

0071-EX-CN-2017

University of Colorado Boulder

MinXSS2 3U CubeSat

Launch: Minotaur-C with TerraBella Skysat 8-13

MinXSS2 estimated integration date: NET April 1, 2017

MinXSS2 estimated launch date: NET June 1, 2017

MinXSS2 estimated deployment date: NET July 1, 2017

Form 442 Question 6: Description of Research Project

The Miniature X-ray Solar Spectrometer (MinXSS) is a 3U CubeSat mission, developed by students, faculty and staff at the University of Colorado Boulder in the Laboratory for Atmospheric and Space Physics (LASP) and the Department of Aerospace Engineering Sciences (AES). Its purpose is to better understand the solar flare energy distribution within the soft X-rays (SXR) and its impact on Earth's ionosphere, thermosphere, and mesosphere (ITM). MinXSS is expected to have a 5 year mission life. The nominal orbit for MinXSS is a 550 x 550 km circular sun synchronous orbit with a 13:15 LTDN.

The primary science payload is Amptek's commercial X123 X-ray Spectrometer with repackaged electronics to mitigate thermal effects due to the space environment. From expected orbit, MinXSS takes daily spectral measurements of the solar soft X-rays. LASP will process and distribute the data daily through the LASP Interactive Solar IRradiance Datacenter (LISIRD). The mission's ground segment that includes mission operations, the UHF ground station operating at 437 MHz, science and engineering data processing, and data distribution are located at the University of Colorado Boulder Laboratory for Atmospheric and Space Physics (LASP) in Boulder, Colorado. MinXSS-2 is nearly identical to MinXSS-1 using the same UHF flight radio (AstroDev Li-1) and University of Colorado ground station. The IRAU has graciously coordinated 437.250MHz for the MinXSS-2 mission. MinXSS-1 was deployed in May 2016 and issued call sign WH2XSF. MinXSS-1 is expected to deorbit by July 2017.

MinXSS is a solar-pointing, 3-axis-controlled, 3U CubeSat that observes the solar soft X-ray spectrum (SXR) between 0.4 and 40 keV (0.03-3 nm) with 0.15 keV resolution (0.0001 nm at 0.03 nm to 1 nm at 3 nm). The spacecraft is designed for use in low earth orbit (LEO) with two deployable solar panels and a deployable UHF monopole antenna. There is a single, fixed solar array panel along the plus X axis. The total spacecraft mass is 3.52 kg with a volume of 10 cm x 34 cm x 10 cm in the stowed configuration. When fully deployed, the spacecraft's monopole antenna extends 47 cm along the minus Z axis and all three solar panels are sun facing. A miniaturized star tracker is mounted such that its boresight is perpendicular to the plus X-axis of MinXSS and pointing 10° from the plus Y axis.

The 3 axis inertial pointing system (from Blue Canyon Technologies) contains 3 reaction wheel assemblies, 3 torque rods, a miniaturized star tracer, and a processor board all self-contained in a ½ U unit that is attached to plus Z side of the main body of the spacecraft. The MinXSS battery pack is comprised of four 2 amp-hour lithium polymer batteries connected in series and parallel to make an 8.4 Volt battery pack with a 4 amp-hour capacity.

All sensors and components on MinXSS are passive. There are no lasers, radiation sources, propellants, pressure vessels, or other hazardous materials on board the spacecraft.