

[WIRELESS SYSTEMS]

Distributed Impact Detection System (DIDS)

Wireless Low-Power Impact Detection

[PRODUCT OVERVIEW]

Distributed Impact Detection System (DIDS)

Invocon's Distributed Impact Detection System (DIDS) is a wireless distributed network of miniaturized, self-powered piezoelectric sensor nodes that continuously monitor for impact events on large structures such as manned spacecraft. Developed under a NASA Langley Research Center Phase 2 SBIR contract, DIDS uses extremely low-latency signal acquisition to capture high-frequency acoustic impact signals while operating at micro-watt average power levels. The system supports accelerometer, acoustic emission, and ultrasonic transducer types, with triangulation capabilities for impact localization.



[CAPABILITIES]

Features & Applications

Key Features

- ◆ **Extremely Low-Power Trigger Architecture**
Innovative signal conditioning circuit operates in the micro-watt range on average while maintaining continuous readiness to capture impact events in the hundreds-of-kilohertz range.
- ◆ **Self-Powered Wireless Nodes**
Miniaturized stick-on nodes operate for up to 2 years, with no wiring required.
- ◆ **Multi-Mode Power Management**
Four operating modes (Trigger, Data, Processing, RF Transmit) allow DIDS to minimize power while maximizing responsiveness to impact events.
- ◆ **Impact Localization via Triangulation**
Multi-node network uses time-of-arrival data to triangulate and determine the location of detected impacts on the monitored structure.
- ◆ **Multi-Transducer Compatibility**
Supports acoustic emission, accelerometer, and ultrasonic transducers, enabling application-specific sensor selection across different structure types.
- ◆ **RF Configuration and Data Download**
RF interface allows remote configuration of sensor thresholds and download of captured impact waveforms without physical access to the nodes.

Typical Applications

- ◆ **Manned Spacecraft Impact Monitoring**
Detects micro-meteoroid and orbital debris impacts on the International Space Station and other crewed vehicles.
- ◆ **Structural Leak Detection**
Ultrasonic sensor variant used for detecting leak events in pressurized spacecraft panels.
- ◆ **Launch Vehicle Structural Monitoring**
Monitors for acoustic emission events indicative of structural impacts or anomalies during pre-launch and ascent.

[TECHNICAL DATA]

Key Specifications

SPECIFICATION	VALUE
ELECTRICAL	
Sensor Types	Acoustic emission, accelerometer, ultrasonic transducer
Signal Acquisition Frequency	Hundreds of kilohertz range
Average Power Consumption	Micro-watt range (trigger mode)
Battery Life (standard 1 mAh)	Up to 1.9 years
Modes of Operation	16 control relays + 2 power relays
RS-422 Links (per relay module)	Trigger, Data, Processing, RF Transmit
Triangulation	Multi-node network supports impact location determination
MECHANICAL	
Weight	1.8 ounces (Sensor Unit + Battery)
Enclosure	Approximately 4.3cm x 4.3cm x 2.2cm.