RD_FA^(*) Collab. Meeting



Franco Bedeschi

RD_FA Collaboration Meeting, Bologna, July 2018



Status and progress
Major deadlines
Organization update

^(*)RD_FA == R&D on Future Accelerators

F. Bedeschi, INFN-Pisa

Status and progress



✤ EIC (USA)

Genova meeting in January

Meeting in Trieste soon

EIC user group meeting, Trieste, 18-22 July 2017, Italy

Impact of new US budget?

Status and progress



EIC (USA)

- Genova meeting in January
- Meeting in Trieste soon
 - EIC user group meeting, Trieste, 18-22 July 2017, Italy
- Impact of new US budget?

Muon Collider (Anywhere!)

- Machine lattice simulation work
- Test beam coming up soon at CERN
- <u>ARIES/APEC</u> participation

Status and progress



IDEA (Int. Detector for Elect.-positron Accelerators):

FCC/CepC specific detector proposed with innovative, but realistic and tested components: MAPS, DCH, preSh, DR, Muon



Status and pro

IDEA (Int. Detector for Elect.-positron A

FCC/CepC specific detector proposed with in components: MAPS, DCH, preSh, DR, Muon

FCC (CERN)

- ► F. Grancagnolo new co-coordinator of WG11
- Many other coordinators: Boscolo, Bacchetta, Azzi, Piccinini, ...
- Large INFN participation at Berlin
- \blacktriangleright Contributions to CDR \rightarrow to be clearly defined \rightarrow will discuss

FCC



CepC (China)

- Dongguan meeting IHEP/INFN support + Chinese vice-minister delegation
- Proposals for MAE/NSFC grants submitted for uRwell and DR calo.
- Contributions to CDR (chairs of November meeting)
 - International Workshop on High Energy Circular Electron Positron Collider 2017 IHEP, Beijing from Nov. 6 to 8, 2017

Circular collider schedules (EU)

CERN-FCC schedule recently presented in Berlin 2017

Technically driven schedule – Reality could be worse (F. Gianotti)



Circular collider schedules (China)

Istituto Nazionale di Fisica Nucleare

China-CepC/SppC schedule recently presented IAS conference on HEP, Hong Kong 2017



R&D deadlines 2017



Simulation for FCC/CepC:

- DR test beam modules should be ready about NOW!
- Integration in progress to be completed before end of July
 - IDEA with simple preShower

R&D deadlines 2017



Simulation for FCC/CepC:

DR test beam modules should be ready about NOW!
 Integration in progress to be completed before end of July
 IDEA with simple preShower

Write ups for CepC ~ early October
 Technical notes on DCH and DR should be ready NOW!
 Write ups for FCC ~ early December

R&D deadlines 2017



Simulation for FCC/CepC:

DR test beam modules should be ready about NOW!
 Integration in progress to be completed before end of July
 IDEA with simple preShower

Write ups for CepC ~ early October
 Technical notes on DCH and DR should be ready NOW!
 Write ups for FCC ~ early December

Are we missing something?

IDEA studies: major topics

Will be addressed in CDR:

- The coil geometry is a major issue to be resolved
 coil inside or outside the calorimeter
- PID resolution of Drift chamber needs demonstration with beam

7

- Dual Readout performance details must be assessed
- Basic pre-shower performance \rightarrow who takes this job?
- Basic key physics benchmarks

IDEA studies: major topics

Will be addressed in CDR:

- The coil geometry is a major issue to be resolved
 coil inside or outside the calorimeter
- PID resolution of Drift chamber needs demonstration with beam
- Dual Readout performance details must be assessed
- \blacktriangleright Basic pre-shower performance \rightarrow who takes this job?
- Basic key physics benchmarks

Will <u>NOT</u> be addressed in CDR:

- Dual readout calorimetry tests with full containment
- Many detector optimization issues in particular for the pre-shower
- Detailed simulation of full set of physics benchmarks





Specify a preliminary detector geometry optimization

RD_FA Collaboration Meeting, July 2017



Specify a preliminary detector geometry optimization

Full simulation of all detector components at a basic level

(that is we'll not draw all screws, cables and cooling tubes in the system with GEANT), but all significant components will be there.



Specify a preliminary detector geometry optimization

- Full simulation of all detector components at a basic level
 - (that is we'll not draw all screws, cables and cooling tubes in the system with GEANT), but all significant components will be there.
- Full pattern recognition in the vertex+DCH+Preshower system



- Specify a preliminary detector geometry optimization
- Full simulation of all detector components at a basic level
 - (that is we'll not draw all screws, cables and cooling tubes in the system with GEANT), but all significant components will be there.
- Full pattern recognition in the vertex+DCH+Preshower system
- PF analysis of the tracker+preshower+DR calorimeter



- Higgs recoil mass distribution from $Z \rightarrow \mu\mu$, $Z \rightarrow ee$ and $Z \rightarrow qq$
 - Highlights performance of tracker, calorimeter and preshower



Simulation of a few performance benchmarks including:

➢ Higgs recoil mass distribution from Z→µµ, Z→ee and Z→qq
 ☑ Highlights performance of tracker, calorimeter and preshower
 ➢ Higgs → µµ invariant mass resolution
 ☑ Highlights tracker performance



- → Higgs recoil mass distribution from $Z \rightarrow \mu\mu$, $Z \rightarrow ee$ and $Z \rightarrow qq$
 - Highlights performance of tracker, calorimeter and preshower
- \rightarrow Higgs \rightarrow µµ invariant mass resolution
 - Highlights tracker performance
- > Invariant mass resolution in $Z \rightarrow qq$ and $W \rightarrow qq$
 - Highlights performance of calorimeter



- → Higgs recoil mass distribution from $Z \rightarrow \mu\mu$, $Z \rightarrow ee$ and $Z \rightarrow qq$
 - Highlights performance of tracker, calorimeter and preshower
- \rightarrow Higgs \rightarrow µµ invariant mass resolution
 - Highlights tracker performance
- > Invariant mass resolution in $Z \rightarrow qq$ and $W \rightarrow qq$
 - Highlights performance of calorimeter
- > Studies of tau polarization in $Z \rightarrow \tau \tau$ events
 - Highlights performance of preshower



- → Higgs recoil mass distribution from $Z \rightarrow \mu\mu$, $Z \rightarrow ee$ and $Z \rightarrow qq$
 - Highlights performance of tracker, calorimeter and preshower
- \rightarrow Higgs \rightarrow µµ invariant mass resolution
 - Highlights tracker performance
- > Invariant mass resolution in $Z \rightarrow qq$ and $W \rightarrow qq$
 - Highlights performance of calorimeter
- > Studies of tau polarization in $Z \rightarrow \tau \tau$ events
 - Highlights performance of preshower
- Studies of precision in acceptance determination with preshower in a few channels



- → Higgs recoil mass distribution from $Z \rightarrow \mu\mu$, $Z \rightarrow ee$ and $Z \rightarrow qq$
 - Highlights performance of tracker, calorimeter and preshower
- \rightarrow Higgs \rightarrow µµ invariant mass resolution
 - Highlights tracker performance
- > Invariant mass resolution in $Z \rightarrow qq$ and $W \rightarrow qq$
 - Highlights performance of calorimeter
- > Studies of tau polarization in $Z \rightarrow \tau \tau$ events
 - Highlights performance of preshower
- Studies of precision in acceptance determination with preshower in a few channels
- Additional studies may be added depending on time availability

Admin. deadlines 2017



- People (w/ formal responsibilities)
- Activities (Travel funds strongly correlated)
 - R&D, Test beams
- Expect plan from coordinators during this meeting
- Budget 2018 is difficult 5% travel cut

Admin. deadlines 2017



- People (w/ formal responsibilities)
- Activities (Travel funds strongly correlated)
 - R&D, Test beams
- Expect plan from coordinators during this meeting
- Budget 2018 is difficult 5% travel cut

CSN1 – Pisa July 24-26

- Status and future plans requested by president
 - Structure to be decided: which talks? ~ 1 hr
 - Very little room for additional requests 2017 small travel adjustment
- Preliminary discussion of FY2018 budget
 - Expect meeting with referees before/after July CSN1
 - will forward specific requests

Organization update



New WP on Dual Readout calorimetry joining RD_FA

- Coordinator: Roberto (Bob) Ferrari
- Reconfiguring Dream/RD52 relation with CERN
 - Must draft full proposal soon with 3-4 yr plan
- Test beam end of July with modified SiPM & coupling to fibers

Organization update



New WP on Dual Readout calorimetry joining RD_FA

- Coordinator: Roberto (Bob) Ferrari
- Reconfiguring Dream/RD52 relation with CERN
 - Must draft full proposal soon with 3-4 yr plan
- Fest beam end of July with modified SiPM & coupling to fibers

PG group leaving due to HL-LHC overload WP 6 will be in the future for DR calo WP 3 will become container for all silicon tracker related items





Much progress since last November

- Preparation phase completed
- ▹ Now need to start delivering results:
 - Document: studies/simulations, tests with beam

Conclusions



Much progress since last November

Preparation phase completed

► Now need to start delivering results:

Document: studies/simulations, tests with beam

2° half of 2017 requires much work for CDR's

Need strong effort from now!

Conclusions



Much progress since last November

- Preparation phase completed
- Now need to start delivering results:

Document: studies/simulations, tests with beam

2° half of 2017 requires much work for CDR's

Need strong effort from now!

More internationalization of our WGs needed

Relations through CERN can help a lot

Conclusions



Much progress since last November

- Preparation phase completed
- Now need to start delivering results:

Document: studies/simulations, tests with beam

2° half of 2017 requires much work for CDR's

Need strong effort from now!

More internationalization of our WGs needed

Relations through CERN can help a lot

INFN support continues in spite of difficult 2018 budget
 Must prepare 2018 requests VERV accurately

Must prepare 2018 requests VERY accurately



13 **RD_FA** Collaboration Meeting, July 2017

F. Bedeschi, INFN-Pisa





2.212e+000 : >2.328e+000



Yoke is 1 m thick pure Fe

RD_FA Collaboration Meeting, July 2017

14

F. Bedeschi, INFN-Pisa





- Max field in yoke < 1 T

RD_FA Collaboration Meeting, July 2017

F. Bedeschi, INFN-Pisa

INF

lstituto Nazionale di Fisica Nucleare **IDEA B field**



RD_FA Collaboration Meeting, July 2017

F. Bedeschi, INFN-Pisa

INF

Istituto Nazionale di Fisica Nucleare

EU support to particle accelerator R&D



Low prioritiy of long-term R&D for large laboratories focused on short-term projects, while small institutions lack critical mass and the experience to be effective \rightarrow a joint collaborative effort with the EU support is the most effective way to push the limits of our technologies.



To edit /remove footer: Insert -> Header & Footer

15

6

back

Istituto Nazionale di Fisica Nucleare

back



ARIES Structure



18 Workpackages: 8 Networks 5 Transnational Access, 5 Joint Research Activities.



To edit /remove footer: Insert -> Header & Footer

10

Task 6.6 Far Future Concepts & Feasibility

Coord's: M. Zanetti (Padova); F. Zimmermann (CERN)

- Analysis of the potential of crystals for charged-particle bending or particle acceleration
- Development of advanced photon colliders, including gamma-gamma and photon-nucleon colliders
- Assessment of advanced muon-collider concepts without ionization cooling
- Assessment of the potential use of large storage rings for gravitational wave detection or generation
- Assessing and ranking a basket of future concepts with regard to "future feasibility" and physics cases
- White list of ranked future options



ARIES WP6 APEC, Frank Zimmermann

RD_FA Collaboration Meeting, July 2017

 Γ'

back

10