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Page: 1 of 7

# RF Exposure Evaluation Report

SZEM1801000701CR **Application No.:** 

Applicant: Hytera Communications Corporation Limited

Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan Address of Applicant:

District, Shenzhen, China

Manufacturer: Hytera Communications Corporation Limited

Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan Address of Manufacturer:

District, Shenzhen, China

Factory: Hytera Communications Corporation Limited Baolong Branch

Plant No.3, Hytera Hi-Tech Park, Baolong Industrial Area, Longgang District, Address of Factory:

Shenzhen, People's Republic of China

**Product Name:** Digital Repeater

RD982S U(1) 100W, RD985S U(1) 100W, RD986S U(1) 100W, Model No.(EUT):

RD988S U(1) 100W, RD98XS U(1) 100W("X" Stand for 2, 5, 6, 8) \*

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: YAMRD98XSU1H

Standards: 47 CFR Part 1.1307 (2016)

47 CFR Part 1.1310 (2016)

Date of Receipt: 2018-01-24

Date of Test: 2018-02-01 to 2018-02-02

Date of Issue: 2018-03-23

**Test Result:** PASS\*

### Authorized Signature:



Keny Xu **EMC Laboratory Manager** 

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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



Report No.: SZEM180100070103

Page: 2 of 7

# 2 Version

Revision Record						
Version	Chapter	Date	Modifier	Remark		
01		2018-03-23		Original		

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



Report No.: SZEM180100070103

Page: 3 of 7

## 3 Contents

		Page
1	COVER PAGE	1
2	VERSION	2
3	CONTENTS	3
4	GENERAL INFORMATION	4
	4.1 GENERAL DESCRIPTION OF EUT	4
	4.2 Test Location	4
	4.3 TEST FACILITY	5
	4.4 Deviation from Standards	5
	4.5 ABNORMALITIES FROM STANDARD CONDITIONS	5
	4.6 OTHER INFORMATION REQUESTED BY THE CUSTOMER	5
5	RF EXPOSURE EVALUATION	6
	5.1 RF Exposure Compliance Requirement	6
	5.1.1 Limits	6
	5.1.1 Limits	6
	4.1.3 EUT RF Exposure Evaluation	7



Report No.: SZEM180100070103

Page: 4 of 7

## 4 General Information

## 4.1 General Description of EUT

Product Name:	Digital Repeater
Model No.:	RD982S U(1) 100W
Trade Mark:	Hytera
Sample Type:	Fixed production
Antenna Gain:	15dBi
Power Supply:	DC 28V
Cable:	DC cable: 2900cm unshielded
	Control cable: 170cm unshielded
	Microphone: 100cm unshielded
Type of Modulation:	FM for Analog; 4FSK for Digital
Frequency Band:	400MHz to 470MHz.

#### Remark:

Model No.: RD982S U(1) 100W, RD985S U(1) 100W, RD986S U(1) 100W, RD988S U(1) 100W, RD98XS U(1) 100W( "X" Stand for 2, 5, 6, 8)

Only the model RD982S U(1) 100W was tested, since the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, with only difference is the model number and the sales areas for marketing purpose.



Report No.: SZEM180100070103

Page: 5 of 7

### 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:

### CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

### 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.

#### Industry Canada (IC)

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3...

### 4.4 Deviation from Standards

None.

## 4.5 Abnormalities from Standard Conditions

None.

# 4.6 Other Information Requested by the Customer

None.

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Report No.: SZEM180100070103

Page: 6 of 7

# 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/cm²)	Averaging time (minutes)			
(A) Limits for Occupational/Controlled Exposures							
0.3–3.0 3.0–30 30–300 300–1500 1500–100,000	614 1842/f 61.4	1.63 4.89/f 0.163	*(100) *(900/f²) 1.0 f/300 5	6 6 6 6			
(B) Limits for General Population/Uncontrolled Exposure							
0.3–1.34	614 824/f 27.5	1.63 2.19/f 0.073	*(100) *(180/f²) 0.2 f/1500 1.0	30 30 30 30 30			

F= Frequency in MHz

Friis Formula

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

Where

Pd = power density in mW/cm<sup>2</sup>

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

The limit of MPE is f/300 mW/cm<sup>2</sup>. 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.



Report No.: SZEM180100070103

Page: 7 of 7

## 4.1.3 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 31.62.

FM	400~470MHz						
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/cm²)	Minimum Distance to Human body (cm)
400.025	15	31.62	49.65	50	100000.00	1.33	434.40
450.025	15	31.62	49.99	50	100000.00	1.50	409.56
459.125	15	31.62	49.66	50	100000.00	1.53	405.48
469.975	15	31.62	49.52	50	100000.00	1.57	400.77
400.025	15	31.62	36.95	37	5011.87	1.33	97.25
450.025	15	31.62	36.98	37	5011.87	1.50	91.69
459.125	15	31.62	36.95	37	5011.87	1.53	90.78
469.975	15	31.62	36.97	37	5011.87	1.57	89.72
4FSK	400~470MHz						
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/cm²)	Minimum Distance to Human body (cm)
400.025	15	31.62	49.58	50	100000.00	1.33	434.40
450.025	15	31.62	49.54	50	100000.00	1.50	409.56
459.125	15	31.62	49.53	50	100000.00	1.53	405.48
469.975	15	31.62	49.45	50	100000.00	1.57	400.77
400.025	15	31.62	36.97	37	5011.87	1.33	97.25
450.025	15	31.62	36.99	37	5011.87	1.50	91.69
459.125	15	31.62	36.95	37	5011.87	1.53	90.78
469.975	15	31.62	36.93	37	5011.87	1.57	89.72

50.0 dBm is the declared maximum rated power, 37dBm is the declared low rated power by manufacturer. To satisfy RF exposure requirements, a separation distance of 434.4 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