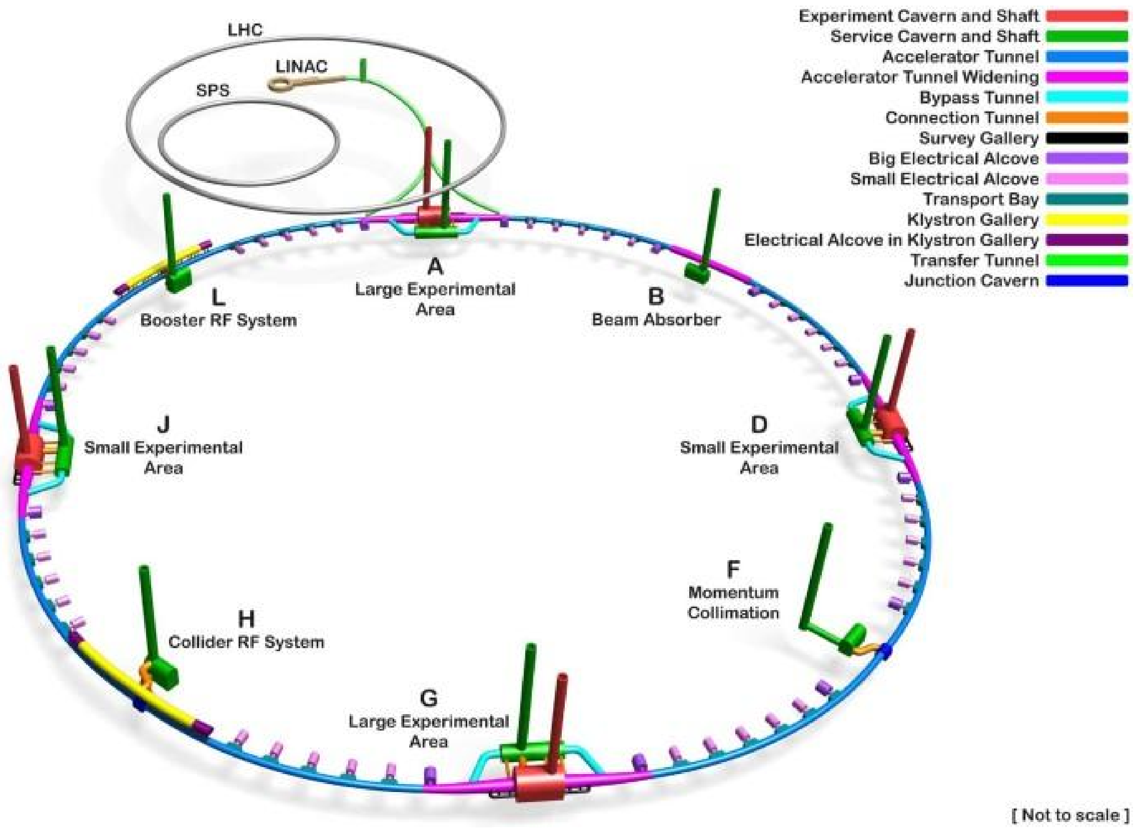
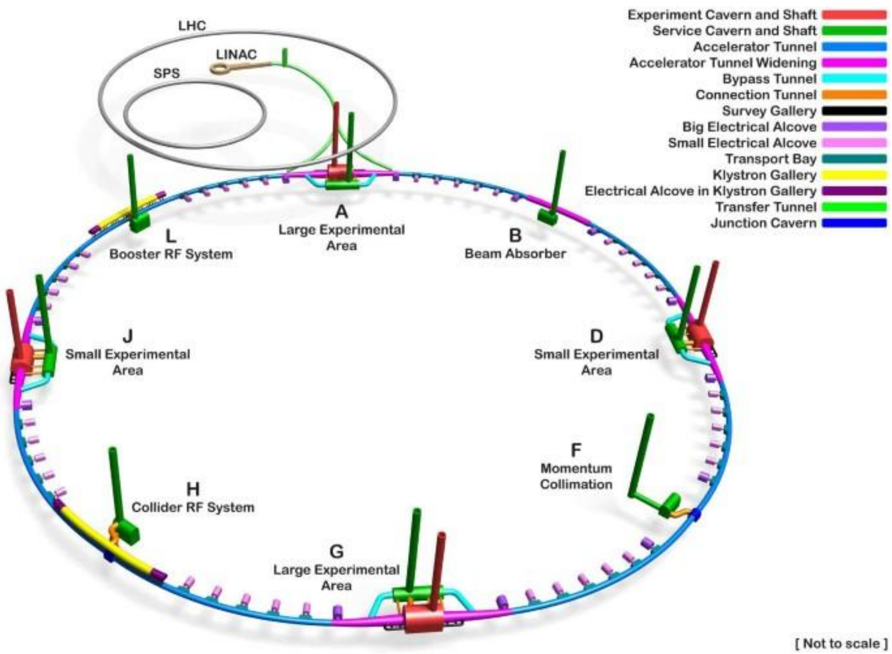


FCC: where could F9 fit in?

A discussion – introduction and starting point on the F9 strategy

F9 department retreat, Krvavec, Sept 28-30, 2026

FCC in one slide



- ~90 km circular tunnel around CERN
- First stage: FCC-ee — precision e^+e^- collider
- Z → WW → Higgs → top program
- Possible start only in the mid-2040s
- A possible successor to the LHC, selected as the flagship project in the CERN Council update of the European Strategy for Particle Physics on May 22, 2026 — not yet an approved project

The FCC programme

FCC-ee: a precision e^+e^- collider in a ~91 km tunnel, operating from the Z pole through WW, Higgs and top thresholds.

FCC-hh: a later hadron collider in the same infrastructure, targeting the ~100 TeV energy frontier.

Timeline:

- 2026: Citizen participation and public consultation processes in Switzerland and France (running through autumn 2026).
- 2026–2032: Preparatory phase featuring in-depth studies commissioned by CERN Member States.
- 2028: Expected go/no-go decision by CERN Member States (via the CERN Council) on whether to approve and build the project.
- 2033–2040: Planned civil engineering phase for the 91-kilometer underground tunnel.
- After 2038: Installation phase for machine components.
- Around 2045: Commissioning and start of operation for the first-stage electron-positron collider (FCC-ee).
- 2070s: Second-stage upgrade to a high-energy proton-proton collider (FCC-hh).

Detector performance

Higgs recoil and invisible decays → hermetic acceptance, low material and excellent momentum resolution.

Electroweak precision at Z/WW → exceptional stability, luminosity and beam-energy control, with robust forward instrumentation.

Heavy flavour and τ physics (with 10^{12} Z^0) → micron-level vertexing, efficient low-momentum tracking and powerful π/K/p identification.

Hadronic W/Z/H decays → highly granular calorimetry and particle-flow performance; very high Z rates favour continuous, triggerless readout.

Detector concepts

CLD — compact all-silicon tracking, high-granularity calorimetry and particle-flow reconstruction.

IDEA — ultra-light drift chamber, silicon vertex/wrapper layers, dual-readout calorimetry and a compact solenoid.

ALLEGRO — silicon tracking around a noble-liquid electromagnetic calorimeter, with granular hadronic calorimetry.

Common R&D frontier: vertexing, timing, particle identification, calorimetry, magnets, electronics, and full-system integration.

Prospective experiments

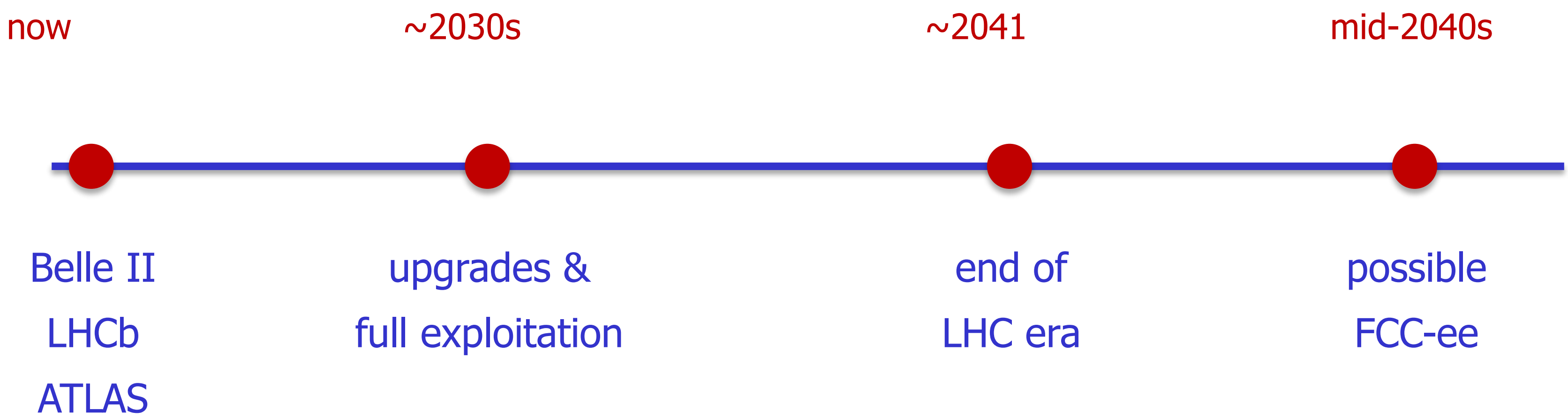
The FCC-ee baseline allows multiple interaction points and complementary detectors.

IDEA, CLD and ALLEGRO are detector-concept communities—not yet approved experiments in the LHC sense.

The design phase remains open: concepts are being benchmarked against common physics cases, engineering constraints and cost.

This could be a useful stage for targeted contributions that connect existing expertise to a clear performance question.

The perspective matters



For F9, FCC is a long-term R&D and positioning activity alongside — not instead of — our present experiments.

Detector RD and SW/computing needs a big project after all upgrades are done.

Why keep an eye on FCC-ee?

Higgs precision

Electroweak precision

Flavour at Tera-Z

Huge, clean event samples put exceptional demands on detector control and open physics opportunities beyond a conventional “Higgs factory”.

For us, the interesting point is the overlap with expertise we are already building elsewhere. + new ideas

What do we already have locally?

Silicon detectors
sensors • irradiation • timing • device R&D

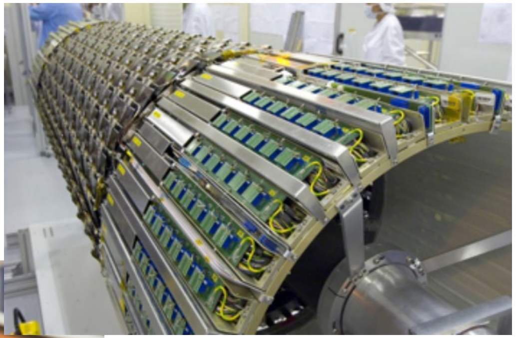
RICH & photosensors
single-photon detection • SiPMs • MCP-PMTs • optics

Flavour physics
Belle II • LHCb • reconstruction & analysis

Energy frontier
ATLAS • tracking • Higgs/EW/top • large collaboration

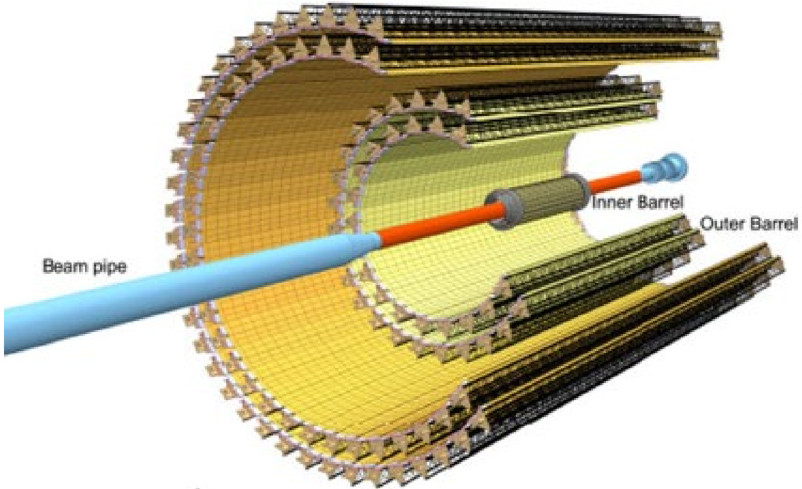
The point is not to invent a new programme, but to identify useful continuity. + new directions

Possible connection I: silicon tracking & vertexing

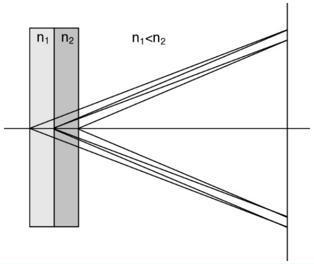


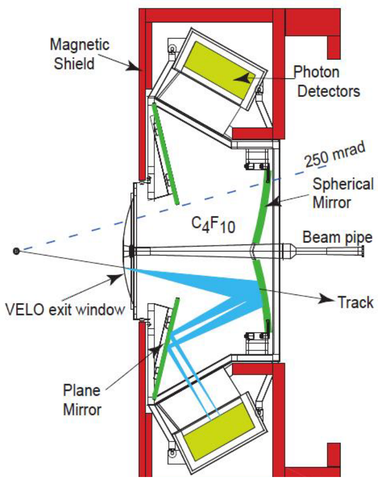
FCC-ee needs:
- very low material budget
- excellent vertexing and tracking
- high stability and precision

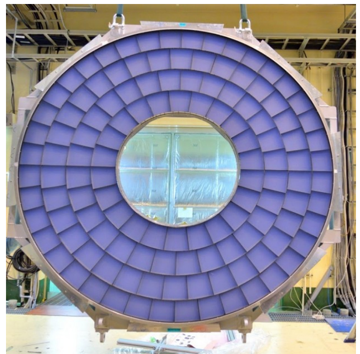
Potential F9 contribution:
- sensor/device R&D
- characterisation and test beams
- timing / novel silicon concepts

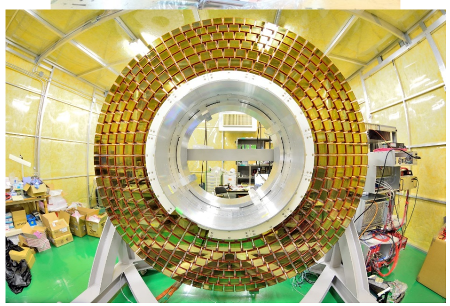


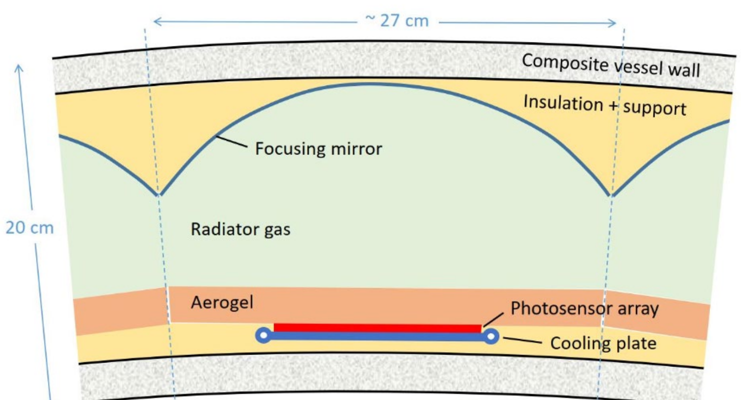
Possible connection II: PID, RICH & photon sensors











ARC detector (one cell)

Flavour physics benefits strongly from π/K/p separation.

F9 has directly relevant experience:

- aerogel RICH
- SiPM single-photon detection
- MCP-PMT / LAPPD studies
- fast electronics & light collection
- LHCb RICH upgrade

A natural niche for exploratory FCC detector studies.

Possible connection III: flavour physics

Belle II — LHCb — FCC-ee

The sensible path is continuity rather than migration:

Belle II and LHCb remain major commitments for roughly the coming decade.

FCC studies can meanwhile provide a place to transfer flavour-analysis experience, define detector/PID requirements, and train younger colleagues for the longer term.

Also very useful: our LEP experience

Possible connection IV: continuity from ATLAS

ATLAS remains central through HL-LHC.

What transfers naturally:

- silicon detector know-how
- reconstruction & simulation
- Higgs / EW / top expertise
- precision-systematics culture
- experience in a large CERN collaboration

+ LHCb experience that we will accumulate in the meantime

ATLAS / HL-LHC

R&D
methods
people

possible FCC-ee

Possible connection V: Machine learning expertize

We have ML experience in various levels of data processing :

- background estimation (fakes, smoothing)
- generative models (fact MC)
- inference/categorization (PID, S/B separation,…)
- ML on chip

Possible new directions

- ML-assisted detector design (MODE collaboration)
- ML-assisted TRG and data flow (e.g., event cleaning)

What could be a realistic F9 involvement now?

1	Stay informed	A few people active in FCC physics/detector working groups
2	Connect existing R&D	Use FCC requirements as one possible benchmark for silicon and photon-sensor work
3	Pick one or two niches	Only where we have a clear local advantage and interested people (detectors, ML, analysis)
4	Keep options open	No major manpower shift while Belle II, LHCb and ATLAS are in full swing

A possible F9 position

FCC is important for our long-term future.

Our next decade is Belle II, LHCb and ATLAS, but we have to plan ahead.

Silicon R&D	RICH & photosensors	Flavour + ATLAS physics	ML, SW, computing and WLCG

For now: modest participation, exploit synergies, and be ready once the project becomes concrete.