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LHC Injectors Upgrade

PSB Beam Dynamics milestones for 2019/2020

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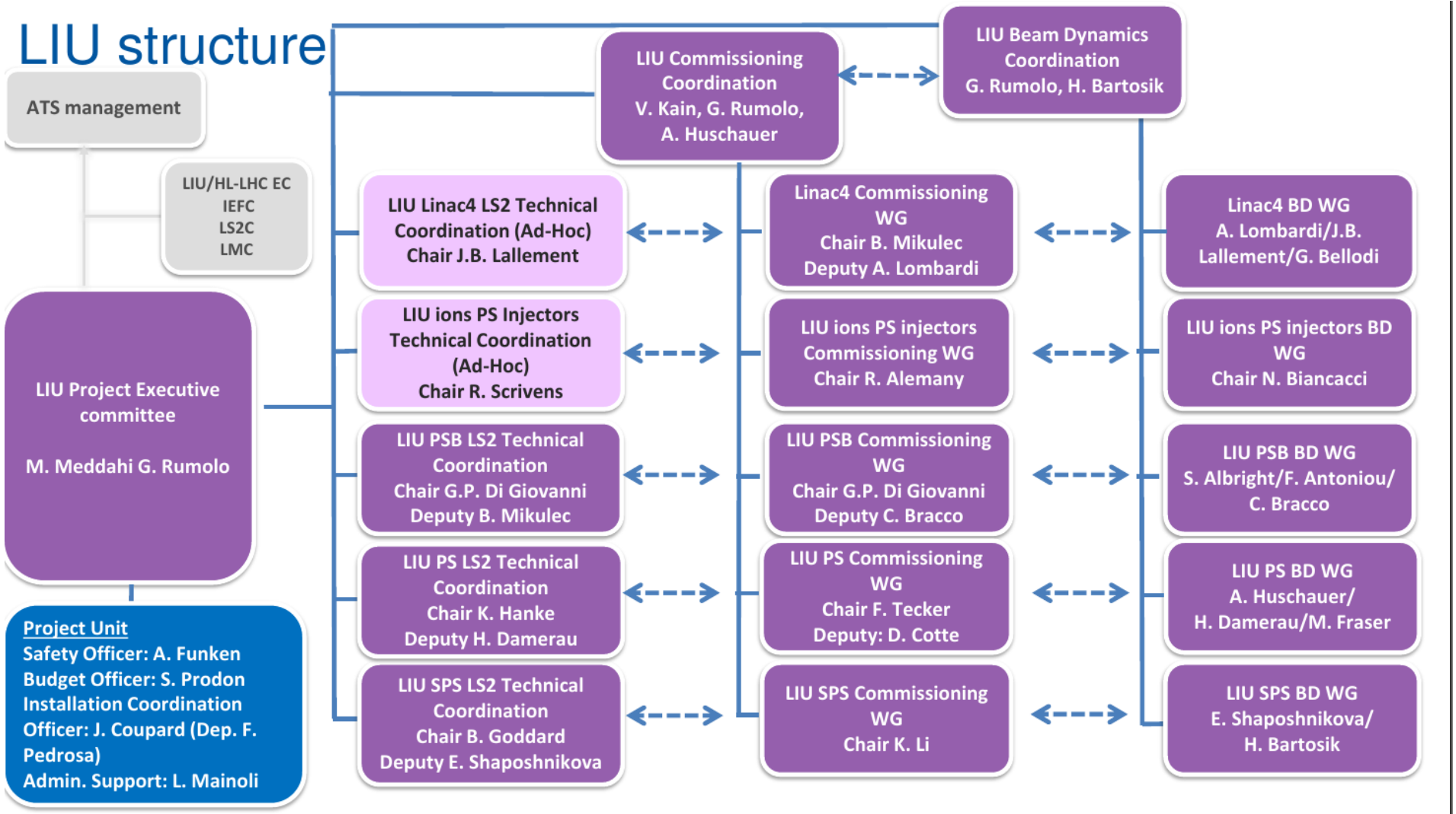
Outline

- LIU structure
- Injection Studies
- Transverse beam dynamics
- Longitudinal beam dynamics

LIU structure



Injection studies

- Space charge simulations for ISOLDE beam w/o long. painting
- Review painting functions for all beams
- Machine learning applied to KSW painting
- Transfer line optics with Space charge
- BSW fringe field effects

Transverse beam dynamics

- Optics studies
  - Wrap-up all the measurements of 2018: What did we learn?
  - Preparation for the commissioning (planning + simulations)
- Brightness studies
  - Wrap up all the measurements done in 2018
  - Understand the impact of deconvolution algorithms and distributions' shapes on emittance reconstraction
- Space charge simulations
  - Set up py-orbit for the PSB and establish a common model to be used (ABP/ABT)
  - Space charge simulations for LHC and high intensity beams
  - Simulations including errors and chicane with imperfections
  - Study in simulations the pros and cons for above the half integer injection
  - Simulations for Q4Q3 vs Q4Q4 optics (coupling resonance excitation by space charge)

Transverse beam dynamics

- Impedance studies
  - Follow up on the recently discovered unmatched termination of the extraction kicker being the source of the horizontal instability observed at 160 MeV
    - Show in simulations what are the implications of correcting this mismatched termination
    - Simulations including the transverse feedback
- Orbit and misalignment studies
  - Develop the tool to find optimal misalignment proposal for all 4 rings

Longitudinal beam dynamics

- Injection beam dynamics and longitudinal painting
  - Effect of fixed frequency with dB/dt > 0
  - Optimum beam parameters from Linac4 for different cycles
  - Chopping patterns for high intensity beams and impact of fixed dE/dt of Linac4
- Controlled Longitudinal Emittance Blow-up
  - Optimum approach for blow-up and longitudinal shaving
- Tomography
  - Technical student started 1st February to work on Fortran ⎵ C++ translation and code extension
  - Summer student requested to study sources and magnitude of uncertainty
- Impedance
  - Current status of model
  - Structures simulated
  - Missing items

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