

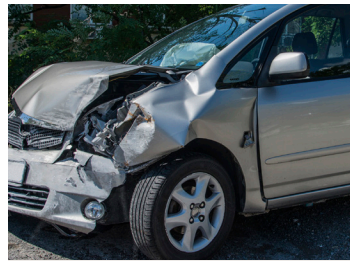


Broadband Fractal SoP Antenna Integrates Multiple Functions Into Single Low-Cost Module

*Customizing power specifications for
automotive radar applications*

A high-performance system-on-package (SoP) antenna increases transmission power and range, reduces system size and cost, and enables designers to customize specifications for high frequency broadband tasks. This novel design integrates an aperture-coupled fractal antenna array with a focusing lens in the low temperature co-fired ceramic (LTCC) medium to enhance overall gain and communication range without increasing power consumption. Developed for Universal Medium Range Radar (UMRR) applications -- which measure range, speed, and angle of multiple objects simultaneously -- the technology supports automotive driver assistance systems as well as wireless devices including cell phones, laptop computers, and robotic devices.

TECHNOLOGY OPPORTUNITY



Benefits

- ▲ **High performance:** Achieves broadband performance in LTCC, enabling high data rate applications
- ▲ **Flexible design:** Enables customizable short-, medium-, and long-range antenna applications
- ▲ **Exact:** Focuses fractal antenna beam for pinpoint accuracy
- ▲ **Robust:** Shields sensitive Integrated Circuit (IC) elements within the assemblage
- ▲ **Compact:** Features 3-dimensional layering reducing the overall system footprint
- ▲ **Low power:** Gain and bandwidth are adjustable through the lens and do not require increased power

Applications

UMRR-based automotive driver assistance systems including:

- Adaptive cruise control
- Pre-crash detection
- Lane change assist
- Blind zone object detection
- ▲ Cell phones & laptops
- ▲ Global positioning systems
- ▲ Robotic devices
- ▲ Traffic management:
 - Speed sensors
 - Area surveillance devices
 - Perimeter monitoring
- ▲ Guided vehicles
- ▲ Aeronautic systems
- ▲ Satellite broadband high frequency tasks

Opportunity

This technology is part of KAUST's technology commercialization program that seeks to stimulate development and commercial use of KAUST-developed technologies.

Opportunities exist for joint development, patent licensing, or other mutually beneficial relationships.

For More Information

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Technology Details

How It Works

The KAUST innovation integrates a novel antenna design, unique materials, and 3-dimensional packaging to produce a compact, high performance antenna system. Incorporating an aperture-coupled fractal antenna array with a focusing lens in the LTCC medium enables designers to customize gain, range, focus, and power specifications for specific tasks without sacrificing accuracy or overburdening power sources. Additionally, a new combination of a low and a high dielectric constant LTCC substrate and superstrate further increases module gain. The large bandwidth of the fractal antenna enables high data rate applications.

System size and cost are reduced by transforming millimeter-scale discrete components into micrometer or nanometer-scaled components embedded within thin film connectors. The ICs are located on the bottom of the configuration and are shielded by the lens, adding to robustness. The design's low cost, low power requirements, and high performance make the innovation highly suitable for UMRR applications, which operate in the 24 Gigahertz (GHz) frequency band and are generally reserved for higher cost advanced functions.

Why It Is Better

Conventional approaches for high frequency antenna place much emphasis on precision assembly and sophisticated tools in order to provide the proper alignment of antenna and lens parts. Skilled technicians test and align components to achieve acceptable performance, and yields suffer from high defect rates. Because the LTCC/SoP approach is integrated and essentially automated, including the high gain antenna, there are far fewer parts to assemble. With the fractal antenna as the primary radiator, designers can fine-tune the geometry of the planar lens to independently adjust gain, side lobes, and bandwidth, which enhances design options and boosts manufacturing process yields.

IP Protection

KAUST has a issued patent US 8,860,607 for this technology.



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