

ILDC/ILMC 2020

A NEW COMPREHENSIVE LIGHTNING INSTRUMENTATION SYSTEM FOR THE MOBILE LAUNCHER 1 AT THE KENNEDY SPACE CENTER, FLORIDA

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A new comprehensive lightning instrumentation system has been designed for the Mobile Launcher 1 (ML-1) at the Kennedy Space Center, Florida. This new instrumentation system includes the synchronized recording of three B-dot, 3-axis measurement stations, one D-dot sensor and eighteen vehicle measurement channels. Each vehicle measurement channel is comprised of two currents and one voltage measurements. The instrumentation system is composed of centralized transient recorders and digitizers, connected to the transient recorders via fiber optic cables. The transient recorders are triggered by the B-dot or D-dot sensors. When the Space Launch System (SLS) vehicle is present at the ML-1, the transient recorders record data on a dual sampling rate mode, continuous slow 5 kilo-samples per second (per channel) and event driven fast 100 mega-samples per second (per channel). Without the presence of the vehicle at the ML-1, the instrumentation system operates only as an event driven fast 100 mega-samples per second (per channel). In the absence of the vehicle, the only measurements recorded are the B-dot and D-dot stations.

Additionally, a portable Lightning Monitoring System (LMS) is temporarily installed inside the Orion Crew Capsule module monitoring one portable B-dot, 3-axis measurement station, and 2 Crew Capsule BUS voltages. The portable LMS has a transient recorder independent of the ML-1 transient recorders, that is triggered by the portable B-dot sensor or transients on the vehicle BUS voltages. This portable instrumentation is removed while performing close out operations before the vehicle launch.

For the ML-1 lightning instrumentation system, new custom B-dot and D-dot sensors were designed and prototypes were tested at the International Center for Lightning Research and Testing (ICLRT) at Camp Blanding, Florida. The Ground Special Power (GSP) vehicle measurement channels monitoring on the ML-1 is done via 1) Commercial off-the-shelf (COTS) current shunts and 2) custom Voltage Dividers.

The new ML-1 lightning instrumentation system was designed, fabricated, deployed, and tested prior to the summer of 2019, in preparation for the first NASA's SLS mission to be launched from the Launch Complex 39B (LC-39B). The ML-1 lightning instrumentation was designed to complement the LC-39B lightning instrumentation system providing electromagnetic measurements closer to the vehicle, at different heights and inside the Crew Capsule module.