

## Company Data

## Core Competencies

Micro Harmonics specializes in ferrite components for use at millimeter-wave frequencies from 25-400 GHz.

Every product that we make offers unique capabilities that distinguish it from any competing technology. See our differentiators below.

Our components find use in a wide range of MMW systems including test & measurement equipment, portal security, telecommunications, scanners, and radar.

Micro Harmonics was founded as a millimeter-wave (MMW) design consultancy in 2008. The company currently employs seven people. In 2015 the company began developing a line of ferrite components for NASA. The initial components were high-frequency MMW isolators and circulators used to suppress standing waves and direct signal flow in MMW systems. In 2018 the product line was expanded to include cryogenic MMW isolators and voltage variable attenuators. These components were targeted for NASA instrumentation but also find wide application in the commercial, scientific, and military sectors. In 2020, Micro Harmonics invented and patented an all new MMW hybrid circulator with significantly higher bandwidth than the previous state-of-the-art. This component will enable ultra-broadband telecommunications links for emerging 5G/6G applications.

## Differentiators

### Full Band Waveguide Isolators

Our millimeter-wave ferrite components are the most advanced in the global market. Our isolators have the industry's **lowest insertion loss** by a wide margin. They employ **diamond heatsinks**, giving them the **highest power handling capability** on the market. Micro Harmonics has developed a full line of isolators optimized for **cryogenic applications**.

### Circulators

Our Y-junction circulators have the **lowest insertion loss** and **broadest bandwidth** in the industry. Our patented millimeter-wave hybrid circulators have an order of magnitude higher bandwidth than traditional Y-junction circulators and are thus an enabling technology for broadband telecommunications and radar applications.

### Voltage Variable Attenuators

Micro Harmonics has developed a line of **voltage variable attenuators for mm-Wave systems** based on the physics of Faraday rotation. They offer **improved power handling and higher bandwidth** than other available technologies.

### Proven Performance

Customers use our products when they need the absolute highest performance in their mm-wave systems. Micro Harmonics has a **unique and sophisticated test and measurement facility** with all of the equipment necessary to make comprehensive vector measurements from a few hundred MHz to over 400 GHz. **We provide RF test data for each and every component that we ship.**

### Socio-Economic Category: SB

**DUNS: 034119968**

**CAGE CODE: 6T4C6**

**NAICS: 334220**

**334419**

**541330**

**541715**

**PSC: H259 AJ12**

**5985 5999**

**C219 AR12**

**C222 C215**

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# SBIR/STTR

Micro Harmonics has been working with NASA to turn research in MMW market solutions since 2015. MHC has been awarded five SBIR's to develop state-of-the-art ferrite components for MMW and THz systems. Every SBIR has resulted in a fully commercialized product line: compact wide band waveguide Faraday rotation isolators optimized for either room temperature or cryogenic applications, wide band Y-junction circulators, voltage variable attenuators, and our patented hybrid circulators.

According to the SBIR/STTR Commercialization Report to Congress (9/15/14), "A significant advantage to Phase I/II award winners is that Federal agencies may pursue *sole source* (emphasis added) contracts to utilize technology developed through prior SBIR/STTR awards which automatically qualify as a Phase III activity."

## Government NASA SBIR Contracts

Year	Contract	Technical Monitor
2015	NNX15CP37P	Goutam.Chattopadhyay@nasa.jpl.gov
2016	NNX16CP07C	Goutam.Chattopadhyay@nasa.jpl.gov
2018	80NSSC18P2018	Goutam.Chattopadhyay@nasa.jpl.gov
2019	80NSSC19C0148	Goutam.Chattopadhyay@nasa.jpl.gov
2020	80NSSC20C0410	Karthick.Srinivasan@nasa.jpl.gov



## Past Performance

### *International Cryogenic Customers*

Micro Harmonics was asked by an international institution to develop a cryogenic isolator in a non-traditional band (W-9, 82-123 GHz) for both room temperature and cryogenic applications. These isolators are also useful for multiplier chains in THz systems.

MHC has designed a very low profile cryogenic isolator in W-band for a radio telescope receiver in Europe. Our miniature isolator design allows for over thirty adjacent isolators to fit into the system. Unlike standard isolators, MHC isolators are not affected by external magnetic fields, so they are a perfect solution for a tight system requiring adjacent units.

### *Leaders in MMW and THz Devices*

Virginia Diodes (VDI) uses Micro Harmonics isolators in their line of MMW frequency extension modules. VDI is a world leader in test and measurement equipment and is a supplier of frequency extenders for Keysight PNA's. MHC is proud to have our components in VDI products. Dr. Jeffrey Hesler, CTO, hesler@vadiodes.com.

### *Research Institutions*

We have also sold products to NASA JPL, National Radio Astronomy Observatory (NRAO), European Space Agency (ESA), Korea Astronomy and Space Science Institute (KASI), National Astronomical Observatory of Japan (NAOJ), University of Chicago, Harvard Smithsonian, MIT, Cal State University, SLAC, Stanford University, Cornell ACERT Lab, Northeastern University, Institute of Electronics Microelectronics and Nanotechnology (IEMN), Institut National d'Optique (INO)

### *Other Notable Customers*

Farran, Low Noise Factory, Northrop Grumman, Teledyne, Spacek Labs