



RF Exposure Evaluation Report

APPLICANT : Ness Corporation
EQUIPMENT : Hub
BRAND NAME : Mezzo
MODEL NAME : Mezzo-915
FCC ID : O2K-MEZZO915LTE
STANDARD : 47 CFR Part 2.1091

We, Sporton International (Shenzhen) 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 (Shenzhen) Inc., the test report shall not be reproduced except in full.

Approved by: Mark Qu / Manager



Sporton International (Shenzhen) Inc.

***1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City
Guangdong Province 518055 China***



Table of Contents

1. ADMINISTRATION DATA	4
1.1. Testing Laboratory	4
2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	5
3. MAXIMUM RF AVERAGE OUTPUT POWER AMONG PRODUCTION UNITS	6
4. RF EXPOSURE LIMIT INTRODUCTION	11
5. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION	12
5.1. Standalone Power Density Calculation	12
5.2. Collocated Power Density Calculation.....	13

**Revision History**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA7D1404	Rev. 01	Initial issue of report	Feb. 14, 2018



1. Administration Data

1.1. Testing Laboratory

Testing Laboratory	
Test Site	Sporton International (Shenzhen) Inc.
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City Guangdong Province 518055 China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595

Applicant	
Company Name	Ness Corporation
Address	4/167 Prospect Hwy, SEVEN HILLS, NSW 2147 AUSTRALIA

Manufacturer	
Company Name	Ness Corporation
Address	4/167 Prospect Hwy, SEVEN HILLS, NSW 2147 AUSTRALIA

**2. Description of Equipment Under Test (EUT)**

Product Feature & Specification	
EUT Type	Hub
Brand Name	Mezzo
Model Name	Mezzo-915
FCC ID	O2K-MEZZO915LTE
IMEI Code	355285080000240
Wireless Technology and Frequency Range	WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Z-wave: 908.4 MHz ~ 916 MHz SRD: 903 MHz ~ 927 MHz
Mode	RMC 12.2Kbps HSDPA LTE: QPSK, 16QAM 802.11b/g/n HT20/HT40 Z-wave: 2FSK(9.6kbps/40kbps)/2GFSK(100kbps) SRD: GFSK
Antenna Type	WWAN : Fixed Internal Antenna WLAN : Fixed Internal Antenna Z-wave : Fixed Internal Antenna SRD : Fixed Internal Antenna
Antenna Gain	WWAN : 2.00 dBi WLAN : 2.00 dBi Z-wave : 2.15 dBi SRD : 2.15 dBi
HW Version	2
SW Version	00.02.17
EUT Stage	Identical Prototype
Remark: 1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description. 2. This device has no voice function.	

**3. Maximum RF average output power among production units****<WCDMA>**

Mode	Average Power (dBm)	
	WCDMA Band II	WCDMA Band V
RMC 12.2Kbps	24.00	24.00
HSDPA Subtest-1	24.00	24.00
HSDPA Subtest-2	23.50	23.50
HSDPA Subtest-3	23.00	23.00
HSDPA Subtest-4	23.00	23.00

<LTE>

Average Power (dBm)								
Modulation	BW (MHz)	RB Size	Target MPR	LTE Band 2	LTE Band 4	LTE Band 5	LTE Band 12	LTE Band 13
QPSK	20	≤ 18	0	23.00	23.00	-	-	-
QPSK	20	> 18	0-1	22.50	22.50	-	-	-
16QAM	20	≤ 18	0-1	23.00	23.00	-	-	-
16QAM	20	> 18	0-2	21.50	21.50	-	-	-
QPSK	15	≤ 16	0	23.00	23.00	-	-	-
QPSK	15	> 16	0-1	22.50	22.50	-	-	-
16QAM	15	≤ 16	0-1	23.00	23.00	-	-	-
16QAM	15	> 16	0-2	21.50	21.50	-	-	-
QPSK	10	≤ 12	0	23.00	23.00	23.00	23.00	23.00
QPSK	10	> 12	0-1	22.50	22.50	22.00	22.50	22.50
16QAM	10	≤ 12	0-1	23.00	23.00	22.50	22.50	22.50
16QAM	10	> 12	0-2	21.50	21.50	21.50	21.50	21.50
QPSK	5	≤ 8	0	23.00	23.00	23.00	23.00	23.00
QPSK	5	> 8	0-1	22.50	22.50	22.00	22.50	22.50
16QAM	5	≤ 8	0-1	23.00	23.00	22.50	22.50	22.50
16QAM	5	> 8	0-2	21.50	21.50	21.50	21.50	21.50
QPSK	3	≤ 4	0	23.00	23.00	23.00	23.00	-
QPSK	3	> 4	0-1	22.50	22.50	22.00	22.50	-
16QAM	3	≤ 4	0-1	23.00	23.00	22.50	22.50	-
16QAM	3	> 4	0-2	21.50	21.50	21.50	21.50	-
QPSK	1.4	≤ 5	0	23.00	23.00	23.00	23.00	-
QPSK	1.4	> 5	0-1	22.50	22.50	22.00	22.50	-
16QAM	1.4	≤ 5	0-1	23.00	23.00	22.50	22.50	-
16QAM	1.4	> 5	0-2	21.50	21.50	21.50	21.50	-

Remark: The mark “-” in gray means that this bandwidth is not supported.

Summarized necessary items addressed in KDB 941225 D05 v02r05																																																				
FCC ID	O2K-MEZZO915LTE																																																			
EUT	Hub																																																			
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz																																																			
Channel Bandwidth	LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 13: 5MHz, 10MHz																																																			
Uplink modulations used	QPSK and 16QAM																																																			
LTE Voice / Data requirements	Data Only																																																			
LTE Release Version	R9, Cat4																																																			
CA Support	Not Supported																																																			
LTE MPR permanently built-in by design	<table><tr><th colspan="7">Table 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3</th></tr><tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth configuration (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 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3							Modulation	Channel bandwidth / Transmission bandwidth configuration (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 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3																																																				
Modulation	Channel bandwidth / Transmission bandwidth configuration (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 A-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												
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 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 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)	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 12												
	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)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704				
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5				
H	23173	715.3	23165	714.5	23155	713.5	23130	711				
LTE Band 13												
	Bandwidth 5 MHz					Bandwidth 10 MHz						
	Channel #		Freq.(MHz)			Channel #		Freq.(MHz)				
L	23205		779.5			23230		782				
M	23230		782									
H	23255		784.5									



Mode		Maximum Average power(dBm)
2.4G WLAN	802.11b	11.00
	802.11g	13.00
	802.11n HT20	12.00
	802.11n HT40	12.00
Z-wave		-1.00
SRD		18.00



4. 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



5. Radio Frequency Radiation Exposure Evaluation

5.1. 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)	Power Density / Limit
WCDMA Band II	1852.4	2.00	24.00	26.00	0.40	398.11	0.079	1.000	0.0792
WCDMA Band V	826.4	2.00	24.00	26.00	0.40	398.11	0.079	0.551	0.1438
LTE Band 2	1850.7	2.00	23.00	25.00	0.32	316.23	0.063	1.000	0.0629
LTE Band 4	1710.7	2.00	23.00	25.00	0.32	316.23	0.063	1.000	0.0629
LTE Band 5	824.7	2.00	23.00	25.00	0.32	316.23	0.063	0.550	0.1145
LTE Band 12	699.7	2.00	23.00	25.00	0.32	316.23	0.063	0.466	0.1349
LTE Band 13	779.5	2.00	23.00	25.00	0.32	316.23	0.063	0.520	0.1211
WLAN2.4GHz 802.11b	2412	2.00	11.00	13.00	0.02	19.95	0.004	1.000	0.0040
WLAN2.4GHz 802.11g	2412	2.00	13.00	15.00	0.03	31.62	0.006	1.000	0.0063
WLAN2.4GHz 802.11n-HT20	2412	2.00	12.00	14.00	0.03	25.12	0.005	1.000	0.0050
WLAN2.4GHz 802.11n-HT40	2422	2.00	12.00	14.00	0.03	25.12	0.005	1.000	0.0050
Z-wave	908.4	2.15	-1.00	1.15	0.00	1.30	0.000	0.606	0.0004
SRD	903	2.15	18.00	20.15	0.10	103.51	0.021	0.602	0.0342

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

**5.2. Collocated Power Density Calculation**

Power Density / Limit				Σ (Power Density / Limit) of
1	2	3	4	
WWAN	2.4GHz WLAN	Z-wave	SRD	1+2+3+4
0.1438	0.0063	0.0004	0.0342	0.1847

Note:

1. For collocation analysis, WCDMA Band V is chosen for summation due to the highest (power density/limit) among all WWAN wireless modes.
2. Considering the WWAN collocation with the 2.4GHz WLAN or Z-wave or SRD transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 2 and 3 collocated transmitters is compliant.
3. Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)].

Conclusion:

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