



«MIP Engineering-III 2021»



Baltic state technical university «VOENMEH», named after
D.F. Ustinov



Laser Systems LLC

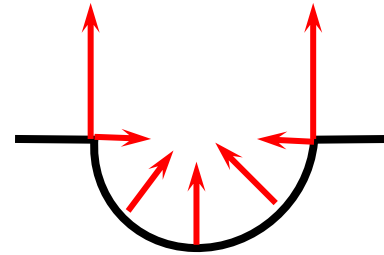
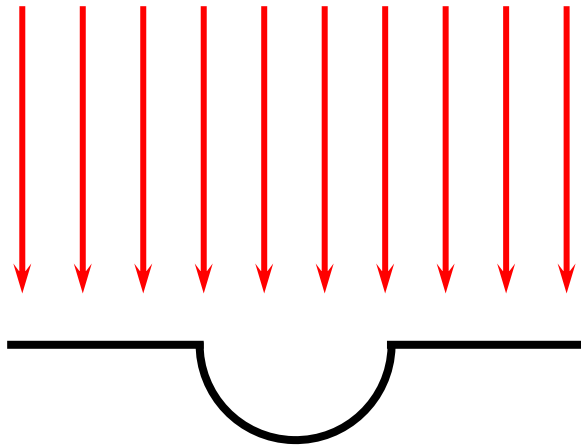
Holographic system for high-precision control in selective laser sintering systems

Authors:

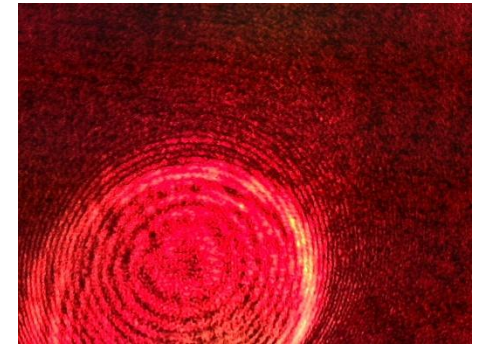
V V Sementin
E E Popov
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Krasnoyarsk 2021

Methods

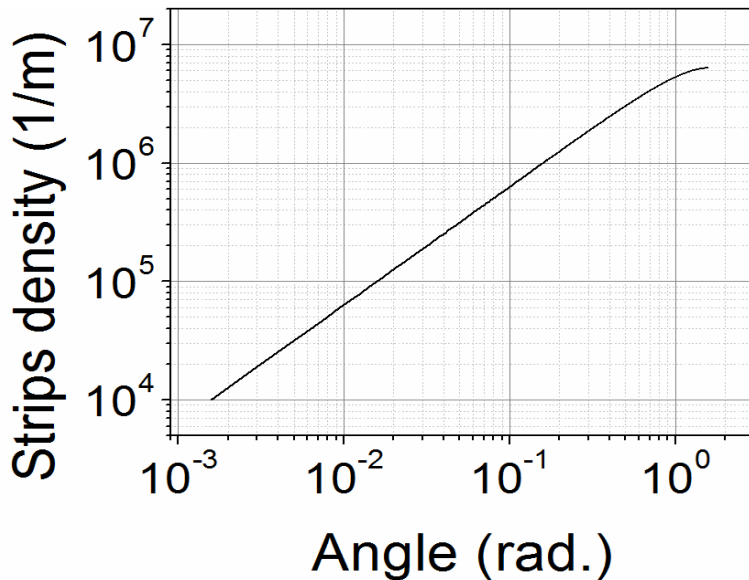


Increasing angle
 ↓
 Local increase in strips density



Increase in line density on a local spherical inhomogeneity

$$\zeta = \frac{2 \times \sin(\alpha)}{\lambda}$$



Altitude spatial resolution:

$$\Delta h = 0.036 \times R$$

Surface spatial resolution:

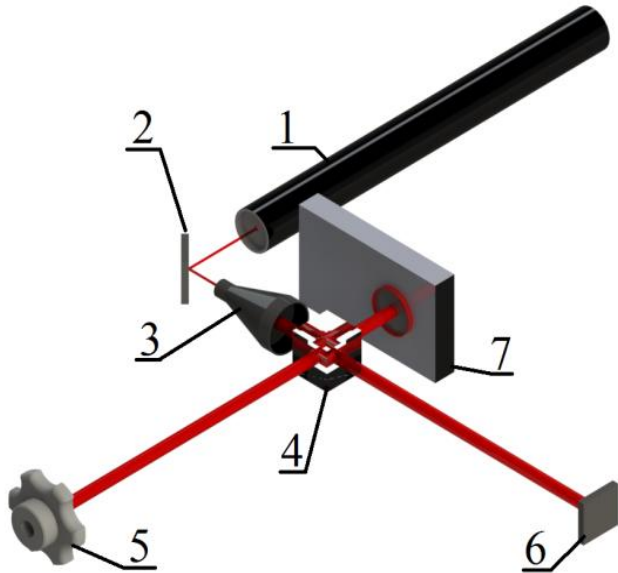
$$R = \frac{D}{S} \times \frac{1}{\zeta}$$

D – is diameter of illuminated area

S - size of image sensor smallest side



Experimental setup



Experimental setup:

1 – He:Ne laser;

2 – 45° mirror;

3 – beam expander;

4 – beam splitter ;

5 – object;

6 – mirror;

7 – CCD camera.

He:Ne laser:

- wavelength - 632.8 nm;
- laser power – 5 mW;
- beam diameter – 1.4 mm;
- spectral line width is less than 5 pm.

Image sensor:

- pixel size – 4.4 μm ;
- image sensor size – 1600×1200 pixels;
- the shortest exposure time – 5×10^{-5} s.



Results

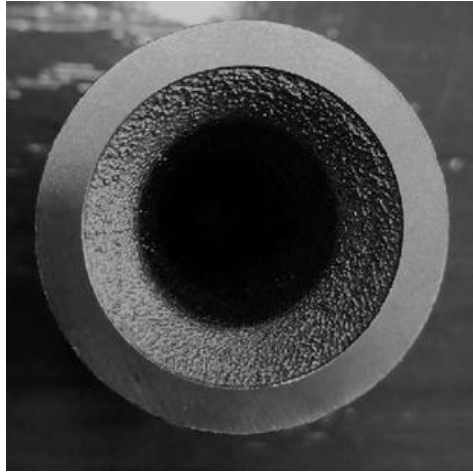


Photo of a part



Hologram of a part

Fraction size of the titanium powder - 50 μm

Characteristic size of An Inhomogeneity on a surface – 100 μm

Calculated surface spatial resolution (R) is 23 μm .

Calculated altitude spatial resolution (Δh) 1 μm .



Thank you for your attention!

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Krasnoyarsk 2021