Samples with noise

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Noise we can expect in data

- **White**, *default* in sim: RMS 2.5 ADC.
- **Exponential**: in sim *off by default*.
- **Coherent**: *not implemented*.
- Various **oscillations**: *not implemented*.

Other distortions

- **Stuck bits**: *implemented*, but applied equally to all channels – way too pesimistic and can hung mitigation forever.
- Channel-to-channel or group-to-group **calibration fluctuation**: *not implemented*, important to have it.
- **Dead channels**: fixed list can be configured.
- **Space-charge**: *implemented*, both spatial and calorimetric (recombination) effects.

Purpose of noisy samples in MCC

- online monitoring: detect level of noises, test workflow with non-zero-suppresed data (big files!), test possibility of stable monitoring with considered metrics
- reconstruction / measurement performance degradation (so all noises & distortions important)
- CNN models preparation

Noises & distortions in MCC8

White & exponential noise: *cosmic muons + beam particle* up to Detsim level

- Default white noise, RMS 2.5 ADC
- „Worst case", parameterization from 35t – test behaviour of online monitoring algorithms
- Medium noise, parameters in the middle between 35t and default – test online monitoring, CNN on noisy data, test reconstruction of beam and cosmics

- All 3 configurtions x electron lifetime: 6ms, 3ms (default), 1ms

Space-charge & default white noise: *all samples*, all levels of sim/reco/ana

- do not complicate studies with higher level of white/exp noise at the same time

✓ **New Detsim configured for all ProtoDUNE simulations.**

✓ **Corresponding DataPrep module configured for wire signal reconstruction**:
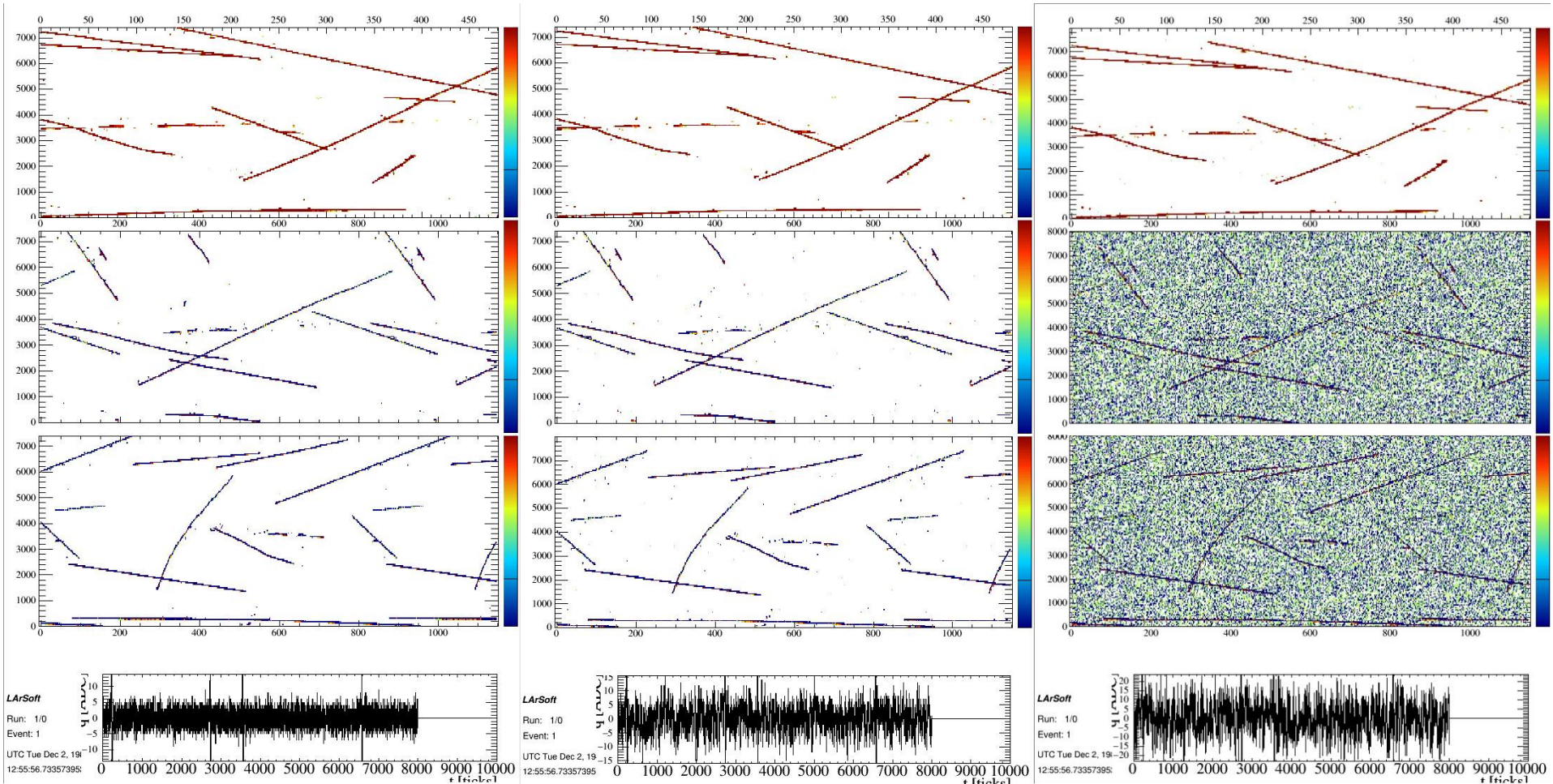   ON: deconvolution, ROI
    OFF: skip noisy/bad (uses list), stuck bits mitigation, early signal finding, coherent noise removal, pedestal adjustments

✓ **Sim-reco chain tested:**
    No changes to signal amplitudes, dE/dx reconstruction, etc.
    You may also use old simulations with the new reco configuration.

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White & exponential noise

default   medium   worst case