Reviewed and edited by:	Date	Document No.
Masud S. Attayi	December 13, 2012	010_Oper_Desc_RFA91LW

List of General Information Required for Certification

In Accordance with FCC Rules and Regulations,
CFR 47, Part 2, 15, 22 and 24

Sub-Part

2.1033 (c) Technical Description of Equipment

(2) Type of Emission:

For GSM/GPRS/EDGE, the modulation is two-level Gaussian Minimum Shift Keying (GMSK) frequency modulation and 8-PSK modulation (EDGE).
For WCDMA/HSDPA, the modulation is QPSK.
For LTE , the modulation is QPSK and 16QAM

(3) Frequency Range:

GSM 850 MHz (NA band)
Tx: 824-849 MHz, 200 kHz channel resolution
Rx: 869-894 MHz, 200 kHz channel resolution

GSM 900 MHz (EU band)
Tx: 880-915 MHz, 200 kHz channel resolution
Rx: 925-960 MHz, 200 kHz channel resolution

DCS 1800 MHz (EU band)
Tx: 1710-1785 MHz, 200 kHz channel resolution
Rx: 1805-1880 MHz, 200 kHz channel resolution

PCS 1900 MHz (NA band)
Tx: 1850-1910 MHz, 200 kHz channel resolution
Rx: 1930-1990 MHz, 200 kHz channel resolution

FDD Band I (EU band)
Tx: 1920-1980 MHz, 200 KHz channel resolution
Rx: 2110-2170 MHz, 200 KHz channel resolution
Channel bandwidth is 5MHz
F(low): Tx: 1922.4 MHz Rx: 2112.4 MHz
F(high): Tx 1977.6 MHz Rx: 2167.6 MHz

FDD Band VIII (EU band)
Tx: 880-915 MHz, 200 KHz channel resolution
Rx: 925-960 MHz, 200 KHz channel resolution
Channel bandwidth is 5MHz
F(low): Tx: 882.4 MHz Rx: 927.4 MHz
F(high): Tx 912.6 MHz Rx: 957.6 MHz

CDMA Band BC0
Tx: 824-849 MHz, 30KHz channel resolution
Rx: 869-894 MHz, 30KHz channel resolution
Channel bandwidth is 1.25MHz
F(low): Tx: 824.62 MHz Rx: 869.62MHz

F(high): Tx 848.38 MHz Rx: 893.38MHz
CDMA Band BC1
Tx: 1850-1910 MHz, 30KHz channel resolution
Rx: 1930-1990 MHz, 30KHz channel resolution
Channel bandwidth is 1.25MHz
F(low): Tx: 1850.62 MHz Rx: 1930.62MHz
F(high): Tx: 1909.38 MHz Rx: 1989.38MHz

LTE Band 13
Tx: 777-787 MHz, 200 KHz channel resolution
Rx: 746-756 MHz, 200 KHz channel resolution
Channel bandwidth is 5MHz
F(low): Tx: 779.4 MHz Rx: 748.4 MHz
F(high): Tx 784.6 MHz Rx: 753.6 MHz

Bluetooth
Tx/Rx: 2402-2480 MHz, 1 MHz channel resolution

WiFi
802.11b/g, n-compatible
Tx/Rx: 2.4-2.4835 GHz
802.11 a, n-compatible
Tx/Rx : 5.18-5.825 GHz

GPS
Tx/Rx 1.58 GHz

NFC Tx/Rx
13.56 MHz

(4) Operating Power Output Levels:

The transmitter is capable of generating RF power at several calibrated levels, ranging from +0 dBm to +30 dBm for PCS/DCS, +5 to +33 dBm for GSM 900, +5 to +33 dBm for GSM 850 band, –6 to +4 dBm for Bluetooth, and +12 to +16 dBm for WiFi. The range of output power is controlled to discrete levels of 2 dB increments for GSM/GPRS/EDGE, and between 2 and 8 dB increments for Bluetooth. The power levels are automatically device selected to balance link with receive power and is not user adjustable. For WCDMA/HSDPA/HSUPA, the maximum output power is limited to nominally +24dBm for all FDD bands. The radio is capable of producing any power level from -55 dBm to +24 dBm while in closed-loop power control with the base station. The base station is able to adjust the handheld’s power in 1dB steps. Under open-loop power control, the handheld utilizes internal calibration data to set an output power within its dynamic range, accounting for worst case errors such that the maximum power limit is never violated.

(5) Maximum Power Rating:

As defined in the applicable parts of the rules:
2.1046 and 24.232 – Mobile/portable stations are limited to 2 Watts EIRP peak power and must be in the range of –7 dBW to 0 dBW EIRP for PCS band.
22.913 – Maximum ERP of mobile transmitters are limited to 7 Watts ERP peak and must be in the range of –7 dBW to 0 dBW ERP for GSM850 band.
The unit tested meets these limits.

(8) Voltages & Currents In All Elements In Final R.F. Amplifying Device:

For GSM/GMSK/EDGE mode, the transmit Power Amplifier (PA) is connected directly to the battery voltage. The operating battery voltage will vary from 3.6 Vdc to 4.35 Vdc, depending on the charge state of the battery. The PA current drain will vary depending on the operating output power. The peak PA output current at max power can reach 1.5 Amperes, depending on band of operation.

For WCDMA/HSDPA/HSUPA mode, the transmit Power Amplifier (PA) are connected to a switching regulator to control the voltage provided to the PA. This output voltage varies depending on the output power required. This voltage will vary from 0.7 Vdc -> 3.4 Vdc, depending on the active band of operation. The PA current drain will vary depending on the operating output power. The PA output current at max power will vary from 0.4 to 0.7 Amperes, depending on band of operation.

Top antenna

	GAIN			Antenna Type
WCDMA Band 1	1920.00	1950.00	1980.00	Embedded
Avg Tx Gain (dBi)	-2.15	-3.08	-2.07	
Peak Tx Gain (dBi)	1.75	1.12	2.03	
GSM1900	1850.00	1880.00	1910.00	Embedded
Avg Tx Gain (dBi)	-2.03	-2.64	-2.86	
Peak Tx Gain (dBi)	1.27	1.26	0.84	
GSM1800	1710.20	1747.40	1784.80	Embedded
Avg Tx Gain (dBi)	-3.23	-3.94	-3.92	
Peak Tx Gain (dBi)	0.37	-0.54	-0.82	
GSM850	824.00	836.50	849.00	Embedded
Avg Tx Gain (dBi)	-5.06	-4.86	-4.68	
Peak Tx Gain (dBi)	-2.56	-2.46	-2.38	
GSM900	880.00	902.50	915.00	Embedded
Avg Tx Gain (dBi)	-4.21	-3.59	-3.17	
Peak Tx Gain (dBi)	-1.61	-0.89	-0.17	
WCDMA Band 8	880.00	902.50	915.00	Embedded
Avg Tx Gain (dBi)	-4.24	-4.15	-4.34	
Peak Tx Gain (dBi)	-1.54	-1.45	-1.14	
Band 13 (700 MHz)	777.00	782.00	787.00	Embedded
Avg Tx Gain (dBi)	-3.82	-4.10	-4.30	
Peak Tx Gain (dBi)	-1.12	-1.40	-1.80	

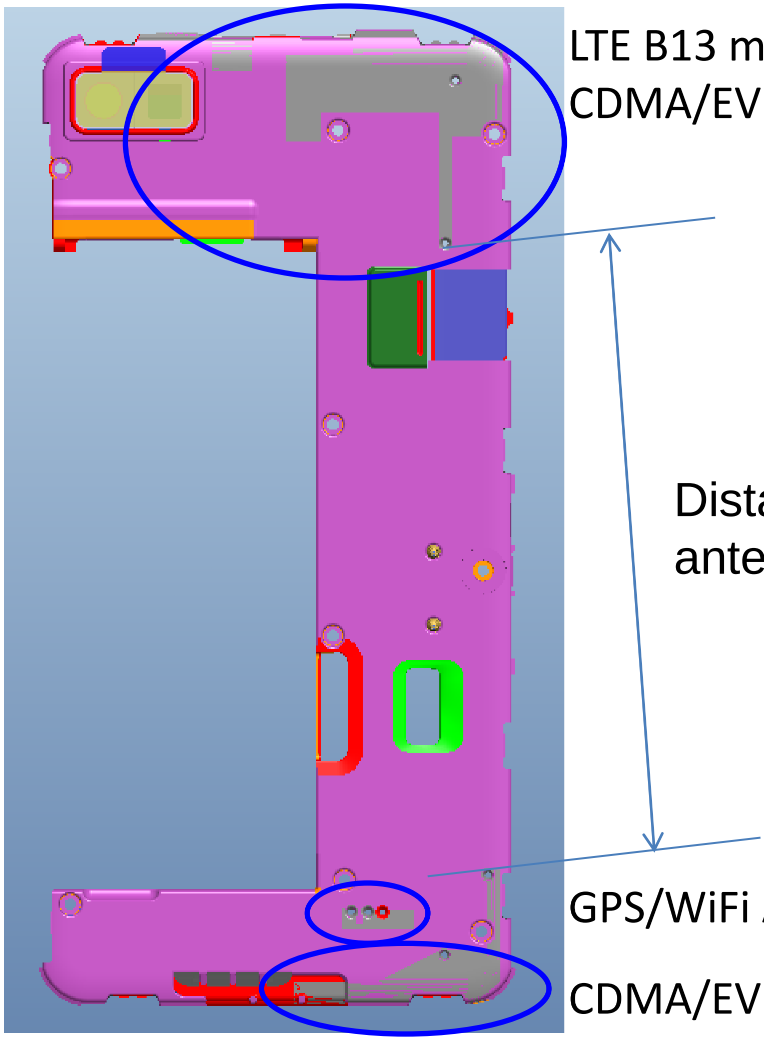
Bottom Antenna

GAIN			Antenna Type	
CDMA BC1	1850.00	1880.00	1910.00	Embedded
Avg Tx Gain (dBi)	-2.09	-1.60	-2.26	
Peak Tx Gain (dBi)	1.11	1.80	0.94	
CDMA BC0	824.00	836.50	849.00	Embedded
Avg Tx Gain (dBi)	-2.65	-2.42	-2.99	
Peak Tx Gain (dBi)	0.55	0.58	0.11	
BT				
Average Gain (dBi)				
Peak Gain (dBi)	2402.00	2441.00	2480.00	Embedded
	-4.89	-4.94	-5.20	
	-0.02	0.00	-0.20	
2.4 GHz WiFi				
Average Gain (dBi)				
Peak Gain (dBi)	2412.00	2437.00	2462.00	Embedded
	-4.9	-4.9	-5	
Average Gain (dBi)	-0.038	-0.01	-0.095	
Peak Gain (dBi)	2472.00			Embedded
	-5.20			
	-0.20			
5 GHz WiFi				
Average Gain (dBi)				
Peak Gain (dBi)	5180.00	5320.00	5500.00	Embedded
	-8.25	-8.00	-8.70	
Average Gain (dBi)	-0.76	-0.40	-0.67	
Peak Gain (dBi)	5700.0	5805.00		Embedded
	-7.1	-7.50		
	1.5	0.99		

Battery cover Antenna

NFC		
H-Field at 25 mm (A/m)		
	13.56	Embedded
	1 A/m	(Battery cover)

R069



LTE B13 main, Quad-band GSM, Dual-band UMTS, CDMA/EVDO diversity

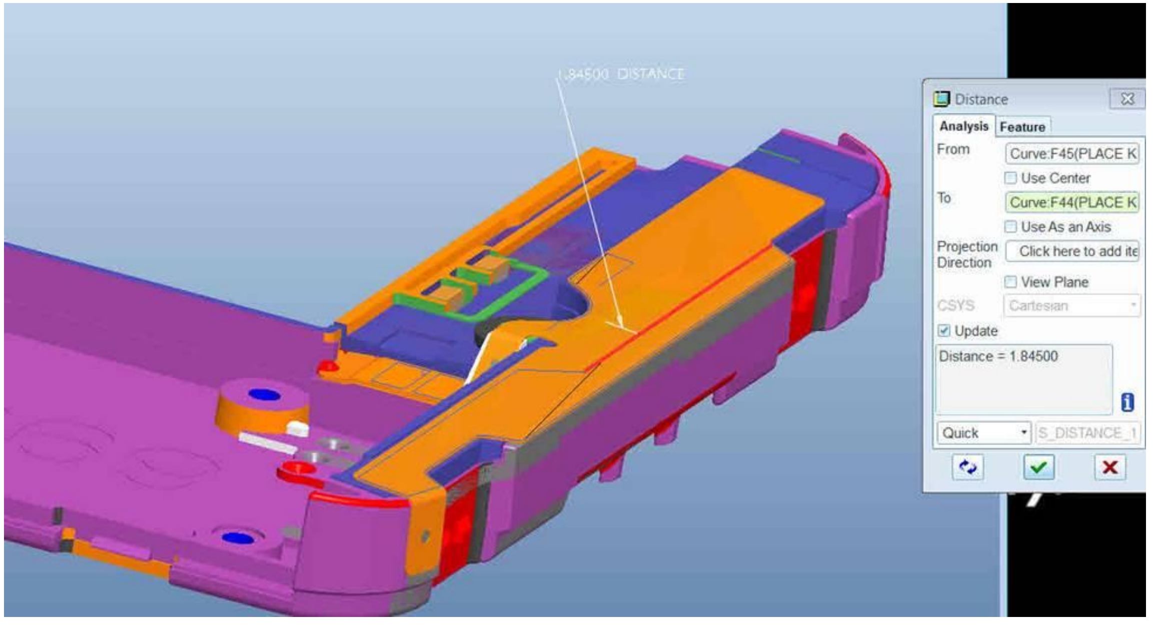
Distance between top and bottom antenna : 81 mm

GPS/WiFi A

CDMA/EVDO main, WiFi b/g, LTE B13 Secondary

Distance between GPS/WiFi A and Bottom Main Antenna

1.845 mm



FCC Part 15.247/Industry Canada RSS-210 Annex 8 Application Form

Product Name: BlackBerry smartphone STL100-4

FCC id/or Industry Canada ID: L6ARFA90LW

Introduction

The following listed sections are requirements outlined by the FCC/Industry Canada which the equipment must meet in order to complete a successful application to the FCC/Industry Canada . If the equipment being submitted for testing is subject to the rules in 15.247 or RSS-210 Annex 8 , the following sections must be completed. Sections 3 to 6 are taken from the FCC Guidance Document DA 00-705.

Section 1

15.203 - Antenna requirement.

a) Integral Antenna [Y]

b) Dedicated Antenna [ ]

c) Antenna Connector* [ ] Antenna Connector Type:..

Where option B is identified please specify how this is connected to the Transmitting circuitry

Where option C is identified please specify the connector type, eg. Reverse SMA and provide or request photographs of both connectors .

Section 2

Has the radio device been approved to 802.15.1? Yes [Y] No [ ]
(Bluetooth)

If **Yes,** then please provide evidence of such approval (e.g. Certificate, Test Report etc) .

If **Yes** you do not have to answer the questions in Sections 3 to 6.

If **No, or no available** evidence please answer the following questions in Sections 3 to 6 is not required.

Note: The supporting evidence for the following sections may either be clear design information, Test Results obtained on the product, or Test Results obtain using the same Driver Chip where the Chip itself controls compliance to the requirement.

Section 3 Pseudorandom Frequency Hopping Sequence

Describe how the hopping sequence is generated. Provide an example of the hopping sequence channels, in order to demonstrate that the sequence meets the requirement specified in the definition of a frequency hopping spread spectrum system.

Co-ordination of the hopping sequence in data mode to avoid simultaneous occupancy by multiple transmitters:

Bluetooth units which want to communicate with other units must be organized in a structure called piconet. This piconet consist of max. 8 Bluetooth units. One unit is the master the other seven are the slaves. The master co-ordinates frequency occupation in this piconet for all units. As the master hop sequence is derived from it's BD address which is unique for every Bluetooth device, additional masters intending to establish new piconets will always use different hop sequences.

Example of a hopping sequence in data mode:

Example of a 79 hopping sequence in data mode: 40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54, 67, 56, 37, 60, 39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59, 72, 29, 76, 31, 74, 61, 78, 63, 01, 41, 05, 43, 03, 73, 07, 75, 09, 45, 13, 47, 11, 77, 15, 00, 64, 49, 66, 53, 68, 02, 70, 06, 01, 51, 03, 55, 05, 04

Derivation and examples for a hopping sequence in hybrid mode.

For the generation of the inquiry and page hop sequences the same procedures as described for the data mode are used (see item 5), but this time with different input vectors:
For the inquiry hop sequence, a predefined fixed address is always used. This results in the same 32 frequencies used by all devices doing an inquiry but every time with a different start frequency and phase in this sequence.
For the page hop sequence, the device address of the paged unit is used as the input vector. This results in the use of a subset of 32 frequencies which is specific for that initial state of the connection establishment between the two units. A page to different devices would result in a different subset of 32 frequencies. So it is ensured that also in hybrid mode, the frequency is used equally on average.

Example of a hopping sequence in inquiry mode: 48, 50, 09, 13, 52, 54,41, 45, 56, 58, 11, 15, 60, 62, 43, 47, 00, 02, 64, 68, 04, 06, 17, 21, 08, 10, 66, 70, 12, 14, 19, 23

Example of a hopping sequence in paging mode: 08, 57, 68, 70, 51, 02, 42, 40, 04, 61, 44, 46, 63, 14, 50, 48, 16, 65, 52, 54, 67, 18, 58, 56, 20, 53, 60, 62, 55, 06, 66, 64

Section 4 Equal Hopping Frequency Use

Describe how each individual EUT meets the requirement that each of its hopping channels is used equally on average (e.g., that each new transmission event begins on the next channel in the hopping sequence after the final channel used in the previous transmission event).

Equally average use of frequencies in data mode and short transmissions:

The generation of the hopping sequence in connection mode depends essentially on two input values:

1. LAP/UAP of the master of the connection
2. Internal master clock

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD_ADDRESS. The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronization with other units, only the offsets are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5 µs. The clock has a cycle of about one day (23h30). In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire LAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR-operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions, the Bluetooth system has the following behavior:

The first connection between the two devices is established, a hopping sequence is generated. For transmitting the wanted data, the complete hopping sequence is not used and the connection ends. The second connection will be established. A new hopping sequence is generated. Due to the fact that the Bluetooth clock has a different value, because the period between the two transmission is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5 µs). The hopping sequence will always differ from the first one.

Section 5 System Receiver Input Bandwidth

Describe how the associated receiver(s) complies with the requirement that its input bandwidth (either RF or IF) matches the bandwidth of the transmitted signal.

Receiver input bandwidth and synchronization in hybrid mode:

The receiver input bandwidth is the same as in the data mode (1 MHz). When two Bluetooth devices establish contact for the first time, one device sends an inquiry access code and the other device is scanning for this inquiry access code. If two devices have been connected previously and want to start a new transmission, a similar procedure takes place. The only difference is, instead of the inquiry access code, a special access code, derived from the BD_ADDRESS of the paged device will be, will be sent by the master of this connection. Due to the fact that both units have been connected before (in the inquiry procedure) the paging unit has timing and frequency information about the page scan of the paged unit. For this reason the time to establish the connection is reduced.

Section 6 System Receiver Hopping Capability

Describe how the associated receiver(s) has the ability to shift frequencies in synchronization with the transmitted signals.

Receiver input bandwidth, synchronization and repeated single or multiple packets:

The input bandwidth of the receiver is 1 MHz.

In every connection, one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection (e.g. single or multi-slot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing is according to the packet type of the connection. Also, the slave of the connection uses these settings. Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

Completed by Name: Lizhong Zhu

Job Title : Director of WLAN and Bluetooth

Signed: .... Date: December 11, 2012