GNSS Retroreflector Activity

- **Background**
  - Current arrays on GPS-35 and 36, and GIOVE-A based on back-coated corner cubes are inadequate in terms of data yield and daylight tracking
  - Current array “effective cross-section” on GLONASS (about 5 time larger) is adequate but the array is very large and heavy
- **Developments**
  - Chinese Navigation Satellite launched on April 13 carrying an array based on uncoated cubes offer promise of significant increase in efficiency (tests imminent)
  - Arrays with hollow-cube (honeycomb) structure study and testing at GSFC offer promise of significant increase in efficiency and significant reduction in weight
  - New climatic test facility at LNG in Frascati will test and compare difference options (LAGEOS Sector, Array identical to GPS-35 and -36, Hollow cubes

GNSS Retroreflector Activity

- **Array Recommmendation**
  - ILRS has approve a “standard” for GNSS “effective cross-section” of 100 million sq. meters (5 times that of GPS-35 and -36)
  - Next step – request for GGOS approval
- **GPS III Series (2013 timeframe)**
  - Dialog continues with relevant agencies on the importance of including reflectors on GPS-III satellites

PASS SEGMENTS for SEP-2005

Station	PAD	WAVE	GPS35	GPS36	GLONASS87	GLONASS89	GLONASS95	TOTAL
Maidanak	1864	5320			5	5	3	13
Simeiz	1873	5320			1	4		5
Riga	1884	5320		1				1
Mcdonald Observ	7080	5320	8	8	12	3	4	35
Yarragadee	7090	5320	44	2	66	35	51	198
Greenbelt	7105	5320	1		1	10	5	17
Monument Peak	7110	5320	18	11	15	15	22	81
Changchun	7237	5320				2	1	3
Tanegashima	7358	5320			2			2
Hartebeesthoek	7501	5320			17	41		58
Zimmerwald	7810	4230	9	16	17	19	16	77
Zimmerwald	7810	8460	7	13	16	20	15	71
Mt Stromlo	7825	5320	3		8	11	7	29
Riyadh	7832	5320	20	18	10	13		61
Graz	7839	5320	6	7	13	10	7	43
Herstmonceux	7840	5320		6	9	8	8	31
Wettzell	8834	5320	4	3	15	11	17	50
			120	85	207	207	156	775

International Laser Ranging Service

Relative Signal Strength Normalized to LAGEOS

(Effective Cross-Section (ECS) are estimated from the array and cornercube specifications)

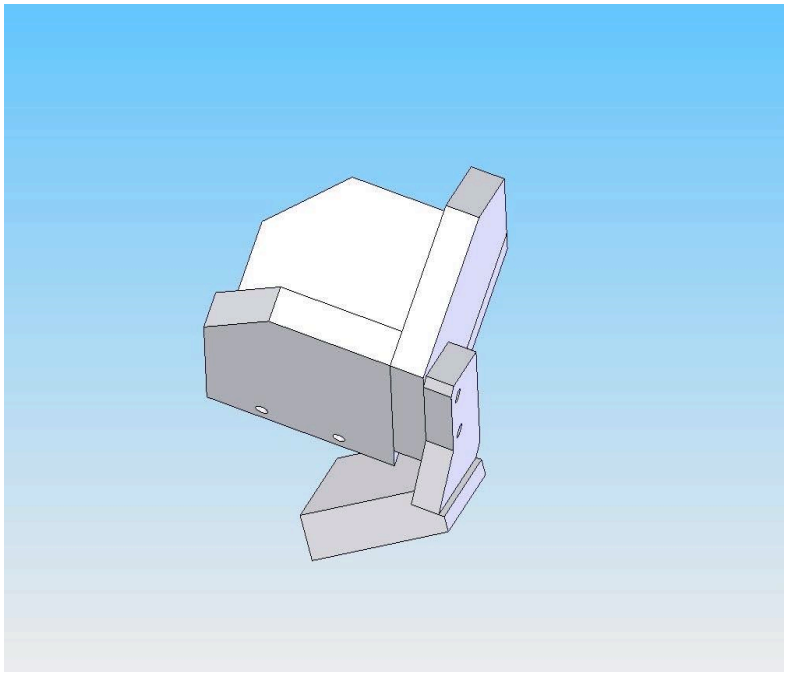
Satellite	Average Range (in 10^3 km.)	Eff. Cross Section .(in 10^6 m^2)	R**4 (in 10^{16} m^2)	Relative Signal Strength normalized to LAGEOS
LAGEOS	6 – 8	7	0.24	1
GLONASS	19 – 21	76	13.3	0.1
GPS 35/36	20 – 22	19	16.0	0.02
GIOVE-A (Galileo)	24-26	45	31.0	0.025

International Laser Ranging Service

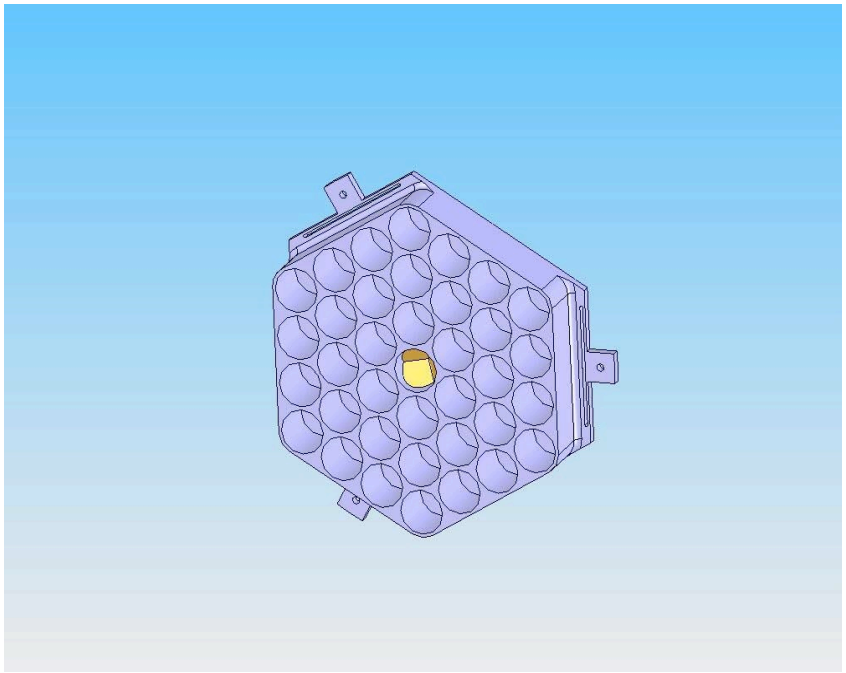
Array Options for Effective Cross Section of 100 million sq. meters.

Design	# of cubes	Diameter of cubes (inch)	Approx. Area of the array (sq cm)	Approx. Mass of the arrays (Kg)
Solid - uncoated (scaled ETS)	50	1.3	847	2.3
Solid - coated (scaled GPS)	160	1.06	2300	6.4
Hollow (calculation)	37	1.4	730	1.2

Hollow Cube Array



Single hollow cube



Hollow cube array configuration