

## **Compact wideband bandpass filter using hybrid hairpin and half-wave parallel coupled resonator in multilayer microstrip configuration for X-band application**

### **ABSTRACT**

This paper presents a new design of wideband filter for X-band application using hybrid hairpin resonator and half wave coupled line resonator in multilayer microstrip configuration. Different resonator shapes were put on two substrates with different dielectric constants. In this work R/T Duroid 6010 and R/T Duroid 5880 with dielectric constant 10.2 and 2.2 respectively were used as the substrates, producing a very small filter size, only at  $10 \times 10$  cm<sup>2</sup>. This configuration is not only producing compact size filter, but also high bandwidth since the overlapping gap between two resonators produces a tight coupling which is needed for wideband filter. The filter can cover whole X-band frequencies by producing 44% bandwidth at 10.2 GHz center frequency with excellent responses, where the measured passband return loss for this filter is better than  $-12.5$  dB and the insertion loss is better than 2.3 dB.

**Keyword:** Wideband filter; Hybrid hairpin; Half-wave parallel coupled; X-band