



# EuroCirCol Overview

## Scope and Goals

Michael Benedikt

CERN

June 2<sup>nd</sup>, 2015



# Welcome to all Participants!

## Welcome to the Future!



Co-funded by the



European  
Commission

EuroCirCol-1505271400-  
EuroCirColOverview

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# Welcome to all Participants!

## Welcome to the Future!

The approval of the EuroCirCol conceptual design study shows that particle accelerators remain a global priority and are an important tool to strengthen Europe's Research Infrastructure!

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Commission

EuroCirCol-1505271400-  
EuroCirColOverview

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# Kick-off Meeting Organisation



Admin: 2/3 June

- **Participants:**  
Project management, administrative and technical contacts
- Project **overview for administration** and management participants
- **Information from CERN EU office**
- **Questions and answers** on administrative, managerial, organisation and legal aspects



Techn.: 4/5 June

- **Establish a work plan (Gantt) for Y1:**  
WP scope, work plan clarification, alignment FCC
- **Establish team database (Sept. 28, 2015):**  
WP and task leaders, key scientists
- Detailed elaboration in parallel meetings

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European  
Commission

# Agenda Tuesday, June 2

**13:00 Welcome by the Accelerator and Technology Sector Director and introduction 15'**

Speaker: Frederick Bordry (CERN)

**13:15 FCC and EuroCircol Overview 45'**

Speaker: Michael Benedikt (CERN)

**14:00 Project plan overview 45'**

Speaker: Daniel Schulte (CERN)

**14:45 Questions concerning scope, project plan 15'**

15:00 Coffee break 30'

**15:30 EuroCirCol project organization 30'**

Speakers: Karen Ernst (CERN), Johannes Gutleber (CERN), Michael Benedikt (CERN)

**16:00 Administrative processes including Q&A 30'**

Speaker: Agnes Szeberenyi (CERN)

**16:30 Result dissemination policy and documentation platform 30'**

Speaker: Johannes Gutleber (CERN)

**17:00 Communication strategy and channels 15'**

Speaker: James Gillies (CERN)

**17:15 Gender equality monitoring and actions 15'**

Speaker: Geneviève Guinot (CERN)

**17:30 Q&A on administration processes and tools 30'**

Speakers: Agnes Szeberenyi (CERN), Livia Lapadatescu (CERN), Johannes Gutleber (CERN)

# Agenda Wednesday, June 3 (i)

**room 40-S2-A01**

09:00 **Opening** 5'

Speaker: Michael Benedikt (CERN)

09:05 **Establishing EuroCirCol Collaboration Board (ECB)** 5'

Speaker: Michael Benedikt (CERN)

09:10 **Election of ECB Chair** 5'

Speaker: ECB members

09:15 **Proposal of EuroCirCol Coordination Committee members** 5'

Speaker: Michael Benedikt

09:15 **Approval of Coordination Committee members** 5'

Speaker: ECB members

09:20 **Plans for next ECB, ECC meetings and establishment of Advisory Committee**

Speaker: Michael Benedikt (CERN)

09:30 **WP 1: Objectives, work baseline and reference documents, schedule including Q&A, work distribution** 10'

Speaker: Michael Benedikt (CERN)

09:45 **WP 2: Objectives, work baseline and reference documents, schedule including Q&A** 15'

Speaker: Antoine Chance (CEA)

10:00 **WP 2: Work distribution** 15'

Speaker: Antoine Chance

# Agenda Wednesday, June 3 (ii)

10:15 **WP 3: Objectives, work baseline and reference documents, schedule including Q&A** 15'

Speaker: Andrei Seryi (University of Oxford)

10:30 **WP 3: Work distribution** 15'

Speaker: Andrei Seryi (University of Oxford)

10:45 **Break** 30' ( )

11:15 **WP 4: Objectives, work baseline and reference documents, schedule including Q&A** 15'

Speaker: Francis Perez (ALBA Synchrotron - CELLS)

11:30 **WP 4: Work distribution** 15'

Speaker: Francis Perez (ALBA Synchrotron - CELLS)

11:45 **WP 5: Objectives, work baseline and reference documents, schedule including Q&A** 15'

Speaker: Davide Tommasini (CERN)

12:00 **WP 5: Work distribution** 15'

Speaker: Davide Tommasini (CERN)

12:15 **Q&A, approval of work plan, agreement on action items for minutes (next steps and responsibilities), A.O.B.** 15'

Speaker: Moderated by ECC Chair

# Outline

- The Future Circular Collider Study
- EuroCirCol
- Scientific Scope and Goals
- Strategic Goals
- Partners
- Project Budget
- Work Packages
- Project Organisation

Co-funded by the



The European Circular Energy-Frontier Collider Study (EuroCirCol) project has received funding from the European Union's Horizon 2020 research and innovation programme under grant No 654305. The information herein only reflects the views of its authors and the European Commission is not responsible for any use that may be made of the information.



# Future Circular Collider Study

- European Strategy for Particle Physics 2013:

*“... to **propose** an **ambitious post-LHC accelerator** project ..., CERN should undertake **design studies** for accelerator projects **in a global context**, with emphasis on proton-proton and electron-positron **high-energy frontier** machines ...”*

- Output of the FCC study
  - Conceptual Design Report by **end 2018** in time for the next European Strategy Update

# FCC Study Setup

- Carried out by global collaboration
- Universities, laboratories & industry worldwide
- Hosted by CERN

**Geographically  
Balanced**

**Worldwide**

**Topically  
Complementary**

**Excellence**

# FCC Collaboration Status 6/2015

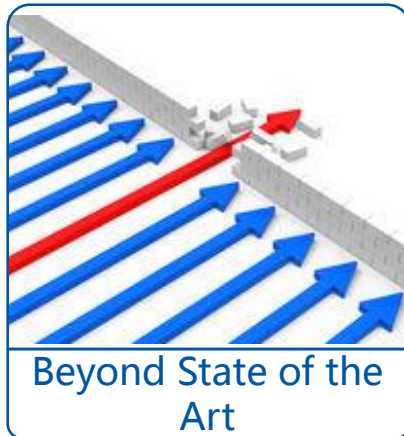
55

Institutes

21

Countries

# Motivators and Goals for EuroCirCol



Reach out to **100 TeV** within **21<sup>st</sup> century**

Extreme luminosities **beyond  $10 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$**

Devise **economic and energy efficient** collider

**Assess scale-up and scale-out** scenarios



Conceptual design of **energy frontier hadron collider**

Assess the **feasibility** of accelerator **key elements**

Plan a research infrastructure under **EU leadership**

Draft an **implementation scenario**

# EC Evaluation Results



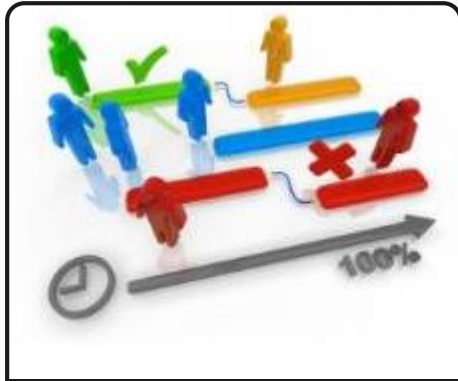
- Science is excellent
- Project is ambitious and shows innovation potential
- Objectives are clear and approach is credible
- Will have impact on other disciplines and industry
- Key element of European Strategy on Particle Physics

## Recognition of FCC Study by European Commission

# EuroCirCol

- Focus on the **key design questions**, which determine the feasibility of a 100 TeV hadron collider in a 100 km long tunnel
- **Out of financing, but in scope of EuroCirCol** of CERN work are:
  - Hadron collider infrastructure requirements
  - Development of implementation & governance model
  - Cost baseline

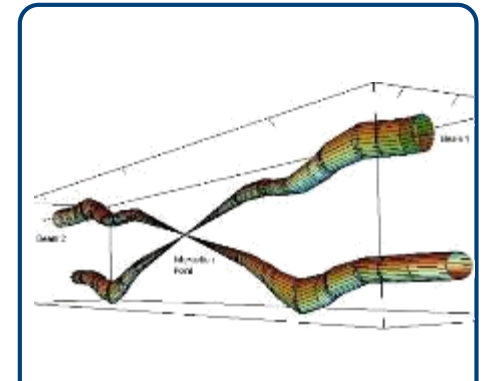
# EC Funded Scope



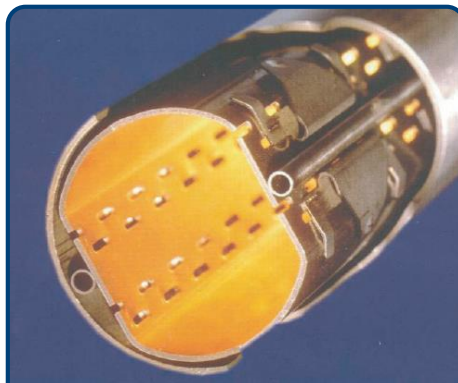
Management



Arc Design



EIR Design



Cryo Beam  
Vacuum



High Field  
Magnet

# WP Lead

WP	Name	Lead		Co-Lead	
1	Management	CERN	M. Benedikt	CERN	D. Schulte
2	Arc Design	CEA	A. Chancé	CERN	R. Tomas
3	EIR Design	UOXF (JAI)	A. Seryi	CERN	B. Holzer
4	Cryo Beam Vacuum	CELLS	F. Perez	CERN	P. Chiggiato
5	High-field Magnet	CERN	D. Tommasini	TBA	TBA



# Scientific Goals

- Develop appropriate **optics and lattice**
  - For 100 TeV in 100 km
  - In agreement with magnet and beam vacuum system requirements and constraints
- Propose suitable **cryogenic beam vacuum system**
  - Mechanical design
  - Addressing synchrotron radiation
  - Measurement results of prototype
- Develop design for **16 T dipole magnet**
  - Assessment of different options based on LTS Nb<sub>3</sub>Sn
  - Cost model
  - Manufacturing folder for short model prototype

# WP 1

- **Study Management**

- CERN coordinates work of all WPs and assures coherence with FCC study

- **Quality Management**

- CERN establishes project infrastructure and establishes quality system for documentation, deliverable production and financial reporting

- **Communication and Outreach**

- CERN with UNILIV established FCC/EuroCirCol communication strategy.
- CERN performs FCC communication activities
- UNILIV performs EuroCirCol communication activities

- **Knowledge and Innovation Management**

- CERN establishes list of contacts in each institute for technology scouting
- All institutes cooperate to document technologies, which have potential societal and industrial impacts

- **Implementation Scenarios**

- CERN documents an implementation and governance model suitable for the construction phase of a post-LHC Research Infrastructure

- **Costing**

- CERN produces an overall cost baseline based on a PBS

# WP 2

- WP is coordinated by CEA
- Develop optimised arc lattice
- Study dynamic aperture and derive field quality tolerances
- Study single beam current limitation
- Understand and control electron cloud effects
- Develop a concept for a collimation system

# WP 3

- WP is coordinated by UOXF
- Develop interaction region lattice consistent with machine and detector requirements
- Specify functions and performances of beam-line elements
- Design machine detector interface
- Study beam-beam interactions

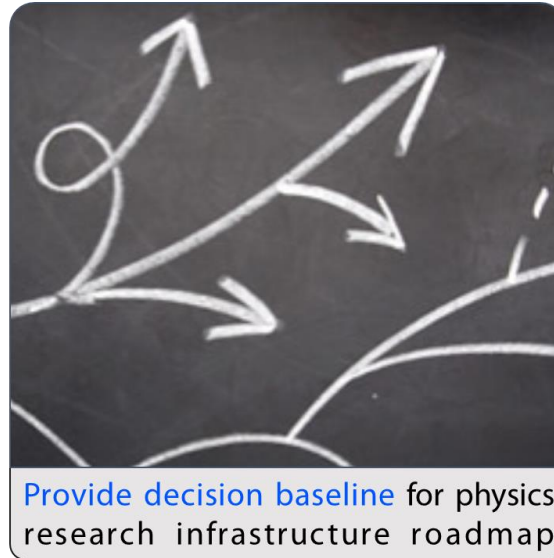
# WP 4

- WP is coordinated by ALBA
- Study beam-induced vacuum effects
- Develop mitigation strategies for beam-induced vacuum effects
- Study beam stability at cryogenic temperatures
- Develop the design for a cryogenic beam vacuum system
- Build a prototype
- Measure the prototype at ANKA light source

# WP 5

- WP is coordinated by CERN
- Study and assess different dipole design options
- Develop a cost model for the dipole
- Develop EM and mechanical design
- Devise a quench protection concept
- Produce a manufacturing folder for a short model

# Strategic Goals



Work towards inclusion of EuroCirCol  
in the ESFRI roadmap  
(European Strategy for Research Infrastructures)

# EuroCirCol in Figures

Duration (months)

48

1.6.2015 - 31.5.2019

WPs

5

Countries

10

Total Cost

11.2 M€

EC Grant

2.99 M€

3<sup>rd</sup> Parties

1

Beneficiaries

16

Person Months

1'509

Other

4

Deliverables

23

Milestones

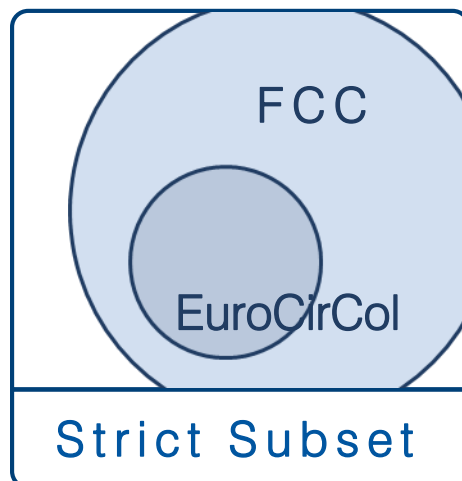
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# Organisation Aspects

- **FCC Study** is a Collaboration based on a **Memorandum of Understanding** by which Participants commit
  - to study circular post-LHC machines
  - on best effort contributions
- **EuroCirCol** is a Consortium of Participants tied together via a **H2020 Grant Agreement (GA)** with the EC and a **Consortium Agreement (CA)**

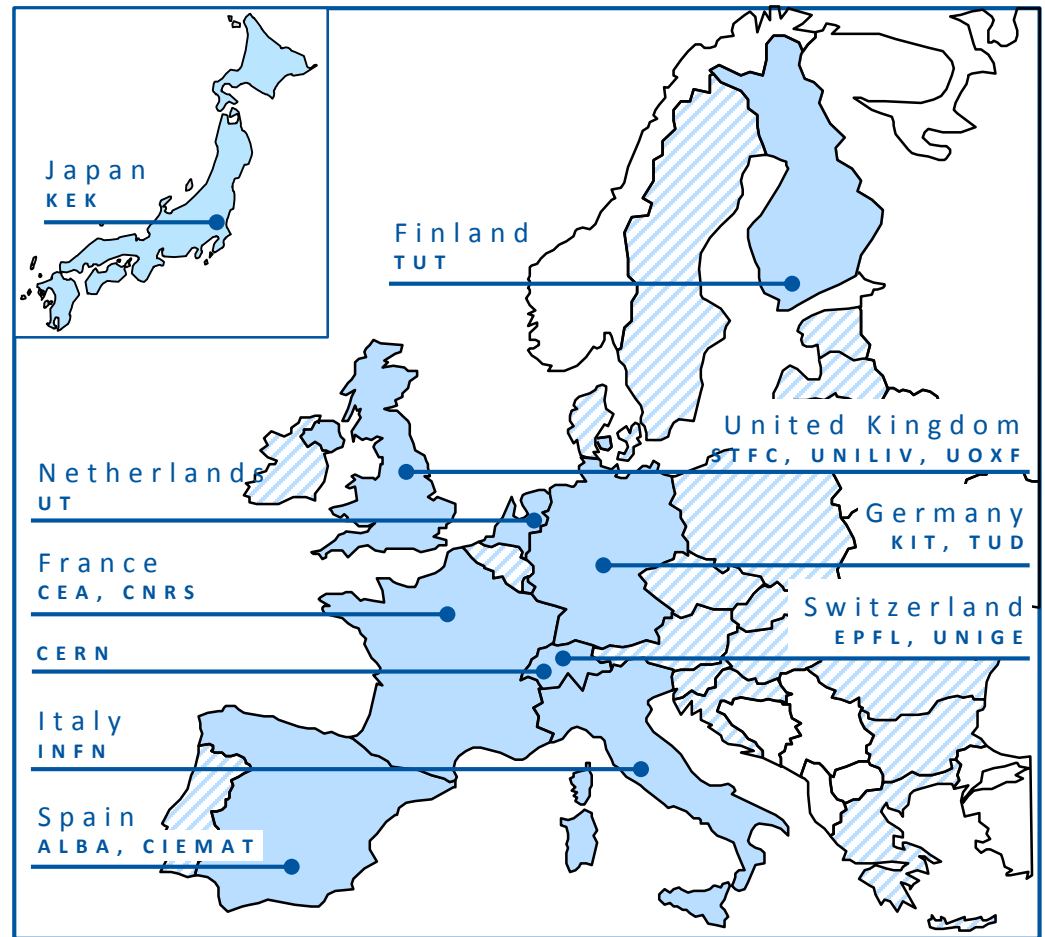
# EuroCirCol is Subset of FCC



- Helps subset of FCC Participants performing their work efficiently
- Consortium Agreement is extension to FCC MoU
- Establishes compliance with EC H2020 rules
- Limits duplication of management / governance
- Quantify and track matching resources
- Support fundraising of matching resources

# EuroCirCol Consortium + Associates

<b>CERN</b>	IEIO
<b>TUT</b>	Finland
<b>CEA</b>	France
<b>CNRS</b>	France
<b>KIT</b>	Germany
<b>TUD</b>	Germany
<b>INFN</b>	Italy
<b>UT</b>	Netherlands
<b>ALBA</b>	Spain
<b>CIEMAT</b>	Spain
<b>STFC</b>	United Kingdom
<b>UNILIV</b>	United Kingdom
<b>UOXF</b>	United Kingdom
<b>KEK</b>	Japan
<b>EPFL</b>	Switzerland
<b>UNIGE</b>	Switzerland
<b>NHFML-FSU</b>	USA
<b>BNL</b>	USA
<b>FNAL</b>	USA
<b>LBNL</b>	USA



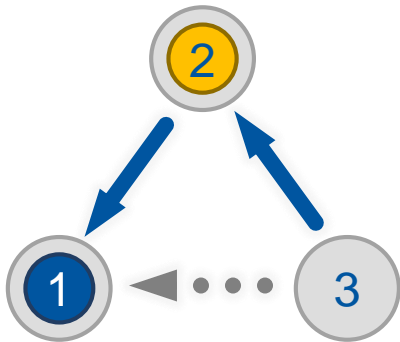
Consortium Beneficiaries, signing the Grant Agreement

# Umbrellas and Third Parties



UOXF - JAI

- **UOXF** acts as legal entity representing contribution of **John Adams Institute**
- **UOXF** signed **GA** and **CA**, all financial and admin communication with **UOXF**.



STFC-UNIMAN

- **STFC** directly contributes to **WP 4**
- Represents contribution of **UNIMAN** with **Cockcroft Institute**, acting as a Third Party to STFC in **WP3**.
- STFC signed GA, CA. Neither CI nor UNIMAN sign GA or CA.

# US Participation

US Partners do not sign GA and CA

FCC MoU remains to be concluded with DOE for contributions of the following labs to WP5

NHFML FSU	Explore potentials to double $J_c$ of $Nb_3Sn$ at 16 T Propose improvements to strand architectures BSCCO-2212 material research
BNL	Develop coil design concepts (common coils, racetrack) Engineering for US-based 16 T model Study YBCO for HTS inserts
FNAL	Develop coil design concepts (cos-theta, collars) Engineering for US-based 16 T model Study BSCCO-2212 for HTS inserts
LBNL	Develop coil design concepts (blocks, canted-cosine-theta) Engineering for US based 16 T model Study BSCCO-2212 for HTS inserts

# GA and CA Status

- All Beneficiaries signed the **GA**.
- EC started pre-financing process (~ 30 days)
- **CA** signature from 1 beneficiary pending

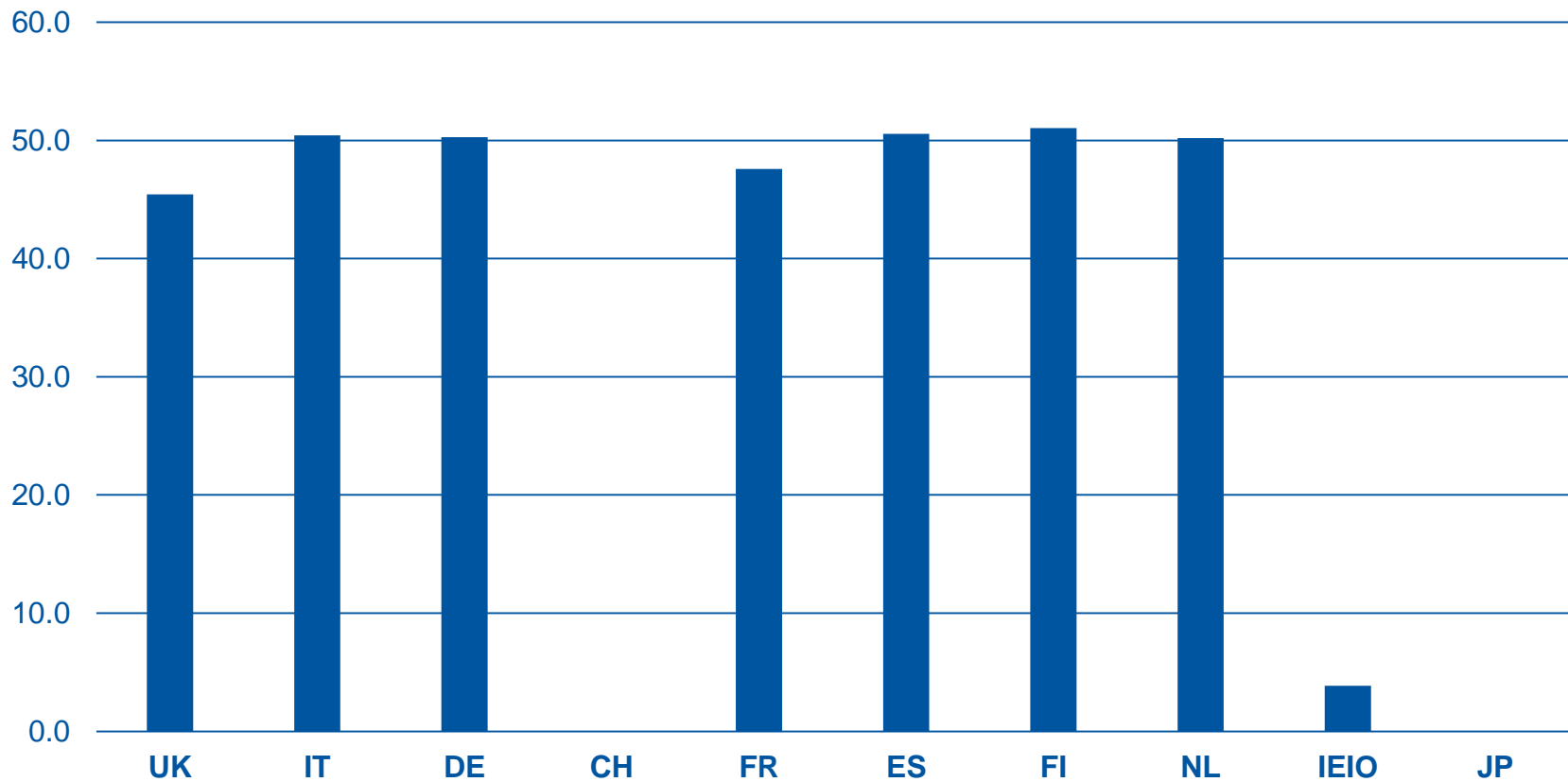
Participant	GA	CA	Participant	GA	CA
UNIGE	✓	✓	EPFL	✓	✓
CNRS	✓	✓	CIEMAT	✓	✓
TUD	✓	✓	KIT	✓	✗
ALBA	✓	✓	INFN	✓	✓
KEK	✓	✓	UOXF	✓	✓
CEA	✓	✓	UNILIV	✓	✓
TUT	✓	✓	STFC	✓	✓
UT	✓	✓	EU	✓	n/a

# Overall Budget

Item	Amount [EUR]
Total budget including matching resources	10'199'136
Eligible budget reported (= EC contribution & matching UOXF, CNRS)	3'989'842
EC contribution	2'999'000
Pre-financing (37.5 % of 2.99 MEUR)	1'124'625
Guarantee Fund (5 % of 2.99 MEUR held back by EC)	149'950
<b>Pre-financing paid to CERN</b>	<b>974'675</b>
<b>To be transmitted to Beneficiaries (60 % of pre) as received</b>	<b>548'805</b>
<b>To be transmitted to Beneficiaries (40 % of pre) at Y1</b>	<b>389'870</b>

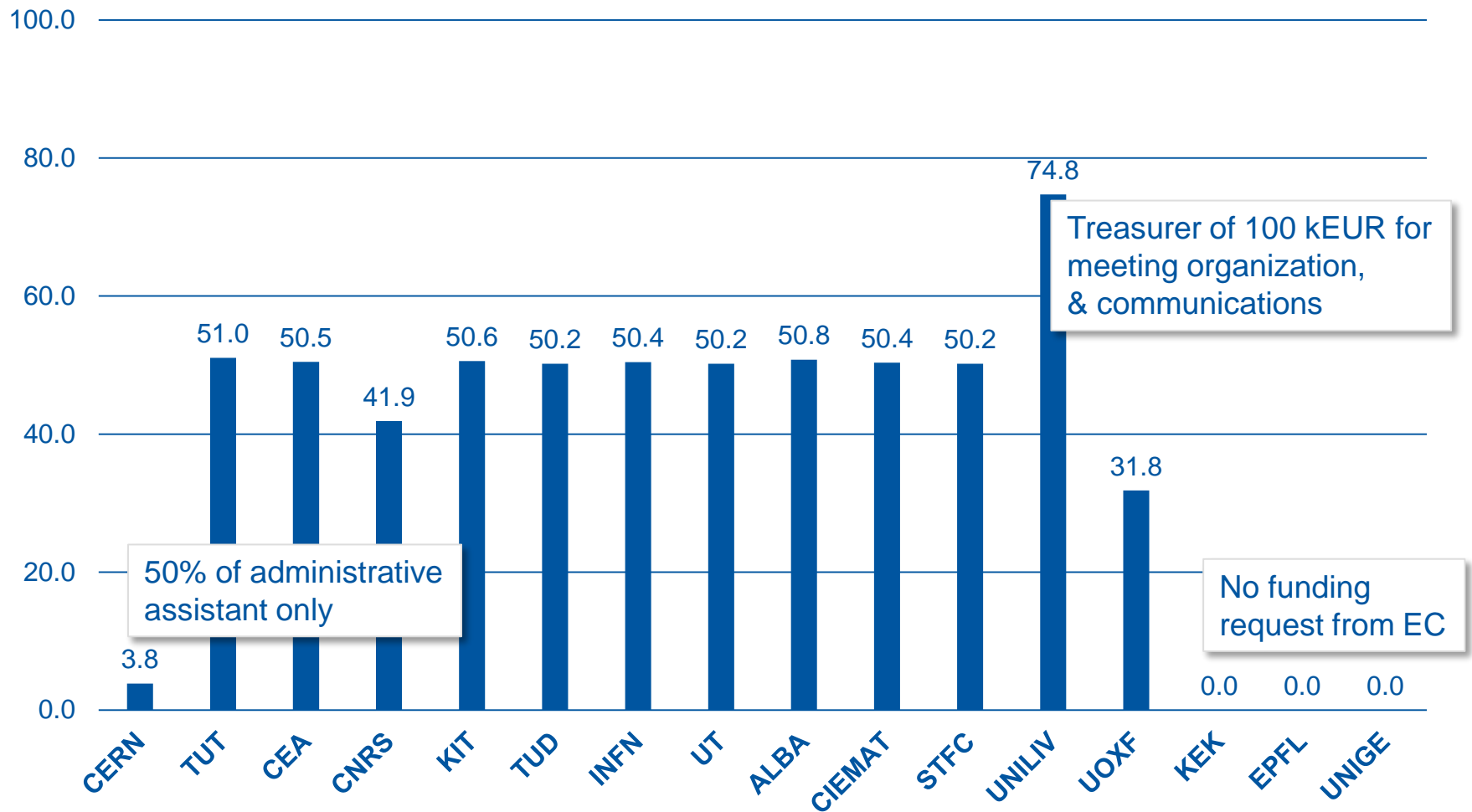
The willingness of all Beneficiaries to participate at an accepted funding rate of 30-50% is an impressive demonstration of the strong commitment of the accelerator community to advance beyond the state-of-science today to conceive tomorrow's next large Research Infrastructure for High-Energy and Particle Physics.

# Funding Ratio in % per Country

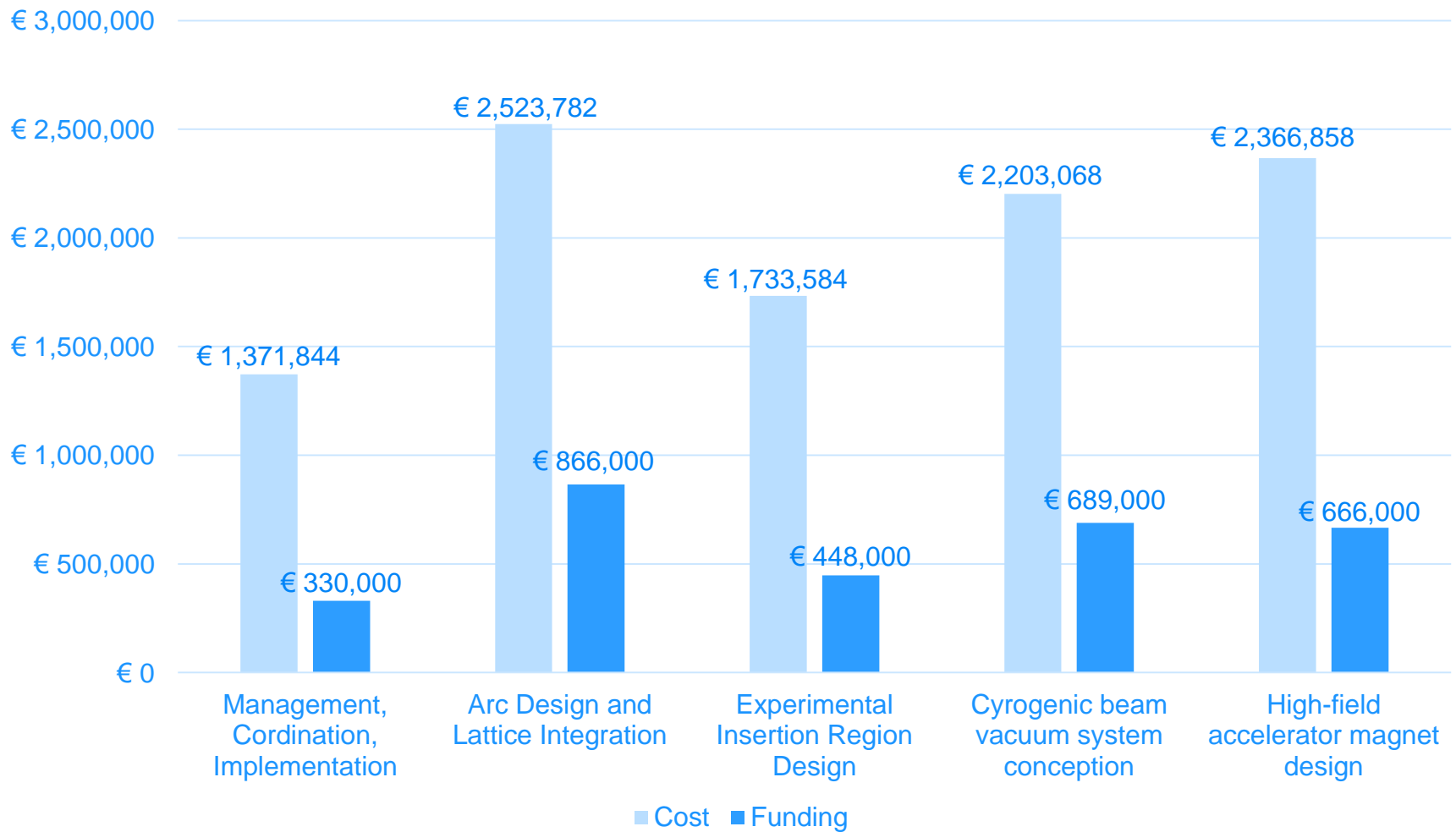




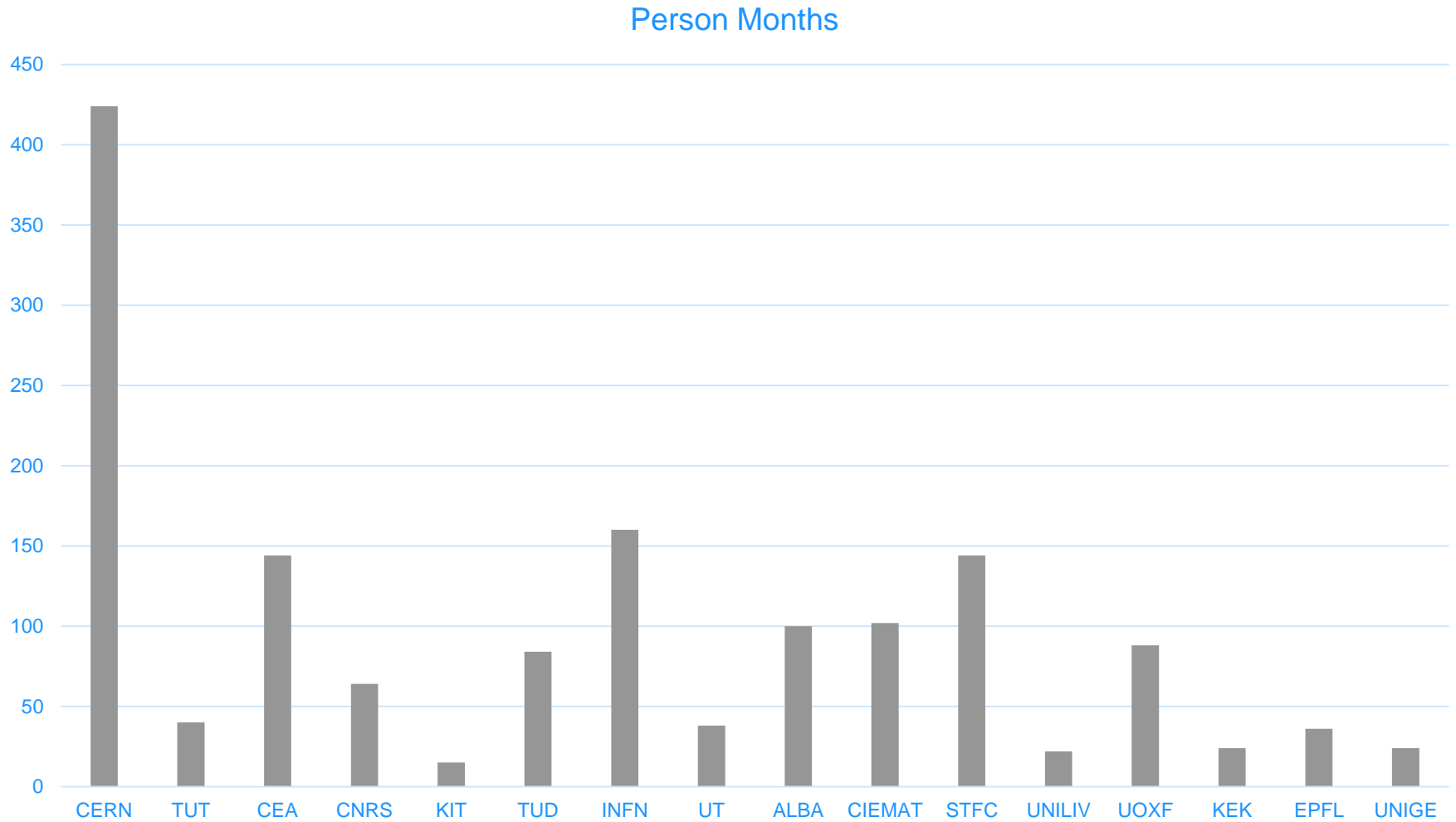
# Beneficiary Funding Rates



# Budget per Work Package

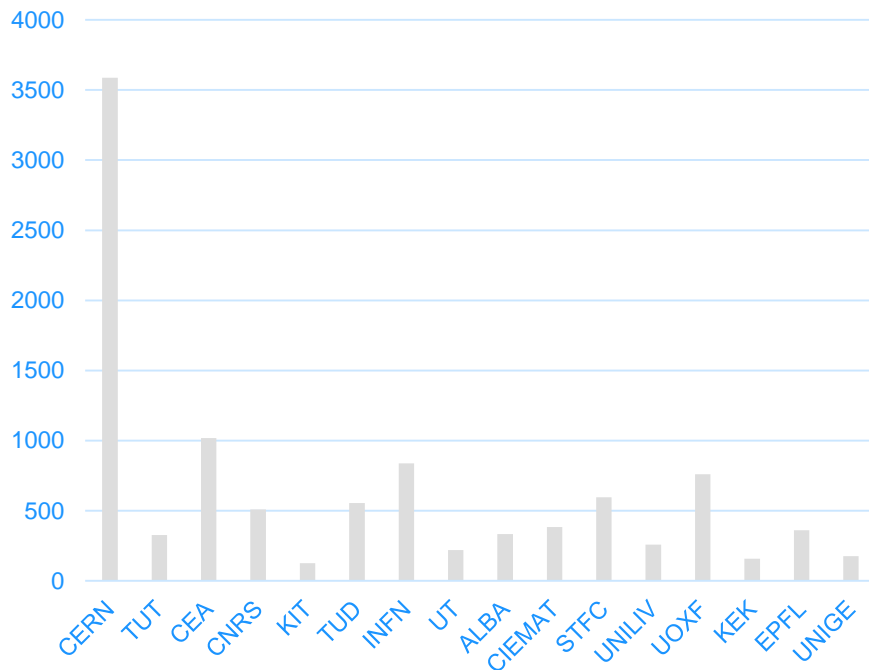


# Total Effort Overview

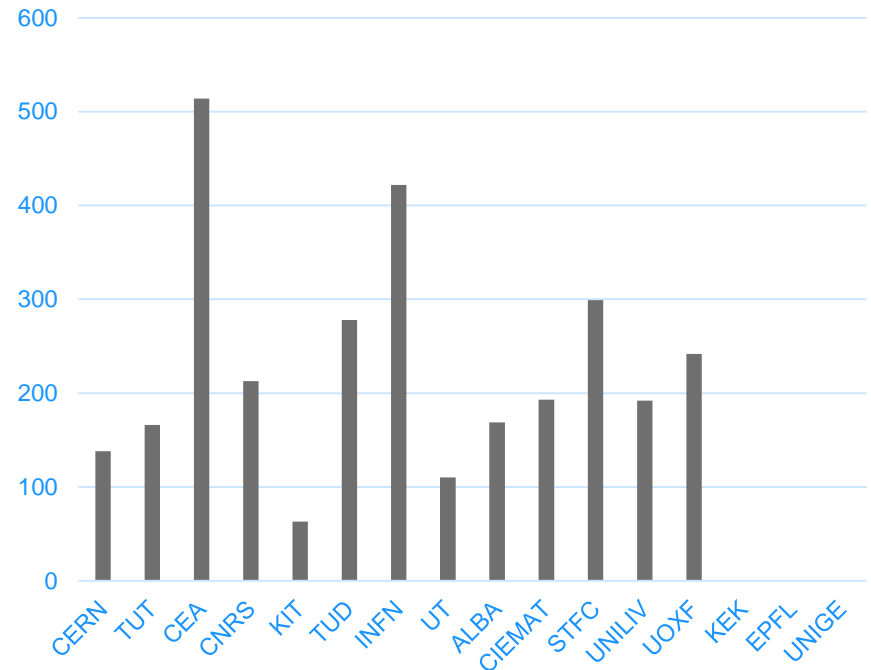


# Cost and Funding Overview

Total Cost [kEUR]



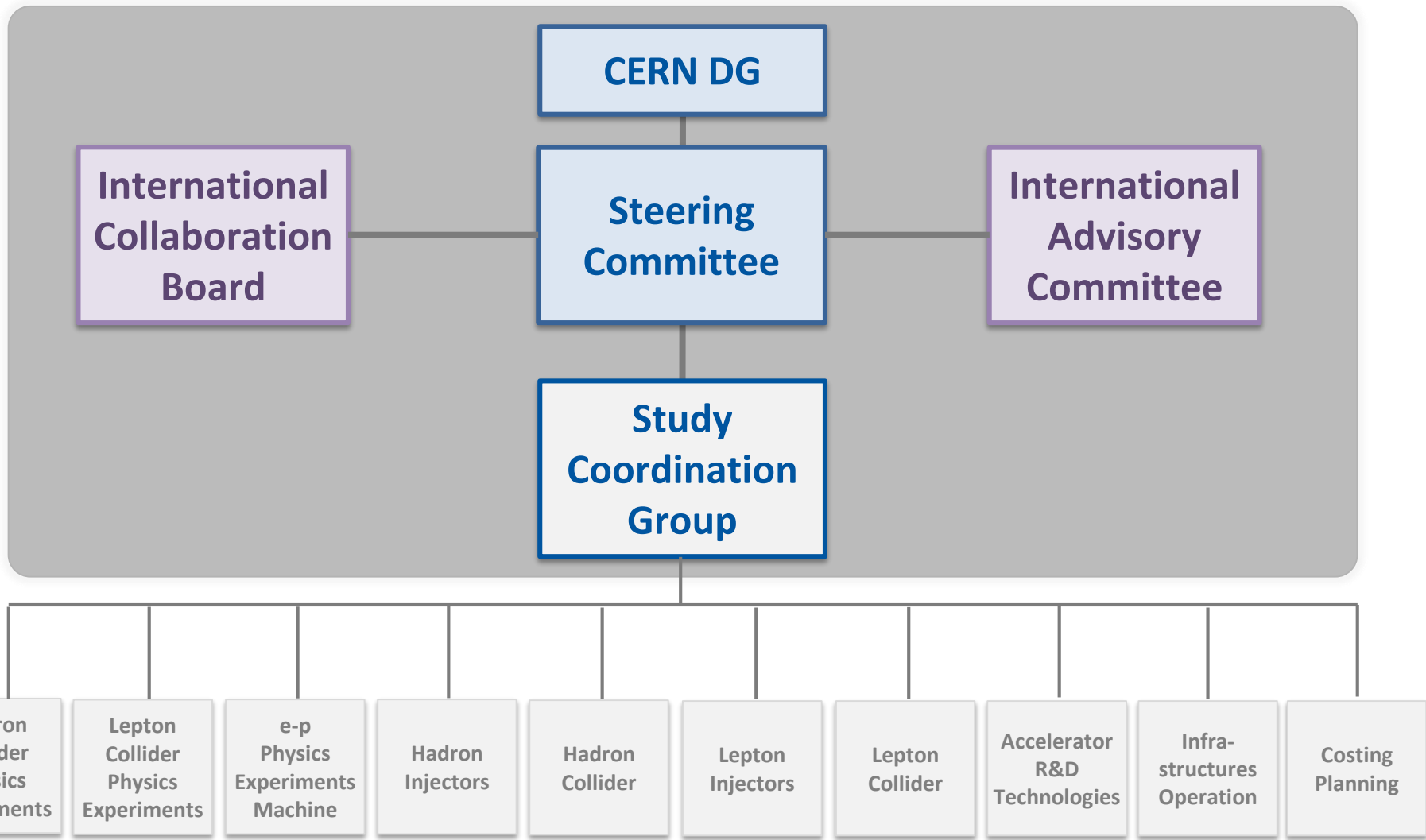
EU Funding [kEUR]



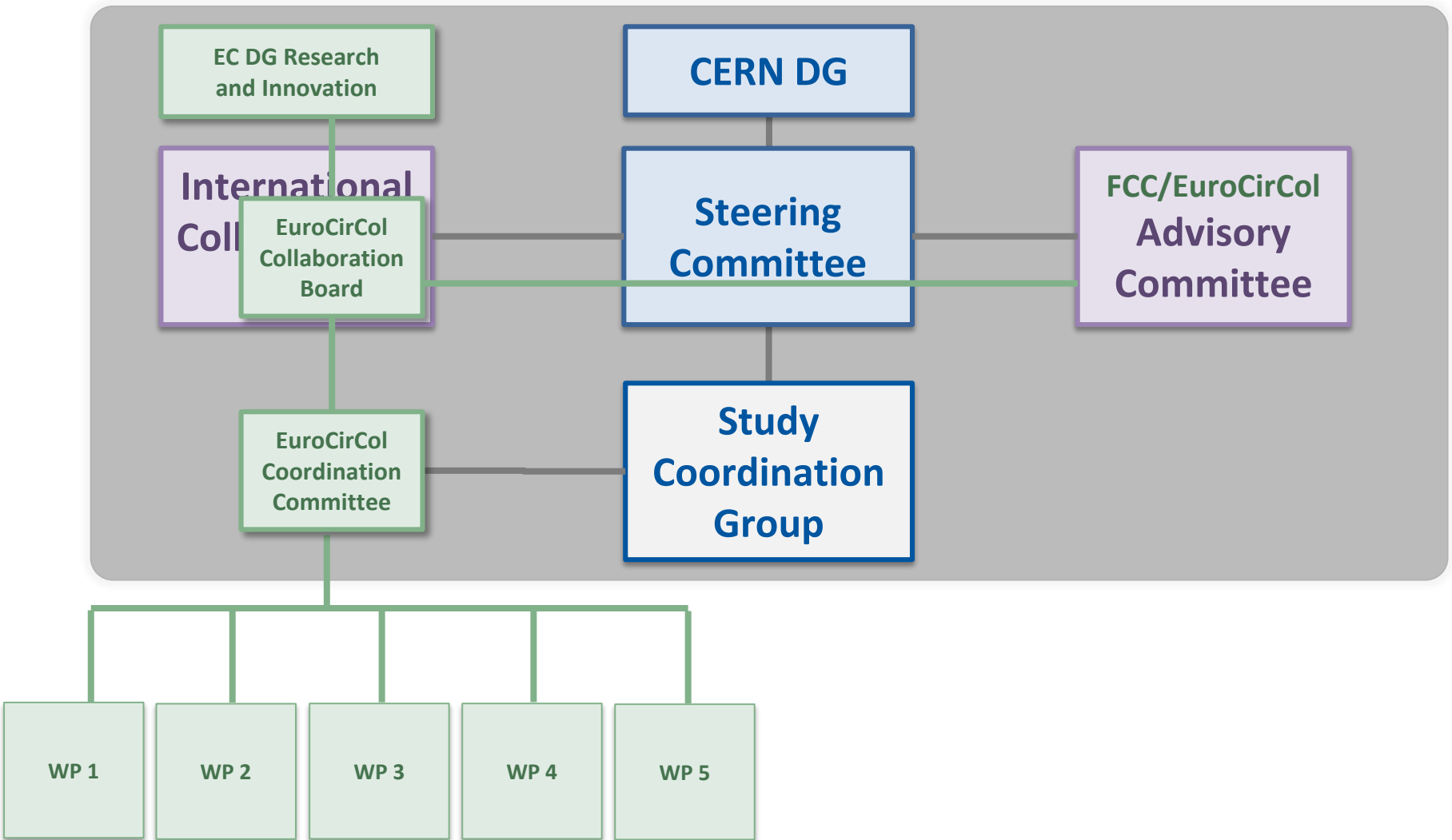
# Participant Person Months

Partner	WP1	WP2	WP3	WP4	WP5	Total PM	Total Cost	EU Funding
CERN	128	90	42	84	80	424	€ 3,587,500	€ 138,000
TUT					40	40	€ 325,188	€ 166,000
CEA		108			36	144	€ 1,018,770	€ 514,000
CNRS		64				64	€ 508,667	€ 213,000
KIT				15		15	€ 124,500	€ 63,000
TUD		84				84	€ 553,905	€ 278,000
INFN			30	94	36	160	€ 836,938	€ 422,000
UT					38	38	€ 219,185	€ 110,000
ALBA				100		100	€ 332,858	€ 169,000
CIEMAT				54	48	102	€ 383,250	€ 193,000
STFC			48	96		144	€ 595,665	€ 299,000
UNILIV	22					22	€ 256,844	€ 192,000
UOXF			88			88	€ 760,691	€ 242,000
KEK		12			12	24	€ 158,445	€ 0
EPFL			36			36	€ 360,000	€ 0
UNIGE					24	24	€ 176,730	€ 0
SUM	150	358	244	443	314	1509	€ 10,199,135	€ 2,999,000

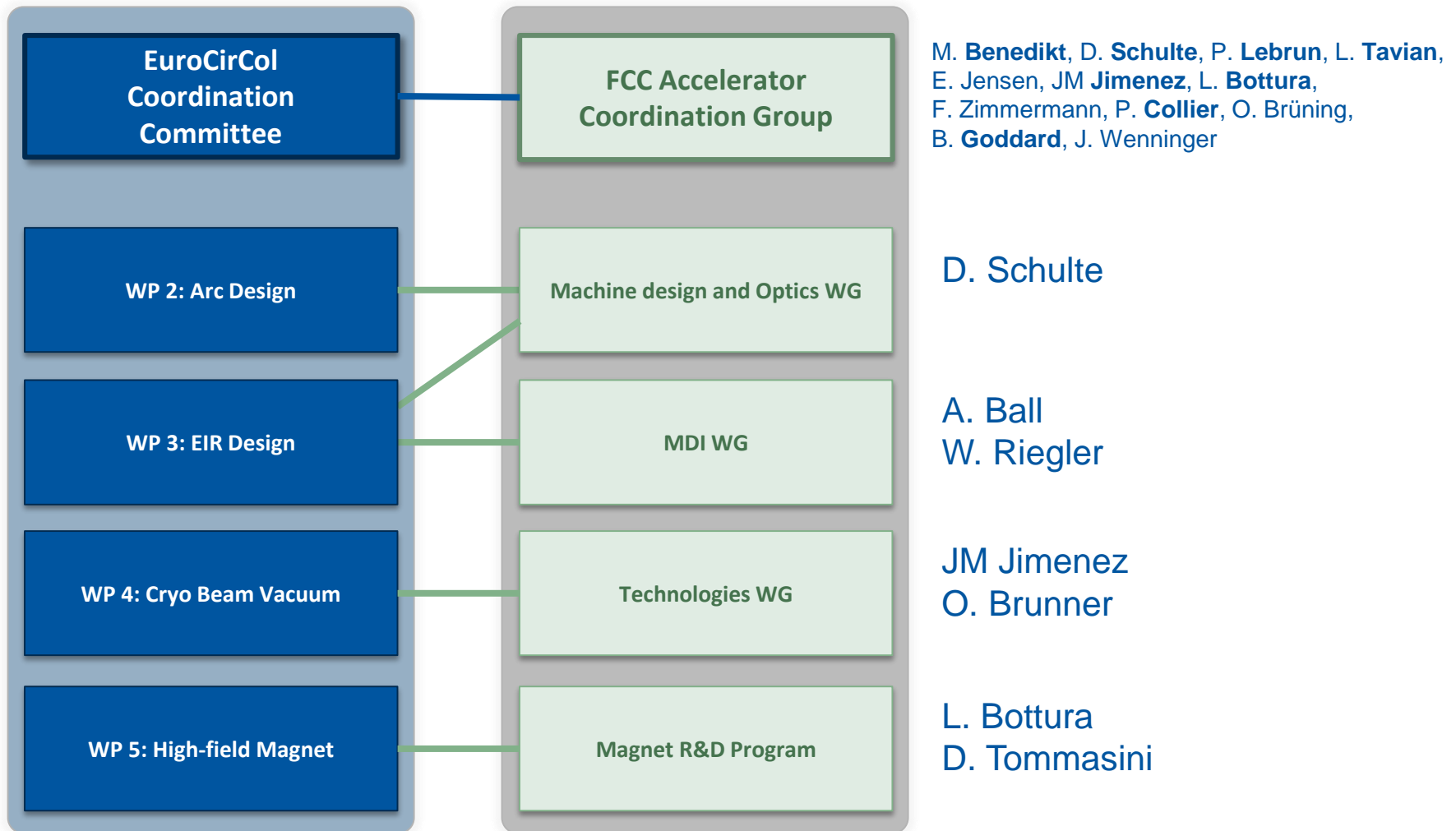
# FCC Governance Structure



# EuroCirCol Governance Structure



# EuroCirCol – FCC-hh Organisation

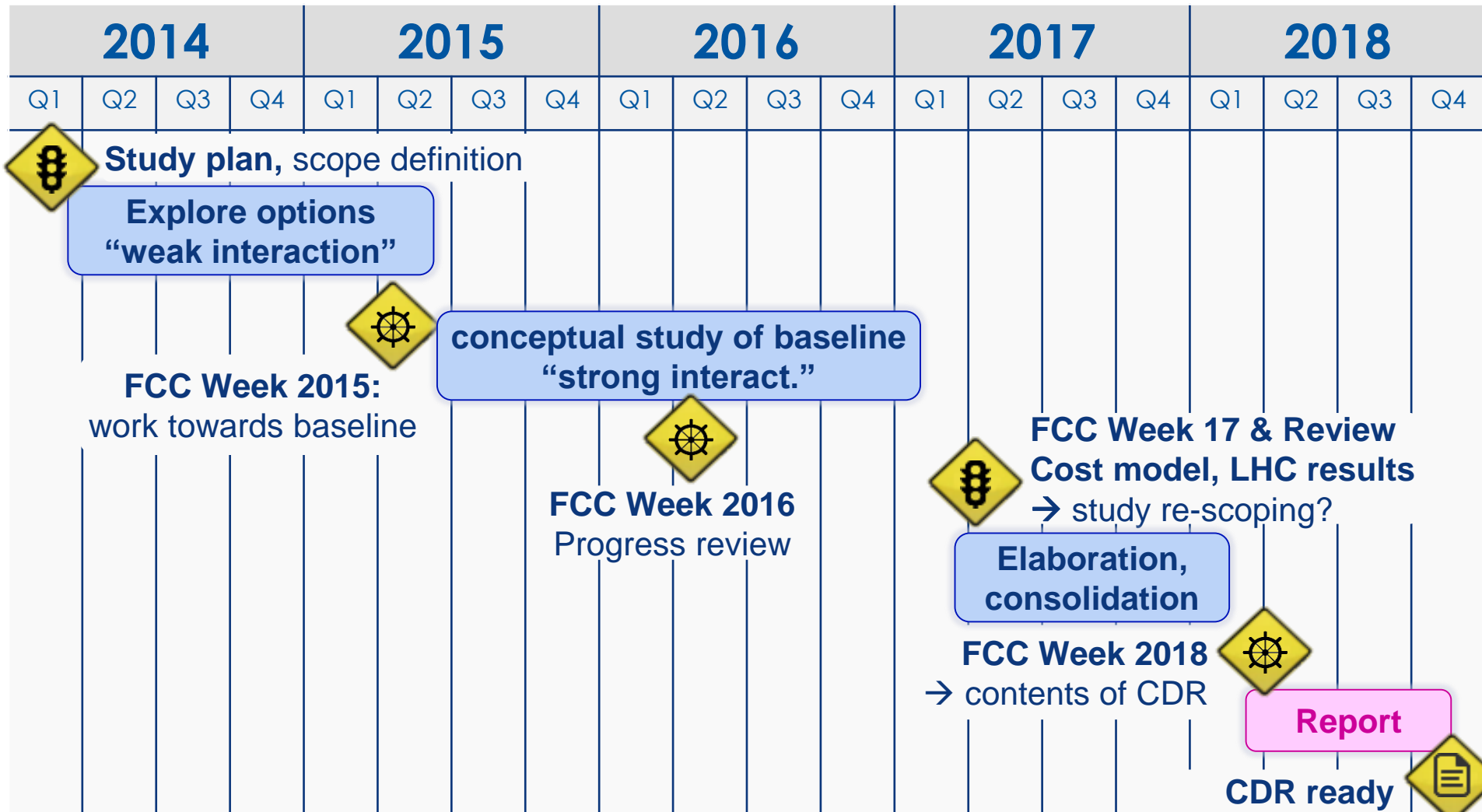




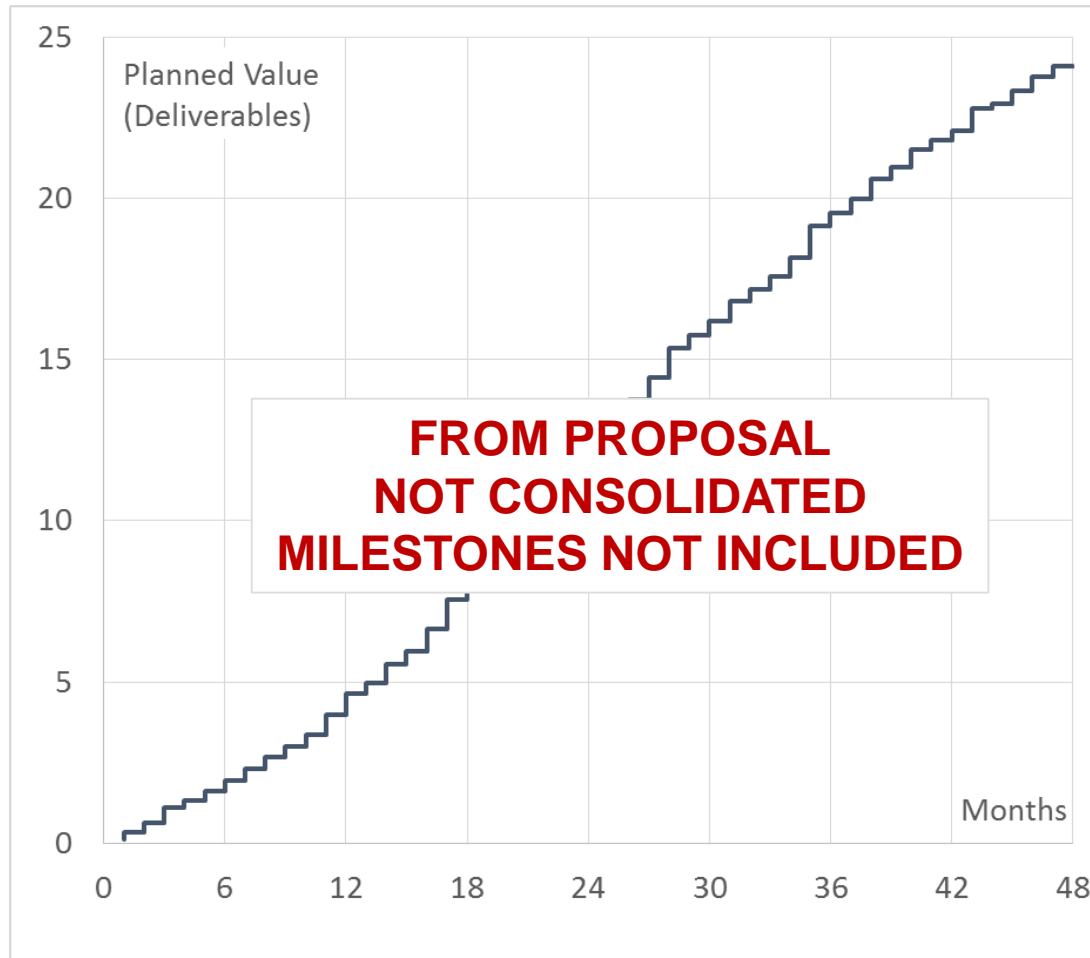
# Goals of WP Meetings this Week

- Review and commit project plan (see D. Schulte)
- Review and adjust dates
  - Start, durations, due dates
- Adjust for 6 months phase shift
  - between EuroCirCol and FCC project schedule
- Identify WP and FCC dependencies
  - between work chunks for milestones and deliverables

# FCC Study time line towards CDR



# Master Schedule



- Schedule towards milestones and deliverables exist for project tracking purposes
- **WP leaders review start and duration of milestones and deliverables to produce an agreed master schedule**
- WP leaders will be periodically asked to provide input to ensure appropriate reporting to EC (item started, completed, delayed, submitted)

# Project Personnel Database

- Administrative
  - Contact for EC project matters (done)
  - Roles for administration support tasks  
**(in progress – please provide information to Julie Hadre as requested)**
- Technical
  - WP leaders
  - WP deputies
  - WP technical contact per WP at Beneficiary
  - Science and engineering team members at Beneficiaries (task leaders, researchers)

# Compile Team Database

**WP leaders send tables to Julie Hadre** with list of persons and work descriptions as input to milestone reports **before October 1, 2015.**

<b>WP 2:</b>		<b>Arc Lattice Design</b>	
<b>Lead:</b>	<b>CEA</b>	<b>Co Lead:</b>	<b>CERN</b>
	A. Chancé		B. Holzer
<b>Participants:</b>	<b>Person (name, email, phone)</b>	<b>Task:</b>	
CERN	Person 1	<i>Work description ...</i>	
	Person 2	...	
CEA	Person 3	...	
	Person 4	...	
CNRS	...	...	
TUD	...	...	
KEK	...	...	

# Administration Support Roles

Names per Beneficiary for:

<b>Administrative Coordination Officer</b>	Collects, compiles and re-distributes technical and financial input (Examples: EU offices, dedicated WP coordination assistants)
<b>Finance Service Officer</b>	Personnel and material resource planning and tracking Preparing Internal Resource Utilisation Summaries and financial reporting to the EC (Examples: finance departments or EU offices)
<b>Communication Officer</b>	Collect, prepare and disseminate information intended for the public (Examples: press offices, outreach groups)
<b>Knowledge and Innovation Officer</b>	Assess background of beneficiaries in the work package Collect and compile IP and technologies with innovation and exploitation potentials Interact with communication offices Liaise with the Coordinator's Knowledge Transfer office
<b>Gender Equality Officer</b>	Monitors gender aspects Assists in identifying and documenting support instruments Work with other Beneficiaries on improvement actions

# Reporting

Report	Date at which information reaches Coordinator	
Internal Activity Report 1	M 10	March 31, 2016
Internal Resource Utilisation 1	M 10	March 31, 2016
Internal Resource Utilisation 2	M 18	November 30, 2016
<b>Periodic Report 1 to EC</b>	M 18 + 10 calendar days	December 10, 2016
Internal Resource Utilisation 3	M 25	June 31, 2017
Internal Activity Report 2	M 25	June 31, 2017
Internal Resource Utilisation 4	M 36	May 31, 2018
<b>Periodic Report 2 to EC</b>	M 36 + 10 calendar days	June 10, 2018
Internal Resource Utilisation 5	M 48	May 31, 2019
<b>Periodic Report 3 to EC</b>	M 48 + 10 calendar days	June 10, 2019

See presentation from Agnes

# CERN takes care of...



Info sheets with project details, processes, contacts, links



Dedicated assistant to project management as link person: **Julie Hadre**



Web with information on project, contacts, templates for report preparation:  
**<http://cern.ch/eurocircol>**



# Next Steps

- Establish governance structures (3. June)
- Schedule for ECC meetings
- Organisation of future WP meetings
  
- Put all agendas on **Indico**
  - <http://cern.ch/fcc-meetings> ► EuroCirCol ► etc.
  
- Work toward milestones in next 12 months

# Milestones & Deliverables

- Check Website: <http://cern.ch/eurocircol>
- Menu ► **Project** ► **Dashboard**

FCC H2020 Project

Team ▾ Work Packages ▾ **Project** ▾ Results ▾ Services ▾ EC ▾ FCC Recent ▾ Search

## Deliverables and Milestone Status

<input type="checkbox"/>	WP	Product	Due Date	Title	Responsible	LinkOut	Status
	1	Milestone	01/07/2015	<a href="#">EuroCirCol Kick-off Meeting</a>	CERN		In progress
	1	Milestone	01/08/2015	<a href="#">Web site available</a>	CERN		In progress
	1	Deliverable	01/10/2015	<a href="#">Preliminary collider baseline parameters</a>	CERN		
	2	Milestone	01/11/2015	<a href="#">WP group established and hiring complete</a>	CEA		
	3	Milestone	01/11/2015	<a href="#">WP group established and hiring complete</a>	UOXF		
	4	Milestone	01/11/2015	<a href="#">WP group established and hiring complete</a>	ALBA		
	5	Milestone	01/11/2015	<a href="#">WP group established and hiring complete</a>	CERN		
	1	Milestone	01/12/2015	<a href="#">QA, publication and communication plan</a>	CERN		
	5	Milestone	01/04/2016	<a href="#">Baseline specifications and assumptions for accelerator magnet</a>	CERN		

# Milestones & Deliverables Y1

Title	Due for EC	Input from WPs
Kickoff meeting report	July 1, 2015	WP leaders provide input before Friday, June 12, 2015
Web site report	August 1, 2015	Done by CERN
Collider baseline parameters	October 1, 2015	Working meeting required to rework baseline parameter document after CE review and include layout baseline
WP team composition reports	November 1, 2015	WP leaders provide team members with work description per person (see table)
QA, publication, communication plan	December 1, 2015	Done by CERN + UNILIV
Magnet baseline specification	April 1, 2016	WP5
Arc optics and lattice files	May 1, 2016	CEA
EIR optics and lattice files	May 1, 2016	UOXF