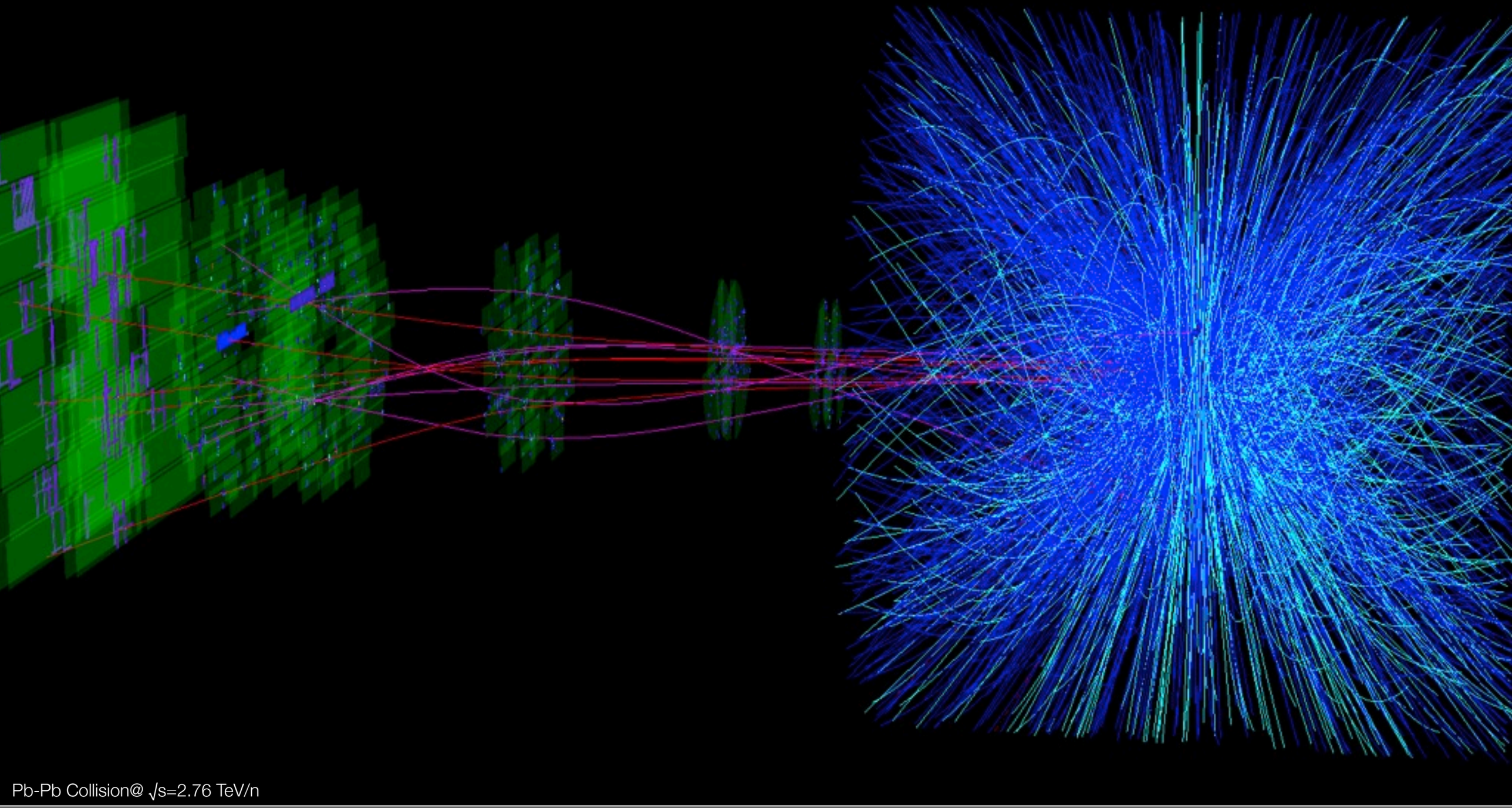


Pb-Pb Collision@ √s=2.76 TeV/n

QGP Strategy

Krakow Meeting Sept. 2012

A. Baldisseri

Irfu

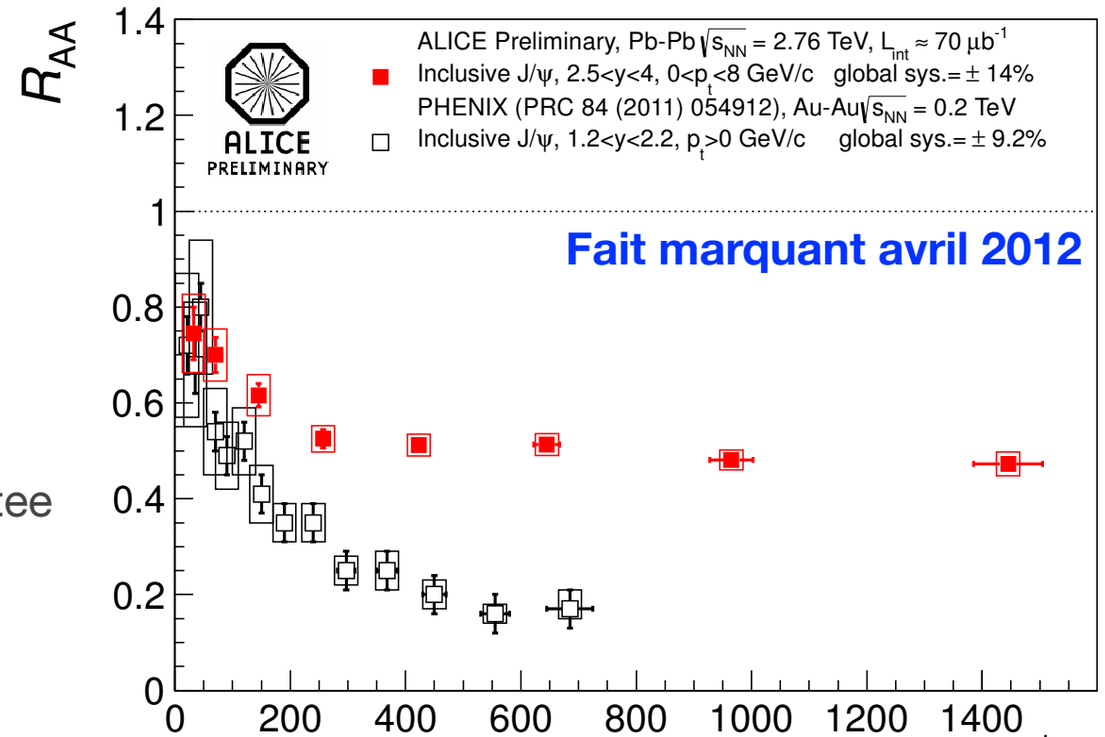
4/09/2012

Outlook

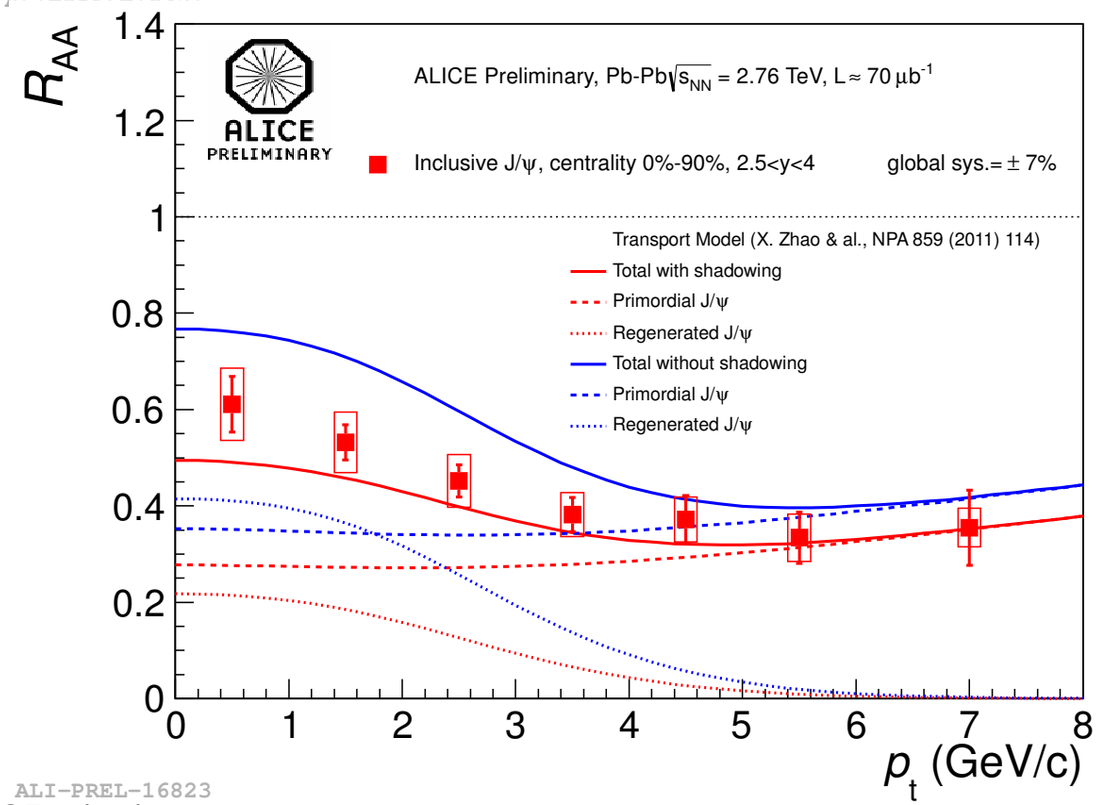
- Positioning of IRFU in the QGP
- ALICE roadmap
- The European Startegy Group (ESG)
- Heavy Ion Strategy
  - In France
  - In ALICE
  - In the QGP community

Physics topics at Saclay

- Quarkonia study
  - R_{AA}: The J/Psi nuclear modification factor
  - J/Psi less supressed at LHC wrt RHIC
  - Saclay in Paper Committee / Internal Rev. Committee

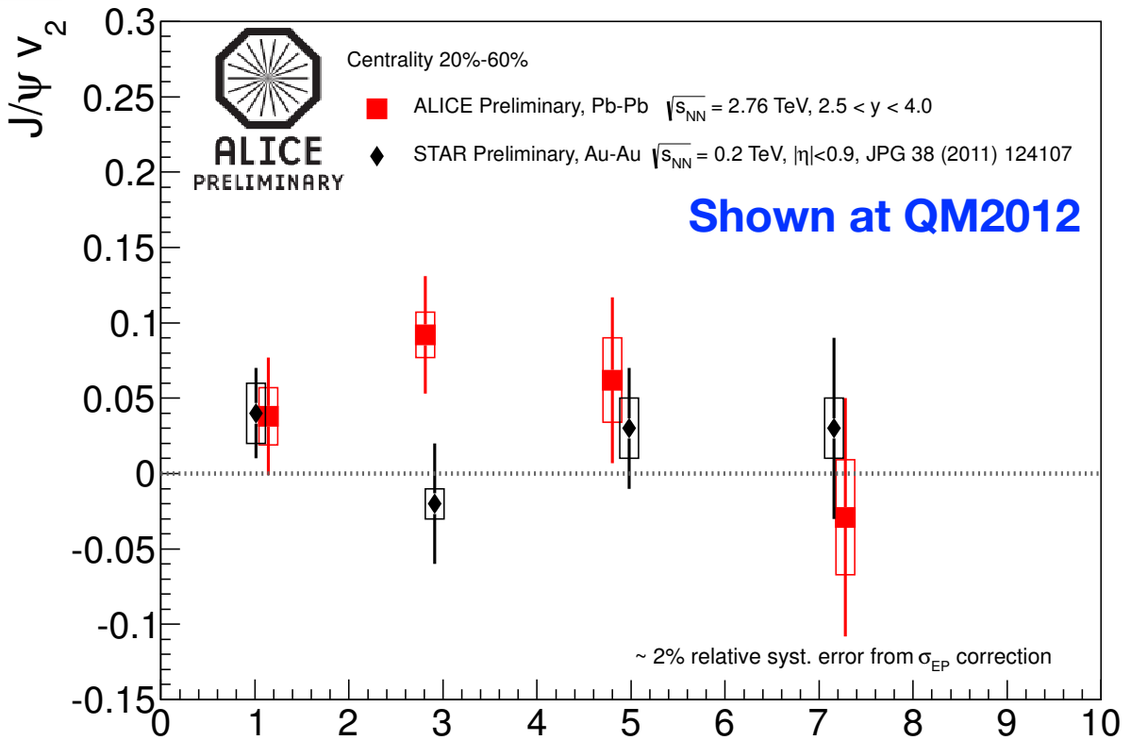


- Evidence for a new process
  - Theoretical calculations under way
  - Not only color screening (Matsui & Satz)
  - Recombinaison at low p_T (ALICE unique at LHC)

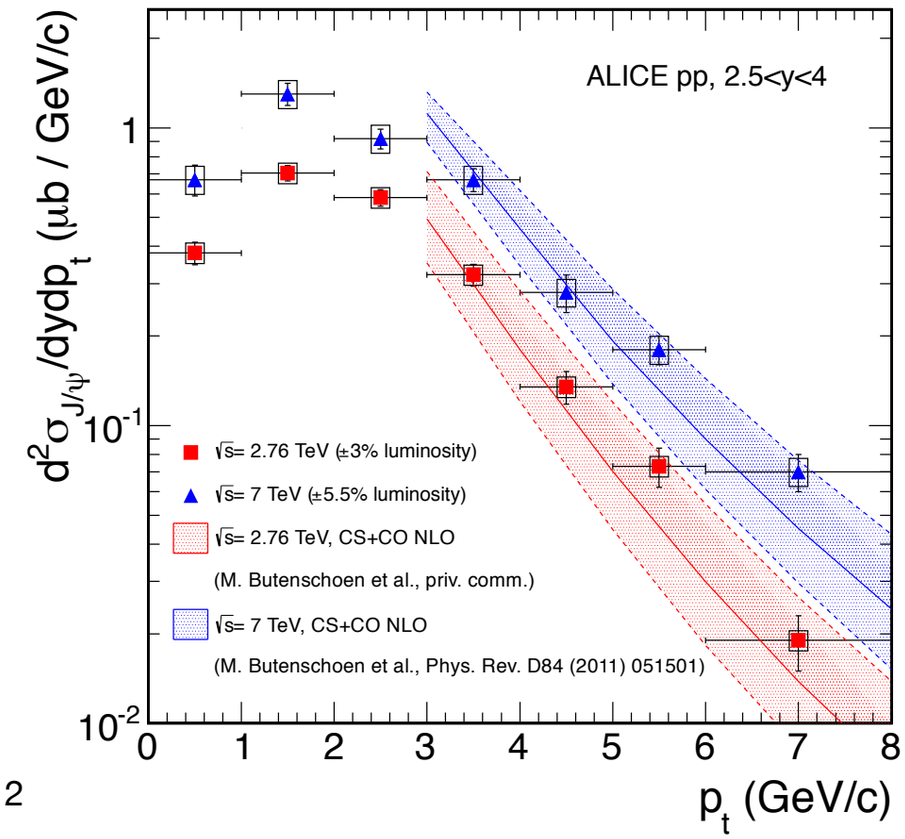


Physics topics at Saclay

- J/Psi flow
  - Recombinaison => flow ≠ 0
  - Postdoc Hongyan Yang



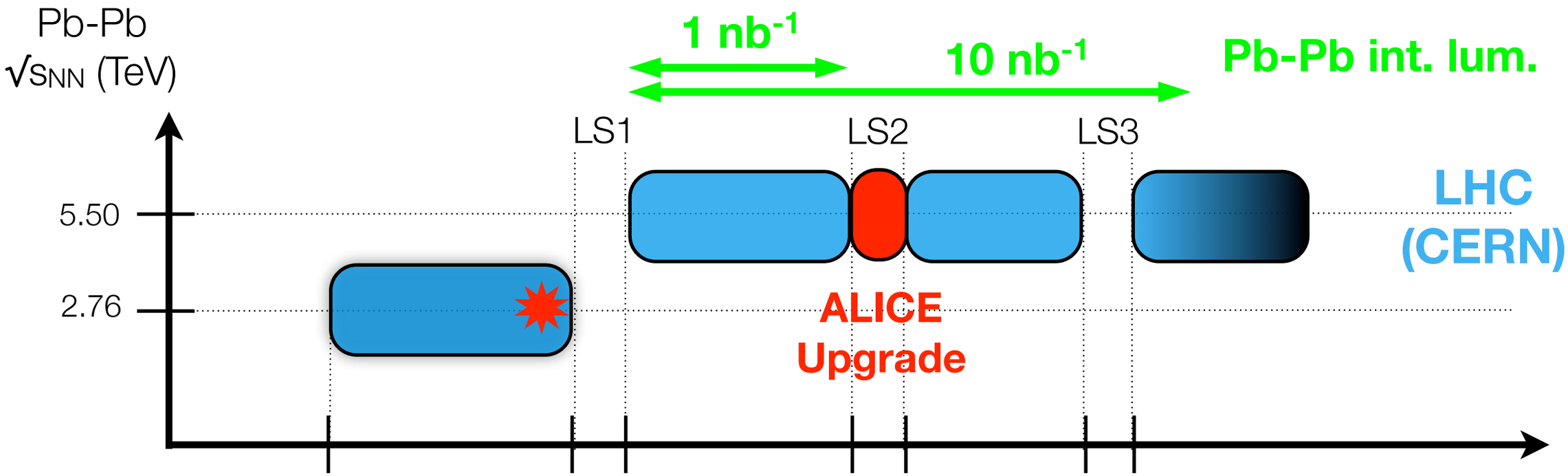
- Needs for pp data for the J/Psi
  - Understand the production process (polarization, ...)
  - Reference for the Pb-Pb R_{AA}
  - Claudio Geuna thesis



Saclay responsabilities in ALICE

- Hardware
  - Design, construction, commissioning of large MUON Arm Tracking Chambers
- Software
  - Responsible of the MUON Tracking Alignment & Calibration
- Analysis
  - Physics group: «Upsilon»
- Management
  - MUON Arm Project Leader
  - MUON Tracking coordinator

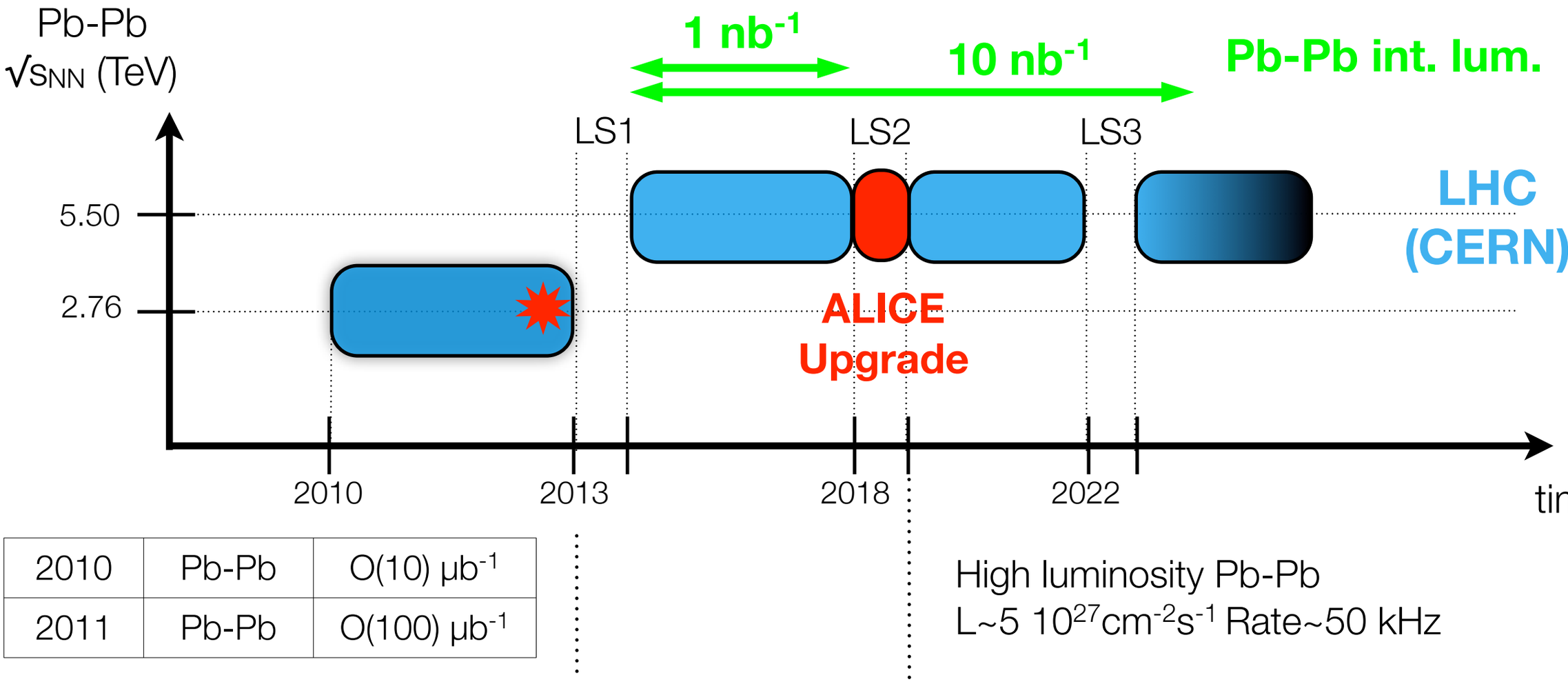
ALICE roadmap



2010	Pb-Pb	O(10) μb^{-1}
2011	Pb-Pb	O(100) μb^{-1}

High luminosity Pb-Pb
L~5 $10^{27} cm^{-2} s^{-1}$ Rate~50 kHz

ALICE roadmap



2010	Pb-Pb	O(10) μb^{-1}
2011	Pb-Pb	O(100) μb^{-1}

High luminosity Pb-Pb
L~5 $10^{27} cm^{-2} s^{-1}$ Rate~50 kHz

- ALICE LoI to LHCC (Sept 2012): new ITS, TPC, TRD, Muon Arm, ...
- LoI addendum (beg. 2013): FOCAL, VHMPID, Muon Forward Tracker (MFT)
- MFT: Increase capabilities of the MUON Arm
  - Open charm and open beauty, B->J/Psi, low mass, ...

European Strategy Group

- Working group: *European Strategy Group (ESG)*
- Nominated by CERN Council
- Important mission of CERN Council: Particle Physics Strategy
- Update of mid and long term strategy
- ESG mandate: Make a proposition to the CERN Council

- ESG composition
  - Member States: France (E. Augé), ...
  - Major European National Labs: IRFU (P. Chomaz), LAL (A. Stocchi), ...
  - Invited: Associate and observer states, ApPEC, NuPECC, ...

Timeline for Update the European Strategy

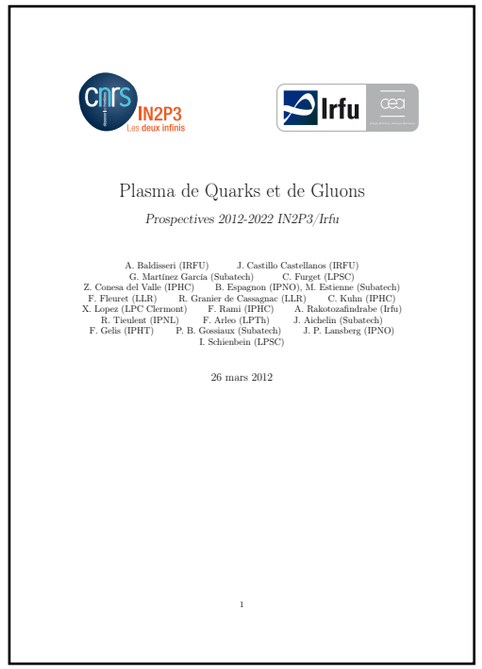
- Open Workshop: Krakow 10-12 Sept. 2012
  - Submission of documents (by end of July 2012)
- ESG meeting (draft writing): January 2013
- Meeting with the CERN Council: March 2013
- Council session to adopt the strategy: May/June 2013

Heavy Ion Strategy Organization

- French level: IN2P3/CEA/Université
  - *Journées Prospectives de Giens* April 2-5 2012
  - QGP group -> Summary submitted
- ALICE
  - Discussions in the collaboration
  - Document submitted
- Heavy Ion Community
  - Town meeting *Relativistic Heavy-Ion Collisions*, June 29 2012 @ CERN
  - Conclusions submitted

French level

- QGP working group: ~30 pages document
  - Open questions (quarkonia & heavy flavors, ...), main results, ...
  - Experiments: ALICE, CMS, CHIC@SPS/AFTER@LHC, CBM@FAIR
  - Summary



Plasma de Quarks et de Gluons

Prospectives 2012-2022 IN2P3/Irfu

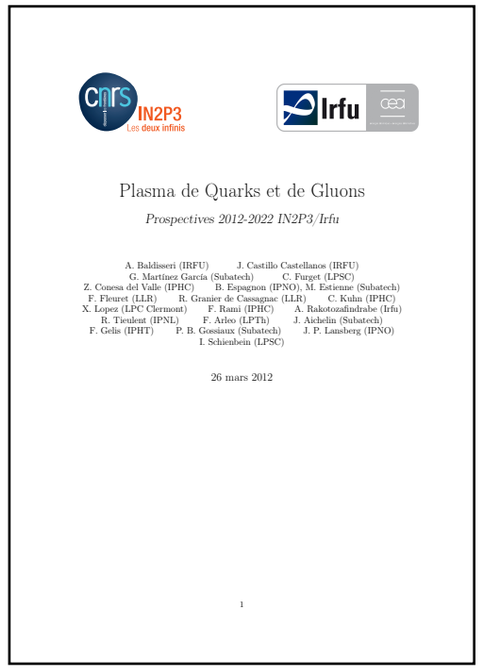
A. Baldisseri (IRFU) J. Castillo Castellanos (IRFU)
G. Martínez García (Subatech) C. Furget (LPSC)
Z. Conesa del Valle (IPHC) B. Espagnon (IPNO), M. Estienne (Subatech)
F. Fleuret (LLR) R. Granier de Cassagnac (LLR) C. Kuhn (IPHC)
X. Lopez (LPC Clermont) F. Rami (IPHC) A. Rakotozafindrabe (Irfu)
R. Tieulent (IPNL) F. Arleo (LPTh) J. Aichelin (Subatech)
F. Gelis (IPHT) P. B. Gossiaux (Subatech) J. P. Lansberg (IPNO)
I. Schienbein (LPSC)

26 mars 2012

1

French level

- QGP working group: ~30 pages document
  - Open questions (quarkonia & heavy flavors, ...), main results, ...
  - Experiments: ALICE, CMS, CHIC@SPS/AFTER@LHC, CBM@FAIR
  - Summary
- Priorities of the french community



Plasma de Quarks et de Gluons

Prospectives 2012-2022 IN2P3/Irfu

A. Baldisseri (IRFU) J. Castillo Castellanos (IRFU)
G. Martínez García (Subatech) C. Furget (LPSC)
Z. Conesa del Valle (IPHC) B. Espagnon (IPNO), M. Estienne (Subatech)
F. Fleuret (LLR) R. Granier de Cassagnac (LLR) C. Kuhn (IPHC)
X. Lopez (LPC Clermont) F. Rami (IPHC) A. Rakotozafindrabe (Irfu)
R. Tieulent (IPNL) F. Arleo (LPTh) J. Aichelin (Subatech)
F. Gelis (IPHT) P. B. Gossiaux (Subatech) J. P. Lansberg (IPNO)
I. Schienbein (LPSC)

26 mars 2012

1

*Our community is currently **strongly involved in the upgrade projects of the ALICE** experiment for the High-Luminosity LHC after 2018.*

*In addition to **upgrading the current muon spectrometer** setup to benefit from the higher LHC luminosities, the french community is also working on the **MFT project**. The MFT is a high precision tracker consisting of an assembly of several pixel planes between the interaction point and the muon spectrometer front absorber.*

5 labs.
(including IRFU)

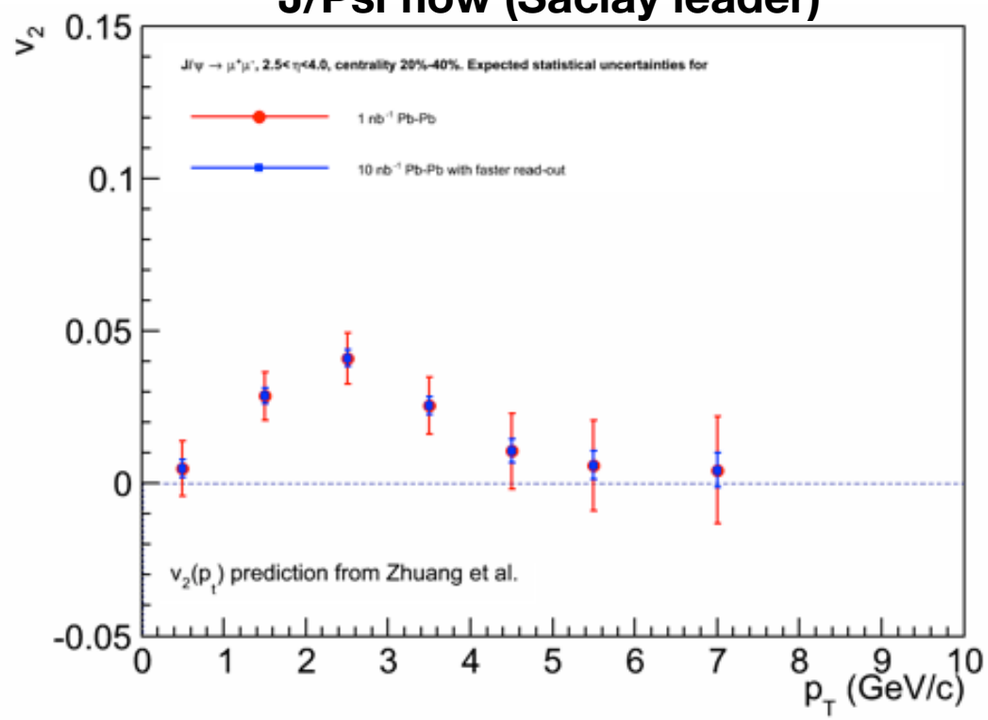
*The installation of a new and highly improved **Inner Tracking System (ITS)** will give access to the measurement of charmed baryons and beauty meson.*

1 lab.

ALICE Strategy

- *Statement from the ALICE Collaboration (14 pages)*
  - All the important physics topics are mentioned: **heavy flavor, quarkonia**, low mass dileptons, Jets, heavy nuclear states
  - Example: Study J/Psi recombinaison at low p_T (unique at LHC)
  - General trend: Moving to hard probes (even in the central barrel)

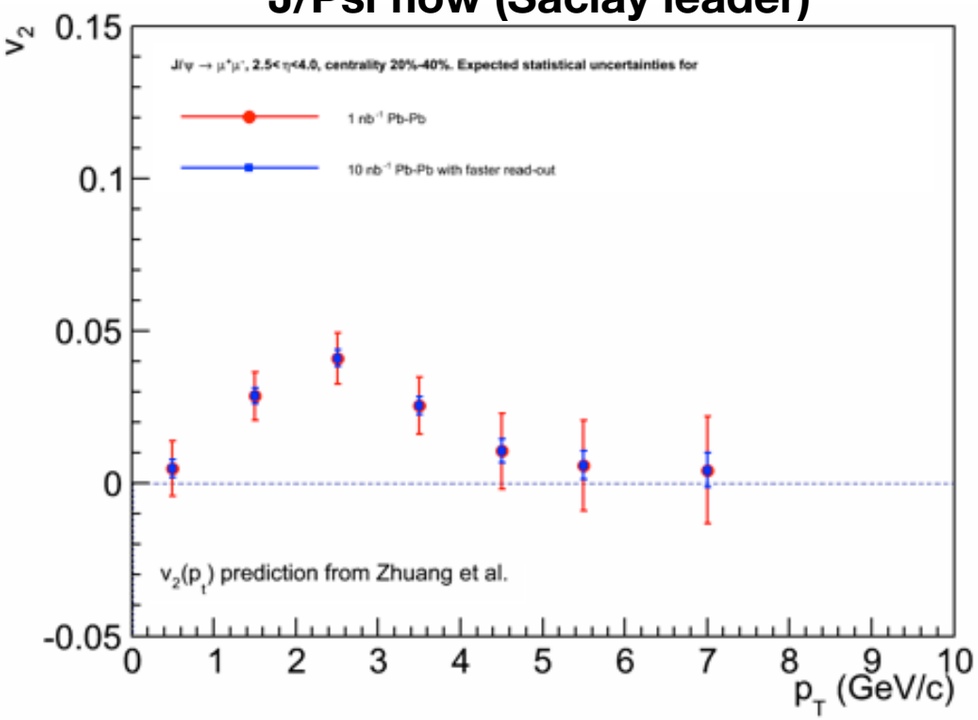
J/Psi flow (Saclay leader)



ALICE Strategy

- *Statement from the ALICE Collaboration (14 pages)*
  - All the important physics topics are mentioned: **heavy flavor, quarkonia**, low mass dileptons, Jets, heavy nuclear states
  - Example: Study J/Psi recombinaison at low p_T (unique at LHC)
  - General trend: Moving to hard probes (even in the central barrel)

J/Psi flow (Saclay leader)



Conclusion

*The main long-term goal of ALICE is to provide a **precise characterization** of the Quark–Gluon Plasma, the state of deconfined matter produced in high-energy heavy-ion collisions. The timely upgrade of the ALICE detector, and the **LHC heavy-ion running till mid-2020** to accumulate integrated luminosity with Pb–Pb collisions above **10 nb^{-1}**, are the necessary conditions to fully exploit the LHC scientific potential in the field of high-temperature QCD*

QGP Town meeting

- One day workshop (June 29th 2012):
  - Organized by: **Blaizot**, Redlich, Wambach, Widemann
  - Collect inputs from the community for the heavy ion session
  - Presentations from LHC (ALICE, ATLAS, CMS), RHIC (STAR, PHENIX), SPS (NA61, dilepton experiment, CHIC), FAIR (CBM), NICA project at JINR, AFTER (LHC fixed target)
  - Presentations from Theory (lattice QCD, hydrodynamics, ...)

QGP Town meeting

- One day workshop (June 29th 2012):
  - Organized by: **Blaizot**, Redlich, Wambach, Widemann
  - Collect inputs from the community for the heavy ion session
  - Presentations from LHC (ALICE, ATLAS, CMS), RHIC (STAR, PHENIX), SPS (NA61, dilepton experiment, CHIC), FAIR (CBM), NICA project at JINR, AFTER (LHC fixed target)
  - Presentations from Theory (lattice QCD, hydrodynamics, ...)
- Conclusions sent to ESG

*The **top priority for future quark matter research in Europe is the full exploitation of the physics potential of colliding heavy ions in the LHC**... To fully exploit these scientific opportunities, a timely implementation of the planned upgrades of the LHC accelerator and experiments will be necessary to **deliver Pb-Pb collisions in the range of O(10) nb^{-1}** ...The **powerful complementarities** of the three LHC experiments, ALICE, ATLAS and CMS,...*

*The town meeting also observed that the **CERN SPS would be well-positioned** to contribute decisively and at a competitive time scale to central open physics issues **at large baryon density**. In particular, the CERN SPS will remain also in the future the only machine capable of delivering, heavy ion beams with energies exceeding 30 GeV/nucleon, and the potential of **investigating rare penetrating probes at this machine is attractive***

*The **complementarity of LHC and RHIC** is an essential resource in efforts to quantify properties of the Quark-Gluon Plasma.*

***Dedicated investments in theoretical research** are needed to fully exploit the opportunities arising from the upcoming precision era of nuclear research at collider and fixed target energies.*

Conclusion

- ALICE Upgrades is the top priority
  - Pb-Pb integrated luminosity: from 1 nb^{-1} (should be reached by LS2) to 10 nb^{-1} (after LS3)
  - At the french level: MFT + MUON Arm Upgrade, ITS
- Inside ALICE
  - Quarkonia physics gave important results: J/Psi R_{AA} (recombination), J/Psi flow (Saclay leader)
  - Recognized by ALICE in the document submitted to the ESG
- In the QGP Community
  - LHC top priority: Accumulation of O(10 nb^{-1}) with upgraded detectors
  - Exploit all the possibilities of SPS

Conclusion

- ALICE Upgrades is the top priority
  - Pb-Pb integrated luminosity: from 1 nb^{-1} (should be reached by LS2) to 10 nb^{-1} (after LS3)
  - At the french level: MFT + MUON Arm Upgrade, ITS
- Inside ALICE
  - Quarkonia physics gave important results: J/Psi R_{AA} (recombination), J/Psi flow (Saclay leader)
  - Recognized by ALICE in the document submitted to the ESG
- In the QGP Community
  - LHC top priority: Accumulation of O(10 nb^{-1}) with upgraded detectors
  - Exploit all the possibilities of SPS

IRFU well positioned