

Re: Solar powered lasers in space

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On 14 Sep, 02:44, Alan Anderson <arand...@xxxxxxxxxxxxxxxx> wrote:

These systems are easily adapted to controlling beams from space and having the beams avoid unwanted targets while at the same time illuminating desirable targets.

From LEO, the time delay is significant.

How high are the space-based beam emitters? Let's call it 300 km, so the round-trip light travel time is a nice round 2 milliseconds. How fast would you need to move your hand through the beam in order to outpace its ability to avoid illuminating your thumb? Let's call the width of your thumb a nice round 2 centimeters.

Two centimeters in two milliseconds. That's a nice round ten meters per second. And it's an easily achievable speed. Wave your hand quickly through the beam and the system won't be able to avoid your thumb. A bird flying into the beam at a sedate ten miles per hour would have the leading half inch of its head and wings exposed to the full strength of the beam. A small aircraft flying at 200 knots would travel more than 20 cm in the time it takes for the active holographic technique to respond.

And that's the last I'm going to say about it.

40% seems a very high efficiency for a laser, but even if this figure is accepted there is one overriding problem. At noon in a desert you have about 1kw/m² coming in through solar power anyway. The obvious question to me is why not have solar power in the desert and be done with it. Lets generate power and split water into hydrogen and oxygen in the desert using the energy that comes from the Sun anyway. Why have a space laser as an intermediate stage?

Is it to get power 24/7? Well you have to be above LEO to effectively extend the desert day.

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The usual version of a space energy system is a microwave system. This has the advantage that it could be beamed fairly close (close enough for high voltage transmission lines to be practical) to where it is consumed. Would be at MEO and operating 24/7. Phased arrays would ensure the correct location and the correct amount at each location.

There again the system would have to be economical with regard to alternative concepts. My pet concept is in fact a biological system for generating hydrogen.

In fact the niche a laser system would occupy is in fact that of providing intense energy for space launches and possibly for other types of transportation.

Let us think for a moment about optical systems, phase arrays etc. Some time ago I contributed to a thread on a space telescope

http://groups.google.co.uk/group/sci.space.policy/browse_frm/thread/89ccc3292c970893/5068e6a9a0d213b3?lnk=st&

and came to the conclusion that in space diffraction limited optics could be made extremely large. Suppose our laser system (it is important to have a system not just a single laser) is 1km across, we wish to focus on an area 1.22m in diameter, we are 10,000km away, and our wavelength is 1 micron. How large? $1.22 \lambda/d = 1,000,000$ and we are 10^7 m away. We need a mirror approx 10m across. 100m would be quite easy to build.

The talk in another posting was about velocities and reaction times. In fact the criteria is unanticipated acceleration. The velocity can be anticipated. Lasers are capable of giving hundreds of MW/m² if focussed. That is their forte. Not in power generation systems.

Lasers could help with deep space probes and also with supersonic and hypersonic aviation. I understand that NASA has in fact performed tests using a ground based system.

<http://members.fcac.org/~sol/station/planetar.htm>

http://www.esa.int/SPECIALS/GSP/SEM2YD6DIAE_2.html Powering spacecraft on surface of Mars. Even more useful in deep space.

<http://personal.ee.surrey.ac.uk/Personal/L.Wood/DARPA-fractionated-spacecraft/darpa-fractionated-spacecraft-age> DARPA conference. Shows work is going on.

<http://www.spacedaily.com/news/laser-97b.html> This is quite an old reference

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– Ian Parker

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