

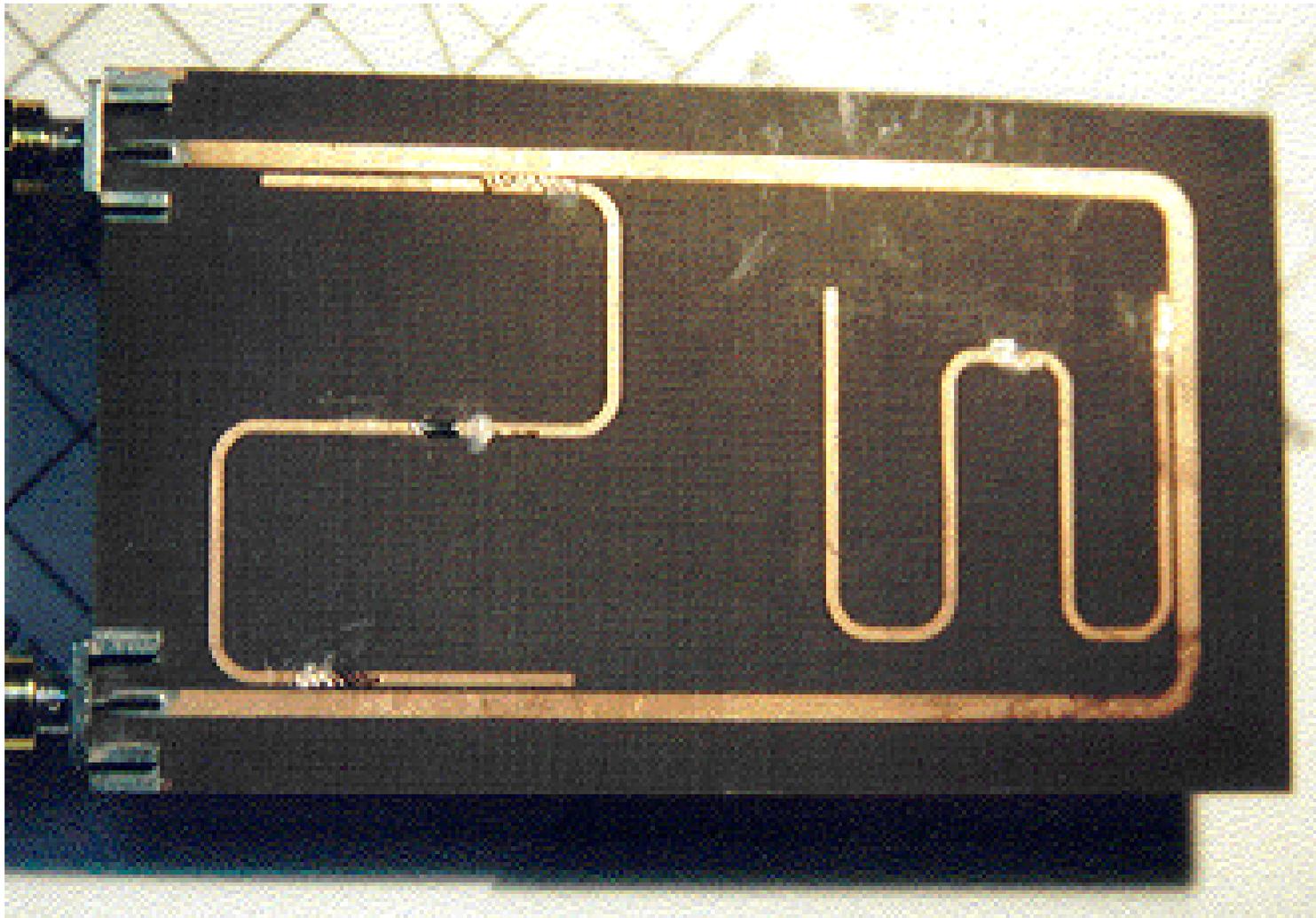
Enhanced Notch Filters

IEEE MTT-S Int. Microwave Symp. Dig., pp. 1315-1318, Fort Worth, TX, June 2004

- **Passive reciprocal circuits with at least 2 signal paths and at least 2 resonators**
- **Several orders of magnitude performance enhancement is possible**
- **Theoretically infinite attenuation from lossy low- Q_u resonators**
- **Minimum relative bandwidth of $2/Q_u$ is independent of notch attenuation**
- **Return loss is independent of notch attenuation**
- **Approach is independent of resonator technology and operating frequency**
- **Measured notch depth improvement of 49 dB; 0.25 dB passband noise figure**
- **Enables use of small, low quality components to reduce filter size and cost**
- **Can incorporate an amplifier to realize even greater performance enhancement**

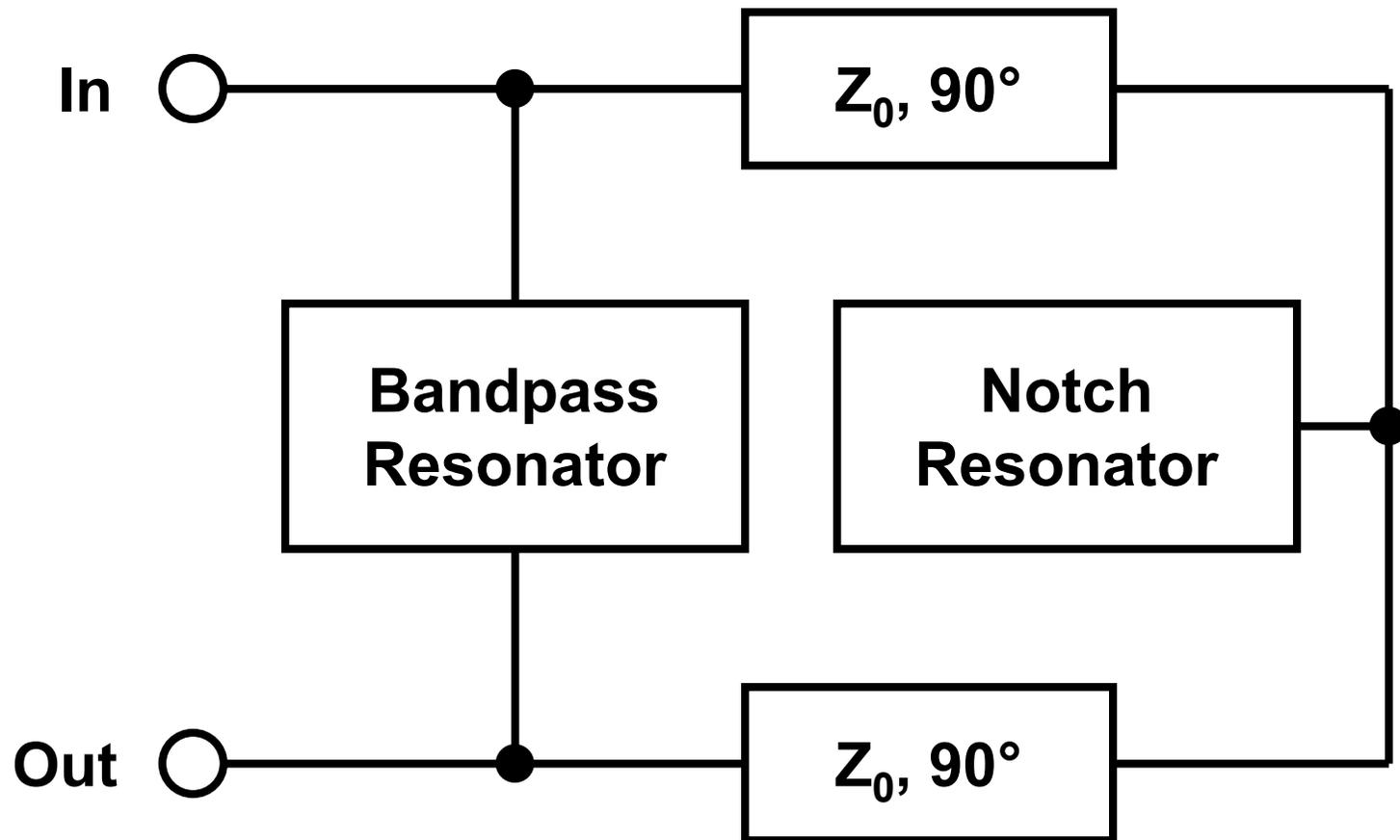
Microstrip realizations of enhanced passive notch filters

Two single-mode $\lambda/2$ resonators



Conceptual diagrams of enhanced passive notch filters

Two single-mode $\lambda/2$ resonators



Measured performance of enhanced passive notch filters

- Relative 3dB bandwidth < 1.55%
- Notch attenuation > 58 dB
- Enhancement factor of 325
- Partly reflective in stopband

