

Update on LC Activities in Europe



Karsten Buesser
22.10.2018





„The Abduction of Europa“
J.-F. de Troy, 1716

Regional Highlights

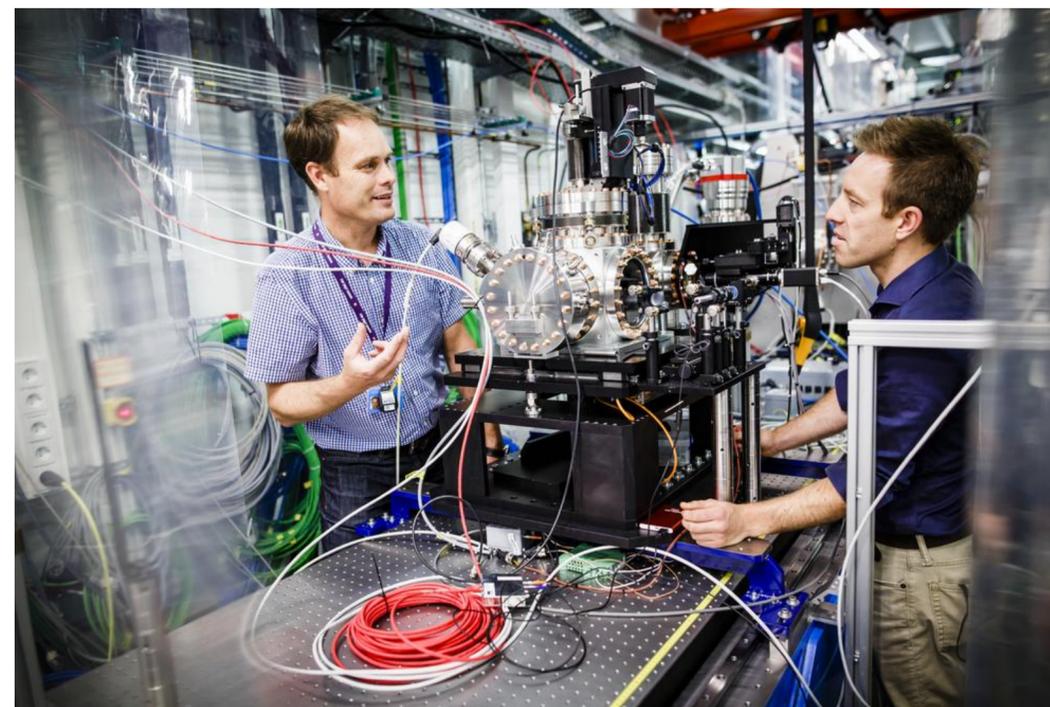
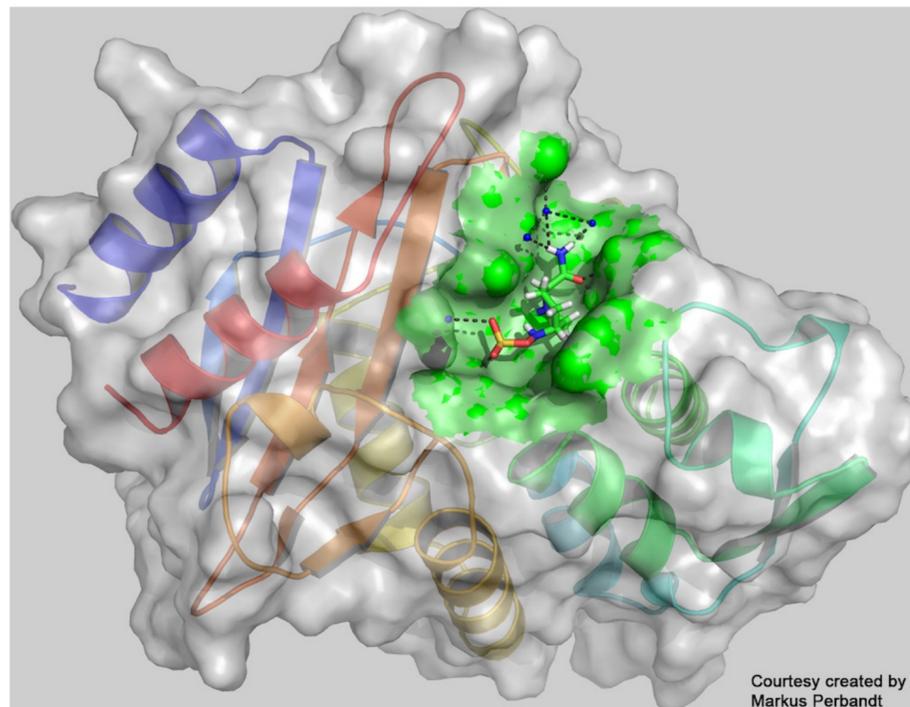
(my personal and very brief selection)

Progress on the European XFEL

The European XFEL has reached its design energy on July 12th 2018:

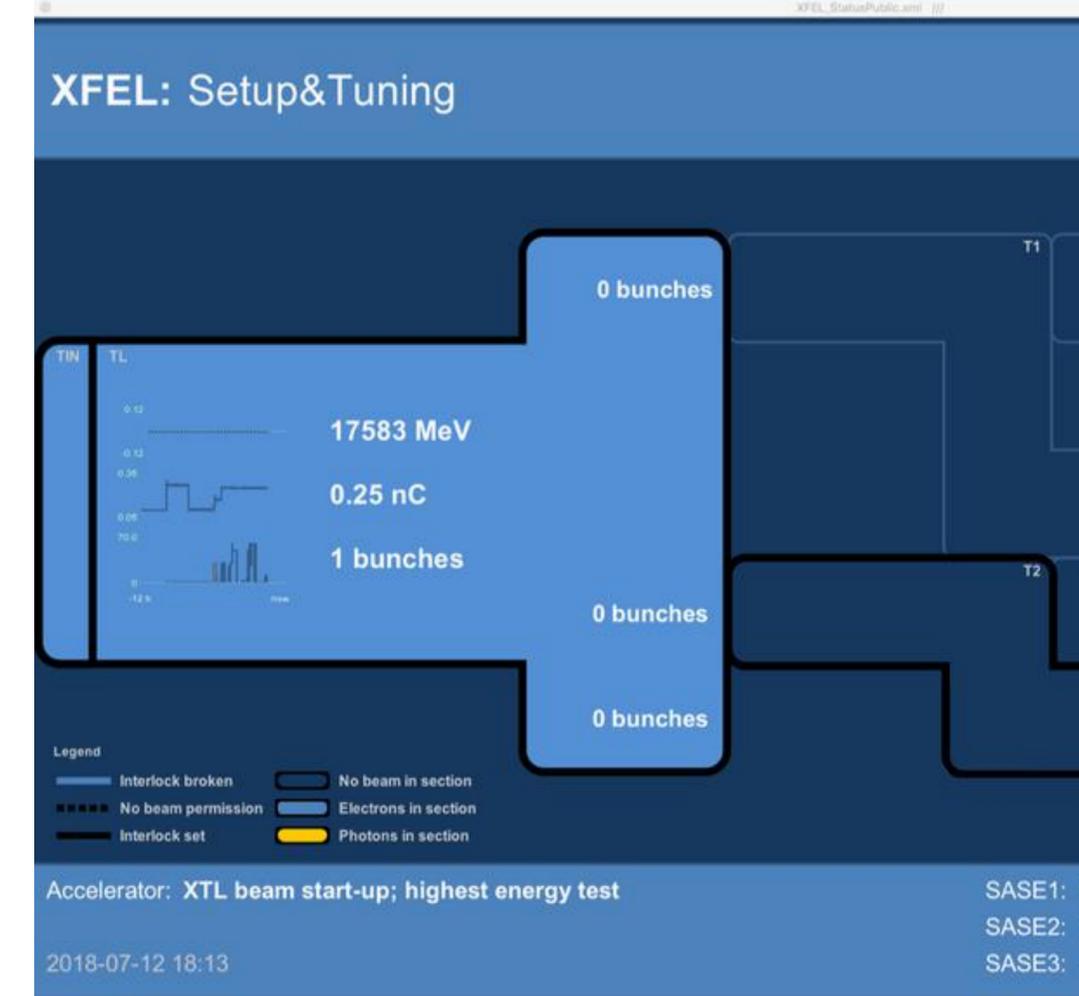
It is now an operating user facility

- ~6800 hours of operation in 2018
- ~2700 hours for experiment commissioning and user time



„Nature Communications“, 2018; DOI: [10.1038/s41467-018-06156-7](https://doi.org/10.1038/s41467-018-06156-7)

The most useful exercise in commissioning and operation of a significant ILC-technology system



SiPM-on-Tile AHCAL Test Beam



“Technological Prototype”, 22000 channels

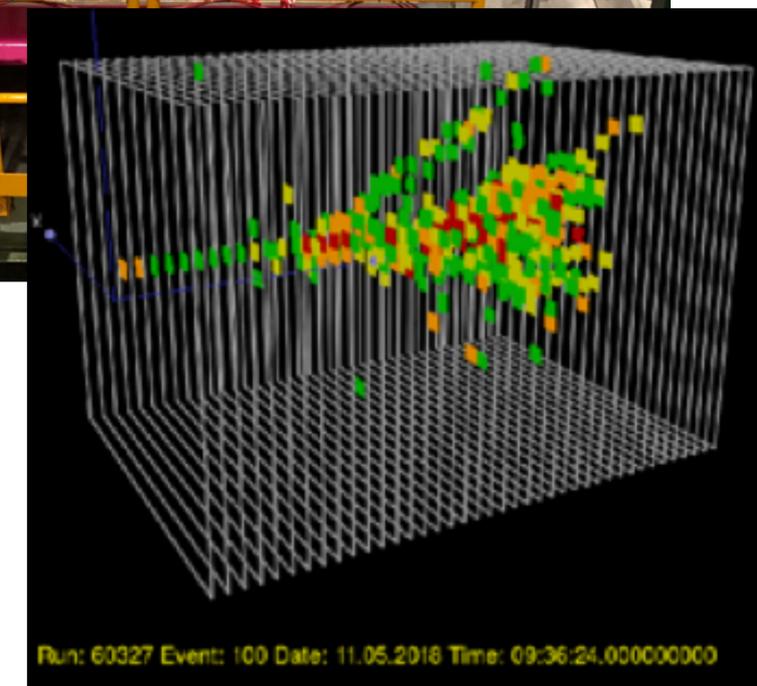
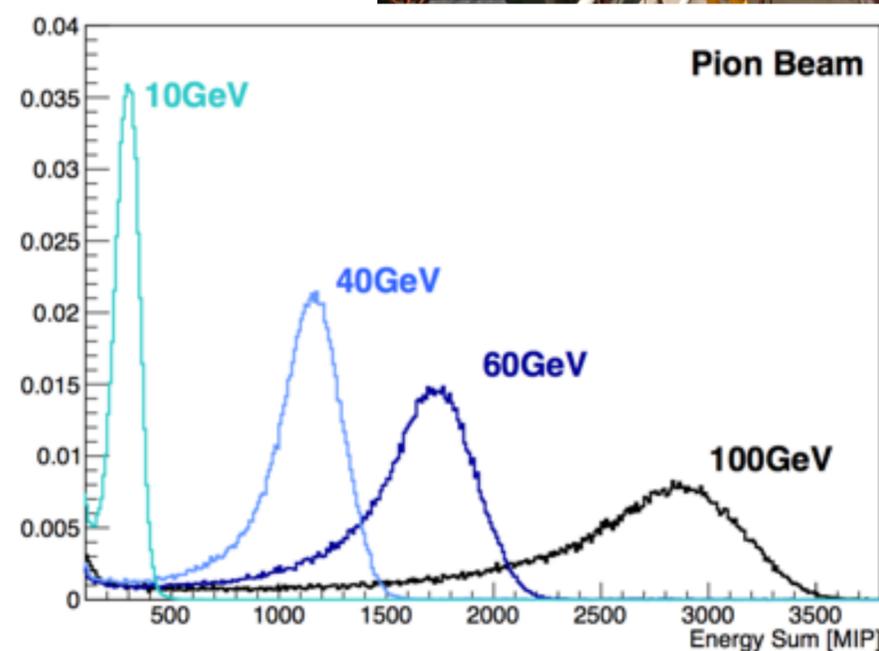
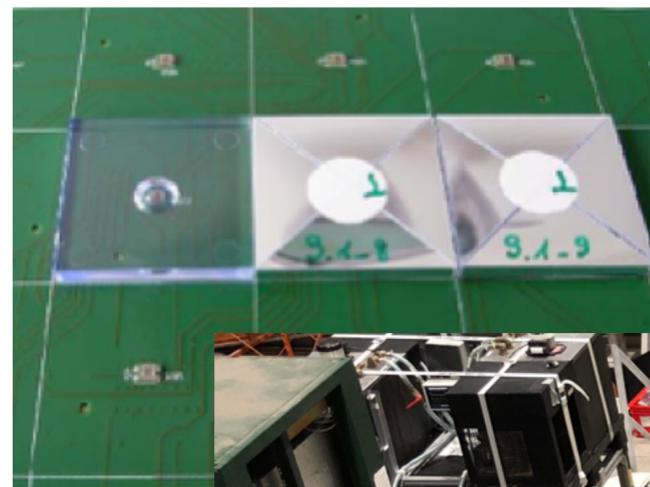
- Scalable design and automated production
- Embedded electronics, power pulsing, temperature compensation
- > 99.9% working channels

Test beam CERN SPS May and June 2018

- 3rd run with CMS HGCal on-going
- > 50 M events collected for analysis

Real system test

- A big step forward



Slide from F. Sefkow

Top-Quark Physics at CLIC

Detailed study on potential of top-quark measurements at 380 GeV, 1.5 TeV and 3 TeV

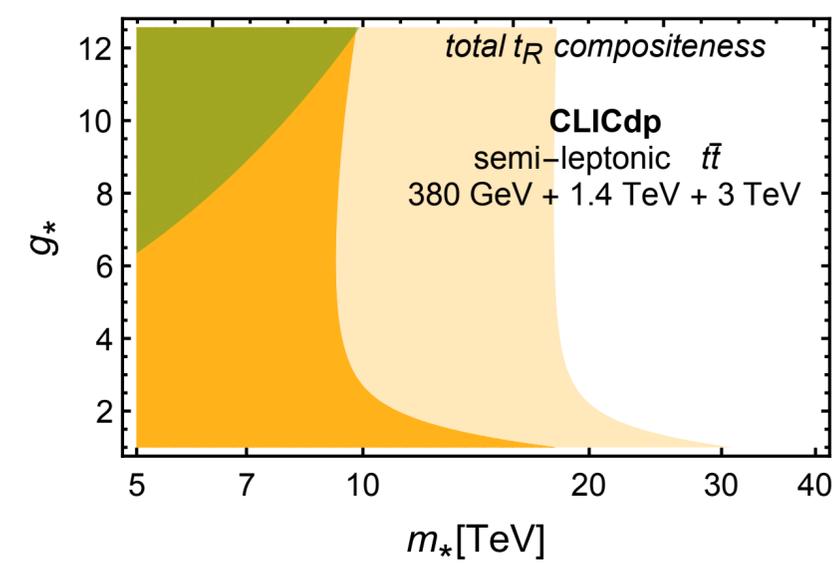
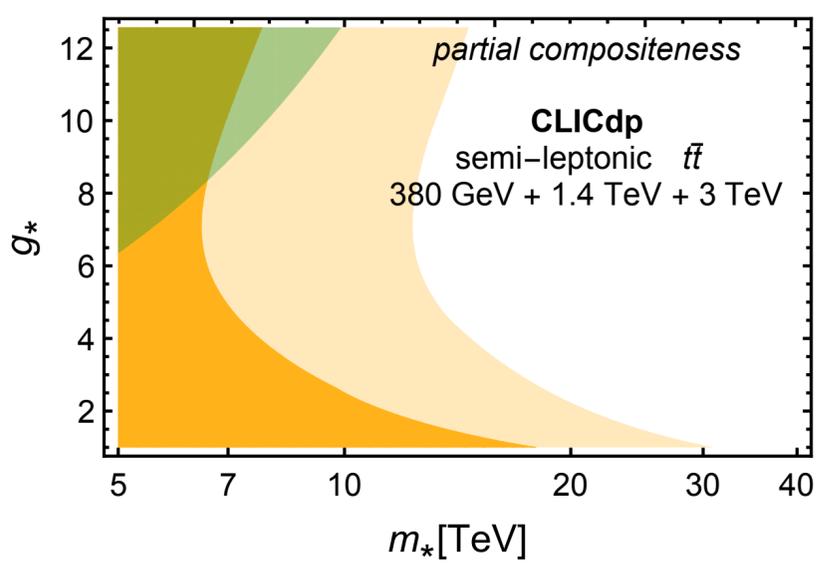
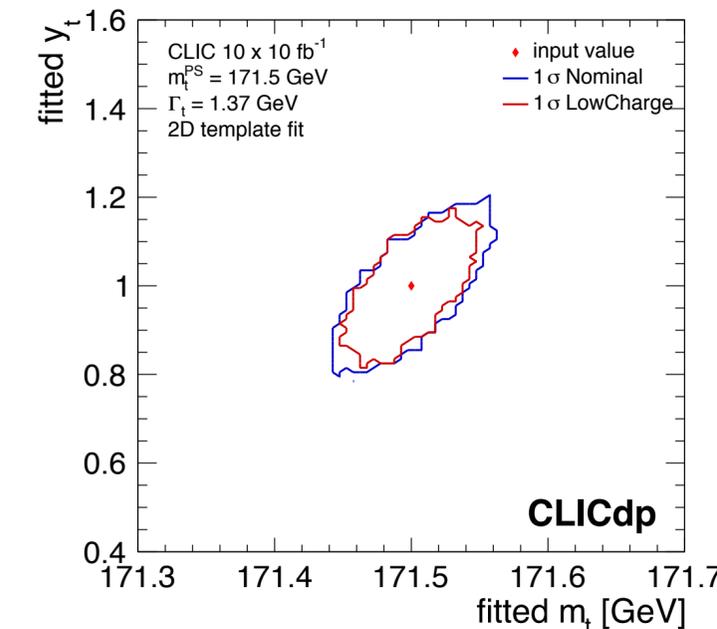
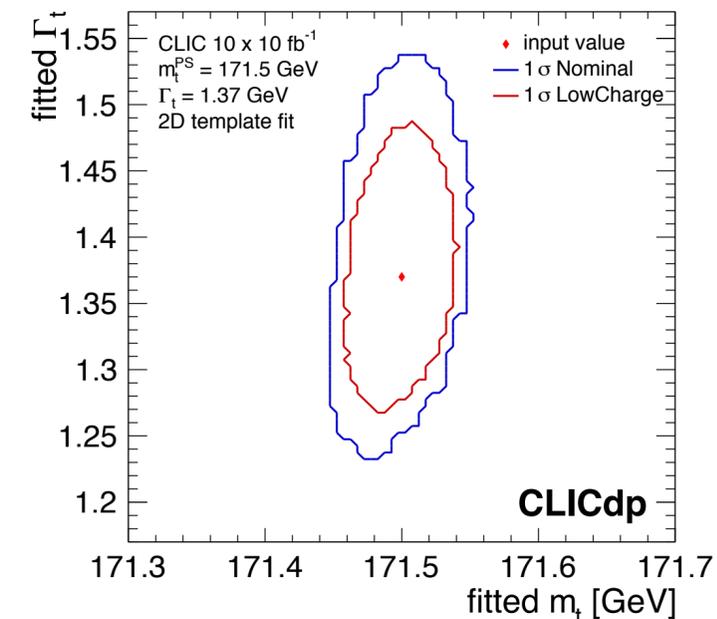
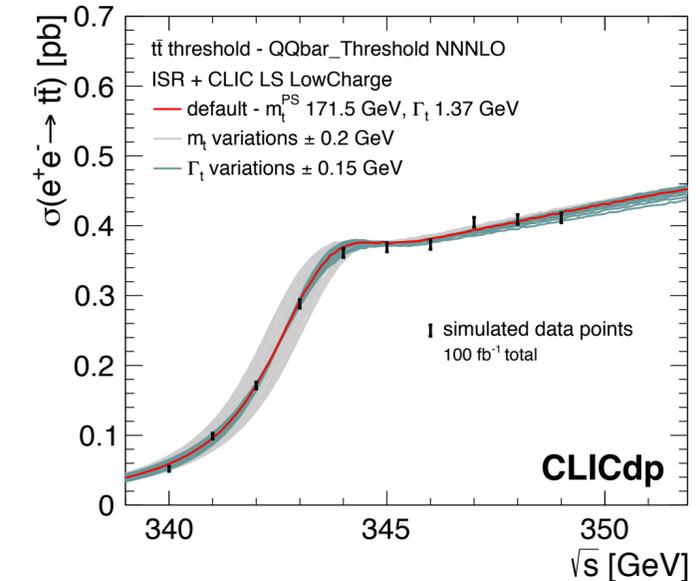
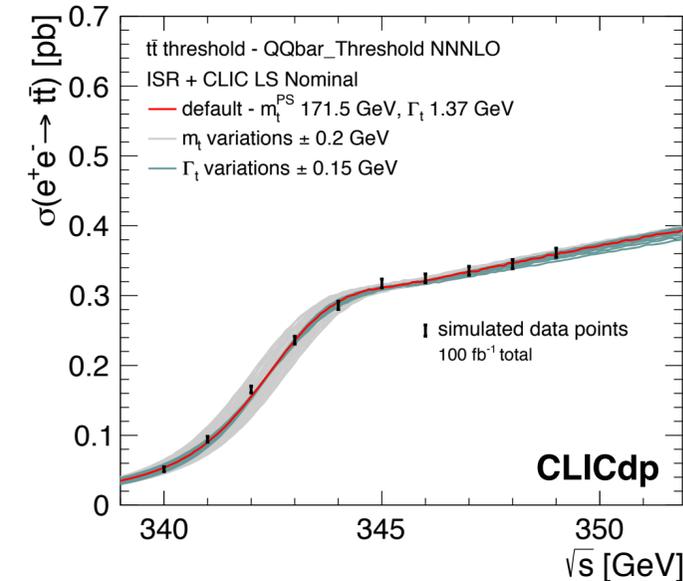
- Paper submitted to JHEP, arxiv:1807.02441

Top threshold scans around 350 GeV

- Total integrated Luminosity of 100 fb^{-1}
- For luminosity spectra of two CLIC parameter sets
- Extract top mass, width, Yukawa couplings

Tests for Compositeness at high energies

- Window to BSM physics



European Strategy

European Strategy Update Process

Defines long-term commitments of European particle physics community

- Implications on national and EU roadmaps and funding at CERN and beyond

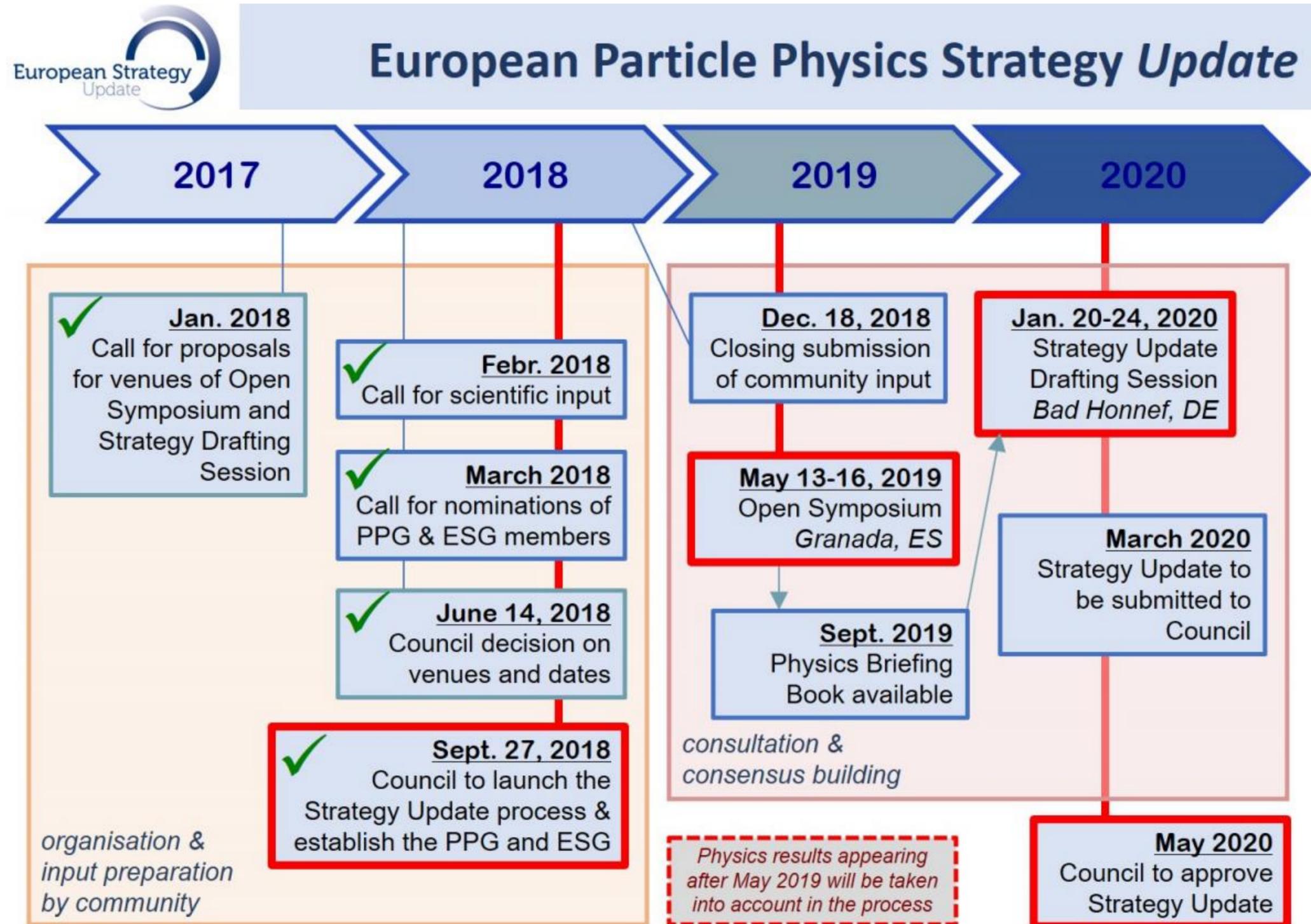
Initiated by CERN Council

- Main bodies:
 - Strategy Secretariat
 - European Strategy Group (ESG)
 - Physics Preparation Group (PPG)

Community Input

- Community Documents
 - 10 pages max.
 - may include links to supporting documents
 - Anyone can submit
 - Deadline: December 18th, 2018
- Open Symposium
 - 13.-16.05.2019, Granada, Spain

<http://europeanstrategy.cern>



CERN Council Open Symposium on the Update of

European Strategy for Particle Physics

13-16 May 2019 - Granada, Spain



Physics Preparatory Group

Halina Abramowicz (Chair)
Shoji Asai Beate Heinemann
Stan Bentvelsen Xinchou Lou
Caterina Biscari Krzysztof Redlich
Marcela Carena Leonid Rivkin
Jorgen D'Hondt Paris Sphicas
Keith Ellis Brigitte Vachon
Belen Gavela Marco Zito
Gian Giudice Antonio Zoccoli

Local Organizing Committee

Francisco del Águila Juan José Hernández
Antonio Bueno (Chair) Mario Martínez
Alberto Casas Carlos Salgado
Nicanor Colino Benjamín Sánchez Gimeno
Javier Cuevas José Santiago
Elvira Gámiz
María José García Borge
Igor García Irastorza
Eugeni Graugés

<https://cafpe.ugr.es/epps2019/>

epps2019@pcgr.org



Sponsored by:



European Strategy for Particle Physics

13-16 May 2019 - Granada, Spain



Physics Preparatory Group

Halina Abramowicz (Chair)	
Shoji Asai	Beate Heinemann
Stan Bentvelsen	Xinchou Lou
Caterina Biscari	Krzysztof Redlich
Marcela Carena	Leonid Rivkin
Jorgen D'Hondt	Paris Sphicas
Keith Ellis	Brigitte Vachon
Belen Gavela	Marco Zito
Gian Giudice	Antonio Zoccoli

Local Organizing Committee

Francisco del Águila	Juan José Hernández
Antonio Bueno (Chair)	Mario Martínez
Alberto Casas	Carlos Salgado
Nicanor Colino	Benjamín Sánchez Gimeno
Javier Cuevas	José Santiago
Elvira Gámiz	
María José García Borge	
Igor García Irastorza	
Eugeni Graugés	

<https://cafpe.ugr.es/epps2019/>

epps2019@pcgr.org



Sponsored by:



IMAGE OF THE WEEK

ILC squat team



6 October 2011

Image: Nicholas Walker

DESY's Eckhard Elsen, Karsten Buesser and Klaus Sinram take a Segway tour of Granada, Spain, while assessing whether Segways would also be a suitable mode of transport for the ILC tunnel.

my last time in Granada
at LCWS11...



LCWS11

European Strategy Update Process



Strategy Secretariat

- Charge: Coordination of the Strategy Update Process
- Members: Scientific Secretary (Chair): Halina Abramowicz, SPC Chair: Keith Ellis, ECFA Chair: Jorgen D'Hondt, Chair EU Lab-Directors Meeting: Lenny Rivkin

European Strategy Group

- Charge: Establish a proposal for the European Strategy for approval by CERN Council
- Members: Strategy Secretary (Chair), one representative from each member state, one representative from each European Lab (CERN, CIEMAT, DESY, Irfu, LAL, Nikhef, LNF, LNGS, PSI, STFC-RAL), CERN-DG, SPC Chair, ECFA Chair
- Invitees: President of CERN Council, one representative each from the Associate Member States, Observer States, European Commission, the Chairs of ApPEC, NuPECC, FALC, ESFRI, members of the Physics Preparatory Group

Physics Preparatory Group

- Charge: Prepare the scientific input („Briefing Book“) based on community input
- Members: Strategy Secretary (Chair) and the other members of the secretariat, four members appointed by recommendation of the SPC, four members appointed by recommendation of ECFA, one representative appointed by CERN, two representatives each for Asia and the Americas

All names on <http://europeanstrategyupdate.web.cern.ch/introduction>

LC Input for the European Strategy Update



Official Input Documents

- ILC:
 - „ILC - a Global Project“: physics and machine
 - „ILC - a European Perspective“: European role and potentials
 - Coordinated by Jim Brau, Juan Fuster, Steinar Stapnes
- CLIC:
 - CLIC project (accelerator & detector)
 - CLIC physics
 - Edited by CLIC/-dp collaboration
- Additional documents expected, e.g. from ILD



Supporting Documents

- ILC: LCB/ICFA statements, reports from physics group on ILC-250, European Preparation Plan, ...
- CLIC: Project Implementation Plan, Preparation Phase Plan, 2018 Summary Report, Physics Potential, Detector Technologies, Parameters and Performance

LC Community Meeting

- Goals: Bring together the LC community and prepare for the Open Symposium in Granada
- Try to define a coherent approach for the realisation of a Linear Collider somewhere in the world
- 08.-09. April 2019 (tbc?), Lausanne, CH

Many discussions planned for this LCWS. Updates will be given by Aidan and Juan on Friday

National Inputs - Example Germany

Series of workshops on future projects:

- The Future of e^+e^- Colliders, 05/2016, Munich
- The Future of Neutrino Physics, 02/2017, Heidelberg
- The Future of Non-Collider-Physics, 04/2017, Mainz
- Future Hadron Colliders at the Energy Frontier, 12/2017, DESY

Concluding Strategy Workshop for Particle Physics, 05/2018, Bonn

Workshop Summary Statement:

- <http://www.ketweb.de/e199632/e199635/e268373/e296589/Abschlusserklaerung.pdf> (sorry, German)
- On e^+e^- colliders: „An electron-positron collider, upgradeable to at least 500 GeV cms energy, should be realised with highest priority.“ (my translation)

The Committee for Particle Physics (KET) is now drafting an input document for the European Strategy Update, based on the workshop summary statement

- For discussion and approval at a community meeting on November 16./17. 2018 in Bad Honnef

Input to the Strategy Update is being prepared from many national communities



European Preparation Plan for the ILC

European Preparation Plan

Started following a request by KEK

- To complement the KEK ILC Action Plan from 2016
- Drafting delegated to E-JADE management
- CERN Council (06/2018): „*The Council took note of a document provided for information, entitled “Preparation plan for European participation in the International Linear Collider”, by the coordinator of the Europe-Japan Accelerator Development Exchange Programme (E-JADE), Professor Stapnes.*“

Potential European involvement in the ILC

- Assumes the ILC will be realised as an international project lead by Japan
- Provides input for the European Strategy preparations
- No commitments at this time!

Assumes three phases:

- 2017-2018: Pre-preparation phase
 - Now, waiting for decisions...
- 2019-2022: Preparation phase
- 2023 and beyond: Construction phase

Preparation Plan for European Participation in the International Linear Collider

Towards a European Contribution to the ILC

Authors: Philip Bambade (LAL Orsay)
 Philip Burrows (Oxford)
 Angeles Faus-Golfe (IFIC-Valencia and LAL)
 Brian Foster (DESY)
 Andrea Jeremie (LAPP Annecy)
 Benno List (DESY)
 Olivier Napoly (CEA-Saclay)
 Thomas Schörner-Sadenius (DESY)
 Marcel Stanitzki (DESY)
 Steinar Stapnes (CERN)
 Nick Walker (DESY)
 Hans Weise (DESY)

Content

Executive Summary	2
1 Introduction	3
2 Past European contributions to the ILC and current activities within Europe	6
3 Preparation phase for the ILC construction 2019–2022	14
4 European in-kind contribution to the ILC construction.	20
5 Possible involvement forms of Europe	21
6 References	23
7 Glossary	24



Pre-Preparation Phase

Current Activities in Europe

- Machine:
 - Major activities are related to large ongoing projects:
 - XFEL, ESS
 - And to R&D facilities:
 - CLIC, ATF2
- Detector R&D is strong in Europe

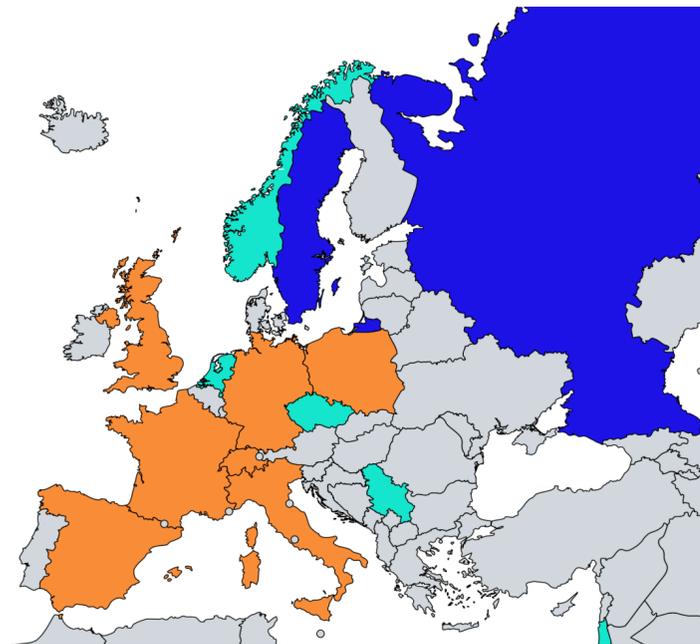


Figure 7: The European countries with current ILC-related activities in the accelerator (blue), detectors (cyan), or both (orange).

Item/topic	Brief description	CERN	France CEA	Germany DESY	Time line
SCRF	Cavity fabrication including forming and EBW technology,	✓			2017-18
	Cavity surface process: High-Q &-G with N-infusion to be demonstrated with statics, using High-G cavities available (# > 10) and fundamental surface research		✓	✓	2017-18
	Power input-coupler: plug compatible coupler with new ceramic window requiring no-coating	✓			2017-19
	Tuner: Cost-effective tuner w/ lever-arm tuner design	✓	✓		2017-19
	Cavity-string assembly: clean robotic-work for QA/QC.		✓		2017-19
Cryogenics	Design study: optimum layout, emergency/failure mode analysis, He inventory, and cryogenics safety management.	✓			2017-18
HLRF	Klystron: high-efficiency in both RF power and solenoid using HTS	✓			2017- (longer)
CFS	Civil engineering and layout optimization, including Tunnel Optimization Tool (TOT) development, and general safety management.	✓			2017-18
Beam dump	18 MW main beam dump: design study and R&D to seek for an optimum and reliable system including robotic work	✓			2017- (longer)
Positron source	Targetry simulation through undulator driven approach			✓	2017-19
Rad. safety	Radiation safety and control reflected to the tunnel/wall design	✓			2017 - (longer)

Table 1: Current common studies between European institutions and Japan relevant for the ILC.

	CERN	DESY	Czech Republic	France	Germany	Italy	Israel	Netherlands	Norway	Poland	Serbia	Spain	UK
Vertexing	✓	✓	✓	✓	✓	✓				✓		✓	✓
Tracking	✓	✓		✓	✓			✓				✓	✓
Calorimetry	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
MDI	✓	✓							✓				✓
System Integration	✓	✓		✓								✓	

Table 6: An overview of present activities in the area of ILC-related detector R&D and integration in Europe.

Preparation Phase

The Preparation Phase will only start if:

- The Japanese government sends a positive signal
- The European Strategy Update ranks European participation in the ILC as a high-priority item

The preparation phase focuses on preparation for construction and agreement of the deliverables and their allocations to the regions

In Europe:

- Technical preparation of European deliverables for the construction phase
 - Final technical specifications, final prototypes, finalisation of pre-series orders
 - Industry involvement
 - Knowledge transfer from XFEL (and ESS) construction to ILC
- European Design Office (most likely at CERN)
 - Satellite offices at other labs
- Documentation based on XFEL experience (EDMS)
- Negotiations about final European contributions, organisation of the project, governance

The founding of the ILC International Lab will be prepared during the preparation phase

Construction Phase

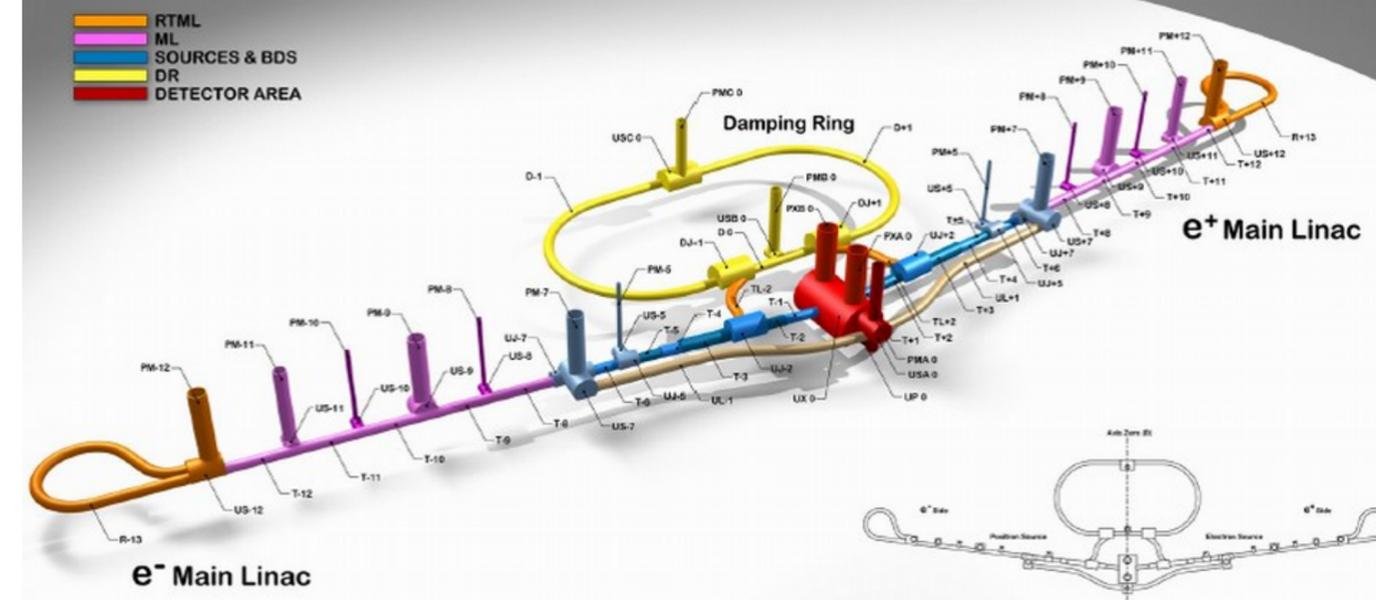
The construction phase starts

- after the establishment of the international ILC laboratory
- after inter-governmental agreements are in place

Preparation plan only describes existing capabilities in Europe

- Detailed contributions will have to be defined during preparation phase and formalised by inter-governmental agreements

Good learning cases are the construction of the XFEL and ESS cryomodules:



	Germany DESY	France CEA Saclay	LAL	Italy INFN Milan	IFJ PAN	Poland WUT	NCBJ	Russia BINP	Spain CIEMAT
Linac									
Cryomodules	✓	✓		✓					
SCRF Cavities	✓			✓					
Power Couplers	✓		✓						
HOM Couplers							✓		
Frequency Tuners	✓							✓	
Cold Vacuum	✓								
Cavity String Assembly	✓	✓							
SC Magnets	✓				✓				✓
Infrastructure									
AMTF	✓				✓	✓		✓	
Cryogenics	✓								
Sites & Buildings									
AMTF hall	✓								

	Germany DESY	France CEA	IPNO	Italy Elettra	INFN-LASA	Poland IFJ-PAN	Spain ESS Bilbao	Sweden ESS	Uppsala	UK STFC
RF systems				✓			✓	✓		
LLRF									✓	
Cryomodules		✓	✓							
SCRF Cavities		✓	✓		✓					✓
Power Couplers		✓	✓							
HOM couplers										
Frequency Tuners		✓	✓							
Cold Vacuum		✓	✓					✓		
Cavity String Assembly		✓	✓							
RF Tests (Cavities)	✓									✓
RF Tests (Cryomodules)		✓	✓			✓		✓	✓	

Table 2: Responsibility matrix for cryomodule production and testing for the European XFEL.

Table 3: Responsibility matrix for the cryomodule production and testing for the ESS.

EU-Funded Projects

EU Funds for Detectors



Follow-up to successful EUDET and AIDA projects

10 M€ EU funds, total 30 M€

- Leverage on national matching funds: 20 M€
- 50% LHC, 25% LC, 25% generic

LC highlights:

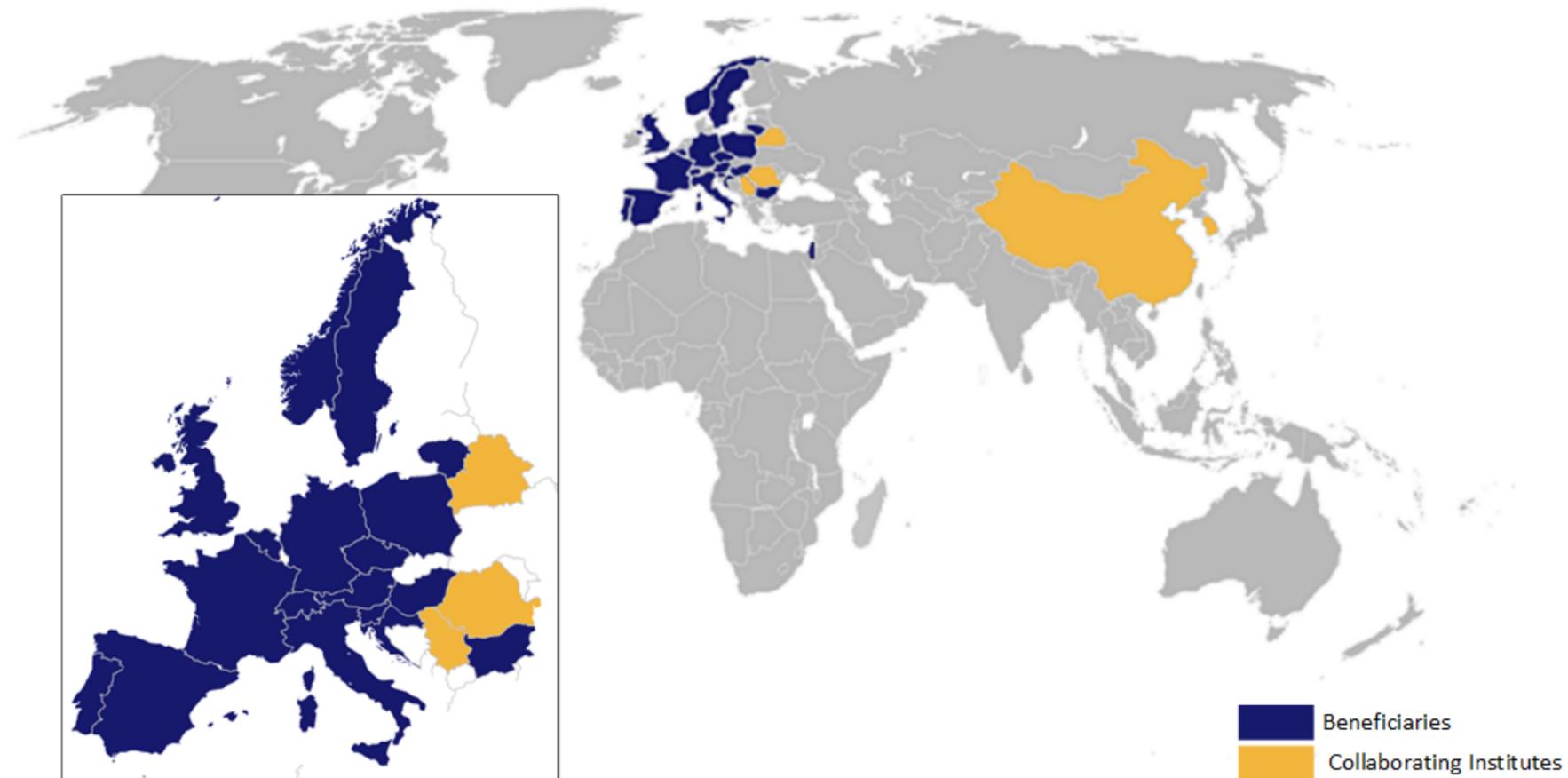
- Common test beam DAQ, reference pixel & st trackers
- Calorimeter infrastructure, software, ASICs

Started 2015 for originally 4 years

- Extended until 4/2020

Expect new call with deadline in 2020 - when new European Strategy in place

<https://aida2020.web.cern.ch>



- 38 institutes, 19 countries

Slide from F. Sefkow

E-JADE

Europe-Japan Accelerator Development Exchange Programme

- Marie Skłodowska-Curie Research and Innovation Staff Exchange (RISE)
- Funded by the EU under Horizon2020

Travel support to Japan for accelerator and detector R&D:

- LHC consolidation, upgrades and R&D for future hadron machines
- Nanometre scale beam handling at ATF
- Linear Collider targeted R&D
- Training and knowledge transfer, Management, Dissemination

18 Partners (14 in Europe, 4 in Japan)

E-JADE researchers have spent so far more than 4500 days doing research in Japan!

Programme ends in this year

- Ideas for a successor programme - including accelerator and detector R&D - exist
- Wait for positive sign from Japan

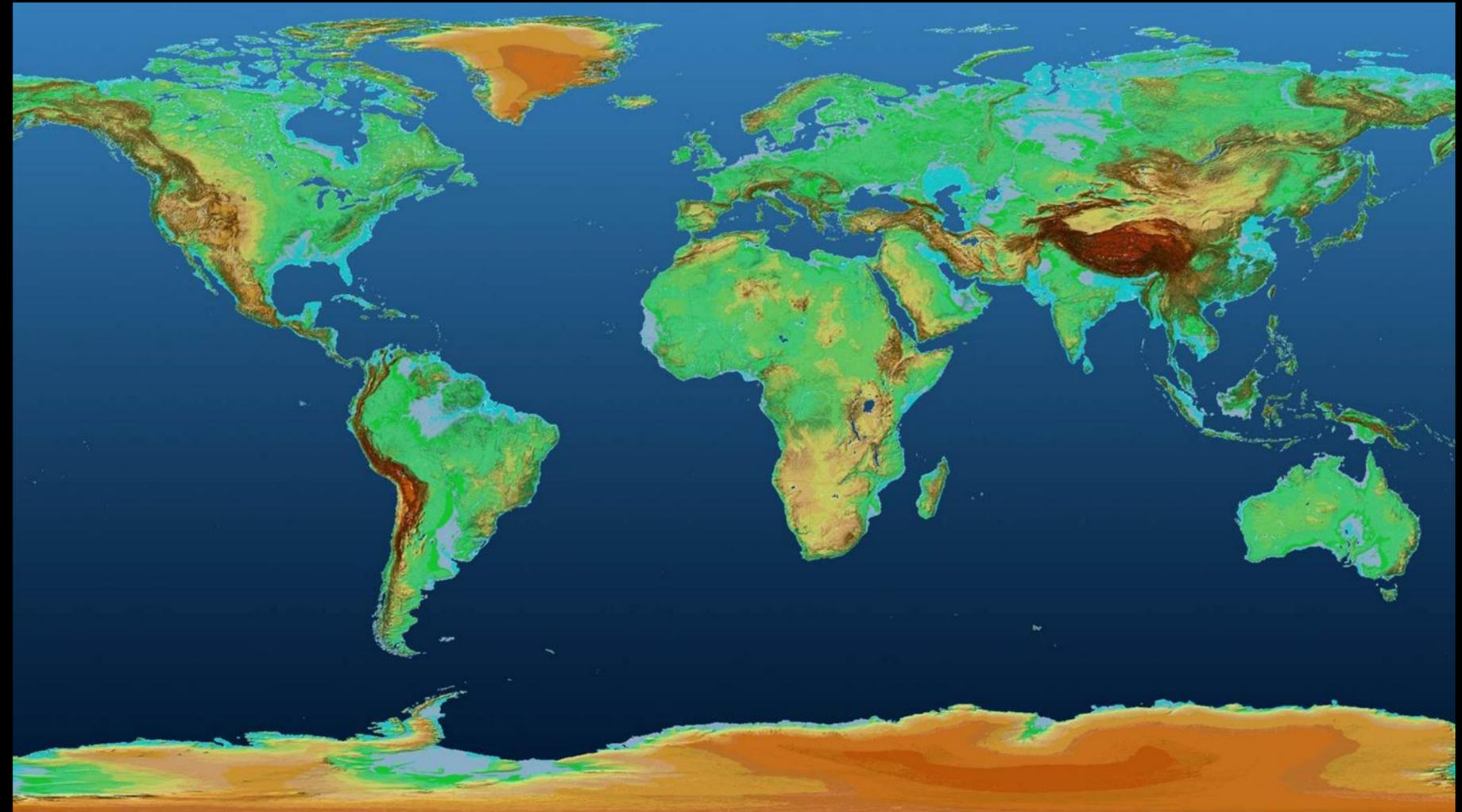


Conclusion

Europa - „the Far-Sighted“

Europe's strategy will have a global perspective

- the global Linear Collider community should give coherent input



Credits: DLR

Contact

DESY.

Deutsches Elektronen-Synchrotron

www.desy.de

Karsten Buesser

karsten.buesser@desy.de

Thanks for input from many colleagues.

Among others: Ties Behnke, Phil Burrows, Juan Fuster, Aidan Robson, Thomas Schoerner, Felix Sefkow, Steinar Stapnes