



---

# SHMS Hodo Efficiency

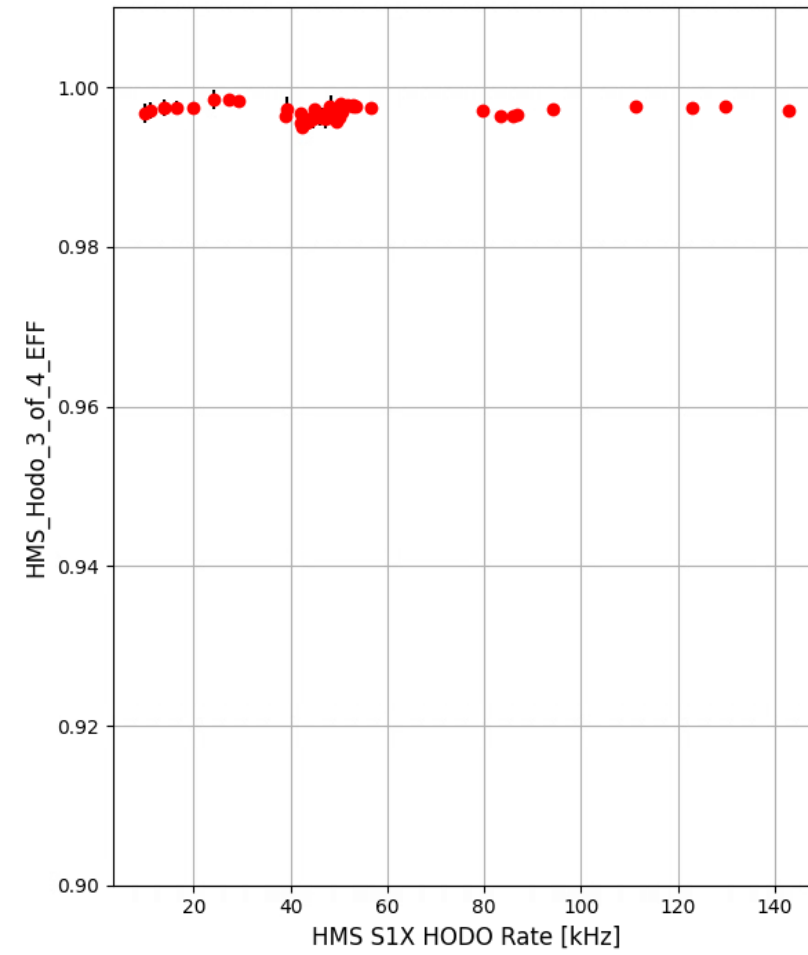
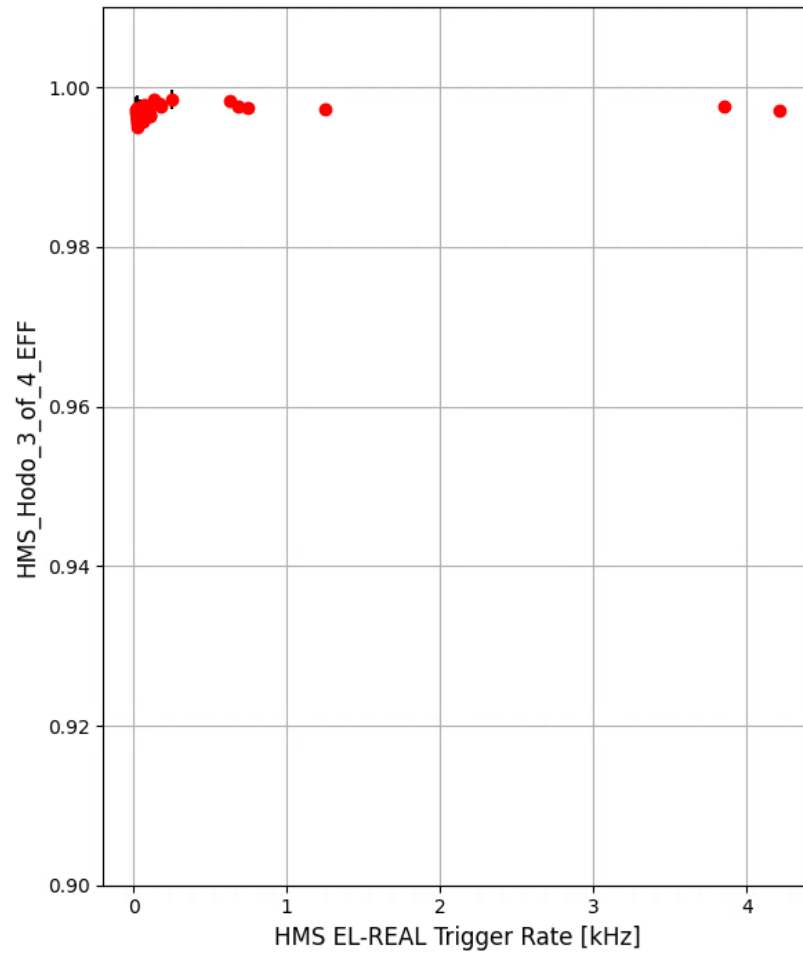
---

Mr. Muhammad Junaid  
Ph.D. Student  
Department of Physics,  
University of Regina, Canada

- **Thanks to Mark Jones.** He fixed the SHMS  $\frac{3}{4}$  Hodo Efficiency issue.
- All of HeePCoin and Production data has SHMS  $\frac{3}{4}$  Hodo Efficiency > 0.99.
- Compiled the Marks hcana for both pionlt and kaonlt group with name **“hcana\_08\_10\_24\_Root6\_24\_08\_Alma9\_HodoEffUpdate”**
- **Major changes to HCANA (Still looking):**
  - Added module for event selection to calculating Hodo Eff for single and coin data separately.
  - Need to the following parameter in “phodo\_cut.param” file  
**pHodoEffEventType = 4 ;(4 = Coin Data, 1 = HMS Sing Data, 2 = SHMS Sing Data)**
- Added two conditions for calculating Eff:  
**goodstarttime && goodEventType**
- Added module to check missing track positions (fTrack\_Miss\_Xpos and fTrack\_Miss\_Ypos)
- For each plane {ip}, the missing track positions are computed using the the track's parameters (X, Y, angles Theta and Phi) and the position of that plane (fPosZ[ip]) and then doing track extrapolation.

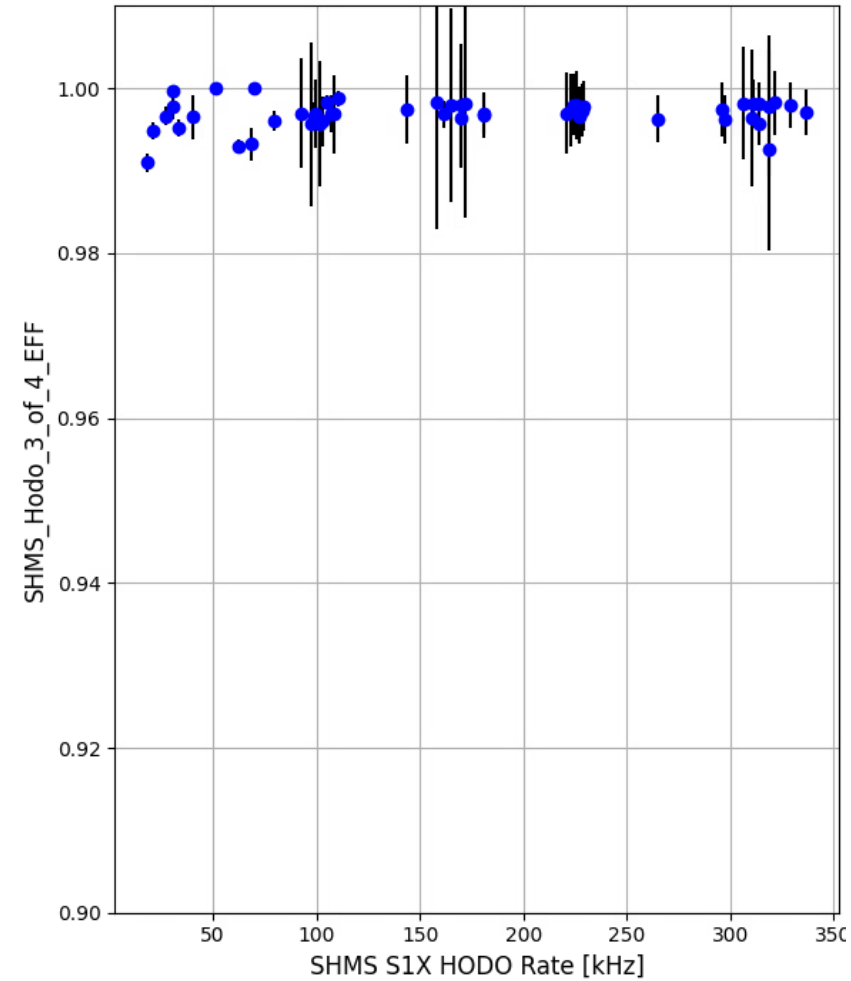
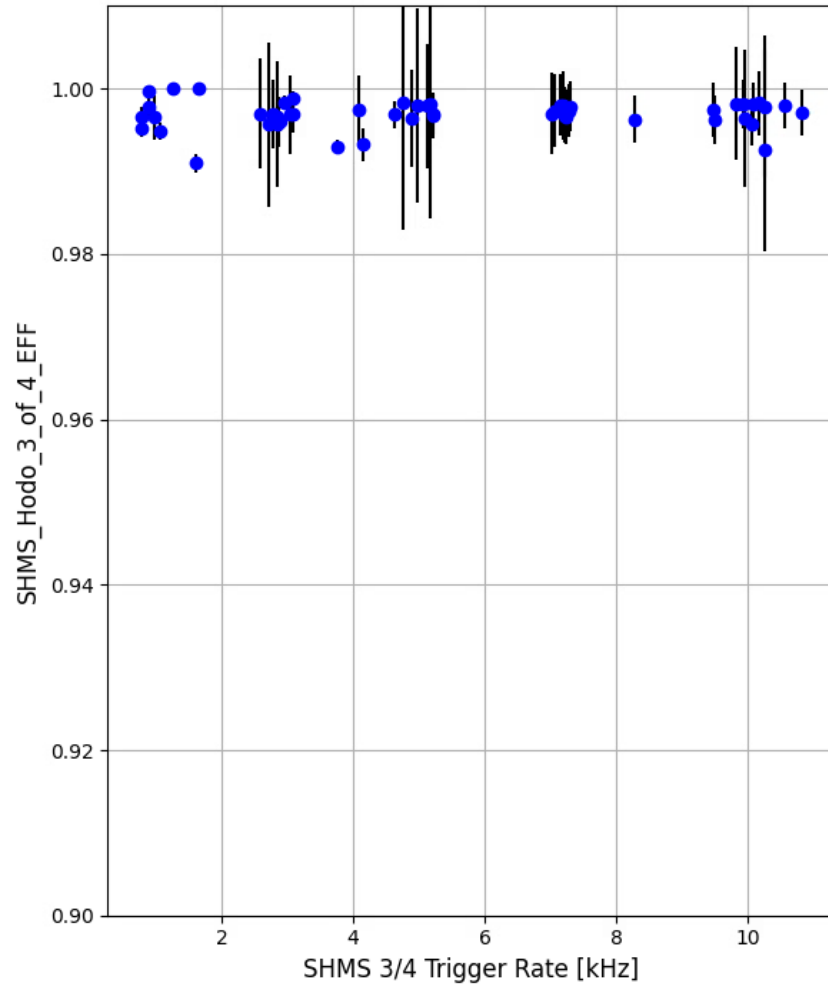
# SHMS Hodo $\frac{3}{4}$ Efficiency

PionLT Experiment



# SHMS Hodo $\frac{3}{4}$ Efficiency

PionLT Experiment



- Assigned the efficiencies of the first four planes to variables p1 through p4

```
Double_t p1234 = p1 * p2 * p3 * p4;  
Double_t p123  = p1 * p2 * p3 * (1.0 - p4);  
Double_t p124  = p1 * p2 * (1.0 - p3) * p4;  
Double_t p134  = p1 * (1.0 - p2) * p3 * p4;  
Double_t p234  = (1.0 - p1) * p2 * p3 * p4;
```

- Computed probabilities for specific plane combinations:

```
fHodoEff_s1 = 1.0 - ((1.0 - p1) * (1.0 - p2));  
fHodoEff_s2 = 1.0 - ((1.0 - p3) * (1.0 - p4));  
fHodoEff_tof = fHodoEff_s1 * fHodoEff_s2;  
fHodoEff_3_of_4 = p1234 + p123 + p124 + p134 + p234;  
fHodoEff_4_of_4 = p1234;
```

- Sum of probabilities of all combinations where exactly three planes detected hits calculated as:

$$fHodoEff_3\_of\_4 = p1234 + p123 + p124 + p134 + p234;$$

- Looked into hcana for efficiency calculations.

```
for (Int_t ip = 0; ip < fNPlanes; ip++) {  
    fStatAndEff[ip] = 0;  
    for (Int_t ic = 0; ic < fNCounters[ip]; ic++) {  
        fStatTrkSum[ip] += fStatTrk[fHod->GetScinIndex(ip, ic)];  
        fStatAndSum[ip] += fHodoAndEffi[fHod->GetScinIndex(ip, ic)];  
    }  
    if (fStatTrkSum[ip] != 0)  
        fStatAndEff[ip] = float(fStatAndSum[ip]) / float(fStatTrkSum[ip]);  
}
```

- fStatAndEff: stores the efficiency for each plane
- fStatTrkSum[ip]: Accumulates the total number of track events for each plane
- fStatAndSum[ip]: Accumulates the number of successful hits for each plane
- If there were any tracks for each plane, compute the efficiency as:

$$\text{fStatAndEff} = \text{fStatAndSum} / \text{fStatTrkSum}$$