LHeC Detector Installation Preliminary Study

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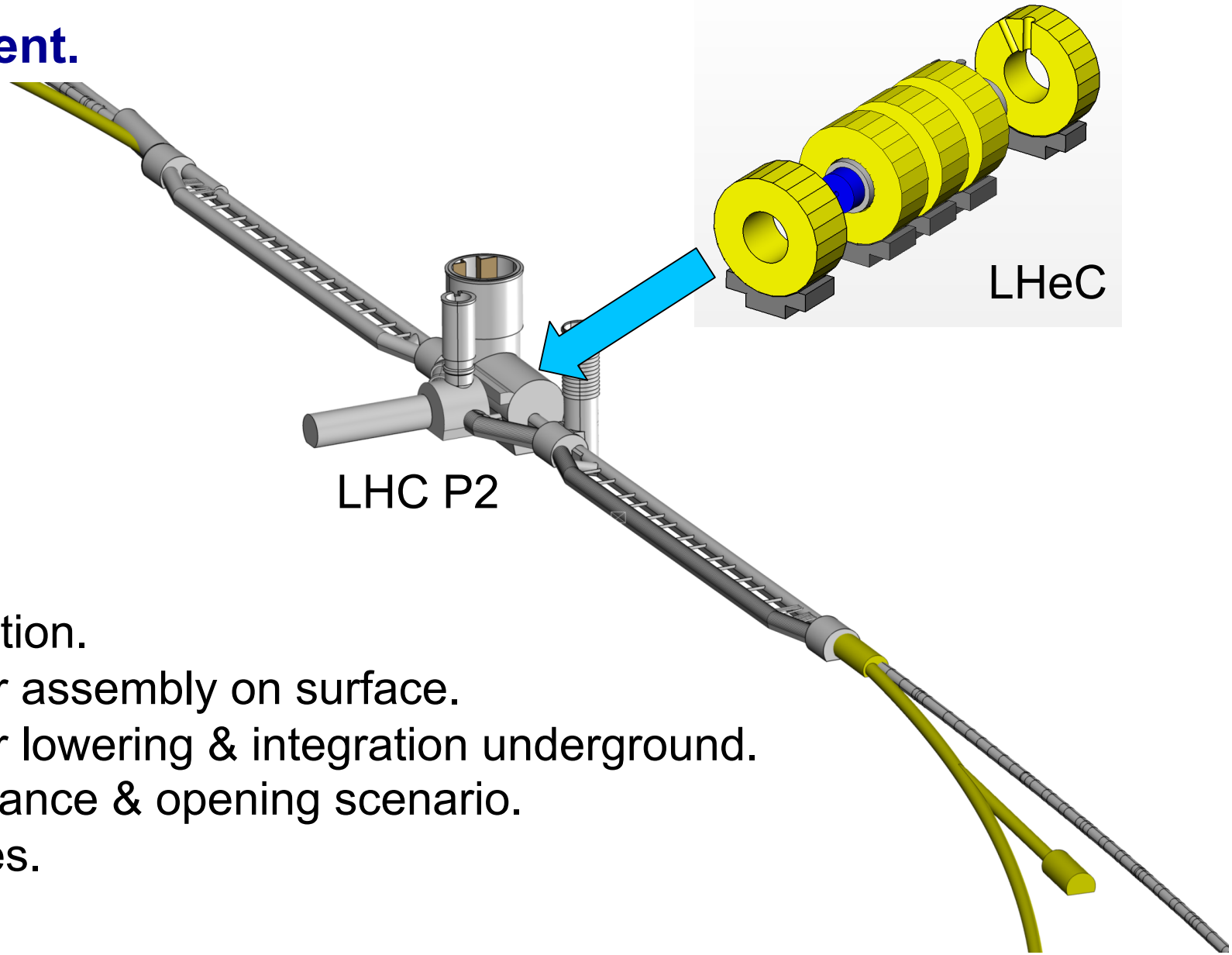
Talk content.



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Introduction.

The following is a very preliminary study of the detector assembly and integration at CERN LHC P2, with some considerations on the detector maintenance scenario. The usual constrains that apply to the detector integration study, are made here even tighter due to the fact that the detector has to replace an existing one, in the shortest allowable time given by the machine shutdown.

Considerations on the activation of the present ALICE detector at LHC P2, at the time of third long shutdown of LHC (LS3) and how fast it can be dismantled are not presented here for lack of time. They shall be addressed in the next future.

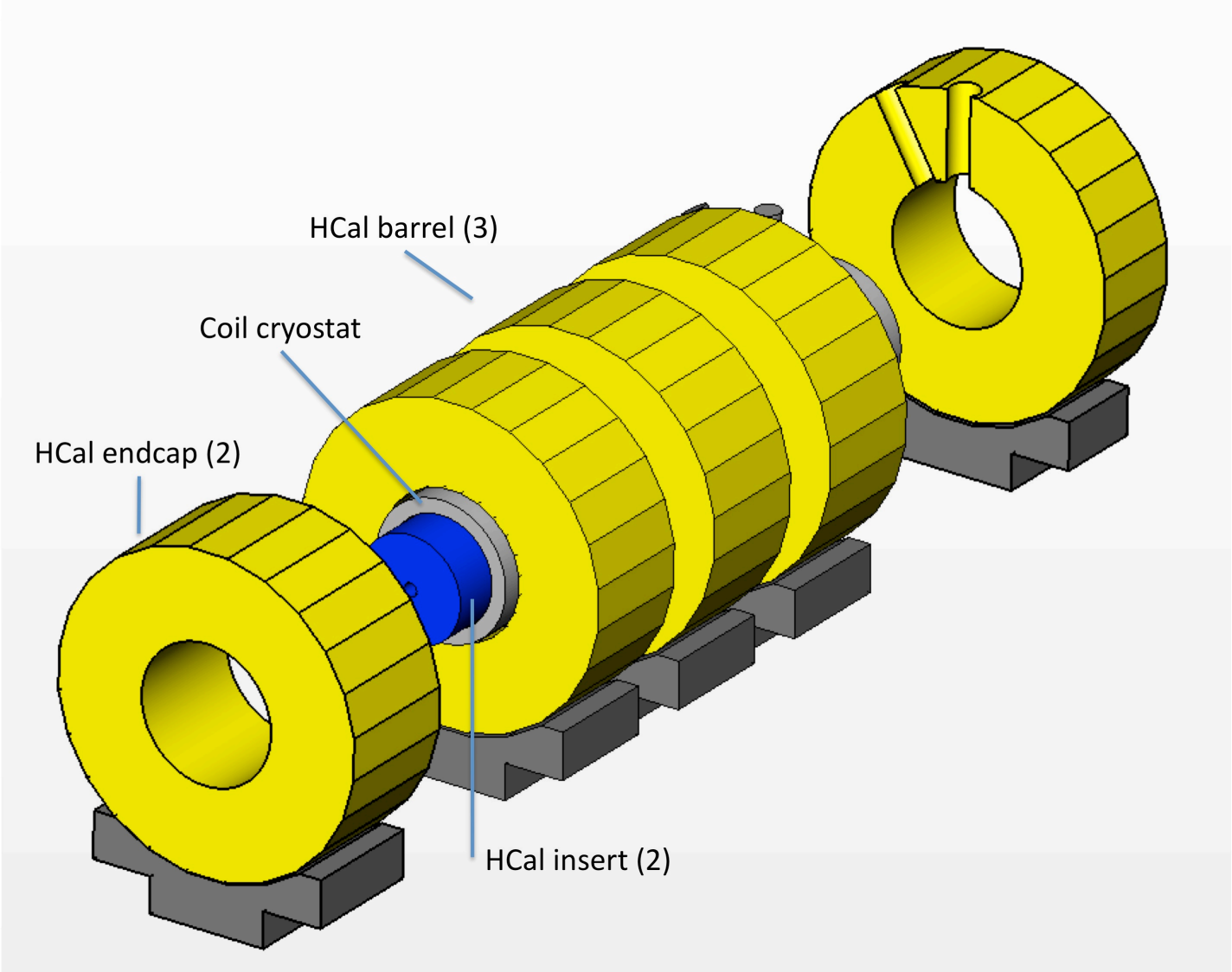
LHeC Detector assembly on surface.

The strategy proposed is to complete as much as possible the assembly of the detector on surface. The detector has been split in the following main parts:

1) Coil cryostat, including the superconducting coil, the two dipoles and eventually the EMCal, if the L-Ar version is retained.
2) Three barrel wheels and two endcaps of HCal tile calorimeter, fully instrumented and cabled.
3) Two HCal inserts, forward and backward.

The maximum weight of a single element to be lowered from surface to underground has been limited to 300 tons, in order to make possible the lowering by renting a standard crane, as already applied by L3 for its barrel HCal.
The superconducting coil and the two integrated dipoles will be tested at nominal current on surface, whilst the field mapping will be performed underground.

LHeC Detector assembly on surface.



L3 Detector lowering at LEP P2 (1988).

L3 Support Tube (300tons)

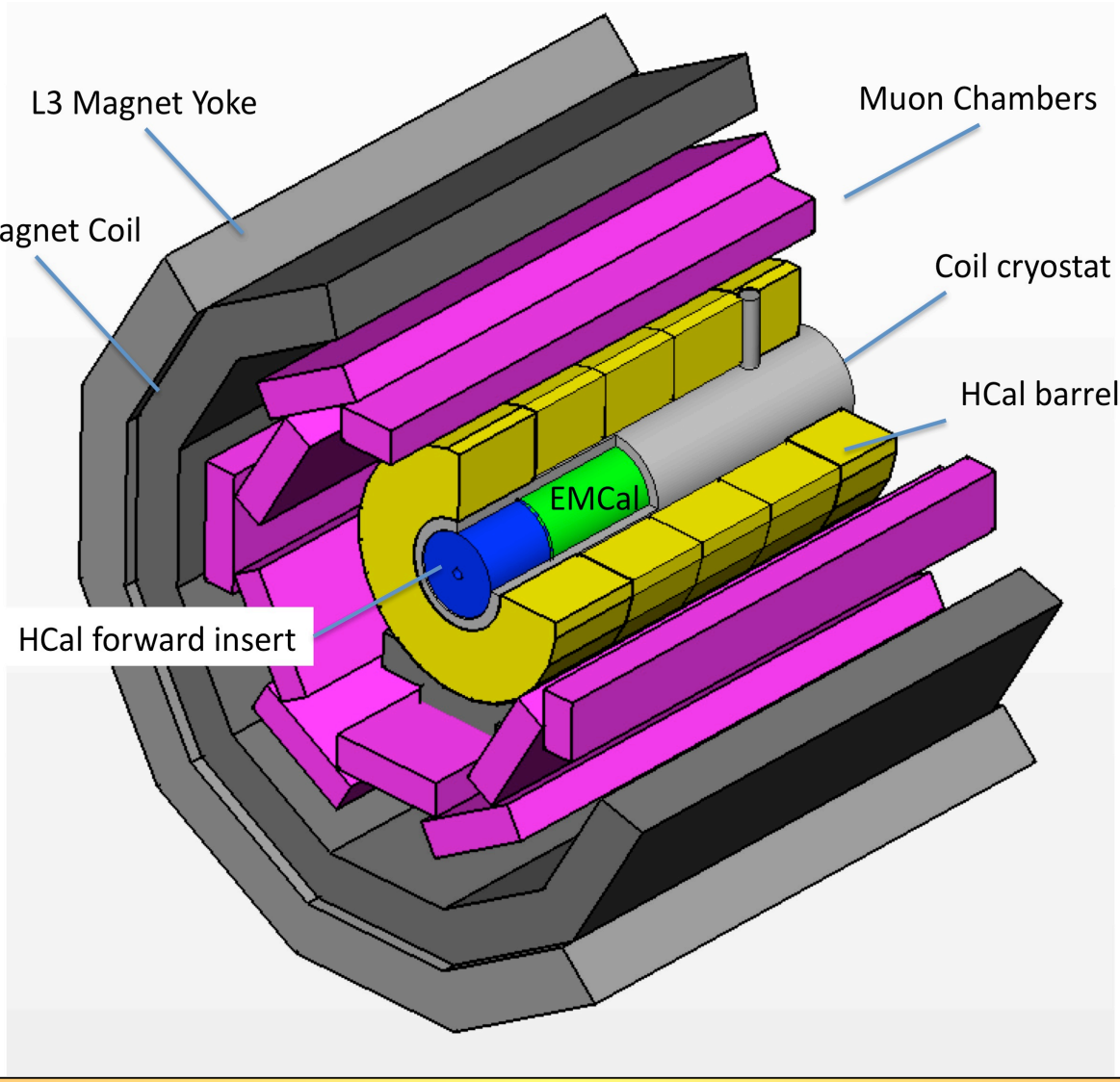
L3 Central HCal (300tons)

1000tons mobile crane at P2

Detector lowering & integration underground.

The detector, including the Muon chambers, fits inside the former L3 Magnet Yoke. The aim, to prevent losing time in dismantling the L3 magnet, is to make use of the sturdy L3 Magnet structure to hold the detector central part on a platform supported by the L3 Magnet crown, whilst the Muon chambers will be inserted into lightweight structures attached to the inner part of the barrel and the doors. The existing door openings are large enough to house the external part of the final dipoles and provide access for cables and services.

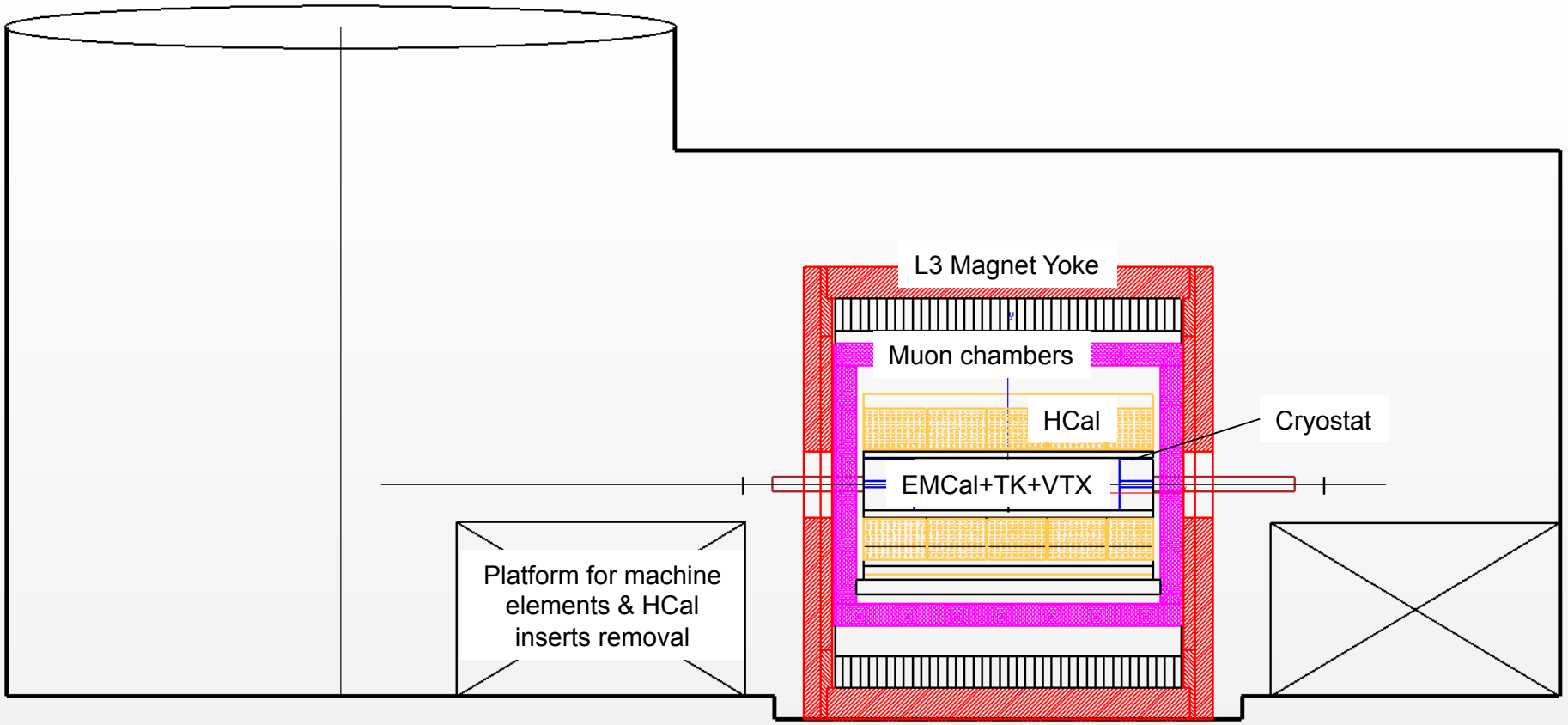
Detector lowering & integration underground.



Maintenance & opening scenario.

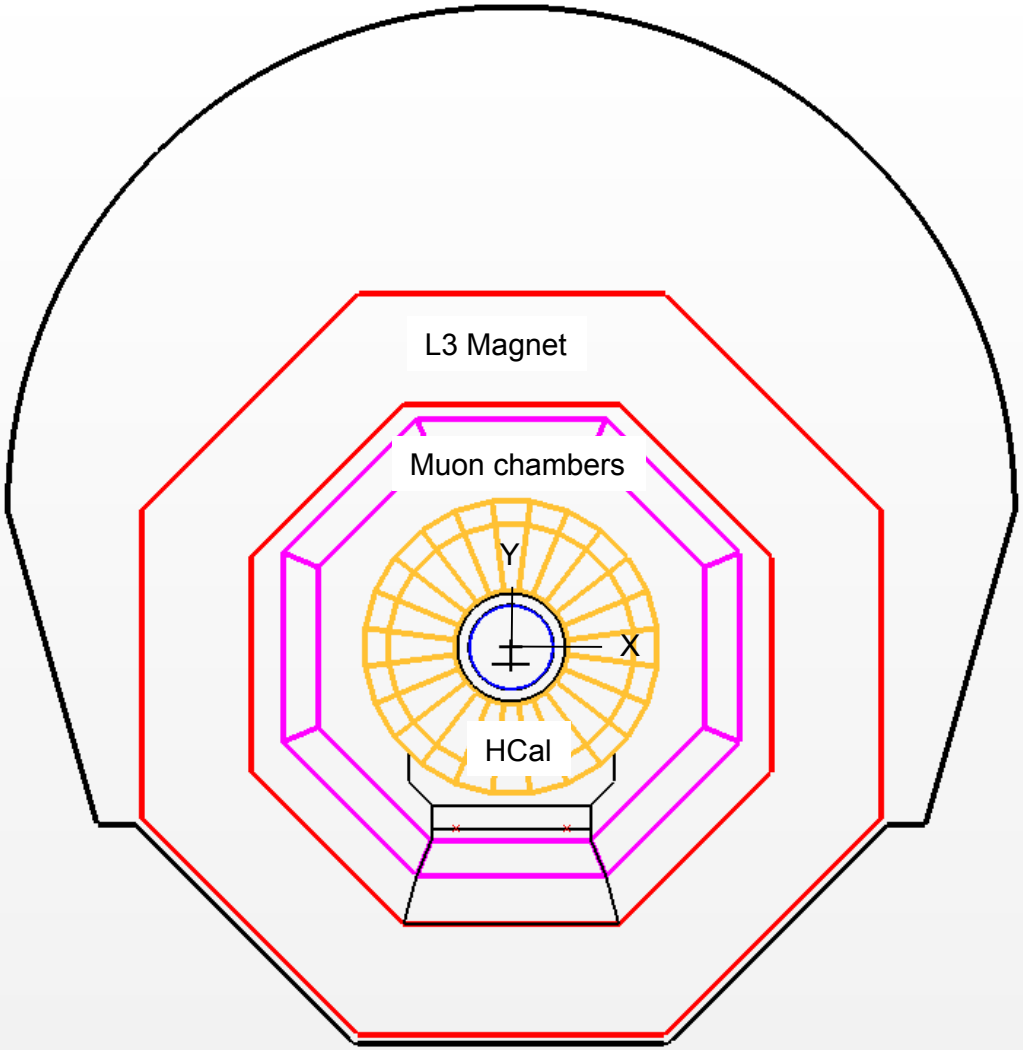
A minimum maintenance scenario has been analysed. This foresees the possibility of opening the detector to get access to the Forward & Central Tracker. To allow this, the two heavy HCal inserts have to be removed from inside the cryostat and moved along z on the platform that supports the last machine elements. These elements have to be previously disconnected from the beam-pipe and moved away on the same platform along x. To avoid disconnecting the HCal inserts form the main services, cable-chains will accomodate extra-lengths of cables, fibres and pipes.

LHeC inside the L3 Magnet, longitudinal cross-section.



LHeC inside the L3 Magnet, transversal cross-section.

The LHeC interaction point has an offset of 300mm along Y and 870mm along Z, with respect to the centre of the L3 Magnet Yoke.



Timelines.

The assembly on surface of the main detector elements as previously defined (with the exception of the coil system that will be produced at the chosen industrial supplier) would take approximately 16 months, the Coil system commissioning on site three additional month, preparation for lowering one month and lowering one week per piece (8 pieces in total). In the same time the L3 Magnet will be freed up and prepared for the new detector.

Underground completion of the integration of the main detector elements inside the L3 Magnet would require about two months, cabling and connection to services some six months, in parallel with the installation of the Muon chambers, the Tracker and the EMCal.

The total estimated time, from the starting of the assembly of the main detector elements on surface to the commissioning of the detector underground is thus 30 months. The field map would take one extra month. Some contingency is foreseen between the lowering period (8 weeks) and the integration inside the L3 Magnet of the same elements (2 months).

Conclusions.

This preliminary study shows that the LHeC Detector fits inside the former L3 Magnet. This would avoid the dismantling of the heavy iron structure that could be re-used as a stiff support for the new detector. The layout is also compatible with a minimum maintenance scenario, allowing access to the LHeC inner detectors in a relatively short time (although the last machine elements have to be disconnected form the beam-pipe and displaced aside a few meters).
The schedule for detector installation & commissioning could finally meet the LS3 plans, providing that most of the assembly is done on surface.

Back-up slides.