



Nanosecond Electrical Pulses

(nsEP)

Fact Sheet

(in development)



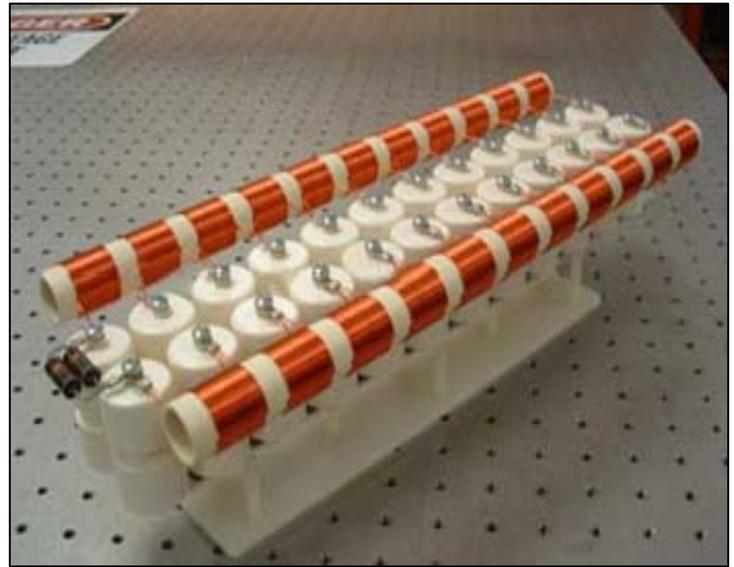
Non-lethal weapons provide warfighters with escalation-of-force options that minimize casualties and collateral damage.

What Is It?

Sponsored by the Joint Non-Lethal Weapons Program, the nanosecond electrical pulse (nsEP) project is a research effort to examine whether stimulation with ultra-short nanosecond electrical pulses can cause safe, controlled, temporary and reversible incapacitation of individuals. This counter-personnel capability will give warfighters a non-lethal option to deter, suppress or even temporarily disable suspicious individuals. It will provide an escalation-of-force option to minimize casualties and collateral damage across the range of military operations.

Nanosecond electrical pulses generate extremely high peak powers but for only very short durations—tiny fractions of a second. Yet these durations are long enough to create reversible incapacitation effects in biological tissue. Also, nsEPs use very low average power. This is important because it means they could potentially be incorporated into small hand-held weapons.

A single-shot, prolonged incapacitation from nanosecond pulses has the potential to support a medium-range, wireless electro-muscular incapacitation capability. A small, lightweight, pulse-creating device could then provide prolonged incapacitation with only a single discharge of the weapon. The project's ultimate goal is to provide reliable and repeatable nanosecond or short-pulse electrical waveform characteristics that produce long-duration incapacitating effects with minimal risk of injury. Researchers are gathering safety and risk assessment data to enable the development of a low-power, compact, wireless nsEP human electro-muscular incapacitation (HEMI) munition.



Nanosecond Pulse Generator:
Experiments use multiple capacitors to generate nanosecond electrical pulses.
Official Department of Defense Image

How Does It Work?

Electro-muscular incapacitation works by overpowering the normal electrical signals within a subject's nervous system and temporarily preventing voluntary movement. Initial studies of nanosecond electrical pulses indicate that they not only can affect the nervous system in this manner, but may also be able to provide longer-duration temporary incapacitation than the electrical waveforms in currently available HEMI devices. A prolonged incapacitation may provide an opportunity to use less energy to achieve the same effects, resulting in a smaller, lighter and safer non-lethal weapon and providing an important counter-personnel capability to U.S. operating forces.

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Human Effects Testing

Nanosecond electrical pulses use relatively high voltages but deposit a very small amount of energy per pulse. Bio-effects, human effects and effectiveness testing will determine the optimal pulse intensity to produce reversible effects but maintain non-lethal counter-personnel effectiveness.

The project plans to continue conducting experiments to study nsEP short- and long-term bio-effects; assess the effects of longer-duration and repetitive pulses, as well as pulses of different intensities; and develop nsEP generators and pulse delivery systems.

System Evolution

Nanosecond electrical pulses are still in the very early research stages. As this technology matures, developers will work to integrate it into existing HEMI devices and developmental long-range HEMI devices. Possible counter-personnel configurations include 12-gauge shotgun rounds and 40mm rounds, as well as pre-emplaced or hand-held devices.

Organizations Involved

The following organizations have participated and plan to continue developmental and logistical support of the nsEP program:

- Department of Defense
 - Joint Non-Lethal Weapons Program
 - U.S. Marine Corps
- Department of Justice

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