Knowledge Transfer Office

香港城市大學
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Broadband Printed Antenna Element

Communications & Information

Digital Broadcasting, Telecommunication and Optoelectronics

Smart Mobility and Electric Vehicle

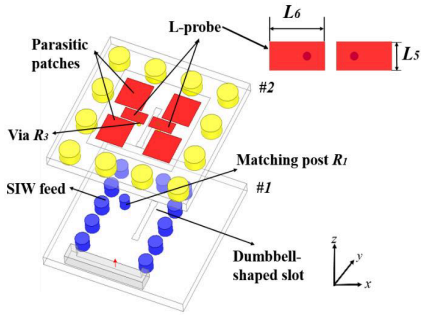

Figure 1. Geometry of the proposed antenna element.

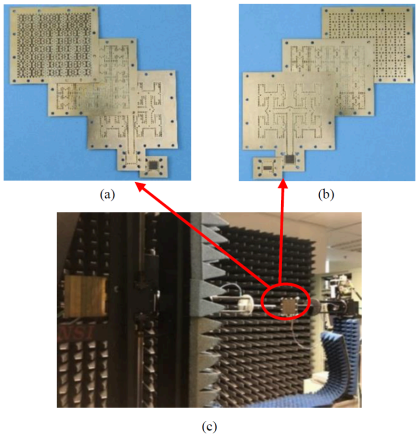

Figure 2. The fabricated antenna. (a) Bottom view (from top to bottom), (b) top view and (c) NSI 2000 measurement system.

TABLE IV
COMPARISON BETWEEN THE PROPOSED ONE AND THOSE IN REFERENCES

Type	Feed network	No. of units	Imp. BW	Max. Gain (dBi)	First Sidelobe (dB)	efficiency
L-Probe patch	CPW	4 × 4	~ 25.5%	16.7	~ -10	/
Cavity backed dipoles	SIW	8 × 8	22.9%	26.7	~ -13.5	~ 80%
ME-dipole	Full corporate (SIW)	8 × 8	18.2%	26.1	~ -13.5	72.2%
Slot	SIW	16 × 16	15%	29.1	~ -17	> 62%
Slot	Ridge gap waveguide	16 × 16	17%	32.5	~ -25	> 70%
Slot and microstrip	SIW	32 × 32	6.4%	29.97	-9	24%
Aperture coupled dipole with 4 patches	SIW	8 × 8	~ 20.9%	~ 26.2	~ -17	~ 80%

Table 1. Comparison between the current work (bottom row) and those in references.

Opportunity

5G and WiMAX need high gain and high polarization purity antenna for communication systems with symmetrical and stable radiation pattern. But there is a tradeoff between the thickness of printed antennas and their electrical performances. This invention provides a novel linearly-polarized printed antenna with wideband, stable radiation pattern and low cross polarization characteristics. The proposed antenna can easily be used for constructing an antenna arrays based on substrate-integrated-waveguide

IP Status
Patent granted

Technology Readiness Level (TRL) 4

Inventor(s)
Prof. CHAN Chi Hou
Dr. WANG Manting
Enquiry: kto@cityu.edu.hk

(SIW) technology. Parasitic elements are employed in the antenna to reduce the profile of the antenna. The thin profile will find many applications where antenna housing space is limited.

Technology

The invention is a linearly polarized antenna consisting of a printed dipole differential-fed by a dumbbell-shaped slot, with four parasitic patches in the proximity to the dipole. With this configuration, it provides a wideband and high gain antenna with stable radiation pattern in the whole operating frequency band. The introduction of the parasitic patches reduces the thickness of this element, making it a low profile antenna. The shorter vertical differential current impact less on the horizontal currents on the dipole and parasitic patches, leading to low cross polarization. With SIW feed technology, an open slot is cut on the top surface to couple energy to the differentially-fed printed dipole with two metal posts located at the opposite sides of the slot. Four parasitic patches are then placed in the proximity to the dipole to improve the antenna impedance bandwidth. The antenna element is housed in a SIW cavity for higher antenna gain.

Advantages

- The invention has wide impedance bandwidth, stable radiation pattern, low cross-polarization level and low backlobe.
- The invention has a thickness of 0.07 λ_o , where λ_o is the free space wavelength at the center frequency, without scarifying the antenna performance versus typical ME(magneto-electric) dipole having a thickness of 0.25 λ_o.

Applications

- 3G, 4G, 5G communications
- WiMax