RF Exposure / RF Technical Brief

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RF exposure information for the equipment Polar Z9 (FCC ID: INWZ9, IC: 6248A-Z9)

1. Introduction:

The device **Polar Z9** (FCC ID: **INWZ9**, IC: **6248A-Z9**) is designed to be used only for fixed and mobile applications.

This product integrates 4 **bluegiga WT11i-A** Bluetooth 2.1 + EDR modules (FCC ID: **QOQWT11IA**, IC: **5123A-BGTWT11IA**). The bluegiga WT11i-A Bluetooth 2.1 + EDR module is granted with a modular approval for mobile applications with integral chip antenna with peak gain of 0.5 dBi.

The antenna used for **Polar Z9** transmitter and the antennas used for the 4 **bluegiga WT11i-A** Bluetooth 2.1 + EDR modules are co-located and can transmit simultaneously.

All the antennas must be installed to provide a separation distance of at least 20 cm from all the persons.

2. MPE limits:

The table below is excerpted from RSS-102, Issue 4, 4.2, titled “RF Limits for Devices used by the General Public”:

Frequency Range (MHz)	Power density (W/m^2)	Power density (mW/cm^2)	Averaging time (minutes)
300 – 1500	f (MHz)/150	f (MHz) /1500	6
1500 – 15000	10	1.0	6

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/cm^2)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1.0	30

3. Compliance criteria:

Power density of individual transmitters is calculated using the equation:

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

3.1. Standalone compliance criteria:

Power density must be lower than the MPE limits stated in item 2.

3.2. Simultaneous transmission compliance criteria

The sum of the MPE ratios (Power density/MPE limit) for all simultaneous transmitting antennas incorporated in the device based on the calculated power density is ≤ 1.0.

4. Compliance calculations:

4.1. Standalone transmission - bluegiga WT11i-A Bluetooth 2.1 + EDR module

Frequency band (MHz)	Frequency range (MHz)	Mode	Conducted output power (W)	Conducted output power (dBm)	Antenna gain (dBi)	Total power (W)	Duty Cycle (%)	Evaluation distance (cm)	Power Density (mW/cm^2)	FCC-IC MPE limit (mW/cm^2)	MPE ratio (Power Density / FCC-IC MPE limit)
2400-2483,5	2402-2480	Bluetooth	0,020	13,01	0,5	0,022	100%	20	0,004	1,00	0,005

Maximum MPE ratio: 0,005

4.2. Standalone transmission – Polar Z9

Frequency band (MHz)	Frequency range (MHz)	Mode	Conducted output power (dBm)	Antenna gain (dBi)	Total power (W)	Duty Cycle (%)	Evaluation distance (cm)	Power Density (mW/cm^2)	FCC-IC MPE limit (mW/cm^2)	MPE ratio (Power Density / FCC-IC MPE limit)
2400-2483,5	2412 - 2462	802.11b	19,09	5,9	0,316	100%	20	0,063	1,00	0,063
2400-2483,5	2412 - 2462	802.11g	16,45	5,9	0,172	100%	20	0,034	1,00	0,035

Maximum MPE ratio: 0,063

4.3. Simultaneous transmission

Transmitter #	Device	Max MPE ratio (Power Density / FCC-IC MPE limit)
1	Polar Z9	0,063
2	bluegiga WT11i-A Bluetooth 2.1 + EDR module	0,005
3	bluegiga WT11i-A Bluetooth 2.1 + EDR module	0,005
4	bluegiga WT11i-A Bluetooth 2.1 + EDR module	0,005
5	bluegiga WT11i-A Bluetooth 2.1 + EDR module	0,005
All	**TOTAL (sum of the MPE ratios)**	**0,083**
	COMPLICANCE (sum of the MPE ratios ≤ 1.0)	**COMPLIANT**

Signed on behalf of **Polar Electro Oy** in Kempele on **Apr. 12, 2013**

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