

RF EXPOSURE REPORT

OF

Applicant: Murata Manufacturing Co., Ltd.
1-10-1 Higashikotari, Nagaokakyo-shi, Kyoto 617-8555
Japan

Product Name: Communication Module

Brand Name: muRata

Model No. / Type No.: 1SS

Model Difference: N/A

Report Number: ER/2019/60071

FCC ID VPYLB1SS

IC 772C-LB1SS

FCC Rule Part Part 2.1091

IC Rule Part RSS-102 issue 5

Issue Date: Sep. 11, 2019

Date of Test: Jun. 24, 2019 ~ Jul. 04, 2019

Date of EUT Received: Jun. 24, 2019

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. The test data, data evaluation in this report is in compliance with FCC Rules Part 2.1091 & ISSED RSS-102 issue 5.

The test results of this report relate only to the tested sample identified in this report.

Approved By:

John Teh

John Yeh / Assistant Manager

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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
ER/2019/60071	Rev.00	Initial creation of document	All	Aug. 29, 2019	Yuri Tsai
ER/2019/60071	Rev.01	Updated power table at section 1	5	Sep. 11, 2019	Yuri Tsai

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1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

General:

Product Name:	Communication Module
Brand Name:	muRata
Model No.:	1SS
Model Difference:	N/A
Hardware Version:	1.0
Software Version:	1.0
Power Supply:	3.3Vdc or 5Vdc from USB Port
IMEI:	356321100004845

Antenna Designation

Vendor	Type	Antenna Model No.	Modulation	Frequency (MHz)			Peak Antenna Gain (dBi)
Murata	Monopole	ANT-LTE3-2	LTE Band 2	1850	~	1910	1.8
			LTE Band 4	1710	~	1755	-0.4
			LTE Band 5	824	~	849	1.5
			LTE Band 12	699	~	716	-0.1
			LTE Band 13	777	~	787	1.1
			LTE Band 17	704	~	716	-0.1
			LTE Band 66	1710	~	1780	0.5
			LTE Band 71	663	~	698	0.5
			LTE Band 85	698	~	716	0.0

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NB IoT (FCC):

Operating Frequency (MHz)		Max. Output Power (dBm)	Antenna Gain (dBi)	ERP / EIRP (dBm)
LTE-Band 2	1850.1 ~ 1909.9	23.19	1.8	24.99 (EIRP)
LTE-Band 4	1710.1 ~ 1754.9	23.16	-0.4	22.76 (EIRP)
LTE-Band 5	824.1 ~ 848.9	23.21	1.5	24.71 (ERP)
LTE-Band 12	699.1 ~ 715.9	23.48	-0.1	23.38 (ERP)
LTE-Band 13	777.1 ~ 786.9	23.40	1.1	24.5 (ERP)
LTE-Band 17	704.1 ~ 715.9	23.47	-0.1	23.37 (ERP)
LTE-Band 66	1710.1 ~ 1779.9	23.35	0.5	23.85 (EIRP)
LTE-Band 71	663.1 ~ 697.9	23.72	0.5	24.22 (ERP)
LTE-Band 85	698.1 ~ 715.9	23.54	0.0	23.54 (ERP)

NB IoT (ISED):

Operating Frequency (MHz)		Max. Output Power (dBm)	Antenna Gain (dBi)	ERP / EIRP (dBm)
LTE-Band 2	1850.1 ~ 1909.9	23.19	1.8	24.99 (EIRP)
LTE-Band 4	1710.1 ~ 1754.9	23.16	-0.4	22.76 (EIRP)
LTE-Band 5	824.1 ~ 848.9	23.21	1.5	24.71 (ERP)
LTE-Band 12	699.1 ~ 715.9	23.42	-0.1	23.32 (ERP)
LTE-Band 13	777.1 ~ 786.9	23.40	1.1	24.5 (ERP)
LTE-Band 17	704.1 ~ 715.9	23.46	-0.1	23.36 (ERP)
LTE-Band 66	1710.1 ~ 1779.9	23.35	0.5	23.85 (EIRP)
LTE-Band 71	663.1 ~ 697.9	23.70	0.5	24.2 (ERP)
LTE-Band 85	698.1 ~ 715.9	23.52	0.0	23.52 (ERP)

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2 FCC MAXIMUM PERMISSIBLE EXPOSURE (MPE)

2.1 FCC Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	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
300-1500	/	/	f/1500	30
1500-15000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equipment power density

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2.2 ISED Standard Applicable

This submittal(s) (test report) is intended to comply with RSS-102 issue 5 Radio frequency Radiation Exposure requirement.

This is a Mobile device, the MPE is required.

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field Strength (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

F = frequency in MHz

* = Based on nerve stimulation (NS).

** = Based on specific absorption rate (SAR)

Maximum Permissible Exposure (MPE) Evaluation

Prediction of MPE limit at a given distance

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

Where: S = Power density

P = Power input to antenna

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

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2.3 Power Density Calculation (Worst Case)

FCC MPE								
Operation Mode	Evaluation Frequency (MHz)	Operation Distance (cm)	Max. output Power (dBm)	Antenna Gain (dBi)	Max. output Power EIRP (mW)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Pass / Fail
NB IoT	1850.10	20	23.19	1.80	315.50	0.063	1.000	Pass

IC MPE								
Operation Mode	Evaluation Frequency (MHz)	Operation Distance (cm)	Max. output Power (dBm)	Antenna Gain (dBi)	Output Power EIRP (mW)	Power Density (W/m ²)	Limit (W/m ²)	Pass / Fail
NB IoT	1850.10	20	23.19	1.8	315.50	0.628	4.476	Pass

Note: For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.

~ End of Report ~

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