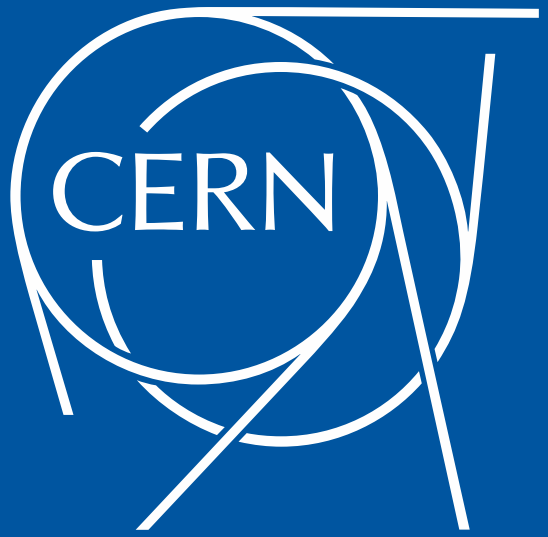
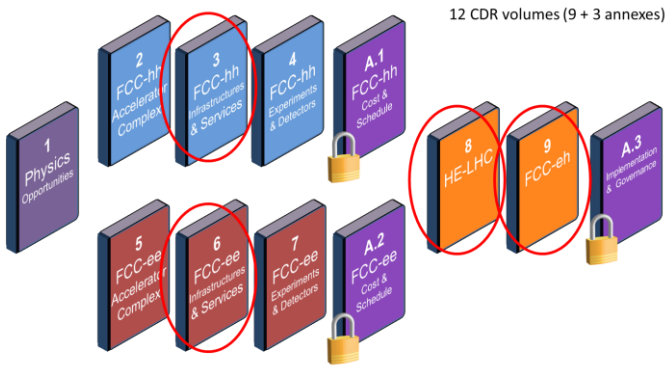

CERN

Conceptual Design Report for FCChh, FCCee and HE-LHC

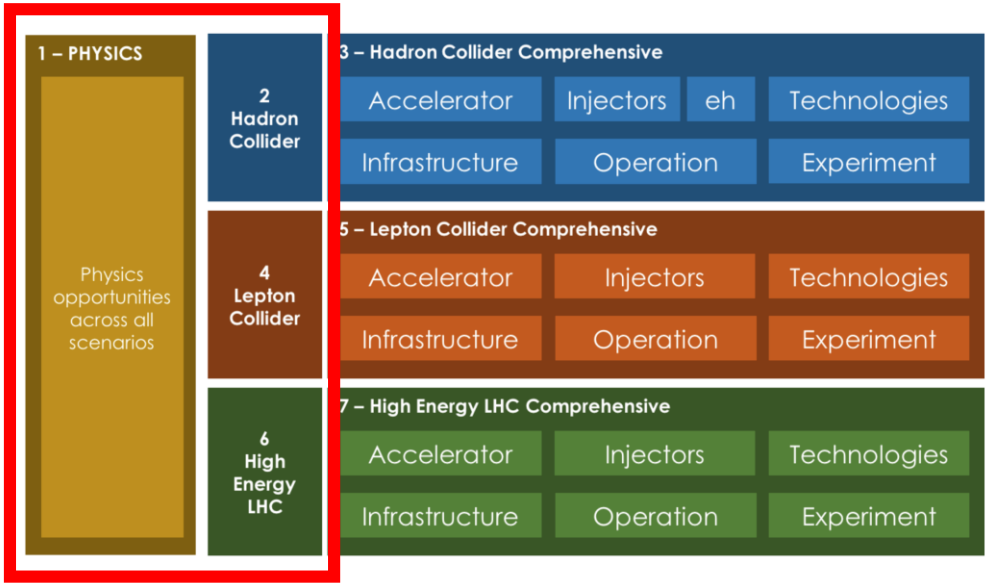
CDR volumes

2016 Proposal



From M. Benedikt's presentation in FCC CGM #39 7.10.2016
https://indico.cern.ch/event/547867/

FINAL SCHEME

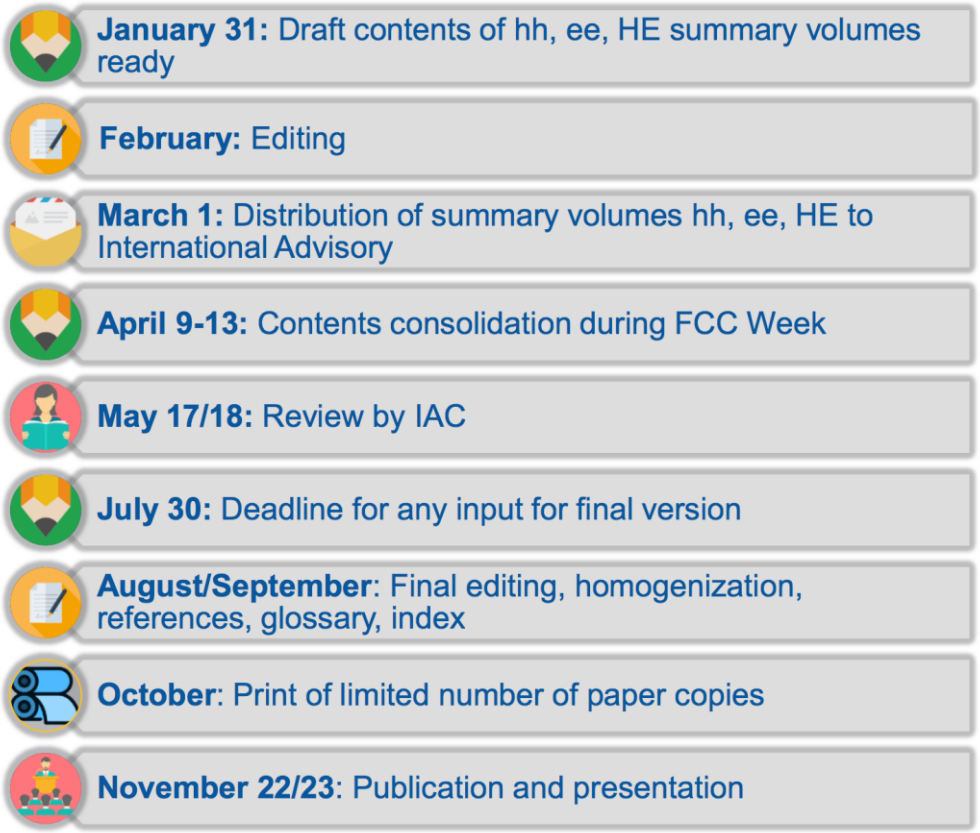


The FCC study aims at producing seven scientific/technical volumes.

The priority for November 2018 is **4 short/concise volumes for** physics (1), the hadron collider (2), the lepton collider (4) and the high-energy LHC (6). Each of these volumes is supposed to have a core text corpus of not more than 150 pages (excluding front matters, appendices, indices and references).

Longer volumes (3,5,7) are considered living-edocuments

CDR Timeline 2018



WP	Title	WP Responsible	CDR section	Author	Editor	Nb pages FCC-hh	Nb of pages FCC-ee
1	Beam vacuum Magnet Cold Bore (EuroCirCol WP4)	Paolo Chiggiato	3.3	Francis Perez	M.Jimenez	4	
2	Cryoplants efficiency	Laurent Tavian	5.6	Laurent Tavian	V.Mertens	4-5	
3	Beam transfer devices	Mike Barnes	3.5	Brennan Goddard	M.Jimenez	5	
4	Manufacturing Technologies	Gilles Favre	12.2	Gilles Favre Cédric Garion	M.Jimenez		
5	Normal conducting magnets	Davide Tommasini	3.2.5	Attilio Milanese	M.Jimenez		
6	Transverse feedback	Wolfgang Hofle	3.4.4	Wolfgang Hofle	M.Jimenez		
7	Beam dumps	Simone Gilardoni	3.6.4	Simone Gilardoni	M.Capeans	2	
8	Beam instrumentation	Rhodri Jones	3.7.2	Rhodri Jones	M.Capeans	1	
9	Beam vacuum induced dynamic effects	Paolo Chiggiato	2.3/2.5	Paolo Chiggiato	M.Jimenez		
10	Cryomagnet insulation vacuum	Paolo Chiggiato	3.3 Subsection?	Paolo Chiggiato	M.Jimenez		
11	Radiation Hardness of electronics	M.Capeans	3.8	M.Capeans	M.Capeans	2-3	
12	Architecture for magnets & machine protection	Andrzej Siemko	3.7.4	Andrzej Siemko	M.Capeans	1	
13	Surface vacuum parameters for beam-induced effects	Paolo Chiggiato	2.3/2.5	Mauro Taboreli	M.Jimenez		
14	Robotics	Alessandro Massi	12.2	Alessandro Massi	M.Jimenez	<1	
	Magnet powering	Jean-Paul Burnet	3.7.3	Jean-Paul Burnet	M.Capeans	1	
	Controls	Eugenia Hatziangeli	3.7.5	Eugenia Hatziangeli	M.Capeans	<1	

CDR FCC-hh
Existing outline

3 Collider Technical Systems **17**
3.1 Requirements and Design Considerations . . . 17
3.2 Main Magnet System . . . 17
3.2.1 Introduction . . . 17
3.2.2 Superconducting Main Dipole . . . 17
3.2.3 Low Temperature Superconductors . . . 18
3.2.4 Final Focus Magnets . . . 18
3.2.5 Other Magnets . . . 18
3.3 Cryogenic Beam Vacuum System . . . 18
3.3.1 Overview . . . 18
3.3.2 Beam Screen . . . 18
3.3.3 Vacuum . . . 18
3.4 Radiofrequency System . . . 18
3.4.1 Overview . . . 19
3.4.2 Superconducting Cavities . . . 19
3.4.3 Powering . . . 19
3.4.4 Feedback . . . 19
3.5 Beam Transfer Systems . . . 19

Chapter for STP
edited by Jimenez/Capeans

3.5.1 Overview . . . 19
3.5.2 Injection . . . 19
3.5.3 Extraction . . . 19
3.5.4 Dumping . . . 19
3.6 Collimation Systems . . . 19
3.6.1 Overview . . . 19
3.6.2 Collimation . . . 19
3.6.3 Protection . . . 19
3.6.4 Dump and Masks . . . 19
3.7 Other Systems . . . 19
3.7.1 Overview . . . 19
3.7.2 Beam Diagnostics Requirements and Concepts . . . 19
3.7.3 Magnet Powering Requirements and Concepts . . . 19
3.7.4 Machine Protection Concepts . . . 19
3.7.5 Controls Requirements and Concepts . . . 19
3.8 Radiation Environment . . . 19

12 Strategic Research and Development
12.1 Strategic Considerations . . .
12.2 Accelerator Related R&D . . .
12.3 Detector Related R&D . . .
12.4 Infrastructures Related R&D . . .
12.5 Risks . . .

Chapter edited by M.Benedikt

CDR FCC-ee
Existing outline

3 Collider Technical Systems

3.1 Main RF systems including staging and RF R and D

3.2 Main Magnet System

3.2.1 Introduction

3.2.2 Main Dipole Magnets

3.2.3 Quadrupoles

3.2.4 Interaction Region and Final Focus

3.2.5 Auxiliary Magnets

3.3 Vacuum system and e-cloud mitigation

3.4 Beam instrumentation and feedback systems

3.5 Beam dumping, beam injection and beam transfer systems

3.6 Other key technologies

3.7 Radiation Environment

Chapter for STP
edited by Jimenez/Capeans

12 Strategic Research and Development **33**

12.1 Strategic Considerations 33

12.2 Accelerator Related R&D 33

12.3 Detector Related R&D 33

12.4 Infrastructures Related R&D 33

12.5 Risks 33

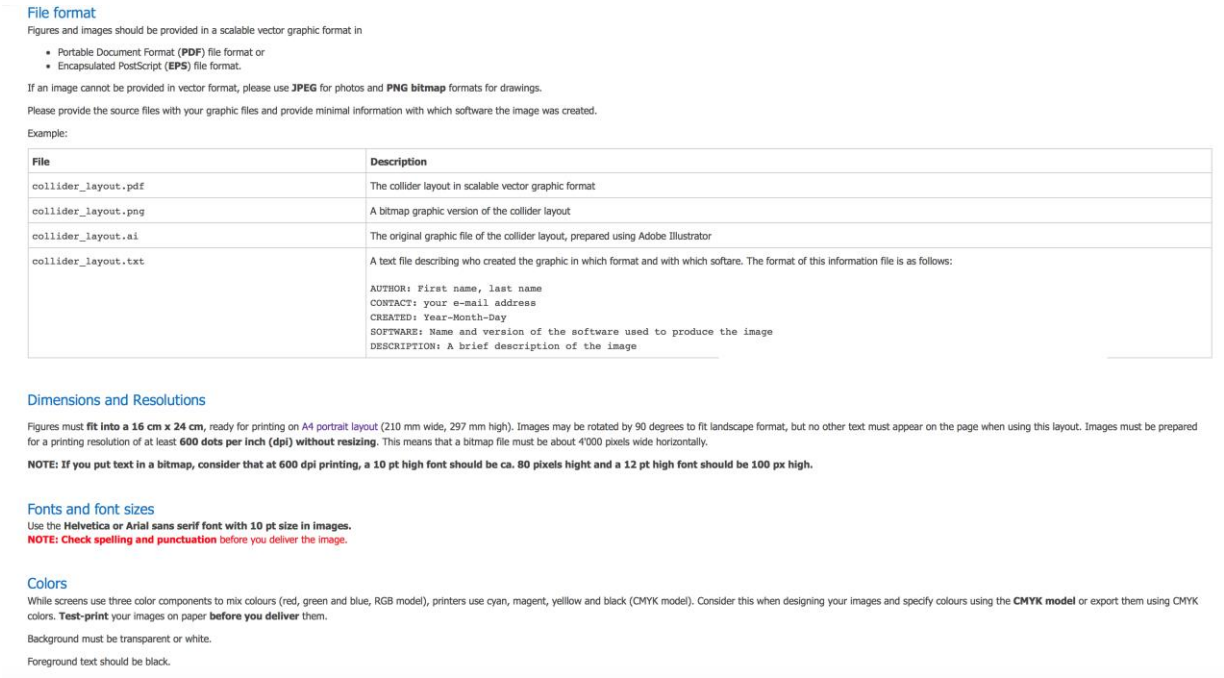
Chapter edited by M.Benedikt

Sections scope for Special Technologies

- Explain if Technology breakthrough or evolution of the technology or both options studied
- Description and technological risk factor/challenges
- Feasibility status and key results
- Next steps (further work to TDR)

Practical details

- Length of Sections x.x.x: between 1 and 2 pages, excluding figures
- Text Format: Latex (Word accepted, but will be converted to Latex)
- Pictures Format:



File format

Figures and images should be provided in a scalable vector graphic format in

- Portable Document Format (**PDF**) file format or
- Encapsulated PostScript (**EPS**) file format.

If an image cannot be provided in vector format, please use **JPEG** for photos and **PNG bitmap** formats for drawings.

Please provide the source files with your graphic files and provide minimal information with which software the image was created.

Example:

File	Description
`collider_layout.pdf`	The collider layout in scalable vector graphic format
`collider_layout.png`	A bitmap graphic version of the collider layout
`collider_layout.ai`	The original graphic file of the collider layout, prepared using Adobe Illustrator

`collider_layout.txt`	A text file describing who created the graphic in which format and with which softare. The format of this information file is as follows:
	
	`AUTHOR: First name, last name`
	`CONTACT: your e-mail address`
	`CREATED: Year-Month-Day`
	`SOFTWARE: Name and version of the software used to produce the image`
	`DESCRIPTION: A brief description of the image`

Dimensions and Resolutions

Figures must **fit into a 16 cm x 24 cm**, ready for printing on A4 portrait layout (210 mm wide, 297 mm high). Images may be rotated by 90 degrees to fit landscape format, but no other text must appear on the page when using this layout. Images must be prepared for a printing resolution of at least **600 dots per inch (dpi) without resizing**. This means that a bitmap file must be about 4'000 pixels wide horizontally.

NOTE: If you put text in a bitmap, consider that at 600 dpi printing, a 10 pt high font should be ca. 80 pixels hight and a 12 pt high font should be 100 px high.

Fonts and font sizes

Use the **Helvetica or Arial sans serif font with 10 pt size in images.**
NOTE: Check spelling and punctuation before you deliver the image.

Colors

While screens use three color components to mix colours (red, green and blue, RGB model), printers use cyan, magent, yelllow and black (CMYK model). Consider this when designing your images and specify colours using the **CMYK model** or export them using CMYK colors. **Test-print** your images on paper **before you deliver** them.

Background must be transparent or white.

Foreground text should be black.

Immediate TO DO List

- 02/02/2018: confirm author list
- 07/02/2018: freeze outline with FCC Editorial Office
- 09/02/18: check point for all sections
- 23/02/18: Authors to deliver draft content to Chapter 3 editorial team (JMJ, MC)
- 02/03/18: Authors to deliver final content to Chapter 3 editorial team (JMJ, MC)

- 5/03/2018: submit edited completed chapter to FCC Editorial Office