

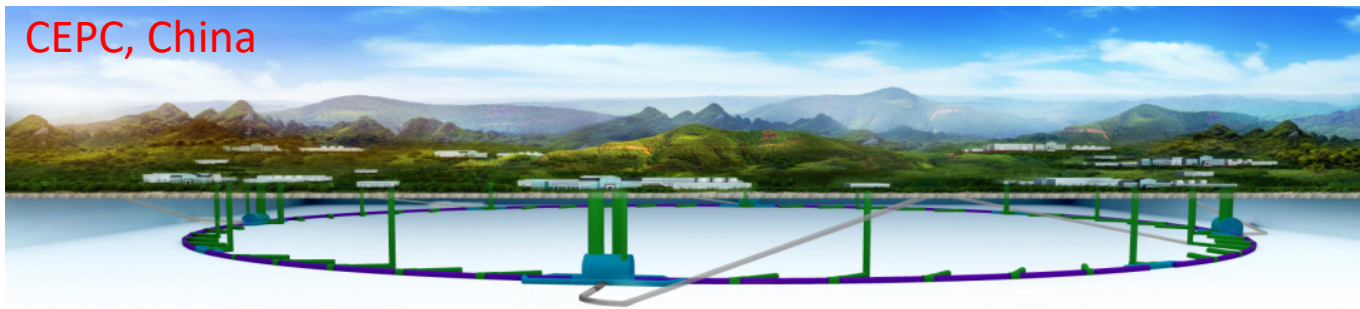
RD_FCC / Pisa Preventivi 2023

Paolo Azzurri

Pisa, 30 Giugno 2022



- Quadro generale & attività
- Anagrafica
- Richieste servizi
- (backup) physics program & IDEA concept



European Strategy for Particle Physics

<http://europeanstrategyupdate.web.cern.ch/>

- «**An electron-positron Higgs factory is the highest-priority facility after the LHC..** a feasibility study should be established and completed on the timescale of the next Strategy update.»
- **Feasibility Study:** consolidation of the physics case and detector concepts

Attività ECFA WG1/2/3

WG1 – precision (A.Irles, A.Meyer, A.Freitas, P.Azzurri)

<https://indico.cern.ch/event/1129966/>

<https://indico.cern.ch/event/1131344/>

Precision for future e^+e^- colliders

<https://indico.cern.ch/event/1140580/>

<https://indico.desy.de/event/33640/>

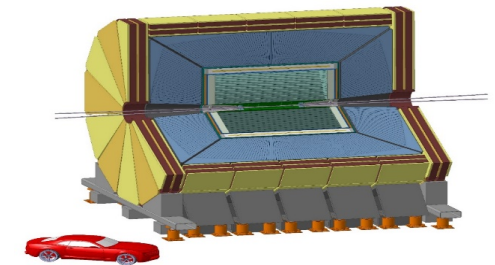
INFN ben rappresentata nelle strutture di FCC (e CEPC)

Detector concept INFN : **IDEA** (nei CDR di FCC e CEPC)

- ✓ Studi software per ottimizzazione e benchmarking
- ✓ R&D su nuove tecnologie per vertex detectors, grandi camere a drift, solenoidi ultrasottili, calorimetria dual readout e cristalli, camere mu basate su μ Rwell, Trigger/DAQ



IDEA concept

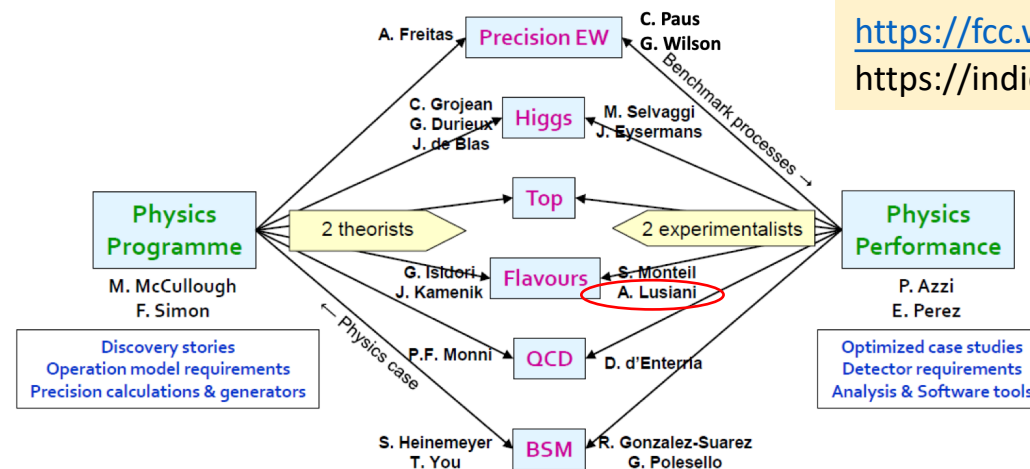




<https://agenda.infn.it/event/29752/>

130 partecipanti - 9 da Pisa

nuovi convener : Physics WG FCC (A Lusiani – Flavours)



<https://fcc.web.cern.ch>

<https://indico.cern.ch/category/15156/>

Attività locale hardware / software ricostruzione

- **Hidra2**: Realizzata stazione di test per fibre scintillanti.
 - Prime misure di attenuazione vs λ (C.Roda, F.Bedeschi)
- **Tracking/Vertexing** (in DELPHES) : simulazione veloce tracciatura e PID/ fit di decadimenti in sequenza con impulsi ed errori delle particelle associate alla catena di decadimento. In arrivo vincoli in massa dei vertici. (F. Bedeschi)

Anagrafica

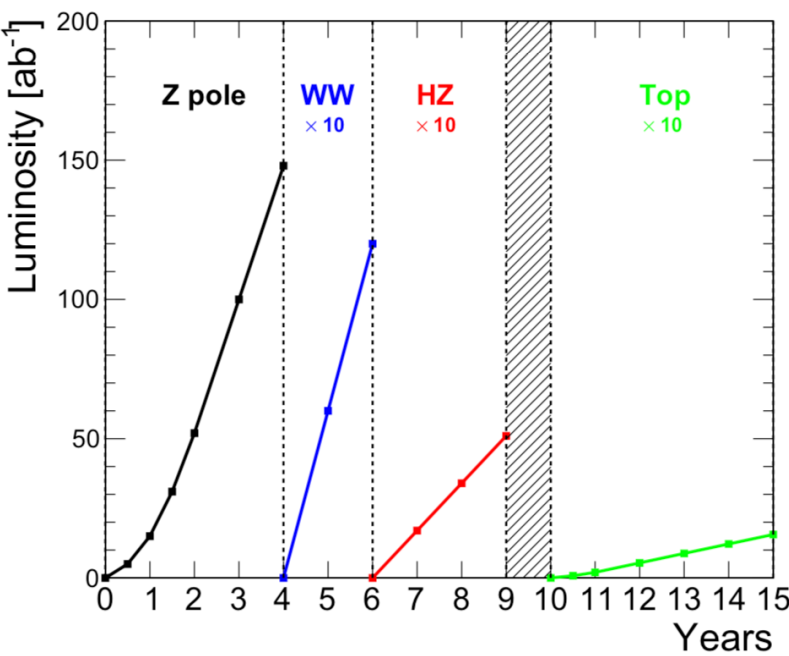
Nome	2021	2022	
• Annovi Alberto	10	10	
• Azzurri Paolo	30	20	EWK/Higgs physics
• Basti Andrea	10	10	Dual Readout
• Bedeschi Franco	25	25	Dual Readout
• Bosi Filippo	0	0	Silicon Detectors
• Cavasinni Vincenzo	0	0	Dual Readout
• Cervelli Franco	0	0	MDI
• Chiarelli Giorgio	10	10	EWK Physics
• Ciocci Agnese	10	10	Silicon Detectors
• Francavilla Paolo	10	10	EWK/Higgs physics
• Leone Sandra	10	10	EWK Physics
• Ligabue Franco	10	10	EWK Physics
• Lusiani Alberto	0	5	Flavor/tau Physics
• Messineo Alberto	10	10	Silicon Detectors
• Palla Fabrizio	5	5	Silicon Detectors
• Punzi Giovanni	10	10	Trigger/DAQ
• Roda Maria Chiara	10	10	Dual Readout
• Rolandi Luigi	15	15	EWK Physics
• Spagnolo Paolo	5	5	EWK Physics
• Tenchini Roberto	10	10	EWK Physics
• Tonelli Guido	0	0	EWK Physics
• Trincherini Enrico	10	10	TH – physics program
• Verducci Monica	20	20	EWK Physics
• TOTALI:		215	

Richieste servizi sezione

- Minimo supporto ingegneri meccanici per R&D
 - μ -cooling silicio → Bosi (anche AIDAinnova)
 - Meccanica IDEA → 0% Basti (20% in Hidra2 sinergico)

Backup : FCCee physics program

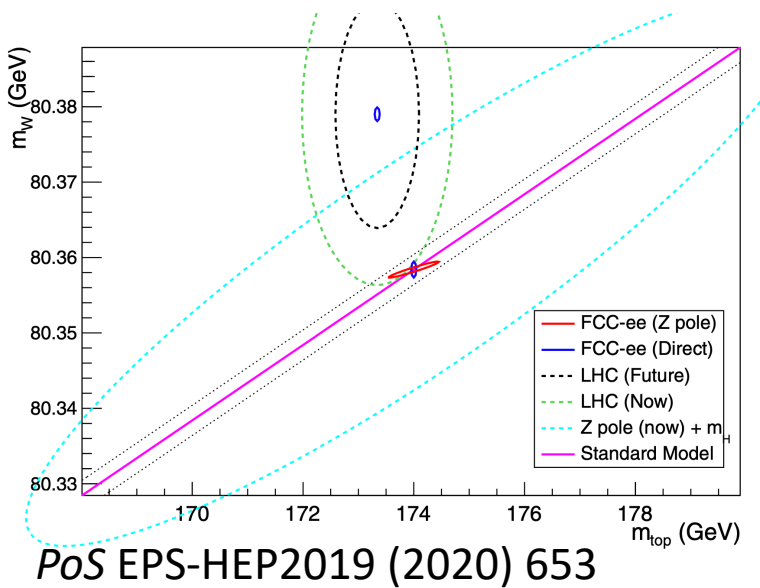
<http://cern.ch/fcc>



$5 \cdot 10^{12}$ hadronic Z
(10^5 LEP1)

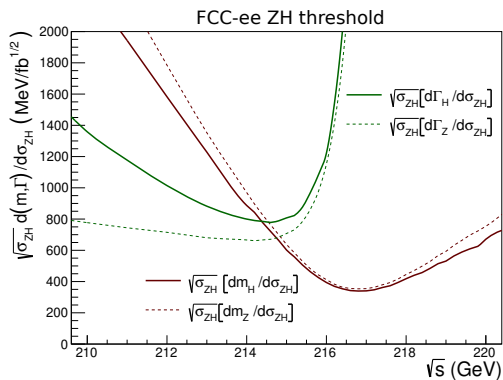
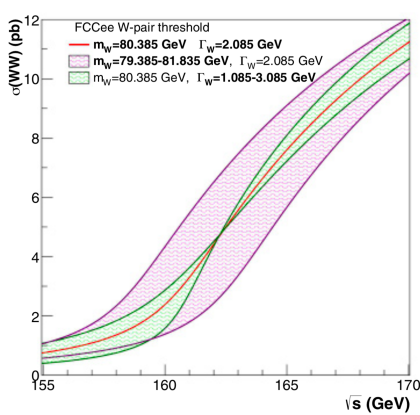
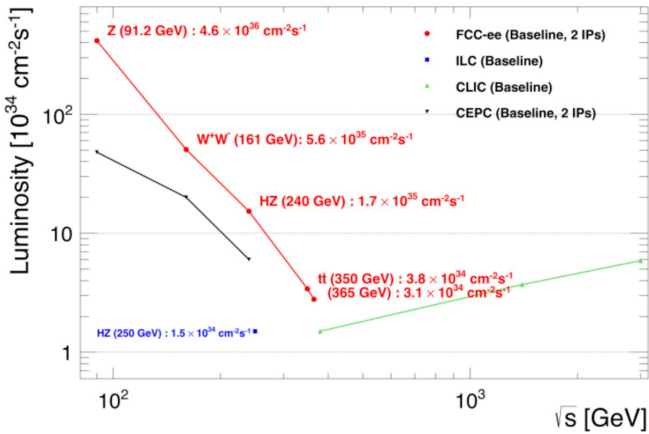
$1.5 \cdot 10^8$ W-pairs
($0.5 \cdot 10^4$ LEP2)

Observable	Present value $\pm$ error	FCC-ee stat.	FCC-ee syst.	Comment and dominant exp. error
m_Z (keV/c ²)	91,186,700 $\pm$ 2200	5	100	From Z line shape scan Beam energy calibration
Γ_Z (keV)	2,495,200 $\pm$ 2300	8	100	From Z line shape scan beam energy calibration
R_Z^e ($\times 10^3$)	20,767 $\pm$ 25	0.06	0.2–1	Ratio of hadrons to leptons acceptance for leptons
$\alpha_s(m_Z)$ ($\times 10^4$)	1196 $\pm$ 30	0.1	0.4–1.6	From R_Z^e above
R_b ($\times 10^6$)	216,290 $\pm$ 660	0.3	< 60	Ratio of $b\bar{b}$ to hadrons stat. extrapol. from SLD
σ_{had}^0 ($\times 10^3$) (nb)	41,541 $\pm$ 37	0.1	4	Peak hadronic cross-section luminosity measurement
N_ν ($\times 10^3$)	2991 $\pm$ 7	0.005	1	Z peak cross sections Luminosity measurement
$\sin^2 \theta_{\text{eff}}^e$ ($\times 10^6$)	231,480 $\pm$ 160	3	2–5	From $A_{\text{FB}}^{\mu\mu}$ at Z peak Beam energy calibration
$1/\alpha_{\text{QED}}(m_Z)$ ($\times 10^3$)	128,952 $\pm$ 14	4	Small	From $A_{\text{FB}}^{\mu\mu}$ off peak
$A_{\text{FB}}^{b,0}$ ($\times 10^4$)	992 $\pm$ 16	0.02	1–3	b-quark asymmetry at Z pole from jet charge
$A_{\text{FB}}^{\text{pol},\tau}$ ($\times 10^4$)	1498 $\pm$ 49	0.15	< 2	τ Polarisation and charge asymmetry τ decay physics
m_W (MeV/c ²)	80,350 $\pm$ 15	0.5	0.3	From WW threshold scan Beam energy calibration
Γ_W (MeV)	2085 $\pm$ 42	1.2	0.3	From WW threshold scan beam energy calibration
$\alpha_s(m_W)$ ($\times 10^4$)	1170 $\pm$ 420	3	Small	From R_W^b
N_ν ($\times 10^3$)	2920 $\pm$ 50	0.8	Small	Ratio of invis. to leptonic in radiative Z returns



Contributi recenti Pisa : EW

Eur.Phys.J.C 80 (2020) 1 PoS ICHEP2020 (2021) 819



Higgs : *Eur.Phys.J.P.* 137 (2022) 1, 23

Backup : FCCee IDEA concept

“International Detector for Electron-positron Accelerators” (IDEA),

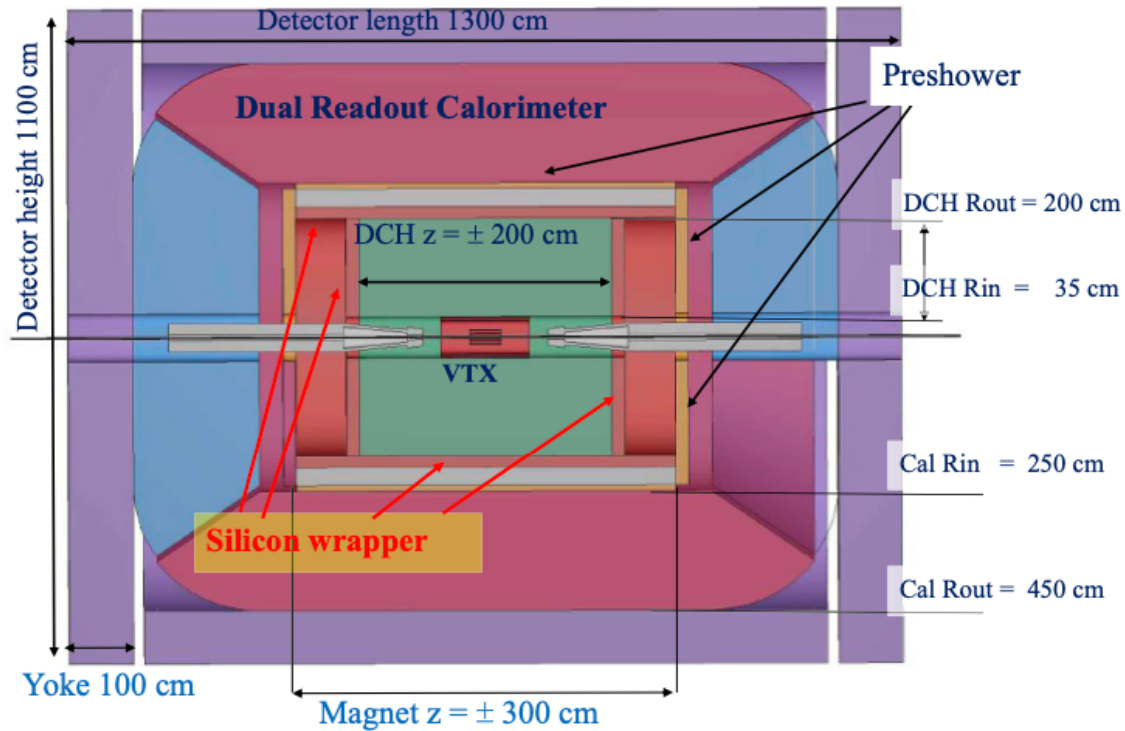


Fig. 7.9. Schematic layout of the IDEA detector.

- vertex detector
- drift chamber
- silicon wrapper
- preshower detector
- dual-readout calorimeter
- muon system