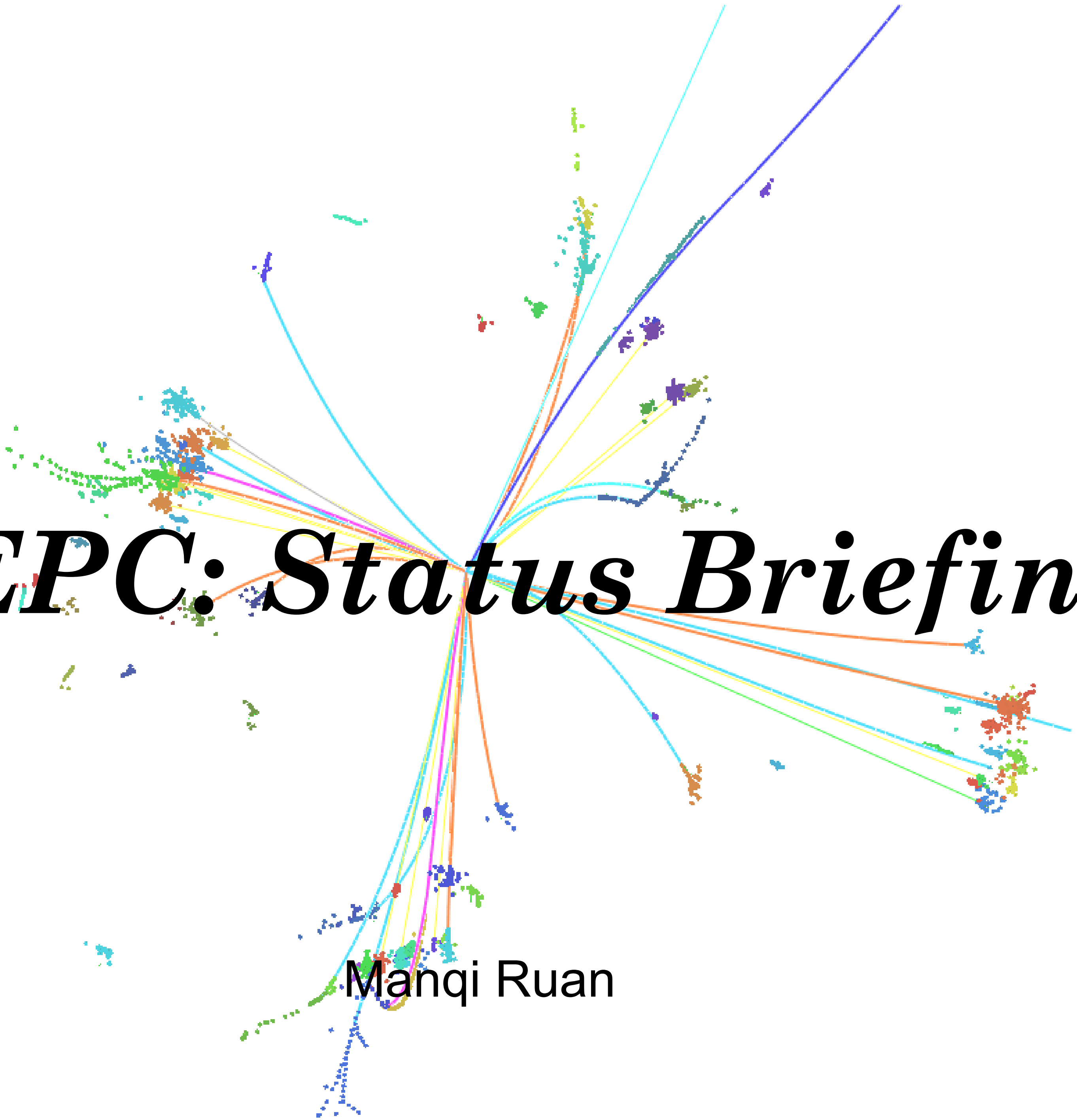
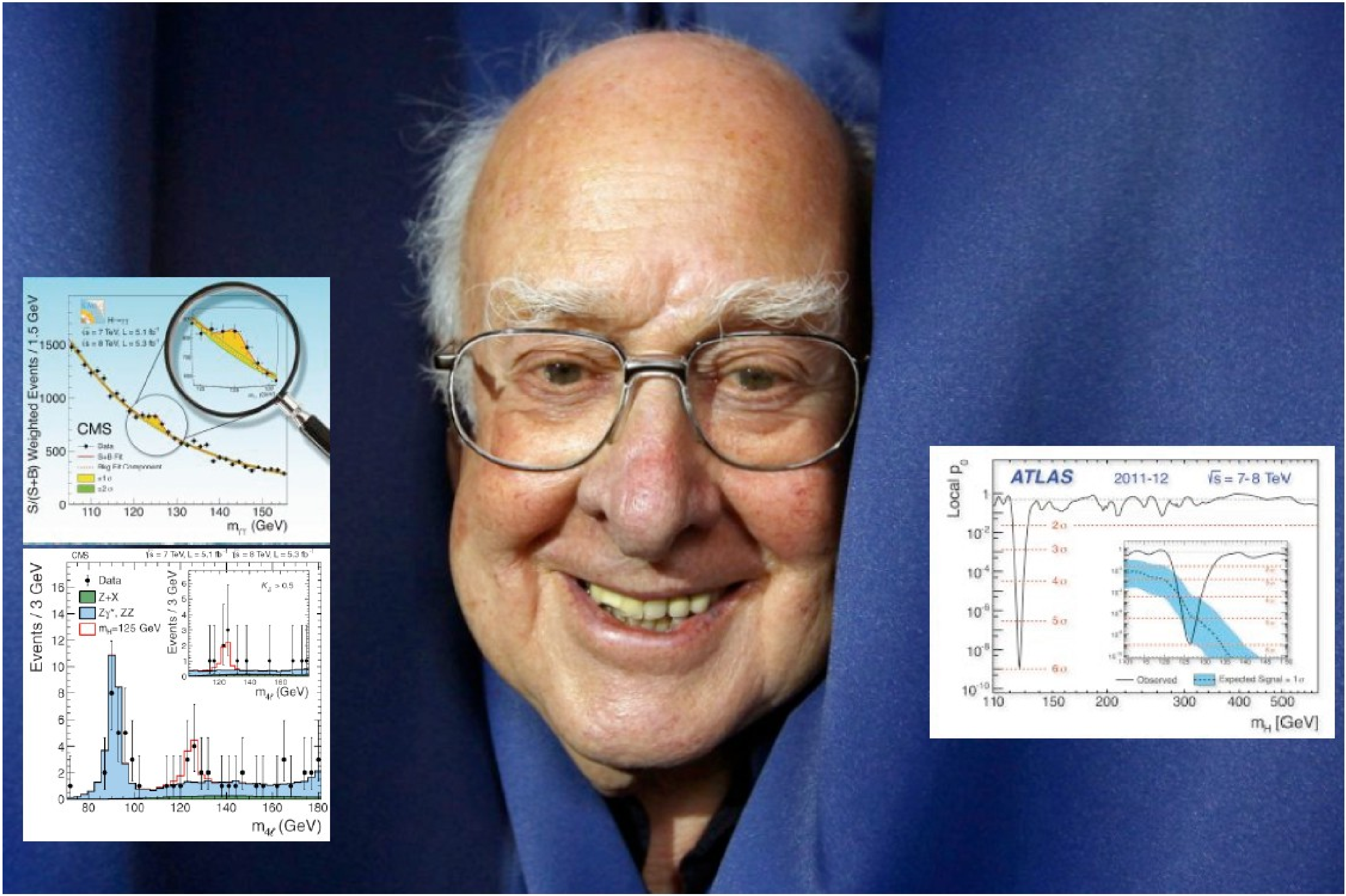


CEPC: Status Briefing

Manqi Ruan

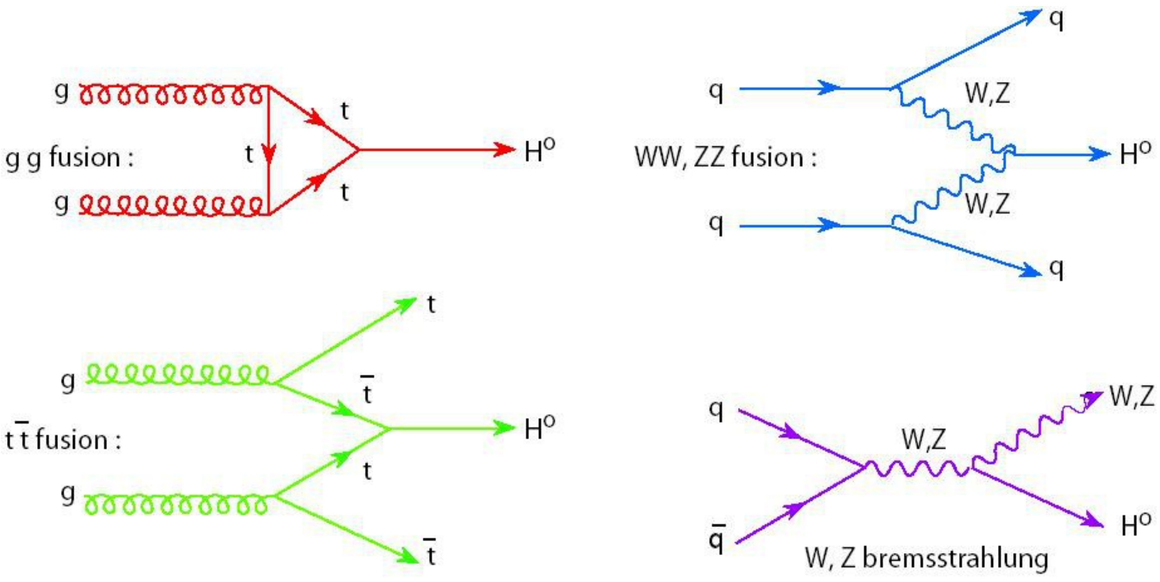


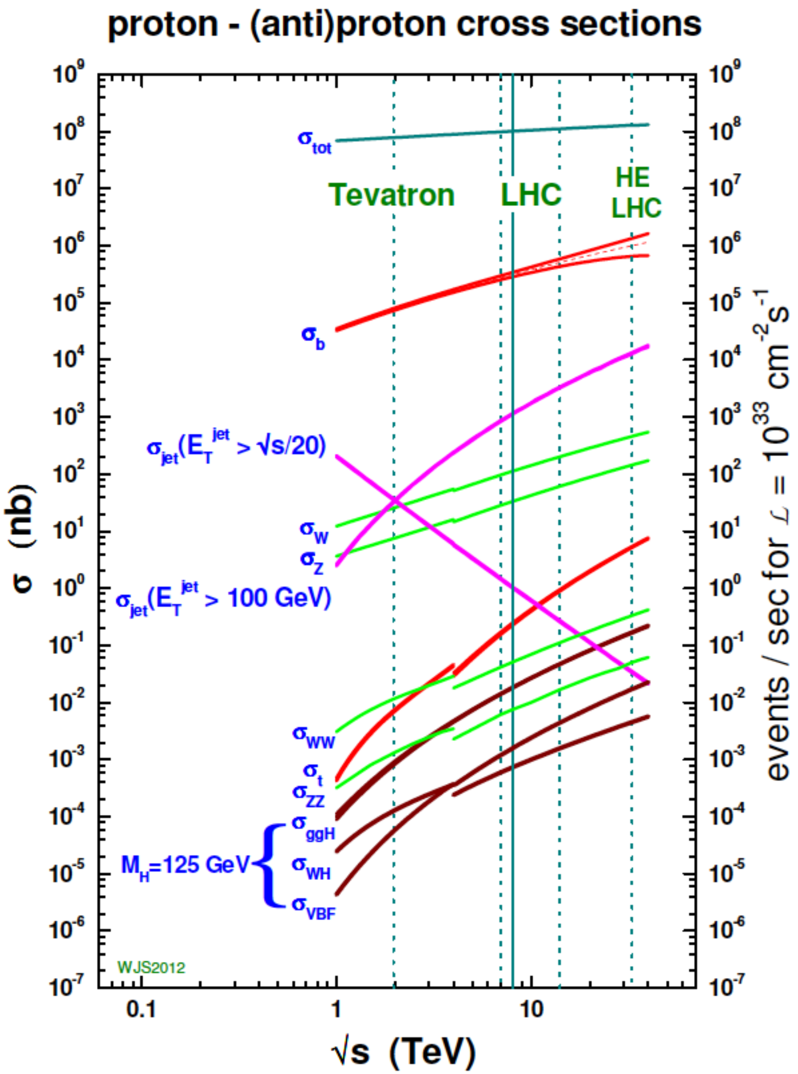
S/(S+B) Weighted Events / 1.5 GeV
CMS
Data
S+B Fit
$m_{\gamma\gamma}$ (GeV)
Events / 3 GeV
Data
Z+X
Zγ*, ZZ
m_H=125 GeV
$m_{4\ell}$ (GeV)
ATLAS
2011-12
$\sqrt{s}$ = 7-8 TeV
Local p_0
Observed
Expected Signal ± 1σ
m_H [GeV]

Higgs 粒子的发现确认了标准模型完整的粒子谱；
然而，标准模型、粒子物理尚有大量未解之谜和理论疑难，其大多和 Higgs 粒子息息相关。

通过 Higgs 粒子的精确测量这一全新的观测手段，可有效探索标准模型背后的、更为基础的物理规律

Higgs @ LHC

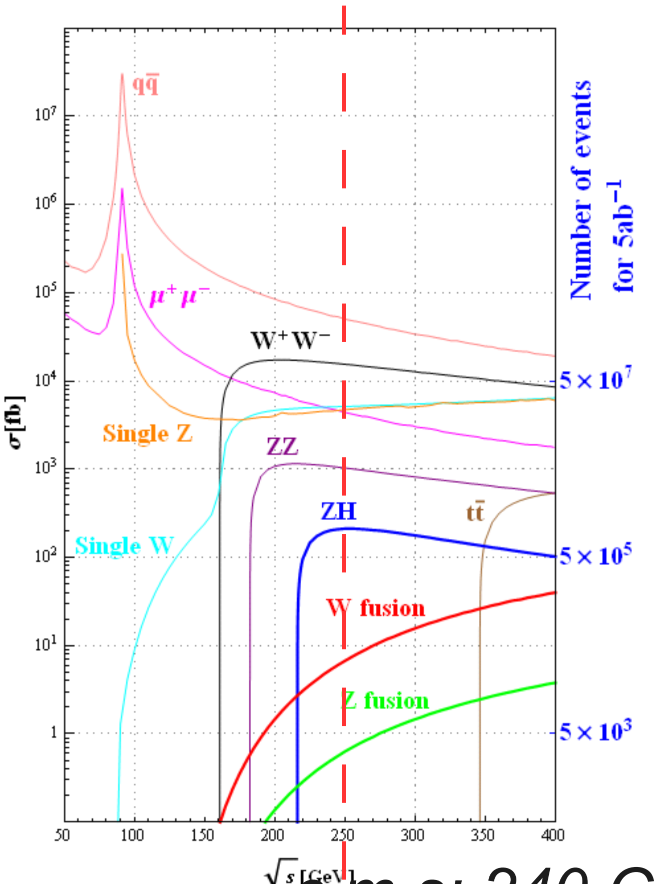


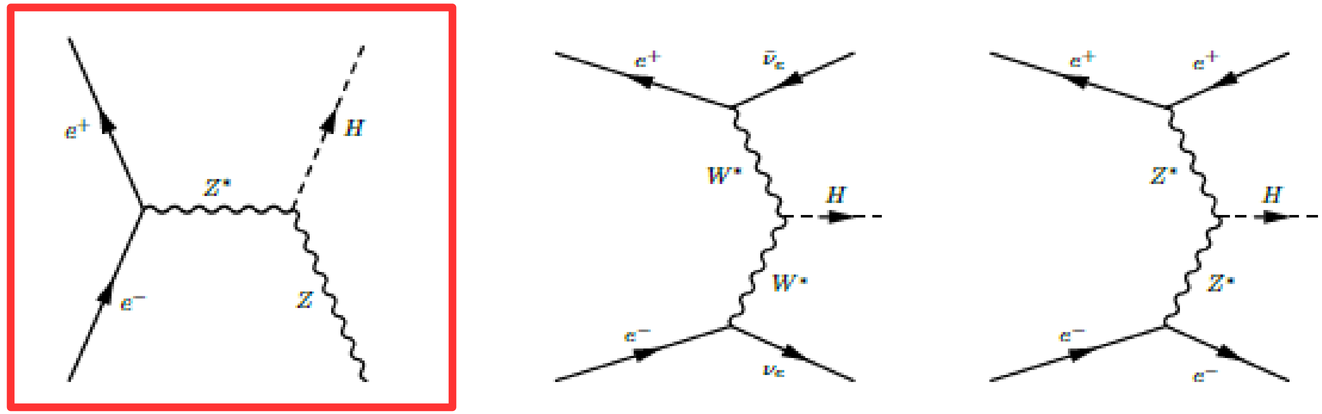


S/B ~ 1:1E10 !!!

$$\sigma(AA \rightarrow H \rightarrow BB) \sim g^2(HAA)g^2(HBB)/\Gamma_{total}$$

Higgs @ Electron Positron Higgs Factories





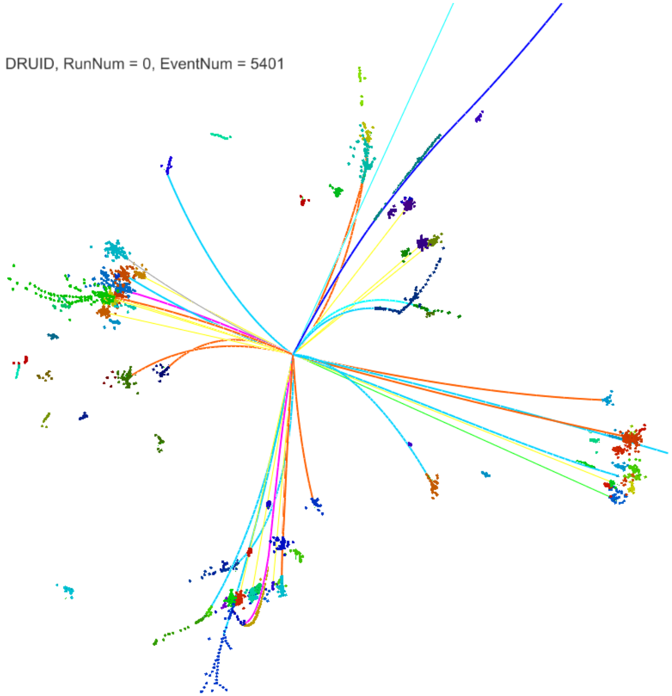
Process	Cross section	Events in 5 ab^{-1}
Higgs boson production, cross section in fb		
$e^+e^- \to ZH$	212	1.06×10^6
$e^+e^- \to \nu\bar{\nu}H$	6.72	3.36×10^4
$e^+e^- \to e^+e^-H$	0.63	3.15×10^3
Total	219	1.10×10^6

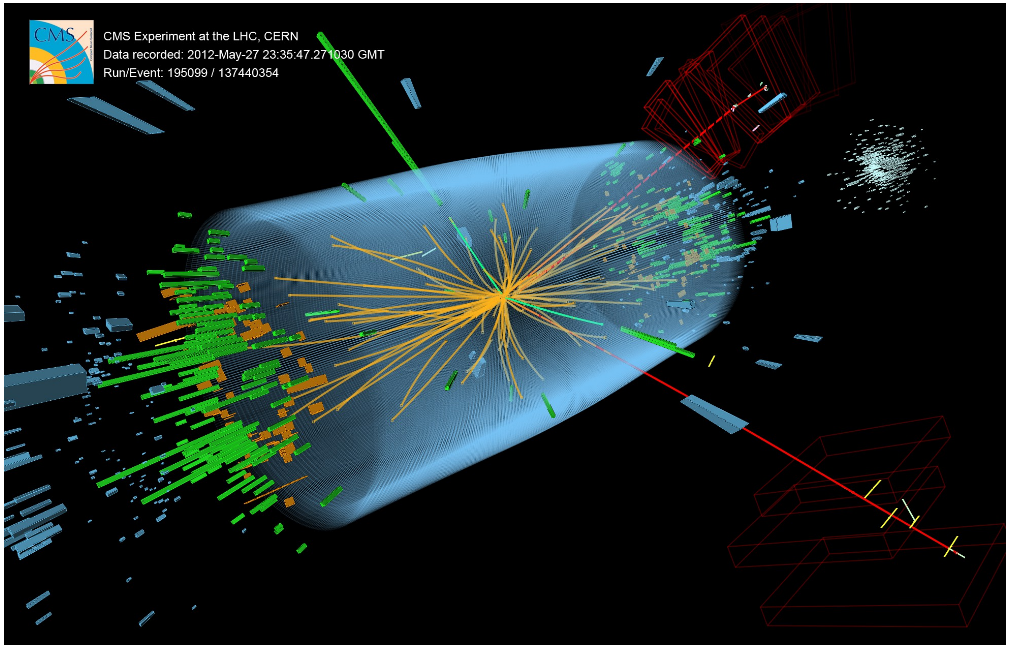
c.m.s: 240 GeV or higher, S/B ~ 1:100 - 1000

Observables: Higgs mass, CP, σ(ZH), event rates (σ(ZH, vvH)*Br(H→X)), Diff. distributions

Derive: Absolute Higgs width, branching ratios, couplings

Higgs measurement at e+e- & pp

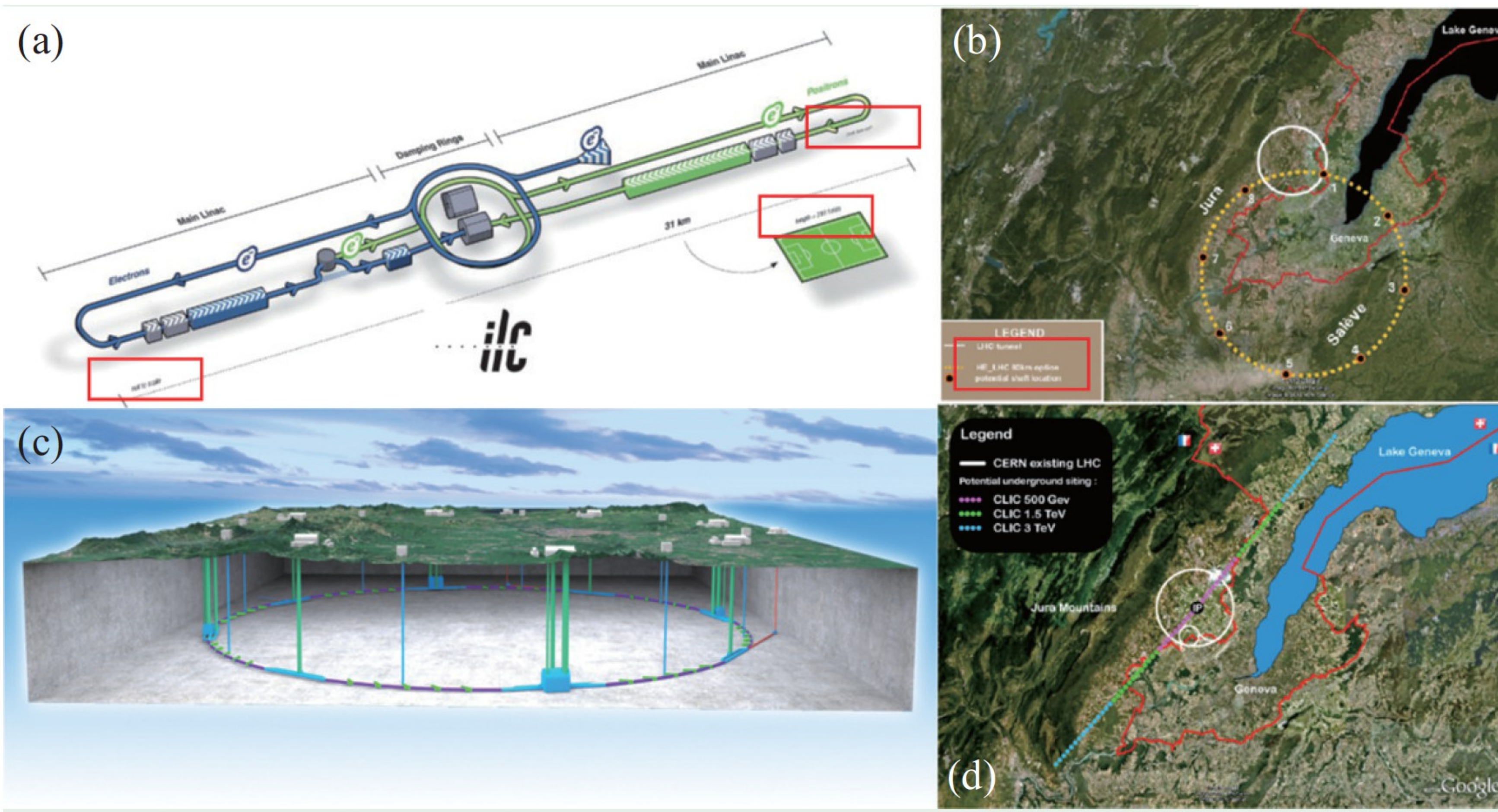




	Yield	efficiency	Comments
LHC	Run 1: 10^6 Run 2/HL: 10^{7-8}	~o(10^{-3})	High Productivity & High background, Relative Measurements, Limited access to width, exotic ratio, etc, Direct access to g(ttH), and even g(HHH)
CEPC	10^6	~o(1)	Clean environment & Absolute measurement, Percentage level accuracy of Higgs width & Couplings

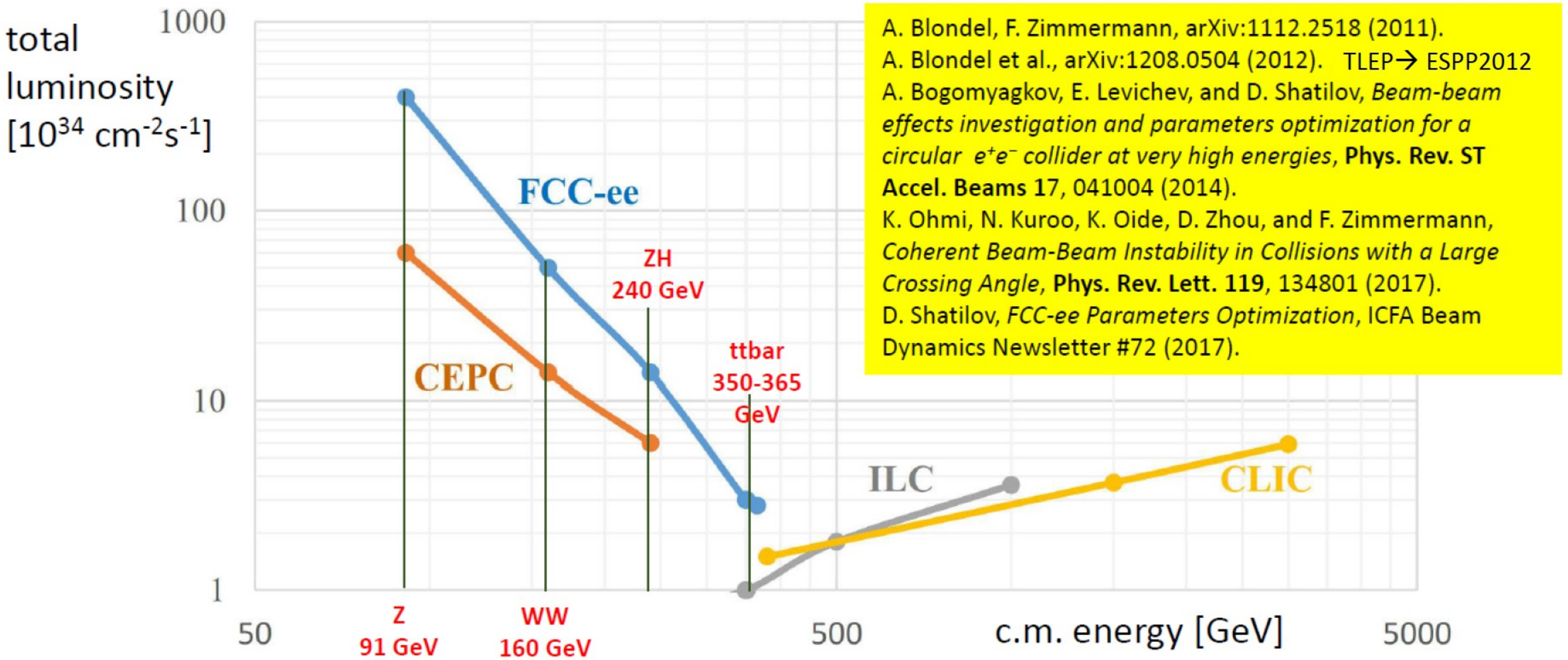
Complementary

Multiple e+e- Higgs factories are proposed



ILC (a): TDR released in 2013
FCC (b): CDR released in 2019
CEPC (c): CDR released in 2018
CLIC (d): CDR released in 2013

Comparison: Linear & Circular



From A. Blondel's presentation at CEPC Oxford WS

summary of national priorities and interests for large future HEP projects :

country	item #	e+e- e-w,H,.. (ILC, ...)	e+e- incl. ttbar (FCC-ee)	e+e- incl. HH (ILC+,CLIC)	hh beyond LHC	hh he-LHC	hh FCC	eh	accel. R&D	R&D magnets FCC,he-LHC	R&D novel PWA,μ+μ-	non-accelerator (DM,ndbd)	neutrino physics	intensity frontier	nuclear (FAIR,EIC...)	astro-particle
A	108	1			3				2			√			√	√
B	122	1														
CH	142	1	1		3		3		2	2	3		√	√	√	√
CZ	88	3		3	2	2	2		1	1	1		√		4	
D	33	1		1	3	3	3		2	2	2	4	√	√	√	√
DK	61	3	3		3		3		2	2	2	1	√	√	√	√
E	31	1	3	1	3	3	3		2	2	4		√		√	√
F	15,116,155	1	√	√	3		3	√	2	2	√	√	√	√	√	√
FIN	55	1		1									√		√	√
I	26,138	1	1		3		3		2	2	2	√	√	√		√
IL	34	√			√							√	√	√		
N	43	1		1					3		3	√			√	√
NL	166	1	3	2	3		3		2	2	3	√	√	√		√
PL	125	1	√	√					2							
RO	73												√	√		
S	127	1		1					2	2	√	√	√	3		√
SLO	78															
UK	134,144	1		1	2		2	2	3	3	√	√	√		√	
total score:		13,67	3	6,83	3,67	1,17	3,33	0,5	6,67	5,33	3,75					

1...4: priority 1 to priority 4;
√: mentioned without (clear) assignment of priority
total score: =Σ(1/priority) where given; √ not counted

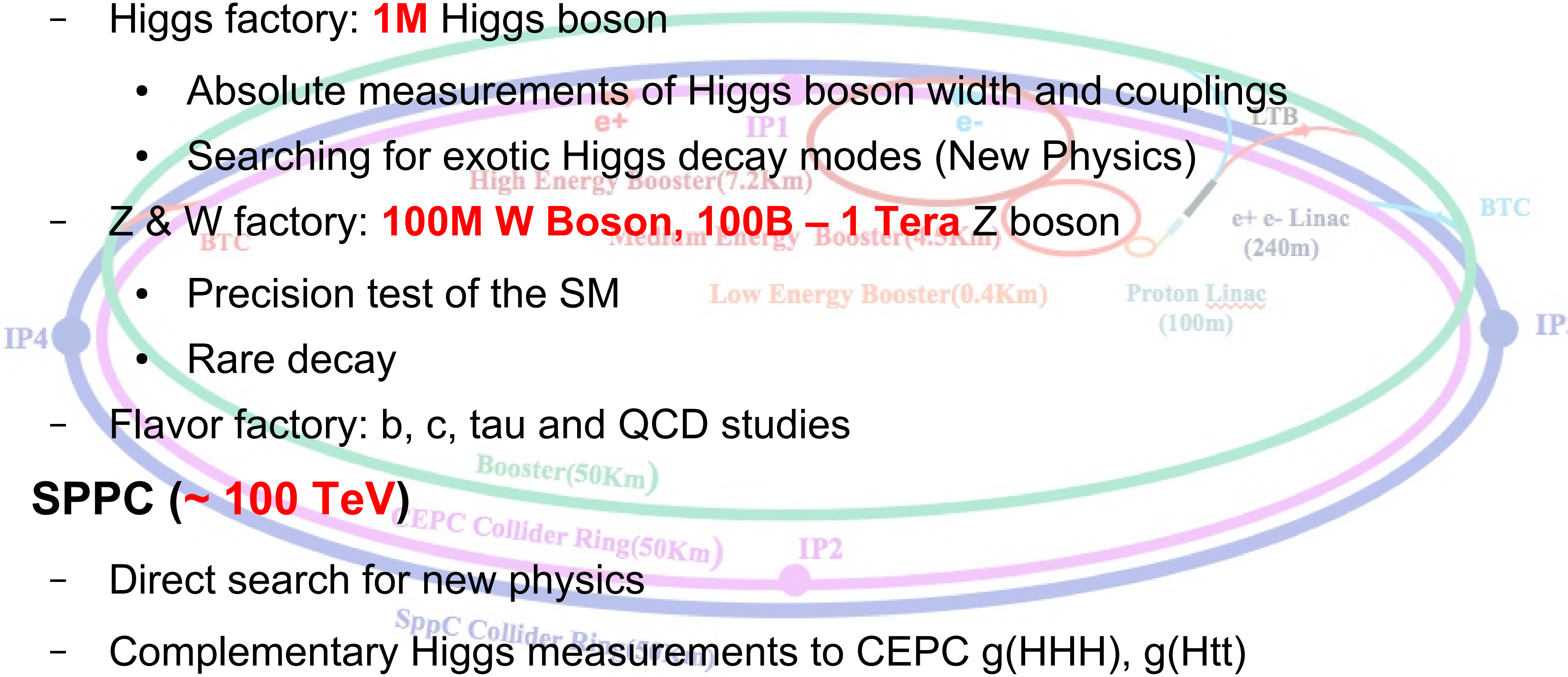
Notes:
– table reflects status of inputs submitted by Dec. 2018
– intended for overview of physics or projects priorities
– see disclaimers on previous and following pages!

Summary of National Inputs S. Bethke (MPP Munich) ESPP Symposium, Granada, 15 May 2019 5

- clear preference for an e^+e^- collider as the next h.e. collider:
  – as H-factory and for precision e.w. measurements (ILC, CEPC, FCC-ee, CLIC)
  – significant demands for upgradeability to access $t\bar{t}$ (ILC, CEPC, FCC-ee, CLIC) and also HH and ttH final states (ILC+; CLIC)

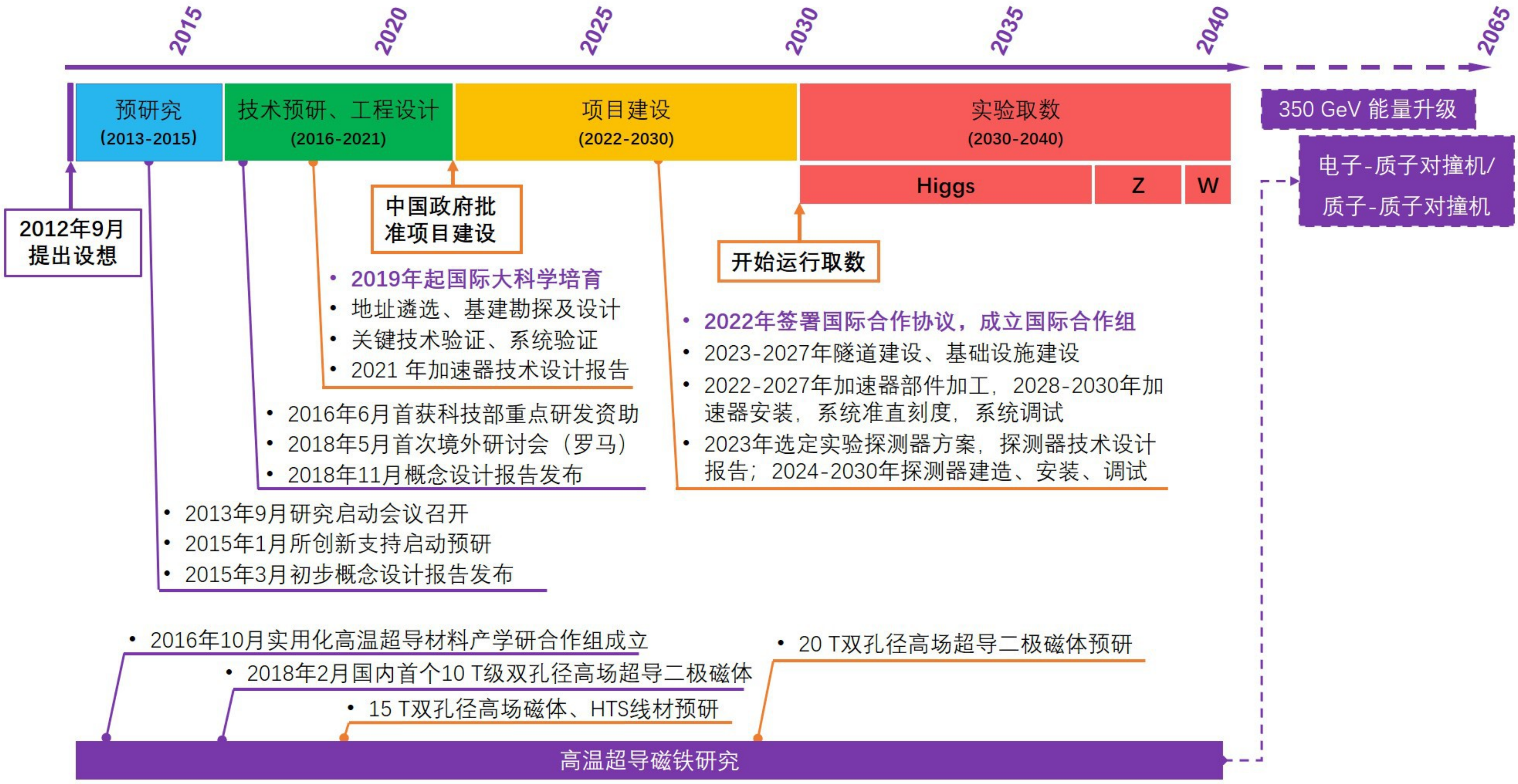
Science at CEPC-SPPC

- **Tunnel ~ 100 km**
- **CEPC (90 – 250 GeV)**
  - Higgs factory: **1M** Higgs boson
    - Absolute measurements of Higgs boson width and couplings
    - Searching for exotic Higgs decay modes (New Physics)
  - Z & W factory: **100M W Boson, 100B – 1 Tera** Z boson
    - Precision test of the SM
    - Rare decay
  - Flavor factory: b, c, tau and QCD studies
- **SPPC (~ 100 TeV)**
  - Direct search for new physics
  - Complementary Higgs measurements to CEPC g(HHH), g(Htt)
  - ...
- **Heavy ion, e-p collision...**



Complementary

环形正负电子对撞机（CEPC）项目路线图

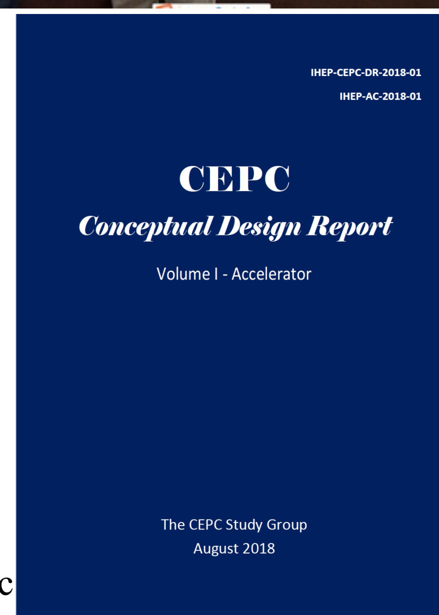


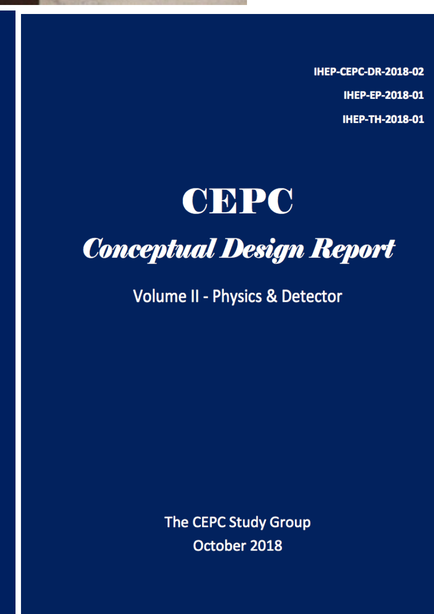
CEPC possible Timeline

- The CDR is delivered Nov. 2018
- Try to get the governments support, most probably as one of the cultivated projects in the establishing framework of “China initiated International Big Science Project”. The Green light can come at earliest ~ 2020 - 2022.
- Accelerator:
  - Pursue TDR at full speed, be delivered at ~2023
- Detector & Physics:
  - Now – Green light: enhance the international collaboration & welcome new ideas – proposals
  - Right after the Green light: a call for LoIs for different detector concepts, and a selective procedure will be performed
  - The selected concepts will be required to deliver their sub-system TDRs, by roughly 3 years after the selection

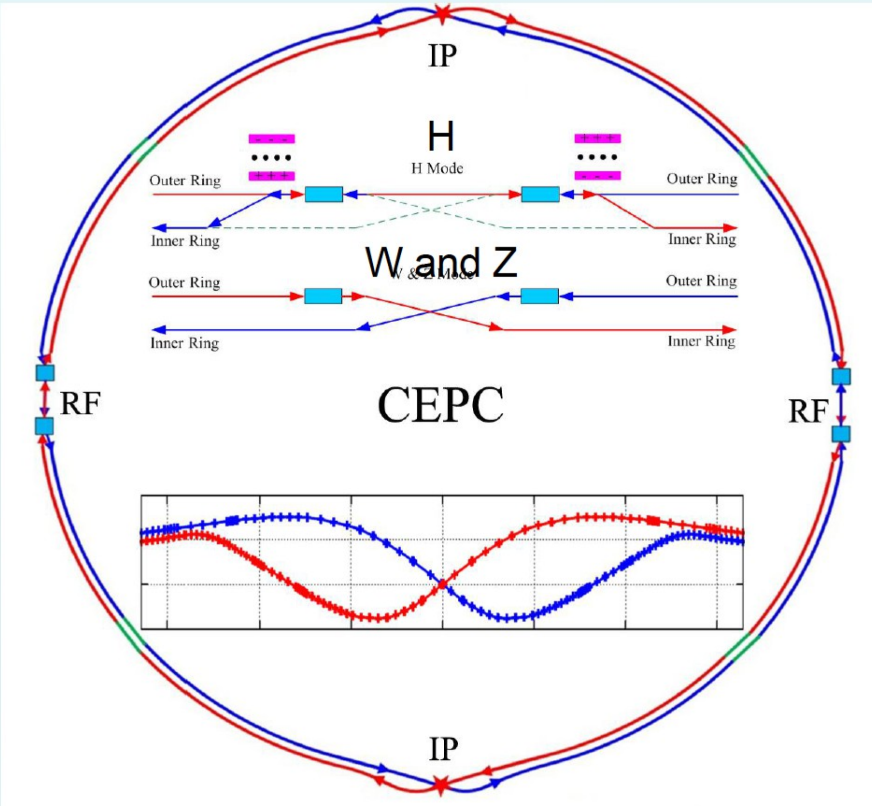
Addendum of https://arxiv.org/pdf/1901.03170.pdf

CDR released in Nov. 2018

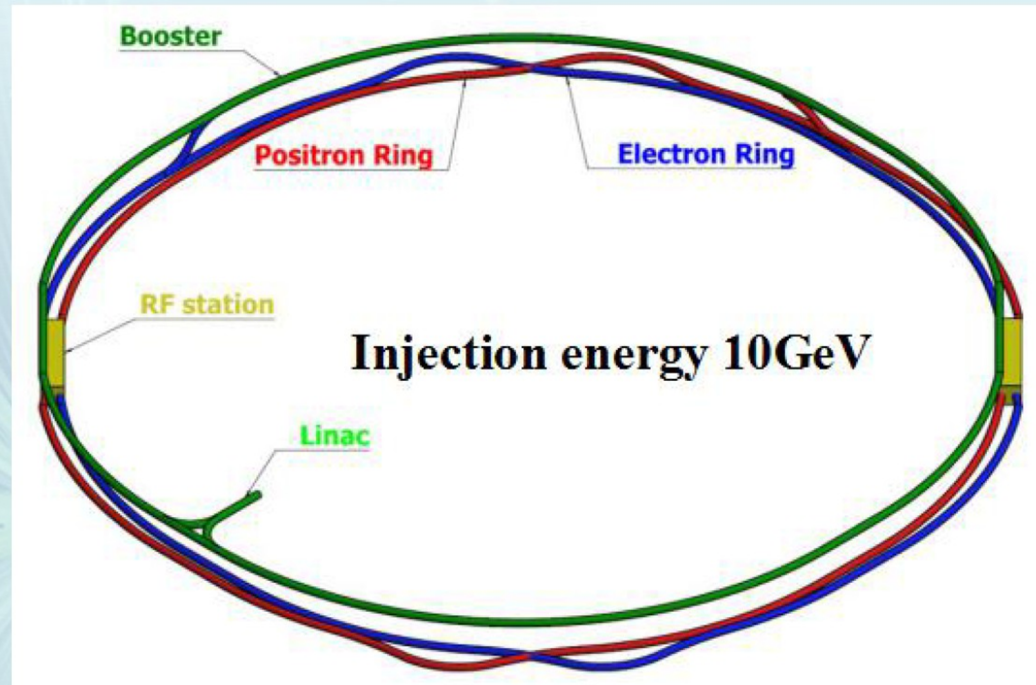




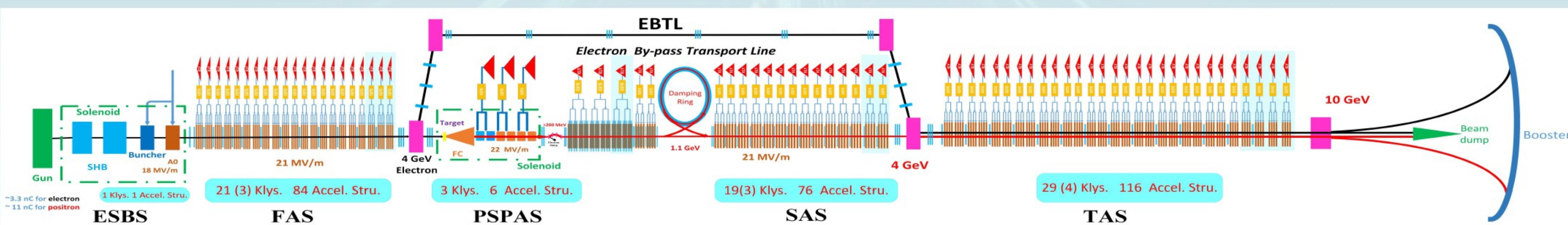
CEPC Accelerator Baseline Layout



CEPC collider ring (100km)



CEPC booster ring (100km)



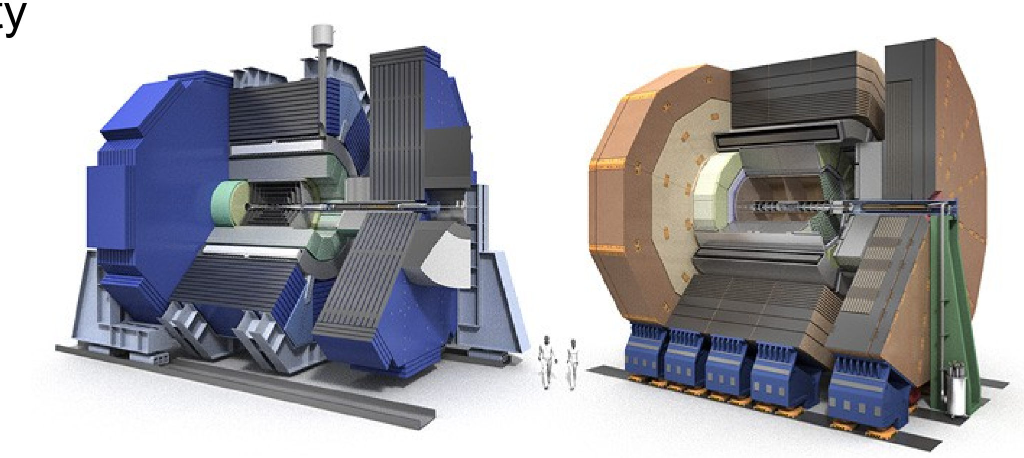
CEPC CDR Parameters

D. Wang

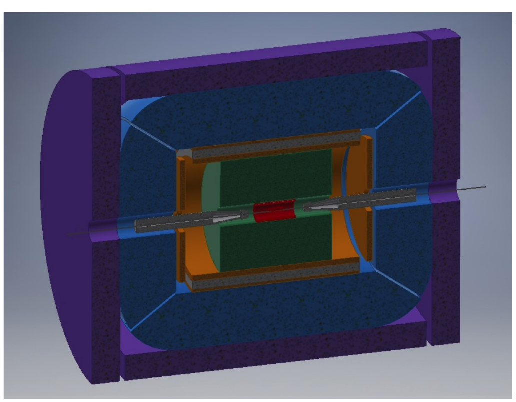
	Higgs	*W*	*Z* (3T)	*Z* (2T)
Number of IPs	2			
Beam energy (GeV)	**120**	**80**	**45.5**	
Circumference (km)	100			
Synchrotron radiation loss/turn (GeV)	1.73	0.34	0.036	
Crossing angle at IP (mrad)	16.5×2			
Piwinski angle	2.58	7.0	23.8	
Number of particles/bunch N_e (10^{10})	15.0	12.0	8.0	
Bunch number (bunch spacing)	**242 (0.68μs)**	**1524 (0.21μs)**	**12000 (25ns+10%gap)**	
Beam current (mA)	17.4	87.9	461.0	
Synchrotron radiation power /beam (MW)	**30**	**30**	**16.5**	
Bending radius (km)	10.7			
Momentum compact (10^{-5})	1.11			
β function at IP β_x^*/β_y^* (m)	**0.36/0.0015**	**0.36/0.0015**	**0.2/0.0015**	**0.2/0.001**
Emittance $\varepsilon_x/\varepsilon_y$ (nm)	1.21/0.0031	0.54/0.0016	0.18/0.004	0.18/0.0016
Beam size at IP σ_x/σ_y (μm)	20.9/0.068	13.9/0.049	6.0/0.078	6.0/0.04
Beam-beam parameters ξ_x/ξ_y	0.031/0.109	0.013/0.106	0.0041/0.056	0.0041/0.072
RF voltage V_{RF} (GV)	2.17	0.47	0.10	
RF frequency f_{RF} (MHz) (harmonic)	650 (216816)			
Natural bunch length σ_z (mm)	2.72	2.98	2.42	
Bunch length σ_z (mm)	3.26	5.9	8.5	
HOM power/cavity (2 cell) (kw)	0.54	0.75	**1.94**	
Natural energy spread (%)	0.1	0.066	0.038	
Energy acceptance requirement (%)	**1.35**	**0.4**	**0.23**	
Energy acceptance by RF (%)	2.06	1.47	1.7	
Photon number due to beamstrahlung	0.1	0.05	0.023	
Lifetime _simulation (min)	100			
Lifetime (hour)	**0.67**	**1.4**	**4.0**	**2.1**
F (hour glass)	0.89	0.94	0.99	
Luminosity/IP *L* (10^{34}cm^{-2}s^{-1})	**2.93**	**10.1**	**16.6**	**32.1**

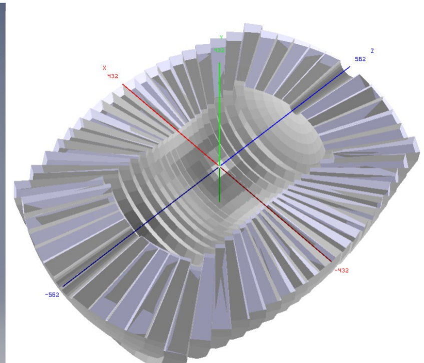
Two classes of Concepts

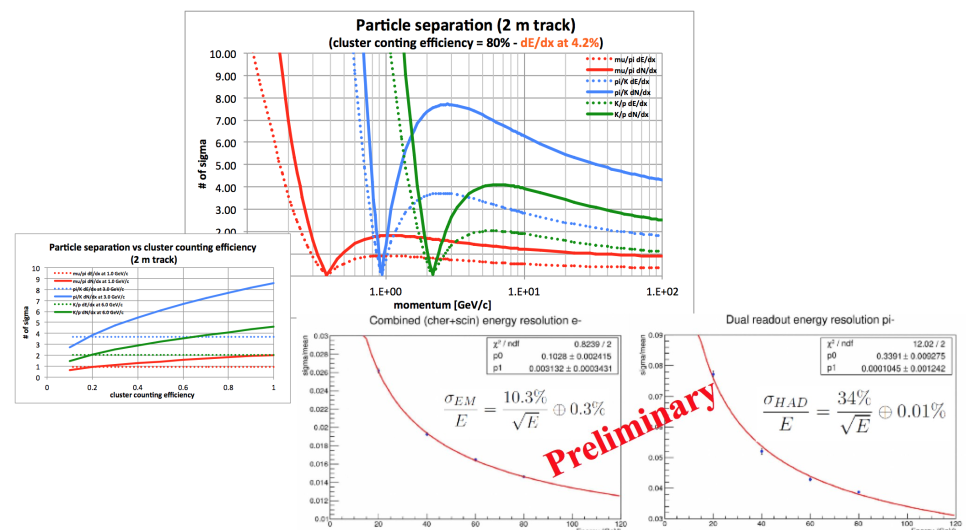
- PFA Oriented concept using High Granularity Calorimeter
  - + TPC (ILD-like, **Baseline**)
  - + Silicon tracking (SiD-like)



- Low Magnet Field Detector Concept (IDEA)
  - Wire Chamber + Dual Readout Calorimeter



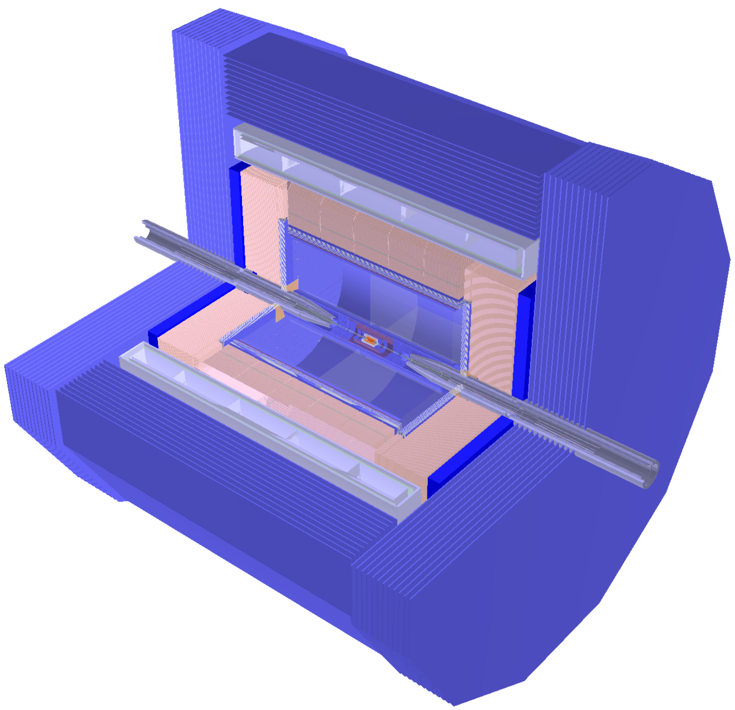


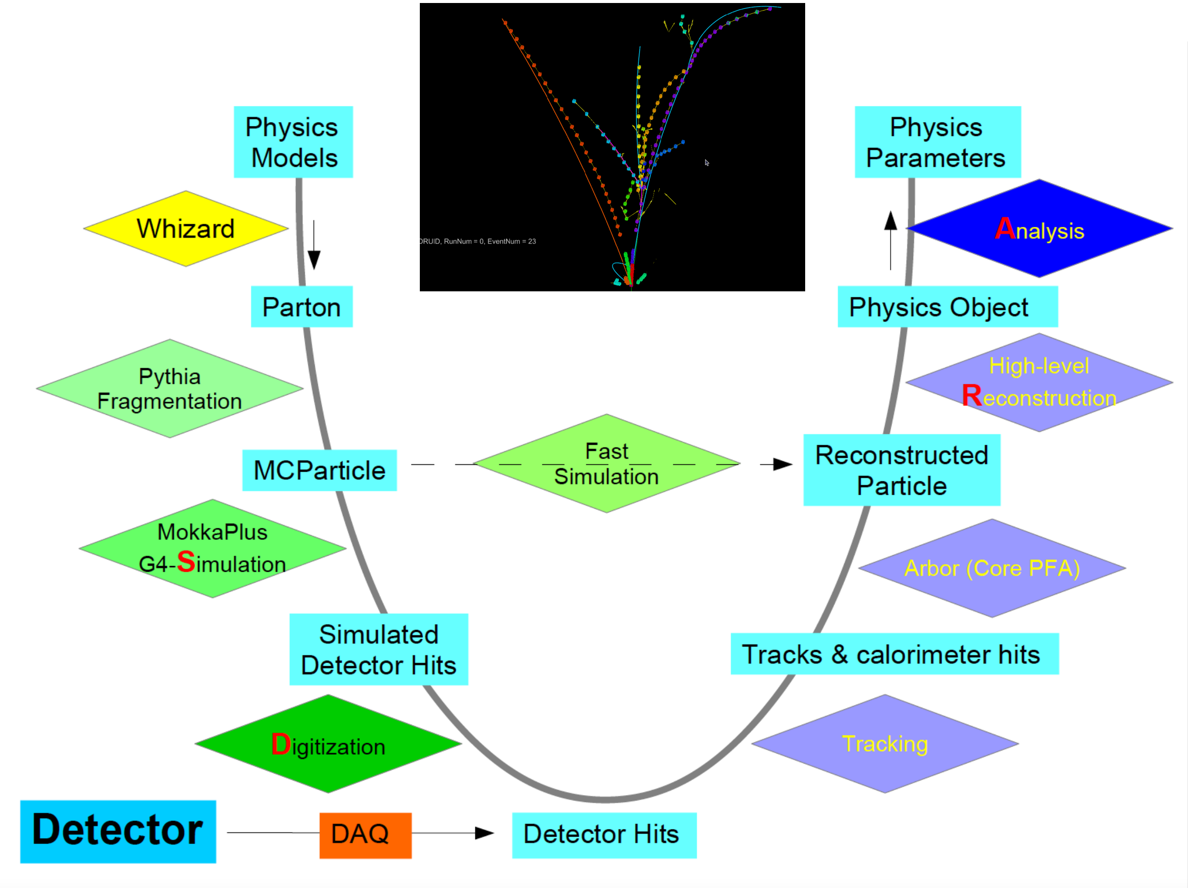


https://indico.ihep.ac.cn/event/6618/

https://agenda.infn.it/conferenceOtherViews.py?view=standard&confId=14816

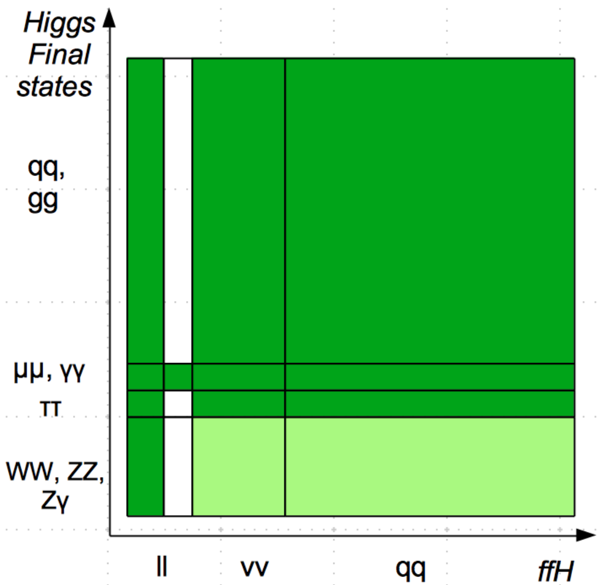
Software & Reconstruction

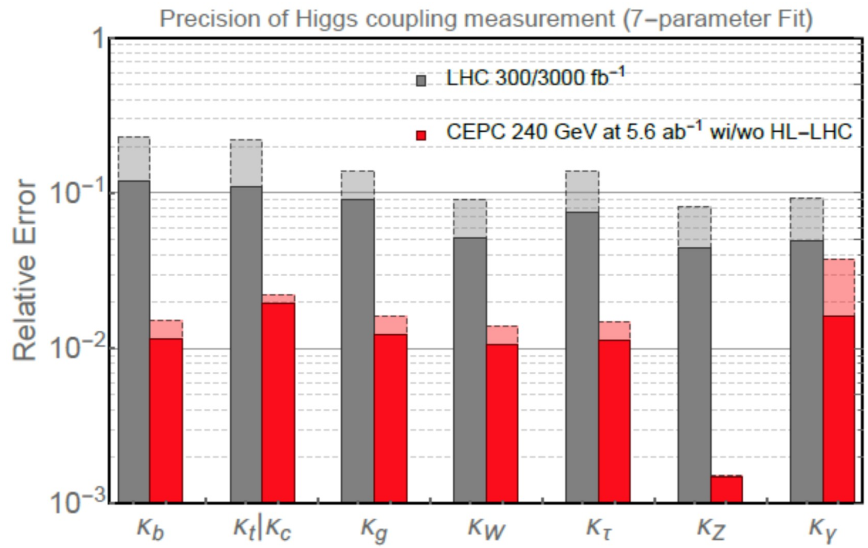


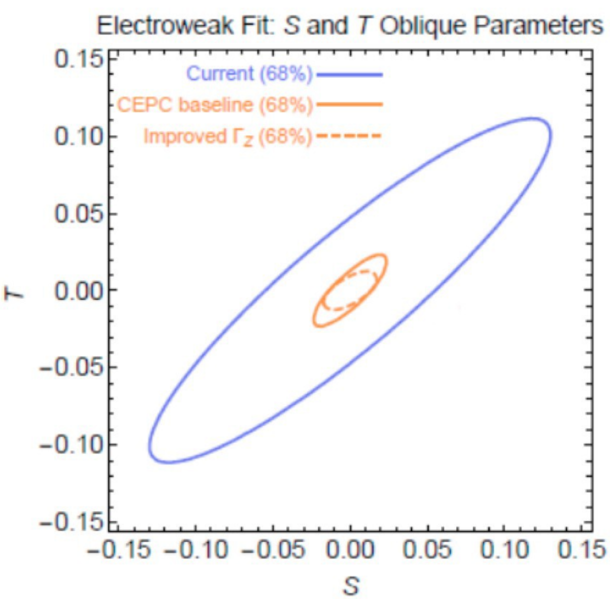


Starting from the ilcsoft & rewriting all the PFA/high-level reconstruction algorithms.

Applied to physics potential study







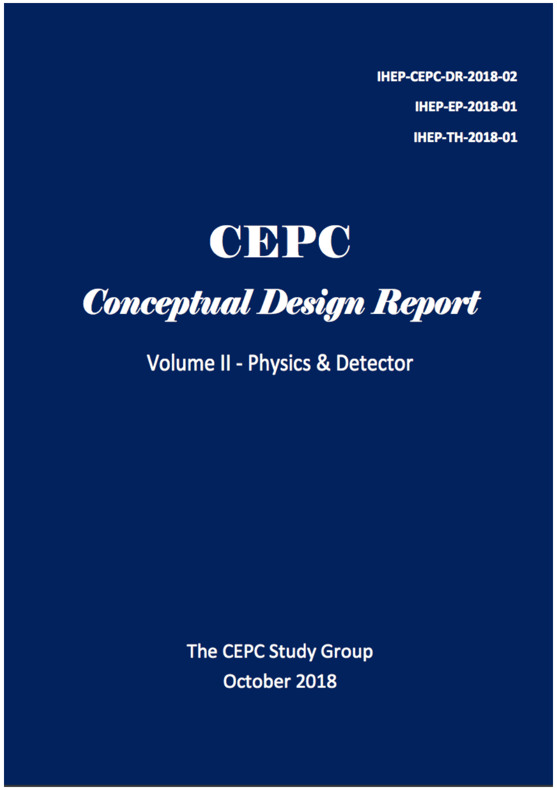
Precision Higgs Physics at CEPC

Initial assessments of Higgs physics potential at the CEPC based on the white paper (to be submitted)

Chinese Physics C Vol. XX, No. X (201X) 010201

Precision Higgs Physics at the CEPC*

Fenfen An[4,21] Yu Bai[9] Chunhui Chen[21] Xin Chen[5] Zhenxing Chen[3] Joao Guimaraes da Costa[4] Zhenwei Cui[3] Yaquan Fang[4,6] Chengdong Fu[4] Jun Gao[10] Yanyan Gao[20] Yuanning Gao[5] Shao-Feng Ge[15,27] Jiayin Gu[13] Fangyi Guo[1,4] Jun Guo[10,11] Tao Han[5,29] Shuang Han[4] Hong-Jian He[10,11] Xianke He[10] Xiao-Gang He[10,11] Jifeng Hu[10] Shih-Chieh Hsu[30] Shan Jin[8] Maoqiang Jing[4,7] Ryuta Kiuchi[4] Chia-Ming Kuo[19] Pei-Zhu Lai[19] Boyang Li[5] Congqiao Li[3] Gang Li[4] Haifeng Li[12] Liang Li[10] Shu Li[10,11] Tong Li[12] Qiang Li[3] Hao Liang[4,6] Zhijun Liang[4] Libo Liao[4] Bo Liu[4,21] Jianbei Liu[1] Tao Liu[14] Zhen Liu[24,28] Xinchou Lou[4,6,31] Lianliang Ma[12] Bruce Mellado[17] Xin Mo[4] Mila Pandurovic[16] Jianming Qian[22] Zhuoni Qian[18] Nikolaos Rompotis[20] Manqi Ruan[4] Alex Schuy[30] Lian-You Shan[4] Jingyuan Shi[9] Xin Shi[4] Shufang Su[23] Dayong Wang[3] Jing Wang[4] Lian-Tao Wang[25] Yifang Wang[4,6] Yuqian Wei[4] Yue Xu[5] Haijun Yang[10,11] Weiming Yao[26] Dan Yu[4] Kaili Zhang[4,6] Zhaoru Zhang[4] Mingrui Zhao[2] Xianghu Zhao[4] Ning Zhou[10]



https://arxiv.org/pdf/1810.09037.pdf

Recent Progresses

- New beam parameters
- Accelerator technologies
  - SRF
  - Klystron
- High Temperature Super Conductor
- Link to the industrial
- Civil & Site Study

- *Many slides are taken directly from the Prof. Foster and Prof. Gao's summary talks at the CEPC Oxford Workshop*

Beam parameters: higher Luminosity

	Higgs	*W*	*Z (3T)*	*Z (2T)*
Number of IPs	2			
Beam energy (GeV)	**120**	**80**	**45.5**	
Circumference (km)	100			
Synchrotron radiation loss/turn (GeV)	1.73	0.34	0.036	
Crossing angle at IP (mrad)	16.5×2			
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Beam current (mA)	17.4	87.9	461.0	
Synchrotron radiation power /beam (MW)	**30**	**30**	**16.5**	

CDR Parameters:

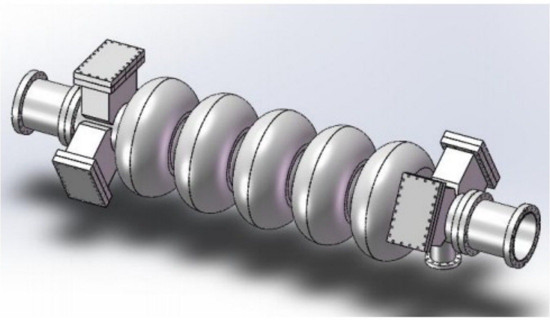
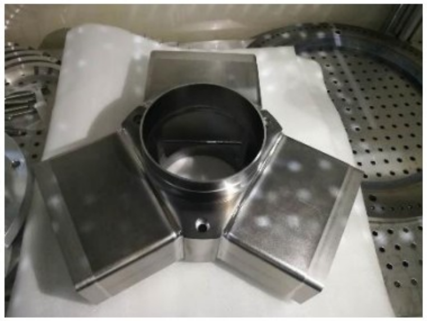
Lifetime (hour)	**0.67**	**1.4**	**4.0**	**2.1**
F (hour glass)	0.89	0.94	0.99	
Luminosity/IP *L* ($10^{34}cm^{-2}s^{-1}$)	**2.93**	**10.1**	**16.6**	**32.1**

HL-Higgs operation Parameters:

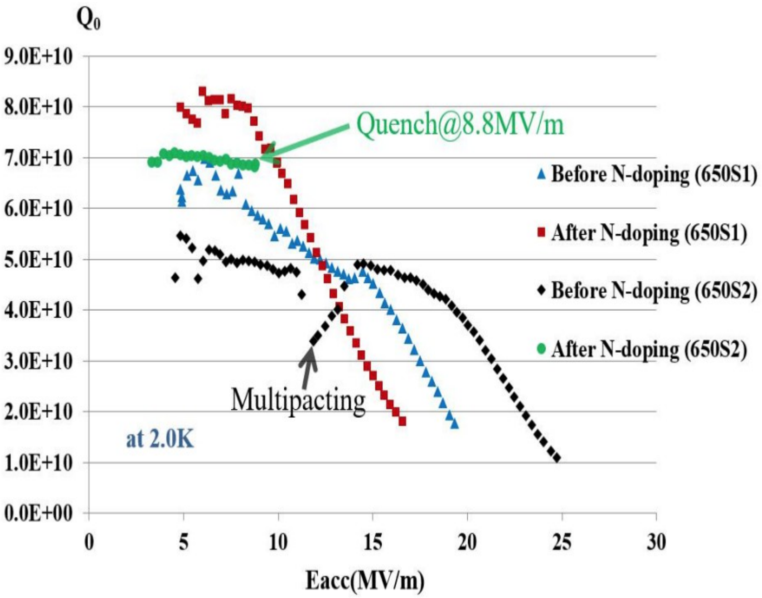
Lifetime (hour)	**0.22**	**1.2**	**3.2**	**2.0**
F (hour glass)	0.85	0.92	0.98	
Luminosity/IP *L* ($10^{34}cm^{-2}s^{-1}$)	**5.2**	**14.5**	**23.6**	**37.7**

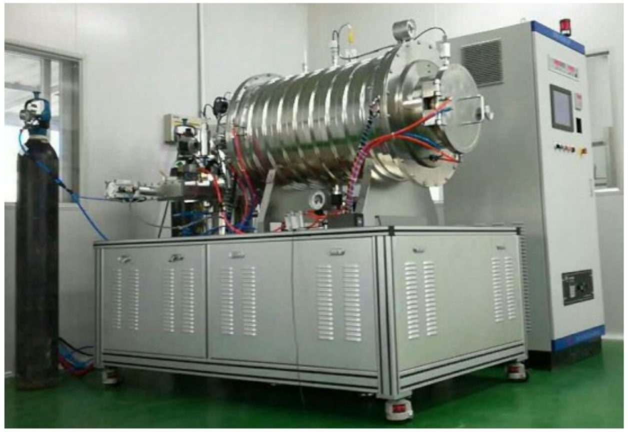
SRF prototyping & tests

650 MHz 2-cell cavity

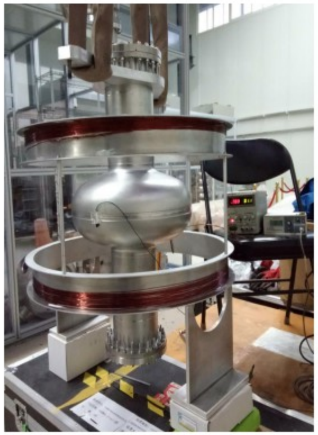




650 MHz 5-cell cavity with waveguide HOM coupler



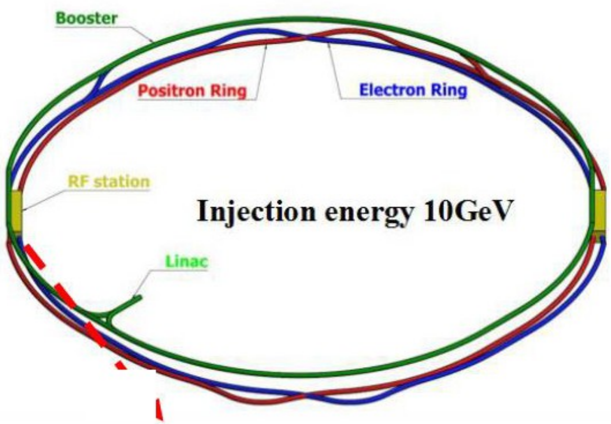


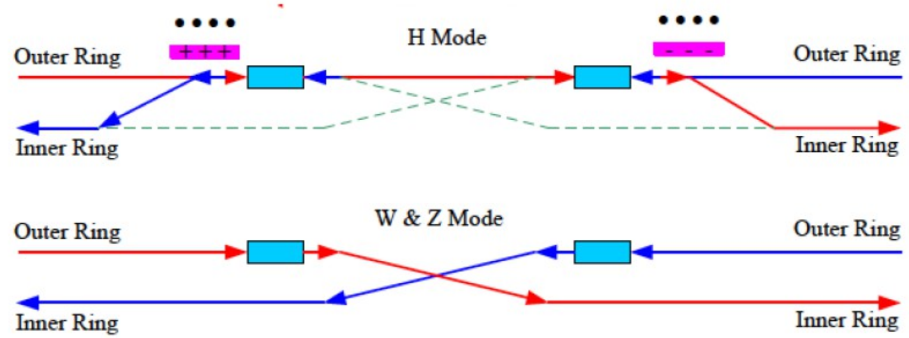
New furnaces for
N-doping and infusion study

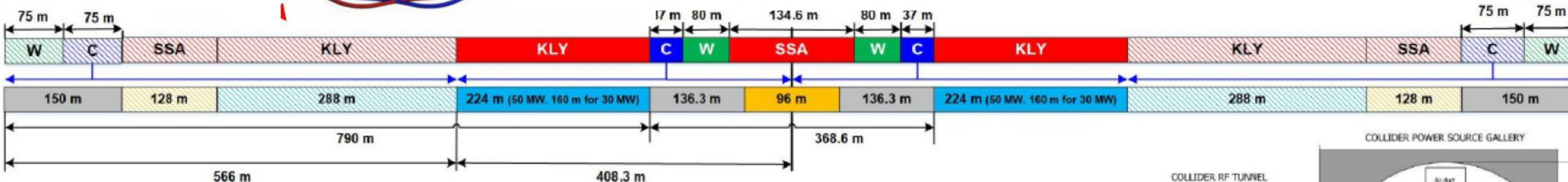


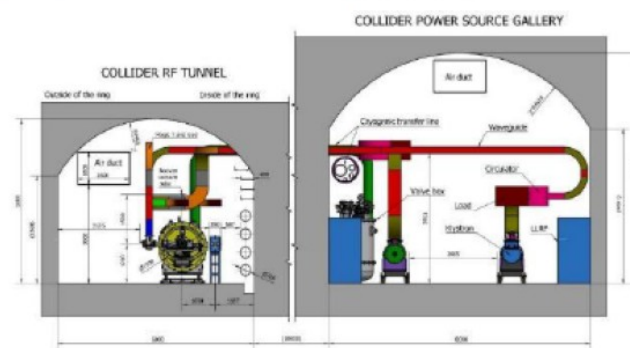
Helmholtz coil & flux gate
for high Q research

CEPC SCRF Cavities





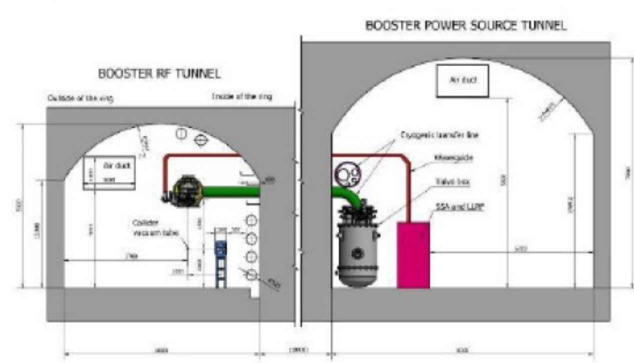


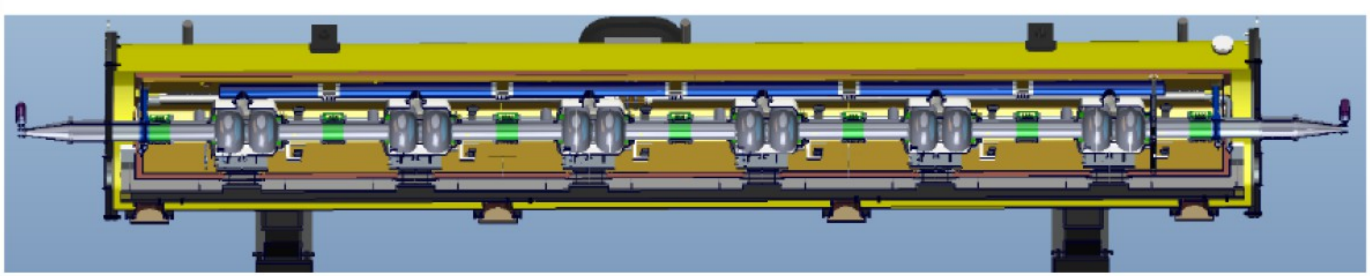


30 MW Higgs:

Collider: 240 650 MHz 2-cell cavities in 40 cryomodules (6 cav./ module).

Booster: 96 1.3 GHz 9-cell cavities in 12 cryomodules (8 cav. / module).





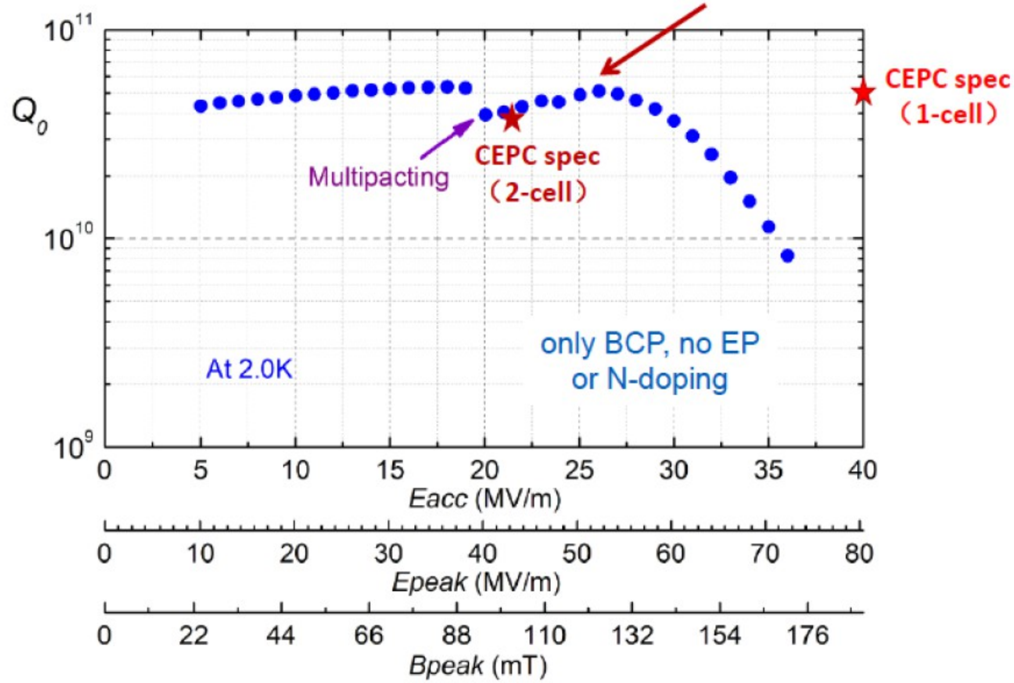
For higher Z lumi, look at 1-cell cavity design.

CEPC SCRF Cavities

650 MHz 1-cell cavity

Accelerating gradient (Eacc) reach 36.0 MV/m, **Q = 5.1E10 @ Eacc = 26 MV/m。**

Next, increase the Q and Eacc through N-doping, EP, etc. Target: **5E10@42MV/m** for vertical test.

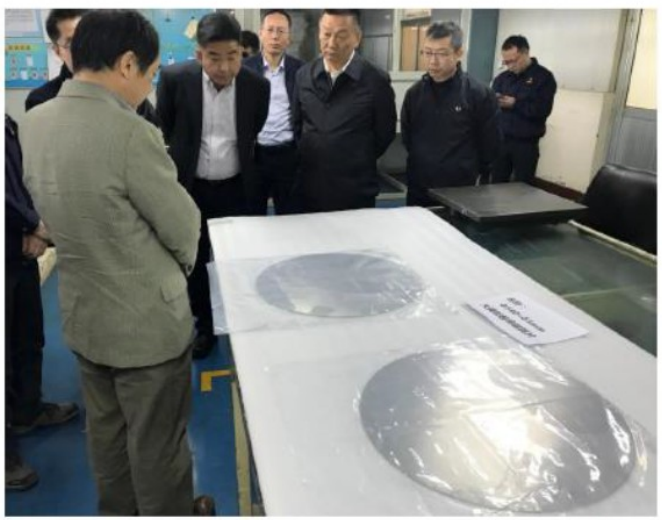


650 MHz 1-cell cavity

CEPC SCRF Cavities

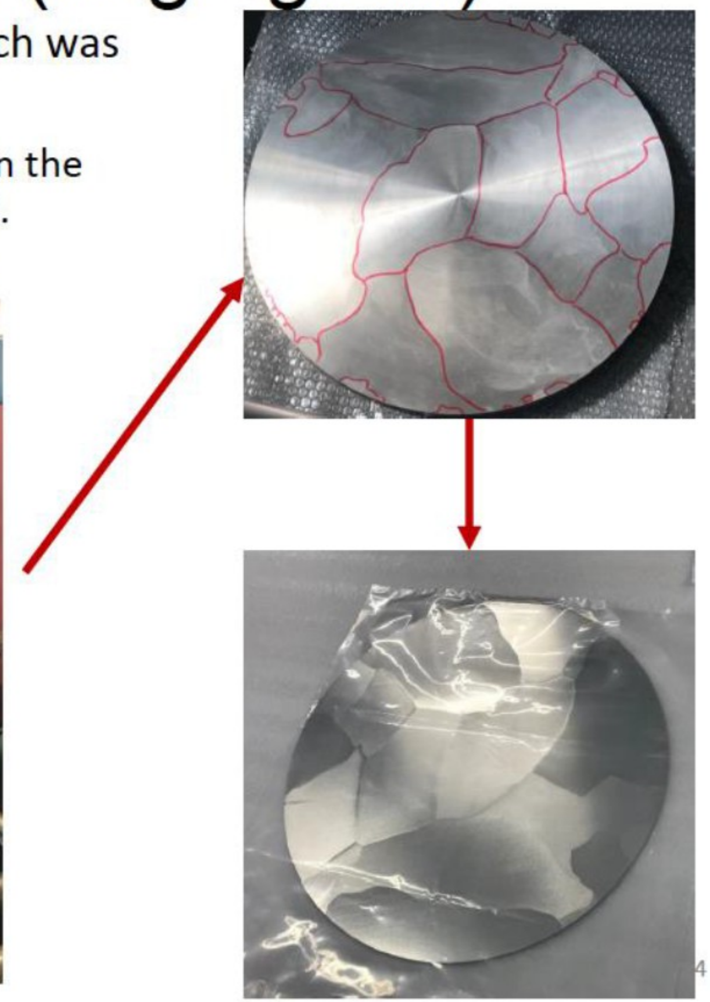
650 MHz 1-cell cavity (large grain)

- Then, OTIC made a new Nb ingot (Φ480mm) for us, which was processed to qualified Nb sheet.
- Four cavities are under fabrication now, which will be tested in the middle 2019. Target of Vertical test: **5E10 @ 42MV/m** at 2.0 K.



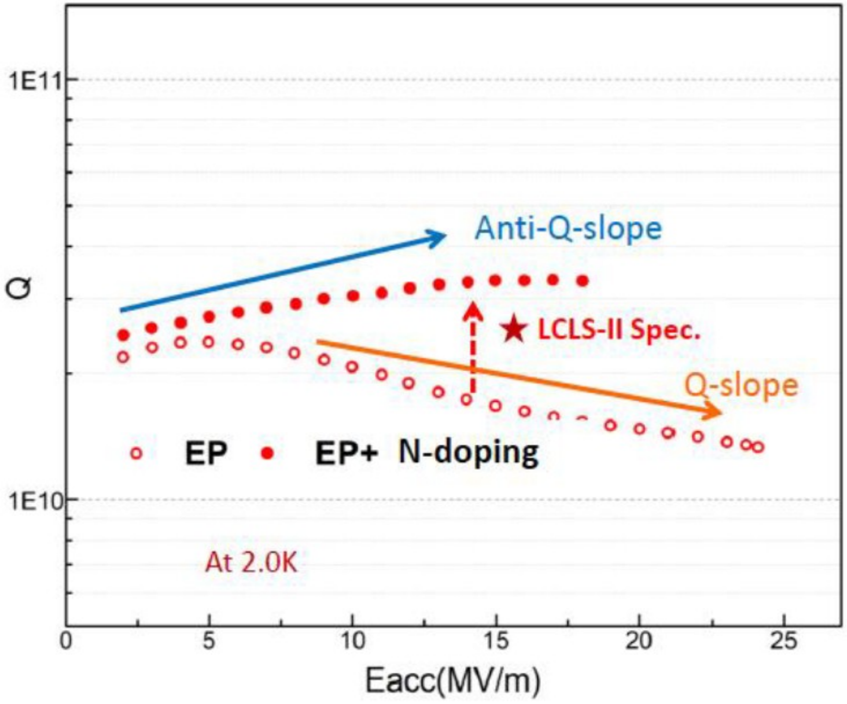
Large grain Nb sheets made by OTIC

Nb ingot (Φ480mm)



N-doping of 1.3 GHz cavity

- After N-doping, 1.3 GHz 1-cell cavity reached 3.3E10 @ 18MV/m, twice of baseline Q, which exceeded LCLS-II Spec (2.7E10 @ 16MV/m) domestically for the first time. This result is also very exciting for Shanghai hard X-FEL (SHINE), which have a 8-GeV SRF LINAC and adopted N-doping as baseline.
- This work is collaborated with KEK colleagues.



CEPC SCRF Cavities

PAPS-SRF infrastructure

- SRF facility construction
  - Civil construction will be finished by end of April, 2019
  - Clean-room and cryogenic system will be ready by the end of 2019
  - Some components are ready for shipment, e.g. furnace, cryomodule for horizontal test, Nb-Cu sputtering system, etc.

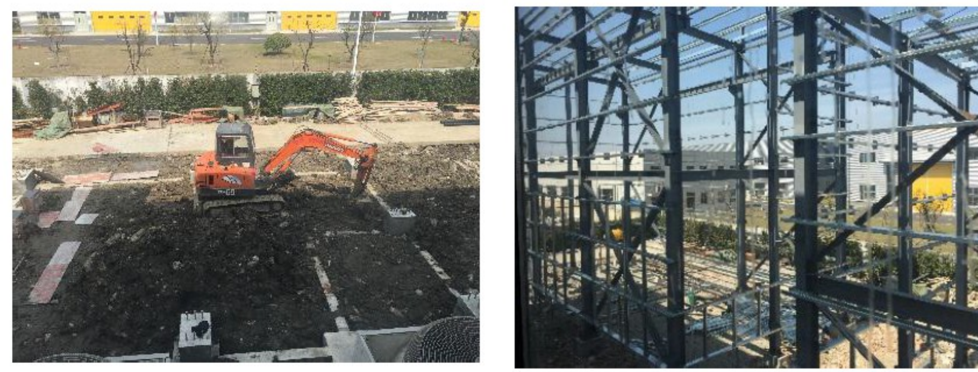
1st 650MHz Klystron Manufacturer and Infrastructure Preparation Progress

Z.S. Zhou

Modulator anode components

Cavities components

Klystron output window



Assembly plant construction

Large size baking furnace commissioning

Klystron R&D

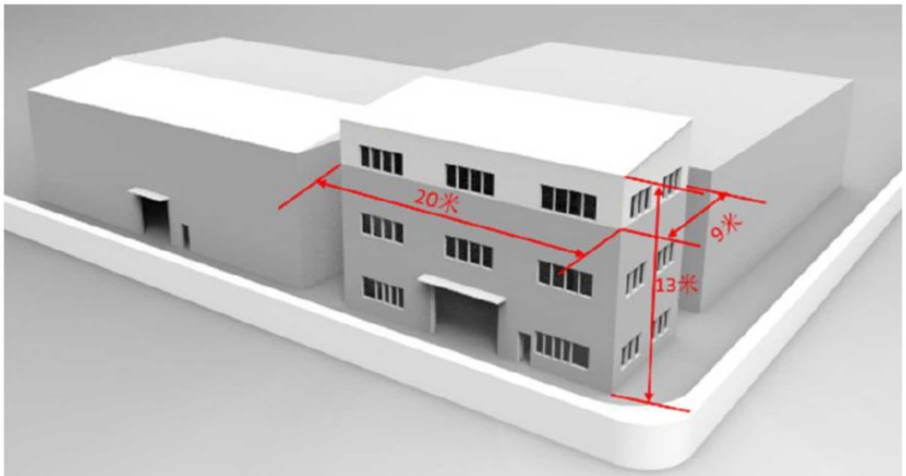
650MHz/800kW meets CEPC project demands

80% efficiency

◆1^{st} prototype tube

Mechanical design and manufacture

Plant and infrastructure preparation



Dimension of new building

Dec. 29, 2018

Jan. 10, 2019

Jan. 28, 2019

Mar. 3, 2019

Mar. 27, 2019

Apr. 12, 2019

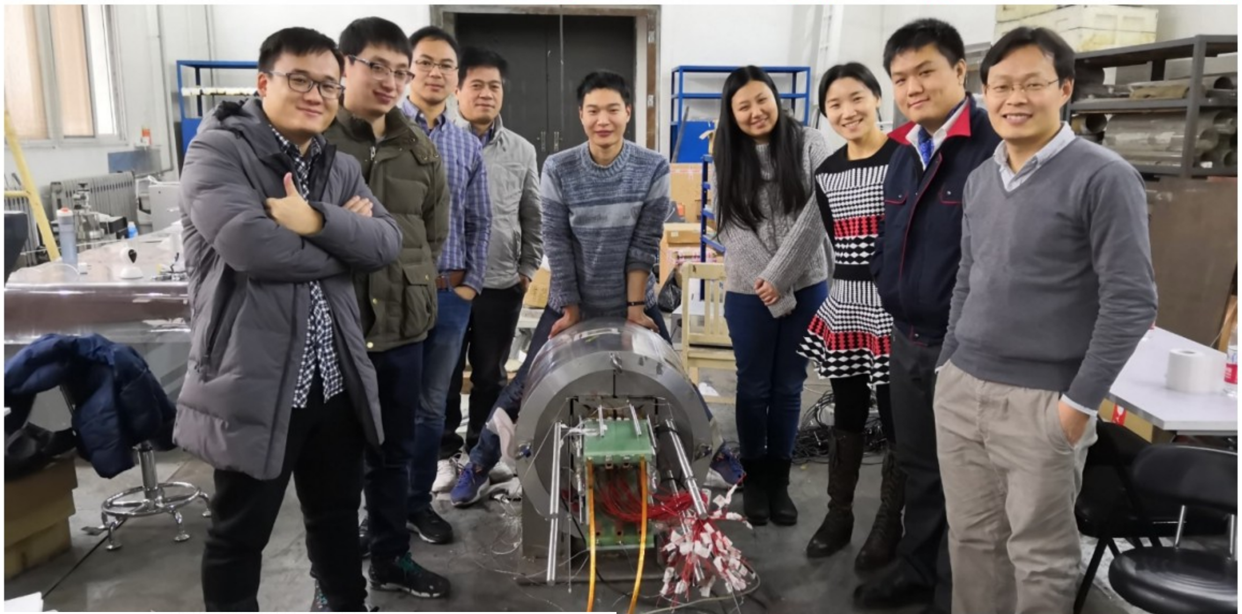
◆**High efficiency design**

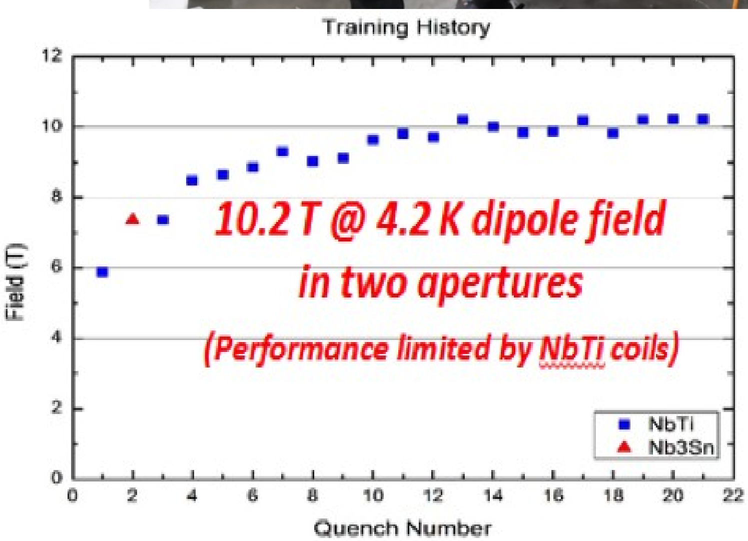
2^{nd} prototype optimization Multi-beam klystron consideration

HTC Superconducting Cables

- Huge impact If magnet can be used at ~ 4.5K - 20 K
- Fe-based HTC cable
  - Metal, easy to process; Isotropic; Cheap in principle
- Background in CAS
  - World highest Tc Fe-based materials
  - World first ~ 115 m Fe-based SC cables: 12000 A/cm^2 @ 10 T
- A collaboration on “HTC SC materials” : Institute of Physics, USTC, Institute of electric engineering, IHEP, 3 SC cable companies in China
  - Iron based HTC cables
  - ReBCO & Bi-2212
  - Goal: ~ 3-5 $ /kA·m
    - Current density: × 10
    - Cost/m: ÷10

Dipole Prototype: B = 10.2T @ 4.2K

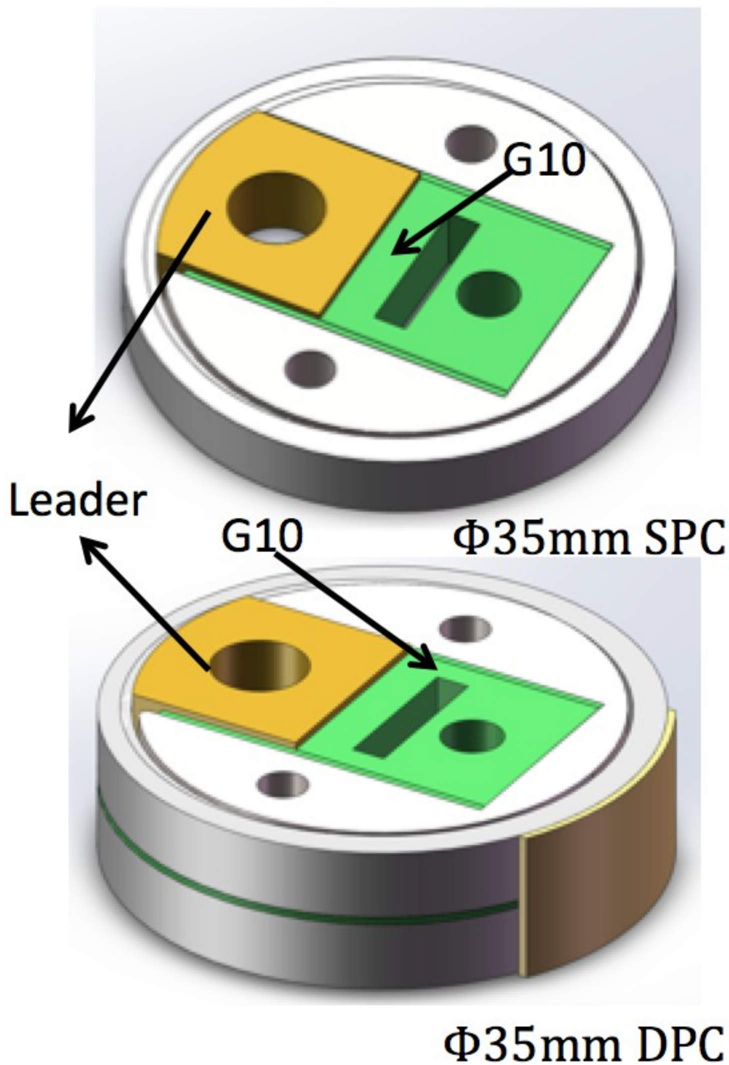


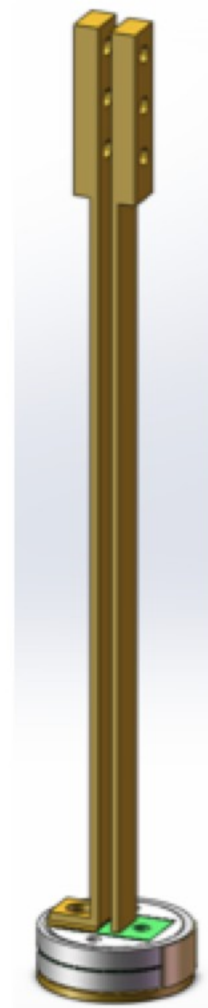


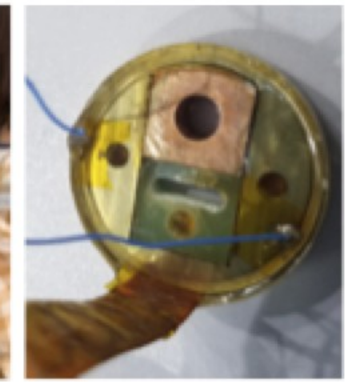
R&D of High Field Dipole Magnets

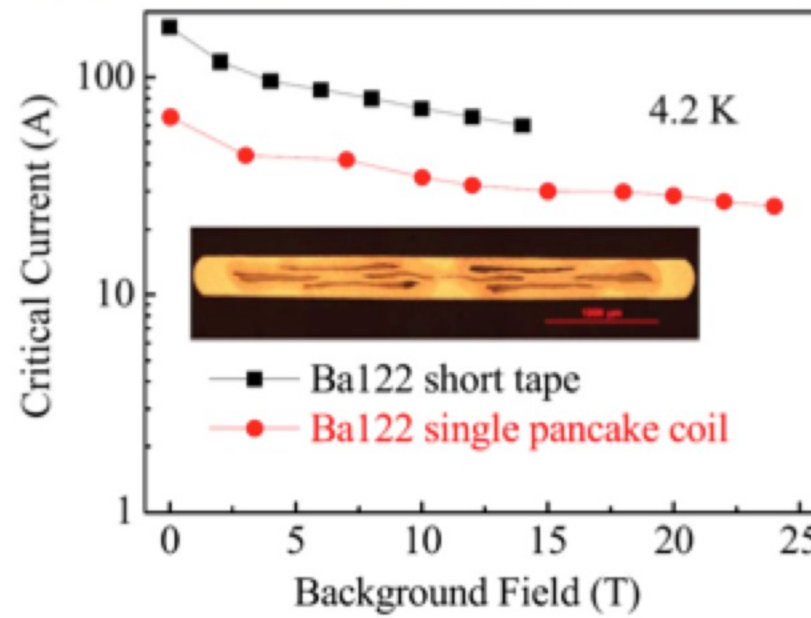
IBS solenoid for testing at 24T

Single and double pancake IBS coils









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Collaboration with industry

The CEPC Industrial Promotion Consortium (CICP) is established in Nov 2017. More than 50 companies joined CICP, with expertise on superconductor, superconducting cavities, cryogenics, vacuum, klystron, electronics, power supply, civil engineering, precise machinery, etc. The CIPC serves as a communication forum for the industrial and the HEP community.

Civil Engineering & Site Selection

Factors affecting site selection:

1、Social factors:

National planning, Regional economic conditions, Cultural environment, Immigration, Environmental protection.

2、Natural conditions and engineering factors:

Climate, Traffic, Topographical geology, Engineering layout, Construction Conditions, Engineering investment.

3、Operating factor:

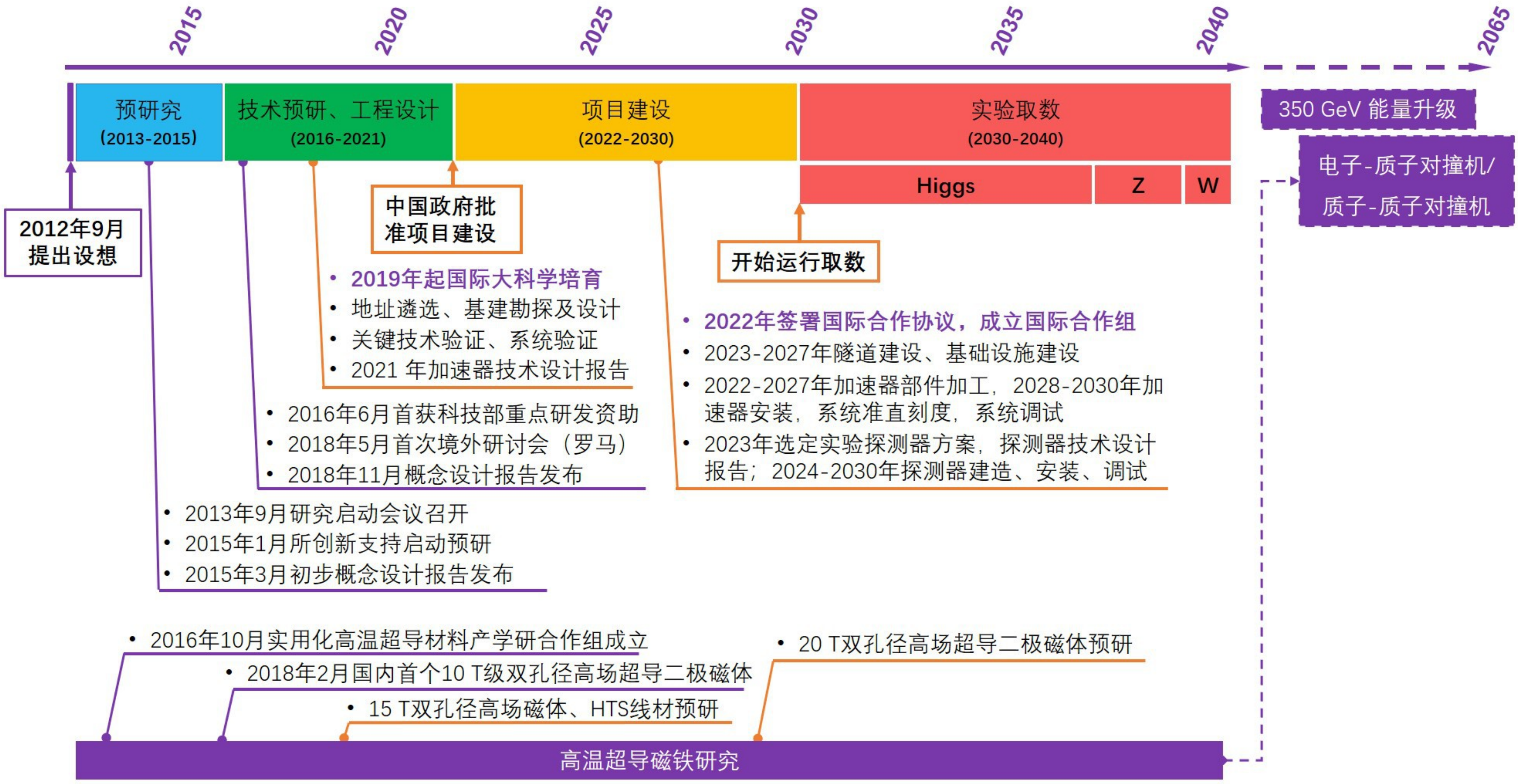
Water supply, power supply, operating costs

In China, there are many sites that meet the construction conditions.

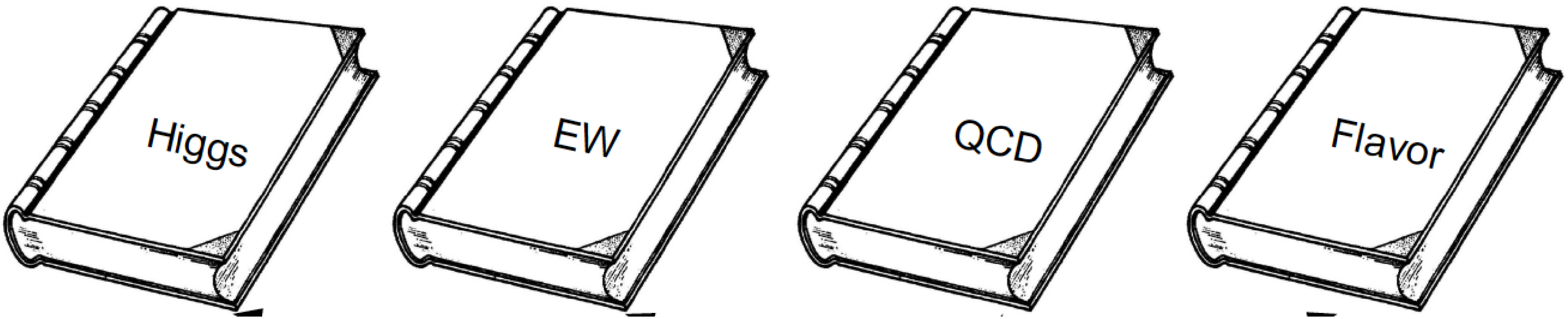
Physics potential study

- Critical in the TDR phase study: To quantify the CEPC physics potential, and its synergy with other facilities
- CEPC
  - A Higgs factory
    - Statistic dominant
    - CDR: Explored by full simulation studies at the CEPC baseline
  - A great probe for the flavor, QCD, EW physics, etc
    - Many are systematic dominant, especially for the EW measurements
    - CDR: Many guess works & need more detailed studies
- The electron positron collider physics potential study is of general interests of the HEP community: need to communicate & collaborate with experts from other facilities, to converge to the consensus.

环形正负电子对撞机（CEPC）项目路线图



Objectives of this workshop

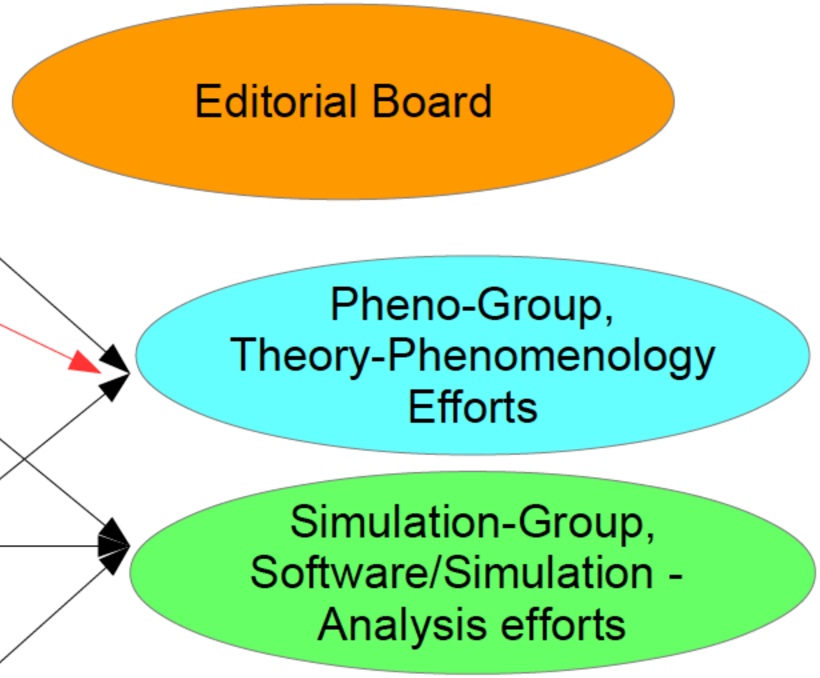


- To promote the physics study at TDR & to converge to the Physics White Papers by the end of 2020
- Physics white papers:
  - Physics handbooks for new comers: PostDoc/Student
  - Official references for the physics potential
  - Guideline for future detector design/optimization

A White paper: Task sharing

- General description
  - Core physics knowledges (from the SM Lagrangian)
  - The physics landscape
- A few physics benchmarks
  - Simple
  - Clear physics meaning
  - Clear requirement on the detector performance
- Optional: Guideline for core physics measurements analysis
- Interpretation and comparison
- Key message to the detector design (executive)?

Ideally...
Each white paper should form it's own working group



Pheno:
Provide valid generator samples for Physics benchmark

Workshop program

	7.1	7.2	7.3	7.4	7.5
Morning	Opening & Briefing	QCD	Higgs	Flavor	Discussion
Afternoon	Higgs	Flavor	QCD	EW	EW
	Reception		Banquet		

- Looking forward to fruitful discussion

Summary

- Electron-positron Higgs factories is critical for future HEP exploration
- CEPC, a productive and clean Higgs/W/Z factory,
  - Boost the Higgs/EW precision by ~ 10 times w.r.t HL-LHC/current boundary
  - Huge potential on QCD, Flavor, etc
  - Surprises: seeking for direct evidence of NP & deviations
- CDR released
  - Accelerator baseline secures high productivity for Higgs, Z and W bosons.
  - Detector baseline fulfills the requirements: clear physics objects + Higgs signal
- Key technology – civil development:
  - Towards the TDR & significant progresses & link to industrial
- The CEPC Physics potential study is critical for the TDR studies
  - To build up the solid knowledge on the potential, to converge to the conscious of our community & to promote the project
  - Objective: to deliver the physics white papers in a relatively short timeline

Back up

Feedbacks from the CDR review...

- Physics potential: Very solid performance study & Higgs Simulation
  - Better quantify physics reach at EW, Flavor and QCD programs
- Detector design: PFA baseline fulfills the requirements
  - Better quantify the requirement: Pid, MET, c-tagging, etc
  - Tensions on the TPC, Muon-Yoke...
  - Better balance between cost and performance
  - Innovative designs, integration (cooling, DAQ, mechanic)...
- Software: Decent PFA and tracking (Lepton, Tau, BMR & MET)
  - High-level objects need more study: Jet clustering, Flavor Tagging, ...
  - Long term: Framework, Parallel computing, ...

White papers

Objectives

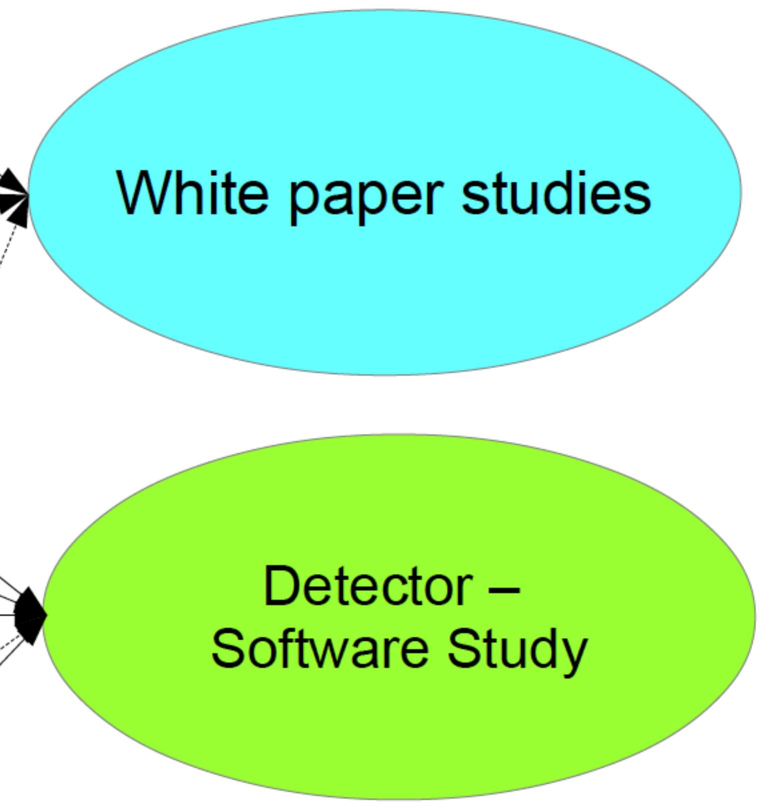
- Address the CDR feedbacks...
- Serve as:
  - Physics hand books for new students/PostDocs
  - Official references for the physics reach
  - Guideline for the detector design
  - *Analogy to LEP Yellow book & LHC Higgs Xsec reports...*
- **Be delivered by Sep. 2020**

Content

- General description
  - Core physics knowledges
  - The physics landscape
- A few physics benchmarks
  - Simple
  - Clear physics meaning
  - Clear requirement on the detector performance
- Optional: Guideline for core analyses
- Interpretation and comparison
- Executive summary to the detector design

Post CDR Study

- Physics potential
  - Better quantify physics reach at EW, Flavor and QCD programs
- Detector design
  - Better quantify the requirement: Pid, MET, c-tagging, etc
  - Tensions on the TPC, Muon-Yoke...
  - Better balance between cost and performance
  - Innovative designs, integration (cooling, DAQ, mechanic)...
- Software
  - High-level objects need more study: Jet clustering, Flavor Tagging, ...
  - Long term: Framework, Parallel computing, ...



CEPC @ Granada

- CEPC is fairly & friendly described in the working group report
- Higgs part is consistent with other facilities.

Table 3. Expected relative precision (%) of the κ parameters in the kappa-0 scenario described in Section 2 for future accelerators. Colliders are considered independently, not in combination with the HL-LHC. No BSM width is allowed in the fit: both BR_{unt} and BR_{inv} are set to 0, and therefore κ_V is not constrained. Cases in which a particular parameter has been fixed to the SM value due to lack of sensitivity are shown with a dash (-). A star ($\star$) indicates the cases in which a parameter has been left free in the fit due to lack of input in the reference documentation. The integrated luminosity and running conditions considered for each collider in this comparison are described in Table 1. Both the initial stage and the full program of the colliders is considered, with "ILC_{500}" corresponding to ILC_{250}+ILC_{350}+ILC_{500}, "$CLIC_{3000}$" to $CLIC_{380}$+$CLIC_{1500}$+$CLIC_{3000}$, and "FCC-ee_{365}" to FCC-ee_{240}+FCC-ee_{365}. FCC-ee/eh/hh corresponds to the combined performance of FCC-ee_{240}+FCC-ee_{365}, FCC-eh and FCC-hh.

kappa-0	HL-LHC	LHeC	HE-LHC	ILC_{250}	ILC_{500}	$CLIC_{380}$	$CLIC_{1500}$	$CLIC_{3000}$	CEPC	FCC-ee_{240}	FCC-ee_{365}	FCC-ee/eh/hh
κ_W (%)	1.2	0.75	0.66	1.8	0.29	0.86	0.17	0.11	.3	1.3	0.43	.15
κ_Z (%)	1.0	1.2	0.6	0.29	0.23	0.5	0.26	0.23	0.13	0.2	0.17	.12
κ_g (%)	2.2	3.6	1.4	2.3	0.97	2.5	1.3	0.9	.5	1.7	1.0	.52
κ_γ (%)	1.7	7.5	0.98	6.7	3.4	98$\star$	5.0	2.2	.7	4.7	3.9	.35
$\kappa_{Z\gamma}$ (%)	10	–	4.0	99$\star$	86$\star$	120$\star$	15	6.9	.2	81$\star$	75$\star$	.7
κ_c (%)	–	4.0	–	2.5	1.3	4.3	1.8	1.4	.2	1.8	1.3	.95
κ_t (%)	2.8	–	2.0	–	6.9	–	–	2.6	–	–	–	.0
κ_b (%)	2.7	2.1	1.7	1.8	0.58	1.9	0.48	0.38	.2	1.3	0.67	.45
κ_μ (%)	4.4	–	1.8	15	9.4	320$\star$	13	5.8	.9	10	8.9	.42
κ_τ (%)	1.6	3.3	1.1	1.9	0.7	3.0	1.3	0.89	.3	1.4	0.73	.49

CEPC possible Timeline

- The CDR is delivered Nov. 2018
- Try to get the governments support, most probably as one of the cultivated projects in the establishing framework of "China initiated International Big Science Project". The Green light can come at earliest ~ 2020 - 2022.
- Accelerator:
  - Pursue TDR at full speed, be delivered at ~2023
- Detector & Physics:
  - Now – Green light: enhance the international collaboration & welcome new ideas – proposals
  - Right after the Green light: a call for LoIs for different detector concepts, and a selective procedure will be performed
  - The selected concepts will be required to deliver their sub-system TDRs, by roughly 3 years after the selection

Addendum of https://arxiv.org/pdf/1901.03170.pdf

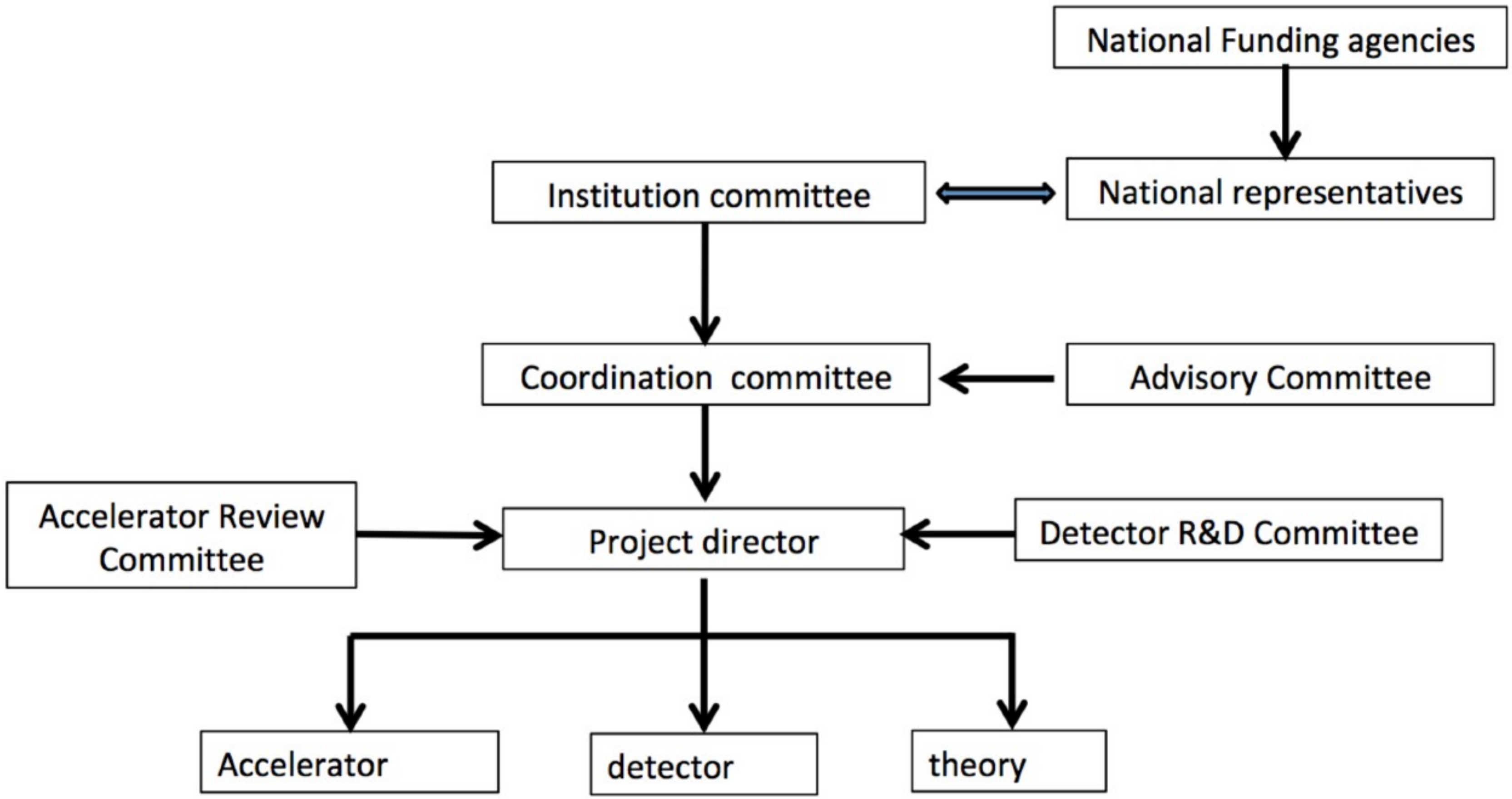


Figure 9, The planned international organization from 2019 till the construction

In this structure, all the building blocks will integrate the international participation. The Institution Committee writes the bylaws and makes major decisions on organizational issues. The national representatives interface with the National Funding Agencies and the corresponding institutions are represented in the Institution Committee. Supported by the Accelerator Review Committee and the Detector R&D Committee, the Project director is responsible for the coordination of studies at each group.