Solid State Active Denial Technology Demonstrator Program

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Outline

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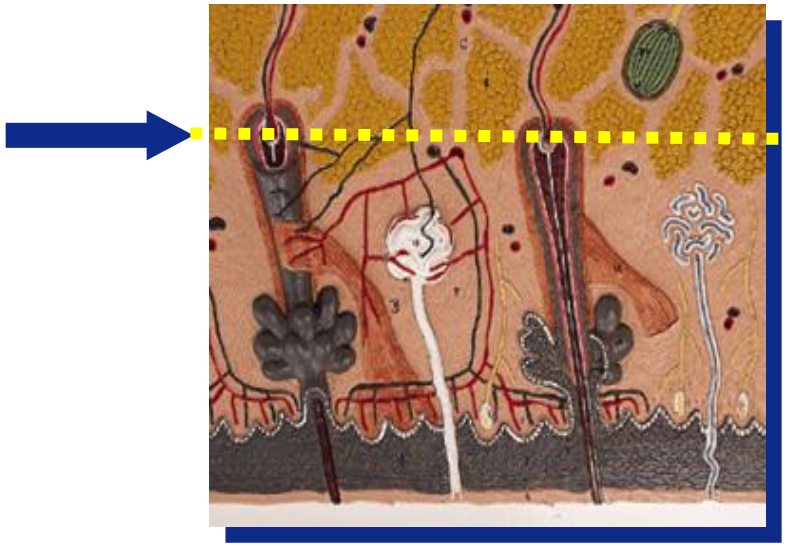
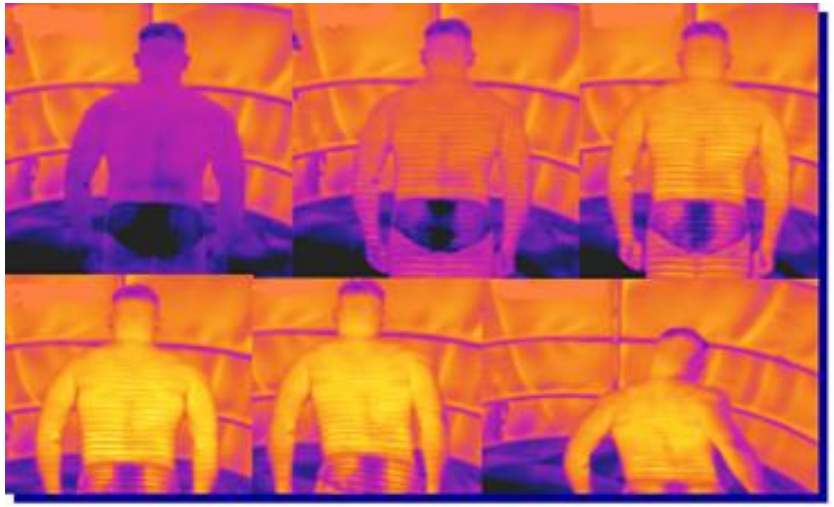
Active Denial Technology (ADT) Description

- At 95GHz, most of the energy is absorbed in top 1/64th inch of skin
- Skin heats, quickly reaching intolerable effect level, forcing a response (flinch/flee)
- Onset of effects begins instantaneously (eye aversion)



Human skin cross-section



- Effect stops when adversary leaves beam
- Very low probability of injury
- Man-in-the-loop

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Active Denial System (ADS) Prototypes

ADS System 0:

- Fixed site tech demonstrator
- 100KW Gyrotron based system

ADS System 2:

- Truck-mounted container system
- 100 KW Gyrotron based system

ADS System 1:

- Hybrid Electric HMMWV-integrated
- 100 KW Gyrotron based system

Silent Guardian:

- Raytheon IR&D
- 30KW System

Repel effect is desired but as an "Adjunct System"

SS-ADT Program Motive

Transitioning for Army Applications

ADS-0

ADS-1

ADS-2

- Dedicated ADS Platform/Vehicles

Solid State Active Denial Technology (SS-ADT)

ADT: Conceptual adjunct implementation

- Mass/volume conducive to an adjunct system
- Integration suitable for new and existing platforms

Active Denial Technology / System Army History

- **2008: TRADOC rejected Joint Capabilities Development Document (CDD) for ADS (tube based)**
  - Supported the ADS "repel effect" but did NOT want a dedicated ADS platform
  - Recommended that S&T be invested to reduce size

- **2008: ARDEC starts investment in Solid State Active Denial Technology (SS-ADT)**
  - Compliments investment already being made by JNLWP, NIJ and Raytheon IR&D

- **2009: US Army Maneuver Center of Excellence (MCOE) begins drafting Ground Combat Vehicle (GCV) Capability Development Document (CDD)**
  - Key System Attribute requires the ability to "repel" personnel within a specified range from the vehicle

- **2010: ARDEC initiates S&T effort for SS-ADT Skid Plate**
  - Demonstrate "repel" capability @ GCV range requirement

SS-ADT Background

Background: SS-ADT will temporarily incapacitate personnel targets with reversible effects, without collateral damage, without adverse environmental impacts and minimal risk of injury. Alternate Active Denial Technologies have been built/investigated using tube based systems (Gyrotron) requiring a dedicated vehicle. Solid State offers size, weight and start-up time reductions as an adjunct system. A TRL 4 prototype was demonstrated in FY10. In FY11, a TRL6 prototype Skid Plate demonstrator was designed integrating different technologies to mature components in terms of weight, input and output power, effective range, beam formation, characterization, control, operational environment and thermal management. JNLWP and RDECOM ARDEC are collaborating to build the Skid Plate pedestal demonstrator by 4QFY13 to meet Ground Combat Vehicle (GCV) non lethal effects threshold of repelling a dismounted human in the open within a specified range from the vehicle.

Why Solid State?

Solid State is optimal (vs. gyrotron) for Army applications with respect to Size, Weight and Power

- "Instant" transition from off to standby mode (e.g. Gyrotrons require up to 16 hours for magnet cool down)
- Scalability – Modular "Building Block" solid state mmW RF Power Source can be built to meet range requirement.

mmW RF Power Source
100 Watt Module

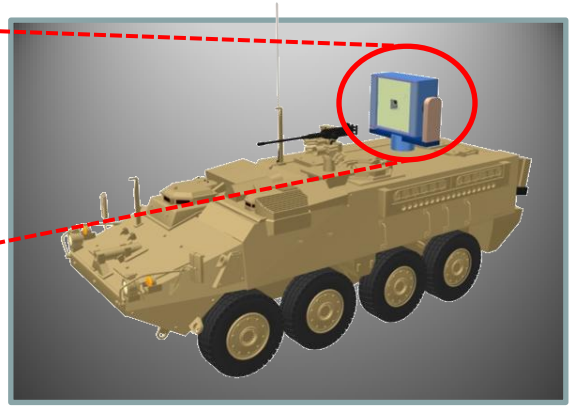
- Electronic focusing and Beam Steering
- Simultaneous multiple target engagement
- Offset/Eliminate Fresnel Max safety issue
- "Moore's Law" development potential

ARDEC SS-ADT Program Priorities

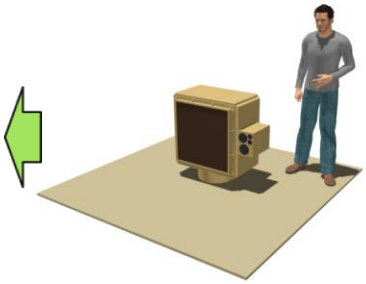
- **Demonstrate SS-ADT can achieve "repel" effect at GCV threshold range**
  - Self contained SS-ADT Skid Plate system being built to demonstrate capability @ range
- **Understand weaponization issues of SS-ADT (GaN Chip) technology**
  - 400 watt Tripod System built to understand weaponization issues
  - CRADA with BAE to investigate vehicle integration issues
- **Continue and support investments to reduce Size Weight Power and Cost**
  - JNLWD GaN Chip Efficiency Improvement
  - MANTECH effort to reduce cost of GaN Chip and Module Mfg costs
- **Resolve outstanding Hazardous Elctro-magnetic Radiation to Ordnance (HERO) issues**
  - Affects all future ADS systems with respect to fielding
- **Investigate technology Spin-offs for Counter-IED application**
  - JIEDDO Forecheck program initiated for PBIED detection

Solid State Active Denial Technology (SS-ADT) Development

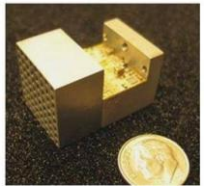
ADS-2: Advanced Concept Technology Demonstrator



Conceptual adjunct implementation



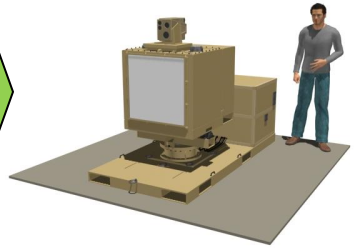
FY17 SS-ADT “Skid Plate” Tactical Concept



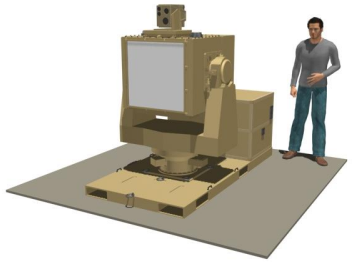
Solid State Sub Module

100 Watt “Building Block” Array Module

TRL 4 “Tripod” Demonstrator



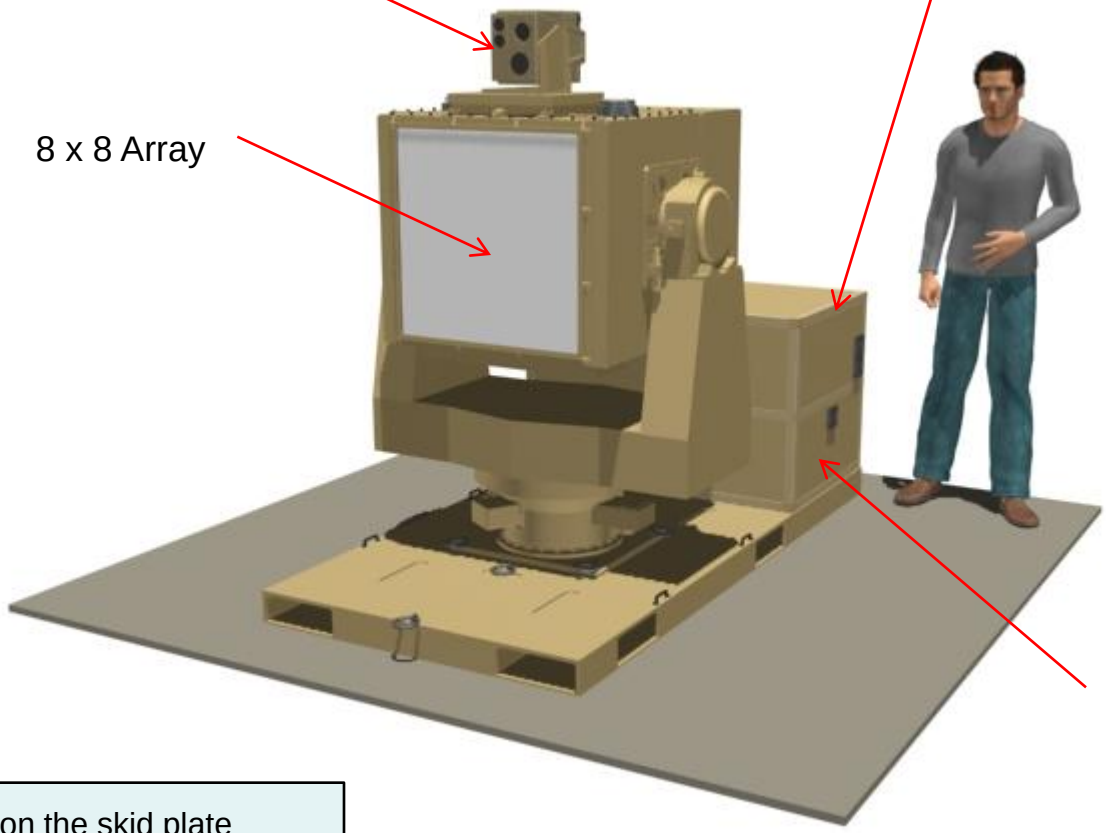
4QFY13 TRL6 SS-ADT “Skid Plate” Pedestal Demonstrator



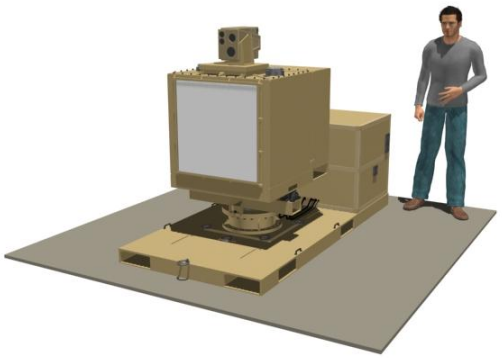
2QFY16 TRL7 SS-ADT “Skid Plate” Gimbaled Demonstrator

Solid State offers a single Non-Lethal approach to meet GCV CDD

SS-ADT Skid Plate Concepts



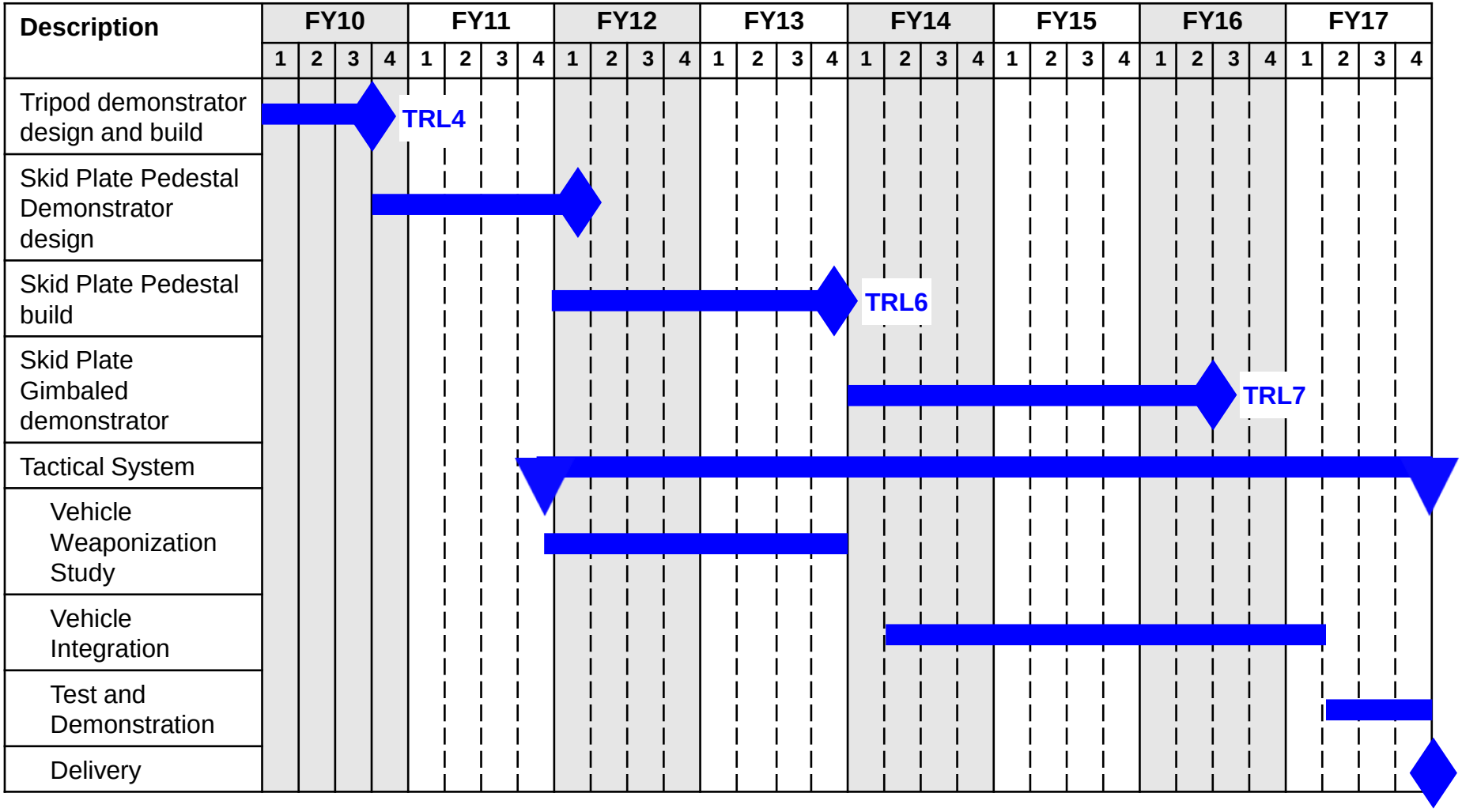
TRL7 Gimbaled System



TRL6 Pedestal system

Cabling on the skid plate connecting various “boxes” not shown. No Cables extend up to the Elevation Payload

SS-ADT Schedule



Summary

The Solid State Active Denial Technology Demonstrator Program

- Addresses Army applications / requirements
- Focused on SWAP-C reduction
- Planned demonstration of SS-ADT technology
- Leverages other ongoing investment and initiatives

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