# Low-Cost High-Gain Planar Antenna Using A Metallic Mesh Cap For Millimeter-Wave Frequency Applications

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## BRIEF DESCRIPTION

This is a new low-cost antenna designed for new generation of wireless systems for a frequency band of 57-64 GHz.

## FULL DESCRIPTION

High frequency antennas for millimeter-wave (MMW) applications are either waveguides or planar micro-strip or slot antennas. A waveguide antenna can provide a high radiation gain at expense of its size. This type of antenna (waveguide antenna) is difficult to integrate on PCBs with other sub-systems due its size. The antenna's dimensions decrease as frequency of operation is increased; this adds complication to the fabrication process since connectors of the antenna require high precision machining which is very expensive. Also, the excitation of the waveguide becomes challenging at high frequencies. To achieve high radiation gain, i.e. from a horn antenna, an array of micro-strip or slot antennas printed on a planar substrate can be used. The drawback of such arrangement is represented by the fact that the field propagates between the radiating elements and the ground plane; therefore a low-loss substrate must be used. In addition a feed network made either by micro-strip lines or slot lines must be used to feed each element of the array further increasing loss. Low-loss substrates for the printed structures operating at MMW frequencies (60 GHz and above), are very expensive, and the feed network can be large; therefore the overall size of the array increases. Also Ohmic losses can be a main drawback at the mentioned frequencies (MMW, i.e. at 60 GHz) for a large feed network structure beside the dielectric losses. However, it should be mentioned that a planar antenna has the advantage of being integrated with other parts of system and fabricated as part of a PCB which is very much desired for MMW applications.

In the university’s design, researchers employed all the advantages of both mentioned antennas without suffering from their shortcomings. The proposed antenna has a single planar feeding structure which can be integrated with other system blocks on a PCB. The proposed antenna provides high radiation gain due to the large number of the radiating elements represented by the periodic openings (slots) in the PRS surface. The feed network for such structure is provided by the wave bouncing between the ground plane and the PRS surface; such feed is essentially in air therefore suffering almost no loss.

## SUGGESTED USES

This invention can be used in the new upcoming generation of wireless systems (57-64 GHz) but the design can be used at higher frequencies as well; for example for automotive radar systems.

## ADVANTAGES

The antenna is designed in a planar form to be integrated on PCB circuits.

The fabrication process is simple and low-cost in comparison with other proposed antennas (mainly micromachining), which is desirable for large production.

## CONTACT

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## INVENTORS

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## OTHER INFORMATION

## KEYWORDS

Fabry-Perot Cavity (FPC) antenna, Frequency Selective Surface (FSS), Thick FSS, Wireless

## CATEGORIZED AS

» **Communications**

» Wireless

## RELATED CASES

2011-573-0

The losses are reduced significantly with respect to the other antennas proposed at 60 GHz previously, by using air as the FP cavity material and having only a single feed.

## PATENT STATUS

| Country | Type | Number | Dated | Case |
|---|---|---|---|---|
| United States Of America | Issued Patent | 8,730,125 | 05/20/2014 | 2011-573 |

## STATE OF DEVELOPMENT

Lab tests conducted.

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