



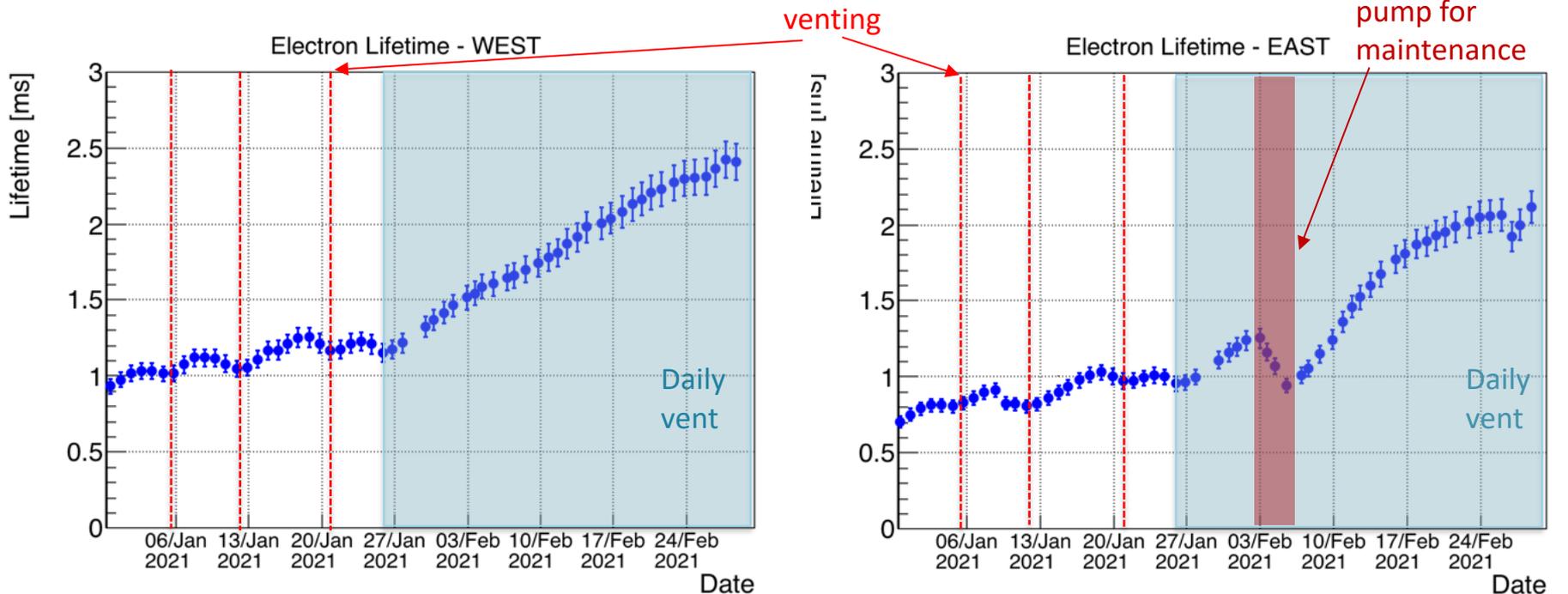
# Status of ICARUS commissioning

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PMG/AEM 03/04/2021

# Cryogenics and electron lifetime

- Cryogenic system overall stable and fully operational!  
South-East condenser started on Feb 16<sup>th</sup> after modifications, and performing strong and steady. GAR filters in North-East condenser being regenerated this week.
- Venting procedure continuing: 10 minutes twice/day since Feb 8<sup>th</sup>, previously 15 minutes once/day. Electron lifetime constantly and slowly improving up to 2.4/2.1 ms in West/East cryostat



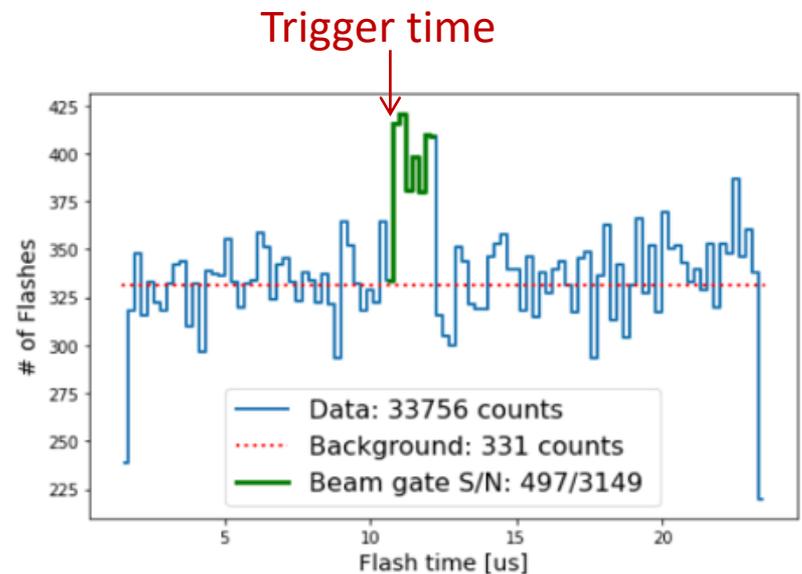
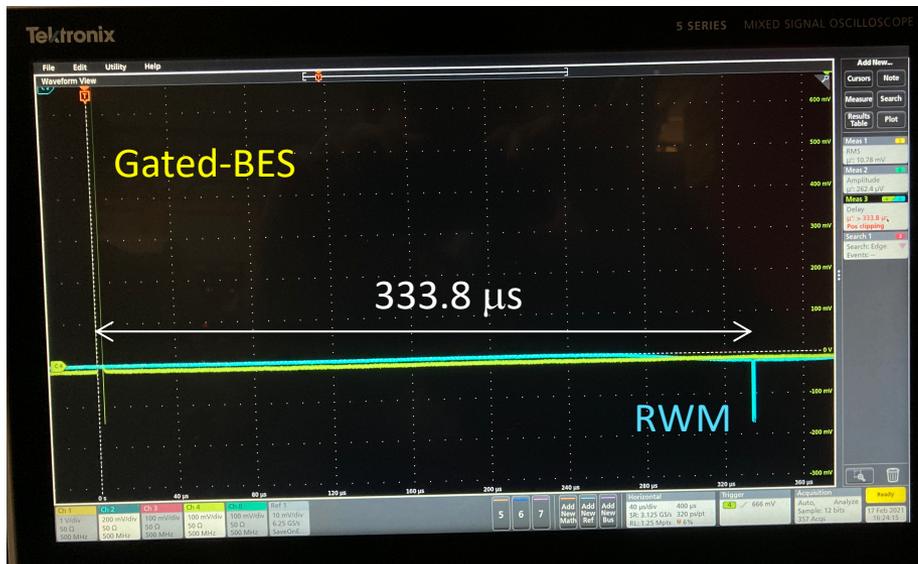
# CRT updates

- Installation of South wall of side CRT completed!  
Major achievement in challenging work conditions (tight clearance, Covid-19 restrictions).
- Cabling, installation and testing of the readout electronics up next.
- Modules of the top CRT currently in transit from CERN to FNAL.  
Plan for installation in preparation. It will be actuated when collaborators will be able to safely travel onsite from Europe.



# Trigger system updates

- Data collected by triggering on the BNB extraction signal (gated-BES) in East cryostat used to check the the PMT timing w.r.t. the gated-BES signal.
- Offset to be added to the gated-BES for the trigger generation  $\sim 335 \mu\text{s}$ : time difference between gated-BES and neutrino extraction (RWM) signals +  $\nu$  time of flight from MI-12 to ICARUS.
- Excess of PMT light flashes ( $>5$  fired PMTs within 150 ns window in coincidence in both left and right TPCs) over the cosmic background rate at the expected time.



# Present trigger system status and next steps

- Trigger logic foreseen for data taking with the beam, based on a fired PMT majority in coincidence with the BNB extraction, being implemented step-by-step:

1. Measurement of multiplicity/rate for 30 PMTs in 6 m detector slice in one TPC wall as a function of PMT threshold.

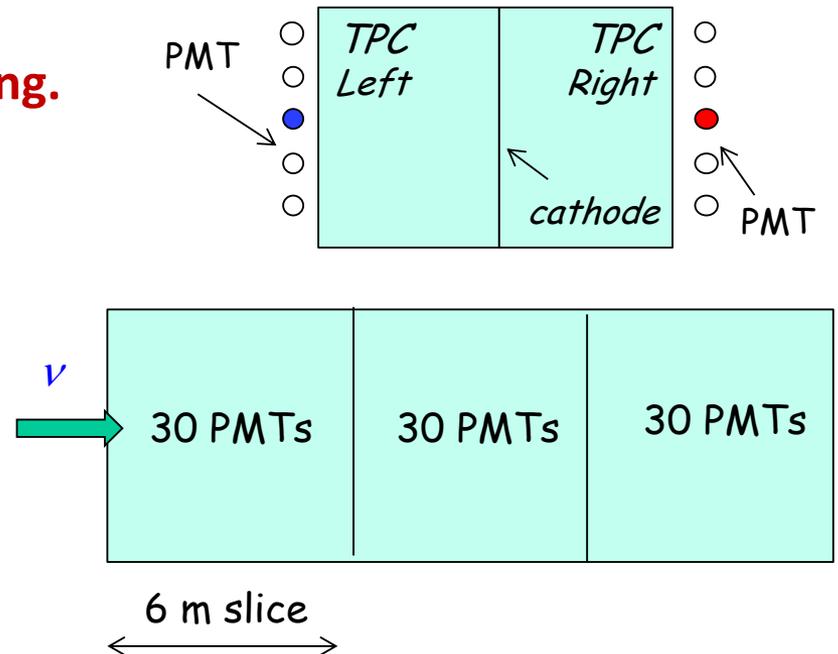
**Data taking complete, analysis ongoing.**

2. Production of a trigger signal by PMT majority inside one 6 m slice in coincidence with BNB beam spill.

**Ongoing.**

3. Extension of the PMT majority logic to 2 others 6 m detector slices of East cryostat and then similarly for the WEST cryostat.

**To follow.**



# Other February updates

- **PMT** commissioning.
  - Tests of future upgrade of the PMT HV system with new power supply boards.
  - Tests to study and improve the calibration of the PMT digitizers.
  - Data taking with laser and new analysis procedure to improve resolution of time and gain equalization.
  - Upgrades of the PMT slow control system.
- **DAQ** commissioning.
  - Debugging event synchronization and identified issues with the trigger information when implementing PMT logic. Working on updating hardware/software in order to finalize readout synchronization.
  - WhiteRabbit BoardReader developed and undergoing integration testing.
  - PMT configuration software development for consistent baseline and threshold settings.
  - Preparing for next DAQ software release, incorporating updates from previous testing at SBN-FD and teststands.