

A Study for Innovative Sources of High Power Microwaves for NLW

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Abstract

Studies have been carried out, under CEPA16-17 Project, for two types of HPM pulsed sources: a single shot one to be placed inside a 127mm Naval Gun full calibre projectile, and based Magnetic Flux Compressor Generator; and a direct energy weapon System, based as far as possible on high efficiency solid state equipments. For both an output frequency of 10÷17 GHz is required to kill the electronics of the target, with level of power depending on distance.

For a naval gun projectile, the expected distance from the target is lower than 100m at Pulsed Power Emission; the required power level is about 300 kW in microwaves and about 1 MW in pulsed electrical power, required to last for at least 100 ns. Compact single shot energy sources are based on Multistage Magneto Flux Compression Generators (MFCGs). They use an exploding wire switch to drive HPM radiator which can drive a HPM radiators like a Vircator or a Klystron., or a UWB antenna.

For a platform-based direct energy weapon, supposed to kill the electronics of the target at distance of 5000 m, the Microwave power level should achieve 300 MW, for less than 100ns. Electrical power figures depends on emitting antenna efficiency but certainly exceed 1 GW. Electric power levels depend on impedance matching between the generator and the antenna as well . A repetitive electric source based on a multi-stage generator, with a repetition rate up to 10 Hz and able to drive either a Vircator or a Klystron has been studied. First stage is based on compact, medium frequency inverters fed in parallel by a DC 600V busbar., followed by step up MF transformers-rectifiers, connected in series at the output, to produce a continuous 40 kV dc source. For high voltage pulse generation, a number of possible solutions are considered: among them, compact Marx generator and modified Magneto Flux Compression Generators.