AF4
Multi-TeV Colliders
Towards White Papers and Report preparation

- The Snowmass community planning exercise resumed full activity since Sept. ’21
- Snowmass Summer Study: July 2022 at UW Seattle http://seattlesnowmass2021.net/
- The P5, Particle Physics Project Prioritization Panel, will take input from Snowmass and develop a strategic plan for U.S. particle physics that can be executed over a **10 year timescale**, in the context of 20-year global vision for the field

- The contributed papers submitted to the Snowmass Proceedings may include documents on specific scientific areas, technical articles presenting new results on relevant physics topics, and reasoned expressions of physics priorities (“white papers”), including those related to community involvement.
  deadline for submitting contributed papers: March 15, 2022
  https://snowmass21.org/submissions/

AF4 – Releted LoI

Primary category	
AF4	26
AF1	2
AF3	3
AF6	8
AF7	6
CF7	2
EF0	2
EF1	1
EF8	1
IF9	1
NF6	1
TF7	1
Total	54

Sub-catergory (AF4)					
General	1		future options		
ILC	1		machine		
CLIC	1		machine		
SPPC	2		machine, R&D		
FCC-hh	1		machine		
eh	1		different machines		
Sea Collider	2		machine, dynamics		
MC	12		machine, dynamics, R&D		
For neutrino	1		physics		
G. technologies	3		magnets, RF, cooling		
gamma-gamma	1				
Total	26				

AF4 - Project White Papers

Category	Machine	Contact	
Lepton Collider	ILC	Steiner Stapnes	A.Grassellino
	CLIC	Erik Adli	
	e+/e- LC	E.A.Nanni	
	Plasma LC	S.Gessner	
	Muon Collider	Mark Palmer	S.Jindariani
		Daniel Schulte	M.E. Biagini
eh Collider	LHeC/FCC-eh	Oliver Bruening	
	eh collider	Y.Zhang	
Lepton-Ion Collider	Muon-Ion Collider	Wei Li	Darin Acosta
Hadron Collider	FCC-hh	M.Benedikt	
	SppC	J.Tang	
Energy Recovery	IFEL	A.Murokh	
gamma-gamma (**)	gamma-gamma	Krasny	
(**) AF6 link			

AF4 - Project White Papers

Category	Machine	Contact
Collider in Sea	Collider in Sea	Peter McIntyre
Plasma acceleration	SWFA demo	J.Shao
		C.Jing
	PWFA	C.Joshi
	Laser P. Linear C.	CB.Schroeder
	AFLC (linear C.)	C.Jing
Neutrino	nuSTORM	K.Long
	TeV Lepton/tau neutrino	M. DallaValle
	MC/Neutrino	S.Machida
Future accelerators	Future accelerators	S.Nagaitsev
	Machine option	PC.Bhat
	Linear and Circular	
	Hadron accel.	
	Future accel. and exp.	
Synergy	Cosmic Ray Observ	D.Soldin
	Astro and Coll. Physics	L.Anchordoqui

AF4 – Technology/other White Papers

Technologies\ Machines	General	ILC/CLIC/LC	FCC-hh/SPPC/eh	MC	Sea Collider	G-G collider
Beam physics/Machine concepts	Low loss control (Nagaitsev)	Dynamics with WFA (Adli)	Layout compatibility with ee (Benedikt)	Fast muon acceleration (Bogacz-109) Vertical FFA (Machida) Low emittance muon mechanism (Ngaitsev) Lattice optics -6TeV (Mokhov) Advanced accelerator design (Schulte) Beam physics for LEMMA concept (Biagini)	Geodesy perturbation (McIntyre-239) Bottoms-up stacking (McIntyre)	PFWA based g-g collider (Jing) Optical energy recovery (Murokh)
		nm beam spot (Stapnes)	Layout compatibility with ee (Tang-021)	Proton source (Rogers-065)		
		Plasma-based final focus (Nagaitsev)	Injector complex (Benedikt)	Positron source (Biagini-135)		
		PWFA based LC (Joshi)	Injector complex (Tang)	Accelerator facility (Int Coll-102)		
		PWFA based LC (Gessner-168)	Integralble optics (Nagatsev)			
		LaserPA for LC (Shroeder)	Top-up injection (Nagaitsev)			
		Argonne Flexible Linear Collider (AFLC) (Jing-088)				
		Structure WFA for LC (Shao, Jing-090)				
Magnets/ Power Supply	Fast-cycling HTS (Piekarz-004)		Stress/strain Sensitive SC (Arbelaez-111)	Very high field magnets (Park-169)	3.5 T dipoles Conf REBCO (McIntyre-238)	
			Fe-HTS HFM (Xu-022)	High-field magnets (Mokhov)		
				High-field magnets (Schulte)		
	High-field magnets (Amm-167)		16-T HFM (Benedikt)	Superc tech and materials (Barzi-199)	Compact SC magets (McIntyre-024)	
RF/ Microwave /WFARF/ Microwave /WFA		Normal conducting RF (Nanni)	Superc tech and materials (Barzi-199)	Normal conducting RF (Luo-093)		
		High gradient SRF (Grassellino)				
		High-gradient structure (Jing)				
	High Power RF (Benedikt-)	X-band structure (Stapnes)				
	Dual-axis SRF structure (Kononlev-101)	High Power RF (Benedikt-151)	Crab cavities (Benedikt)	Fast ramping magnet (Schulte)		
Beam manipulation				Advanced ionization cooling (Rogers-066)		
			Strong ion cooling (Zhang-108)	6D muon cooling (Yonehara)		
Cryogenics		Cost effective CM (Grassellino)				
Vacuum			Electron cloud (Nagaitsev)			
Targetry/ Collimator/ Dump				Tungsten production target (Densham-191)		
				Robust target and shileding (Shculte)		
				Target material for LEMMA (LiVoti-137)		
	Beam intercepting devices (Calviani-159)		Collimator materials (Calviani)	Target material for LEMMA (Biagini, Calviani, LiVoti) New target concepts (Rogers)		
Control/ Instrumentation	Adaptive BI/Control (Scheinker-029)	Machine learning (O'Shea-165)	Machine protection (Benedikt)			
Mechanics/ Alignment						
MDI				Radical background (Bartosik-104)		
				Radical background (Mokhov)		
				Beam-induced background (Jindariani)		
	Technical challenges and methods (Ambrosio-054)			Luminosity measurement (Aime)		
Site/Safety				Neutrino radiation hazard (Nagaitsev, Schulte)		

To be noted towards next steps

GOAL

AF4 team aim to coordinate the “project” white papers

➔ proposing guidelines

➔ ask to include all critical technology contributions whenever identified within the “project” white papers with cross-referencing to the relevant “technology/other” white papers that are relevant

AF4 will be coordinating with the other AFx groups where submissions are connected to optimize final reports/summaries

extras

Machine Concept LoIs – December 2020

Machine	CERN	S.Stapnes	CLIC	AF4-AF3-EF0	177	steinar.stapnes@cern.ch
Machine	TAMU	P.McIntyre	Collider in Sea	AF4-AF0	239	mcintyre@physics.tamu.edu
Machine	JLAB	Y.Zhang	eh Collider	AF4-AF0	144	yzhang@jlab.org
Machine	CERN	M.Benedikt	FCC-hh	AF4-AF1-EF0	153	Michael.Benedikt@cern.ch
Machine		Krasny	gamma-gamma		1	mieczyslaw.witold.krasny@cern.ch
Machine	FNAL	A.Grassellino	ILC	AF4-AF0	75	annag@fnal.gov
Machine	CERN	D.Schulte	MC	AF4-AF0-EF0	103	daniel.schulte@cern.ch
Machine	MCC/CERN	S.Schulte	MC	AF4-AF7	102	daniel.schulte@cern.ch
Machine	MCC/RAL	T.Rogers	MC at CERN	AF4-AF7-EF0	65	chris.rogers@stfc.ac.uk
Machine	INFN	M.Biagini	MC-LEMMA	AF4-AF7	135	marica.biagini@lnf.infn.it
Machine	MCC	S.Machida	MC/Neutrino	AF4-AF2	36	shinji.machida@stfc.ac.uk
Machine	IHEP	J.Tang	SPPC	AF4-AF0	21	tangjy@ihep.ac.cn

Accelerator Frontier Working Group 4

Multi-TeV Colliders

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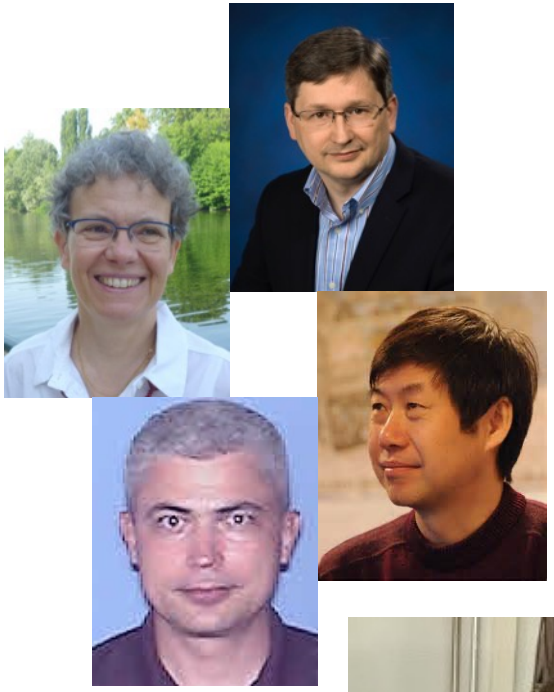

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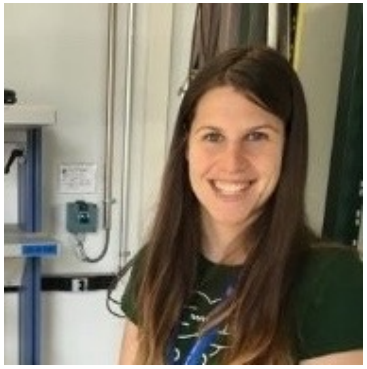
Alexander Valishev valishev@fnal.gov



for the Snowmass Young Accelerator Frontier

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