RF EXPOSURE EVALUATION REPORT

FCC ID	:	**2AHUF-6294**
Equipment	:	**Digital Media Receiver**
Model Name	:	**ZE39KL**
Applicant	:	**Nimbostratus LLC** **945 Concord St. Framingham, MA 01701**
Standard	:	**47 CFR Part 2.1091**

We, SPORTON INTERNATIONAL INC has been evaluated this product in accordance with 47 CFR Part2.1091 and it complies with applicable limit.

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC evaluation.

The results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full

Cona Huang

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History of this test report

Report No.	Version	Description	Issued Date
FA693034-06	Rev. 01	Initial issue of report	Sep. 30, 2021
FA693034-06	Rev. 02	Updated section 1, 2 and 4.1	Dec. 15, 2021

1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Digital Media Receiver
Model Name	ZE39KL
FCC ID	2AHUF-6294
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2472 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz Zigbee: 2405 MHz ~ 2480 MHz
Mode	WLAN: 802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE Zigbee: BPSK

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

Reviewed by: Jason Wang

Report Producer: Paula Chen

2. Maximum RF average output power among production units

Band / Mode	Average Power (dBm)
Zigbee	19.0

Band / Mode	Average Power (dBm)			
	BR / EDR			LE
	1M	2M	3M	GFSK
Bluetooth	12.0	9.5	9.5	7.5

Band / Channel / Frequency (MHz)			IEEE 802.11 Average Power (dBm)							
			Ant 0			Ant 1			Ant 0+1	
			11b	11g	HT20	11b	11g	HT20	11g	HT20
2.4GHz WLAN	Ch 1	2412	18.5	17.0	15.5	18.5	19.0	19.0	18.0	16.0
	Ch 6	2437	20.0	19.5	19.5	20.0	20.0	20.0	22.0	21.5
	Ch 11	2462	19.0	18.0	17.5	16.5	18.5	18.0	20.0	19.0
	Ch 12	2467	15.5	17.0	16.0	15.5	17.5	17.0	17.0	16.5
	Ch 13	2472	12.5	14.5	14.5	10.5	15.5	15.5	15.0	15.5

Band / Channel / Frequency (MHz)			IEEE 802.11 Average Power (dBm)											
			Ant 0						Ant 1					
			11a	HT20	HT40	VHT20	VHT40	VHT80	11a	HT20	HT40	VHT20	VHT40	VHT80
5.2GHz WLAN	Ch 36	5180	17.5	17.5		17.5			16.0	16.0		16.0		
	Ch 38	5190			13.5		13.0				12.0		12.0	
	Ch 42	5210						12.5						11.5
	Ch 44	5220	20.0	20.0		20.0			20.0	20.0		20.0		
	Ch 46	5230			19.0		19.0				17.5		17.5	
	Ch 48	5240	20.0	20.0		20.0			20.0	20.0		20.0		
5.3GHz WLAN	Ch 52	5260	19.6	20.0		19.9			19.0	20.0		19.9		
	Ch 54	5270			18.7		18.6				18.6		18.5	
	Ch 56	5280												
	Ch 58	5290						13.4						15.3
	Ch 60	5300	16.9	15.6		15.5			18.8	19.7		19.6		
	Ch 62	5310			14.4		14.3				14.5		14.4	
	Ch 64	5320	16.5	15.4		15.3			16.3	16.4		16.3		
5.5GHz WLAN	Ch 100	5500	16.6	16.2		16.1			15.2	15.1		15.0		
	Ch 102	5510			13.10		13.0				11.0		10.9	
	Ch 106	5530						13.3						10.0
	Ch 110	5550			19.3		19.2				17.2		17.1	
	Ch 116	5580	18.7	19.1		19.0			17.1	17.3		17.2		
	Ch 122	5610						17.8						15.9
	Ch 124	5620												
	Ch 126	5630												
	Ch 132	5660												
	Ch 134	5670			16.5		16.4				13.8		13.7	
	Ch 138	5690						18.3						17.1
	Ch 140	5700	16.3	15.9		15.8			14.1	13.7		13.6		
	Ch 142	5710			18.7		18.6				18.6		18.5	
	Ch 144	5720	18.6	18.7		18.6			17.9	19.8		19.7		
5.8GHz WLAN	Ch 149	5745	20.0	20.0		20.0			20.0	20.0		20.0		
	Ch 151	5755			20.0		20.0				20.0		20.0	
	Ch 155	5775						20.0						17.5
	Ch 157	5785	20.0	20.0		20.0			20.0	20.0		20.0		
	Ch 159	5795			20.0		20.0				20.0		20.0	
	Ch 165	5825	20.0	20.0		20.0			20.0	20.0		20.0		

Band / Channel / Frequency (MHz)			IEEE 802.11 Average Power (dBm)					
			Ant 0+1					
			11a	HT20	HT40	VHT20	VHT40	VHT80
5.2GHz WLAN	Ch 36	5180	19.5	19.5		19.5		
	Ch 38	5190			14.5		14.5	
	Ch 42	5210						13.5
	Ch 44	5220	22.5	22.5		22.5		
	Ch 46	5230			20.5		20.5	
	Ch 48	5240	22.5	22.5		22.5		
5.3GHz WLAN	Ch 52	5260	16.98	17.62		17.57		
	Ch 54	5270			18.83		18.73	
	Ch 56	5280						
	Ch 58	5290						10.48
	Ch 60	5300	14.64	13.58		13.48		
	Ch 62	5310			12.0		11.9	
	Ch 64	5320	13.75	12.40		12.34		
5.5GHz WLAN	Ch 100	5500	12.75	13.22		13.12		
	Ch 102	5510			11.84		11.78	
	Ch 106	5530						9.90
	Ch 110	5550			13.74		13.7	
	Ch 116	5580	12.27	12.24		12.22		
	Ch 122	5610						16.09
	Ch 124	5620						
	Ch 126	5630						
	Ch 132	5660						
	Ch 134	5670			16.67		16.64	
	Ch 138	5690						19.61
	Ch 140	5700	16.44	16.35		16.31		
	Ch 142	5710			21.13		21.03	
	Ch 144	5720	19.74	19.68		19.58		
5.8GHz WLAN	Ch 149	5745	22.0	23.0		23.0		
	Ch 151	5755			23.0		23.0	
	Ch 155	5775						20.5
	Ch 157	5785	22.0	22.5		22.0		
	Ch 159	5795			22.0		22.0	
	Ch 165	5825	22.0	22.0		22.0		

3. 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/f2)	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/f2)	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

4. Radio Frequency Radiation Exposure Evaluation

4.1. Standalone Power Density Calculation

Band	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
Zigbee	4.90	19.0	23.900	0.245	245.471	0.049	1.000	0.049
Bluetooth	3.20	12.0	15.200	0.033	33.113	0.007	1.000	0.007
2.4GHz WLAN Ant 0	4.80	20.0	24.800	0.302	301.995	0.060	1.000	0.060
2.4GHz WLAN Ant 1	4.10	20.0	24.100	0.257	257.040	0.051	1.000	0.051
2.4GHz WLAN Ant 0+1	4.80	22.0	26.800	0.479	478.630	0.095	1.000	0.095
5.2GHz WLAN Ant 0	3.50	20.0	23.500	0.224	223.872	0.045	1.000	0.045
5.2GHz WLAN Ant 1	4.20	20.0	24.200	0.263	263.027	0.052	1.000	0.052
5.2GHz WLAN Ant 0+1	4.20	22.5	26.700	0.468	467.735	0.093	1.000	0.093
5.3GHz WLAN Ant 0	3.93	20.0	23.930	0.247	247.172	0.049	1.000	0.049
5.3GHz WLAN Ant 1	4.32	20.0	24.320	0.270	270.396	0.054	1.000	0.054
5.3GHz WLAN Ant 0+1	4.32	18.8	23.150	0.207	206.538	0.041	1.000	0.041
5.5GHz WLAN Ant 0	4.25	19.3	23.550	0.226	226.464	0.045	1.000	0.045
5.5GHz WLAN Ant 1	3.92	19.8	23.720	0.236	235.505	0.047	1.000	0.047
5.5GHz WLAN Ant 0+1	4.25	21.1	25.350	0.343	342.768	0.068	1.000	0.068
5.8GHz WLAN Ant 0	5.30	20.0	25.300	0.339	338.844	0.067	1.000	0.067
5.8GHz WLAN Ant 1	5.50	20.0	25.500	0.355	354.813	0.071	1.000	0.071
5.8GHz WLAN Ant 0+1	5.50	23.0	28.500	0.708	707.946	0.141	1.000	0.141

Note:

1. 2.4GHz / 5GHz WLAN and Bluetooth can transmit simultaneously.

4.2. Collocated Power Density Calculation

Maximum WLAN Power Density / Limit	Maximum Bluetooth Power Density / Limit	Σ(Power Density / Limit) of WLAN + Bluetooth
0.141	0.007	0.148

Note:

1. ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WLAN + Bluetooth.
2. Considering the WLAN module collocation with the Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 2 collocated transmitters is compliant.

Conclusion:

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