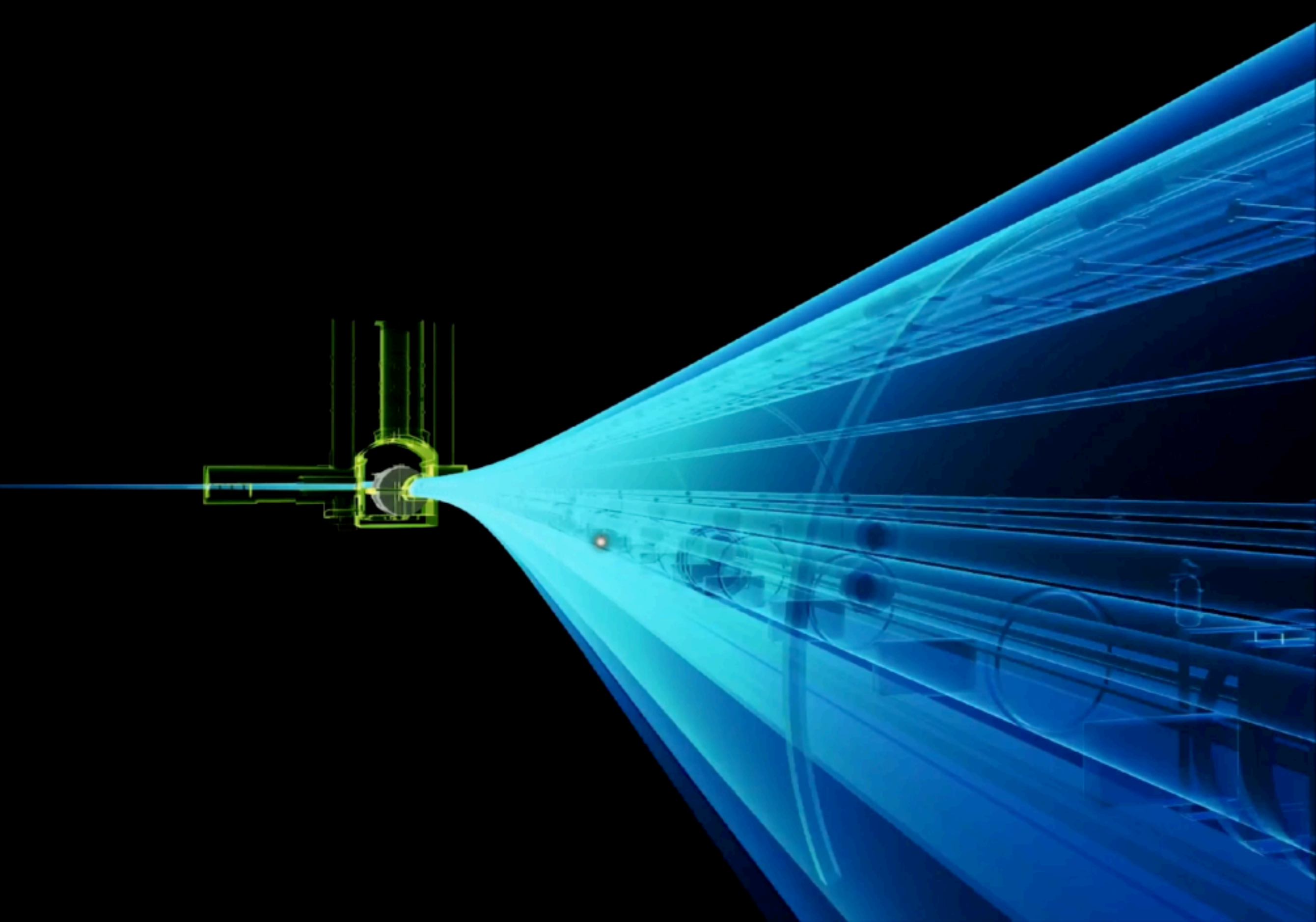


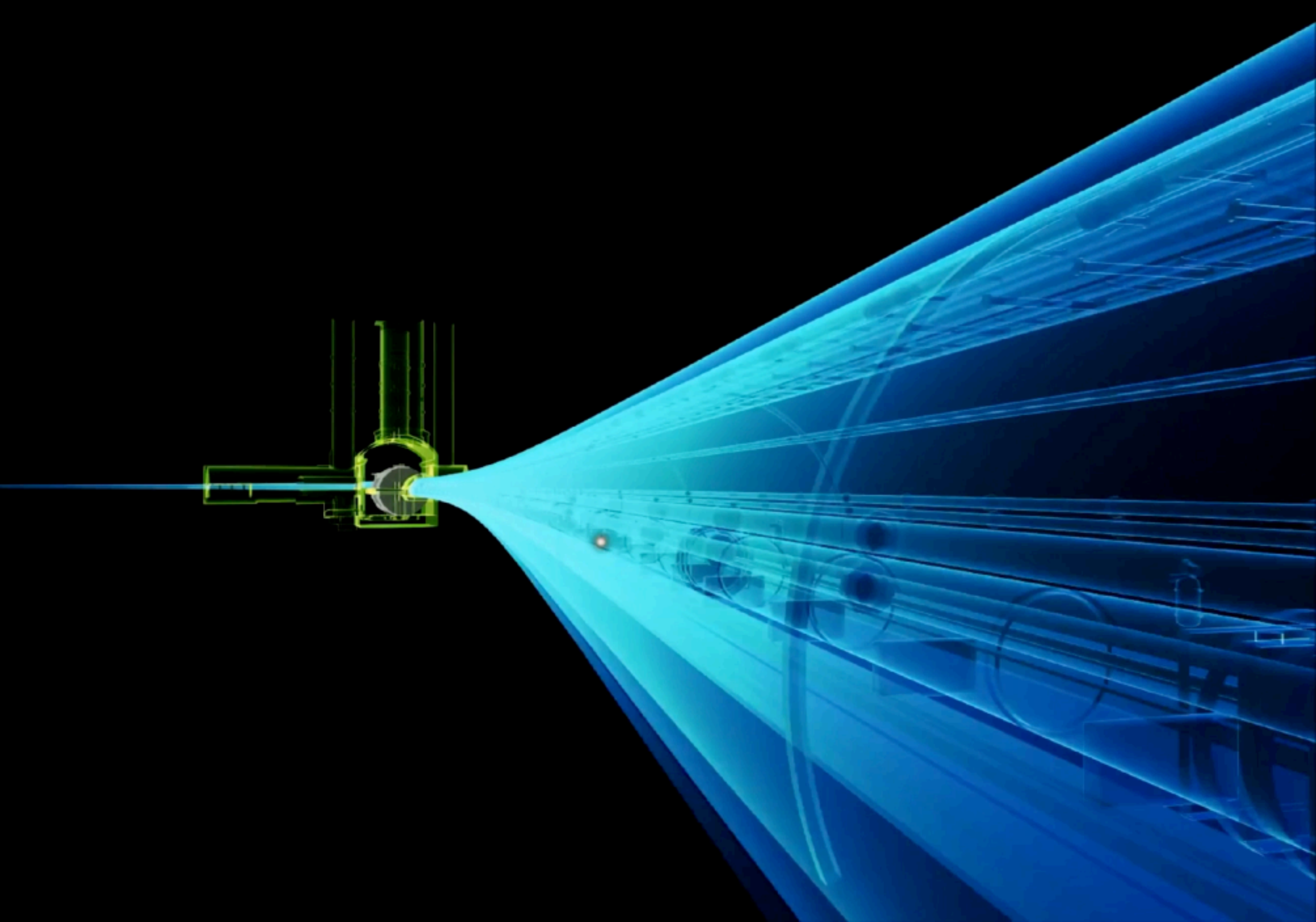


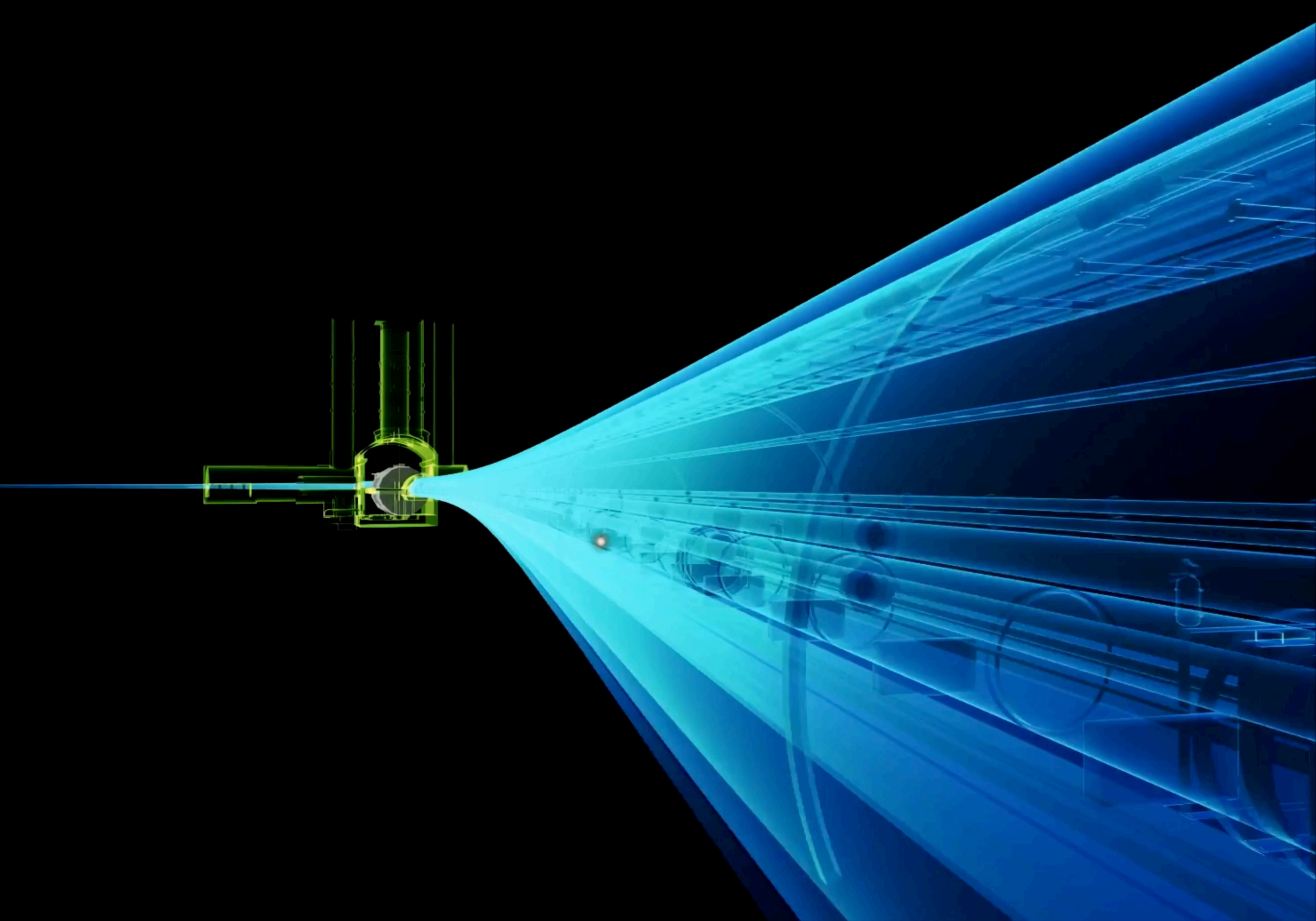
Proton Accelerator: Neutrino Factory





[ATLAS Experiment: Link]

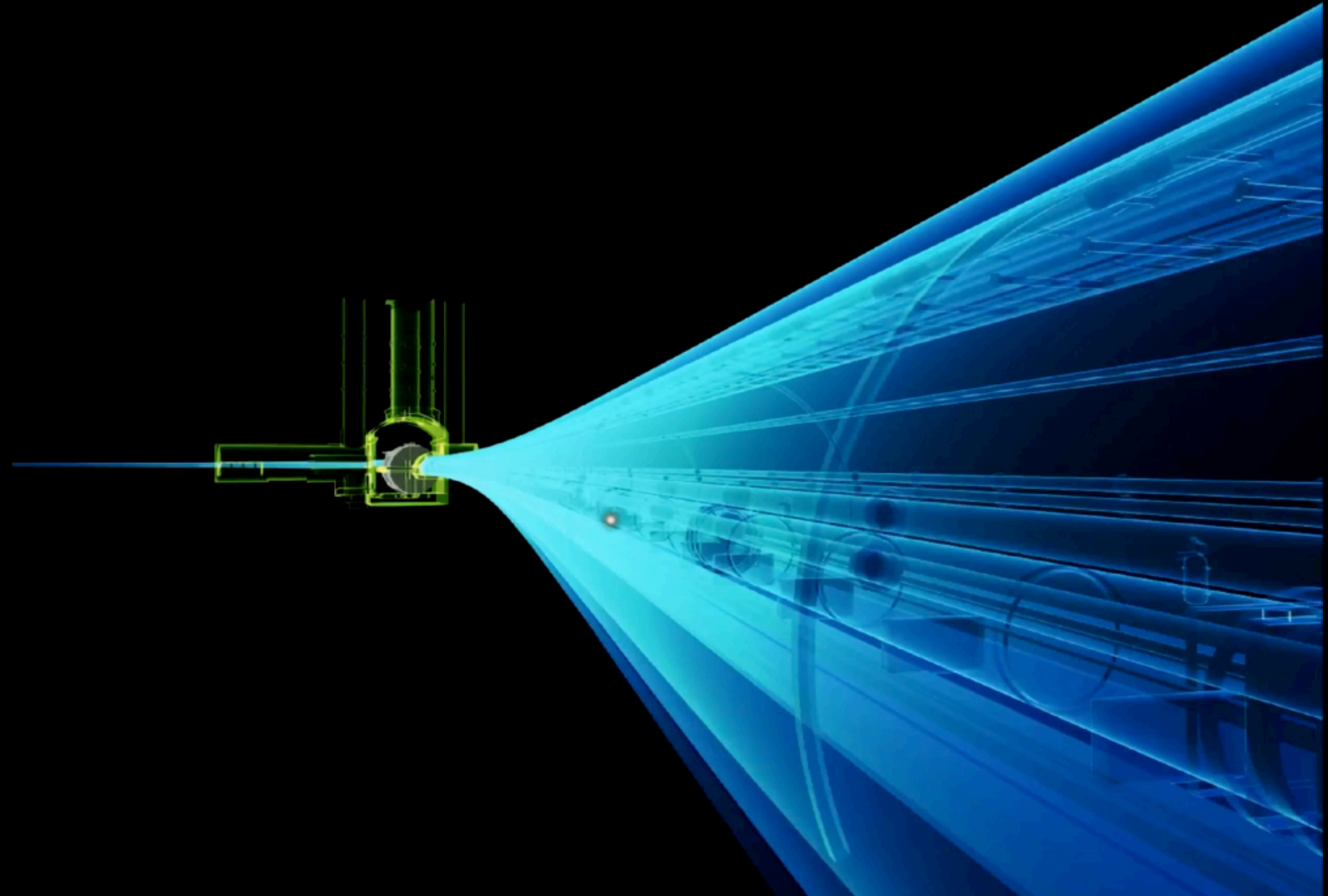




Large Hadron Collider

Proton accelerator: Neutrino Factory

- **An Unexplored Source:** LHC provides the highest-energy neutrinos ever produced in a laboratory.
- **The Ring:** Protons travel around a **27-Km ring (LHC)** before they are guided into collision.
- **Detection:** p-p collisions at $\sqrt{s} = 13 \text{ TeV}$ (13.000x higher than AGS) inside detectors like ATLAS.
- **Forward secondary particles:** These collisions create a massive spray of secondary **hadrons** (π , K , ...).



Large Hadron Collider

Neutrino production at LHC

- Unstable hadrons travel forward and **decay** almost instantly, producing **collimated beam** of neutrinos → **FASER** detector.
- **FASER detector 480 meters downstream** from the collision point, perfectly aligned with the beam (TI12 service tunnel).
- **Shielding:** 100 meters of rock and concrete filter out all particles except neutrinos and very high-energy muon.
- Expecting $\sim 1700 \nu_e$, $\sim 8500 \nu_\mu$ and $\sim 30 \nu_\tau$ charged current (CC) neutrino interactions in FASER ν in LHC Run-3 (250/fb).

