

RF EXPOSURE REPORT

OF

Applicant: Murata Electronics North America
2200 Lake Park Dr #7604, Smyrna, GA 30080 USA

Product Name: Type 1SC

Brand Name: Murata

Model No.: LBAD0XX1SC-DM

Model Difference: N/A

Report Number: ER/2019/A0129

FCC ID: HSW-TY1SCDM

IC: 4492A-TY1SCDM

FCC Rule Part Part 2.1091

IC Rule: RSS-102 issue 5 Mar. 19, 2015

Issue Date: Feb. 11, 2020

We hereby certify that:

The above equipment was verified by SGS Taiwan Ltd. The evaluation in this report is in compliance with the above rule(s).

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

John Teh

Approved By:**John Yeh / Asst. Manager**Testing Laboratory
0513

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Revision History

Report Number	Revision	Description	Issue Date	Remark
ER/2019/A0129	Rev.00	Original.	Feb. 11, 2020	Revised By: Karen Huang

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1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

1.1 General:

Product Name:	Type 1SC
Brand Name:	Murata
Model No.:	LBAD0XX1SC-DM
Model Difference:	N/A
Hardware Version:	ES2
Software Version:	RK_02_01_02_00_57
Power Supply:	3.6Vdc from DC power supply

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2 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)

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)				
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 FCC MPE Calculation and Maximum Allowable Gain

FCC CAT M1

Operation Mode	Freq. (MHz)	Operation Distance (cm)	Conducted Average output power (dBm)	Max. output Power include tolerance (dBm)	Antenna Gain (dBi)	EIRP (ERP) Limit (dBm)	Max. output Power (mW)	Power Density (PD) (mW/cm ²)	PD Limit (mW/cm ²)	Allowable Gain according to EIRP (dBi)	Allowable Gain according to PD (dBi)	Max Allowable Gain (dBi)
Band 2	1850.7	20	22.80	23.00	10.20	33.00	2089.30	0.416	1.000	10.20	14.01	10.20
Band 4	1710.7	20	22.97	23.00	7.03	30.00	1006.93	0.200	1.000	7.03	14.01	7.03
Band 5	824.7	20	22.46	23.00	11.41	38.45	2760.58	0.549	0.550	15.99	11.41	11.41
Band 12	699.7	20	20.85	23.00	10.69	34.77	2338.84	0.466	0.466	13.92	10.69	10.69
Band 13	779.5	20	20.71	23.00	11.17	34.77	2612.16	0.520	0.520	14.06	11.17	11.17
Band 14	788.1	20	21.51	23.00	11.21	34.77	2636.33	0.525	0.525	13.26	11.21	11.21
Band 17	704.1	20	22.94	23.00	10.72	34.77	2355.05	0.469	0.469	11.83	10.72	10.72
Band 25	1850.7	20	21.11	23.00	11.89	33.00	3083.19	0.614	1.000	11.89	14.01	11.89
Band 26	814.7	20	20.85	23.00	11.36	38.45	2728.98	0.543	0.543	17.60	11.36	11.36

FCC NB IoT

Operation Mode	Freq. (MHz)	Operation Distance (cm)	Conducted Average output power (dBm)	Max. output Power include tolerance (dBm)	Antenna Gain (dBi)	EIRP (ERP) Limit (dBm)	Max. output Power (mW)	Power Density (PD) (mW/cm ²)	PD Limit (mW/cm ²)	Allowable Gain according to EIRP (dBi)	Allowable Gain according to PD (dBi)	Max Allowable Gain (dBi)
Band 2	1850.2	20	22.75	23.00	10.25	33.00	2113.49	0.421	1.000	10.25	14.01	10.25
Band 4	1710.2	20	22.92	23.00	7.08	30.00	1018.59	0.203	1.000	7.08	14.01	7.08
Band 5	824.2	20	22.46	23.00	11.41	38.45	2760.58	0.549	0.549	15.99	11.41	11.41
Band 12	699.2	20	23.49	24.00	9.69	34.77	2338.84	0.466	0.466	11.28	9.69	9.69
Band 13	777.2	20	23.43	24.00	10.15	34.77	2600.16	0.518	0.518	11.34	10.15	10.15
Band 17	704.2	20	23.55	24.00	9.72	34.77	2355.05	0.469	0.469	11.22	9.72	9.72
Band 25	1850.2	20	20.85	22.00	12.15	33.00	2600.16	0.518	1.000	12.15	15.01	12.15
Band 26	814.1	20	23.40	24.00	10.36	38.45	2728.98	0.543	0.543	15.05	10.36	10.36

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2.4 ISED MPE Calculation and Maximum Allowable Gain**ISED CAT M1**

Operation Mode	Freq. (MHz)	Operation Distance (cm)	Conducted Average output power (dBm)	Max. output Power include tolerance (dBm)	Antenna Gain (dBi)	EIRP (ERP) Limit (dBm)	Max. output Power (mW)	Power Density (PD) (W/m ²)	Limit (W/m ²)	Allowable Gain according to EIRP (dBi)	Allowable Gain according to PD (dBi)	Max Allowable Gain (dBi)
Band 2	1850.7	20	22.80	23.00	10.20	33.00	2089.30	4.159	4.477	10.20	10.52	10.20
Band 4	1710.7	20	22.97	23.00	7.03	30.00	1006.93	2.004	4.243	7.03	10.29	7.03
Band 5	824.7	20	22.46	23.00	8.12	38.45	1294.20	2.576	2.577	15.99	8.12	8.12
Band 12	699.7	20	20.85	23.00	7.63	34.77	1156.11	2.301	2.303	13.92	7.63	7.63
Band 13	779.5	20	20.71	23.00	7.96	34.77	1247.38	2.483	2.480	14.06	7.96	7.96
Band 17	704.1	20	22.94	23.00	7.65	34.77	1161.45	2.312	2.313	11.83	7.65	7.65
Band 25	1850.7	20	21.11	23.00	10.52	33.00	2249.05	4.477	4.477	11.89	10.52	10.52
Band 26	814.7	20	20.85	23.00	8.09	38.45	1285.29	2.558	2.556	17.60	8.09	8.09

ISED NB IoT

Operation Mode	Freq. (MHz)	Operation Distance (cm)	Conducted Average output power (dBm)	Max. output Power include tolerance (dBm)	Antenna Gain (dBi)	EIRP (ERP) Limit (dBm)	Max. output Power (mW)	Power Density (PD) (W/m ²)	Limit (W/m ²)	Allowable Gain according to EIRP (dBi)	Allowable Gain according to PD (dBi)	Max Allowable Gain (dBi)
Band 2	1850.2	20	22.75	23.00	10.25	33.00	2113.49	4.207	4.477	10.25	10.52	10.25
Band 4	1710.2	20	22.92	23.00	7.08	30.00	1018.59	2.027	4.242	7.08	10.29	7.08
Band 5	824.2	20	22.46	23.00	8.12	38.45	1294.20	2.576	2.576	15.99	8.12	8.12
Band 12	699.2	20	23.49	24.00	6.63	34.77	1156.11	2.301	2.302	11.28	6.63	6.63
Band 13	777.2	20	23.43	24.00	6.95	34.77	1244.51	2.477	2.475	11.34	6.95	6.95
Band 17	704.2	20	23.55	24.00	6.65	34.77	1161.45	2.312	2.313	11.22	6.65	6.65
Band 25	1850.2	20	20.85	22.00	11.52	33.00	2249.05	4.477	4.477	12.15	11.52	11.52
Band 26	814.1	20	23.40	24.00	7.08	38.45	1282.33	2.552	2.554	15.05	7.08	7.08

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

The calculation maximum power density was equal to or less than the required limits for general population exposure for FCC and RSS-102 provided that the antenna chosen has a gain of equal or lesser than which is shown in the above table.

~ End of Report ~

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