4th Wernher von Braun Memorial Symposium
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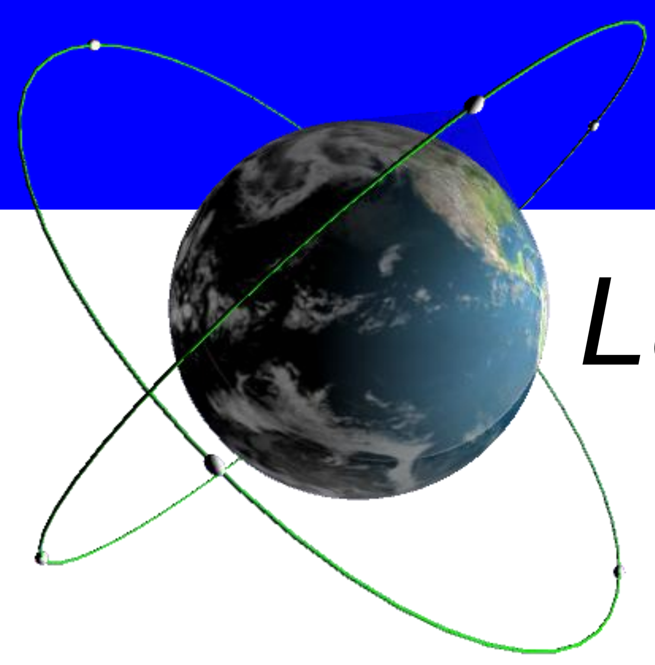
American Astronautical Society

Energy Infrastructure Arrangement for Near Earth Space



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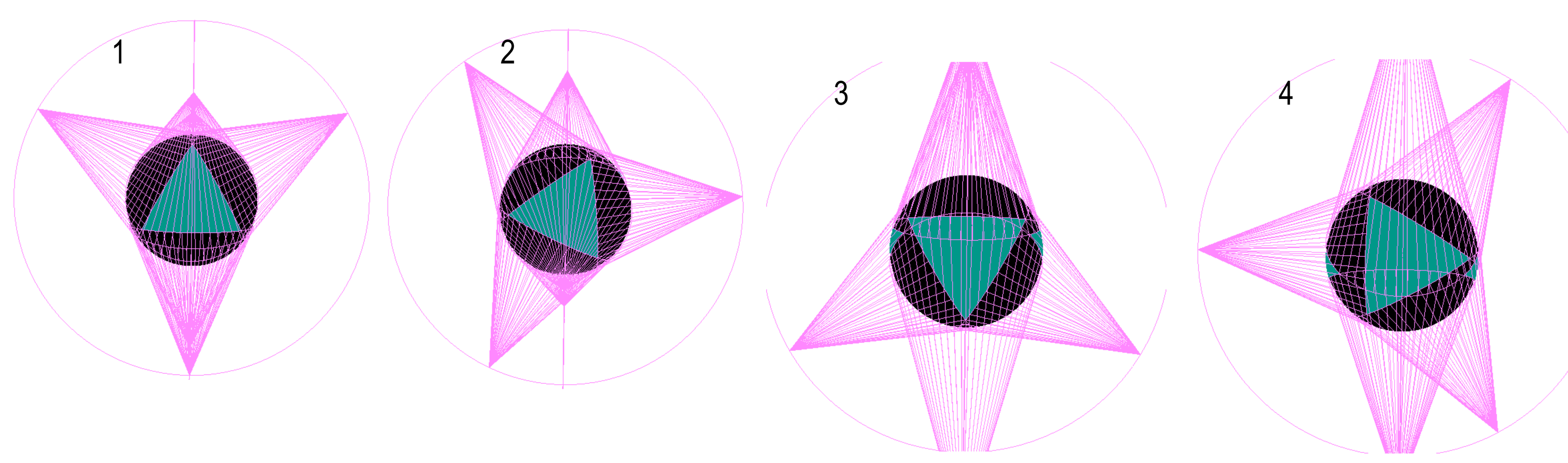
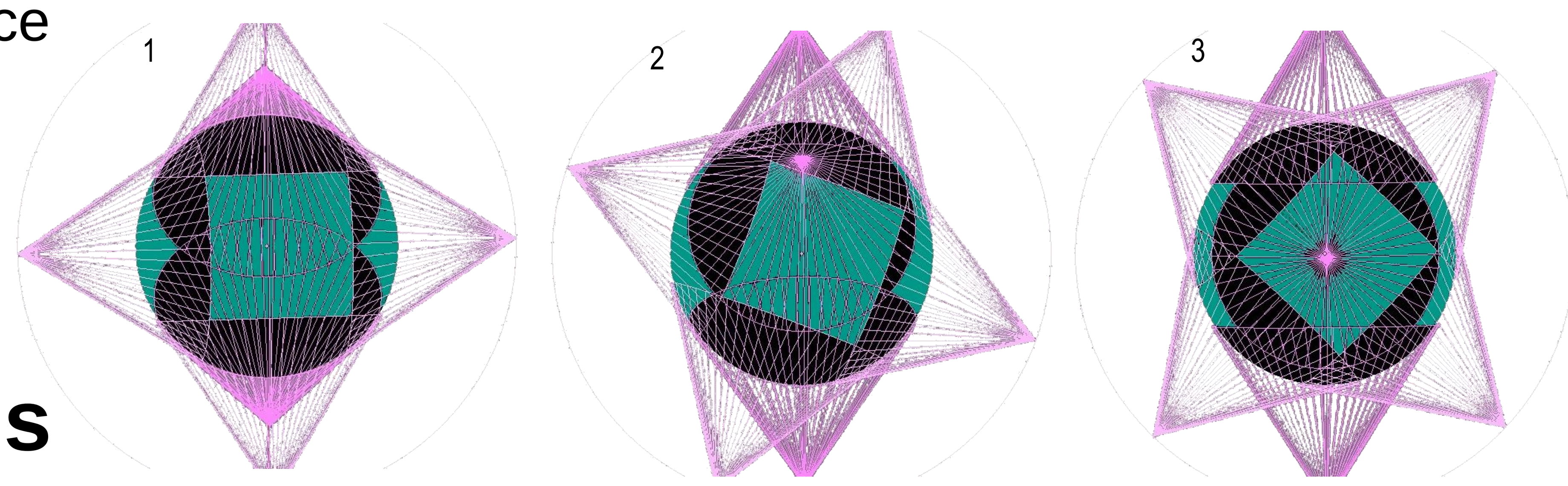
Overview

A design concept of an energy infrastructure for near Earth space based on coherent light is described. The approach is based on small numbers of spacecraft orbiting in highly specific configurations that are always in position to receive energy from our Sun and to deliver energy anywhere and anytime as a system in near Earth space. These configurations also offer the maximum possible performance and minimum cost of key elements, such as the optical systems and number of spacecraft. Methods for ensuring safe transmission of laser energy have been researched, simulated and analyzed at University of Alabama in Huntsville.

Explanation

An energy sharing system is crucial to insuring overall safety, expandability and reliability of space travel. Optical energy availability is advantages to most craft in space and is applicable in a wide range of space tasks. Pulsed lasers give an specific kind of energy that can be used for many purposes. Creating ablation on the surface of an object in space in order to move it is a task lowest order Gaussian mode pulsed lasers can achieve. A system for optical energy sharing will provide the option of assistance to many spacecraft near earth.

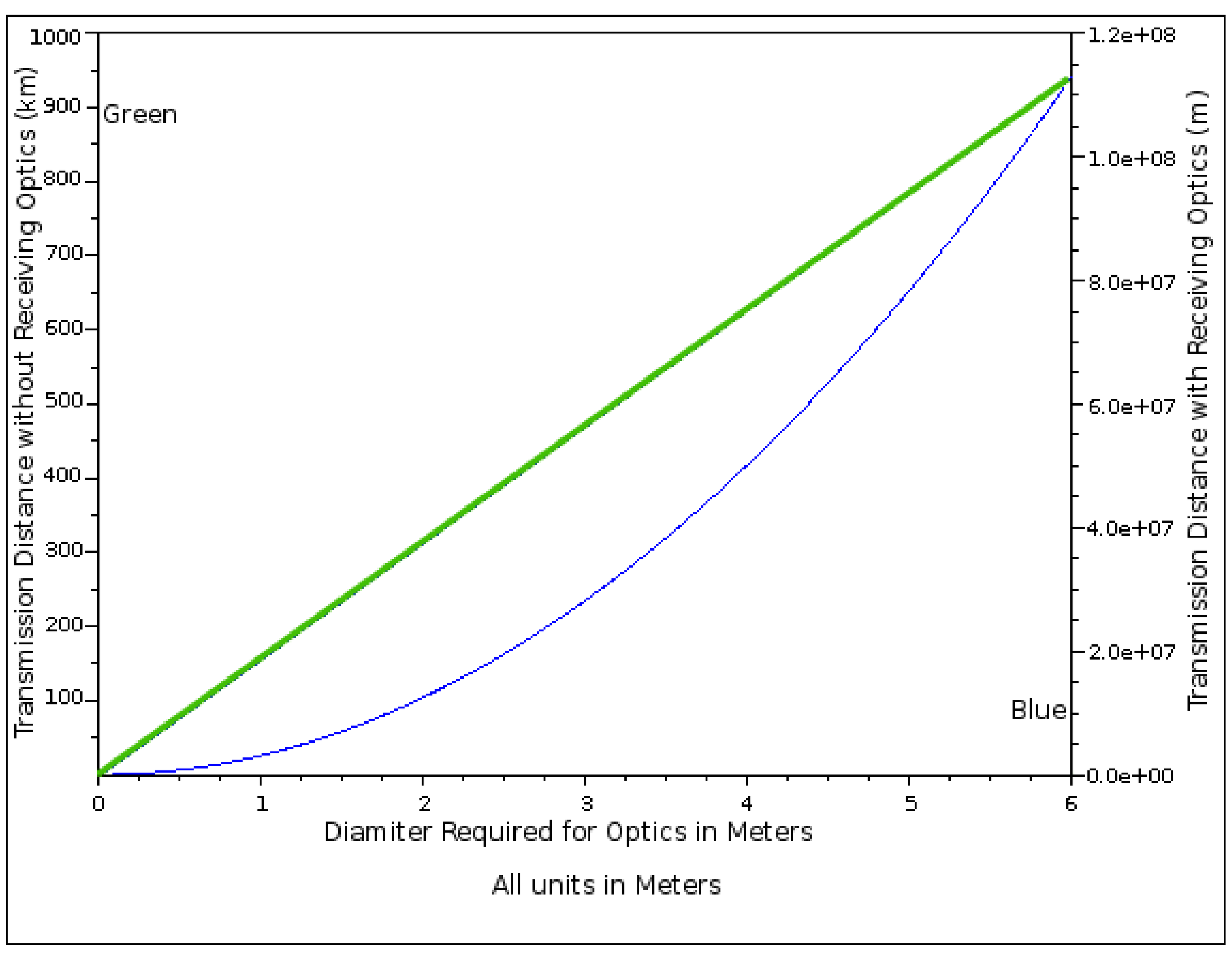


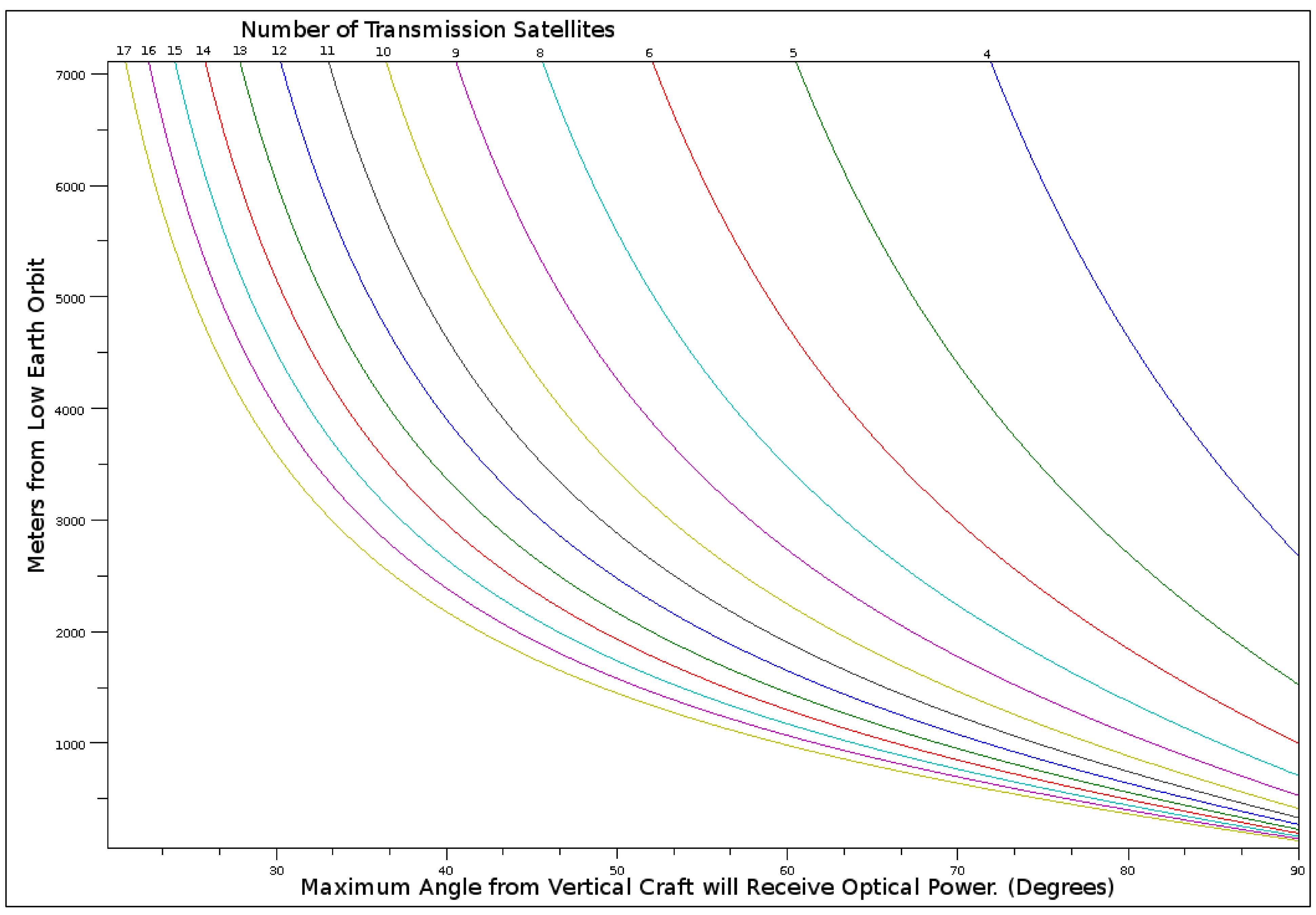


$$R_o \geq \frac{R_p \cdot \sqrt{2}}{\cos\left(\frac{\pi}{N}\right)}$$

Key Findings

Our method results in a simple equation that is also intuitively derivable from the equation provided in an article by Dr. Fork in the Proceedings of IEEE March 2011. R_o represents the radius of orbit, R_p the radius of the planet and N the number of satellites per orbital plane. Orbital methods with more than six satellites have been computationally simulated to find even better configurations with a smaller radius of orbit.





Impact

The planned placement of such an energy structure in space would encourage development of more efficient propulsion methods and strategies for planetary defense. Mr. Grant Bergstue's poster titled "Beamed Energy for Ablative Propulsion in Near Earth Space" demonstrates possible methods for space propulsion using laser power.

Acknowledgements

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