Jurnal Elektronika dan Telekomunikasi

Volume 22, Number 1, August 2022

e-ISSN: 2527-9955; p-ISSN: 1411-8289

Abstract Index

Imelda U. V. Simanjuntak[a], Agus D. Rochendi[b], Lukman M. Silalahi[a] ([a]Program Studi Teknik Elektro, Universitas Mercu Buana, [b]Research Center for Oceanography, National Research and Innovation Agency)

Integrated Microstrip Antenna Reflector Based on SIW for 5G Networks

Jurnal Elektronika dan Telekomunikasi, August 2022, e-ISSN: 2527-9955, p-ISSN: 1411-8289, Vol. 22, No. 1, pp. 1 - 7.

High data rates, low latency, and low energy consumption are required for the fifth-generation (5G) mobile wireless network. One of the devices that garner interest to be developed is the antenna. Microstrip antennas are widely used in cellular communications because of their simple profile and easy fabrication. However, it has limitations in terms of performance. The millimeter-wave band has been selected to provide high-speed service in 5G wireless networks. Compared to other frequency bands, the propagation path in millimeter-wave is significantly decreased. The substrate integrated waveguide (SIW) technology aims to integrate all components on the same substrate, with low insertion loss and a low profile. Using a dielectric substrate on top and a metallic coating at the bottom with metalized holes, the SIW structure offers a compact form factor for integrating active circuits, passive components, and radiation elements within the same substrate. Therefore, this study aims to design and implement a reflector integrated microstrip antenna with a compact form and a working frequency of 26 GHz. The measurements showed the return loss value of -11 dB, voltage standing wave ratio (VSWR) of 1.9, and the antenna impedance of 63 Ω. The antenna that was designed and fabricated in this work is suitable for operation in the millimeter-wave range for 5G technology.

Keywords: microstrip antenna, SIW, millimeter-wave, reflector, 5G

Fajri Darwis[a], Enjel Al Birr Rahayu[b], Sutrisno[b], Hanny Madiwati[b], Taufiqqurrachman[a], Arie Setiawan[a,c], Erry Dwi Kurniawan[a], Yusuf Nur Wijayanto[a] ([a]Research Center for Telecommunication, National Research and Innovation Agency, [b]Departement Electrical Electronic Engineering, Polytechnic State of Bandung, [c]Graduate School of Engineering, Mie University)

Cross-Coupled Line Bandpass Filter Based on Modified Parallel-Coupled Line Structure

Jurnal Elektronika dan Telekomunikasi, August 2022, e-ISSN: 2527-9955, p-ISSN: 1411-8289, Vol. 22, No. 1, pp. 8 - 13.

This paper presents a study of a narrow bandwidth of the bandpass filter with a cross-coupled line structure. This structure was designed to have a good filter selectivity with the transmission zeros and a simple design. Since the structure has a cross shape, cross-coupling between the resonators consequently occurs. This interferes with the passband of the filter. Optimization in the size of the coupled lines and transmission lines was done to minimize the interference. Rogers RT/duroid 5880 was used as a substrate to fabricate the bandpass filter to verify the proposed design. As a result, the fabricated cross-coupled line bandpass filter has an 80 MHz of 3 dB bandwidth with operating frequency ranges from 2.97 GHz to 3.05 GHz. The bandwidth is reduced by 20 % from the specification. It shows that the cross-coupled line structure can yield a narrow bandwidth. Based on the 3 dB bandwidth, the center frequency is shifted 0.33 % above the specification. Meanwhile, the return loss and insertion loss of the proposed bandpass filter successfully comply with the required specifications. In conclusion, the proposed bandpass filter can be applied to S-Band applications that require narrow bandwidth.

Keywords: bandpass filter, cross-coupled, s-band, parallel-coupled, microstrip.

Ahmad Heri Ilyasah[a], M. Reza Hidayat[a] , Salita Ulitia Prini[b] ([a]Faculty of Engineering Universitas Jenderal Achmad Yani, [b]Research Center for Telecommunication, National Research and Innovation Agency)

2×1 Truncated Corner Microstrip Array Antenna to Increase Gain and Bandwidth for LTE Applications at 2.3 GHz Frequency

Jurnal Elektronika dan Telekomunikasi, August 2022, e-ISSN: 2527-9955, p-ISSN: 1411-8289, Vol. 22, No. 1, pp. 14 - 22.

In the development of telecommunications in Indonesia, cellular networks, especially 4G, have grown rapidly since the launch of 4G LTE services. In the implementation of LTE, an antenna that has performance values of bandwidth, working frequency, VSWR, and gain that meets the specifications was needed. This research aims to study a microstrip antenna for LTE applications at a frequency of 2.3 GHz on its effect on the gain and bandwidth parameters using the 2×1 array method and the truncated corner which was simulated using HFSS software. The microstrip antenna was made using FR4 substrate with a thickness (h) of 1.6 mm and a dielectric constant (εr) of 4.4 with an expected working frequency of 2.3 GHz with the desired parameters return loss < -10 dB, VSWR < 1.5, gain > 2 dB, and bandwidth > 200 MHz in the simulation. Based on the simulation results of the microstrip antenna with the 2×1 truncated corner array method, the return loss value= 18.171 dB, VSWR= 1.281, gain= 3.963 dB, and bandwidth= 283 MHz, which worked at a frequency of 2.3 GHz. Meanwhile, based on the results of the antenna measurements that have been implemented, the return loss value was= 11.07 dB, and the VSWR= 1.49, which works at a frequency of 2.2 GHz.

Keywords: microstrip antenna, HFSS, LTE (Long Term Evolution), truncated corner.

Liya Yusrina Sabila[a], Teguh Prakoso[b], Munawar Agus Riyadi[b] ([a]Departement of Electrical Engineering, University of Ahmad Dahlan, [b]Departement of Electrical Engineering, University of Diponegoro)

Miniaturized Spiral Planar Inverted F Antenna of 2.4 GHz Using Design of Experiment Method for EEG-based Controlled Prosthetic Arm

Jurnal Elektronika dan Telekomunikasi, August 2022, e-ISSN: 2527-9955, p-ISSN: 1411-8289, Vol. 22, No. 1, pp. 23 - 29.

This paper presents the design of a planar inverted F antenna with a miniature or tiny shape at the frequency of 2.4 GHz. The antenna uses a spiral design to reduce the dimension of the antenna with conformal shape for a suitable prosthetic arm. Usually, the antenna design uses long experimental steps, namely trial and error. It can be summarized using the DOE (design of experiment) method. The DOE is a method to streamline the experimental steps to get the best design. The DOE method uses a tuning reference at the design parameter variation of ±5 % of the nominal value. Four tuning steps can get the best results from S11, bandwidth, and gain. The designed antenna works at the resonant frequency of 2.431 GHz with the value of S11 is -22.634 dB, bandwidth of 37.1 MHz, and gain of -7.596 dBi.

Keywords: antenna, PIFA, spiral design, 2.4 GHz, conformal antenna, prosthetic arm.

Swivano Agmal[a], Jalu Ahmad Prakosa[b], Agus Sukarto Wismogroho[c] ([a]Research Center for Quantum Physics National Research and Innovation Agency, [b]Research Center for Photonics, National Research and Innovation Agency, [c]Research Center for Advanced Material, National Research and Innovation Agency)

Wireless Temperature Measurement Validation Method for PCR Machines by Magnetic Hall-Effect Sensor

Jurnal Elektronika dan Telekomunikasi, August 2022, e-ISSN: 2527-9955, p-ISSN: 1411-8289, Vol. 22, No. 1, pp. 30 - 39.

The temperature validation controlled by temperature indication has a vital role in the polymerase chain reaction (PCR) test machine or thermal cycler. However, the validation process is complicated for several types of thermal cycler. Some PCR test machines must close the lid tightly while running. It makes the probe’s cable of the temperature sensor might be pinched or break when the thermal cycler lid is closed. Opening the lid (open-air condition) makes the measurement will not accurate. To solve this problem, wireless temperature measurement and validation methods for PCR machines are developed based on magnetic field measurements. The magnetic field of the object will respond to any changes in temperature. The hall-effect sensor, which is validated by gauss meter, detects any magnetic response a certain material covers even the object. This detection yields output data processed to find the thermal cycler's appropriate temperature wireless validation method. The experiment used a Neodymium magnet as a wireless probe. The position of the Neodymium magnet pole significantly affected the relation between magnetic flux and temperature in experimental results. The reversed pole toward sensors had better linearity (R^2= 0.8062) than the unreversed pole (R^2= 0.7794). The annealing step commonly achieved the optimum measurement uncertainty. However, the measurement uncertainty

and signal sensitivity investigation recommended employing the beneficial combination of pole magnet position to design the temperature validator based on magnetic induction for a closed lid thermal cycler (PCR machine). Overall, the experimental yields can be used to build a wireless temperature validator for a sealed PCR machine based on magnetic induction.

Keywords: PCR, magnetic induction, thermal cycler, magnetic hall-effect sensor.

Farra Anindya Putri[a], Dayat Kurniawan[b], Rahmawati Hasanah[a], Taufiqurrahman[b,c], Eko Joni Pristianto[b], Hana Arisesa[b, c], Yusuf Nur Wijayanto[d], Deni Permana[b], Winy Desvasari[b], Ken Paramayudha[b], Arief Budi Santiko[b], Dadin Mahmudin[b,c], Pamungkas Daud[b], Fajri Darwis[b], Erry Dwi Kurniawan[b], Arie Setiawan[b,e], Tajul Miftahushudur[b,f], Prasetyo Putranto[b,g], Syamsu Ismail ([a]Departement of Electronic Engineering, Bandung State Polytechnic, [b]Research Center for Telecommunication, National Research and Innovation Agency, [c]Faculty of Electrical Engineering, Universiti Teknologi Malaysia [d]Research Center for Electronic, National Research and Innovation Agency, [e]Graduate School of Engineering, Mie University, [f]Department of Electrical and Electronic Engineering, The University of Manchester, [g]School of Electrical Engineering and Computer Science, KTH Royal Institute of Technology)

Development of FMCW Radar Signal Processing for High-Speed Railway Collision Avoidance

Jurnal Elektronika dan Telekomunikasi, August 2022, e-ISSN: 2527-9955, p-ISSN: 1411-8289, Vol. 22, No. 1, pp. 40 - 47.

This paper discusses the development of frequency modulated continuous wave (FMCW) radar signal processing for high-speed railway collision avoidance. The development of radar signal processing combines a two-dimensional constant false alarm rate (2D-CFAR) and robust principal component analysis (RPCA) to detect moving targets under clutter. Cell average (CA) and Greatest of CA (GOCA) CFAR are evaluated under a cluttered wall environment along the railway track. From the experiment, the development of FMCW radar can detect stationary or moving obstacles around 675 meters in front of the locomotive. Combining 2D-CFAR and RPCA algorithm outperforms average background subtraction in extracting moving targets from strong clutter signals along the railway track.

Keywords: railway system, FMCW radar, collision avoidance, clutter removal, 2D-CFAR, RPCA.

Jurnal Elektronika dan Telekomunikasi

Volume 22, Number 1, August 2022

e-ISSN: 2527-9955; p-ISSN: 1411-8289

Author Index