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OPTI 523
Requirements Review

Purpose

To create a 3D additive printer that utilizes solar radiation to construct objects. The system will utilize a Cassegrain telescope, along with fiber optics to deliver solar radiation to an area where it will be concentrated and used to sinter lunar regolith. By using this method, complex objects can be created using materials that are found on the lunar surface.

Requirements

Telescope requirements

- Telescope FOV: at least 32 arcminutes
- Primary Mirror Diameter: 2 meters
- Secondary Mirror Diameter: 0.5 meters
- Mirror Reflectance: Greater than 80% from 250nm to 1000nm
- Telescope F/#: 2
- Mirror Materials: Zerodur or ULE
- Primary Mirror Mount: Must be able to achieve 50 nm rms from surface irregularities, self-weight deflection and mound induced deflection for zenith to horizon pointing
- Mirror Mount and Secondary mirror support Material: Low CTE Graphite Epoxy
- Operational Position Stability: less than 1 arminute tip/tilt, and 50 µm decenter
- Angle of incidence at Fiber Optic interface: 14.5 degrees
- Beam Width at Fiber Optic interface: less than 350 µm

Focusing Lens Requirements

- Light transmission: from 250nm to 1000 nm
- Back focal distance: 20 cm
- Focal plane spot size: 50 µm

Operational Environment

- Temperature: -100C to 100C
- Gravity: 1/6 Earth gravity

Survival:

- Shock: 40G
- Temperature: -100C to 100C

Limitations

- Weight limitations: Less than 50 kg

Design Preferences

Schedule: Preliminary Design by 4/19, Final Design by 5/1
Cost: a lot

Report Expectation

It is expected that the system will be able to function with a final throughput of greater than 50%. This means that for a surface collecting area of 2.9 square meters, and an incident light power of 1.3 kW/m^2, the final energy concentrated on image place should be 1.9 kW.

Basic Design Concept

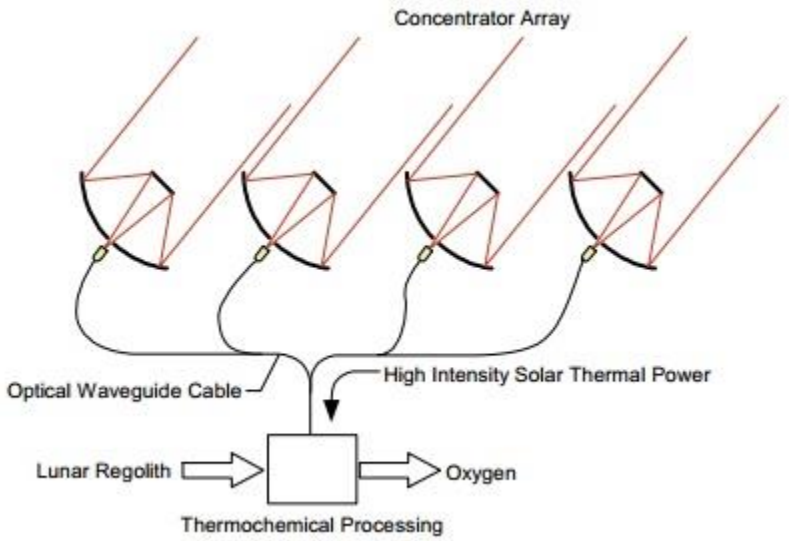

Figure 1: The design will only incorporate one solar concentrator

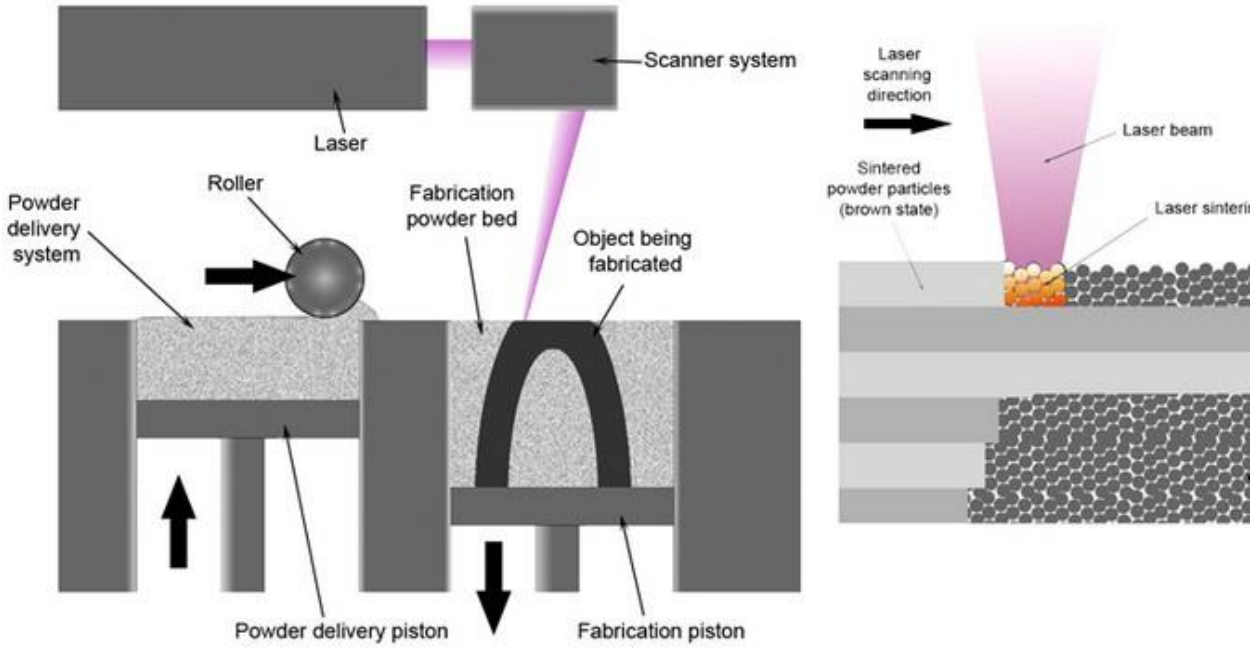

Figure 2: Additive 3D printing with laser sinter