der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

Drahtgebundene Kommunikation einschließlich xDSL
VoIP und DECT
Akustik
Funk einschließlich WLAN
Short Range Devices (SRD)
RFID
WiMax und Richtfunk
Mobilfunk (GSM / DCS, Over the Air (OTA) Performance)
Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive
Produktsicherheit
SAR und Hearing Aid Compatibility (HAC)
Umweltsimulation
Smart Card Terminals
Bluetooth
Wi-Fi- Services

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 18.01.2013 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 80 Seiten.

Registrierungsnummer der Urkunde: D-PL-12076-01-01

Frankfurt am Main, 18.01.2013

Back side of certificate

Deutsche Akkreditierungsstelle GmbH

Standort Berlin
Spittelmarkt 10
10117 Berlin

Standort Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Standort Braunschweig
Bundesallee 100
38116 Braunschweig

Die auszugsweise Veröffentlichung der Akkreditierungsurkunde bedarf der vorherigen schriftlichen Zustimmung der Deutsche Akkreditierungsstelle GmbH (DAkkS). Ausgenommen davon ist die separate Weiterverbreitung des Deckblattes durch die urkundlich genannte Konformitätsbewertungsstelle in unveränderter Form.

Es darf nicht der Anschein erweckt werden, dass sich die Akkreditierung auch auf Bereiche erstreckt, die über den durch die DAkkS bestätigten Akkreditierungsbereich hinausgehen.

Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstelle (AkkStelleG) vom 31. Juli 2009 (BGBl. I S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung im Zusammenhang mit der Vermarktung von Produkten (Abl. L 218 vom 9. Juli 2008, S. 30).
Die DAkkS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der European co-operation for Accreditation (EA), des International Accreditation Forum (IAF) und der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen erkennen ihre Akkreditierungen gegenseitig an.

Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

Note:

The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.

http://www.cetecom.com/eu/de/cetecom-group/europa/deutschland-saarbruecken/akkreditierungen.html