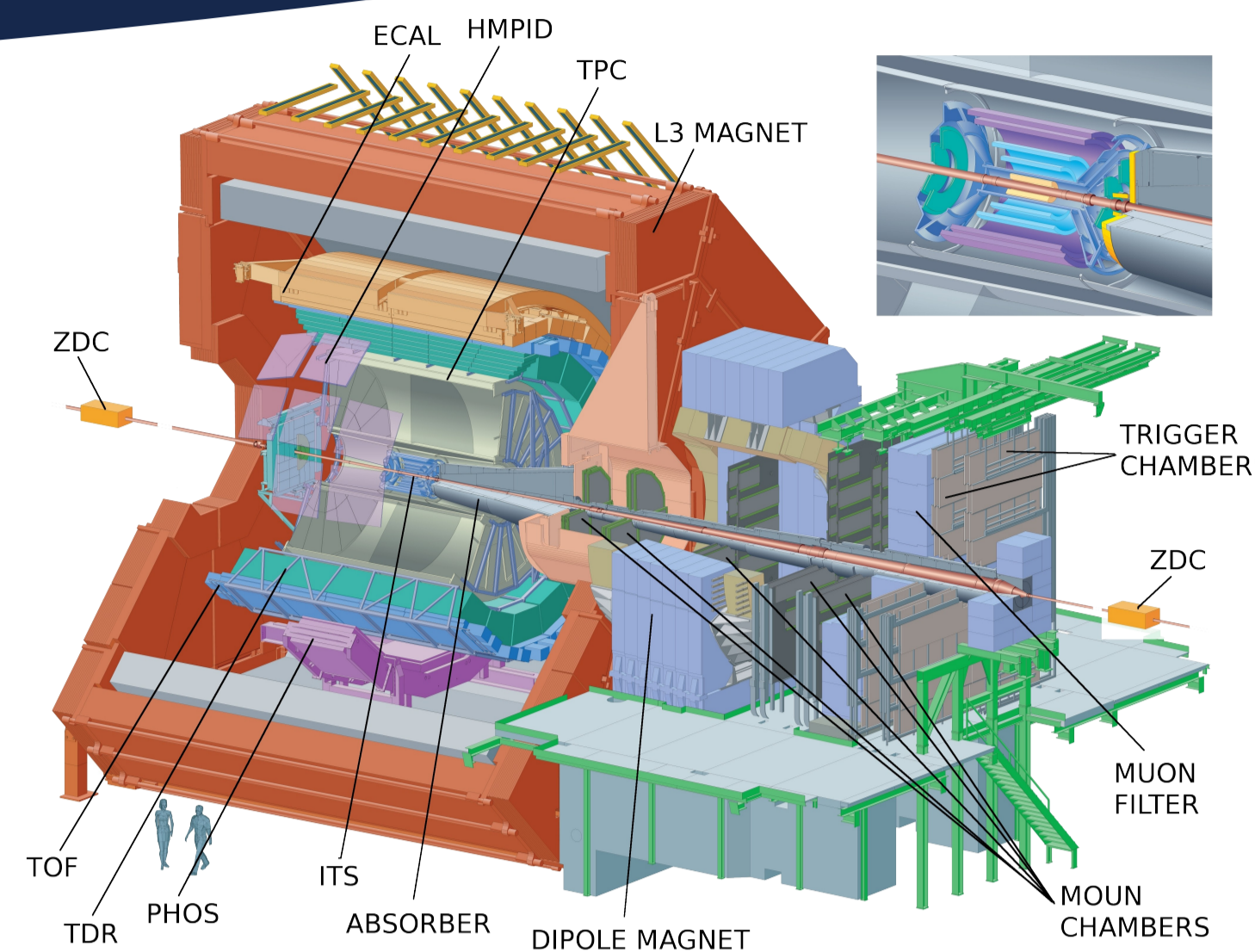


**Antonio URAS\***  
for the ALICE Collaboration

In the current ALICE setup, muons are detected at forward rapidities ( $2.5 < \eta < 4.0$ ) by means of the MUON spectrometer. This allows one to study:

- Quarkonia production
- Open Heavy Flavor (single muons and dimuons)
- Low mass dimuons

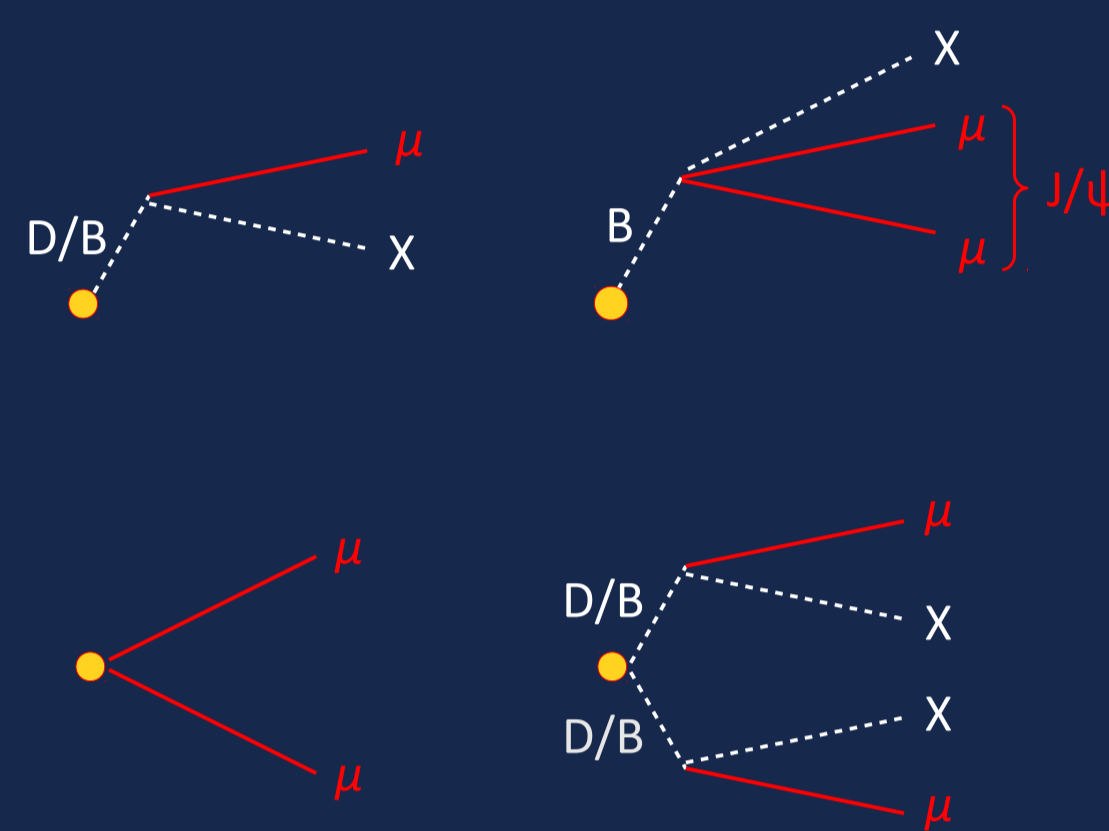
The presence of the hadron absorber is needed to identify the muons. At the same time, the absorber prevents the muon spectrometer to “see” the details of the vertex region



**The MFT concept:** to correct the “myopia” of the muon spectrometer, we perform a precise tracking of the particles before they enter the hadron absorber

The muon tracks measured in the spectrometer are extrapolated back to the origin and matched with the clusters left in the MFT

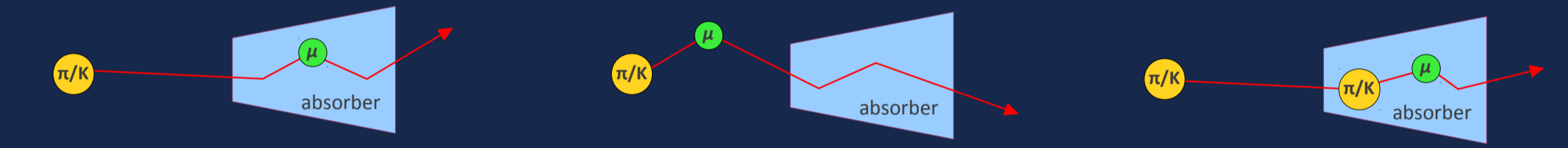
By measuring the muons' offset (transverse distance between the primary vertex and the muon track) we can distinguish between prompt and displaced muons and dimuons



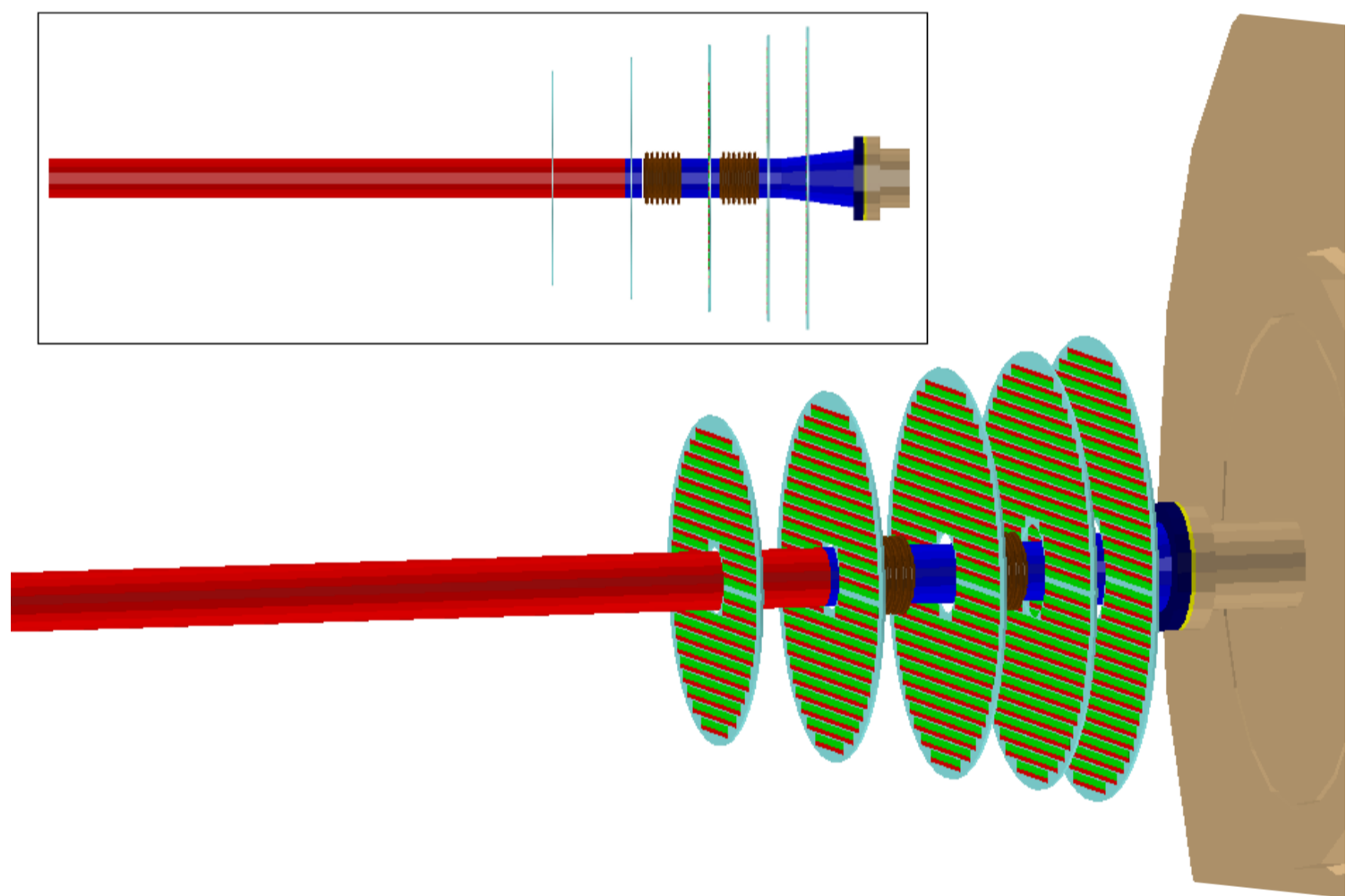
Open charm ( $c\tau \approx 150 \mu\text{m}$ ) and open beauty ( $c\tau \approx 500 \mu\text{m}$ ) will be disentangled on the basis of their offset distributions.  $J/\psi$  production from  $b$  will be identified

Background coming from semi-muonic decays of light flavored mesons (mainly  $\pi$  and  $K$ ) will be rejected applying a cut on both the offset and the matching quality between muon tracks and MFT clusters

The reduced uncertainty on the opening angle will significantly improve the mass resolution for all resonances, especially at low mass and low  $p_T$

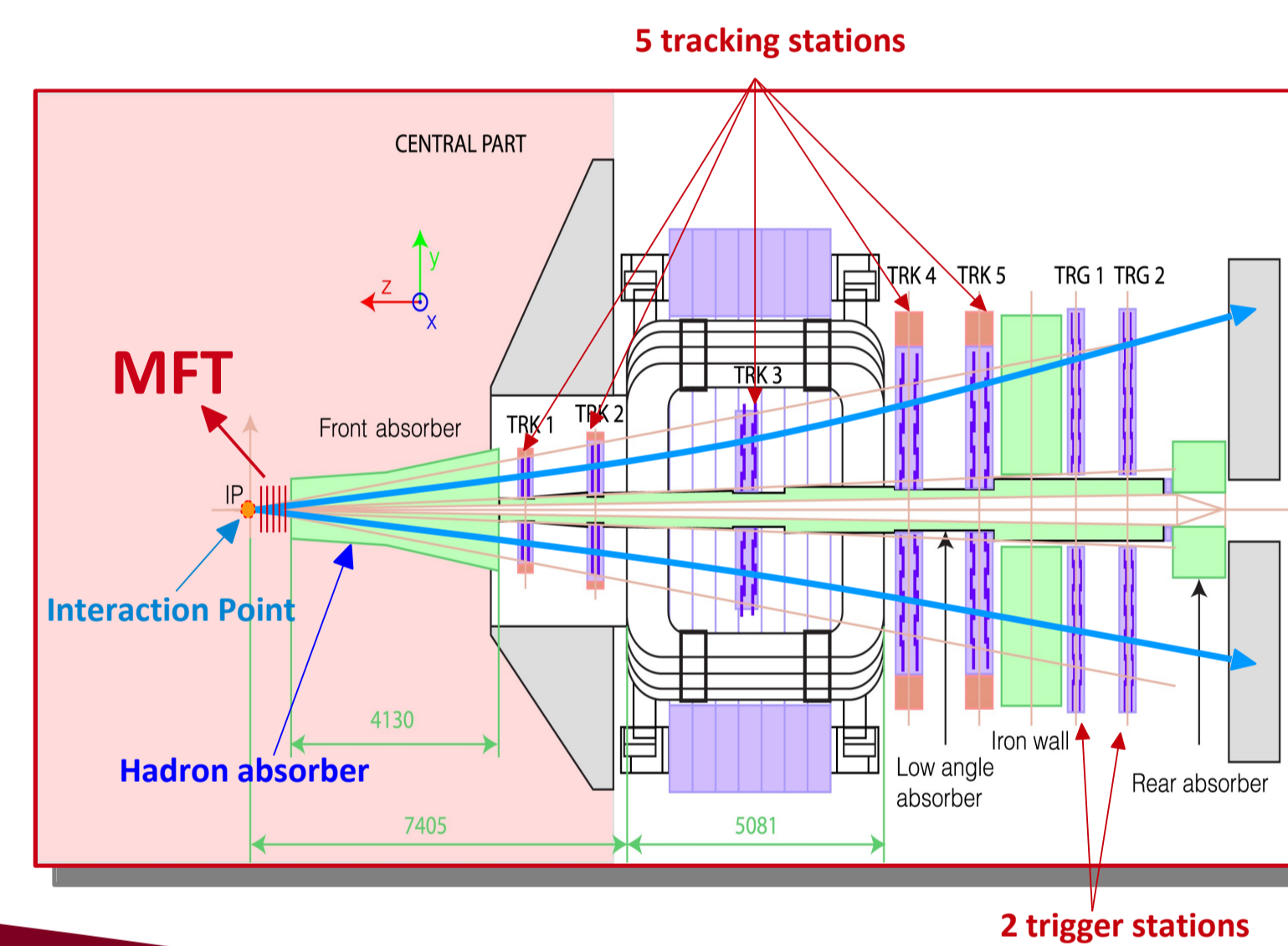


Several physics topics will profit from the MFT measurement capabilities: forward multiplicity, reaction plane and azimuthal anisotropies, trigger schemes, long range correlations, ...



Current MFT design specifications:

- 5 disk-shaped pixel silicon planes
- $25 \times 25 \mu\text{m}^2$  pixels
- 0.4 %  $x/X_0$  per plane
- z-positions between 50 and 76 cm from I.P.
- angular acceptance:  $3^\circ < \theta < 9^\circ$  as seen from the I.P.
- more than 3'000  $\text{cm}^2$  of active area



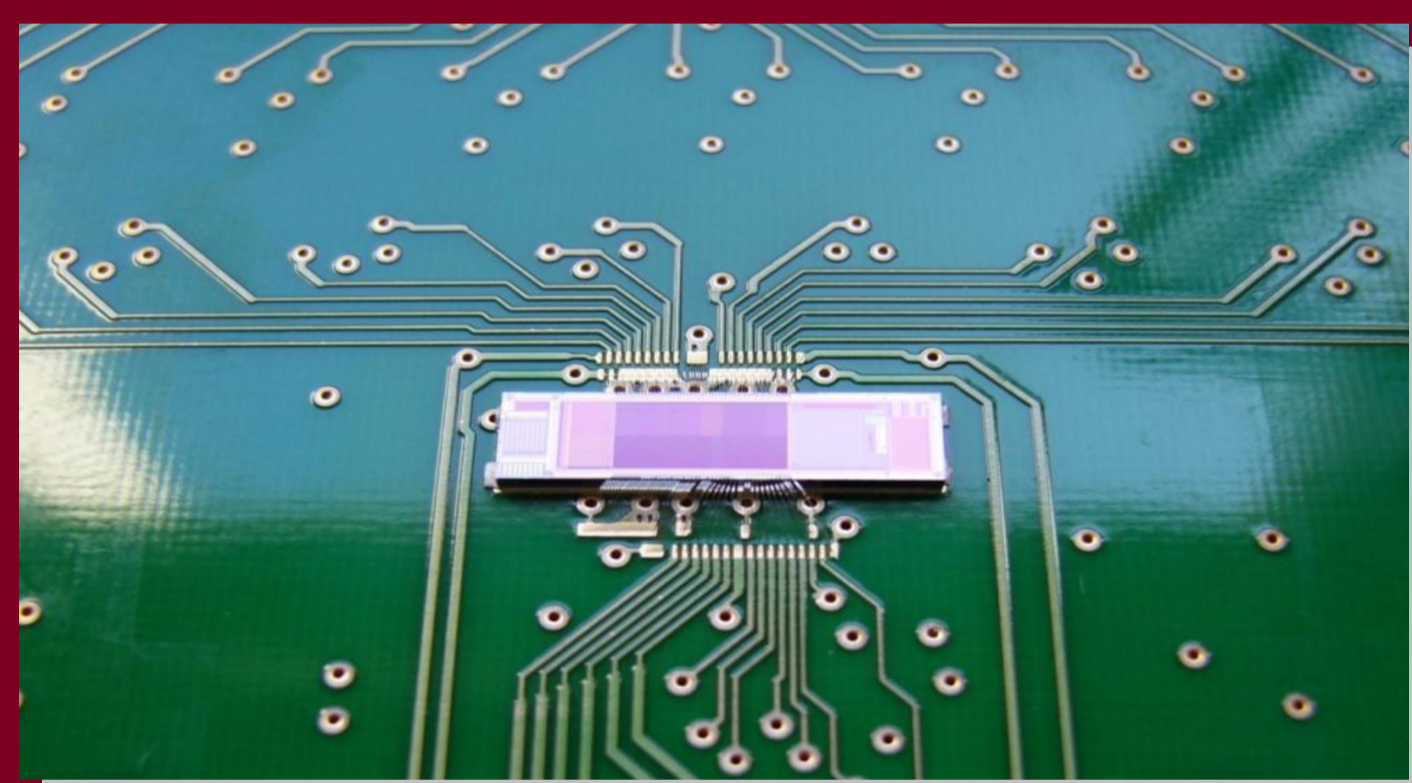
The MFT support structure will also provide support for the ALICE beam pipe

Thermal isolation is needed:  $\sim 1 \text{ kW}$  of thermal power must be dissipated by air flow and/or liquid cooling

Several integration scenarios under study: the MFT must be easily extractable during LHC winter shutdowns

CMOS technology will be used for the pixel sensor. Good trade-off between:

- high granularity
- low material budget
- power consumption
- radiation tolerance
- costs

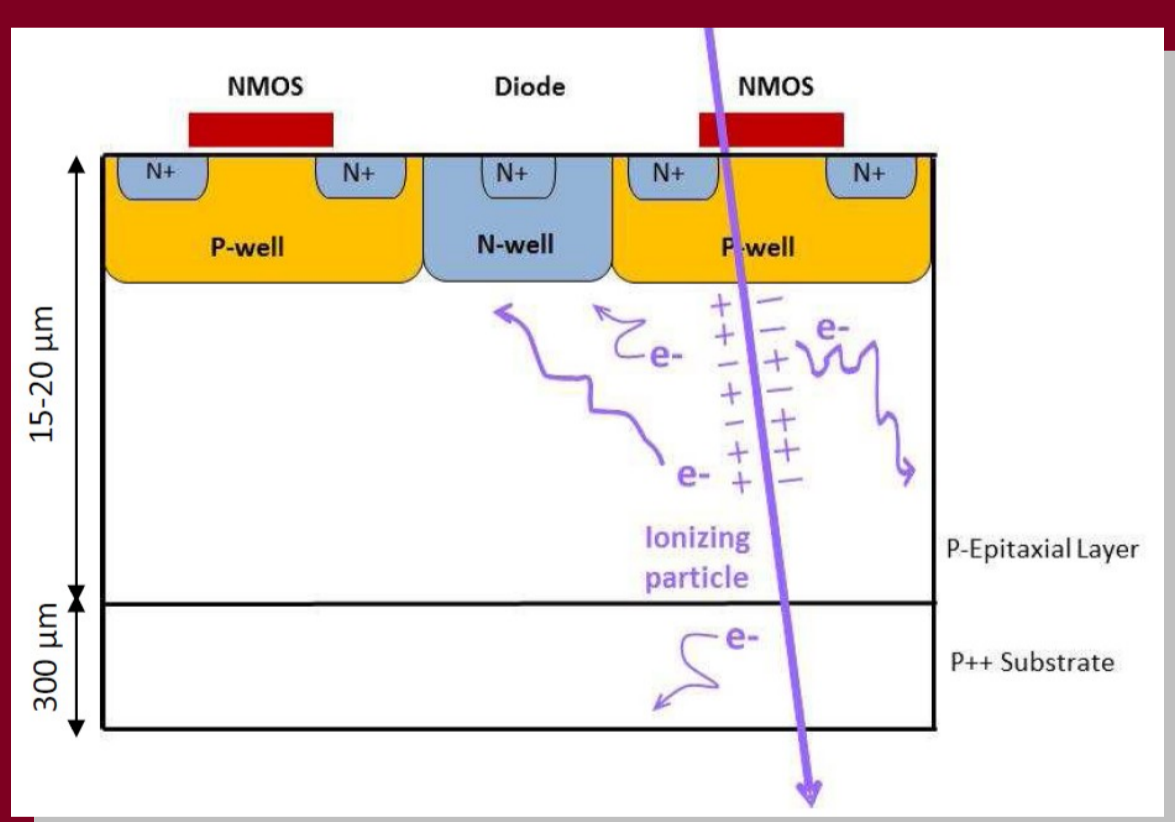


The architecture proposed for the MFT CMOS sensor is mainly based on the one of the MIMOSA26 CMOS sensor

Pixel size:  $18.4 \mu\text{m}$

Readout speed:  $T \sim 150 \text{ ns}$  per row

Radiation tolerance: few 100 kRad

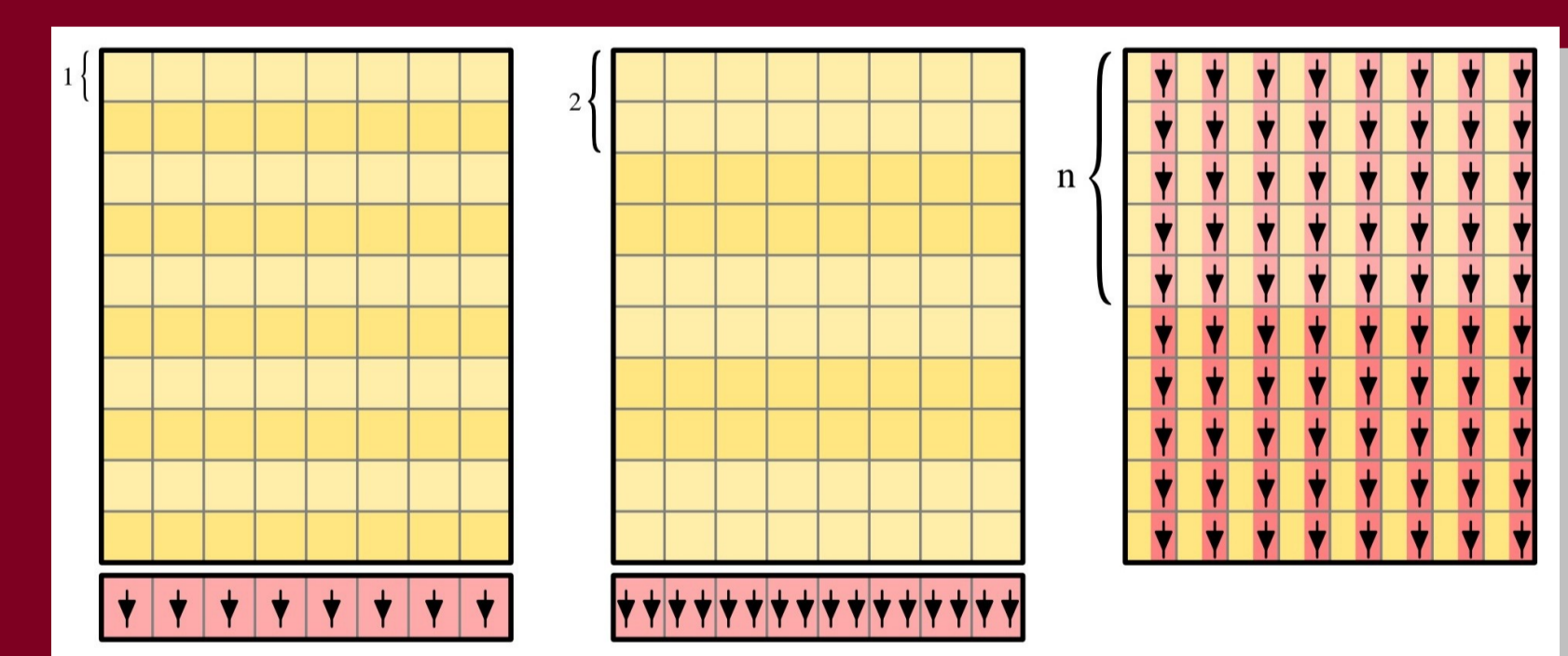


For the MFT project, the main parameter of the sensor to be improved is the readout time

Target interaction rate for ALICE after 2018 (high-luminosity Pb-Pb):

- Pb-Pb interactions at 50 kHz

Target for the MFT: no pile-up in Pb-Pb collisions (interactions every 20  $\mu\text{s}$ ), no ambiguity in assigning muon tracks to vertex



NOMINAL

1 discr/column  
Readout time:  
 $T \cdot n_{\text{row}}$

IMPROVED

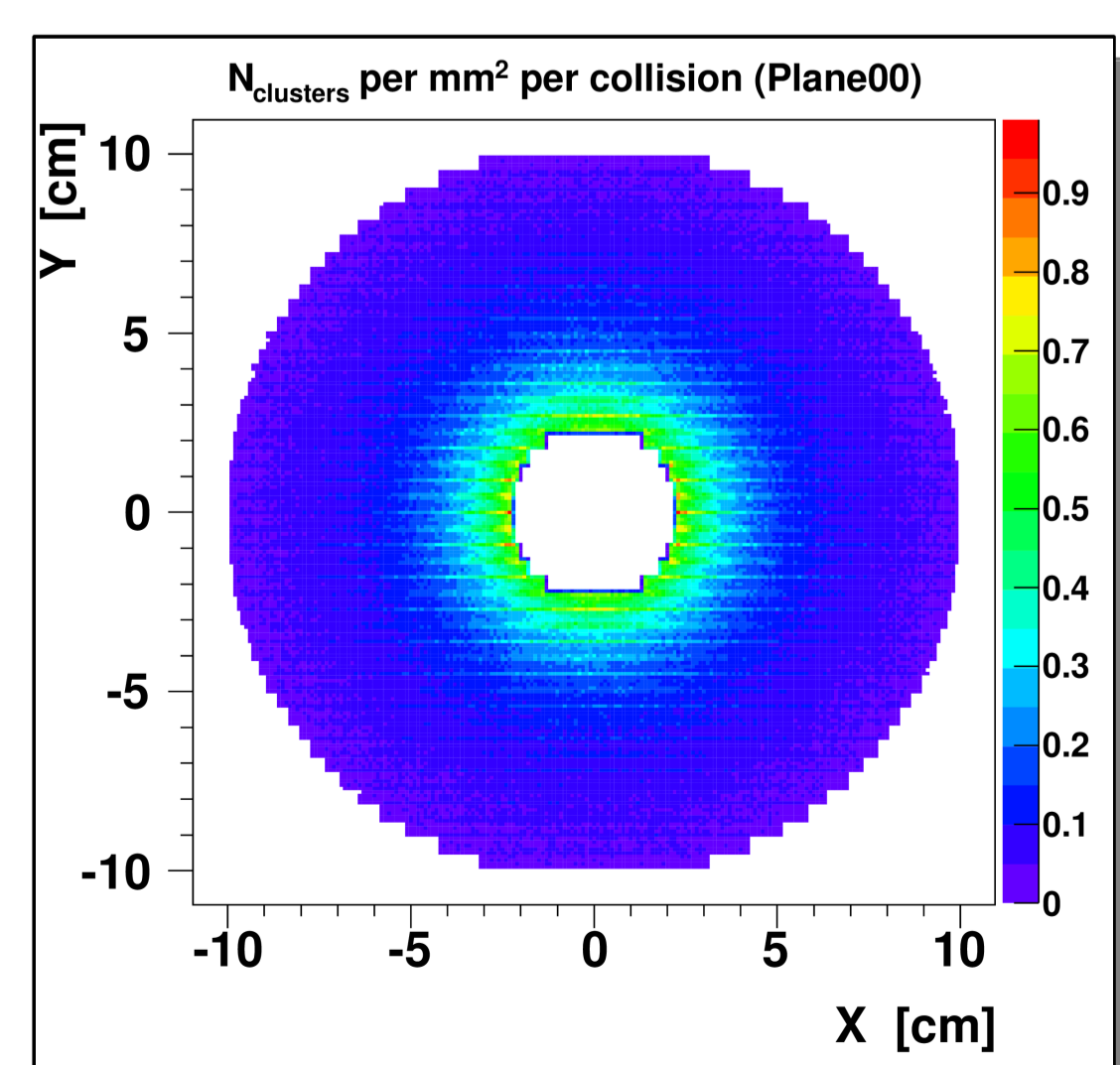
2 discr/column  
Readout time:  
 $(T \cdot n_{\text{row}})/2$

NEW CONCEPT

1 discr/pixel  
Readout time:  
 $(T \cdot n_{\text{row}})/n$

Track density below 1 track per  $\text{mm}^2$  in central Pb-Pb collisions even in the tracking planes closest to the I.P.

Residual misalignments to be estimated: preliminary studies suggest that it should have a negligible impact on the MFT physics. Systematic studies are ongoing



Preliminary results for Low Mass Dimuons:

- Mass resolution improvement: up to factor  $\sim 3$  for resonances  $\omega$  and  $\phi$
- Cut on single muons' offset allows us to improve the Signal/Background ratio
- Reducing combinatorial background: smaller systematic uncertainties on signal extraction

