Army Projectile Development Program
Reducing Parasitic Mass Ratio

C-Shaped Armature With Integral Bore Rider - SMJ2 100 ms
SLEKE Mid-driven Long Rod Aluminum Armature/Sabot
FTP Design - Aluminum Armature Composite Sabot

Muzzle X-Ray
Tareget Chamber X-Ray
In-Flight Video
Target Penetration 18" RHA

C-Shaped Armature with Base Pused Rodman Core
Rectangular launch package with mid drive high/LD tungsten rod and 55% payload fraction.
- Multi-shot (3 salvos of 5 rounds) 185 kg 1.0 km/s
- Highest payload fraction for a high LD tungsten long rod ILP ever tested at 55% at the time
- Accuracy testing at ARI, proved design and showed no accuracy barriers for EM guns.

Long Rod Penetrators with Mid-Drive Spearating Sabots
Army Pulsed Power Development Program
Improving Energy Density

- Power supply for 15 shot, 30 mm railgun system
- 40 MJ, 2 GW, Rotating Armature Self-Excited, Air-Core Compulsator
- Self-excited, solid-state switching
- Flexible, high current kickless cable and connector
- Complete mobile system
- Multi-shot (3 salvos of 5 rounds) .185 kg, 1.9 km/s
- Demonstrated controlled self-excitation, discharge and barrel energy recovery

- 25 MJ, 4 GW Multi-Phase Pulsed alternator
- Multi Phase, Rotating Field Machine, Self Excited
- All-composite structure
- 1.2 MA multiphase power converter
- Demonstrated feasibility of rotating field, multi-phase compulsator
- Highest power-density rotating machine for EM Gun applications at the time
- Produced and benchmarked very-high-accuracy flexible EML performance prediction code

- 9 MJ, 6MW
- Demonstrated composite rotor, air-core compulsator approach
- First use of passive muzzle switch to suppress muzzle signature
- Validated self-excited, air-core compulsator performance codes
- Multi-shot of 32 gm projectiles at 2 km/s, 10 Hz, 3 rounds
- 1st self-excited CPA
- 1st air-core CPA
- Record hybrid ceramic bearing speeds in generator

Electric Gun Program (2000-2010) - US Army
- Manufactured and tested high-speed composite growth-matching arbor
- Developed Integrated and automated composite structure
- Measurement of rotor winding in appropriate-scale and speed test and development of empirical loss and heating model at low pressure
- Development of method to accurately predict dynamic losses in field coil during all phases of operation
- Development of flexible system model to study synchronization issues

Patented Active Compulsator, 1980
- US4200831 A
- Program funded by DoE – LLL (1977-1981)
- Power Supply for Laser flashlamps

- 40 MJ, 1 GW Iron-Core Compulsator
- Rapid-fire operation at 3600 rounds per min.
- Demonstrated railgun barrel magnetic energy recovery
- First pre-injector with hot-cath system
- Benchmarked several design & analysis codes
- First demonstration of C-shape armature
- 3 Railguns with High L:injector/autoloader
- Fully operational system with auxiliaries

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