PRIMA
RICERCA & SVILUPPO

RAPPORTO DI PROVA / *TEST REPORT*

Rif./*Ref*.No. MPETR_140934-1	**Data / *Date*:04/12/2015**	Pagine / *Pages* **: 8**
Scopo delle prove /*Test object :*	Prove di tipo in accordo a / *Type test according to* **FCC Cfr 47 part 2 - §2.1091, part 1 - §1.1310**	
Richiedente / *Applicant* **:**	**EMBIT S.r.l EMBEDDED & WIRELESS SOLUTION** Via Emilia Est, 911 – 41100 Modena (MO) Italy Phone +39 059 371714 Fax +39 059 3680498	
Persona di riferimento / *Applicant's referee :*	Mr. Daniele Rosani	
Marchio commerciale / *Trade mark* **:**	embit	
Fabbricante / *Manufacturer :*	EMBIT S.r.l EMBEDDED & WIRELESS SOLUTION.	
Prodotto / *Product :*	**ZIGBEE Radio module**	
Modello / *Model* **:**	**EMB-Z2538PA**	
Versioni / *Versions*	**EMB-Z2538PA / UL, EMB-Z2538PA / IA**	
EUT FCC ID	Z7H-EMB2538PA	
Data ricevimento campioni / *Date of test samples receipt*:	08/08/2014	
Campioni verificati / *No. of tested samples*	1	
Data verifiche / *Testing date* :	August/September 2014	
Sito di prova / *Testing site :*	Prima Ricerca & Sviluppo Via Campagna-92 I-22020 FALOPPIO (CO)	
Esito delle valutazioni / *Assessment results :*	**CONFORME / COMPLIANT**	
Verifiche effettuate da / *Verifications carried out by :*	Giacomo ARMELLINI Responsabile Laboratorio EMC e RADIO/ *EMC and RADIO Laboratory Manager*	Giacomo Armellini
Approvato / *Approved by* **:**	Vincenzo LA FRAGOLA Direttore generale / *Managing director*	Vincenzo La Fragola

I risultati delle prove riportati nel presente rapporto di prova si riferiscono solo ai campioni esaminati./*The test results reported in this test report shall refer only to the samples tested*

Questo Report non può essere riprodotto in modo parziale, salvo espressa autorizzazione scritta da parte del Laboratorio / *This report may not be partially reproduced, except with the prior written permission of the issuing Laboratory*

CONTENUTO / TABLE OF CONTENTS

0 RELEASE CONTROL RECORD

TEST REPORT NUMBER	REASON OF CHANGE	DATE OF ISSUE
MPETR_140934-0	Original Release	10/06/2015
MPETR_140934-1	Editorial Change	04/12/2015

1 TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

1.1 Identification

Trademark:	
Manufacturer:	EMBIT S.r.l EMBEDDED & WIRELESS SOLUTION.
Type of Equipment :	ZIGBEE Radio module
Model name:	EMB-Z2538PA
Versions:	EMB-Z2538PA / UL, EMB-Z2538PA / IA In the EMB- Z2538PA / UL version: the RF output is connected to the uF.l connector via the 0ohm resistor In the EMB- Z2538PA / IA version: the RF output is connected to the integrated PIFA antenna via the 0ohm resistor
Serial number :	prototype
FCC ID :	Z7H-EMB2538PA
Country of manufacturer:	ITALY

1.2 Technical data

Product type:	Radio Equipment
Radio type:	Intentional radiators
Product description / application	The EUT is 2.4GHz Zigbee Transceiver
Power supply requirements :	2V to 3.6V (typ. 3V) 3,3V (powered by demoboard connected to PC USB port)
Operating Frequency range	2400-2483,5MHz
Operating Frequency:	From 2405MHz to 2480MHz
Channel bandwidth	5MHz
Channel spacing	5MHz
Number of Channel	16
Modulation Type	QPSK
Antenna Type	EMB-Z2538PA / IA: Manufacturer: EMBIT Type: Printed Integrated PIFA Antenna Model: EMB-AN24-15PFA Gain: -2 dbi Connector: pad
	EMB-Z2538PA / UL: Antenna: Manufacturer: EMBIT Type: Swivel Antenna Model: EMB-AN24-70SA-R1 Gain: 7dbi Connector: SMA Reverse Polarity Cable: Manufacturer: EMBIT Type: SMA-RP (Female) To U.FL diameter 1.37mm Model: EMB-CA-SU-100 Loss: 0.25dB Connector: u.Fl – SMA Reverse Polarity
Power Control Setting	EA

1.3 Ports identification

This section contains descriptions of all signal ports and AC/DC power input/output ports, the length and the type of the cable provided by manufacturer needed for the tests. Moreover it is specified if the ports are ever or optionally connected.

Port		*Description*	*Connection*
1	**Enclosure**	Not present (electronic PCB board only)	Plug-in electronic board
2	**AC Power Supply**	Not present (electronic PCB board only)	-----
3	**DC power supply**	3.3Vdc	Plug-in electronic board
4	**Signal lines**	Signal line	Plug-in electronic board
5	**Telecomm. Lines**	Not present (electronic PCB board only)	-----
6	**Antenna port**	For external antenna	u.Fl connector
Note: During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.			

1.4 Auxiliary equipment

- EMBIT Evaluation Board EMB-Z2538PA(/xx)-EVB (used during the session to power supply the EUT and for channel setting)

2 REFERENCE STANDARDS

CODE OF FEDERAL REGULATIONS	
Title 47 Part 1 Subpart I § 1.1310	Procedures Implementing the National Environmental Policy Act of 1969. Radiofrequency radiation exposure limits.
Title 47 Part 2 Subpart J § 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.
ANSI C63.4	American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz

3 MEASUREMENTS AND CALCULATION RESULTS

3.1 Calculation Method

Far Field Power flux Calculation model.

This model is applicable in the far-field region and over-estimates in the radiating near-field region. The far-field calculations are accurate when the distance, r, from an antenna of length D to a point of investigation is greater than

$$r = \frac{2D^2}{\lambda}$$

The Power Flux is

$$S = \frac{PG}{4\pi r^2} \quad \text{or equivalent} \quad S = \frac{EIRP}{4\pi r^2}$$

where

P = input power of the antenna

G = antenna gain relative to an isotropic antenna

r = distance from the antenna to the point of investigation.

EIRP = Effective Isotropic Radiated Power

3.2 Limits

Tab. 1 of CFR Title 47 Part 1 Subpart I § 1.1310

Table 1—Limits for **M**aximum **P**ermissible **E**xposure (**MPE**)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(B) Limits for General Population/Uncontrolled Exposure				
.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	$*180/f^2$	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Note to Table 1: 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 can not exercise control over their exposure.

3.3 Measurements

EMB-Z2538PA / UL + EMB-CA-SU-100 CABLE + EMB-AN24-70SA-R1 ANTENNA EIRP
WORST CASE

Channel	Frequency (MHz)	Conducted Output Power at u.Fl connector (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)
11	2405	22.44	0.25	7	29.19	0.830

EMB-Z2538PA / IA EIRP
WORST CASE

Channel	Frequency (MHz)	Conducted Output Power at u.Fl connector (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)
11	2405	22.44	0.25	-2	20.44	0.111

Note

In the EMB-Z2538PA / IA version the RF output power is delivered to the external antenna connecting the 0Ω resistor to the u.Fl connector.

In the EMB-Z2538PA / IA version the RF output power is delivered to the printed PCB Antenna connecting the 0Ω resistor to the pad of the printed antenna.

For this reason the Conducted output power measured on the EMB-Z2538PA / UL u.Fl connector has been used to calculate the EIRP of the EMB-Z2538PA / IA

3.4 RF Exposure Evaluation

EMB-Z2538PA / UL + EMB-CA-SU-100 CABLE + EMB-AN24-70SA-R1

TX Freq. (MHz)	EIRP (W)	Evaluation distance (m)	Power density at evaluation distance (W/m^2)	FCC Power density Limit (W/m^2)	RESULT
2405	0.830	0.20	1.652	10.00	WITHIN THE LIMIT

EMB-Z2538PA / IA

TX Freq. (MHz)	EIRP (W)	Evaluation distance (m)	Power density at evaluation distance (W/m^2)	FCC Power density Limit (W/m^2)	RESULT
2405	0.111	0.20	0.221	10.00	WITHIN THE LIMIT