
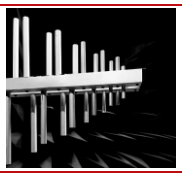
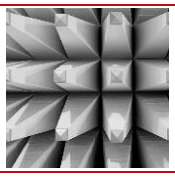

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Maximum Permissible Exposure (MPE) & Exposure evaluation

Report identification number: 1-1364/16-01-12

EUT: RoadLog made by Continental Automotive (online version)	
Certification numbers and labeling requirements	
FCC ID	2AHPQ3290X QIPPDS5-US (WWAN module) K7T-BPM2001 **(BT module)**
IC number	21323-3290X 7830A-PDS5US (WWAN module) 2377A-BPM2001 (BT module)
HVIN (Hardware Version Identification Number)	3290X
PMN (Product Marketing Name)	RoadLog™
FVIN (Firmware Version Identification Number)	-/-
HMN (Host Marketing Name)	-/-

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.

Document authorized:

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EUT technologies:

a) Internal antenna

Case 1

Technologies:	Max. power:	Timebased AVG-Power:	Max. gain:	Max. EIRP
GSM 850 GPRS	35.0 dBm	29.0 dBm (2Slots)	0 dBi	29.0 dBm
BT/BTLE				16.0 dBm

Case 2

Technologies:	Max. power:	Timebased AVG-Power:	Max. gain:	Max. EIRP
WCDMA 850	25.0 dBm	100% Duty Cycle	0 dBi	25.0 dBm
BT/BTLE				16.0 dBm

Case 3

Technologies:	Max. power:	Timebased AVG-Power:	Max. gain:	Max. EIRP
PCS 1900 GPRS	32 dBm	26 dBm (2Slots)	3 dBi	29.0 dBm
BT/BTLE				16.0 dBm

Case 4

Technologies:	Max. power:	Timebased AVG-Power:	Max. gain:	Max. EIRP
WCDMA 1900	25 dBm	100% Duty Cycle	3 dBi	28.0 dBm
BT/BTLE				16.0 dBm

Notes:

- Maximum Power includes maximum tune-up tolerance of +2 dB for GSM and +1 dB for WCDMA.
- Corresponding to RF-test report 1-1364/16-01-07 a maximum gain of 0 dBi for the 850 MHz range and 3 dBi for the 1900 MHz range was assumed.
- For Bluetooth/Bluetooth LE the maximum declared EIRP of 16 dBm has been applied.

b) External (roof-top) antenna

Case 1

Technologies:	Max. power:	Timebased AVG-Power:	Max. gain:	Max. EIRP:
GSM 850 GPRS	35.0 dBm	29.0 dBm (2Slots)	tbd)*	29.0 dBm

Case 2

Technologies:	Max. power:	Timebased AVG-Power:	Max. gain:	Min. pathloss:
WCDMA 850	25.0 dBm	100% Duty Cycle	tbd)*	24.0 dBm

Case 3

Technologies:	Max. power:	Timebased AVG-Power:	Max. gain:	Min. pathloss:
PCS 1900 GPRS	32.0 dBm	26 dBm (2Slots)	tbd)*	26.0 dBm

Case 4

Technologies:	Max. power: (AVG)	Timebased AVG-Power:	Max. gain:	Min. pathloss:
WCDMA 1900	25.0 dBm	100% Duty Cycle	tbd)*	24.0 dBm

Notes:

- Maximum Power includes maximum tune-up tolerance of +2 dB for GSM and +1 dB for WCDMA.
-)* max gain of external antenna is defined in the calculations below.

Prediction of MPE limit at given distance - FCC

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S = PG / 4\pi R^2$

where: S = Power density
P = Power input to the antenna
G = Antenna gain (declared by provider)
R = Distance to the center of radiation of the antenna

Note: for BT/BTLE the worst case EIRP has been assumed as P = 16 dBm with gain G = 0 dBi

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled “Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure”

Frequency Range (MHz)	Power Density (mW/cm²)	Averaging Time (minutes)
300 -1500	f/1500	30
1500 - 100000	1.0	30

where f = Frequency (MHz)

a) Internal antenna

Case 1 GSM850 and BT active simultaneously

		> 1500 MHz		< 1500 MHz
	Technology	BT 2.4 GHz		GSM 850
P	Maximum power	16 dBm		29.0 dBm
R	Distance	20 cm		20 cm
G	Antenna gain	0 dBi		0 dBi
S	MPE limit for uncontrolled exposure	1.0 mW/cm²		0.56 mW/cm²
	Calculated Power density:	**0.0079 mW/cm²**		**0.158 mW/cm²**
	Colocation:	**0.79 %**		**28.22 %**
	Sum (worst case/all transmitters active):	**29.01 %**		

Case 2 WCDMA850 and BT active simultaneously

		> 1500 MHz		< 1500 MHz
	Technology	BT 2.4 GHz		WCDMA 850
P	Maximum power	16 dBm		25.0 dBm
R	Distance	20 cm		20 cm
G	Antenna gain	0 dBi		0 dBi
S	MPE limit for uncontrolled exposure	1.0 mW/cm²		0.56 mW/cm²
	Calculated Power density:	**0.0079 mW/cm²**		**0.063 mW/cm²**
	Colocation:	**0.79 %**		**11.2 %**
	Sum (worst case/all transmitters active):	**11.99 %**		

Case 3 PCS 1900 and BT active simultaneously

		> 1500 MHz		> 1500 MHz
	Technology	BT 2.4 GHz		PCS 1900
P	Maximum power	16 dBm		26 dBm
R	Distance	20 cm		20 cm
G	Antenna gain	0 dBi		3 dBi
S	MPE limit for uncontrolled exposure	1.0 mW/cm^2		1.0 mW/cm^2
	Calculated Power density:	**0.0079 mW/cm^2**		**0.158 mW/cm²**
	Colocation:	**0.79 %**		**15.8 %**
	Sum (worst case/all transmitters active):	**16.59 %**		

Case 4 WCDMA 1900 and BT active simultaneously

		> 1500 MHz		> 1500 MHz
	Technology	BT 2.4 GHz		WCDMA 1700
P	Maximum power	16 dBm		25.0 dBm
R	Distance	20 cm		20 cm
G	Antenna gain	0 dBi		3 dBi
S	MPE limit for uncontrolled exposure	1.0 mW/cm^2		1.0 mW/cm^2
	Calculated Power density:	**0.0079 mW/cm^2**		**0.126 mW/cm²**
	Colocation:	**0.79 %**		**12.6 %**
	Sum (worst case/all transmitters active):	**13.39 %**		

This prediction demonstrates the following:

The power density levels for FCC at a distance of 20 cm are below the maximum levels allowed by regulations.

b) External antenna

Case 1 GSM850

		< 1500 MHz
	Technology	GSM 850
P	Maximum power	29.0 dBm
R	Distance	20 cm
G	Antenna gain	0 dBi
S	MPE limit for uncontrolled exposure	0.56 mW/cm²
	Calculated Power density:	**0.158 mW/cm²**
		28.22 %
	Max antenna gain for 100% limit	**2.14 dBi**

Case 2 WCDMA 850

		< 1500 MHz
	Technology	WCDMA 850
P	Maximum power	25.0 dBm
R	Distance	20 cm
G	Antenna gain	0 dBi
S	MPE limit for uncontrolled exposure	1.0 mW/cm²
	Calculated Power density:	**0.126 mW/cm²**
		12.6 %
	Max antenna gain for 100% limit	**2.14 dBi**

Case 3 PCS 1900

		> 1500 MHz
	Technology	PCS 1900
P	Maximum power	26 dBm
R	Distance	20 cm
G	Antenna gain	0 dBi
S	MPE limit for uncontrolled exposure	1.0 mW/cm²
	Calculated Power density:	**0.08 mW/cm²**
		7.92 %
	Max antenna gain	**1.0 dBi**

Case 4 WCDMA 1900

		> 1500 MHz
	Technology	WCDMA 1900
P	Maximum power	25.0 dBm
R	Distance	20 cm
G	Antenna gain	0 dBi
S	MPE limit for uncontrolled exposure	1.0 mW/cm²
	Calculated Power density:	**0.048 mW/cm²**
		4.77 %
	Max antenna gain	**1.0 dBi**

Note : Max. antenna gain limitation in the 850 MHz band has been derived from RSS-102 limit
Max. antenna gain limitation in the 1900 MHz band is caused by FCC part 24 E EIRP limit : max. 2 W (33.0 dBm) burst power

This prediction demonstrates the following:

The power density levels for FCC at a distance of 20 cm are below the maximum levels allowed by regulations when used with an antenna with **maximum gain 2.14 dBi in the 850 MHz band and 1.0 dBi in the 1900 MHz band**.

Prediction of MPE limit at given distance - IC

RSS-102, Issue 5, 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2}\ f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

a) Internal antenna

Note: for BT/BTLE the worst case EIRP has been assumed as P = 16 dBm with gain G = 0 dBi

Case 1 GSM850 and BT active simultaneously

	Technology	GSM 850		BT 2.4 GHz	-/-
P	Max power	29.0 dBm		16 dBm	**Sum**
G	Antenna gain	0 dBi		0 dBi	
S	MPE limit for uncontrolled exposure	1300 mW		2700 mW	
	Calculated output power:	794 mW		39.8 mW	
	Colocation GSM 850 + BT 2.4 GHz	**61.1 %**		**---**	
	Colocation GSM 850 + BT 2.4 GHz	**---**		**1.47 %**	**62.6 %**

Case 2 WCDMA 850 and BT active simultaneously

	Technology	WCDMA 850		BT 2.4 GHz	-/-
P	Max power	25.0 dBm		16 dBm	**Sum**
G	Antenna gain	0 dBi		0 dBi	
S	MPE limit for uncontrolled exposure	1300 mW		2700 mW	
	Calculated output power:	316 mW		39.8 mW	
	Colocation GSM 850 + BT 2.4 GHz	**24.3 %**		**---**	
	Colocation GSM 850 + BT 2.4 GHz	**---**		**1.47 %**	**25.8 %**

Case 3 PCS 1900 and BT active simultaneously

	Technology	PCS 1900		BT 2.4 GHz	-/-
P	Max power	26.0 dBm		16 dBm	**Sum**
G	Antenna gain	3 dBi		0 dBi	
S	MPE limit for uncontrolled exposure	2280 mW		2700 mW	
	Calculated output power:	794 mW		39.8 mW	
	Colocation PCS 1900 + BT 2.4 GHz	**34.8 %**		**---**	**36.3 %**
	Colocation PCS 1900 + BT 2.4 GHz	**---**		**1.47 %**	

Case 4 WCDMA 1900 and BT active simultaneously

	Technology	WCDMA 1900		BT 2.4 GHz	-/-
P	Max power	25.0 dBm		16 dBm	**Sum**
G	Antenna gain	3 dBi		0 dBi	
S	MPE limit for uncontrolled exposure	2113 mW		2700 mW	
	Calculated output power:	631 mW		39.8 mW	
	Colocation WCDMA 1700 + BT 2.4 GHz	**29.9 %**		**---**	**31.4 %**
	Colocation WCDMA 1700 + BT 2.4 GHz	**---**		**1.47 %**	

Conclusion: for applications where minimum distance to radiating element is 20cm Annex C of RSS-102 should be filled out.

b) External antenna

Case 1 GSM850

	Technology	GSM 850
P	Max power	29.0 dBm
G	Antenna gain	0 dBi
S	MPE limit for uncontrolled exposure	1300 mW
	Calculated output power:	794 mW
		61.1 %
	Max antenna gain for 100% limit	**2.14 dBi**

Case 2 WCDMA 850

	Technology	WCDMA 850
P	Max power	24.0 dBm
G	Antenna gain	0 dBi
S	MPE limit for uncontrolled exposure	1300 mW
	Calculated output power:	251 mW
		19.3 %
	Max antenna gain for 100% limit	**2.14 dBi**

Case 3 PCS 1900

	Technology	PCS 1900
P	Max power	26.0 dBm
G	Antenna gain	0 dBi
S	MPE limit for uncontrolled exposure	2280 mW
	Calculated output power:	398 mW
		17.5 %
	Max antenna gain	**1.0 dBi**

Case 4 WCDMA 1900

	Technology	WCDMA 1900
P	Max power	24.0 dBm
G	Antenna gain	0 dBi
S	MPE limit for uncontrolled exposure	2113 mW
	Calculated output power:	251 mW
		11.9 %
	Max antenna gain	**1.0 dBi**

Note : max. antenna gain limitation in the 850 MHz band has been derived from RSS-102 limit
Max antenna gain limitation in the 1900 MHz band is caused by FCC part 24 E EIRP limit : max. 2 W (33.0 dBm) burst power

Conclusion: for applications where minimum distance to radiating element is 20cm Annex C of RSS-102 should be filled out.