

Data fusion with Hydra Star Tracker on Spot6

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Sodern's HYDRA multi-head star tracker has achieved TRL-9 having been launched successfully aboard the French Spot-6 earth observation satellite on September 9th 2012. The launch was on India's Polar Satellite Launch Vehicle (PSLV) C21 mission operating from the Satish Dhawan Space Center. The 1,569-pound (712-kilogram) Spot 6 satellite will be joined in its 435-mile (700-kilometer) polar low-Earth orbit by the identical Spot 7 to be launched in late 2013. Astrium Services has financed the Spot 6 and Spot 7 project aimed at forming a commercial earth-imaging satellite constellation. Both satellites will be phased at 180° in the same orbit as the French Pléiades constellation (Sun synchronous quasi-polar orbit). The Spot-6 architecture is close to that of the Pleiades satellites. Spot 6 and 7 include four control moment gyroscopes, a fibre-optic gyroscope and the HYDRA three head 3-axis star tracker. HYDRA is the multiple head CMOS Active Pixel Sensor (APS) star tracker developed by Sodern under contract to the European Space Agency with enhanced designs funded by the French CNES.

This paper presents results of HYDRA multi head Star tracker showing the benefits of data fusion in terms of robustness and performance with respect to conventional single Field Of View Star Trackers.

The downloaded telemetries confirmed our expectations for the new technologies incorporated into the HYDRA design. During the sun spinning phase, Optical Heads were occulted by the Earth, one after the other, often two at the same time. Despite occultation, tracking was maintained due to the multiple head management algorithm.

The star position fusion of each Field Of View performed by HYDRA processing unit provided a blended attitude quaternion with enhanced performances: few arcsec accuracy along the three axes. HYDRA incorporates Line Of Sight correction with a Kalman Filter. This feature compensates the distortion of satellite structure automatically with no need of additional correction by the OBC to maintain the full performance.