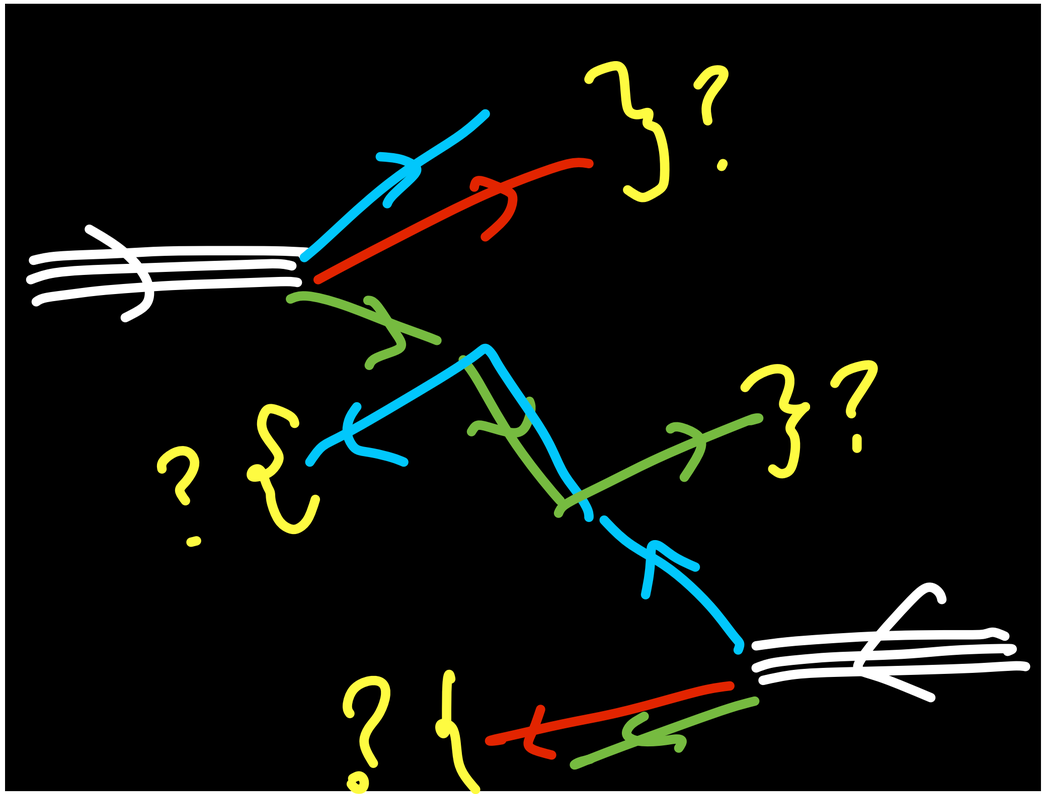
Třetí miniworkshop difrakce a ultraperiferálních srážek

Introduction to FDD

Guillermo Contreras
Czech Technical University in Prague

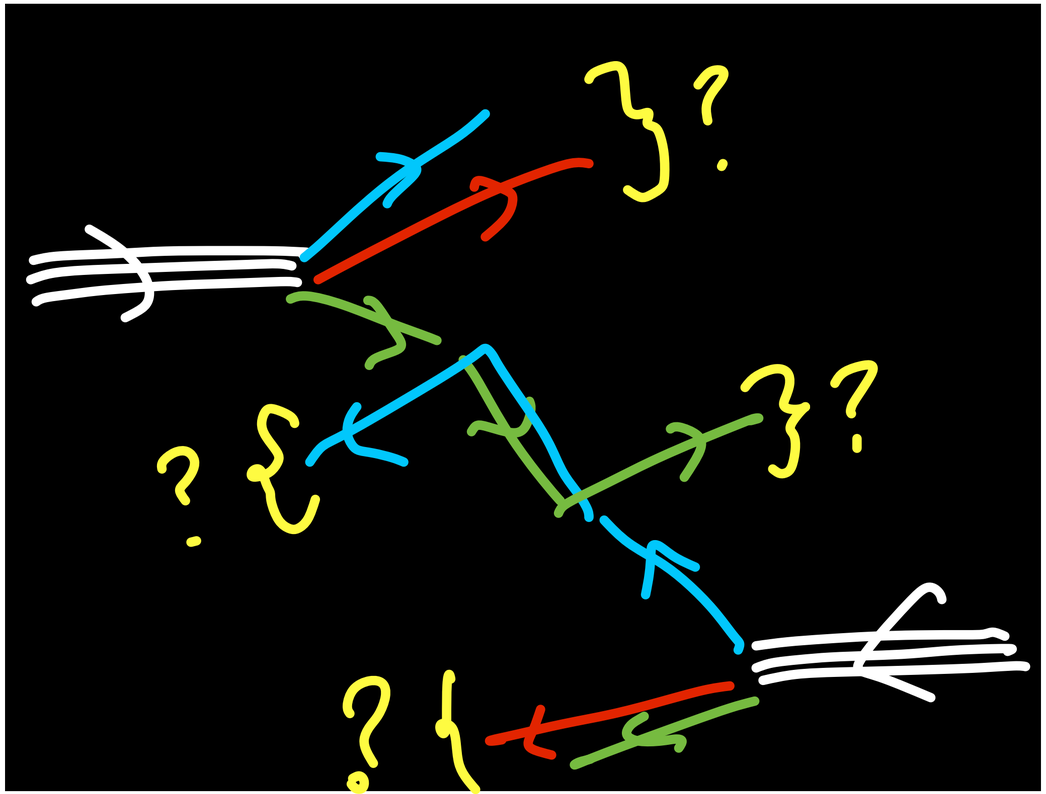
Děčín
September 15, 2020

Why forward?



In an inelastic collision via the strong interaction the immediate products have colour charges ....

Why forward?

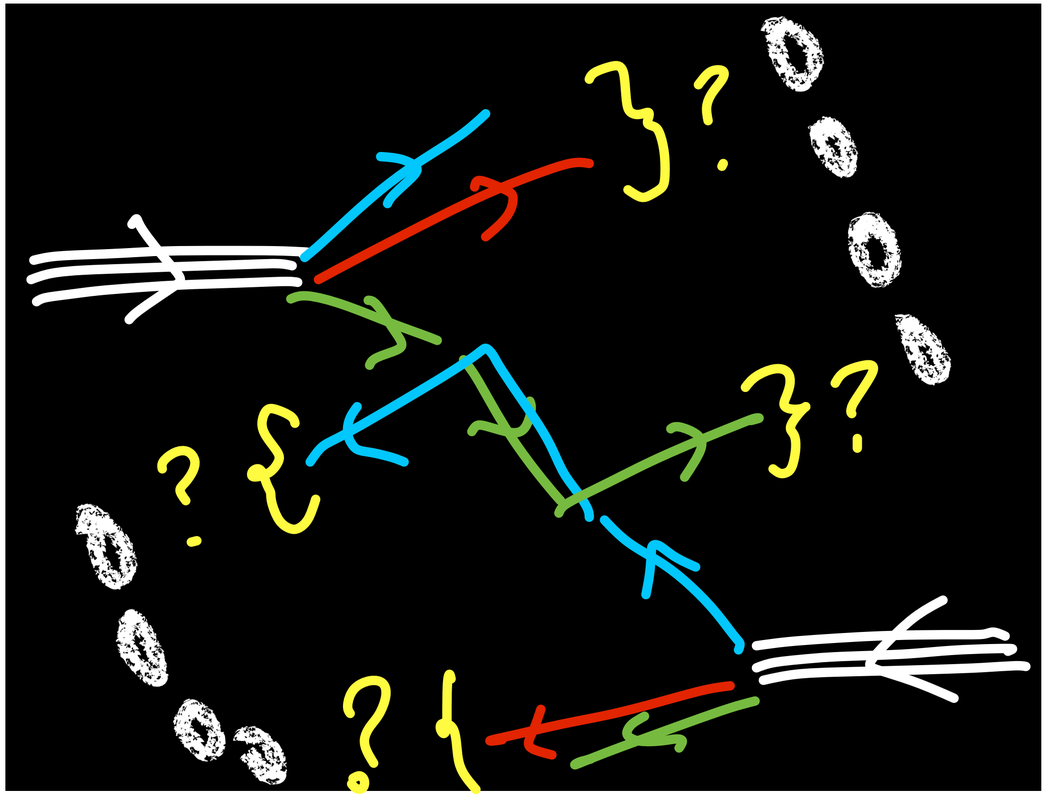


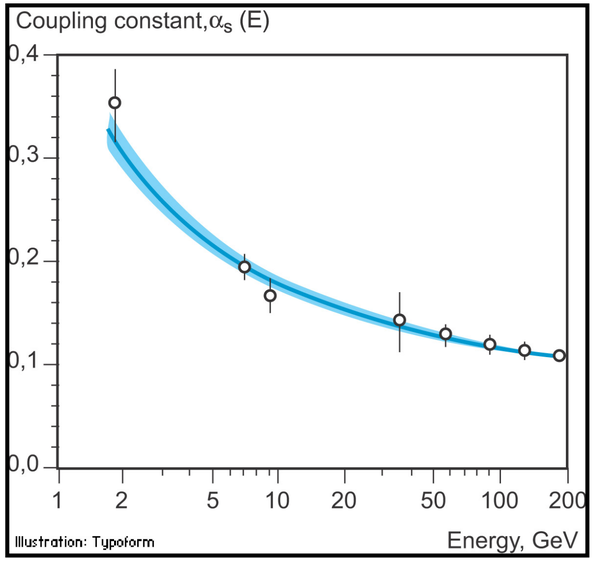
In an inelastic collision via the strong interaction the immediate products have colour charges ....

But below (beyond) few hundredths of MeV (1 fm) QCD does not permit coloured objects ...

Why forward?

https://www.nobelprize.org/prizes/physics/2004/popular-information/





A nonperturbatve process, called hadronisaton, occurs which breaks the strong resulting colour flows such that white hadrons can be formed in between the colour charges that are flying apart

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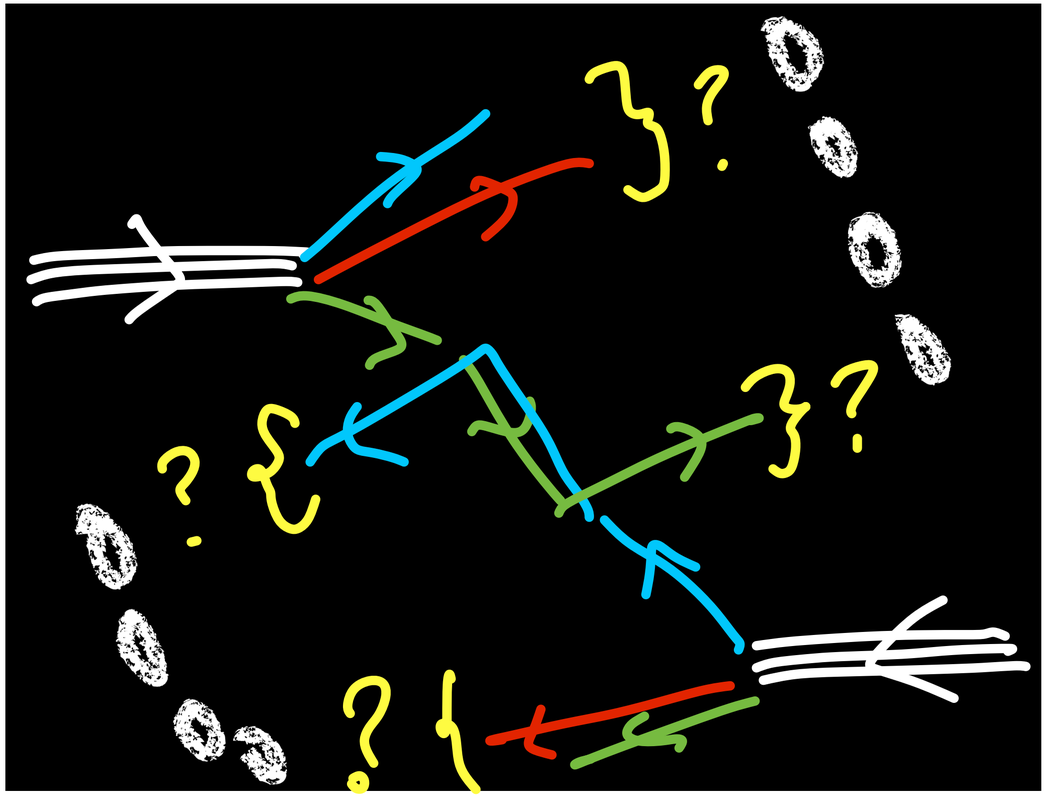

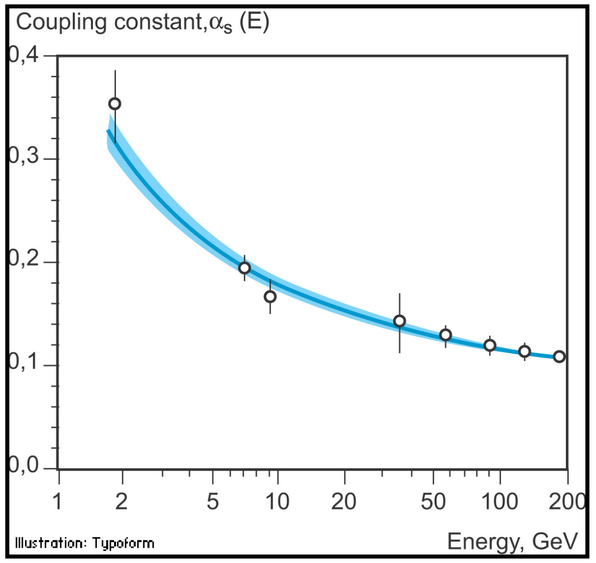

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The region near the direction of flight of the incoming target is called forward rapidity

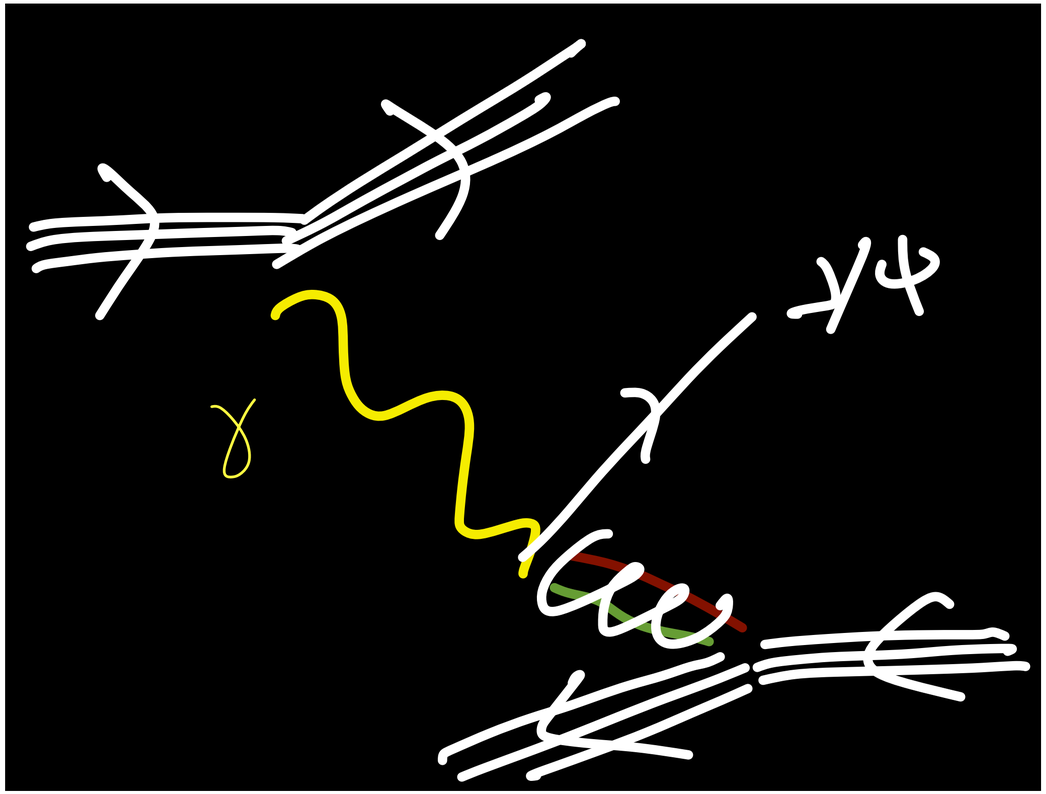
Diffraction

There are special configurations of colour fields that are able to interact strongly without a colour flow between the interacting nor scattered particles.

Such processes are called diffractive and, in some cases, are said to be mediated by the exchange of a pomeron

In perturbative QCD the simplest model involves the exchange of two gluons

Diffraction



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Requirements of FDD

We need a detector to tell us if the target underwent a diffractive interaction.

That is, it has to tell us if there was at least one particle at forward rapidity

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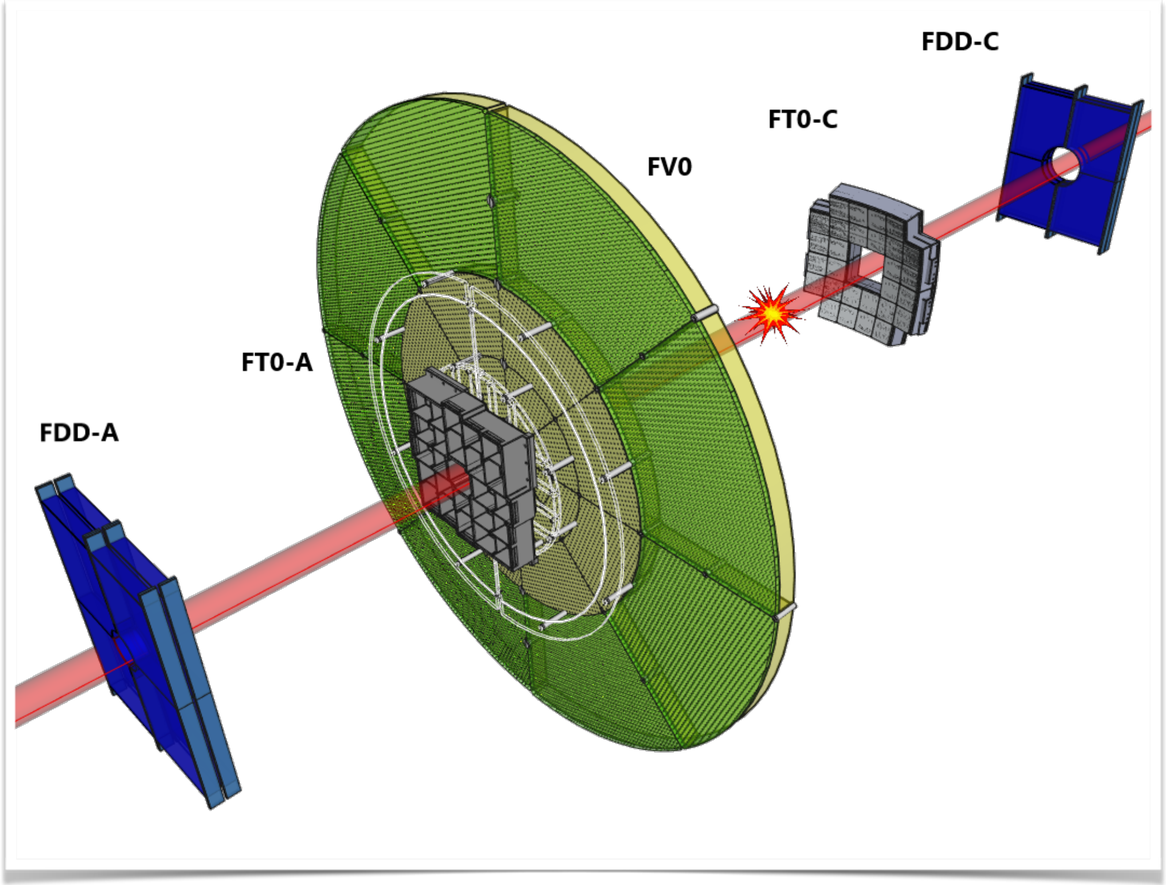
FDD

Fast

Sensitive to single MIPS

Covering small angles wrt the beam direction

The FDD



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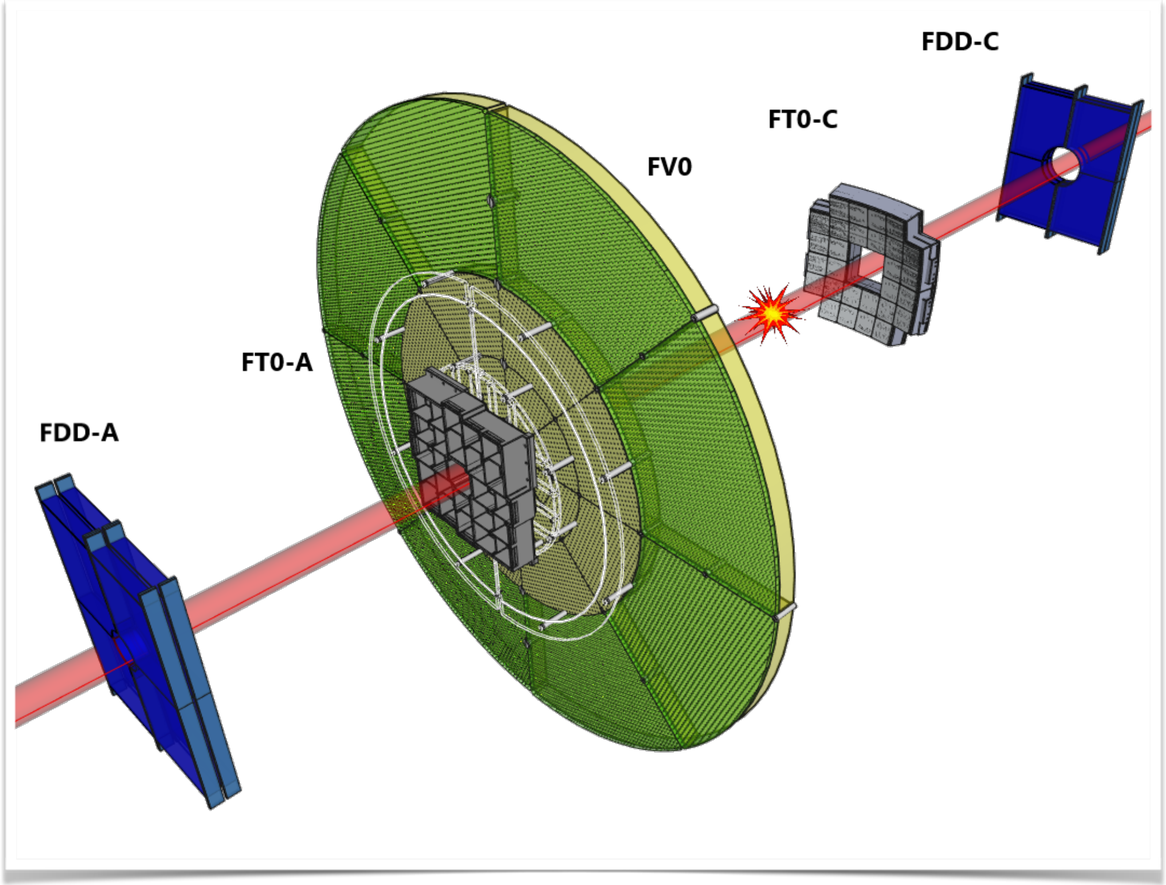
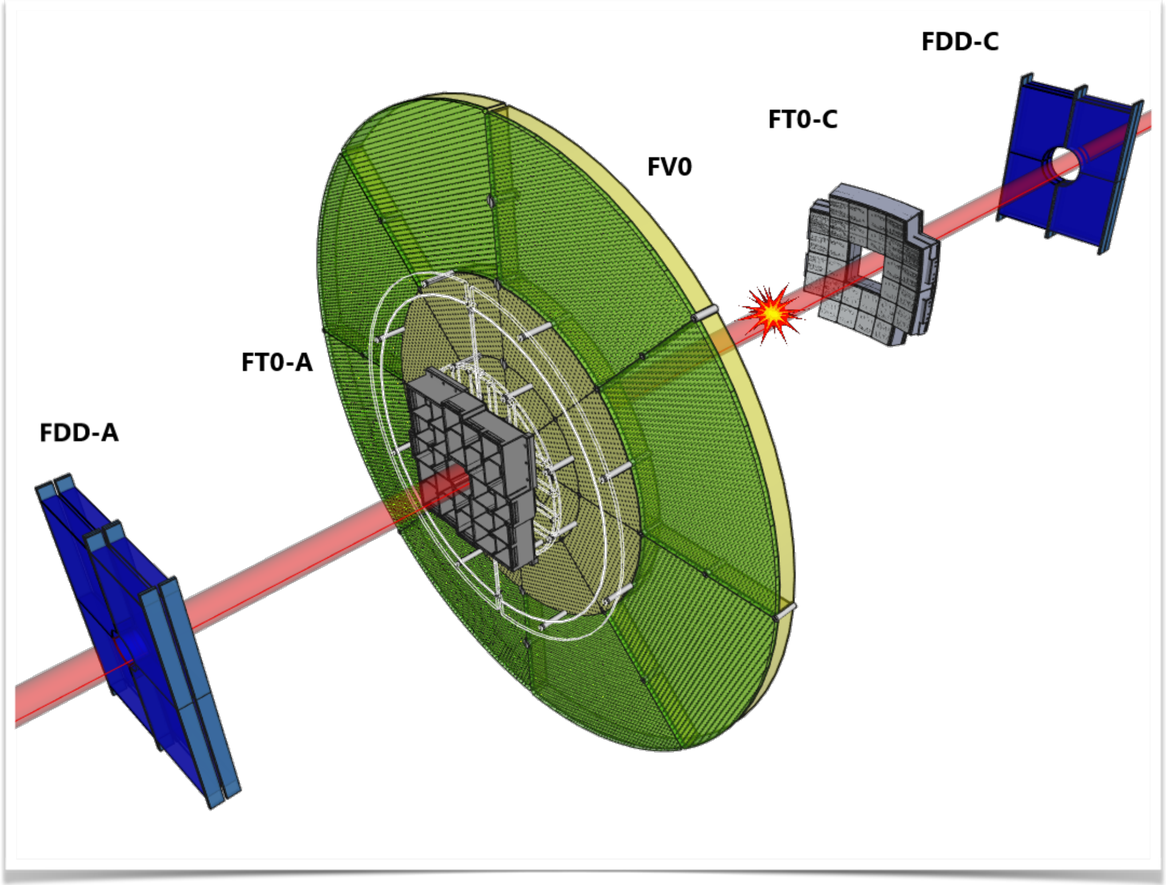


Two arrays: FDDA, FDDC
Each made of four sectors
Each sector made of two independent modules

The FDD



Two arrays: FDDA, FDDC
Each made of four sectors
Each sector made of two independent modules

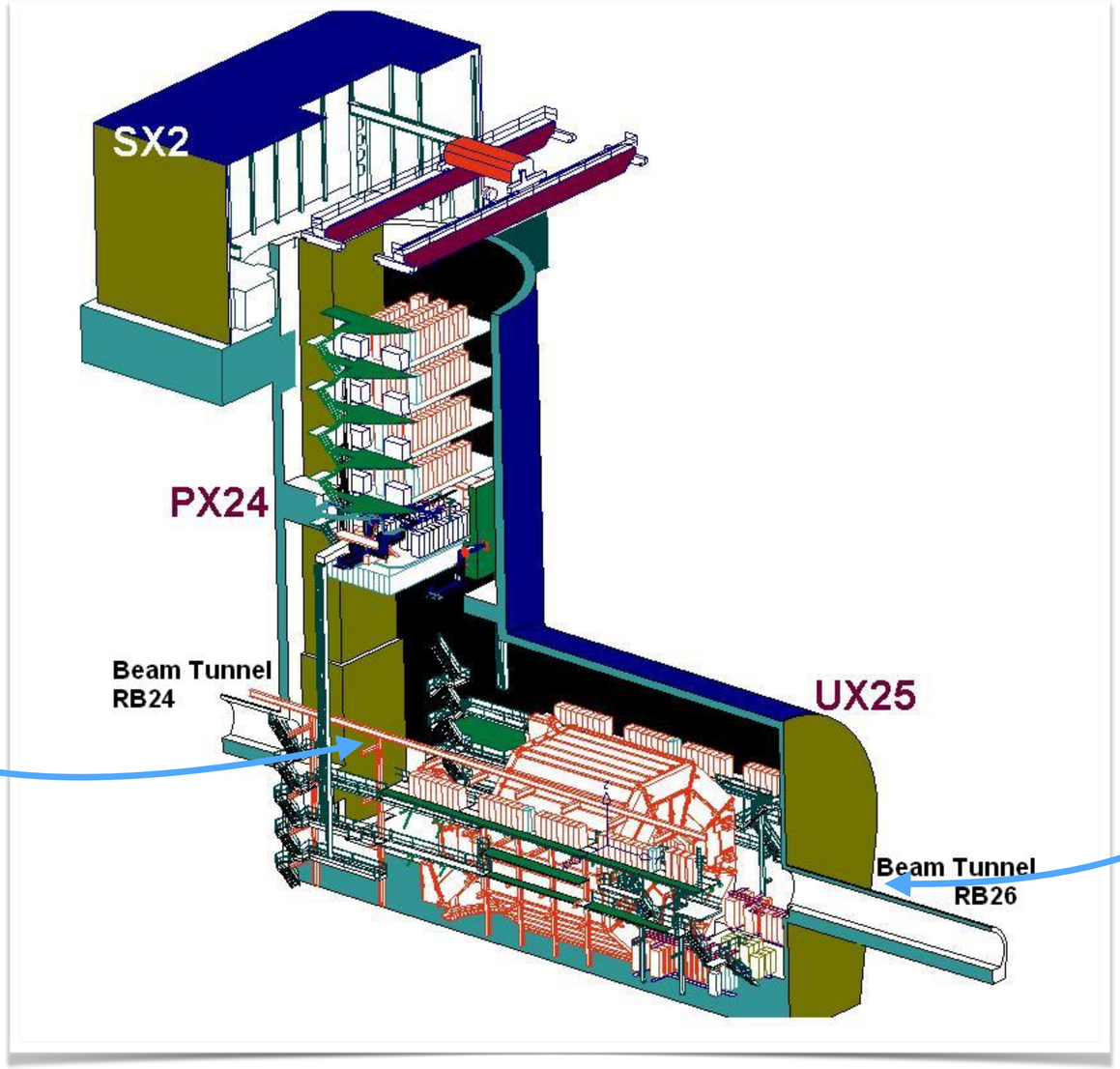
For each module:
Plastic scintillator
WLS
Clear fibers
PMTs
and cables, readout, calibration, …
… simulation

General overview

ALICE diagrams from: http://alice-detector-facilities.web.cern.ch/alice-detector-facilities/

FDD-A

FDD-C



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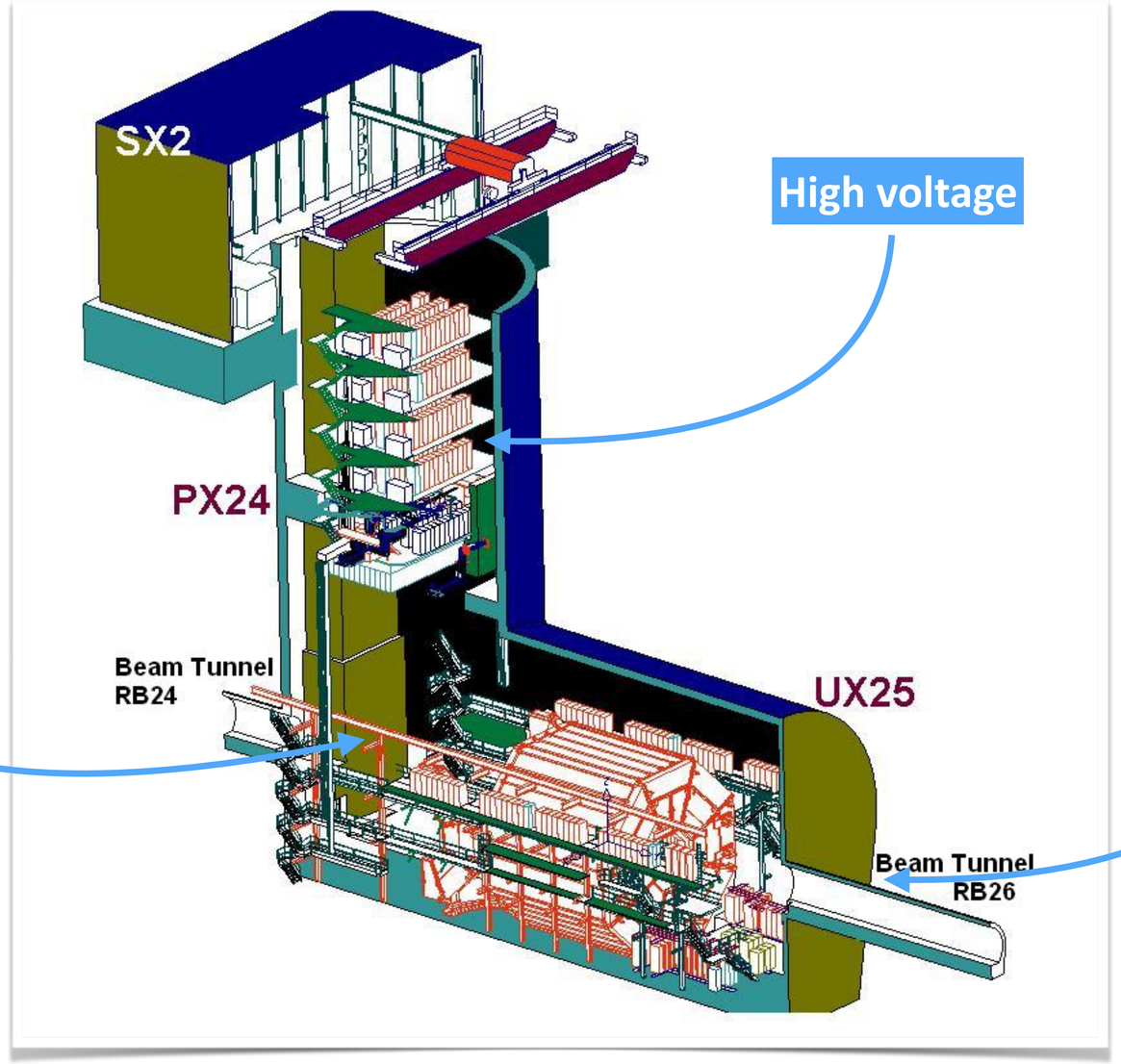

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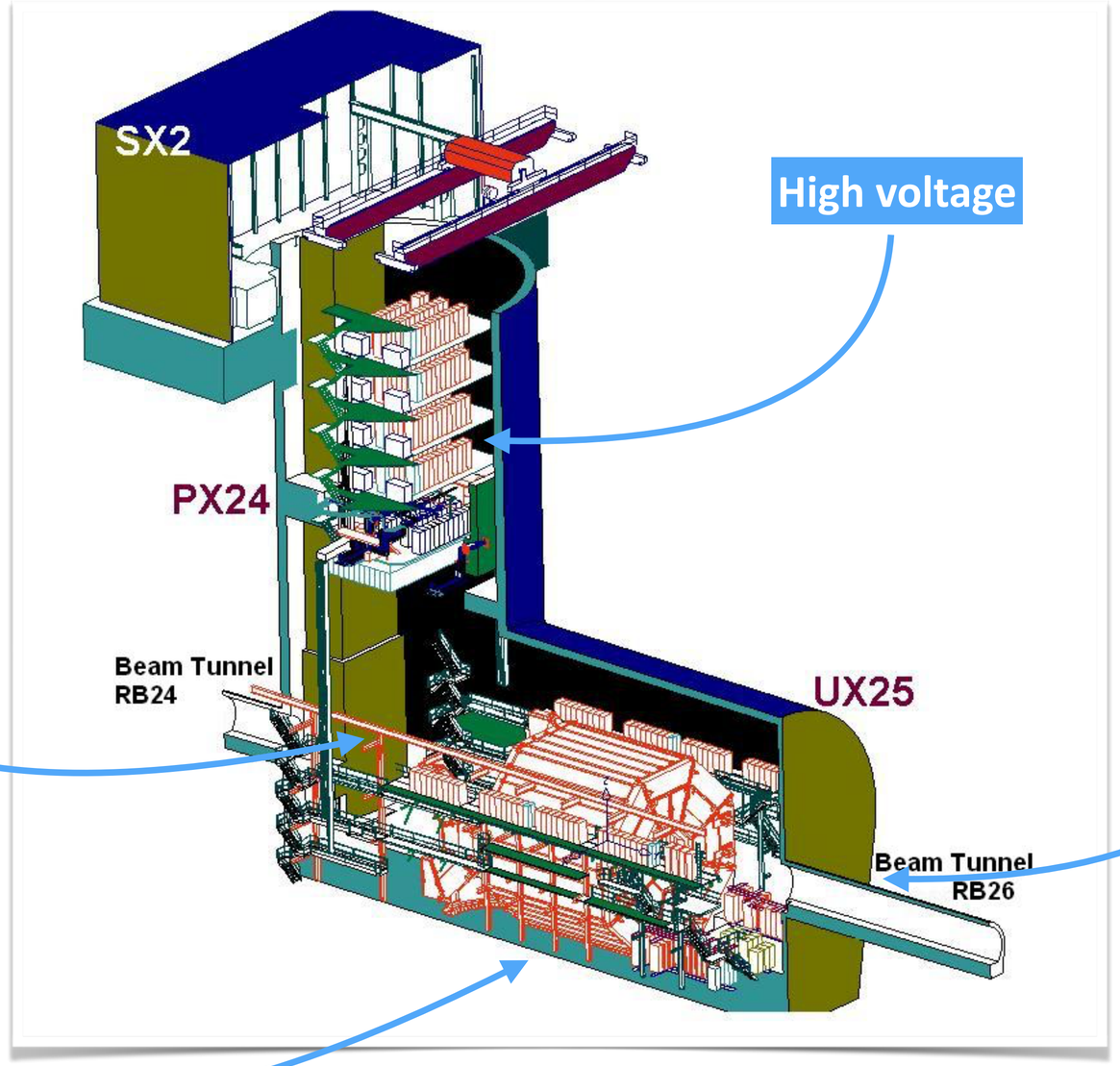
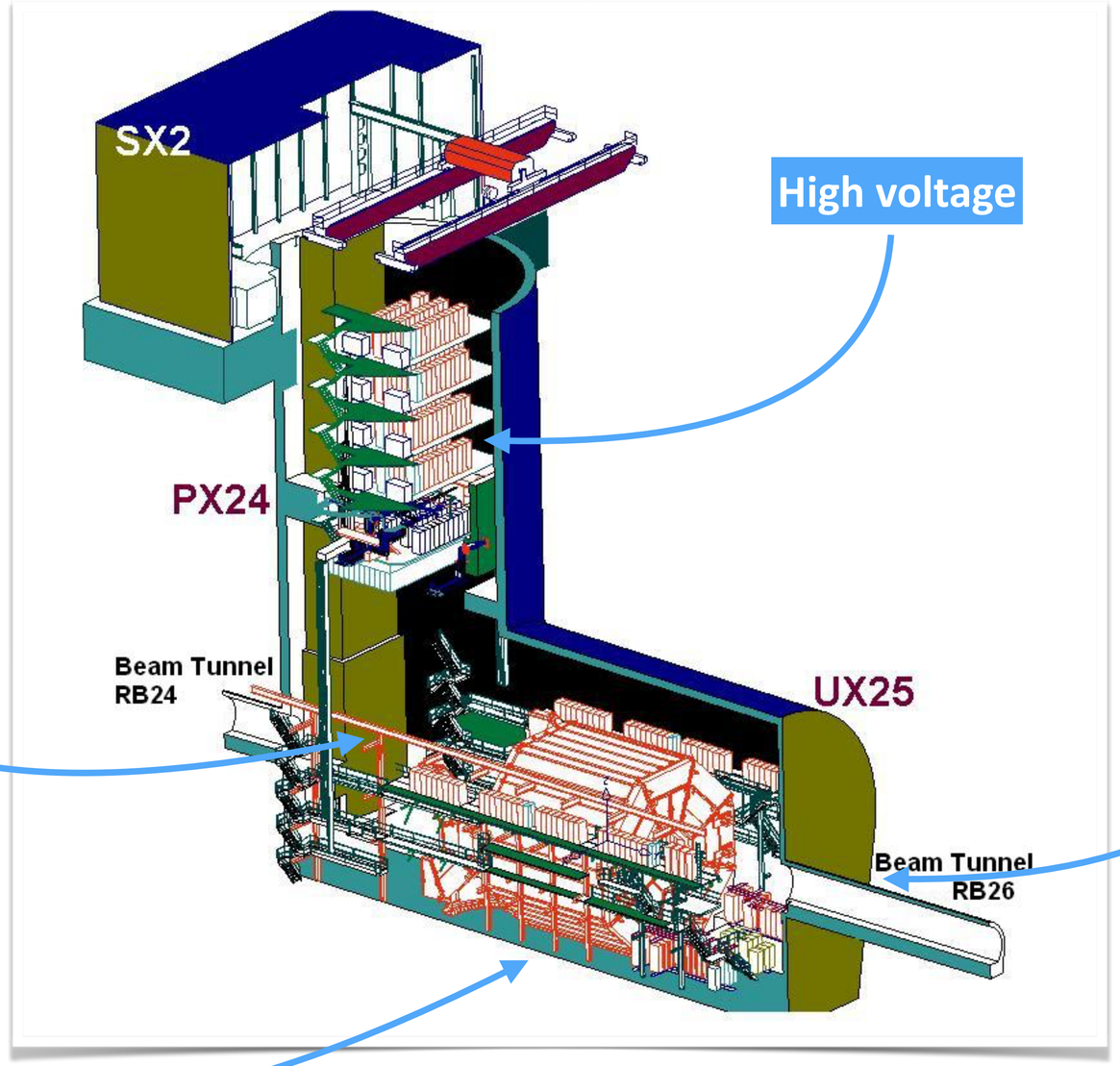


General overview

In addition DCS, DAQ, simulation, laser monitoring system ...



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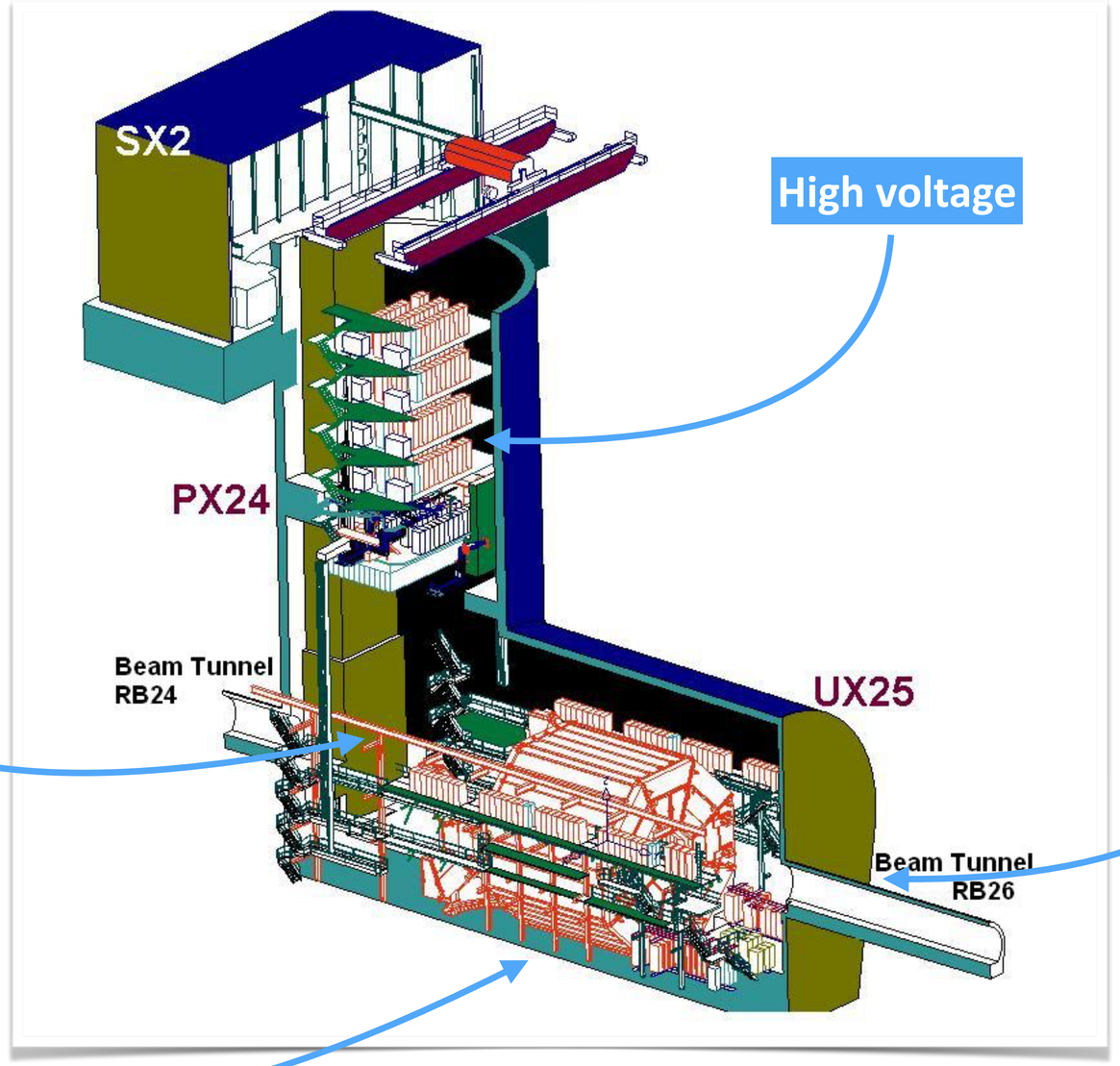

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... operation over many years ...

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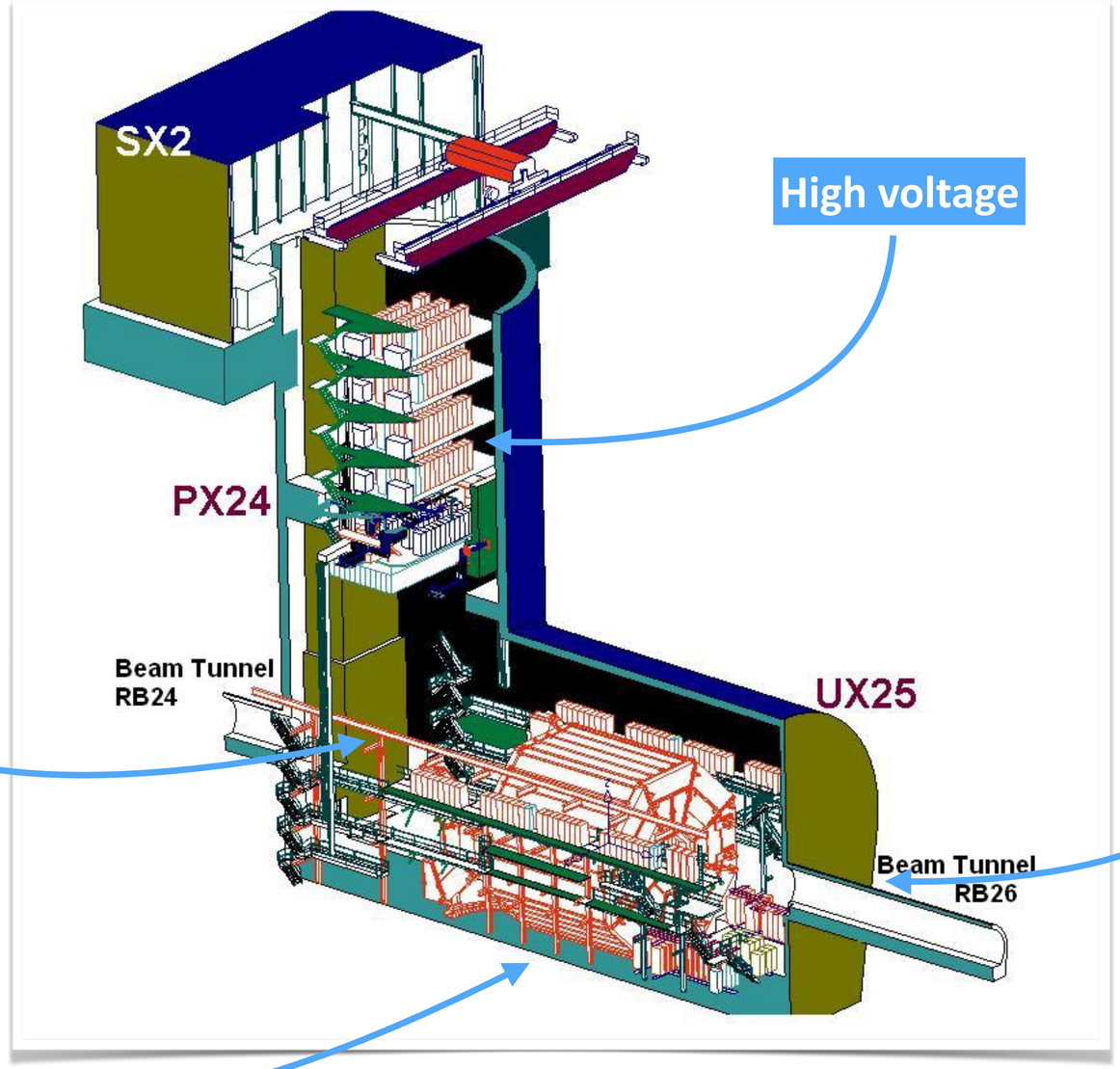

High voltage

FDD-A

FDD-C

Electronics

In addition DCS, DAQ, simulation, laser monitoring system ...

... operation over many years ...

… and lots of money (≈ 0.3 MCHF?) …

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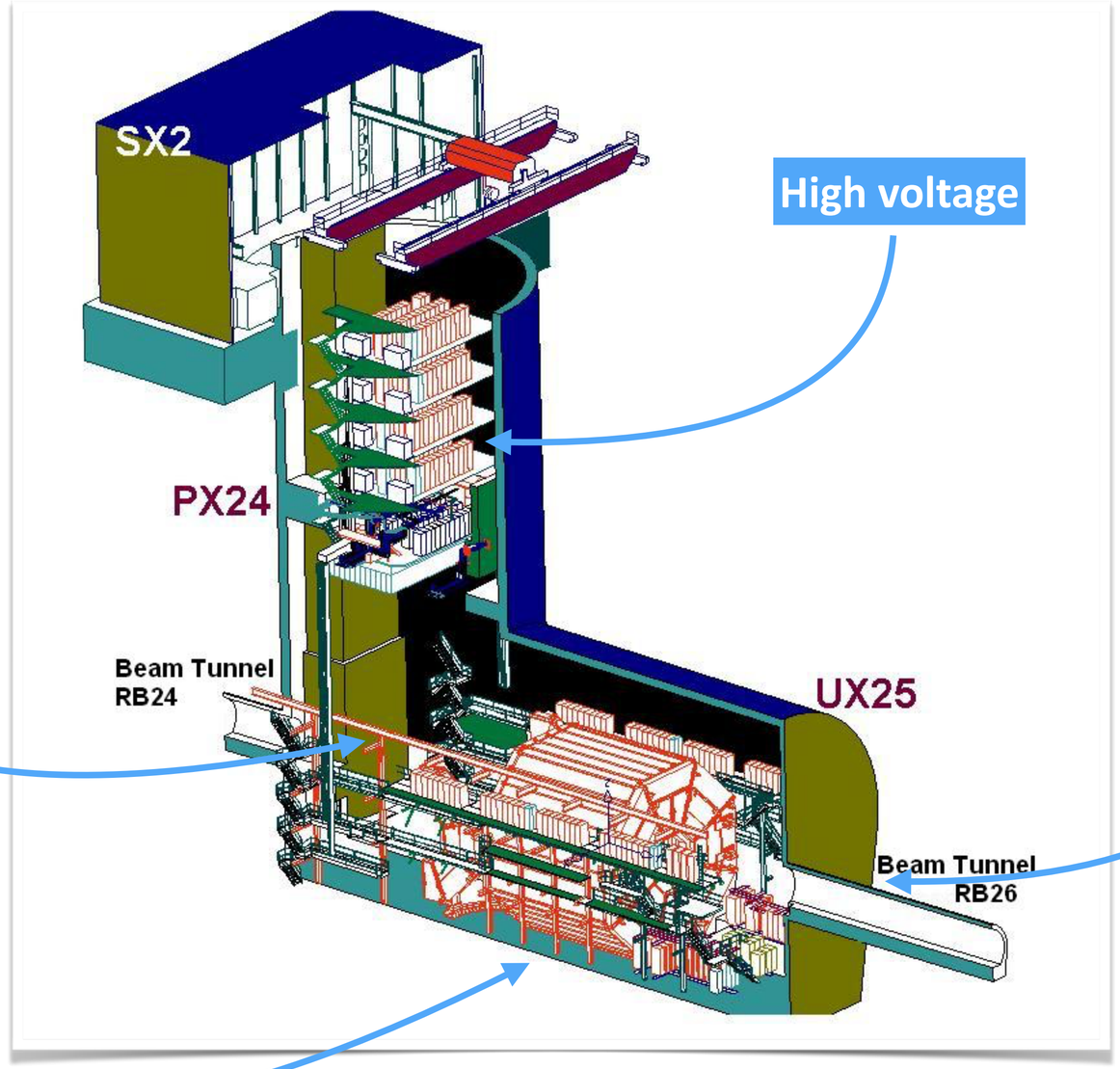

In addition DCS, DAQ, simulation, laser monitoring system ...

... operation over many years ...

… and lots of money (≈ 0.3 MCHF?) …

... and contribution to nice physics analyses and the corresponding papers :)

Let's build it!

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