The time difference between SSD and WCD

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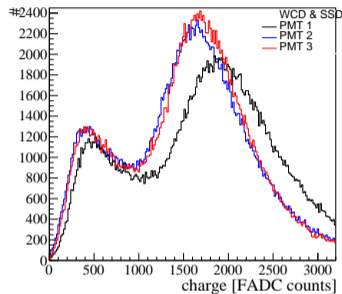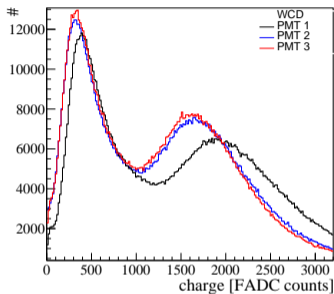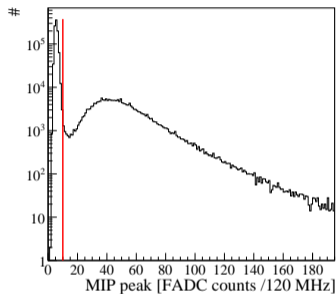
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- details in GAP-2021-046

- An extra from the coincidence calibration studies

What are coincidence calibration histograms? (a reminder)
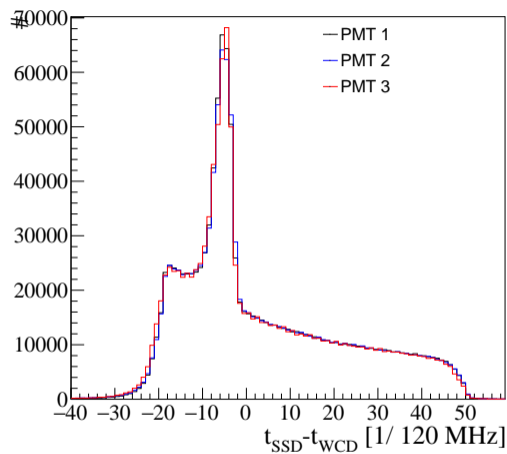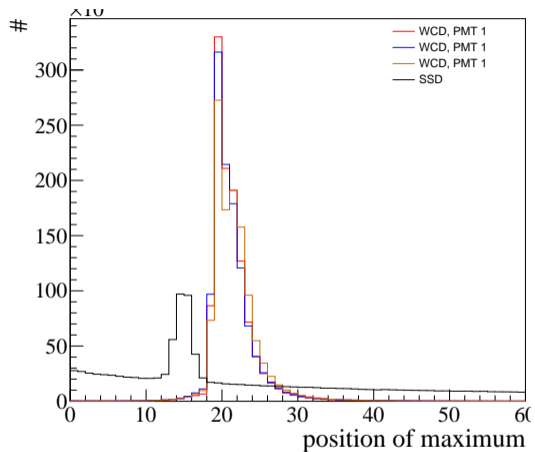
simple noise reduction: MIP peak > 10 counts/120 MHz
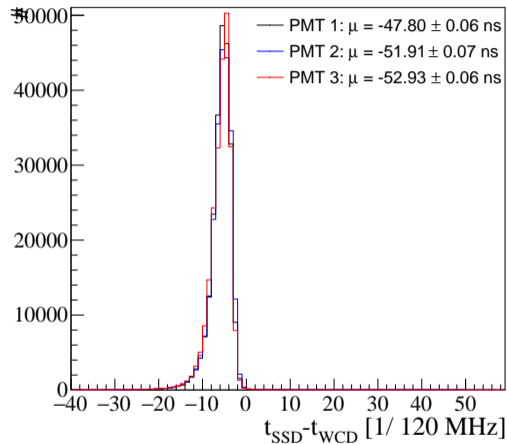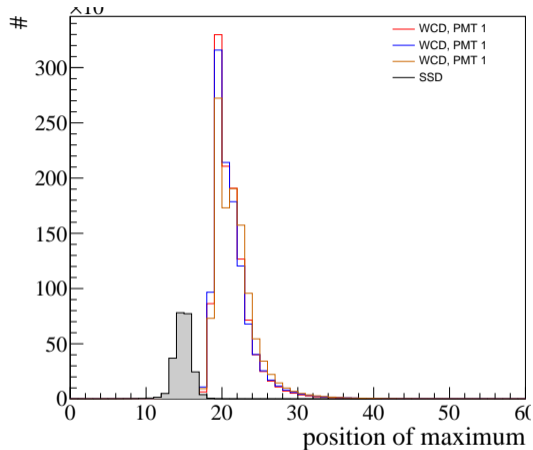

hump/valley improvements:

$(1.55, 1.58, 1.59) \rightarrow (2.65, 2.63, 2.81)$ (for the charge)

$(1.17, 1.18, 1.20) \rightarrow (2.01, 1.85, 1.90)$ (for the peak)

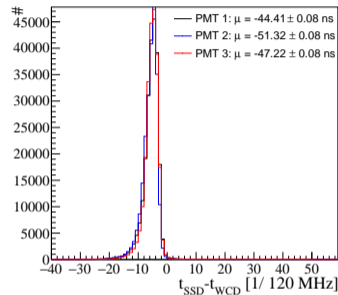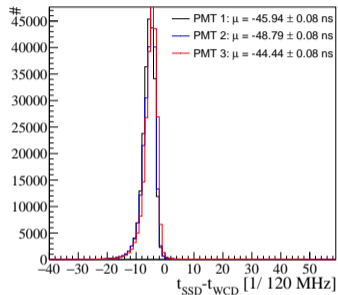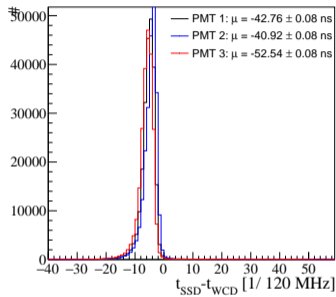# Position of the maximum and time difference (Trak Jr.)

Position of the maximum and time difference (Trak Jr.)

coincidence condition: average time difference 5.6 bins

Extending this study to Van Mieu, Zapata and Bac Dau

Time difference between 40 and 53 ns

Summary of the time delays

Even if the UUB delays are very small, a large and significant delay is observed between the SSD and WCD using the single muons with the SSD signal arriving earlier than the WCD by more than 40 ns (given the sharp rise of the signal, the peak position can be translated to the start time)

This delay is not yet understood: (just about 10 ns can be explained by the light travel in the WCD)

Discussion and proposed actions

1. Has the same delay been checked in data (large signals or inclined showers)?
2. Proposal: Make a simple measurement for the full array to measure the variations
3. Understand and validate from simulations this delay