RF Exposure Evaluation Report

Application No.:	SZEM2005003755CR
Applicant:	Hytera Communications Corporation Limited
Address of Applicant:	Hytera Tower, Hi-Tech Industrial Park North 9108#Beihuan Road, Nanshan District, Shenzhen, People's Republic of China
Manufacturer:	Hytera Communications Corporation Limited
Address of Manufacturer:	Hytera Tower, Hi-Tech Industrial Park North 9108#Beihuan Road, Nanshan District, Shenzhen, People's Republic of China
Factory:	Hytera Communications Corporation Limited
Address of Factory:	Plant No.1, No.2 And No.3, Hytera Hi-Tech Park, No.3 Baolong 4th Road, Baolong Street, Longgang District, Shenzhen, Guangdong
Product Name:	Digital Repeater
♣	RD982S VHF 100W, RD985S VHF 100W, RD986S VHF 100W, RD988S VHF 100W ♣
Model No.(EUT):	Please refer to section 4.1 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark:	Hytera
FCC ID:	YAMRD98XSVHFH
Standards:	47 CFR Part 1.1307 (2016) 47 CFR Part 1.1310 (2016)
Date of Receipt:	2020-05-14
Date of Test:	2020-05-15 to 2020-06-24
Date of Issue:	2020-06-30
Test Result :	**PASS***

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager

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2 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2020-06-30		Original

Authorized for issue by:				
				
		Edison Li /Project Engineer		
				
		Eric Fu /Reviewer		

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4 General Information

4.1 General Description of EUT

Power supply:	DC28V
Cable:	DC cable: 3017cm unshielded Control cable: 170cm unshielded
Internal source:	More than 108MHz
Sample Type:	Fixed device
Frequency Range:	136MHz to 174MHz
Modulation Type:	FM for Analog; 4FSK for Digital
Channel Separation:	12.5KHz/25KHz for FM, 12.5KHz for 4FSK
Number of Channels:	The equipment is able to operate on any designated channel within the specified frequency range.
Antenna Type:	External
Antenna Gain:	15dBi
Classification:	Occupational/ Controlled Environment

Remark:

Model No.: RD982S VHF 100W, RD985S VHF 100W, RD986S VHF 100W, RD988S VHF 100W

Only the model RD982S VHF 100W was tested, since according to the declaration from the applicant, the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, with only difference on sales territory.

4.2 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China 518057
Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594
No tests were sub-contracted.

4.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.4 Deviation from Standards

None.

4.5 Abnormalities from Standard Conditions

None.

4.6 Other Information Requested by the Customer

None.

5 RF Exposure Evaluation

5.1 RF Exposure Compliance Requirement

5.1.1 Limits

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

F= Frequency in MHz

Friis Formula

Friis transmission formula: $Pd = (Pout*G)/(4* Pi * R^2)$

Where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

The limit of MPE is 1.0 mW/cm^2 . If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

5.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

5.1.3 EUT RF Exposure Evaluation

1) Test Results

The best case gain of the antenna is 15dBi. 15dB logarithmic terms convert to numeric result is nearly 3.55.

FM	136-174MHz						
Frequency (MHz)	Maximun Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Max Tune-up tolerance power (dBm)	Max Tune-up tolerance power (mW)	Power density (mW/cm^2)	Minimum Distance to Human body (cm)
136.125	15	31.62	50	50	100000.00	1.00	502
136.125	15	31.62	36.9	37	5011.87	1.00	112
151.125	15	31.62	50	50	100000.00	1.00	502
151.125	15	31.62	37	37	5011.87	1.00	112
158.125	15	31.62	50	50	100000.00	1.00	502
158.125	15	31.62	37	37	5011.87	1.00	112
173.875	15	31.62	50	50	100000.00	1.00	502
173.875	15	31.62	37	37	5011.87	1.00	112
4FSK	**136-174MHz**						
Frequency (MHz)	Maximun Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power (dBm)	Max Tune-up tolerance power (dBm)	Max Tune-up tolerance power (mW)	Power density (mW/cm^2)	Minimum Distance to Human body (cm)
136.125	15	31.62	50	50	100000.00	1.00	502
136.125	15	31.62	37	37	5011.87	1.00	112
151.125	15	31.62	50	50	100000.00	1.00	502
151.125	15	31.62	37	37	5011.87	1.00	112
158.125	15	31.62	50	50	100000.00	1.00	502
158.125	15	31.62	37	37	5011.87	1.00	112
173.875	15	31.62	50	50	100000.00	1.00	502
173.875	15	31.62	37	37	5011.87	1.00	112

50 dBm is the declared maximum rated power, 36.98dBm is the declared low rated power by manufacturer. To satisfy RF exposure requirements, a separation distance of 502 cm or more should be maintained between this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended.

End of Report

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