High End Engineering Photonic Labs

Optical Space Surveillance Sensor

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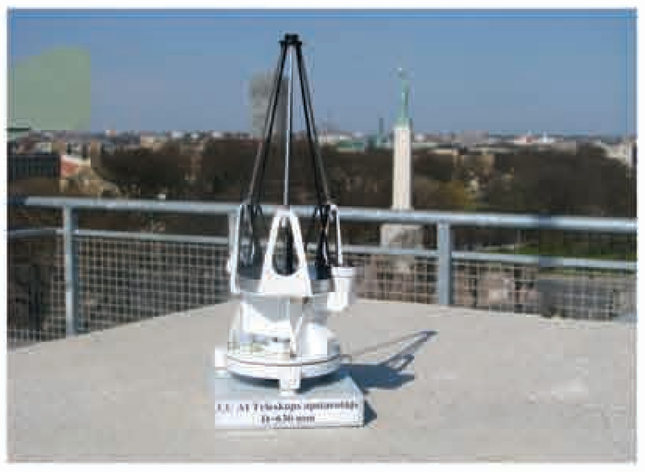
Objectives:

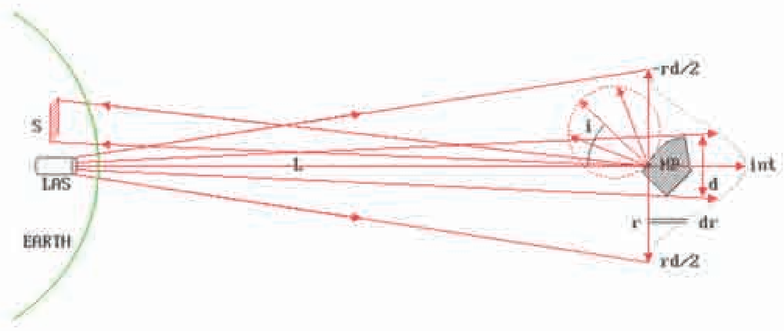
- **Objectives:**
  Detection and Tracking of objects in Earth-bound orbits (LEO,MEO, GEO, HEO).
- **Project objectives:**
  Detection and Tracking NEO (and small size debris) with high energy laser;
  Detection and Tracking the objects in Earth-bound orbits (LEO,MEO, GEO, HEO).

Main Features:

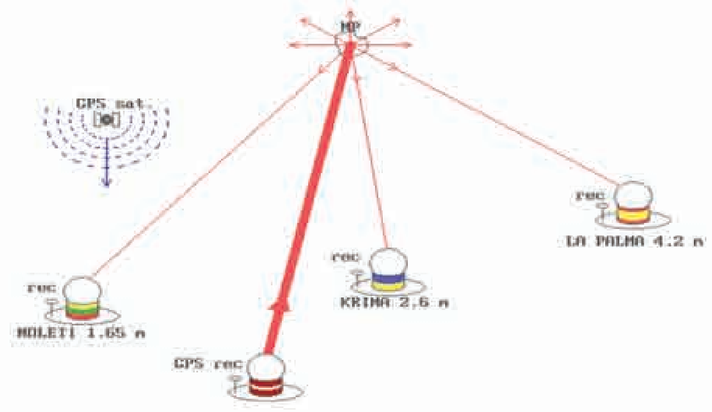
- **Optical Space Surveillance Sensor main features:**
  Design for different light sources: different lasers included high energy pulsed and white light source
  Parabolic main mirror 0.63 m
  Alt-azimutal mount
  Aiming and guiding accuracy: about 1 arcsec
  Output light beem colimation: about 2 arcsec

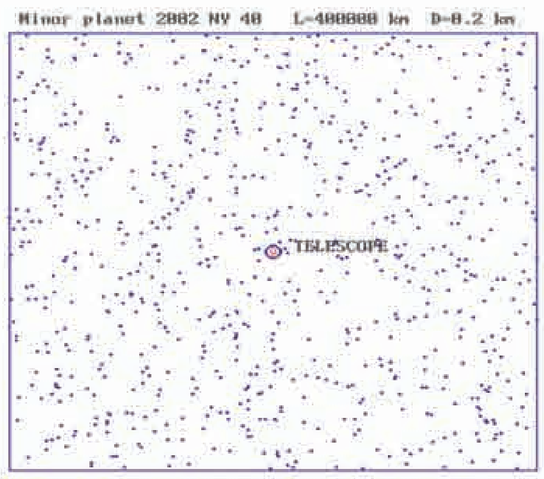


Schematics:

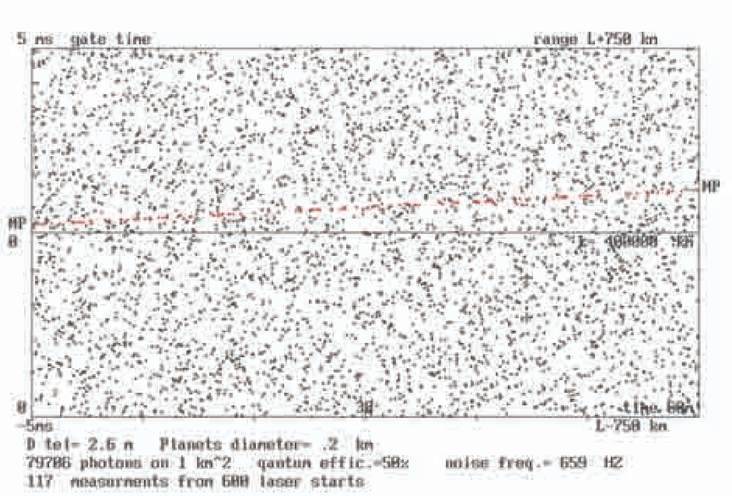


Measurments of minor planets with laser ranging device





photons 79786 on 1km^2, 11 laser shot, rec. photons 2 , telescope 2.6 m
Fig. 2. Photons rain on Earth surface



D tel= 2.6 m Planets diameter= .2 km
79786 photons on 1 km^2 qantum effic.=50% noise freq.= 659 HZ
117 measurments from 600 laser starts

Fig.3. Reflected laser pulses and noise from minor planet

Table 1.

laser energ.= 10 J
laser wavelength= .694 mkm
laser beam divergence= .5819907 " (2 r difr)
atmospher transmitance= .8
qantum effect.= 50 %
planets albedo= 10 % (black)

	minor planets diameter m				
	50	100	200	400	800
range km	reflected photons on 1 km^2				
50000	1.953181E+7	6.593346E+7	1.413264E+8	1.583583E+8	1.631335E+8
100000	1275306	4882952	1.648337E+7	3.53316E+7	3.958758E+7
200000	80580	318026	1228738	4128841	8832981
400000	5052	20147	79786	305184	1038218
800000	316	1263	5036	19926	76296
1600000	19	79	315	1259	4981

Reflected photons from minor planet

Application:

- Space objects position determination for Space Situational Awareness - SSA program and alike, for ex. space debris special small objects observations by laser ranging and high angular resolution video sensor;
- Free space optical (FSO) system for large range communications, for ex. space communications (earth - sattelite)
- Night-time atmospheric cartography with white light sorce for different flying instrumental platforms.

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