



Human Electromuscular Incapacitation (HEMI)

Non-Lethal Weapons Research and Technology Development

Industry Day

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Wesley Burgei

Officer of Primary Responsibility, HEMI

<http://jnlwp.defense.gov>



Background

- Human Electromuscular Incapacitation (HEMI) is the general term used to describe the immobilizing effect that occurs from exposure to an electric stun device.
- Commercial off the shelf devices, such as the TASER® X26™, are widely used by law enforcement and military agencies.
- The JNLWD is focused on developing and demonstrating HEMI technology that increases the standoff range and duration of effect compared to existing technology while minimizing the risk of significant injury (RSI).





Technical Objectives

- Develop predictive scientific model that correlates device output parameters to the efficacy/effectiveness of the stimulus and risk of significant injury (RSI).
 - On/off duty cycling
 - Predict RSI as a function of stimulation duration
- Develop and demonstrate HEMI device prototypes to non-lethally engage:
 - Point targets with an effective standoff range of 2-100 meters
 - Multiple simultaneous target engagement



Relevant Work

- HEMI Bioeffects
 - Performers: The JNLWP HEMI Bioeffects work has been a collaborative effort with a number of Government laboratory and academic performers including:
 - Government:
 - Air Force Research Laboratory
 - Naval Medical Research Unit
 - Academia:
 - Pennsylvania State University, Applied Research Laboratory
 - University of Texas Health and Science Center
 - Texas A&M University
 - Johns Hopkins University, Applied Physics Laboratory
 - University of Chicago
 - Focus: Characterize safety; correlate device parameters to effectiveness and risk of significant injury.



Relevant Work

Sample of HEMI Bioeffects work funded by the JNLWP:

- “Electromuscular Incapacitation Results From Stimulation of Spinal Reflexes” Despa et al. *Bioelectromagnetics* **30**:411-421 (2009)
- “Dosimetry considerations for electrical stun devices” Reilly et al. *Physics in Medicine and Biology*, **54**: 1319–1335 (2009)
- “Acute effects of an alternative electronic-control-device waveform in swine” Jauchem et al. *Forensic Science, Medicine, and Pathology* **5**: 2-10 (2009)
- “Human Electromuscular Incapacitation Devices Characterization: A Comparative Study on Stress and the Physiological Effects on Swine” Werner et al. *Journal of Strength and Conditioning Research* **26(3)**: 804–810 (2012)



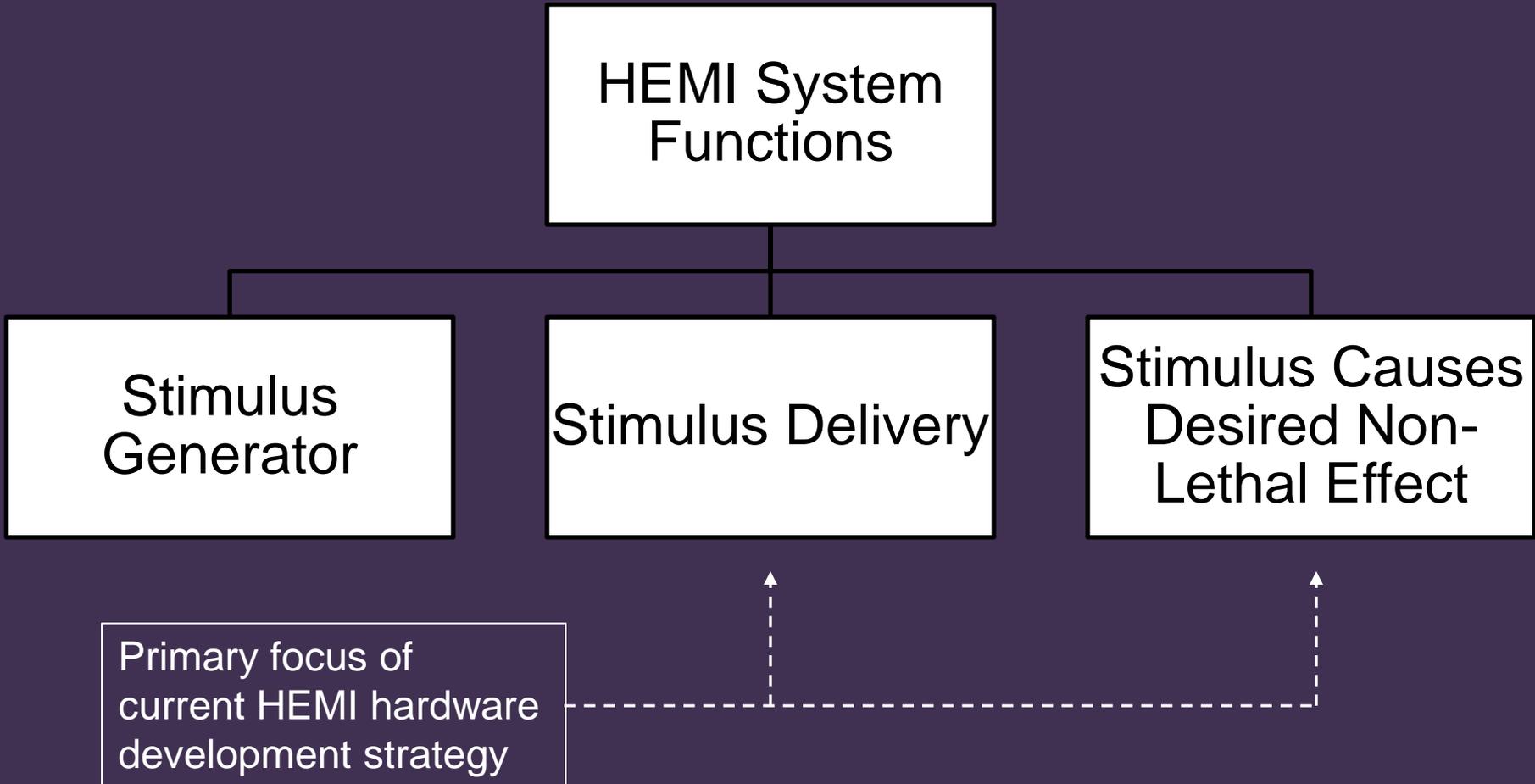
Relevant Work

- 40mm HEMI Projectile
 - TASER International
 - Contract No.: M67854-08-C-7029
 - Focus:
 - Package a HEMI circuit into a 40mm projectile form factor compatible with existing military 40mm launchers (e.g. M203, M320, and M32).
 - 10-50m standoff range; 30-60 second duration of stimulation.



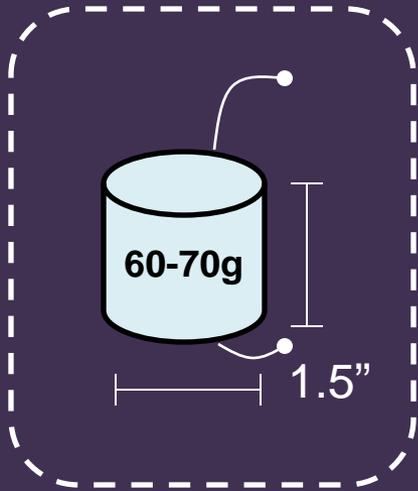


Research & Development Tasks





Research & Development Tasks



Base Stimulation Circuit
Payload

Packaged into a variety of delivery platforms including:

- Projectiles compatible with existing launchers
- Novel projectiles (e.g. airburst)
- New launching systems (e.g. variable velocity)
- Unmanned vehicles

To achieve various performance goals

- Reduced blunt impact RSI
- Extended range
- Multiple simultaneous target engagement
- Improved probability of hit and target attachment



Research & Development Tasks

General types of tasks required for HEMI Research and development:

- Prototype development, testing, and demonstration of longer range HEMI projectile/device/launcher
- Bioeffects research to include animal and human subject research
- Modeling and simulation of HEMI bioeffects
- Systems engineering and technology integration



Capabilities

General capabilities and expertise that may be required to execute planned R&D HEMI tasks:

- Engineers/Scientists with expertise in high voltage electronics, ballistics, mechanics, materials and systems engineering
- Facilities and equipment to build and test prototype systems
- Biomedical researchers with expertise with bioelectricity and other fields relevant HEMI bioeffects research
- Accredited institutional controls for bioeffects research:
 - Institutional Review Board (IRB)
 - Institutional Animal Care and Use Committee (IACUC)
- Computational scientists and engineers to build computer based models and run simulations



Questions?

Please submit questions by 29 June 2012:

wesley.burgei@usmc.mil

and

alicia.owsiak@usmc.mil