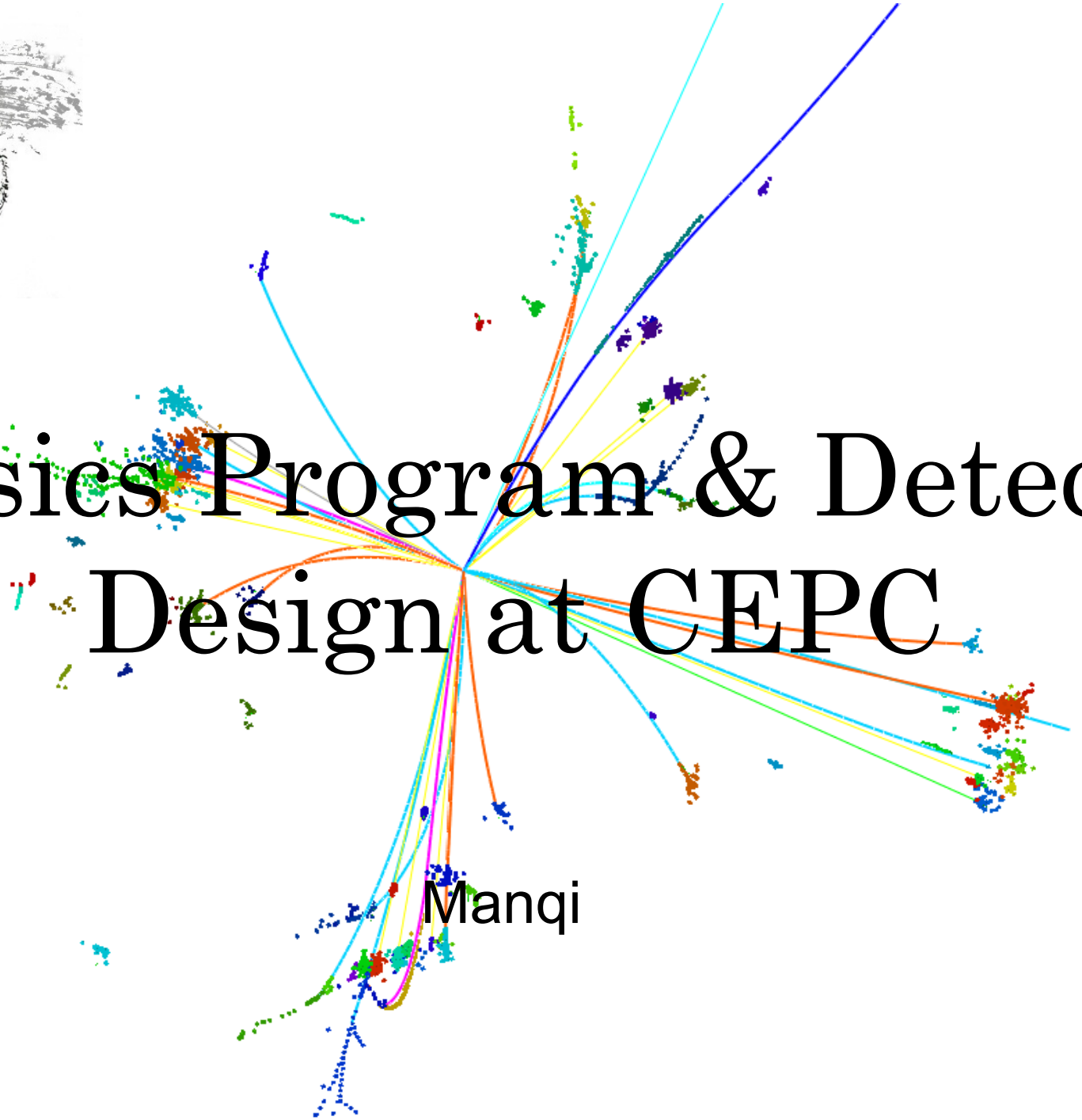
Physics Program & Detector Design at CEPC

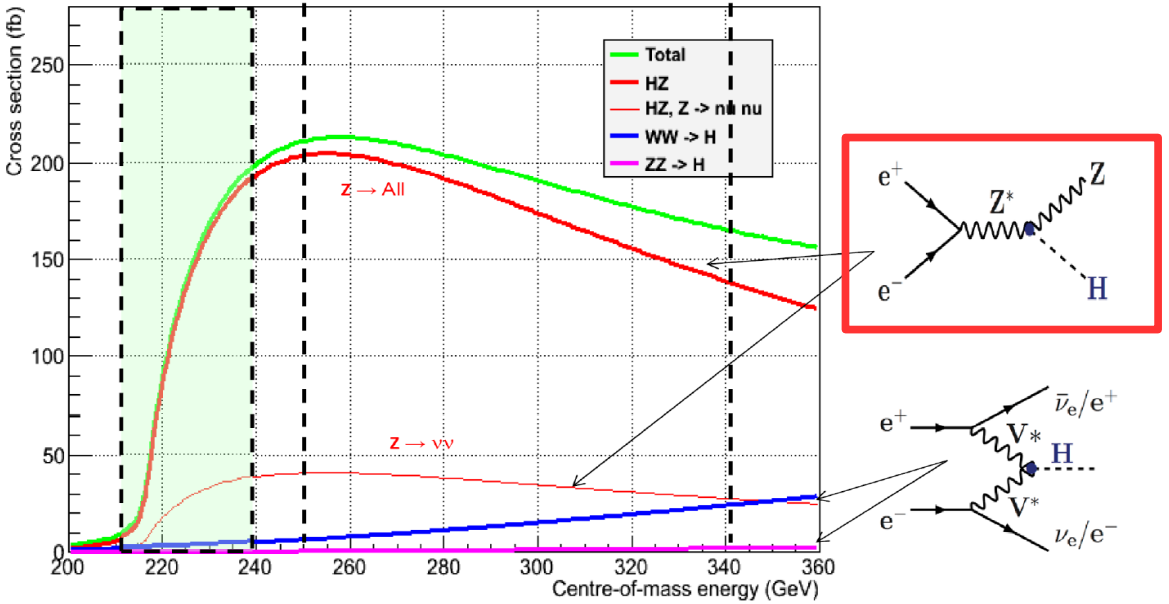


Manqi


Higgs, the gate
Naturalness,
Electro-Weak Phase Transition,
Dark matter...

The key: e^+e^- Higgs factory

$$g/g_{SM} \sim 1 + \delta(1\text{TeV}/\Lambda_{NP})^2$$

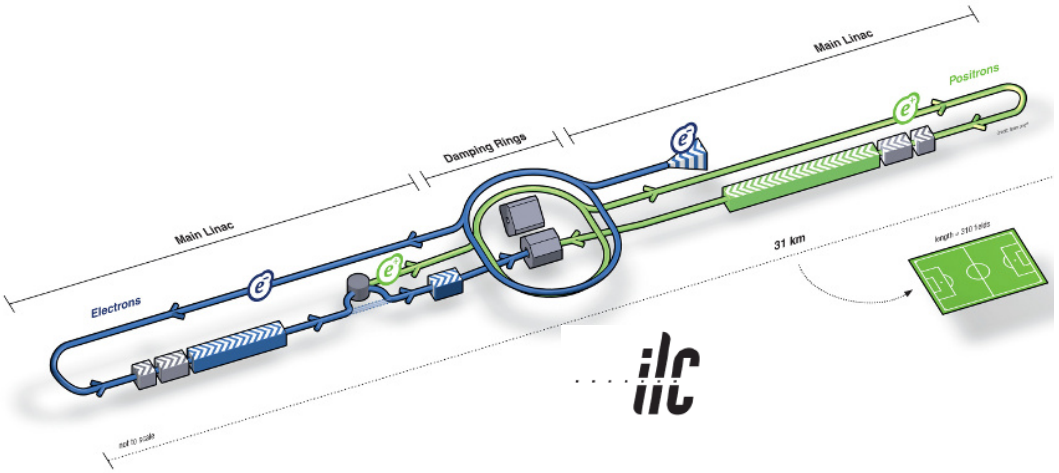


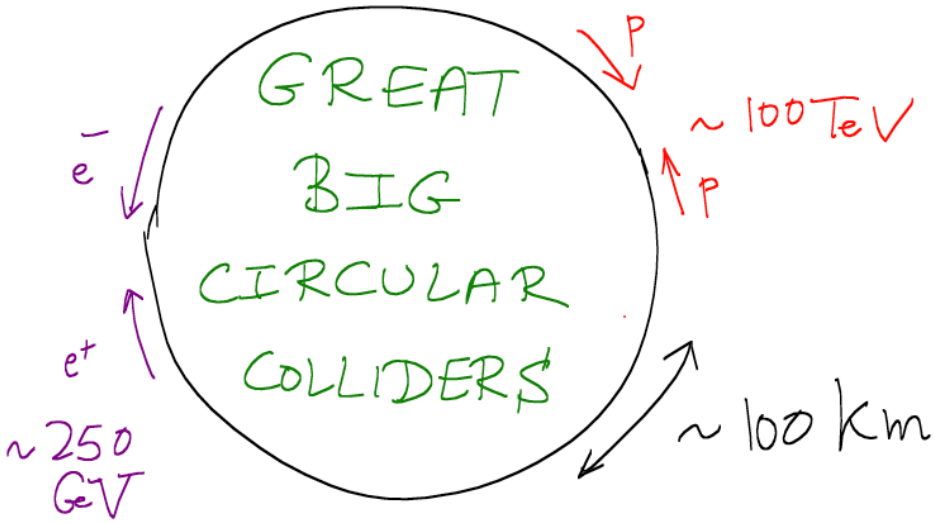
NP model	δ(hVV)	δ(htt)	δ(hbb)
Extra Higgs	<1%	<1%	1.7%
Composite Higgs	8%	~ 10%	~ 10%
Mixed in Singlet	6%	6%	6%
MSSM	< 1%	3%	10%-100%
Top parter	0.8 – 2.9%		
…			

ILCTDR, 1310.8361 [hep-ex]...

...Higgs couplings: **absolute** measurements to percentage level...
... a vision of New Physics Landscape at TeV era...

Higgs factory: Linear or Circular





	Linear: ILC, CLIC	Circular: FCC, CEPC
Pro	C.o.M energy can be upgraded to 1-3 TeV Longitudinal polarized beam Power pulsed detector	Cost-efficient, component-mature technology Multiple interaction point High luminosity & beam quality
Con	Expensive (~ 8 – 10 B euros) Single interaction point, might need push-pull	Center of mass energy limited in e^+e^- phase (but can be upgraded to ~ 100 TeV in pp phase) No beam polarization at high energy No power pulse

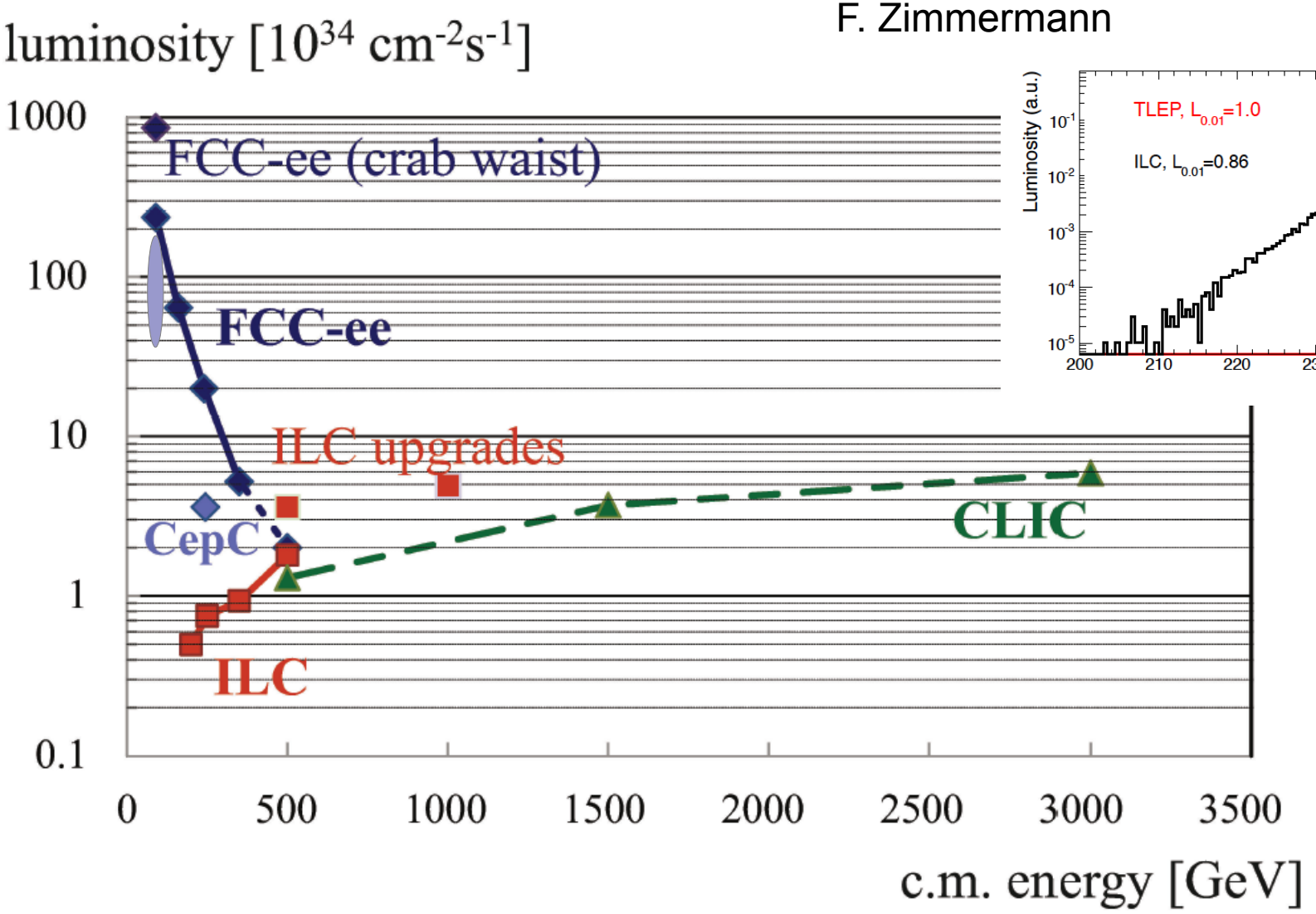
Muon & photon colliders are also possible Higgs factories, but...

CEPC


S363
S251
G1
高能所
秦皇岛市
G102
抚宁县
S267
G205
S365
Image © 2013 DigitalGlobe
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
2013 Mapabc.com
Image © 2013 TerraMetrics

e^+e^- luminosity vs energy

F. Zimmermann

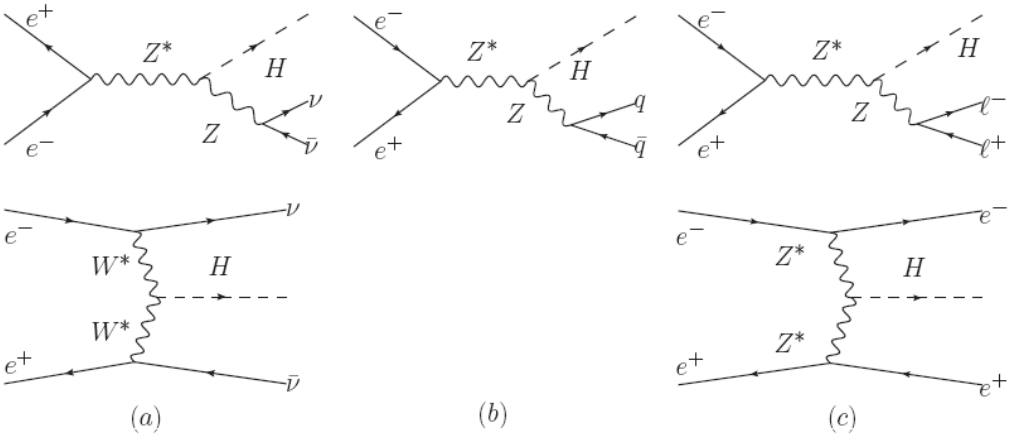


CEPC: 10 year of operation & 2 IP: 5 inv(ab) & 1 M Higgs

8 + 5 + 1 SM Higgs observables

- From 10^6 Higgs, make following direct measurements
  - Mass, spin, σ(ZH)
  - Branching ratios (b, c, tau, g, W, Z)
  - Branching ratios (gamma, mu)

    +
  - Branching ratios (Z - gamma)
  - Invisible Branching ratio
  - σ(vvH)*Br(H→bb)



- Calculate: width – coupling

Mode	$b\bar{b}$	$c\bar{c}$	gg	WW*	$\mu^+\mu^-$	$\tau^+\tau^-$	ZZ*	$\gamma\gamma$	$Z\gamma$
BR (%)	57.8	2.7	8.6	21.6	0.02	6.4	2.7	0.23	0.16

g(Hbb), g(Hcc), g(Htt), g(HWW)/Γ_H, g(Hμμ), g(Hττ), g(HZZ)/Γ_H, g(HWW)/g(Htt)

Higgs measurement

	Absolute σ(ZH)	Absolute decay branching Ratios	Absolute Width	Direct & absolute Measurement of g(Htt) & g(HHH)
ILC	+	+	++	+
CEPC	++	++	+	-

- The adjoint Z in Higgsstralung: key to Model Independent measurements
- CEPC has no plan for energy higher than 250 GeV
  - Better measurement of σ(ZH) and decay branching ratios (2 – 3 times better than ILC)
  - Measurement of the Higgs width is limited
    - Need to be measure σ(ZH)*Br(H→ZZ) or σ(vvH)*Br(H→bb)
- ILC provides essential input of the Higgs width measurement. With CEPC, ILC can
  - Focus on higher energy runs (350, 500, 1TeV)
  - Be free of push-pull scenario

Higgs measurement

	Absolute σ(ZH)	Absolute decay branching Ratios	Absolute Width	Direct & absolute Measurement of g(Htt) & g(HHH)
ILC	+	+	++	+
CEPC	++	++	+	-
ILC + CEPC	++	++	++	++
e+e- + LHC	++	+++	++	++++
e+e- + LHC + SPPC	++	+++	++	++++

- Hadron Colliders: tag the final states
  - $\sigma(AA \rightarrow H)*Br(H \rightarrow BB) \sim g^2(HAA)g^2(HBB)/\Gamma$
  - Huge inclusive cross section
    - 1E6 at electron-positron
    - 1E8 at LHC
    - 1E10 at CEPC hadron phase (SPPC)
  - Sensitive to rare decays, rare generation and multi-higgs processes

Z & W measurements

- Numbers:
  - e+e-: 17 M Visible Z boson at LEP & 500k at SLC;
  - Many measurements are updated from Tevatron/LHC
  - 10^{10} – 10^{12} Z can be easily produced at CEPC/FCC: efforts need to be put to control the systematics
- Observables:
  - All LEP measurements (mass, width, Weinberg angle, A_{fb}, A_l, R_b, R_l...)
  - Neutrino generation: though Zγ events
  - Rare decays of Z and its daughters
  - α_S: though Ratio of 3-jet events to 2-jet events
  - W measurements (mass, width & g(ZWW))


Paces...

Kick-off @ Sep 2013

CEPC Detector: Institutes

Theory

VTX	TPC	Calo	Physics Requirement
ShanDong University (SDU) IHEP ...	Tsinghua University (THU), University of Chinese Academic of Science (UCAS), IHEP ...	University of Science and Technology of China (USTC), Shanghai Jiaotong University (SJTU), Wuhan University (WhU), Nanjing University IHEP ...	Nankai University, HKSTU Pekin University (PKU), Beihang University, Center China Normal University (CCNU), IHEP ...

Machine

Establishment of theory center

http://cfhep.ihep.ac.cn/

Center for Future High Energy Physics

高能物理前沿研究中心

Home | Program | Visitors | Visiting CFHEP | Contact | Job | TPD of IHEP

Particle physics is at an exciting juncture. With the discovery of the Higgs boson, the Standard Model is "complete", but fundamental questions remain unanswered, from an understanding of the origin of the electroweak scale to the composition of the dark matter of the universe.

An extended high energy experimental program beyond the planned running of the LHC will be crucial to fully address these questions. The Center for Future High Energy Physics is dedicated to carrying out detailed studies on both the physics case and the design of possible future colliders. The immediate focus will be on circular colliders: an electron-positron collider as Z and Higgs factory, and a high-energy proton-proton collider.

The near term goal of the center is to present a conceptual design report. To facilitate this study, the center will host an active visitor program , as well as occasional workshops on topics essential to the center's mission. The center will also offer regular lecture series and run schools to prepare students and junior researchers. See the link an updated list of recent and planned activities.

If you have any questions, please contact us.

Current/Upcoming workshop

2nd CFHEP Symposium on circular collider physics---August 11-15

Previous workshop

Working Groups

Weekly Calendar

Download

News

下一代环形正负电子对撞机项目引热评

[科技日报]"中国建大加速器，将激励一代人"

[新华网]中国科学家提出建设下一代环形正负电子对撞机探索"上帝粒子"奥秘

[科技日报]大加速器：上帝粒子发现后的"中国梦"

[中新网]中国科学家酝酿建造下一代环形正负电子对撞机

The Center for Future High Energy Physics (CFHEP) was inaugurated in Beijing on December 17, 2013. The director of CFHEP, Prof. Nima Arkani-Hamed and the head of IHEP, Prof. Wang Yifang unveiled the foudation of the center.

Director: Nima Arkani-Hamed (IAS, USA)
Deputy Director: Cai-Dian Lu (IHEP, China)

Conferences...

2nd CFHEP Symposium on circular collider physics

11-15 August 2014
IHEP
Asia/Shanghai timezone

- Overview
- Scientific Programme
- Timetable
- Contribution List
- Author index
- Registration
  - Registration Form
- Local accommodation
- Transportation
- Visa
- 1st CFHEP Symposium

Center for Future High Energy Physics, http://cfhep.ihep.ac.cn, will organize a week-long workshop on the physics opportunities at future circular colliders in Beijing starting August 11. We are writing to invite you to participate the workshop.

As you know, there are many physics studies on this and related topics being carried out, both from domestic working groups and from the international community. As part of the Chinese effort, we are aiming at presenting a summary report on the physics case this fall. The purpose of the August workshop is to collect available results, gather input, and prepare the ground for the report. During the workshop, we will hear the summaries from the working groups, and perspectives from abroad.

If you plan to come, we would appreciate it if you could register (website) or inform us as soon as possible.

Organizers:
Nima Arkani-Hamed, director (IAS)
Cai-Dian Lu, deputy director (IHEP)

Sally Dawson (BNL), Tao Han (U. Pittsburgh/Tsinghua U.), Hongjian He (Tsinghua U.), Michelangelo Mangano (CERN), Shufang Su (U. Arizona), Lian-Tao Wang (U. Chicago), Zhizhong Xing (IHEP), Jinmin Yang (ITP), Xinmin Zhang (IHEP) Shouhua Zhu (Peking U.)

Starts Aug 11, 2014 08:00
Ends Aug 15, 2014 18:00
Asia/Shanghai

IHEP
Main Building A214
19B YuquanLu, Shijingshan District, P. O. Box 918-4, Beijing, 100049, P. R. China

The Fourth International Workshop on Future High Energy Circular Colliders

12-13 September 2014
Asia/Shanghai timezone

- Timetable
- Registration
  - Registration Form
- List of registrants

The workshop is dedicated to bring together people interested in circular high energy e+e- collider (CEPC) as a Higgs factory as well as a future circular high energy pp collider (SPPC) beyond the Higgs factory. Participants will report on the progresses made in theory, accelerator design, detector design and optimization, simulations of benchmark physics processes etc. since the CEPC-SPPC kick-off meeting in September 2013. The focus will be on the preparation for the CEPC pre-CDR. International collaboration and study organization will also be examined.

There are three CEPC working groups. If you would like to give a presentation at the CEPC workshop, please contact related group conveners listed in the following.
- Accelerator Working Group: Qing Qin (qinq@ihep.ac.cn) and Jie Gao (gaoj@ihep.ac.cn)
- Theory Working Group: Hongjian He (hjhe@mail.tsinghua.edu.cn) and Shouhua Zhu (shzhu@pku.edu.cn)
- Physics & Detector Working Group: Yuanning Gao (gaoyn@mail.tsinghua.edu.cn) and Shan Jin (jins@ihep.ac.cn)

The workshop will be held at Shanghai Jiao Tong University (Minhang Campus) on September 12-13, 2014. Detailed information about the workshop including visa, accommodation and ground transportation etc. is also available.

Starts Sep 12, 2014 08:30
Ends Sep 13, 2014 18:00
Asia/Shanghai

Prof. Lou, Xinchou
Prof. Yang, Haijun

Third Workshop on Future High Energy Circular Colliders

chaired by Xinchou Lou (IHEP, Beijing)

from Tuesday, March 18, 2014 at **08:30** to Wednesday, March 19, 2014 at **18:30** (Asia/Shanghai) at **IHEP (C305)**

Description ***The Program***

The workshop will bring together people interested in circular high energy e+e- colliders as a Higgs factory as well as a future circular high energy pp collider beyond the Higgs factory. Participants will report on the progress made in theory, accelerator design and detector simulations since the kick-off meeting in September 2013. The focus will be on the preparation for the CEPC CDR. International collaboration and study organization will also be examined.

Steering Committee meeting will be on March 18,2014.

Go to day

Tuesday, March 18, 2014

18:30 - 21:00 CEPC-SppC Steering Committee & Conveners Meeting *2h30'* (B410)

Wednesday, March 19, 2014

08:30 - 09:00 Registration *30'*

09:00 - 10:15 Opening Session
Convener: Prof. Xinchou Lou (IHEP, Beijing)
- 09:00 **Welcome and Introduction** *30'*
  Speaker: Prof. Yifang Wang (IHEP)
- 09:30 **Global Efforts for High Energy Accelerators** *45'*
  Speaker: Dr. Weiren Chou (FNAL)
  Material: Slides

10:15 - 10:35 Photo session and coffee break

10:35 - 12:15 Accelerator Session
Convener: Dr. Qing QIN (Institute of High Energy Physics)
- 10:35 **Lattice design for CEPC** *20'*
  Speaker: Ms. Huiping Geng (Institute of High Energy Physics)
  Material: Slides
- 10:55 **Final focus design for CEPC** *20'*
  Speaker: Dr. Dou Wang (IHEP)
  Material: Slides
- 11:15 **Beam-beam simulations for CEPC** *20'*
  Speaker: Mr. Yuan Zhang (IHEP, Beijing)
  Material: Slides
- 11:35 **CDR Discussion** *20'*

1st CFHEP Symposium on circular collider physics

23-25 February 2014
IHEP
Asia/Shanghai timezone

- Overview
- Scientific Programme
- Timetable
- Contribution List
- Author index
- Registration
  - Registration Form
- List of registrants
- Accommodation
- Travel
- Visa

The Center for Future High Energy Physics (CFHEP), hosted by Institute of High Energy Physics, will start its activities in Feb. 2014. CFHEP will dedicate its efforts to carrying out detailed studies on both the physics case and the design of the possible future colliders. The immediate focus will be on an electron-positron Higgs factory and a high energy proton-proton collider, based on a circular tunnel. More information regarding CFHEP can be found at http://cfhep.ihep.ac.cn.

This symposium is the kick-off meeting for CFHEP. There will be a day of public events on Feb 23, highlighting new physics opportunities after the discovery of the Higgs. It will feature a panel discussio at Tsinghua University with panelists Nima Arkani-Hamed, David Gross, Gerard 't Hooft, Joseph Incandela, Luciano Maiani, Hitoshi Murayama, Yifang Wang and Edward Witten, moderated by Shing-Tung Yau, on the topic of "After the Higgs Discovery: Where is Fundamental Physics Going?".

A two-day workshop (Feb 24 - 25) will then be held at IHEP, focusing on the physics case for future circular colliders, as well as discussions on how to synchronize the domestic theoretical particle physics effort with the planning and designing of future circular machines.

The registration fee is 500 RMB, exclusive of board and lodging. The registration fee must be paid in Chinese RMB at the registration desk on-site. Please note that the credit card payment cannot be accepted.

Regular meetings, communications

INDICO Integrated Digital Conference

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Home » 所外区 (Open Zone) » CEPC » Physics and Detector Meetings

Physics and Detector Meetings

Managers: LI, G.; Li, Q.

There are 11 events in the *future*. Show them.

September 2014

- 24 Sep CEPC physics+detector regular meeting
- 17 Sep Simulation & Physics Analysis Meeting
- 05 Sep CEPC physics+detector regular meeting
- 05 Sep CEPC Calorimeter Group Meeting (protected) New!
- 01 Sep Simulation & Physics Analysis Meeting

August 2014

- 27 Aug CEPC physics+detector regular meeting
- 27 Aug CEPC VTX group meeting (protected)
- 20 Aug Simulation & Physics Analysis Meeting
- 13 Aug CEPC physics+detector regular meeting
- 06 Aug Simulation & Physics Analysis Meeting

There are 74 events in the *past*. Show them.

INDICO Integrated Digital Conference

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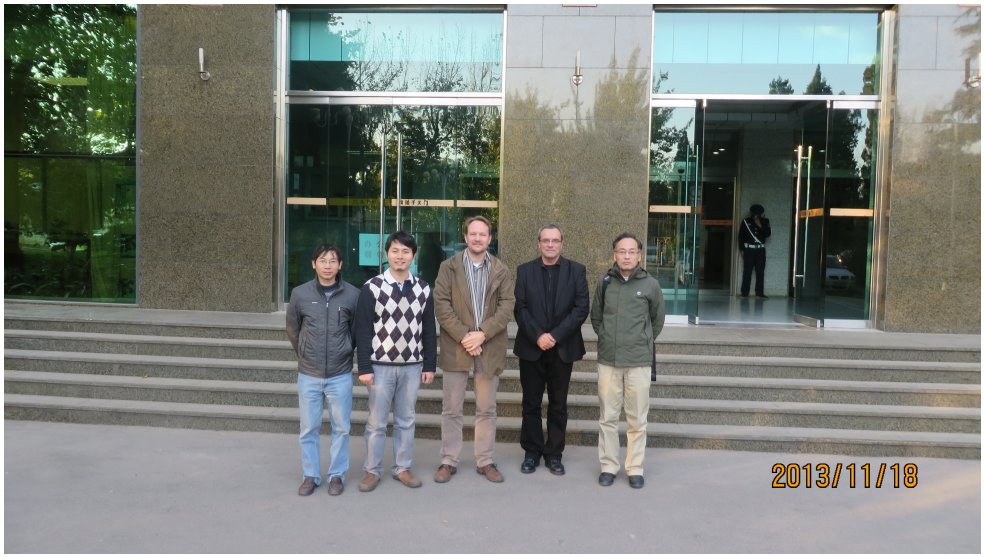
CEPC

Go to parent category | View

CEPC + SppC events

Managers: WEN, S.; Zhu, H.; Yang, H.; Hu, T.; Ruan, M.; QI, H.; Wang, D.; Geng, H.; Wang, D.; Wang, F.; wang, M.

- Accelerator Meetings 6 events
- General Meetings 2 events
- Physics and Detector Meetings 95 events
- SPPC Magnets Group Meetings 4 events
- Training 2 events



Internal | Events | Contact Us

CEPC

Circular Electron Positron Collider

HOME | ABOUT CEPC | ORGANIZATION | RESULTS | WHY SCIENCE | JOIN US

Future High Energy Circular Colliders

The Standard Model (SM) of particle physics can describe the strong, weak and electromagnetic interactions under the framework of quantum gauge field theory. The theoretical predictions of SM are in excellent agreement with the past experimental measurements. Especially the 2013 Nobel Prize in physics was awarded to F. Englert and P. Higgs "for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider".

After the discovery of the Higgs particle, it is natural to measure its properties as precise as possible, including mass, spin, CP nature, couplings, and etc., at the current running Large Hadron Collider (LHC) and future electron positron colliders, e.g. the International Linear Collider (ILC). The low Higgs mass of ~125 GeV makes possible a Circular Electron Positron Collider (CEPC) as a Higgs Factory, which has the advantage of higher luminosity to cost ratio and the potential to be upgraded to a proton-proton collider to reach unprecedented high energy and discover New Physics.

http://cepc.ihep.ac.cn/

Panel Discussion on Fundamental Physics

What's new After the Higgs discovery: Where is the Fundamental Physics going?

NATURE | NEWS

عربي

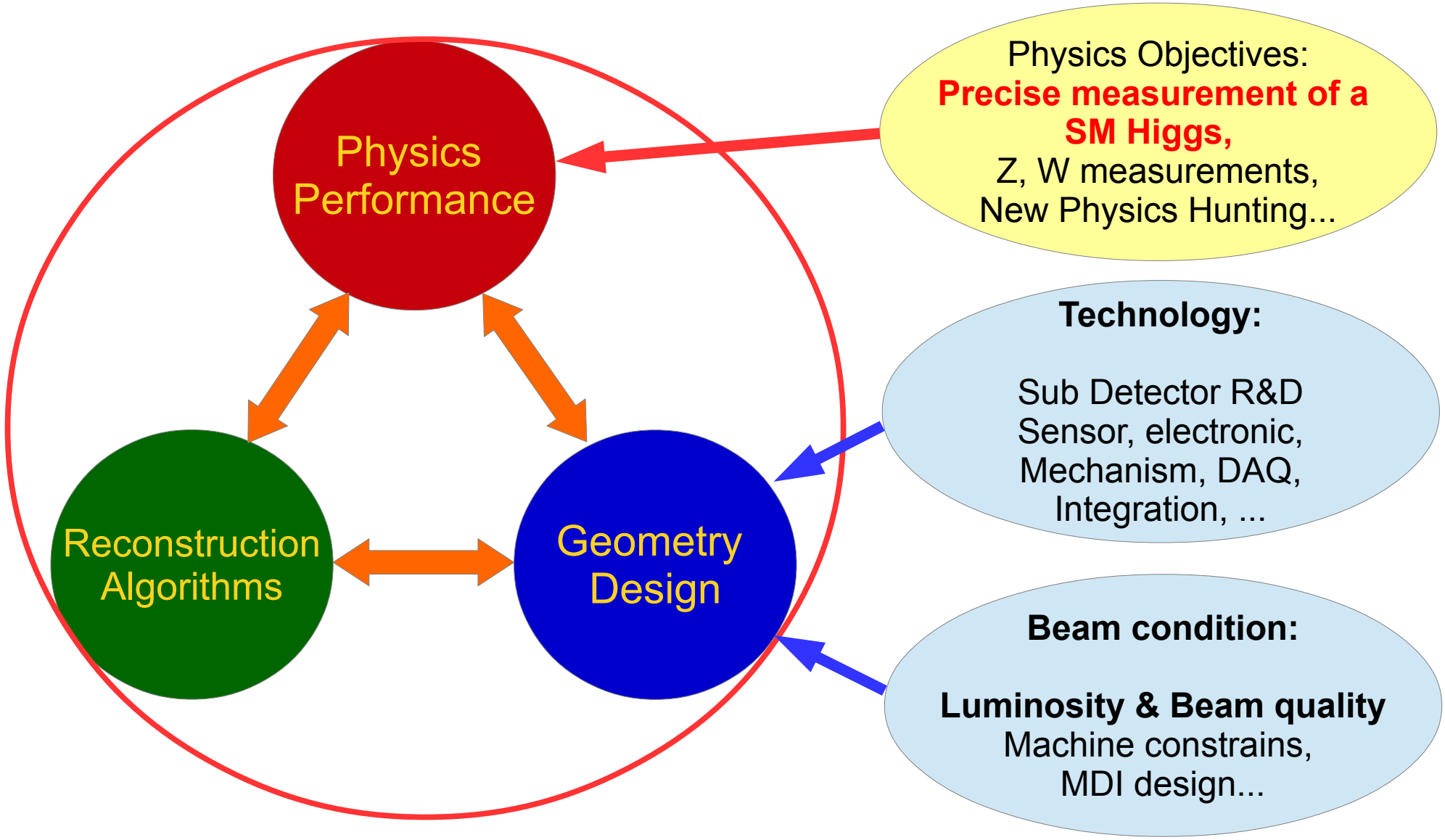
China plans super collider

Proposals for two accelerators could see country become collider capital of the world.

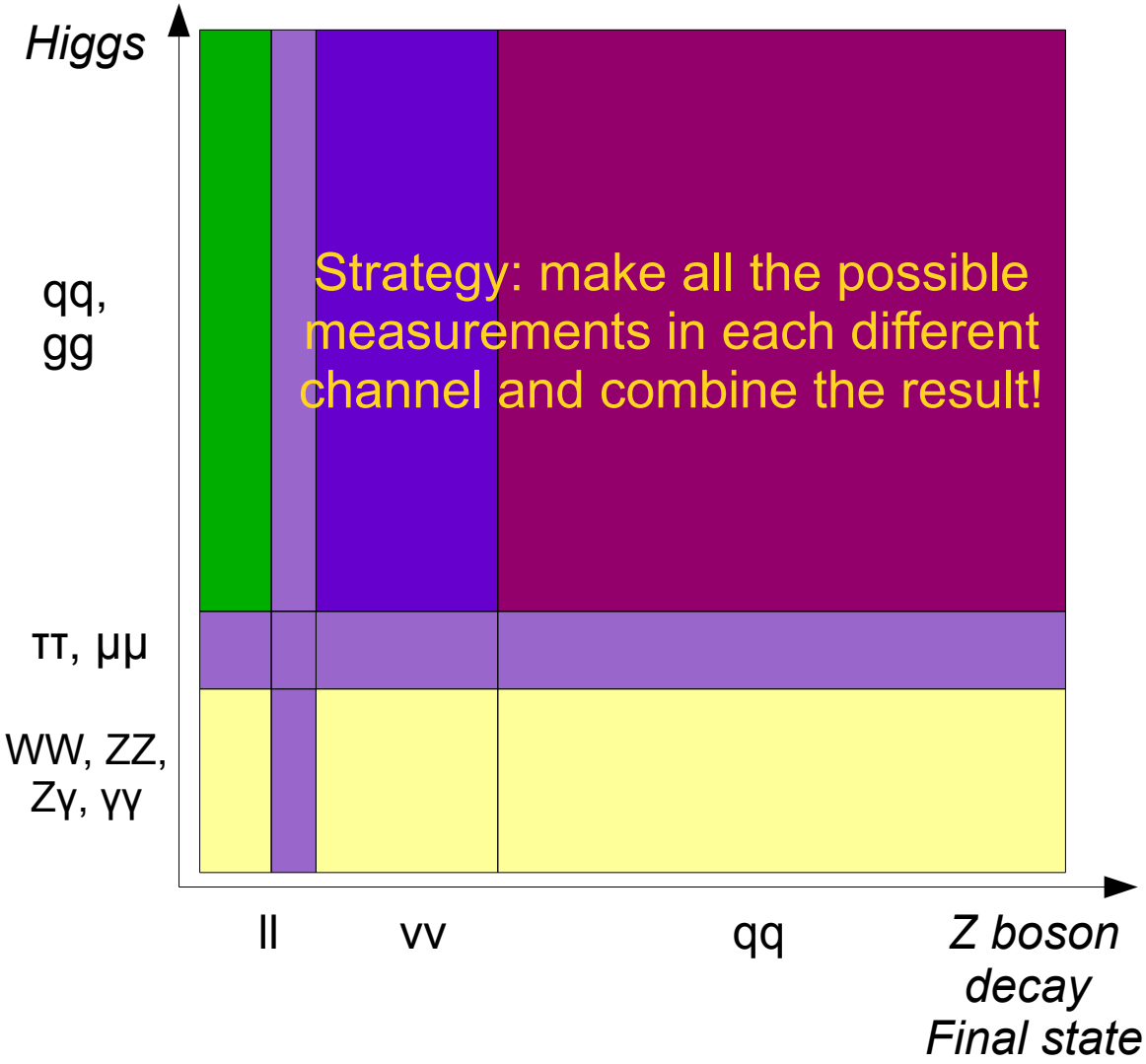
Elizabeth Gibney

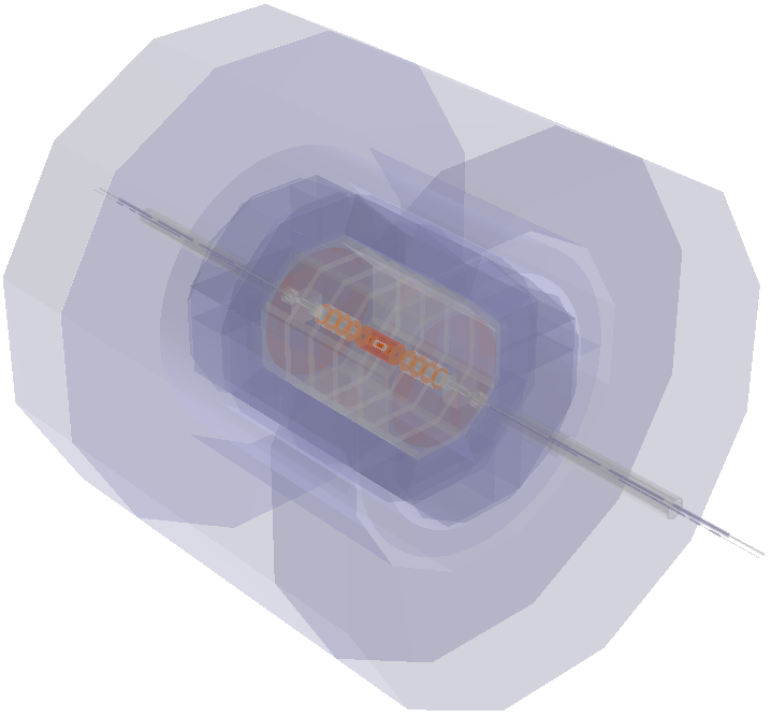
22 July 2014

Detector design: Basic ingredients



ZH event: requirement on detector

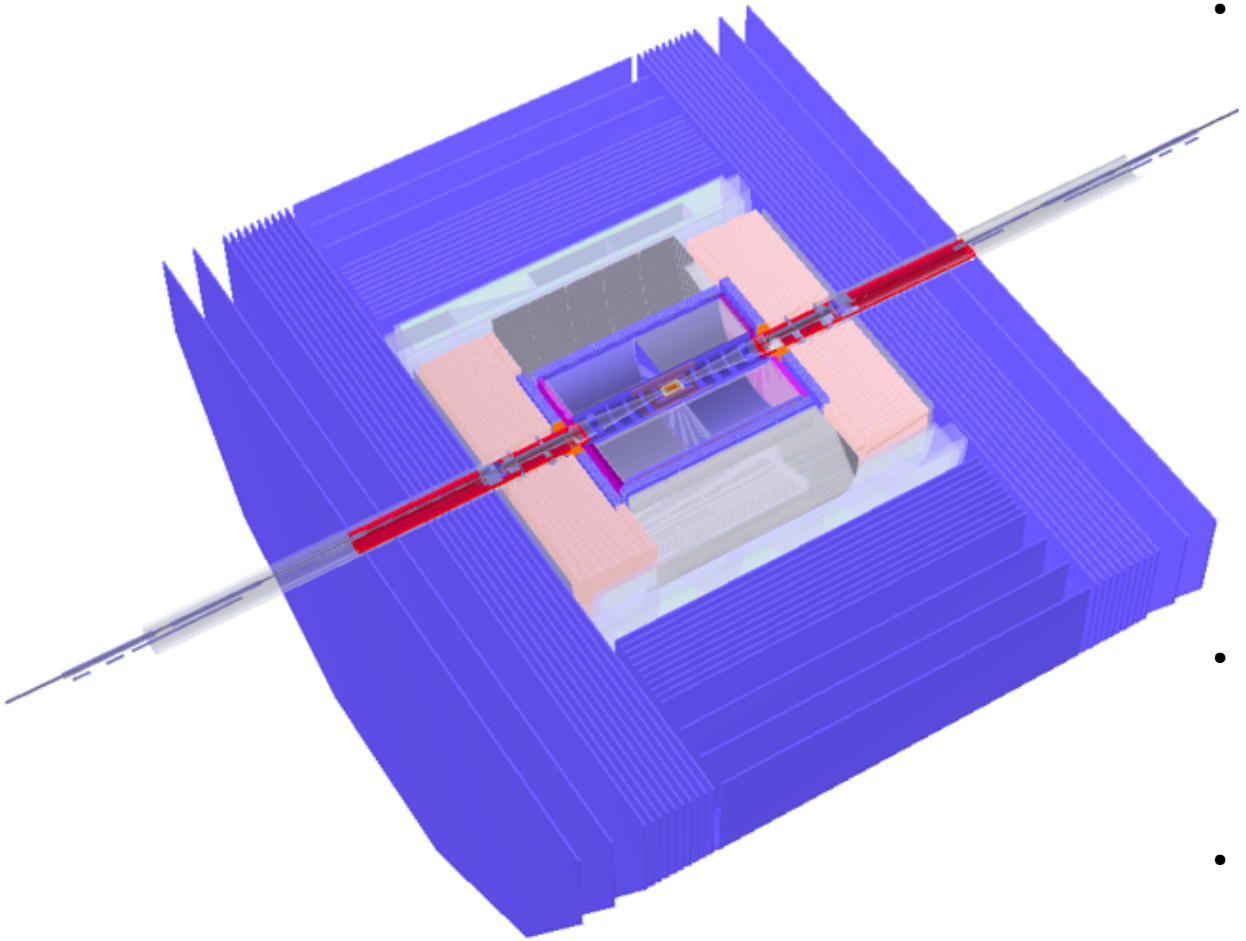




ILD: fulfill the Physics requirement Of Higgs measurement at ILC – our Reference detector

LC-REP-2013-021

An example design: ILD → X_v0 (?)



- Geometry changes
  - TPC Radius 1808 → 1365 mm (?)
  - TPC Half Z 2350 → 1900 mm (?)
  - HCAL Layer Num: 48 → 40 (?)
  - ECAL Layer Num: 30 → 16 (?)
  - ECAL/HCAL Cell Size: 5/10 mm → 20 mm (?)
  - B Field: 3.5 T → 3 T (?)
  - **L*: 3.5 m → 1.5 m**
- Validation:
  - How much luminosity we can achieve with L* = 1.5 m
- Simulation: Geometry implemented

All Changes need to be implemented into simulation, iterate with physics analysis (Fast – Full Simulation) and cost estimation...

organization

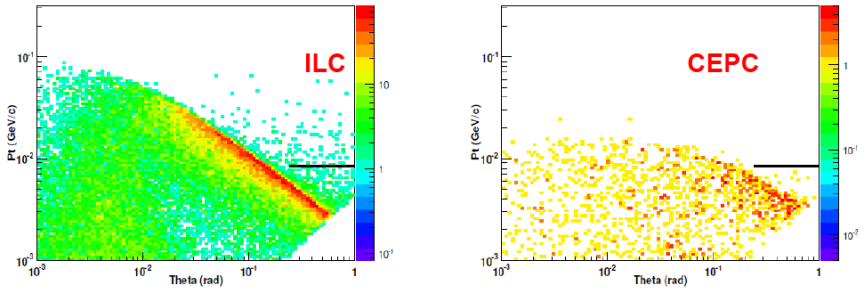
- physics and detector WG:
  GAO Yuanning (THU), JIN Shan (IHEP)
- sub-groups
  - physics analysis and optimization:
    RUAN Manqi (IHEP), WANG Dayong (PKU)
  - vertexing: OUYANG Qun (IHEP), WANG Meng (SDU)
    - with silicon tracking: TU Yanjun (HKU), ZHU Hongbo (IHEP)
  - tracking: LI Yulan (THU), QI Huirong (IHEP)
  - calorimetry and muon:
    HU Tao (IHEP), YANG Haijun (SJTU)
- civil construction: ZHAO Jingwei (IHEP)

A pre-CDR will be delivered by the end of this year

Sub detector groups: VTX & TPC

Radiation Background

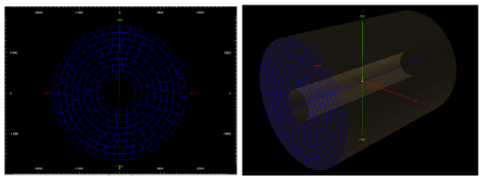
- beam induced background imposes large impacts on detector design (e.g. detector occupancies, radiation damage, etc.)
- may degrade detector performance (additional noise in finding tracks/vertices)
- **Guinea-Pig** (beam-beam interaction simulation) + **Geant4**



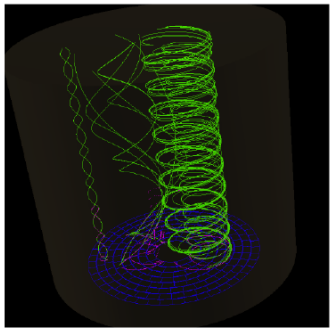
Particles induced by two main processes (**beamstrahlung photons** + **pair production**) for **ILC** and **CEPC**. The black line indicates the polar angle coverage of the vertex detector → **Do we have much less background?**

ILD TPC endplate

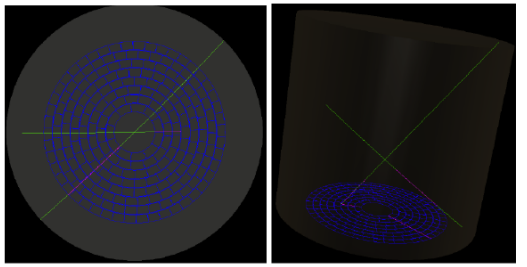
- half Z: 2200 mm
- inner radius: 329 mm
- outer radius: 1808 mm
- pad pitch: ∼ 1.2 mm, height: 5.6 mm



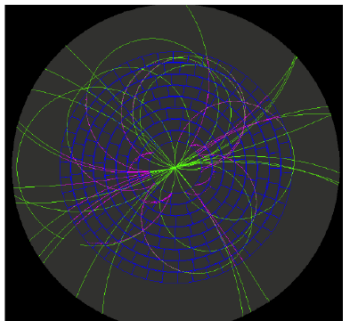
$e^+e^- \to HZ$



$e^+e^- \to \mu^+\mu^-\nu_e\bar{\nu}_e$



$e^+e^- \to W^+W^-$



MDI design: key issue for CEPC detector

Fujii San visited us last month, giving lecture on TPC Physics

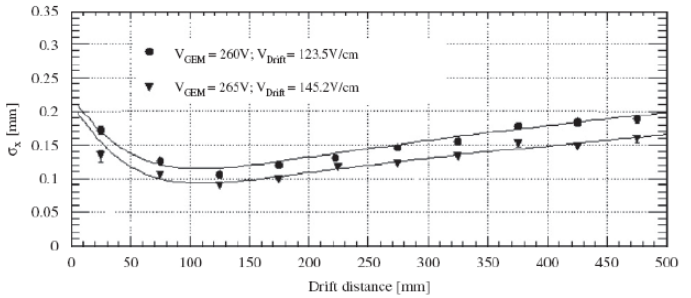


Fig. 6. x-Resolution for Ar–Iso–CF_4 = 96.3–3.1–0.6 gas with $B = 1$ T under two different test conditions ($\varphi < 2°$, $\theta < 10°$).

Sub detector: Calo & Muon

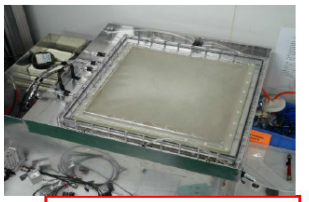
layout of Calo pre-CDR

1st draft is circulating

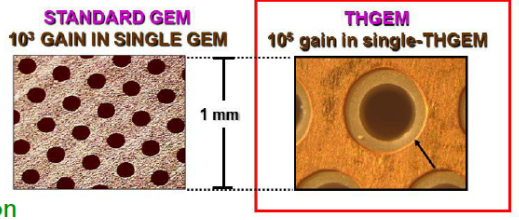
- Introduction and general layout to calorimeters
- ECAL for Particle Flow Approach
  - Scintillator Tungsten Sandwich – WANG Zhigang (IHEP)
  - Silicon Tungsten Sandwich - Jean Claude Brient, Vincent Boudry (IN2P3)
- HCAL for Particle Flow Approach
  - SDHCAL (RPCs) – HAN Ran (NCEPU), Imad LAKTINEH (IPNL)
  - DHCAL (RPCs) – XIA Lei (ANL/SJTU)
  - DHCAL (ThGEM) – YU Boxiang (IHEP)
- Muon system – XIE Yuguang (IHEP)
- Calorimeter Calibration and Alignment (included in sub-detector option)
- Front-End Readout System (included in sub-detector option)
- Power and Cooling System (included in sub-detector option)
- Cost Estimation (included in sub-detector option)

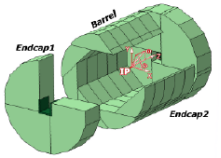
Wang M.（王萌）

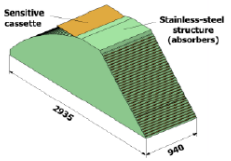
about DHCAL (ThGEM)



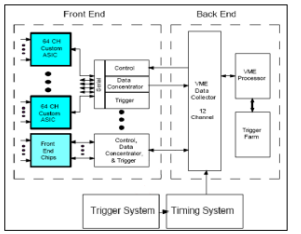
- Content
  - Introduction
  - Digital Hadronic Gas Calorimeter
  - The Active Layers
  - Energy Reconstruction & Calibration
  - Digital readout system
  - Cost of THGEM DHCAL
  - Reference







Content	Unit cost	Total require	Total cost
THGEM	0.8 yuan/cm²	50 M cm²	¥ 40 M
Electronics	8 yuan/channel	50 M channel	¥ 400 M
Absorber	30 k yuan/ton	1200 ton	¥ 36 M
total			¥ 476 M



Wang M.（王萌）

About simulation

- A dedicated Geant4-Mokka training had been held last month
  - http://indico.ihep.ac.cn/conferenceDisplay.py?confId=4287

- In principle, we can edit the geometry at src code level & maintain the database
- Many Thanks to Emilia (Becheva) and LLR!

Simulation & Analysis

	CEPC @ 5 ab^{-1}	Current Status	Responsable & perspective
mH (Model Independent)	8 MeV	12 MeV (μμH)	IHEP, CCNU
σ(ZH)	0.7 %	1.2 %	IHEP, CCNU
Higgs CP		Theoretically Investigated	THU, HKU
Δ(σ*Br)/(σ*Br)			
ZH, H→bb	0.4%	0.22% (qqH channel)	SJTU, IHEP
H→cc	2.1%	2.2 – 2.8%	SJTU, IHEP
H→gg	1.8%	1.8 – 2.4%	SJTU, IHEP
H→WW*	**1.3%**	2.9% (μμH)	IHEP, PKU
H→ττ	1.2%	Efforts initialized	IHEP, USTC
H→ZZ*	5.1%	~ 4%	SDU
H→γγ	8%	~ 12% (vvH)	WhU, IHEP
H→μμ	?		UCAS, IHEP
H→Inv.	0.3%		IHEP, HKU, HKUST
vvH, H→bb	**3.8%**		PKU, IHEP

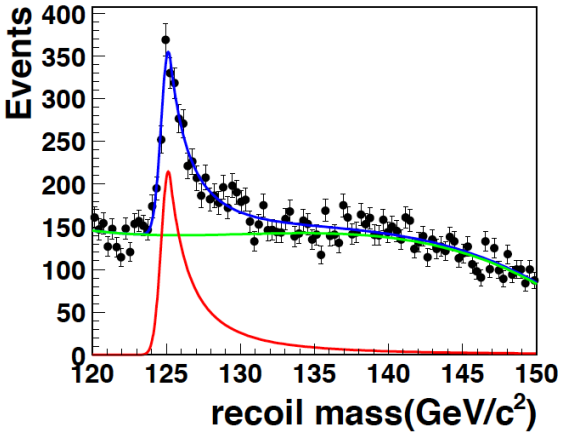
Optimistic Perspective
By the end of 2014

To be validated by Full Simulation

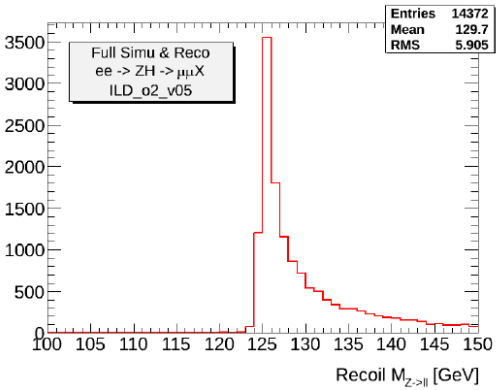
Fast Simulation Level

Some analysis on Higgs measurements

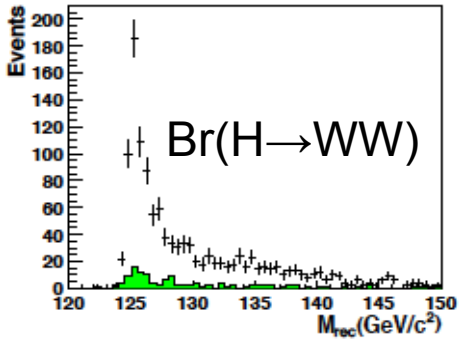
Higgs recoil mass and cross section



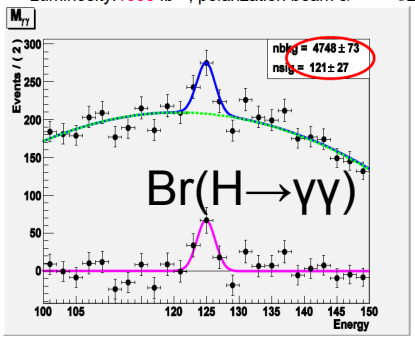
➔Recoil Mass of Z → μμ
Mean = 129.7 GeV
RMS = 5.9 GeV



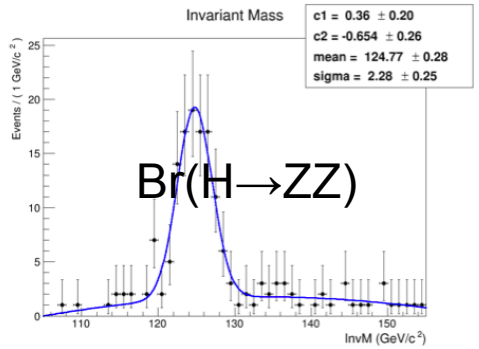
Br(H→bosons)



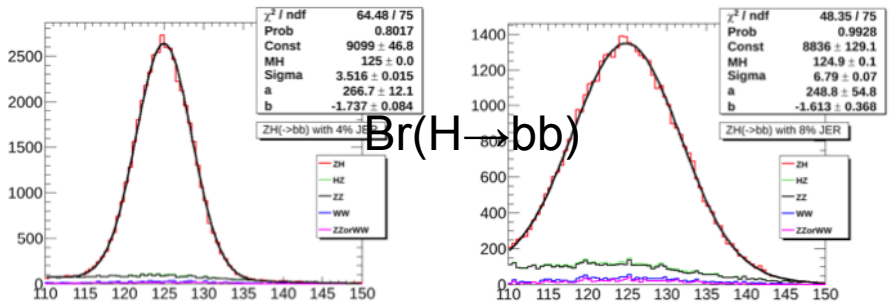
Luminosity:1000 fb⁻¹ , polarization beam & δE/E= $\frac{10\%}{\sqrt{E}} \oplus 1\%$

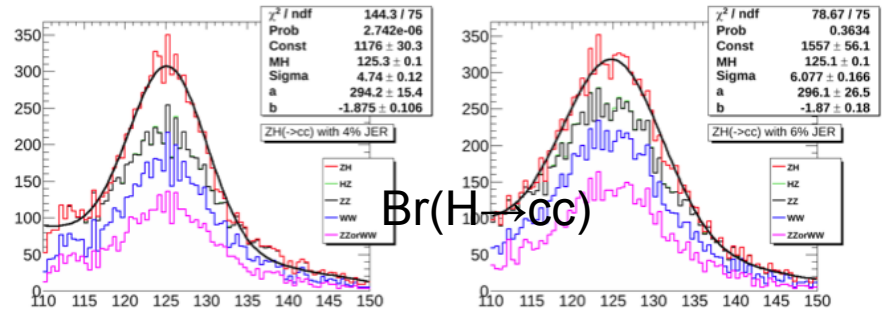


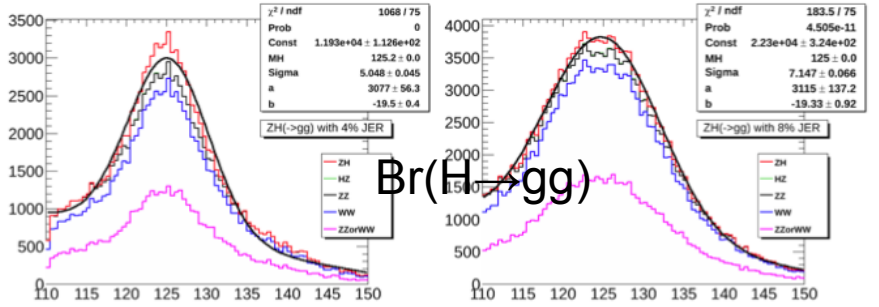
Significance : 4.78σ



Br(H→2 jets)







Lots of questions on detector design/optimization

- Power pulsing:
  - Active Cooling, or smaller granularity
  - Low power consumption electronic design & DAQ system design
- MDI design:
  - Smaller L*
  - B-Field Shielding? Radiation Protection of QD0?
- Sub detector technologies (for example silicon...) and prototype construction
- Along the full simulation/reconstruction chain
  - Dedicated fast simulation tool
  - Reconstruction algorithm optimization
  - Generic analysis framework...
- Arrangement of computing resource, development of future software framework...

We need hands – Skillful hands

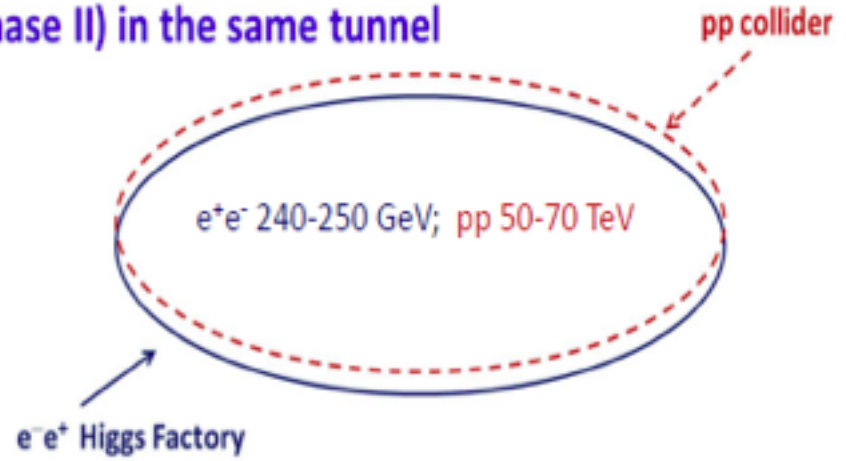
Summary

- ILC & CEPC: highly complementary electron-positron project
  - Physics program
  - Technology development
- CEPC: 2 year's anniversary
  - People gathered, studies initialized, substantial progress for all three groups
  - Big exercise for the whole community
  - Working toward pre-CDR
- Cooperations are needed:
  - **International cooperations is indispensable, please contact us**

CEPC+SppC

- We are looking for a machine after BEPCII
- A circular Higgs factory fits our strategic needs in terms of timing, science goal, technological & economical scale, manpower reality, etc.
- Its life can be extended to a pp collider: great for the future

- **Circular Higgs factory (phase I) + super pp collider (phase II) in the same tunnel**



- Circular Higgs factory is complementary to ILC
  - Push-pull option
  - Low energy vs high energy

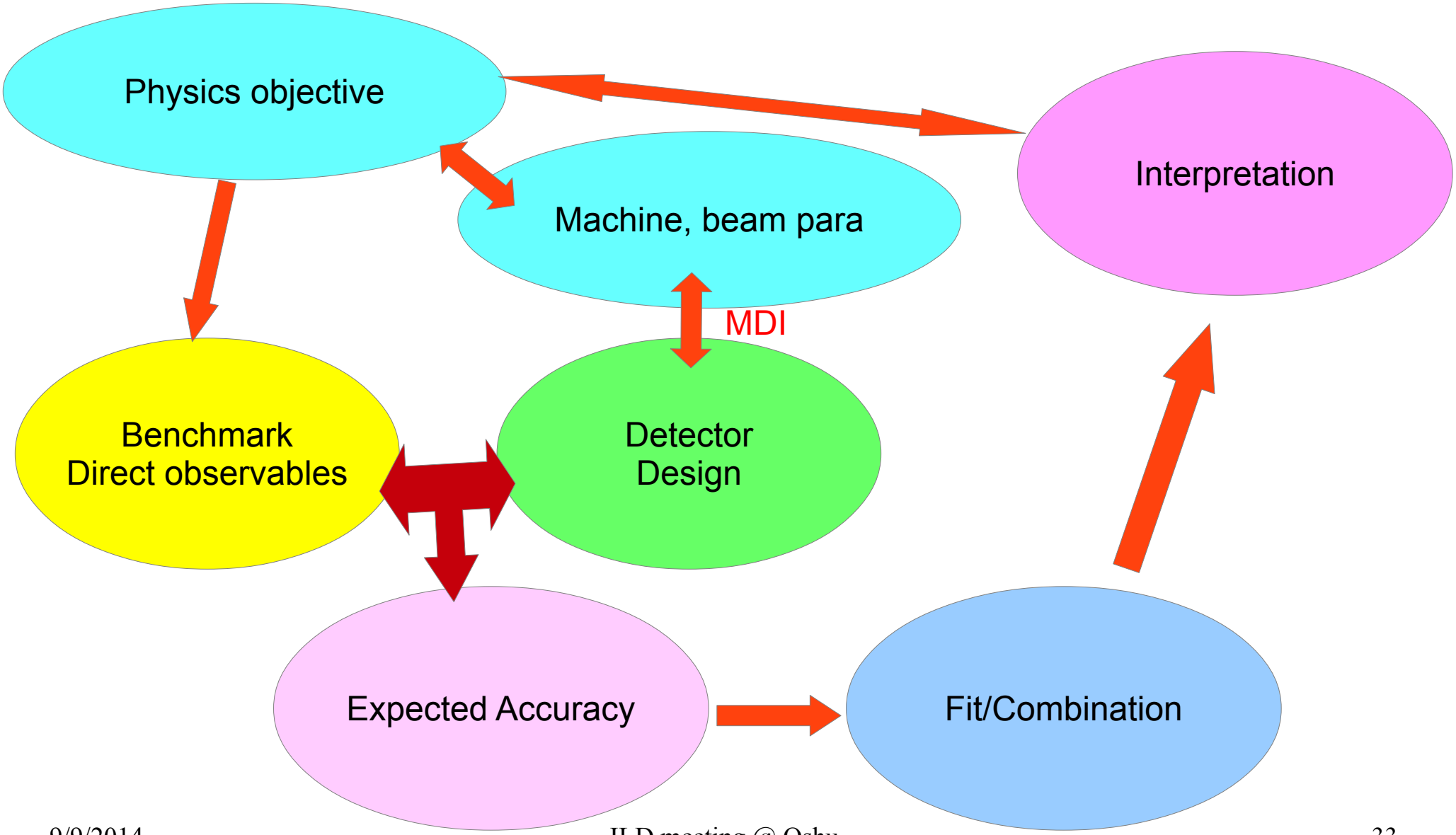
We hope to collaborate with anyone who is willing to host this machine. Even if the machine is not built in China, the process will help us to build the HEP in China


www.taohuaan.net 桃花庵

My feeling

- For a very long time, China played a small role in high energy physics, and the whole fundamental research
- CEPC is the project, with which China can make her contribution to the fundamental research, adequate to her economical size
- Big exercise, we need to
  - Build our team
  - Develop needed technologies
  - **International cooperation is indispensable**
- No matter where the future goes, China will have stronger participants with these people & experience

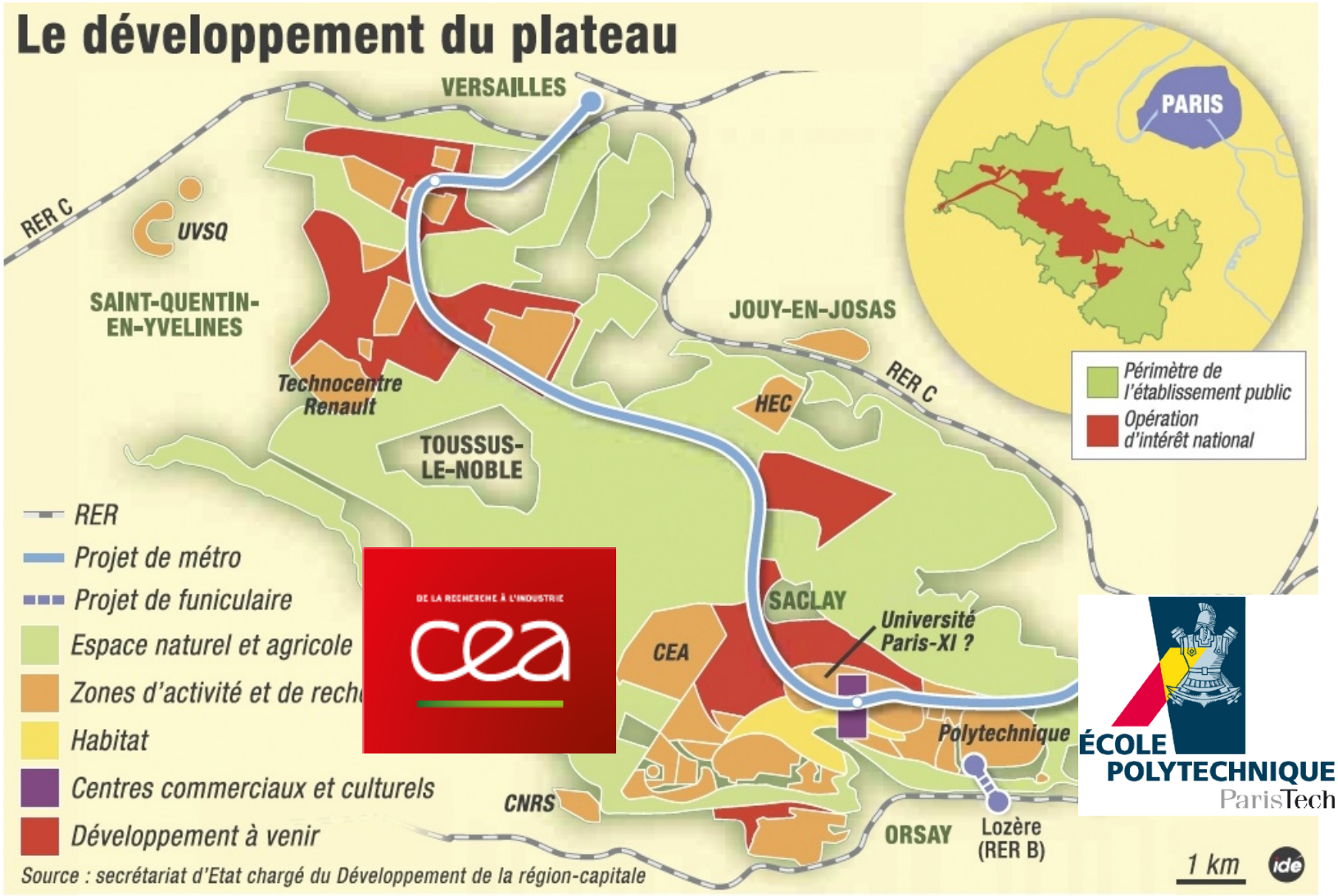
Demonstration of Physics potential



Key technology

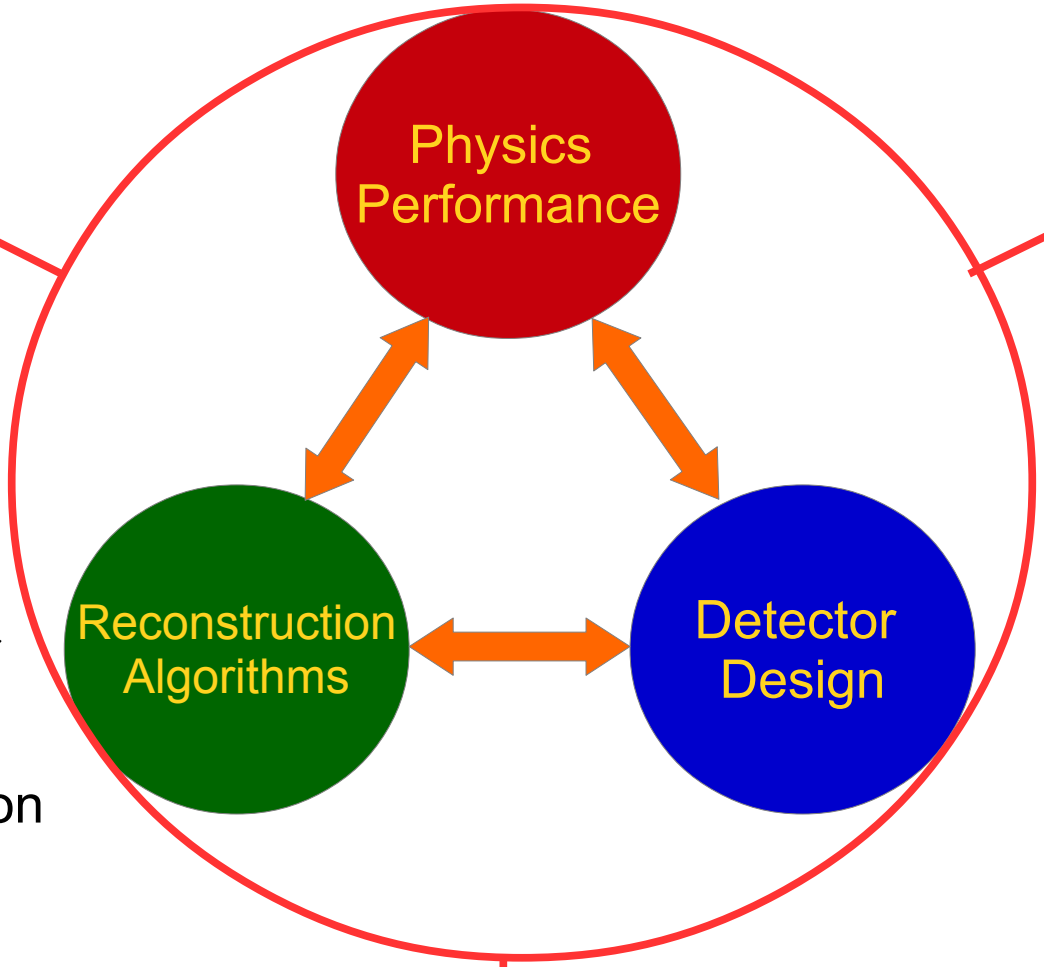
		Cooperation	Comments
BeamBk & MDI	GunieaPig, etc	?	Need iterate with Acc group
Generator	Madgraph		Very limited manpower
	Whizard	In contact with author	Validation phase
	Geant 4 - Mokka		Relatively strongly supported
Simulation	Delphes		Very limited manpower
	Dedicated cepc	author	Using Ideal PFA approach
	Tracking		Optimization phase, man
Reconstruction	PFA		power consumer
	Flavor Tagging		Validation phase
Analysis	Key channels	-	Waiting for full - reco sample
	Combination	Author, adjusting	
Computing	Distributed		Tested, adjusting to cepc
Software Framework			Initialized, to understand, follow recent development

Franco-Chine Cooperations: with LLR & Saclay



Model independent Higgs measurements though HZ, Z->2j events

Br(H→2γ) measurements, Higgs CP measurements, etc.



Arbor PFA

Performance study & Optimization

Framework optimization

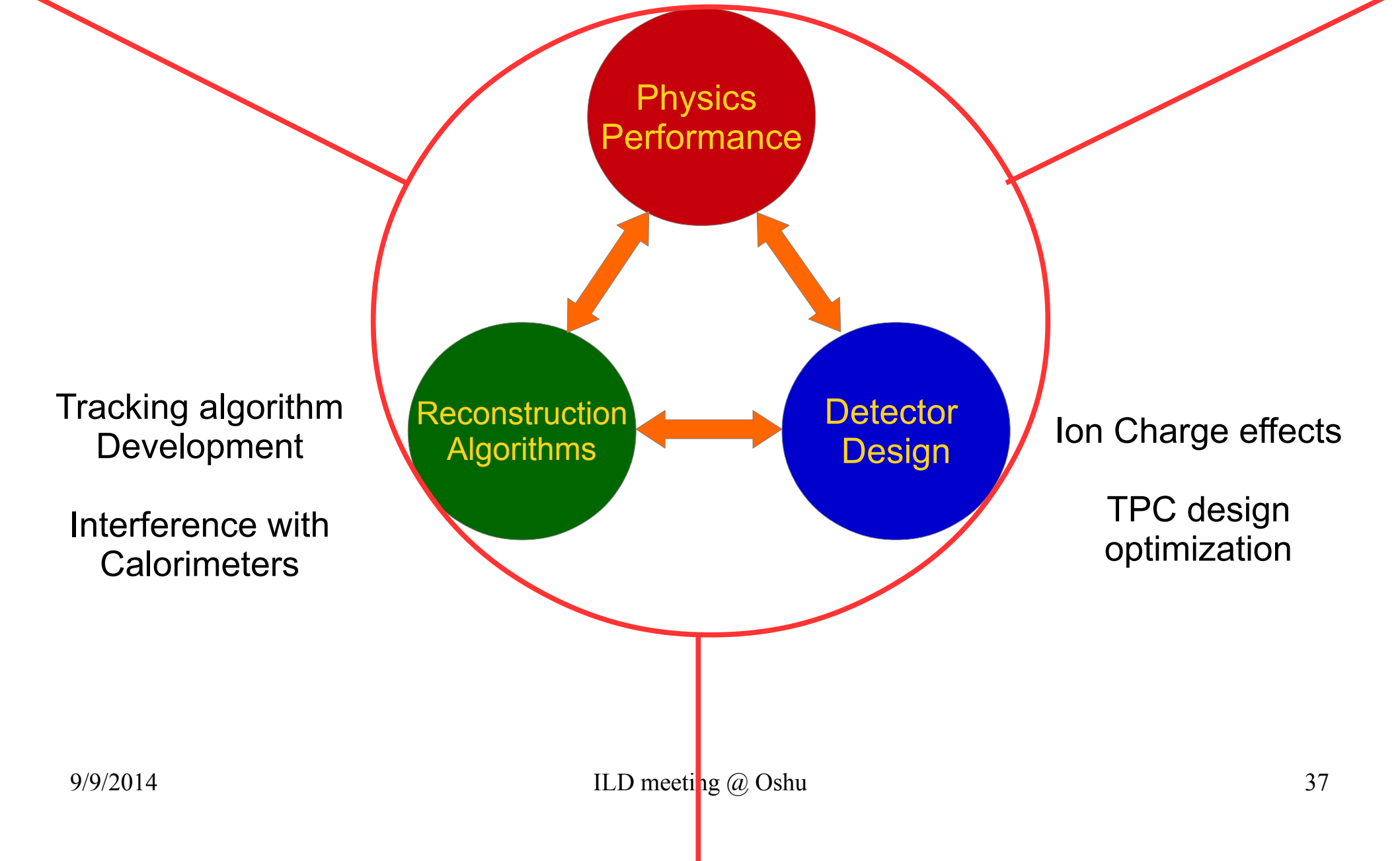
Dedicated algorithm development

G4 Simulation: Maintenance & development

Silicon technology

Calorimeter design, Performance study & optimization

Higgs Invisible Decay Branching ratio, Neutrino Generation, Rare decay of Z



Pre-CDR: layout of simulation part

- X.1: Introduction to Physics Motivation
- X.2: A brief description of the detector
  - ILD & cepc_v0
- X.3: Higgs Measurements
  - Overview
  - Measurement through the recoil mass spectrum
  - Measurement through final state tagging
  - Summary (Interpretation)
- X.4: W & Z
  - Z pole, Neutrino Generation
  - W mass, width & Triplet Gauge Coupling
- X.5: Discussion on Detector Optimization
- X.6: Complementary with other projects
- X.7: Summary