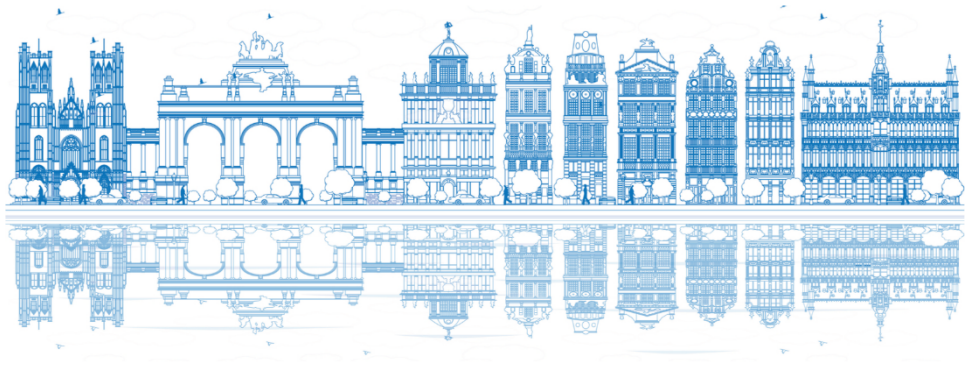
Welcome to FCC-eh

Introductory Remarks on Status and Prospects

Max Klein
with apologies to be absent

University of Liverpool

FCC WEEK 2019
BRUSSELS, BELGIUM
24 - 28 JUNE 2019
Crowne Plaza Brussels
Le Palace



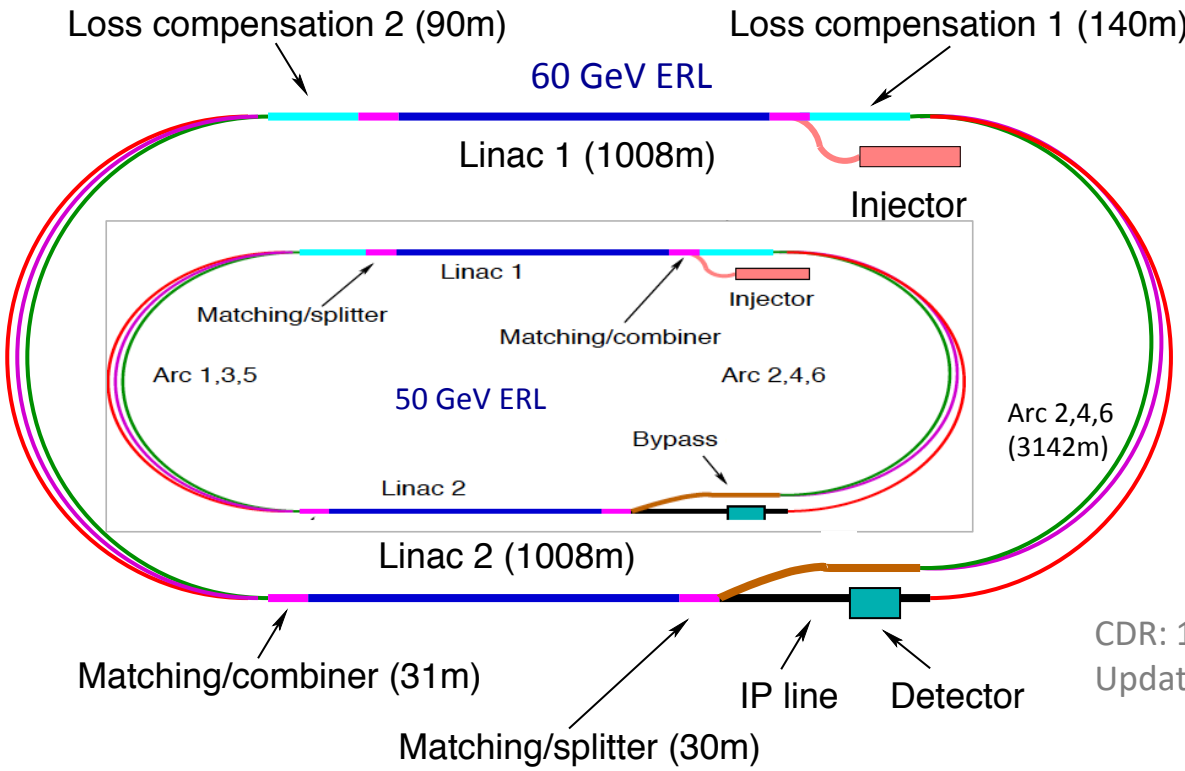
WRITING the FUTURE
http://fccweek2019.web.cern.ch

If you want to discover a great taste, you will have to sample several: J de Hondt, slide 93 opening session

Parallel Session on FCCeh at the 2019 FCC Week at Brussels, Belgium, 27.6.2019

Energy Frontier in Deep Inelastic ep/eA Scattering with LHC & FCC

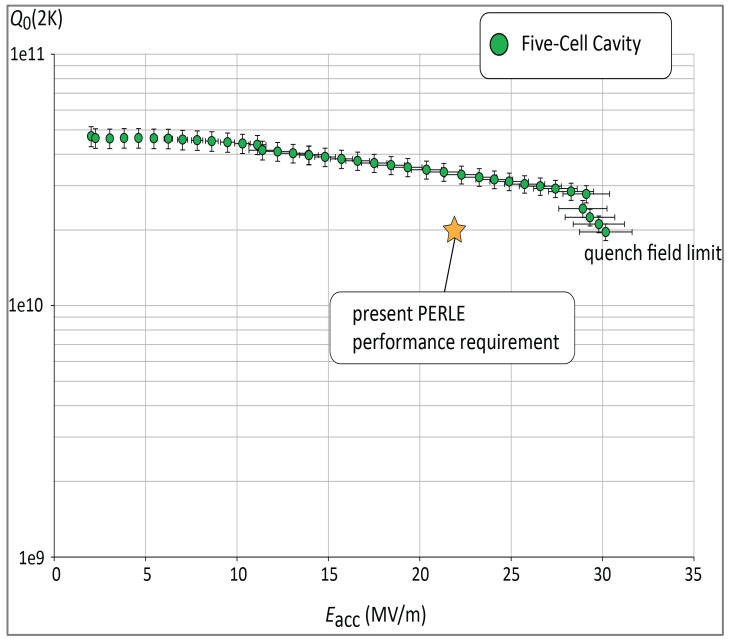
Cleanest high resolution microscope for proton and nuclear matter.
Discovery in QCD and electroweak sector. High precison Higgs in ep+pp



CDR: 1206.2913
Update: 10/2019

50-60 GeV energy: 1.3-1.6 MCHF
802 MHz SCRF: $Q_0 > 10^{10}$
Power: < 100 MW wall-plug
Luminosity $10^{34}cm^{-2}s^{-1}$ → 1 / 2 ab^{-1}
with LHeC / HE-LHeC and FCC-eh

F.Bordry et al: arXiv:1810.13022



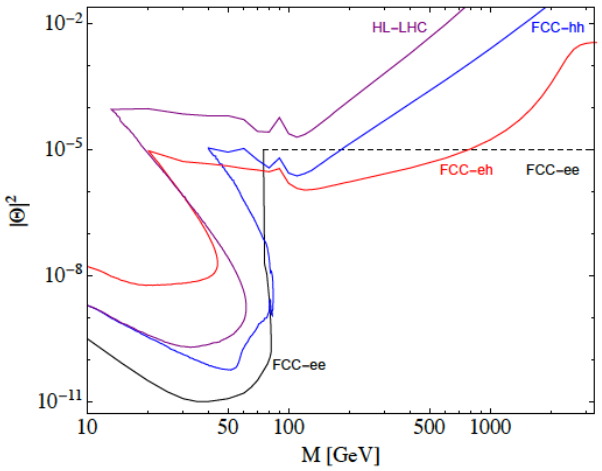
Highest energy application of novel energy recovery principle.
1000 x more luminous than HERA, hugely extended Q^2,x range.
Concurrent ep+pp operation. IP2 at LHC and point L at FCC

First 802 MHz cavity, CERN – Jlab
ERL Development at PERLE@LAL

FCC-eh in the CDR [V1 Physics and V3 hh]

Volume 1 had been the collaborative effort to present **the entity of FCC physics, in ee, pp and ep, including AA and eA**
Volume 3 on FCC hh contains a short summary of **the main characteristics of FCC-eh and the detector concept**

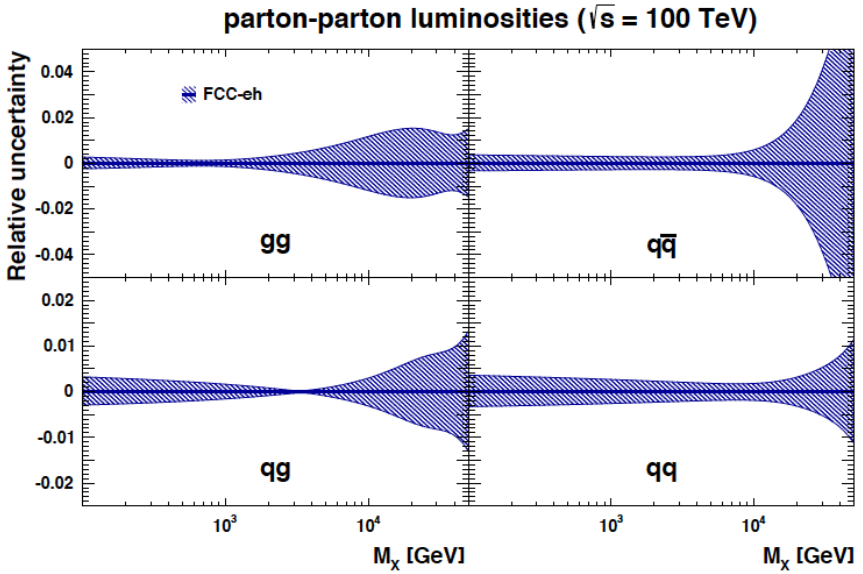
Some striking physics eh prospects are on searches and the high precision measurements on Higgs and proton structure:



Complementary prospects to **discover rh massive neutrinos** in ee, ep and pp
[mixing angle vs mass]

Collider	FCC-ee	FCC-eh
Luminosity (ab^{-1})	+1.5 @ 365 GeV	2
Years	3+4	20
$\delta\Gamma_H/\Gamma_H$ (%)	**1.3**	SM
$\delta g_{HZZ}/g_{HZZ}$ (%)	**0.17**	0.43
$\delta g_{HWW}/g_{HWW}$ (%)	**0.43**	0.26
$\delta g_{Hbb}/g_{Hbb}$ (%)	**0.61**	0.74
$\delta g_{Hcc}/g_{Hcc}$ (%)	**1.21**	1.35
$\delta g_{Hgg}/g_{Hgg}$ (%)	**1.01**	1.17
$\delta g_{H\tau\tau}/g_{H\tau\tau}$ (%)	**0.74**	1.10
$\delta g_{H\mu\mu}/g_{H\mu\mu}$ (%)	**9.0**	n.a.
$\delta g_{H\gamma\gamma}/g_{H\gamma\gamma}$ (%)	**3.9**	2.3
$\delta g_{Htt}/g_{Htt}$ (%)	—	1.7
BR_{EXO} (%)	< **1.0**	n.a.

Prospects for high precision measurements of **Higgs couplings at FCC ee and ep**. Note ee gets the width with Z recoil. ee is mainly ZHZ, while ep is mainly WWH: complementary also to pp

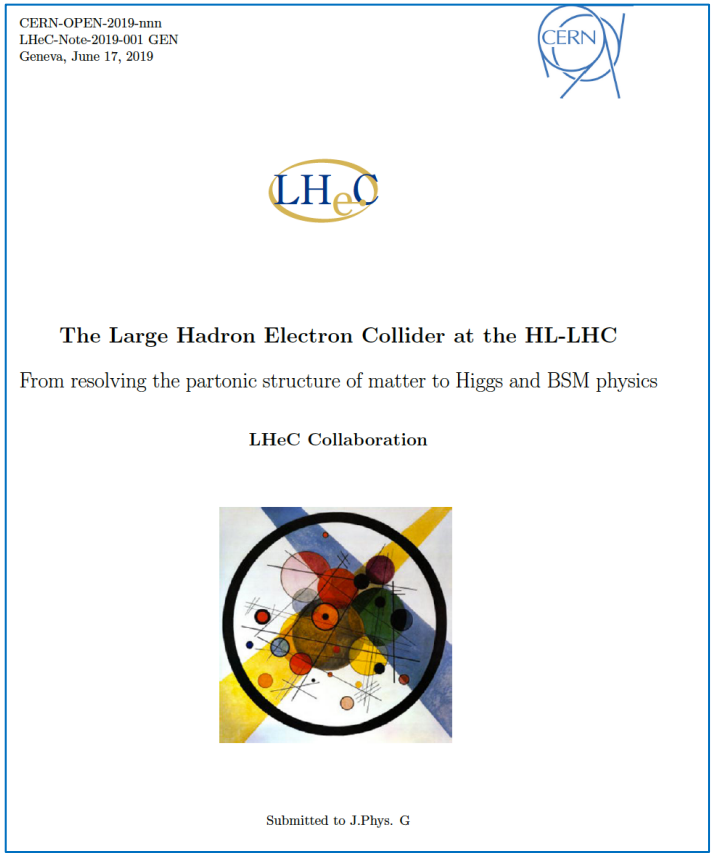


Unique resolution of partonic contents of and dynamics inside the proton, providing precise and independent parton luminosities for interpretation and searches on FCC-hh

Remarks on the Further Development

The FCC-eh development relies on that of the LHeC.

Following the much cited CDR **arXiv:1206.2913** the intention is to deliver a comprehensive report on the LHeC at HL-LHC by the end of 2019. You are **invited to contribute and join the workshop, which will be held at Chavannes near CERN, 24/25.10.**


CERN-OPEN-2019-nnn
LHeC-Note-2019-001 GEN
Geneva, June 17, 2019

CERN

LHeC

The Large Hadron Electron Collider at the HL-LHC

From resolving the partonic structure of matter to Higgs and BSM physics

LHeC Collaboration

Submitted to J.Phys. G

There are a number of important tasks and issues leading beyond this year:

- Physics is evolving with LHC and prospects need to be deeper studied (for example the genuine EFT application of Higgs physics in ep)

- The LHeC in order to be realised has to be accepted and affordable (Oliver Bruening*)

- The ERL technology is advancing (recent success of cBeta) worldwide a one of the indeed few radically new accelerator technologies and ideas!

- PERLE will be the genuine 802 MHz, high current multi-turn demonstrator (AsTeC, BINP, CERN, Liverpool, Jlab, Orsay (LAL+IPN) + (Walid Kaabi *)

- The 3-beam interaction region design is challenging [Q1 prototype] (Kevin Andre and Emilia Cruz*) ...

The future of FCC-eh is linked to that of FCC. If CERN embarks on FCC-ee directly after HL-LHC then FCC-eh is deferred by many decades and basically postponed.

If CERN goes directly to an FCC-hh (then at lower energy) eh should be part of it and not considered an option later as it is an asset for the success of hh. This depends also on whether LHeC will operate before.

*) speakers today