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2P34 - Feasibility Study of Guiding High Power Microwave with Laser Created Plasma Ring Channels or Photonic Crystals in Air

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High Power Microwave (HPM) is a proven effective mean to suppress electronic system or disable Unmanned Aerial Vehicle (UAV) because the power level can be as high as GW, however, due to basic limitation from antenna theory, the power per unit area quickly decline when the distance to target increases, therefore difficult to extend the effective range to more than a few km. Elaborately designed phased array can ameliorate this situation but comes with its own tradeoffs. Recently substantial progress has been made in High Energy Laser (HEL) such that 50-100 KW DC or pulsed lasers are possible, and it is also used in destroying UAV but with heating mechanism. It seems there is a possibility to combine these two directed energy technologies together to form a new weapon. A ring plasma channel with different reflective index can be formed in air with DC or pulsed HEL, and the HPM can be confined inside the plasma channel to travel to a greater distance without as high attenuation as in open air. Also possible is several plasma photonic-crystal structures can be formed by HEL to trap the HPM inside such structures to transfer the HPM to a longer distance. Each approach comes with its own tradeoffs in total energy efficiency and performance. This HEL outside, HPM inside directed energy weapon can have both the heating mechanism of the HEL and the breakdown mechanism of HPM and maybe described as "Photon Torpedo". Simulations are used to estimate the field confinement effect of such Photon Torpedo.

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