

From: David Arnold <david-arnold2006@earthlink.net> **Date:** Monday, October 15, 2018 at 1:50 PM **To:** ErricosUmhc Pavlis <epavlis@umhc.edu> **Cc:** Mike Pearlman <mpearlman@cfa.harvard.edu> **Subject:** Re: Lunar Laser Ranging Intramural Proposal

Erricos,

The OSR coating would not be used on the cavity. The emissivity of the cavity needs to be low. Metals already have a low emissivity. The question is the surface treatment of the core to lower the core temperature.

OSR stands for Optical Solar Reflector. The principle is very simple. In metals the solar absorptivity is generally higher than the emissivity. This results in metals getting hot. Glasses such as quartz have a very low solar absorptivity and high emissivity. This makes them run cold. The OSR takes advantage of the reflectivity of the metal and the high emissivity of glass to create a surface that is very good at getting rid of solar heat. The solar radiation passes through the glass and is mostly reflected and partially absorbed by the metal. The solar radiation absorbed by the metal is conducted to the glass and radiated very efficiently by the glass.

The technique used on LAGEOS was sandblasting the surface of the aluminum to increase the emissivity. This also increases the solar absorptivity. Apparently, the emissivity is increased more than the absorptivity so that the aluminum runs cooler. The OSR coating would be much more effective.

The disadvantage of any coating is its stability in space. OSR is a well developed space technology. The question is the long term stability. Although satellites like LAGEOS and LARES will be around for a long time they will eventually become replaced by newer technology. Even if they do eventually degrade they might provide very high quality data for a considerable period of time. I would like to know more about the feasibility of using an OSR coating rather than some type of sandblasting or other surface treatment to lower the a/e of the core. Lowering the core temperature would make it possible to virtually eliminate thermal problems with the cube corners.

Best,

David Arnold

From: ErricosUmbe Pavlis <epavlis@umbc.edu> **Date:** Monday, October 15, 2018 at 1:19 PM **To:** David Arnold <david-arnold2006@earthlink.net> **Cc:** Mike Pearlman <mpearlman@cfa.harvard.edu> **Subject:** Re: Lunar Laser Ranging Intramural Proposal

Dave, I am not an expert on these topics, so this question might be dumb but I need to understand what is proposed: what is this “OSR”? When you propose using this on LARES-2, do you mean that we would have to cover the inside surface of the hole that receives the CCR with some glass material that will be reflective?

ecp

On Oct 15, 2018, at 1:01 PM, David Arnold <david-arnold2006@earthlink.net> wrote:

Hi Erricos,

I just got a very interesting email. I wonder if this second surface reflector technology could be used instead of sanding the surface to lower the temperature of the core on LARES-2. It makes a lot of sense. Apparently, this technique is space qualified. I am hesitant to contact anyone on the LARES-2 team since relations have been tense.

David Arnold