



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-1609-5876-TFC225RI-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	<div style="display: flex; justify-content: center; align-items: center;">   </div> <p style="text-align: center; font-size: small;"> A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Filed Test Laboratory, Reg.-No.: 96970 IC OATS Filing assigned code: 3470A </p>
Applicant's name	TomTom Telematics B.V.
Address	De Ruijterkade 154 1011 AC Amsterdam NETHERLANDS
Test specification:	
Standard.....	47 CFR Part 15C RSS-210, Issue 8, 2010-12
Test scope.....	complete Radio compliance test
Equipment under test (EUT):	
Product description	Telematics Accessory with Touch-Display and RFID-interface
Model No.	PRO202
Additional Model(s)	None
Brand Name(s)	PRO 2020
Hardware version	Plugtown_2_mb_20160218
Firmware / Software version	1.0.xxxx
	FCC-ID: 2AGPAPRO202 IC: 20911-PRO202
Test result	Passed

Possible 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:

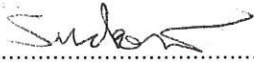
Test Lab Temperature : 20 – 23 °C


Test Lab Humidity : 32 – 38 %

Date of receipt of test item : 2016-09-22

Date (s) of performance of tests : 2016-09-22 – 2016-09-26

Compiled by : Sebastian Suckow

Tested by (+ signature) : Sebastian Suckow 
 (Responsible for Test)

Approved by (+ signature) : Christian Weber 
 (Head of Lab)

Date of issue : 2016-11-09

Total number of pages : 27

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:

Version History

Version	Issue Date	Remarks	Revised by
01	2016-11-09	Initial Release	

REPORT INDEX

1	EQUIPMENT (TEST ITEM) DESCRIPTION:	5
1.1	Photos – Equipment External	6
1.2	Photos – Equipment internal	8
1.3	Photos – Test setup	10
1.4	Supporting Equipment Used During Testing	11
1.5	Test Modes	12
1.6	Test Equipment Used During Testing	13
1.7	Sample emission level calculation	14
2	RESULT SUMMARY	15
3	TEST CONDITIONS AND RESULTS	16
3.1	Test Conditions and Results – Occupied Bandwidth	16
3.2	Test Conditions and Results – Fundamental in-band field strength emissions	17
3.3	Test Conditions and Results – Emissions radiated outside the specified frequency band	19
3.4	Test Conditions and Results – Frequency stability	21
ANNEX A	Transmitter in-band emissions	23
ANNEX B	Transmitter radiated spurious emissions	24

1 Equipment (Test item) Description:

Description	Telematics Accessory with Touch-Display and RFID-interface	
Model	PRO202	
Additional Model(s)	None	
Brand Name(s)	PRO 2020	
Serial number	None	
Hardware version	Plugtown_2_mb_20160218	
Software / Firmware version	1.0.xxxx	
PMN	N/A	
HVIN	PRO202	
FVIN	N/A	
HMN	N/A	
FCC-ID	2AGPAPRO202	
IC	20911-PRO202	
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	
Antenna	Type	integrated
	Model	printed loop antenna
	Manufacturer	TomTom Development Germany GmbH
Manufacturer	ProDrive Technologies BV	
	Science Park Eindhoven 5501	
	5692 EM Son	
	The Netherlands	
Power supply	V_{NOM}	12 VDC (Car battery only)
	V_{MIN}	9.0 VDC
	V_{MAX}	30 VDC
Temperatures	T_{NOM}	20°C
	T_{MIN}	-20°C
	T_{MAX}	50°C

1.4 Supporting Equipment Used During Testing

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

1.5 Test Modes

Mode #	Description	
Single	General conditions:	EUT powered by laboratory power supply
	Radio conditions:	Mode = standalone transmit Modulation = ASK Power level = Maximum

1.6 Test Equipment Used During Testing

Measurement Software			
Description	Manufacturer	Name	Version
EMC Test Software	Dare Instruments	Radimation	2015.2.4

Occupied Bandwidth					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSW	EF00896	2016-05	2016-12

Field strength emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-anechoic chamber	Frankonia	AC 6	EF00899	-	-
Semi-anechoic chamber	Frankonia	AC 6	EF00910	-	-
Spectrum Analyzer	R&S	ESU 26	EF00887	2016-01	2017-01
Loop Antenna	R&S	HFH2-Z2	EF00184	2014-11	2016-11
Biconical Antenna	R&S	HK 116	EF00013	2016-06	2018-06

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 dB μ V. 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:

$$\text{Reading on Analyzer (dB}\mu\text{V)} + \text{A.F. (dB)} = \text{Net field strength (dB}\mu\text{V/m)}$$

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 μ V/m). The FCC limits are given in units of μ V/m. The following formula is used to convert the units of μ V/m to dB μ V/m:

$$\text{Limit (dB}\mu\text{V/m)} = 20 * \log (\mu\text{V/m})$$

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:

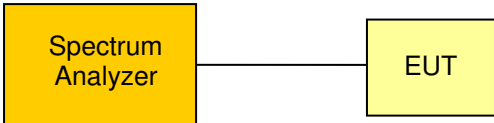
$$\begin{array}{rclclcl} \text{Reading} & + & \text{AF} & = & \text{Net Reading} & : & \text{Net reading - FCC limit} & = & \text{Margin} \\ 21.5 \text{ dB}\mu\text{V} & + & 26 \text{ dB} & = & 47.5 \text{ dB}\mu\text{V/m} & : & 47.5 \text{ dB}\mu\text{V/m} - 57.0 \text{ dB}\mu\text{V/m} & = & -9.5 \text{ dB} \end{array}$$

2 Result Summary

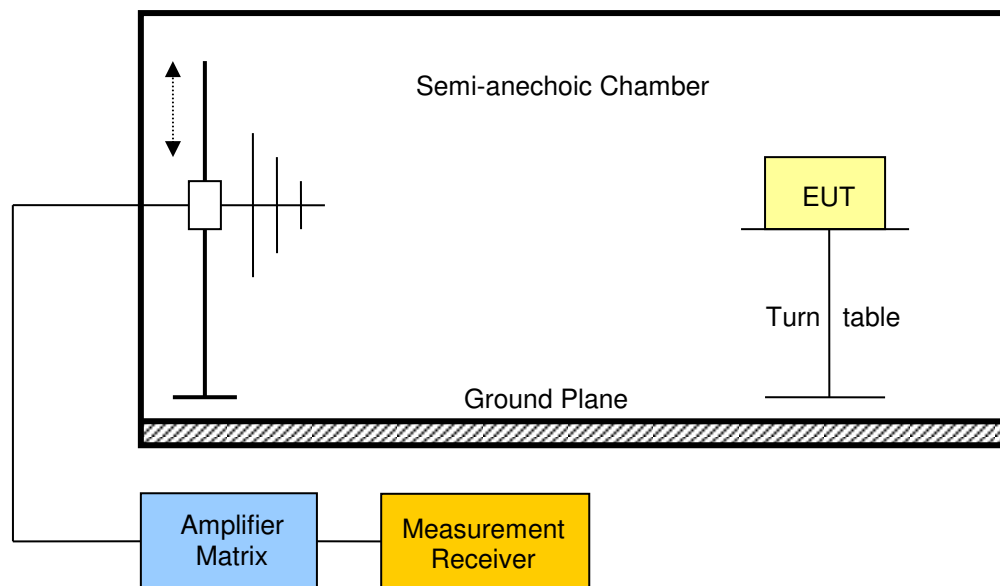
FCC 47 CFR Part 15C, IC RSS-210				
Product Specific Standard Section	Requirement – Test	Reference Method	Result	Remarks
RSS-Gen 6.6	Occupied Bandwidth	RSS-Gen 6.6	N/R	Informational only
FCC 15.225(a-c) IC RSS-210 A2.6(a-c)	Fundamental in-band field strength emissions	ANSI C63.4	PASS	
FCC 15.225(d) FCC 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 7.1	Receiver radiated spurious emissions	ANSI C 63.4	N/A	
47 CFR 15.207 RSS-Gen 8.8	AC power line conducted emissions	ANSI C63.4	N/R	Applies to AC supplied Devices
Remarks:				

3 Test Conditions and Results

3.1 Test Conditions and Results – Occupied Bandwidth

Occupied Bandwidth acc. to IC RSS-Gen		Verdict: PASS
Test according to measurement reference	Reference Method	
	RSS-Gen 6.6	
Test frequency range	Tested frequencies	
	F _{MID}	
EUT test mode	Single	
Limits		
None (Informational only)		
Test setup		
 <pre> graph LR SA[Spectrum Analyzer] --- EUT[EUT] </pre>		
Test procedure		
<ol style="list-style-type: none"> 1. EUT set to test mode (Communication tester is used if needed) 2. Span set to at least twice the emission spectrum 3. Resolution bandwidth set to 1 % of span 4. Occupied Bandwidth (99 %) measurement with spectrum analyser built in measurement function 		
Test results		
Channel	Frequency [MHz]	Occupied Bandwidth [kHz]
F _{MID}	13.56	2.16
Comments: Measurement is applicable to all variants		

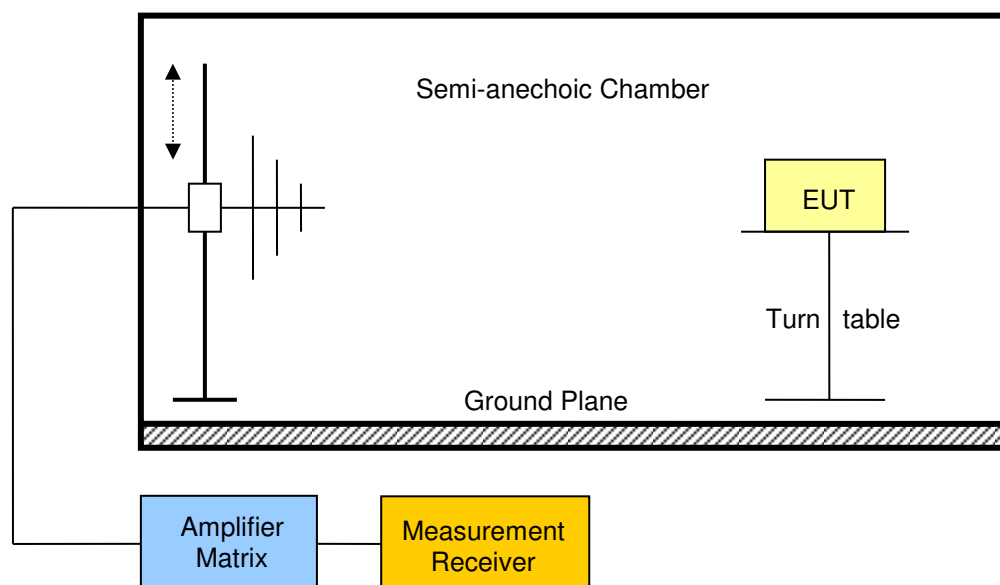
3.2 Test Conditions and Results – Fundamental in-band field strength emissions

Field strength emissions acc. to FCC 47 CFR 15.225 / IC RSS-210		Verdict: PASS	
Test according referenced standards	Reference Method		
	FCC 15.225(a-c) / IC RSS-210 A2.6(a-c)		
Test according to measurement reference	Reference Method		
	ANSI C63.4		
Test frequency range	Tested frequencies		
	F _{MID}		
EUT test mode	Single		
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	106	40.5	30
Test setup			
			
Test procedure			
<ol style="list-style-type: none"> 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)). 			

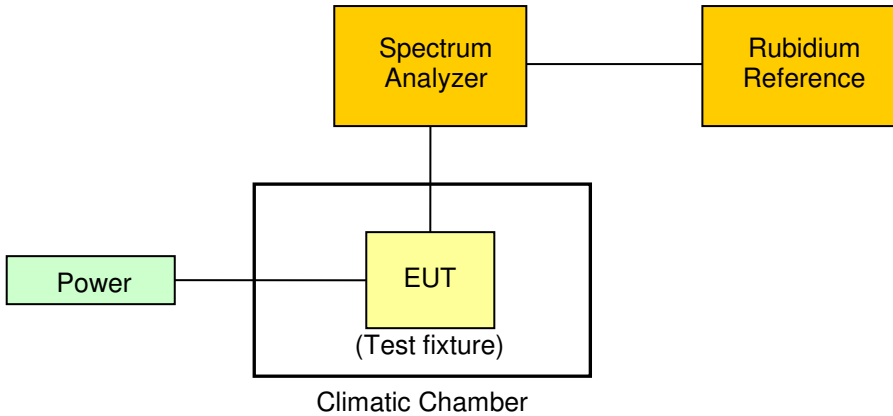
Test results								
Channel	Frequency [MHz]	Emission [MHz]	Level @ 30m [db μ V/m]	Det.	Pol.	Limit @ 30m [db μ V/m]	Measurement distance [m]*	Margin [dB]
F _{MID}	13.56	13.559	25.2	pk	-	84	3	-58.80
Comments: * Physical distance between EUT and measurement antenna. See Annex								

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

Radiated out-of-band emissions acc. to FCC 47 CFR 15.225 / IC RSS-210				Verdict: PASS
Test according referenced standards	Reference Method			
	FCC 15.225(d) / IC RSS-210 A2.6(d)			
Test according to measurement reference	Reference Method			
	ANSI C63.4			
Test frequency range	Tested frequencies			
	9 kHz – 216 MHz			
EUT test mode	Single			
Limits				
Frequency range [MHz]	Detector	Limit [μ V/m]	Limit [dB μ V/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 – 2.97	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
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.				

Test setup								
								
Test procedure								
<ol style="list-style-type: none"> 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								
Channel	Frequency [MHz]	Emission [MHz]	Level [db μ V/m]	Detector	Pol.	Limit [db μ V/m]	Limit distance [m]*	Margin [dB]
F _{MID}	13.56	122	34.05	pk	ver	43.5	3	-09.45
Comments: * Physical distance between EUT and measurement antenna.								

3.4 Test Conditions and Results – Frequency stability

Frequency Stability acc. to FCC 15.225 / IC RSS-210		Verdict: PASS
Test according referenced standards	Reference Method	
	FCC 15.225(e) / IC RSS-210 A2.6	
Test according to measurement reference	Reference Method	
	ANSI C63.4	
Test frequency range	Tested frequencies	
	F_{MID}	
EUT test mode	Single	
Limits		
Frequency error limit		
$\pm 0.01\%$ ($\pm 100\text{ppm}$)		
Test setup		
 <pre> graph TD Power[Power] --- EUT[EUT (Test fixture)] subgraph Climatic Chamber EUT end EUT --- SA[Spectrum Analyzer] SA --- RR[Rubidium Reference] </pre>		
Test procedure		
<ol style="list-style-type: none"> 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 		

Frequency stability versus Temperature								
Temp.	0 Minute		2 Minute		5 Minute		10 Minute	
	Freq. [MHz]	Freq. error [ppm]	Freq. [MHz]	Freq. error [ppm]	Freq. [MHz]	Freq. error [ppm]	Freq. [MHz]	Freq. error [ppm]
-20°C	13.558800	7.23	13.558800	7.23	13.558800	7.23	13.558801	7.30
-10°C	13.558786	6.20	13.558786	6.20	13.558786	6.20	13.558786	6.20
0°C	13.558797	7.01	13.558800	7.23	13.558800	7.23	13.558800	7.23
10°C	13.558800	7.23	13.558800	7.23	13.558800	7.23	13.558800	7.23
20°C	13.558702*	0	13.558702	0	13.558702	0	13.558702	0
30°C	13.558702	0.00	13.558718	1.18	13.558718	1.18	13.558718	1.18
40°C	13.558701	-0.07	13.558698	-0.30	13.558698	-0.30	13.558698	-0.30
50°C	13.558698	-0.30	13.558700	-0.15	13.558700	-0.15	13.558700	-0.15
Comments: * reference value								
Frequency stability versus Voltage								
Temp.	Vmin = 9.0 VDC			Vmax = 30 VDC				
	Freq. [MHz]	Freq. error [ppm]		Freq. [MHz]	Freq. error [ppm]			
20°C	13.558702	0		13.558702	0			
Comments:								

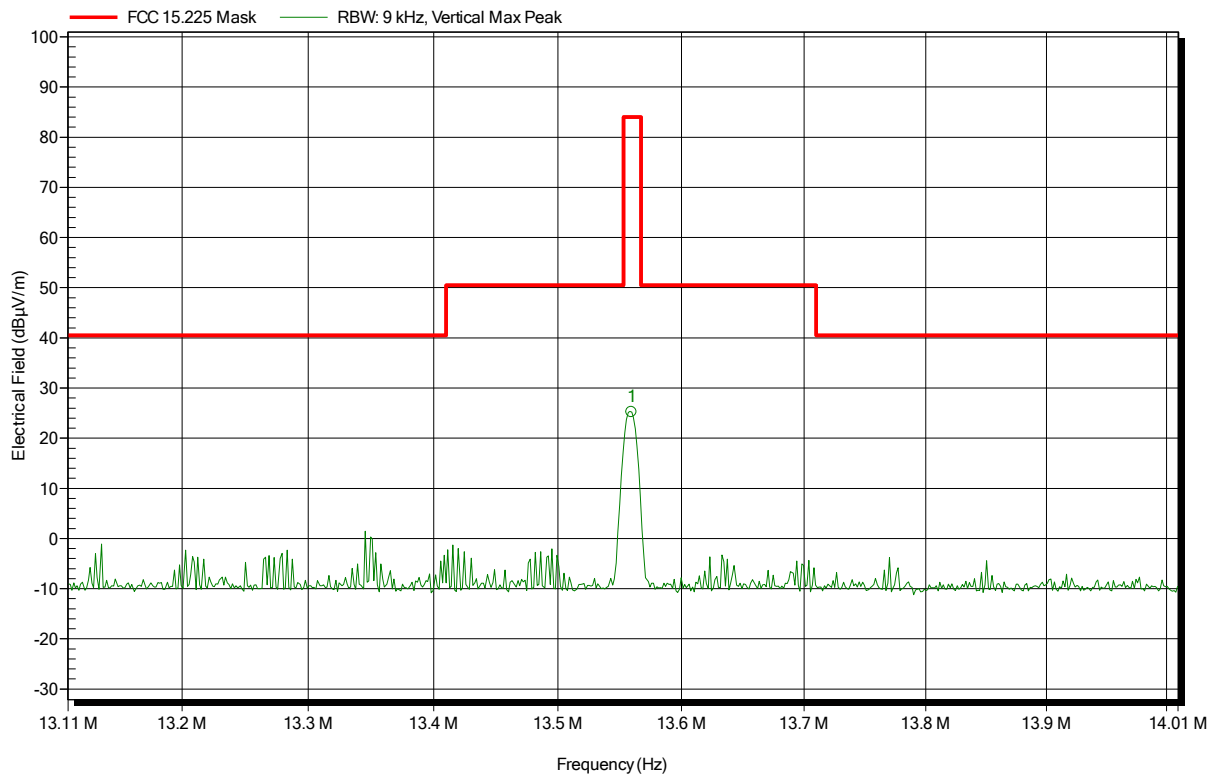
ANNEX A Transmitter in-band emissions

Spurious emissions according to FCC 15.225

Project number: G0M-1609-5876

Applicant:	TomTom Telematics B.V.
EUT Name:	Telematics Accessory with Touch-Display and RFID-interface
Model:	PRO202
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Suckow
Test Conditions:	Tnom: 20°C, Vnom: 12 VDC
Antenna:	Rohde & Schwarz HFH 2-Z2
Measurement distance:	3 m converted to 30 m
Mode:	TX; RFID 13.56 MHz
Test Date:	2016-09-22
Note:	

Index 7



Frequency
13.559 MHz

Peak
25.2 dBµV/m

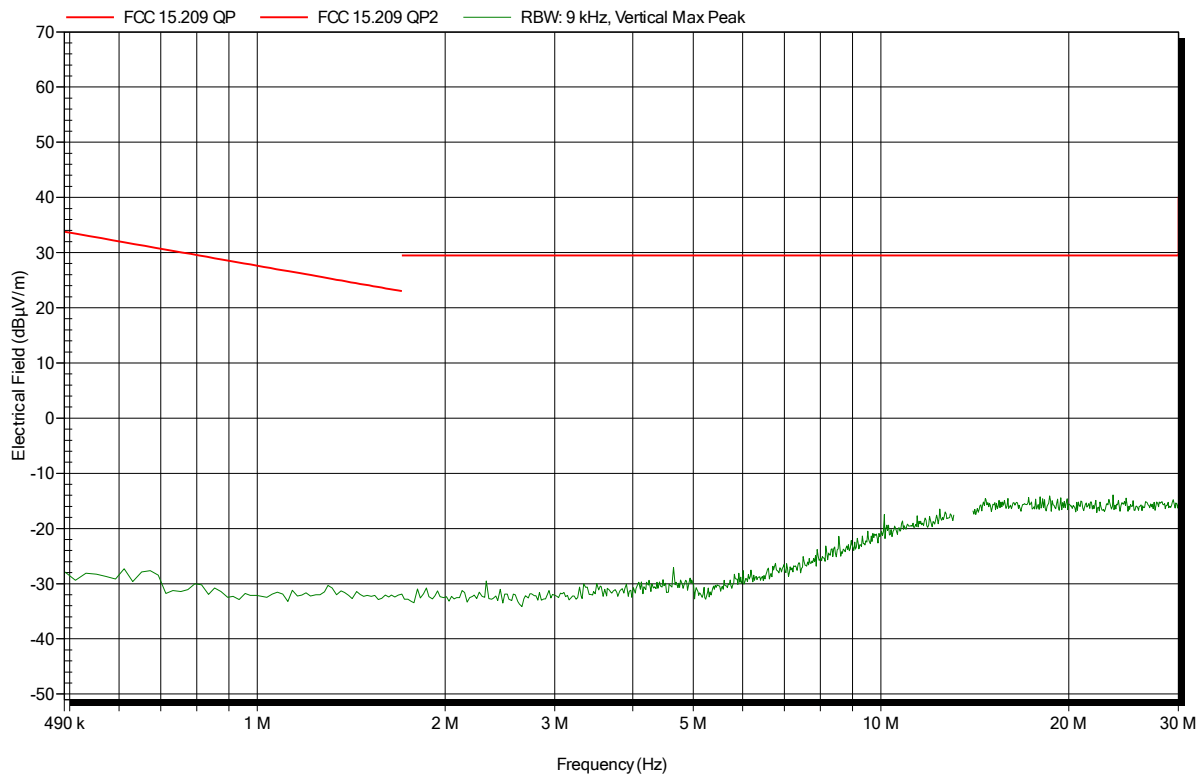
ANNEX B Transmitter radiated spurious emissions

Spurious emissions according to FCC 15.225

Project number: G0M-1609-5876

Applicant:	TomTom Telematics B.V.
EUT Name:	Telematics Accessory with Touch-Display and RFID-interface
Model:	PRO202
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Suckow
Test Conditions:	Tnom: 20°C, Vnom: 12 VDC
Antenna:	Rohde & Schwarz HFH 2-Z2
Measurement distance:	3 m converted to 30 m
Mode:	TX; RFID 13.56 MHz
Test Date:	2016-09-22
Note:	

Index 6

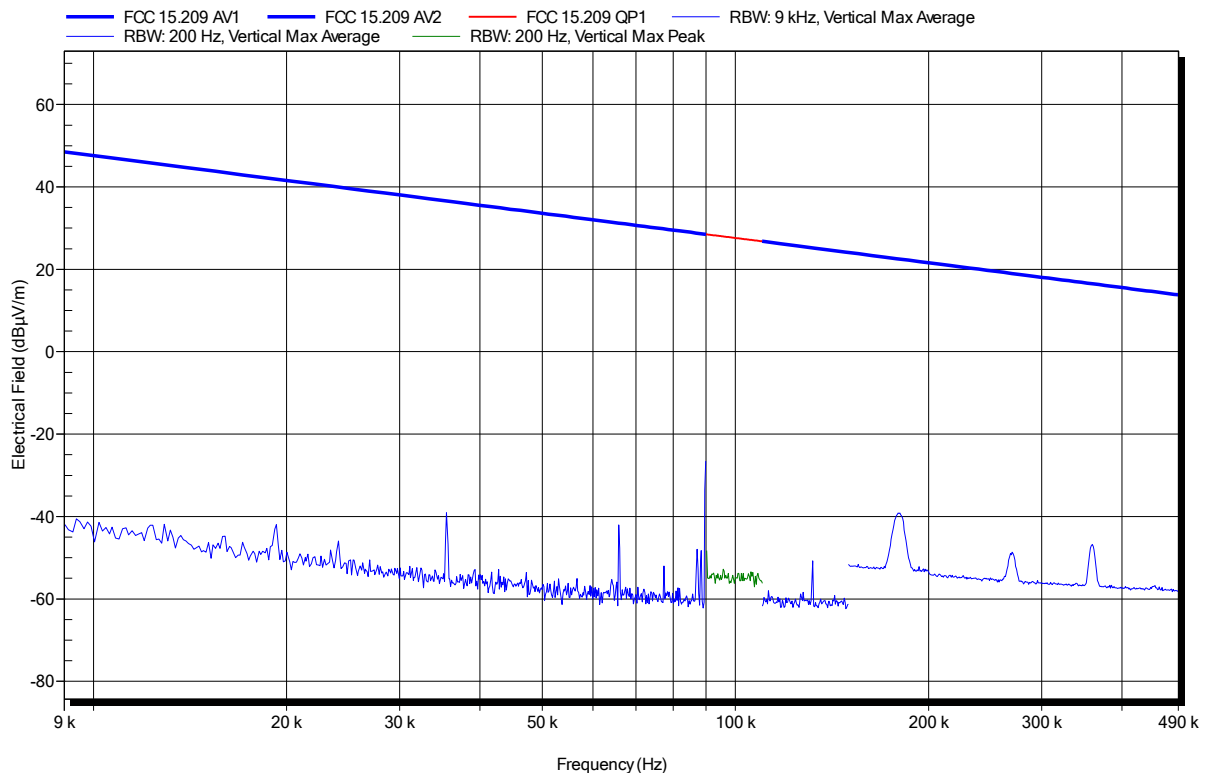


Spurious emissions according to FCC 15.225

Project number: G0M-1609-5876

Applicant:	TomTom Telematics B.V.
EUT Name:	Telematics Accessory with Touch-Display and RFID-interface
Model:	PRO202
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Suckow
Test Conditions:	Tnom: 20°C, Vnom: 12 VDC
Antenna:	Rohde & Schwarz HFH 2-Z2
Measurement distance:	3 m converted to 300 m
Mode:	TX; RFID 13.56 MHz
Test Date:	2016-09-22
Note:	

Index 9

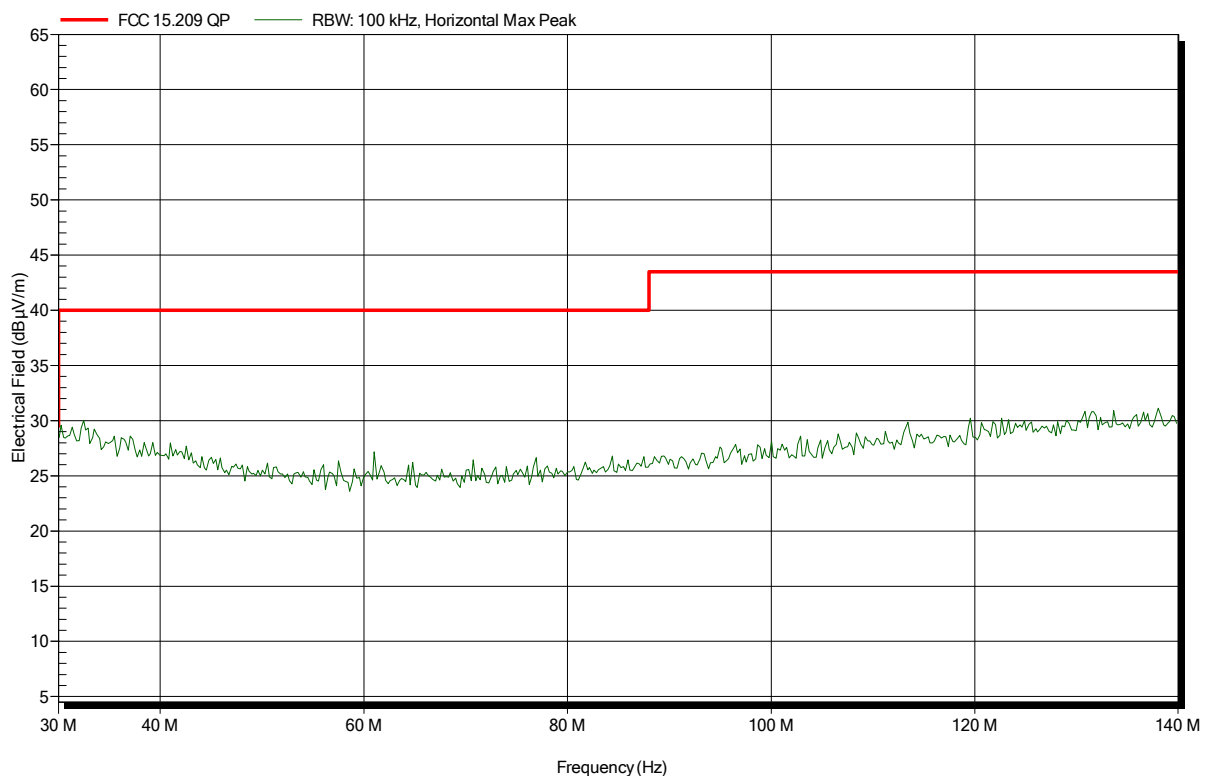


Spurious emissions according to FCC 15.225

Project number: G0M-1609-5876

Applicant:	TomTom Telematics B.V.
EUT Name:	Telematics Accessory with Touch-Display and RFID-interface
Model:	PRO202
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Suckow
Test Conditions:	Tnom: 20°C, Vnom: 12 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	RFID 13.56 MHz
Test Date:	2016-09-26
Note:	

Index 11



Spurious emissions according to FCC 15.225

Project number: G0M-1609-5876

Applicant:	TomTom Telematics B.V.
EUT Name:	Telematics Accessory with Touch-Display and RFID-interface
Model:	PRO202
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Suckow
Test Conditions:	Tnom: 20°C, Vnom: 12 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	RFID 13.56 MHz
Test Date:	2016-09-26
Note:	

Index 10

