

RF Exposure Evaluation

1. The module identified in Table-1 below was originally granted by the FCC on September 04, 2009 under the grantee name of IPWireless Inc.

Table-1: WWAN PCI Express™ Mini card		
IPWireless Inc., Model: AAU1		
FCC ID	PKTPEMAAU1	September 04, 2009
Max.Tx power	0.25 W	
Granted antenna gain	9 dBi	

The AAU1 module is compliant with the standards & requirements listed in Table-2 below when used in qualified laptop host systems subjected to the conditions stated in the grant notes of Equipment Authorization.

Table-2: Compliance of Module and antenna with Standards
FCC Part 2.1091, Part 27 (2496 – 2690MHz)

2. The additional WWAN antenna systems listed in Table-3 are subjected to “Mobile” category (Part 2.1091) as shown in the Appendix in this document, and the maximum antenna gains are less than the original granted value. Therefore those antenna systems have found to comply with the Federal Register/Vol. 69, No. 172, September, 2004 and section 8) of KDB447498, November, 2009.

Table-3: WWAN antenna models added in this Class I Permissive Change				
Host PC name	Antenna manufacturer & Part number	Max. Gain	Verdict	certified Maximum gain
ThinkPad T400 series Model: TP00015A TP00030A	Amphenol: C-3068-11-000-27	-0.68dBi	pass	9 dBi (2496 – 2690MHz)
	Foxconn: WDAN-L1NZ4001-DH	0.26dBi	pass	
ThinkPad T400s series Model: TP00003B TP00031A	Amphenol: C-3220-11-000-27	-1.17dBi	pass	
	Foxconn: WDAN-LWSN4001-DH	0.35dBi	pass	
ThinkPad X200 series Model: TP00018A TP00018B	YAGEO: 25.90A91.001	-1.56dBi	pass	
	Wistron NeWeb: 25.90A91.011	-0.82dBi	pass	
ThinkPad X1 series Model: TP00025A	TE Connectivity: 25.90AA8.001	2.13dBi	pass	
	YAGEO: 25.90AA8.011	-0.54dBi	pass	

3. The AAU1 module has found to comply with the co-location MPE limit for the specific WLAN or WiMAX transmitter devices in Table-4 used for the host PC devices listed in Table-5 as described hereafter.

Pw: max. Tx power of AAU; 250mW (Table-1)
 Gw: max. antenna gain of additional antenna system; 2.13 dBi (Table-3)
 PL: max. Tx power of collocated WLAN transmitter; 744mW (Table-4)
 G L: max. antenna gain of collocated WLAN transmitter; 2.49 dBi (Table-5)

$$\begin{aligned}
 \text{Co-location MPE} &= [Pw \times 10^{(Gw/10)} + PL \times 10^{(GL/10)}] / 4 \pi 20^2 \\
 &= [250 \times 10^{(2.13/10)} + 744 \times 10^{(2.49/10)}] / 4 \pi 20^2 \\
 &= \mathbf{0.344 \text{ mW/ cm}^2} \text{ (limit: 1.0, FCC CFR Part 1.1310)}
 \end{aligned}$$

Table-4 Co-located WLAN/WiMAX transmitter devices

FCC ID IC Cert. Number	Original Grant date	WLAN				WiMAX
		Part 15C 2.4GHz band	Part 15E 5.18 ~ 5.32GHz	Part 15E 5.50 ~ 5.70GHz	Part 15C 5.745 ~ 5.825GHz	Part 27 2.496 ~ 2.690GHz
FCC ID:TX2-RTL8188CE IC: 6317A-RTL8188CE	02/ 10/ 2010 02/ 12/ 2010	0.288 W				
FCC ID: QDS-BRCM1050I IC: 4324A-BRCM1050	09/ 21/ 2010 09/ 24/ 2010	0.3396 W				
FCC ID: QDS-BRCM1051I IC: 4324A-BRCM1051	11/ 24/ 2010 11/ 23/ 2010	0.225 W				
FCC ID: PD92200BNHU IC: 1000M-2200BNHU	10/ 27/ 2011 10/ 27/ 2011	0.100 W				
FCC ID: QDS-BRCM1041 IC: 4324A-BRCM1041	04/ 02/ 2009 03/ 30/ 2009	0.275 W	0.098 W	0.127 W	0.352 W	
FCC ID: QDS-BRCM1058 IC: 4324A-BRCM1058	06/ 30/ 2011 07/ 01/ 2011	0.744 W	0.101 W	0.116 W	0.711 W	
FCC ID: PD9633ANHU IC: 1000M-633ANHU	08/ 19/ 2009 08/ 20/ 2009	0.048 W	0.049 W	0.050 W	0.050 W	
FCC ID: PD9622ANHU IC: 1000M-622ANHU	09/ 22/ 2009 09/ 22/ 2009	0.048 W	0.049 W	0.050 W	0.050 W	
FCC ID: PD962205ANHU IC: 1000M-633ANHU	09/ 14/ 2010 09/ 14/ 2010	0.117 W	0.032 W	0.034 W	0.120 W	
FCC ID: PD9622ANXHU N/A for IC	10/ 01/ 2009	0.046 W	0.034 W	0.035 W	0.035 W	0.269 W

Table-5 WLAN/WiMAX antenna gains of Host PC devices

Host PC name	Antenna manufacture	WLAN				WiMAX
		Part 15C 2.4GHz band	Part 15E 5.18 ~ 5.32GHz	Part 15E 5.50 ~ 5.70GHz	Part 15C 5.745 ~ 5.825GHz	Part 27 2.496 ~ 2.690GHz
ThinkPad T400 series Model: TP00015A TP00030A	Amphenol: C-3033-11-000-26	0.35 dBi	0.82 dBi	0.67 dBi	0.59 dBi	0.85 dBi
	Amphenol: C-3068-11-000-26	-1.31 dBi	-0.31 dBi	0.98 dBi	0.93 dBi	-1.04 dBi
	Foxconn: WDAN-L1NZ4001-DH	0.35 dBi	0.19 dBi	0.15 dBi	-0.11 dBi	0.87 dBi
	Foxconn: WDAN-L1NZ4003-DH	0.35 dBi	0.19 dBi	0.15 dBi	-0.11 dBi	0.87 dBi
ThinkPad T400s series Model: TP00003B TP00031A	Amphenol: C-3033-11-000-26	-1.19 dBi	-0.36 dBi	1.13 dBi	1.13 dBi	-1.63 dBi
	Foxconn: WDAN-LWSN4001-DH	0.87 dBi	0.00 dBi	-0.35 dBi	-0.64 dBi	0.77 dBi
ThinkPad X200 series Model: TP00018A TP00018B	Yageo; 25.91370.011	1.60 dBi	0.23 dBi	-0.26 dBi	-0.14 dBi	0.34 dBi
	Wistron NeWeb; 25.91370.021	0.58 dBi	0.61 dBi	-0.21 dBi	-0.21 dBi	0.92 dBi
ThinkPad X1 series Model: TP00025A	Foxlink; 25.90A4W.011	1.98 dBi	-0.43 dBi	0.53 dBi	0.30 dBi	2.49 dBi
	Yageo; 25.90A4W.001	0.07 dBi	-0.28 dBi	-0.13 dBi	1.12 dBi	-0.25 dBi

- The Bluetooth module (FCC ID: QDS-BRCM1046LE) integrated in the subjected host PC devices is not required the co-located RF evaluation in accordance with Table-2 of KDB616217 due to its low power (3.0 mW) and antenna-to-antenna distance (≥ 5 cm).
- The USB ports are located with more than 5cm of separation distance from the all WLAN/WiMAX and WWAN Tx antennas. Therefore those are compliant with the section 2) of "Supplement to FCC KDB 616217".

With the above evaluation results, the additional antenna systems and co-located transmitter devices satisfy the conditions regarding FCC CFR Part 1.1310, 2.1091, KDB 447498 and KDB 616217.

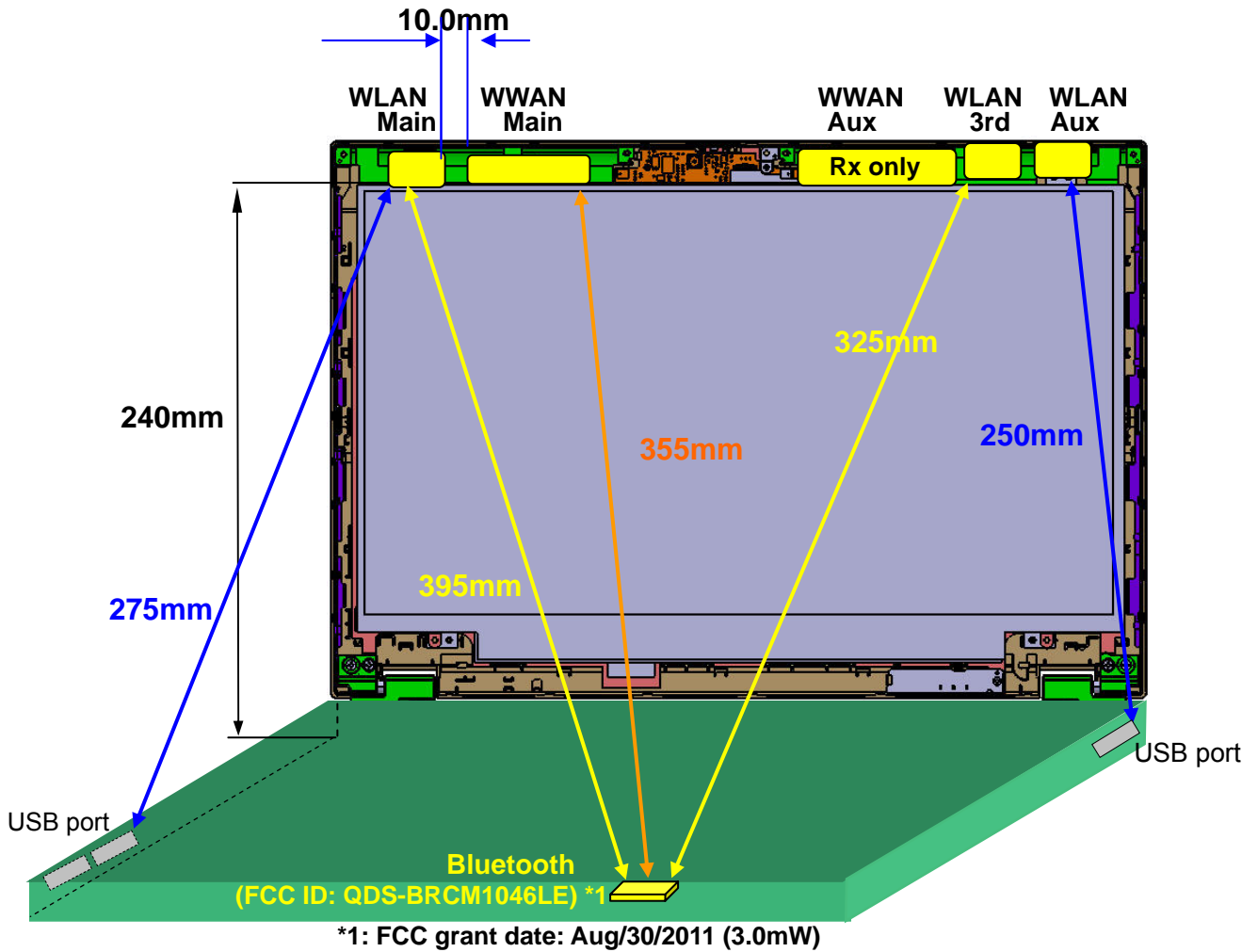
March 23, 2012



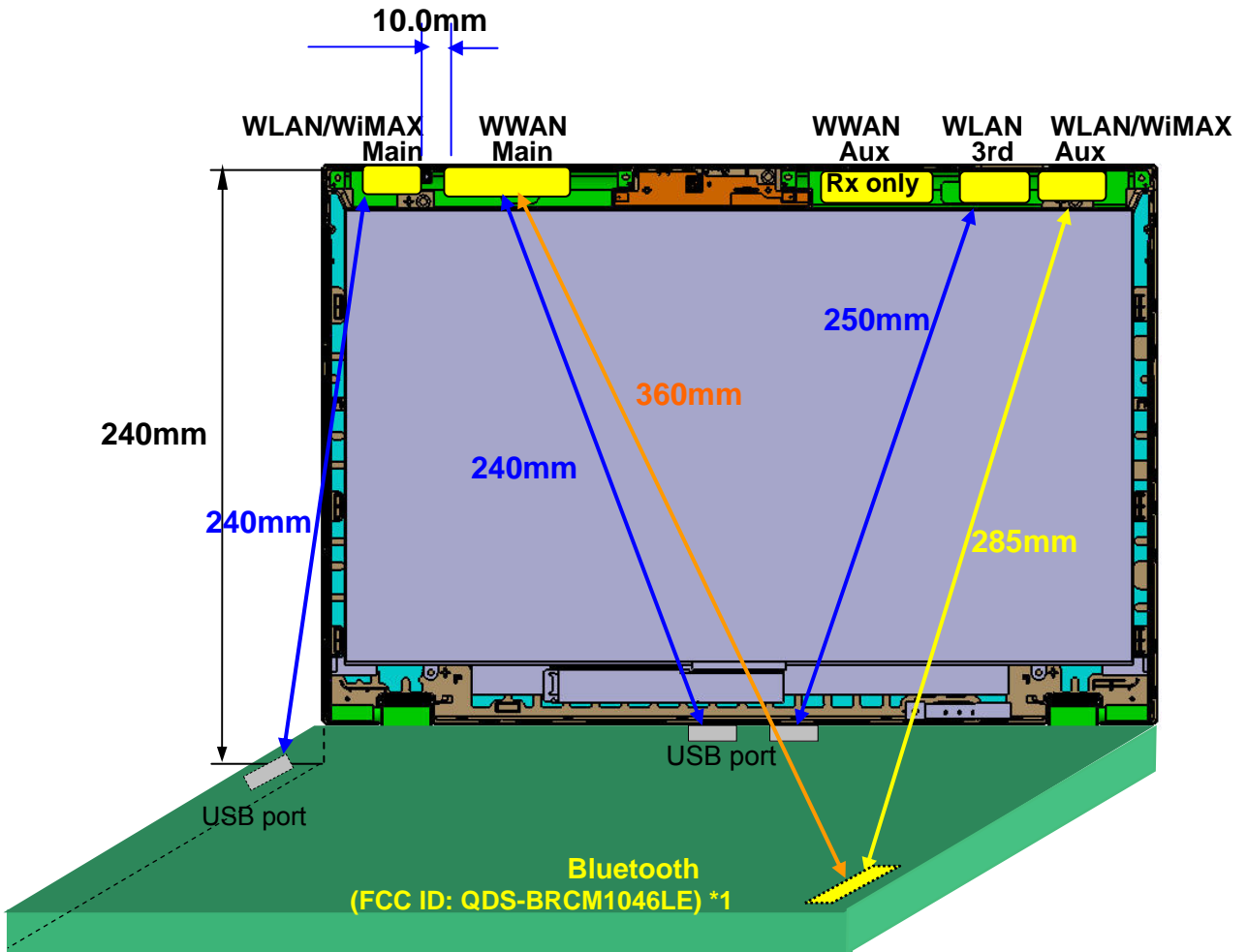
Toshiya Murota, Lenovo(Japan)Ltd.
Advisory R&D Engineer, Wireless Communication, Subsystems, Notebook Development Lab.

Appendix: Additional antenna systems

Lenovo ThinkPad T400 Series (Model: TP00015A and TP00030A)

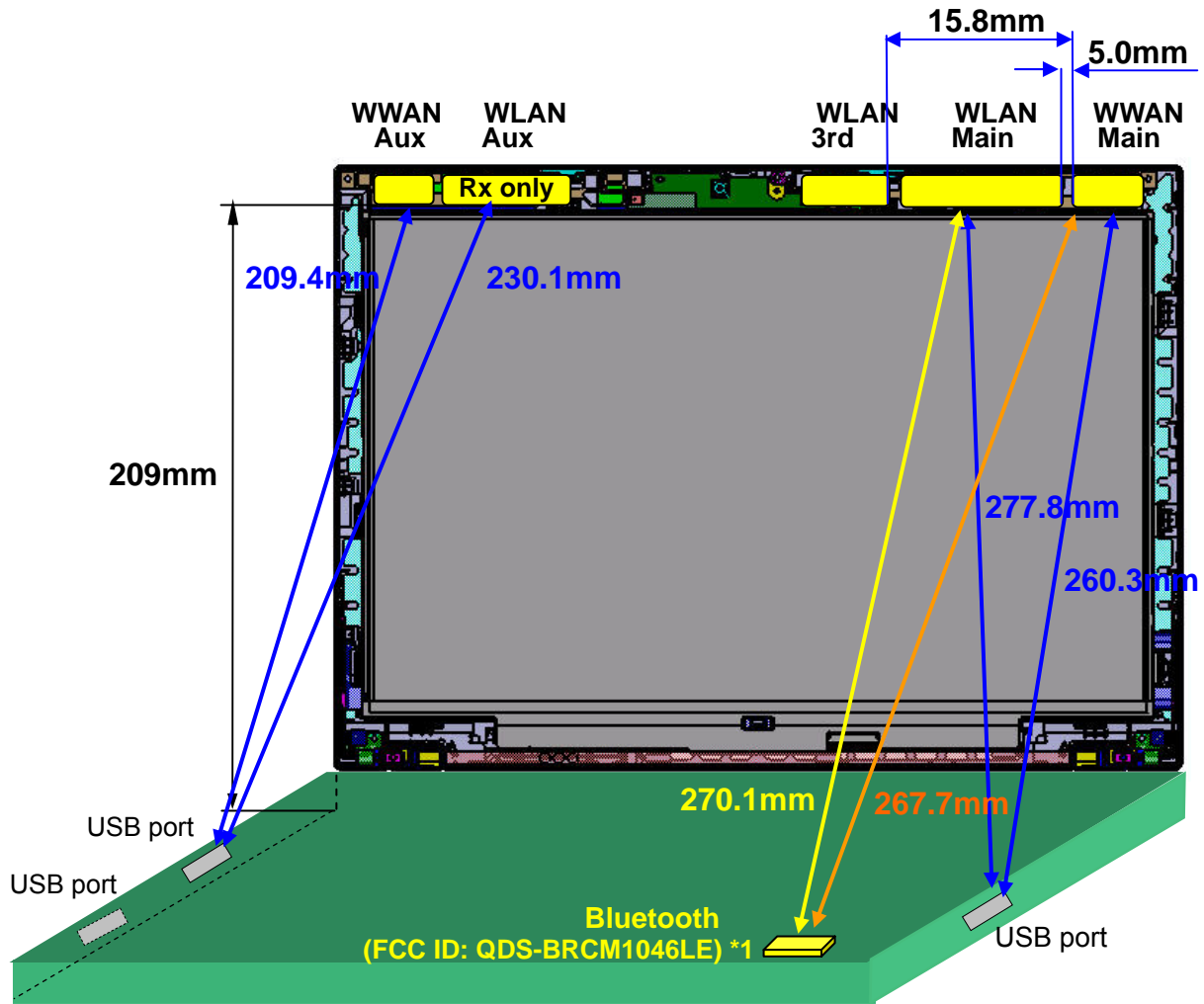


Lenovo ThinkPad T400s Series (Model: TP00003B and TP00031A)

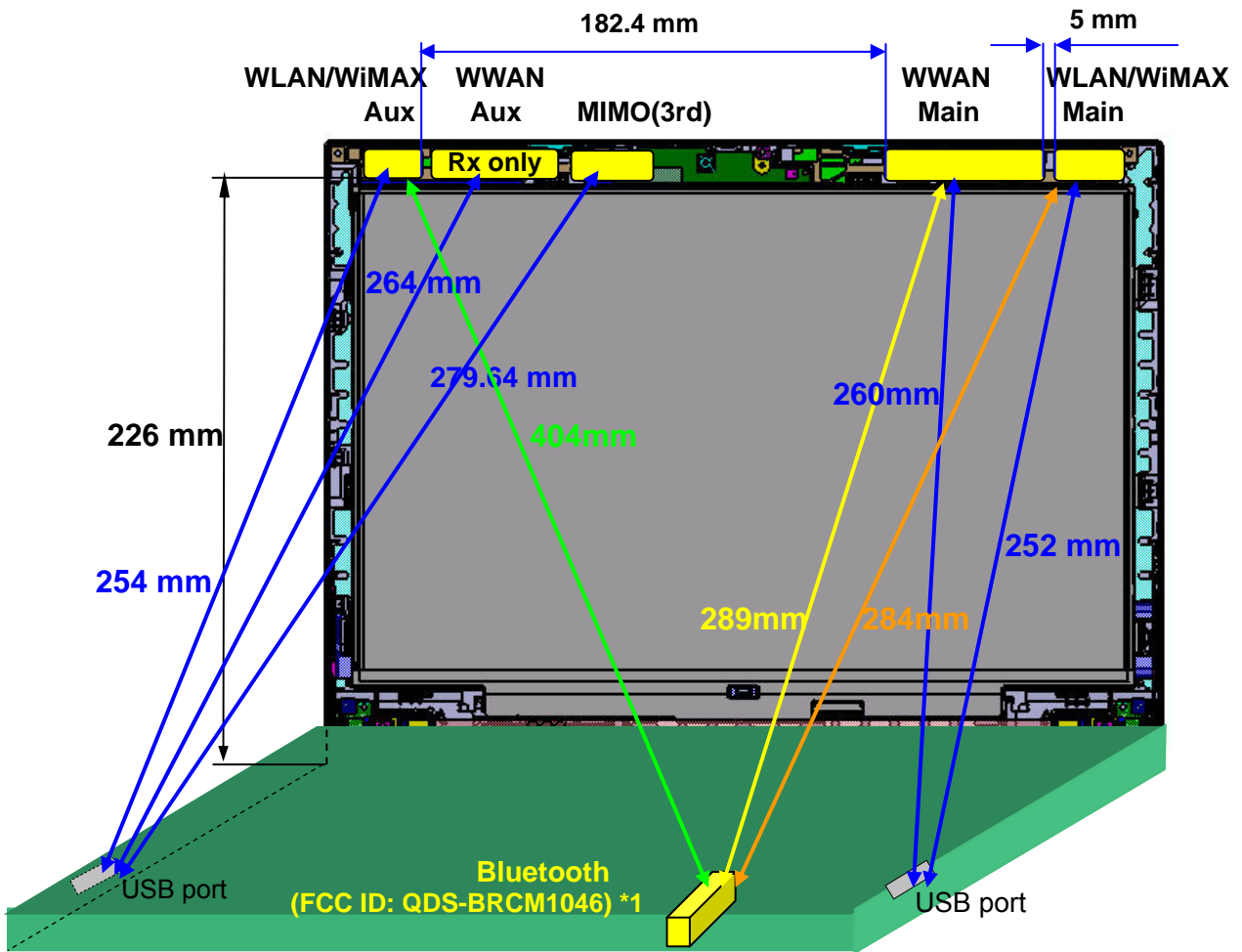


*1: FCC grant date: Aug/30/2011 (3.0mW)

Lenovo ThinkPad X200 Series (Model: TP00018A and TP00018B)



Lenovo ThinkPad X1 Series (Model: TP00025A)



*1: FCC grant date: May/05/2009 (3.06mW)