Smart Plasma RFID

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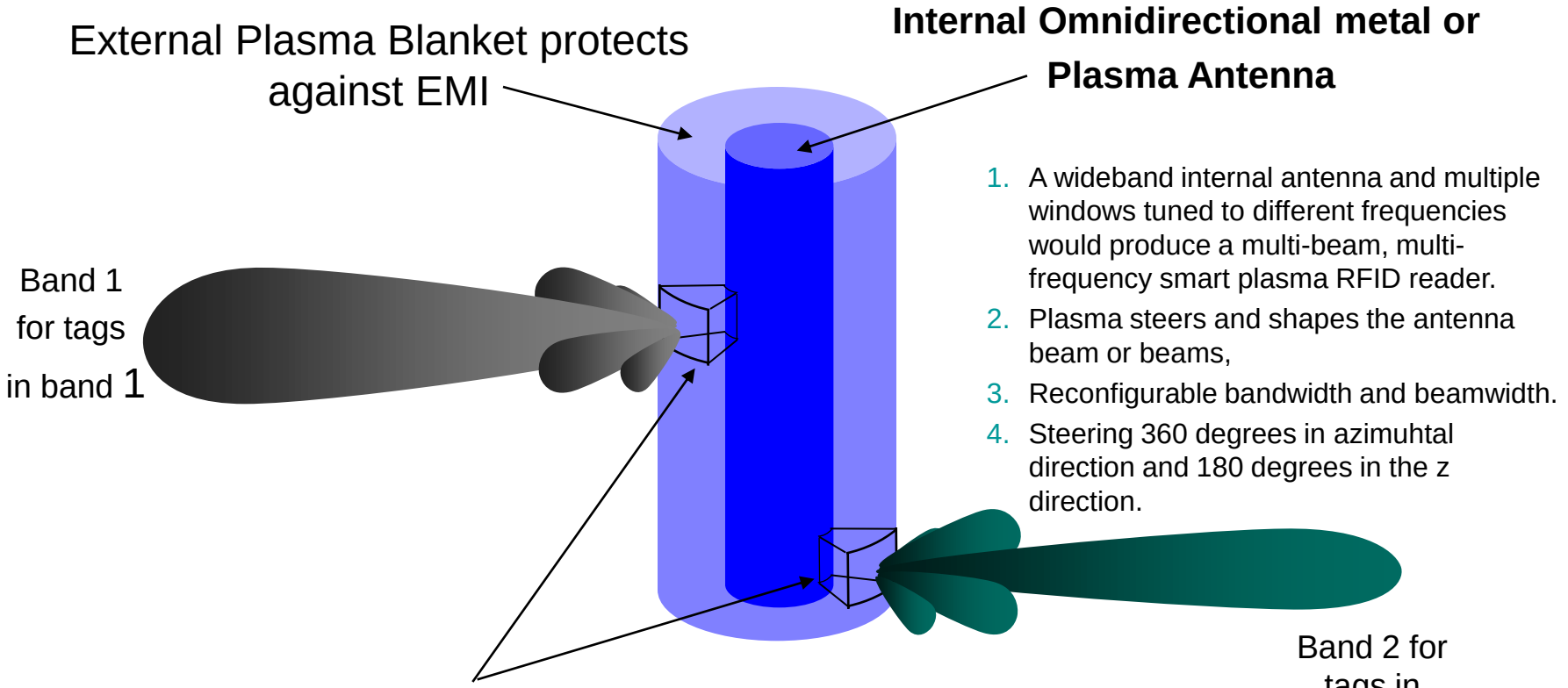
Smart Plasma RFID Reader

The smart plasma RFID readers can be used with current tags for an initial hybrid technology.

Note: 2 bands are given, but multibands can be implemented.



1. A wideband internal antenna and multiple windows tuned to different frequencies would produce a multi-beam, multi-frequency smart plasma RFID reader.
2. Plasma steers and shapes the antenna beam or beams,
3. Reconfigurable bandwidth and beamwidth.
4. Steering 360 degrees in azimuhtal direction and 180 degrees in the z direction.

Low Density Plasma Windows Opened for Transmit or Receive

Smart Plasma Retrofit Antenna for RFID Application

Convenient way to develop a smart plasma RFID reader. An example.

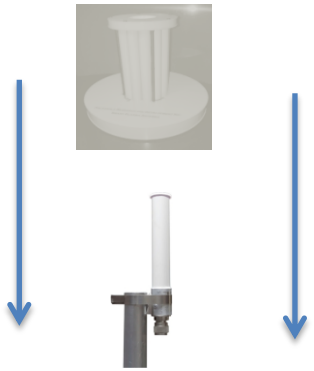
Traditional Dipole Antenna

Laird Technologies 5.15 – 5.875 GHz

Features:

- Omnidirectional
- Specific frequency 5.150- 5.875 GHz
- Non Steerable beam
- Fixed Horizontal beamwidth 360°
- Fixed Vertical Beamwidth 29°

Smart Plasma Retrofit Antenna



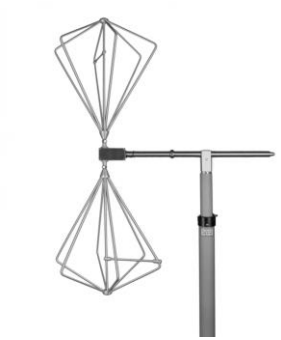
New Enhanced Features:

- Omnidirectional to
  - Directional with gain increase
  - Multibeam
    - increasing range and security
    - Steerable in azimuthal 360˚ and 180˚ z direction
- Reconfigurable bandwidth and beamwidth
- Multiband for plasma frequency selective surfaces(FSS)
- Average gain in 9 dB with respect to dipole.
- Beam focusing by plasma lenses can increase gain to 20 dB with respect to dipole.
- Protection against EMI from plasma shield.

Smart Plasma Retrofit Antenna for RFID Application

Convenient way to develop a smart plasma RFID reader. An example.

Traditional Biconical Antenna

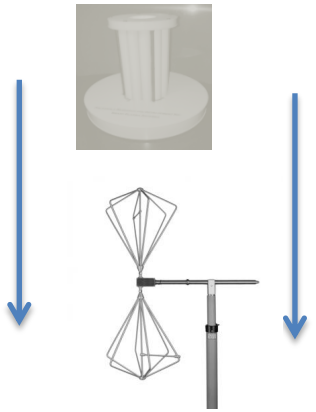


BBA 9106 + VHA 9103 B

<u>Features:</u>

- Omnidirectional
- Broad Band frequency 30 – 300 MHz
- Non Steerable beam
- Fixed Horizontal beamwidth 360°
- Fixed Vertical Beamwidth 29°

Plasma Smart Retrofit Antenna



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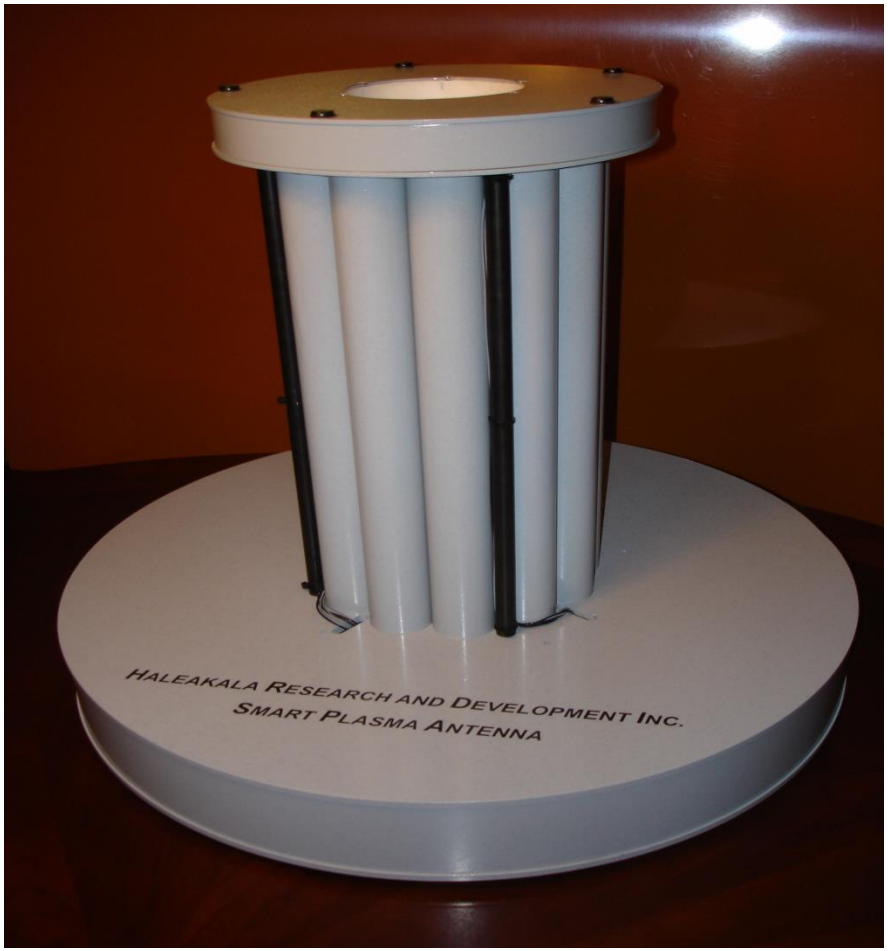
Ruggedized Smart Plasma RFID Reader



Smart Plasma Reader

- Smart Metal RFID readers need arrays to steer antenna beam.
- Smart Plasma RFID readers use plasma to steer and shape antenna beam. Much more compact than metal RFID readers. As an example at 2.4 GHz, the plasma RFID reader is about the size of a 2 coke cans in diameter and height.
- Smart Metal RFID readers have limited beam steering.
- Smart Plasma RFID readers can steer 360 degrees in the azimuthal direction and 180 degrees in the z direction.
- Metal and smart plasma RFID readers have the same range if the power supply, transmitters, and directivities are the same.
  - But with antenna beam focusing using plasma lenses the gain, range, and accuracy the smart plasma RFID reading is more accurate.
  - See accompanied slides on plasma beam focusing and experiments.
  - See T. Anderson, “Plasma Antennas” Artech House, chapter 8, 2011.
- The plasma smart RFID reader antenna is much more compact than a metal smart plasma antenna reader because plasma physics steers and shapes the antenna beam and not arrays.
  - Topologically, the plasma smart RFID reader is an array folded in on itself.

Smart Plasma Reader
steps to full plasma technology

- Initial smart plasma antenna RFID system should be a hybrid model of smart plasma antenna reader and current tags.
- Non interfering active and passive plasma tags will be developed.
- Implement internal plasma antenna.
- Smart containers will be developed with plasma frequency selective surafces.
  - See website www.ionizedgasantennas.com for plasma frequency selective surafces peer reviwed journal article.
  - See T. Anderson, “Plasma Antennas” Artech House, chapter 8, 2011.

Relevant Smart Plasma RFID Patents.

Dr. Theodore Anderson inventor and owner

- 8,384,602 Plasma devices for steering and focusing antenna beams
- RE43,699 Reconfigurable scanner and RFID system using the scanner
- 8,077,094 Plasma device with low thermal noise
- 7,453,403 Tunable plasma frequency devices
- 7,342,549 Configurable arrays for steerable antennas and wireless network incorporating the steerable antennas
- 7,292,191 Tunable plasma frequency devices
- 6,922,173 Reconfigurable scanner and RFID system using the scanner
- 6,700,544 Near-field plasma reader