FCC Test Report

Product Name: HSPA Rotate USB Stick

Model Number: E180

Report No: SYBH(R) 016042008EB-3
FCC ID: QISE180

Reliability Laboratory of Huawei Technologies Co., Ltd.

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REPORT ON	**FCC Test of HSPA Rotate USB Stick**
	M/N: E180
	Report No: SYBH(R) 016042008EB-3
REGULATION	**FCC CFR47 Part 2: Subpart J;**
	FCC CFR47 Part 24: Subpart E;
CONCLUSION	**Pass**

	Date	Name	signature
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1 Summary

The table below summarizes the measurements and results for the HUAWEI E180 Rotate USB Stick. Detailed results and descriptions are shown in the following pages.

Table 1 Summary of results

FCC Measurement Specification	FCC Limits Part(s)	Description	Result
2.1046	24.232	Effective Radiated Power of Transmitter	PASS
2.1046	24.232	Conducted Power of Transmitter	PASS
2.1047		Modulation Characteristics	PASS
2.1049		Occupied Bandwidth	PASS
2.1051	24.238	Band Edges Compliance	PASS
2.1051	24.238	Spurious Emission at Antenna Terminal	PASS
2.1055	24.235	Frequency Stability	PASS
2.1053	24.238	Radiated Spurious Emissions	PASS

Note: The Radiated Spurious Emissions' test results are shown in the EMC report.

2 Product Description

2.1 Production Information

2.1.1 General Description

HUAWEI E180 Rotate USB Stick is subscriber equipment in the GSM system. The frequency band is 1900M. The E180 implements such functions as RF signal receiving / Transmitting, EDGE/GPRS/GSM protocol processing and data service etc. Externally it provides USB interface (to connect to the notebook etc.), USIM card interface. It has an internal antenna. E180 uses Qualcomm MSM6290 chipset and Zero-IF technologies.

2.1.2 Support function and Service

The HUAWEI E180 ROTATE USB STICK support the function and service as follows:

Table 2 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
data	Modulation: GMSK	TM1	
data	Modulation: 8PSK	TM2	

Note: * The specified GPRS test conditions & settings are defined in 3GPP TS51.010 V5.4.0 and the EDGE test conditions & settings are defined in 3GPP TS51.010 V5.4.0.

2.2 Modification Information

For original equipment, following table is not application.

Table 3 Modification Information

Model Number	Board/Module	Original Version	New Version	Modify Information

Not applicable

3 Test Site Description

The test site of:

Huawei Technologies Co. Ltd.
P.O. Box 518129
Huawei base, bantian,
Longgang District, Shenzhen, China

The test site description has been submitted to FCC and registration granted under the registration number **97456** on Aug 20. 2006. The test site has been accredited by and the accredited number is **2174.01** in Jan of 2006.

3.1 Testing Period

The test have been performed during the period of

April.28, 2008 – May.3, 2008

3.2 General Set up Description

HUAWEI E180 Rotate USB Stick can support GPRS/EDGE mode and PCS Band. During this measurement, the HUAWEI E180 Rotate USB Stick works in GPRS/EDGE mode and PCS Band.

TM1: GPRS/GSM Mode with GMSK Modulation
TM2: EDGE Mode with 8PSK Modulation

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 4 Frequency Range

Uplink band:	1850 to 1910 MHz
Downlink band:	1930 to 1990 MHz

4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

	EDGE/GPRS/GSM
Channel raster	200k Hz
Channel spacing:	200k Hz

4.1.3 Type of Emission

Table 6 Type of Emission

	EDGE/GPRS/GSM
Emission Designation:	300KG7W / 300KGXW

According to CFR 47 (FCC) part 2, subpart C, section 2.201 and 2.202

4.1.4 Environmental Requirements

Table 7 Environmental Requirements

Minimum temperature:	- 10 °C
Maximum temperature:	+ 55 °C
Relative Humidity:	5%-95%RH

4.1.5 Power Source

Table 8 Power Source

DC voltage nominal:	⎓ 5.0V; Supplied by USB port of notebook
DC voltage range	⎓ 4.75-5.25V
DC current maximal:	500mA

4.1.6 Tune-up Procedure

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.

4.1.7 Applied DC Voltages and Currents

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8).

The voltage and current in the final RF stage is:

Table 9 Applied RF Module Voltages and Currents

Voltage:	⎓ 2.85V
Current:	150mA According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)

4.2 EUT Identification List

4.2.1 Board Information

Table 10 Board Information

HSPA Rotate USB Stick		
E180		
Board and Module		
Model name	Serial Number	Remarks
E180	DJ2AC10840700022	CD66TCPU

4.2.2 Adapter Technical Data

Not Applicable.

4.2.3 Battery Technical Data

Not Applicable.

4.2.4 FCC Identification

Grantee Code: **QIS**
Product Code: **E180**
FCC Identification: **QISE180**

5 Main Test Instruments

Table 11 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YYYY)
Test Receiver Display Unit	R&S	ESMI 804.8932.52	829214/011	05,22.2008
Test Receiver RF Unit	R&S	ESMI 1032.5640.53	829550/008	05,22.2008
Receiver	R&S	ESIB 26	100318	05.21.2008
Pre-Amplifier	Agilent	8447D	2944A10146	05.21.2008
Pre-Amplifier	Agilent	83017A	3950M00246	05.21.2008
Loop Antenna	Schwarzbeck	FMZB1516	1516115	05.29.2008
BiLog Antenna	Schaffner	CBL 6112B	2747	0525.2008
BiLog Antenna	Schaffner	CBL 6112B	2536	06.07.2008
Horn Antenna	ETS-Lindgren	3117	00062549	06.05.2008
Horn Antenna	ETS-Lindgren	3160	00060008	05.09.2008
Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	08.27.2008
Signal Generator	R&S	SMT06	830264/009	09.29.2008
Signal Generator	R&S	SMR 40	100325	08.09.2008
Power Supply	Keithley	2306	1045337	08.14.2008
Climate Chamber	WEISS	WK11-180	58226049470010	12.09.2008
Universal Radio Communication Tester	R&S	CMU200	108522	01.01.2009
Universal Radio Communication Tester	Agilent	8960	GB46490162	06.24.2008
Vector Signal Generator	R&S	SMU200A	101394	09.29.2008
Signal Analyzer	R&S	FSU26	1166.1660K26	08.21.2008
Power Divider	Agilent	11667B	F048AXH049	05.23.2008

6 Transmitter Measurements

6.1 Effective Radiated Power of Transmitter (EIRP)

6.1.1 Test Conditions

Table 12 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2 at frequency Bottom, Middle, Top

6.1.2 Test Specifications and Limits

6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 24.232

6.1.2.2 Supporting Standards

Table 13 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;

6.1.2.3 Limits

Compliance with part 24.232, mobile/portable stations are limited to 2 watts EIRP peak power.
W(dBm)= 10*log ($W_{In\ mWatts}$).

Table 14 Limits

Maximum Output Power (Watts)	< 2 Watts
Maximum Output Power (dBm)	< 33 dBm

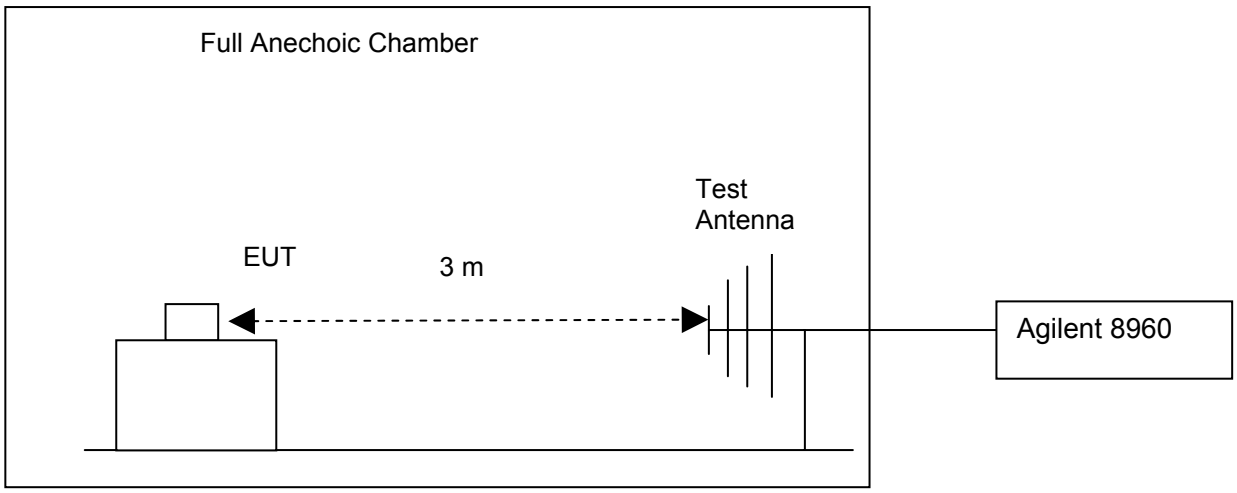
6.1.3 Test Method and Setup

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, ERP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the HUAWEI E180 ROTATE USB STICK to the wireless communication tester CMU200 via the air interface. The band is set as PCS.
(b) Test the Radiated maximum output power by the 8960 received from test antenna.
(c) Use substitution method to verify the maximum output power. The EUT is substituted by a horn antenna. The horn antenna is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step (b) on Agilent 8960, and

record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

Test setup

Step 1: Pre-test



Step 2: Substitution method to verify the maximum EIRP

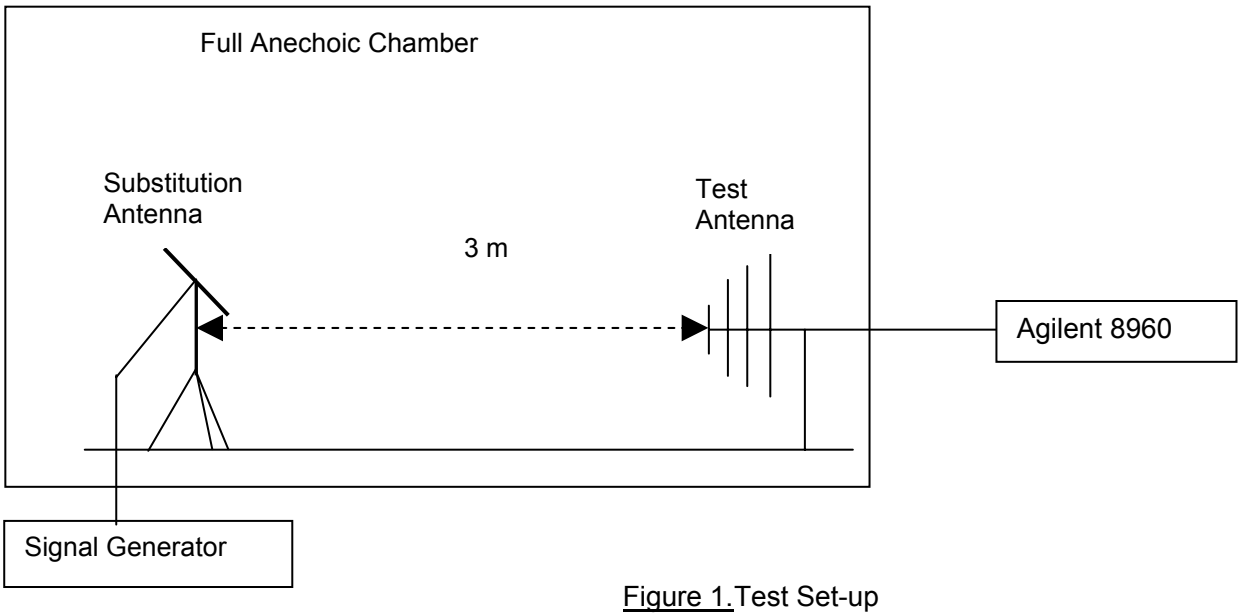


Figure 1.Test Set-up

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.
There is a constant difference of 2.15 dB between EIRP and ERP.
EIRP (dBm)= ERP (dBm) + 2.15 (ITU-R Recommendation SM.329-10).
EIRP was measured using 3 hosts.
Host 1: BenQ Joy book S72
Host 2: BenQ R55V
Host 3: Acer ZH1

6.1.4 Measurement Results

6.1.4.1 Pre-test Results

Table 15 Measurement Results

		RF Output Power (EIRP)					
TEST CONDITIONS		Channel512(B) 1850.2MHz		Channel661 (M) 1880MHz		Channel810(T) 1909.8MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1(Host 1)	T_{nom} (25 °C) V_{nom} (5 V)	30.60	33	30.51	33	30.44	33
TM2(Host 1)	T_{nom} (25 °C) V_{nom} (5 V)	26.19	33	26.10	33	26.03	33
TM1(Host 2)	T_{nom} (25 °C) V_{nom} (5 V)	30.78	33	30.64	33	30.58	33
TM2(Host 2)	T_{nom} (25 °C) V_{nom} (5 V)	26.26	33	26.18	33	26.22	33
TM1(Host 3)	T_{nom} (25 °C) V_{nom} (5 V)	30.78	33	30.83	33	30.79	33
TM2(Host 3)	T_{nom} (25 °C) V_{nom} (5 V)	26.44	33	26.19	33	26.33	33

6.1.4.2 Substitution Results

Table 16 Substitution Results

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP [dBm]	Substitution Gain [dBi]	Cable Loss [dB]	Substitution Level (EIRP) [dBm]	FCC limit [dBm]	Result
TM1(Host 1)	1850.2	30.60	Horn Ant.	26.88	4.5	1.0	30.38	33	Pass
TM1(Host 1)	1880	30.51	Horn Ant.	26.81	4.5	1.0	30.31	33	Pass
TM1(Host 1)	1909.8	30.44	Horn Ant.	26.55	4.8	1.0	30.35	33	Pass
TM2(Host 1)	1850.2	26.19	Horn Ant.	22.45	4.5	1.0	25.95	33	Pass
TM2(Host 1)	1880	26.10	Horn Ant.	22.38	4.5	1.0	25.88	33	Pass

TM2(Host 1)	1909.8	26.03	Horn Ant.	22.22	4.8	1.0	26.02	33	Pass
TM1(Host 2)	1850.2	30.78	Horn Ant.	27.04	4.5	1.0	30.54	33	Pass
TM1(Host 2)	1880	30.64	Horn Ant.	27.05	4.5	1.0	30.55	33	Pass
TM1(Host 2)	1909.8	30.58	Horn Ant.	26.65	4.8	1.0	30.45	33	Pass
TM2(Host 2)	1850.2	26.26	Horn Ant.	22.57	4.5	1.0	26.07	33	Pass
TM2(Host 2)	1880	26.18	Horn Ant.	22.66	4.5	1.0	26.16	33	Pass
TM2(Host 2)	1909.8	26.22	Horn Ant.	22.28	4.8	1.0	26.08	33	Pass
TM1(Host 3)	1850.2	30.78	Horn Ant.	27.16	4.5	1.0	30.66	33	Pass
TM1(Host 3)	1880	30.83	Horn Ant.	27.26	4.5	1.0	30.76	33	Pass
TM1(Host 3)	1909.8	30.79	Horn Ant.	26.83	4.8	1.0	30.63	33	Pass
TM2(Host 3)	1850.2	26.44	Horn Ant.	22.78	4.5	1.0	26.28	33	Pass
TM2(Host 3)	1880	26.19	Horn Ant.	22.62	4.5	1.0	26.12	33	Pass
TM2(Host 3)	1909.8	26.33	Horn Ant.	22.46	4.8	1.0	26.26	33	Pass

Note: a, For get the EIRP (Efficient Isotropically Radiated Power) in substitution method, the following formula should take to calculate it,

EIRP [dBm] = SGP [dBm] – Cable Loss [dB] + Gain [dBi]

NOTE: SGP- Signal Generator Level

b, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 200kHz for TM1 and TM2..

6.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.

6.2 Conducted Power of Transmitter

6.2.1 Test Conditions

Table 17 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	52 %
Test Configurations:	TM1/TM2 at frequency Bottom, Middle, Top

6.2.2 Test Specifications and Limits

6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 24 subpart E

6.2.2.2 Supporting Standards

Table 18 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;

6.2.2.3 Limits

Compliance with part 24.232, in no any case may the peak power of a mobile station transmitter exceed 2 W. The calculated longitude EIRP by following formula:

EIRP(dBm)= 10*log ($EIRP_{in\ mW}$).

And for conducted power, we can use Antenna Gain to calculate the limit. So the conducted power:

$P_{cod.}$(dBm)=EIRP(dBm)- Gain(dBi).
and Gain (dBi)= Gain(dBd)+ 2.15dB

Table 19 Limits

Maximum Output Power (Watts)	< 2 Watts (33 dBm)
Antenna Gain(dBi):	1.73
Maximum Conducted Output Power (dBm)	< 31.27

6.2.3 Test Method and Setup

(a)For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, Conducted maximum power shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the HUAWEI E180 ROTATE USB STICK to the wireless communication tester CMU200 via the antenna connector. The band class is set as PCS.
(b)Test the Conducted maximum output power by the CMU200.

Test setup

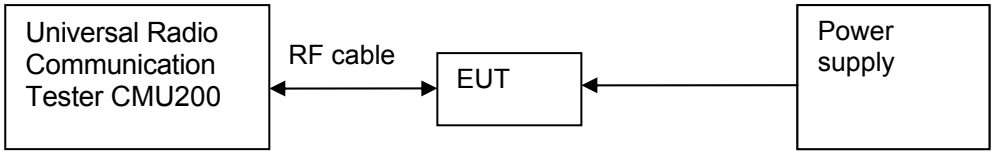


Figure 2. Test Set-up

6.2.4 Measurement Results

Table 20 Measurement Results

		RF Output Power(Conducted)					
TEST CONDITIONS		Channel512(B) 1850.2MHz		Channel661 (M) 1880MHz		Channel810(T) 1909.8MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	T_{nom} (25 °C) V_{nom} (5 V)	28.87	31.27	28.78	31.27	28.71	31.27
TM2	T_{nom} (25 °C) V_{nom} (5 V)	24.46	31.27	24.37	31.27	24.30	31.27

6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.

6.3 Modulation Characteristics

6.3.1 Test Conditions

Table 21 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	52 %
Test Configurations:	TM1/TM2 at frequency Middle

6.3.2 Test Specifications and Limits

6.3.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 24 subpart E

6.3.2.2 Supporting Standards

Table 22 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;

6.3.2.3 Limits

No specific modulation characteristics requirement limits in part 2.1047 and part 24 subpart E.

Table 23 Limits

Limits	Not applicable

6.3.3 Test Method and Setup

Connect the HUAWEI E180 Rotate USB Stick to Universal Radio Communication Tester CMU200 via the antenna connector. The frequency band is set as PCS; the HUAWEI E180 Rotate USB Stick 's output is matched with 50 Ω load, test method was according to 3GPP TS 51.010. The waveform quality and constellation of the HUAWEI E180 Rotate USB Stick was tested.

Test setup

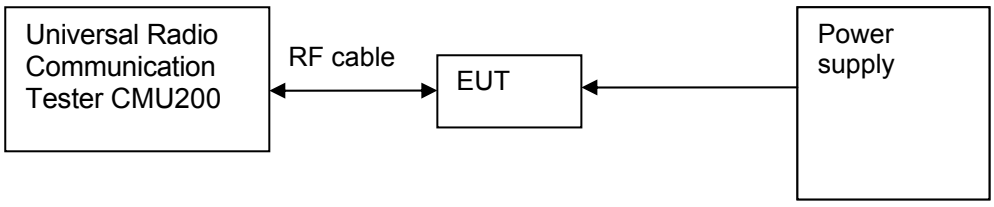


Figure 3.Test Set-up

6.3.4 Measurement Results

Table 24Measurement Results

		Modulation Characteristic	
TEST CONDITIONS		Channel661(M) 1880MHz	
		Measured	
		TM1	TM2
T_{nom} (25 °C)	V_{nom} (5.0V)	Refer to Appendix A	Refer to Appendix A

6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.

For the measurement results refer to appendix A.

6.4 Occupied Bandwidth

6.4.1 Test Conditions

Table 25 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	TM1/TM2 at frequency Bottom, Middle, Top

6.4.2 Test Specifications and Limits

6.4.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 24 subpart E

6.4.2.2 Supporting Standards

Table 26 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;

6.4.2.3 Limits

No specific occupied bandwidth requirement in part 24 subpart E, but the occupied bandwidth was defined in part 2.1049: the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

Table 27 Limits

Upper /lower frequency limits	0.5% of the mean power

6.4.3 Test Method and Setup

HUAWEI E180 Rotate USB Stick was connected to the wireless signal analyzer R&S FSU26 via the one RF connector. The band class is set as PCS; HUAWEI E180 Rotate USB Stick was controlled to transmit maximum power. Measure and record the occupied bandwidth of the HUAWEI E180 Rotate USB Stick by the R&S FSU26.

The OBW, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

Refer to 47CFR part2.1049 section (g)&(h).
(g) Transmitter in which the modulating base band comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the

services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer's maximum rated condition.
(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudorandom generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

For TM1/TM2 following RBW and VBW are employed:
Measurement bandwidth (RBW): 3 kHz (Resolution bandwidth)
Video bandwidth (VBW): 10 kHz

Test Set-up

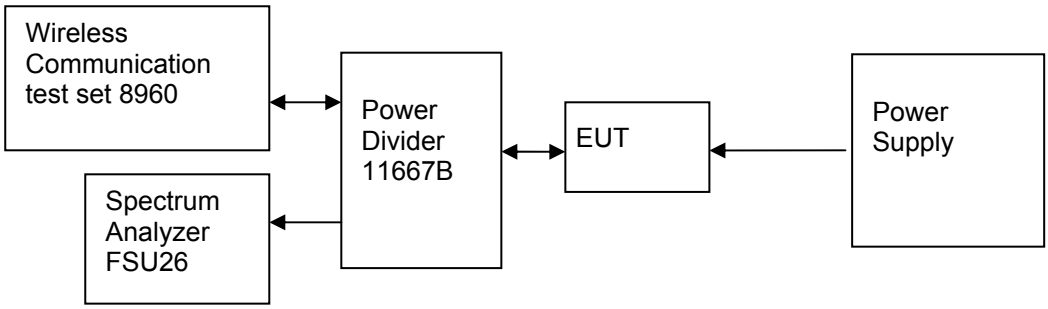


Figure 4.Test Set-up

6.4.4 Measurement Results

Table 28 Measurement Results

TEST CONDITIONS		Occupied Bandwidth					
Center Frequency		Channel512 (B) 1850.2MHz		Channel661 (M) 1880MHz		Channel810 (T) 1909.8MHz	
		Measured (kHz)		Measured (kHz)		Measured (kHz)	
		TM1	TM2	TM1	TM2	TM1	TM2
T_{nom} (25 °C) V_{nom} (5 V)	99%	246.79	243.59	246.79	248.40	245.19	241.99

6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix B.

6.5 Band Edges Compliance

6.5.1 Test Conditions

Table 29 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55 %
Test Configurations:	TM1/TM2at frequency Bottom, Top

6.5.2 Test Specifications and Limits

6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 24.238

6.5.2.2 Supporting Standards

Table 30 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;

6.5.2.3 Limits

Compliance with part 24.238, all spurious emission must be attenuated below the transmitter power by at least 43 +10 $\log_{10}$ P(W). (Whereas P is the rated power of the EUT).

Table 31 Limits for GPRS

	TM1	TM2
Rated Power:	30 dBm	26 dBm
Required attenuation:	43+10log (1) = 43 , 30 dBm - 43 dB	43+10log (0.4) = 39 , 26 dBm - 39 dB
Absolute level	- 13 dBm	- 13 dBm

6.5.3 Test Method and Setup

HUAWEI E180 Rotate USB Stick was connected to the wireless signal analyzer R&S FSU26 via the one RF connector, the band class is set as PCS. HUAWEI E180 Rotate USB Stick was controlled to transmit maximum power. Measure and record band edges compliance of the HUAWEI E180 Rotate USB Stick by the R&S FSU26.

For TM1/TM2 following RBW and VBW are employed:

Measurement bandwidth (RBW): 3 kHz (Resolution bandwidth)
Video bandwidth (VBW): 10 kHz

Test Set-up

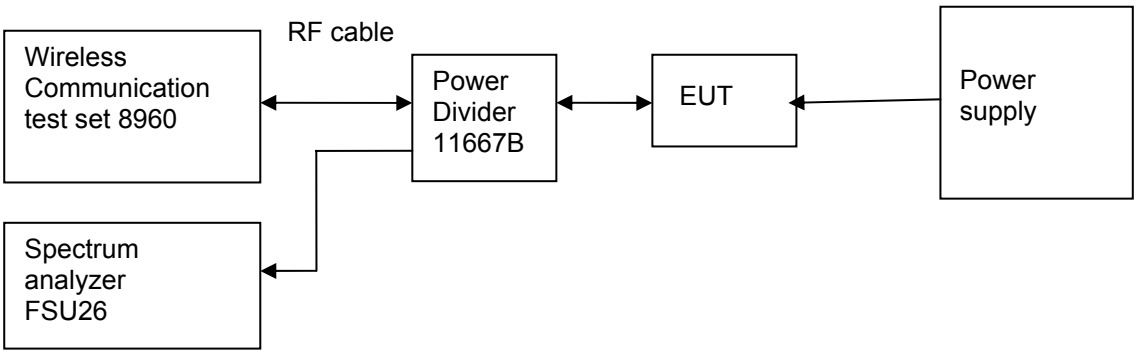


Figure 5. Test Set-up

6.5.4 Measurement Results

Table 32 Measurement Results outside Band Edges-- Single Carrier

Band	Frequency of Band edges [MHz]	Channel Number	Test Mode	Spurious Level measured [dBm]	FCC limit	Result
PCS	T_{nom} (25 °C), V_{nom} (5.0V)					
	1850.2	512	TM1	<-13(See appendix C)	- 13 dBm	Pass
	1909.8	810	TM1	<-13(See appendix C)	- 13 dBm	Pass
	1850.2	512	TM2	<-13(See appendix C)	- 13 dBm	Pass
	1909.8	810	TM2	<-13(See appendix C)	- 13 dBm	Pass

6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix C.

6.6 Spurious Emission at Antenna Terminal

6.6.1 Test Conditions

Table 33 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	50 %
Test Configurations:	TM1/TM2at frequency Bottom, Middle, Top

6.6.2 Test Specifications and Limits

6.6.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 24.238

6.6.2.2 Supporting Standards

Table 34 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;

6.6.2.3 Limits

Compliance with part 24.238, all spurious emission must be attenuated below the transmitter power by at least 43 +10 $\log_{10}$ P. (Whereas P is the rated power of the EUT).

Table 35 Limits for GPRS Mode

	TM1	TM2
Rated Power:	30 dBm	26 dBm
Required attenuation:	43+10log (1) = 43 , 30 dBm - 43 dB	43+10log (0.4) = 39 , 26 dBm - 39 dB
Absolute level	- 13 dBm	- 13 dBm

6.6.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSU26 via the one RF connector, the band class is set as PCS. The EUT was controlled to transmit maximum power. Measure and record the Conducted Spurious Emission of the EUT by the R&S FSU26.

According to part 24.238, the defined measurement bandwidth as following:

24.238 (b) Measurement procedure: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;
Measurement bandwidth (RBW) for 150 kHz up to 30MHz: 10 kHz;
Measurement bandwidth (RBW) for 30 MHz up to 20GHz: 1MHz;

Test Set-up

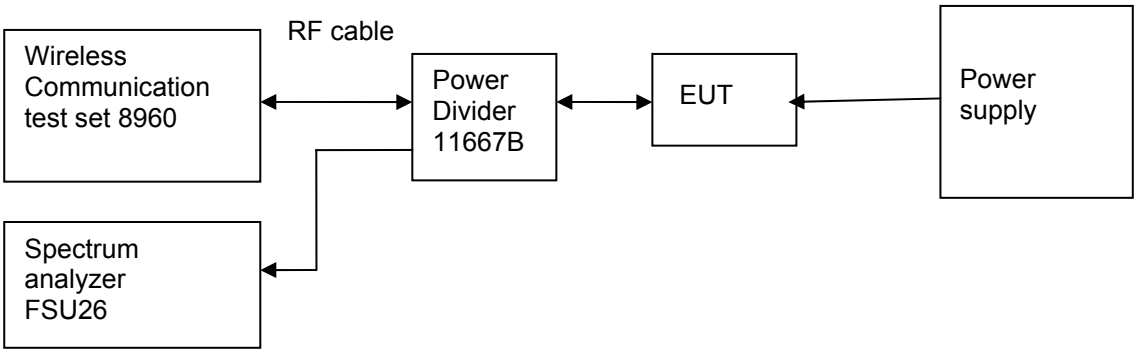


Figure 6. Test Set-up

6.6.4 Measurement Results

Table 36 Measurement Results

Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 512(B)	TM1	9 kHz~20GHz	30	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM2	9 kHz~20GHz	26	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 698(M)	TM1	9 kHz~20GHz	30	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM2	9 kHz~20GHz	26	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 810(T)	TM1	9 kHz~20GHz	30	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM2	9 kHz~20GHz	26	<- 13 dBm (See appendix D)	- 13 dBm	Pass

6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix D.

6.7 Frequency Stability

6.7.1 Test Conditions

Table 37 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	55 % at 25 °C
Test Configurations:	TM1/TM2at frequency M

6.7.2 Test Specifications and Limits

6.7.2.1 Specification

CFR 47 (FCC) part 2.1055 and part 24.235

6.7.2.2 Supporting Standards

Table 38 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;

6.7.2.3 Limits

No specific frequency stability requirement in part 2.1055 and part 24.235.

6.7.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature as follows:
(1) From -30 ° to +50 ° centigrade for all equipment except that specified in subparagraphs
(2) and (3) of paragraph 2.1055

(a) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10^{o} centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(b) The frequency stability shall be measured with variation of primary supply voltage as follows:
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point, which shall be specified by the manufacturer.
(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(c) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

The EUT can only work in such extreme voltage 4.75V and 5.25V，so here the EUT is tested in the 4.75V and 5.25V.

Test Set up

Connect the EUT to the Wireless Communication test set 8960 via the connector. Then measure the frequency error by the Wireless Communication test set 8960. The EUT's output is matched with a 50 Ω load.

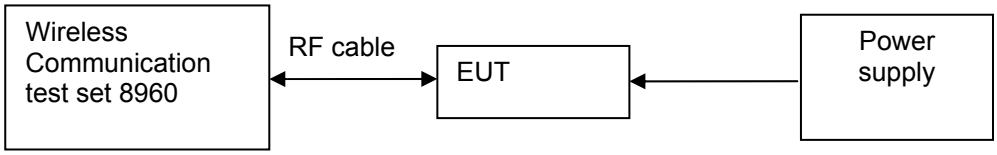


Figure 7. Test Set up

6.7.4 Measurement Results

6.7.4.1 Measurement Results vs. Variation of Temperature

- **TM1, 5.0V DC Channel No.661(1880.0MHz)**

Table 39 Measurement Results vs. Variation of Temperature－TM1

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	30	1880.0	-33	Pass
-20 °C	30	1880.0	-22	Pass
-10 °C	30	1880.0	18	Pass
0 °C	30	1880.0	-11	Pass
+10 °C	30	1880.0	-3	Pass
+20 °C	30	1880.0	-1	Pass
+30 °C	30	1880.0	8	Pass
+40 °C	30	1880.0	10	Pass
+50 °C	30	1880.0	-10	Pass

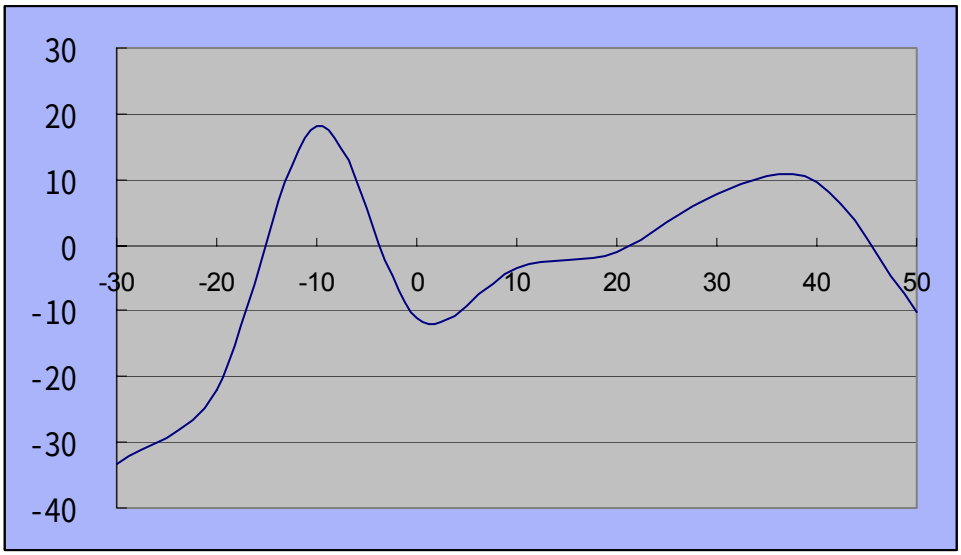


Figure 8.GPRS Mode Test Graph

- **TM2, 5.0V DC Channel No.661(1880.0MHz)**

Table 40 Measurement Results vs. Variation of Temperature—TM2

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	26	1880.0	28	Pass
-20 °C	26	1880.0	19	Pass
-10 °C	26	1880.0	-12	Pass
0 °C	26	1880.0	14	Pass
+10 °C	26	1880.0	4	Pass
+20 °C	26	1880.0	-2	Pass
+30 °C	26	1880.0	5	Pass
+40 °C	26	1880.0	11	Pass
+50 °C	26	1880.0	15	Pass

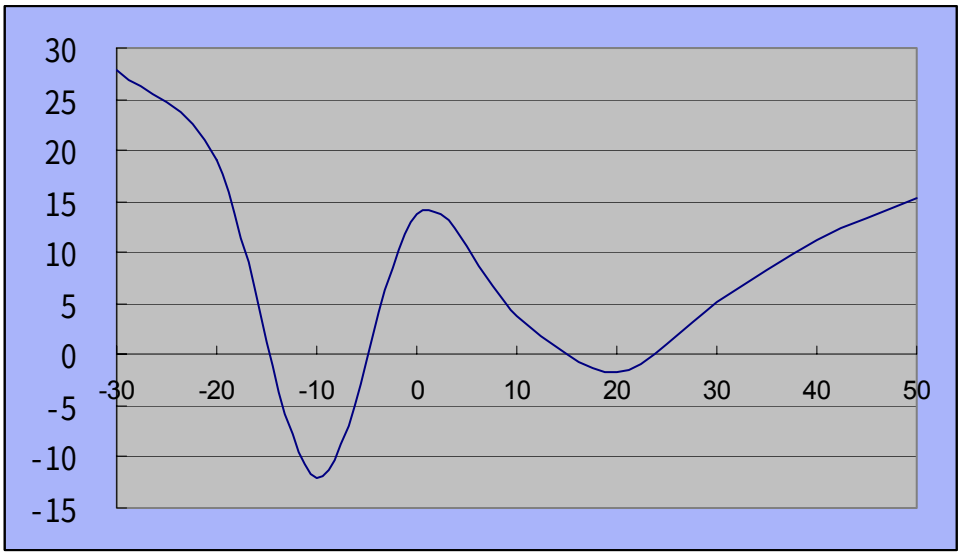


Figure 9. EDGE Mode Test Graph

6.7.4.2 Measurement Results vs. Variation of Voltage

- **TM1, 25 °C ,Channel No. 661(1880.0MHz)**

Table 41 Measurement Results vs. Variation of Voltage－TM1

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75 V	30	1880	21	Pass
5 V	30	1880	-14	Pass
5.25 V	30	1880	13	Pass

- **TM2, 25 °C ,Channel No. 661(1880.0MHz)**

Table 42 Measurement Results vs. Variation of Voltage－TM2

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75 V	26	1880	22	Pass
5 V	26	1880	-13	Pass
5.25 V	26	1880	15	Pass

6.7.5 Conclusion

The equipment **PASSED** the requirement of this clause.

7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Table 43 System Measurement Uncertainty

Items		Extended Uncertainty
Effective Radiated Power of Transmitter	EIRP (dBm)	U=3dB; k=2
Band Width	Magnitude (%)	U＝0.2%; k=2
Band Edge Compliance	Disturbance Power(dBm)	U＝2.0dB; k=2
Conducted Spurious Emission at Antenna Terminal	Disturbance Power(dBm)	U＝2.0dB; k=2
Frequency Stability	Frequency Accuracy(ppm)	U＝0.21ppm; k=2

8 Appendices

Appendix A	Measurement Results Modulation Characteristics	3 Pages
Appendix B	Measurement Results Occupied Bandwidth	7 Pages
Appendix C	Measurement Results Band Edges	5 Pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	19 Pages