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Rule-Spacer Detection in Indonesian Language on Instagram Comment Section Using Maximum Entropy Classification Method
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Decision Support System: Employee Recommendation using Fuzzy Suseno Method as a Job Search Service
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Fuzzy K-Nearest Neighbor for Restaurants Business Sentiment Analysis on TripAdvisor
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Discover the Indonesian Digital Workers in Online Gig Economy Platforms
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Predicting the Potential Telemarketing Customers using Data Mining Approach
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Parallel Session 4-A

mRNA Based Gene Regulation of Bladder Cancer in A Specific Population of Caucasian Race and Different Sexes
Margareta Dorina Velosko (Indonesia International Institute for Life Sciences (IL), Indonesia), David Agustawan (Indonesia International Institute for Life Sciences (IL), Indonesia & AsiaUniversity, Taiwan)

Identification of microRNA Targeting Cancer Gene of Colorectal Carcinoma in Caucasian Population
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The Application of Entropic Weighted Tree Similarity Algorithm for Similarity Searching
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Dual Band Antenna with Parasitic Patch for Satellite Applications

Harshal Nigam
ECE Department, SKIT Jaipur
Jaipur, India
hrshlnigam@gmail.com

Monika Mathur
ECE Department, SKIT Jaipur
Jaipur, India
monikamathur16@gmail.com

Mukesh Arora
ECE Department, SKIT Jaipur
Jaipur, India
arora.mukesh02@gmail.com

Abstract—In this paper, a compact microstrip patch antenna having parasitic patch and partial ground plane to achieve high bandwidth and resonating frequency is designed, along with minimum attenuation levels, the antenna is working on multiple bands of 13-16 GHz and 17-20 GHz that lies in the Ku and K bands and can be used for satellite applications, minimum attenuation levels are achieved at the resonant frequencies of 14.6 GHz and 19.2 GHz of -58 dB and -41 dB respectively. The antenna is showing a good impedance matching bandwidth with multiple bands. The antenna has been simulated on CST Microwave Studio

Keywords— Ku band, K band, Microstrip Patch Antenna (MSA), Parasitic Patch, Partial ground

I. INTRODUCTION

Satellite technology is developing at a very fast rate, the different applications include weather forecasting, broadcasting and many others. The satellite applications operate in the Ku and K bands. Microstrip antennas are the most common type of antennas that can support different frequencies for satellite applications and are also easy to design.

Multiband antennas operate on different frequency bands at the same time else different antennas had to be used for different frequency bands, thus the multiband antennas have a single antenna to work on different bands, thus it reduces cost and complexity of having different antennas, Multiband antennas are designed as in [1]-[2]. In a dual band antenna, there are two operating frequencies as in [3]-[6], for satellite applications microstrip antennas are very commonly used that can accommodate multiple bands as in [7]-[8].

Many works have been reported in literature related to dual band antennas for satellite applications but in this design impedance bandwidth has been improved and also much lower attenuation levels are achieved.

In this paper, a dual band antenna is designed that is working on two different frequency bands, thus a single antenna that can work on two different frequency bands at the same time so multiple band antennas are more preferred nowadays. There are many techniques to improve the bandwidth of patch antenna Here, the conventional patch antenna is designed then a parasitic circular patch inside the rectangular patch is used that is coupled with the main driven patch by a circular gap, the circular patch is driven solely by the electromagnetic energy that is coupled from the main patch. Parasitic patch technique is used to add capacitance to the structure thus increasing the impedance bandwidth, with a nominal VSWR value. Here, a partial ground plane is used that changes the current path thus multiple bands can be obtained. Defected ground structures are now very commonly used where a certain defect is made on the ground to change the path of the current on the ground plane. The defect can be single or it can be a

periodic defect repeated after certain distances on the ground plane. The defects increase the current path thus the current has to travel a much larger distance so it affects the frequency and bandwidth of the antenna. Here, in this paper a partial ground plane is being used having a width same as that of substrate but a variable length. The value for this length has been optimized to get better frequency, bandwidth and minimum attenuation levels.

II. ANTENNA DESIGN

For designing the microstrip antenna, the starting has been done with the following steps:

- Selection of substrate for designing of Microstrip antenna
- Selecting the transmission line modal for analyzing the patch antenna
- Selecting appropriate feeding technique and modifications on the antenna to achieve desired results.

The selected substrate for designing the antenna is FR4 having a dielectric constant of 4.4 and a thickness of 1.6 mm. The antenna with front view as shown in Fig.1 and back view as in Fig.2, the design consists of a rectangular patch antenna fed by a microstrip line. The dimensions in Fig.1 are as follows, $L_1=11.5$ mm, $W_1=16$ mm, $W=2.8$ mm and $L=6$ mm. A circular patch is also designed at the center that is coupled with the rectangular patch through a very small circular gap of 0.2 mm. The rectangular patch is fed through the feed line as in Fig.1 and the energy is coupled to the circular patch through a small coupling gap, to decide the radius of circular patch the variation of radius 'r' of the patch as in Fig.1 has been observed and its effect on reflection coefficient, it has been observed that as the radius is increased, a higher bandwidth is achieved because the circular patch introduces a capacitive effect on antenna thus enhancing the bandwidth and also achieving a minimum attenuation level as shown in Fig.3. The analysis is done by taking values of radius as 4.2, 4.4 and 4.6 mm respectively and best results were obtained at a value of 'r=4.6 mm'. In the back view, the ground plane is partial, having a width equal to that of substrate and having a length 'l', by applying parametric analysis it has been observed that at an optimum value of length we get multiple bands with minimum attenuation as shown in Fig.4. Here, analysis is done by taking values of length as 6.3, 11.3, 16.3 and 21.3 mm respectively and best results were obtained at a value of 'l=16.3 mm'. The current path is changed by using a partial ground, thus multiple bands are achieved.