

RF-EXPOSURE ASSESSMENT REPORT

FCC 47 CFR Part 2.1091
Industry Canada RSS-102

RF-Exposure evaluation of mobile equipment

Report Reference No. : G0M-1307-2974-TFC091M-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 : TomTom International BV

Address : Rembrandtplein 35
1017 CT Amsterdam
Netherlands

Test specification:

Standard..... : 47 CFR 1.1310 / 47 CFR 2.1091 / 47 CFR 2.1093
OET Bulletin 65:1997
RSS-102, Issue 4:2010
Safety Code 6:2009

Equipment under test (EUT):

Product description : Telematic Device with GPRS+WCDMA/BT/GPS

Model No. : L0530

Hardware version : drs2_3_pcb 22/2013

Firmware / Software version : 11_10_2880

FCC-ID: S4LLINK530

IC: 5767A-LINK530

Test result : **Passed**

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

Possible test case verdicts:

- not applicable to test object : N/A
- test object does meet the requirement..... : P (Pass)
- test object does not meet the requirement..... : F (Fail)

Testing:

Date of receipt of test item : 2013-07-08

Date (s) of assessment : 2013-09-10

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(Test Lab Manager)

Jens Zimmermann

Date of issue : 2013-09-11

Total number of pages : 26

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	2013-09-11	Initial Release	

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1 Equipment (Test item) Description

Description	Telematic Device with GPRS+WCDMA/BT/GPS
Model	L0530
Serial number	None
Hardware version	drs2_3_pcb 22/2013
Software / Firmware version	11_10_2880
FCC-ID	S4LLINK530
IC	5767A-LINK530
Equipment type	End product

1.1 Reference Documents

Document type	Document No.	Issued by	Date
FCC 22H/24E Test Report	G0M-1307-2974-TFC224M-V01	Eurofins Product Service GmbH	2013-08-26
FCC 15.247 Test Report	G0M-1307-2974-TFC247B-V01	Eurofins Product Service GmbH	2013-08-28

1.2 Standalone Radiation Sources

Mode #	Description	
GSM / GPRS850 / int. antenna	Frequency range [MHz]	824.2 - 848.8
	Channel spacing	200 kHz
	Modulations	GMSK
	Maximum radiated power [dBm e.i.r.p.]	35.85
	Maximum transmission duty cycle [%]	50
GSM / GPRS850 / ext. antenna	Frequency range [MHz]	824.2 - 848.8
	Channel spacing	200 kHz
	Modulations	GMSK
	Maximum radiated power [dBm e.i.r.p.]	28.25
	Maximum transmission duty cycle [%]	50
GSM / GPRS1900 / int. antenna	Frequency range [MHz]	1930.2 - 1989.8
	Channel spacing	200 kHz
	Modulations	GMSK
	Maximum radiated power [dBm e.i.r.p.]	27.4
	Maximum transmission duty cycle [%]	50
GSM / GPRS1900 / ext. antenna	Frequency range [MHz]	1930.2 - 1989.8
	Channel spacing	200 kHz
	Modulations	GMSK
	Maximum radiated power [dBm e.i.r.p.]	20.4
	Maximum transmission duty cycle [%]	50
UMTS FDDV / int. antenna	Frequency range [MHz]	826.4 - 846.6
	Channel raster	200 kHz
	Modulations	QPSK
	Maximum radiated power [dBm e.i.r.p.]	31.25
	Maximum transmission duty cycle [%]	100
UMTS FDDV / ext. antenna	Frequency range [MHz]	826.4 - 846.6
	Channel raster	200 kHz
	Modulations	QPSK
	Maximum radiated power [dBm e.i.r.p.]	23.75
	Maximum transmission duty cycle [%]	100

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UMTS FDDII / int. antenna	Frequency range [MHz]	1852.4 - 1907.6
	Channel raster	200 kHz
	Modulations	QPSK
	Maximum radiated power [dBm e.i.r.p.]	27.1
	Maximum transmission duty cycle [%]	100
UMTS FDDII / ext. antenna	Frequency range [MHz]	1852.4 - 1907.6
	Channel raster	200 kHz
	Modulations	QPSK
	Maximum radiated power [dBm e.i.r.p.]	19.0
	Maximum transmission duty cycle [%]	100
Bluetooth	Frequency range [MHz]	2402 – 2480
	Channel raster	1 MHz
	Modulations	GFSK / PI/4-DQPSK / 8-DPSK
	Maximum radiated power [dBm e.i.r.p.]	4.52
	Maximum transmission duty cycle [%]	77

1.3 Concurrent Radiation Sources

Mode #	Description	
GSM / GPRS850 + Bluetooth	Mode 1	GSM / GPRS850 / int. antenna
	Mode 2	Bluetooth
GSM / GPRS1900 + Bluetooth	Mode 1	GSM / GPRS1900 / int. antenna
	Mode 2	Bluetooth
UMTS FDDV + Bluetooth	Mode 1	UMTS FDDV / int. antenna
	Mode 2	Bluetooth
UMTS FDDII + Bluetooth	Mode 1	UMTS FDDII / int. antenna
	Mode 2	Bluetooth

2 Result Summary

FCC 47 CFR Part 2.1091, IC RSS-102			
Product Specific Standard Section	Requirement	Result	Remarks
47 CFR 2.1091	Maximum permissible exposure @ 20cm below limit	PASS	
RSS-102 2.5.2	Maximum permissible exposure @ 20cm below limit	PASS	
Remarks:			

3 RF-Exposure Classifications

Device Types	
Fixed	A fixed device is defined as a device physically secured at one fixed location and cannot be easily re-located.
Mobile	A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. (47 CFR 2.1091)
Portable	A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. (47 CFR 2.1093)

Exposure Categories	
Occupational / Controlled	Limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
General population / uncontrolled	Exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

4 Assessment

4.1 MPE Assessment – 47 CFR 2.1091 / RSS-102

MPE Assessment acc. to 47 CFR 2.1091 / IC RSS-102				Verdict: PASS
Assessment according to reference		Reference Method		
		FCC OET Bulletin 65 / RSS-102 & Safety Code 6		
Device type		mobile		
Exposure category		General public		
IC Limits – Occupational / Controlled Exposure				
Frequency range [MHz]	Electric field strength [V/M]	Magnetic field strength [A/M]	Power density [W/m ²]	Averaging time [min]
0.003 – 1.0	600	4.9	N/A	6
1 – 10	600/f	4.9/f	N/A	6
10 – 30	60	4.9/f	N/A	6
30 – 300	60	0.163	10.0*	6
300 – 1500	3.54·f ^{0.5}	0.0094·f ^{0.5}	f/30	6
1500 - 15000	137	0.364	50	6
15000 - 150000	137	0.364	50	616000/f ^{0.5}
150000 - 300000	0.354·f ^{0.5}	9.4·10 ⁻⁴ ·f ^{0.5}	3.33·10 ⁻⁴ ·f	616000/f ^{0.5}
IC Limits – General Population / Uncontrolled Exposure				
Frequency range [MHz]	Electric field strength [V/M]	Magnetic field strength [A/M]	Power density [W/m ²]	Averaging time [min]
0.003 – 1.0	280	2.19	N/A	6
1 – 10	280/f	2.19/f	N/A	6
10 – 30	28	2.19/f	N/A	6
30 – 300	28	0.073	2.0*	6
300 – 1500	1.585·f ^{0.5}	0.0042·f ^{0.5}	f/150	6
1500 - 15000	61.4	0.163	10	6
15000 - 150000	61.4	0.163	10	616000/f ^{0.5}
150000 - 300000	0.158·f ^{0.5}	4.21·10 ⁻⁴ ·f ^{0.5}	6.67·10 ⁻⁵ ·f	616000/f ^{0.5}
* = Power density is applicable at frequencies greater than 100 MHz; f in MHz				

FCC Limits – Occupational / Controlled Exposure				
Frequency range [MHz]	Electric field strength [V/M]	Magnetic field strength [A/M]	Power density [mW/cm ²]	Averaging time [min]
0.3 – 3.0	614	1.63	(100)*	6
3.0 - 30	1842/f	4.89/f	(900/f ²)*	6
30 - 300	61.4	0.163	1.0	6
300 - 1500	N/A	N/A	f/300	6
1500 - 100000	N/A	N/A	5.0	6
FCC Limits – General Population / Uncontrolled Exposure				
Frequency range [MHz]	Electric field strength [V/M]	Magnetic field strength [A/M]	Power density [mW/cm ²]	Averaging time [min]
0.3 – 1.34	614	1.63	(100)*	30
1.34 - 30	842/f	2.19/f	(180/f ²)*	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	N/A	N/A	f/1500	30
1500 - 100000	N/A	N/A	1.0	30
* = Plane wave equivalent power density; f in MHz				
Assessment Relations				
$\lambda \text{ m} = \frac{c \frac{\text{m}}{\text{s}}}{f \text{ Hz}} ; R_{FF} \text{ m} \geq \frac{2 \cdot D \text{ m}^2}{\lambda \text{ m}}$ $\sum_{n=1}^N \frac{S_i}{S_{Limit,i}} \leq 1 ; S[\text{mW/cm}^2] = \frac{P_{E.I.R.P.} \text{ mW}}{4\pi R \text{ cm}^2} ; R[\text{cm}] = \frac{P_{E.I.R.P.}[\text{mW}]}{4\pi S[\text{mW/cm}^2]}$ $P_R \text{ mW} = P_C \text{ mW} \cdot G ; P_R \text{ dBm} = P_C \text{ dBm} + G \text{ dBi}$ $DCC [\text{dB}] = 10 \cdot \text{Log}_{10} \frac{DC[\%]}{100}$				
Assessment procedure				
<p>For each radio and frequency band the worst case transmission mode with the highest peak conducted or radiated power is evaluated at the frequency that results in the most restrictive rf-exposure limit. From the peak power values, antenna gains and duty cycles taken from the reference documents, the source average radiated power values are calculated. From the average radiated power the power densities at antenna far-field distance, at 20cm separation distance from the radiation source is calculated. Compliance with the RF-Exposure limit is determined at 20cm separation distance.</p>				

Assessment results – GSM / GRPS850 / int. antenna		
Transmission mode		
Operating mode frequency range [MHz]	824.2 - 848.8	
Assessment frequency (f) [MHz]	848.8	
Transmission duty cycle (DC) [%]	50	
Peak radiated power (P _R) [dBm e.i.r.p.]	35.85	
Source average Power		
Maximum transmission duty cycle (DC)	50.0 %	
Duty cycle correction (DCC)	0.50	-3.01 dB
Measured peak radiated power (P _R)	3845.92 mW	35.85 dBm
Averaged peak radiated power (P _{RAVG})	1922.96 mW	32.84 dBm
Power density		
Compliance power density limit	0.566 mW/cm ²	5.66 W/m ²
Power density @ 20cm	0.383 mW/cm ²	3.826 W/m ²
Verdict		
The power density of the EUT at 20cm is below the FCC/IC MPE limit!		
Comments:		

Assessment results – GSM / GRPS850 / ext. antenna		
Transmission mode		
Operating mode frequency range [MHz]	824.2 - 848.8	
Assessment frequency (f) [MHz]	848.8	
Transmission duty cycle (DC) [%]	50	
Peak radiated power (P _R) [dBm e.i.r.p.]	28.25	
Source average Power		
Maximum transmission duty cycle (DC)	50.0 %	
Duty cycle correction (DCC)	0.50	-3.01 dB
Measured peak radiated power (P _R)	668.34 mW	28.25 dBm
Averaged peak radiated power (P _{RAVG})	334.17 mW	25.24 dBm
Power density		
Compliance power density limit	0.566 mW/cm ²	5.66 W/m ²
Power density @ 20cm	0.066 mW/cm ²	0.665 W/m ²
Verdict		
The power density of the EUT at 20cm is below the FCC/IC MPE limit!		
Comments:		

Assessment results – GSM / GRPS1900 / int. antenna		
Transmission mode		
Operating mode frequency range [MHz]	1930.2 - 1989.8	
Assessment frequency (f) [MHz]	1989.8	
Transmission duty cycle (DC) [%]	50	
Peak radiated power (P _R) [dBm e.i.r.p.]	27.4	
Source average Power		
Maximum transmission duty cycle (DC)	50.0 %	
Duty cycle correction (DCC)	0.50	-3.01 dB
Measured peak radiated power (P _R)	549.54 mW	27.40 dBm
Averaged peak radiated power (P _{RAVG})	274.77 mW	24.39 dBm
Power density		
Compliance power density limit	1.000 mW/cm ²	10.00 W/m ²
Power density @ 20cm	0.055 mW/cm ²	0.547 W/m ²
Verdict		
The power density of the EUT at 20cm is below the FCC/IC MPE limit!		
Comments:		

Assessment results – GSM / GRPS1900 / ext. antenna		
Transmission mode		
Operating mode frequency range [MHz]	1930.2 - 1989.8	
Assessment frequency (f) [MHz]	1989.8	
Transmission duty cycle (DC) [%]	50	
Peak radiated power (P _R) [dBm e.i.r.p.]	20.4	
Source average Power		
Maximum transmission duty cycle (DC)	50.0 %	
Duty cycle correction (DCC)	0.50	-3.01 dB
Measured peak radiated power (P _R)	109.65 mW	20.40 dBm
Averaged peak radiated power (P _{RAVG})	54.82 mW	17.39 dBm
Power density		
Compliance power density limit	1.000 mW/cm ²	10.00 W/m ²
Power density @ 20cm	0.011 mW/cm ²	0.109 W/m ²
Verdict		
The power density of the EUT at 20cm is below the FCC/IC MPE limit!		
Comments:		

Assessment results – UMTS FDDV / int. antenna		
Transmission mode		
Operating mode frequency range [MHz]	826.4 - 846.6	
Assessment frequency (f) [MHz]	846.6	
Transmission duty cycle (DC) [%]	100	
Peak radiated power (P _R) [dBm e.i.r.p.]	31.25	
Source average Power		
Maximum transmission duty cycle (DC)	100.0 %	
Duty cycle correction (DCC)	1.00	0.00 dB
Measured peak radiated power (P _R)	1333.52 mW	31.25 dBm
Averaged peak radiated power (P _{RAVG})	1333.52 mW	31.25 dBm
Power density		
Compliance power density limit	0.564 mW/cm ²	5.64 W/m ²
Power density @ 20cm	0.265 mW/cm ²	2.653 W/m ²
Verdict		
The power density of the EUT at 20cm is below the FCC/IC MPE limit!		
Comments:		

Assessment results – UMTS FDDV / ext. antenna		
Transmission mode		
Operating mode frequency range [MHz]	826.4 - 846.6	
Assessment frequency (f) [MHz]	846.6	
Transmission duty cycle (DC) [%]	100	
Peak radiated power (P _R) [dBm e.i.r.p.]	23.75	
Source average Power		
Maximum transmission duty cycle (DC)	100.0 %	
Duty cycle correction (DCC)	1.00	0.00 dB
Measured peak radiated power (P _R)	237.14 mW	23.75 dBm
Averaged peak radiated power (P _{RAVG})	237.14 mW	23.75 dBm
Power density		
Compliance power density limit	0.564 mW/cm ²	5.64 W/m ²
Power density @ 20cm	0.047 mW/cm ²	0.472 W/m ²
Verdict		
The power density of the EUT at 20cm is below the FCC/IC MPE limit!		
Comments:		

Assessment results – UMTS FDDII / int. antenna		
Transmission mode		
Operating mode frequency range [MHz]	1852.4 - 1907.6	
Assessment frequency (f) [MHz]	1907.6	
Transmission duty cycle (DC) [%]	100	
Peak radiated power (P _R) [dBm e.i.r.p.]	27.1	
Source average Power		
Maximum transmission duty cycle (DC)	100.0 %	
Duty cycle correction (DCC)	1.00	0.00 dB
Measured peak radiated power (P _R)	512.86 mW	27.10 dBm
Averaged peak radiated power (P _{RAVG})	512.86 mW	27.10 dBm
Power density		
Compliance power density limit	1.000 mW/cm ²	10.00 W/m ²
Power density @ 20cm	0.102 mW/cm ²	1.020 W/m ²
Verdict		
The power density of the EUT at 20cm is below the FCC/IC MPE limit!		
Comments:		

Assessment results – UMTS FDDII / ext. antenna		
Transmission mode		
Operating mode frequency range [MHz]	1852.4 - 1907.6	
Assessment frequency (f) [MHz]	1907.6	
Transmission duty cycle (DC) [%]	100	
Peak radiated power (P _R) [dBm e.i.r.p.]	19.0	
Source average Power		
Maximum transmission duty cycle (DC)	100.0 %	
Duty cycle correction (DCC)	1.00	0.00 dB
Measured peak radiated power (P _R)	79.43 mW	19.00 dBm
Averaged peak radiated power (P _{RAVG})	79.43 mW	19.00 dBm
Power density		
Compliance power density limit	1.000 mW/cm ²	10.00 W/m ²
Power density @ 20cm	0.016 mW/cm ²	0.158 W/m ²
Verdict		
The power density of the EUT at 20cm is below the FCC/IC MPE limit!		
Comments:		

Assessment results – Bluetooth		
Transmission mode		
Operating mode frequency range [MHz]	2402 – 2480	
Assessment frequency (f) [MHz]	2480	
Transmission duty cycle (DC) [%]	77	
Peak radiated power (P _R) [dBm e.i.r.p.]	4.52	
Source average Power		
Maximum transmission duty cycle (DC)	77.0 %	
Duty cycle correction (DCC)	0.77	-1.14 dB
Measured peak radiated power (P _R)	2.83 mW	4.52 dBm
Averaged peak radiated power (P _{RAVG})	2.18 mW	3.38 dBm
Power density		
Compliance power density limit	1.000 mW/cm ²	10.00 W/m ²
Power density @ 20cm	0.000 mW/cm ²	0.004 W/m ²
Verdict		
The power density of the EUT at 20cm is below the FCC/IC MPE limit!		
Comments:		

Assessment results – GSM / GPRS850 + Bluetooth	
Transmission mode	
Number of concurrent transmission modes	2
Transmission mode 1	
Mode	GSM / GRPS850 / int. antenna
Power density @ 20 cm [W/m ²] (S ₁)	3.826 W/m ²
Compliance power density limit [W/m ²] (S _{LIMIT,1})	5.66 W/m ²
S/S _{LIMIT}	0.6758
Transmission mode 2	
Mode	Bluetooth
Power density @ 20 cm [W/m ²] (S ₂)	0.004 W/m ²
Compliance power density limit [W/m ²] (S _{LIMIT,2})	10.00 W/m ²
S/S _{LIMIT}	0.0004
Concurrent Operation	
$S_i / S_{Limit,i}$	$0.6758 + 0.0004 = 0.6762 < 1$
Verdict	
The power density of the concurrent operational mode of the EUT at 20cm is below the FCC/IC MPE limit!	
Comments:	

Assessment results – GSM / GPRS1900 + Bluetooth	
Transmission mode	
Number of concurrent transmission modes	2
Transmission mode 1	
Mode	GSM / GRPS1900 / int. antenna
Power density @ 20 cm [W/m ²] (S ₁)	0.547 W/m ²
Compliance power density limit [W/m ²] (S _{LIMIT,1})	10.00 W/m ²
S/S _{LIMIT}	0.0547
Transmission mode 2	
Mode	Bluetooth
Power density @ 20 cm [W/m ²] (S ₂)	0.004 W/m ²
Compliance power density limit [W/m ²] (S _{LIMIT,2})	10.00 W/m ²
S/S _{LIMIT}	0.0004
Concurrent Operation	
$S_i \ S_{Limit,i}$	$0.0547 + 0.0004 = 0.05513 < 1$
Verdict	
The power density of the concurrent operational mode of the EUT at 20cm is below the FCC/IC MPE limit!	
Comments:	

Assessment results – UMTS FDD V + Bluetooth	
Transmission mode	
Number of concurrent transmission modes	2
Transmission mode 1	
Mode	UMTS FDDV / int. antenna
Power density @ 20 cm [W/m ²] (S ₁)	2.653 W/m ²
Compliance power density limit [W/m ²] (S _{LIMIT,1})	5.64 W/m ²
S/S _{LIMIT}	0.4704
Transmission mode 2	
Mode	Bluetooth
Power density @ 20 cm [W/m ²] (S ₂)	0.004 W/m ²
Compliance power density limit [W/m ²] (S _{LIMIT,2})	10.00 W/m ²
S/S _{LIMIT}	0.0004
Concurrent Operation	
$S_i / S_{Limit,i}$	$0.4704 + 0.0004 = 0.4708 < 1$
Verdict	
The power density of the concurrent operational mode of the EUT at 20cm is below the FCC/IC MPE limit!	
Comments:	

Assessment results – UMTS FDD II + Bluetooth	
Transmission mode	
Number of concurrent transmission modes	2
Transmission mode 1	
Mode	UMTS FDDII / int. antenna
Power density @ 20 cm [W/m ²] (S ₁)	1.020 W/m ²
Compliance power density limit [W/m ²] (S _{LIMIT,1})	10.00 W/m ²
S/S _{LIMIT}	0.1020
Transmission mode 2	
Mode	Bluetooth
Power density @ 20 cm [W/m ²] (S ₂)	0.004 W/m ²
Compliance power density limit [W/m ²] (S _{LIMIT,2})	10.00 W/m ²
S/S _{LIMIT}	0.0004
Concurrent Operation	
$S_i \ S_{Limit,i}$	$0.102 + 0.0004 = 0.1024 < 1$
Verdict	
The power density of the concurrent operational mode of the EUT at 20cm is below the FCC/IC MPE limit!	
Comments:	