Reading SSP Data

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Introduction

- SSP settings we need to choose during comissioning.

- What's in the SSP data format?
  - What happens in SSPToOffline

SiPM Control

- Currently setting the bias on all SiPMs to the same value, 26.5 V.
  - Recommended values for warm: 27.0 V
  - Recommended value for cold: 25.5 V
  - Can be set channel-by-channel if we want to fine-tune SiPMs for more uniform response

```
#bias_config register sets channel bias voltages
#bit 0x40000 enables biasing,
#bits 0xFFF set value on linear scale 0-30V.
#Comment out all lines to disable biasing.
#Can use ARR_bias_config (as above for
#ARR_channel_config) to set
#bias voltages per channel.

#ALL_bias_config:            0x00040FFF # 30V
ALL_bias_config:             0x00040E21 # 26.5V
```

SSP Self-triggering

- Has an internal hit finding algorithm
  - Detects baseline
  - Identifies sharp rise with CFD
  - Identifies overlapping events

- Only one parameter to tune, leading edge threshold
  - `ALL_led_threshold`
    - Current default **500** is "high"
    - A value of **50** is "low"
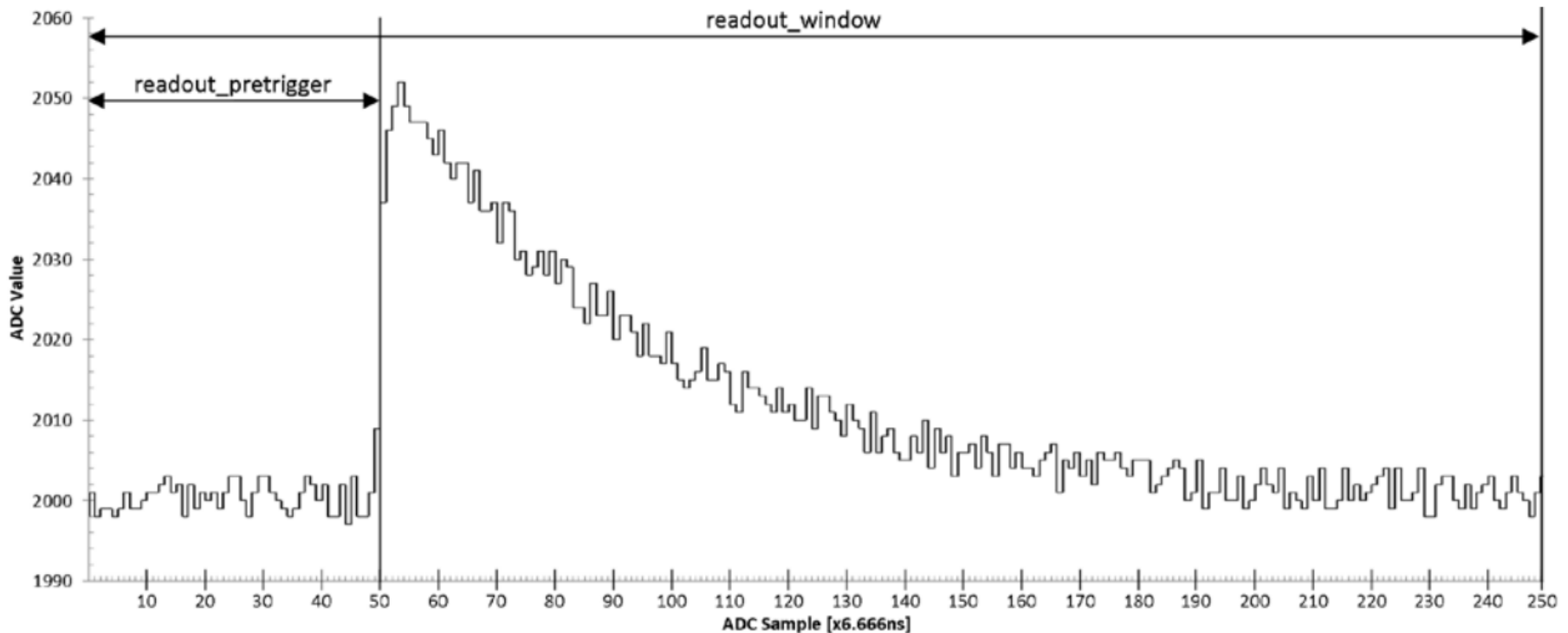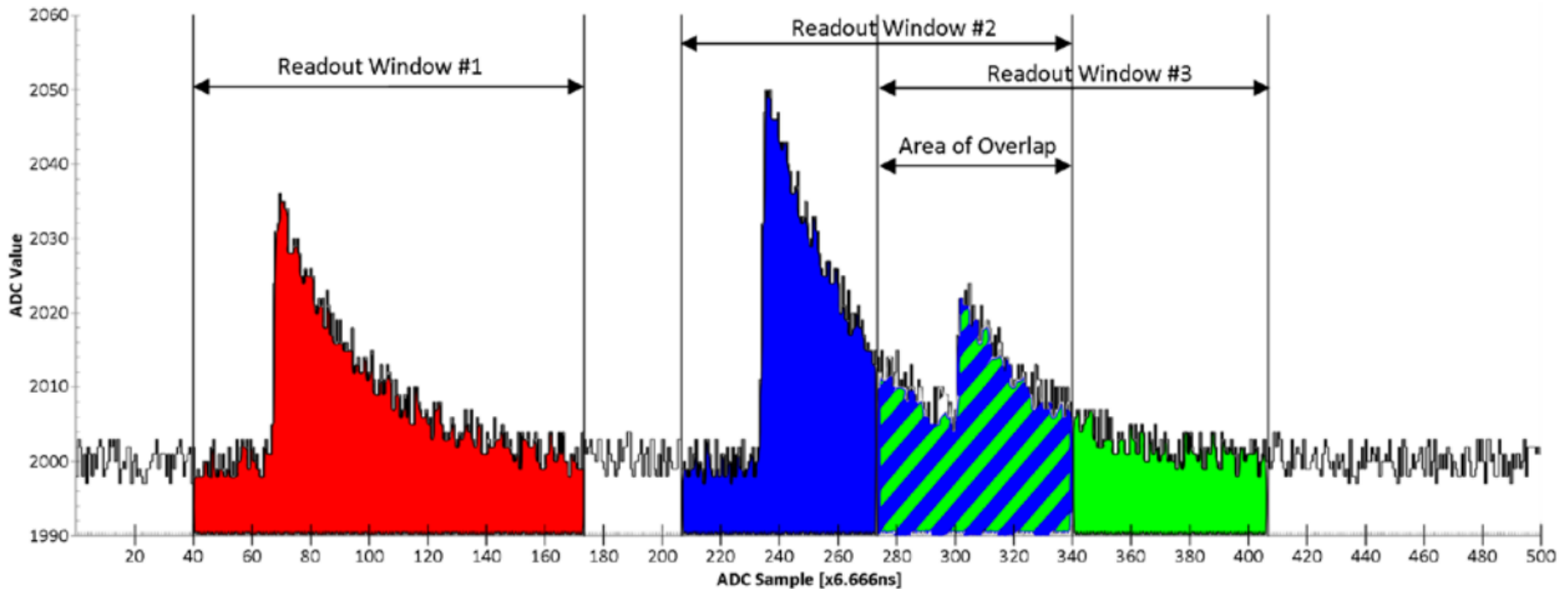
Readout Window

Figure 11-2: Waveform readout parameters. (readout_pretrigger=50, readout_window=250)

- `ALL_readout_window`
  - Currently set to 200 by default
  - Produces 2,000 sample waveforms (~max)

- `ALL_readout_pretrigger`
  - Currently set to 0, probably want to change this

Handling Overlaps

Figure 11-3: Example of overlapping waveform readout windows.
(readout_pretrigger=40, readout_window=200)

- We have three choices of how to handle overlapping events.
  - Note: I don't see a parameter in SSP fhicl files corresponding to this setting
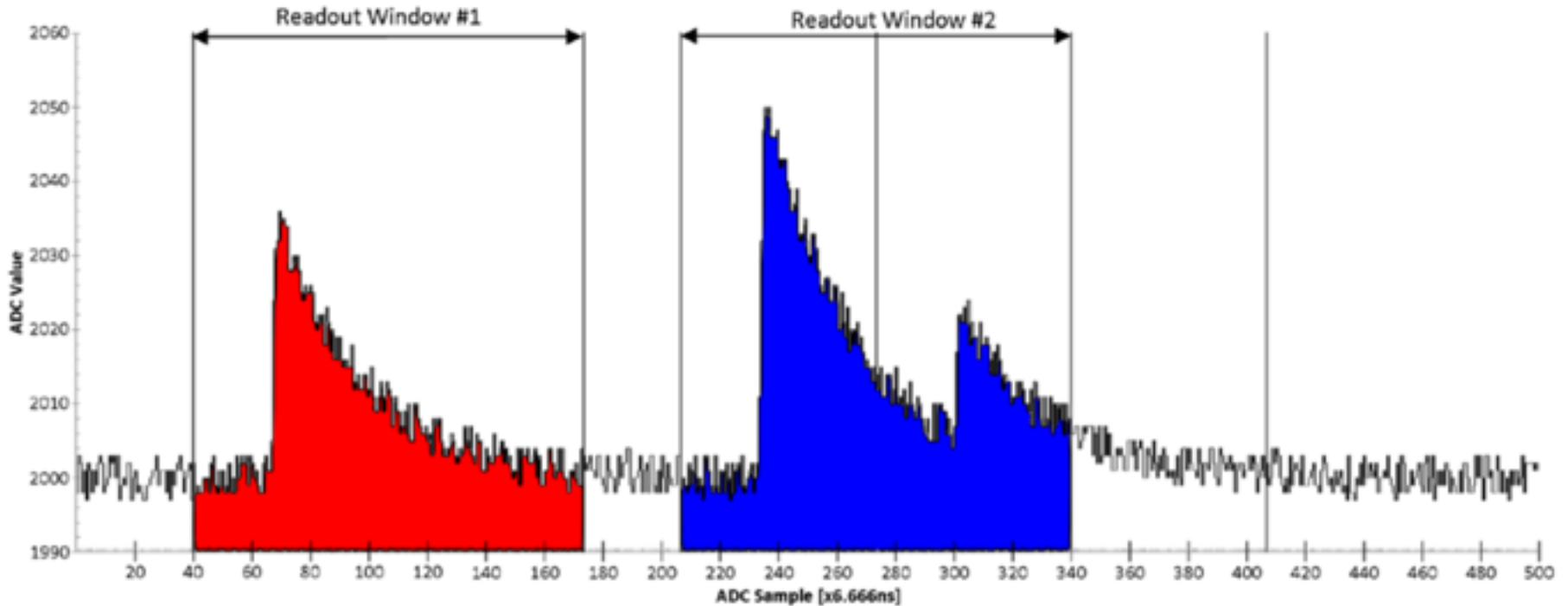
6

Handling Overlaps

Figure 11-4: Example with offset disabled mode. (readout_pretrigger=40, readout_window=200)

- Offset disabled
  - Drop's the tail of the overlapping signal
  - Windows are fixed length

Handling Overlaps

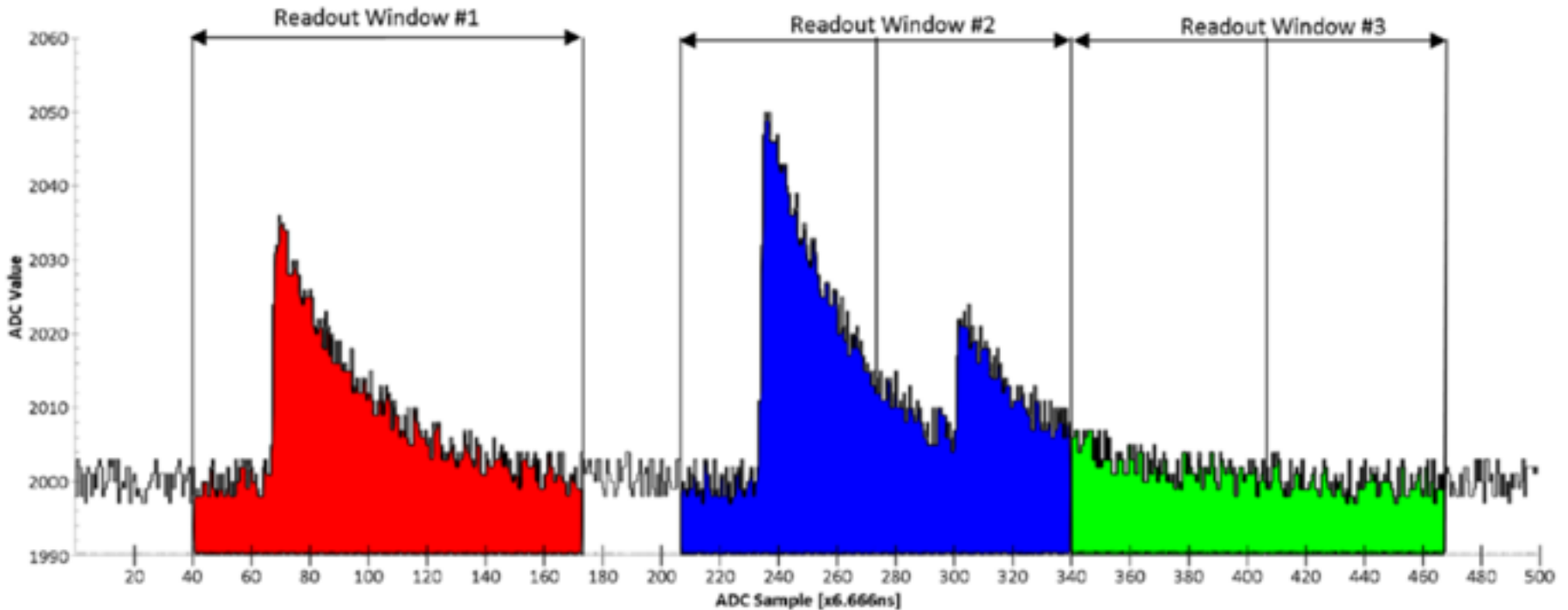

Figure 11-5: Example with offset mode. (readout_pretrigger=40, readout_window=200)

- Offset
  - Takes a longer tail from the overlapping signal
  - Windows are fixed length

8

Handling Overlaps

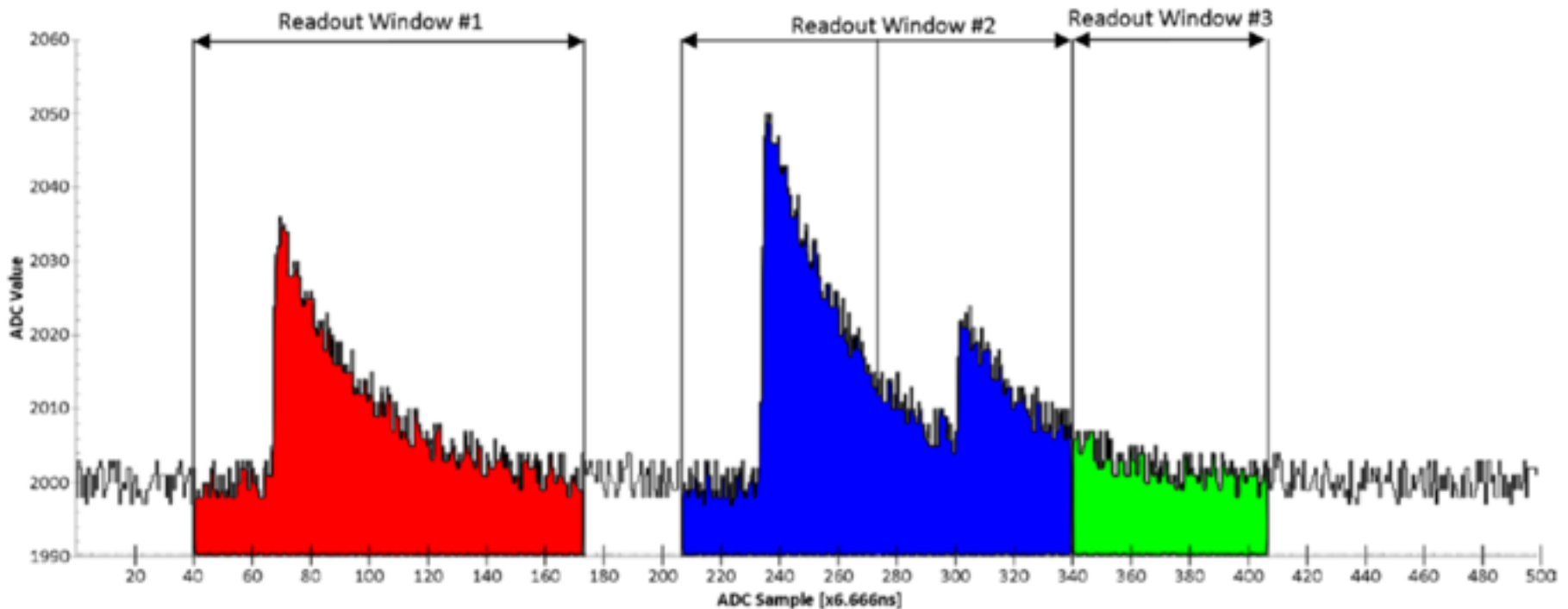

Figure 11-6: Example with offset with truncation mode. (readout_pretrigger=40, readout_window=200)

- Offset with truncation
  - Most fairly samples the overlapping hit
  - Variable length windows

Handling Overlaps

- How much does it matter?
  - Not sure yet – don't have this behavior of the SSPs included in our simulation

- My preference: Offset with truncation
  - We restitch and redo hit-finding offline, so the more fairly we can sample the better
  - All code which handles waveforms (including reformatter) has been written for variable-length windows.

SSPFragmentToOpDetWaveform

- From the header
  - Nova timestamp, converted to a double in units of microseconds
    - Done so code upstream of here could be shared across experiments with different clock speeds
  - SSP Number and Hardware channel
    - These are packed together as two hexadecimal digits of `daqHeader->group2`
    - Online→offline channel conversion happens here

- The digitized waveform
  - Vector of shorts, size determined dynamically