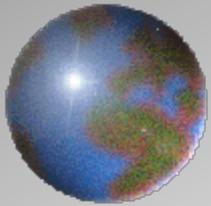




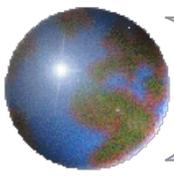
长春人造卫星观测站  
Changchun Observatory, NAOC, CAS



# *Progress of Changchun SLR*

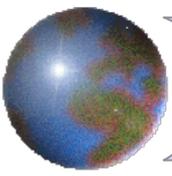
*You ZHAO, Cunbo FAN, Xinwei HAN, Gang ZHAO,  
Ziang ZHANG, Xue DONG*

*Changchun Observatory/NAOC, CAS, 130117, China*



# Abstract

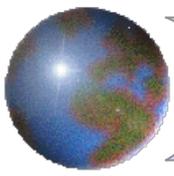
- The paper presents the summary and progress of Changchun SLR during the past years. It includes some special satellites observation, such as ETS-8, GIOVE-A, B, and Compass (Beidou) ; the laser time transfer and comparison experiment cooperated with shanghai observatory; aintenance and improvement of the system; the design and development of any frequency fire rate control system; the basic process and application of SLR data.



# Upgrading SLR—LTT, BD

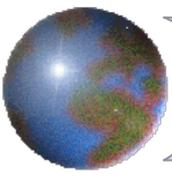
- **New laser: (a loan from NCRIEO)**
- **Active-active mode locked Nd:YAG laser**
- **100-150mJ in 532nm, 250ps, 20Hz**
- **New Coude mirrors**
- **210mm diameter transmitting telescope**
- **10 aresec laser beam divergency**
- **ET-A320 event timer**





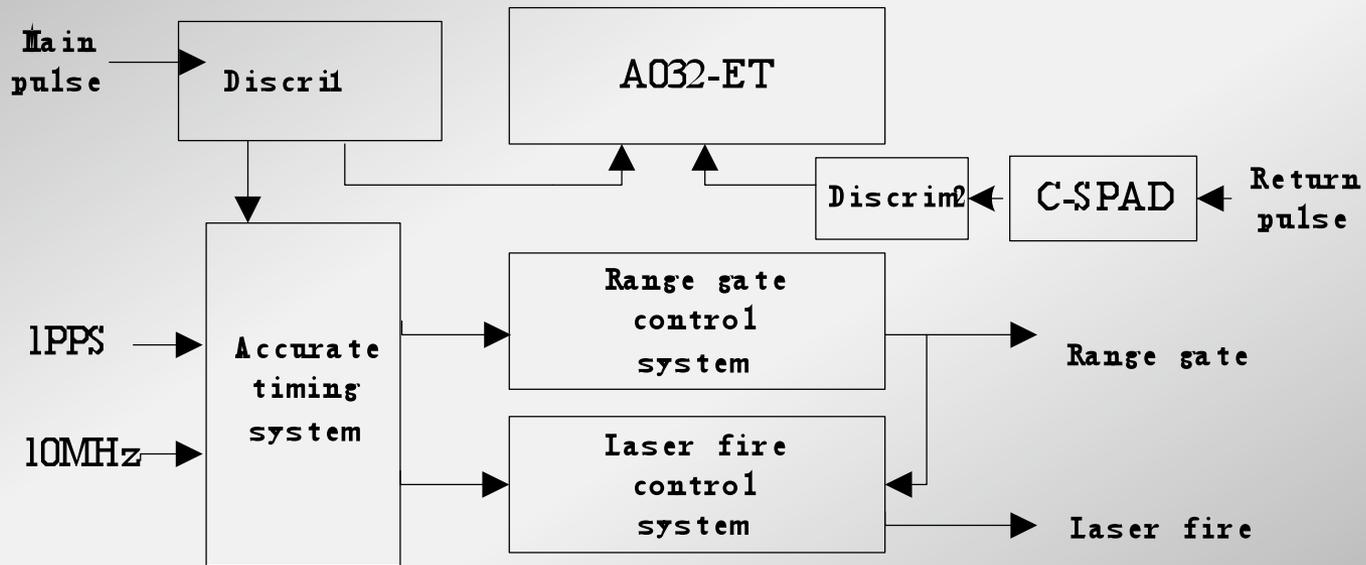
# Satellite Observation (2007-2008)

<b>Satellites</b>	<b>Pass</b>
BD-MEO	77
Giove-A	106
ETS-8	33
GioveB	21

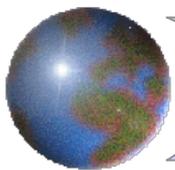


# KHz Hardware Design

- The hardware control system is mainly composed of three parts: accurate timing part, range gate control part and laser fire control part.



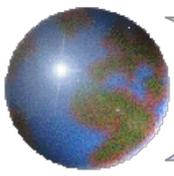
Control system Frame



# Laser (Test for KHz)

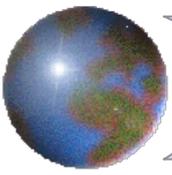
<b>Model</b>	<b>DS20-532</b>
<b>Wavelength</b>	<b>532 nm</b>
<b>Average Power @ 10 kHz</b>	<b>18 Watts</b>
<b>Nominal Pulse Width @ 10 kHz</b>	<b>40 ns</b>
<b>Pulse Energy @ 10 kHz</b>	<b>1.8 mJ</b>
<b>Beam Mode</b>	<b>TEM<sub>00</sub> - M<sup>2</sup> &lt; 1.1</b>
<b>Polarization</b>	<b>100:1 Vertical</b>
<b>Beam Diameter</b>	<b>1.0 mm</b>
<b>Beam Divergence</b>	<b>1.6 mrad</b>
<b>Pulse-to-Pulse Instability</b>	<b>&lt;3% rms</b>
<b>Long-Term Instability</b>	<b>+/- 3%</b>
<b>Pointing Stability</b>	<b>&lt; 25 μrad</b>
<b>Pulse Repetition Rate</b>	<b>500 to 10kHz</b>





# Data Analysis

- For LAGEOS, the present ability of our precise orbit determination work is in the middle level about 1 to 2 cm;
- In the case of our study, the choice of gravity model has slight effect on precision of LAGEOS orbit determination. The influencing order is on sub-mm level.
- 6 stations comparison



***Thanks !***