EPSC

EPSC-DPS Joint Meeting 2019
15–20 September 2019 | Geneva, Switzerland

ADVANCED POINTING IMAGING CAMERA (APIC) CONCEPT. R.S. Park[1] and J.E. Riedel, [1]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA (e-mail Ryan.S.Park@jpl.nasa.gov)

Introduction: The Advanced Pointing Imaging Camera (APIC) is a high-resolution imaging system which simultaneously takes images of targets and star fields with two-axis pointing control capability, allowing rapid target imaging and image motion compensation (IMC) with extremely precise pointing knowledge. Such imaging data can accurately measure the geophysical property and high-resolution topography of target objects. Figure 1 shows a CAD drawing of APIC and Table 1 shows its characteristics.

Main Objectives: The main science application of APIC is to serve as a geodesy/geophysical instrument which can provide the data to constrain the interior structure of planetary objects. Specific science objectives include: determination of geometric tidal flexing of natural satellites and determination of rotational libration, nutation, and precession of natural satellites and asteroids.
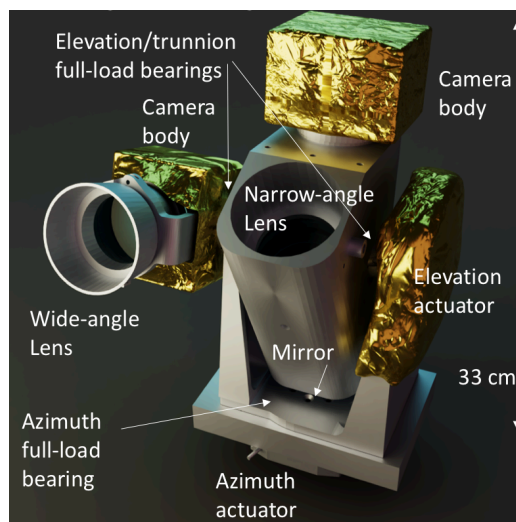
Parameter	Values
Dimension	~2U
Mass	<5 kg
Power	12 W
Image Resolution	19 μrad
Pointing Knowledge	2 arcsec
Az Range	inf
El Range	±90°
Az max rate	0.5 /s
El max rate	0.5 /s

Table 1: APIC characteristics

Science and Engineering Enabled by APIC:

- APIC's 2-DOF actuation would allow significantly more effective and efficient science/mission operations by providing rapid and flexible imaging capability (*e.g.*, much less constraints on spacecraft operational geometry).

- APIC's IMC ability, using the internal gimbal and attitude knowledge dramatically reduces the implementation and operational cost of IMC for any mission, and increases the achievable resolution of fast flyby missions.

- APIC's high-resolution narrow-angle-camera (NAC) and wide-angle-camera (WAC) would provide important unique science return via the ability

Figure 1: APIC current design showing principal components and heritage

to simultaneously take the images of the target body and star field, allowing high-resolution surface imaging with extremely precise pointing knowledge. Such imaging data with precise pointing information can accurately measure the tidal deformation and/or libration/precession of the target body, and thereby reveal target body's interior structure

- Furthermore, APIC can provide data for stereo (or stereophotoclinometric) reconstruction of target topography, including shape, size and volume, via control networks that would provide very accurate determination of the target-relative position of the spacecraft.

- APIC's combined functionalities would offer a powerful optical navigation capability, that would significantly enhance spacecraft orbit reconstruction and prediction accuracy, and thus, potentially reducing operations costs. Furthermore, APIC can serve as an ideal platform for autonomous navigation and internal star-finding/tracking can provide backup attitude information for the host spacecraft