



RF Exposure Evaluation Report

APPLICANT : FIBOCOM WIRELESS INC.
EQUIPMENT : LTE Module
BRAND NAME : FIBOCOM
MODEL NAME : L831-EA
FCC ID : ZMOL831
STANDARD : 47 CFR Part 2.1091

We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

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**Revision History**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA531804	Rev. 01	Initial issue of report	Jun. 29, 2015

**1. Administration Data****1.1. Testing Laboratory**

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958
Applicant	
Company Name	FIBOCOM WIRELESS INC.
Address	5/F, Tower A, Technology Building II, 1057# Nanhai Blvd, Shenzhen, P. R. China
Manufacturer	
Company Name	FIBOCOM WIRELESS INC.
Address	5/F, Tower A, Technology Building II, 1057# Nanhai Blvd, Shenzhen, P. R. China

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	LTE Module
Brand Name	FIBOCOM
Model Name	L831-EA
FCC ID	ZMOL831
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz
Mode	<ul style="list-style-type: none"> • GPRS/EGPRS • RMC12.2Kbps • HSDPA • HSUPA • DC-HSDPA • HSPA+(Downlink only) • LTE
Antenna Type	Fixed External Antenna
Antenna Gain	3dBi
HW Version	V1.0.3
SW Version	L831_V3E.0C.02.00
EUT Stage	Identical Prototype
Remark: 1. The device supports GPRS/EGPRS Class 33. 2. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.	

3. Maximum RF average output power among production units

Mode	Average Power (dBm)	
	GSM850	GSM1900
GSM (GMSK, 1 Tx slot) – CS1	33.5	31.0
GPRS (GMSK, 1 Tx slot) – CS1	33.5	31.0
GPRS (GMSK, 2 Tx slots) – CS1	33.5	31.0
GPRS (GMSK, 3 Tx slots) – CS1	32.5	30.0
GPRS (GMSK, 4 Tx slots) – CS1	31.5	29.0
EDGE (8PSK, 1 Tx slot) – MCS5	28.0	27.0
EDGE (8PSK, 2 Tx slots) – MCS5	28.0	27.0
EDGE (8PSK, 3 Tx slots) – MCS5	27.5	26.0
EDGE (8PSK, 4 Tx slots) – MCS5	26.5	25.0

Mode	Average power (dBm)		
	WCDMA Band V	WCDMA Band II	WCDMA Band IV
AMR 12.2Kbps	24.0	24.0	24.0
RMC 12.2Kbps	24.0	24.0	24.0
HSDPA Subtest-1	24.0	24.0	24.0
HSDPA Subtest-2	24.0	24.0	24.0
HSDPA Subtest-3	23.0	23.0	23.0
HSDPA Subtest-4	23.0	23.0	23.0
DC-HSDPA Subtest-1	23.0	23.0	23.0
DC-HSDPA Subtest-2	23.0	23.0	23.0
DC-HSDPA Subtest-3	23.0	23.0	23.0
DC-HSDPA Subtest-4	23.0	23.0	23.0
HSUPA Subtest-1	23.0	23.0	23.0
HSUPA Subtest-2	21.0	21.5	21.5
HSUPA Subtest-3	22.0	22.5	22.5
HSUPA Subtest-4	21.5	22.0	22.0
HSUPA Subtest-5	23.5	24.0	23.5

Band / Mode		Average Power (dBm)
LTE	Band 17	22.5
	Band 13	22.0
	Band 5	23.0
	Band 4	23.0
	Band 2	23.0
	Band 7	23.5

4. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

Band GSM850	Burst Average Power (dBm)			Frame-Average Power (dBm)		
Tx Channel	128	189	251	128	189	251
Frequency (MHz)	824.2	836.4	848.8	824.2	836.4	848.8
GSM (GMSK, 1 Tx slot) – CS1	32.97	33.12	33.18	23.97	24.12	24.18
GPRS (GMSK, 1 Tx slot) – CS1	32.90	33.02	33.17	23.90	24.02	24.17
GPRS (GMSK, 2 Tx slots) – CS1	32.85	32.90	32.96	26.85	26.90	26.96
GPRS (GMSK, 3 Tx slots) – CS1	32.17	32.19	32.23	27.91	27.93	27.97
GPRS (GMSK, 4 Tx slots) – CS1	31.14	31.25	31.20	28.14	28.25	28.20
EDGE (8PSK, 1 Tx slot) – MCS5	27.76	27.72	27.56	18.76	18.72	18.56
EDGE (8PSK, 2 Tx slots) – MCS5	27.76	27.68	27.54	21.76	21.68	21.54
EDGE (8PSK, 3 Tx slots) – MCS5	27.08	26.91	26.85	22.82	22.65	22.59
EDGE (8PSK, 4 Tx slots) – MCS5	26.06	25.95	25.80	23.06	22.95	22.80
Band GSM1900	Burst Average Power (dBm)			Frame-Average Power (dBm)		
Tx Channel	512	661	810	512	661	810
Frequency (MHz)	1850.2	1880	1909.8	1850.2	1880	1909.8
GSM (GMSK, 1 Tx slot) – CS1	30.86	30.66	30.72	21.86	21.66	21.72
GPRS (GMSK, 1 Tx slot) – CS1	30.84	30.78	30.79	21.84	21.78	21.79
GPRS (GMSK, 2 Tx slots) – CS1	30.85	30.77	30.76	24.85	24.77	24.76
GPRS (GMSK, 3 Tx slots) – CS1	29.92	29.84	29.86	25.66	25.58	25.60
GPRS (GMSK, 4 Tx slots) – CS1	28.44	28.45	28.48	25.44	25.45	25.48
EDGE (8PSK, 1 Tx slot) – MCS5	26.50	26.65	26.68	17.50	17.65	17.68
EDGE (8PSK, 2 Tx slots) – MCS5	26.57	26.62	26.64	20.57	20.62	20.64
EDGE (8PSK, 3 Tx slots) – MCS5	25.78	25.91	25.94	21.52	21.65	21.68
EDGE (8PSK, 4 Tx slots) – MCS5	24.69	24.81	24.88	21.69	21.81	21.88

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:

Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB

Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB

Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB

Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

<WCDMA Conducted Power>

Band	WCDMA Band V			WCDMA Band II			WCDMA Band IV		
Tx Channel	4132	4182	4233	9262	9400	9538	1312	1413	1513
Frequency (MHz)	826.4	836.4	846.6	1852.4	1880	1907.6	1712.4	1732.6	1752.6
3GPP Rel 99 AMR 12.2Kbps	23.35	23.54	23.65	23.88	23.84	23.79	23.72	23.85	23.81
3GPP Rel 99 RMC 12.2Kbps	23.36	23.55	23.66	23.89	23.85	23.80	23.73	23.86	23.82
3GPP Rel 6 HSDPA Subtest-1	23.25	23.45	23.60	23.85	23.70	23.62	23.65	23.74	23.70
3GPP Rel 6 HSDPA Subtest-2	22.72	23.03	23.12	23.42	23.35	23.23	23.20	23.31	23.24
3GPP Rel 6 HSDPA Subtest-3	22.33	22.18	22.67	22.94	22.88	22.78	22.76	22.91	22.75
3GPP Rel 6 HSDPA Subtest-4	22.12	22.30	22.44	22.64	22.64	22.50	22.53	22.68	22.51
3GPP Rel 8 DC-HSDPA Subtest-1	22.18	22.37	22.45	22.39	22.32	22.34	22.38	22.34	22.38
3GPP Rel 8 DC-HSDPA Subtest-2	22.14	22.35	22.42	22.38	22.32	22.35	22.32	22.31	22.36
3GPP Rel 8 DC-HSDPA Subtest-3	22.13	22.32	21.72	22.32	22.33	21.86	22.30	22.27	21.68
3GPP Rel 8 DC-HSDPA Subtest-4	22.10	22.29	21.98	22.31	22.31	21.58	22.31	22.24	21.89
3GPP Rel 6 HSUPA Subtest-1	22.35	22.54	22.68	22.94	22.84	22.75	22.76	22.90	22.87
3GPP Rel 6 HSUPA Subtest-2	20.67	20.80	20.90	21.23	21.16	21.09	21.10	21.21	21.13
3GPP Rel 6 HSUPA Subtest-3	21.69	21.84	21.95	22.21	22.18	22.01	22.05	22.19	22.02
3GPP Rel 6 HSUPA Subtest-4	21.12	21.05	21.14	21.55	21.47	21.35	21.34	21.50	21.34
3GPP Rel 6 HSUPA Subtest-5	23.06	23.12	23.21	23.51	23.40	23.21	23.31	23.45	23.32

<LTE Conducted Power>
<LTE Band 17>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	MPR (dB)
Channel				23780	23790	23800	
Frequency (MHz)				709	710	711	
10	QPSK	1	0	22.08	22.08	22.18	0
10	QPSK	1	24	22.11	22.27	22.19	
10	QPSK	1	49	21.85	22.15	22.02	
10	QPSK	25	0	20.93	21.46	21.26	0-1
10	QPSK	25	12	21.02	21.29	21.27	
10	QPSK	25	24	20.94	21.23	21.24	
10	QPSK	50	0	20.97	21.22	21.25	0-1
10	16QAM	1	0	21.66	21.85	21.82	
10	16QAM	1	24	21.60	21.76	21.81	
10	16QAM	1	49	21.40	21.79	21.60	0-2
10	16QAM	25	0	20.18	20.30	20.39	
10	16QAM	25	12	20.12	20.36	20.34	
10	16QAM	25	24	20.06	20.30	20.29	0-2
10	16QAM	50	0	20.18	20.38	20.29	
Channel				23755	23790	23825	MPR (dB)
Frequency (MHz)				706.5	710	713.5	
5	QPSK	1	0	22.01	22.20	22.06	0
5	QPSK	1	12	21.91	22.24	22.04	
5	QPSK	1	24	21.79	22.04	22.00	
5	QPSK	12	0	21.04	21.22	21.11	0-1
5	QPSK	12	6	20.95	21.25	21.12	
5	QPSK	12	11	21.01	21.15	21.11	
5	QPSK	25	0	20.95	21.18	21.14	0-1
5	16QAM	1	0	21.16	21.41	21.06	
5	16QAM	1	12	21.17	21.30	21.08	
5	16QAM	1	24	21.07	21.11	21.03	0-2
5	16QAM	12	0	20.16	20.38	20.15	
5	16QAM	12	6	20.14	20.30	20.22	
5	16QAM	12	11	20.14	20.34	20.22	0-2
5	16QAM	25	0	20.16	20.35	20.19	

<LTE Band 13>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	MPR (dB)
Channel					23230		
Frequency (MHz)					782		
10	QPSK	1	0		21.51		0
10	QPSK	1	24		21.69		
10	QPSK	1	49		21.19		
10	QPSK	25	0		20.69		0-1
10	QPSK	25	12		20.68		
10	QPSK	25	24		20.64		
10	QPSK	50	0		20.72		0-1
10	16QAM	1	0		20.86		
10	16QAM	1	24		21.02		
10	16QAM	1	49		20.52		0-2
10	16QAM	25	0		19.80		
10	16QAM	25	12		19.64		
10	16QAM	25	24		19.67		0-2
10	16QAM	50	0		19.70		
Channel				23205	23230	23255	MPR (dB)
Frequency (MHz)				779.5	782	784.5	
5	QPSK	1	0	21.70	21.74	21.77	0
5	QPSK	1	12	21.80	21.79	21.82	
5	QPSK	1	24	21.79	21.68	21.73	
5	QPSK	12	0	20.74	20.68	20.78	0-1
5	QPSK	12	6	20.69	20.75	20.74	
5	QPSK	12	11	20.71	20.74	20.73	
5	QPSK	25	0	20.71	20.76	20.69	0-1
5	16QAM	1	0	20.99	21.14	21.10	
5	16QAM	1	12	21.13	21.08	21.13	
5	16QAM	1	24	21.04	21.10	20.97	0-2
5	16QAM	12	0	19.74	19.85	19.77	
5	16QAM	12	6	19.76	19.80	19.74	
5	16QAM	12	11	19.69	19.85	19.75	0-2
5	16QAM	25	0	19.70	19.73	19.71	

<LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	MPR (dB)
Channel				20450	20525	20600	
Frequency (MHz)				829	836.5	844	
10	QPSK	1	0	22.36	22.28	22.11	0
10	QPSK	1	24	22.19	22.17	22.07	
10	QPSK	1	49	22.09	21.89	21.94	
10	QPSK	25	0	21.46	21.33	21.24	0-1
10	QPSK	25	12	21.40	21.22	21.13	
10	QPSK	25	24	21.36	21.15	21.17	
10	QPSK	50	0	21.43	21.31	21.09	0-1
10	16QAM	1	0	21.87	21.67	21.52	
10	16QAM	1	24	21.63	21.34	21.38	
10	16QAM	1	49	21.49	21.33	21.30	0-2
10	16QAM	25	0	20.59	20.36	20.40	
10	16QAM	25	12	20.46	20.36	20.29	
10	16QAM	25	24	20.45	20.30	20.34	0-2
10	16QAM	50	0	20.44	20.33	20.31	
Channel				20425	20525	20625	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5	
5	QPSK	1	0	22.42	22.20	22.12	0
5	QPSK	1	12	22.35	22.18	22.06	
5	QPSK	1	24	22.32	22.17	22.10	
5	QPSK	12	0	21.40	21.35	21.20	0-1
5	QPSK	12	6	21.41	21.31	21.25	
5	QPSK	12	11	21.43	21.25	21.26	
5	QPSK	25	0	21.40	21.22	21.25	0-1
5	16QAM	1	0	21.50	21.26	21.17	
5	16QAM	1	12	21.39	21.19	21.36	
5	16QAM	1	24	21.29	21.08	21.30	0-2
5	16QAM	12	0	20.47	20.30	20.30	
5	16QAM	12	6	20.48	20.24	20.30	
5	16QAM	12	11	20.46	20.25	20.29	0-2
5	16QAM	25	0	20.50	20.24	20.28	



BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	MPR (dB)
Channel				20415	20525	20635	
Frequency (MHz)				825.5	836.5	847.5	
3	QPSK	1	0	22.82	22.64	22.61	0
3	QPSK	1	7	22.81	22.58	22.60	
3	QPSK	1	14	22.80	22.59	22.59	
3	QPSK	8	0	21.94	22.69	21.72	0-1
3	QPSK	8	4	21.91	21.70	21.70	
3	QPSK	8	7	21.89	21.66	21.69	
3	QPSK	15	0	21.91	21.67	21.70	0-1
3	16QAM	1	0	22.11	21.82	21.86	
3	16QAM	1	7	22.13	21.78	21.83	
3	16QAM	1	14	21.89	21.75	21.89	0-2
3	16QAM	8	0	20.93	20.72	20.76	
3	16QAM	8	4	20.91	20.71	20.71	
3	16QAM	8	7	20.89	20.70	20.67	
3	16QAM	15	0	20.93	20.77	20.76	
Channel				20407	20525	20643	MPR
Frequency (MHz)				824.7	836.5	848.3	(dB)
1.4	QPSK	1	0	22.86	22.68	22.71	0
1.4	QPSK	1	2	22.87	22.52	22.76	
1.4	QPSK	1	5	22.84	22.66	22.72	
1.4	QPSK	3	0	22.91	22.71	22.68	
1.4	QPSK	3	1	22.89	22.70	22.70	
1.4	QPSK	3	2	22.90	22.72	22.67	
1.4	QPSK	6	0	21.94	21.72	21.73	0-1
1.4	16QAM	1	0	22.01	21.82	21.81	0-1
1.4	16QAM	1	2	22.03	21.77	21.85	
1.4	16QAM	1	5	22.06	21.78	21.81	
1.4	16QAM	3	0	21.96	21.71	21.77	
1.4	16QAM	3	1	21.93	21.73	21.80	
1.4	16QAM	3	2	21.95	21.72	21.75	
1.4	16QAM	6	0	20.95	20.69	20.75	0-2



<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	MPR (dB)
Channel				20050	20175	20300	
Frequency (MHz)				1720	1732.5	1745	
20	QPSK	1	0	22.25	22.44	22.60	
20	QPSK	1	49	21.80	22.04	22.32	0
20	QPSK	1	99	21.81	21.84	22.09	
20	QPSK	50	0	21.22	21.30	21.51	
20	QPSK	50	24	21.40	21.12	21.20	0-1
20	QPSK	50	49	21.03	21.10	21.17	
20	QPSK	100	0	21.17	21.17	21.34	
20	16QAM	1	0	21.81	21.91	22.01	0-1
20	16QAM	1	49	21.33	21.38	21.45	
20	16QAM	1	99	21.32	21.36	21.26	
20	16QAM	50	0	20.35	20.29	20.61	0-2
20	16QAM	50	24	20.08	20.10	20.31	
20	16QAM	50	49	20.11	20.07	20.30	
20	16QAM	100	0	20.23	20.19	20.40	
Channel				20025	20175	20325	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5	
15	QPSK	1	0	22.17	22.28	22.61	
15	QPSK	1	37	21.64	22.02	22.05	0
15	QPSK	1	74	21.82	21.92	22.06	
15	QPSK	36	0	21.19	21.22	21.52	
15	QPSK	36	18	20.89	21.09	21.25	0-1
15	QPSK	36	37	20.91	21.04	21.24	
15	QPSK	75	0	21.07	21.16	21.41	
15	16QAM	1	0	21.34	21.65	21.95	0-1
15	16QAM	1	37	21.06	21.26	21.40	
15	16QAM	1	74	21.14	21.20	21.42	
15	16QAM	36	0	20.41	20.45	20.62	0-2
15	16QAM	36	18	20.06	20.18	20.35	
15	16QAM	36	37	20.08	20.19	20.29	
15	16QAM	75	0	19.94	20.15	20.42	
Channel				20000	20175	20350	MPR (dB)
Frequency (MHz)				1715	1732.5	1750	
10	QPSK	1	0	22.51	22.70	22.91	
10	QPSK	1	24	22.13	22.48	22.54	0
10	QPSK	1	49	22.22	22.47	22.51	
10	QPSK	25	0	21.36	21.61	21.77	
10	QPSK	25	12	21.23	21.47	21.59	0-1
10	QPSK	25	24	21.24	21.45	21.56	
10	QPSK	50	0	21.31	21.53	21.66	
10	16QAM	1	0	21.69	21.96	22.19	0-1
10	16QAM	1	24	21.39	21.57	21.89	
10	16QAM	1	49	21.43	21.74	21.81	
10	16QAM	25	0	20.41	20.67	20.83	0-2
10	16QAM	25	12	20.29	20.54	20.70	
10	16QAM	25	24	20.30	20.56	20.65	
10	16QAM	50	0	20.40	20.61	20.69	



BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	MPR (dB)
Channel				19975	20175	20375	
Frequency (MHz)				1712.5	1732.5	1752.5	
5	QPSK	1	0	21.96	22.10	22.35	0
5	QPSK	1	12	21.90	22.12	22.20	
5	QPSK	1	24	21.79	22.01	22.16	
5	QPSK	12	0	20.87	21.07	21.29	0-1
5	QPSK	12	6	20.85	20.99	21.18	
5	QPSK	12	11	20.77	20.99	21.09	
5	QPSK	25	0	20.88	21.11	21.17	0-1
5	16QAM	1	0	21.43	21.55	21.77	
5	16QAM	1	12	21.34	21.44	21.61	
5	16QAM	1	24	21.14	21.40	21.53	0-2
5	16QAM	12	0	20.05	20.38	20.42	
5	16QAM	12	6	19.96	20.18	20.30	
5	16QAM	12	11	19.95	20.23	20.27	0-2
5	16QAM	25	0	19.95	20.08	20.31	
Channel				19965	20175	20385	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5	
3	QPSK	1	0	22.23	22.47	22.56	0
3	QPSK	1	7	22.16	22.37	22.43	
3	QPSK	1	14	22.11	22.38	22.39	
3	QPSK	8	0	21.26	21.49	21.58	0-1
3	QPSK	8	4	21.23	21.48	21.56	
3	QPSK	8	7	21.22	21.44	21.50	
3	QPSK	15	0	21.24	21.50	21.55	0-1
3	16QAM	1	0	21.42	21.72	21.79	
3	16QAM	1	7	21.39	21.71	21.72	
3	16QAM	1	14	21.44	21.70	21.71	0-2
3	16QAM	8	0	20.31	20.55	20.62	
3	16QAM	8	4	20.28	20.57	20.61	
3	16QAM	8	7	20.26	20.53	20.55	0-2
3	16QAM	15	0	20.32	20.57	20.66	
Channel				19957	20175	20393	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3	
1.4	QPSK	1	0	21.82	22.02	22.21	0
1.4	QPSK	1	2	21.84	22.13	22.08	
1.4	QPSK	1	5	21.84	22.08	22.15	
1.4	QPSK	3	0	21.92	22.12	22.18	
1.4	QPSK	3	1	21.88	22.09	22.26	
1.4	QPSK	3	2	21.85	22.10	22.11	
1.4	QPSK	6	0	20.92	21.01	21.25	0-1
1.4	16QAM	1	0	21.10	21.40	21.40	0-1
1.4	16QAM	1	2	21.10	21.45	21.42	
1.4	16QAM	1	5	21.09	21.33	21.39	
1.4	16QAM	3	0	20.96	21.15	21.09	
1.4	16QAM	3	1	20.94	21.31	21.07	
1.4	16QAM	3	2	20.96	21.25	21.06	
1.4	16QAM	6	0	20.02	20.26	20.30	0-2

**<LTE Band 2>**

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	MPR (dB)
Channel				18700	18900	19100	
Frequency (MHz)				1860	1880	1900	
20	QPSK	1	0	22.40	22.39	22.23	0
20	QPSK	1	49	22.25	21.96	21.84	
20	QPSK	1	99	22.17	21.87	21.73	
20	QPSK	50	0	21.30	21.23	21.04	0-1
20	QPSK	50	24	20.97	20.88	20.76	
20	QPSK	50	49	20.94	20.80	20.78	
20	QPSK	100	0	21.08	21.02	20.90	0-1
20	16QAM	1	0	21.67	21.92	21.80	
20	16QAM	1	49	21.03	21.03	21.26	
20	16QAM	1	99	20.77	21.11	21.14	0-2
20	16QAM	50	0	20.42	20.45	20.29	
20	16QAM	50	24	20.10	20.05	20.01	
20	16QAM	50	49	20.06	20.04	19.97	0-2
20	16QAM	100	0	20.29	20.21	20.04	
Channel				18675	18900	19125	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5	
15	QPSK	1	0	22.19	22.33	22.00	0
15	QPSK	1	37	21.84	21.79	21.79	
15	QPSK	1	74	21.59	21.64	21.55	
15	QPSK	36	0	21.27	21.21	20.95	0-1
15	QPSK	36	18	21.04	20.91	20.84	
15	QPSK	36	37	20.96	20.86	20.72	
15	QPSK	75	0	21.01	21.00	20.78	0-1
15	16QAM	1	0	21.78	21.90	21.50	
15	16QAM	1	37	21.47	21.38	21.08	
15	16QAM	1	74	21.15	21.30	21.12	0-2
15	16QAM	36	0	20.28	20.35	20.18	
15	16QAM	36	18	20.18	20.14	19.94	
15	16QAM	36	37	20.04	20.04	19.90	0-2
15	16QAM	75	0	20.11	20.15	20.02	
Channel				18650	18900	19150	MPR (dB)
Frequency (MHz)				1855	1880	1905	
10	QPSK	1	0	22.38	22.31	21.96	0
10	QPSK	1	24	21.94	21.78	21.84	
10	QPSK	1	49	21.99	21.62	21.74	
10	QPSK	25	0	21.15	21.09	20.93	0-1
10	QPSK	25	12	21.07	20.85	20.77	
10	QPSK	25	24	20.91	20.82	20.72	
10	QPSK	50	0	20.96	20.99	20.93	0-1
10	16QAM	1	0	21.90	21.55	21.56	
10	16QAM	1	24	21.63	21.51	21.44	
10	16QAM	1	49	20.97	21.08	21.41	0-2
10	16QAM	25	0	20.37	20.13	20.12	
10	16QAM	25	12	20.15	20.08	19.88	
10	16QAM	25	24	20.07	19.93	19.88	0-2
10	16QAM	50	0	20.22	20.07	20.17	



BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	MPR (dB)
Channel				18625	18900	19175	
Frequency (MHz)				1852.5	1880	1907.5	
5	QPSK	1	0	22.12	21.86	21.69	0
5	QPSK	1	12	22.02	21.88	21.69	
5	QPSK	1	24	21.95	21.54	21.65	
5	QPSK	12	0	21.11	20.95	20.87	0-1
5	QPSK	12	6	21.04	20.90	20.85	
5	QPSK	12	11	20.97	20.84	20.87	
5	QPSK	25	0	21.03	20.87	20.85	0-1
5	16QAM	1	0	21.32	21.19	21.08	
5	16QAM	1	12	21.31	21.24	21.09	
5	16QAM	1	24	21.41	20.96	20.98	0-2
5	16QAM	12	0	20.27	20.08	19.95	
5	16QAM	12	6	20.21	20.01	20.01	
5	16QAM	12	11	20.13	19.96	19.99	0-2
5	16QAM	25	0	20.29	20.02	20.03	
Channel				18615	18900	19185	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5	
3	QPSK	1	0	22.53	22.50	22.45	0
3	QPSK	1	7	22.48	22.53	22.40	
3	QPSK	1	14	22.44	22.43	22.42	
3	QPSK	8	0	21.57	21.59	21.56	0-1
3	QPSK	8	4	21.54	21.53	21.57	
3	QPSK	8	7	21.55	21.52	21.52	
3	QPSK	15	0	21.56	21.54	21.55	0-1
3	16QAM	1	0	21.75	21.70	21.76	
3	16QAM	1	7	21.80	21.75	21.74	
3	16QAM	1	14	21.71	21.71	21.69	0-2
3	16QAM	8	0	20.72	20.71	20.70	
3	16QAM	8	4	20.67	20.65	20.67	
3	16QAM	8	7	20.65	20.61	20.69	0-2
3	16QAM	15	0	20.75	20.69	20.74	
Channel				18607	18900	19193	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3	
1.4	QPSK	1	0	22.51	22.43	22.53	0
1.4	QPSK	1	2	22.49	22.43	22.53	
1.4	QPSK	1	5	22.52	22.45	22.54	
1.4	QPSK	3	0	22.54	22.51	22.54	
1.4	QPSK	3	1	22.53	22.46	22.52	
1.4	QPSK	3	2	22.50	22.54	22.52	
1.4	QPSK	6	0	21.58	21.56	21.59	0-1
1.4	16QAM	1	0	21.75	21.78	21.74	0-1
1.4	16QAM	1	2	21.78	21.74	21.65	
1.4	16QAM	1	5	21.68	21.76	21.66	
1.4	16QAM	3	0	21.64	21.62	21.63	
1.4	16QAM	3	1	21.66	21.60	21.58	
1.4	16QAM	3	2	21.60	21.58	21.62	
1.4	16QAM	6	0	20.74	20.67	20.69	0-2

<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	MPR (dB)
Channel				20850	21100	21350	
Frequency (MHz)				2510	2535	2560	
20	QPSK	1	0	22.71	22.87	22.96	0
20	QPSK	1	49	22.22	22.23	22.35	
20	QPSK	1	99	22.24	22.33	22.36	
20	QPSK	50	0	21.54	21.74	21.94	0-1
20	QPSK	50	24	21.03	21.37	21.65	
20	QPSK	50	49	21.14	21.35	21.65	
20	QPSK	100	0	21.39	21.63	21.83	
20	16QAM	1	0	21.88	22.10	22.56	0-1
20	16QAM	1	49	21.09	21.35	21.36	
20	16QAM	1	99	21.15	21.26	21.69	
20	16QAM	50	0	20.72	20.95	21.22	0-2
20	16QAM	50	24	20.31	20.69	20.88	
20	16QAM	50	49	20.36	20.70	20.84	
20	16QAM	100	0	20.60	21.02	21.00	
Channel				20825	21100	21375	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5	
15	QPSK	1	0	22.54	22.61	23.18	0
15	QPSK	1	37	22.04	22.34	22.81	
15	QPSK	1	74	22.09	22.35	22.60	
15	QPSK	36	0	21.34	21.67	21.72	0-1
15	QPSK	36	18	21.02	21.41	21.64	
15	QPSK	36	37	21.03	21.29	21.65	
15	QPSK	75	0	21.15	21.52	21.79	
15	16QAM	1	0	21.55	21.90	22.01	0-1
15	16QAM	1	37	21.03	21.27	21.67	
15	16QAM	1	74	20.88	21.37	21.60	
15	16QAM	36	0	20.59	20.95	21.36	0-2
15	16QAM	36	18	20.30	20.67	20.85	
15	16QAM	36	37	20.26	20.65	20.96	
15	16QAM	75	0	20.36	20.78	21.07	



BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	MPR (dB)
Channel				20800	21100	21400	
Frequency (MHz)				2505	2535	2565	
10	QPSK	1	0	22.14	22.58	22.81	
10	QPSK	1	24	21.87	22.35	22.51	0
10	QPSK	1	49	21.78	22.27	22.53	
10	QPSK	25	0	21.10	21.48	21.73	
10	QPSK	25	12	20.96	21.29	21.55	0-1
10	QPSK	25	24	20.75	21.31	21.56	
10	QPSK	50	0	20.94	21.30	21.58	
10	16QAM	1	0	21.23	21.29	21.68	0-1
10	16QAM	1	24	21.22	21.48	22.01	
10	16QAM	1	49	21.03	21.67	21.37	
10	16QAM	25	0	20.41	20.74	21.00	0-2
10	16QAM	25	12	20.20	20.56	20.81	
10	16QAM	25	24	20.03	20.59	20.87	
10	16QAM	50	0	20.33	20.67	20.98	
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	MPR (dB)
Channel				20775	21100	21425	
Frequency (MHz)				2502.5	2535	2567.5	
5	QPSK	1	0	21.85	22.28	22.49	
5	QPSK	1	12	21.91	22.30	22.44	0
5	QPSK	1	24	21.75	22.13	22.36	
5	QPSK	12	0	20.94	21.35	21.60	
5	QPSK	12	6	20.72	21.34	21.54	0-1
5	QPSK	12	11	20.74	21.26	21.55	
5	QPSK	25	0	20.89	21.29	21.54	
5	16QAM	1	0	20.80	21.15	21.38	0-1
5	16QAM	1	12	20.75	21.09	21.28	
5	16QAM	1	24	20.64	21.04	21.23	
5	16QAM	12	0	20.27	20.69	20.94	0-2
5	16QAM	12	6	20.32	20.71	20.88	
5	16QAM	12	11	20.01	20.56	20.87	
5	16QAM	25	0	20.20	20.61	20.85	

The table below summarized necessary items addressed in KDB 941225 D05 v02r03

FCC ID	ZMOL831																																														
EUT	LTE Module																																														
Operating Frequency Range of each LTE transmission band	LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 7: 2506.5 MHz ~ 2567.5 MHz																																														
Channel Bandwidth	1.4MHz, 3MHz, 5MHz, 10MHz (LTE Band 5) 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz (LTE Band 2/4) 5MHz, 10MHz, 15MHz, 20MHz (LTE Band 7) 5MHz, 10MHz (LTE Band 13/17)																																														
uplink modulations used	QPSK and 16QAM																																														
LTE MPR permanently built-in by design	<table><tr><th colspan="8">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</th></tr><tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr><tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr><tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr></table>	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3								Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3																																															
Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)																																								
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz																																									
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1																																								
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1																																								
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2																																								
LTE -MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI).																																														
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																														



Transmission (H, M, L) channel numbers and frequencies in each LTE band												
Band 17												
	Bandwidth 5 MHz					Bandwidth 10 MHz						
	Channel #		Frequency (MHz)			Channel #		Frequency (MHz)				
L	23755		706.5			23780		709				
M	23790		710			23790		710				
H	23825		713.5			23800		711				
Band 13												
	Bandwidth 5 MHz					Bandwidth 10 MHz						
	Channel #		Frequency (MHz)			Channel #		Frequency (MHz)				
L	23205		779.5			23230		782				
M	23230		782									
H	23255		784.5									
LTE Band 5												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)		
L	20407	824.7	20415	825.5	20425	826.5	20450	829				
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5				
H	20643	848.3	20635	847.5	20625	846.5	20600	844				
LTE Band 4												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745
LTE Band 2												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900
LTE Band 7												
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510				
M	21100	2535	21100	2535	21100	2535	21100	2535				
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560				

5. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) 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
1500-100,000			1.0	30

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna



6. Radio Frequency Radiation Exposure Evaluation

6.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)
GSM 850 (1 Tx slot)	824.2	3.00	33.50	36.50	4.47	562.34	0.11	0.55
GPRS 850 (1 Tx slot)	824.2	3.00	33.50	36.50	4.47	562.34	0.11	0.55
GPRS 850 (2 Tx slots)	824.2	3.00	33.50	36.50	4.47	1122.02	0.22	0.55
GPRS 850 (3 Tx slots)	824.2	3.00	32.50	35.50	3.55	1330.45	0.26	0.55
GPRS 850 (4 Tx slots)	824.2	3.00	31.50	34.50	2.82	1412.54	0.28	0.55
EGPRS 850 (1 Tx slot)	824.2	3.00	28.00	31.00	1.26	158.49	0.03	0.55
EGPRS 850 (2 Tx slots)	824.2	3.00	28.00	31.00	1.26	316.23	0.06	0.55
EGPRS 850 (3 Tx slots)	824.2	3.00	27.50	30.50	1.12	420.73	0.08	0.55
EGPRS 850 (4 Tx slots)	824.2	3.00	26.50	29.50	0.89	446.68	0.09	0.55
GSM 1900 (1 Tx slot)	1850.2	3.00	31.00	34.00	2.51	316.23	0.06	1.00
GPRS 1900 (1 Tx slot)	1850.2	3.00	31.00	34.00	2.51	316.23	0.06	1.00
GPRS 1900 (2 Tx slots)	1850.2	3.00	31.00	34.00	2.51	630.96	0.13	1.00
GPRS 1900 (3 Tx slots)	1850.2	3.00	30.00	33.00	2.00	748.17	0.15	1.00
GPRS 1900 (4 Tx slots)	1850.2	3.00	29.00	32.00	1.58	794.33	0.16	1.00
EGPRS 1900 (1 Tx slot)	1850.2	3.00	27.00	30.00	1.00	125.89	0.03	1.00
EGPRS 1900 (2 Tx slots)	1850.2	3.00	27.00	30.00	1.00	251.19	0.05	1.00
EGPRS 1900 (3 Tx slots)	1850.2	3.00	26.00	29.00	0.79	297.85	0.06	1.00
EGPRS 1900 (4 Tx slots)	1850.2	3.00	25.00	28.00	0.63	316.23	0.06	1.00
WCDMA Band V	826.4	3.00	24.00	27.00	0.50	501.19	0.10	0.55
WCDMA Band IV	1712.4	3.00	24.00	27.00	0.50	501.19	0.10	1.00
WCDMA Band II	1852.4	3.00	24.00	27.00	0.50	501.19	0.10	1.00
LTE Band 17	706.5	3.00	22.50	25.50	0.35	354.81	0.07	0.47
LTE Band 13	779.5	3.00	22.00	25.00	0.32	316.23	0.06	0.52
LTE Band 5	824.7	3.00	23.00	26.00	0.40	398.11	0.08	0.55
LTE Band 4	1710.7	3.00	23.00	26.00	0.40	398.11	0.08	1.00
LTE Band 2	1850.7	3.00	23.00	26.00	0.40	398.11	0.08	1.00
LTE Band 7	2502.5	3.00	23.50	26.50	0.45	446.68	0.09	1.00

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

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.