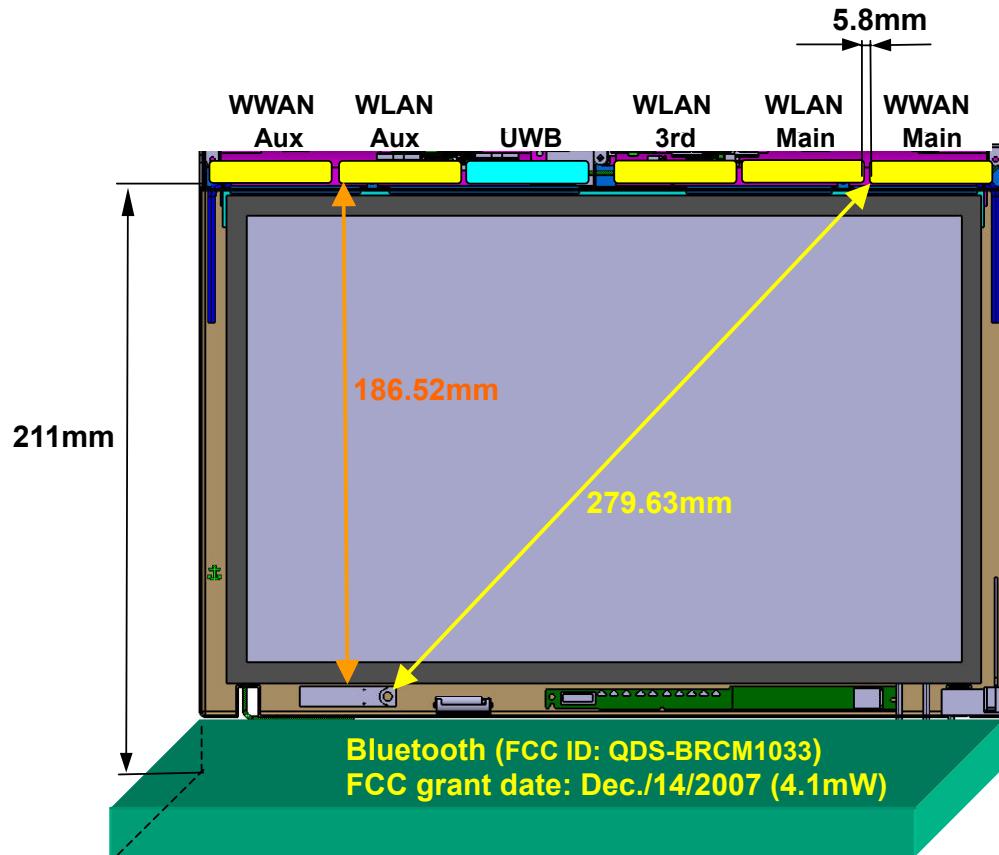


# RF Exposure Info. for Model UNDP-1

Figure-1 Antenna configuration of ThinkPad X200/X200s



## WWAN - Bluetooth:

The RF Exposure evaluation nor SAR testing in co-locating with Bluetooth is not required pursuant to the FCC document "616217 D01 SAR for Laptop v01" issued on December/07/2007, since the separation distance to the nearest WLAN Tx antenna is more than 5cm apart and its maximum power is 4.1mW.

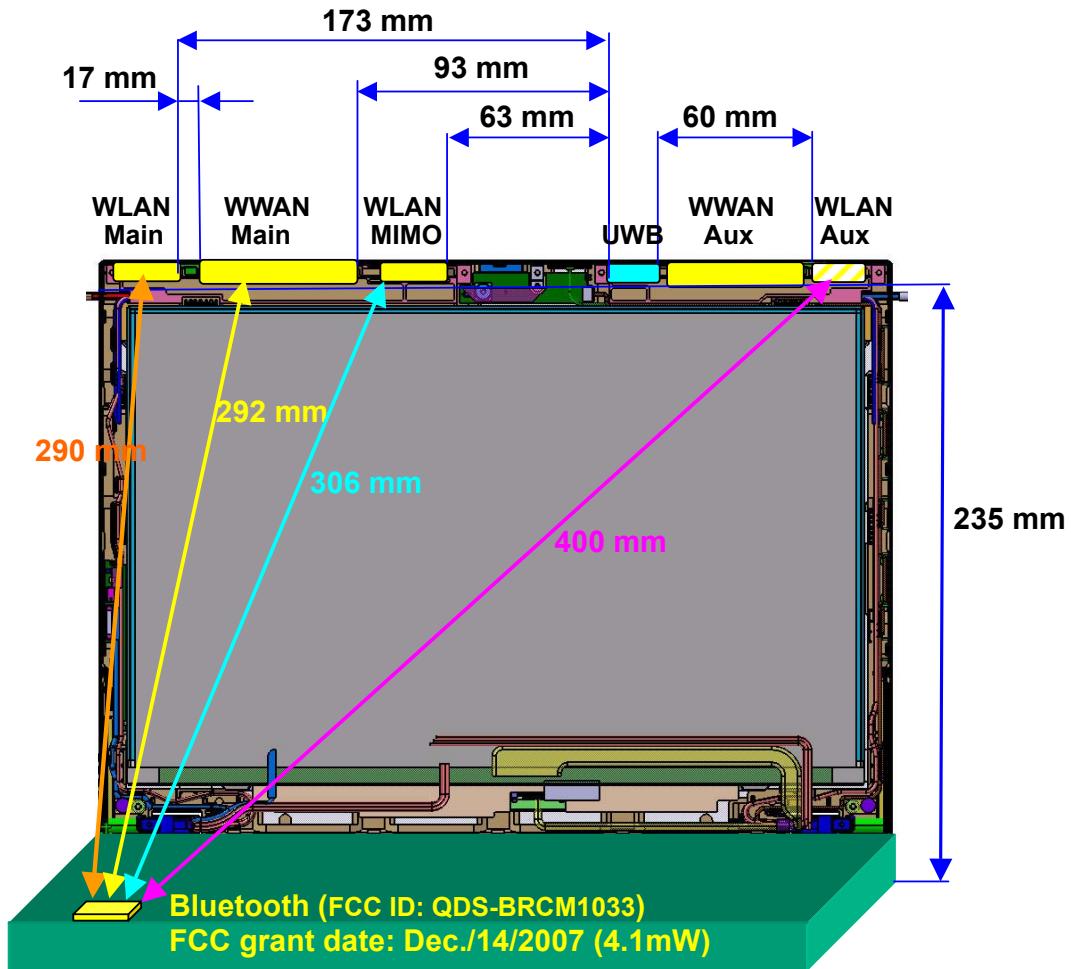
## WWAN - UWB:

Since UWB transmitter is not mentioned in the section 2.1091 and 2.1093, it does not subject to RF exposure evaluation. Therefore no co-located MPE or SAR testing is required.

## WWAN - WLAN:

The WWAN main (Tx) antenna and WLAN antennas co-locate with 5.8mm of separation distance, and both devices transmit RF simultaneously.

**Figure-2 Antenna configuration of ThinkPad X300/X301**



#### WWAN - Bluetooth:

The RF Exposure evaluation nor SAR testing in co-locating with Bluetooth is not required pursuant to the FCC document "616217 D01 SAR for Laptop v01" issued on December/07/2007, since the separation distance to the nearest WLAN Tx antenna is more than 5cm apart and its maximum power is 4.1mW.

#### WWAN - UWB:

Since UWB transmitter is not mentioned in the section 2.1091 and 2.1093, it does not subject to RF exposure evaluation. Therefore no co-located MPE or SAR testing is required.

#### WWAN - WLAN:

The WWAN main (Tx) antenna and WLAN antennas co-locate with 17mm of separation distance, and both devices transmit RF simultaneously.

Table-1: WWAN (Model: UNDP-1) MPE info.

UNDP-1 Grant date	Host PC model	FCC CFR	Max. Conducted power (P)	Max. Host PC antenna gain (G)	Distance (D)	MPE *1 (mW/cm <sup>2</sup> )	limit (mW/cm <sup>2</sup> )
05/14/2008	ThinkPad 200/X200s	Part 22H	1.986 W	-1.17 dBi	21.1 cm	<b>0.27</b>	0.53 (=800/1500)
	ThinkPad 300/X301			-0.04 dBi	23.5 cm	<b>0.28</b>	
	ThinkPad 200/X200s	Part 24E	0.885 W	1.34 dBi	21.1 cm	<b>0.22</b>	1.0
	ThinkPad 300/X301			3.92 dBi	23.5 cm	<b>0.31</b>	

$$*1: MPE = (Px1000)x(10^{\frac{G}{10}}) / (4 \times \pi \times D^2)$$

Table-2: Maximum WWAN antenna gain

Host PC model	Antenna Manufacturer	LCD size	Antenna P/N	Cable length (mm)	LCD Material	Frequency band (MHz)	
						EVDO/GSA/UMTS (US)	
						824 - 849	1850 - 1910
ThinkPad X200/X200s	ACON	12.1"	25.90600.001	535	Magnesium+ Alminium+ABS	-1.86 dBi	1.34 dB
	Wistron		25.90589.001	551		-1.17 dBi	-1.09 dB
ThinkPad X300/X301	NISSEI	13.3"W	3209996	486	CFRP+GFRP	-0.04 dBi	3.92 dBi

Table-3: Co-located WLAN Peak power

Grant date	WLAN FCC ID	Part 15C 2.4GHz band	Part 15E 5.18 – 5.32GHz	Part 15E 5.50 – 5.70GHz	Part 15C 5.745 – 5.825GHz
05/09/2008	PPD-AR5BHB63-L	<b>0.1977W</b>	N/A	N/A	N/A
06/24/2008	PD9LEN512ANMU	0.091 W	0.028 W	0.054 W	0.021 W
07/07/2008	PD9533ANMU	0.130 W	<b>0.110 W</b>	<b>0.110 W</b>	<b>0.068 W</b>

Table-4: WLAN MPE info.

	Max. Conducted power from Table-3 (P)	Max. Host PC antenna gain from Table-5 (G)	MPE *2 (mW/cm <sup>2</sup> )	limit (mW/cm <sup>2</sup> )
Part 15C 2.4GHz band	0.198 W	1.94 dBi	<b>0.062</b>	1.0
Part 15E 5.18 – 5.32GHz	0.110 W	2.12 dBi	0.036	
Part 15E 5.50 – 5.70GHz	0.110 W	2.34 dBi	0.038	
Part 15E 5.745 – 5.825GHz	0.068 W	2.31 dBi	0.023	

$$*2: MPE = (Px1000)x(10^{\frac{G}{10}}) / (4 \times \pi \times 20^2)$$

Table-5: Certified WLAN antenna List

Host PC	Antenna Manufacturer	Antenna P/N	Main Antenna				Auxiliary Antenna				
			Frequency band (GHz)				Frequency band (GHz)				
			2.4 -2.5	5.15 -5.35	5.47 -5.725	5.725 -5.85		2.4 -2.5	5.15 -5.35	5.47 -5.725	5.725 -5.85
X300	NISSEI	3209970	1.88	2.12	2.34	2.31	3210002	1.26	-0.14	1.44	1.47
X301							25.90597.001	1.04	-0.11	0.33	-1.06
X200/X200s	ACON	25.90598.001	1.17	-1.19	-2.38	-2.36	25.90586.001	0.59	-1.27	-0.33	-0.77
	Wistron NW	25.90587.001	1.94	0.16	0.61	0.29					

3rd Antenna					
Antenna P/N	Frequency band (GHz)				
	2.4 -2.5	5.15 -5.35	5.47 -5.725	5.725 -5.85	
3209988	0.90	-0.14	-0.50	-0.64	
25.90601.001	-1.05	-1.39	-3.47	-4.61	
25.90590.001	0.44	-1.77	-1.06	-1.01	

With the results of Table-1 and Table-4, the summation of the highest MPE for WWAN and WLAN devices is calculated as below.

1) Part 24E (PCS) & Part 15C/E:

$$0.31 + 0.062 = \mathbf{0.372} \text{ mW/cm}^2 \text{ (Limit}=1.0)$$

2) Part 22H (Cellular) & Part 15C/E:

Per OET Bulletin 65 for frequency bands with different limits, the MPEs are calculated separately for each band, then divided by the limit for the band and the results are then summed. The summation must be less than 1.

$$\text{i.e. } 0.28 / 0.53 + 0.062 / 1.0 = 0.59 < 1.0$$

Therefore, the applying modular transmitter has found to comply with the FCC MPE limit according to FCC CFR 47 section 2.1091 for general Population/Uncontrolled exposure, even the co-located WLAN devices shown in the Table-3 transmit RF simultaneously.