AAC-TV5 Plasma Limiters

AAC’s line of plasma limiter devices are designed to protect sensitive electronics such as, radar systems, EW systems, hybrid microwave integrated circuit boards (HMICs), Ethernet network systems and the like, from short-pulse, high-power electromagnetic interference (EMI) or electromagnetic pulse (EMP) attack. Types of this EMI/EMP include high power microwaves (HPM), ultra-wideband (UWB) interference, lightning strikes, and other high power transients. Operating in conjunction with conventional diode limiters, protection from a variety of Directed Energy Weapons (DEW), such as E-bombs, is achievable.

It’s [EMP attack] the most significant threat we face in this country, behind nuclear attack – Rep. Curt Weldon, HASC vice chairman

Specifically AAC has developed its TVS products for operation in:

- X-band waveguide,
- S-band waveguide,
- coaxial transmission lines,
- Ethernet (RJ-45) networks, and
- microstrip/strip line transmission lines.

Beneficial systems include:

- Active electronic phased array radar,
- X-band and S-band waveguide systems,
- Air traffic control and weather radar,
- Military and civilian GPS systems.

The characteristics of existing devices are compared in Table 1. Solid state devices have extremely fast turn-on times (<1 psec) and even high peak power capability (~100 kW); however, they have low average power handling capability (<10 kW). Conversely, conventional gas discharge tubes can easily handle high peak power (> 1MW) and average powers (> 10kW) but have inherently slow turn-on times (>100 nsec). Since the threat is both high power and has fast rise times, the AAC limiter is the only device that addresses both simultaneously.
Table 1: Comparison of Competitive High Power Protective Devices

<table>
<thead>
<tr>
<th>Device</th>
<th>Turn on Time</th>
<th>Average Power</th>
<th>Peak Power</th>
<th>Stops High Power Pulse</th>
<th>Stops Short Pulse</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC-TVS Plasma Limiter</td>
<td>&lt; 10 nsec</td>
<td>&gt;10 kW</td>
<td>&gt; 1MW</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Gas Discharge Tube</td>
<td>&gt; 100 nsec</td>
<td>&gt; 10 kW</td>
<td>&gt; 1MW</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Solid State Device</td>
<td>&lt; 1 psec</td>
<td>&lt; 10 kW</td>
<td>&lt; 100kW</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

In the past, the conventional devices have been sufficient to protect against interference pulses from lightning or power transients. Present day protection technology of conventional gas arrestors and silicon avalanche diodes has been rendered inadequate by recent advancements in RFI sources. The costs namely involved with lacking RFI protection are the loss of capability and functionality of radar and battlefield communication systems. Our limiter corrects this deficiency.

![Incident and transmitted microwave power through the plasma limiter](zoomed-in view shows 2 nsec response time)

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