

SSP Data Rate

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How the SSPs Read Out

- Expected mode during operations: self-triggering
- In this mode each channel is independent:
 - If a channel goes above threshold it triggers only itself to read out
- Can also be externally triggered (all channels together) or externally gated (inhibit triggers outside the gate)
- Knobs
 - The threshold is configurable
 - Current value in DAQ configuration is 500, “High”
 - The size of the minimum readout window is configurable
 - Current value is 2000 samples, or 15.6 μ s
 - Because of overlap protection there may be multiple contiguous windows if the signal is longer than the specified readout window.

SSP Data Rate

- Each waveform is $(48 + 16 \times n_{\text{samples}})$ bits
 - 32 kbits/waveform w/ 2,000 samples
- We currently have 71 live channels
- Each cosmic ray is likely to trigger ~every photon detector
 - 2.3 Mbits/cosmic ray \rightarrow 9 Mbits/5 ms
- Dark noise is ~ 20 Hz/PD
 - ~ 2 waveforms \rightarrow 64 kbits / 5 ms

SSP Data Rate

- Radiologicals: ^{39}Ar , ^{222}Rn
 - These are the big unknowns, since they depend both on the photon detector sensitivities and on the 35ton filtration setup
- Estimate based on FD simulation:
 - Singles rate: 8.8 kHz/PD with radiator design
 - Assume $\times 4$ less light with 35ton designs
 - ~ 18 kHz singles rate for the whole 35ton
 - 90 waveforms \rightarrow 2.9 Mbits/5 ms
- In μBooNE the radon is much worse...
 - Don't have a numbers yet – maybe double ^{39}Ar ?
- Expect a better estimate next week from Jonathan based on 35ton simulation

All Together

Source	Rate (Mbits/5 ms)
4 cosmic rays	10.0
Dark noise	0.1
^{39}Ar	2.9
$^{222}\text{Rn}???$	5.8
Total	~19

~Half of a gigabit ethernet link if run continuously.

- Easy savings: $15.6 \mu\text{s} \rightarrow 2 \mu\text{s}$ windows
 - $\times 8$ savings, 19 Mb/millislice \rightarrow 2.4 Mb/millislice
 - Long enough for the SiPM fall time, rely on overlap identification to get full waveforms.
 - Commissioning: need to confirm looking at real waveforms in the cold that $2 \mu\text{s}$ is long enough.
- Harder savings: raise thresholds above radiologicals
 - Likely means giving up late light
 - May require external triggering if PDs are not performing well