

Some Personal Takeaways from FCC Week in Helsinki

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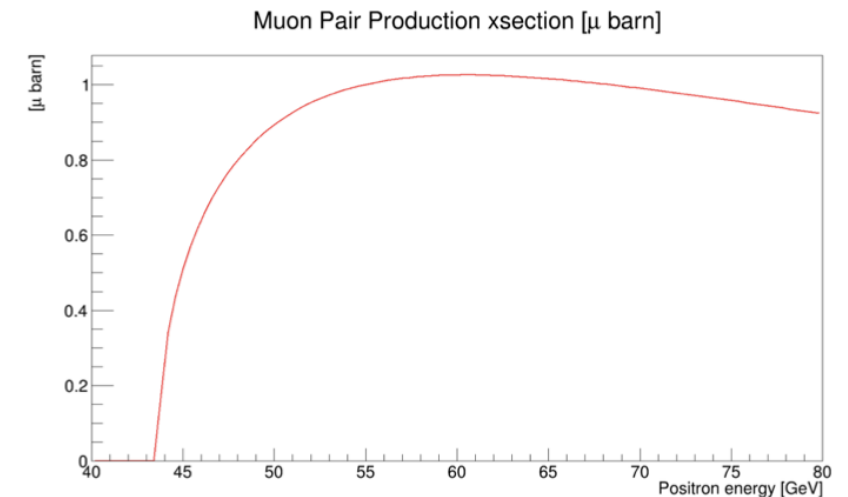
Muon Pair Production at Threshold ([slides](#))

Measurement of m_Z

- Systematic uncertainty ~ 100 keV from absolute beam energy vs ~ 5 keV statistical
- Nominal beam energy measurement by resonant depolarization
- Can we cross check, constrain, improve?

Recall [LEMMA proposal](#) for low-emittance source for Muon Collider

- ~ 45 GeV e^+ beam on e^- target to produce $\mu^+\mu^-$ at/near threshold
- Cross section is steep function of energy
 - Dominant cross section uncertainty is muon mass
 - Known to $\sim 2 \times 10^{-8}$
 - Threshold energy uncertainty similar to m_Z statistical uncertainty



Next Morning: What About Motion of Target Electron?

CY

- Estimated change in $\sqrt{s} \sim MeV$
- Asked Claude: 4 – 5 MeV

Josh

- Very similar estimates by Josh Bendavid and his AI

Impact

- Ruins the original plan, but
- Problem solved by measuring **both** outgoing muons to determine the boost
- Additional benefit: effectively taking data at several energies in parallel

Beamstrahlung Dump

From FCC Week 2023 ([link](#))

- Each beam @ 91 GeV creates ~370 KW of beamstrahlung photons
- Compared with ~ 300 KW for SPS beam dump
- Two options considered: graphite (conventional) and liquid lead

Recent focus on latter

- [2601.18470](#)
- [IPAC'26](#)
- FCC Week [presentation](#) by Jean-Paul Burnet
 - Several geometries being investigated
 - Liquid lead turns solid in absence of heat.....

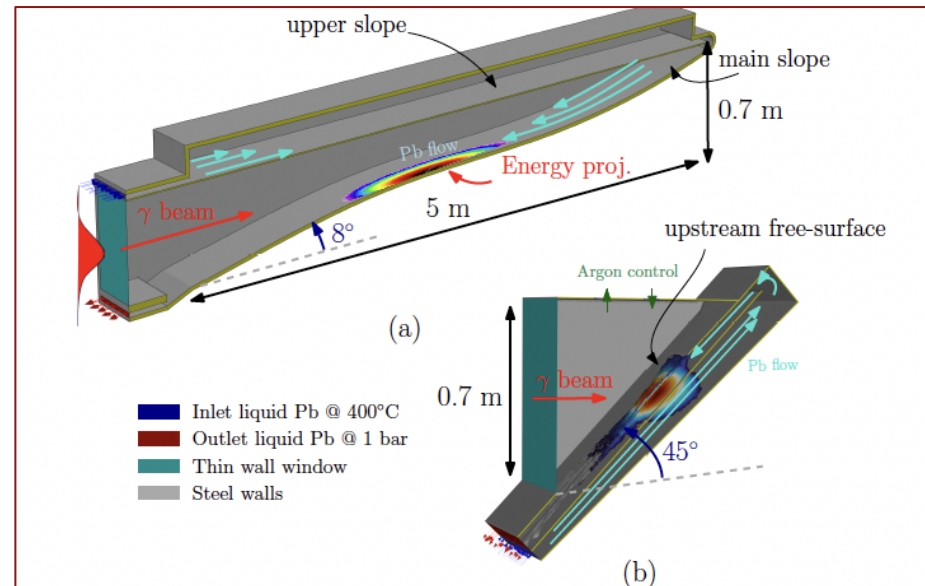
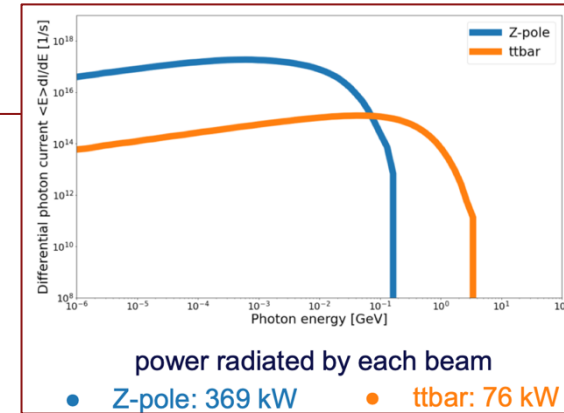


Figure 1: Conceptual layouts of the two liquid-lead absorber configurations considered for the FCC-ee beamstrahlung dump: (a) Double-Slope (DSlope) concept and (b) Compact Upstream Slope plus Pool (CUSP).

Detector Backgrounds in Central Tracking Detectors

Local Chromatic Correction (LCC) – see slides by [Michael Benedikt](#) and [Pantaleo Raimondi](#)

- Endorsed in review in January 2026
 - Transparency conditions allow for modular design of technical insertions (straight section and final focus)
 - Reduced sextupoles -> higher dipole full-factor -> reduced synchrotron radiation by ~10%
- Its adoption has been a big change for machine but now allows adiabatic improvements

Detector backgrounds in central tracker reported by [Daniel Jeans](#) for LCC v106.2 @ 91 GeV

- Incoherent Pair Creation (IPC) tolerable
 - Synchrotron Radiation (SR) unacceptable
 - Note: SR < IPC in previous optics
- Global Hybrid Correction (GHC)

@ 91 GeV	Silicon Tracker pixel rate @ 3 pix/hit	Drift Chamber occupancy	TPC typical distortion
IPC	10 kHz / cm ²	~7%*	few mm
SR <small>my back-of-envelope</small>	~GHz / cm ²	>1000%	few m

IPC [comfortable → challenging]
SR [extremely challenging → impossible]

Do not panic (yet) – let's check everything

GHC vs LCC

	GHC	LCC
Chromaticity correction	Global horizontal correction in the arcs, with local vertical correction near the IP	Local chromaticity correction in both planes in the Final Focus
Arc concept	<ul style="list-style-type: none"> • FODO arcs with many non-interleaved sextupole pairs in $-I$ transformations → imposing constraints on cell phase advance (and momentum compaction / emittance) • Twin aperture dipoles and quadrupoles, with strong symmetry constraints between the two beams 	<ul style="list-style-type: none"> • Repetitive 5-cell FODO structure with only 4 sextupole families in 4 nested pairs. Achromatic and anharmonic lattice. High flexibility in tuning phase advance and momentum compaction factor / emittance • Twin-aperture quadrupoles powered separately for the two beams • Higher dipole filling factor: 10% lower synchrotron radiation per turn
Technical insertions	Identical / universal technical straight sections , with strong dependence on superperiodicity	Specialized straight sections for injection, collimation, RF using transparency conditions
Switching between energy modes	Different magnet layout at different energies	Simplified energy transitions thanks to common layout across energies