

UNIVERSITI TEKNOLOGI MARA

**SUBSTRATE INTEGRATED WAVEGUIDE (SIW)
BANDPASS FILTER WITH IMPROVEMENT OF
INSERTION LOSS AND RETURN LOSS AT 2.4 GHz**

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ABSTRACT

This paper presents a design of 2.4 GHz substrate Integrated Waveguide (SIW) bandpass filter using single layer technique on the Printed Circuit Board (PCB). The circular cavity structure using TM_{010} mode for filter is reemployed in the design of this bandpass filter. To realize this concept, the magnitude of E-field distribution for SIW filter resonating at TM_{010} mode is study and analyzed based on the effect of using low permittivity of substrate rogers duroid which is 2.2 and make it air as substrate have a permittivity of 1.

The simulation results show a good insertion loss and return loss that prove the concept of low permittivity substrate gives better insertion and return loss. To prove the concept, the SIW filter is fabricated using Rogers Duroid RT5880 with dielectric constant, $\epsilon_r = 2.2$, tangent loss of 0.001, and thickness of 0.787mm. The measured results show good agreement with simulation results. Results show 48.06% improvement (-18.81dB) of return loss (S_{11}) can be obtained from air as substrate compare with Roger Duroid RT5880 has -9.77dB. In the case of make the air as substrate, the insertion loss (S_{21}) is at least 69.57% improvement of -1.05dB compared with Roger Duroid which has -3.45dB. The proposed SIW bandpass filter are offer a low profile, low loss, high quality factor, easily to fabricated and integrated with other elements of circuits.

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