

49th STUDENT CONFERENCE (E2)  
Educational Pico and Nano Satellites (4)

Author: Mr. Håkon Kindem  
Norway, haakonek@stud.ntnu.no

## DESIGN OF A ROBUST SMALLSAT DEPLOYABLE INSTRUMENT BOOM

**Abstract**

Instrument booms present a challenging engineering problem in volume constrained CubeSats developed by time-constrained university teams. The design effort is multidisciplinary in nature, including control circuits, moving parts and a need for high reliability. This paper presents an instrument arm design that is suitable for permanently deployed arms in the range of 0 to 30 cm in length in the CubeSat Z-axis and up to 100 cm in the X/Y-plane. This includes a complete description of the design rationale and verification campaign, highlighting several major design considerations that are critical for avoiding failure modes when implementing the design.

This instrument boom design is robust and can be modified to accommodate any length within the 0-100cm range. The boom is folded in a container with a lid which is held down by a burn-wire attached to a resistor circuit. The design has been implemented as a 25 cm instrument boom which has been verified by statistically significant testing of the burn-wire release mechanism and vibration test of the complete boom assembly, as well as high speed camera verification of the boom release dynamics. The structural and electrical components have been designed to consist of a limited number of parts, which are easily manufactured.