

80 & 89 GHz filters for direct detection radiometers

One of the crucial components of a direct detection radiometer is a filter. The filter determines the operational band where the radiometer channel is sensitive to the observed scene.

A filter should have low insertion loss and its bandwidth and frequency center have to be stable over the radiometer operational temperature range. The ease of manufacturing and its repeatability is also important for a filter, and eventually a radiometer and its cost.

BEST has designed similar filters operating up to 200 GHz.

To prove our technological capabilities, we have designed, evaluated and tuned a couple of filters for 80 and 89 GHz. The filters are very small, their volume is approximately 10 mm³, thus very suitable for integration into a radiometer receiver.

Figures 1 and 3 show a plot of the 80 and 89 GHz filter S₂₁ and S₁₁ parameters (gain and input return loss) respectively. Figures 2 and 4 show measured final bandwidth and insertion losses. Filter center frequencies vary only ±8 MHz over the operational temperature range from -40°C to +80°C.

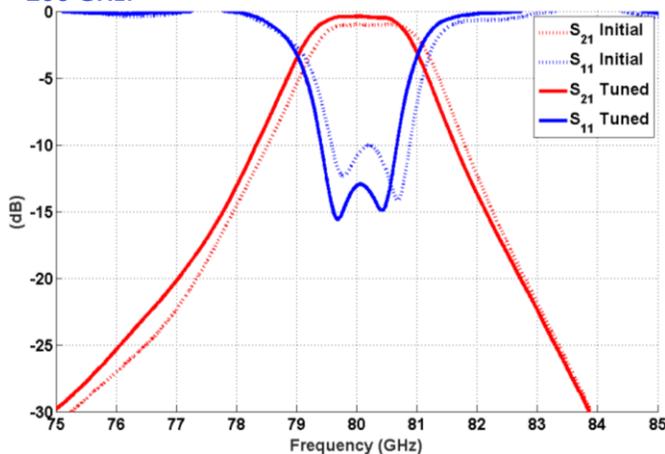


Figure 1. Measured characteristics of an 80 GHz radiometer filter before and after tuning. The dotted line is a plot of the filter initial results and the full line show results after it was tuned for bandwidth and center frequency.

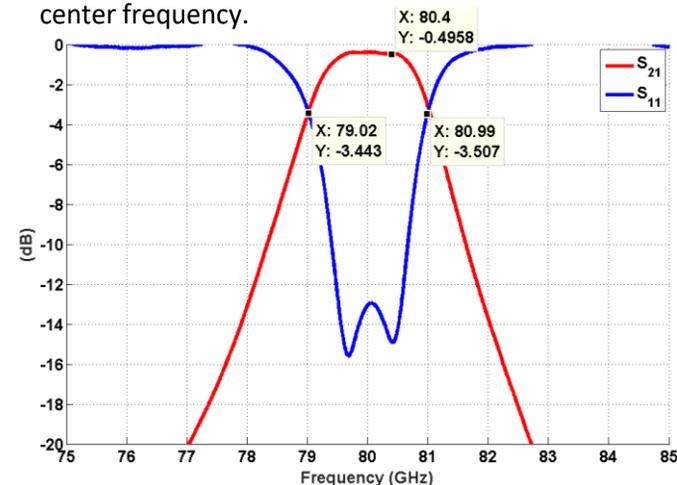


Figure 2. Measured bandwidth and insertion losses of the 80 GHz radiometer filter after tuning. The insertion losses are less than 1 dB and the bandwidth is from 79 to 81 GHz, as designed.

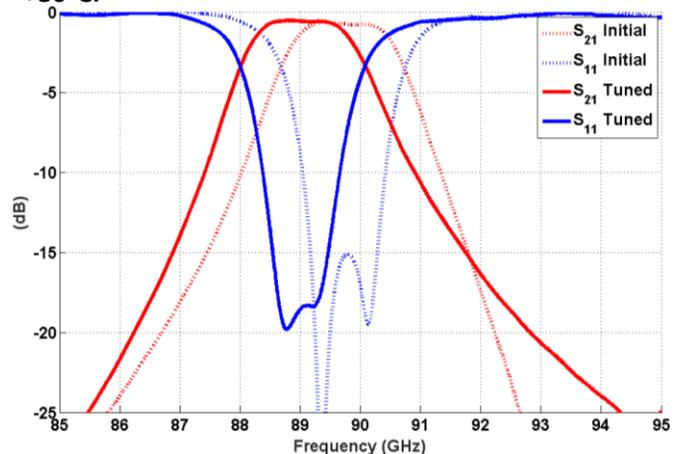


Figure 3. Measured characteristics of an 89 GHz radiometer filter before and after tuning. The dotted line is a plot of the filter initial results and the full line shows results after it was tuned for bandwidth and center frequency.

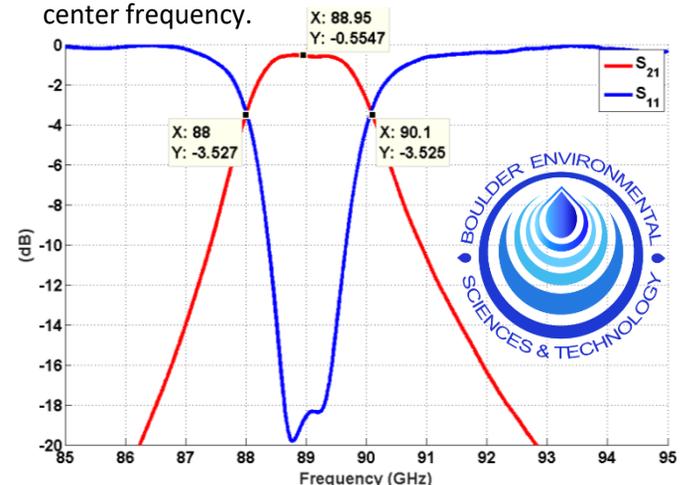


Figure 4. Measured bandwidth and insertion losses of the 89 GHz radiometer filter after tuning. The insertion losses are less than 1 dB and the bandwidth is from 88 to 90 GHz, as designed.

