Monocycle Optical Power for Propulsion

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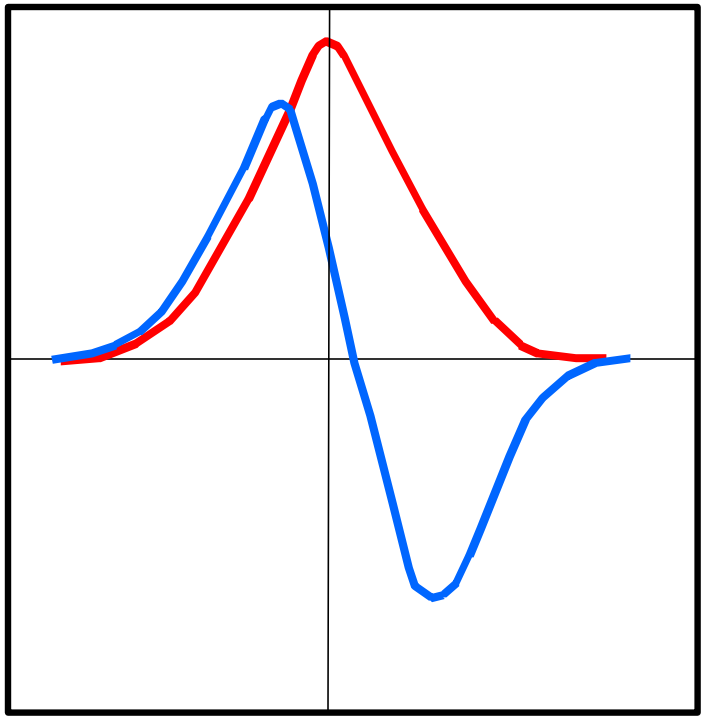
- **Optical power can be delivered in space as ultrashort optical pulses.**
- **Ultrashort pulse technology is within a factor of 2 of producing monocycle pulses.**
- **Interaction of monocycle optical pulses with charged particles when the pulses are locally converted to unipolar (half cycle) pulses appears to offer adjustable high specific impulse at high efficiency.**
- **Useful power levels and beamed ultrashort optical pulses appear eventually accessible via direct conversion from sunlight and deliverable as off-board power.**
- **Propagation distances, average power and adjustable low to high specific impulse relevant to the near-Earth HEDS missions appear accessible within time frames of practical interest.**

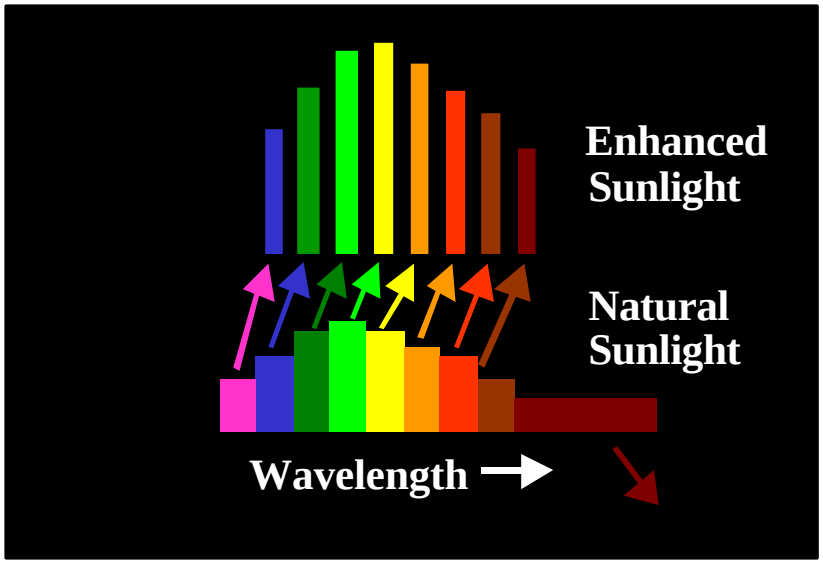
Transformation of mono-cycle to half-cycle pulses



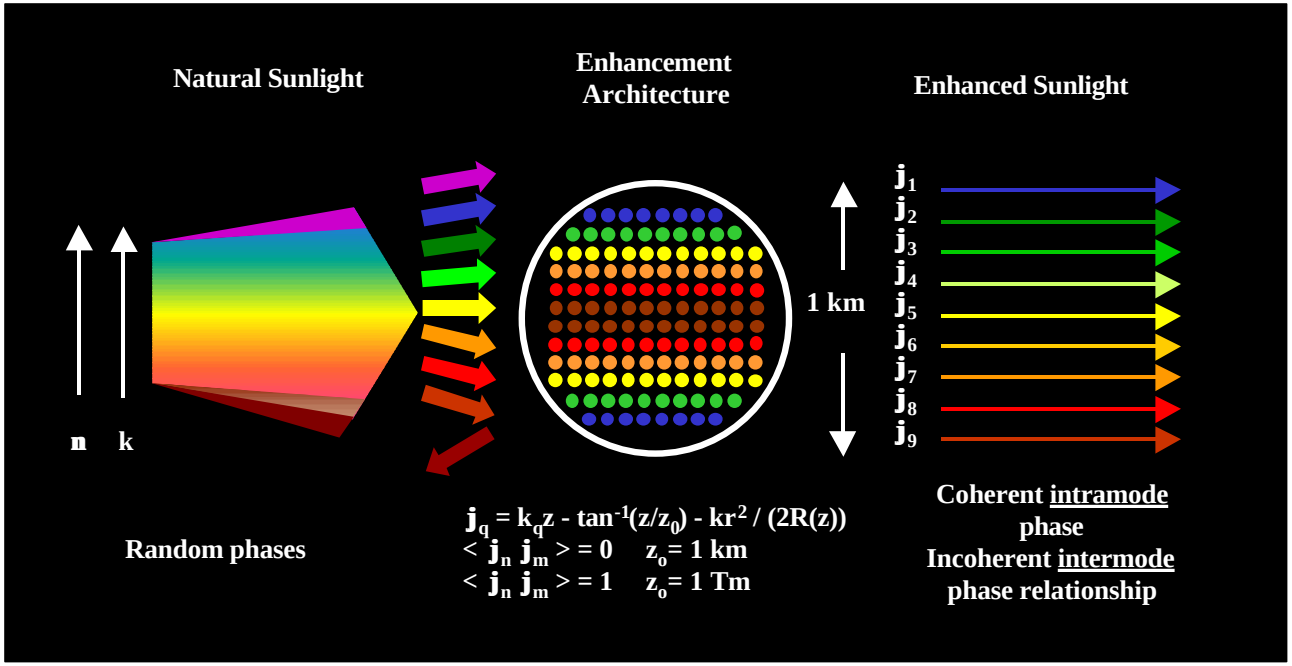
•**“Based on time-space reciprocity, the pulse transformation that is due to diffraction can be reversed, e.g., by reflection of a pulse from a spherical concave mirror”. A. Kaplan, JOSA B 15 951-956 (1998).**

•**Unipolar solitons from Maxwell-Bloch equations, R.K. Bullough and F. Ahmad, Phys. Rev. Lett. 27, 330 (1971).**

Light having the spectral bandwidth and coherence needed to produce monocycle pulses appears derivable from sunlight.



The technology needed for useful propulsion is using monocycle pulses is formidable, but not forbidden.



Current calculational papers are addressing the properties of single cycle optical pulses. See, e.g., Kurt Oughstun and Hong Xiao, Optics Express 8, 475-491 (2001).

The principal point is that intense unipolar optical pulses appear to be accessible in the foreseeable future. These could have significant impact on propulsion for space applications.

This technology is a natural derivative of space solar power efforts and could provide a means of direct conversion of space solar power to high specific impulse thrust.