

# SIMULTANEOUS TRANSMISSION EVALUATION SAR REPORT

For

## Huawei Technologies Co., Ltd.

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**FCC ID: QIS E5776S-420**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Mobile wifi
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<b>Report Number:</b> R1DG140620002-20	
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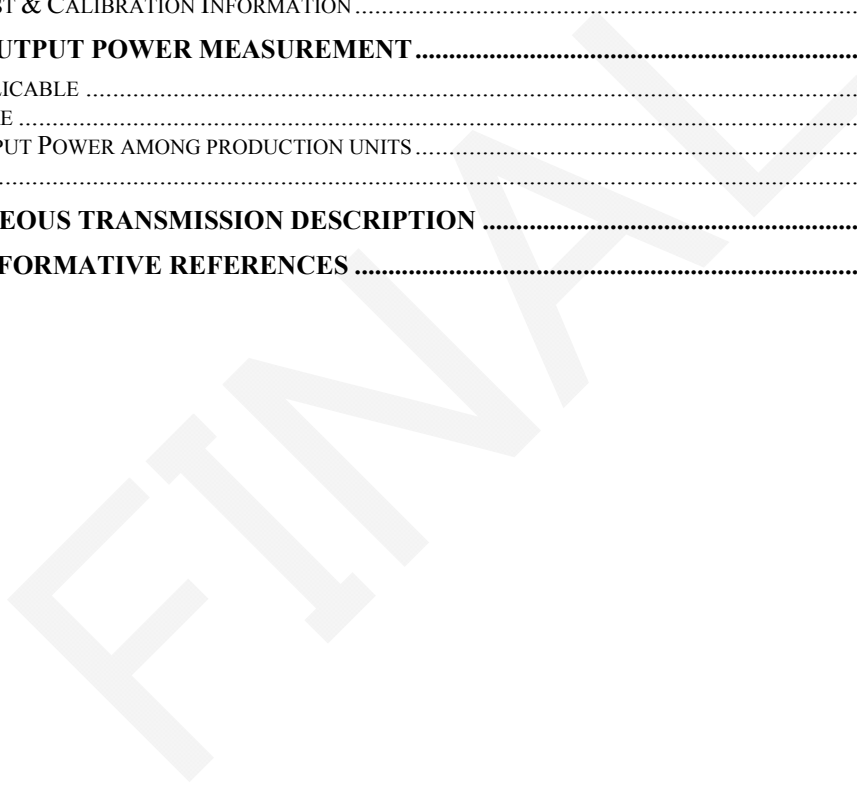
**Note:** This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

Attestation of Test Results		
<b>EUT Information</b>	<b>Company Name</b>	Huawei Technologies Co., Ltd.
	<b>EUT Description</b>	Mobile wifi
	<b>FCC ID</b>	QIS E5776S-420
	<b>Model Number</b>	E5776s-420
<b>Frequency</b>	<b>Max. SAR Level(s) Reported</b>	<b>Limit(W/Kg)</b>
<b>LTE Band 43</b>	0.200 W/kg 1g Body SAR	<b>1.6</b>
<b>Simultaneous (Wi-Fi&amp; LTE)</b>	0.590W/kg 1g Body SAR	
<b>Applicable Standards</b>	<b>ANSI / IEEE C95.1 : 2005</b> IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields,3 kHz to 300 GHz.	
	<b>ANSI / IEEE C95.3 : 2002</b> IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to SuchFields,100 kHz—300 GHz.	
	<b>IEEE1528:2013</b> IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques	
	<b>KDB procedures</b> 447498 D01 General RF Exposure Guidance v05r02 KDB 865664 D01SAR Measurement Requirements for 100 MHz to 6 GHz v02r03 KDB 941225 D05SAR for LTE Devices v02r03	
<p><b>Note:</b> This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Standards and has been tested in accordance with the measurement procedures specified in IEEE 1528-2013 and RF exposure KDB procedures.</p> <p><b>The results and statements contained in this report pertain only to the device(s) evaluated.</b></p>		

**Note:** The stand-alone SAR value of LTE mode was derived from the SAR report FA482613.

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**DOCUMENT REVISION HISTORY**

Revision Number	Report Number	Description of Revision	Date of Revision
0	RSZ140812003-20	Original Report	2014-09-01

FINAL

## EUT DESCRIPTION

This report has been prepared on behalf of Huawei Technologies Co., Ltd. and their product, FCC ID: QIS E5776S-420 , Model: E5776s-420 or the EUT (Equipment under Test) as referred to in the rest of this report.

### Technical Specification

<b>Product Type</b>	Portable
<b>Exposure Category:</b>	Population / Uncontrolled
<b>Antenna Type(s):</b>	Internal Antenna
<b>Operation Mode :</b>	LTE Band 43and Wi-Fi
<b>Frequency Band:</b>	LTE Band 43: 3650-3675 MHz(TX&RX) Wi-Fi: 2412MHz-2462MHz
<b>Conducted RF Power:</b>	LTE Band 43 : 22.88 dBm Wi-Fi: 12.63 dBm
<b>Dimensions (L*W*H):</b>	105 mm (L) × 66 mm (W) × 16 mm (H)
<b>Power Source:</b>	3.7 V <sub>DC</sub> Rechargeable Battery
<b>Normal Operation:</b>	Body-worn

## REFERENCE, STANDARDS, AND GUIDELINES

### FCC:

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

### CE:

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 2 mW/g as recommended by EN62209-1 for an uncontrolled environment. According to the Standard, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in Europe is 2 mW/g average over 10 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

**SAR Limits**

FCC Limit (1g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

CE Limit (10g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 10 g of tissue)	2.0	10
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

Occupational/Controlled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

General Population/Uncontrolled environments Spatial Peak limit 1.6W/kg (FCC) & 2 W/kg (CE) applied to the EUT.

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## **FACILITIES**

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The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect data is located at 6/F, the 3rd Phase of WanLi Industrial Building, Shi Hua Road, Fu Tian Free Trade Zone, Shenzhen, Guangdong, P.R. of China

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**EQUIPMENT LIST AND CALIBRATION****Equipments List & Calibration Information**

Equipment	Model	Calibration Date	S/N
Attenuator	3dB	2014-05-08	5402
EMI Test Receiver	ESCI	2013-11-12	101120

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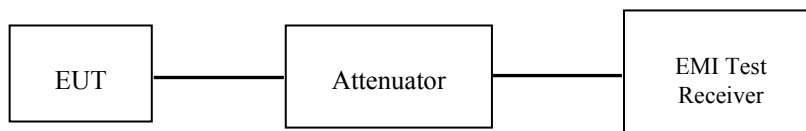
## CONDUCTED OUTPUT POWER MEASUREMENT

### Provision Applicable

The measured peak output power should be greater and within 5% than EMI measurement.

### Test Procedure

The RF output of the transmitter was connected to the input of the EMI Test Receiver through sufficient attenuation.



Wi-Fi

### Maximum Output Power among production units

Max Target Power for Production Unit (dBm)			
Mode/Band	Channel		
	Low	Middle	High
Wi-Fi	12.70	12.70	12.70
LTE Band 43	23.00	23.00	23.00

### Test Results:

#### WiFi

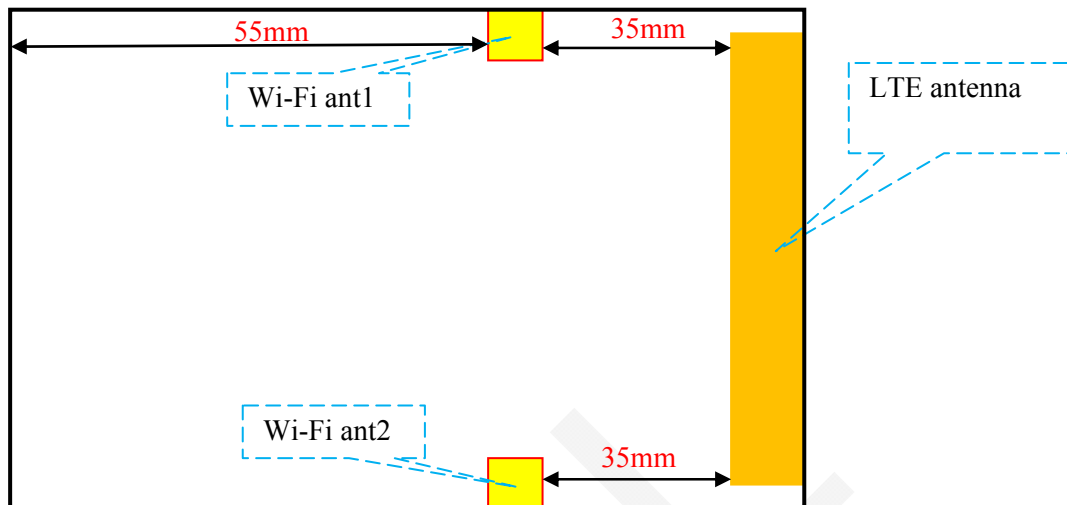
Band	Frequency (MHz)	Conducted Output Power			Ant 1& Ant 2 transmit Simultaneously?
		Ant 1	Ant 2	Total	
802.11b	2412	12.63	12.20	/	No
	2437	12.42	12.44	/	
	2462	12.52	12.58	/	
802.11g	2412	10.94	10.82	/	
	2437	10.38	10.59	/	
	2462	10.67	10.17	/	
802.11n HT20	2412	6.61	7.91	10.32	yes
	2437	6.07	8.08	10.20	
	2462	6.49	7.54	10.06	
802.11n HT40	2422	6.56	7.59	10.12	
	2437	6.51	7.87	10.25	
	2452	6.49	7.62	10.10	

#### Note:

- The output power was tested under data rate 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n HT20, 13.5Mbps for 802.11n HT40.

## SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

### Wi-Fi and LTE Antennas Location:



### Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities		Antennas Distance (mm)
Transmitter Combination	Simultaneous?	
LTE Band 43 + Wi-Fi	√	35

### Standalone SAR test exclusion considerations

Body Position:

Mode	Frequency (MHz)	P <sub>avg</sub> (dBm)	P <sub>avg</sub> (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
LTE Band 43	3662	23.00	199.53	10.00	38.17	3.0	NO
Wi-Fi	2450	12.70	18.62	10.00	<b>2.92</b>	3.0	Yes

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

- f(GHz) is the RF channel transmit frequency in GHz.
- Power and distance are rounded to the nearest mW and mm before calculation.
- The result is rounded to one decimal place for comparison.
- When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

**Standalone SAR estimation:**

Mode	Frequency (GHz)	Distance (mm)	P <sub>avg</sub> (dBm)	P <sub>avg</sub> (mW)	Estimated 1-g (W/kg)
Wi-Fi Body	2.45	10	12.70	18.62	0.390

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}/x]$   
W/kg for test separation distances  $\leq 50$  mm;

where  $x = 7.5$  for 1-g SAR.

When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test Exclusion

**Simultaneous SAR test exclusion considerations:****Conclusion:**

$\Sigma\text{SAR} < 1.6$  W/kg therefore simultaneous transmission SAR with Volume Scans is **not** required.

**Hotspot:**

Evaluations for Simultaneous SAR, Mobile Hot Spot Positions						
Test Position	Front (1.0cm)	Back (1.0cm)	Left (1.0cm)	Right (1.0cm)	Bottom (1.0cm)	Top (1.0cm)
Mode	Stand Alone 1-g SAR (W/Kg)					
LTE Band 43	0.195	0.136	0.200	0.045	/	0.103
Wi-Fi	0.390	0.390	0.390	0.390	/	/
	$\Sigma$ 1-g SAR(W/Kg)					
LTE Band 43 + Wi-Fi	0.585	0.526	<b>0.590</b>	0.435	/	/

**Note:**

1. The stand-alone SAR value of LTE mode was derived from the SAR report FA482613.
2. If the sum of the 1g SAR measured for the simultaneously transmitting antennas is less than the SAR limit, SAR measurement for simultaneous transmission is not required.

## APPENDIX G INFORMATIVE REFERENCES

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