ILRS SLR Mission Support Request Form
Retroreflector Information

Satellite name: HY-2

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A prerequisite for accurate reduction of laser range observations is a complete set of pre-launch parameters thatdefine the characteristics and location of the LRA on the satellite. The set of parameters should include a generaldescription of the array, including references to any ground-tests that may have been carried out, array manufacturerand whether the array type has been used in previous satellite missions. So the following information is requested:

1. Array type (spherical, hexagonal, planar, etc.), to include a diagram or photograph:

   LRA is hemispherical surface with 9 corner cubes. (Fig.1)

2. Array manufacturer:

   Wuhan University

3. Link (URL or reference) to any ground-tests that were carried out on the array:

4. The LRA design and/or type of cubes was previously used on the following missions:

For accurate orbital analysis it is essential that full information is available in order that a model of the 3-dimensional position of the satellite centre of mass may be referred to the location in space at which the laser rangemeasurements are made. To achieve this, the 3-D location of the LRA phase centre must be specified in a satellitefixed reference frame with respect to the satellite's mass centre. In practice this means that the following parametersmust be available at mm accuracy or better:

5.The 3-D location (possibly time-dependent) of the satellite's mass centre relative to a satellite-based origin:

6.The 3-D location of the phase centre of the LRA relative to a satellite-based origin:

   The phase centre of LRA is (311.26, -213.81, 1068.12) mm only for normal incidence of laser beam.
   The range correction of LRA from spherical centre is 73.7mm.

However, in order to achieve (6) if it is not directly specified (the ideal case) by the satellite manufacturer, and as anindependent check, the following information must be supplied prior to launch:

7.The position and orientation of the LRA reference point (LRA mass-centre or marker on LRA assembly)relative to a satellite-based origin:

The spherical centre point (reference point) of LRA is (311.26, -213.81, 994.42) mm.

The LRA mass-centre point is (311.26, -213.81, 1065.6) mm.

8.The position (xyz) of either the vertex or the centre of the front face of each corner cube within the LRAassembly, with respect to the LRA reference point and including information of amount of recession offront faces of cubes:

The LRA reference point is spherical centre point of LRA. The centre of the front face of each corner cube are as following: (Fig.2) . No.1 (-61.74, -61.74,78.62) mm , No.2 (-87.32, 0, 78.62) mm , No.3 (-61.74, 61.74, 78.62) mm , No.4 (0, 87.32, 78.62) mm , No.5 (61.74, 61.74, 78.62) mm , No.6 (87.32, 0, 78.62) mm , No.7 (61.74, -61.74, 78.62) mm , No.8 (0, -87.32, 78.62) mm , No.9 (0, 0, 117.5) mm

9.The orientation of each cube within the LRA assembly (three angles for each cube):

The definition of the orientation (α, β) of each cube with spherical coordinates as following: (Fig.3) , No.1 (48°, 225°) , No.2 (48°, 180°) , No.3 (48°, 135°) , No.4 (48°, 90°) , No.5 (48°, 45°) , No.6 (48°, 0°) , No.7 (48°, 315°) , No.8 (48°, 270°) , No.9 (0°, 0°)

10. The shape and size of each corner cube, especially the height:

Circular, radius of 16.5 mm, 26.2mm in height

11. The material from which the cubes are manufactured (e.g. quartz):

Quartz

12. The refractive index of the cube material, as a function of wavelength λ (micron):

1.461 at 532 nm

13. Dihedral angle offset(s) and manufacturing tolerance:

No.1 (2.0 1.7 1.9) " , No.2 (1.8 1.9 1.9) " , No.3 (1.7 1.9 2.0) ",
No.4 (1.9 1.9 1.8) " , No.5 (1.9 1.9 2.0) " , No.6 (1.7 1.9 2.1) " ,
No.7 (2.0 2.1 2.2)" , No.8 (1.9 2.1 2.1) " , No.9 (2.1 2.2 2.1)"

14. Radius of curvature of front surfaces of cubes, if applicable:

15. Flatness of cubes' surfaces (as a fraction of wavelength):

<0.1λ

16. Whether or not the cubes are coated and with what material:

Coated with Ag

An example of the metric information (points 5-8 above) that should be supplied is given schematically below forthe LRA on the GIOVE-A satellite. Given the positions and characteristics of the cubes within the LRA tray (points8-12), it is possible to compute the location of the array phase centre. Then given the C and L vectors (points 5 and7) it is straightforward to calculate the vector from the satellite's centre of mass (CoM) in a spacecraft-fixed frame tothe LRA phase centre. Further analysis to derive the array far-field diffraction patterns will be possible using the information given in points 8-16.

Fig.1The LRA configuration for HY-2

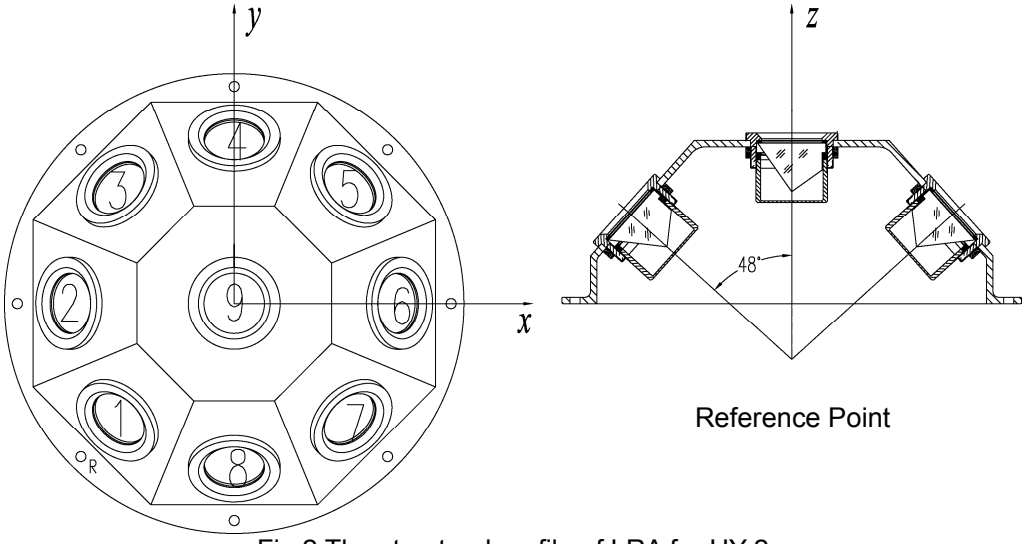

Fig.2 The structural profile of LRA for HY-2

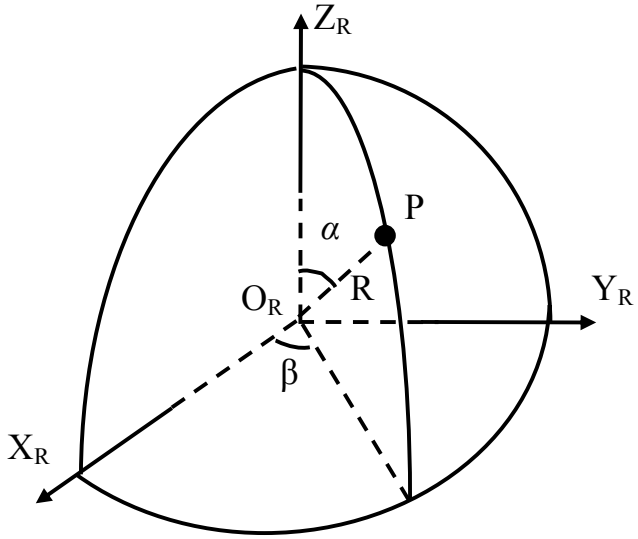

Fig.3The definition of the orientation (α, β) of each cube **P** with spherical coordinates