Motivations de physique pour un upgrade du spectromètre à muons. Quelques constraintes expérimentales

Discussions informelles entres collègues

IN2P3

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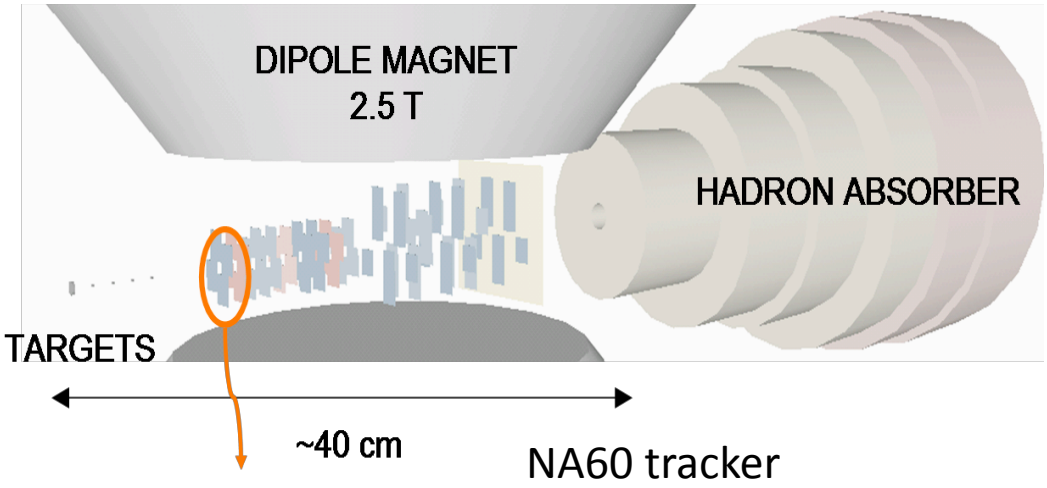
What we do need to understand to consider quarkonia as a QGP probe

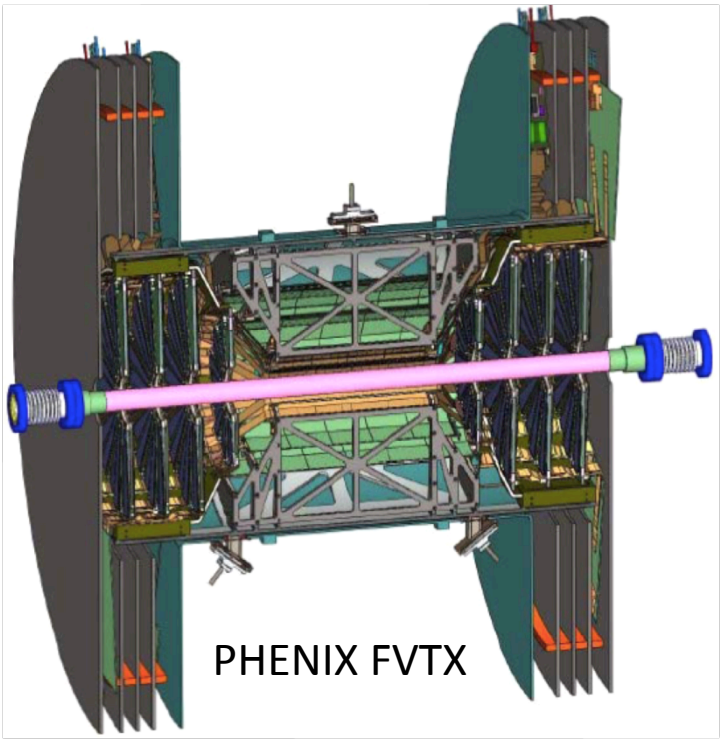
Subjacent mechanism	Current detector and LHC perform.	Comments
Feed-down from higher res.	Ok for ψ' and upsilon familiy. Bad for χ_c.	For ψ' significance is not very good. Reducing combinatorial bck would help. Upsilon family statistics is limited. Lighter system like Ar+Ar (Xe+Xe ?) would help.
Shadowing	Ok via p+Pb	
Normal Absorption	Ok via pPb and pAr	pAr is not foreseen. But it is crucial to probe the QGP (Main lesson from RHIC)
Open charm and beauty prod.	Ok for beauty. Not optimal for charm	Muon from charm contributes more that beauty muons at low pT where the muon for pi and K are dominant.
Charmonia from B decays	Possible in an indirect way.	DCA of the muon tracking has bad resolution due to absorber multi-coulomb scattering.

Quarkonium becomes then a probe of the QGP (like at SPS)

Na50 and Phenix upgrades

- Both experiment have chosen a similar upgrade: Silicon Tracker in front of their respective absorbers





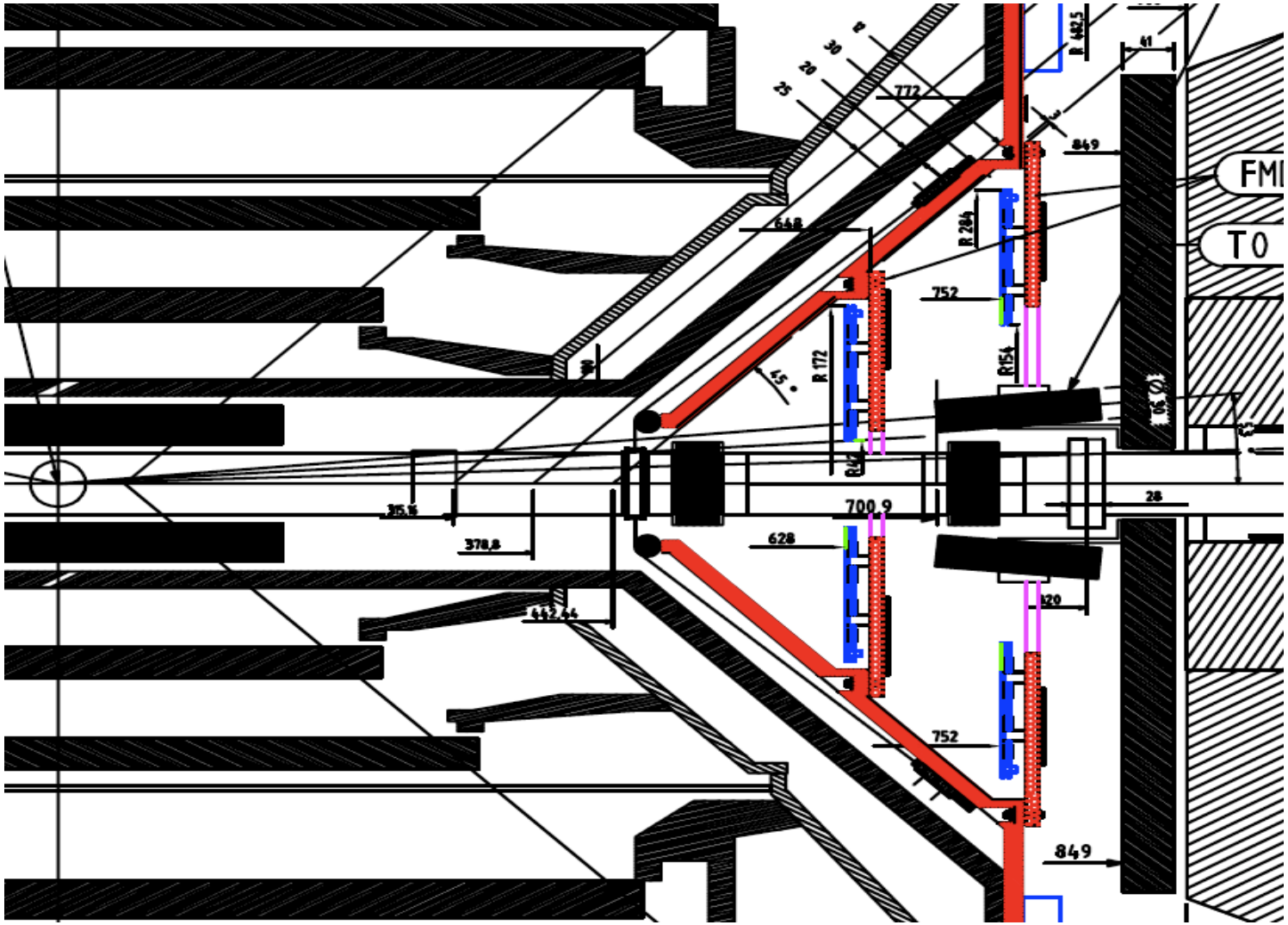
High resolution muon vertexing is available then:

- Combinatorial background can be reduced via DCA analysis (important for ψ' and χ_c);
- Muon from charm can be discriminated from kpi-muons;
- Additional constraint to beauty/charm muon analysis due to the different $c\tau$ values;
- Charmonia from B can be tagged (b-physics);
- Measurement of Drell-Yan;
- Thermal dimuon production?

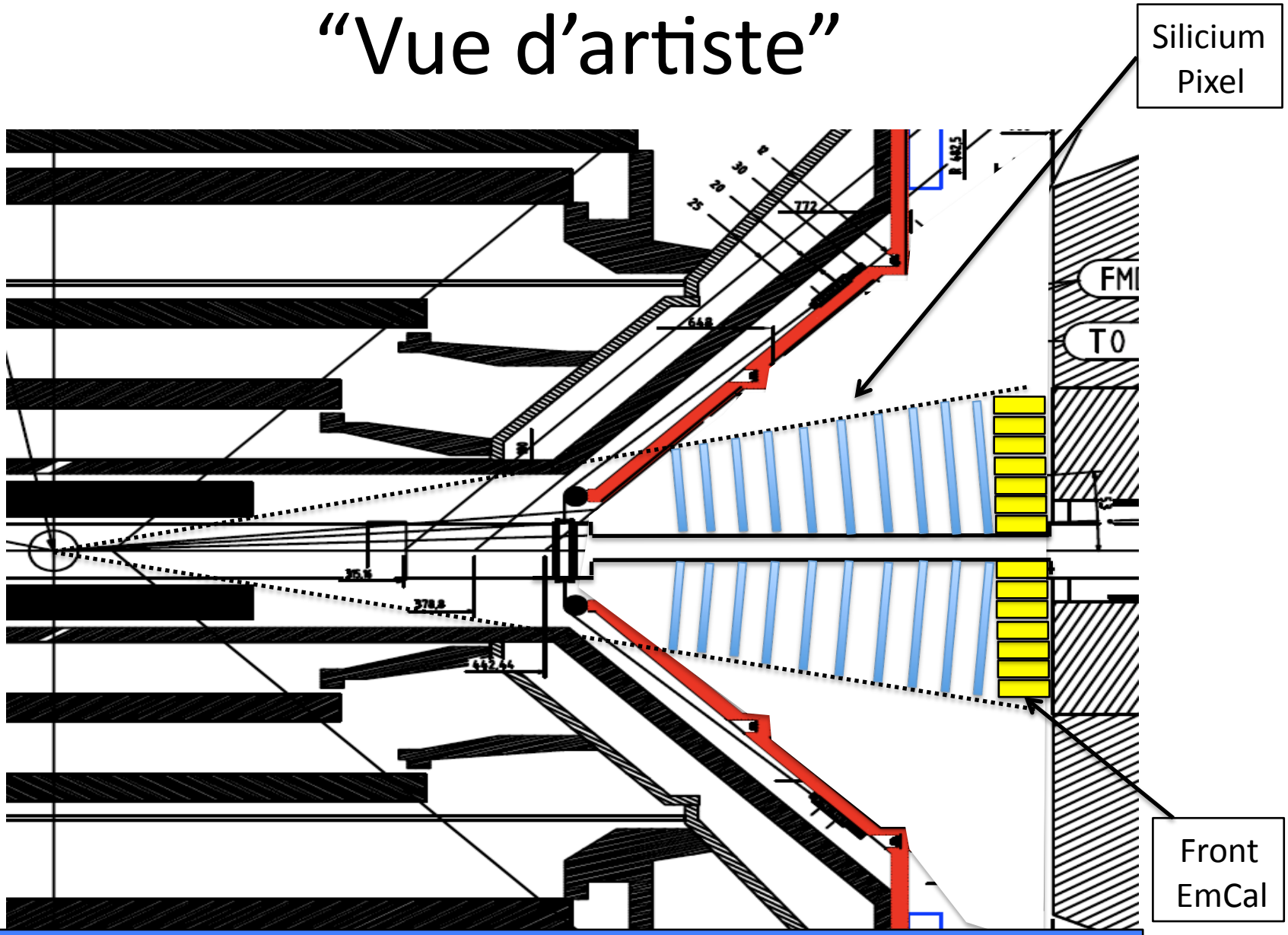
If em calorimetry is available in the muon acceptance region

- The feed-down form χ_c can be measured;
- But only in pp and pA;

Forward region in front of the absorber



“Vue d’artiste”



Draft of the JRA proposal for the I3HP2 (J.Y. Grossiord)

Comment and some parameters

- Modification of the Be beam pipe;
- Removing FMD_C and T0C (V0C ?);
- Acceptance $2.5<\eta<3.5$;
- R_{min}=2.7 cm and R_{max} from 8.6 to 14 cm;
- if 10 detection planes, surface of 0.60 m^2;
- Pixel technology ~10 microns resolutions;
- ~ 100 millions channels per plane (10x50 microns);
- Thickness ~50 microns;
- At pT=2 GeV, bending of 15 microns per cm in the transverse plane;
- If R_m=2cm, 150 channels in the EMCAL;

People

- Groups involved in the muon spectrometer;
- Informal discussions with ALICE colleagues working in the SPD (Padova, Bari) and FMD group from Copenhagen;
- …

Questions to be addressed

- "*Realistic*" geometry;
- Low multiplicity environment (pp):
  - DCA resolution;
  - pT resolution;
  - Tracking efficiency;
  - Matching efficiency;
- High multiplicity environment :
  - Determine the maximum allowed multiplicity;

Feasibility studies are being done by the Lyon Group (L.D.)