

Preparation for the ECFA HL-LHC workshop:
Heavy Ions – 1st meeting (June 8)

+ new material from ALICE

ECFA HL-LHC Physics and Experiments ws

- ◆ HL-LHC: High-Luminosity Upgrade of the LHC (phase 2)
 - <http://hilumilhc.web.cern.ch/hilumilhc/index.html>
 - Planned for LS3 (~2023)
 - For HI, workshop scope: after LS2 (Runs 3-4)
 - Because of ALICE and LHCb major upgrades and increase of LHC Pb-Pb luminosity (up to $\sim 6 \times 10^{27}$, i.e. int. rate of ~ 50 kHz)
- ◆ 3rd ECFA HL-LHC Workshop: Aix-Les-Bains Oct 3-6 2016
 - <http://indico.cern.ch/event/524795>
 - Physics on Oct 4 morning; 1 talk HI exp + 1 talk HI th
- ◆ Previous workshops:
 - 2nd ECFA HL-LHC Workshop: Aix-Les-Bains Oct 21-23 2014
 - <http://indico.cern.ch/event/315626>
 - 1st ECFA HL-LHC Workshop: Aix-Les-Bains Oct 1-3 2013
 - <http://indico.cern.ch/event/252045>

HI after LS2: current plans

◆ LHC ion running after LS2:

- Experiments target: integrate $>10/\text{nb}$ after LS2 (e.g. ALICE Upgrade LOI: $13/\text{nb}$ at 50 kHz max)
- pp, p-Pb reference at the same energy as Pb-Pb and with the same (upgraded) detector layout
 - ALICE: $6/\text{pb}$ pp 5.5 TeV (minimum bias)
 - ATLAS/CMS: $300/\text{pb}$ pp 5.5 TeV

◆ Main observables / objectives (as presented in 2014):

- Low- p_T heavy-flavour and charmonium production + flow (ALICE)
- Precise multi-differential Y family measurements (ATLAS, CMS, ALICE)
- Low-mass and low- p_T dileptons, ρ , ω , continuum (ALICE)
- Jets: flavour dependent in-medium fragmentation functions (ALICE, ATLAS, CMS), differential jet, b-jet, di-jet, γ/Z^0 -jet measurements at high p_T (mainly ATLAS, CMS)

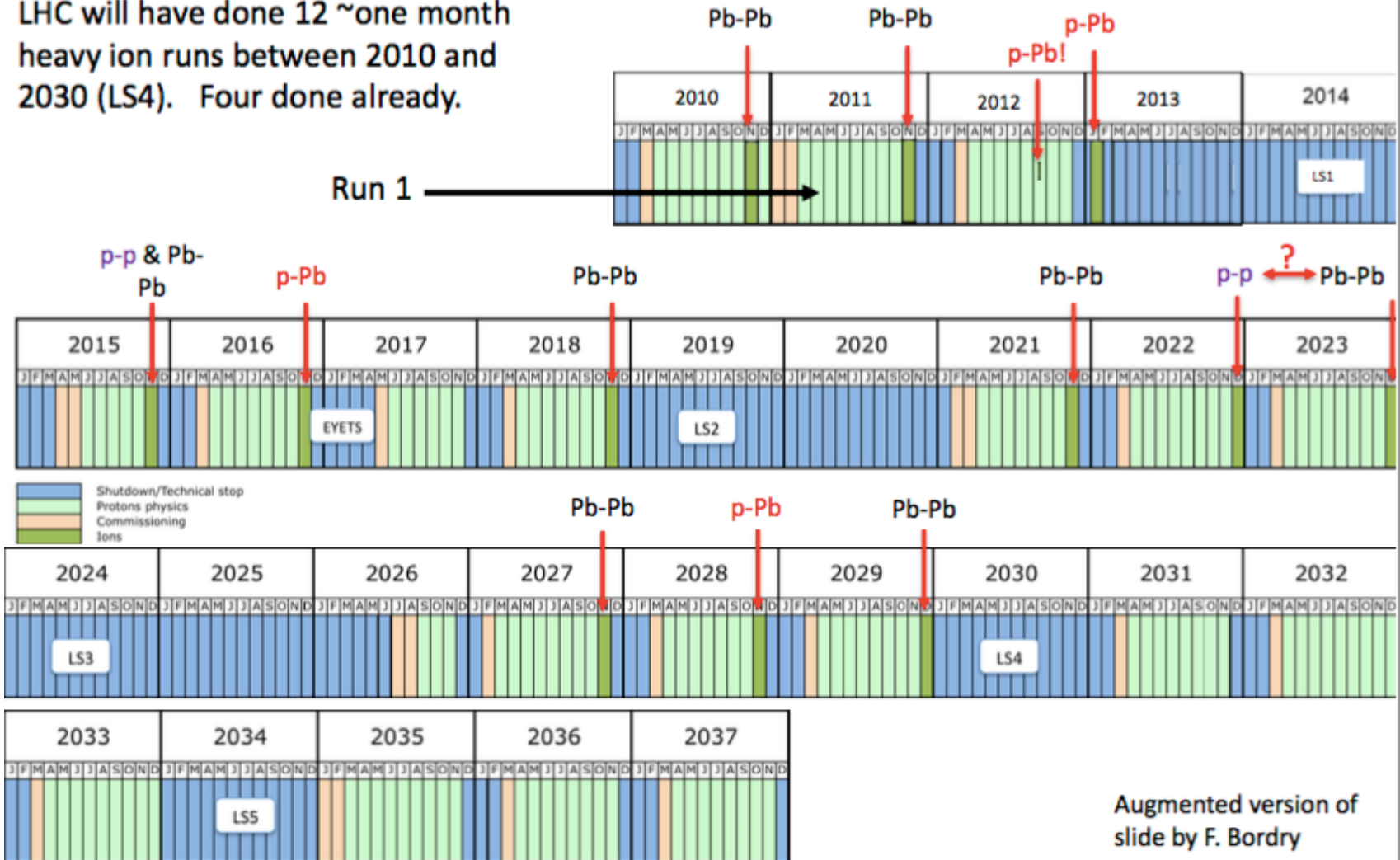
Pb-Pb in Run3+Run4

- ◆ J.Jowett, Chamonix 2016:
- ◆ https://indico.cern.ch/event/448109/contributions/1942066/attachments/1219095/1781439/Chamonix2016_Jowett_1.pdf
- ◆ Contact John to get an update from him?
 - Will HI running be covered in one of the machine talks in Aix-les-Bains?

Pb-Pb in Run3+Run4

LHC heavy-ion runs, past & approved future
+ species choices according to ALICE 2012 Lol (could evolve if required)

LHC will have done 12 ~one month heavy ion runs between 2010 and 2030 (LS4). Four done already.



Augmented version of slide by F. Bordry

Pb-Pb in Run3+Run4

Integrated luminosity in annual Pb-Pb run

$$\begin{aligned}L_{\text{int,annual}} &= \eta \langle L \rangle T_{\text{run}} \\ &= (50\%)(2.01 \times 10^{27} \text{ cm}^{-2}\text{s}^{-1})(24 \text{ day}) \\ &\approx 2 \text{ nb}^{-1}\end{aligned}$$

where we (pessimistically?!) assume an operation efficiency $\eta = 50$ and $T_{\text{run}} = 24 \text{ day}$ (i.e., no p-p reference run or similar).

Implies about 38 ideal fills (start-up absorbed in efficiency).

$\approx 8 \text{ nb}^{-1}$ in the 4 Pb-Pb runs foreseen after LS2.

close to experiments request: $\sim 10/\text{nb}$ (ALICE $13/\text{nb}$)

More on requests

- ◆ Are the Pb-Pb and pp5.5 requests confirmed?
- ◆ Is there an internal discussion in the experiments about lighter-ion collisions? ^{40}Ar , ^{16}O , ^{130}Xe ?
 - J. Jowett (Oct 2015): there may be a pilot Xe-Xe or p-Xe run during 2017 → is it confirmed?
 - Probably too early to reach a conclusion by October this year ...
- ◆ LHCb requests?

Towards Aix-les-Bains 2016

- ◆ Collect new material from the experiments on performance projections
 - See info for ALICE in next slide
- ◆ Ask J.Jowett for an update on LHC performance projections and tests with Xe ions
- ◆ Start internal discussion in the experiments about possible new requests
- ◆ Another informal meeting in July to check for updates?
- ◆ Other suggestions?

ALICE: new material wrt 2014 ws

- ◆ TDR of the Muon Forward Tracker (CERN-LHCC-2015-001)
 - Separation of prompt and non-prompt (di)muons at $2.5 < y < 3.5$
 - Jpsi from B, c/b → muon, improved performance on prompt Jpsi and psi(2S), low-mass dimuons
- ◆ New studies for full B decay reconstruction at mid-rapidity down to low p_T
 - $B^+ \rightarrow D^0 + \pi$
 - $B^+ \rightarrow J\psi + K$
- ◆ Ongoing: update of Λ_c performance studies
 - May be ready by October