

Antenna Information

ThinkPad T60 Series

1. Antenna Specification

Transmission Antenna assembly overview

Manufacture	Antenna Designator		Antenna type	LCD size	Cable type and length
Hitachi Cable Co., Ltd. (Japan)	Main	HFT38	Dual Band Meander (Planner Inverted F) Antenna	14"	Coax 528mm
		HFT38D4		15"	Coax 559mm
		HFT38D5		14"	Coax 528mm
	Auxiliary	HFT39		15"	Coax 559mm
		HFT39D4		14"	Coax 614mm
		HFT39D5		15"	Coax 484mm
				14"	Coax 614mm
				15"	Coax 484mm
FOXCONN HON HAI PRECISION IND. Co., Ltd. (R.O.C.)	Main	023-0100-2400	Dual Band Meander (Planner Inverted F) Antenna	14"	Coax 528mm
				15"	Coax 559mm
	Auxiliary	023-0100-2399		14"	Coax 614mm
				15"	Coax 484mm

Antenna Gains

Frequency	Main						Aux					
	Hitachi				FOX CONN		Hitachi				FOX CONN	
	HFT38		HFT38 D4	HFT38 D5	023-0100-2400		HFT39		HFT39 D4	HFT39 D5	023-0100-2399	
	14"	15"	14"	15"	14"	15"	14"	15"	14"	15"	14"	15"
2400 - 2500 MHz	-0.54 dBi @2400 MHz	-0.42 dBi @2450 MHz	-1.01 dBi @2400 MHz	-0.34 dBi @2450 MHz	0.20 dBi @2500 MHz	-0.30 dBi @2400 MHz	1.80 dBi @2500 MHz	-1.27 dBi @2450 MHz	1.87 dBi @2400 MHz	1.94 dBi @2450 MHz	-1.00 dBi @2450 MHz	-1.00 dBi @2400 MHz
5150 - 5350 MHz	2.77 dBi @5150 MHz	1.20 dBi @5150 MHz	1.88 dBi @5350 MHz	1.29 dBi @5350 MHz	1.45 dBi @5350 MHz	0.40 dBi @5250 MHz	0.66 dBi @5250 MHz	-1.91 dBi @5250 MHz	1.97 dBi @5150 MHz	1.02 dBi @5150 MHz	0.80 dBi @5150 MHz	0.60 dBi @5150 MHz
5725 - 5850 MHz	1.69 dBi @5750 MHz	1.87 dBi @5750 MHz	2.99 dBi @5725 MHz	1.43 dBi @5850 MHz	1.74 dBi @5750 MHz	-1.10 dBi @5850 MHz	1.45 dBi @5800 MHz	-0.49 dBi @5800 MHz	2.44 dBi @5850 MHz	-0.04 dBi @5800 MHz	0.10 dBi @5750 MHz	-0.50 dBi @5750 MHz

Notes:

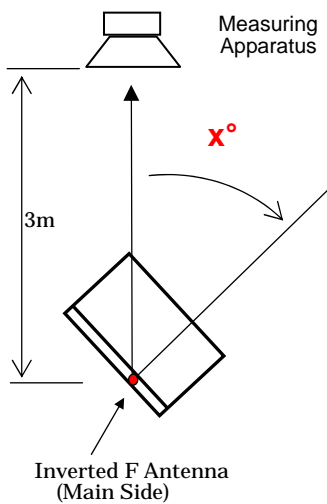
- 1a. Includes all cable losses.
- 1b. Antenna type should be Omni Directional and have gain of 3.0 dBi or less for IEEE802.11a(5GHz band) and have gain of 2.0 dBi or less for IEEE802.11b/g(2.4GHz band), regarding the IBM internal specification.

2. Radiation characteristic of antennas

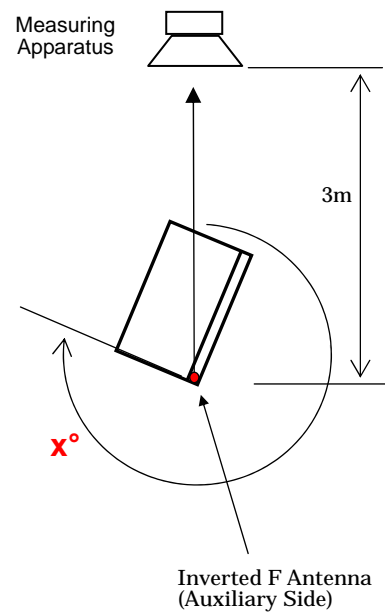
Radiation characteristic of antenna is measured in regard to the rotation angle x° as shown below:

The rotation angle X° for the measurement

Main Antenna



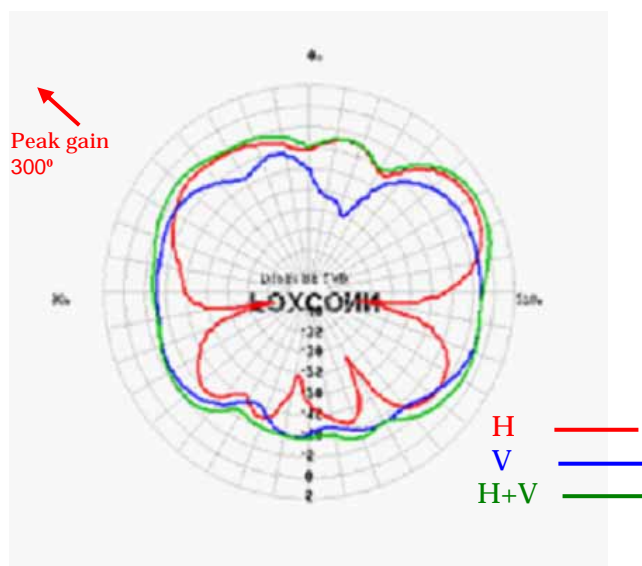
Auxiliary Antenna



Hereafter, the higher gain data of the previous table in page 1 represents in this report.

2.1 2400-2500MHz radiation characteristic

Main (FOXCONN 023-0100-2399, 14" LCD model)

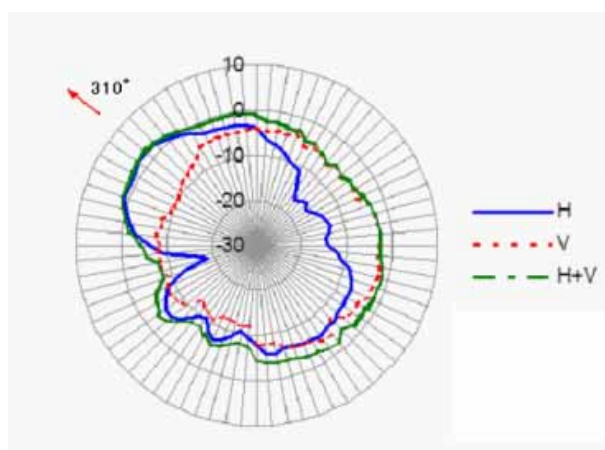


Hori (dBi) ave.	-7.40
Vert (dBi) ave.	-7.40
H+V (dBi) ave.	-4.38
Peak(dBi) (H)	0.20
Peak Angle (X°=)	300°
Center Frequency	2500MHz

Note1) The measurement was performed at 3 frequencies (2400, 2450, 2500MHz).

Note2) The maximum antenna gain was found around **300 degree** angle from measuring apparatus in **horizontal** polarization at the high frequency (2500MHz).

Auxiliary (Hitachi HFT39D5, 15" LCD model)



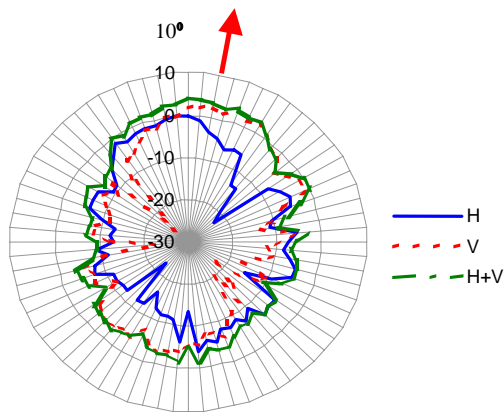
Hori (dBi) ave.	-4.81
Vert (dBi) ave.	-5.93
H+V (dBi) ave.	-2.33
Peak(dBi) (H)	1.94
Peak Angle (X°=)	310°
Center Frequency	2450MHz

Note1) The measurement was performed at 3 frequencies (2400, 2450, 2500MHz).

Note2) The maximum antenna gain was found around **310 degree** angle from measuring apparatus in **horizontal** polarization at the high frequency (2450MHz).

2.2 5150-5350MHz radiation characteristic

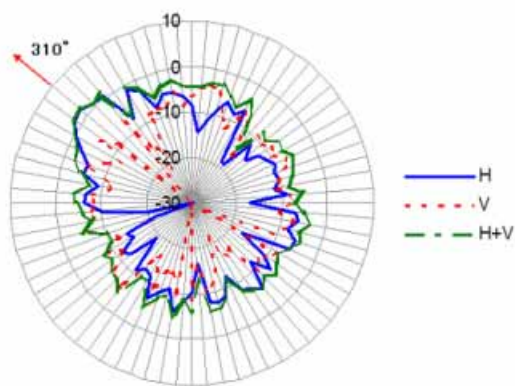
Main (Hitachi HFT38, 14” LCD model)



Hori (dBi) ave.	-6.36
Vert (dBi) ave.	-4.15
H+V (dBi) ave.	-2.10
Peak(dBi) (V)	2.77
Peak Angle (X°=)	10°
Center Frequency	5150MHz

Note1) The measurement was performed at 4 frequencies (5150, 5200, 5250, 5350MHz).
Note2) The maximum antenna gain was found around **10 degree** angle from measuring apparatus in **vertical** polarization at the low frequency (5150MHz).

Auxiliary (Hitachi HFT39D4, 14” LCD model)

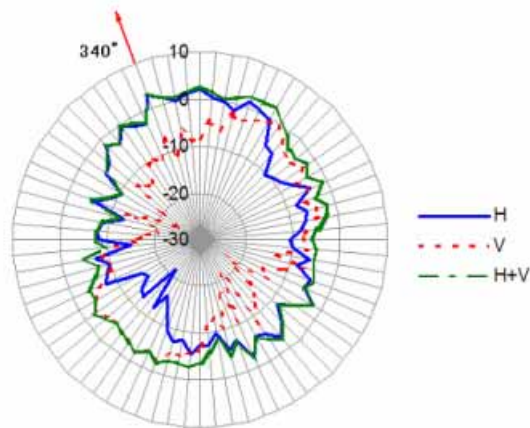


Hori (dBi) ave.	-6.49
Vert (dBi) ave.	-8.99
H+V (dBi) ave.	-4.56
Peak(dBi) (H)	1.97
Peak Angle (X°=)	310°
Center Frequency	5150MHz

Note1) The measurement was performed at 3 frequencies (5150, 5250, 5350MHz).
Note2) The maximum antenna gain was found around **310 degree** angle from measuring apparatus in **horizontal** polarization at the high frequency (5150MHz).

2.3 5725-5850MHz radiation characteristic

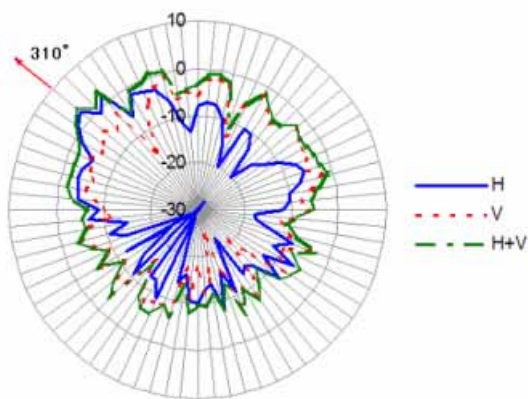
Main (Hitachi HFT38D4, 14” LCD model)



Hori (dBi) ave.	-4.33
Vert (dBi) ave.	-6.59
H+V (dBi) ave.	-2.30
Peak(dBi) (H)	2.99
Peak Angle (X°=)	340°
Center Frequency	5725MHz

Note1) The measurement was performed at 4 frequencies (5725, 5750, 5800, 5850MHz).
Note2) The maximum antenna gain was found around **340 degree** angle from measuring apparatus in **horizontal** polarization at the middle frequency (5725MHz).

Auxiliary (Hitachi HFT39D4, 14” LCD model)

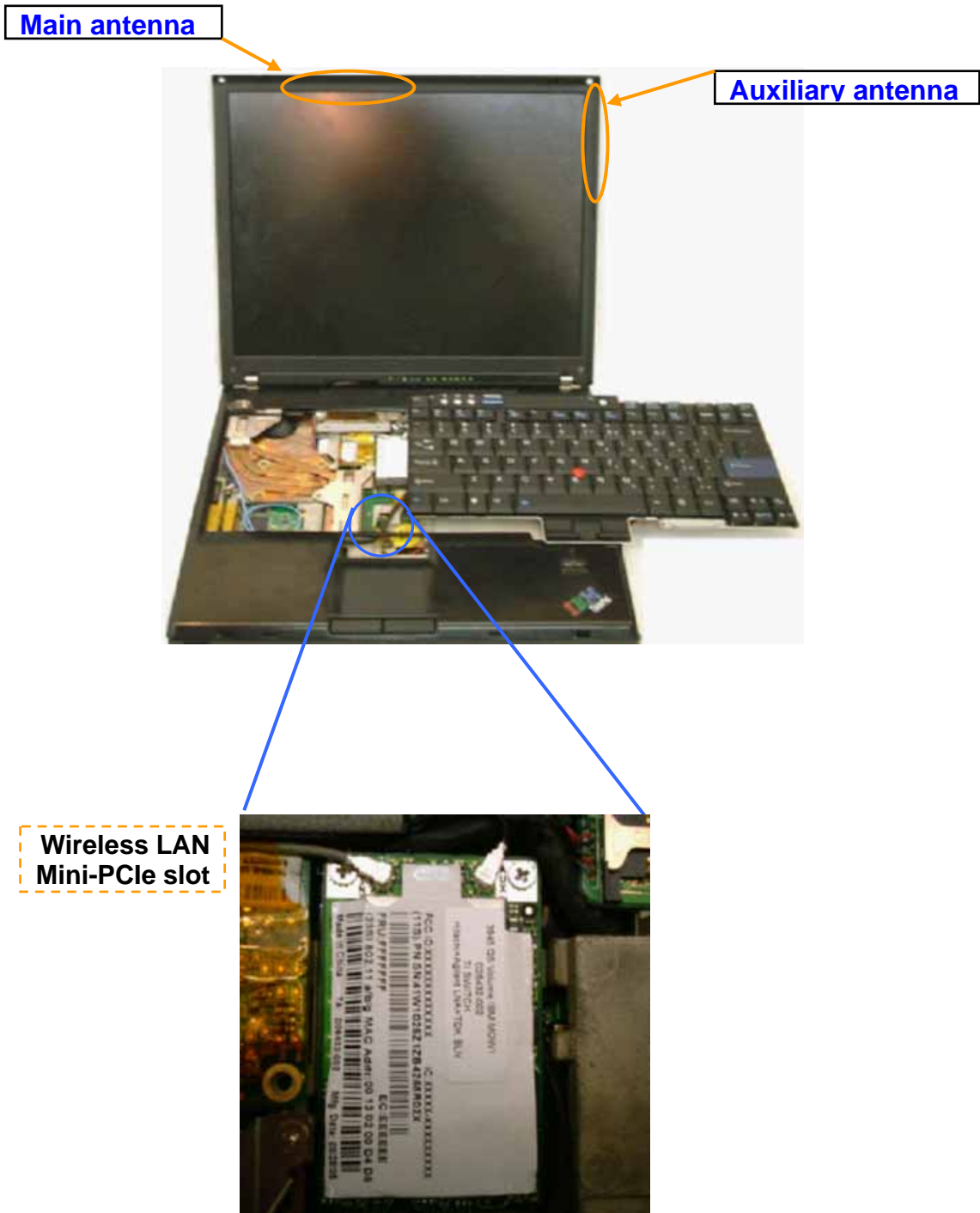


Hori (dBi) ave.	-7.02
Vert (dBi) ave.	-6.41
H+V (dBi) ave.	-3.70
Peak(dBi) (H)	2.44
Peak Angle (X°=)	310°
Center Frequency	5850MHz

Note1) The measurement was performed at 4 frequencies (5725, 5750, 5800, 5850MHz).
Note2) The maximum antenna gain was found around **310 degree** angle from measuring apparatus in **horizontal** polarization at the high frequency (5850MHz).

3. Host PC Information

The main antenna, meander type, is built-in the top portion of LCD and the auxiliary antenna, meander type, is built-in the right upper portion of LCD as shown in the Photo. Those diversity antennas are not used simultaneously. One of the antennas is selected automatically or manually to have a good quality of radio communication. The selected antenna performs transmission or receiving in half duplex alternatively.



ThinkPad T60 Series, LCD 14 inch model



Front View

ThinkPad T60 Series, LCD 15 inch model



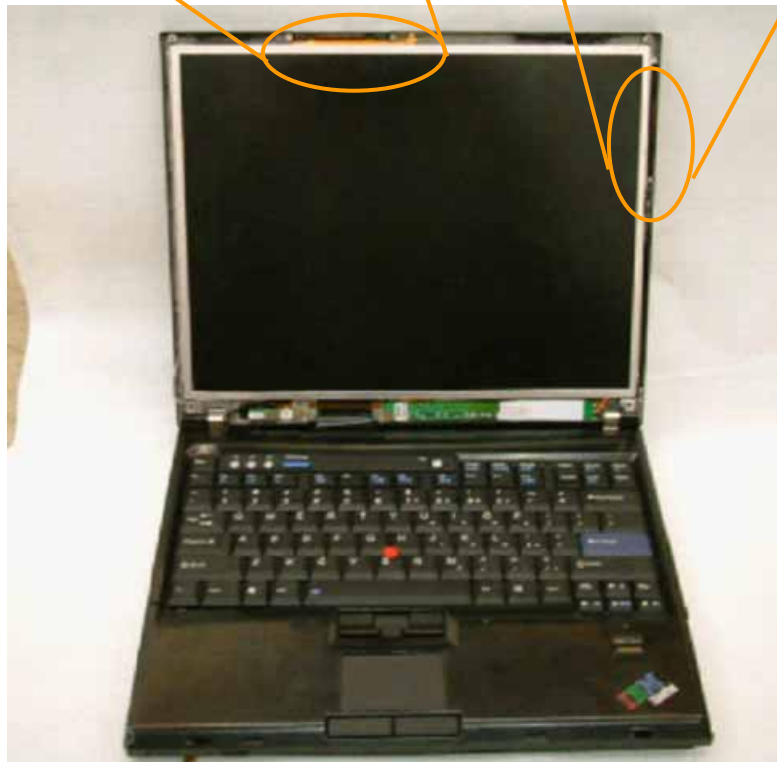
Front View

4. Antenna Locations

**Main antenna
Dual Band Meander**

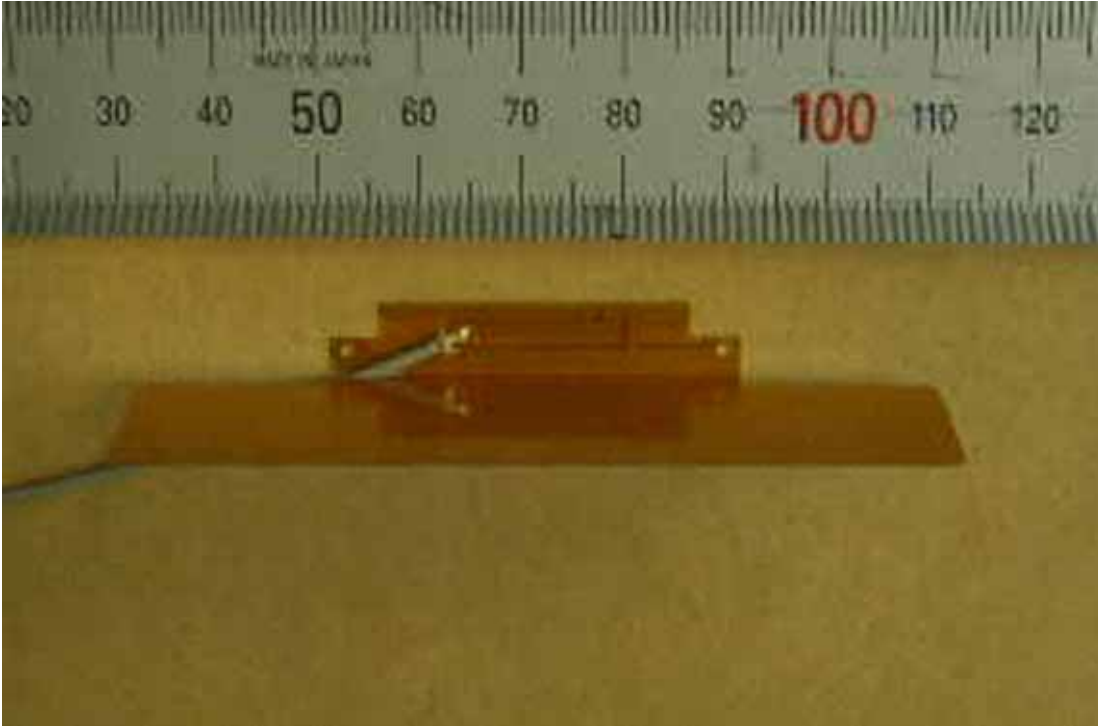


**Auxiliary antenna
Dual Band Meander**

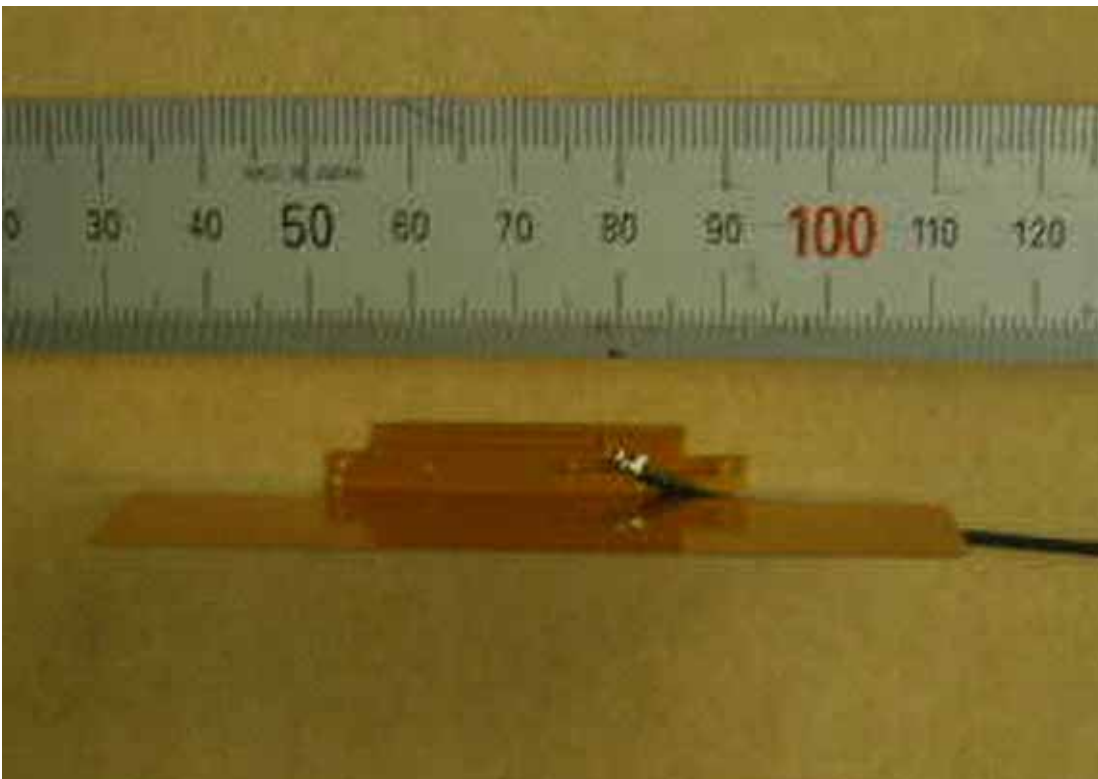


5. Exterior Photos of Antennas

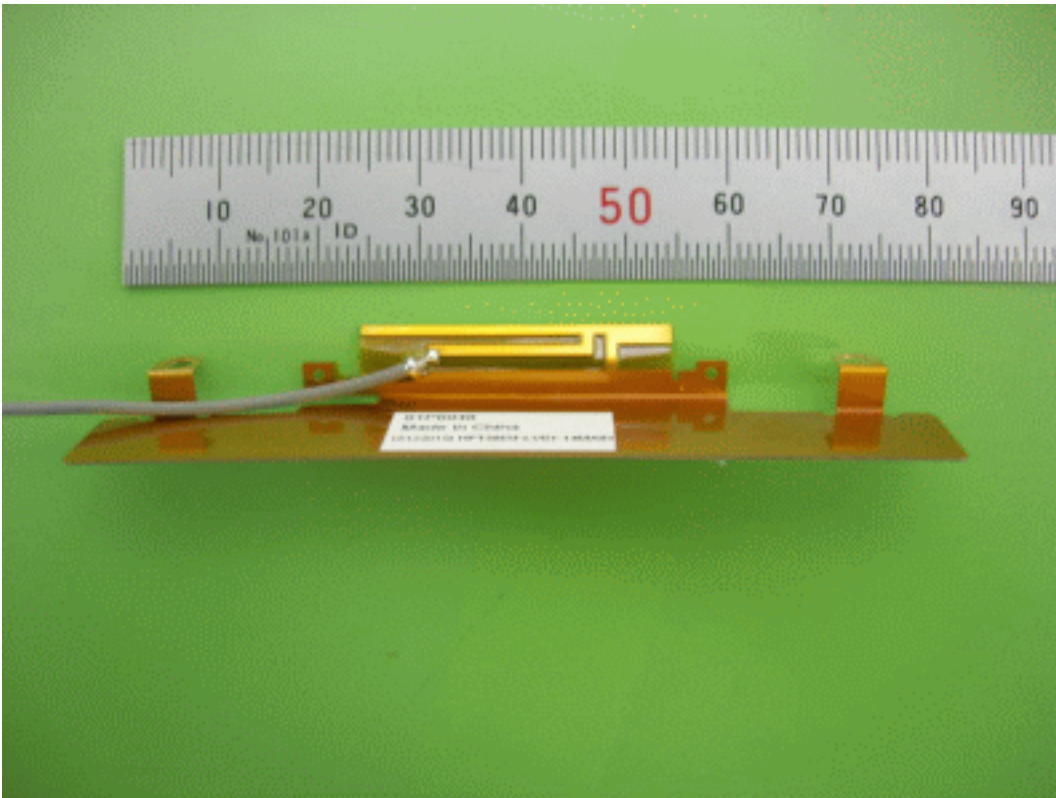
Main antenna Hitachi HFT38 Cable : coax 528mm(14"), 559mm(15")



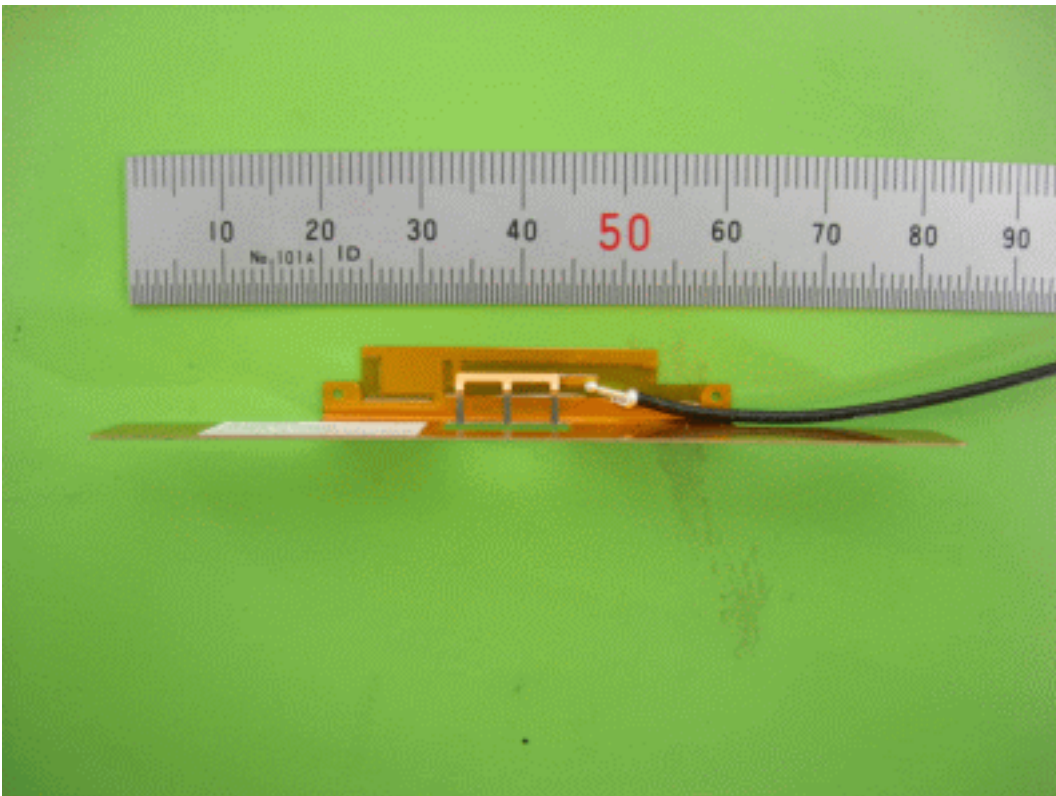
Auxiliary antenna Hitachi HFT39 Cable : coax 614mm(14"), 484mm(15")



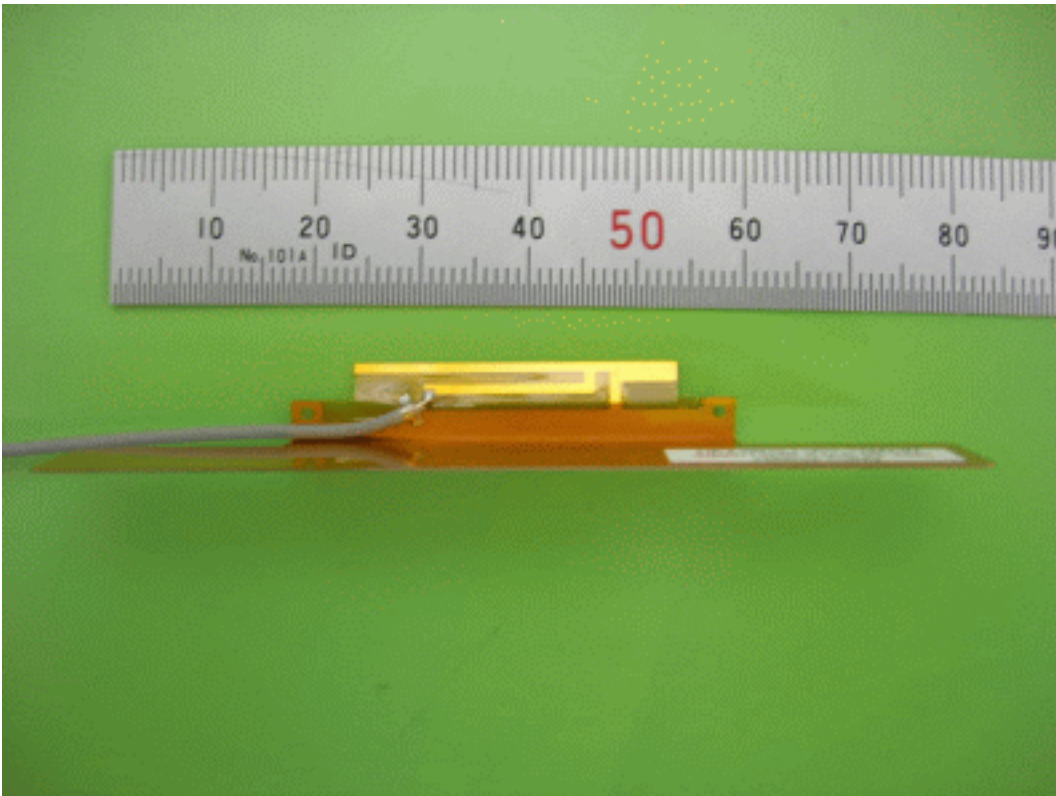
Main antenna Hitachi HFT38D4 Cable : coax 528mm(14")



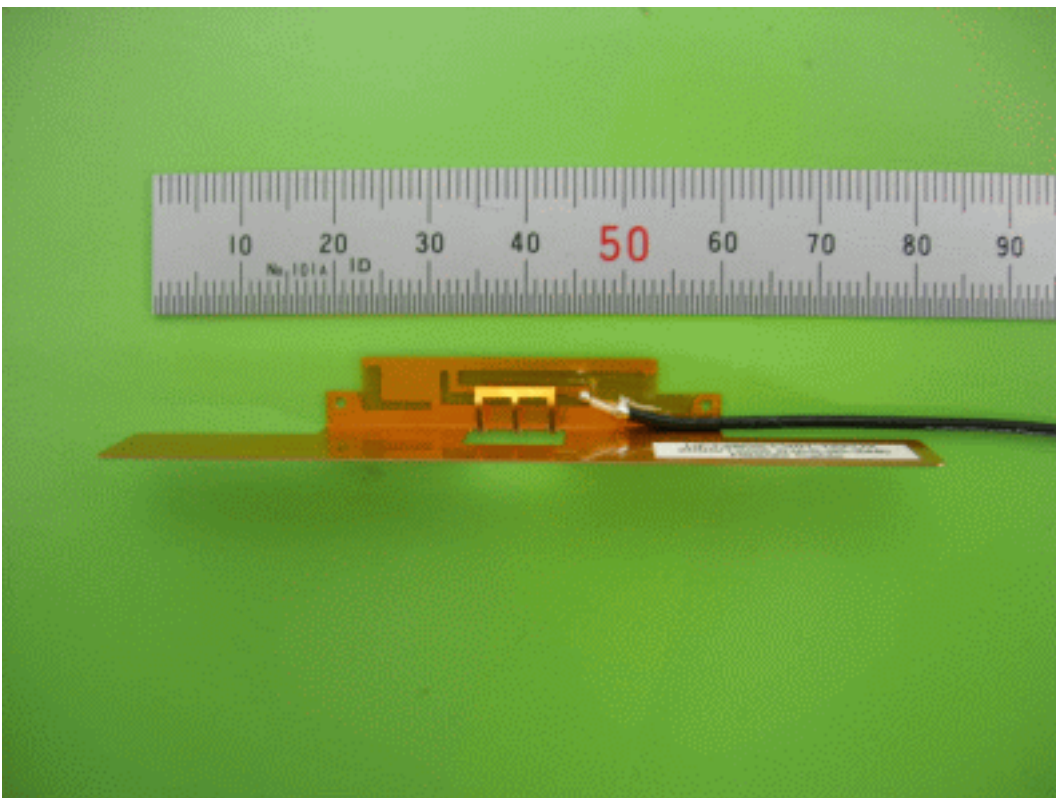
Auxiliary antenna Hitachi HFT39D4 Cable : coax 614mm(14")



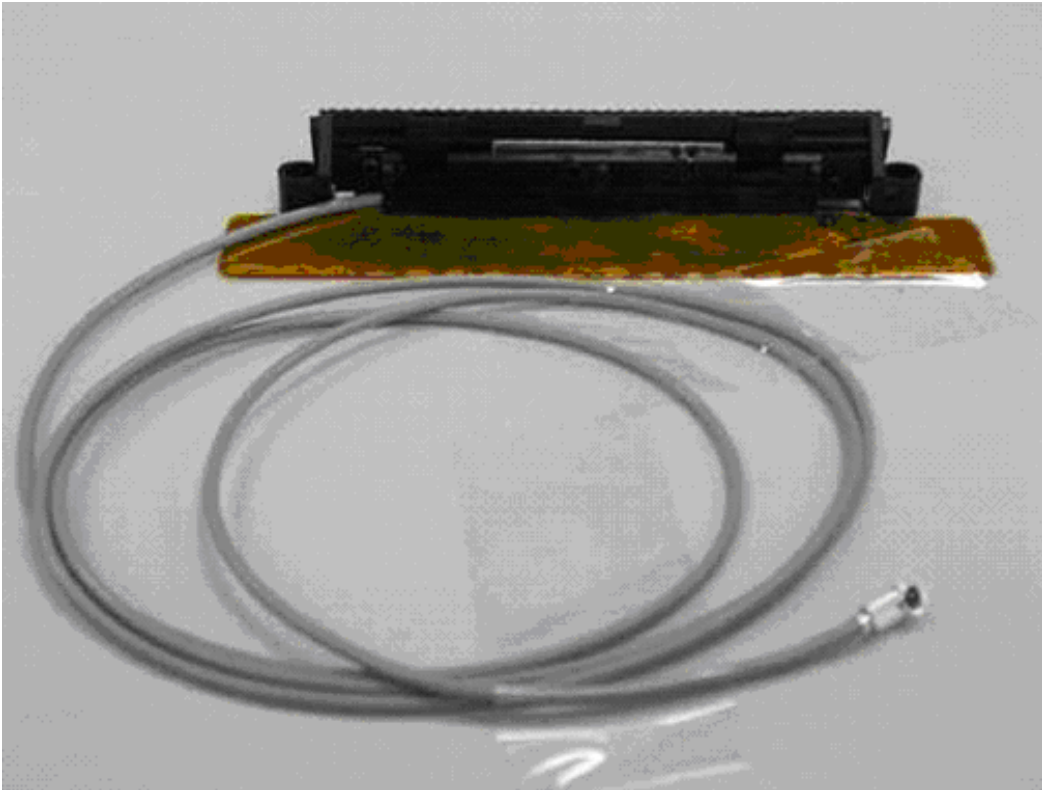
Main antenna Hitachi HFT38D5 Cable : coax 559mm(15")



Auxiliary antenna Hitachi HFT39 Cable : coax 484mm(15")



Main antenna FOXCONN 023-0100-2400 Cable : coax 528mm(14"), 559mm(15")



Auxiliary antenna FOXCONN 023-0100-2399 Cable : coax 614mm(14"), 484mm(15")

