

# CERN Initiatives

Steve Myers,

29th February 2012

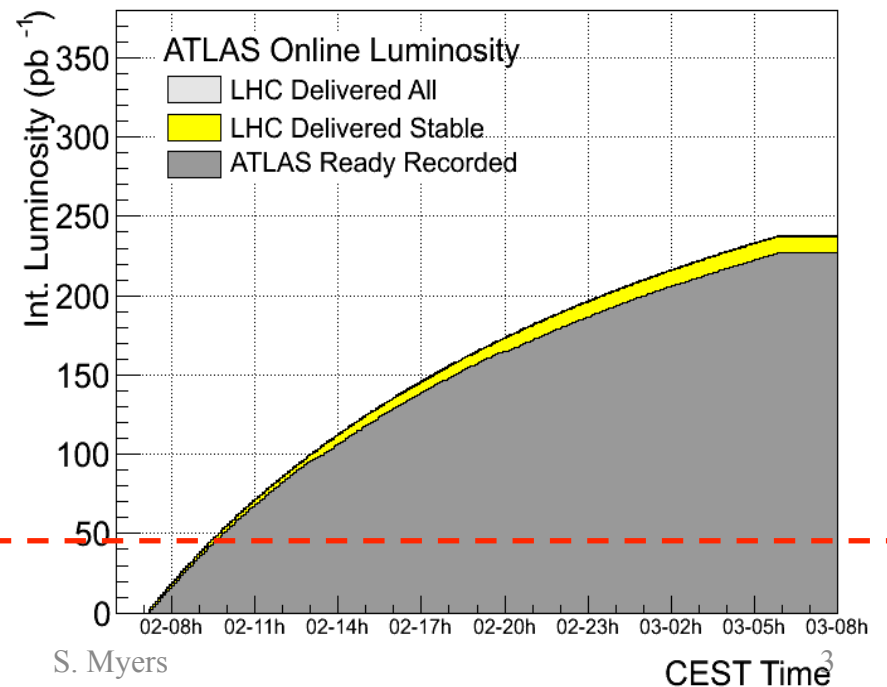
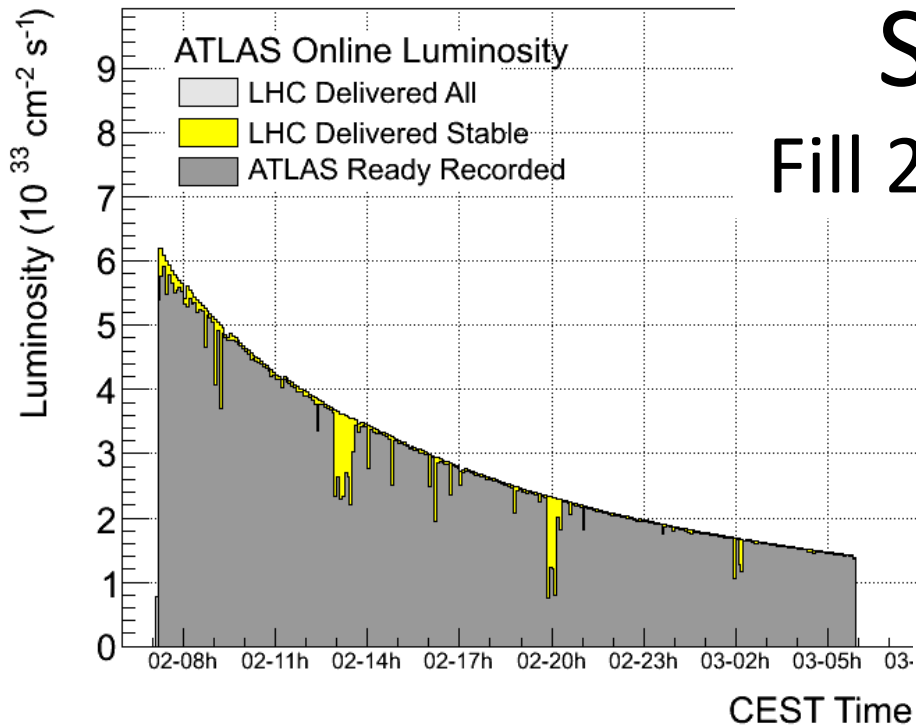
ICTR-PHE 2012 Geneva, Switzerland

# LHC News

## 2 slides

# Saturday 2<sup>nd</sup> June

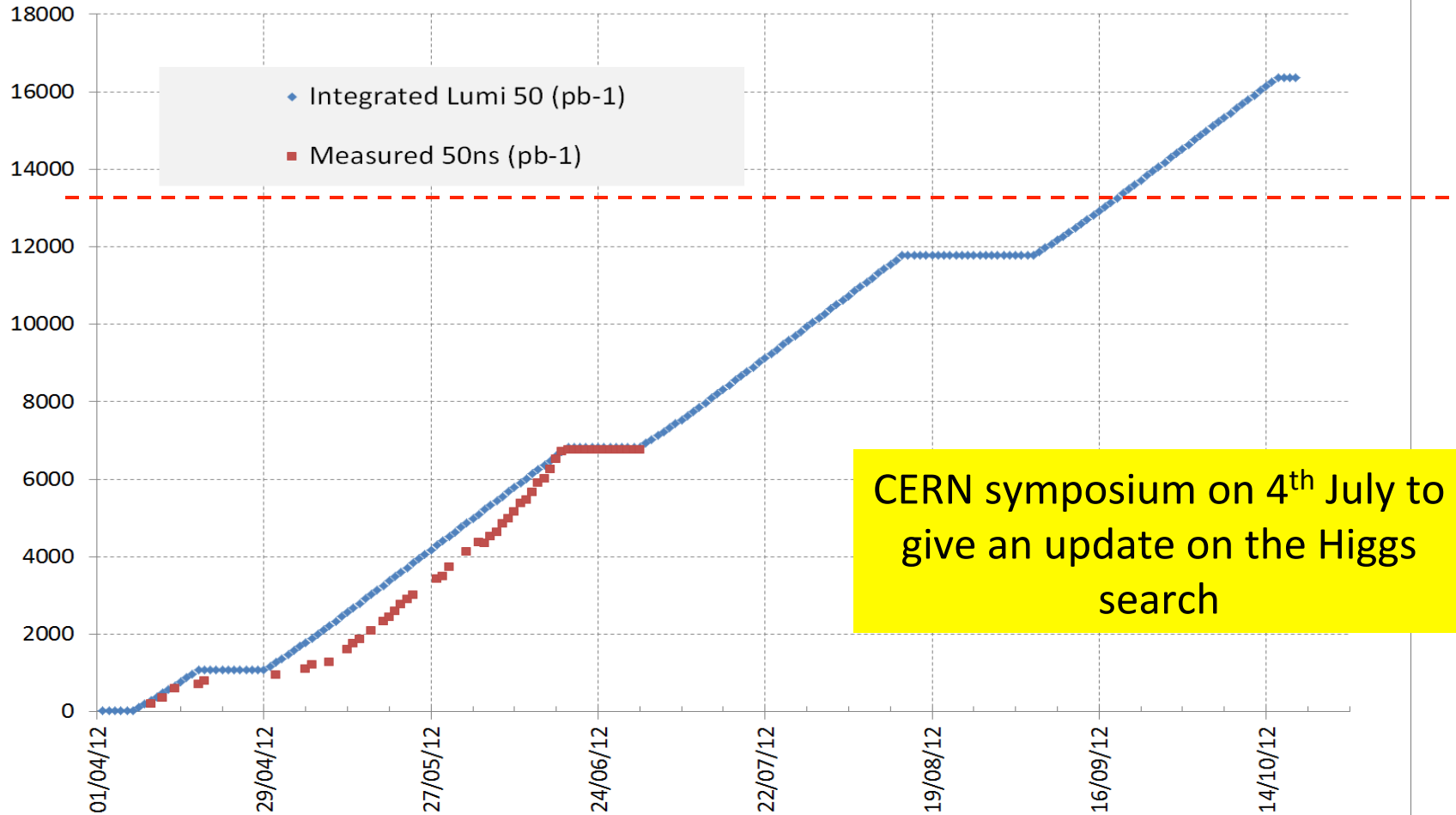
## Fill 2692 (238pb-1 in 23 hours)



Integral of all of 2010  
now 2.5 hours

# With Respect to estimates (as of Thursday June 21)

2012 Measured vs Predicted Integrated Luminosity



CERN symposium on 4<sup>th</sup> July to give an update on the Higgs search

# SCOPE FOR TODAY

Do we need a facility?

If yes, to better understand requirements and needs

The aim is to collect expectations from the future user community for the design of the facility.

Which particles and what energies

Position paper for the European Strategy Preparatory Symposium in September and for identifying funding sources (EC, and other possibilities?.....)

# Why are we having this brainstorming...

What would be the purpose of such a facility;

- Radiobiology
- Applied Physics

What end-station equipment is (a) the minimum and (b) most desirable?

What biology labs are required?

Should to be based on CERN model of working?:  
open calls and peer reviewed.....

# Needs for a radiation facility

## Increase radiobiological knowledge:

- Cell response to different dose fractionations
- Early and late effects on healthy tissue
- Irradiation of cell at different oxygenation levels
- Differing radio-sensitivity of different tumours/patients

## Simulations:

- Ballistics and optimization of particle therapy treatment planning
- Validation of Monte Carlo codes at the energies of treatment and for selected ion-target combinations

## Instrumentation tests:

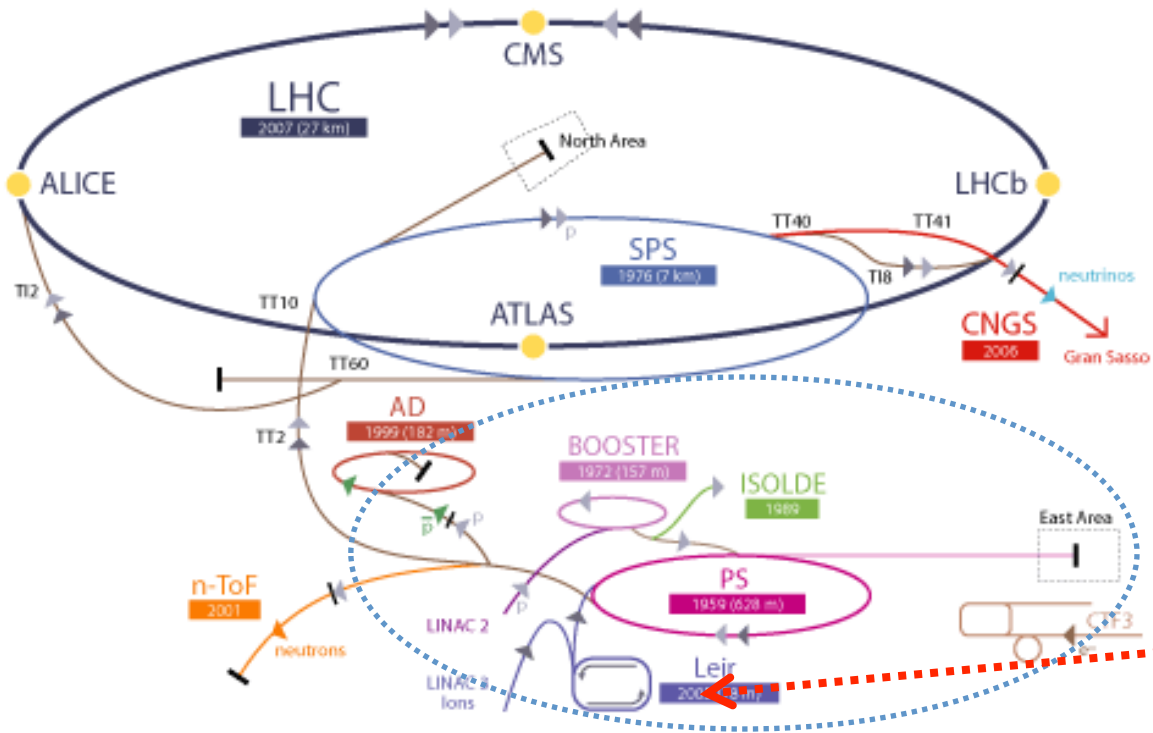
- Providing a beam line to test dosimeters, monitors and other detectors used in hadron therapy

# Reminder: the 3 CERN Initiatives

- Biomedical Facility (Manjit Dosanjh)
  - creation of a facility at CERN that **provides particle beams of different types and energies to external users** interested in radiobiology and detector development
- Medical Accelerator Design (Daniel Brandt)
  - coordinate an **international collaboration** to design a new cost-effective accelerator facility, which would use the most advanced technologies
- Radio Isotopes (Dewi Lewis/Uli Koestner)
  - Set up a **European user facility** to supply innovative radioisotopes (produced at ISOLDE-CERN, ILL, PSI, Arronax,...) for R&D in life sciences (preclinical and clinical studies)



# The CERN accelerator complex



**NOT TO SCALE!**  
**LHC diameter = 8.5 km**  
**LEIR diameter = 25 m**

## LEIR:

- Provides ion beams for LHC
- Accumulation of several pulses from Linac3 with electron cooling

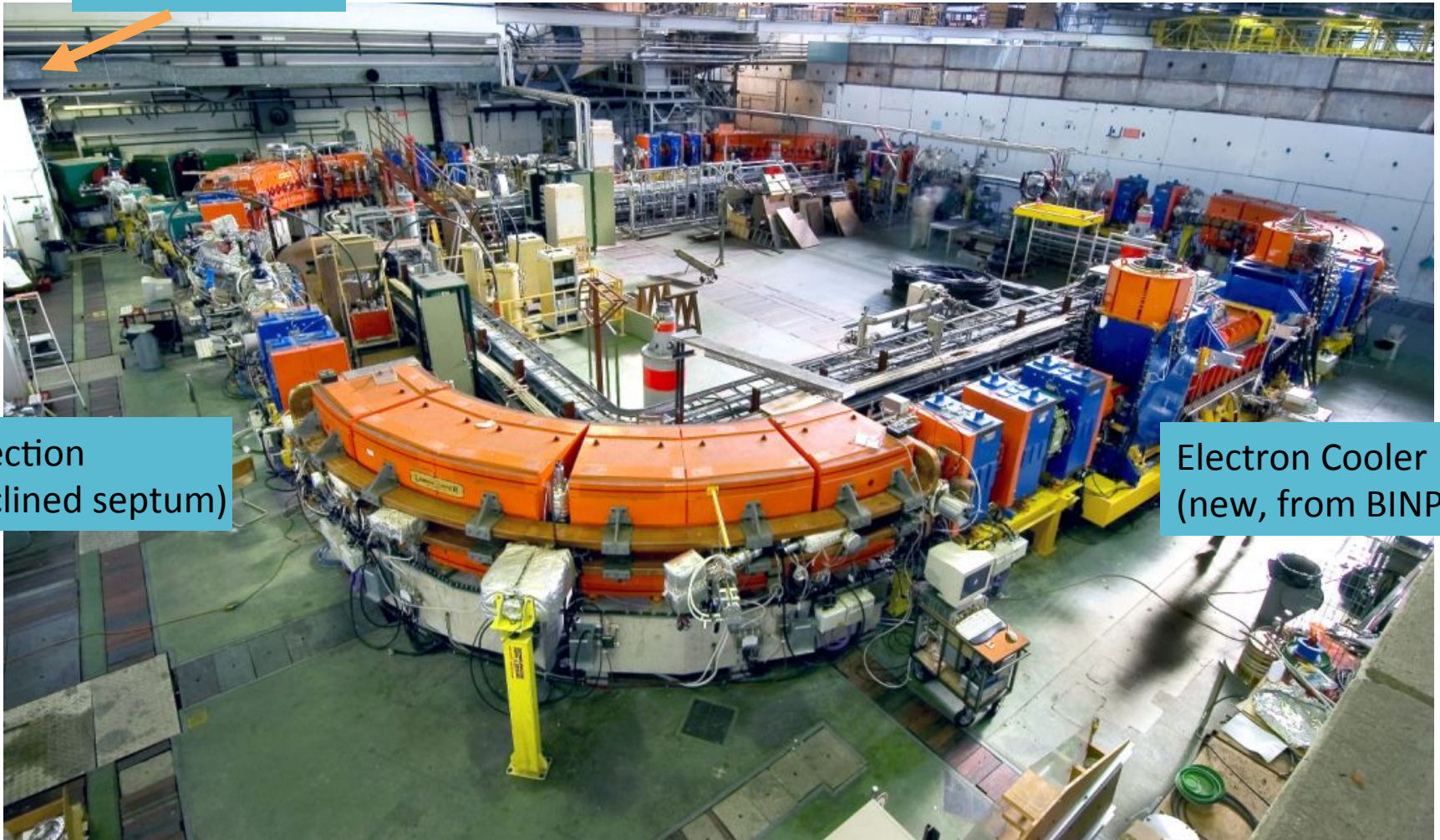
## Why LEIR?

- Existing accelerator maintained for LHC (and SPS fixed target)
- Energy range similar to treatment ion facilities
- Small upgrades required to provide beams for bio-medical experiments

# LEIR



Transfer tunnel



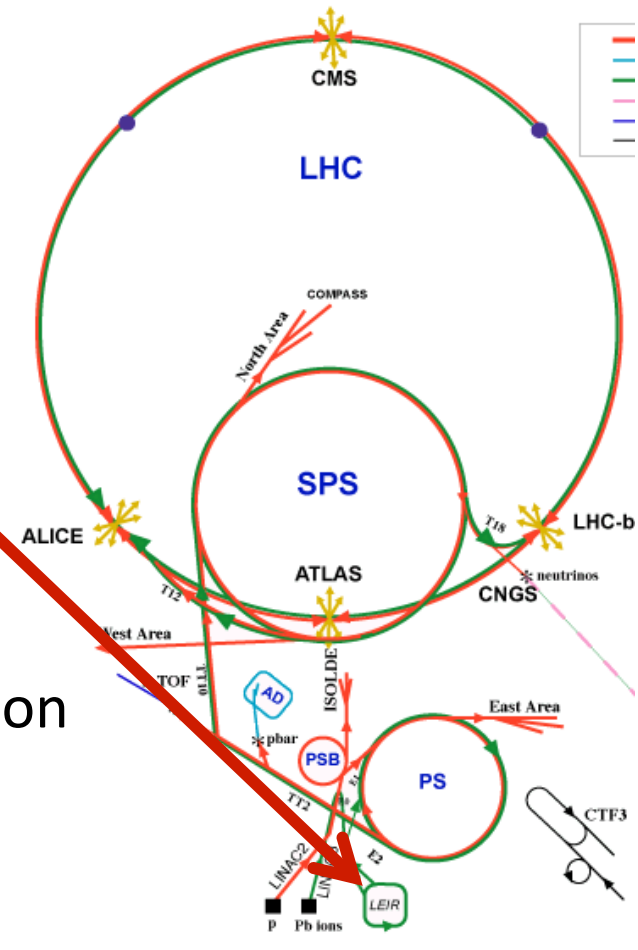
Injection  
(inclined septum)

Electron Cooler  
(new, from BINP)

# Radiobiological Facility @ CERN

## @ **LEIR** (Low Energy Ion Ring)

- part of LHC injection chain
- accumulator for LHC ion programme (lead ions)
  - only used for several weeks / year
- Planned to **establish facility** for
  - **radiobiology**
  - basic physics studies such as fragmentation of ion beams
  - dosimetry
  - test of instrumentation



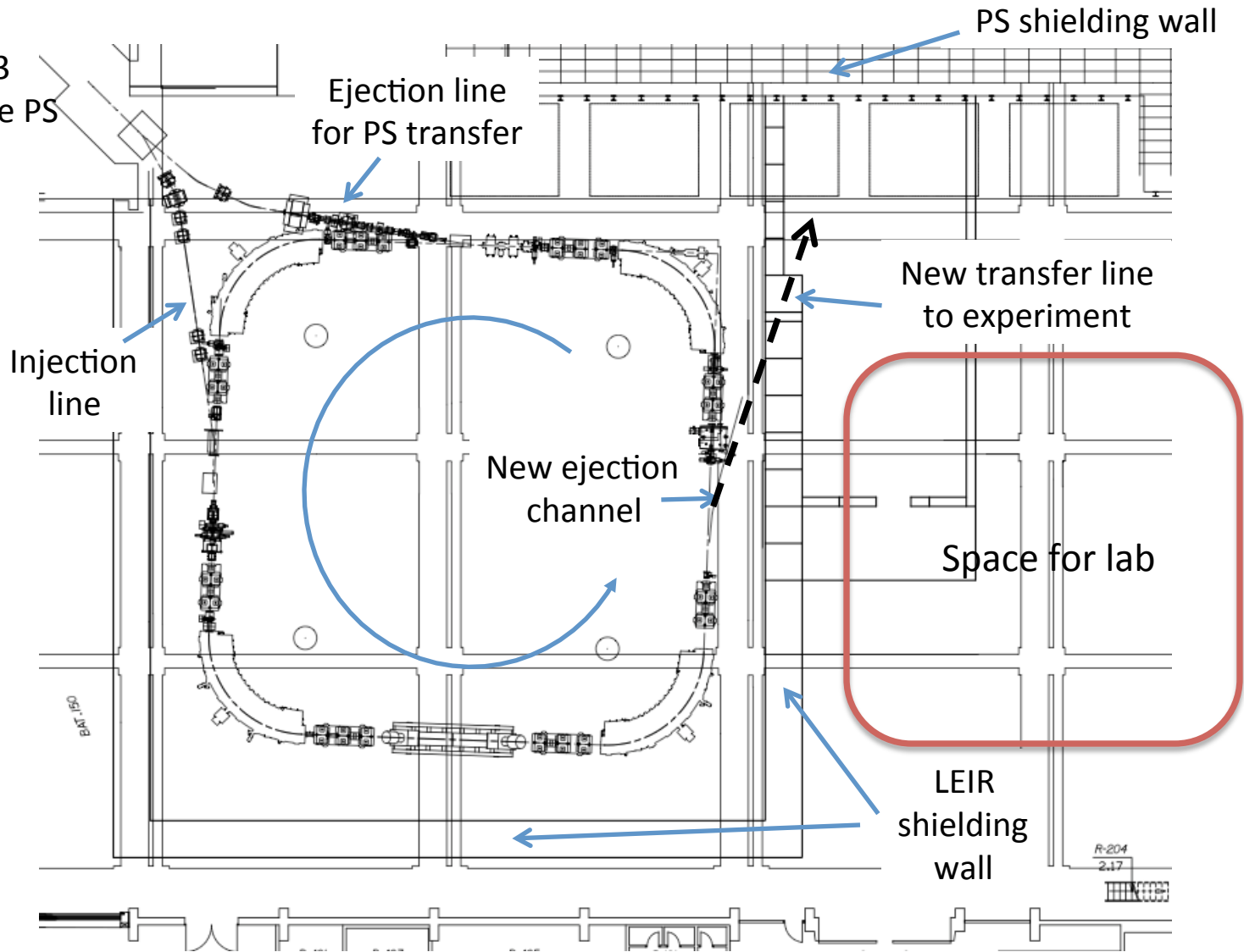
# Facility for Radiobiology Studies

## Sketch of LEIR



Transfer lines

- from Linac3
- towards the PS



# Comments



- Ion species:
  - ◆ In principle, ECR sources can provide most species, but some may be difficult
  - ◆ With one source no fast switching (e.g. for biomedical experiments between LHC fills) between species
  - ◆ **Second ion source (possibly optimized for lighter ions with dedicated RFQ) for more efficient use of LEIR (in parallel to LHC operation)**
- Energy:
  - ◆ At present beam rigidity limited by main power converter to 4.87 Tm allow 6.67 Tm
  - ◆ Corresponding to 240 MeV/n and 430 MeV/n for  $^4\text{He}$  or  $^{16}\text{O}$  ions
- Conclusion:
  - ◆ LEIR can provide ions for biomedical studies up to <430 MeV (with new main power converter)
  - ◆ Study of implementation of slow ejection with longitudinal and/or transverse excitation
  - ◆ New extraction channel (septa) and transfer line to experiment
    - Radio protection issues (ceiling above LEIR probably required)

**Christian Carli will give more technical details**

- Thank you for your attention