E-JADE intro

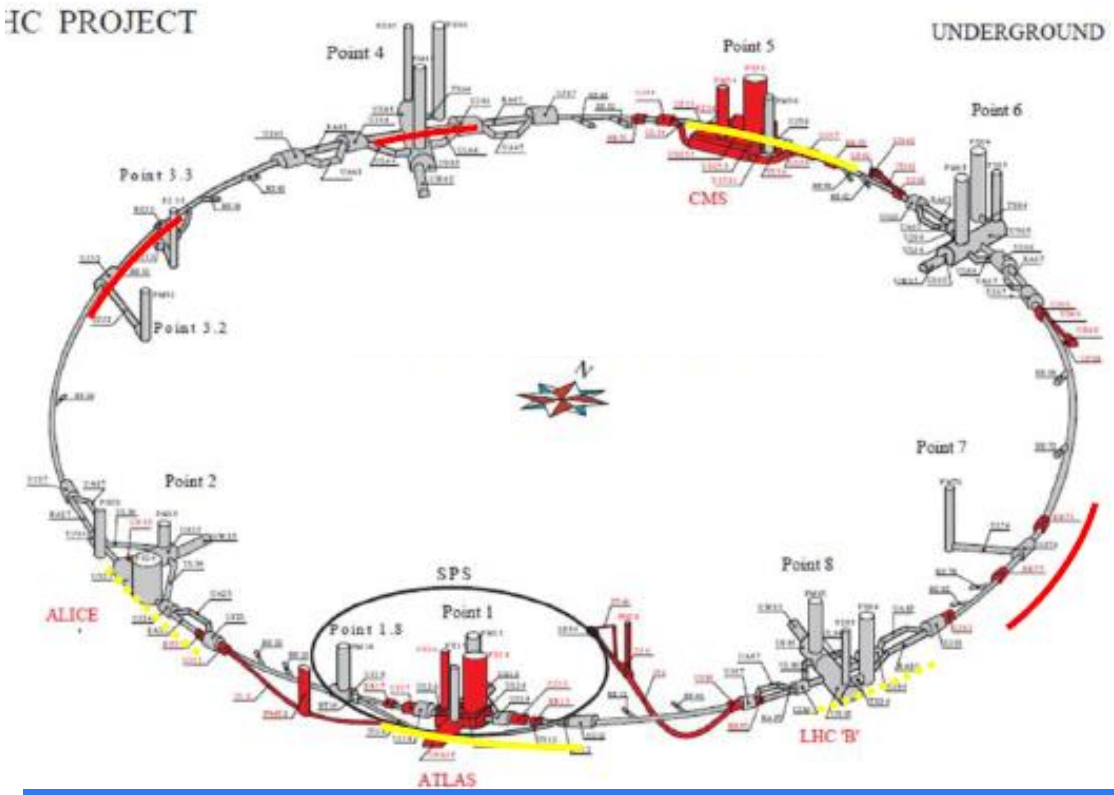
- Application overview
  - Background – motivation – goals
  - Challenges ➔ actions
  - Next steps (by end of the day)
- Practical information about today

Participant number *(as table §A.2)*	Partnership Member	Legal Entity Short Name	Academic (Y/N)	Country
	Beneficiaries			
1	European Organisation for Nuclear research	CERN	Y	CH
2	Commissariat à l'énergie atomique et aux énergies alternatives	CEA	Y	FR
3	Centre National de Recherche Scientifique	CNRS	Y	FR
4	Agencia Estatal Consejo Superior de Investigaciones Cientificas (CSIC)	CSIC	Y	SP
5	Deutsches Elektronen-Synchrotron	DESY	Y	DE
6	Royal Holloway, University of London	RHUL	Y	UK
7	University of Oxford	UOXF	Y	UK
	Partner Organisations			
8	High Energy Accelerator Research Organisation	KEK	Y	JP
9	University of Tokyo	UoT	Y	JP

European Strategy and KEK roadmaps

- Overlapping interests
- Collaboration on projects
- Common R&D interests
- Same timescale

The HL-LHC Project

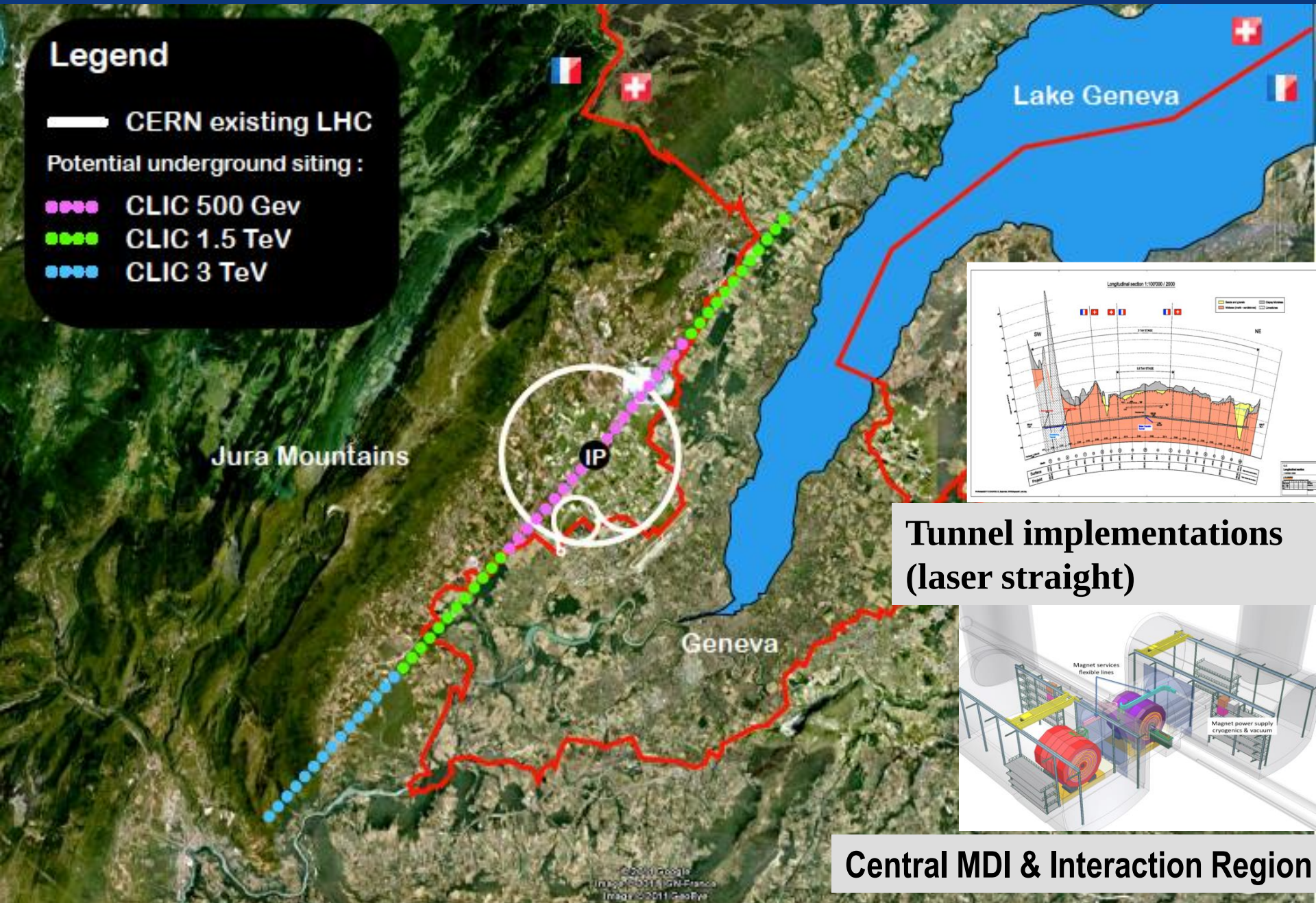


- New IR-quads Nb_3Sn (inner triplets)
- New 11 T Nb_3Sn (short) dipoles
- Collimation upgrade
- Cryogenics upgrade
- Crab Cavities
- Cold powering
- Machine protection
-

Major intervention on more than 1.2 km of the LHC

Collaboration also on LIU

CLIC

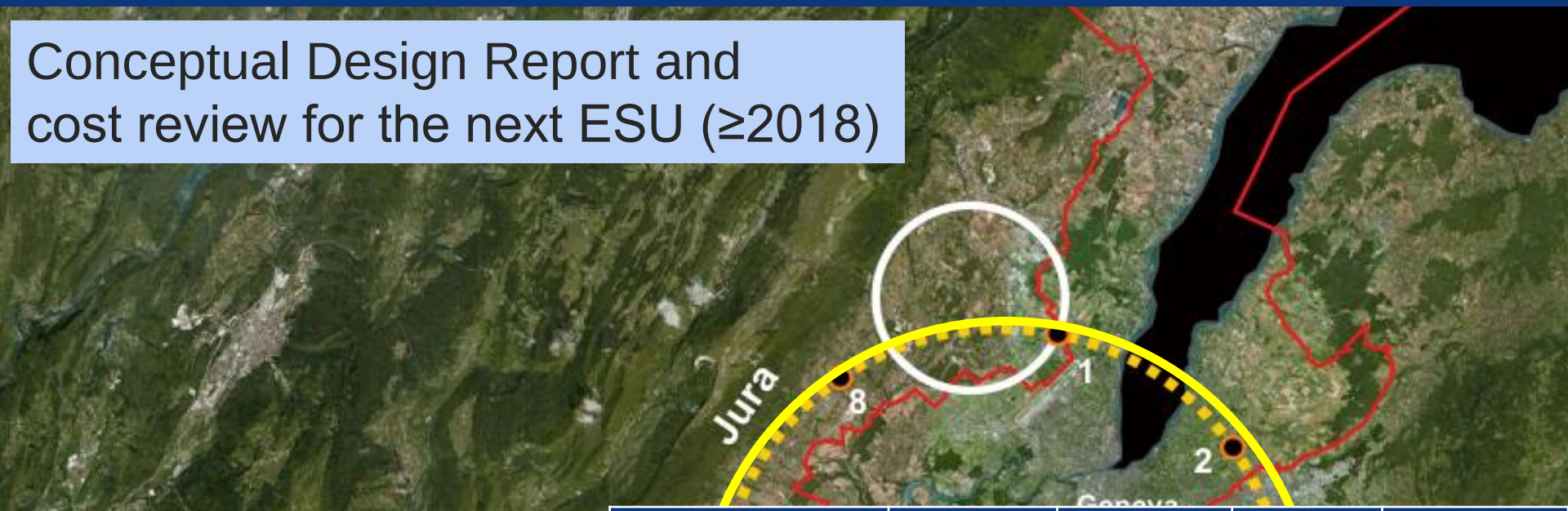


Tunnel implementations (laser straight)

Central MDI & Interaction Region

FCC: 80-100 km tunnel infrastructure in Geneva area – design driven by pp-collider requirements with possibility of e+-e- (FCC-EE) and p-e

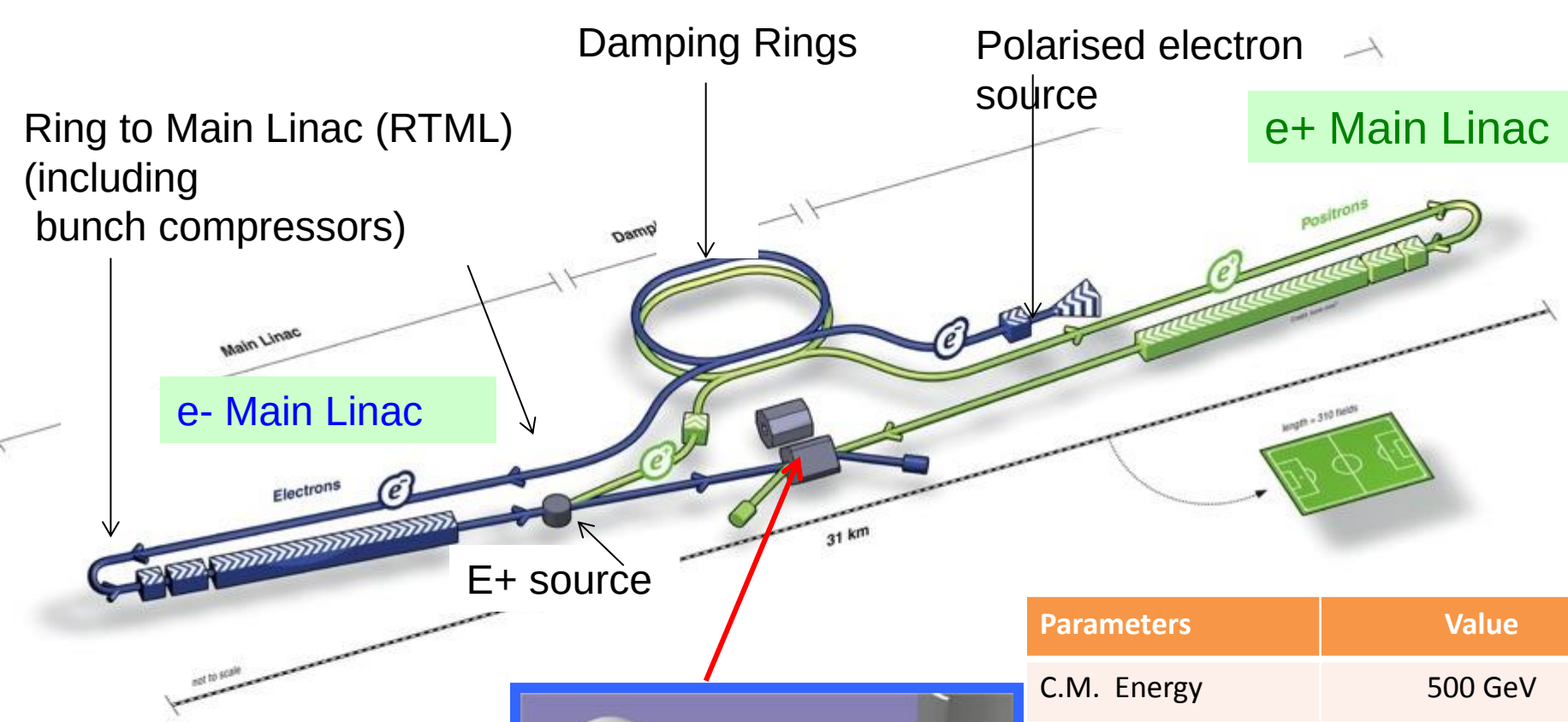
Conceptual Design Report and cost review for the next ESU (≥2018)

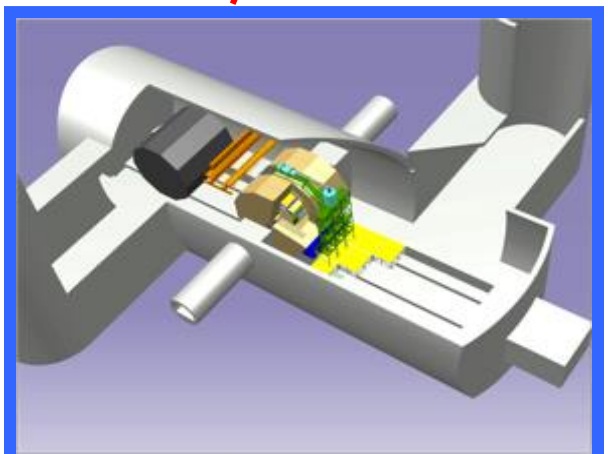


15 T ⇒ 100 TeV in 100 km
20 T ⇒ 100 TeV in 80 km

Parameters (changing)	LHC	HL-LHC	HE-LHC	VHE-LHC
E [TeV]	14	14	33	100
C [km]	26.7	26.7	26.7	80 (100)
B [T]	8.33	8.33	20	20 (16)
P_{SR} [W/m]	0.21	0.4	3.5	84
L [$10^{34}cm^{-2}s^{-1}$]	1	7.4	5	5

ILC TDR Layout





Parameters	Value
C.M. Energy	500 GeV
Peak luminosity	1.8 x10^{34} cm^{-2}s^{-1}
Beam Rep. rate	5 Hz
Pulse duration	0.73 ms
Average current	5.8 mA (in pulse)
E gradient in SCRF acc. cavity	31.5 MV/m +/-20% Q_0 = 1E10

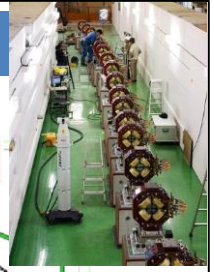
ILC next steps

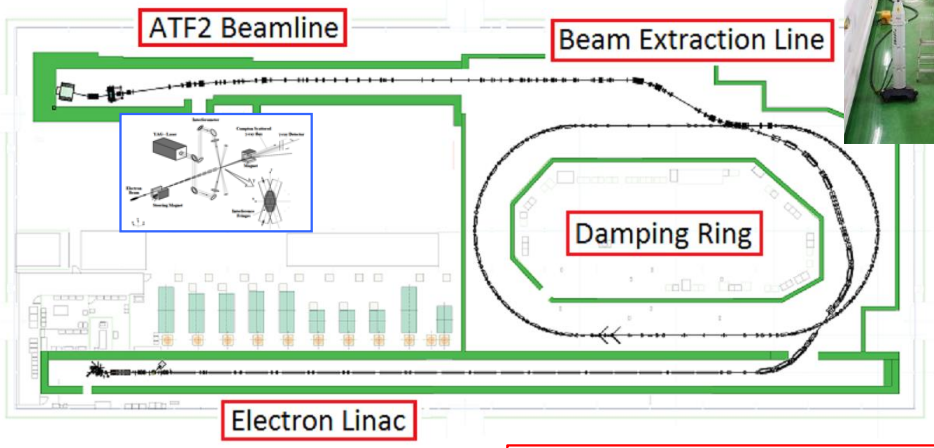
Category	Work-base	Specific subject	Global Collaboration w/
Positron Source		Positron source	PosiPol Collaboration
Nano Beam	ATF	37 nm beam 2 nm stability	ATF collaboration
SCRF Cavity Integration	STF	Power Input Coupler Tuner He-Vessel	CERN-DESY-KEK CEA-Fermi/SLAC-KEK DESY-KEK
CM integration	STF, ILC	Conduction-cooled SC Quadrupole	Fermilab-KEK
Cryogenics	ILC	Cryog. Underground He inventry High p. Gas Safety	CERN-Fermilab-KEK (WS at CERN, 18 June)
CFS	ILC	CFS design prep.	CERN-Fermilab-KEK
Radiation Safety	ILC	ML radiation shield	SLAC-DESY-CERN-KEK

n, Deputies: N. Walker and H. Hayano *KEK LC Project Office Head: A. Yamamoto

	Deputy/Contact p.	KEK-Leader* Deputy	Sub-Group	Global Leader Deputy/Contact P.	KEK-Leader* Deputy
ADI	**N. Walker (DESY)** K. Yokoya(KEK)	K. Yokoya	SRF	**H. Hayano (KEK)** C. Ginsburg (Fermi), E. Montesinos (CERN)	H. Hayano Y. Yamamoto
Sources (e-, e+)	**W. Gai (ANL)** M. Kuriki (Hiroshima U.)	T. Omori	RF	**S. Michizono (KEK)** TBD (AMs , EU)	S. Michizono T. Matsumoto
Damping Ring	**D. Rubin (Cornell)** N. Terunuma(KEK)	N. Terunuma	Cryogenics (incl. HP gas)	**H. Nakai: KEK** T. Peterson (Fermi), D. Delikaris (CERN)	H. Nakai Cryog. Center
RTML	**S. Kuroda (KEK)** A. Latina (CERN)	S. Kuroda	CFS	**V. Kuchler (Fermi)** M. Miyahara (KEK), J. Osborne (CERN),	M. Miyahara T. Sanuki
Main Linac	**N. Solyak (Fermi)** K. Kubo (KEK)	K. Kubo	Rad. Safety	**T. Sanami (KEK)** TBD (AMs) S. Roesler (TBD, CERN)	T. Sanami T. Sanuki
BDS	**G. White (SLAC),** R. Tomas (Cern) T. Okugi(KEK)	T. Okugi	Elect. Support (PS etc.)	TBD	TBD
MDI	**K. Buesser (DESY)** T. Tauchi (KEK)	T. Tauchi	Mechanical S. (Vac. & others)	TBD	TBD
			Dom. Program, Hub Lab. Funct.	TBD	H. Hayano T. Saeki

Final focus: ATF 2 at KEK





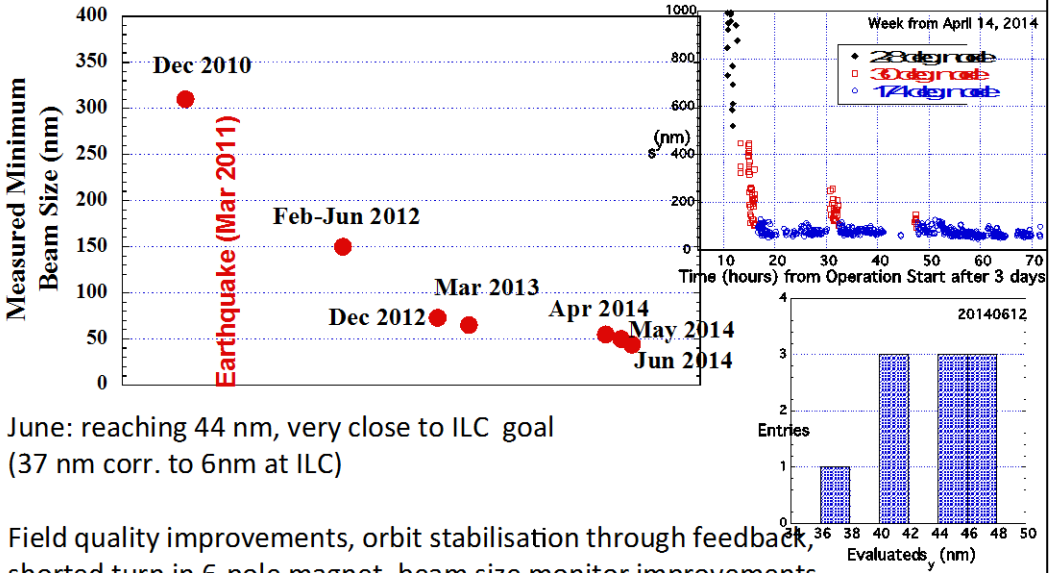
Local chromatic corrections

Similar optics, similar tolerances ATF and ILC

Goal 1: demonstrate optics, tunability

Goal 2: beam st
feedback

ATF-2 beam size development

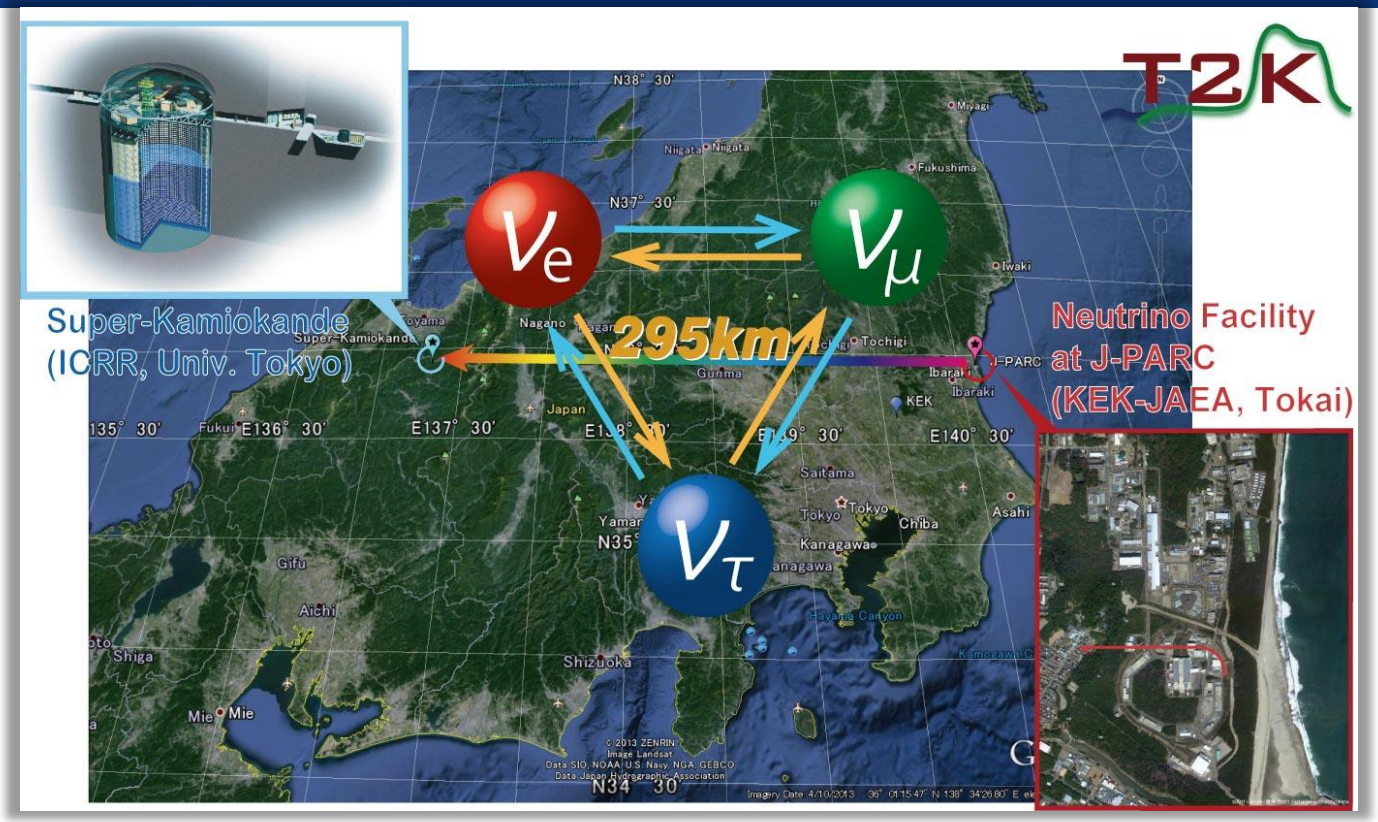


June: reaching 44 nm, very close to ILC goal
(37 nm corr. to 6nm at ILC)

Field quality improvements, orbit stabilisation through feedback, shorted turn in 6-pole magnet, beam size monitor improvements

ATF 2 Future program – next Run October

J-PARC

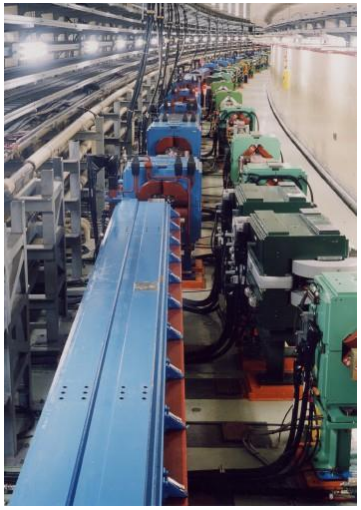


At J-PARC, a proton beam is accelerated by a series of accelerators, which consists of

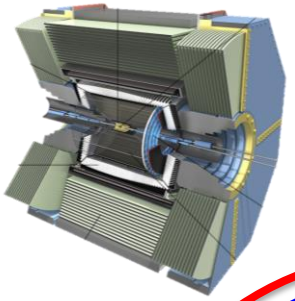
- A 400 MeV (currently operating at 180 MeV) linear accelerator (LINAC)
- A 3 GeV rapid cycling synchrotron (RCS)
- A 50 GeV (currently 30 GeV) main ring (MR)

The applications of these beams include fundamental nuclear and particle physics, materials and life science, and nuclear technology.

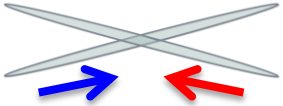
Higher intensity plans exists, as well as detector upgrade plans …

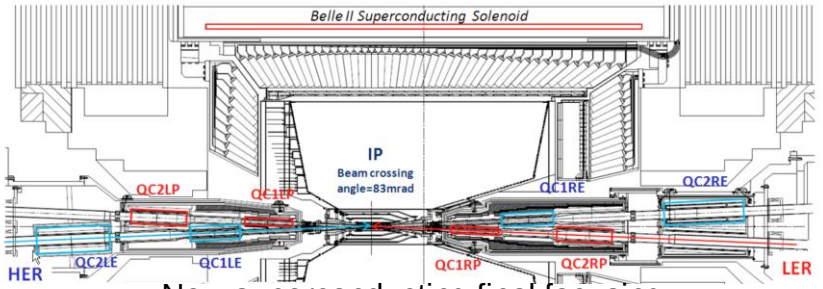


Upgrade to Belle II detector



Colliding bunches





New superconducting final focusing magnets near the IP

e^+ 3.6A

e^- 2.6A

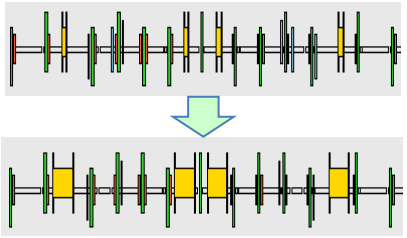
KEKB to SuperKEKB

- Nano-Beam scheme
  extremely small β_y^*
  low emittance
- Beam current double

$$L = \frac{\gamma_\pm}{2er_e}\left(1+\frac{\sigma_y^*}{\sigma_x^*}\frac{I_\pm \xi_{\pm y}}{\beta_y^*}\right)\frac{R_L}{R_y}$$

40 times higher luminosity
2.1×10^{34} --> 8×10^{35} $cm^{-2}s^{-1}$

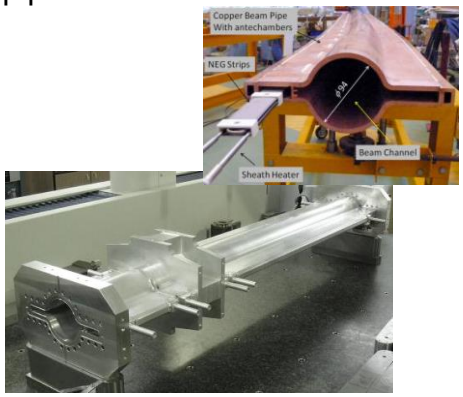
Redesign the lattice to squeeze the emittance (replace short dipoles with longer ones, increase wiggler cycles)



Reinforce RF systems for higher beam currents

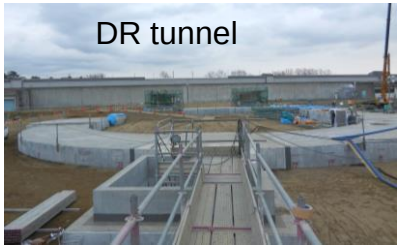
Improve monitors and control system

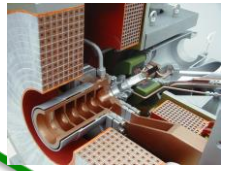
Replace beam pipes with TiN-coated beam pipes with antechambers



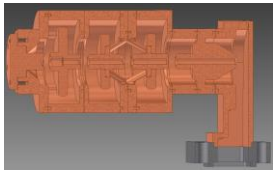
Injector Linac upgrade

Upgrade positron capture section





Low emittance RF electron gun



New e+ Damping Ring

Goals

1) **Optimisation of common efforts to boost future accelerator projects that are part of the Europe and Japan roadmaps by the following means:**
   - Exchange expertise in key technical and organisational areas;
   - Enhance communication and common efforts on developing high-priority projects;
   - Increase information flow, logistics and knowledge exchange among their partners.
2) **Identification of collaboration potential and optimisation of project planning:**
   - Identify skills, expertise, and technologies for application in project development;
   - Improve efficiency of resource usage, including personnel and expertise;
   - Share and develop experience on global partnerships for realising frontier projects.
3) **"Familiarisation"**, including:
   - The scientific, industrial and academic landscapes;
   - Working philosophy and methodology;
   - Culture and languages;
   - Personnel contacts.

Work-packages

Work Package No	Work Package Title	Activity Type (e.g. Research, Training, Management, Communication, Dissemination…)	Number of person-months involved	Start Month	End month
1	LHC consolidation, upgrades and R&D for future hadron machines	Research	78	1	48
2	Nanometre scale beam handling at the ATF	Research	178	1	48
3	Linear Collider targeted R&D	Research	163	1	48
4	Management and Dissemination	Management and Dissemination	99	1	48
5	Training and Knowledge Transfer	Training	22	1	48

Interactions

We propose several network activities for ensuring the coherence of E-JADE and the quality of knowledge transfer among the participations.

- An initial kick-off meeting is foreseen for E-JADE project participants focussing on the plans for the project execution.
- E-JADE meetings will be included in the annual workshops of the major projects (HL-LHC, Linear colliders, ATF).
- Each Beneficiary will organise a specialist Topical Workshop (TW), which will be open and advertised to a wide community, for the purpose of enabling knowledge transfer and exchange of ideas between Early Stage and Experienced Researchers from the Beneficiaries, Partner Organizations and other members of the global research community. The TW will provide an opportunity for assessment of scientific progress in the subject, discussion and development of strategy and future directions in the scientific area, and presentation of industrial applications. The TWs will be distributed across the four-year period.
- We plan to have an annual E-JADE meeting linked to the annual CERN-KEK meeting, to allow follow up and planning. This will allow annual reports across the work-packages and discussions with the CERN and KEK managements.
- We propose to organise two workshops aimed at dissemination, in particular focussing on links with industry. The first workshop will take place at KEK (2016) and the second at CERN (2018); each will last about three days.

1. The **first E-JADE workshop** will be the occasion to present the first results and conclusions from each work package. For several of the projects important goals are due on this timescale. For ILC a site specific design and a formal statement about hosting the project can be expected. For the LHC luminosity upgrade projects construction planning will move rapidly ahead over the coming two years. LHC results at higher energy are also expected to become available 2015-16, which will motivate directions for future accelerator projects. The main focus will be interactions between accelerator developers and industry in each region, with overview of the industrial capabilities, as well as technology transfer activities and innovation potential.
2. **The final E-JADE workshop in 2018** will take place at CERN. It will have similar scope as the first but will also attempt to take a more complete stock of the technical achievements of the E-JADE project, as well as interpret these results in the context of the European Strategy Update at around that time. Again there will be a strong focus on industrial developments and capabilities. The network of European Industry Liaison and Technology Transfer officers will be invited.

Dissemination

3.3.1. Dissemination strategy to achieve the potential impact of the project

The results of this project will be disseminated to its stakeholders, being the scientific community, politicians and policymakers and the general public. Researchers in the staff exchange programme will inherently be the messengers for the global strategy of particle physics and the emerging new infrastructures. They will, at their level, become ambassadors of Europe and the European scientific community. The project will include a task on dissemination of project results, including outreach. This activity will be closely connected to the outreach activities of the LHC, which are well established both at CERN and elsewhere, and the outreach programme for the global Linear Collider Collaboration and its predecessor, the ILC Global Design Effort. There are already professional "communicators" for the LC activities in Japan, Europe and Americas.

The dissemination of results to governments, politicians and policymakers will be done via CERN Council report on the projects in which each Member State is represented. The results will also directly be communicated to high-ranking Japanese government officials. The E-JADE project will intensify the international links with the establishment of the CERN-KEK office, which will act as a bridge of communication. The programme intensifies the relations between the EU and Japan through personal acquaintances, work relations, shared experience and common achievements, and thus laying the foundations for the truly international challenges posed by the next-generation accelerator and experiments in high energy physics.

The results of the research will be presented at conferences and published in open-access journals. They will also be made available in the public domain via web sites and video casts as well as public lectures and magazines. The designs, operational knowledge and performance measurements will be disseminated to the wider scientific community via talks at appropriate meetings. The simulation codes for beam instrumentation will be disseminated via web-pages and open source code repositories. The results are therefore freely available to every interested party and are expected to have significant impact also in other, related fields of research, development and industry. For the industry, specific reports will be disseminated via the CERN Industry and Technical Transfer Officers. All results will be presented at (national and international) conferences, industry meetings and at presentations in laboratories and universities, such as:

Communication

Table B.3.3.2 Outreach activities organized by the network

Activities	Target group	Impact
The seconded researcher will be involved in school class and university visits to the laboratories where they are seconded	12-18 year old high school students, 18-25 year old students	Enhanced interest in science subjects on high schools and universities as well as interest in scientific careers and recognition of the international aspect/possibilities of science.
Guided tours, visitor programmes and science open days at all research institutes	Public at large	Inform the general public and motivate young adults on following a scientific career. Communicate on research benefits and justify tax expenses.
Articles in newspapers and/or popular science magazines	Public at large	Information on real-life implications of key E-JADE innovations to targeted industrial audiences and the public at large; showcasing good use of taxpayers' money.
Multimedia/New Media updates (internet, social media) on E-JADE	Public at large, Young Internet users	Increased interest in science among the European policy; enhanced in scientific careers. Each seconded researcher will be interviewed about their experience.
E-JADE public exhibition	Public at large	Presentation of the results and experiences from the E-JADE programme

More – and “the end”

- WPs goals … after lunch
- Management structure – will come back to after lunch as well (WP4)

- Scientific goals fine
- All “others” must be goal next 6 months