News and Next

10:00	Coffee	
	0 - Introduction	Max
	1 - FCC status	Frank
	5 - A set-up for ERL	Oliver
11:00	6 - 802 MHz cavity development	Erk
	7 - Discussion	
	3 - Conferences	Nestor
	2 - Physics+Detector News	Max (Peter, Stefano)
12:00	8 - Collaborations	Bruce, Paul
	4 - Discussion / AOB	

Max Klein
University of Liverpool and CERN

2.10.2015, CERN

Guido Altarelli (1941-2015)

A set of questions for the Workshop:

From 2008 WS
Divonne les Bains

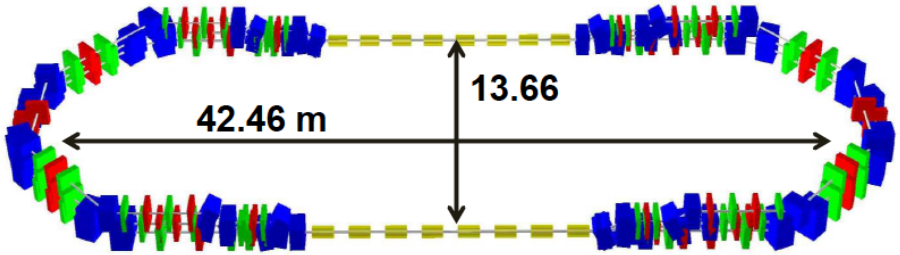
How well can the LHeC do on

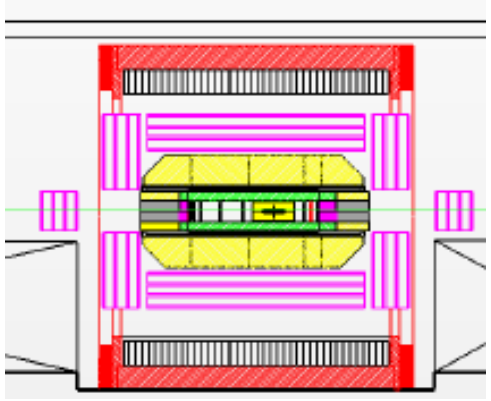
measuring α_s in DIS
sharpening our grasp on pdf's
measuring F_L
studying heavy flavour production, eg $F^{cc}_{2,L}$, $F^{bb}_{2,L}$
clarifying the small-x domain
disentangling resummation effects
approaching the saturation regime
studying inclusive/exclusive diffraction,
deep virtual Compton & non forward pdf
achieving the goals of $e^{\pm}$-ion collisions
studying electroweak processes
complementing the LHC on new physics

It would be a waste not to exploit the 7 TeV beams for eP and eA physics at some stage during the LHC time

6/2015 at IAC: The physics case is made, can we do the LHeC?

Highlights from Chavannes 15





Potential ultimate goal? BDT cut >0.3: Hcc Signal events : 133

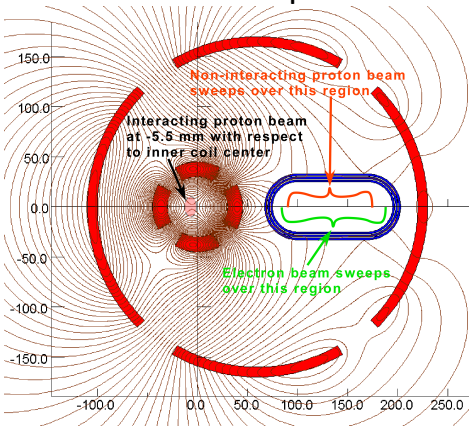
S/√S+B=1.5 → κ(Hcc) = 7% for 1000 fb^{-1}

[assuming backgrounds to 10% (100%) κ(Hbb) = 17% (50%)]

Uta Klein, Higgs to HFL

➔ There is a clear potential to measure Hcc at LHeC

B Parker seet spot - IR

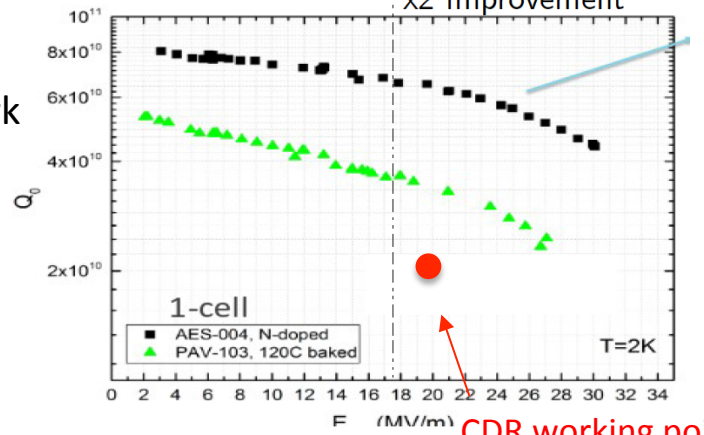


and many more results ..

We reached a phase were progress requires real work and dedicated time for it.

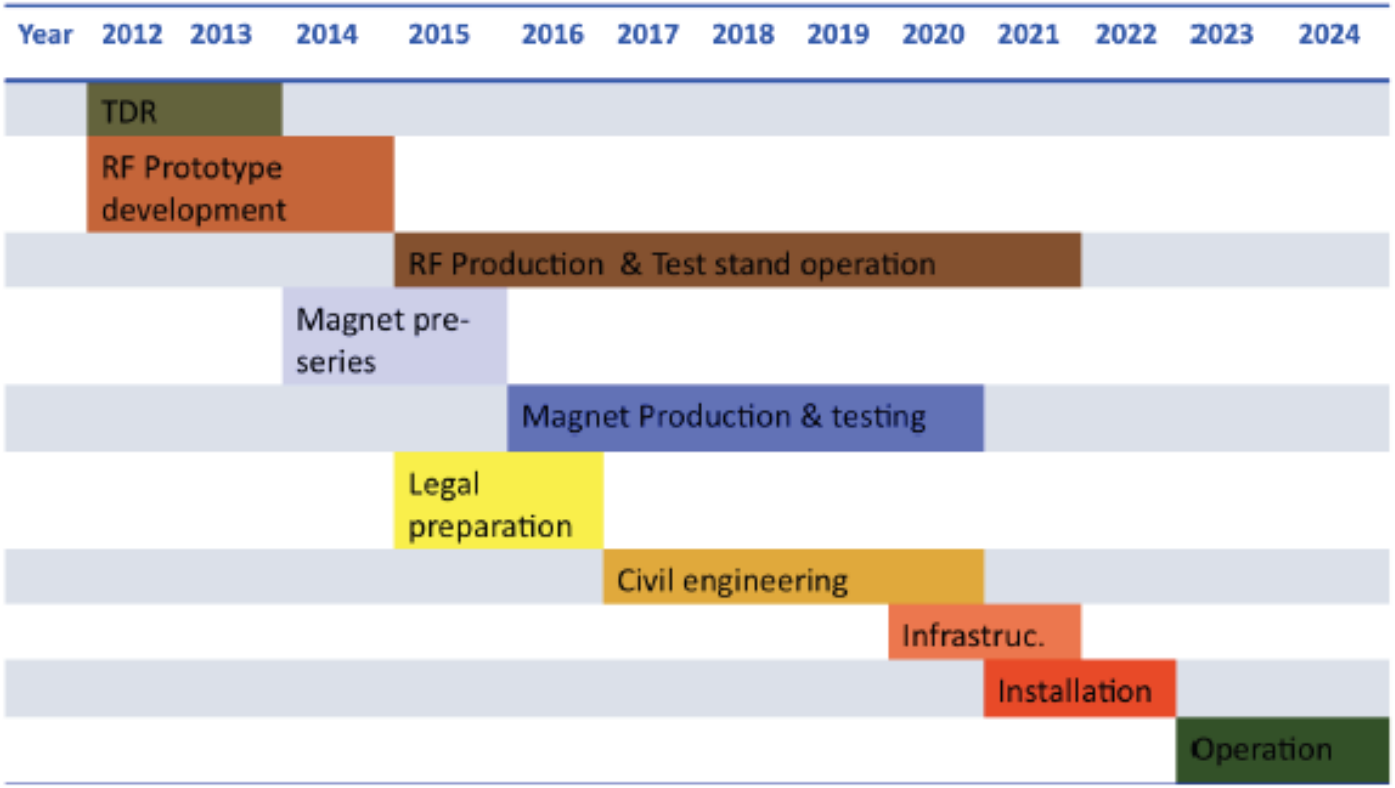
Romenko FCC DC, 650 MHz, N doped, 1 cell

x2 improvement



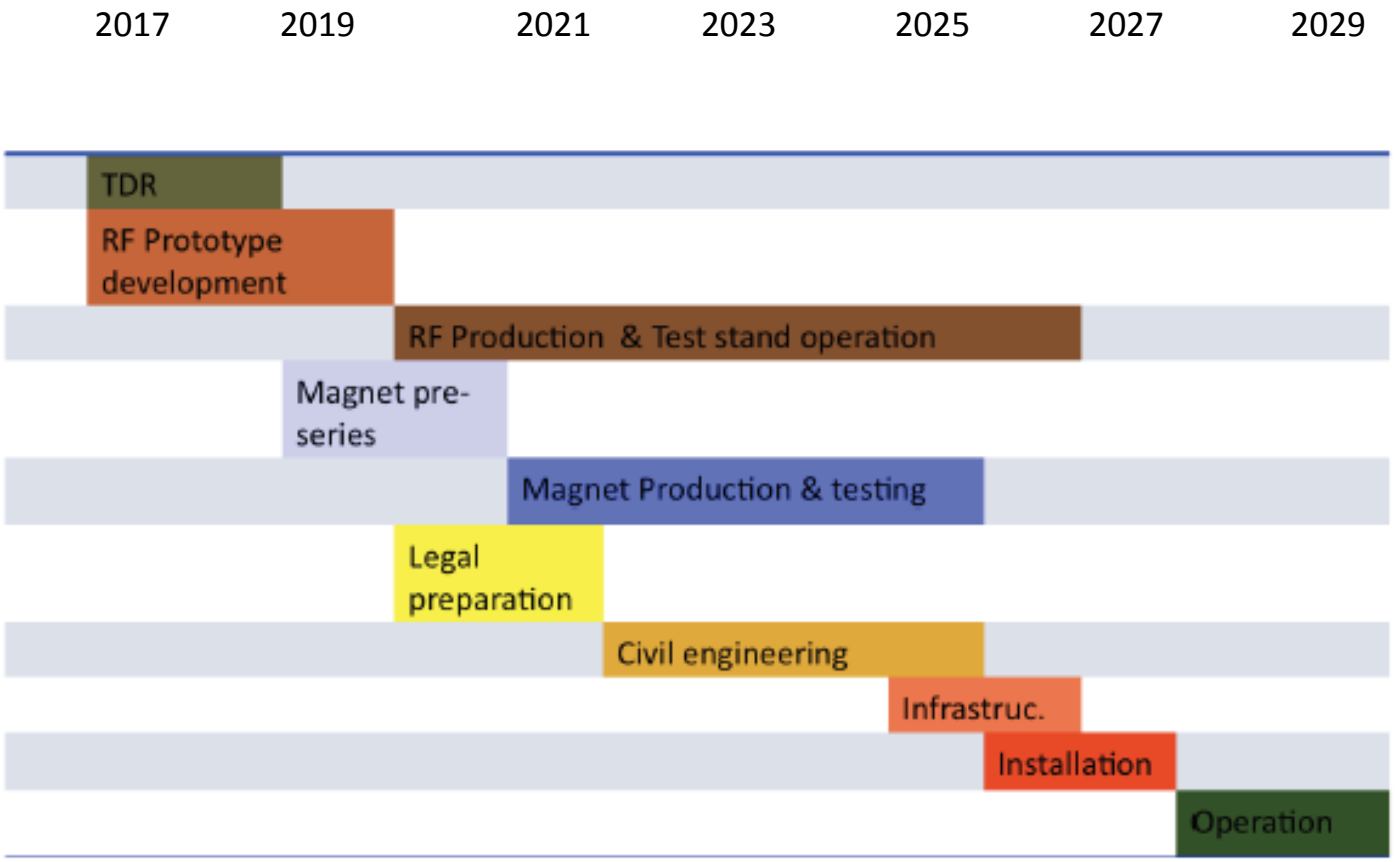
CDR working point

Where are we in time?



The CDR timeline

Where are we in time?



LHC results by 2017/18
EU strategy update by ~2018
CE during shutdown (in LS3 in this picture)
→ The LHeC can still be realised (bridge from HL to HE LHC?)
→ It needs ``to demonstrate the feasibility" (IAC) to reach roadmap 18/19

See talk by Oliver

ERL Set-Ups

	MESA	LTS1	LTS2	PERLE
f/MHz	1300	802	802	802
Current/mA Cryo modules Nr of Cavities	1 1=2*25MeV 2 (8-cell)	10 1=4*18MeV 4 (5-cell)	10 2=2*(4*18) 8	10 4=4*(4*18) 16
passes	2	3	3	3
Energy/MeV Footprint D*L	105 ~15*2 m^2	230 ~20*(2-3) m^2	455 20*4 m^2	905 42*14 m^2

LTS2: test of 2 cryomodules with 4 five-cell cavities in each, for reliable test (?)

Dipoles in Arcs: 4*6 = 24 (80 cm long) 1.45 down to 0.24 T

Quadrupoles : 14*6 = 84

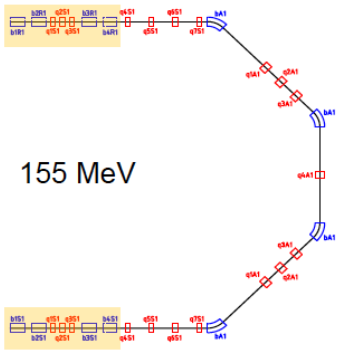
Spreader+Combiner: 12 * 4 dipoles = 48 and 36 quads

→ Total of nearly 200 warm, conventional magnets

Disclaimer (AV): quick downscaling of PERLE –

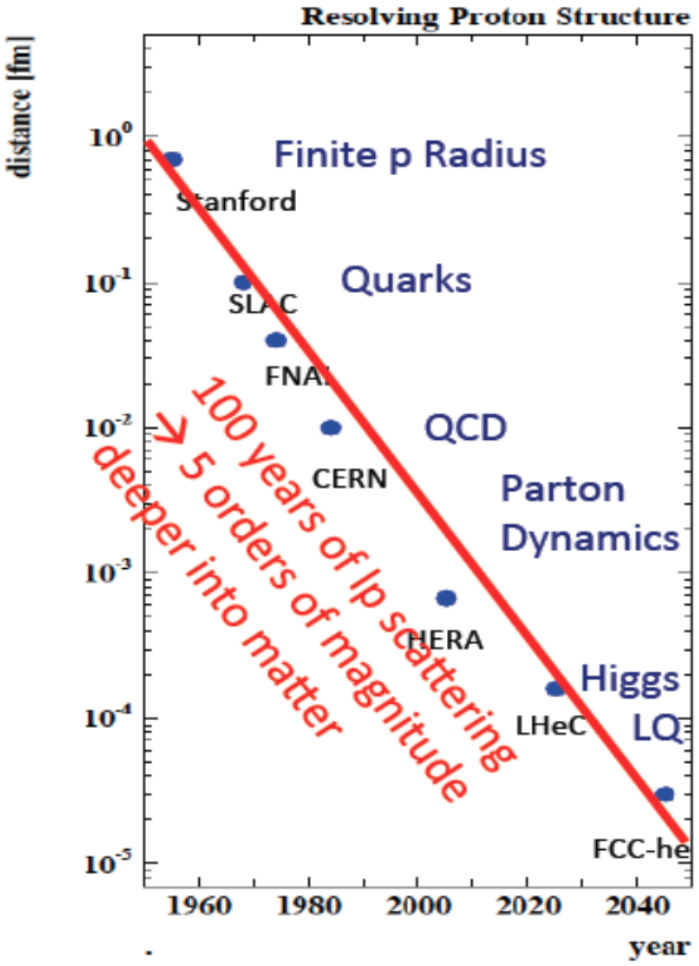
certainly there is room for simplification

(MESA has ~ 100 magnets)



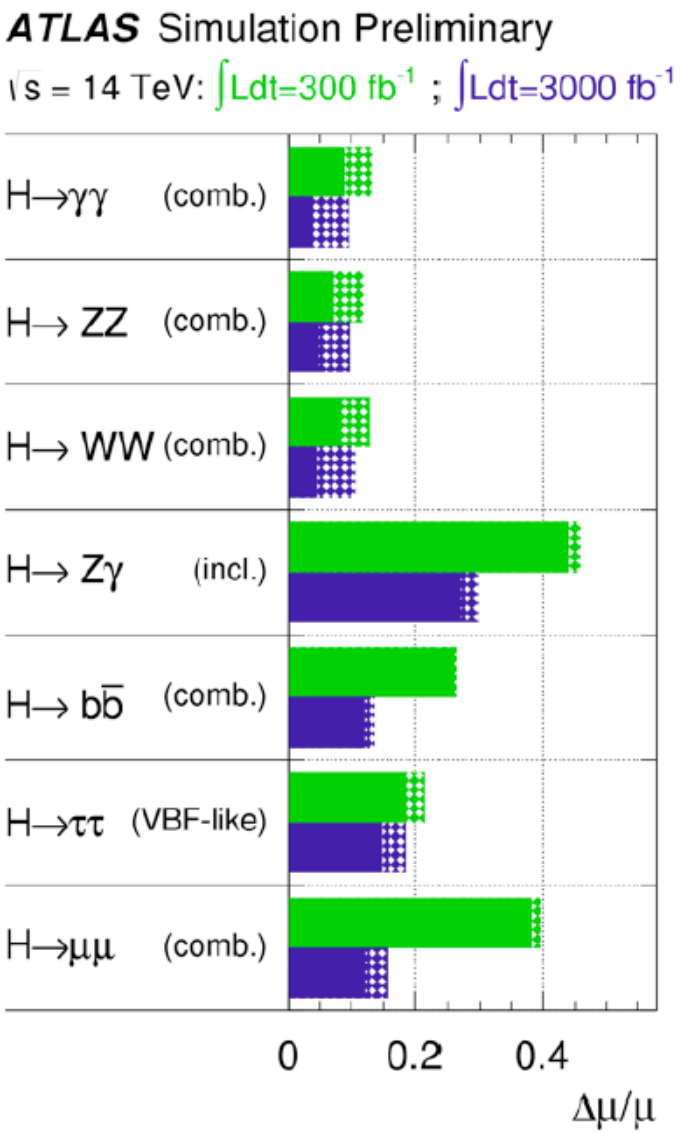
LTS = Linac Test Set-up

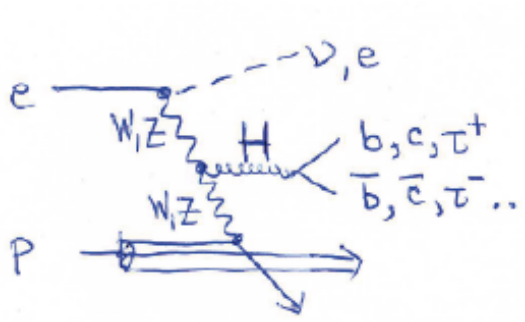
The Value of the LHeC



Mankind's path in resolving the substructure of matter may be continued with the LHeC

The Value of the LHeC

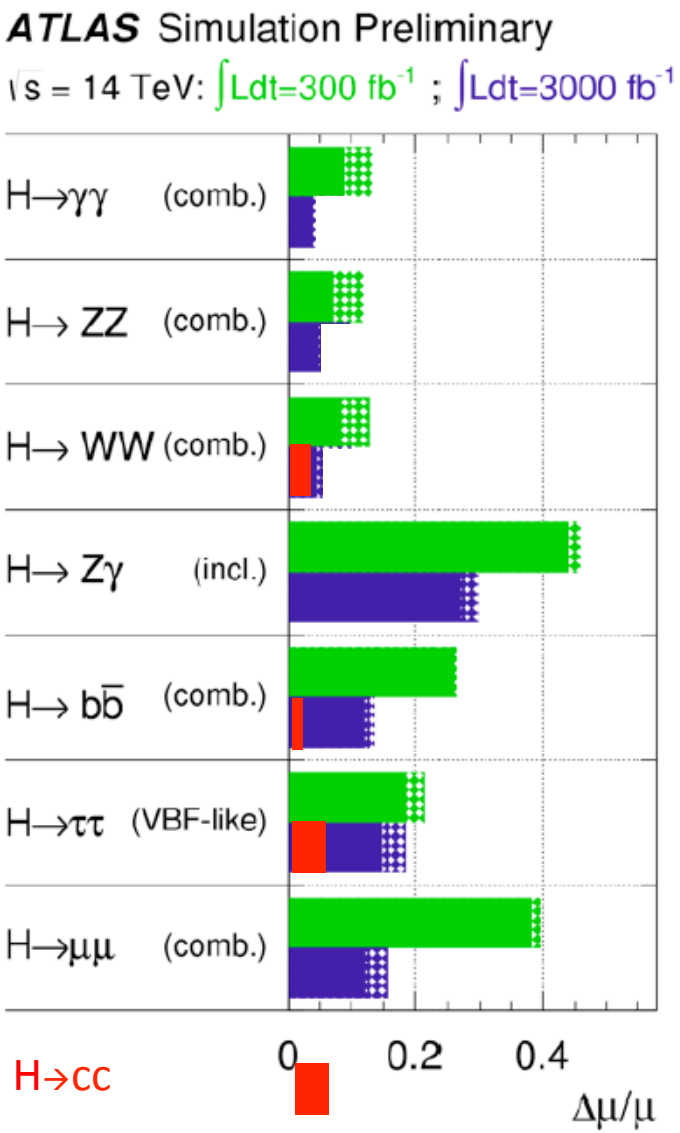


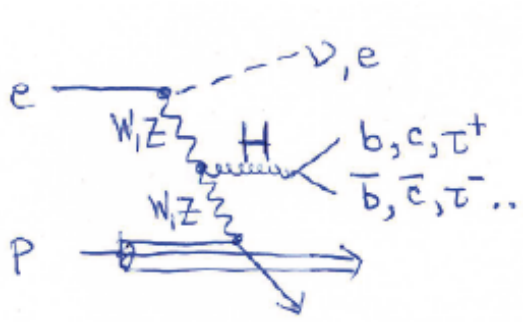


Higgs in e^-p		CC - LHeC
Polarisation		-0.8
Luminosity [ab^{-1}]		1
Cross Section [fb]		196
Decay	BrFraction	N^H_{CC}
$H \to b\bar{b}$	0.577	113 100
$H \to c\bar{c}$	0.029	5 700
$H \to \tau^+\tau^-$	0.063	12 350
$H \to \mu\mu$	0.00022	50
$H \to 4l$	0.00013	30
$H \to 2l2\nu$	0.0106	2 080
$H \to gg$	0.086	16 850
$H \to WW$	0.215	42 100
$H \to ZZ$	0.0264	5 200
$H \to \gamma\gamma$	0.00228	450
$H \to Z\gamma$	0.00154	300

The Value of the LHeC

bb and cc so far only worked on !





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LHC → sustained facility for precise Higgs and BSM physics

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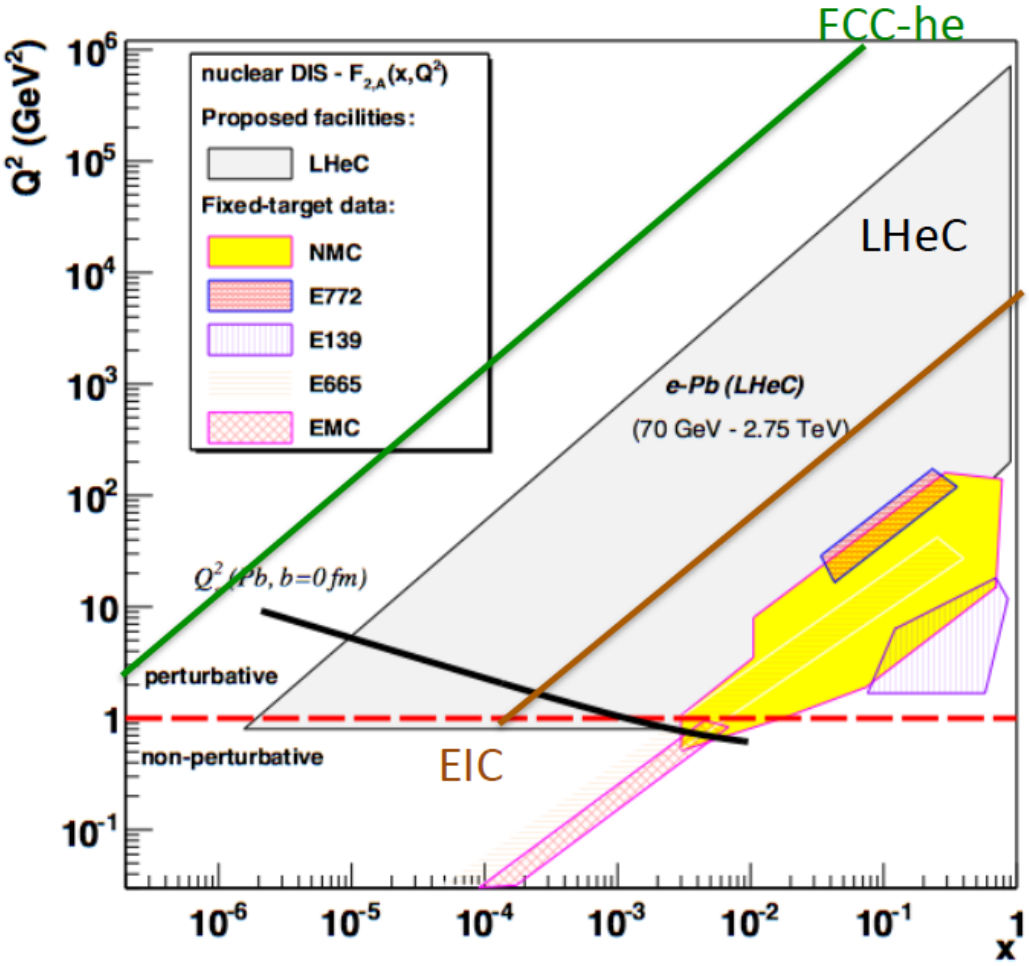
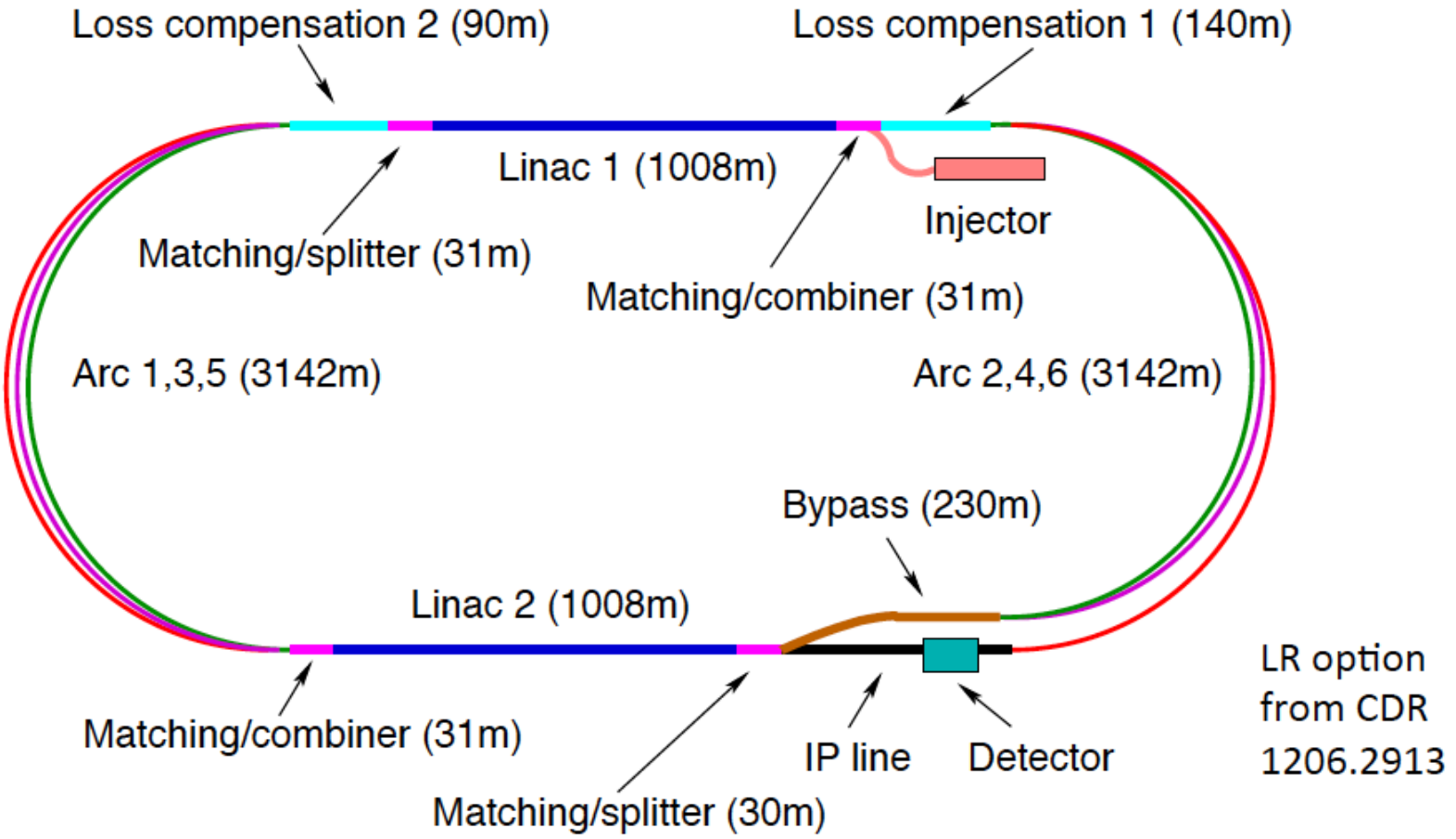


New physics in the QGP and the unexplored substructure of nuclei

The Value of the LHeC



A new accelerator and a complete detector with innovative technology (SCRF, ERL)

Updating the CDR by 2016/17

New physics, new LHC results, new luminosity goal, new detector and IR →

An ep Higgs Facility resolving the Substructure of Matter

Table of Contents - sketch

An ep Higgs Facility resolving the Substructure of Matter

1. Physics

Higgs
Top
BSM
QCD
Small x
Ions

2. Accelerator

Design for 10^{34}
SCRF
Magnets
Integration
Civil Engineering
Auxiliary Equipment
Tests and Preparations

3. Detector

Basic Design
Performance
Components
Beam Pipe
Interaction Region
Software

4. Appendix

ERL Test
Preparations
Energy-L Choice
Cost Estimate

Should include FCC-eh
perhaps as point 5

This requires: a recognition of the LHeC value/development
real support to attract partners and resources
the ERL test set up to indeed go ahead

Immediate next steps

Ongoing discussion with community – no alternative to make that value clear(er)
Preparation of a 3 year plan, including resources, for the early 2016 session of the IAC*)
Following what we initiated – cavity, cryomodule/ physics ..
Integration in FCC activities (from Washington15 to Rome16)
A stronger role of our group to not loose time and ideas

I hope that the next phase can be reached with optimism and support and have reasons to

Thank you all!

*) The proposal is to realise the ERL Test Set up and to write an Updated CDR.

backup

The Nearest Friend - MESA

2 * 8-cell 1.3 GHz cavity cryo module (ELBE type) → 2 * 25 MeV/ pass
ERL mode: 5+ 2 passes *50 – 105 MeV, 1mA current, internal H2 gas target
Non-ERL: polarised gun, 5 + 3 passes * 50 = 155 MeV, 0.15mA current
Cryomodule ordered 4/2015 → beam in 2017 at Mainz

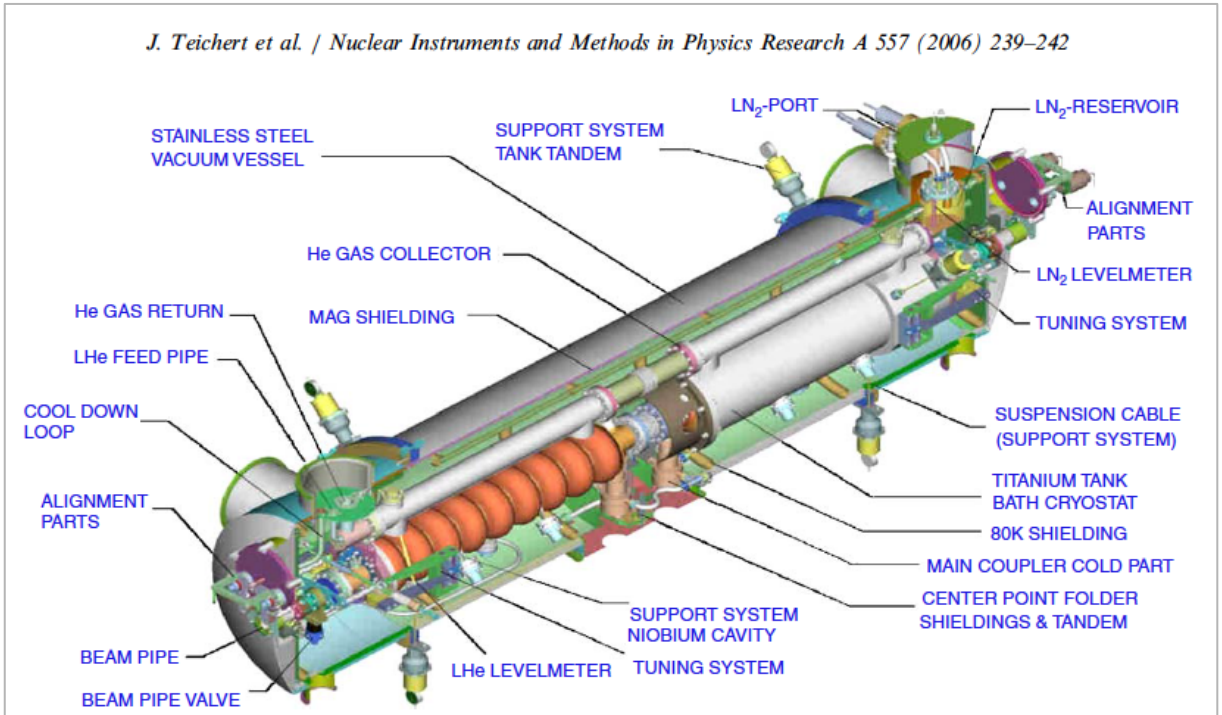


Fig. 1. Three-dimensional drawing of the ELBE cryomodule.

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