

# Long Range RF Combat Identification Tag

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A large, rapidly growing market exists for RF Identification (RFID) technology, ranging from complex combat identification tags to simple theft-control and remote intelligent read/write devices. The core thrust of Spectra Research's RFID technology is focused on the near-term fieldability for Air-to-Ground Combat Identification (CID) and fratricide elimination. Spectra Research has a suite of RF Tag devices in the advanced stages of development. The Spectra Research Long Range RF Tag (US Patent No. 6,100,840) has been successfully demonstrated in various combat scenarios at long standoff ranges.



This technology base spawned from combat identification requirements evolving from friendly-fire experiences in recent war efforts. S\*R RF Tags are passive modulated devices operating in the microwave band with a radar system serving as the interrogating source. S\*R has successfully demonstrated both directional and omnidirectional RF tags operating in X- and K-bands with radars ranging from handheld police speed guns to over 10 fighter aircraft and other aerial platforms. The Spectra Research RF Tag represents an affordable solution and requires no (or at most modest) changes to US and coalition fighter aircraft radars. Further development of these devices will swiftly propel the technology to the battlefield and into the hands of the Warfighter.

## • UNIQUE ADVANTAGES

- Combines the ability of radar to **detect and locate objects** with the ability of the tag to **provide positive identification** information to the radar.
- With a suitable choice of operating frequency, radar **penetrates visual barriers** such as fog, rain, foliage, as well as frame and masonry buildings to interrogate the tag.
- Passive modulated retroreflector tags **can respond to simultaneous interrogation by multiple radars**. This is not possible with active transponders.
- Since the **tag response is coincident in time with the natural radar return** of the tagged object, it does not interfere with the normal operation of the radar. This is not true with some active tags.

## • TAG TECHNOLOGY

S\*R Long Range RF Tags are passive devices which superimpose modulations on the incoming radar signal and reflect it back in the direction from which it came. Because of retroreflective gain (the same principle exhibited by road signs and bicycle reflectors) the radar return is quite large for the size of the tag. Tags can be sized to provide identification sidebands as large as the radar return of the object or vehicle they are mounted on, making the identification range equal to the radar detection range. Typical ranges are on the order of 100 - 800 meters for tags illuminated by a handheld radar (i.e. speed gun) and many nautical miles for tags illuminated by an airborne radars. Tag modulations are matched to the signal processing capabilities of the interrogating radar, thus reducing required software modifications.

## • S\*R EXPERTISE

S\*R expertise in this field originated more than ten years ago with specialists in the areas of antennas and radar cross section (RCS) reduction (i.e. stealth). Our first RF tag for individual soldier combat identification applications was demonstrated in 1993. Since that time S\*R tag development has concentrated on size reduction and conformal planar microstrip configurations.

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Planar RF Tag configurations can be made very thin – down to a thickness of a few millimeters – by the use of microstrip patch antennas and transmission lines. Conversely, non-planar configurations are preferable for some applications. The prototype tag shown at the left provides coverage of 360° in azimuth and ±45° in elevation. The antenna and electronics are sealed in a polyethylene radome for protection from rain, sand, and dust. The prototype tag shown to the right represents a thin configuration using advanced antenna and electronics techniques.



The X-band RF ID tag shown below is a 2 x 4 active microstrip repeater array using cavity-backed slot antennas. These wideband antennas operate over a wide bandwidth, allowing simultaneous operation with a variety of radars. This tag covers a field of view of approximately ±45° with an equivalent modulated radar cross section (RCS) of approximately 10 dBsm. The modulating waveform is provided by a microprocessor-based programmable waveform generator which provides numerous waveforms detectable by a variety of radars.

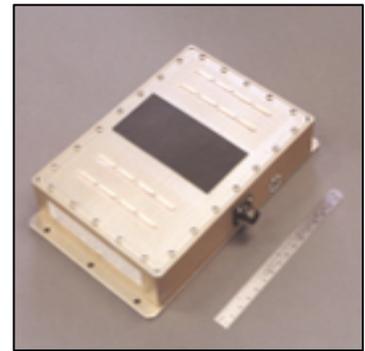
## • TECHNOLOGY APPLICATIONS

### Military

- Positive combat identification of aircraft, vehicles and individual soldiers;
- Location and identification of vehicles and shipping containers in storage areas;
- Training instrumentation for monitoring resource location; and
- Geo-location for SAR map calibration.

### Commercial

- Location and identification of assets such as shipping containers, semi-trailers, railroad cars, barges, aircraft, etc.;
- Location and tracking of personnel in hazardous areas such as firefighters, search and rescue personnel, and police;
- Vehicle electronic license plate applications;
- Remote data acquisition for adverse weather/nighttime operation;
- Through-the-wall acquisition; and
- Inventory control.



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## • PARTNER OPPORTUNITIES

Spectra Research, Inc. is actively seeking partnerships with companies, government agencies, universities, and individuals with interest in producing the S\*R Long Range RF ID devices. Specific applications include:

- Combat identification in conjunction with existing military radars;
- Personnel tracking, identification, and status reporting for fire fighters and rescue workers;
- Tracking for shipping containers, semitrailers, railroad cars, barges, etc.; and
- Inventory control.

For further information, please visit our website at [www.spectra-research.com](http://www.spectra-research.com) or contact:

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