Cluster Counting Algorithm Update

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Setup

We use the long drift tube which was previously presented in the context of the "analogic derivative" method of finding clusters. The method sends the tube signal and a delayed copy into a discriminator with a given threshold. The output enhances cluster arrivals because of the fast rise times of clusters.
In this case the time delay is 15ns with a 10mV threshold. Operating voltage was 2050V. Studies are underway which investigate the effect of different delays, thresholds, and voltages. Also under study is the effect of adding layers of material between the Sr90 source and the wire (to change the effective spectrum), but in this case 4 thin layers of aluminium foil were present. The impact parameter was set to 0mm, and the gas mixture is He:Methane 70:30.

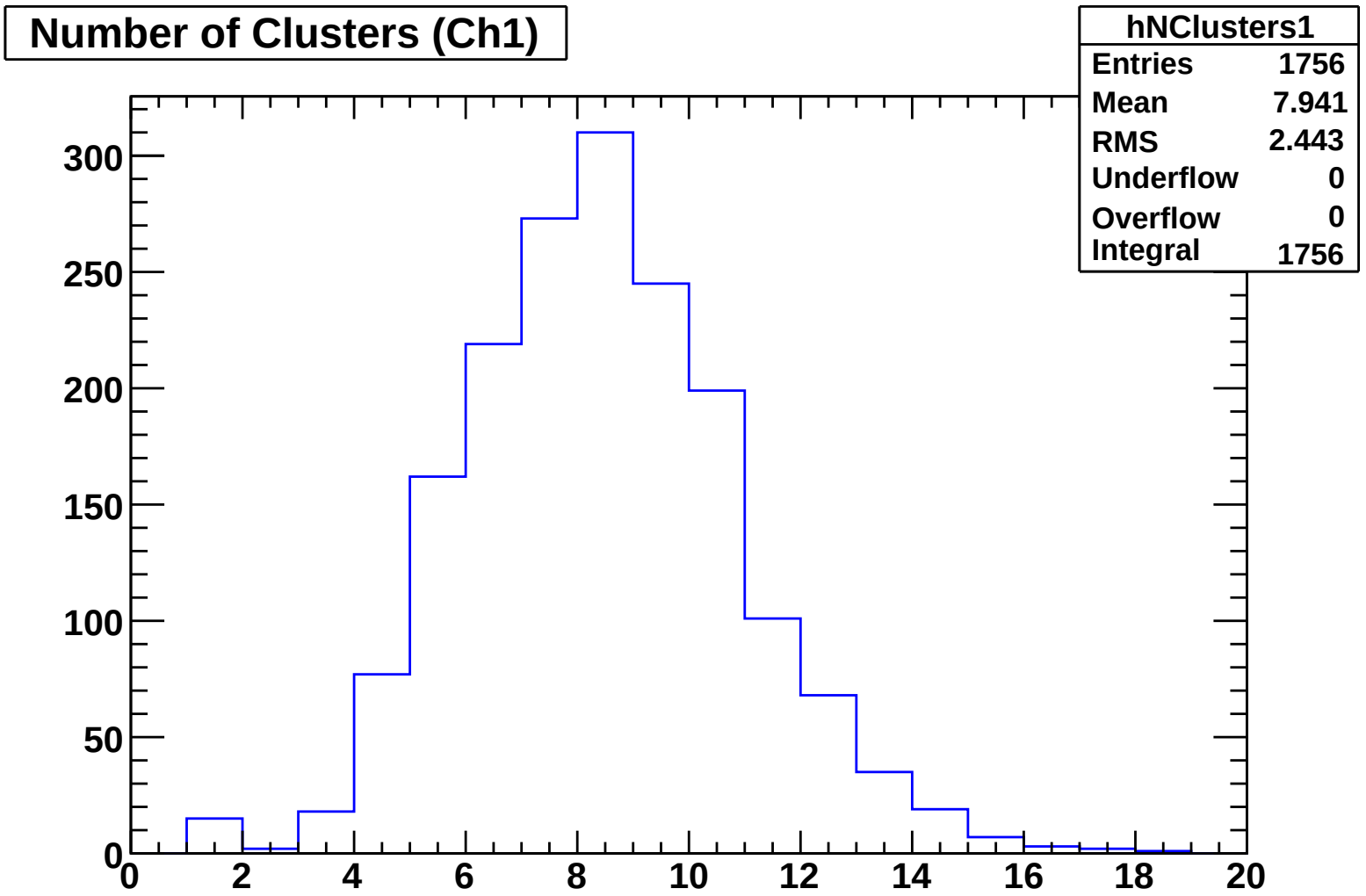
Acquisition

The data are oscilloscope traces with 1024 samples per trace. The bandwidth is limited by the preamp at 300MHz. Data from the preamp and from the "analogic derivative" module are acquired in two different channels.
The data are written to a binary file on disc which is then converted into a ROOT TTree by a custom script. The contents of the TTree include an event index, two sequences of 1024 voltage samples (for each channel), and a sequence of time indexes.
The use of a TTree allows us to use a "Selector"-based analysis structure that is familiar to BaBar people.

Algorithm 1

```
FOR EACH i IN timeidx:
 OldVoltage = CurrentVoltage
 CurrentVoltage = Voltage(i)
 IF CurrentVoltage < Threshold AND OldVoltage > Threshold:
 THEN NClusters = NClusters + 1
```

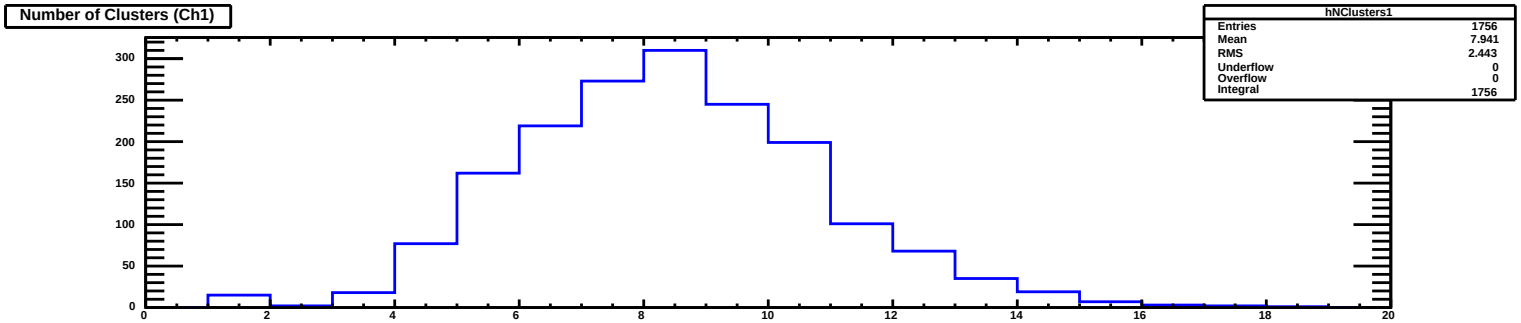
Algorithm 1 Result

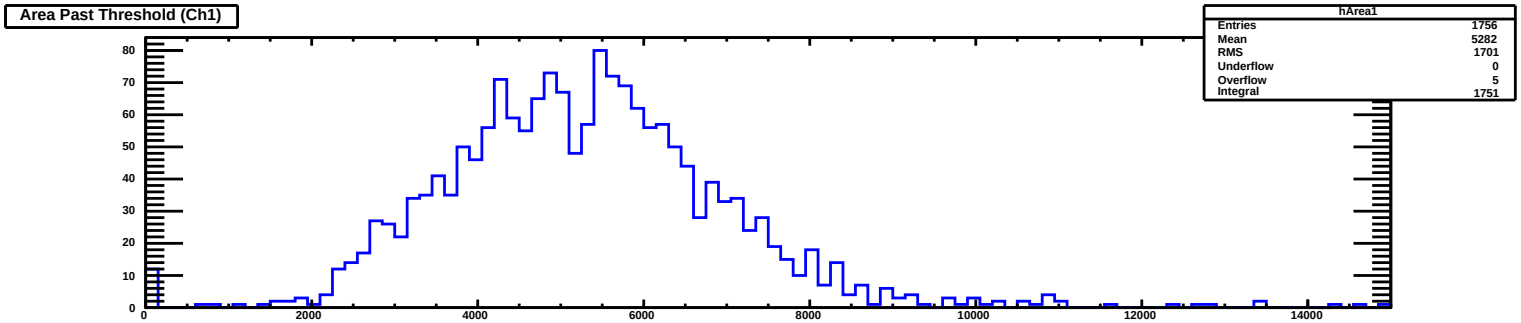


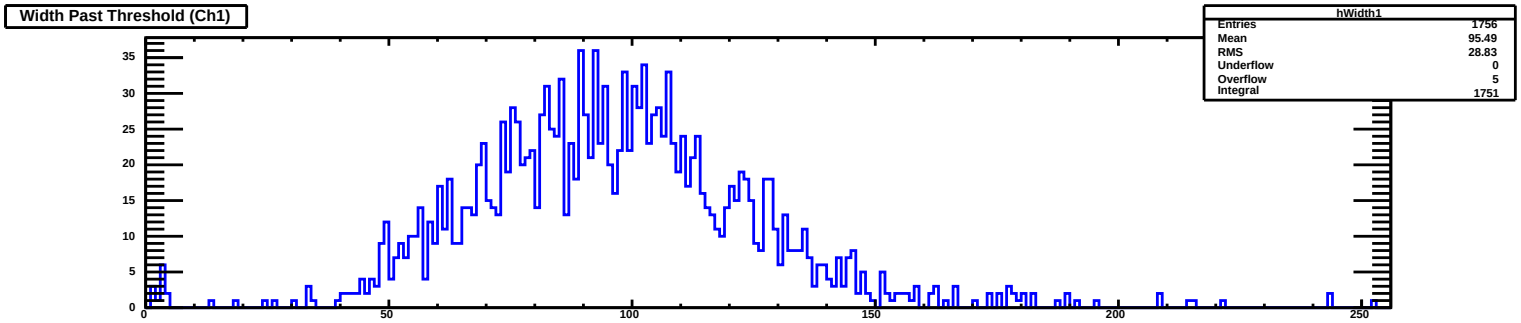
Algorithms 2 and 3

```
FOR EACH i IN timeidx:
 IF CurrentVoltage < Threshold:
 THEN
 Area = Area + (CurrentVoltage-Threshold)
 Width = Width + 1
```

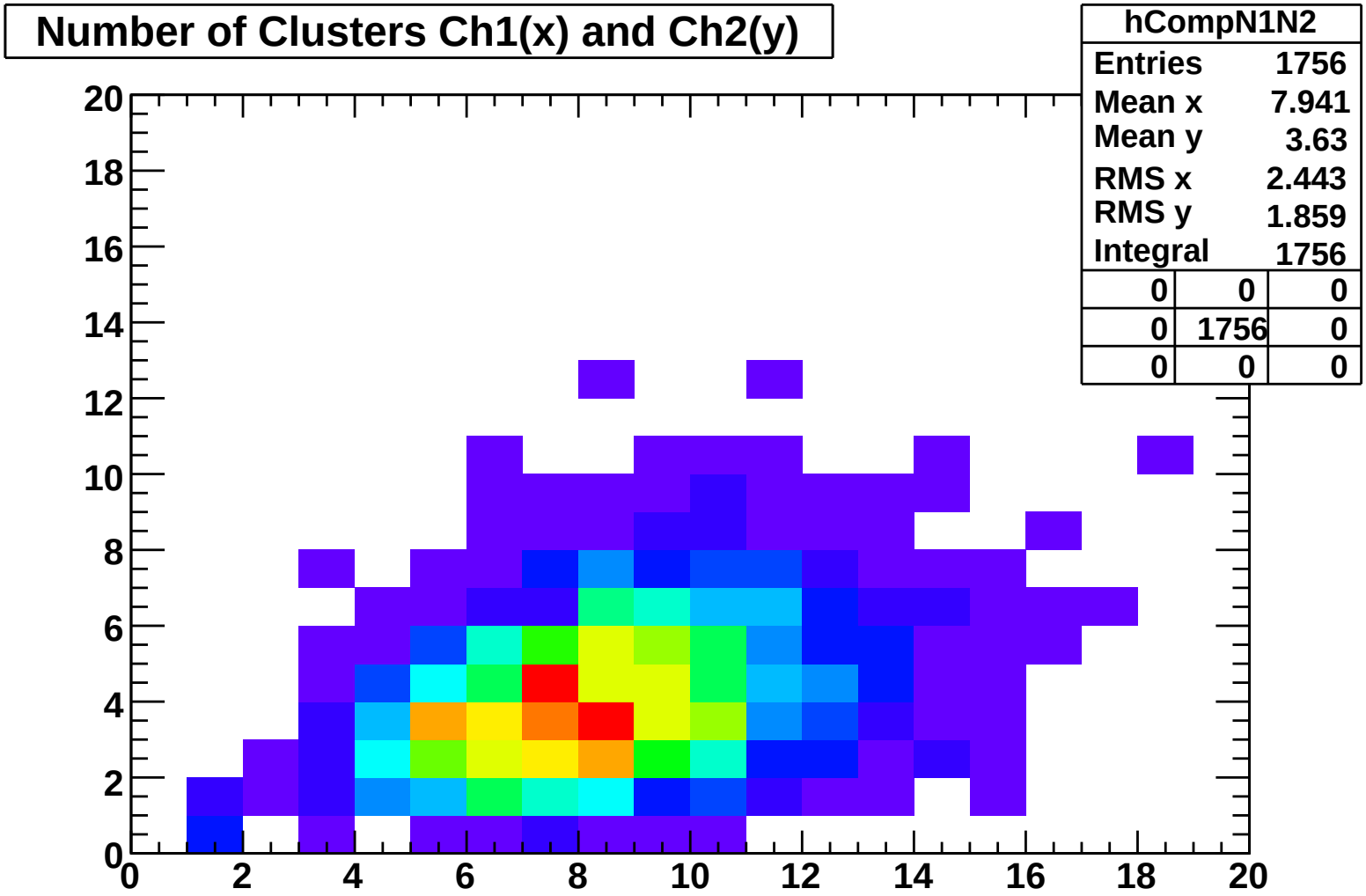
Algorithm Comparisons



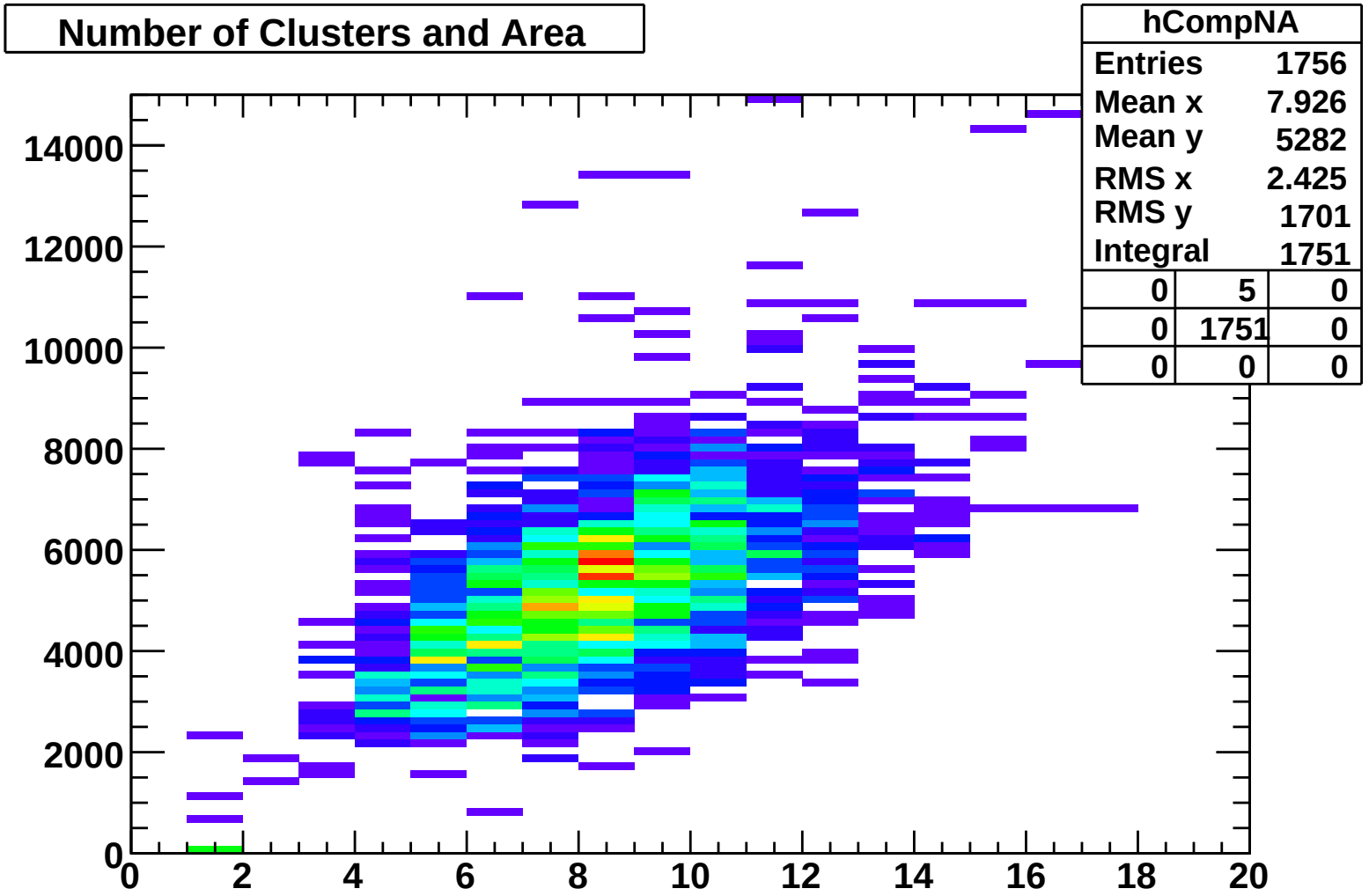




Analogic Derivative



Algorithms 1 and 2



Algorithms 2 and 3