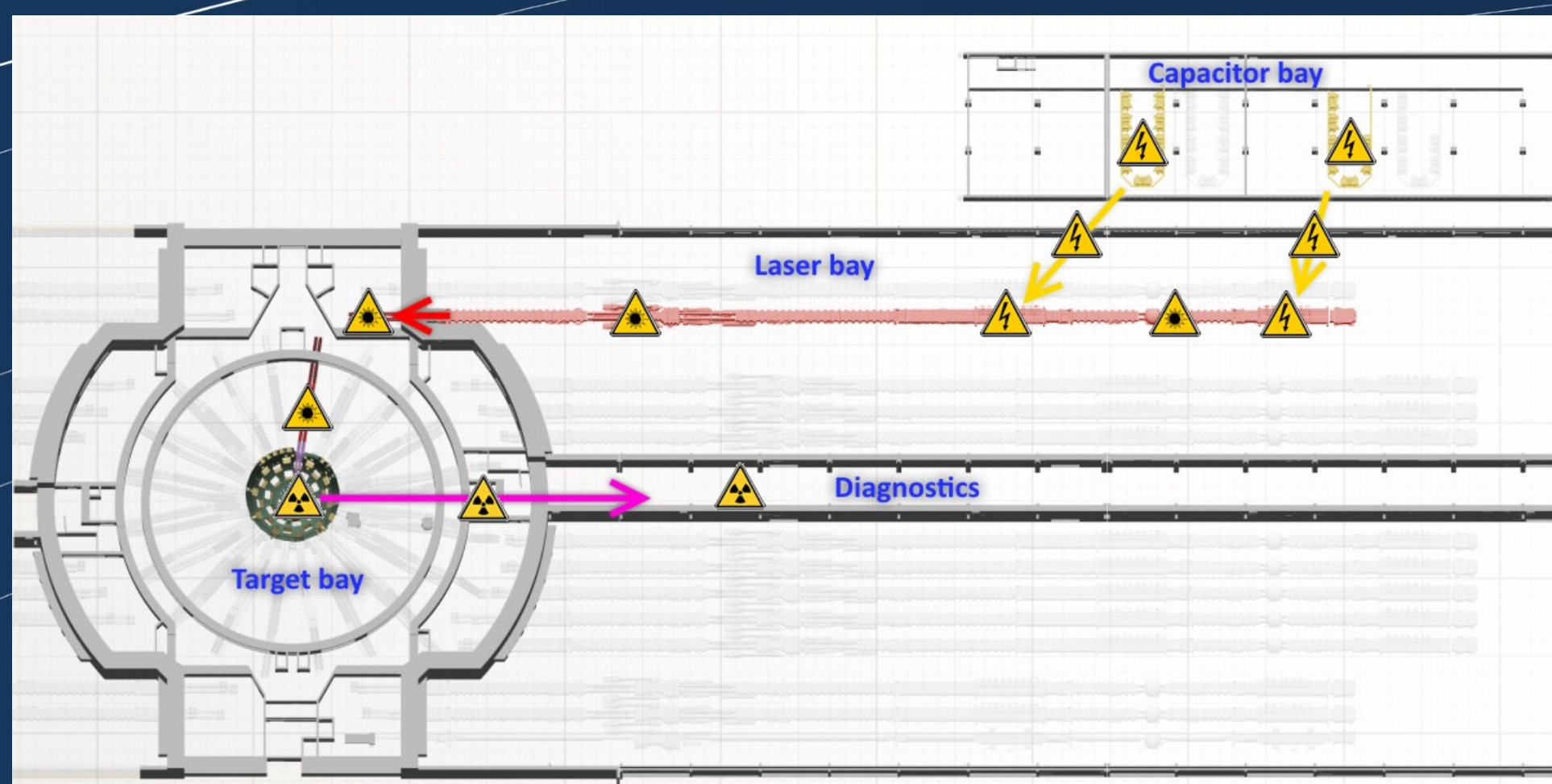




The Laser MegaJoule (LMJ) is a 176-beam laser facility, located at the CEA CESTA Laboratory near Bordeaux (France). It is designed to deliver about 1.4 MJ of energy to targets, for high energy density physics experiments, including fusion experiments. LMJ process hazards types are laser, high voltage,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

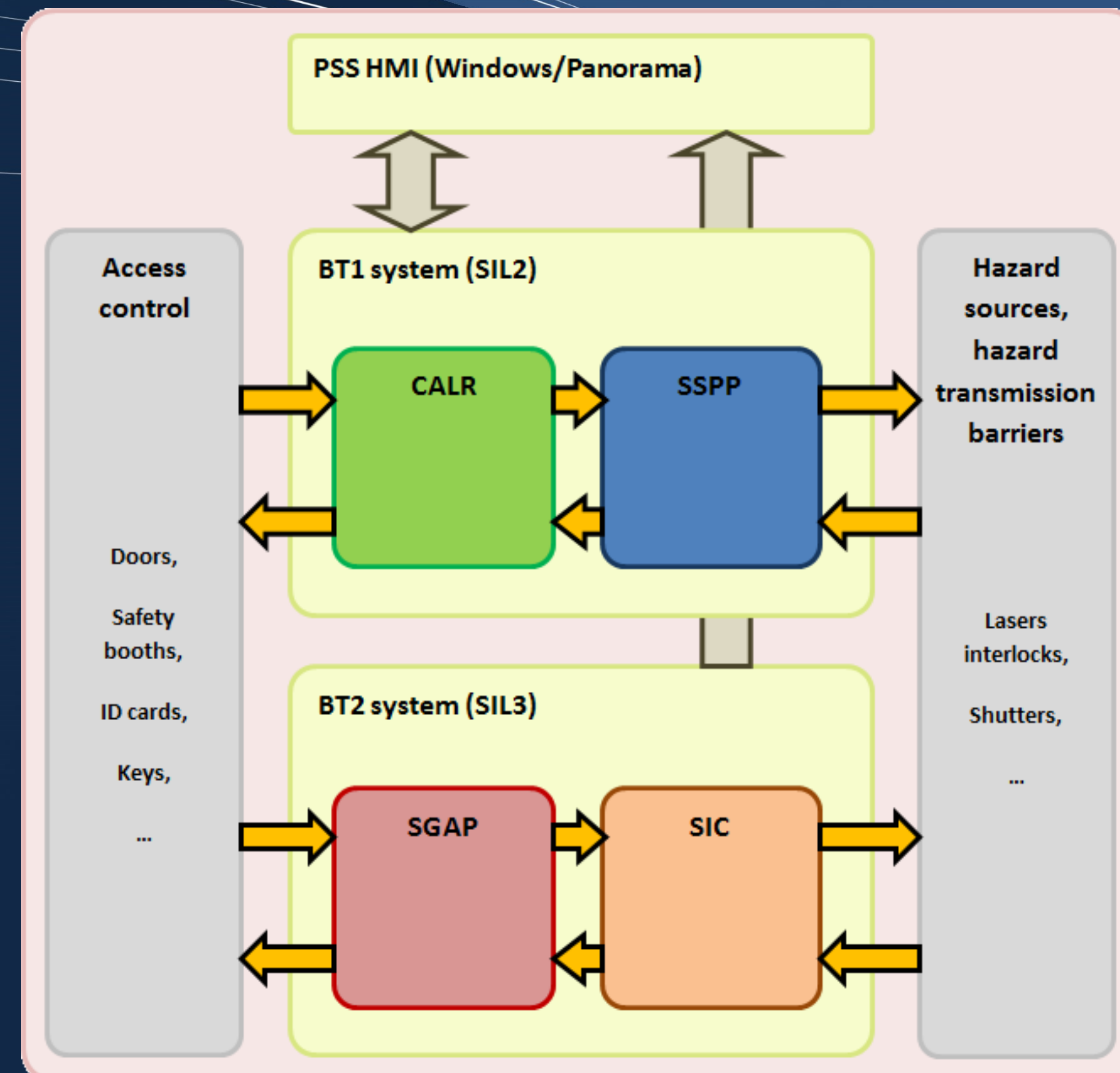
PSS

The PSS protects personnel by managing risks presence and transmission between bays, using safety interlocks and transmission barriers.

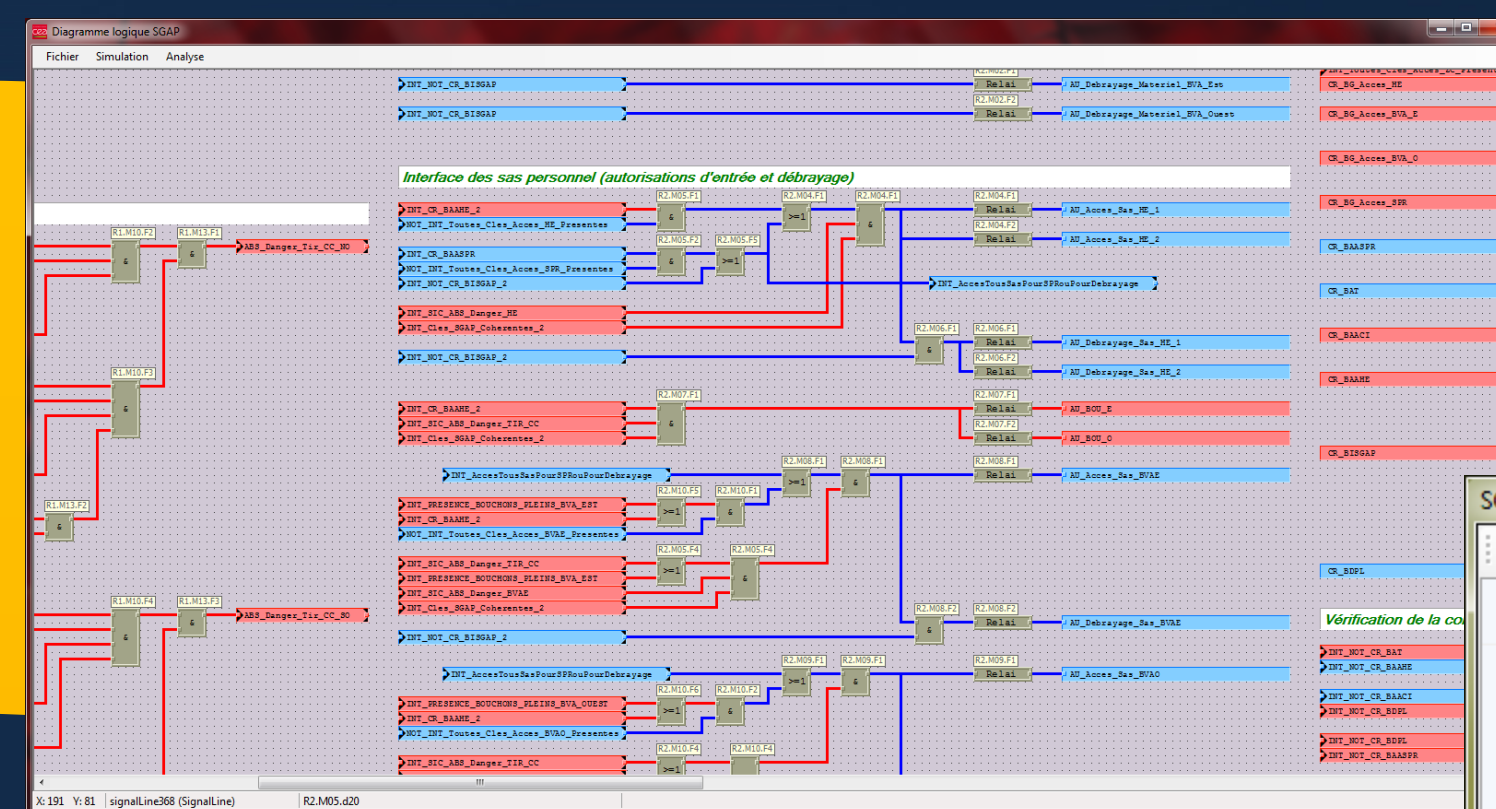
For reliability reasons, the PSS is built around two independent systems named "BT1" and "BT2".

The 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.



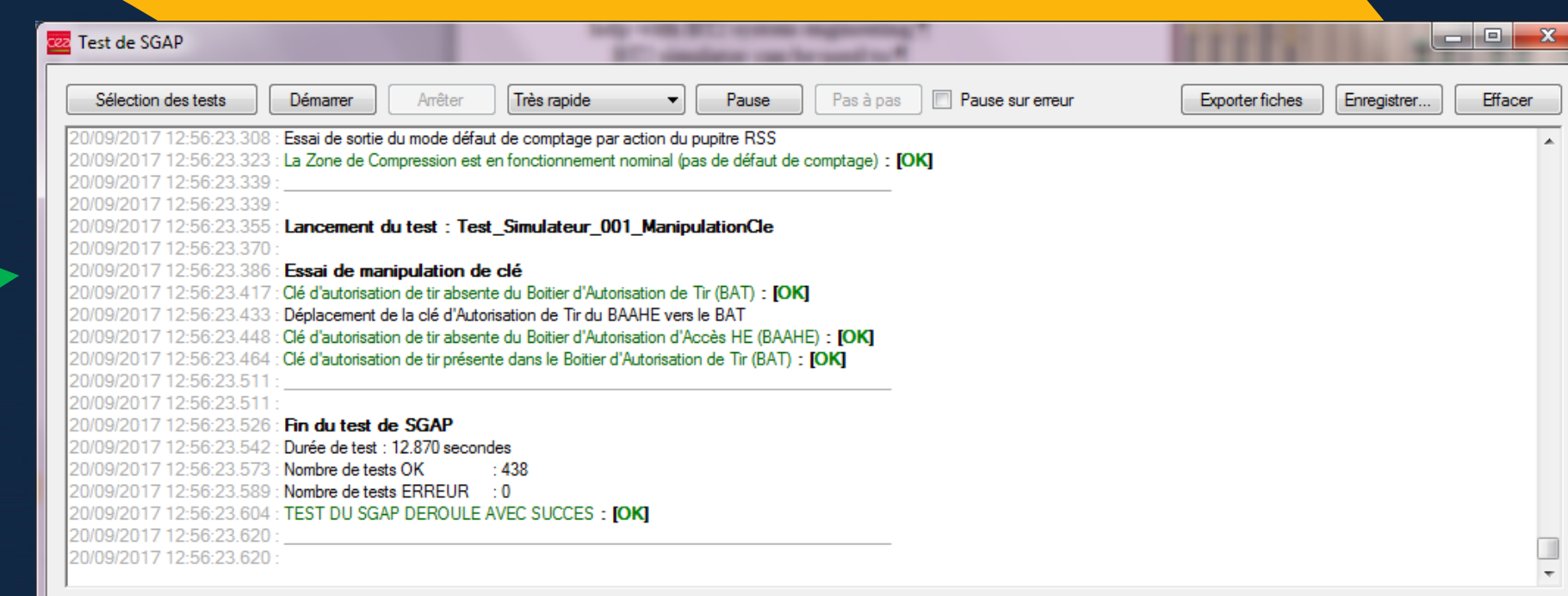
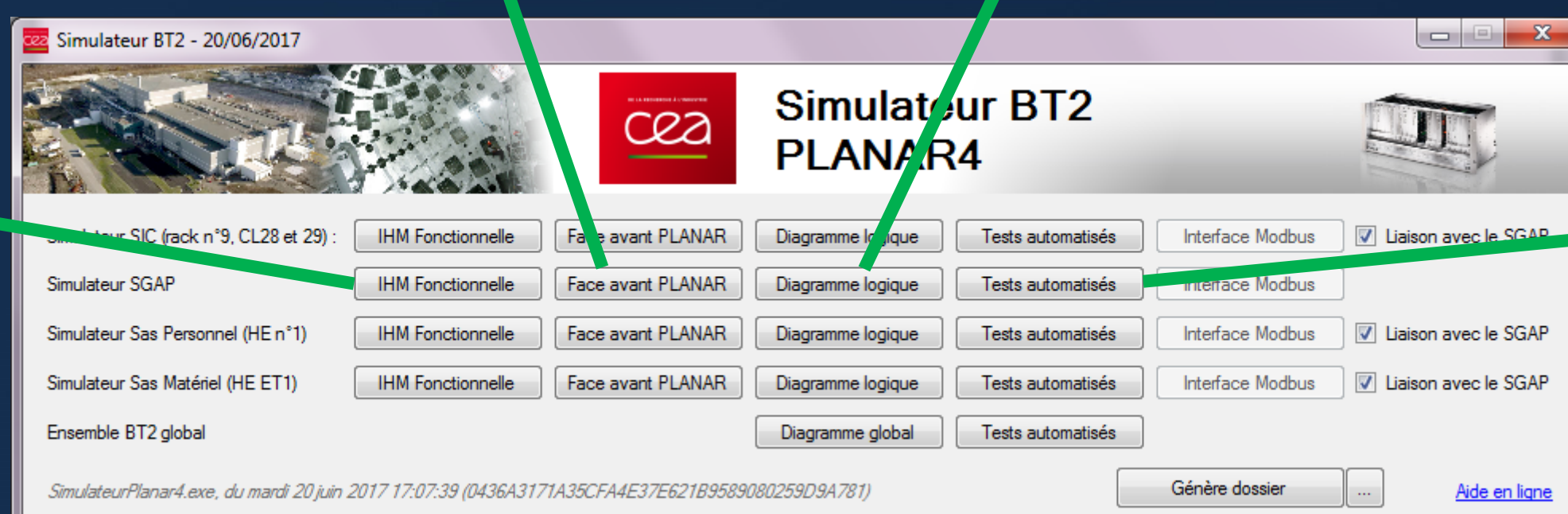
Technical view window shows rack faces, including status indicators and configuration buttons. It allows virtually disconnecting any module and simulating fuse states.



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

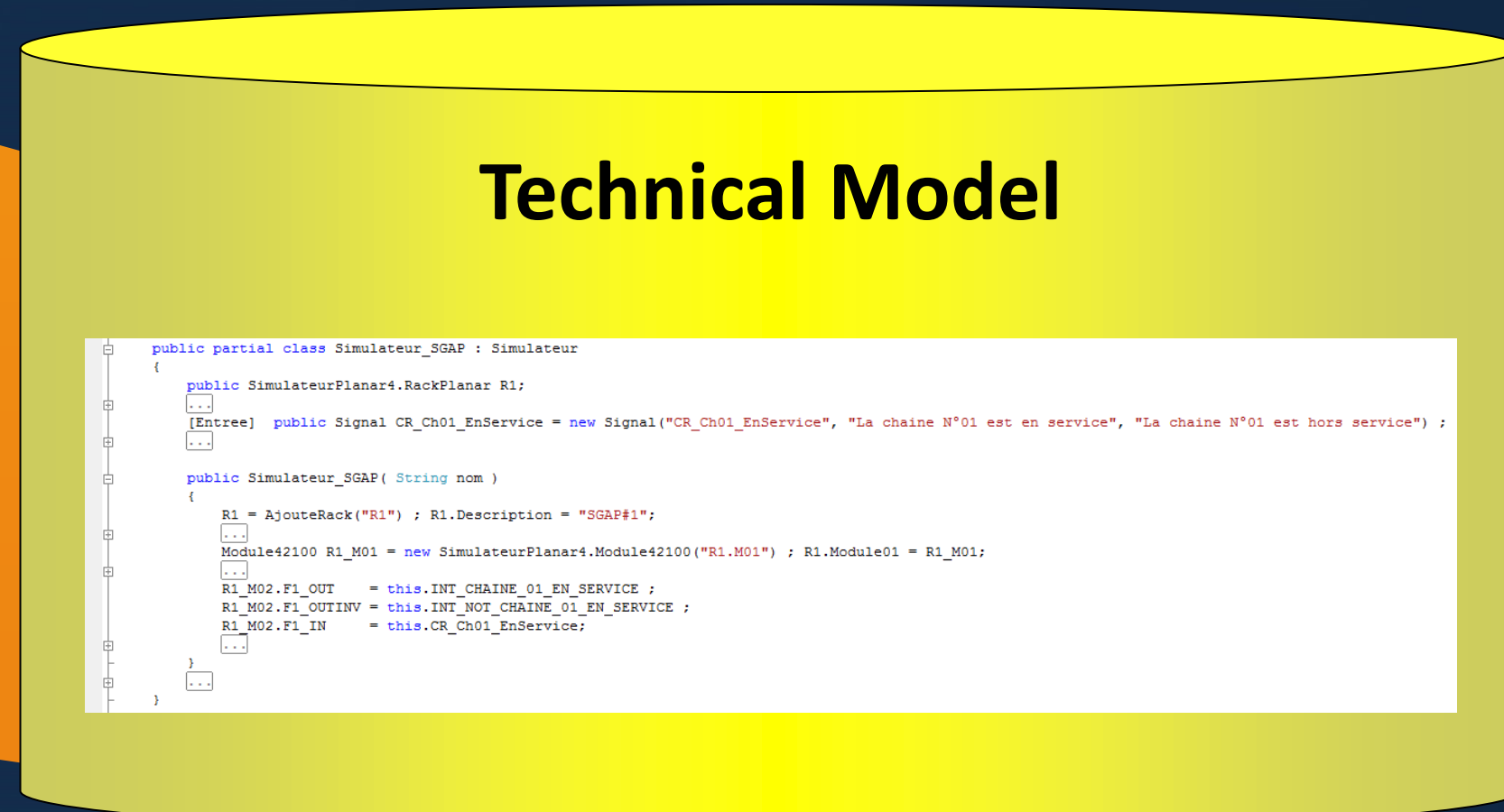
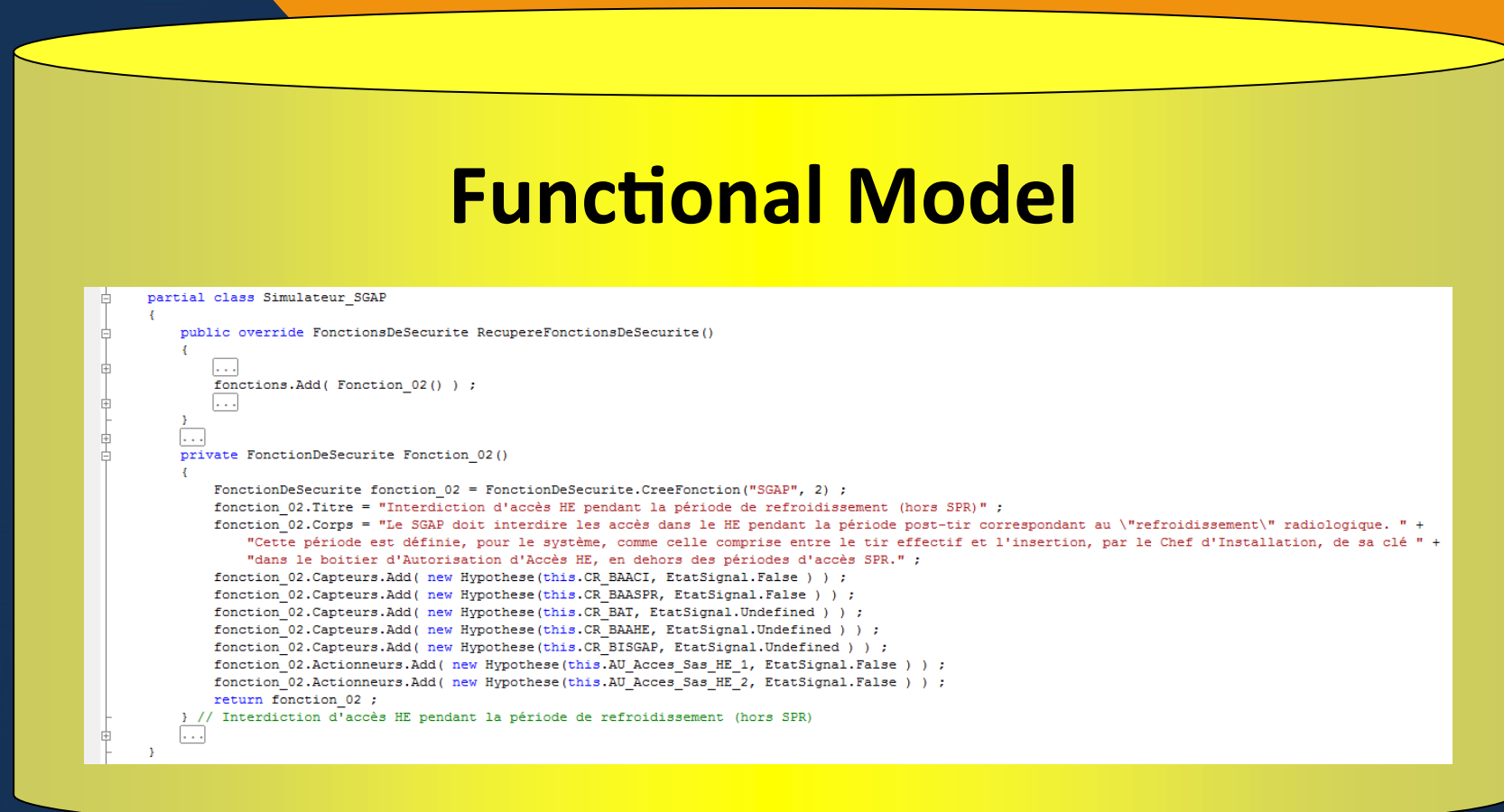


Functional view window shows process states, and allow manually triggering of any external signal. A functional view is available for each BT2 subsystem.



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

BT2 SIMULATOR



Safety Requirements Specification

System Architecture

Subsystem logic design

Wiring

Wiring tests

System tests (on site)

System tests (factory)

Subsystem tests

Simulator allows designing logic and proving its compliance with specification. Simulator generates compliance checking document. Simulator generates wiring specification documents.

Automatically generated tests from functional model are not on site runnable. Some tests are hand-written. These tests are run on technical model. The same tests are then exported as blank test files for factory and site runs.

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.

BT2 DEVELOPMENT