

Innovative design of high precision positioning antenna and antenna module – Castle patch antenna inside

The consumer electronics in past decades used for tracking and navigation systems like GPS, GLONASS, Galileo, BeiDou or QZSS used signals of the L1 frequency band, which provides positioning accuracy about 5 – 10 meters. With the maturity of positioning technology, modern GNSS receivers have added another band at lower frequencies, such as L5 and E6. Having GNSS signals in multiple frequency bands, including high and low frequencies, helps to eliminate ionospheric errors, improve multi-path effects, reduce interference in narrow frequency bands as well as achieve sub-meter positioning accuracy.

Standard antennas for dual frequency navigation consists of two single-band patch antennas stacked together. Such design comes with a relatively higher cost, larger size and a less stable performance.

In response to the above problems, Unictron has developed an innovative dual-frequency high-precision positioning antenna, which got a nickname “Castle” patch.

Features of Unictron’s Castle patch antenna

Compared with the traditional stacked antenna, the single-layer design of Castle patch antenna has a better signal quality, competitive cost, thereby further improving the reception of existing multi-frequency GNSS (L1, L2, L5, L6) satellite signals performance, to meet the market demand for high-precision positioning.

With a more compact, neat and flat antenna design, Unictron’s Castle patch antenna uses ceramic material as the base material combined with the cavity pattern to form a single-layer structure for receiving multi-frequency GNSS signals. Such design allows to perform dual-frequency, triple-frequency, even multi-frequency operations, especially suitable for applications equipped with RTK high-precision positioning technology.

Unictron’s innovative patch antenna design uses the hollow area in the ceramic body to create different equivalent dielectric constants in different areas, so that a single-layer patch antenna can support multi-band signal reception. The name Castle comes from its similar appearance to an outline of a medieval castle building.

Castle patch antenna adopts a neat single-layer design. Its biggest advantage lies in its flat structure. Compared with the current stacking process in the mainstream market, the manufacturing method has better yield, stable quality and competitive cost. The regular 18x18mm or 25x25mm Castle patch antenna can achieve good L1+L2 or L1+L5 receiving efficiency, while the larger 40x40mm and 50x50mm

models can use the design of multiple feed points to achieve tri-band (L1+L2+L5) or even full-frequency (bands L1+L2+L5+E6) reception, and has better bandwidth and performance.

Currently even larger sizes of castle patch antenna are under development, such as 66x66mm, to achieve even better performance on all frequency bands, L1+L2+L5+E6.

Antenna modules with Castle patch antenna





Following the launch of Castle patch antenna, Unictron designs and manufactures high-precision positioning antenna modules and external antennas (including housing) with anti-jamming capabilities for customers.

In order to reduce the degradation of signal quality caused by the interference of environmental noise sources, Unictron has developed a series of antenna modules with anti-interference ability, combining low-noise amplifier (LNA) circuit design with patented Castle patch antenna. The external antenna with housing helps to avoid external noise interference in actual use case scenarios to ensure good reception quality.

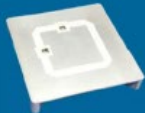
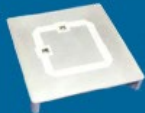
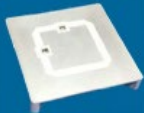


Standard for navigation and positioning: Anti-jamming active antenna

Regardless of the design, LNA or the external antenna module with housing, the Castle patch antenna series from Unictron are all multi-frequency and multi-mode receivers, covering the American GPS (Global Positioning System), Russia's GLONASS, European's GALILEO and Chinese BEIDOU satellite navigation systems. Because the multi-band system can cover more available satellites than a single-band GNSS system, it can reduce the time needed for the first adjustment of position and greatly improve the positioning accuracy. The urban environment is rather complex; thus, stable and high-precision positioning has gradually become the norm. However, the current positioning devices also have various wireless signals with different functions. In addition to mobile phone telecommunications transmission, multi-band Wi-Fi, Bluetooth, multi-band GPS, LTE or 5G signals interfere with each other, coupled with the city environment of high-rise buildings, the excellent anti-interference ability of the receiving module has become the basic need for customer positioning.







◆ 25mm and 18mm series

Castle type	 PB254D8X		 PB254D8		 PB187D		 PB187D	
Dimension(mm)	25*25*4.5		25*25*4.5		18*18*7		18*18*7	
Center Frequency(MHz)	L1	L2	L1	L5	L1	L2	L1	L5
	1575	1227	1575	1176	1575	1227	1575	1176
Gain at Zenith(dBic)	5	3.3	5	2.5	4.1	1.2	4.3	1.3
Efficiency (%)	60	50	60	48	52	32	55	33
Test condition	100mm *100 mm GND							




◆ 50mm and 40mm series

Castle type	 508(dual pins)			 508 (dual pins)		 508 (dual pins)		 PB40D9NX		 PB40D9NS	
Dimension(mm)	50*50*8			50*50*8		50*50*8		40.2*40.2*6		40.2*40.2*6	
Center Frequency(MHz)	L1	L2	L5	L1	L2	L1	L5	L1	L2	L1	L5
	1575	1227	1176	1575	1227	1575	1176	1575	1227	1575	1176
Gain at Zenith(dBic)	4.3	2.2	2.3	4.5	6.2	4.5	6.1	5.8	5.1	6.5	4.8
Efficiency (%)	53	33	34	53	78	58	77	84.5	69.5	80	65
Test condition	100mm *100 mm GND										

Castle Antenna Module Series

						
Antenna Model	NB18DG	NB26DG	NB35DG	NB40DG	NB60DG	NB80DG
Dimension (mm)	18*18*7.6	26*26*8.75	34*32*8.75	40*40*10.25	60*60*10.25	Φ80,H:12.1
◆ GPS Castle Antenna						
Center Frequency (MHz)	L1 1575	L5 1176	L1 1575	L5 1176	L1 1575	L5 1176
Gain at zenith(dBi)	1.8	-0.5	0.6	-0.8	2.0	-1.1
Efficiency (%)	36	20	23	25	37	25
Polarization	RHCP					
◆ LNA Electrical properties						
Gain (dB)	24	25	28	28	28	28
Noise Figure (dB)	2.7	2.5	3.0	3.0	3.0	3.0

Castle External Antenna Series

					
Antenna Model	HB45DF	HB50DF	HB70DF	HB80DF	HB80DG
Dimension (mm)	Φ45.3,H:15.6	65*49*18.5	70*70*17	Φ80,H:25.4	Φ80,H:25.4
◆ GPS Castle Antenna					
Center Frequency (MHz)	L1 1575	L5 1176	L1 1575	L5 1176	L1 1575
Gain at zenith (dBi)	2.2	0.2	1.7	4.2	4.7
Efficiency (%)	45	31	40	56	75
Polarization	RHCP				
◆ LNA Electrical properties					
Gain (dB)	28	28	28	28	28
Noise Figure (dB)	3	3	3	3	3