## IDT-WG2 report

Shin MICHIZONO (KEK/IDT-WG2) (June 28, 2022)

-Snowmass accelerator

Conference information: July 6-13: ICHEP 2022 (Bologna, Italy) <u>https://agenda.infn.it/event/28874/program</u> July 17-26: Snowmass Community Summer Study Workshop <u>http://seattlesnowmass2021.net/</u>



DPF Community Planning Exercise

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Announcements Snowmass Calendar Ethics Guidelines Snowmass Report

#### Organization

Snowmass Steering Group Snowmass Advisory Group Frontier Conveners APS DPF Snowmass page Snowmass Early Career

#### Snowmass Frontiers

**Energy Frontier** Neutrino Physics Frontier Rare Processes and Precision **Cosmic Frontier** Theory Frontier Accelerator Frontier Instrumentation Frontier Computational Frontier **Underground Facilities** Community Engagement Snowmass Liaisons Letters of Interest Contributed (White)

Trace: • accelerator

### ACCELERATOR FRONTIER

\* Snowmass 21/22 Community Summer Study (Seattle, July 17-26) - please, REGISTER ASAP http://seattlesnowmass2021.net/

### AF Reports (Drafts)

Here is the list of the preliminary drafts of reports in the Accelerator Frontier and their associated documents to collect feedback by the community before the reports are finalized. LINKS ARE TO BE ADDED

### 1. WAF1: Beam Physics, Education and Outreach Please enter your comments and feedback on the report draft in this shared document 2. AF2: Accelerators for Neutrinos Please enter your comments and feedback on the report draft in this shared document 3. AF3: Higss/Electroweak Factories Please enter your comments and feedback on the report draft in this shared document 4. AF4: Energy Frontier Ciolliders Please enter your comments and feedback on the report draft in this shared document 5. AF5: Beams for BSM Physics Please enter your comments and feedback on the report draft in this shared document 6. SAF6: Advanced Colliders Please enter your comments and feedback on the report draft in this shared document 7. AF7-T: Accelerator Technologies - Targets and Sources Please enter your comments and feedback on the report draft in this shared document 8. WAF7-M: Accelerator Technologies - Magnets Please enter your comments and feedback on the report draft in this shared document 9. SAF7-R: Accelerator Technologies - RF Please enter your comments and feedback on the report draft in this shared document 10. Solution Task Force Report

Please enter your comments and feedback on the report draft in this shared document.
 10. Implementation Task Force Report

 Please enter your comments and feedback on the report draft in this shared documer.

 11. Muon Colliders Forum Report (available)

## Next page

Please enter your comments and feedback on the report draft in this shared document
 12. e+e- Colliders Forum Report

 Please enter your comments and feedback on the report draft in this shared document

 13. Accelerator Fronties Summary Report

 Please enter your comments and feedback on the report draft in this shared document

To join the Snowmass mailing list, follow the instructions at the bottom of the Welcome page.

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## https://snowmass21.org/accelerator/start

# Implementation Task Force report

Draft was released last week and I circulated it to the IDT-WG2 steering members .

https://indico.fnal.gov/event/54953/sessions/20614/attachments/156153/203696/ITFreportDRAFT.pdf

### Report of the Snowmass'21 Collider Implementation Task Force

Thomas Roser (chair)<sup>1</sup>, Reinhard Brinkmann<sup>2</sup>, Sarah Cousineau<sup>3</sup>, Dmitri Denisov<sup>1</sup>, Spencer Gessner<sup>4</sup>, Steve Gourlay<sup>5</sup>, Philippe Lebrun<sup>6</sup>, Meenakshi Narain<sup>10</sup>, Katsunobu Oide<sup>7</sup>, Tor Raubenheimer<sup>4</sup>, John Seeman<sup>4</sup>, Vladimir Shiltsev<sup>8</sup>, Jim Strait<sup>8</sup>, Marlene Turner<sup>5</sup>, and Lian-Tao Wang<sup>9</sup>

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 <sup>9</sup>University of Chicago, Chicago, IL 60637, USA
 <sup>10</sup>Brown University, Providence, RI, 02912, USA

June 15, 2022

### Abstract

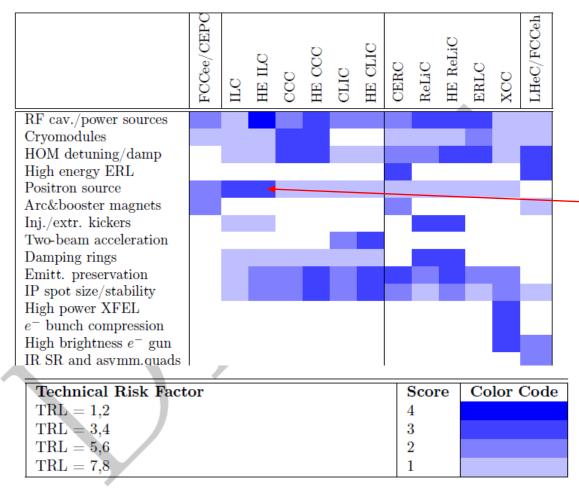
The Snowmass'21 Implementation Task Force has been established to evaluate the proposed future accelerator projects for performance, technology readiness, schedule, cost, and environmental impact. Corresponding metrics has been developed for uniform comparison of the proposals ranging from Higgs/EW factories to multi-TeV lepton, hadron and ep collider facilities, based on traditional and advanced acceleration technologies. This report documents the metrics and processes, and presents evaluations of future colliders performed by Implementation Task Force.

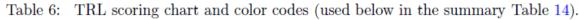
Proposal Name	CM energy	Lum./IP	Years of	Years to	Construction	Est. operating
	nom. (range)	@ nom. CME	pre-project	first	cost range	electric power
	[TeV]	$[10^{34} \text{ cm}^{-2} \text{s}^{-1}]$	R&D	physics	[2021 B\$]	[MW]
$FCC-ee^{1,2}$	0.24	8.5(28.9)	0-2	13-18	12-18	280
	(0.09-0.37)					
$CEPC^{1,2}$	0.24	8.3(16.6)	0-2	13-18	12-18	340
	(0.09-0.37)					
ILC <sup>3</sup> - Higgs	0.25	2.7	0-2	< 12	7-12	140
factory	(0.09-1)					
$CCC^3$ (Cool	0.25	1.3	3-5	13-18	7-12	150
Copper Collider)	(0.25-1)					
CLIC <sup>3</sup> - Higgs	0.38	1.5	0-2	13-18	7-12	170
factory	(0.09-1)					
CERC <sup>3</sup> (Circular	0.24	78	5-10	19-24	18-30	90
(ERL collider)	(0.09-0.6)					
ReLiC <sup>1,3</sup> (Linear	0.24	165 (330)	5-10	$>\!25$	7-12	100
ERL collider)	(0.25-1)					
$ERLC^3$ (ERL	0.24	90	5-10	$>\!25$	12-18	250
linear collider)	(0.25 - 0.5)					
XCC (FEL-based	0.125	0.1	5-10	19-24	4-7	$\sim 90$
$\gamma\gamma$ collider)	(0.125 - 0.14)					
Muon Collider	0.13	0.01	> 10	19-24	4-7	200
Higgs Factory <sup>3</sup>						

Table 1: Main parameters of the submitted Higgs factory proposals. The superscripts next to the name of the proposal in the first column indicate (1) Facility is optimized for 2 IPs. Total peak luminosity for multiple IPs is given in parenthesis; (2) Energy calibration possible to 100 keV accuracy for  $M_Z$  and 300 keV for  $M_W$ ; (3) Collisions with longitudinally polarized lepton beams have substantially higher effective cross sections for certain processes

# Implementation Task Force report

Table 7: Technical risk registry of accelerator components and systems for future  $e^+e^-$  and ep colliders: lighter colors indicate progressively higher TRLs (less risk), white is for either not significant or not applicable.





ILC Higgs Factory	Risk Factor	Technology Validation	Cost Reduction Impact	Performance Achievability	R&D Timescale	Average of Squares
Critical Enabling Technologies						0.05
Critical Enabling Technologies SRF Cavities	1	1	1	1	0.5	0.85
	1 1	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{1.5}$	$0.5 \\ 0.5$	$\frac{0.85}{2.3}$
SRF Cavities	1 1 2	$     \begin{array}{c}       1 \\       2 \\       2     \end{array} $	$\begin{array}{c} 1 \\ 2 \\ 1 \end{array}$	1 1.5 3		
SRF Cavities Cryomodules/Assembly	1 1 2 1				0.5	2.3

Table 13: ILC Higgs Factory Scoring Example

Performance Achievability	Score	Color Code
Significant - needs explicit demo of beyond state-of-the-art	3	
Moderate - Feasible to achieve 2 - 3X state-of-the-art	2	
Feasible - at state-of-the-art	1	

Table 11: Technical component and subsystems' performance achievability scoring chart and colorcodes (used below in the summary Table 14).

## Our comments are

 in Table 7 (Techninical Risk) ILC and HEILC, the positron column should be the same gray as CCC, CLIC, etc.
 change "Performance Achievability" from 3 to 1 for the positron source in Table 13

## meeting with ITF - Snowmass Accelerator Conveners (AF1-AF7, ee/mmFora) Meeting #18 https://indico.fnal.gov/event/55116/

 $\blacksquare$  Wednesday 29 Jun 2022, 16:00  $\rightarrow$  19:00 Europe/Berlin

Steve Gourlay (LBNL), Tor Raubenheimer (SLAC), Vladimir Shiltsev (FNAL)

Description Q&A Meeting with ITF - Snowmass Accelerator Frontier Conveners and Proponents (Meeting #18) Time: Wed., June 29, 2022 09:00 AM Central Time (US and Canada)

Agenda:

1. ITF members address submitted questions and comments

2. Discussion

ITF Report:

https://indico.fnal.gov/event/54953/sessions/20614/attachments/156153/203696/ITFreportDRAFT.pdf

Submitted Questions/comments: https://docs.google.com/document/d/1zBnSmDX0iAmnE1\_X5agaBHjk4Echjk31Qs7ZrGrs4xM/edit

### Zoom Link:

Join Zoom Meeting https://fnal.zoom.us/j/98105241806?pwd=RjJ4QlhGcXQ1aE5DV3NVdmZhVG5rZz09

Meeting ID: 981 0524 1806 Passcode: 527516



 $\rightarrow$  18:45 Summaries:: ITF (chair and members) address submitted Qs/comments and critique

Convener: Vladimir Shiltsev (FNAL)



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