

FCC TEST REPORT

FCC 47 CFR Part 15C Industry Canada RSS-210

Operation within the 13.110 - 14.010 MHz band

Report Reference No. G0M-1201-1687-TFC225D-V01

Testing Laboratory: Eurofins Product Service GmbH

Address: Storkower Str. 38c

15526 Reichenwalde

Germany

Accreditation:





A2LA Accredited Testing Laboratory, Certificate No.: 1983.01

FCC Filed Test Laboratory, Reg.-No.: 96970

IC OATS Filing assigned code: 3470A

Applicant's name metraTec GmbH

Address Werner-Heisenberg-Str. 1

39106 Magdeburg

GERMANY

Test specification:

Standard.....: 47 CFR Part 15C

RSS-210, Issue 8, 2010-12 RSS-Gen, Issue 3, 2010-12

ANSI C63.4:2009

Equipment under test (EUT):

Product description RFID module QR15-HL built into Product Benchtop Photometer

DR6000 / LPG441

Model No. QR15-HL in end product Benchtop Photometer DR6000 / LPG441

Hardware version

Firmware / Software version

FCC-ID: YUH-QR15HL IC: 9278A-QR15HL

Test result Passed



P	ossik	ole	test	case	verdicts:	

- neither assessed nor tested: N/N

- required by standard but not appl. to test object: N/A

- required by standard but not tested: N/T

- not required by standard for the test object: N/R

- test object does meet the requirement P (Pass)

- test object does not meet the requirement F (Fail)

Testing:

Date of receipt of test item...... 2012-03-13

Date (s) of performance of tests...... 2012-04-26

Compiled by...... Christian Weber

(Testing Manager)

Approved by (+ signature).....:

(Test Lab Manager)

Jens Zimmermann

Date of issue...... 2012-05-11

Total number of pages 39

General remarks:

The test results presented in this report relate only to the object tested.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Additional comments:



REPORT INDEX

1	EQUIPMENT (TEST ITEM) DESCRIPTION:	4
1.1	Photos – Equipment External	5
1.2	Photos – Equipment internal	8
1.3	Photos – Test setup	9
1.4	Supporting Equipment Used During Testing	12
1.5	Test Modes	13
1.6	Test Equipment Used During Testing	14
1.7	Sample emission level calculation	15
2	RESULT SUMMARY	16
3	TEST CONDITIONS AND RESULTS	17
3.1	Test Conditions and Results – Occupied Bandwidth	17
3.2	Test Conditions and Results – Fundamental in-band field strength emissions	18
3.3	Test Conditions and Results – Emissions radiated outside the specified frequency band	20
3.4	Test Conditions and Results – Frequency stability	22
3.5	Test Conditions and Results – AC power line conducted emissions	24
	EX A Transmitter in-band emissions IEX B Transmitter radiated spurious emissions	27 29

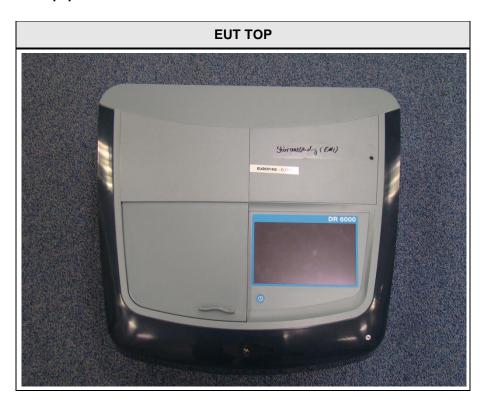


1 Equipment (Test item) Description:

Description	RFID module QR15-HL built into Product Benchtop Photometer DR6000 / LPG441				
Model	QR15-HL in end pro	QR15-HL in end product Benchtop Photometer DR6000 / LPG441			
Serial number	1414862 &1414671				
Hardware version					
Software / Firmware version					
FCC-ID	YUH-QR15HL				
IC	9278A-QR15HL				
Equipment type	End product				
Radio type	Transceiver				
Radio technology	13.56 MHz RFID				
Operating frequency range	13.56 MHz				
Assigned frequency band	13.110 - 14.010 MHz				
Frequency range	F _{MID} 13.56 MHz				
Spreading	None				
Modulations	ASK				
Number of channels	1				
Channel spacing	None				
Number of antennas	1				
	Туре	integrated			
Antenna	Model	printed loop antenna			
	Manufacturer	metraTec			
	V _{NOM}	120.0 VAC			
Power supply	V _{MIN}	102 VAC			
	V _{MAX}	138 VAC			
	T _{NOM}	25°C			
Temperatures	T _{MIN}	-20°C			
	T _{MAX}	+50°C			
	Model	N/A			
AC/DC-Adaptor	Vendor	N/A			
AGIDG-Adaptol	Input	N/A			
	Output	N/A			



1.1 Photos – Equipment External







Product Service







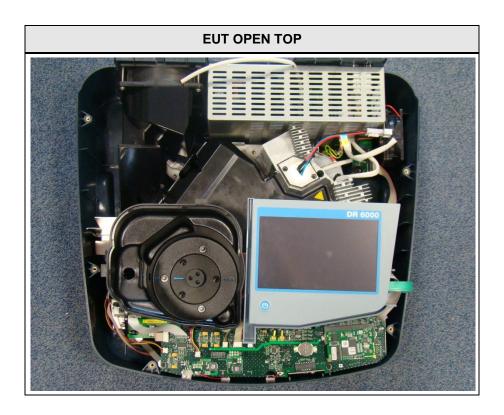
Product Service

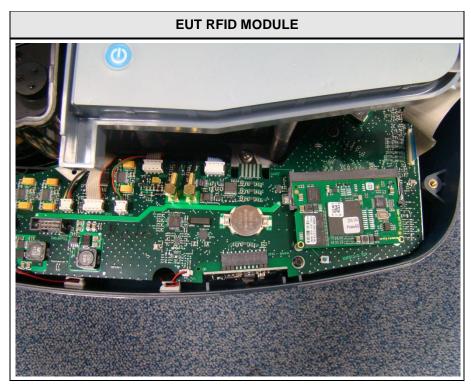






1.2 Photos – Equipment internal

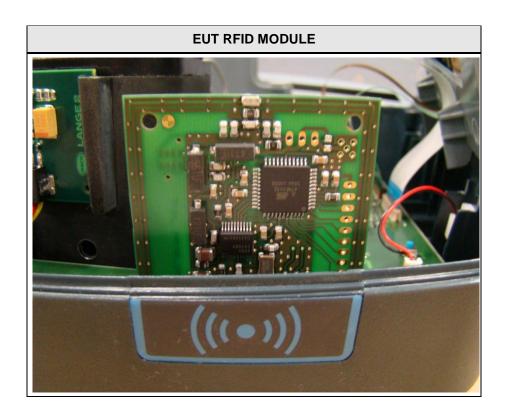




Test Report No.: G0M-1201-1687-TFC225D-V01

Eurofins Product Service GmbH Storkower Str. 38c, D-15526 Reichenwalde, Germany







1.3 Photos – Test setup





Product Service





1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments			
None							
*Note: Use the following abbreviations:							
AE :	AE : Auxiliary/Associated Equipment, or						
SIM : Simulator (Not Subjected to Test)							
CABL:	Connecting cables						



1.5 Test Modes

Mode #		Description
	General conditions:	EUT powered by ac-mains
Single	Radio conditions:	Mode = standalone transmit Modulation = ASK Power level = Maximum



1.6 Test Equipment Used During Testing

		Occupied Ba	ndwidth		
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2011-12	2012-12

Field strength emissions							
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due		
Semi-anechoic chamber	Frankonia	AC 5	EF00395	-	-		
Spectrum Analyzer	R&S	FSIQ26	EF00242	2011-04	2012-04		
Loop Antenna	R&S	HFH2-Z2	EF00184	2011-09	2012-09		
Biconical Antenna	R&S	HK 116	EF00012	2010-01	2013-01		
LPD Antenna	R&S	HL 223	EF00187	2011-02	2014-02		
LPD Antenna	R&S	HL 025	EF00327	2010-02	2013-02		

Conducted emissions						
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due	
AMN	R&S	ESH2-Z5	EF00182	2010-09	2012-09	
AMN	R&S	ESH3-Z5	EF00036	2010-11	2012-11	
EMI Test Receiver	R&S	ESCS 30	EF00295	2011-06	2012-06	



1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBµV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyzer (dB μ V) + A.F. (dB) = Net field strength (dB μ V/m)

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of $dB\mu V/m$). The FCC limits are given in units of $\mu V/m$. The following formula is used to convert the units of $\mu V/m$ to $dB\mu V/m$:

Limit (dB μ V/m) = 20*log (μ V/m)

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading + AF = Net Reading : Net reading - FCC limit = Margin 21.5 dB μ V + 26 dB = 47.5 dB μ V/m : 47.5 dB μ V/m - 57.0 dB μ V/m = -9.5 dB



2 Result Summary

Product Specific Standard Section	Requirement – Test	Reference Method	Result	Remarks	
RSS-Gen 4.6.1	Occupied Bandwidth	RSS-Gen 4.6.1	N/R	Informational only	
FCC 15.225(a-c) IC RSS-210 A2.6(a-c)	Fundamental in-band field strength emissions	ANSI C63.4	PASS		
FCC 15.225(d) FCC 15.209 IC RSS-210 A2.6(d)	Emission radiated outside the specified frequency band	ANSI C63.4	PASS		
FCC 15.225(e) IC RSS-210 A2.6	Frequency stability	ANSI C63.4	PASS		
IC RSS-Gen 4.10 IC RSS-Gen 6.1	Receiver radiated spurious emissions	ANSI C 63.4	N/A		
47 CFR 15.207 RSS-Gen 7.2.4 AC power line conducted emissions ANSI C63.4 PASS					



3 Test Conditions and Results

3.1 Test Conditions and Results - Occupied Bandwidth

Occupied Bandwidth acc. IC RSS-Gen Verdict: PASS						
Test acco	ording to	Reference Method				
measureme		RSS-Gen 4.6.1				
Toot from a	anou rongo	Tested frequencies				
Test freque	ency range	F _{MID}				
EUT tes	st mode	Single				
		Limits				
	1	None (Informational only)				
		Test setup				
	Spectrum Analyzer EUT					
		Test procedure				
	,	ation tester is used if needed)				
•	at least twice the emis	•				
	eandwidth set to 1 % o	•				
Occupied Bandwidth (99 %) measurement with spectrum analyzer built in measurement function Test results						
Channel						
	Frequency [MHz]	Occupied Bandwidth [kHz]				
F _{MID}	F _{MID} 13.56 0.461					
Comments: Measurement is applicable to all variants						

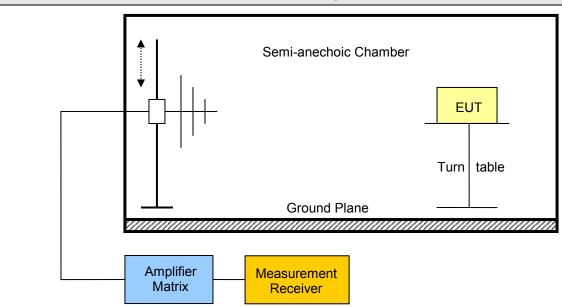


3.2 Test Conditions and Results - Fundamental in-band field strength emissions

Field strength emissions acc. FCC 47 CFR 15.225 / IC RSS-210 Verdict: PASS				
Test according referenced	Reference Method	d		
standards	FCC 15.225(a-c) / IC RSS-210 A2.6(a-c)			
Test according to	Reference Method	d		
measurement reference	ANSI C63.4			
T 16	Tested frequencie	s		
Test frequency range	F _{MID}			
EUT test mode Single				
Limite				

Limits						
Frequency range [MHz]	Limit [µV/m]	Limit [dBµV/m]	Limit Distance [m]			
13.553 – 13.567	15848	84	30			
13.410 – 13.553 13.567 – 13.710	334	50.5	30			
13.110 – 13.410 13.710 – 14.010	50	40.5	30			

Test setup



Test procedure

- 1. EUT set to test mode
- 2. Span it set according to measurement range
- 3. Resolution bandwidth below 1 GHz is set according to CISPR 16 with peak/quasi-peak detector
- 4. Below 30MHz and extrapolation factor of 40dB/decade is used and at 30MHz and above an extrapolation factor of 20dB/decade is used (47 CRF 15.31(f)).

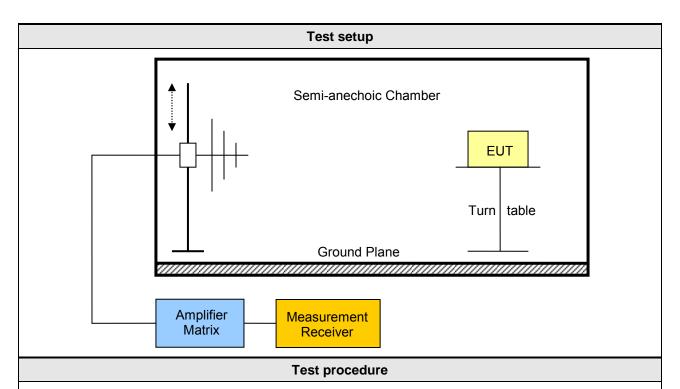
Test results								
Channel	Frequency [MHz]	Emission [MHz]	Level @ 30m [dbµV/m]	Det.	Pol.	Limit @ 30m [dbµV/m]	Measurement distance [m]*	Margin [dB]
F _{MID}	13.56	13.56	27.01	pk	ver	84	3	56.99
Comments: * Physical distance between FUT and measurement antenna. See Annex								



3.3 Test Conditions and Results - Emissions radiated outside the specified frequency band

Radiated out-of-band band emissions acc. FCC 47 CFR 15.225 / IC RSS-210 Verdict: PASS						
Test according refe	erenced	Reference Method				
standards		FCC 15.225(d) / IC RSS-210 A2.6(d)				
Test according	g to	Reference Method				
measurement ref	erence	ANSI C63.4				
Took from your over		Tested frequencies				
Test frequency r	ange	9 kHz – 5 GHz				
EUT test mod	de	Single				
Limits						
Frequency range [MHz]	Detector	Limit [µV/m]	Limit [dBµV/m]	Limit Distance [m]		
0.009 - 0.490	Quasi-Peak	2400/F[kHz]	48.5 – 13.8	300		
0.490 – 1.705	Quasi-Peak	2400/F[kHz]	13.8 – 1.4	30		
1.705 – 30	Quasi-Peak	30	29.5	30		
30 – 88	Quasi-Peak	100	40	3		
88 – 216 Quasi-Peak		150	43.5	3		
216 – 960 Quasi-Peak		200	46	3		
960 – 1000	Quasi-Peak	500	54	3		
> 1000 Average		500	54	3		

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.



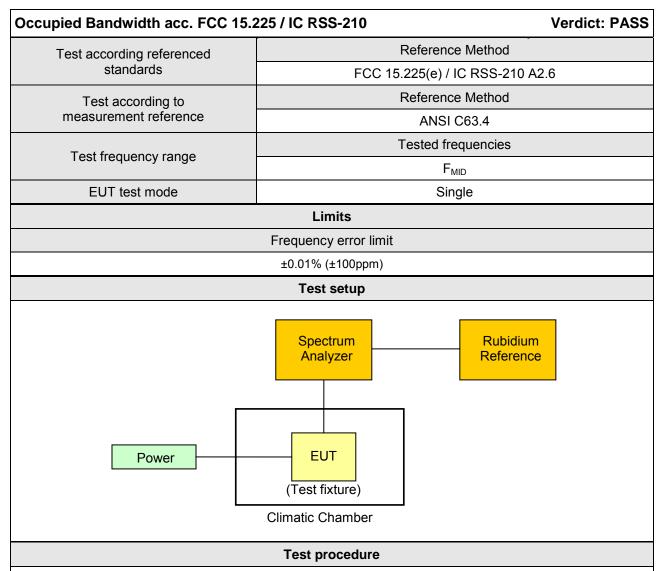
- 1. EUT set to test mode
- 2. Span it set according to measurement range
- 3. Resolution bandwidth below 1 GHz is set according to CISPR 16 with peak/quasi-peak detector and RBW of 1 MHz with peak/average detector is used above 1 GHz
- 4. Markers are set to maximum emission levels

Test results

see Annex



3.4 Test Conditions and Results - Frequency stability



- 1. EUT set to test mode
- 2. The ambient temperature and supply voltage is set according to measurement conditions
- 3. Span is set to capture fundamental emission
- 4. Frequency error is measured with frequency counter measurement function



Test results							
Channel	Frequency [MHz]	Temp.	Voltage	Measured Frequency [MHz]	Error [ppm]		
F _{MID}	13.56	T _{nom} = 20°C	V_{nom} = 120.0 VAC	13.5604313	31.81		
F _{MID}	13.56	T _{min} = -20°C	V _{min} = 102 VAC	13.5605268	38.85		
F _{MID}	13.56	T _{min} = -20°C	V _{max} = 138 VAC	13.5605269	38.86		
F _{MID}	13.56	T _{min} = +50°C	V _{min} = 102 VAC	13.5604156	30.65		
F _{MID}	13.56	T _{min} =+50°C	V _{max} = 138 VAC	13.5604165	30.72		
Comments: Measurement is applicable to all variants							



3.5 Test Conditions and Results – AC power line conducted emissions

Power line conducte	Verdict: PASS					
Test according re	Reference Method					
standard	ANSI C63.4					
Fully configured sample	Frequency range					
the following freque	0.15 MHz to 30 MHz					
Points of Appli	Application Interface					
AC Mains	LISN					
EUT test me	AC-Powerline					
Limits and results						
Frequency [MHz]	Quasi-Peak [dBµV]		Result	Average [dBµV]	Result	
0.15 to 5	66 to 56*		PASS	56 to 46*	PASS	
0.5 to 5	56		PASS	46	PASS	
5 to 30	60		PASS	50	PASS	
Comments: * Limit decreases linearly with the logarithm of the frequency.						



Conducted Emissions

EMI voltage test in the ac-mains according to FCC Part 15b/c

Project number: G0M-1201-1687

Manufacturer: metraTec GmbH

EUT Name: QR15-HL + VIS Spectrophotometer

Model: QR15-HL + DR6000

Test Site: Eurofins Product Service GmbH

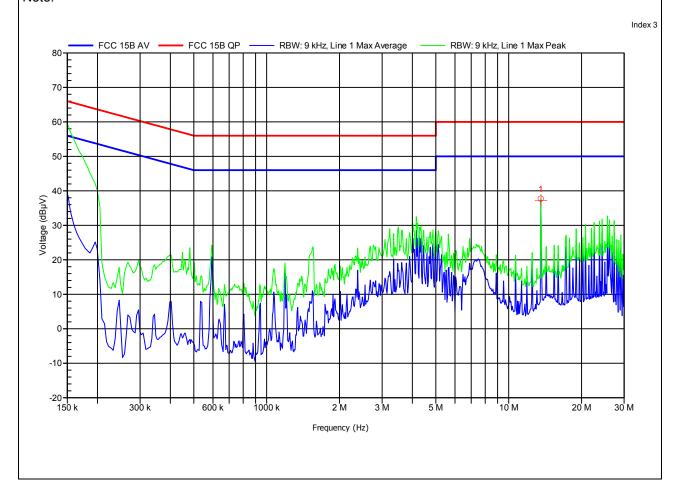
Operator: Mr. Klein

Test Conditions: Tnom: 23°C, Unom: 120VAC

LISN: ESH2-Z5 L

Mode: USB communication, Ethernet ping, RFID on, Lamp on

Test Date: 2012-04-26





Conducted Emissions

EMI voltage test in the ac-mains according to FCC Part 15b/c

Project number: G0M-1201-1687

Manufacturer: metraTec GmbH

EUT Name: QR15-HL + VIS Spectrophotometer

Model: QR15-HL + DR6000

Test Site: Eurofins Product Service GmbH

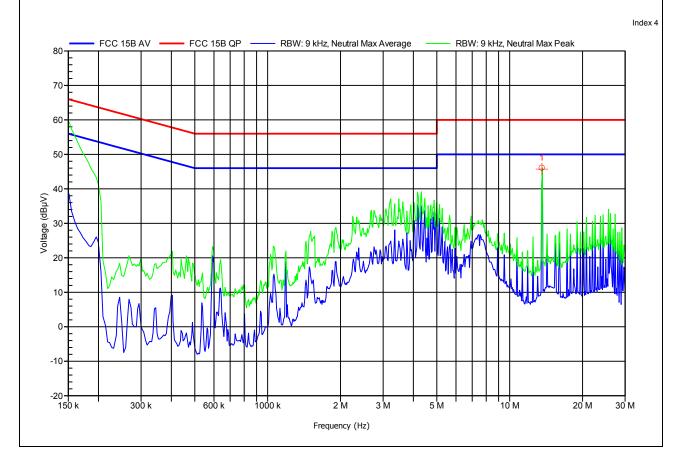
Operator: Mr. Klein

Test Conditions: Tnom: 23°C, Unom: 120VAC

LISN: ESH2-Z5 N

Mode: USB communication, Ethernet ping, RFID on, Lamp on

Test Date: 2012-04-26





ANNEX A Transmitter in-band emissions

Spectrum mask

FCC rules part 15.225

metraTec GmbH / G0M-1201-1687
QR15-HL + VIS Spectrophotometer
QR15-HL + DR6000 Approval Holder: EUT:

Model:

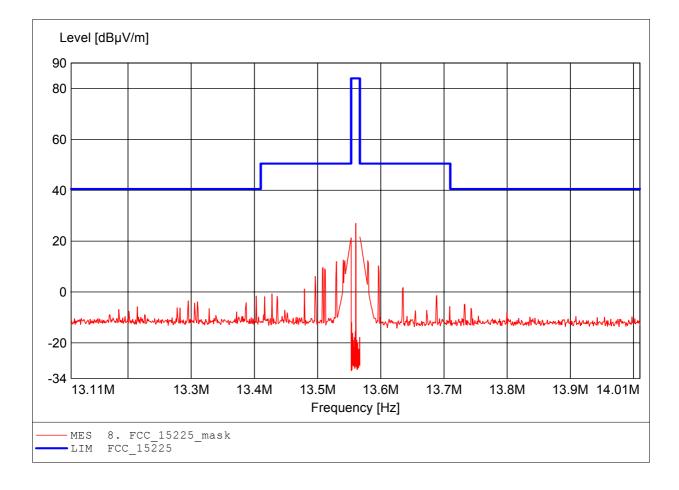
Operator: Eurofins Product Service GmbH / Mr. Handrik

Test Conditions: Tnom: 22°C / Vnom: 120VAC

Test Specification: according to \$15.209, peak detector

Comment 1:

Dist.: 30m, Ant.: HFH2-Z2 Freq: 13.561MHz, Emax: 27.01dBµV/m, RBW: 0.2-10kHz Comment 2:





ANNEX B Transmitter radiated spurious emissions

FCC RULES PART 15, SUBPART C

Approval Holder: metraTec GmbH / G0M-1201-1687 QR15-HL + VIS Spectrophotometer EUT:

QR15-HL + DR6000 Model:

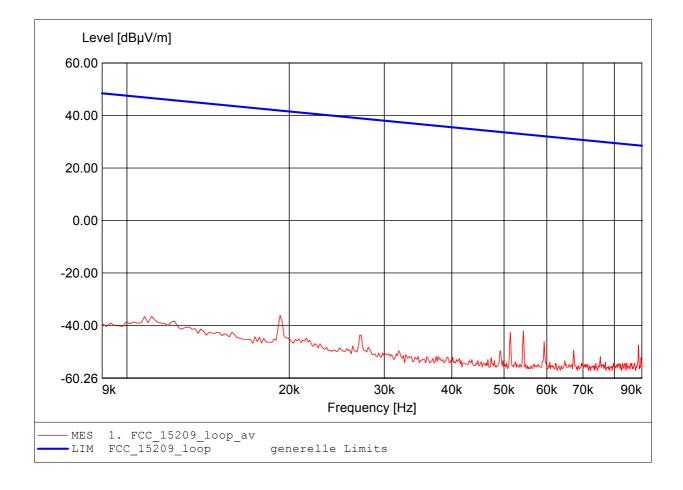
Operator: Eurofins Product Service GmbH / Mr. Handrik

Test Conditions: Tnom: 22°C / Vnom: 120VAC

Test Specification: according to \$15.209, average detector

Comment 1:

Dist.: 300m, Ant.: HFH2-Z2 Freq: 19.226kHz, Emax: -36.13dB\(\psi\)V/m, RBW: 200Hz Comment 2:



FCC RULES PART 15, SUBPART C

Approval Holder: metraTec GmbH / G0M-1201-1687 QR15-HL + VIS Spectrophotometer EUT:

QR15-HL + DR6000 Model:

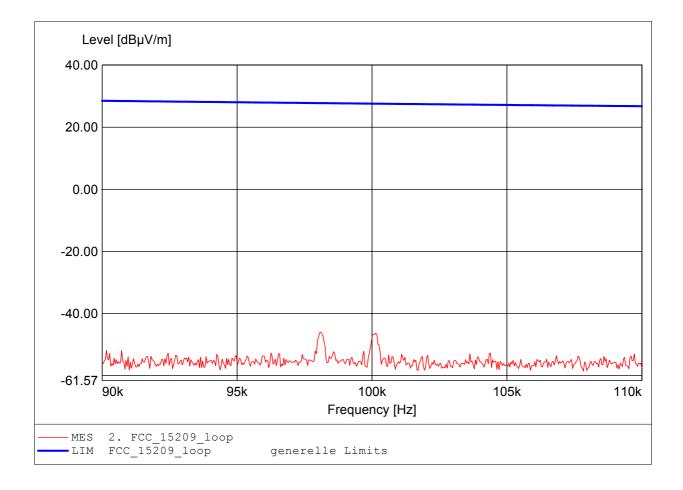
Operator: Eurofins Product Service GmbH / Mr. Handrik

Test Conditions: Tnom: 22°C / Vnom: 120VAC

Test Specification: according to \$15.209, peak detector

Comment 1:

Dist.: 300m, Ant.: HFH2-Z2 Freq: 98.096kHz, Emax: -45.94dBuV/m, RBW: 200Hz Comment 2:



FCC RULES PART 15, SUBPART C

Approval Holder: metraTec GmbH / G0M-1201-1687 QR15-HL + VIS Spectrophotometer EUT:

QR15-HL + DR6000 Model:

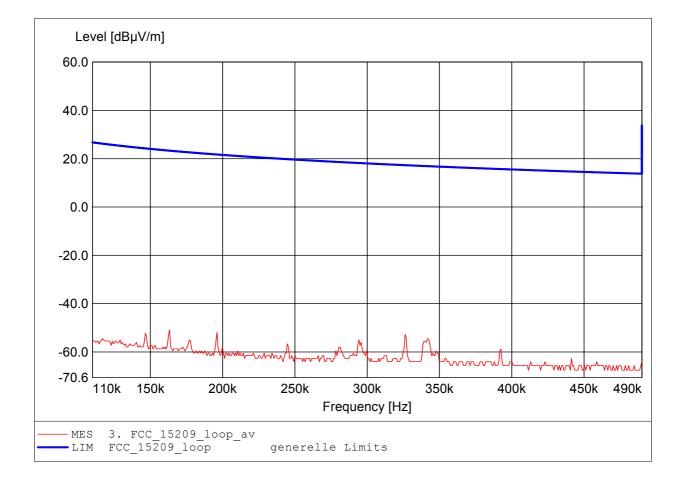
Operator: Eurofins Product Service GmbH / Mr. Handrik

Test Conditions: Tnom: 22°C / Vnom: 120VAC

Test Specification: according to \$15.209, average detector

Comment 1:

Dist.: 300m, Ant.: HFH2-Z2 Freq: 163.307kHz, Emax: -50.95dBµV/m, RBW: 200Hz Comment 2:



FCC RULES PART 15, SUBPART C

Approval Holder: metraTec GmbH / G0M-1201-1687 QR15-HL + VIS Spectrophotometer EUT:

QR15-HL + DR6000 Model:

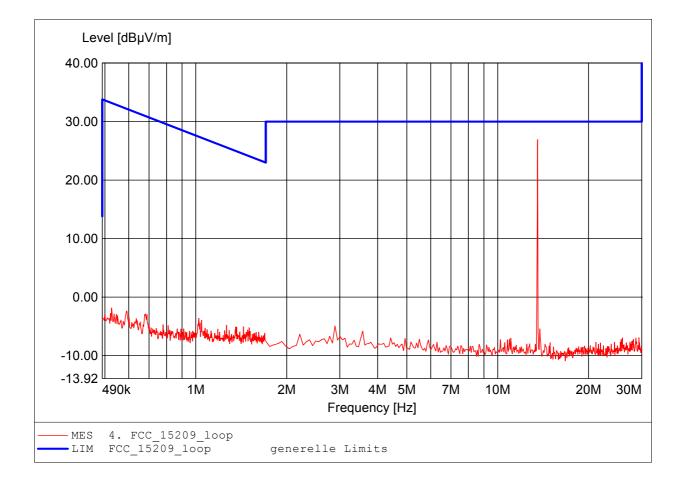
Operator: Eurofins Product Service GmbH / Mr. Handrik

Test Conditions: Tnom: 22°C / Vnom: 120VAC

Test Specification: according to \$15.209, peak detector

Comment 1:

Dist.: 30m, Ant.: HFH2-Z2 Freq: 13.553MHz, Emax: 26.94dBµV/m, RBW: 10kHz Comment 2:



Project number: G0M-1201-1687

Manufacturer: metraTec GmbH

EUT Name: QR15-HL + VIS Spectrophotometer

Model: QR15-HL + DR6000

Test Site: Eurofins Product Service GmbH

Operator: Mr. Klein

Test Conditions: Tnom: 23°C, Unom: 120VAC

Antenna: Rohde & Schwarz HK 116, Horizontal

Measurement distance: 3m

Mode: USB communication, Ethernet ping, RFID on, Lamp on,

Test Date: 2012-04-26



Project number: G0M-1201-1687

Manufacturer: metraTec GmbH

EUT Name: QR15-HL + VIS Spectrophotometer

Model: QR15-HL + DR6000

Test Site: Eurofins Product Service GmbH

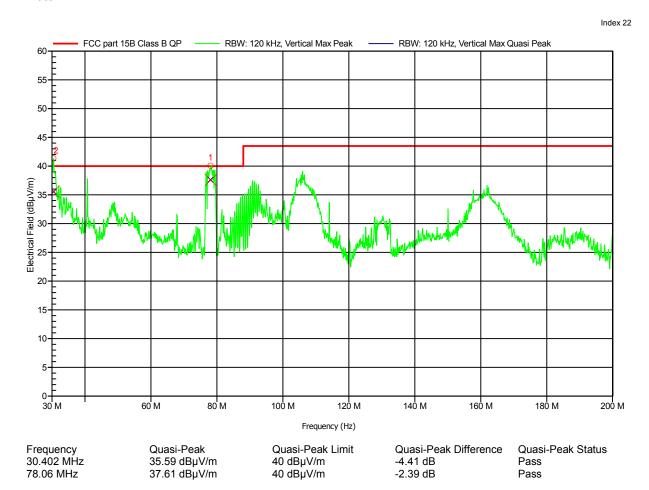
Operator: Mr. Klein

Test Conditions: Tnom: 23°C, Unom: 120VAC
Antenna: Rohde & Schwarz HK 116, Vertical

Measurement distance: 3m

Mode: USB communication, Ethernet ping, RFID on, Lamp on

Test Date: 2012-04-26



Project number: G0M-1201-1687

Manufacturer: metraTec GmbH

EUT Name: QR15-HL + VIS Spectrophotometer

Model: QR15-HL + DR6000

Test Site: Eurofins Product Service GmbH

Operator: Mr. Klein

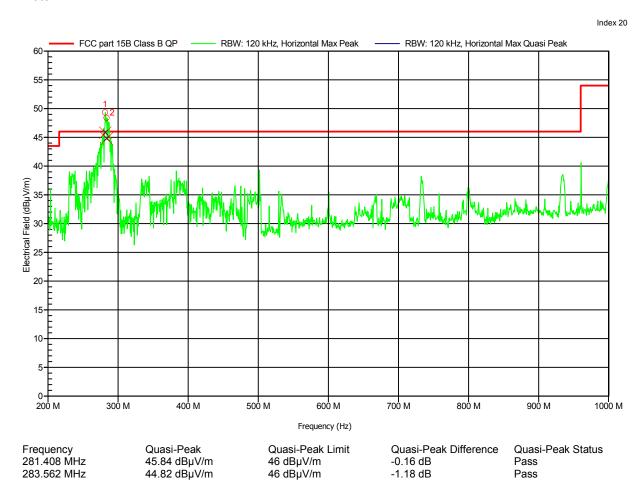
Test Conditions: Tnom: 23°C, Unom: 120VAC

Antenna: Rohde & Schwarz HL 223, Horizontal

Measurement distance: 3m

Mode: USB communication, Ethernet ping, RFID on, Lamp on

Test Date: 2012-04-26



Project number: G0M-1201-1687

Manufacturer: metraTec GmbH

EUT Name: QR15-HL + VIS Spectrophotometer

Model: QR15-HL + DR6000

Test Site: Eurofins Product Service GmbH

Operator: Mr. Klein

Test Conditions: Tnom: 23°C, Unom: 120VAC
Antenna: Rohde & Schwarz HL 223, Vertical

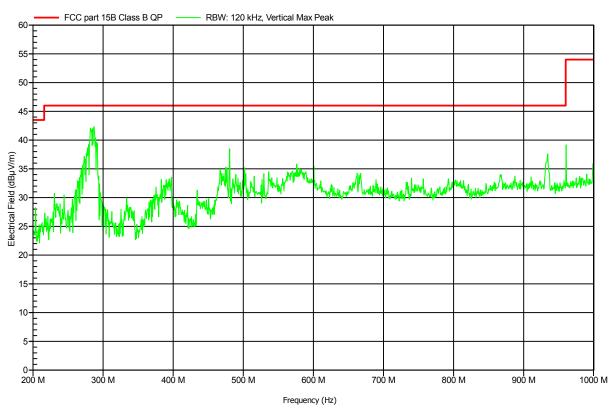
Measurement distance: 3m

Mode: USB communication, Ethernet ping, RFID on, Lamp on

Test Date: 2012-04-26

Note:

Index 21



Project number: G0M-1201-1687

Manufacturer: metraTec GmbH

EUT Name: QR15-HL + VIS Spectrophotometer

Model: QR15-HL + DR6000

Test Site: Eurofins Product Service GmbH

Operator: Mr. Klein

Test Conditions: Tnom: 23°C, Unom: 120VAC

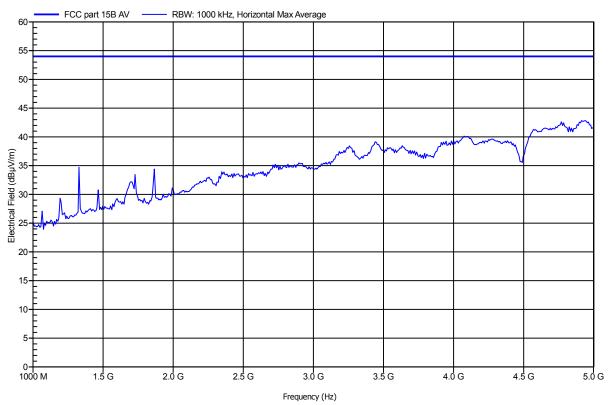
Antenna: Rohde & Schwarz HL 025, Horizontal

Measurement distance: 3m

Mode: USB communication, Ethernet ping, RFID on, Lamp on

Test Date: 2012-04-26





Project number: G0M-1201-1687

Manufacturer: metraTec GmbH

EUT Name: QR15-HL + VIS Spectrophotometer

Model: QR15-HL + DR6000

Test Site: Eurofins Product Service GmbH

Operator: Mr. Klein

Test Conditions: Tnom: 23°C, Unom: 120VAC Antenna: Rohde & Schwarz HL 025, Vertical

Measurement distance: 3m

Mode: USB communication, Ethernet ping, RFID on, Lamp on

Test Date: 2012-04-26

