

Notched Bands in Ultra-Wideband UWB Filter Design for Advanced Wireless Applications

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Abstract : With the increasing demand for wireless communication systems for unlicensed indoor applications, the FCC, in February 2002, allocated unlicensed bands ranging from 3.1 GHz to 10.6 GHz with fractional bandwidth of about 109 %, because it plays a key role in the radiofrequency (RF) front ends devices and has been widely applied in many other microwave circuits. Targeting the proposed band defined by the FCC for the UWB system, this article presents a UWB bandpass filter with three stop bands for the mitigation of wireless bands that may interfere with the UWB range. For this purpose, two resonators are utilized for the implementation of triple-notched bands. The C-shaped resonator is used for the first notch band creation at 3.4 GHz to suppress the WiMAX signal, while the H-shaped resonator is employed in the initial UWB design to introduce the dual notched characteristic at 4.5 GHz and 8.1 GHz to reject the WLAN and Satellite Communication signals. The overall circuit area covered by the proposed design is 30.6 mm × 20 mm, or in terms of guided wavelength at the first stopband, its size is $0.06 \lambda_g \times 0.02 \lambda_g$. The presented structure shows a good return loss under -10 dB over most of the passband and greater than -15 dB for the notched frequency bands. Finally, the filter is simulated and analyzed in HFSS 15.0. All the bands for the rejection of wireless signals are independently controlled, which makes this work superior to the rest of the UWB filters presented in the literature.

Keywords : a bandpass filter (BPF), ultra-wideband (UWB), wireless communication, C-shaped resonator, triple notch

Conference Title : ICAEEME 2024 : International Conference on Advances in Electronics, Electrical and Mechanical Engineering

Conference Location : Jeddah, Saudi Arabia

Conference Dates : February 19-20, 2024