

Centre-of-mass correction information at the ILRS Website

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The centre-of-mass corrections of almost all the ILRS-approved satellite missions have been organised at "SLR center-of-mass measurement correction information" page (http://ilrs.gsfc.nasa.gov/missions/spacecraft_parameters/center_of_mass.html; Fig. 1). This page provides the constant offsets for spherical satellites and the three-dimensional offset vectors for non-spherical satellites, and acts as a bridge between the spacecraft manufacturers and the analysts.

When a new satellite becomes available, we usually take the information from the ILRS Mission Request Form that was submitted by a space agency and was later recommended for tracking approval by ILRS Missions Working Group. A new row for the satellite is then inserted in the table of the webpage. Based on the experiences in handling several new satellites, the following issues are raised for future improvement:

- Blank or "TBC/TBD" columns are often seen.
- No forms are submitted for nearly identical satellites within a constellation that has already been approved for tracking by the ILRS (e.g. GLONASS), but the retroreflector array is sometimes different.
- Communications with the contact persons are not always smooth.
- No columns are assigned for the spacecraft-fixed coordinate definition and the transformation rule.

Satellite	Size of Array	Number of Reflectors	Body Fixed Coordinates of Array Phase Center (mm)	Spacecraft Coordinate Definition	CoM Correction (mm) and details
ADEOS-1	35.6 cm edge hollow cube	1	?	?	
ADEOS-2	16 cm diameter hemisphere	9	(+5000, +1050, +500)	Y-axis anti-parallel with velocity, Z-axis away from nadir	details
Ajisai	214 cm diameter sphere	1,436	1028	sphere: radius of phase center of each cube	details
Beacon-C	Pyramidal array on nadir face	160	?	phase center of each cube	
BLITS	85.16 mm diameter sphere	1	(0, 0, 0)	origin at center of the single sphere	details
CHAMP	5cm diameter, 45 deg pyramid	4	(0, 0, 250)	Z-axis towards nadir	details
CryoSat-2	11.4 cm diameter, 0 or 57.5 deg pyramid	7	(1808.5, -935.0, -450.0) plus 15-25 mm for LRA details	X-axis 6° from the flight direction (nose-down), negative-Z-axis 6° from the nadir, Yaw steering (normal operation) applied so that Y-axis orthogonal to the satellite ground track	details

Fig. 1. The SLR Center-of-Mass (CoM) Measurement Correction Information table at the ILRS Website. This table contains more than 30 rows.

- It is not easy to determine the “phase center of LRA” at the mm level.

for most of which are being discussed in the ILRS Mission Working Group. All of these issues are of course closely related with the orbit precision requested to laser ranging.

In parallel, we review our experiences with the table and point out possible improvement items as follows:

- Separate tables should be given for spherical and non-spherical satellites.
- Better ways to express the coordinate definition should be sought.
- Handling of the time-varying attitude and centre-of-mass correction should be addressed.

We would like to hear from the community any suggestions that would increase the value and further improve access to the information.