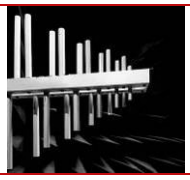
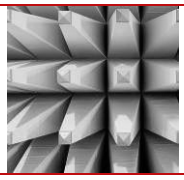

CETECOM™
CETECOM ICT Services
consulting - testing - certification

TEST REPORT

Test report no.: 1-5865/13-02-02

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

RSI Video Technologies
Siège Social -Headquarters
25 rue Jacobi-Netter
67200 Strasbourg / FRANCE
Phone: +33 3 90 20 66 96
Fax: +33 3 88 29 04 00
Contact: Thierry Petri
e-mail: thierry.petri@rsivideotech.com
Phone: +33 3 90 20 66 96

Manufacturer

RSI Video Technologies
Siège Social -Headquarters
25 rue Jacobi-Netter
67200 Strasbourg / FRANCE

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:	**Wireless Keypad Alarm**
Model name:	**WMB611/WMB621**
FCC ID:	**X46WM00**
IC:	**8816A-WM00**
Frequency:	ISM band 902 MHz to 928 MHz (lowest channel 904.5 MHz, highest channel 926.1 MHz)
Technology tested:	FHSS system with FSK modulation
Antenna:	Integrated wire antenna
Power Supply:	3.6V DC by 3* LS14500 Li - Battery
Temperature Range:	-30°C to +60°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=Stefan Boes, o=CETECOM ICT Services GmbH, ou=BOE-111011, email=Stefan.Boes@cetecom.com, c=DE
2013.03.19 15:27:05 +01'00'

Stefan Bös
Senior Testing Manager

Test performed:

cn=Tobias Wittenmeier, o=CETECOM ICT Services GmbH, ou=WIT-111222, email=tobias.wittenmeier@cetecom.com, c=DE
2013.03.19 15:08:04 +01'00'

Tobias Wittenmeier
Expert

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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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In no case this test report can be considered as a Letter of Approval.

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

2.2 Application details

Date of receipt of order:	2013-02-04
Date of receipt of test item:	2013-02-25
Start of test:	2013-02-25
End of test:	2013-02-26
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	2010-10	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS - 210 Issue 8	2010-12	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}	+60 °C	during high temperature tests
	T_{min}	-30 °C	during low temperature tests
Relative humidity content:		55 %	
Barometric pressure:		not relevant for this kind of testing	
Power supply:	V_{nom}	3.6 V	DC by 3* LS14500 Li - Battery
	V_{max}	4.1 V	
	V_{min}	3.1 V	

5 Test item

Kind of test item :	**Wireless Keypad Alarm**
Type identification :	**WMB611/WMB621**
S/N serial number :	**Rad. 4B434912C61A0005** **Cond. 4B434912C61A0003**
HW hardware status :	**Unknown**
SW software status :	**Unknown**
Frequency band [MHz] :	**ISM band 902 MHz to 928 MHz** **(lowest channel 904.5 MHz, highest channel 926.1 MHz)**
Type of radio transmission : **Use of frequency spectrum :**	**FHSS**
Type of modulation :	**FSK**
Number of channels :	**25**
Antenna :	**Integrated wire antenna**
Power supply :	**3.6 V DC by 3* LS14500 Li - Battery**
Temperature range :	**-30°C to +60 °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	Passed	2013-03-19	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Results (max.)
§15.247(b)(4)	Antenna Gain	Nominal	Nominal	TX	☒	☐	☐	☐	complies
§15.247(a)(1) (i) RSS-210 A8.1 (b)	Carrier Frequency Separation	Nominal	Nominal	TX	☒	☐	☐	☐	complies
§15.247(a)(1)(i) RSS-210 A8.1 (c)	Number of Hopping channels	Nominal	Nominal	TX	☒	☐	☐	☐	complies
§15.247(a)(1)(i) RSS-210 A8.1 (c)	Average Time of Occupancy (Dwell Time)	Nominal	Nominal	TX	☒	☐	☐	☐	complies
§15.247(a)(1)(i) RSS-210 A8.1 (c)	20dB Bandwidth	Nominal	Nominal	TX	☒	☐	☐	☐	complies
§15.247(b)(2) RSS-210 A8.4 (1)	Maximum Output Power Radiated	Nominal	Nominal	TX	☒	☐	☐	☐	complies
§15.247(b)(4) RSS-210 A8.4 (1)	Maximum Output Power Conducted	Nominal	Nominal	TX	☒	☐	☐	☐	complies
§15.247(d) §15.205(a)	Band-edge Compliance	Nominal	Nominal	TX	☒	☐	☐	☐	complies
§15.247(d)	TX Spurious Emission Conducted	Nominal	Nominal	TX	☒	☐	☐	☐	complies
§15.209(a)	TX Spurious Emission Radiated < 30 MHz	Nominal	Nominal	TX	☒	☐	☐	☐	complies
§15.247(d) §15.209 A8.5	TX Spurious Emission Radiated > 30 MHz	Nominal	Nominal	TX	☒	☐	☐	☐	complies
§15.109	RX Spurious Emissions Radiated	Nominal	Nominal	Idle	☒	☐	☐	☐	complies

Note: NA = Not Applicable; NP = Not Performed

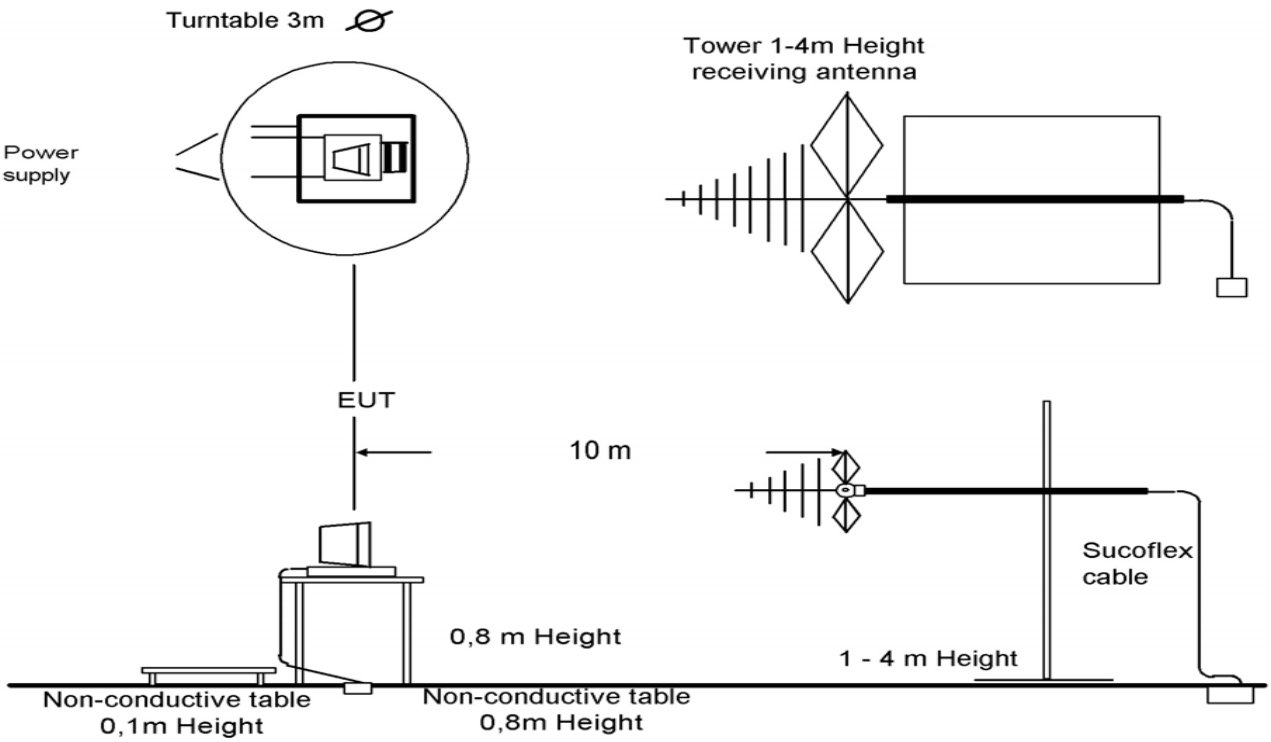
8 RF measurements

8.1 Description of test setup

8.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 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 C63.2-1996 clause 15 and ANSI C63.4-2009 clause 4.1.5. 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 C63-4-2009 clause 4.2.
Antennas are confirmed with ANSI C63.2-1996 item 15.

Semi anechoic chamber



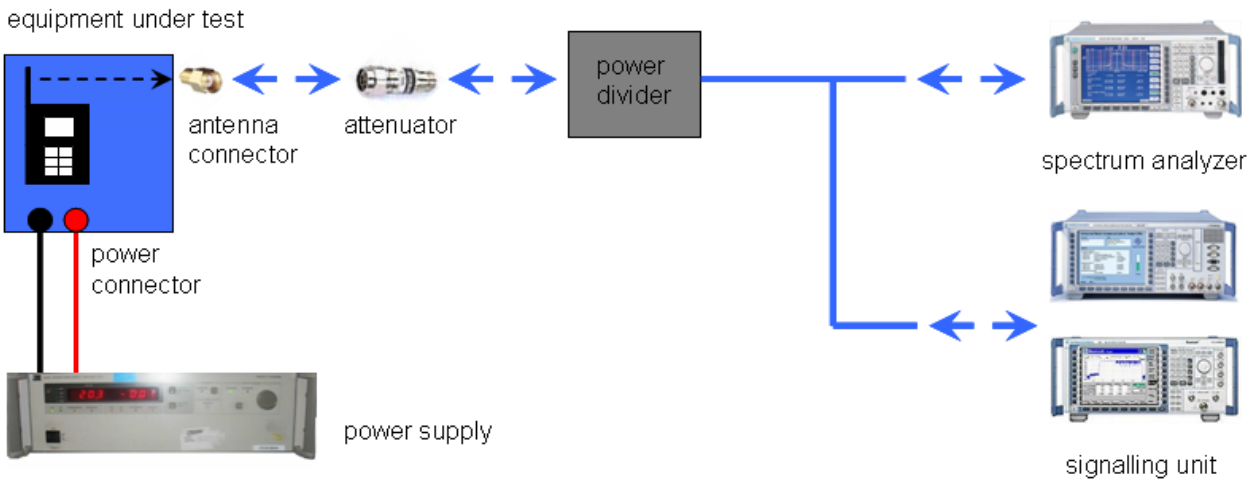
Picture 1: Diagram radiated measurements

9 kHz - 30 MHz:	active loop antenna
30 MHz – 1 GHz:	tri-log antenna
> 1 GHz:	horn antenna

All measurements are done in accordance with the Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems DA 00-705 and Appendix A “BLUETOOTH® APPROVALS”
The EUT is powered by an external power supply with nominal voltage. The signalling is performed from outside the chamber with a signalling unit (CMU200 or other) by air link using signalling antenna.

8.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is first 10dB attenuated before it is power divided (~6dB loss per branch). One of the signal paths is connected to the communication base Station (CMU200 or other), the other one is connected to the spectrum analyzer. The specific losses for both signal paths are first checked within a calibration. The measurement readings on the signalling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signalling unit and the spectrum analyzer are impedance matched on 50 Ohm.



Picture 2: Diagram conducted measurements

8.2 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

Test mode: ☒ 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	**:**	**1-5865/13-02-02**
Equipment model number	**:**	**WMB611/WMB621**
Certification number	**:**	**8816A-WM00**
Manufacturer (complete address)	**:**	**RSI Video Technologies Siège Social -Headquarters 25 rue Jacobi-Netter 67200 Strasbourg / FRANCE**
Tested to radio standards specification no.	**:**	**RSS 210, Issue 8**
Open area test site IC No.	**:**	**IC 3462C-1**
Frequency range	**:**	**ISM band 902 MHz to 928 MHz (lowest channel 904.5 MHz, highest channel 926.1 MHz)**
RF-power [mW] (max.)	**:**	**Cond.: 68.08 mW (FSK modulation) EIRP: 25.70 mW (FSK modulation)**
Occupied bandwidth (99%-BW) [kHz]	**:**	**303 (FSK modulation)**
Type of modulation	**:**	**FHSS technology with FSK modulation.**
Emission designator (TRC-43)	**:**	**303KFXD (FSK modulation)**
Antenna information	**:**	**Integrated wire antenna**
Transmitter spurious (worst case) [dBµV/m @ 3m]:		**72.16 @ 2748 MHz Peak 44.92 @ 2748 MHz AVG**

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:

2013-03-19	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.

Measurement parameters:

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

Results:

	Low channel 904.5 MHz	Middle channel 915.3 MHz	High channel 926.1 MHz
Conducted power [dBm]	18.33	18.25	18.14
Radiated power [dBm]	14.10	13.86	13.52
Gain [dBi] Calculated	-4.23	-4.39	-4.62

Limits:

FCC	IC
Antenna gain	
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	

Result: Passed

9.2 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:	2 MHz
Trace-Mode:	Max Hold

Result: The channel separation is: 926 kHz

Limits:

FCC	IC
Carrier Frequency Separation	
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.	

Result: Passed

Plot 1:

Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 926.000000 kHz
PNO: Far
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
11:40:49 AM Feb 26, 2013
ΔMkr1 926 kHz
3.10 dB
10 dB/div
Log
Ref 18.00 dBm
8.00
-2.00
-12.0
-22.0
-32.0
-42.0
-52.0
-62.0
-72.0
1Δ2
Center 906.849 MHz
#Res BW 100 kHz
#VBW 100 kHz
Span 2.000 MHz
Sweep 1.00 ms (1001 pts)
Marker
Select Marker
1
Normal
Delta
Fixed
Off
Properties
More
1 of 2

9.3 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:	100 kHz
Resolution bandwidth:	100 kHz
Span:	28.2 MHz
Trace-Mode:	Max Hold

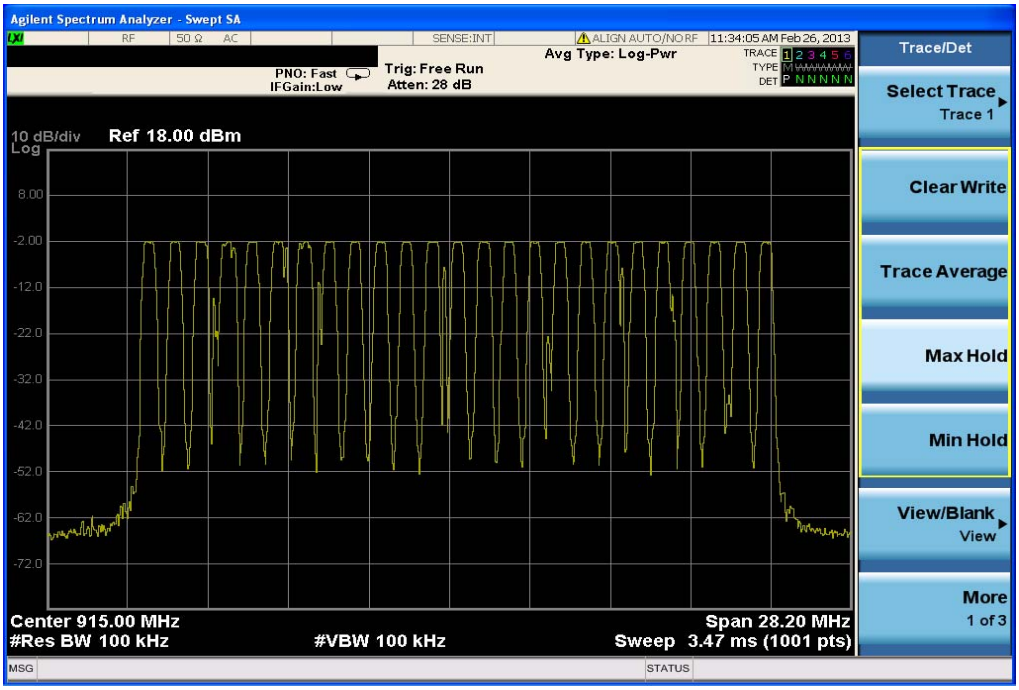
Result: The number of hopping channels is: 25

Limits:

FCC	IC
Number of Hopping Channels	
For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.	

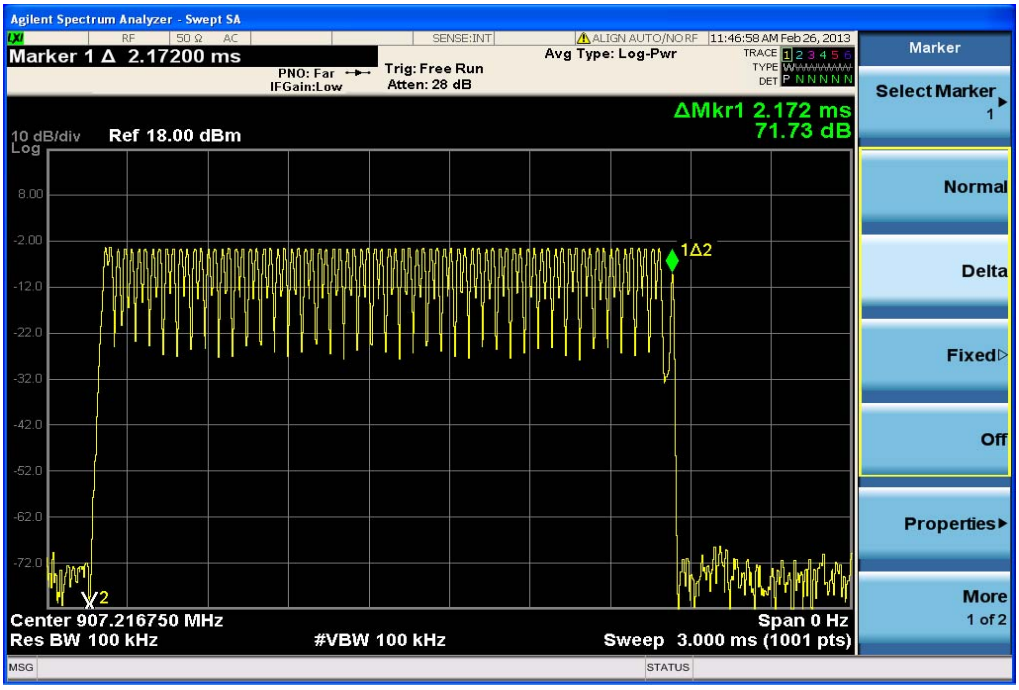
Result: Passed

Plot 1:

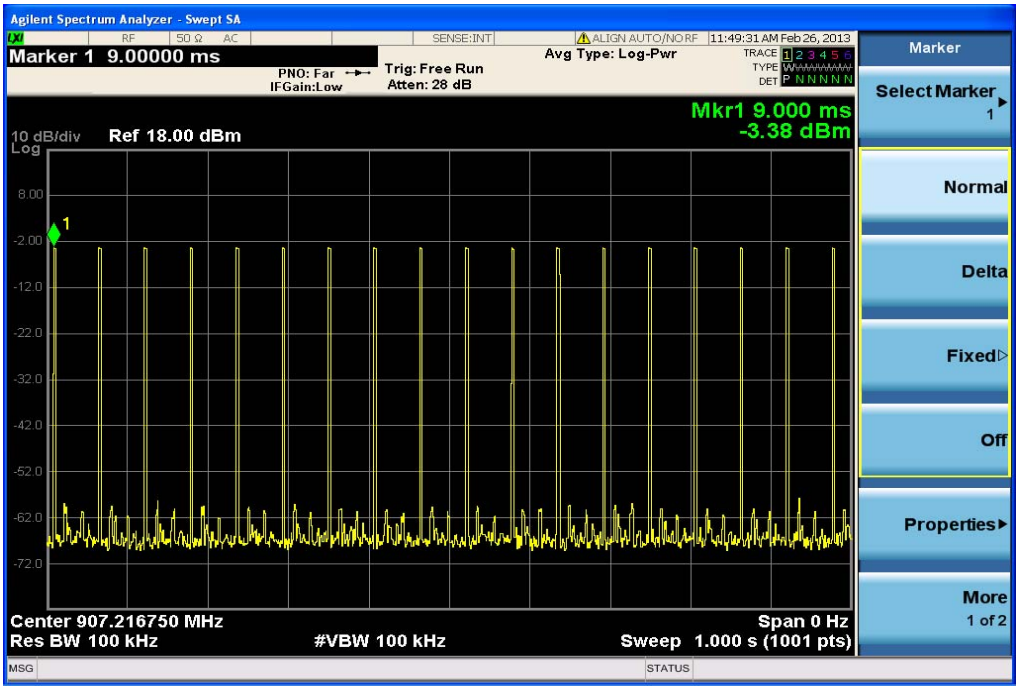

Agilent Spectrum Analyzer - Swept SA
RF
50 Ω AC
SENSE:INT
ALIGN AUTO/NO RF
11:34:05 AM Feb 26, 2013
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE
DET P N N N N N
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 28 dB
10 dB/div
Log
Ref 18.00 dBm
8.00
-2.00
-12.0
-22.0
-32.0
-42.0
-52.0
-62.0
-72.0
Center 915.00 MHz
#Res BW 100 kHz
#VBW 100 kHz
Span 28.20 MHz
Sweep 3.47 ms (1001 pts)
MSG
STATUS
Trace/Det
Select Trace
Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View/Blank
View
More
1 of 3

9.4 Average Time of Occupancy

Plot 1: Time slot length = 2.172 ms



Plot 2: Single channel used within 1s = 18



Result: The time slot length is = 2.172 ms
Single channel used within 1s = 18

Within 10 s period, the average time of occupancy = 10 s * 18 * 2.172 ms

→ The average time of occupancy = 390.96 ms

Limits:

FCC	IC
Average time of occupancy	
For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within 10 second period.	

Result: Passed

9.5 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:	Auto
Video bandwidth:	30 kHz
Resolution bandwidth:	10 kHz
Span:	1 MHz
Trace-Mode:	Max Hold

Result:

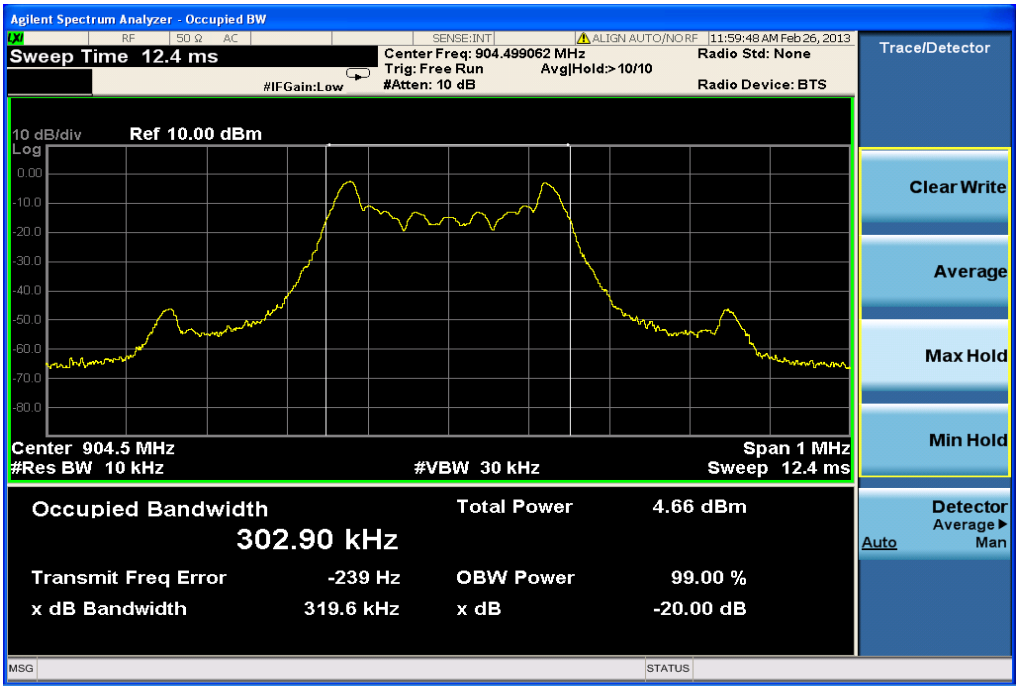
Test Conditions		20dB BANDWIDTH [kHz]		
		904.5 MHz	915.3 MHz	926.1 MHz
T_{nom}	V_{nom}	302.90	296.11	300.31
Measurement uncertainty		± 30 kHz		

Limits:

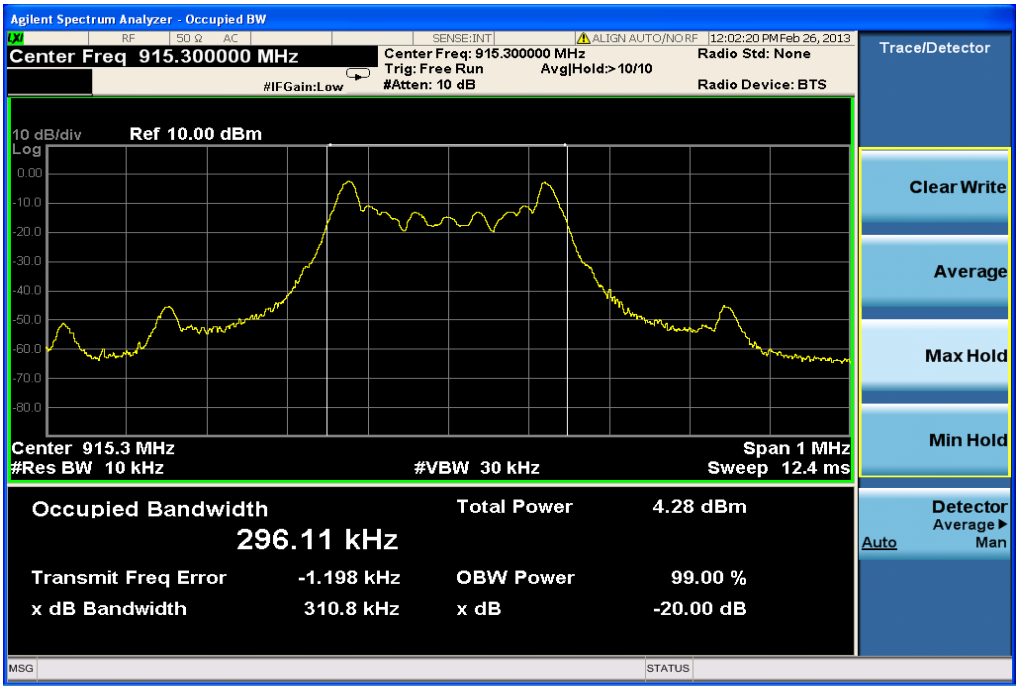
FCC	IC
20dB Bandwidth	
The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.	

Result: Passed

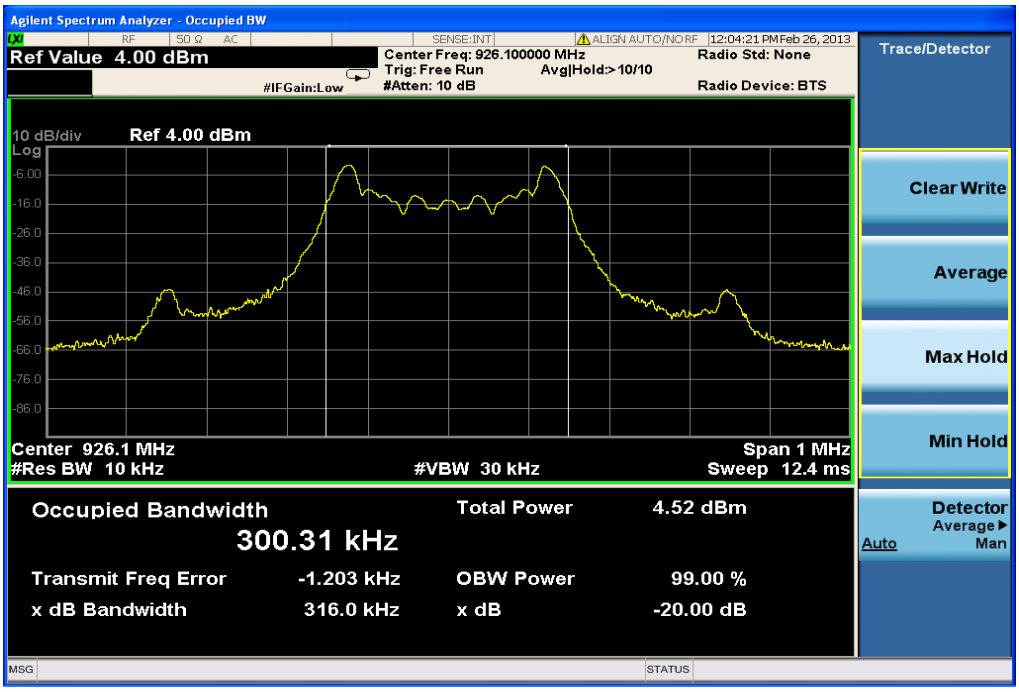
Plot 1: Low Channel



Plot 2: Middle Channel



Plot 3: High Channel



9.6 Maximum Output Power Radiated

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	5 MHz
Trace-Mode:	Max Hold

Result:

Test Conditions		EIRP [dBm]		
		904.5 MHz	915.3 MHz	926.1 MHz
T_{nom}	V_{nom}	14.10	13.86	13.52
Measurement uncertainty		± 3dB		

Limits:

FCC	IC
EIRP	
For frequency hopping systems operating in the 902–928 MHz band: 1 watt (30 dBm) for systems employing at least 50 hopping channels; and, 0.25 watts (24 dBm) for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.	

Result: Passed

9.7 Maximum Output Power Conducted

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:	1 MHz
Span:	Zerospan
Trace-Mode:	Max Hold

Result:

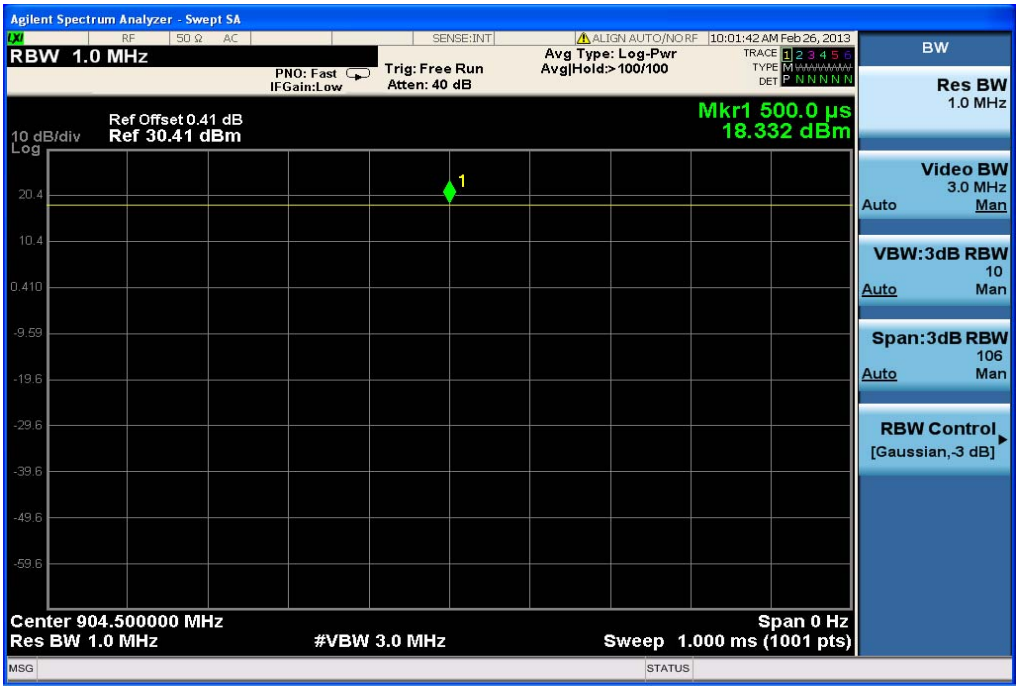
Test Conditions		Maximum Output Power Conducted [dBm]		
		904.5 MHz	915.3 MHz	926.1 MHz
T_{nom}	V_{nom}	18.33	18.25	18.14
Measurement uncertainty		± 3 dB		

Limits:

FCC	IC
Maximum Output Power Conducted	
For frequency hopping systems operating in the 902–928 MHz band: 1 watt (30 dBm) for systems employing at least 50 hopping channels; and, 0.25 watts (24 dBm) for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.	

Result: Passed

Plot 1: Low Channel



Plot 2: Middle Channel

Plot3: High Channel

9.8 Band-edge Compliance of conducted and radiated emissions

No restricted band in the range ± 2 channel bandwidths of the Band-edges of the specified emission band! (608 MHz – 614 MHz and 960 MHz – 1240 MHz).

Section 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

Limits:

FCC	IC
Band-edge Compliance of conducted and radiated emissions	
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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §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)).	

Result: Passed

9.9 Spurious Emissions Conducted (Transmitter)

Description:

Measurement of the conducted spurious emissions in transmit mode. The EUT is set to single channel mode and the transmit channel is low, mid and high.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	F < 1 GHz: 1 MHz F > 1 GHz: 1 MHz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 100 kHz
Span:	9 kHz to 12.75 GHz
Trace-Mode:	Max Hold

Result:

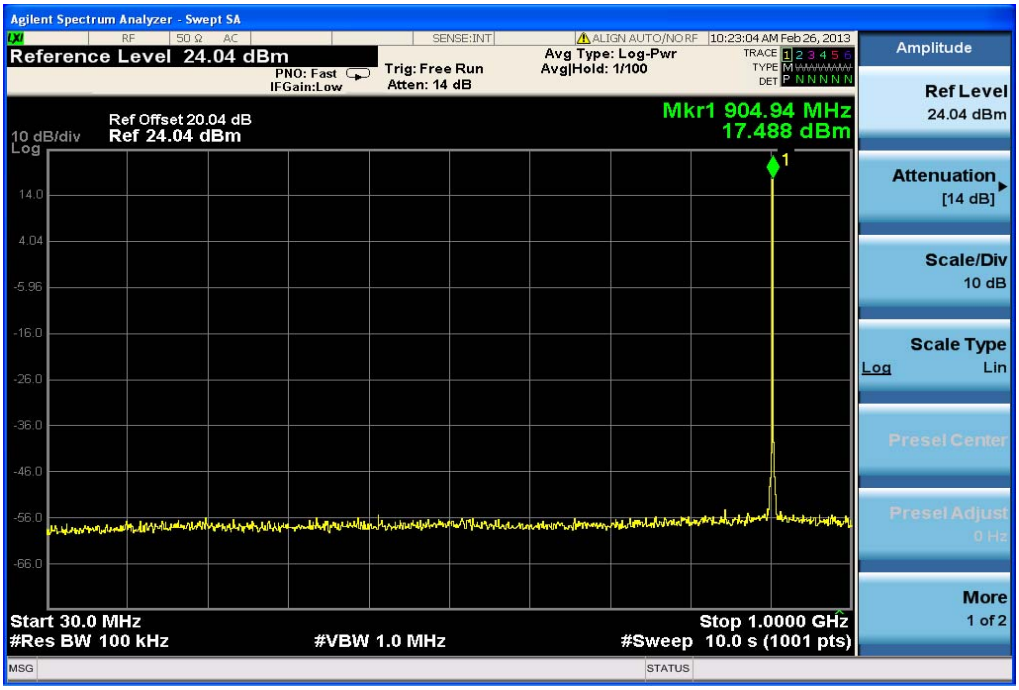
Emission Limitation					
Frequency [MHz]		Amplitude of emission [dBm]	Limit max. allowed emission power	actual attenuation below frequency of operation [dB]	Results
904.5		17.49	24 dBm		Operating frequency
No critical peaks detected! All detected emissions are more than 20 dB below the limit!			-20 dBc		passed
915.3		17.49	24 dBm		Operating frequency
No critical peaks detected! All detected emissions are more than 20 dB below the limit!			-20 dBc		passed
926.1		17.50	24 dBm		Operating frequency
No critical peaks detected! All detected emissions are more than 20 dB below the limit!			-20 dBc		passed
Measurement uncertainty			± 3dB		

Limits:

FCC	IC
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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §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)).	

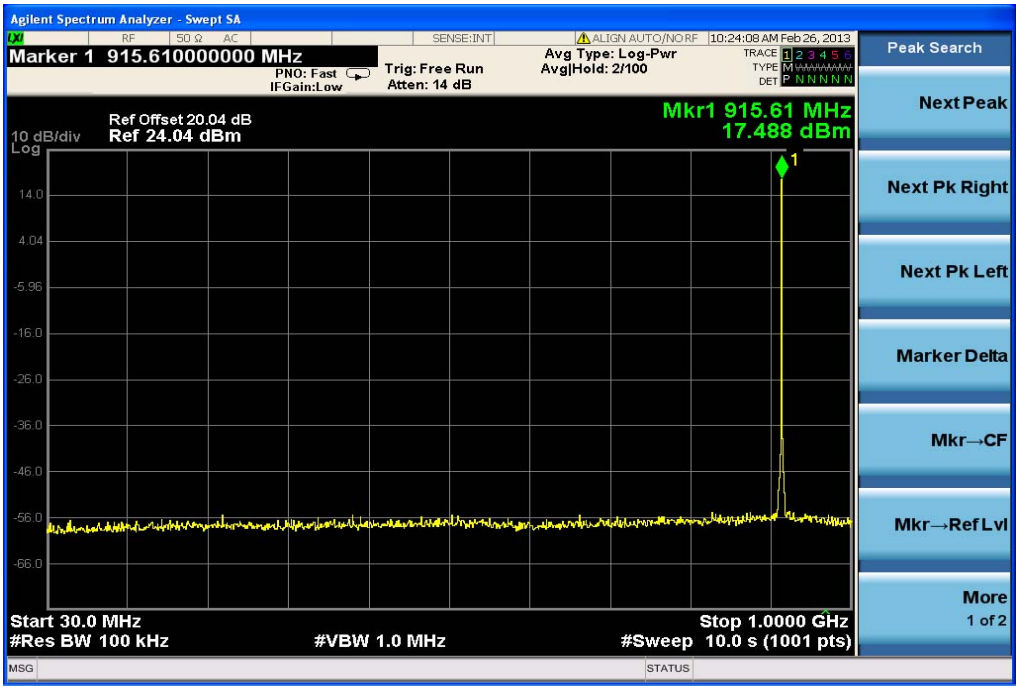
Result: Passed

Plot 1: Low channel

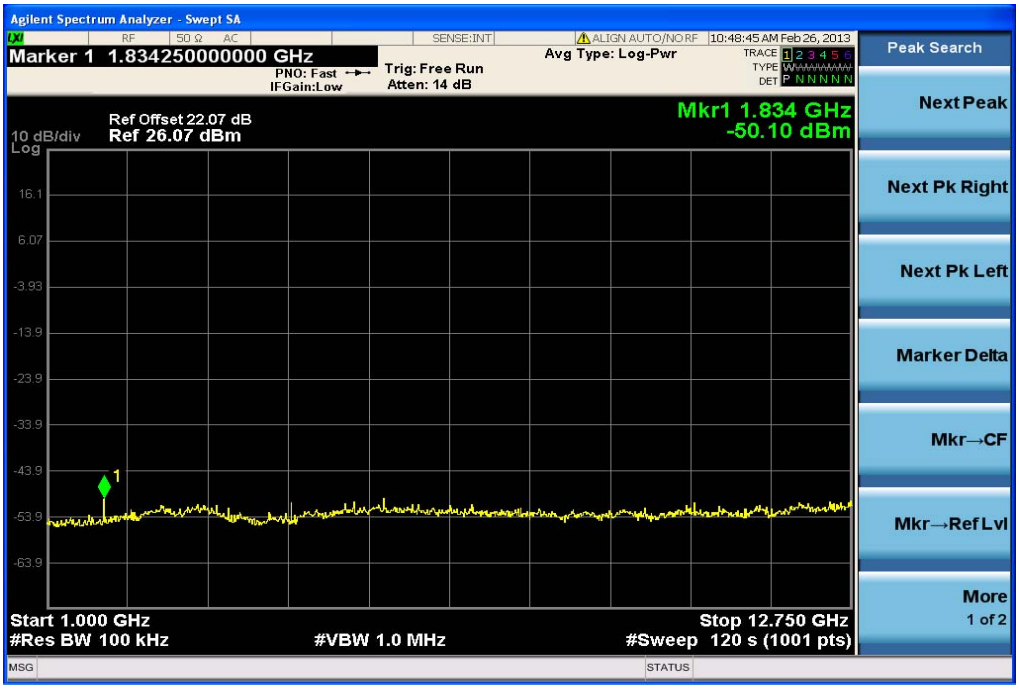


Plot 2: Low channel

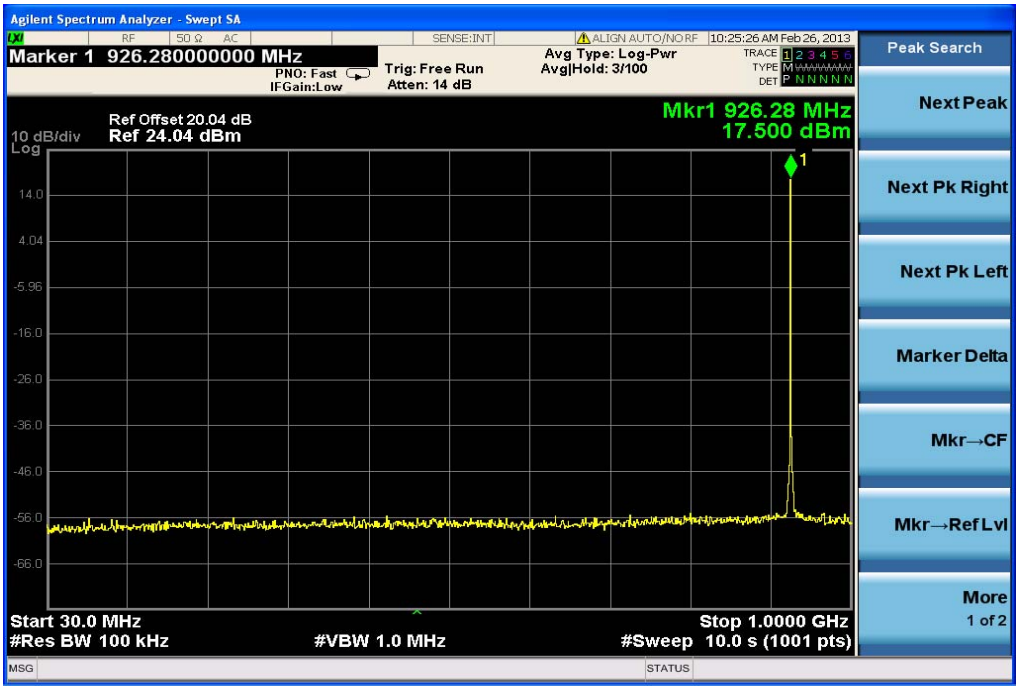
Plot 3: Middle channel



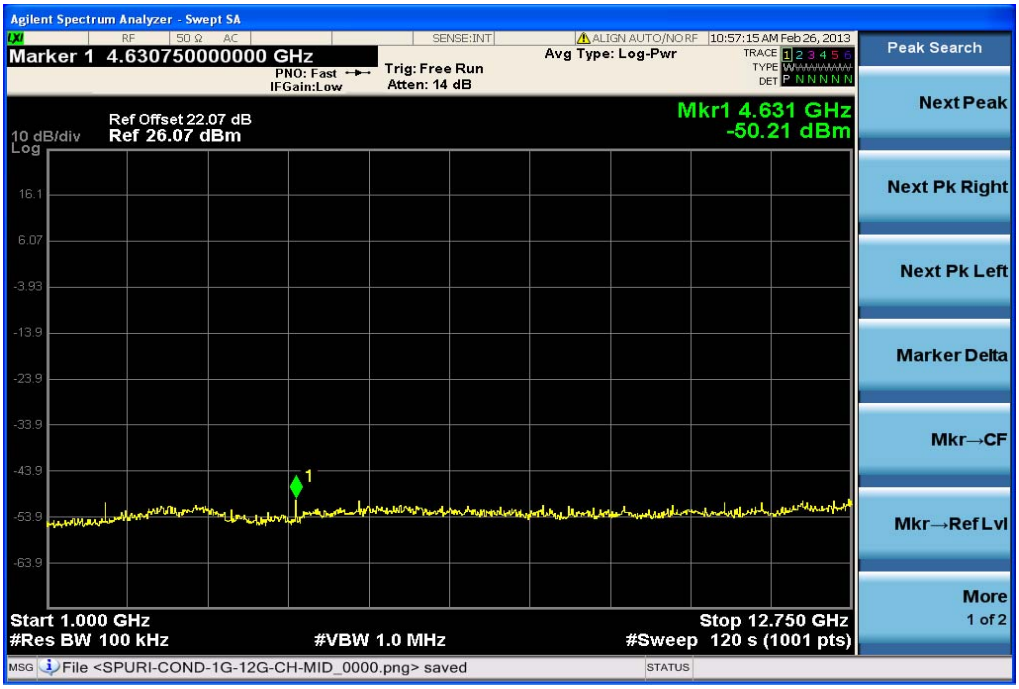
Plot 4: Middle channel



Plot 5: High channel



Plot 6: High channel



9.10 Spurious Emissions Radiated < 30 MHz

Measurement:

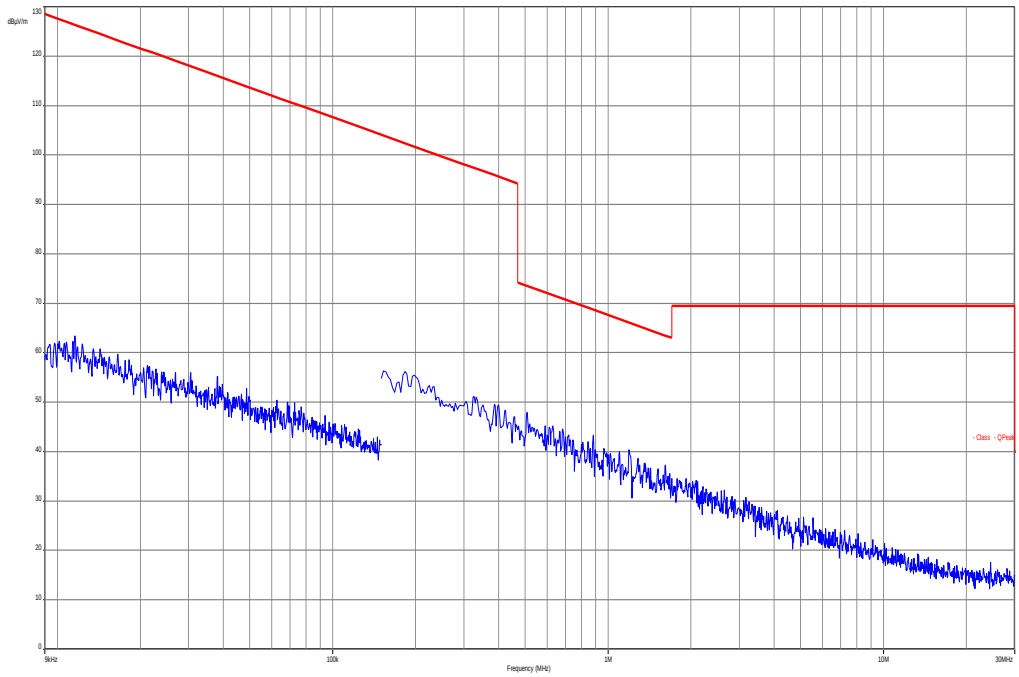
Measurement parameter	
Detector:	Quasi Peak / Average
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	100 kHz
Span:	Steps 100 MHz
Trace-Mode:	Free Run

Limits:

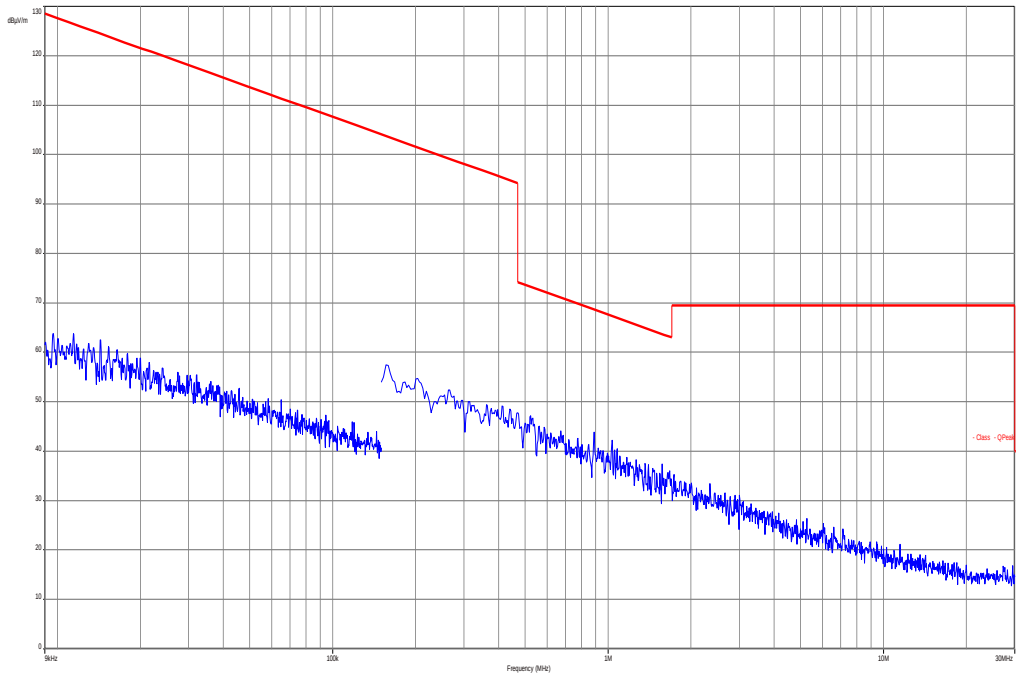
FCC		IC
Spurious Emissions Radiated < 30 MHz		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Result: Passed

Plot 1: TX-Mode



Plot 2: RX-Mode



9.11 Spurious Emissions Radiated (Transmitter) > 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode. The EUT is set to single channel mode and the transmit channel is low, mid and high.

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

Result:

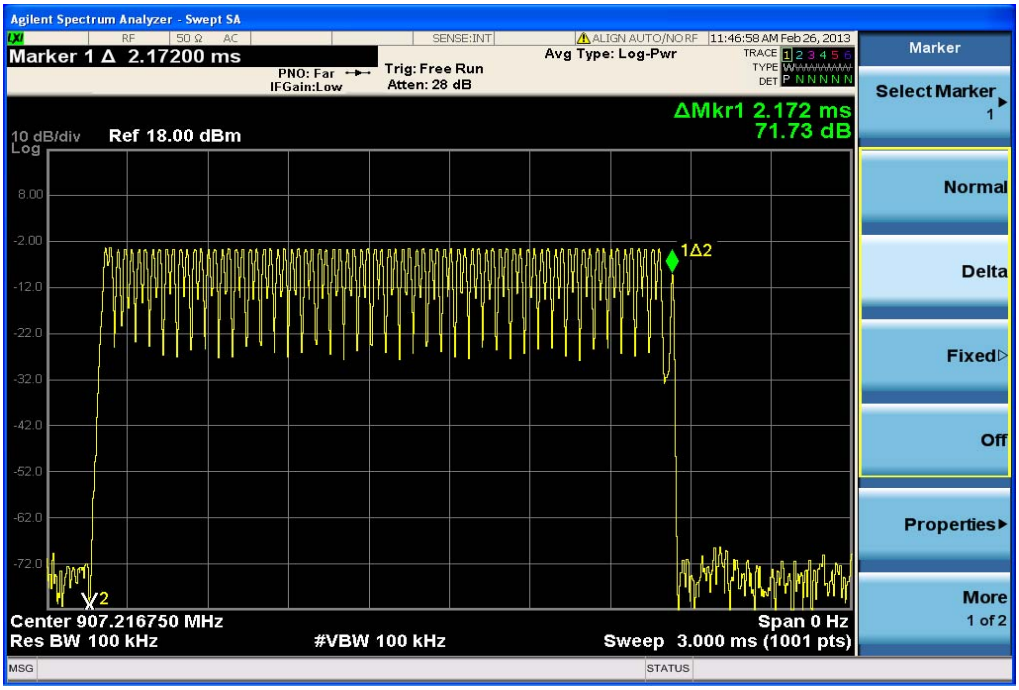
For radiated spurious emission the limits of 15.209 applies for all frequencies mentioned in 15.205. According to FCC Public Notice DA 00-705 (ANSI C63.10) the average emission shall be determined by using Video averaging (VBW = 10 Hz). If the dwell time of the hopping signal is less than 100 ms (per channel), the VBW=10 Hz reading may be adjusted by a factor:

F = 20*log (dwell time/100 ms)

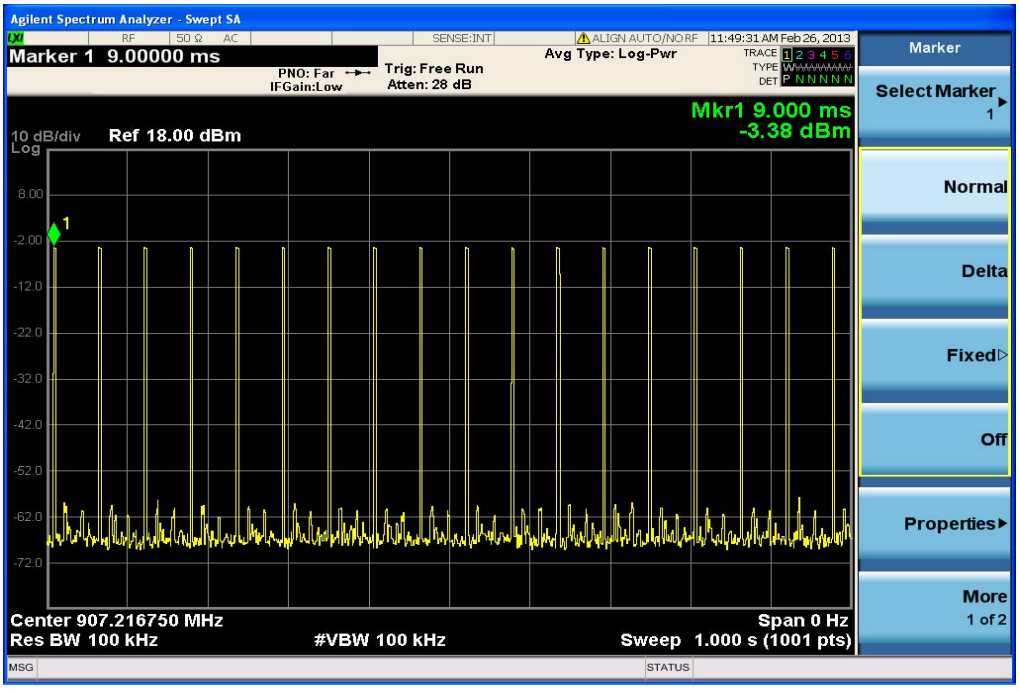
In a period of 100 ms, we have a maximum of 2 transmissions and that gives the correction factor for spurious measurement.

F = 20*log (2*2.172/100) = -27.24 dB

Plot 1: Time slot length = 2.172 ms



Plot 2: Number of hopping channels in 1s = 18



Results:

SPURIOUS EMISSIONS LEVEL [dBµV/m]								
904.5 MHz			915.3 MHz			926.1 MHz		
Frequency [MHz]	Detector	Level [dBµV/m]	Frequency [MHz]	Detector	Level [dBµV/m]	Frequency [MHz]	Detector	Level [dBµV/m]
2713	Peak	66.84	2748	Peak	72.16	2781	Peak	71.99
	AVG*	39.60		AVG*	44.92		AVG*	44.75
3618	Peak	62.10	3664	Peak	63.26	3708	Peak	64.16
	AVG*	34.86		AVG*	36.02		AVG*	36.92
4522	Peak	62.17	4581	Peak	65.44	4635	Peak	70.89
	AVG*	34.93		AVG*	38.20		AVG*	43.65
5427	Peak	61.62	7329	Peak	61.39	7416	Peak	65.15
	AVG*	34.38		AVG*	34.15		AVG*	37.91
8141	Peak	53.12						
	AVG*	25.88						
9045	Peak	51.40						
	AVG*	24.16						
Measurement uncertainty			±3 dB					

AVG*: Detector Average corrected with the correction factor F = -27.24 dB

<u>All detected peaks above the limit line in the pre-scan are compliant to the peak and average limits.</u>

Limits:

ANSI C63.10 – FCC Public Notice DA 00-705
The average emission shall be determined by using Video averaging (VBW = 10 Hz). If the dwell time of the hopping signal is less than 100 ms (per channel), the VBW=10 Hz reading may be adjusted by a factor: F = 20log (dwell time/100 ms)

FCC	IC
Band-edge Compliance of conducted and radiated emissions	
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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §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)).	

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

Result: Passed

Plot 1: 30 MHz – 1 GHz, antenna vertical / horizontal (lowest channel)

CETECOM ICT Services GmbH

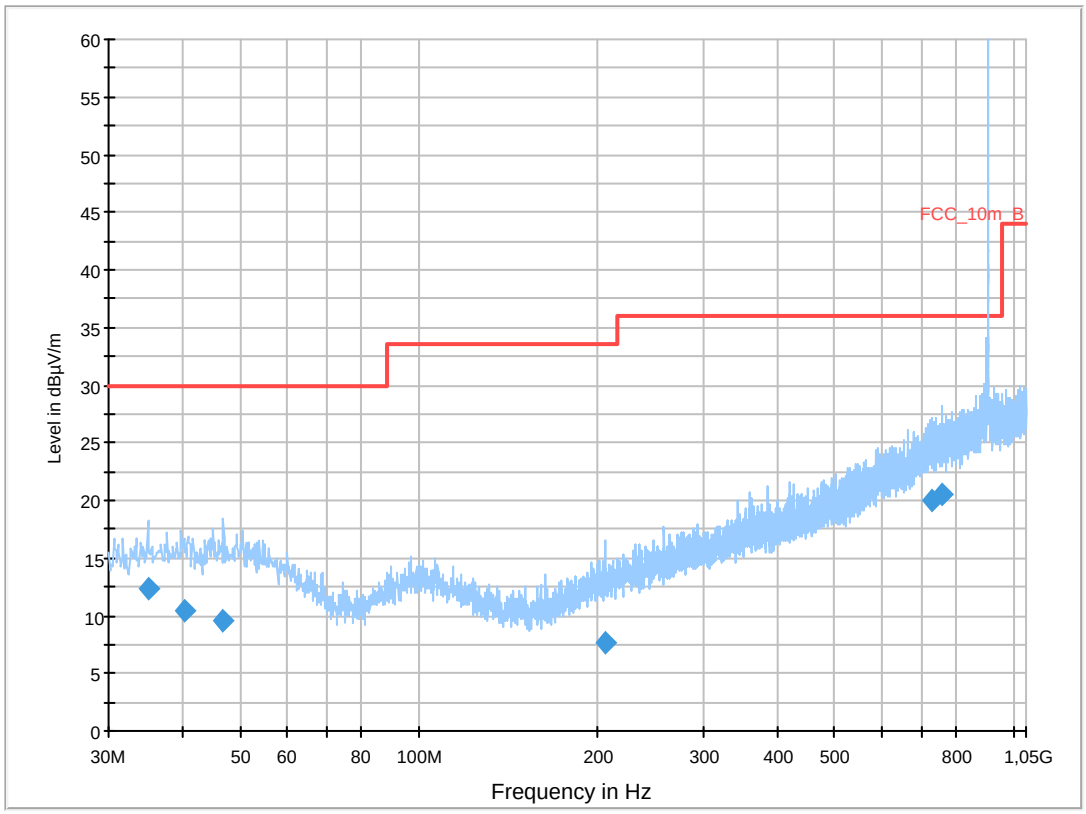
Common Information

EUT:	WMB621 Keypad
Serial Number:	4B434912C61A0005
Test Description:	FCC part 15 class B @ 10m
Operating Conditions:	cont. TX Ch. 0 (904 MHz)
Operator Name:	Hennemann
Comment:	battery powered

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

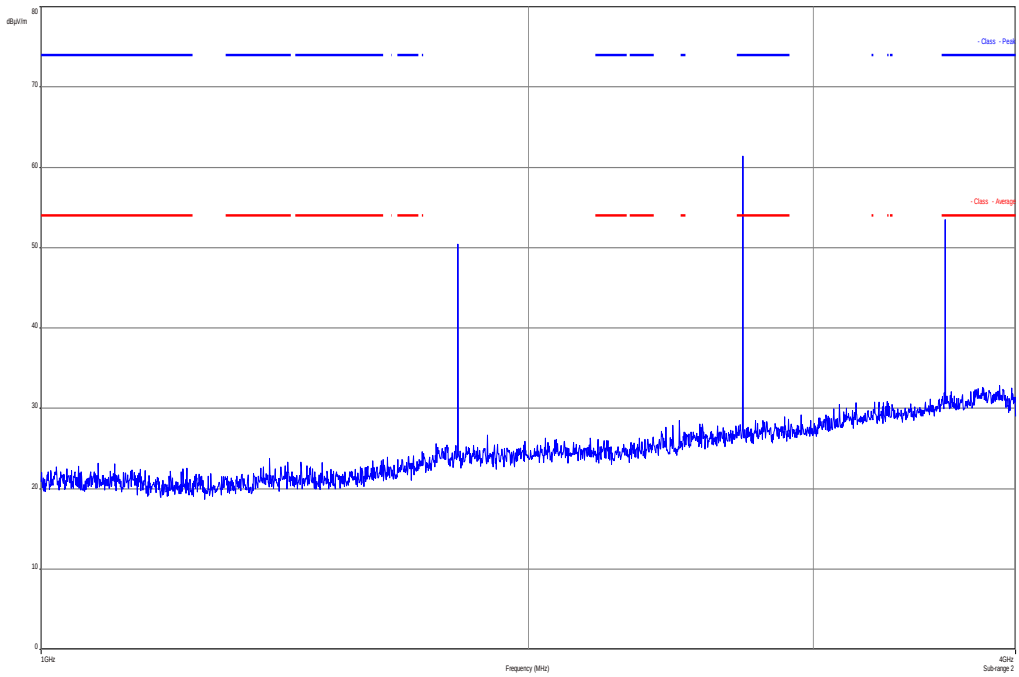
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
35.030100	12.4	1000.0	120.000	98.0	V	190.0	13.0	17.6	30.0	
40.303650	10.3	1000.0	120.000	98.0	V	-9.0	13.4	19.7	30.0	
46.797300	9.5	1000.0	120.000	121.0	H	265.0	13.3	20.5	30.0	
205.557750	7.6	1000.0	120.000	170.0	V	81.0	11.9	25.9	33.5	
726.467250	20.0	1000.0	120.000	98.0	V	10.0	23.1	16.0	36.0	
760.130100	20.5	1000.0	120.000	170.0	H	265.0	23.7	15.5	36.0	

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

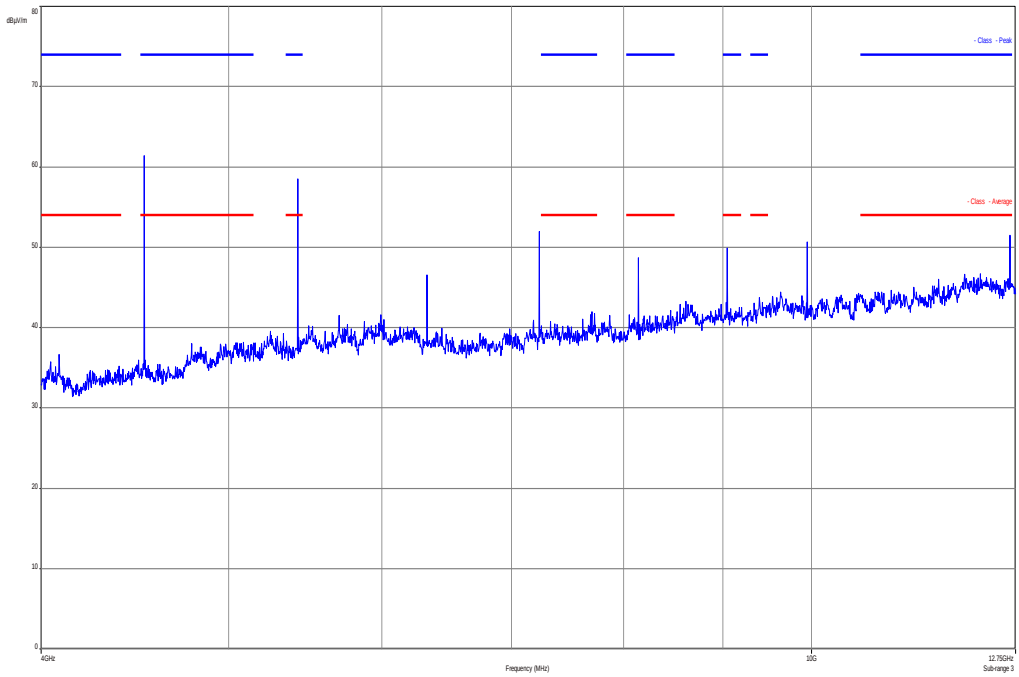
Subrange 1

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

Plot 2: 1 GHz – 4 GHz, antenna vertical / horizontal (lowest channel)



Plot 3: 4 GHz – 12 GHz, antenna vertical / horizontal (lowest channel)



Plot 4: 30 MHz – 1 GHz, antenna vertical / horizontal (middle channel)

CETECOM ICT Services GmbH

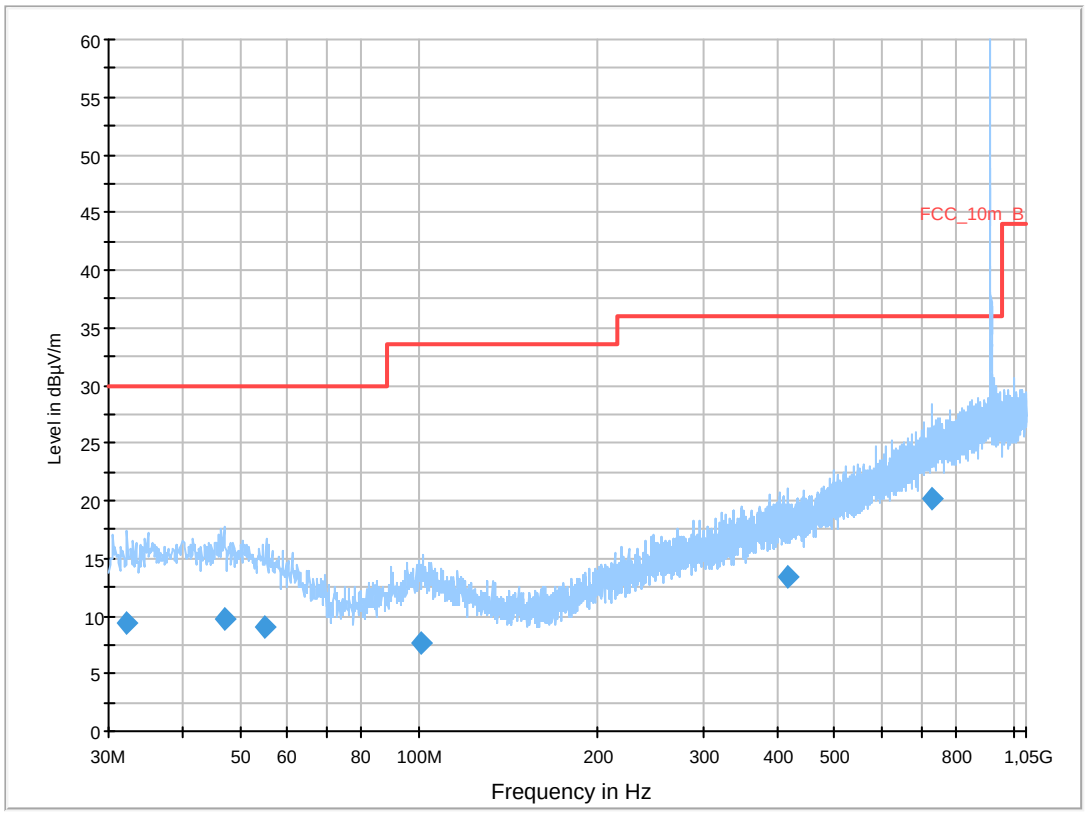
Common Information

EUT:	WMB621 Keypad
Serial Number:	4B434912C61A0005
Test Description:	FCC part 15 class B @ 10m
Operating Conditions:	cont. TX Ch. 12 (915,3 MHz)
Operator Name:	Hennemann
Comment:	battery powered

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

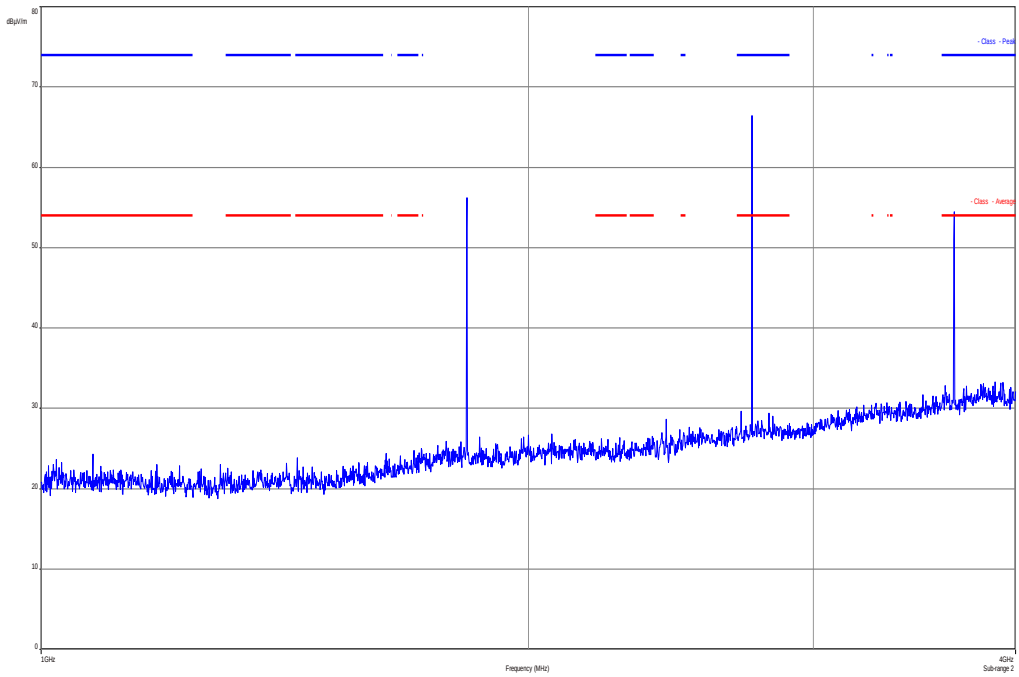
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
32.120100	9.4	1000.0	120.000	170.0	H	266.0	12.7	20.6	30.0	
46.903500	9.7	1000.0	120.000	105.0	V	190.0	13.3	20.3	30.0	
55.045650	9.0	1000.0	120.000	121.0	H	10.0	12.9	21.0	30.0	
100.680900	7.7	1000.0	120.000	170.0	H	182.0	11.8	25.8	33.5	
417.121200	13.3	1000.0	120.000	104.0	H	190.0	17.2	22.7	36.0	
729.910650	20.3	1000.0	120.000	112.0	H	190.0	23.2	15.7	36.0	

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

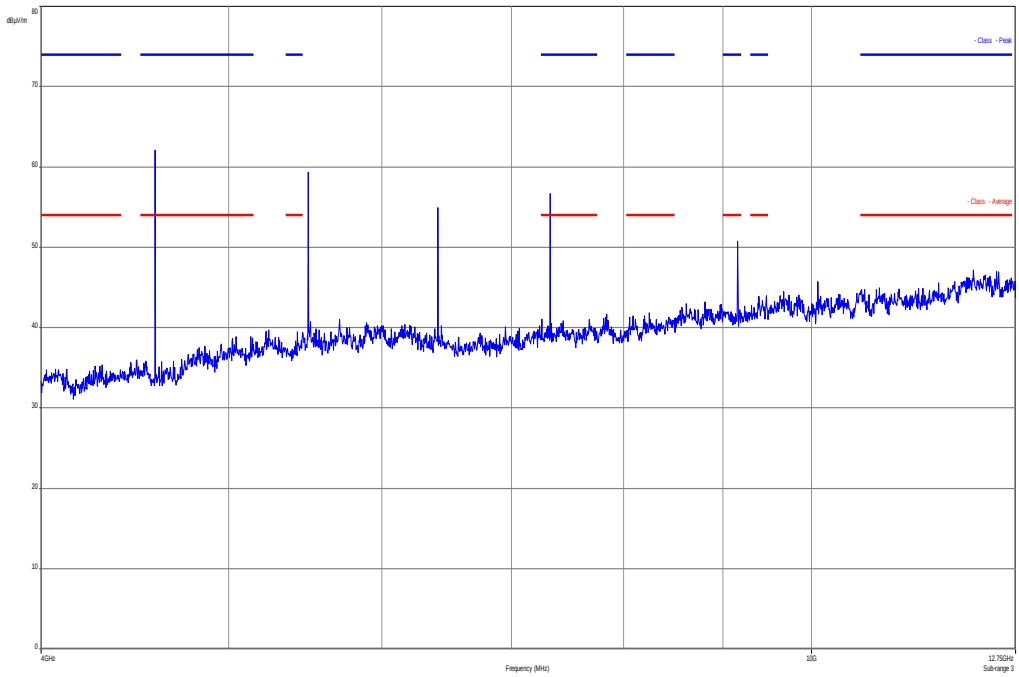
Subrange 1

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

Plot 5: 1 GHz – 4 GHz, antenna vertical / horizontal (middle channel)



Plot 6: 4 GHz – 12 GHz, antenna vertical / horizontal (middle channel)



Plot 7: 30 MHz – 1 GHz, antenna vertical / horizontal (highest channel)

CETECOM ICT Services GmbH

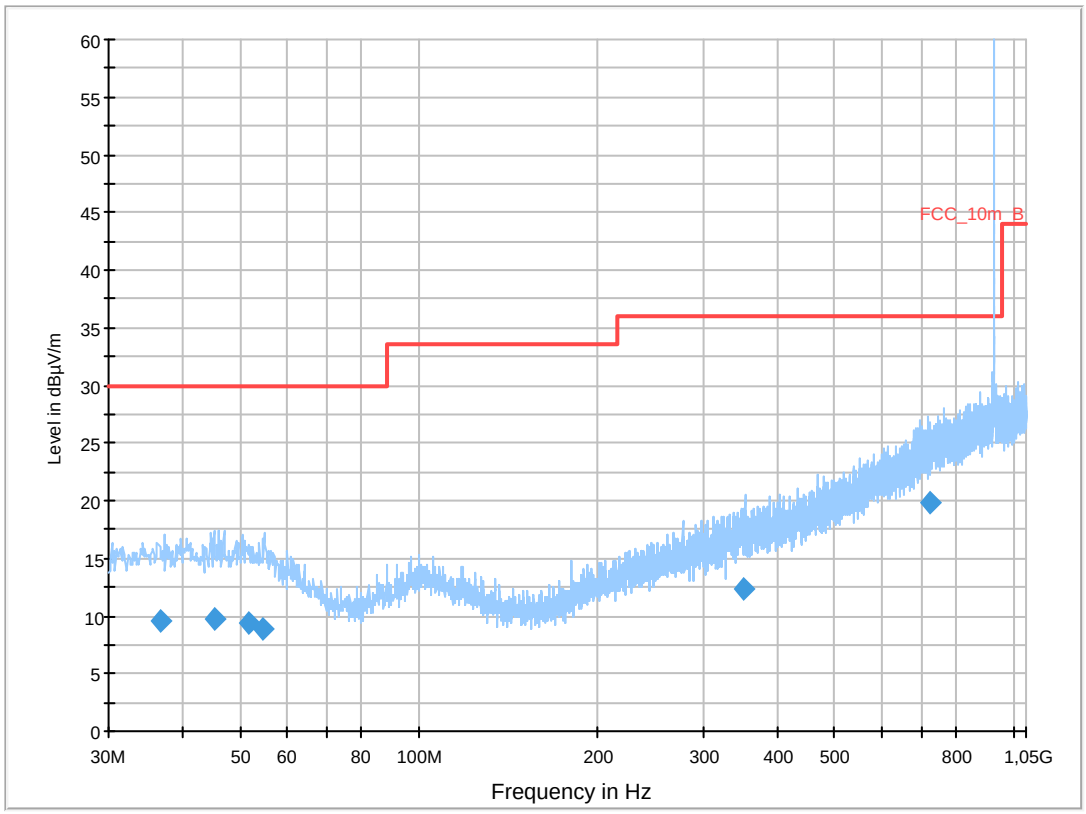
Common Information

EUT:	WMB621 Keypad
Serial Number:	4B434912C61A0005
Test Description:	FCC part 15 class B @ 10m
Operating Conditions:	cont. TX Ch. 24 (926,1 MHz)
Operator Name:	Hennemann
Comment:	battery powered

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

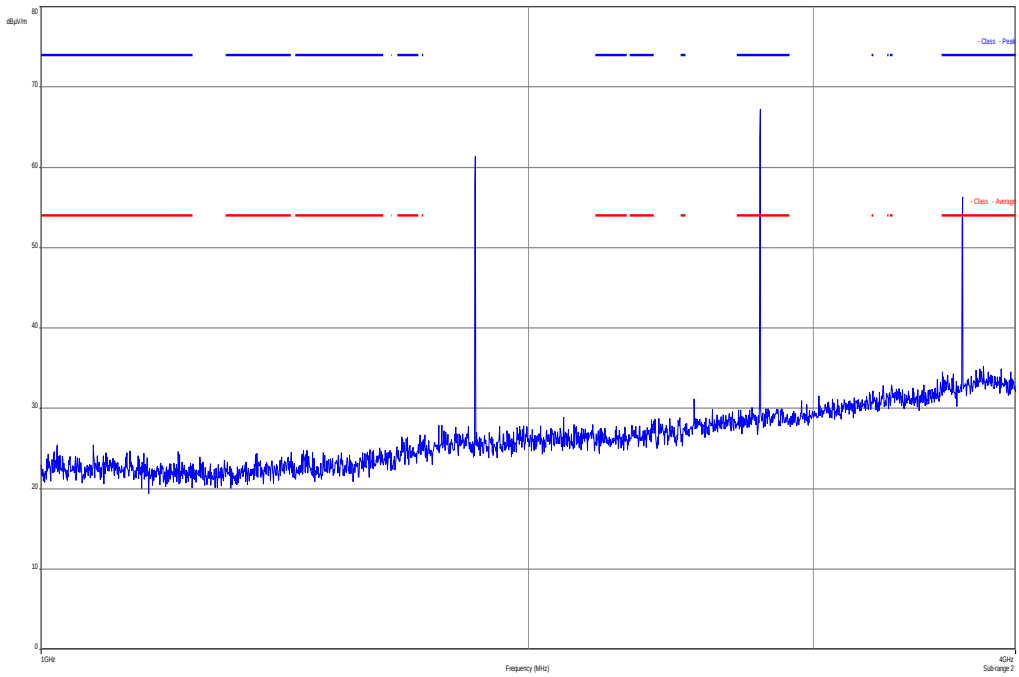
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
36.792600	9.6	1000.0	120.000	155.0	V	100.0	13.2	20.4	30.0	
45.099600	9.7	1000.0	120.000	145.0	V	3.0	13.3	20.3	30.0	
51.821550	9.5	1000.0	120.000	170.0	H	93.0	13.2	20.5	30.0	
54.731250	8.9	1000.0	120.000	134.0	H	260.0	12.9	21.1	30.0	
352.659150	12.3	1000.0	120.000	170.0	H	93.0	16.1	23.7	36.0	
720.772950	19.9	1000.0	120.000	170.0	H	-5.0	23.0	16.1	36.0	

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

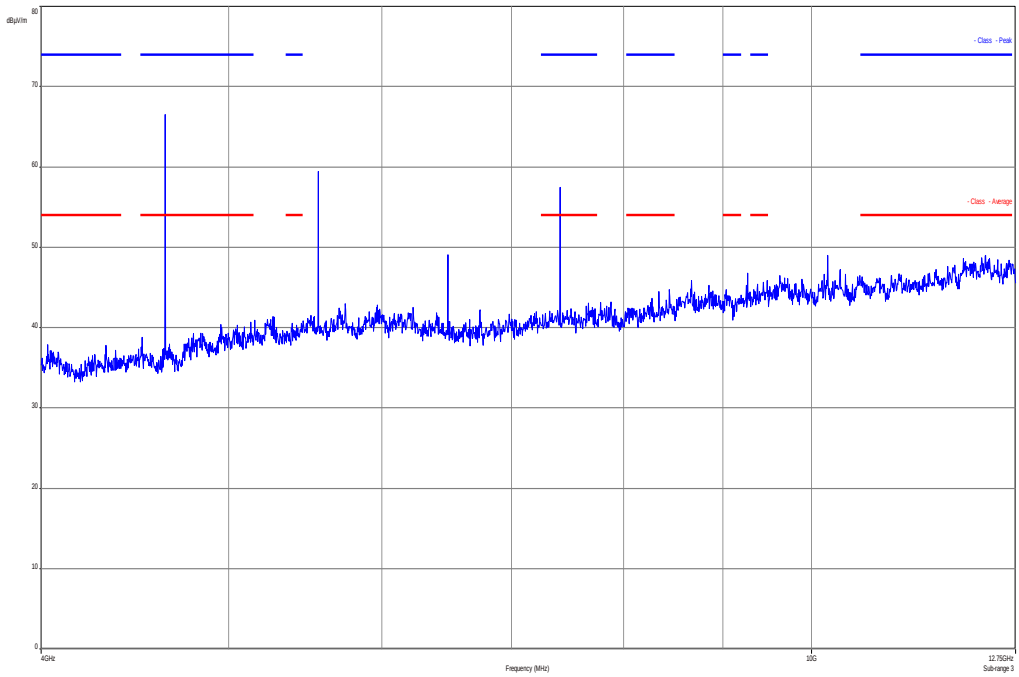
Subrange 1

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

Plot 8: 1 GHz – 4 GHz, antenna vertical / horizontal (highest channel)



Plot 9: 4 – 12 GHz, antenna vertical / horizontal (highest channel)



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

Result:

SPURIOUS EMISSIONS LEVEL [dBµV/m]								
RX mode								
Frequency [MHz]	Detector	Level [dBµV/m]	Frequency [MHz]	Detector	Level [dBµV/m]	Frequency [MHz]	Detector	Level [dBµV/m]
No peaks detected. All emissions are below limit!								
Measurement uncertainty			±3 dB					

Limits:

FCC		IC
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	40	3
88 – 216	43.5	3
216 – 960	46.0	3
Above 960	54.0	3

Result: Passed

Plot 1: 30 MHz – 1 GHz, antenna vertical / horizontal

CETECOM ICT Services GmbH

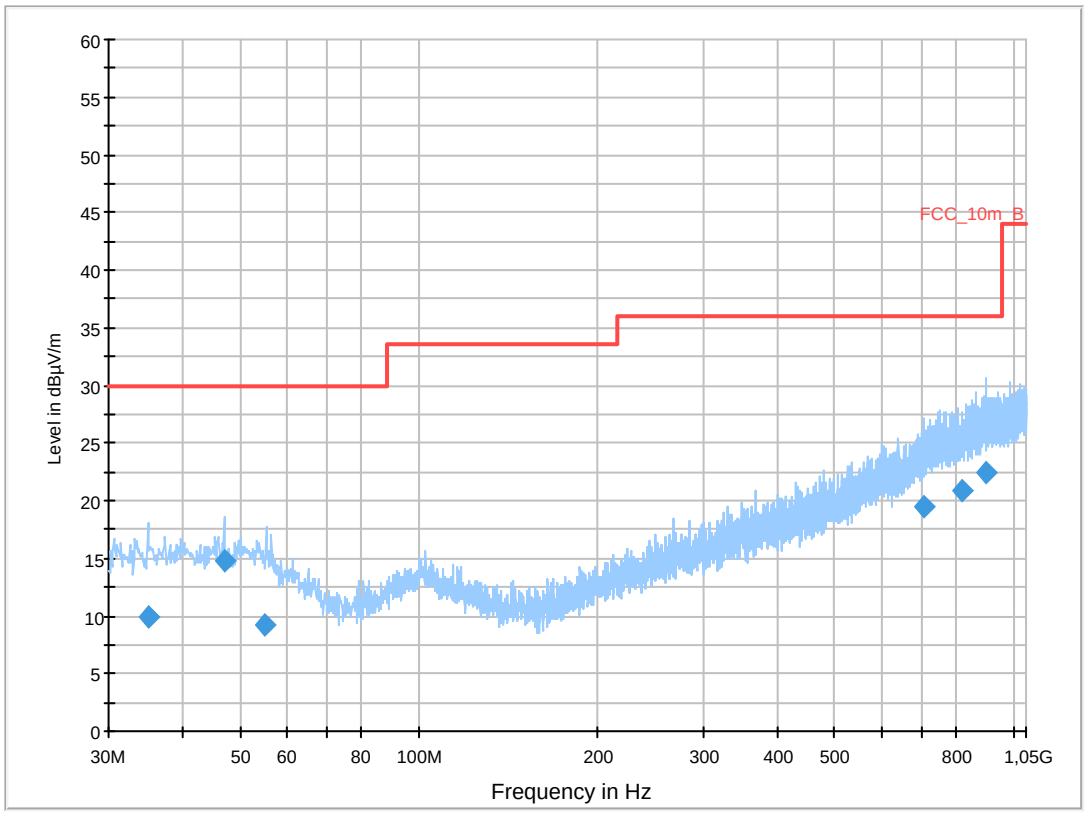
Common Information

EUT:	WMB621 Keypad
Serial Number:	4B434912C61A0005
Test Description:	FCC part 15 class B @ 10m
Operating Conditions:	cont. RX
Operator Name:	Hennemann
Comment:	battery powered

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

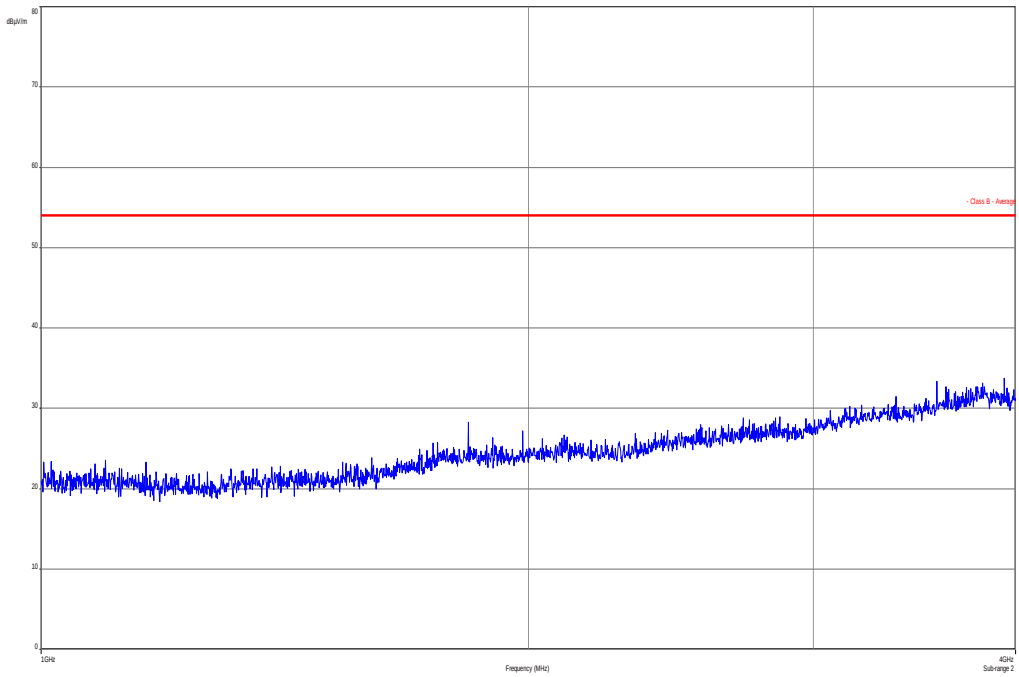
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
35.089200	9.9	1000.0	120.000	154.0	V	80.0	13.0	20.1	30.0	
46.991700	14.7	1000.0	120.000	111.0	V	280.0	13.3	15.3	30.0	
55.010850	9.2	1000.0	120.000	170.0	V	88.0	12.9	20.8	30.0	
704.180250	19.5	1000.0	120.000	104.0	V	-10.0	22.6	16.5	36.0	
820.199100	20.8	1000.0	120.000	98.0	V	2.0	24.1	15.2	36.0	
897.306300	22.4	1000.0	120.000	170.0	V	2.0	25.2	13.6	36.0	

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

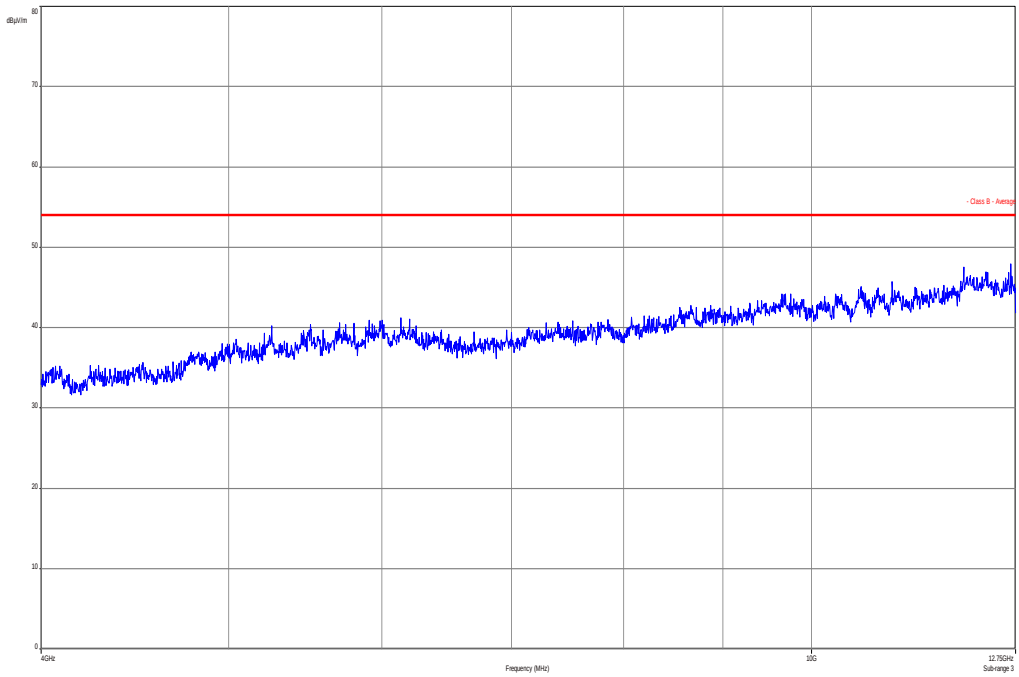
Subrange 1

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

Plot 2: 1 GHz – 4 GHz, RX-Mode, antenna vertical / horizontal



Plot 3: 4 GHz – 12 GHz, RX-Mode, antenna vertical / horizontal



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.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vlKl!	11.05.2011	11.05.2013
2	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
3	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
4	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
5	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156	ne		
6	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
7	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
8	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
9	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
10	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
11	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vlKl!	14.10.2011	14.10.2014
12	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	19.12.2011	19.02.2014
13	n. a.	Power Supply DC	NGPE 40/40	R&S	388	400000078	vlKl!	21.08.2012	21.08.2014
14	n. a.	MXA Signal Analyzer 20 Hz - 26.5 GHz	N9020A MXA Signal Analyzer	Agilent Technologies	US46220229	300003805	vlKl!	16.01.2013	16.01.2015

Agenda: Kind of Calibration

k calibration / calibrated
ne not required (k, ev, izw, zw not required)
ev periodic self verification
Ve long-term stability recognized
vlkl! Attention: extended calibration interval
NK! Attention: not calibrated

EK limited calibration
zw cyclical maintenance (external cyclical maintenance)
izw internal cyclical maintenance
g blocked for accredited testing

*) 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:

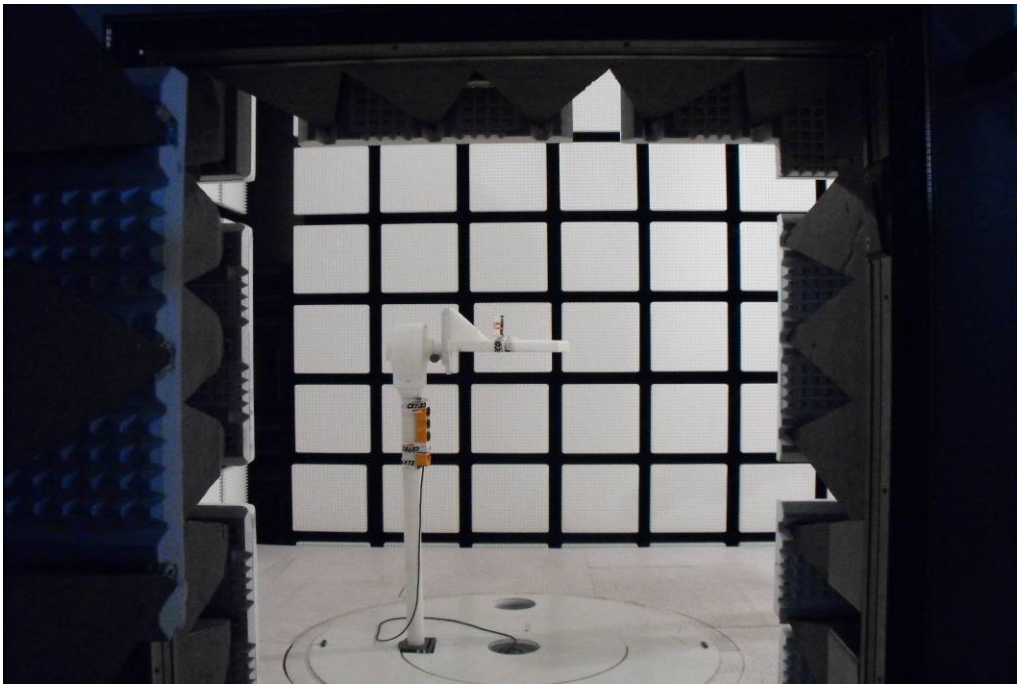


Photo 2:

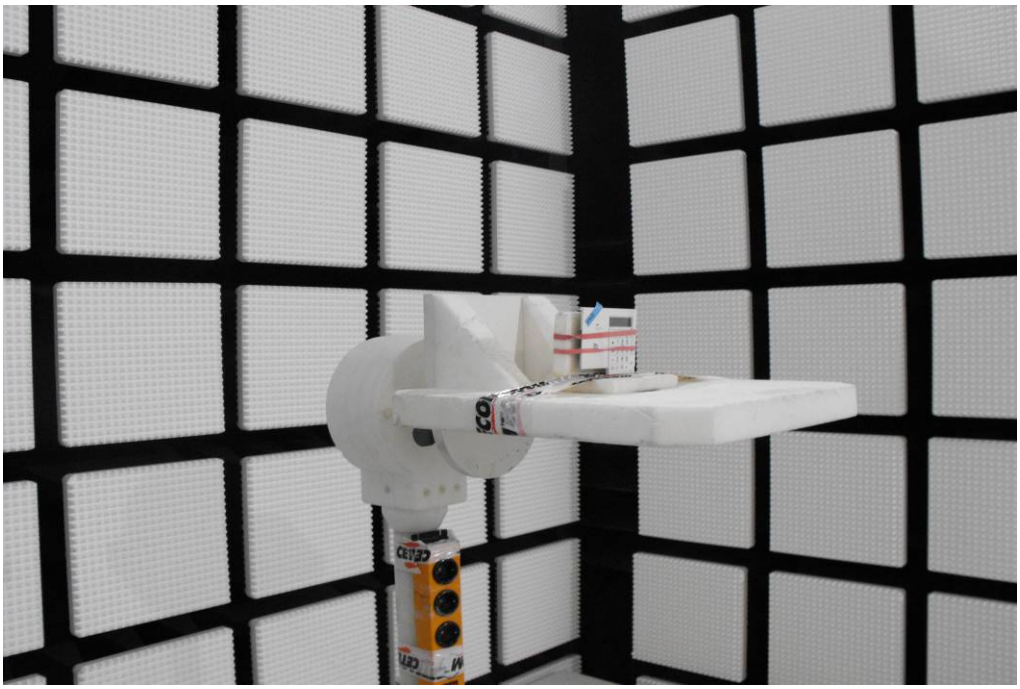


Photo 3:

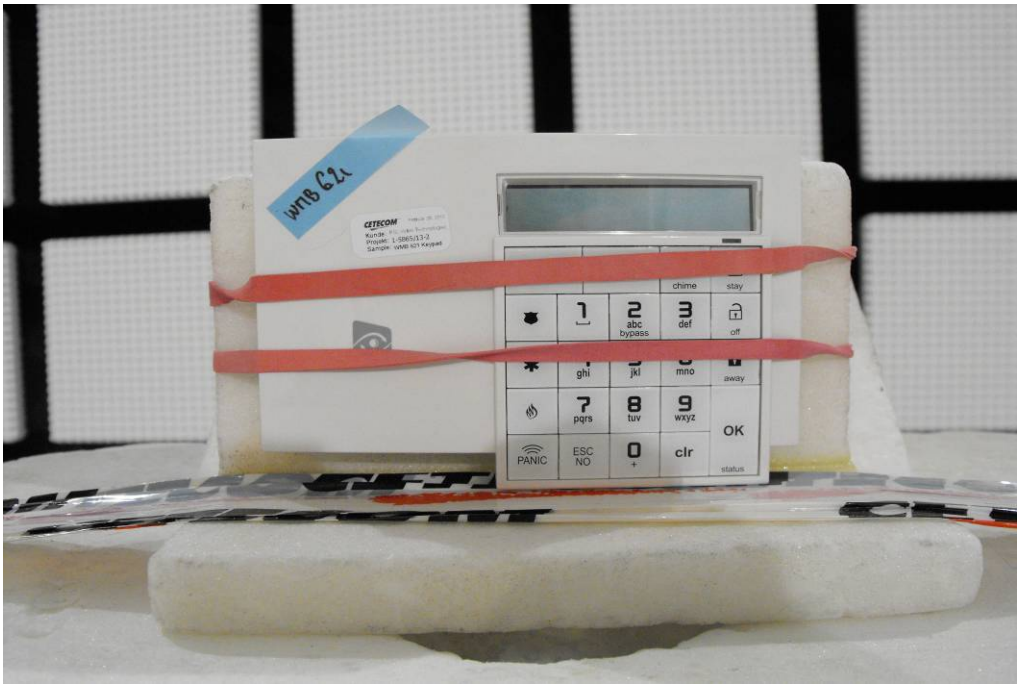


Photo 4:

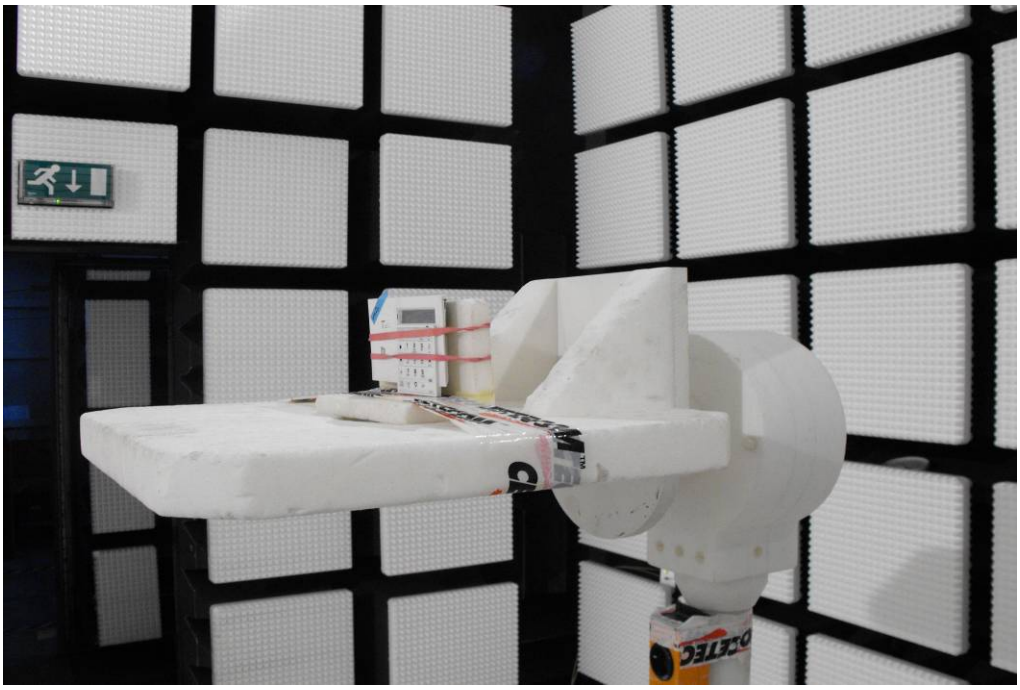
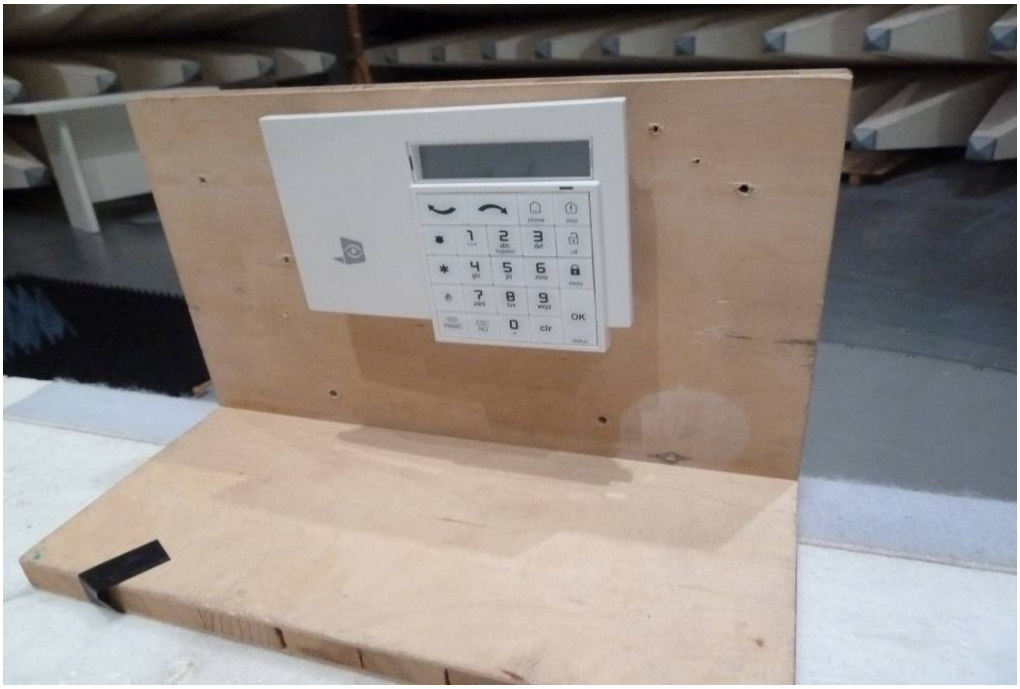


Photo 5:

Photo 6:

Photo 7:



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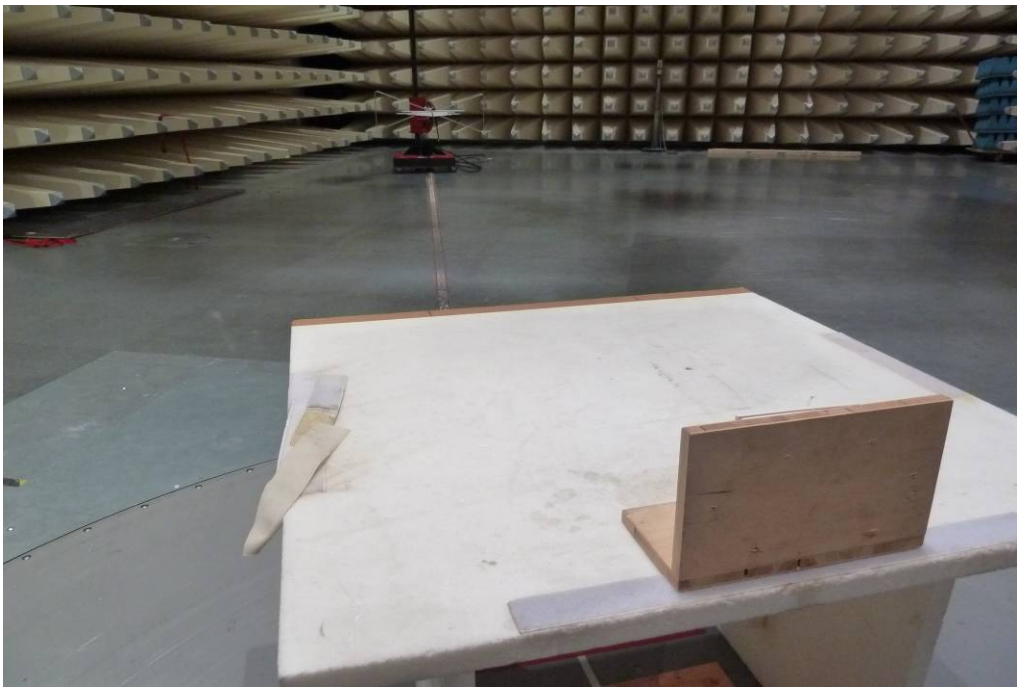


Annex B External photographs of the EUT

Photo documentation:

Photo 1:

Photo 2:

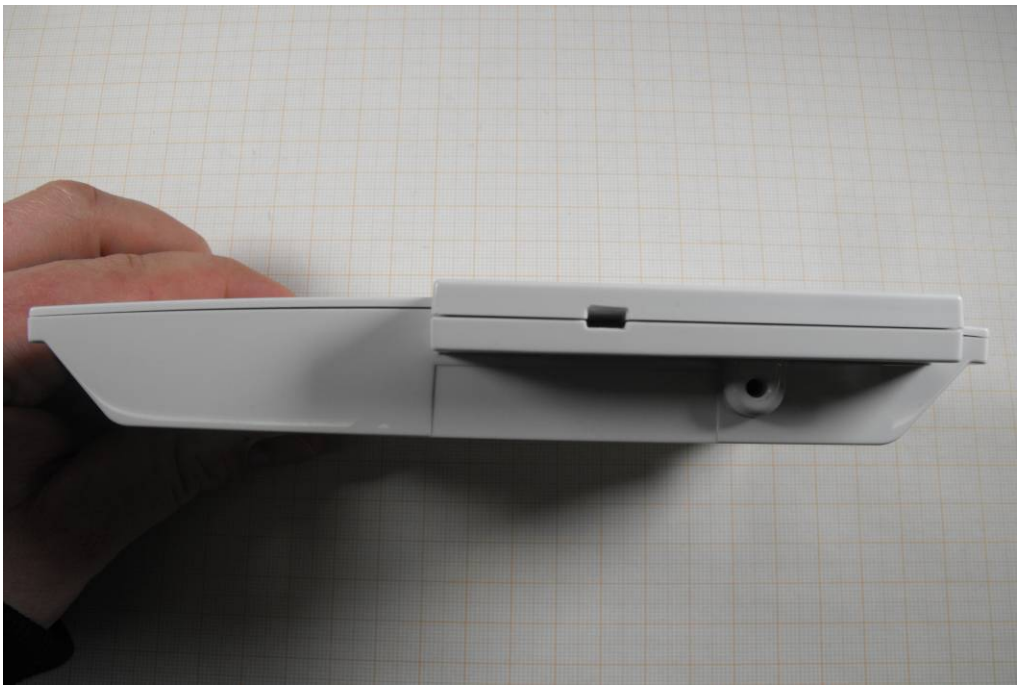


Photo 3:

Photo 4:

Photo 5:

Photo 6:

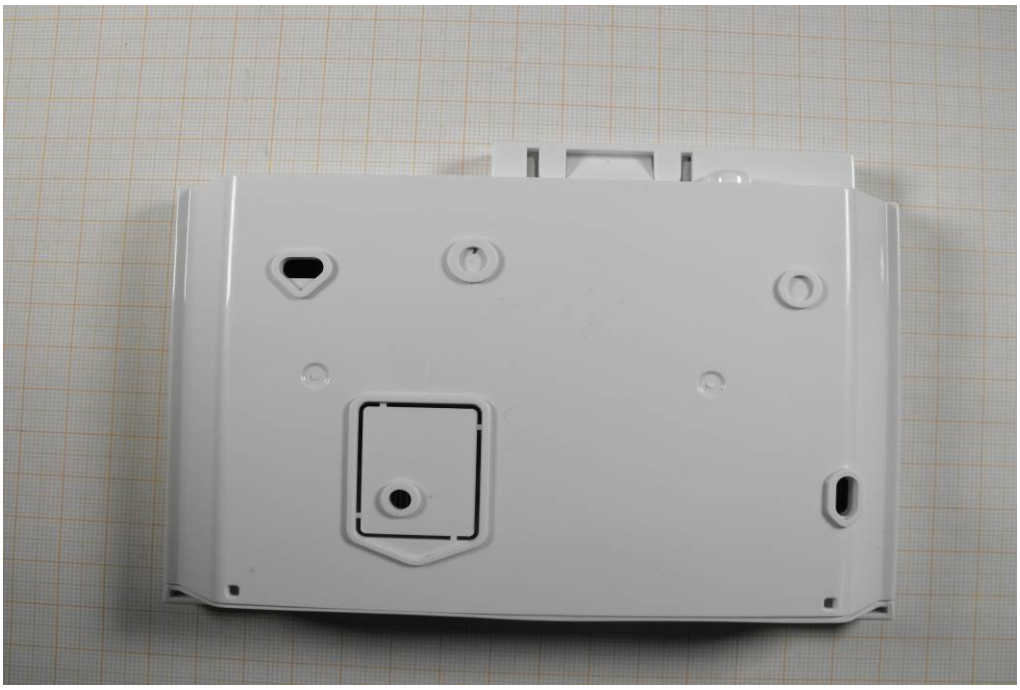
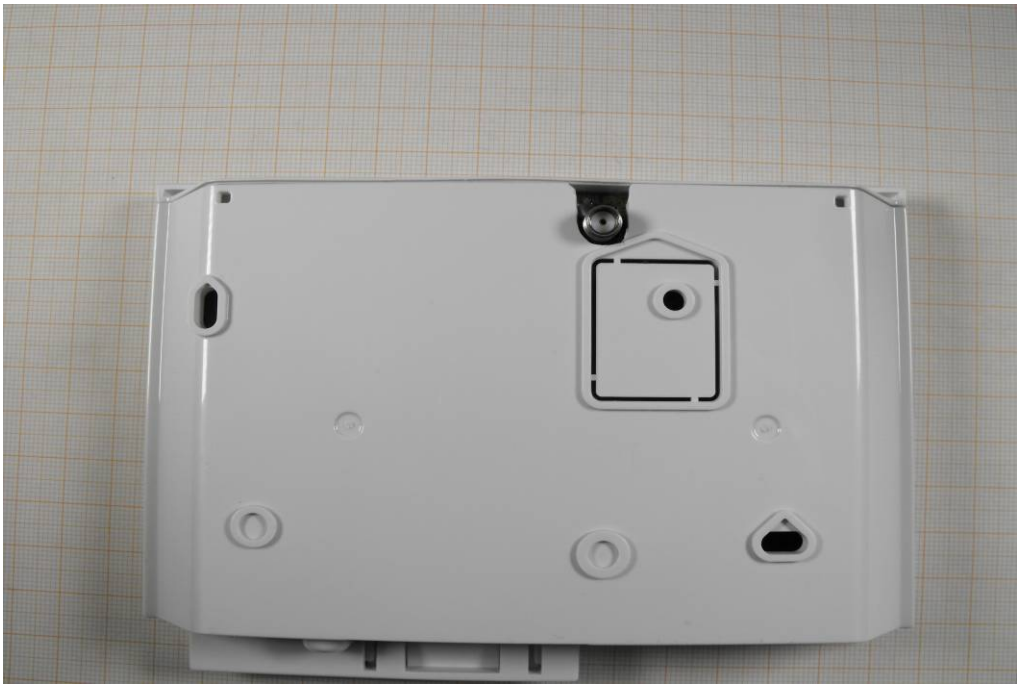


Photo 7:



Annex C Internal photographs of the EUT

Photo documentation:

Photo 1:

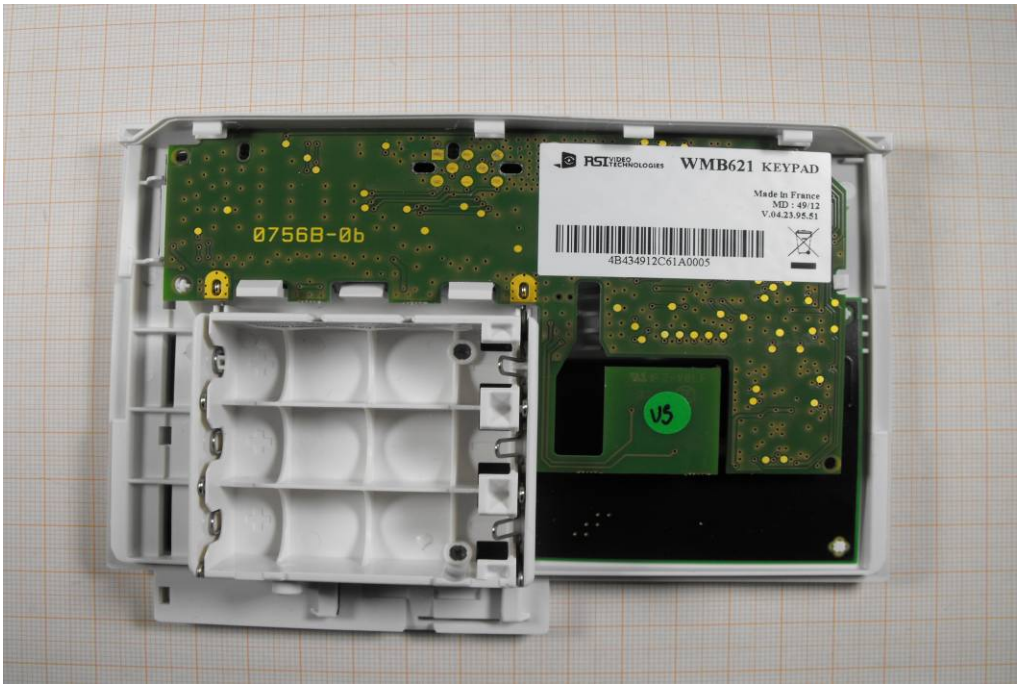


Photo 2:

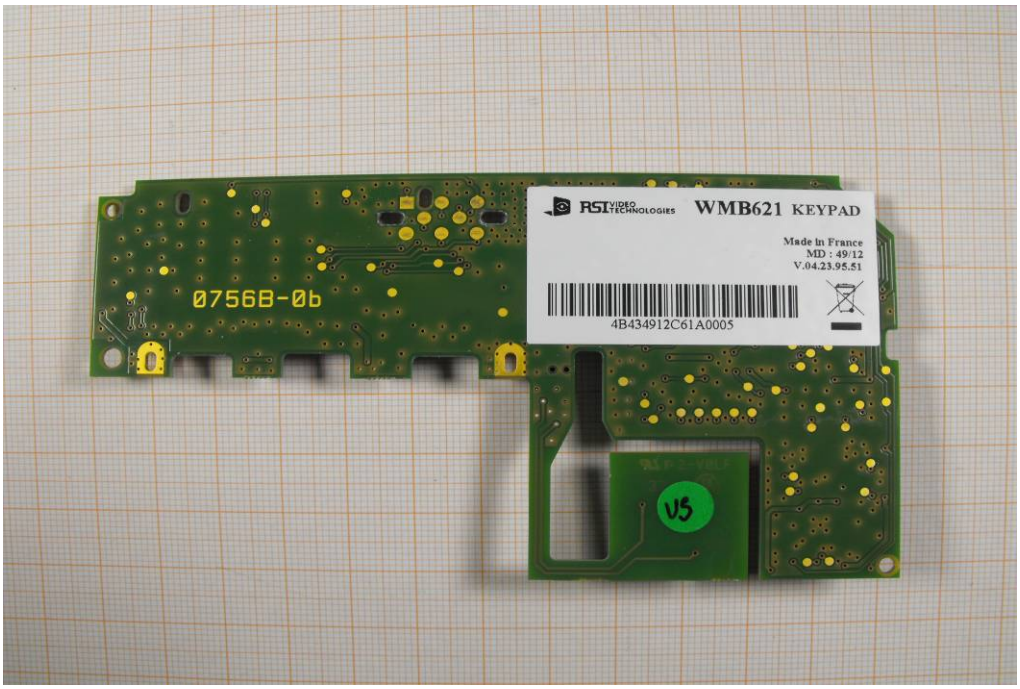


Photo 3:

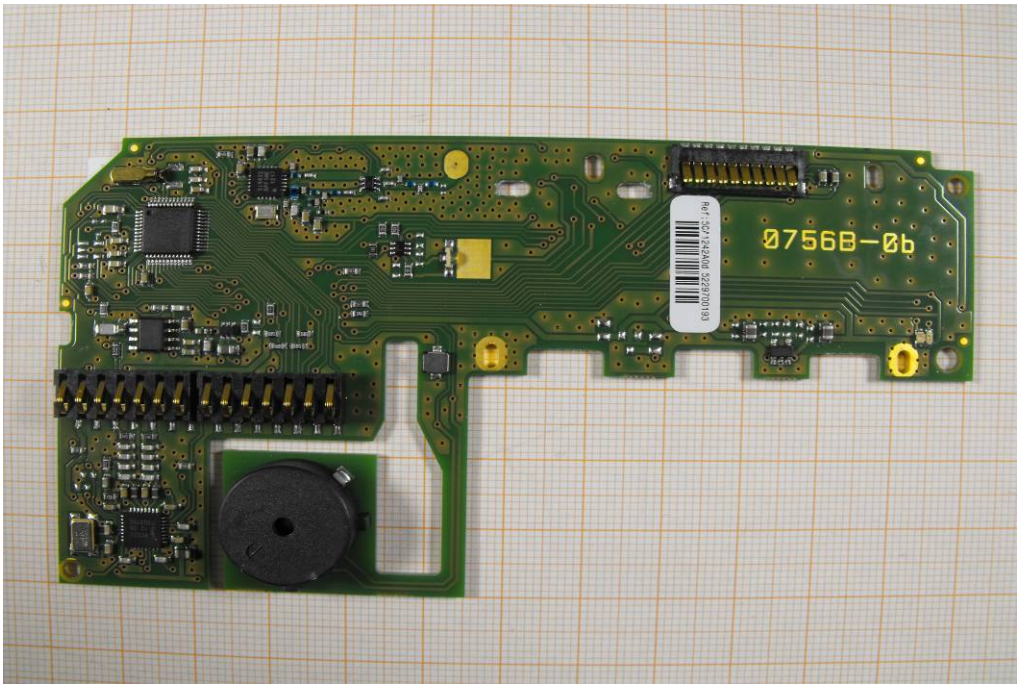


Photo 4:

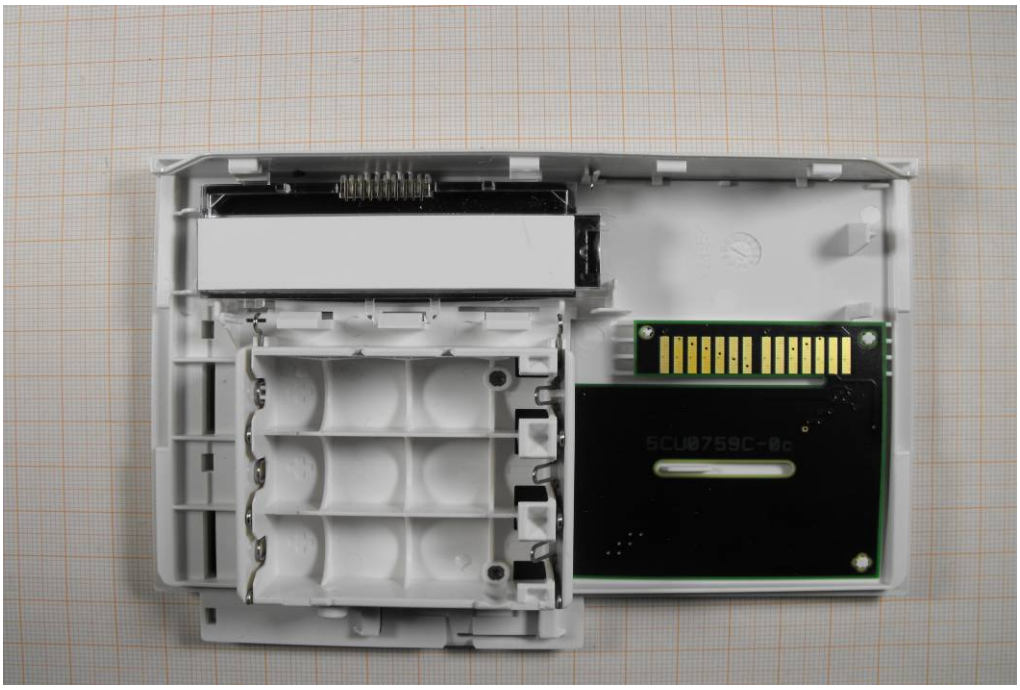
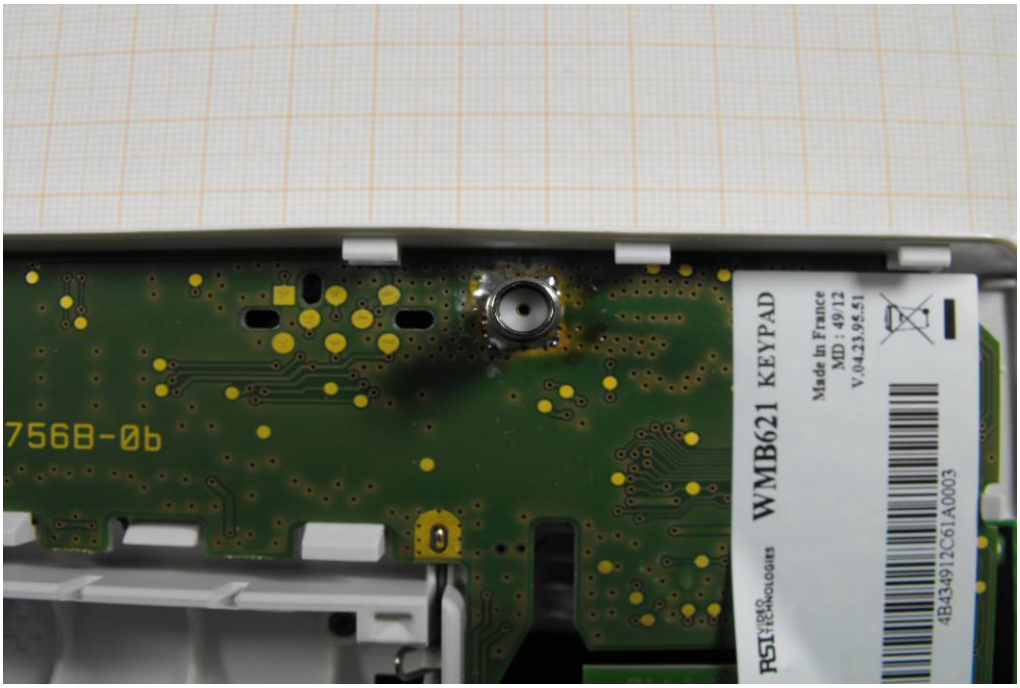


Photo 5:


RSI VIDEO TECHNOLOGIES
WMB621 KEYPAD
Made in France
MD : 49/12
V.04.23.95.51
4B434912C61A0003
756B-0b

Annex D Document history

Version	Applied changes	Date of release
1.0	Initial release	2013-03-19

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

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

Im Auftrag
Dipl.-Ing. (FH) Axel Egner
Abteilungsleiter

Siehe Hinweise auf der Rückseite

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

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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