Ihtesham Khan

PhD Student at UPNA

Ihtesham Khan is from Pakistan.

He has studied BSc Telecommunication Engineering in Peshawar, Pakistan and MSc Electronics Science and Technology Engineering in China.

He has been awarded with Prime Minister National ICT Scholarship for BSc degree and also an awardee of Chinese Government Scholarship for his MSc degree.

He has more than 4 year of research experience in the field Antennas and wave Propagation.

His current research interests include Antennas Designing, Metamaterials, EBGs and Electromagnetics.

Ihtesham is integrated in the Antenna Group of Public University of Navarra under the supervision of Proffessor Dr. Iñigo Ederra, who joined the Antenna Group in 2000 and is full professor of the UPNA since 2022.

Research

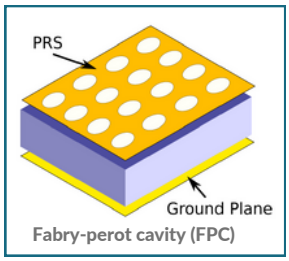
High-Gain Fabry Perot antennas for THz frequencies.

Research objective: The objective of this research is to design FPC antennas in THz range in the areas that limits its performance: bandwidth, gain and feeding systems.

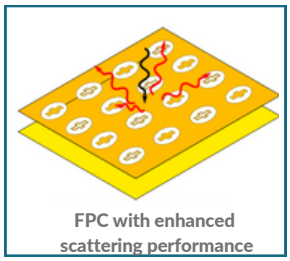
Abstract:

Next generation communication systems demand wide channelization bandwidths, high transmission speed, and low latency, characteristics provided ideally by the millimeter wave and terahertz bands. However, some challenges still remain to be addressed to fully develop all the potential of these frequency ranges in wireless communication technologies. For example, highly directive antennas are needed to compensate for the increased free-space propagation loss compared to microwaves as well as additional losses due to the attenuation of atmospheric gases; in addition, wide-angle scanning is also required.

Traditionally, high gain antennas have the drawback of high volume and weight. In this sense, Fabry-Perot (FPC) or resonant cavity antennas have deserved large interest in the last decades. These antennas, based on the resonator created between a partially reflective surface (PRS) and a ground plane, see Figure , constitute a low-profile alternative for moderate or high-gain antennas.



Fabry-perot cavity (FPC)


FPC with enhanced scattering performance

However, being based on a resonant structure, their main drawback is the trade-off between bandwidth and gain. As a consequence, development of high gain antennas based on these configurations is challenging and it is difficult to find examples with gain higher than 20 dB. Therefore, this research activity will contribute to the development of design strategies for high-gain FPC antennas, while keeping a reasonable bandwidth. To this end non-uniform cavities combining varying partial reflecting surfaces and thickness will be investigated. This research activity proposes the use of metallic cavities to create dual polarization feeds. Initial results already show the feasibility of some configurations. In addition, in order to facilitate manufacturing, novel technologies, such as gap waveguide will be explored.

The last area of intended research deals with the possibility to add additional features to the antennas. Given their large area it could be possible to integrate on the PRS additional scattering features, such as those required for smart environments. In particular their reflection can be tailored for specific purposes, such as radar cross-section reduction of wave manipulation.

'This PhD project will contribute to realizing my potential and to catalyzing significant development in my career in both the academic and non-academic organizations.'

'My unique interest in the fields of RF Electronics, Electromagnetics and Antennas design as well as my passion for these subjects, led me to choose "Design and Analysis of Metamaterial Based Switchable and Wearable Patch Antennas for Diverse Medical and Wireless Communication Applications" for my undergraduate final year research project. I was the principal investigator of this research-based project.'