(Not only) Post-ICHEP2024

Discussion Points

K. Augsten, J. Bielčíková, Z. Hubáček,
D. Krupová, J. Kvita, P. Váňa…

Fri 27th Sept 2024, T1 :: MFF UK

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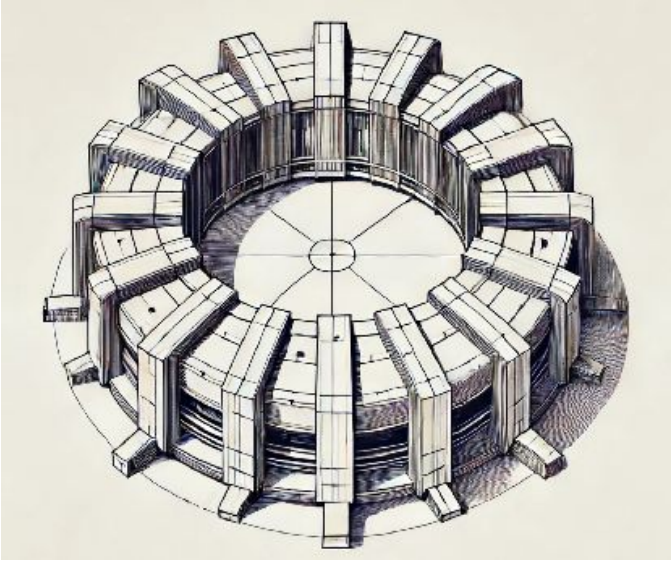


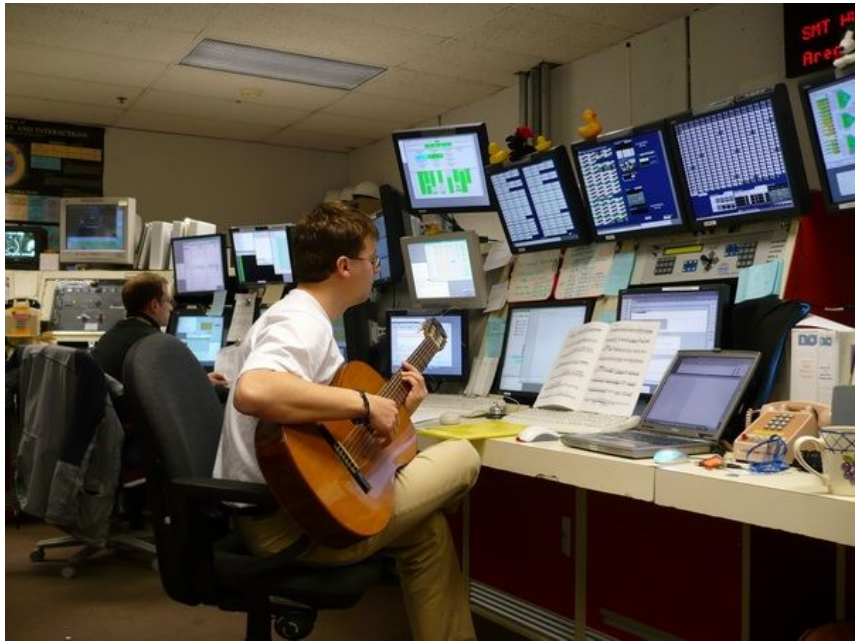
Item	Cost estimate [milion CHF]
FCC-ee (including civil engineering)	10 500
FCC-hh (if replacing FCC-ee)	17 000
Electron source	7.9
CERN yearly budget (2022)	1 400

Once upon a time at Fermilab

2007

Once upon a time at Fermilab

2004



Particle Data Group booklet, 1992

https://pdg.lbl.gov/rpp-archive/

HIGH-ENERGY COLLIDER PARAMETERS: pp, $\bar{p}p$ and ep Colliders

The numbers here were received from representatives of the colliders in 1991. Numbers are subject to change, and many are only estimates. Quantities are, where appropriate, r.m.s. H, V, and s.c. indicate horizontal and vertical directions, and superconducting.

	S$p\bar{p}$S (CERN)	TEVATRON (Fermilab)	HERA (DESY)	UNK (Serpukhov)	LHC (CERN)			SSC (USA)
Physics start date	1981	1987	1990	1997	1998			2000
Particles collided	$p\bar{p}$	$p\bar{p}$	ep	pp	pp	Pb Pb	ep	pp
Maximum beam energy (TeV)	0.315 (0.45 in pulsed mode)	0.9–1.0	e: 0.026 p: 0.82	0.4 (3)	7.7	631	e: 0.06 p: 7.7	20
Luminosity ($10^{30}\text{cm}^{-2}\text{s}^{-1}$)	6	2 (1989) 10 (1993)	16	1000	1.7×10^4	0.002	280	1000, $\beta^* = 0.5$ m 55, $\beta^* = 10$ m
Time between collisions (μs)	3.8	3.5	0.096	0.165	0.015	0.105	0.165	0.016678
Crossing angle (μ rad)	0	0	0	0	200	200	0	75
Energy spread (units 10^{-3})	0.35	0.15	e: 0.91 p: 0.2	± 1 (± 0.3)	0.1	0.2	0.1	0.058
Bunch length (cm)	20	50	e: 0.83 p: 8.5	70 (40)	7.5	7.5	e: 0.93 p: 7.5	6.0
Beam radius (10^{-6} m)	p: 73(H), 36(V) $\bar{p}$: 55(H), 27(V)	36	e: 280(H), 37(V) p: 265(H), 84(V)	70	15	12	122 (H) 37 (V)	4.8, $\beta^* = 0.5$ m 21.7, $\beta^* = 10$ m
Free space at interaction point (m)	16	± 6.5	± 5.5	± 8	40	40	15	± 20, $\beta^* = 0.5$ m ± 120, $\beta^* = 10$ m

Particle Data Group booklet, 1992

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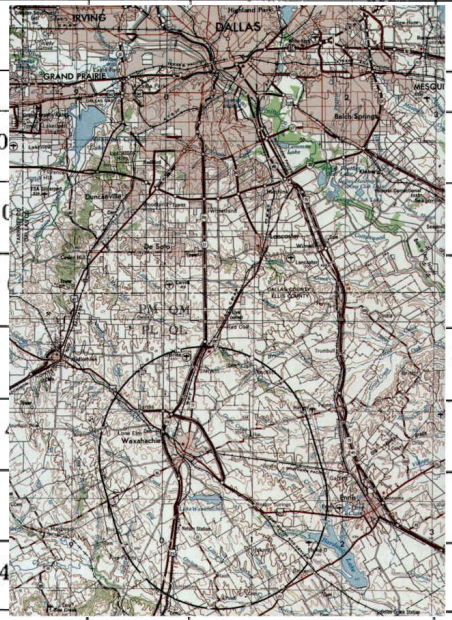
	$S p\bar{p}S$ (CERN)	TEVATRON (Fermilab)	HERA (DESY)	UNK (Serpukhov)	LHC (CERN)			SSC (USA)
Luminosity lifetime (hr)	15	15–40	>3	10	11	11	24	~24
Filling time (min)	0.5	8	e: 15 p: 20	20				~60
Acceleration period (s)	10	44	—	100				1000
Injection energy (TeV)	0.026	0.15	e: 0.014	0.065 (0.4)	0			2
Transverse emittance ($10^{-9}\pi$ rad-m)	p: 9 $\bar{p}$: 5							0.047
β^*, amplitude function at interaction point (m)	0.6 (H 0.15 (V							0.5 at 2 IR's 10 at 2 IR's
Beam-beam tune shift per crossing (units 10^{-4})	50							$\beta^* = 0.5$ m: 8 head on, 13 long range
RF frequency (MHz)	100+20							359.75
Particles per bunch (units 10^{10})	p: 15 $\bar{p}$: 8							0.84
Bunches per ring per species	6				4			17,424
Average beam current per species (mA)	p: 6 $\bar{p}$: 3	p: 4.6 $\bar{p}$: 3.2	e: 58 p: 163	240	850	7.4	e: 84 p: 273	73
Circumference (km)	6.911	6.28	6.336	20.772	26.659			87.12
Interaction regions	2	2 high $\mathcal{L}$	3	4	3	1	1	Maximum 8 total, 4 simultaneous
Utility insertions	—	4	4	2	2			2



SSC hopes

https://www.aps.org/archives/publications/apsnews/201310/physicshistory.cfm
https://en.wikipedia.org/wiki/Superconducting_Super_Collider

Partial construction and financial issues [edit]

During the design and the first construction stage, a heated debate ensued about the high cost of the project. In 1987, Congress was told the project could be completed for $4.4 billion, and it gained the enthusiastic support of Speaker Jim Wright of nearby Fort Worth, Texas.[4][16] A recurring argument was the contrast with NASA's contribution to the International Space Station (ISS), a similar dollar amount.[4] Critics of the project

Fermilab director and subsequent Nobel physics prizewinner Leon Lederman was a very prominent early supporter – some sources say the architect[10] or proposer[11] – of the Superconducting Super Collider project, as well as a major proponent and advocate throughout its lifetime.[12][13]

Leaders hoped to get financial support from Europe, Canada, Japan, Russia, and India. This was hindered by promotion of the project as promoting American superiority.[18] European funding remained at CERN, which was already working on the Large Hadron Collider. India pledged $50 million, but talks with Japan foundered over trade tensions in the automobile industry.[18] A US-Japanese trade mission where SSC funding was supposed to be discussed ended in the George H. W. Bush vomiting incident.[18]

SSC clouds

https://www.aps.org/archives/publications/apsnews/201310/physicshistory.cfm
https://en.wikipedia.org/wiki/Superconducting_Super_Collider

A Central Design Group (CDG) was organized in California at the Lawrence Berkeley Laboratory, which became the gathering place for physicists to come and support the SSC design effort. In the mid-1980s, many leading high-energy physicists, including theorist J. David Jackson of Berkeley, Chris Quigg of Fermilab, Maury Tigner of Cornell, Stanley Wojcicki, as well as Lederman, Chicago's James Cronin, Harvard theorist Sheldon Glashow, and Roy Schwitters, continued their efforts to promote the Super Collider.[14]

grown to $8.4 billion.[19] In June, the non-profit Project on Government Oversight released a draft audit report by the Department of Energy's Inspector General heavily criticizing the Super Collider for its high costs and poor management by officials in charge of it.[20][21] The Inspector General investigated $500,000 in questionable expenses over three years, including $12,000 for Christmas parties, $25,000 for catered lunches, and $21,000 for the purchase and maintenance of office plants.[22] The report also concluded that there was inadequate documentation for $203 million in project spending, or 40% of the money spent up to that point.[23]

In 1993 U.S. President Bill Clinton tried to prevent the cancellation by asking Congress to continue "to support this important and challenging effort" through completion because "abandoning the SSC at this point would signal that the United States is compromising its position of leadership in basic science".[24]

SSC – R.I.P.

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The closing of the SSC had adverse consequences for the southern part of the Dallas–Fort Worth Metroplex, contributing to a mild recession especially in those parts of Dallas which lay south of the Trinity River.[32] When the project was canceled, 22.5 km (14.0 mi) of tunnel and 17 shafts to the surface were already dug, and nearly two billion dollars had already been spent on the massive facility.[33]

Cancellation [edit]

After $2 billion had been spent ($400 million by the host state of Texas, the rest by the Department of Energy[18]), the House of Representatives rejected funding on October 19, 1993, and Senate negotiators failed to restore it.[25] Following Rep. Jim Slattery's successful orchestration in the House,[25] President Clinton signed the bill that finally canceled the project on October 30, 1993, stating regret at the "serious loss" for science.[26]

Why

- Many young/early people helped organizing the ICHEP2024 conference!
  - again, huge thanks! ;-)
- The future is yours! The future is in your hand!
- Get involved in shaping it!
- Future of
  - particle physics
  - particle physics in Czechia/Slovakia
  - your career path
- Can we do better in
  - sharing ideas
  - exchanging technical tools, contacts, career opportunities
  - inspiring each other
  - keep the community
  - present your work, share you outputs

What can we do for all that?

- Would you like to meet?
  - formally – topical workshops? Also related to the FORTE project
    - May/June or October 2025?
  - informally – get togethers like this after events like this;)
    - there will be Jan and March meetings
  - both;-)
- Tell others
  - events like FCC should be of interest not only to experimentalists but also theorists and phenomenologists
  - the more of you, the stronger the community
- What to discuss
  - particle physics is highly evolving field
    - accelerators
      - neutrino physics also needs accelerators;)
    - changing tools like analysis approaches, languages, AI/ML
- Your ideas;-)

Your contact point

https://www.particle.cz/ecfa/ecr/

Your contact points

https://www.particle.cz/ecfa/ecr/

Who are we?

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Czech Technical University in Prague
Faculty of Nuclear Sciences and Physical Engineering

Our Mission

- Organize meetings where ECRs from Czech institutions can meet and discuss various topics
- Inform what is happening in ECFA and ECFA ECR Panel
- Address topics that are important for ECRs and for the future of the field, if suitable organize topical events
- Create and maintain Czech HEP Alumni (ECR)