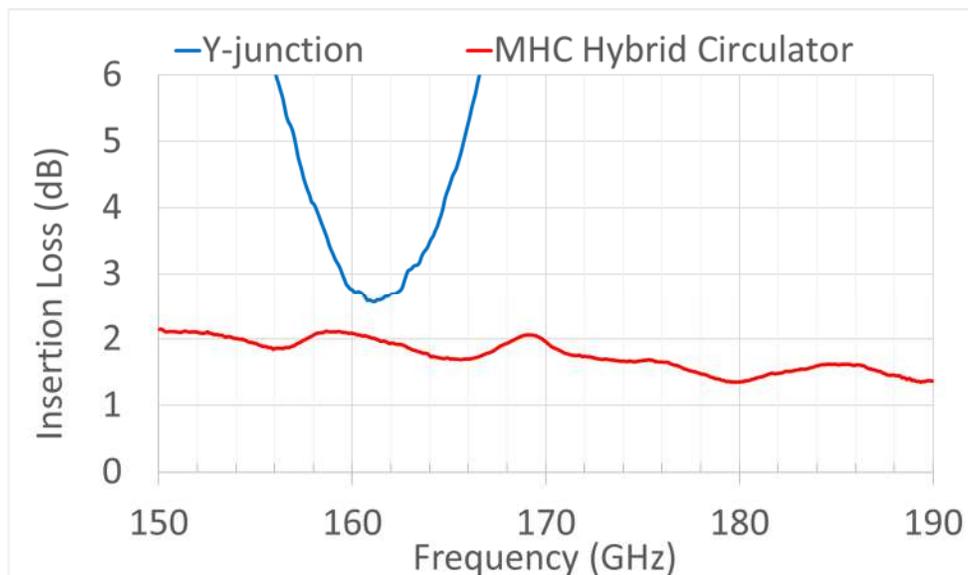
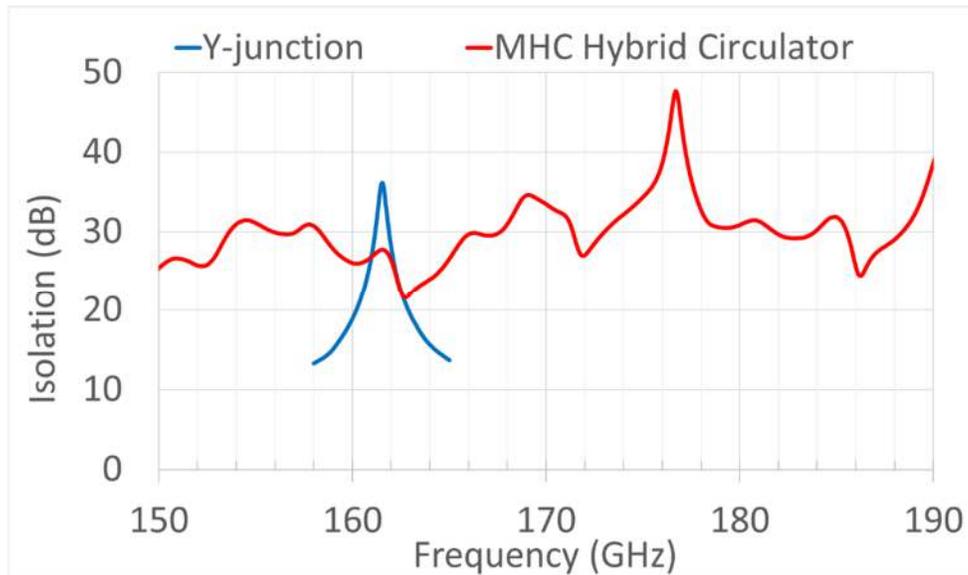


Hybrid Circulators

Y-junction circulators are commercially available up to 40 GHz with 16 dB isolation and full waveguide band operation (40% fractional bandwidths). Above 50 GHz the bandwidth is severely limited, making them unsuitable for many systems. For example, a Y-junction circulator tuned near 160 GHz typically has a 20 dB fractional bandwidth of less than 2%.

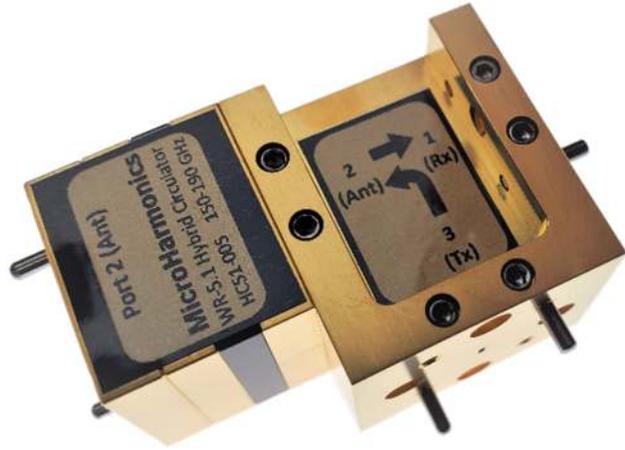
At Micro Harmonics we developed an all new mm-wave hybrid circulator technology with a 24% fractional bandwidth. Our initial prototypes cover the entire band from 150 GHz to 190 GHz with more than 20 dB isolation and less than 2.2 dB insertion loss. The test data are shown below. For comparison, we also show test data from a 162 GHz Y-junction circulator.



A photograph of a WR-5.1 hybrid circulator prototype is shown in the picture to the right. The dimensions are approximately 1.5 x 1 x 0.75 inch (38 x 25 x 19 mm).

A WR-5.1 circulator with a 24% fractional bandwidth is undoubtedly a remarkable result. In fact, this would have to be considered an enabling technology. But the good news gets even better. In theory, the hybrid circulator can be designed to cover full rectangular waveguide bands with fractional bandwidths exceeding 40%. But this requires a change in the geometry that is both more complicated and more costly to machine. Therefore, the immediate development efforts will continue to be in 24% fractional bands.

Micro Harmonics is currently working with NASA to develop hybrid circulators in additional 24% bands as indicated in the table below. The development will occur over the next two years. The estimated release dates are also indicated in the table. There is some flexibility in the target bands. If you have a specific band of interest, please contact us and we may be able to accommodate your needs.



[Hybrid circulator webpage](#)

Model Name	EIA Flange	Frequency (GHz)	Est. Release Date
HC148	WR-15	54 - 68	June 2022
HC122	WR-12	70 - 88	November 2022
HC100	WR-10	84-104	March 2023
HC80	WR-8	107 - 133	July 2023
HC65	WR-6.5	118-150	October 2023
HC51	WR-5.1	150 – 190	Current
HC43	WR-4.3	200 - 250	December 2023

Micro Harmonics designs and manufactures all of our products in the United States. We do reliability testing (Belcore) and cryogenic cycling tests. Nylon thread lockers are used to ensure that our components stay assembled in the field. Every component is thoroughly RF tested and the data is shared with the customer. Every component is fully warranted. When you purchase a Micro Harmonics component you can rest assured that you are receiving the highest quality and best performance available on the global commercial market.

Micro Harmonics Corporation
20 S Roanoke St, Ste 202
Fincastle, VA 24090

Ph: 540.473.9983
Fax: 844.449.1561
MicroHarmonics.com