The Laser Megajoule (LMJ) is a 176-beam laser facility, located at the CEA CESTA Laboratory near Bordeaux (France). It is designed to deliver about 1.4 MJ of energy to targets, for high energy density physics experiments, including fusion experiments. LMJ process hazards types are laser, high voltage, and radiations. These hazards are transmitted between bays.

The PSS protects personnel by managing risks presence and transmission between bays. For reliability reasons, the PSS is built around two independent systems named “BT1” and “BT2.” BT1 system is designed using programmable technology, following IEC61508 requirements to achieve Safety Integrity Level 2. The BT2 system is designed using non-programmable technology, following IEC61508 requirements to achieve SIL3. BT2 logic is built using PLANAR4 products from HIMA. While implemented using non-programmed logic technology, BT2 system functions are complex and require a software-like development process. BT2 simulator software helps following this process.

The technical view window shows rack faces, including status indicators and configuration buttons. It allows virtually disconnecting any module and simulating fuse states.

The logic diagram window shows all the racks' logic. All signals may be forced or monitored. Always visible spy windows are available on every signal.

The functional view window shows process states, and allows manually triggering of any external signal. A functional view is available for each BT2 subsystem.

The test window allows selecting and running tests. Tests can be interrupted and run step by step. Manual test instructions can be generated.

The simulator allows designing logic and proving its compliance with specification. Simulator generates compliance checking document.

Simulator generates wiring specification documents.

Being the base of the development process, the BT2 simulator has to be validated as a tool following IEC61508 part 3. This validation is currently in progress.