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LAB N° 1347

RAPPORTO DI PROVA

TEST REPORT

Rif. / Ref. n.	**MPETR_178785-0**	Data / Date:	**21/12/2020**	Pagine / Pages:	**8**

Scopo delle prove *Test object*	Prove di tipo in accordo alla Norma *Type test according to standards* **FCC Cfr 47 part 2 - §2.1093**
Richiedente *Applicant*	**Paradox Engineering SA** Via Passeggiata 7 – 6883 Novazzano – CH Tel.: +41912330100
Marchio commerciale *Trade mark*	MinebeaMitsumi Passion to Create Value through Difference
Fabbricante *Manufacturer*	**MinabeaMitsumi Inc.** 3-9-6 Mita, Minato-ku, Tokyo 108-8330 Tel.: 81-3-6758-6711
Prodotto *Product*	PE IoT Engine - Sub 1-GHz IPv6/6LoWPAN communication module, radio module
Modello testato *Testing model*	**NDWM005 US (PRD-CMD-0002)**
Identificativo FCC *FCC ID*	**2AKPQNDWM005**
Data ricevimento campioni *Date of test samples receipt*	02/11/2020
Campioni verificati *No. of tested samples*	1 – Sample by the applicant
Data verifiche *Testing date*	From 02/11/2020 to 30/11/2020
Sito di prova *Testing site*	PRSLAB S.r.l. Unipersonale - Via Campagna 92 - 22020 Faloppio - Como - Italy
Esito delle valutazioni *Assessment results*	**CONFORME / COMPLIANT**

Verifiche effettuate da *Verifications carried out by*	**Daniele AOSANI** Tecnico laboratorio EMC & RADIO *EMC & RADIO Test Engineer*	Daniele Aosani
Approvato *Approved by*	**Riccardo PFEIFFER** Responsabile laboratori EMC & RADIO EMC & RADIO *Laboratory manager*	Riccardo Pfeiffer

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.
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0. RELEASE CONTROL RECORD

TEST REPORT NUMBER	REASON OF CHANGE	DATE OF ISSUE
MPETR_178785-0	Original Release	21/12/2020

1. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

1.1 EUT Identification

DESCRIPTION	PE IoT Engine - Sub 1-GHz IPv6/6LoWPAN communication module, radio module
MODEL NAME	NDWM005 US (PRD-CMD-0002)
SN	Prototype
PRS LAB INTERNAL REFERENCE	BC 313/2020 1/5 BC 313/2020 2/5
TRADEMARK	MinebeaMitsumi Passion to Create Value through Difference
MANUFACTURER	MinebeaMitsumi Inc.
COUNTRY OF MANUFACTURER	Japan
SINGLE UNIT OR SYSTEM	Single
POWER SOURCE	DC power USB port
SUPPLY VOLTAGE	From 2 Vdc (Low Power Mode) to 5 Vdc
MAX POWER or MAX ABSORBED CURRENT	31 mA
HW VERSION	ELB-PED-0146-07
SW VERSION	FW 3.14.0 PHY 1.3.11 NET 1.1.10 RADIO TEST 1.1.6 SPIRIT2 1.2.0
OPERATING TEMPERATURE	-40°C ~ +70°C
DIMENSIONS	47x37x14 mm (LxWxH)
EUT STANDING	---

1.1 RADIO module technical data

CHIP MANUFACTURER		
CHIP MODEL	**S2-LPQTR**	
RADIO CATEGORY	Short Range Device	
WORKING FREQUENCY BAND	902.42 – 927.58MHz	
CHANNELS	75	
CHANNEL SPACING	340kHz	
TRANSFER RATE	100kbps	
TYPE OF MODULATION	GFSK	
SENSITIVITY	-104dBm	
ANTENNA TYPE	External dipole antenna	Patch antenna
ANTENNA MODEL	**ANT-916-CW-HW**	**2067640100**
ANTENNA GAIN	1.2dBi	1.2dBi
ANTENNA MANUFACTURER		

1.2 Ports identification

	PORT	DESCRIPTION	CONNECTION	NOTES
☒	Enclosure	PCB board	---	---
☐	AC Power input	Port not present	---	---
☒	DC Power input	3.6V (declared by manufacturer)	Cable	<3mt
☒	Signal / Control port	USB port	---	<3mt
☐	Telecomm.port	Port not present	---	---
☒	Antenna port	External	UFL	---

Note:
During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.

1.3 Modifications incorporated in E.U.T.

The following items are the modifications introduced in the equipment under test:

- None

1.4 Auxiliary equipment

- Personal computer model AH532, manufacturer by Fujitsu, with software Radio Tester 1.12.3, to set channels.

Special Test Software: Special software by the Applicant to operate the EUT at each channel frequency continuously. For example, the transmitter will be operated at each of the lowest, middle and highest frequencies individually continuously during testing

2. REFERENCE STANDARDS

REFERENCE STANDARD	
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 SAR exemption

This device has been excluded from SAR testing based on source-based time-averaged conducted output power and KDB 447498 D01 section 4.3.1 1). This document serves as the RF exposure exhibit in the FCC Form 731 application in lieu of a SAR report.

3.1 Operational Description

The **Module** is a communication device based on 900MHz technology intended to be used in multiple portable applications. It is necessary a calculation for portable use demonstrating that the transmitter can be excluded from SAR testing.

3.2 RF Exposure Conditions

The device is intended for use as portable.

3.3 RF Output Power

TX frequency Range: 902.42MHz – 927.58MHz
Max measured EIRP with PATCH ANTENNA type 2067640100: 14.95dBm (31.2mW)
Max measured EIRP with DIPOLE ANTENNA type ANT-916-CW-HW: 14.95dBm (31.2mW)

3.4 FCC Calculation method and limits

SAR Test Exclusion Thresholds:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [vf(GHz)] ≤ 3.0 (for 1-g body SAR) or 7.5 (for 10-g extremity SAR)

where respectively

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

3.5 FCC Calculation results

Measured Output Power: 31.2mW
Min Test separation distance: 5mm
f: 902.42MHz (as worst case)

Exclusion Threshold Extremity SAR: 7.5 (10-g extremity SAR)

$$\frac{31.2mW}{5mm} * \sqrt{0.90242} = 5.93 \leq 7.5$$

RESULT: The device is excluded from SAR testing.