Startup Snowmass
Sub –Topic IF-7
Electronics & ASICs

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LOI Submissions Directed to IF07 topic as Primary *as of Sept 15, 2020*

IF 7   LOI Summary September 15, 2020

PDF Reference	Contact	Near Term Dev	Long Term	Quality Control	Existing FE	Description
SNOWMASS21-IF7_IF0-073	SMU (Jingbo)	X				Optical Link HS (xtreme environment)
SNOWMASS21-IF7_IF0_Frank_Krennrich-173	F. Krennerich			X		Quality Control Cryogenic Detector FE Readout
SNOWMASS21-IF7_IF1_Carl_Grace-109	Carl Grace LBL		X			Low Temp SiGe heterogenus bipolar
SNOWMASS21-IF7_IF2-NF10_NF0_Analog_Photon_Processor-052	Josh Klein				X	Analog Processor with parametric feature Extraction
SNOWMASS21-IF7_IF3_Leo_Greiner-160	Leo Greiner		X			BNL & LBL MAPs
SNOWMASS21-IF7_IF4_Sandeep_Miryala-180	Sandeep		X			AI ASICs for front end processing
SNOWMASS21-IF7_IF4-132	NALU scientific		X			ML and AI data inferential reduction
SNOWMASS21-IF7_IF5_H.MULLER-101	Hans Muller Bonn Univ.	X				ART for Scaleable Readout System
SNOWMASS21-IF7_IF8-NF10_NF0_Jonathan_Asaadi-079	Jonathan Asaadi Q-Pix				X	Pixelated LAR_TPC Readout Technique
SNOWMASS21-IF7_IF8-NF10_NF0-UF3_UF0_Dan_Dwyer-171	Dan Dwyer				X	Pixelated LAR_TPC Readout Technique
SNOWMASS21-IF7_IF9-CF2_CF4_Austin_Minnich-117	Austin Minnich (Caltech)		X			Quantum-limited transist uwave amplifiers

Technology Specificic Near Term Continued Development

Technogy Specific Long Term Investigation

Quality Control technique for Extreme Environments

Existing F E Electronics Tech to implement novel detector readout

Totals	2	5	1	3

3

A few months back – before the pause

Started to work on consolidating from LOIs to white papers

From LOIs to white papers

- Data handling
  - Addressable Readout Techniques for Scaleable Readout System
  - Self-driving data trigger, filtering, and acquisition systems for high-throughput physics facilities
  - Real-time adaptive deep-learning with embedded systems for discovery science
  - FPGA Based Artificial Intelligence Inference In Triggered Detectors
- AI/ML
  - Self-driving data trigger, filtering, and acquisition systems for high-throughput physics facilities
  - Real-time adaptive deep-learning with embedded systems for discovery science
  - FPGA Based Artificial Intelligence Inference In Triggered Detectors
  - AI ASICs for front end processing focus on Optimal Implementation
  - ML and AI data inferential reduction

A few months back – before the pause

Started to work on consolidating from LOIs to white papers

From LOIs to white papers

- Pixelated Liquid Noble readouts
  - Pixelated LAR_TPC ionization current Reconstruction Technique
  - Pixelated LAR_TPC Readout Establish R&D mechanisms
- Monolithic sensor readout
  - Large area CMOS monolithic active pixel sensors for future colliders
  - 28nm CMOS for 4D Tracker Readout Chips
  - 4-Dimensional Trackers
  - BNL & LBL MAPs Tracker development

A few months back – before the pause

Started to work on consolidating from LOIs to white papers

From LOIs to white papers

- Calorimetry
  - High precision, high dynamic range readout
- Optical links
  - Optical Link HS (xtreme radiation environment)
  - Radiation-hard high-speed fiber-optical data links for HEP experiments
- Timing
  - Time of Flight Detector for circular electron positron collider
  - PRECISION TIMING DETECTORS FOR FUTURE COLLIDERS

A few months back – before the pause

Started to work on consolidating from LOIs to white papers

From LOIs to white papers

- Deep cryogenic readout
  - 4K and below Cryo SiGe heterogenus bipolar

- Design for reliability analytical techniques
  - Quality Control Cryogenic Detector FE Readout

- Photodetector readout
  - Analog Processor with parametric feature Extraction

Organizational Meeting   Sept 13, 2021

- Reviewed IF7 LOIs   White Paper worthy sub-topics from 2020
- Starting consolidating/coordinating on a few areas:
  - ASIC Workforce/tools/Foundries
  - Calorimetry
  - Photodetectors
  - Silicon Sensors
  - TDAQ
- IF7 - Strong connection established (last year) with:
  - TDAQ/Triggering   (IF4)
  - Solid State Detectors /Tracking (IF3)

  IF7 related contributions will likely be merged into IF3 and IF4 white papers.

Meanwhile: progress on ASIC Workforce/tools/Foundries

Our CPAD community discussion concluded that there was movement towards direct support for instrumentation and, in fact, two FOA's from DOE appeared in the Spring that included some wording from the 2019 BRN Instrumentation report.

Microelectronics Co-Design Research   LAB opportunity

and

Traineeship in High Energy Physics   University Program

This year we have participated in discussions with ASIC foundry representatives to explore opportunities for multi-party NDA's.

Notably:

Skywater (open source technology) & *TSMC (commercially vetted)*

We expect to continue to pursue opportunities through the HEPIC and follow the progress of the 3 funded Traineeship programs.

Next immediate steps – our plans

- Refresh meetings with our group and connections with other IF groups
- Invite speakers to update & invigorate progress on white papers