



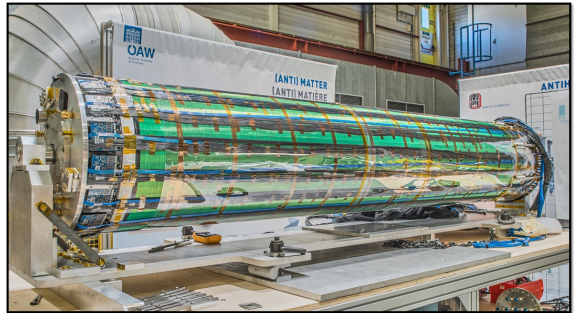
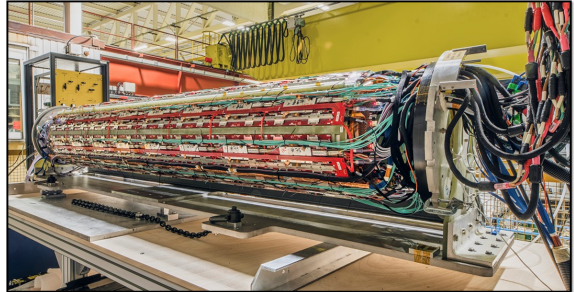
## Science Technology Update Status

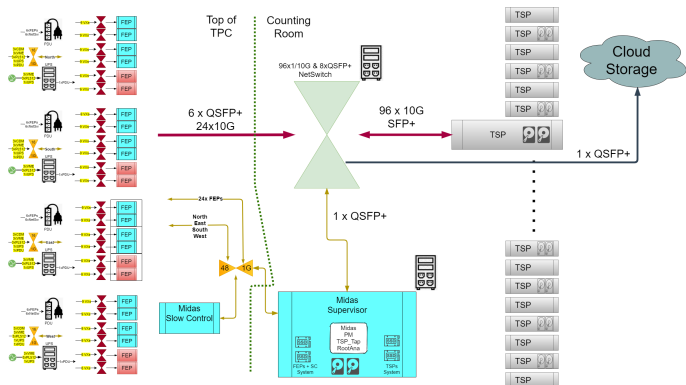
Overview of SciTech progress in the last 6 months

Nigel Hessey  
TRIUMF

Progress in our various projects  
Changes in organisation  
Cryogenics planning

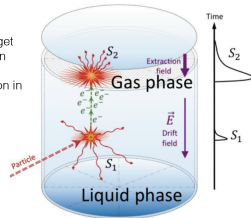
- ▶ Deformations of outer cylinder reduced, improving e-field and hence gain uniformity a factor 20
- ▶ Returned to CERN; pictures of TPC and cosmic veto taken at CERN
- ▶ All wires intact; further tests on-going
- ▶ This was a major SciTech project, with collaboration across all groups.





- ▶ Complete slice of DAQ architecture for Darkside demonstrated at TRIUMF
- ▶ Solution adopted by Darkside

- DM signature: scattering on LAr target
- S1 pulse: primary scintillation in Liquid Argon (LAR)
  - S2 pulse: secondary scintillation in Ar gas phase
  - Drift time: z position, S2 light: x-y coordinate

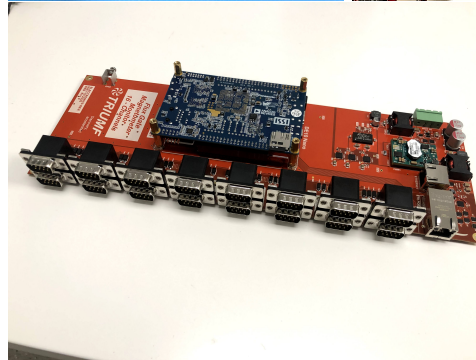
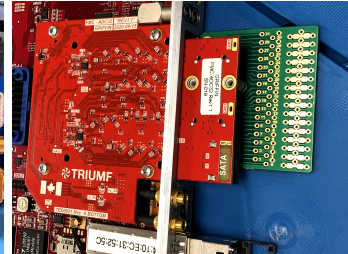
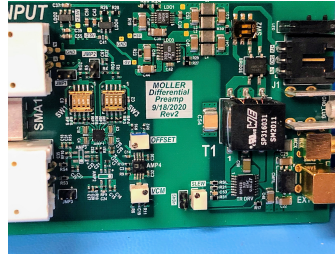


**344 MBs**  
**8280 PDMs**  
**~200000 SiPMs**

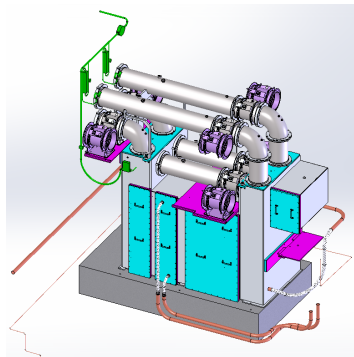
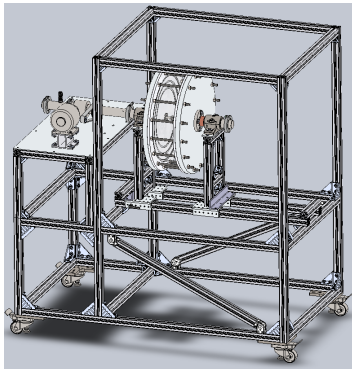
**~350 cm**

**DS-20k**  
 20t fiducial

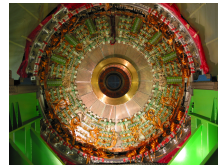
- ▶ Moller Electronics -  
Differential front end  
amplifier and ADC  
prototypes produced
- ▶ Fluxgate Magnetometer  
Readout board produced for  
nEDM



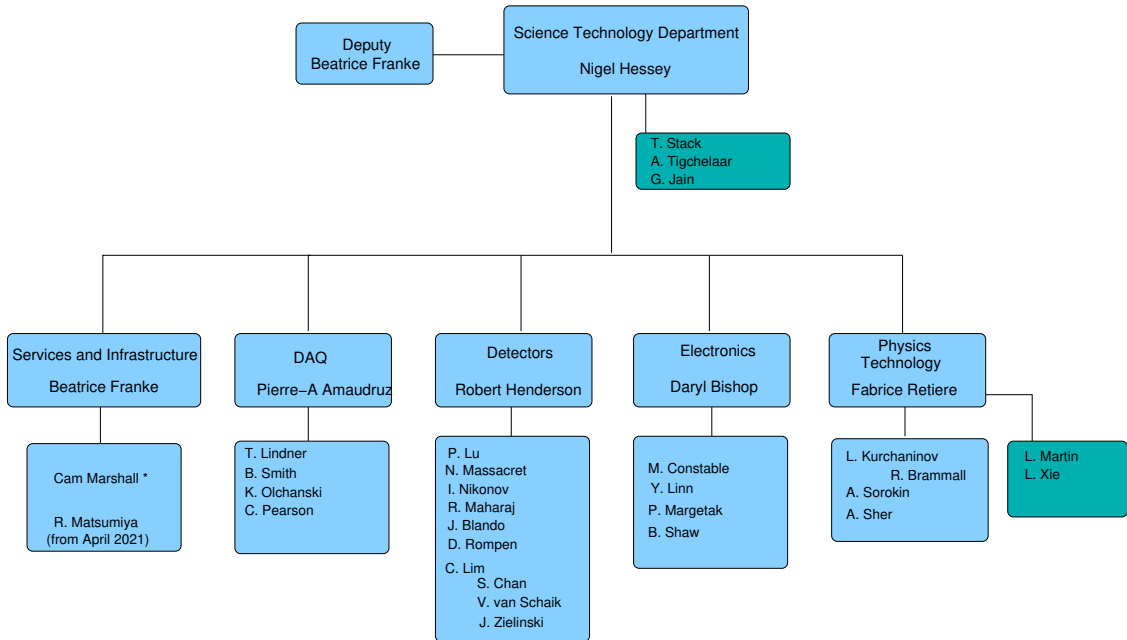
- ▶ UCN rotating and heated surface coating machine: vibrations reduced, progressing
- ▶ Ariel Target Station cooling gas supply system: design complete, undergoing approval



- ▶ TRIUMF is hosting the next International Conference on Technology and Instrumentation for Particle Physics (TIPP)
  - ▶ Was scheduled for May 2020 in Whistler; postponed due to Covid
  - ▶ Now scheduled on-line for May 24-29 2021



- ▶ New projects CFI approved:
  - ▶ nEXO (next generation Xe double beta decay, contingent on DOE funding)
  - ▶ IWCD (Water cerenkov detector for Hyper-K flux measurement, Japan)
  - ▶ Darkside-20k (20 tonne Liquid Ar WIMP Search, Gran Sasso)
- ▶ Up-coming PPAC proposals (Gate 0)
  - ▶ PIENUXE (10 x precision on  $R_{e/\mu} = \Gamma(\pi^+ \rightarrow e^+\nu)/\Gamma(\pi^+ \rightarrow \mu^+\nu)$  and  $\pi^+ \rightarrow e^+\nu$  at TRIUMF). Presenting at PP-EEC next week.
  - ▶ Darklight (New Physics in  $e^+e^-$  with an Invariant Mass of 13-17 MeV using ARIEL). Presenting at PP-EEC next week.
  - ▶ TIQC (Trapped Ion Quantum Computing at TRIUMF)
  - ▶ EXACT (active target detector for TIGRESS)
  - ▶ P-One (Neutrino observatory in the Pacific)
  - ▶ Argo (Future 200 tonne liquid Ar detector at SNOLAB)
- ▶ Evaluating technical needs of proposals
  - ▶ Interact with proponents to clarify who does what
  - ▶ Improve estimates of effort needed, with uncertainties
  - ▶ Show management time-evolution of resources (by type) needed if all are approved





- ▶ Cryogenics engineering:
  - ▶ Identified several experiments, current and future, that need cryogenics (about half of proposals)
  - ▶ UCN particularly with specialist He cooling needs
  - ▶ Liquid Ar, Xe, plus cryogenic probe station for nEXO
  - ▶ All point to importance of succession planning
  - ▶ Several other detector support services also needed; created new "Services Infrastructure Group"
- ▶ Firmware:
  - ▶ Continue to train and retain FPGA skills
  - ▶ Look at future proposals to fund expansion (even if temporary hires)
- ▶ High precision and specialist machining:
  - ▶ Steve Chan retires end of this month
  - ▶ Will replace, with emphasis on highest-level machining skills ("Journeyman")
  - ▶ Ceramics, precision, specialist materials like G10

- ▶ SciTech continues to provide high quality support to experiments
- ▶ ALPHA-g completion frees up considerable resources, needed for new projects
- ▶ Adapting to future needs: firmware support and cryogenics