

# RF Exposure Evaluation

## in co-locating with other transmitters

### 1. Conditions

As shown in the separate exhibits "WLAN Antenna Info-CL1\_A" and "WLAN Antenna Info-CL1\_W", the applying host PC device incorporates the four kinds of transmitters listed below.

WLAN/WiMAX:	FCC ID: <b>PD9533ANXMU</b>
Bluetooth:	FCC ID: QDS-BRCM1033
UWB:	FCC ID: V4EUWB3480MPE
WWAN:	FCC ID: J9CUNDP-1L
	or FCC ID: VV7-MBMF3507G-L

The minimum separation distance between human body and the WLAN/WiMAX Tx antenna of the host PC device is **30.5mm** (in Figure-2). Therefore the applying WLAN/WiMAX transmitter module (FCC ID: **PD9533ANXMU**) and the antenna system is subjected to SAR testing pursuant to FCC CFR 47 Section 2.1093.

The applying WLAN/WiMAX transmitter module has been tested and found to comply with the SAR limits as shown by the separate SAR report.

#### 1.1 RF exposure justification regarding WLAN/WiMAX & WWAN co-location

The WLAN/WiMAX Tx antenna locates very close to WWAN Tx (main) antenna. However both transmitter modules do not establish network link connections simultaneously, but switch the operation each other within 11 seconds of handover time if one of them is in active. See "Hand-over logic" exhibit.

Therefore, no RF Exposure evaluation in co-locating with WLAN/WiMAX and any WWAN transmitter is required.

#### 1.2 RF exposure justification regarding WLAN/WiMAX & Bluetooth co-location

The Bluetooth antenna separation distance from human body in Figure-2 is 30.5mm. And the antenna separation distance between the WLAN/WiMAX **Aux** antenna and Bluetooth antenna is 35.5mm.

Therefore, the **Aux** antenna in Figure-2 requires a RF Exposure evaluation for co-location with Bluetooth. The Bluetooth device installed in the host PC device is as follows.

Bluetooth Model name	FCC ID, IC Cert. Number	Grantee Name	Granted Date	Conducted Tx power
BCM92046MD_GEN	FCC ID: QDS-BRCM1033	Broadcom Corporation	Dec./ 14 / 2007	4.1 mW
	IC: 4324A-BRCM1033		Dec./ 19 / 2007	

The separate SAR report indicates the evaluation of co-location of the applying WLAN/WiMAX transmitter and the subjected Bluetooth device, and then found to comply with the SAR limits.

#### 1.3 RF exposure justification regarding WLAN/WiMAX & UWB co-location (US only)

UWB transmitter is not mentioned in FCC CFR 47 Section 2.1091 and 2.1093, so it does not subject to RF exposure requirement. Therefore, no additional SAR testing or RF Exposure evaluation is required for any combination with UWB transmitter.

#### 1.4 Summary of RF Exposure evaluation

Operation mode	Antenna combination	Clause number	Category	Result	Pass or fail
Notebook, Primary Landscape	Aux	3.1.1	MPE	0.117 mW/cm <sup>2</sup>	Pass
	Main / 3rd	3.1.2	SAR	0.126 W/Kg	Pass
Primary Portrait	Main / 3rd	3.2.1	MPE	0.117 mW/cm <sup>2</sup>	Pass
	Aux	3.2.2	SAR	0.136 W/Kg	Pass
Lap Held	Main / Aux / 3rd	3.3	SAR	0.053 W/Kg	Pass
Secondary Landscape	Main / 3rd	3.4	SAR	0.179 W/Kg	Pass
	Aux	-	Not used	-	N/A
Secondary Portrait	Main / 3rd	-	Not used	-	N/A
	Aux	3.5	SAR	0.155 W/Kg	Pass

## 2. Configuration of EUT

Figure-1: Notebook mode

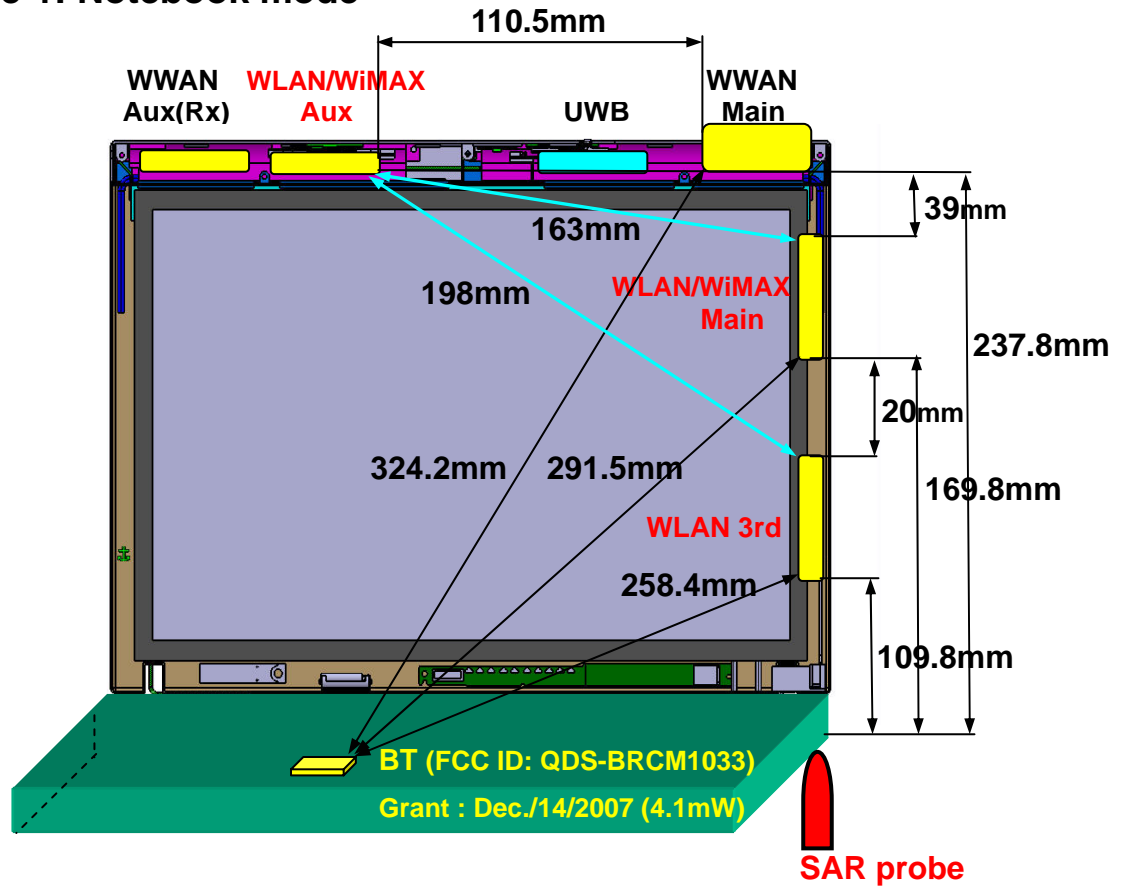
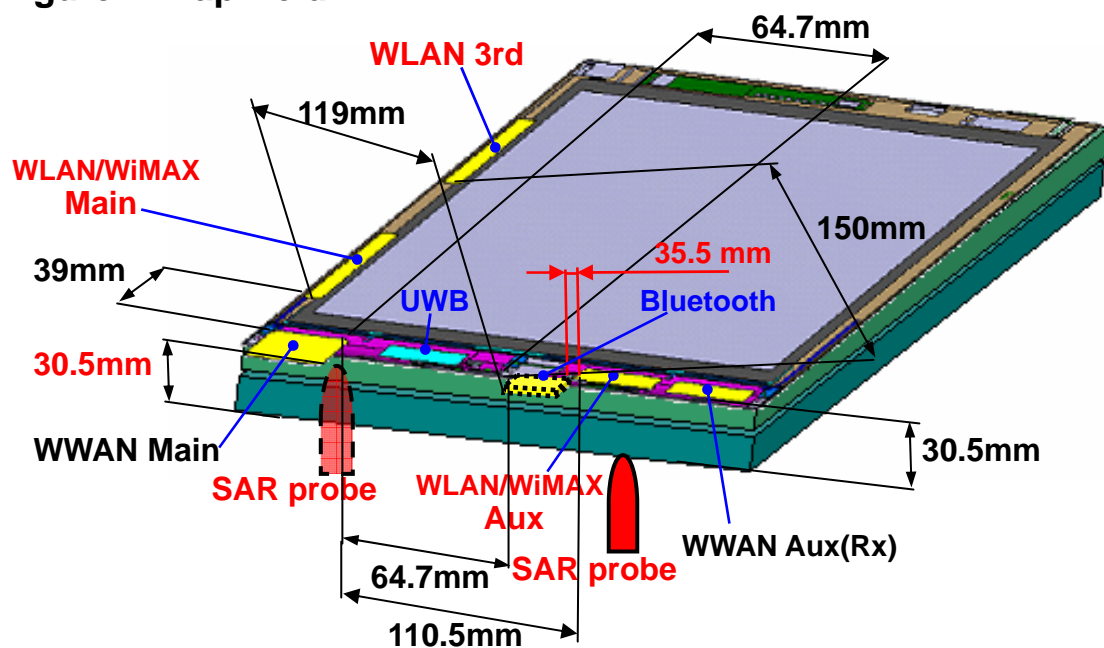
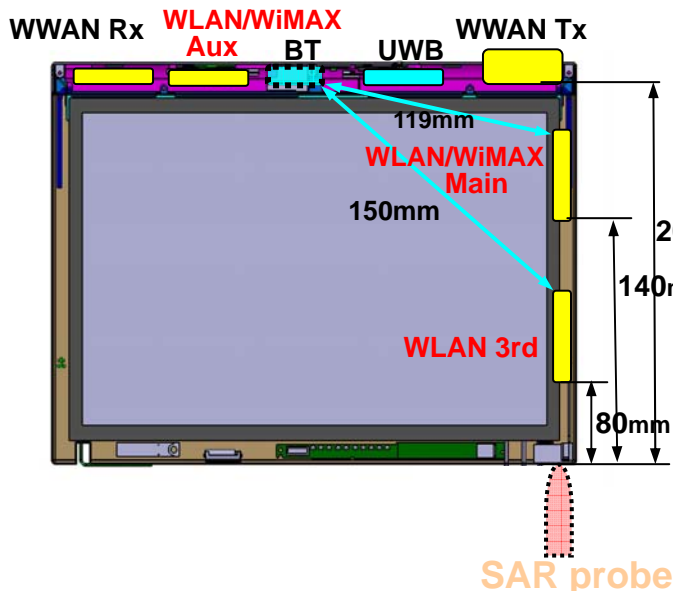


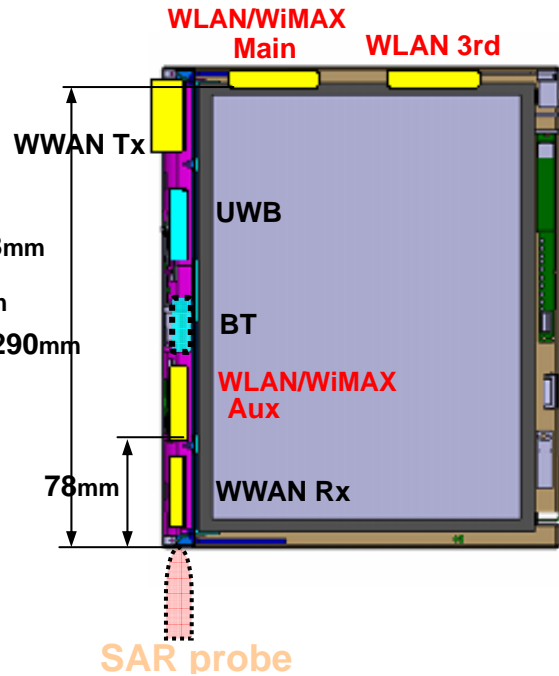
Figure-2: Lap Held



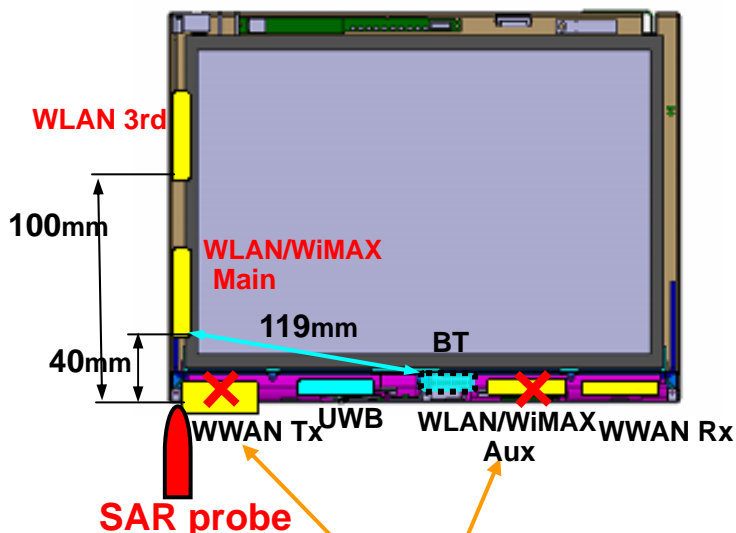
**Figure-3:**  
**Tablet PL (Primary Landscape)**



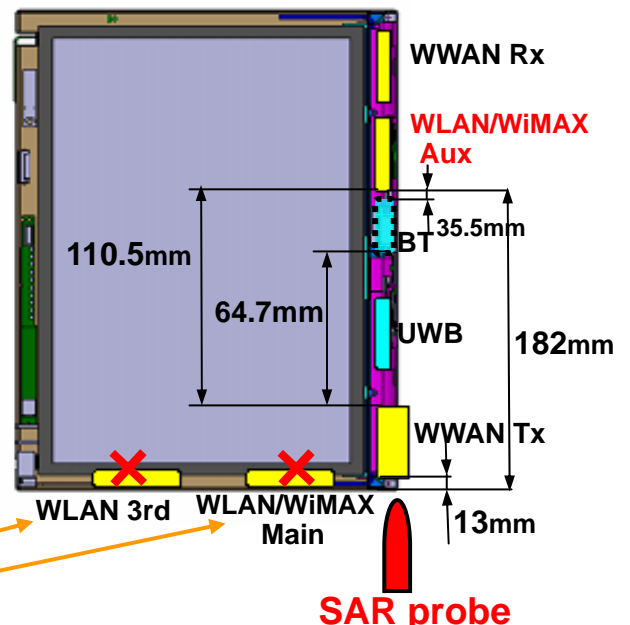
**Figure-4:**  
**Tablet PP (Primary Portrait)**



**Figure-5:**  
**Tablet SL (Secondary Landscape)**



**Figure-6:**  
**Tablet SP (Secondary Portrait)**



**✗ Tx antennas in these rotary screen positions do not transmit RF (Rx only).**

See separate exhibit "Tablet Tx control logic" in more details.

### 3. RF Exposure evaluation

#### 3.1 Notebook & Primary Landscape modes

The Notebook and Primary Landscape modes are similar test configurations with or without the thickness of keyboard section, and Landscape mode represents for evaluation as the worse case.

##### 3.1.1 Aux antenna (MPE)

**Table-1:** WLAN&WiMAX MPE info.

FCC CFR	Frequency	Max. Conducted power (P)	Max. Host PC antenna gain (G)	MPE *1 (mW/cm <sup>2</sup> )	Pass or Fail	limit (mW/cm <sup>2</sup> )
Part 15C	2.4GHz band	0.470 W	1.32 dBi	0.117	Pass	1.0
Part 15E	5.18– 5.32GHz	0.048 W	1.45 dBi	0.012	Pass	
Part 15E	5.50 – 5.70GHz	0.048 W	1.47 dBi	0.012	Pass	
Part 15C	5.745 – 5.825GHz	0.436 W	1.13 dBi	0.104	Pass	

$$*1: MPE = (1000 \times P) \times (10^{G/10}) / (4 \times \pi \times 20.8^2)$$

##### 3.1.2 Main / 3rd antenna (SAR)

**Table-2:** SAR test results at Primary Landscape mode

FCC CFR	Frequency	SAR (W/Kg)		Pass or Fail	limit (W/Kg)
		3rd non MIMO	Main+Aux+3rd 802.11n MIMO		
Part 15C	2.4GHz band	0.050	0.064	Pass	1.6
Part 15E	5.18– 5.32GHz	0.061	0.100	Pass	
Part 15E	5.50 – 5.70GHz	*2	0.126	Pass	
Part 15C	5.745 – 5.825GHz	*2	0.084	Pass	

\*2: Measurement was omitted because the results of Main+Aux+3rd MIMO are surely worse than \*2.

#### 3.2 Primary Portrait modes

##### 3.2.2 Main / 3rd antennas (MPE)

Those are Mobile configuration, and the MPE results are the same as Table-1 since the maximum total power from the Main and 3rd antennas does not exceed the values in Table-1.

##### 3.2.1 Aux antenna (SAR)

**Table-3:** SAR test results at Primary Portrait mode

FCC CFR	Frequency	SAR (W/Kg)	Pass or Fail	limit (W/Kg)
		Aux		
Part 15C	2.4GHz band	0.017	Pass	1.6
Part 15E	5.18– 5.32GHz	0.136	Pass	
Part 15E	5.50 – 5.70GHz	0.045	Pass	
Part 15C	5.745 – 5.825GHz	0.026	Pass	

### 3.3 Lap held mode

**Table-4:** SAR test results at Lap held mode

FCC CFR	Frequency	SAR (W/Kg) *3		Pass or Fail	limit (W/Kg)
		Main or Aux or 3rd non MIMO	Main+Aux+3rd 802.11n MIMO		
Part 15C	2.4GHz band	0.023	0.023	Pass	1.6
Part 15E	5.18– 5.32GHz	0.027	0.053	Pass	
Part 15E	5.50 – 5.70GHz	0.028	0.032	Pass	
Part 15C	5.745 – 5.825GHz	0.029	0.023	Pass	

\*3: Bluetooth co-location evaluation was taken into account for Aux antenna. Refer to Clause 1.2.

### 3.4 Secondary Landscape mode

**Table-5:** SAR test results at Secondary Landscape mode

FCC CFR	Frequency	SAR (W/Kg)		Pass or Fail	limit (W/Kg)
		Main non MIMO	Main + 3rd 802.11n MIMO		
Part 15C	2.4GHz band	0.032	0.179	Pass	1.6
Part 15E	5.18– 5.32GHz	0.058	0.177	Pass	
Part 15E	5.50 – 5.70GHz	*4	0.123	Pass	
Part 15C	5.745 – 5.825GHz	*4	0.091	Pass	

\*4: Measurement was omitted because the results of Main+3rd MIMO are surely worse than \*4.

### 3.5 Secondary Portrait mode

**Table-6:** SAR test results at Secondary Portrait mode

		SAR (W/Kg)	Pass or Fail	limit (W/Kg)
		Aux		
Part 15C	2.4GHz band	0.083	Pass	1.6
Part 15E	5.18– 5.32GHz	0.155	Pass	
Part 15E	5.50 – 5.70GHz	0.115	Pass	
Part 15C	5.745 – 5.825GHz	0.062	Pass	