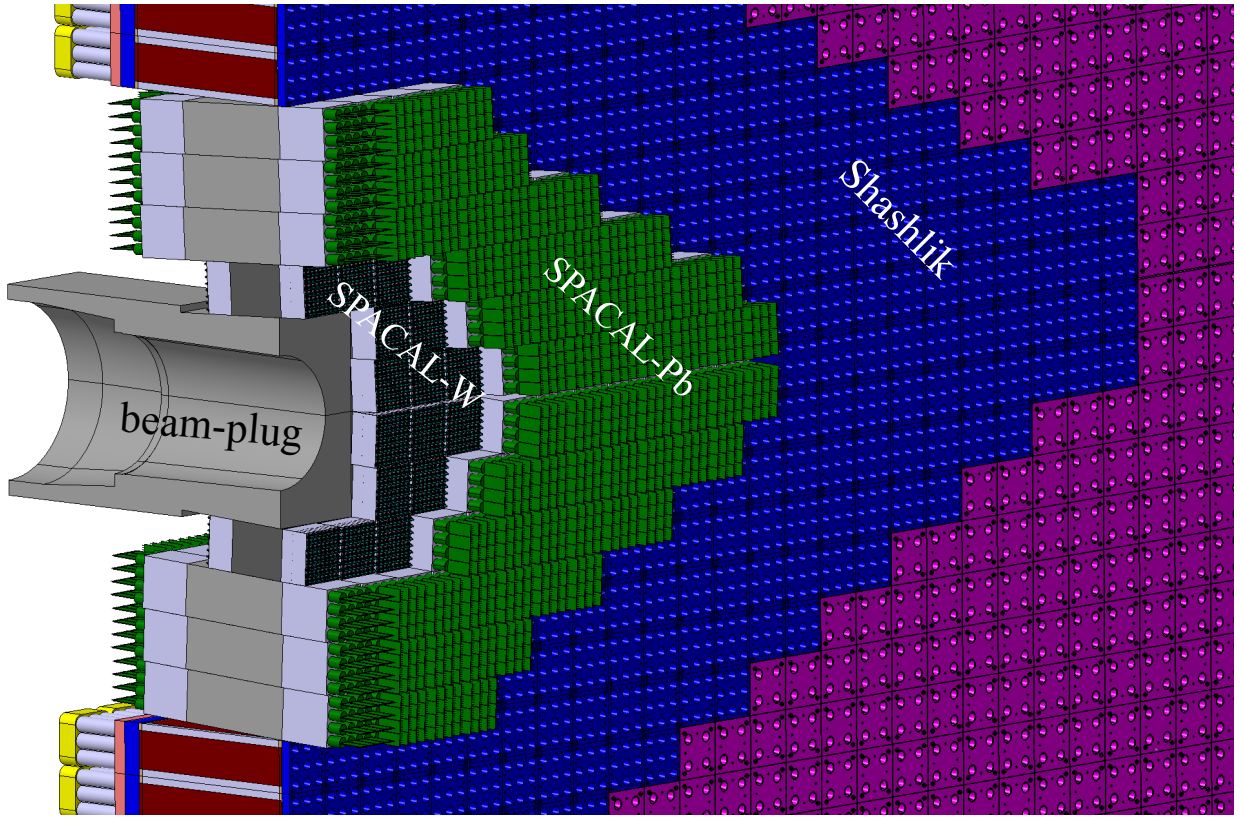
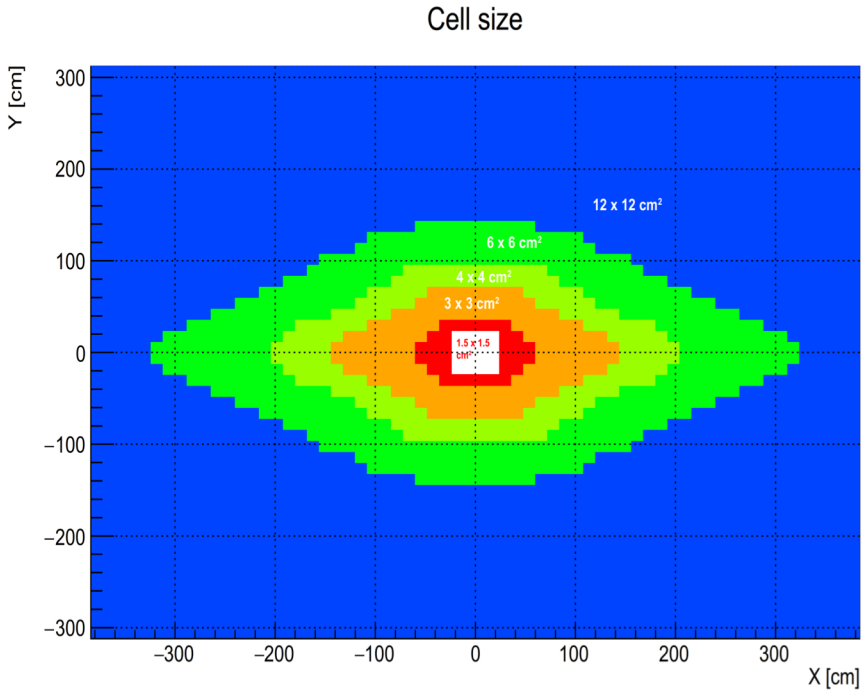
ECAL consolidation in LS3

ECAL Upgrade II workshop, Orsay, 12-14 Dec 2022



Discussion Session

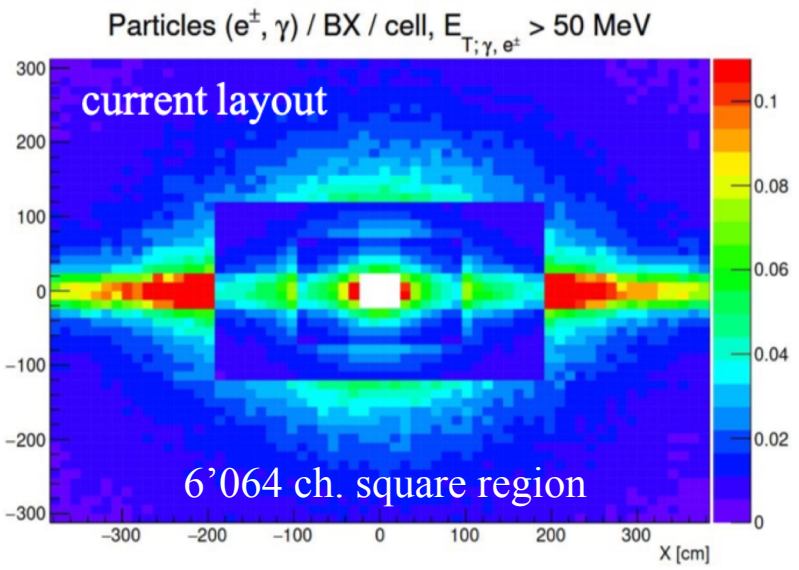
Baseline LS3 configuration

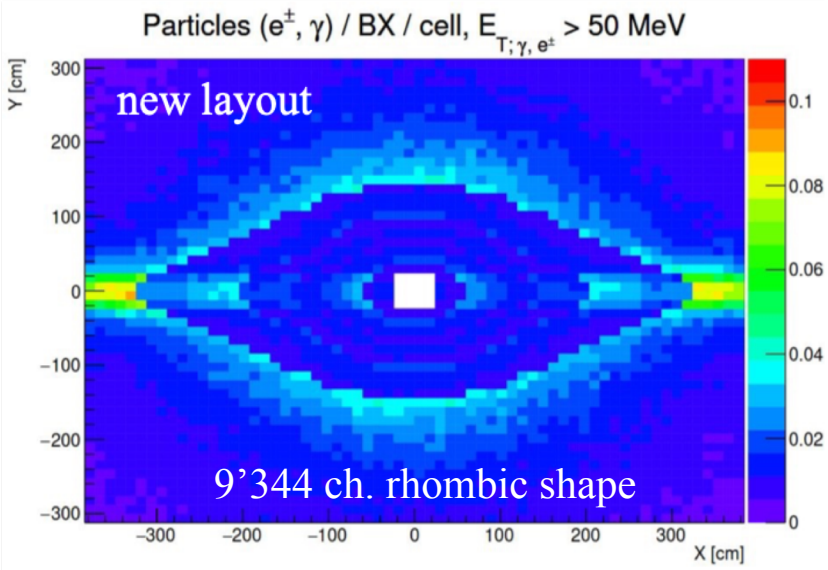


Cell size:	Modules:
2 x 2 cm²	32 *new* SpaCal-W modules with polystyrene fibers
3 x 3 cm²	144 *new* SpaCal-Pb modules (identical to UII)
4 x 4 cm²	176 existing Shashlik modules
6 x 6 cm²	448 existing Shashlik modules
12 x 12 cm²	2512 existing Shashlik modules

➢ everything in single sided R/O (no longitudinal segmentation)

Particle flux at L = 2 x 10^{33} $cm^{-2}s^{-1}$





LS3 configuration:

- ✓ 176 new SPACAL modules
- ✓ 9'344 cells/channels single sided R/O
- ✓ rhombic shape
- ✓ tilted SPCAL (3°+3°)
- ✓ ps-timing for new SPACAL modules
  → 3'456 new electronic channels

Planning towards ECAL consolidation in LS3

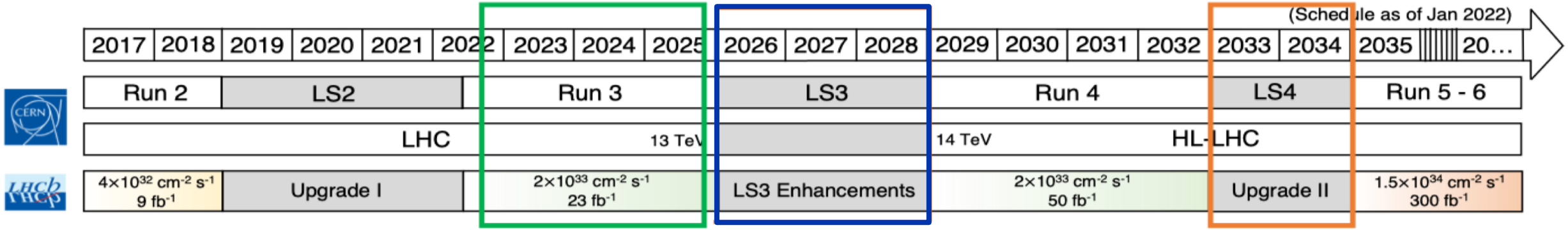
Proposal of planning and scheduling:

- ✓ Light-weight **TDR for LS3 consolidation**:
  - ➢ Proposal: submit TDR to LHCC by **September 2023** (combined PID TDR with RICH)
  - ➢ Physics performance improvement as compared to run 3 configuration
  - ➢ Demonstration of required technological performance (R&D and prototyping) for proposed consolidation
  - ➢ Infrastructure requirements for LS3 and LS4 (new platform)
  - ➢ Institute responsibilities
  - ➢ Planning, schedule (personnel loaded) and cost

- ✓ Light-weight **LHCb-internal review by U2PG** on LS3 consolidation :
  - ➢ Proposal: **spring 2023** (followed by official agreement by Technical Board for proceeding with TDR)
  - ➢ Main reviewers: Hassan Jawahery, Guy Wilkinson (+ ad-hoc experts)
  - ➢ Should include: physics opportunities, technology readiness, schedule, availability of person-power and resources

→ Do we all agree on the proposed dates for TDR and review?

Scheduling of ECAL consolidation in LS3 and upgrade II in LS4



Summary of proposed schedule for LS3:

- ✓ April/May 2023: Light-weight internal U2PG review to approve ECAL LS3 consolidation (internal to LHCb Collaboration)
- ✓ September 2023: Light-weight PID TDR to LHCC for LS3 consolidation (ECAL & RICH)
- ✓ 2024: Scoping Document for LHCb Upgrade phase IIb (including ECAL)
- ✓ 2025-2027:
  - ➢ production of 176 SPACAL modules
  - ➢ 3'500 new electronics channels
  - ➢ PCIe400 (how many?)
- ✓ 2026-2028:
  - ➢ infrastructure modification (platform) + HCAL?!
  - ➢ ECAL re-built (new modules, rhombic shape)

Some observations

- Need to demonstrate gain in physics performance for run4 → complete physics studies with different configurations
  - ✓ Anyone doing analysis, please contribute to the performance studies in comparing run3 and run4 configurations! Realistic simulation available…
- Have to progress in determining final technologies → continue R&D in all areas (detector, electronics, R/O, …)
  - ✓ SPACAL R&D well advanced but far from serial production readiness
  - ✓ Shashlik R&D to improve timing at low energies (optimized scintillator?, WLS fiber density?, …)
  - ✓ Photodetector R&D on critical path (linearity, timing, size)
  - ✓ HV and calibration completely uncovered
  - ✓ Electronics design depending on detector performance parameters → determine clear requirements
  - ✓ Infrastructure modifications (design, tooling, planning… on critical path)
  - → Prioritize activities where needed
  - → **urgently need new contributors to all these items! Please participate to the many testbeam activities!**
- Should start realistic planning
  - ✓ Agree on institutes responsibilities
  - ✓ schedule, cost
  - ✓ financial and personnel resources