PRS LAB S.r.l. Unipersonale
Sede operativa e Laboratori di prova
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LAB N° 1347 L

RAPPORTO DI PROVA

TEST REPORT

Rif. / Ref. n.	**MPETR_181511-0**	Data Emissione /Issue Date:	**25/07/2022**	Pagine / Pages:	**13**

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*	Sub 1-GHz IPv6/6LoWPAN Hardware radio device, compliant within NEMA standard, that operates as: Smart Lighting Node and Gateway for other Nodes
Modello *Model*	**NDLM007US-1** **NDLM007US-2**
Identificativo FCC *FCC ID*	**2AKPQNDLM007**
Data ricevimento campioni *Date of test samples receipt*	09/05/2022
Campioni verificati *No. of tested samples*	2 – Sampled by the applicant
Data verifiche *Testing date*	From 23/05/2022 to 26/03/2022
Sito di prova *Testing site*	PRSLAB S.r.l. Unipersonale - Via Campagna 92 - 22020 Faloppio - Como - Italy
Identificativo FCC del sito di prova *FCC designation number*	IT0012
Esito delle valutazioni *Assessment results*	**CONFORME / COMPLIANT**

Verifiche effettuate da *Verifications carried out by*	**Daniele AOSANI** Tecnico Laboratorio *Laboratory Engineer*	Daniele Aosani
Approvato *Approved by*	**Riccardo PFEIFFER** Responsabile Laboratorio *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.
Il campione è stato fornito dal cliente ed i risultati si riferiscono al campione così come ricevuto
The sample has been provided by the customer and the results apply to the sample as received

CONTENUTO

TABLE OF CONTENTS

0. RELEASE CONTROL RECORD

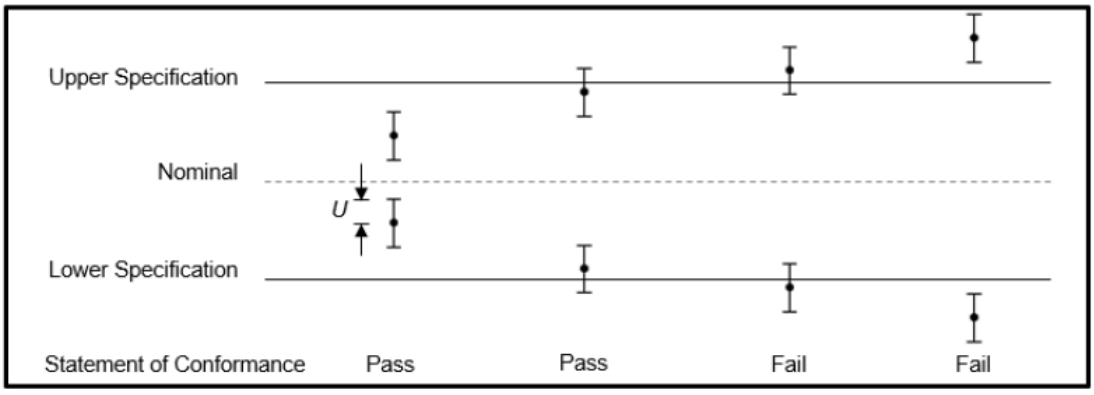
TEST REPORT NUMBER	REASON OF CHANGE	DATE OF ISSUE
MPETR_181511-0	Original release	25/07/2022

This document is valid in last revision that deletes and replaces the previous one

1. DECISION RULE

PRS LAB specifies that, if the decision rules of conformity of the test results are not indicated in detail in the standard/s object of tests, it takes as a decision rule for the declaration of conformity the simple binary system (w = 0) stated in the ILAC-G8-09:2019 document.

The decision rule is applicable for all parts of standard



U = 95% expanded measurement uncertainty

Statements of conformity are reported as:

- Pass: the measured value is below the acceptance limit, $AL{=}TL$.
- Fail: the measured value is above the acceptance limit, $AL{=}TL$.

Definitions

- Guard Band (w): interval between a tolerance limit and a corresponding acceptance limit where length $w{=}|TL{-}AL|$.
- Tolerance Limit (TL) (Specification Limit): specified upper or lower bound of permissible values of a property.
- Acceptance Limit (AL): specified upper or lower bound of permissible measured quantity values.

2. INFORMATION PROVIDED BY CUSTOMER

- None

3. GENERAL REMARKS

- None

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4. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

4.1 EUT Identification

DESCRIPTION	Sub 1-GHz IPv6/6LoWPAN Hardware radio device, compliant within NEMA standard, that operates as: - Smart Lighting Node - Gateway for other Nodes
COMMERCIAL NAME	PE Smart Lighting Node Hybrid NEMA
MODEL NAME	NDLM007US-1 NDLM007US-2
SERIAL NO.	Prototype
PRSLAB IDENTIFICATION	BC 144/2022 1/4_ NDLM007US-1 BC 144/2022 2/4_ NDLM007US-2
TRADEMARK	MinebeaMitsumi Passion to Create Value through Difference
MANUFACTURER	MinebeaMitsumi Inc.
COUNTRY OF MANUFACTURER	Japan
SINGLE UNIT OR SYSTEM	Single
FCC CLASSIFICATION	Class B
POWER SOURCE	AC main
SUPPLY VOLTAGE	100 – 277V ~ 50-60Hz
MAX POWER or MAX ABSORBED CURRENT	600W with max load
OPERATING TEMPERATURE	-40°C ÷ +70°C
HW VERSION	PRD-LMN-0058 (-01) NDLM007US-1
FW VERSION	4.6.0
DIMENSIONS	Diameter 84mm; Height 106.9mm
EUT STANDING	Mounted on street lights (NEMA connector)

4.1 Bluetooth Low Energy module technical data

MODULE MANUFACTURER	life.augmented
MODULE MODEL	**BlueNRG-2**
ETS CATEGORY	Bluetooth Low Energy 5.2
TYPE OF RADIO DEVICE	Transceiver
FREQUENCY BAND	2400 – 2483.5MHz
NUMBER OF CHANNELS	40
CHANNEL BANDWIDTH	2MHz
CHANNEL SPACING	2MHz
TYPE OF MODULATION	GFSK
DATA RATES (Mbit/s)	1
ANTENNA TYPE	Ceramic chip antenna
ANTENNA GAIN	5.05dBi
ANTENNA MODEL	**ANT3216LL00R2400A (ELC-OTH-0166)**
ANTENNA MANUFACTURER	YAGEO

4.2 Radio module technical data

CHIP MANUFACTURER	life.augmented
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	PCB printed
ANTENNA GAIN	0dBi

4.3 LTE module technical data (model NDLM007US-1)

MODULE MANUFACTURER	SIERRA WIRELESS		
MODULE TYPE	**WP7702**		
FCC ID	**N7NWP77B**		
ETS CATEGORY	Long Term Evolution (LTE) CAT M1		
WORKING BAND	LTE Band 2/4/5/12/13/26		
DUPLEX MODE	FDD		
FDD TX FREQUENCY RANGE	LTE Band 2: 1850-1910MHz	LTE Band 4: 1710-1755MHz	LTE Band 5: 824-849MHz
	LTE Band 12: 699-716MHz	LTE Band 13: 777-787MHz	LTE Band 26: 814-849MHz
FDD RX FREQUENCY RANGE	LTE Band 2: 2110-2170MHz	LTE Band 4: 2110-2155MHz	LTE Band 5: 869-894MHz
	LTE Band 12: 729-746MHz	LTE Band 13: 746-756MHz	LTE Band 26: 859-894MHz
EQUIPMENT CLASSIFICATION	Fixed use		
MODULATION	QPSK & 16QAM		
ANTENNA TYPE	Ceramic chip antenna		
ANTENNA GAIN	1.8dBi @ 699-960MHz 1.9dBi @ 1710-2690MHz		
ANTENNA MODEL	**RUN mXTEND™ (NN02-224)**		
ANTENNA MANUFACTURER	ignion		

4.4 LTE module technical data (model NDLM007US-2)

MODULE MANUFACTURER	SIERRA WIRELESS		
MODULE TYPE	**WP7611-1**		
FCC ID	**N7NWP76B**		
ETS CATEGORY	Long Term Evolution (LTE) CAT 1		
WORKING BAND	LTE Band 2/4/5/12/13/14/25/26/66/71		
DUPLEX MODE	FDD		
FDD TX FREQUENCY RANGE	LTE Band 2: 1850-1910MHz	LTE Band 4: 1710-1755MHz	LTE Band 5: 824-849MHz
	LTE Band 12: 699-716MHz	LTE Band 13: 777-787MHz	LTE Band 14: 788-798MHz
	LTE Band 25: 1850-1915MHz	LTE Band 26: 814-849MHz	LTE Band 66: 1710-1780MHz
	LTE Band 71: 663-698MHz		
FDD RX FREQUENCY RANGE	LTE Band 2: 2110-2170MHz	LTE Band 4: 2110-2155MHz	LTE Band 5: 869-894MHz
	LTE Band 12: 729-746MHz	LTE Band 13: 746-756MHz	LTE Band 14: 758-768MHz
	LTE Band 25: 1930-1995MHz	LTE Band 26: 859-894MHz	LTE Band 66: 2110-2200MHz
	LTE Band 71: 617-652MHz		
EQUIPMENT CLASSIFICATION	Fixed use		
MODULATION	QPSK & 16QAM		
ANTENNA TYPE	STM mount antenna (MAIN)		
ANTENNA GAIN	1.8dBi @ 699-960MHz 1.9dBi @ 1710-2690MHz		
ANTENNA MODEL	**RUN mXTEND™ (NN02-224)**		
ANTENNA MANUFACTURER	ignion		

4.5 Ports identification

	PORT	DESCRIPTION	CONNECTION	NOTES
☒	Enclosure	Plastic	Snaps	---
☒	AC mains power port	115V ~ 60Hz	Plug	---
☐	DC mains power port	Port not present	---	---
☐	Wired network port	Port not present	---	---
☒	Signal / Control port	Load connection	---	<3m
☐	Antenna port	☒Internal; ☐External	---	---

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

4.6 Modifications incorporated in E.U.T.

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

- None.

4.7 Auxiliary equipment

- None.

5. REFERENCE STANDARDS

REFERENCE STANDARD	DESCRIPTION
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: 2014	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
FCC KDB 447498 D01	General RF Exposure Guidance v06

6. MEASUREMENTS AND CALCULATION RESULTS

6.1 RF Exposure Conditions

The device is intended for use in fixed position.
According to "FCC KDB publication 447498 D01 General RF Exposure Guidance v06" sections 7.1 and 7.2 have been applied.
Transmitters used in mobile device exposure conditions for simultaneous transmission operations.
Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is *≤ 1.0*

6.2 EUT composition

Configuration #1: EUT model NDLM007US-1:

- LTE module **WP7702** (FCC ID: **N7NWP77B**) with 699MHz 1.8dBi Chip Antenna
- 915MHz radio with 0dBi PCB antenna
- BLE module with 2.4GHz 5.05dBi Chip Antenna

Configuration #2: EUT model NDLM007US-2:

- LTE module **WP7611-1** (FCC ID: **N7NWP76B**) with 699MHz 1.8dBi Chip Antenna
- 915MHz radio 0dBi PCB antenna
- BLE module with 2.4GHz 5.05dBi Chip Antenna

6.3 Calculation method, results and limits

Configuration #1									
Radio	Frequency	Power	Power	Antenna Gain	EIRP	EIRP	Distance	Power Density	Limit
	MHz	dBm	W	dBi	dBm	mW	cm	mW/cm^2	mW/cm^2
LTE CatM1	699	24.00	0.25	1.80	25.80	389	50	0.012	1.0
Narrowband 915MHz	915	17.40	0.06	0.00	17.40	55	50	0.002	0.6
BLE	2440	0.26	0.01	5.05	5.31	3	50	0.0001	1.0

N7NWP77B Power Density = EIRP/(4πr^2) = 389mW/(4π*2500cm^2) = 0.012 mW/cm^2
Narrowband Power Density = EIRP/(4πr^2) = 55mW/(4π*2500cm^2) = 0.002 mW/cm^2
BLE Power Density = EIRP/(4πr^2) = 3mW/(4π*2500cm^2) = 0.0001 mW/cm^2

Configuration #2									
FCC ID	Frequency	Power	Power	Antenna Gain	EIRP	EIRP	Distance	Power Density	Limit
	MHz	dBm	W	dBi	dBm	mW	cm	mW/cm^2	mW/cm^2
LTE Cat1	699	24.00	0.25	1.80	25.80	389	50	0.012	1.0
Narrowband 915MHz	915	17.40	0.06	0.00	17.40	55	50	0.002	0.6
BLE	2440	0.26	0.01	5.05	5.31	3	50	0.0001	1.0

N7NWP76B Power Density = EIRP/(4πr^2) = 389mW/(4π*2500cm^2) = 0.012 mW/cm^2
Narrowband Power Density = EIRP/(4πr^2) = 55mW/(4π*2500cm^2) = 0.002 mW/cm^2
BLE Power Density = EIRP/(4πr^2) = 3mW/(4π*2500cm^2) = 0.0001 mW/cm^2

6.4 Result

Configuration with EUT model NDLM007US-1

FCC ID	Power Density	Limit	PD/Limit
	mW/m^2	mW/cm^2	
LTE CatM1	0.012	1.0	0.012
Narrowband 915MHz	0.002	0.6	0.003
BLE	0.0001	1.0	0.0001
		∑=	0.015

Configuration with EUT model NDLM007US-2

FCC ID	Power Density	Limit	PD/Limit
	mW/m^2	mW/cm^2	
LTE Cat1	0.012	1.0	0.012
Narrowband 915MHz	0.002	0.6	0.003
BLE	0.0001	1.0	0.0001
		∑=	0.015

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END OF TEST REPORT