

Applicant:	Kyocera
FCC ID:	V65C5155
Report #:	CT-C5155-15C-0412-R0

RF Emissions Test Report

FCC Part 15.247

For

Kyocera Corporation c/o Kyocera Communication Inc.

Product:	CDMA Cellular Phone
Model:	C5155



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ATTESTATION

The tested device complies with the requirements in respect of all parameters subject to the test.

The test results and statements relate only to the items tested.

The test equipment used was suitable for the tests performed and within manufacturer's published specifications and operating parameters.

The test methods were consistent with the methods described in the relevant standards.

Product:	CDMA Cellular Phone with Bluetooth + EDR 2.1 & WLAN
Model #:	C5155
FCC ID:	V65C5155
Tested in accordance with:	FCC Part 15.247
Test performed by:	Comptest Services LLC
Test Requested by:	KYOCERA Corporation
	C/o KYOCERA Communication Inc.
	8611 Balboa Avenue San Diego, CA 92123 United States
Date of Test:	March 5- March 7, 2012

Responsible Engineer

Benjamin Nguyen

Benjamin Nguyen Test Engineer Reviewed and approved by:

Tammy To Quality Manager



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1 SUMMARY OF TESTING

Section #	Rule Part	Test Description	Verdict
4	FCC § 15.247 b1, IC RSS-210 §A8.4 (2)	Peak Output Power	Pass
5	FCC § 15.247 a1, IC RSS-210 §6.2.2(o) a1	20 dB Bandwidth	Pass
6	FCC § 15.247 a1, IC RSS-210 §A8.1(2)	.247 a1, IC RSS-210 §A8.1(2) Carrier Frequency Separation	
7	7 FCC § 15.247 a1 iii, IC RSS-210 §A8.1 (4) Number of Hopping Frequencies		Pass
8	FCC § 15.247 a1 iii, § 15.247 f, IC RSS-210 §A8.1 (4)	Time of Occupancy	Pass
9	FCC § 15.247 d, IC RSS-210 §A8.5 Band-edge Compliance of Conducted Emissions		Pass
10	10 FCC § 15.247 d, IC RSS-210 §A8.5 Spurious RF Conducted Emissions		Pass
11	11FCC § 15.107 § 15.207, IC RSS-210 §6.6AC Power Line Conducted Emissions		Pass
12	FCC § 15.109, § 15.209, IC RSS-210 §A2.9(2)	Spurious Radiated Emissions	Pass

2 EQUIPMENT UNDER TEST INFORMATION

EUT Serial Number:	268435457816726141	
Туре:	[] Prototype, [X] Pre-Production, [] Production	
Equipment Category:	Portable	
TX Frequency (MHz):	2402 to 2480	
Channel Numbers:	79	
Channel Spacing (MHz):	1	
Bluetooth version:	□ 1.1 □ 1.2 □ 2.0 ⊠ 2.1 + EDR	
Modulation:	Frequency Hopping Spread Spectrum (FHSS), Class 2	
Max. Output Power (dBm)	0.96 dBm	
Antenna:	Internal	
Antenna Gain (dBi):	-1.5 (Peak)	



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3 TEST FACILITIES

The test sites and measurement facilities used to collect data are located at 8611 Balboa Avenue, San Diego, CA 92123, USA

4 TEST SETUP

The Bluetooth RF output of the equipment under test (EUT) was connected to the input of the spectrum analyzer through a RF cable with a specialized RF connector. The amplitude of the spectrum analyzer is corrected for the cable insertion loss and any other applicable losses. A fully charged battery was used as power supply voltage.



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5 PEAK OUTPUT POWER

5.1 Test Configuration

FCC: § 15.247 b1

IC: RSS-210 §A8.4 (2)

The Bluetooth transmitter was enabled at low, mid and high channels of separately to investigate the peak output power for each channel.

Frequencies of Interest: Spectrum was investigated from 2400 MHz – 2483.5 MHz.

Limits: < 1 watt (for systems with at least 75 hopping channels)

5.2 Results and Limits:			
Figure	Channel	Modulation	Results (dBm)
5-1		Basic Rate	0.10
5-1a	0	EDR DQPSK	0.32
5-1b		EDR D8PSK	0.47
5-2	39	Basic Rate	-0.41
5-2a		EDR DQPSK	-0.21
5-2b		EDR D8PSK	-0.06
5-3		Basic Rate	0.48
5-3a	78	EDR DQPSK	0.81
5-3b		EDR D8PSK	0.96
Comments: Within Bluetooth Power Class 2 limit			



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🔅 Agilent			R	Т
Ref 10 dBm	•Atten 30	dB Ext PG -0.50	6 dB	Mkr1 2.401 835 GHz 0.10 dBm
*Peak Log 10		1 Ö		
dB/				
LgAv				
V1 \$2 \$3 FC				
£(f): FTun				
Swp				
Center 2.402 000 GHz				Span 2 MHz
Res BW 1 MHz		■VBW 1 MHz	•Swee	n 1.093 ms (401 nts)

Figure 5-1: Peak Output Power, Basic Rate Channel 0.









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🔅 Agilent			RT	
Ref 10_dBm	•Atten 30 dB Ex	t PG -0.56 dB	Mkr1	2.441 135 GHz -0.41 dBm
■Peak Log 10		1 0		
jB/				
.gAv				
/1 \$2 53 FC				
E(f):				
Swp				
Center 2.441 000 GH	z •URU	1 MU-2	Sweep 1 093	Span 2 MHz

Figure 5-2: Peak Output Power, Channel 39.



Figure 5-2a: Peak Output Power, EDR DQPSK Channel 39.



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A Adimit			Mkri	2.479 860 GHz
lef 10 dBm	 Atten 30 dB 	Ext PG -0.56 dB		0.48 dBm
Peak .og		\$		
в/				
gAv				
1 \$2				
3 FL				
t(f): Tun				
чр				
enter 2.480 000 GH	z		*Curren 1.05	Span 2 MHz

Figure 5-3: Peak Output Power, Channel 78.



Figure 5-3a: Peak Output Power, EDR DQPSK Channel 78.



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6 20 DB BANDWIDTH

6.1 Test Configuration

FCC: § 15.247 a1

IC: RSS-210 §6.2.2(o) a1

The Bluetooth transmitter was enabled at low, mid, high channels and at each supporting modulation scheme separately to investigate the 20dB-bandwidth for each channel. Delta marker on the spectrum analyzer was moved from the center frequency until –20dBc to measure the 20dB-bandwidth.

Frequencies of Interest: Spectrum was investigated from 2402 MHz – 2480 MHz.

6.2 20dB Bandwidth Plots and Results				
Figure	Channel	Modulation	Results	
6-1a		Basic Rate	625 kHz	
6-1b	0	EDR DQPSK	1.05 MHz	
6-2c		EDR D8PSK	1.05 MHz	
6-2a		Basic Rate	635 kHz	
6-2b	39	EDR DQPSK	1.05 MHz	
6-2c		EDR D8PSK	1.05 MHz	
6-3a		Basic Rate	635 kHz	
6-3b	78	EDR DQPSK	1.05 MHz	
6-3c		EDR D8PSK	1.04 MHz	



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Figure 6-2a: 20dB Bandwidth Basic rate, Channel 39.







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Figure 6-3a: 20dB Bandwidth Basic rate, Channel 78.







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CARRIER FREQUENCY SEPARATION

7.1 Test Configuration

FCC: § 15.247 a1

IC: RSS-210 §A8.1(2)

The Bluetooth transmitter was set in hopping mode to investigate the carrier frequency separation between mid-channel and its adjacent channels. The carrier frequency separation is independent of modulation and packet length (DH1, DH3, etc.).

Limits:

a) \geq 25 kHz or 20 dB Bandwidth, whichever is greater

b) For FH systems operating in 2400-2483.5MHz and with output power less than 125mW the carrier frequency separation should be greater than 25kHz or 2/3 of 20dB Bandwidth.

7.2 Results: Carrier Frequency				
Figure	Frequency Separation	Limits > 2/3 of 20 dB Bandwidth	Result	
7	1020 kHz	700 kHz (2/3)*1.05 MHz = 700kHz	Pass	



Figure 7: Carrier Frequency Separation between channels 38, 39 (mid-channel) & 40.



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8 NUMBER OF HOPPING FREQUENCIES

8.1 Test Configuration

FCC: § 15.247 a1 iii

IC: RSS-210 §A8.1 (4)

The Bluetooth transmitter was set in hopping mode to investigate the number of hopping frequencies. The number of frequency hopping is independent of modulation and packet length (DH1, DH3, etc.).

Limits:

At least 15 non-overlapping channels

8.2 Res	8.2 Results: Number of Hopping Frequencies					
Figure	Results					
8a	Number of Hopping Frequencies (Channels 0-39)		79			
8b Hopping		Number of Hopping Frequencies (Channels 39-78)	(Channels 0-78)			
Comments: Pass						



Figure 8a: Number of Hopping Frequencies (Channels 0-39).



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* A	gilent																			F	2	Τ						
	824																						Μ	kr2)	2.48	30	05 GHz
Ref 10	dBm				#[ft	ter	13	0 0	βB	E	Xt	PG	; _	0.5	i6 d	IB										0.3	4 dBm
#Peak																										2	2	
10 10	Samo	റവ	00/	1.0	hh	0	~	пŕ	νħ.	m	T	m	٦n	σ <i>ι</i>	٦r	50	πr		m	7	١M	m	ъı	٦r		ιnδ	<u>۲</u>	
dB/	VVVVI	IVV	VV	VV	Y		Iĭ	Y	$\left\{ \right\}$		VV	Y	Y	IV	¥	¥ ¥	V	¥	٧V	ľ	Y	¥	IV	V	V	¥Ϋ́	ł	
																								T				
																								┢			ł	
																								-				
LgAv																											ł	
W1 S2																												
\$3 FC																								T				MAA
£ (f):																								┢				
FTun																												
Ѕ₩р																												
																								┢				
Start 2	.440 00	GHz																					S	ito	p i	2.48	5 (00 GHz
#Res B	W 300 kH	Z								ŧV	BW	3	00	kНz	2					S	òwe	ep	1.	01	3	ms ((40	1 pts)

Figure 8b: Number of Hopping Frequencies (Channels 39-78).



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9 TIME OF OCCUPANCY (DWELL TIME)

9.1 Test Configuration

FCC: § 15.247 a1 iii, § 15.247 f

IC: RSS-210 §A8.1 (4)

The Bluetooth transmitter was set in hopping mode to capture one of the transmissions of mid-channel. Mid-channel (CH 39) was measured here.

Comments:

The dwell time is independent of modulation and packet length (DH1, DH3, etc.).

According to the Bluetooth Core Specification v1.1, we have 1600 hops in a second for a one slot packet type. One frequency hop lasts 625 μ s; this increment is called a time slot. In a period of 31.6 seconds, the time of occupancy for any given channel is calculated as follows:

Duration of one transmission*(1600 hops/sec)/(No. of time-slots)/(79 channels)*31.6 sec

For a DH1 (1 time-slot) packet type, ideally the duration of one transmission is 625 μ s. Therefore, the dwell time is given by:

 $625 \ \mu s^{1}600/s/(1 \ time-slot)/79^{3}1.6 \ s= 0.4 \ s.$

Spectrum Analyzer Parameters:

The measurement is conducted with zero span centered at mid-channel (2441 MHz) with sweep time sufficient enough to capture one transmission (in this case, $\ge 625 \ \mu s$).

Limits:

 \leq 0.4 s (in a period of 31.6 s)

9.2 Results: Dwell Time					
Figure	Channel	Results			
9	Hopping	0.18s			
Comments: PASS					



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Figure 9: Duration of one transmission (Channel 39).



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10 BANDEDGE

10.1 Test Configuration

FCC:	§ 15.247 d	

IC: RSS-210 §A8.5

The Bluetooth RF output port of the EUT was directly connected to the input of the spectrum analyzer with sufficient attenuation. Subsequently, the low and high channels of Bluetooth transmitter were enabled separately to investigate the band-edge compliance of conducted emissions. To ensure the band-edge compliance when the channels are hopping, measurements were also conducted at low and high channels in this mode. A fully charged battery was used as supply voltage

Frequencies of Interest: Spectrum was investigated from 2400 MHz – 2483.5 MHz.

Limits: \leq -20 dBc

In any 100kHz band, the highest radio frequency power outside the band (2400-2483.5 MHz) is measured to be at least 20 dB below the desired power of intentional radiator within the band.

10.2 Resul	ts: Bandedge			
Figure	Channel/Edge	Modulation	Plot Description	Results
10-1a		Pagia Pata	Hopping disabled	-58.15 dBc
10-1b		Dasic Rale	Hopping enabled	-56.75 dBc
10-2a	0 Low Pond Edge		Hopping disabled	-54.14 dBc
10-2b	0 Low Band Edge	EDR DQP3K	Hopping enabled	-55.06 dBc
10-3a			Hopping disabled	-53.61 dBc
10-3b		EDR DOPSK	Hopping enabled	-55.32 dBc
10-4a		Pooio Poto	Hopping disabled	-61.57 dBc
10-4b		Dasic Rale	Hopping enabled	-57.23 dBc
10-5a	79 High Bond Edgo		Hopping disabled	-59.98 dBc
10-5b	78 High Band Euge	EDR DQF3R	Hopping enabled	-58.02 dBc
10-6a			Hopping disabled	-60.27 dBc
10-6b		EDK DOFSK	Hopping enabled	-57.75 dBc



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Figure 10-1a: Basic Rate Low band edge with hopping disabled.



Figure 10-1b: Basic Rate Low band edge with hopping enabled.



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🔆 Agilent R T ▲ Mkr1 -2.30 MHz Ref 10 dBm #Peak #Atten 30 dB Ext PG -0.56 dB -55.06 dB .og 1R 10 m WW dB/ Ag .gAv V1 S3 S2 FC \$ wh **£**(f): f>50k Swp Center 2.400 00 GHz #Res BW 100 kHz Span 10 MHz #VBW 100 kHz_ Sweep 1.227 ms (401 pts)

Figure 10-2b: EDR DQPSK Low band edge with hopping enabled.



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Figure 10-4a: Basic Rate High band edge with hopping disabled.



Figure 10-4b: Basic Rate High band edge with hopping enabled.



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Figure 10-5a: EDR DQPSK High band edge with hopping disabled.



Figure 10-5b: EDR DQPSK High band edge with hopping enabled.



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11 SPURIOUS RF CONDUCTED EMISSIONS

11.1 Test Configuration

FCC: § 15.247 d

IC: RSS-210 §A8.5

The Bluetooth RF output port of the EUT was directly connected to the input of the spectrum analyzer with sufficient attenuation. Subsequently, the low, mid and high channels of Bluetooth transmitter were enabled separately and the frequency spectrum was investigated for any spurious emissions. A fully charged battery was used as supply voltage.

Frequencies of Interest: Spectrum was investigated from 9kHz – 25 GHz.

Limits: <-20 dBc

11.2 Results: Conducted Spurious Emissions						
Figure	Results					
11-1a	0	Conducted spurious emissions, 30kHz to 2.7GHz	22.52 dPo			
11-1b	0	Conducted spurious emissions, 2.7GHz to 25GHz	-32.52 UDC			
11-2a	20	Conducted spurious emissions, 30kHz to 2.7GHz	22.20 dPo			
11-2b		Conducted spurious emissions, 2.7GHz to 25GHz	-32.20 UDC			
11-3a	70	Conducted spurious emissions, 30kHz to 2.7GHz	20.66 dPa			
11-3b	10	Conducted spurious emissions, 2.7GHz to 25GHz	-30.00 000			

Comments:

Spurious RF Conducted Emission testing was performed on the modulation that has the highest conducted power in comparison with the other modulation.



Applicant:	Kyocera
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🔆 Agilent			RT
Ref 10 dBm	#Atten 30 dB	Fxt PG −0 56 dB	Mkr1 1.850 GHz _31 05 dBm
#Peak			
10			
dB/			
DI		1	
dBm			
LgAv			
V1 S2			
S3 FC-wather and a state of the state	have shown and the second s	anan ang pantang pang pang pang pang pang pang pang p	end federatering frankeren frankeren frankeren en e
£(f): FTun			
Śwp			
Start 30 MHz #Res BW 1 MHz	#VB	W 1 MHz	Stop 2.700 GHz Sweep 4.48 ms (601 pts)

Figure 11-1a: Conducted Spurious Emissions (CH 0).



Figure 11-1b: Conducted Spurious Emissions (CH 0).



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* A	gilent							RT		
									Mkr1 1	.850 GHz
Ref 10	dBm		#At	ten 30 di	B Ext PG	-0.56 c	IB		-32	2.14 dBm
#Peak										
109 10										
dB/										
DI										
-21.4 dBm							\$			
LGUA										
V1 S2										
S3 FC	ere al and a start and a start	April Marchine	portubly have have	haddenader	and proper services	hopponetra	mannah	er weeken star weeken solo	moundante	homenon
£ (f):										
FTun										
Swp										
Start 3	0 MHz								Stop 2	.700 GHz
#Res Bl	W 1 MHz				#VBW 1 M	Hz		Sweep	4.48 ms (1	601 pts)_

Figure 11-2a: Conducted Spurious Emissions (CH 39).





Applicant:	Kyocera
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¥ A	gilent							RT		
									Mkr1 1	.850 GHz
Ref 10	dBm		#At	ten 30 di	3 Ext PG	-0.56 c	IB		-29	.70 dBm
#Peak										
LU9 10										1
dB/										
DI							1			
-19.5										
dBm										
LgHv										
M1 S2										
\$3 FC	nor milita	mounder heart	or manutan	humbershide	and the second	nor when the	wownshi	homewhere	mannow	le lateration and a
£ (f)										
FTun										
Ѕ₩р										
Start 3	0 MHz								Stop 2	.700 GHz
#Res B	W 1 MHz				₩VBW 1 M	Hz		Sweep	4.48 ms (1	601 pts)_

Figure 11-3a: Conducted Spurious Emissions (CH 78).





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12 AC POWER LINE CONDUCTED EMISSIONS

12.1 Test Configuration & Results

FCC: § 15.107 § 15.207

IC: RSS-210 §6.6

See separate report

13 RADIATED EMISSIONS

13.1 Test Configuration & Results

FCC: § 15.109 § 15.209

IC: RSS-210 §A2.9 (2)

See separate report

14 TEST EQUIPMENT

The test equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

Description	Manufacturer	Model No.	Serial No.	Cal Due Date
Spectrum Analyzer	Agilent	E4440A	MY44303130	12/14/12