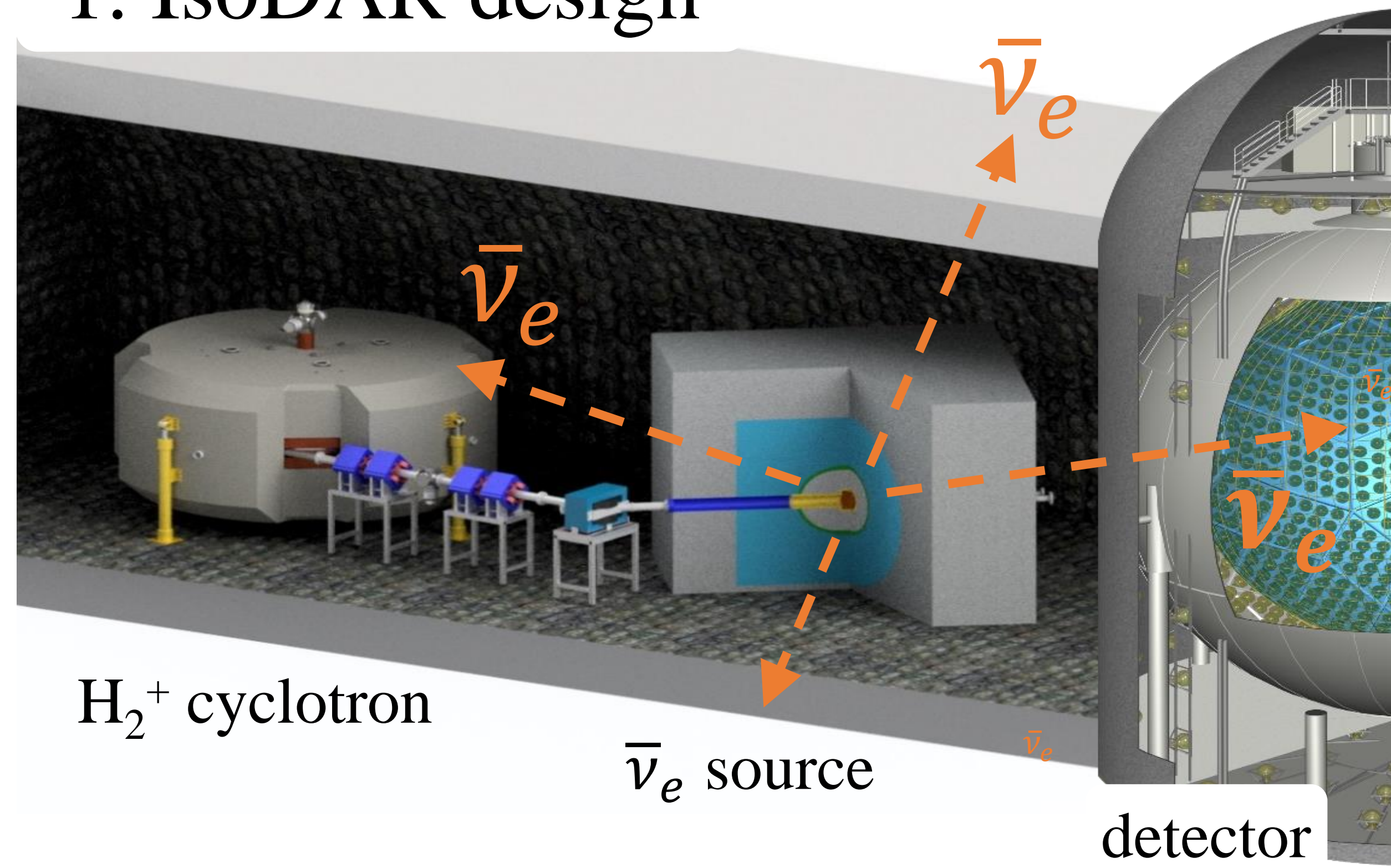
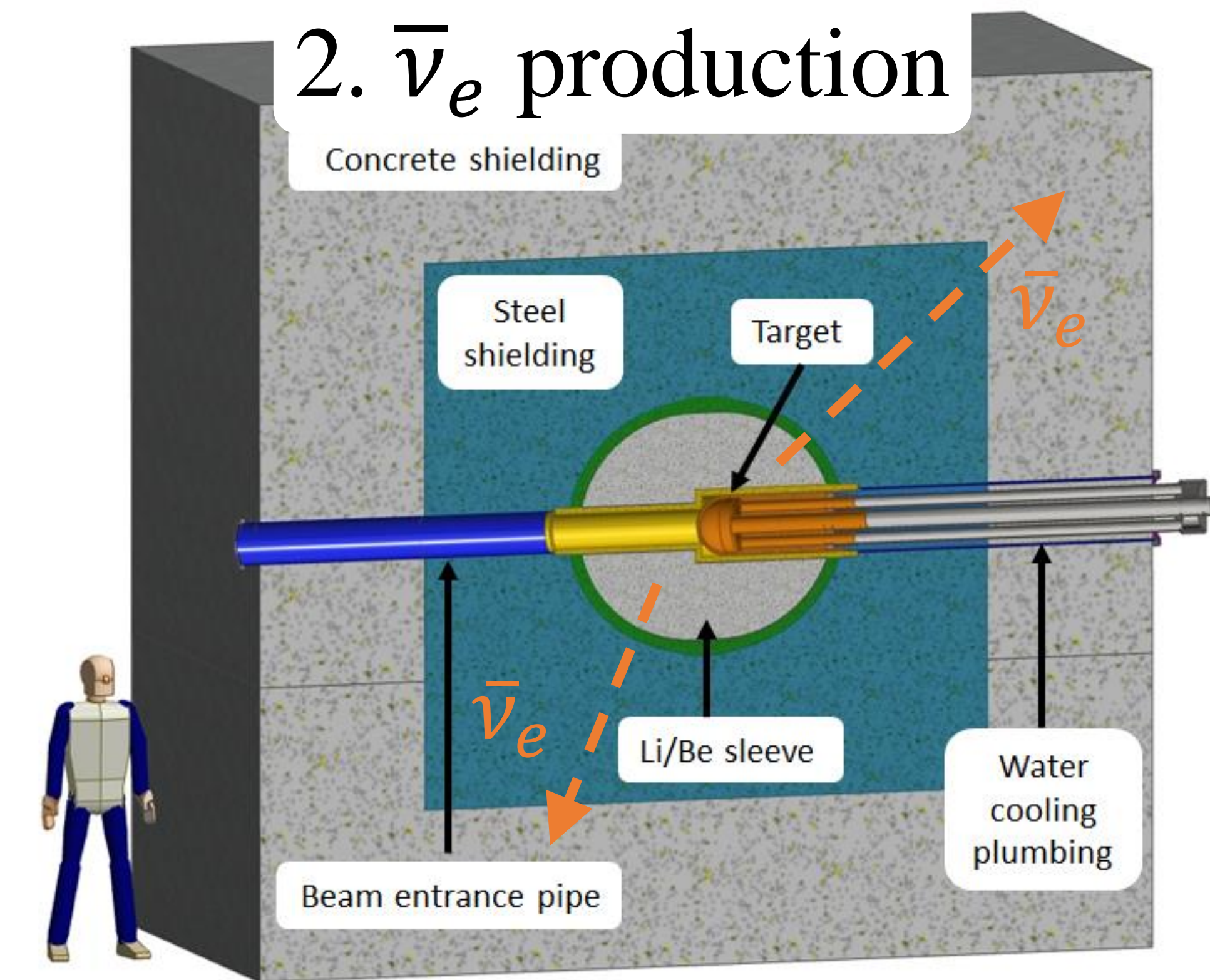


1. IsoDAR design



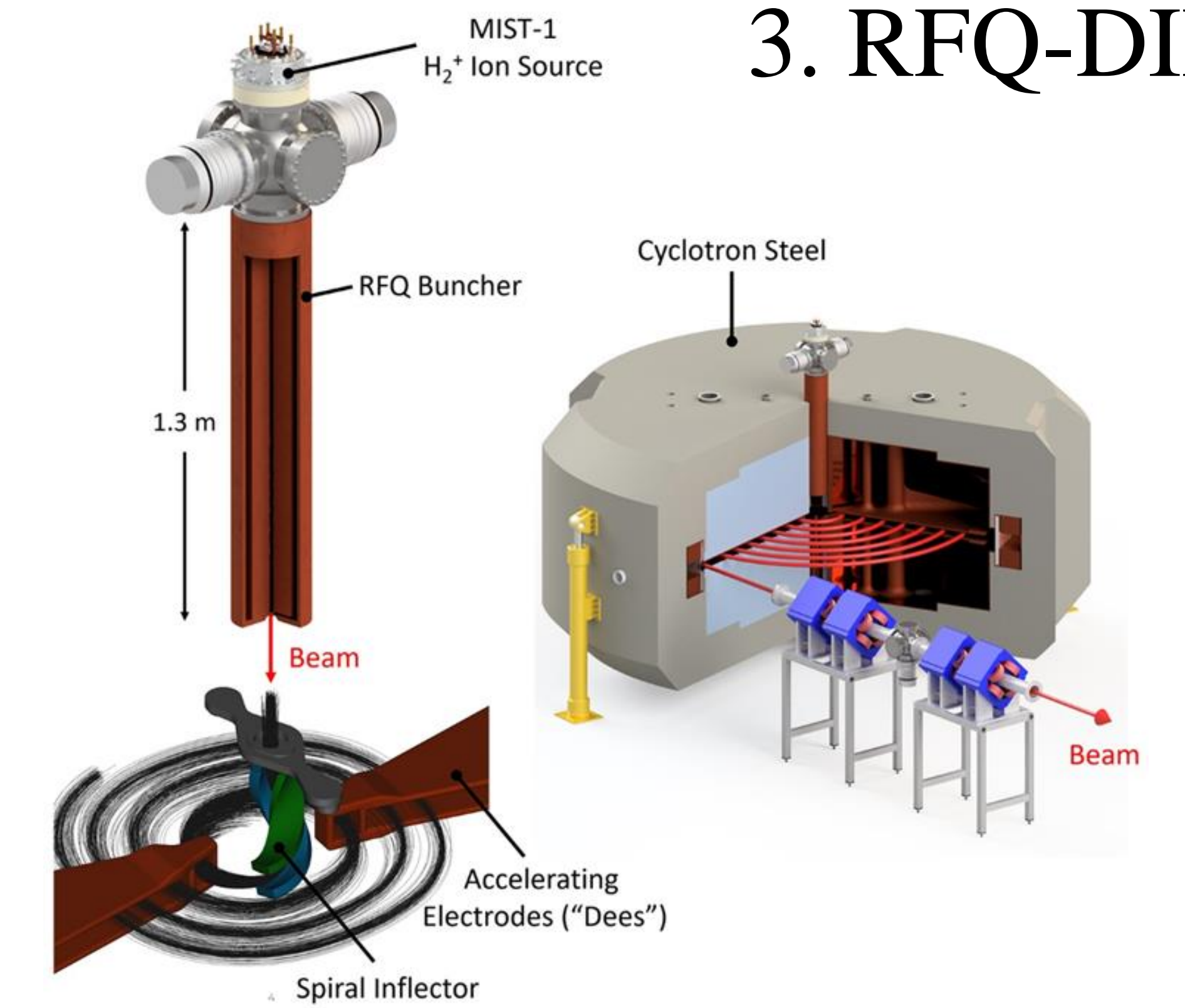
- $\bar{\nu}_e$ disappearance experiment designed to investigate LSND and MiniBooNE results
- 5- σ detection sensitivity for eV scale ν_s in 5 years runtime, if paired with a kiloton scale detector such as KamLAND
- Able to discriminate between sterile neutrino models
- Requires $\sim 10\times$ the proton current available from commercial compact cyclotrons

2. $\bar{\nu}_e$ production



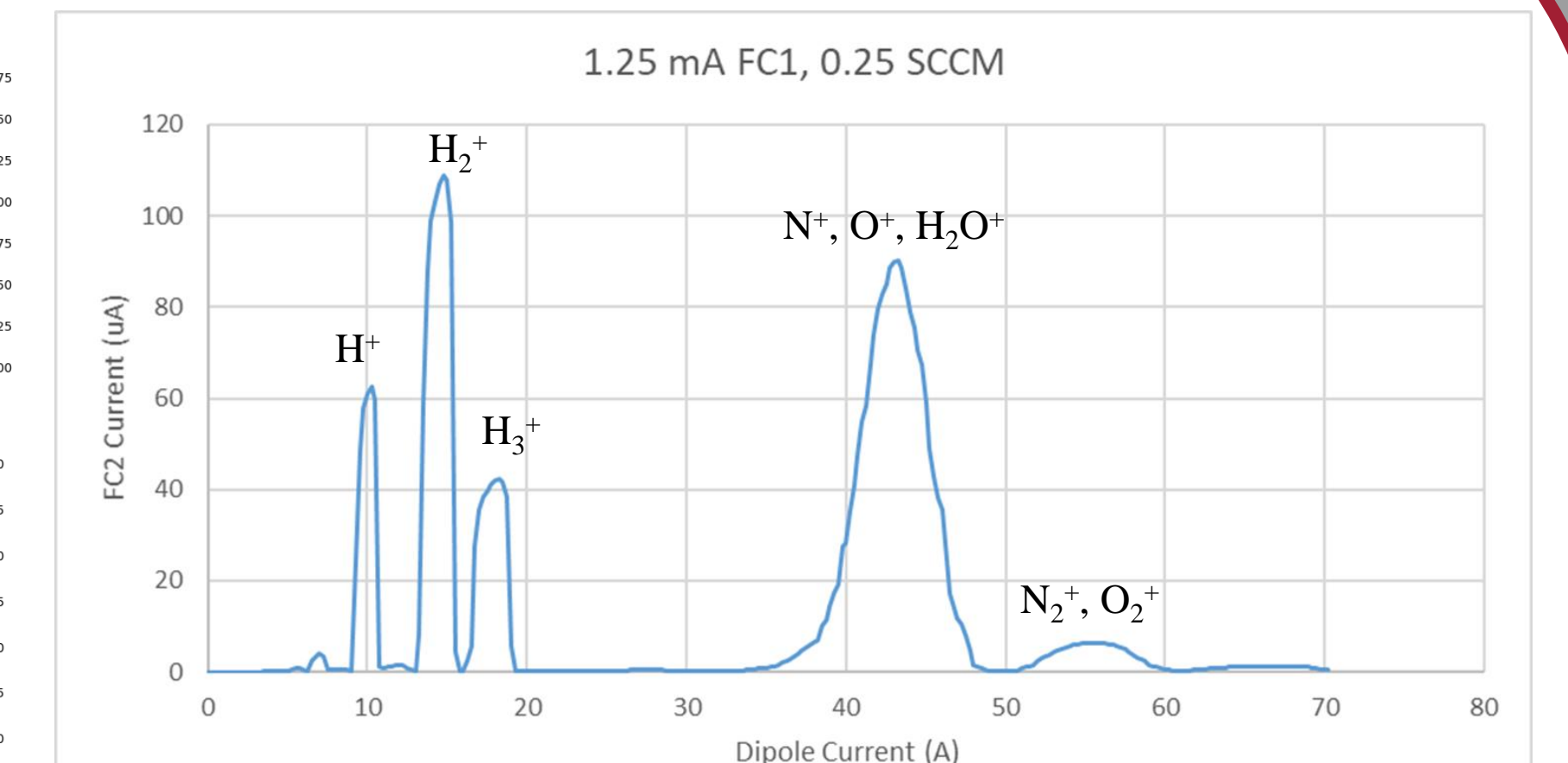
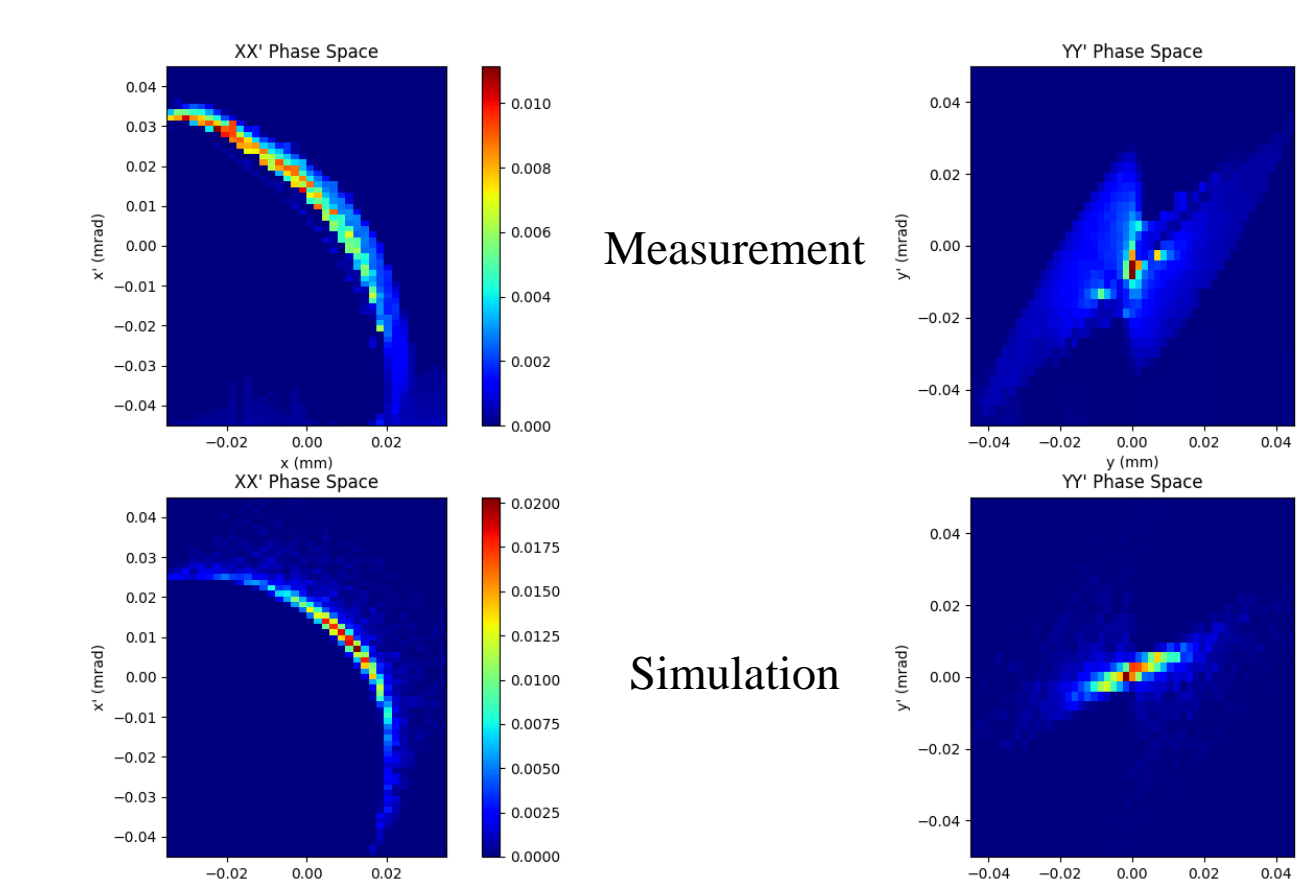
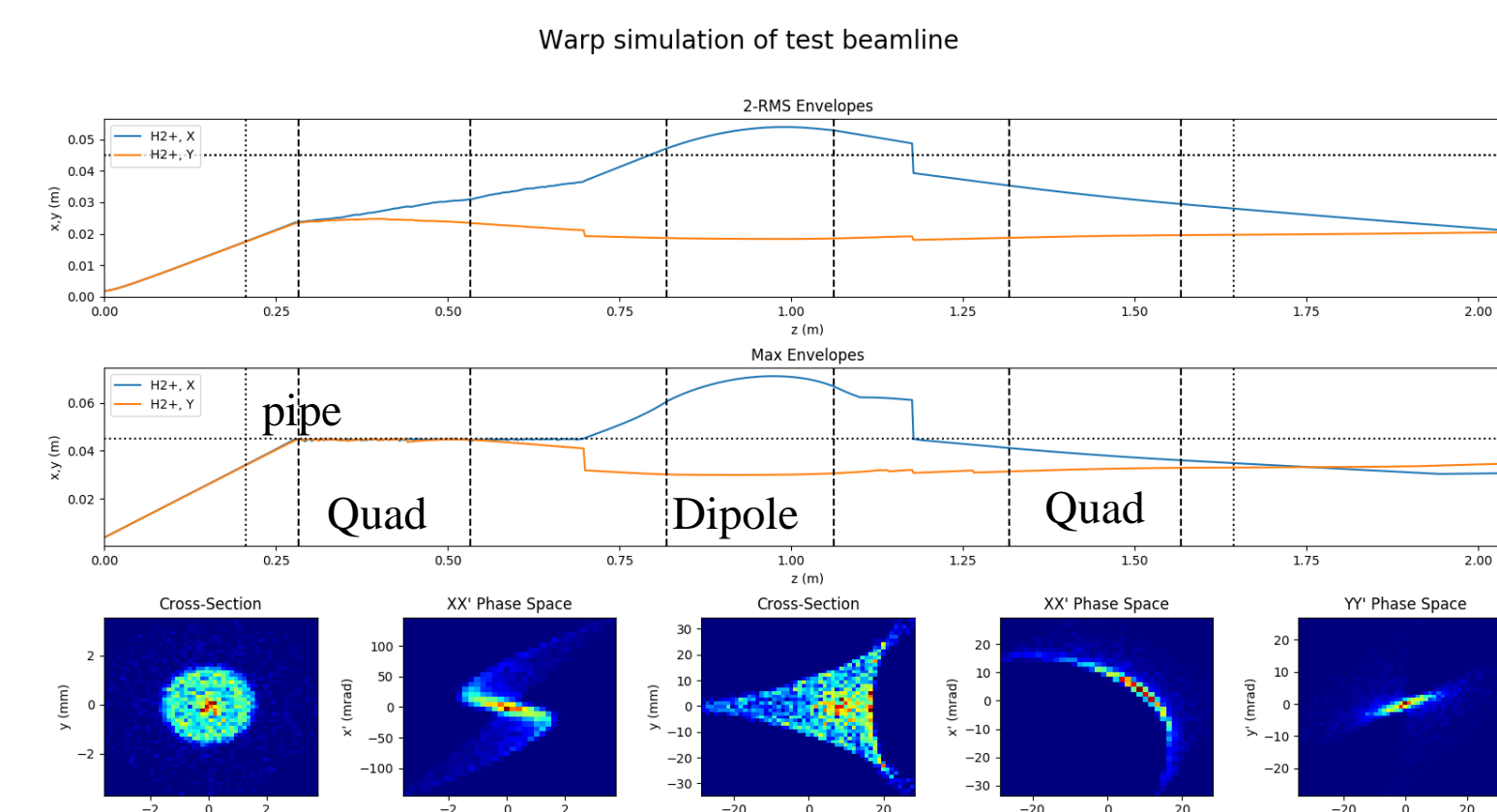
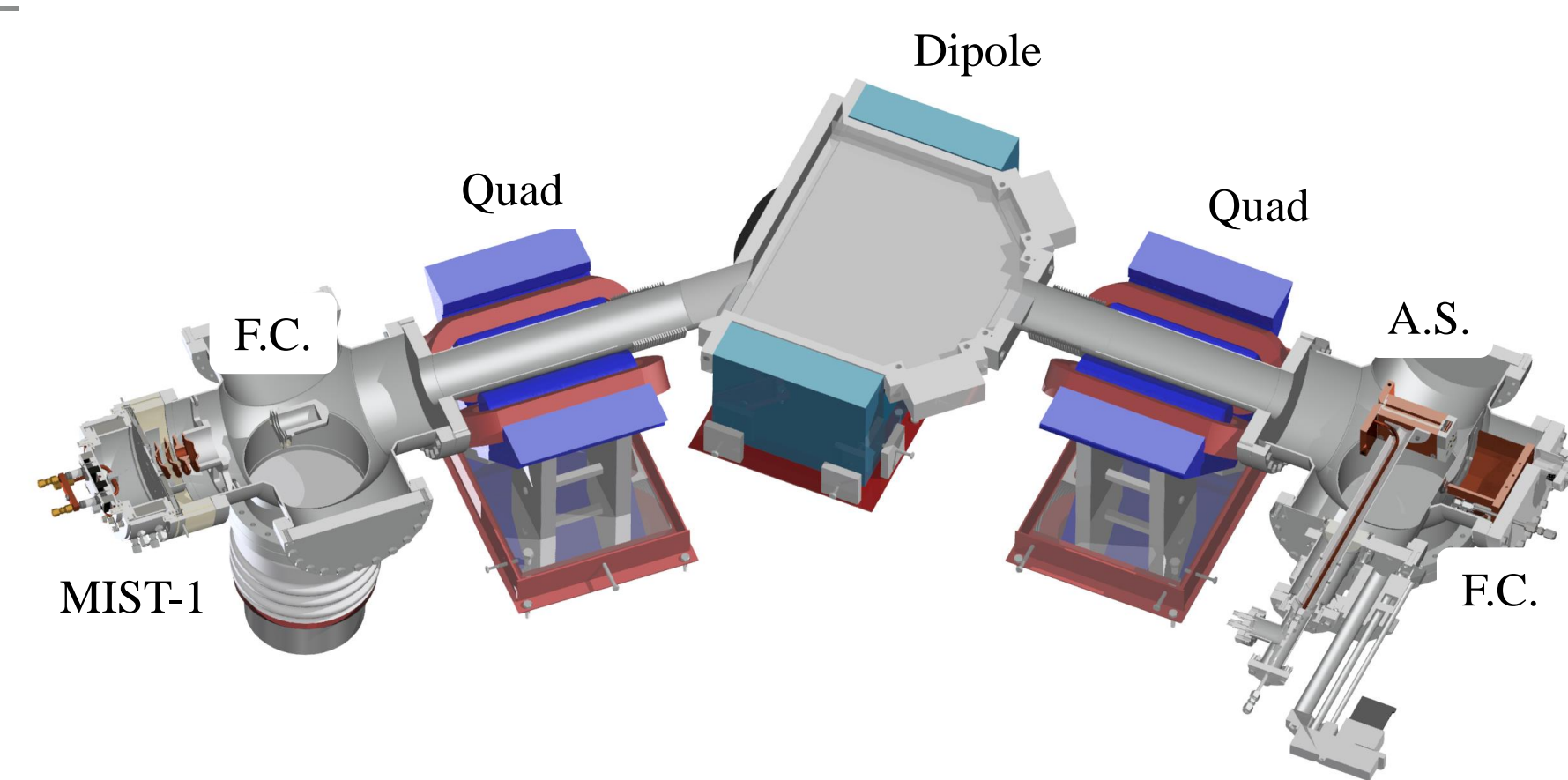
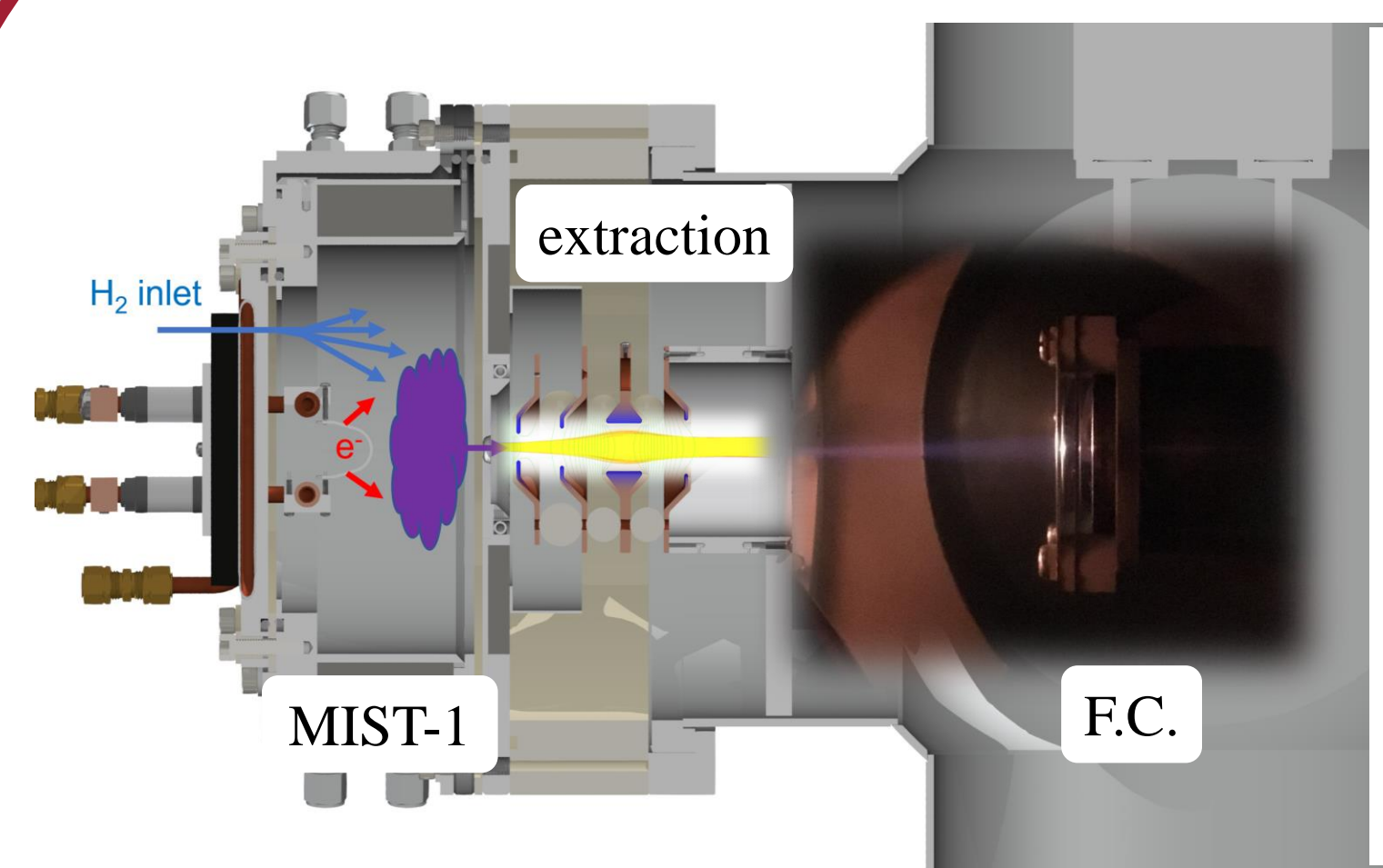
- 10 mA, 60 MeV protons impinge on ${}^9\text{Be}$ target producing neutrons
- Neutrons are captured by a surrounding sleeve of highly pure ${}^7\text{Li}$ producing ${}^8\text{Li}$
- ${}^8\text{Li}$ β -decays, producing $\bar{\nu}_e$ (Isotope Decay-At-Rest)
- $\bar{\nu}_e$ source with known energy spectrum and baseline
- Target, sleeve, and shielding design in advanced stages

3. RFQ-DIP



- Accelerate 5 mA H_2^+ to 60 MeV in a compact cyclotron, reducing spacecharge compared to H^+
- RFQ for bunching, axial injection, higher transmission rates (Direct-Injection-Project)
- RFQ frequency matched to cyclotron frequency to produce CW beam
- Technical design in advanced stage

MIST-1: A dedicated H_2^+ Ion Source for IsoDAR



Multicusp Ion Source Technology

- Commissioning at M.I.T.
- Electrons emitted from heated tungsten filament ignite plasma
- Permanent magnets confine plasma
- Early current measurements of up to 5 mA (40 mA/cm^2)
- Now optimizing source for H_2^+ production

Test beamline

- 1 dipole magnets
- 2 quadrupoles magnets (for vertical focusing)
- 2 Faraday cups (F.C.)
- 2 Allison scanners (A.S.)

Simulations

- Ion extraction simulated using IBSimu
- Beam transport simulated using Warp
- Magnetic fields generated in COMSOL

Beamline Measurements

- Preliminary phase-space measurements match simulations
- Species composition of beam heavily dependent on source parameters
- Upgraded beamline was temporarily shut down

Outlook

- The proton driver and $\bar{\nu}_e$ production designs for IsoDAR are well underway
- MIST-1 has produced current densities needed for the IsoDAR experiment
- MIST-1 optimization studies resumed last week

