Activities & Contacts @ Pisa

Cristina Alexe[1,3] & Antoine Venturini[2,3]
1. Scuola Normale Superiore di Pisa 2. Università di Pisa 3. INFN Pisa

First ECFA-INFN Early Career Researchers Meetings
July 3, 2024 @ INFN Laboratories of Frascati

1. R&D Detectors, Electronics, Algorithms etc… for FCC-ee
   - Fabrizio Palla fabrizio.palla@pi.infn.it
   - Franco Bedeschi bed@fnal.gov
2. Physics @ FCC-ee & other FC: Analysis & Simulations
   - Paolo Azzurri paolo.azzurri@pi.infn.it
3. Simil-fellow program @ CERN:
   - Roberto Tenchini roberto.tenchini@pi.infn.it
4. Muon Colliders (MuCol):
   - Alessandro Cerri alessandro.cerri@pi.infn.it

Collaborating with…

INFN Divisions & Universities

- Bari
- Bologna
- Laboratori Frascati
- Lecce
- Milano
- Pavia
- Perugia
- Torino

CERN

INFN

PSI

Universität Zürich[UZH]

TU WIEN

TEXAS A&M UNIVERSITY

UNIVERSITAS STUDIORUM INSUBRIAE

UNIVERSITY OF MARYLAND 18 56

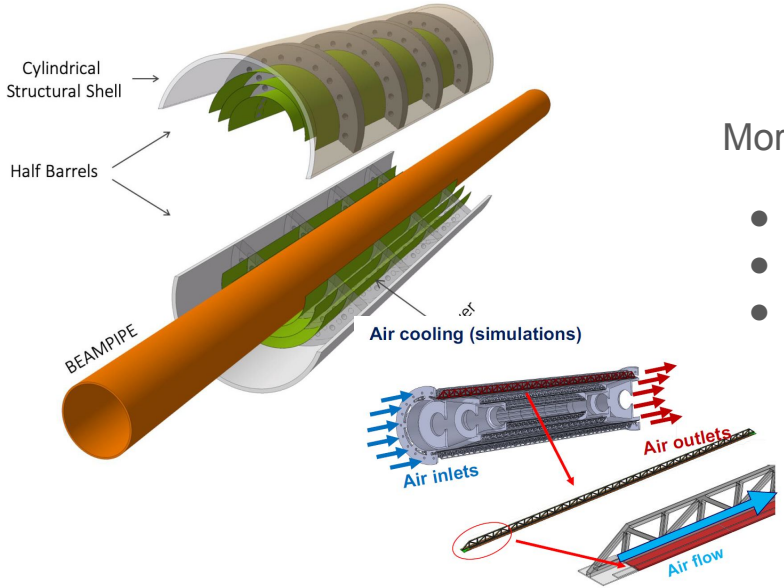
UNIVERSITAS STUDIORUM MEDIOLANENSIS

R&D

FCC-ee

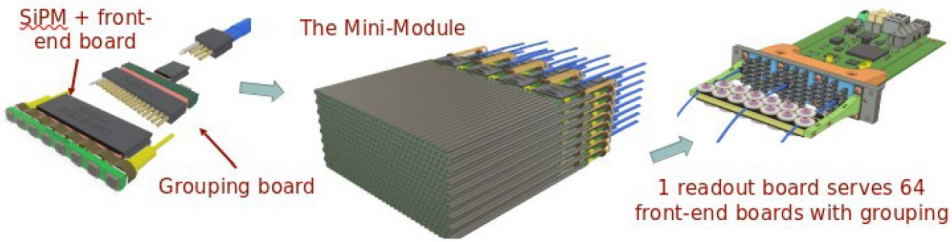
Vertex Tracker & MDI

- Synergy with Belle II & ALICE groups
- Mechanics & cooling studies



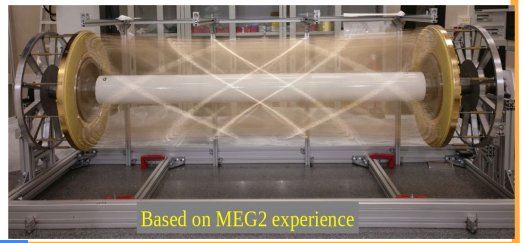
Calorimetry

- Taking part in the HiDRA 2 project for a Dual Readout calorimeter



More

- Drift chamber “à la” MEG II
- Electronics (for drift chambers)
- Reconstruction algorithms, ML & more

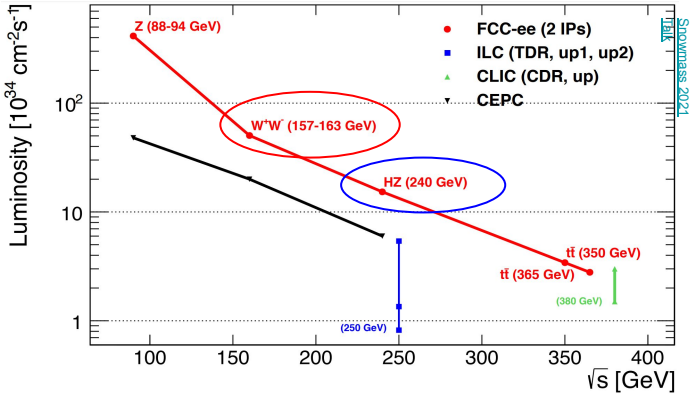


Muon Colliders

- Detector Design for tracking
- Picosec detectors for muon identification

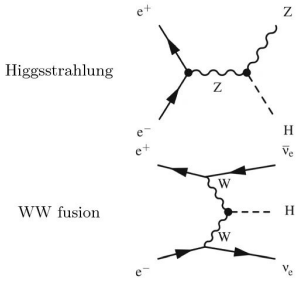
Analyses

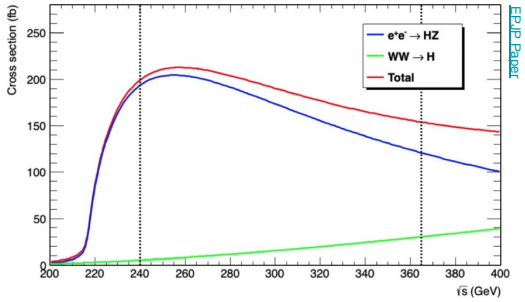
- **Electroweak Physics** at FCC-ee → improvements in precision by factor x 20-500
- Many **new measurement opportunities** due to the increased luminosity and collision energy



Higgs mass and production cross section

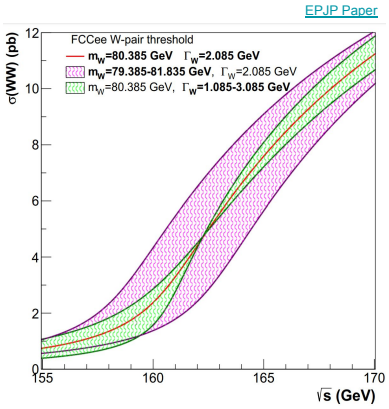
- Precise measurement of **ZH production** cross section (1% stat) → key input to **HZZ coupling** "standard candle"
- 1st evidence for **trilinear Higgs self-coupling**
- **Reduce m_H uncertainty** to 6 MeV (stat) (current Δm_H= 110 MeV) → prerequisite for **electron Yukawa coupling**





W mass and width

- **2 new measurements** using W pair production



1) Using **σWW** measured at 2 energies

- extremely simple and clean
- statistical **uncertainty of 0.5(1.2) MeV** on $m_W(\Gamma_W)$, systematics of similar order
- Δm_W ~ 10 MeV @ LHC

2) Using the **kinematic reconstruction** of the 2 W with 2/4 jets

- precision similar to the 1st method