Contribution ID: **228**                                                                                             Type: **Poster**

# The modification of CMS electromagnetic calorimeter supermodule insertion tool

*Monday, 23 May 2022 11:09 (1 minute)*

The Electromagnetic Calorimeter (ECAL) barrel of CMS experiment at CERN is made of 36 Supermodules, each consisting of 1700 lead tungstate scintillating crystals. Each Supermodule weighs 2.7 tonnes and is a highly sensitive and fragile object. The Supermodules, 18 Supermodules on each side of CMS barrel, were successfully inserted inside the Hadronic Calorimeter (HCAL) barrel of CMS in 2007 with a dedicated insertion tool called "Enfourneur". The movements of the Enfourneur are controlled by a fine adjustment system for the Supermodule insertion and extraction. During the Long Shutdown 3 foreseen in 2026, the Enfourneur will be used to extract the Supermodules for their electronics upgrade in view of the HL-LHC future runs and to insert the Supermodules again in CMS.

Based on the past operations, modifications on the current Enfourneur have been implemented in order to improve and facilitate the functionalities, in compliance with the up-to-date international standards concerning machinery safety and CERN internal applicable rules. This work was carried out through several stages and iterations covering a complete design study, FEA simulation within the scope of Eurocode 3, installation of the modifications, and validation tests. The modified Enfourneur fulfills all the intended technical and safety requirements.

In this paper, a review of the Enfourneur functionalities, the applied modifications, and the performed validation tests will be presented.

## Collaboration

CERN - CMS - ECAL collaboration

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**Session Classification:**   Detector Systems and Future accelerators - Poster session