埼玉大学　馬・大平・王研究室

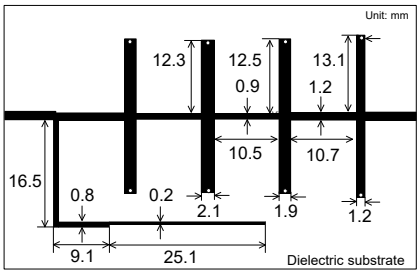
小型高性能マイクロ波受動回路の研究開発

Research and Development of Miniaturized High-Performance Microwave Passive Circuits

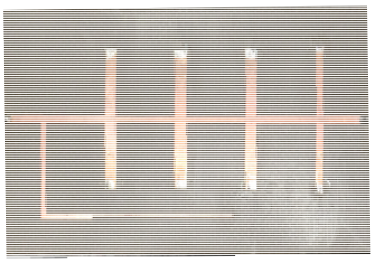
Ma, Ohira & Wang Laboratory, Saitama University, Japan

Microwave and Quasi-MM-Wave Wideband BPFs

- Wide passband, low insertion loss, high frequency selectivity, easy for low-cost fabrication.

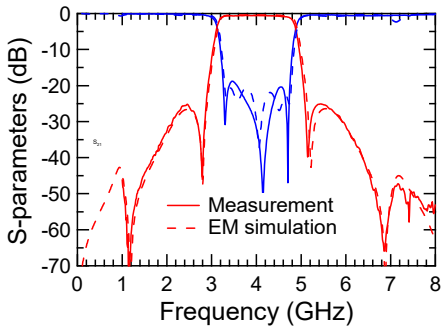


Wideband BPF with multi-transmission zeros (f_0=4 GHz, *FBW*=40%, 5-poles)

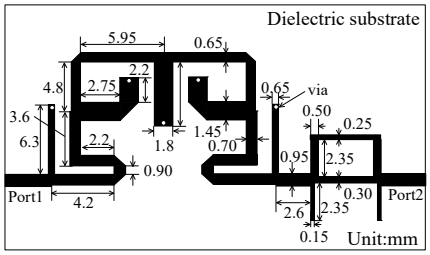


Substrate with ε_r=2.9, thickness t=0.5 mm

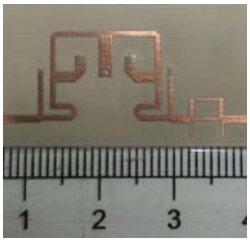
Fabricated filter



Frequency response

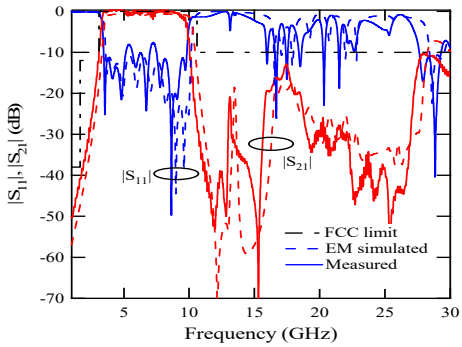


UWB BPF with wide stop-band (f_0=6.85 GHz, *FBW*=95%, 9-poles)

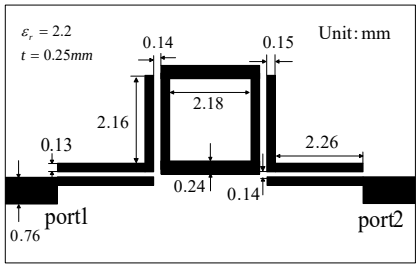


Substrate with ε_r=4.5, thickness t=0.5 mm

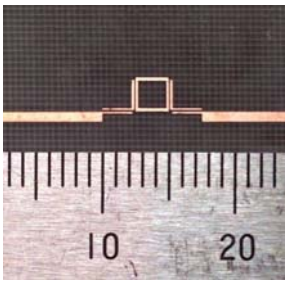
Fabricated filter



Frequency response

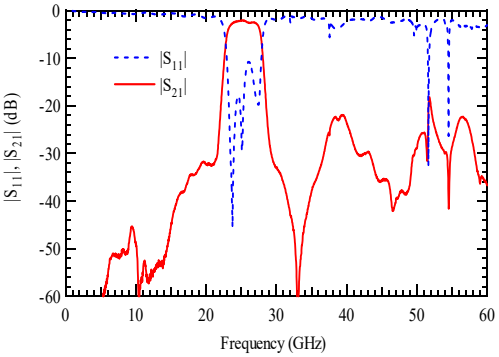


Quasi-Millimeter UWB BPF (f_0=25.5 GHz, 3dB-*FBW*=20%, 4-poles)

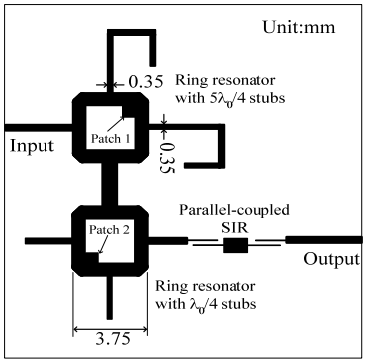


Substrate with ε_r=2.2, thickness t=0.25 mm

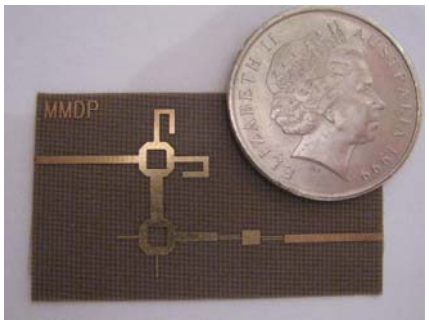
Fabricated filter



Frequency response

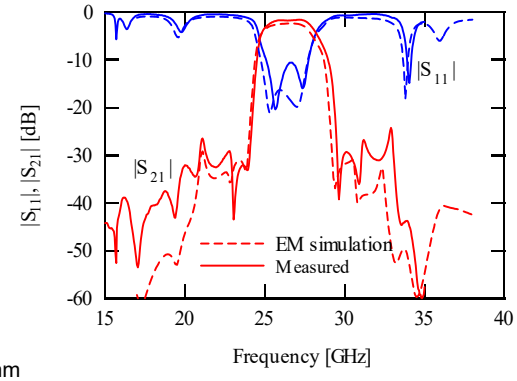


Quasi-Millimeter UWB BPF (Specifications as above)



Substrate with ε_r=2.2, thickness t=0.25 mm

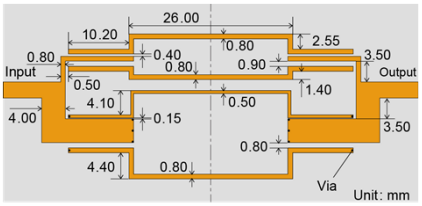
Fabricated filter



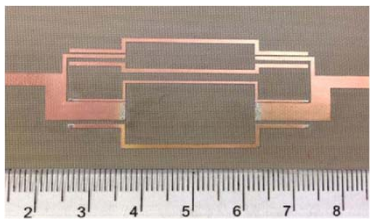
Frequency response

Fully Canonical BPFs Using New Coupling Topology

- Parallel arrangement of microstrip even- and odd-mode λ/2 resonators.
- Filter circuit synthesis based on a generalized Chebyshev function.
- High skirt selectivity with four transmission zeros located near the passband edges.
- Low loss with *I.L.* = 1 dB in passband.

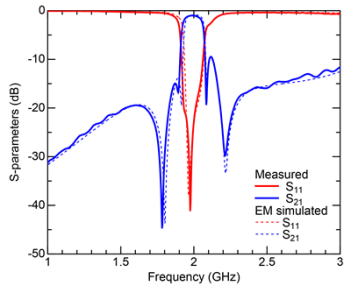


BPF using 4th-order transversal coupling (f_0=2 GHz, *FBW* =6%)

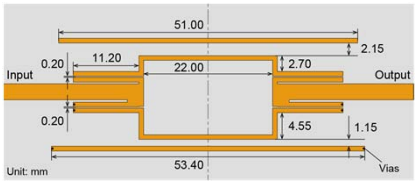


Substrate with ε_r=2.6, thickness t=1.0mm

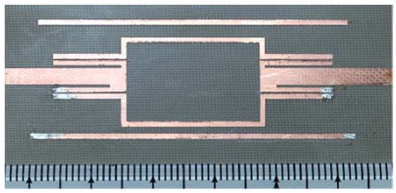
Fabricated filter



Frequency response

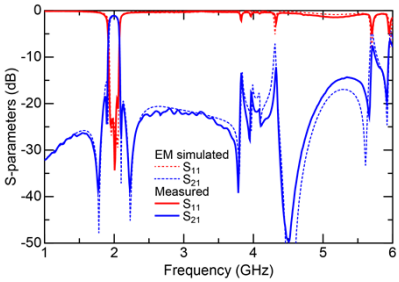


BPF using 4th-order Cul-de-Sac coupling (f_0=2 GHz, *FBW* =6%)



Substrate with ε_r=2.6, thickness t=1.0mm

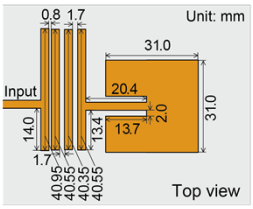
Fabricated filter

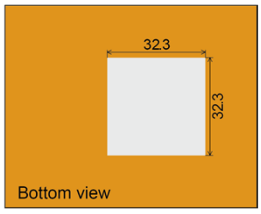


Frequency response

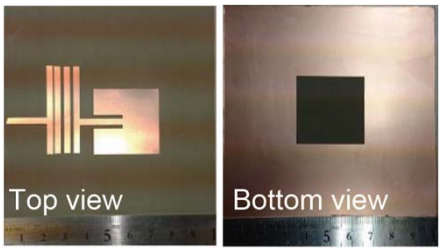
Microstrip Filtering Antenna (Filtenna)

- A patch antenna fully integrated within a microstrip BPF.
- Co-design with a filter synthesis theory and radiation Q evaluation of antenna.
- Flat in-band gain as antenna and frequency selectivity function as BPF.



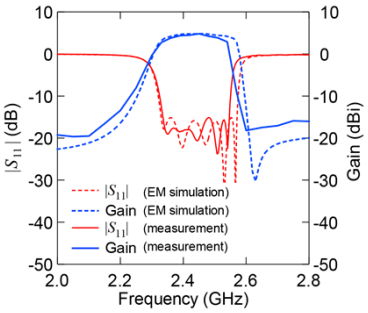


Filtenna based on 5th-order Chebyshev BPF (f_0=2.45 GHz, *FBW* =10%)



Substrate with ε_r=2.6, thickness t=1.0mm

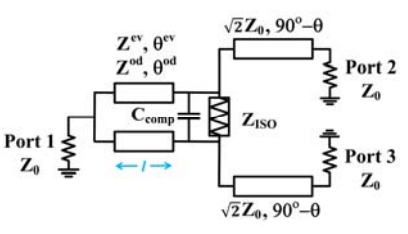
Fabricated filtenna



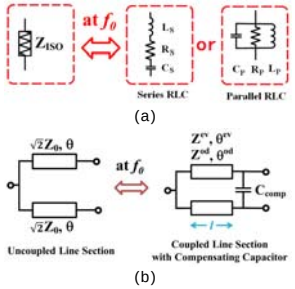
Frequency response

Miniaturized Wilkinson Power Divider

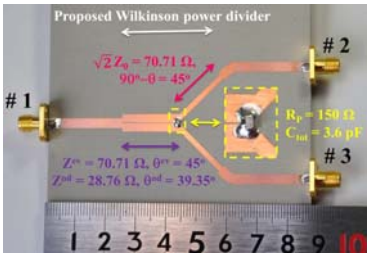
- Capacitors for characteristic impedance compensation and phase compensation.
- The relationship between lumped elements and bandwidths is newly proved.
- Circuit size is reduced to 50%.



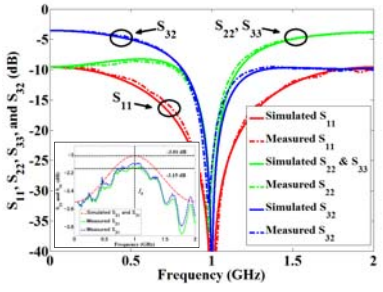
Proposed WPD



Equivalent circuits



Fabricated circuit



Frequency response