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# Tracking Efficiency Studies

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- The tracking efficiency is defined as follows:

$$\epsilon_{tracking} = \frac{\text{shmsscindid}}{\text{shmsscinsould}}$$

**shmsscinsould = hod + PID**

**shmsscindid = shmsscinsould + dc.track>0**

- Hod cuts used for tracking efficiency study

HMS Hod Cuts	SHMS Hod Cuts
H.hod.goodscinhit == 1	P.hod.goodscinhit == 1
H.hod.betanotrack > 0.8 && H.hod.betanotrack < 1.3	P.hod.betanotrack > 0.5 && P.hod.betanotrack < 1.4
H.hod.goodstarttime == 1	P.hod.goodstarttime == 1

- PID cuts used for tracking efficiency study

HMS PID Cuts	
Det.	Electron Selection
HMS Cer	H.cer.npeSum > 1.5
HMS Cal	H.cal.etotnorm > 0.7

SHMS PID Cuts			
Det.	Pion Selection	Proton Selection	Electron Selection
SHMS HGC	P.hgcer.npeSum > 1.0	P.hgcer.npeSum < 1.0	P.hgcer.npeSum > 1.0
SHMS Aero	P.aero.npeSum > 1.5	P.aero.npeSum < 1.5	P.aero.npeSum > 1.0
SHMS Cal	P.cal.etotnorm > 0.05	P.cal.etotnorm > 0.05	P.cal.etotnorm > 0.7
SHMS NGC	-	-	P.ngcer.npeSum > 1.0

# Efficiency Study

PionLT Experiment

Prod	HMS_Elec_SING Track_Eff < 0.993	Comments	Red: Bad Run Green: Good Run
12845	0.9798	HMS 2U2 wires time and distance distribution were distorted Fixed by rebooting ROC3 ( <a href="https://logbooks.jlab.org/entry/3933114">https://logbooks.jlab.org/entry/3933114</a> )	Bad Run
12846	0.3129	HMS 2U2 wires time and distance distribution were distorted Fixed by rebooting ROC3 ( <a href="https://logbooks.jlab.org/entry/3933114">https://logbooks.jlab.org/entry/3933114</a> )	Bad Run
12847	0.3059	HMS 2U2 wires time and distance distribution were distorted	Bad Run
12848	0.3128	HMS 2U2 wires time and distance distribution were distorted	Bad Run
12850	0.3066	HMS 2U2 wires time and distance distribution were distorted	Bad Run
13191	0.0	HMSbetanotrack zero events after cut/online was fine Calibrations were missing in param files (Fixed it for all 5 runs)	Good Run
13193	0.0	HMSbetanotrack zero events after cut/online was fine	Good Run
13194	0.0	HMSbetanotrack zero events after cut/online was fine	Good Run
13195	0.0	HMSbetanotrack zero events after cut/online was fine	Good Run
13196	0.0	HMSbetanotrack zero events after cut/online was fine	Good Run

# Efficiency Study

PionLT Experiment

Prod	HMS_Elec_SING Track_Eff < 0.993	Comments	Red: Bad Run Green: Good Run
15020	0.9928	Dummy Target (beam went off for last 5 min)	Green: Good Run
15033	0.9852	Dummy Run	Green: Good Run
15043	0.9923	Dummy Run	Green: Good Run
15058	0.9828	Beam was tripping ( <a href="https://logbooks.jlab.org/entry/4005117">https://logbooks.jlab.org/entry/4005117</a> )	Need to check
15059	0.9758	Beam was tripping ( <a href="https://logbooks.jlab.org/entry/4005117">https://logbooks.jlab.org/entry/4005117</a> )	Need to check
15061	0.9712	Dummy Run	Green: Good Run
15102	0.9878	Dummy Run	Green: Good Run
15103	0.9924	No issue (55 $\mu$ A)	Green: Good Run
15121	0.9915	Dummy Run	Green: Good Run

# Efficiency Study

PionLT Experiment

Prod	HMS_Elec_SING Track_Eff < 0.993	Comments	Red: Bad Run Green: Good Run
15487	0.9901	Beam was tripping ( <a href="https://logbooks.jlab.org/entry/4014689">https://logbooks.jlab.org/entry/4014689</a> )	Need to check
15489	0.925	Less number of pions (ROC3 problem) ( <a href="https://logbooks.jlab.org/entry/4014716">https://logbooks.jlab.org/entry/4014716</a> ) ( <a href="https://logbooks.jlab.org/entry/4014729">https://logbooks.jlab.org/entry/4014729</a> ) ( <a href="https://logbooks.jlab.org/entry/4014741">https://logbooks.jlab.org/entry/4014741</a> )	Bad Run
15490	0.9318	ROC3 problem	Bad Run
15491	0.899	ROC3 problem	Bad Run
15492	0.926	ROC3 problem	Bad Run

# Efficiency Study

PionLT Experiment

Prod	SHMS_Pion_SING Track_Eff < 0.97	Comments	Red: Bad Run Green: Good Run
12467	0.9674	Q1 interlock-short run (30 pions only)	Bad Run
15717	0.9141	SHMS Bad DC - LV power supplies ( <a href="https://logbooks.jlab.org/entry/4019672">https://logbooks.jlab.org/entry/4019672</a> ) ( <a href="https://logbooks.jlab.org/entry/4019686">https://logbooks.jlab.org/entry/4019686</a> )	Bad Run
15718	0.9184	SHMS Bad DC	Bad Run
15719	0.9181	SHMS Bad DC	Bad Run
15720	0.9195	SHMS Bad DC	Bad Run
15722	0.9175	SHMS Bad DC	Bad Run

# Efficiency Study

PionLT Experiment

HeeP Coin	HMS_Elec_SING Track_Eff < 0.996	Comments	Red: Bad Run Green: Good Run
13057	0.9959	Dummy run	Good Run
13062	0.9957	Dummy run	Good Run
14577	0.9959	No issue	Good Run
14590	0.9954	No issue	Good Run
14986	0.9958	TDC Error in Replay, Rates were different than expected <a href="https://logbooks.jlab.org/entry/4004070">https://logbooks.jlab.org/entry/4004070</a> <a href="https://logbooks.jlab.org/entry/4004102">https://logbooks.jlab.org/entry/4004102</a>	Good Run
14987	0.9956	TDC Error in Replay	Good Run
14989	0.9957	TDC Error in Replay	Good Run
14991	0.9935	TDC Error in Replay	Good Run
14992	0.9913	TDC Error in Replay	Good Run
16280	0.9949	Dummy Run	Good Run



# Efficiency Study

PionLT Experiment

HeeP Coin	SHMS_Prot_SING Track_Eff < 0.97	Comments	Red: Bad Run Green: Good Run
13165	0.9655	No issue	Green: Good Run
14992	0.96900001	(30 min run instead of 60 min) Last run of Setting	Green: Good Run

HeePSing SHMS	SHMS_Elec_SING Track_Eff	Comments	Red: Bad Run Green: Good Run
15036	0.0	Its HMS HeeP Sing run	Good Run
15037	0.0	Its HMS HeeP Sing run	Good Run
15038	0.0	Its HMS HeeP Sing run	Good Run

# Efficiency Study

PionLT Experiment

LumiCoin	SHMS_Elec_SING Track_Eff < 0.995	Comments	Red: Bad Run Green: Good Run
16241	0.9949	Q1 Interlocked ( <a href="https://logbooks.jlab.org/entry/4029661">https://logbooks.jlab.org/entry/4029661</a> )	Need to check
LumiCoin	HMS_Elec_SING Track_Eff < 0.9875	Comments	Red: Bad Run Green: Good Run
16273	0.9874	Coda crashed ( <a href="https://logbooks.jlab.org/entry/4030693">https://logbooks.jlab.org/entry/4030693</a> )	Need to check
LumiSing SHMS	SHMS_Elec_SING Track_Eff < 0.96	Comments	Red: Bad Run Green: Good Run
12141	0.9539	Short run (Beam went down after 5min)	Need to check
16761	0.9962	Coda Failed at end of run (Failed to generate BCM current param)	Need to check
LumiSing HMS	HMS_Elec_SING Track_Eff	Comments	Red: Bad Run Green: Good Run
16738	0.0	Its Lumi-SHMS run	Good Run

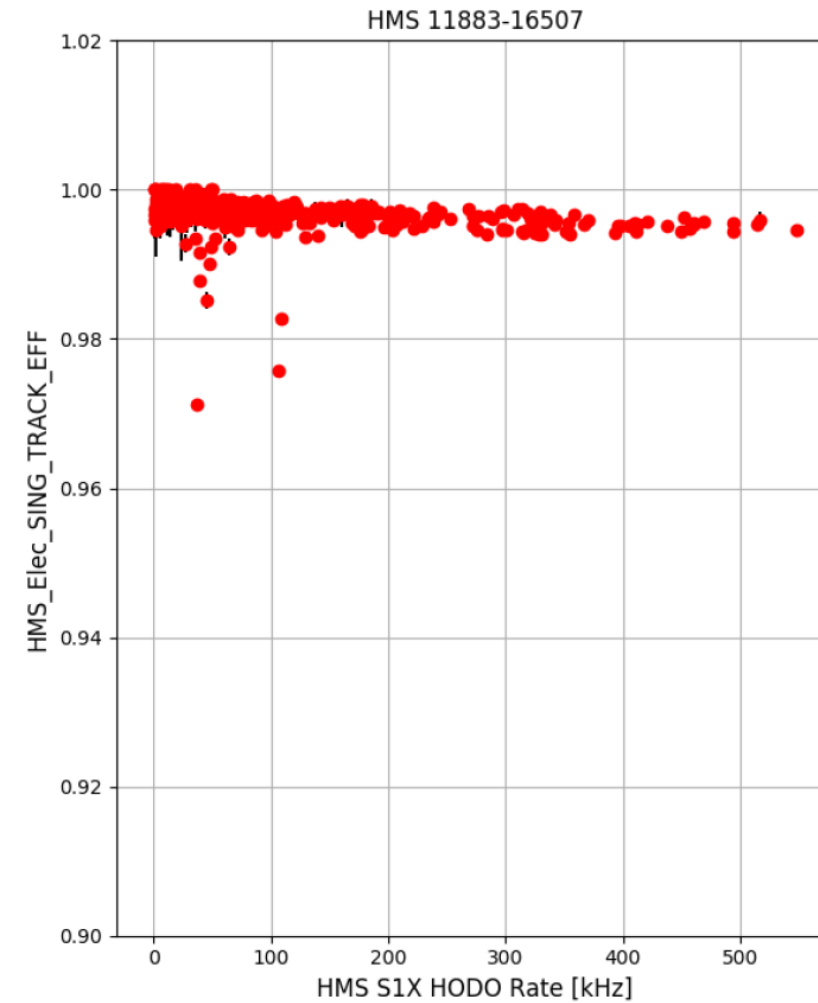
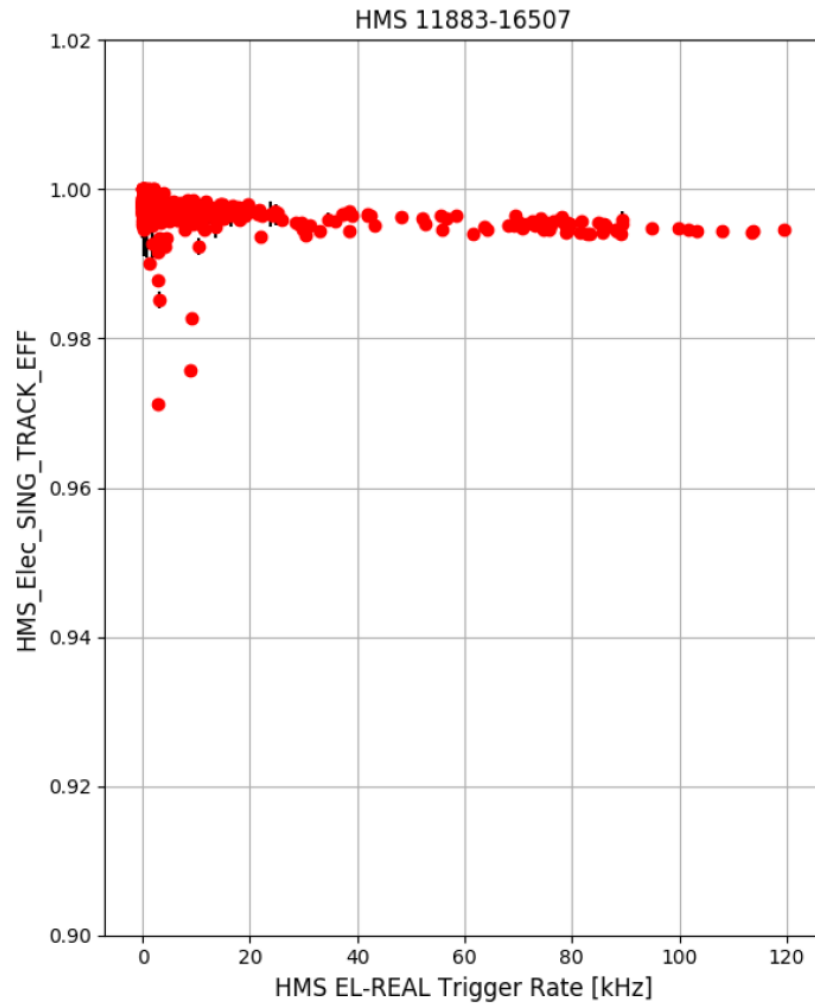
# Efficiency Study

PionLT Experiment

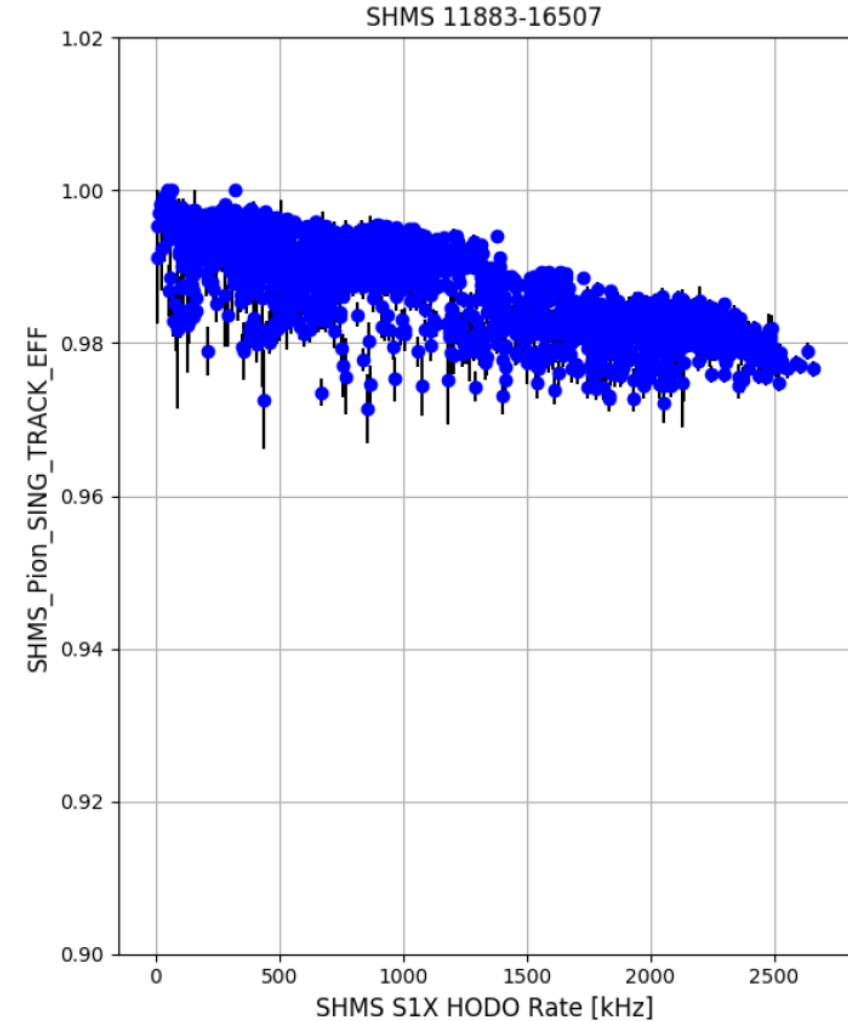
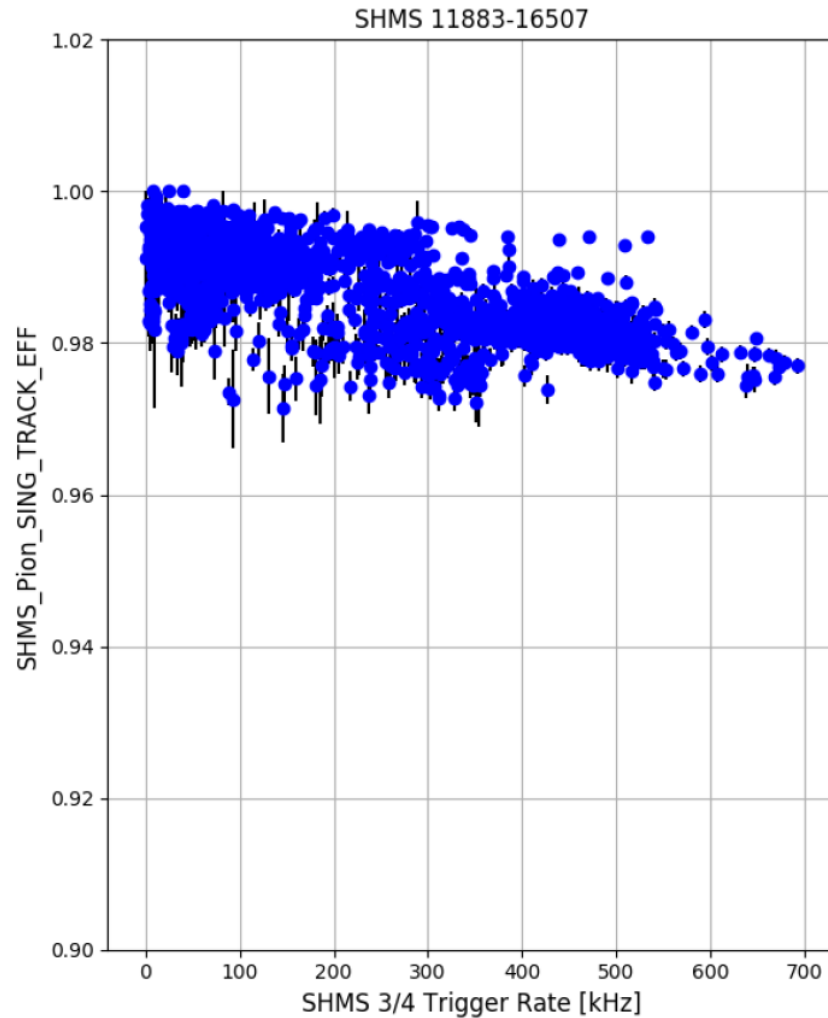
pTRIG6	HMS_Elec_SING Track_Eff	Comments	Red: Bad Run Green: Good Run
14330	0.9615	Data Corrupt (TDC error) ( <a href="https://logbooks.jlab.org/entry/3973402">https://logbooks.jlab.org/entry/3973402</a> )	Bad Run
16205	0.9934	No issue	Green: Good Run
16222	0.9938	FADC mode 10 was On (by mistake) ( <a href="https://logbooks.jlab.org/entry/4029397">https://logbooks.jlab.org/entry/4029397</a> )	Its FADC run
16223	0.9928	DAQ hung at the end of run (did kcode/startcode ) ( <a href="https://logbooks.jlab.org/entry/4029397">https://logbooks.jlab.org/entry/4029397</a> )	Green: Good Run
16232	0.9927	High rates	Green: Good Run

pTRIG6	SHMS_Pion_SING Track_Eff	Comments	Red: Bad Run Green: Good Run
15036	0.0	Its HMS HeeP Sing run	Good Run

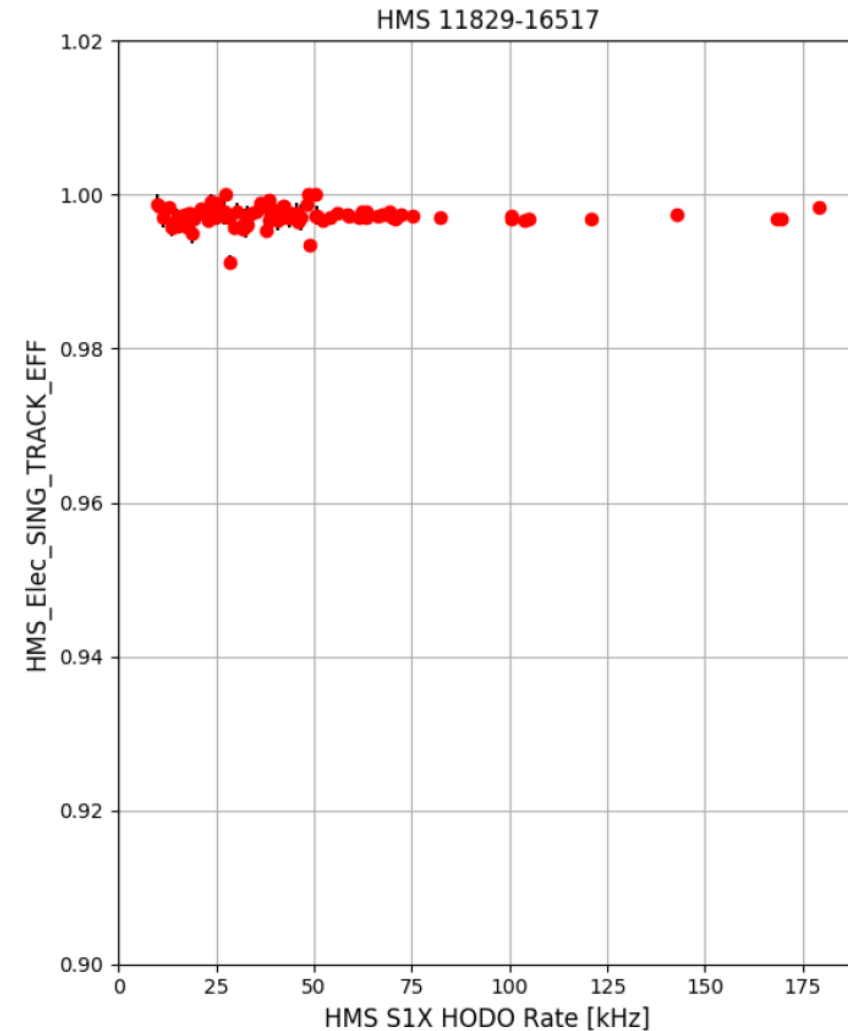
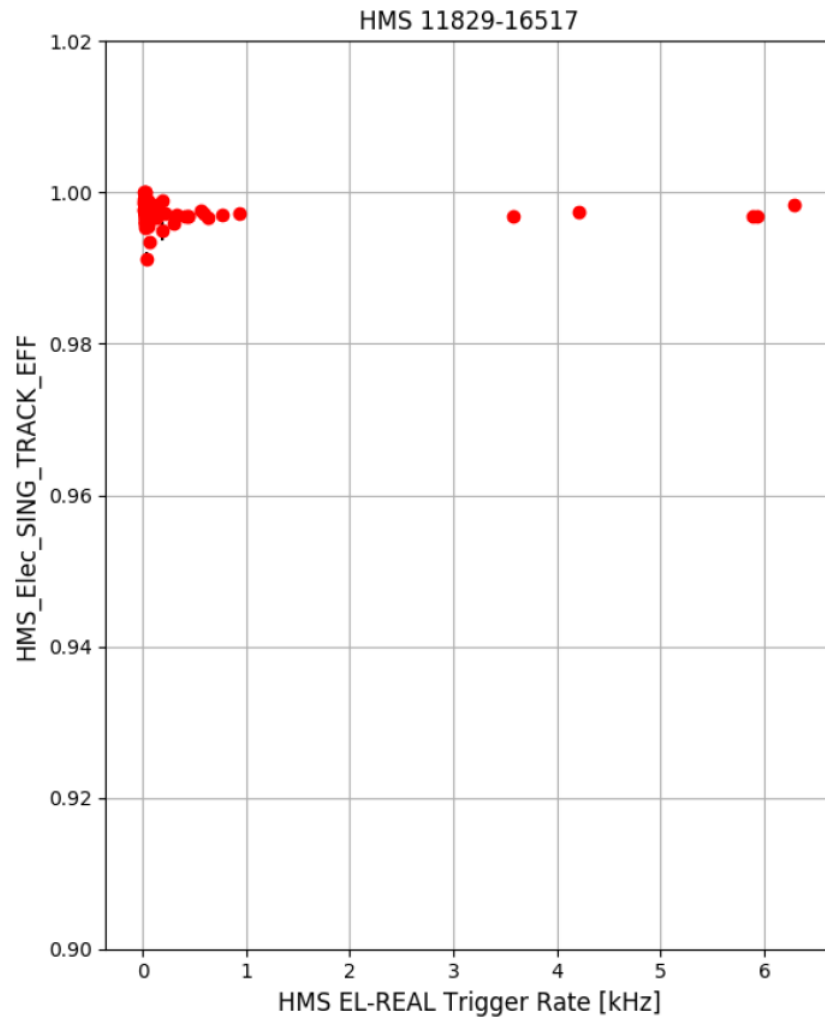
- Tracking efficiency plots for production data:



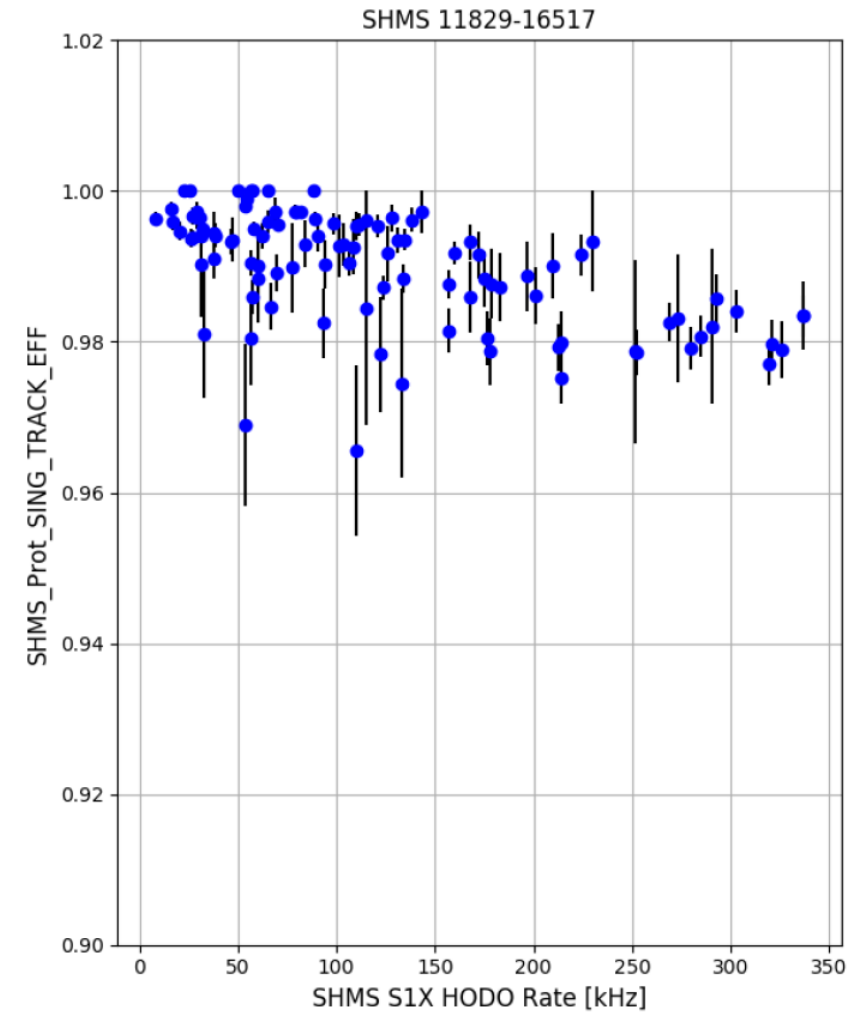
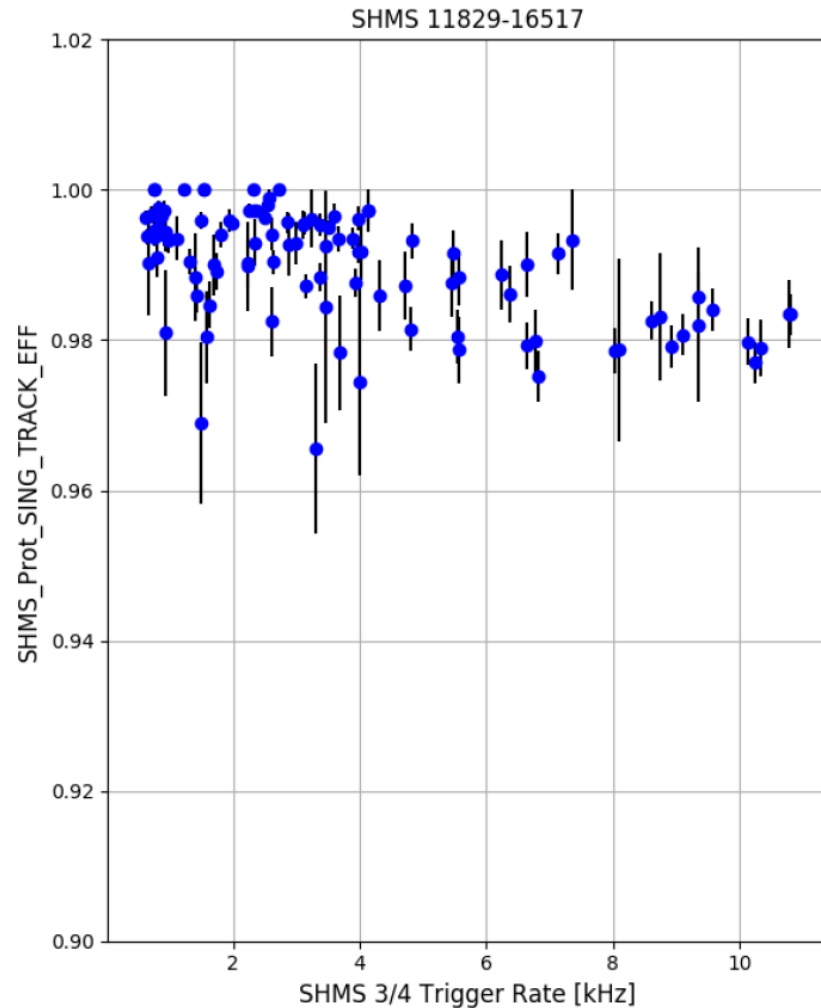
- Tracking efficiency plots for production data:



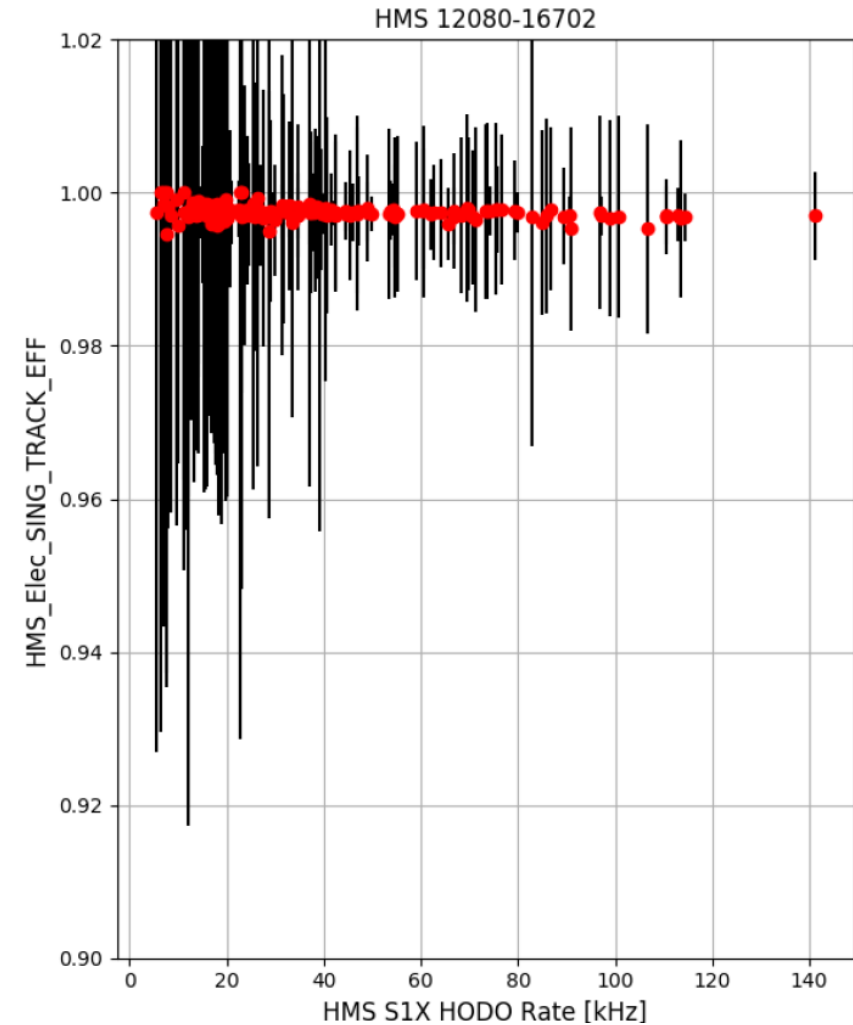
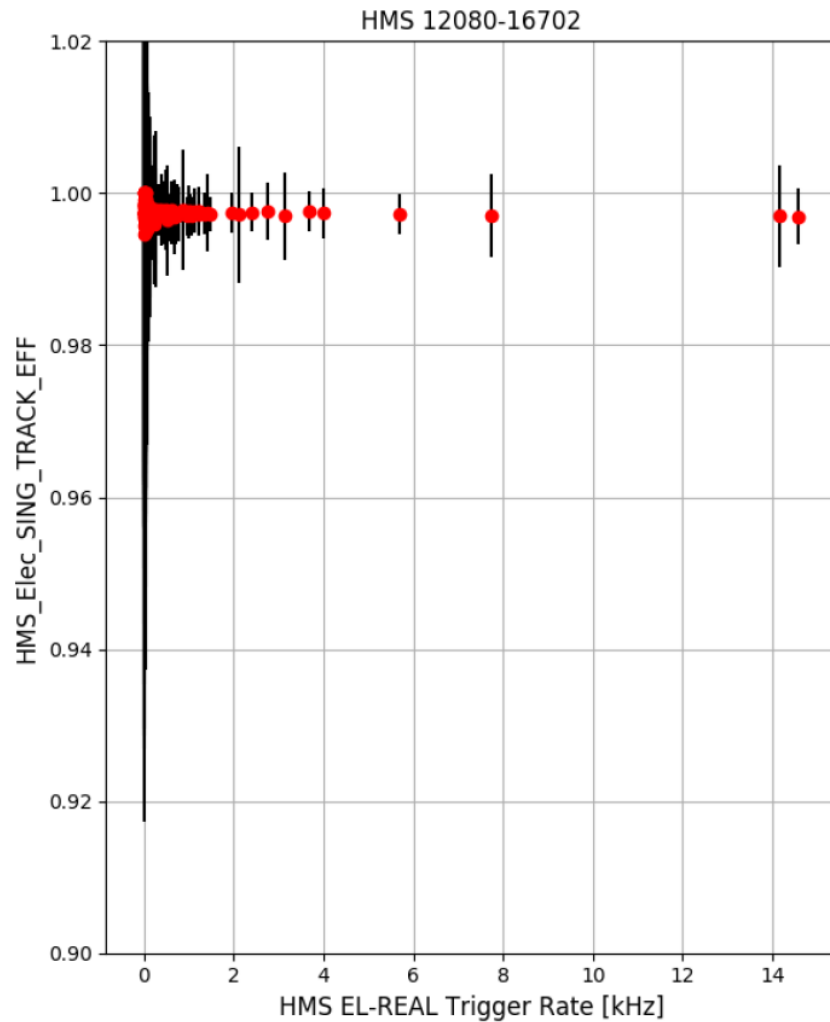
- Tracking efficiency plots for HeePCoin data:



- Tracking efficiency plots for HeePCoin data:

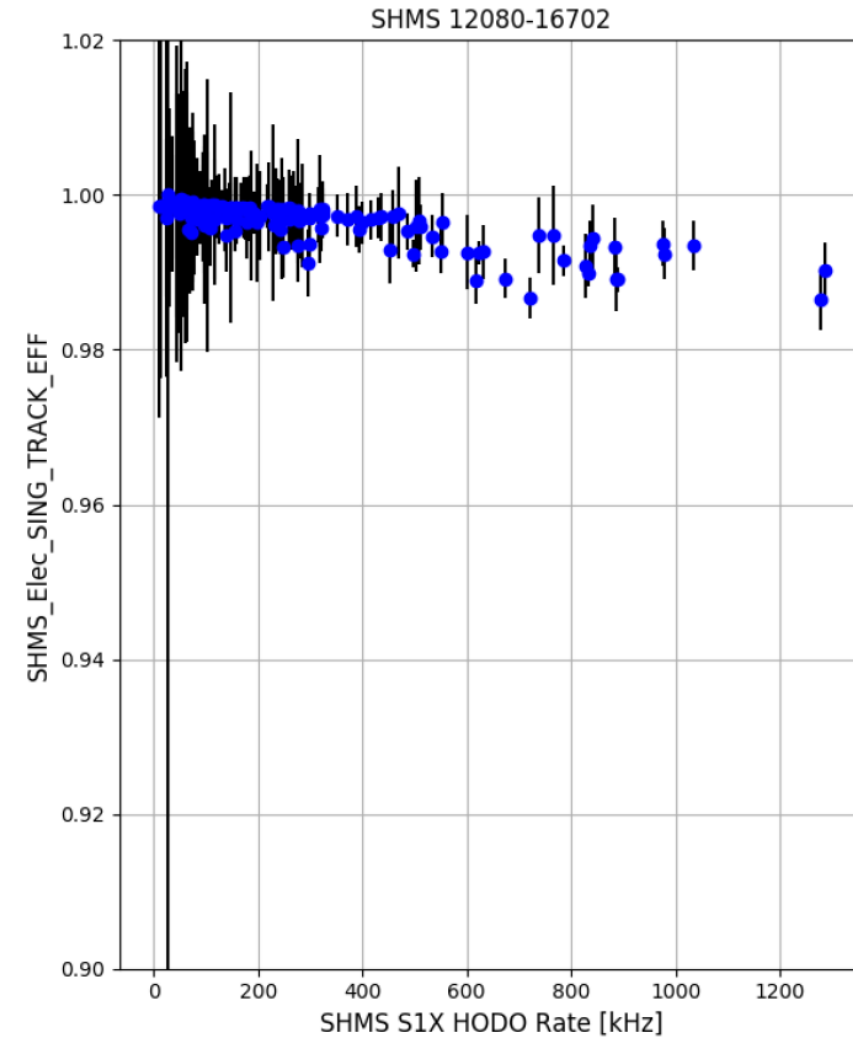
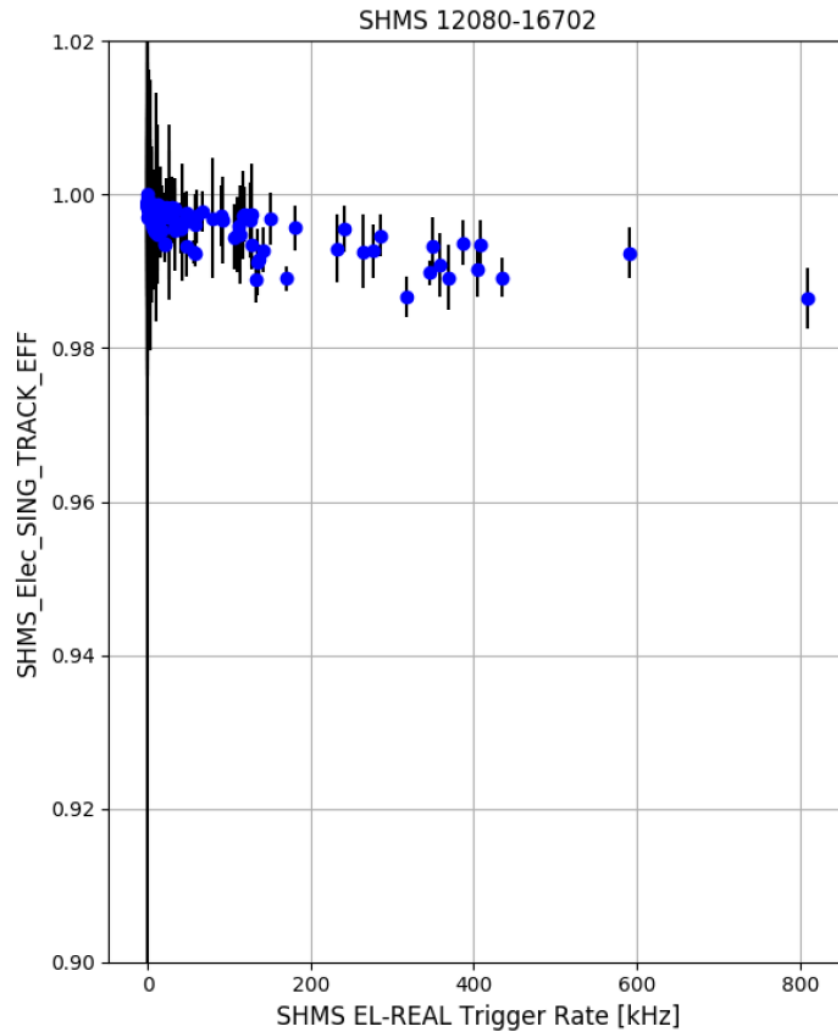


- Tracking efficiency plots for HMS HeePSing data:

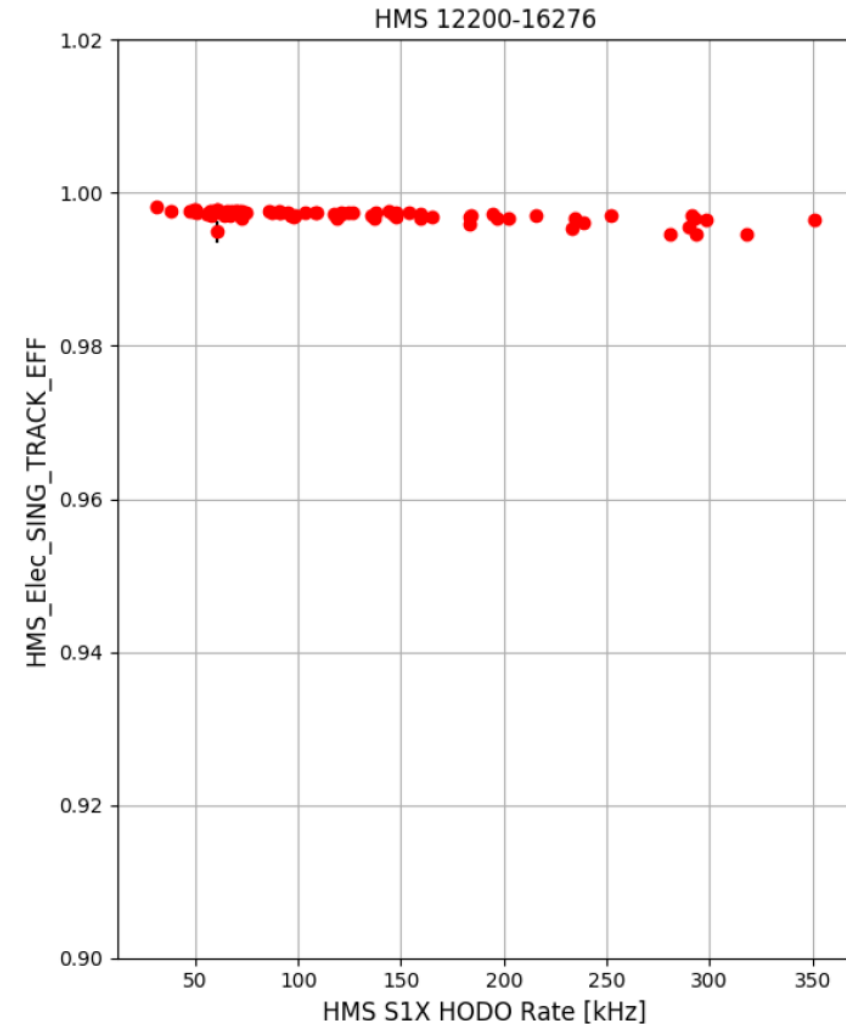
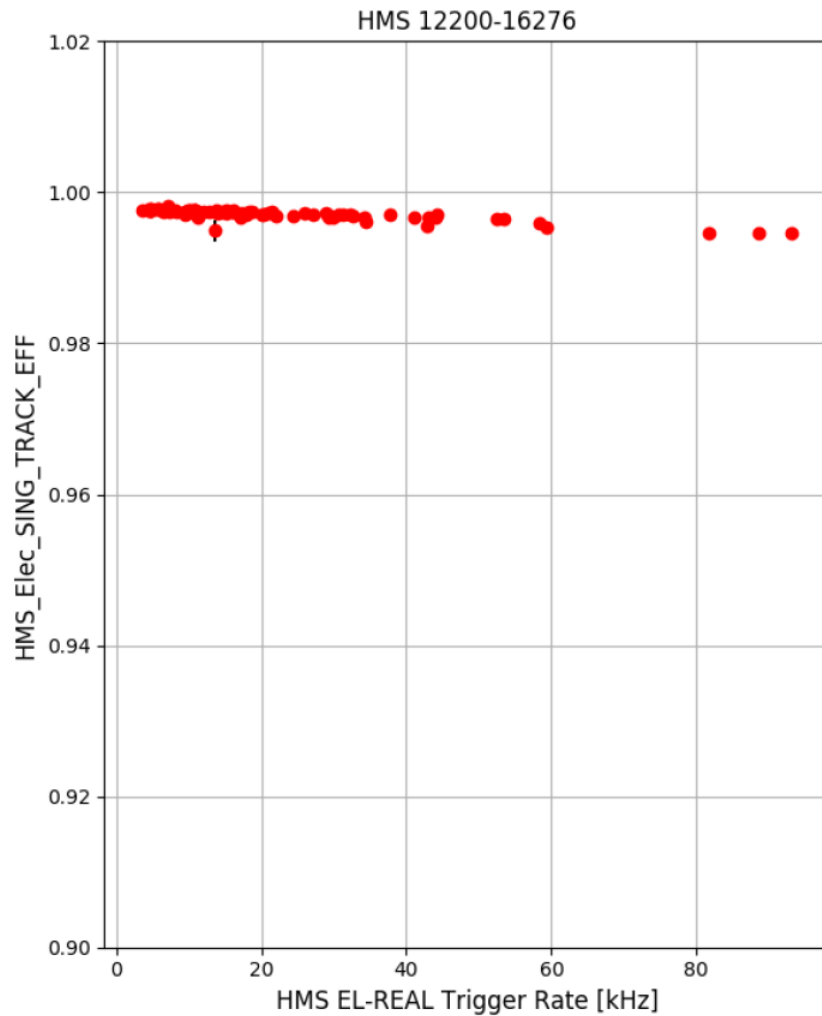




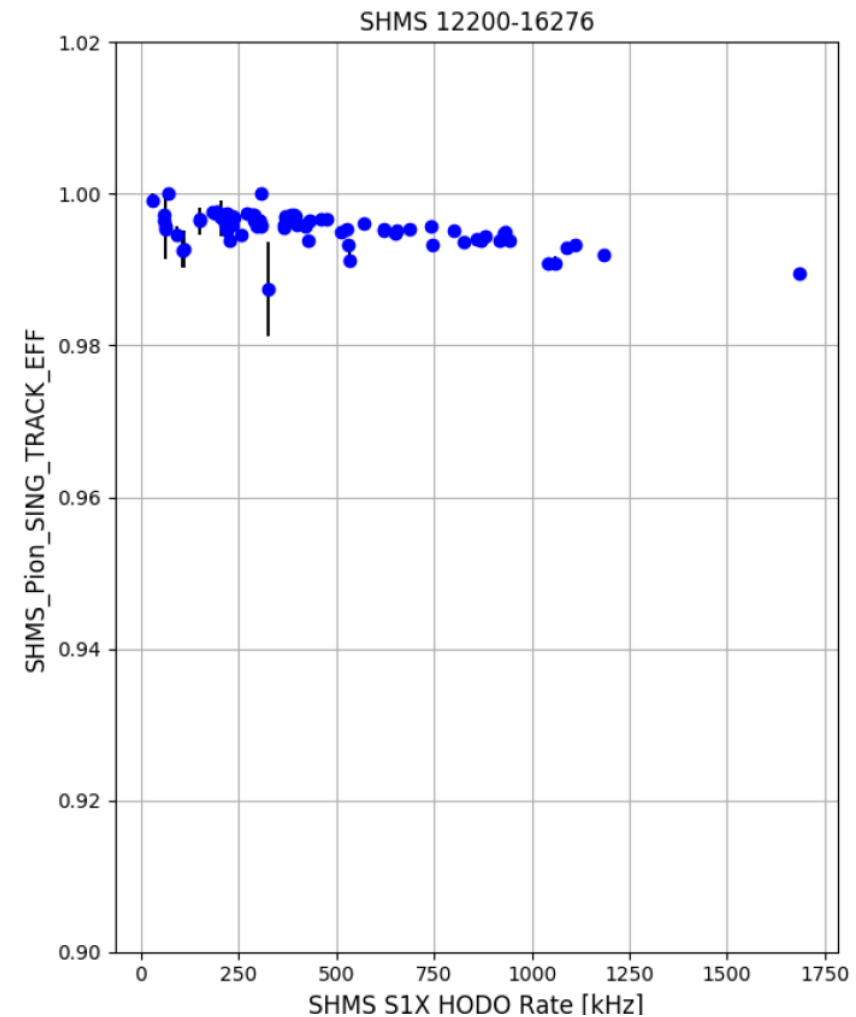
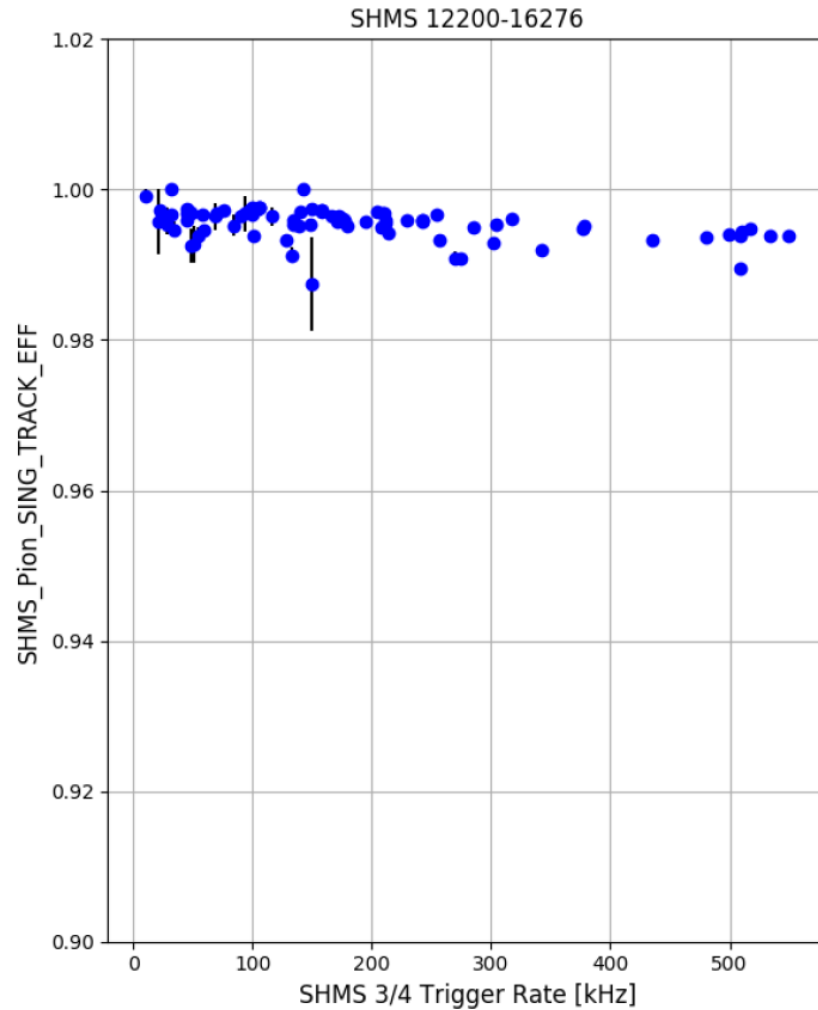
- Tracking efficiency plots for **SHMS HeePSing data**:



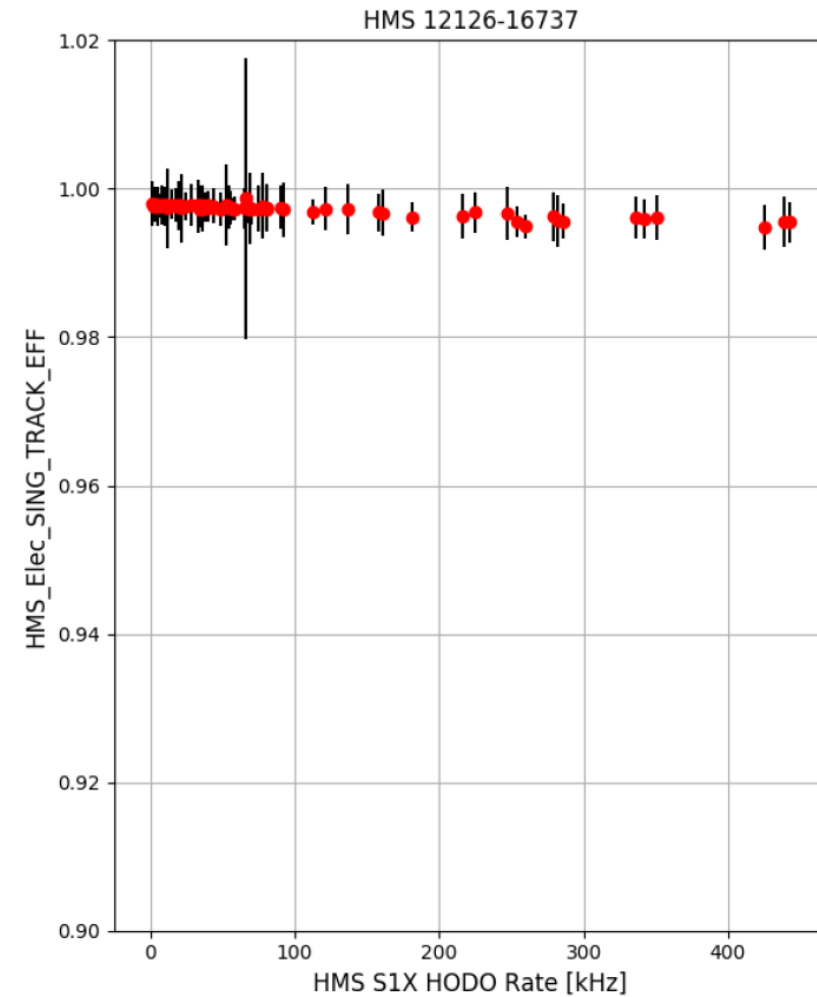
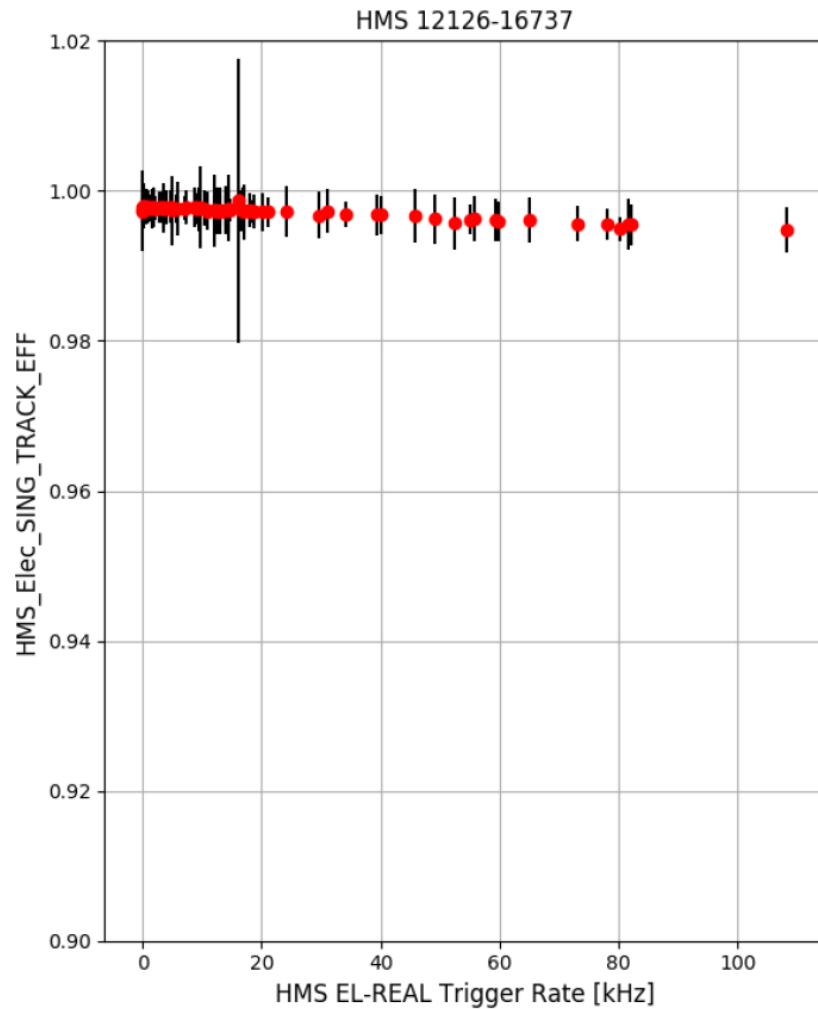
- Tracking efficiency plots for **LumiCoin** data:



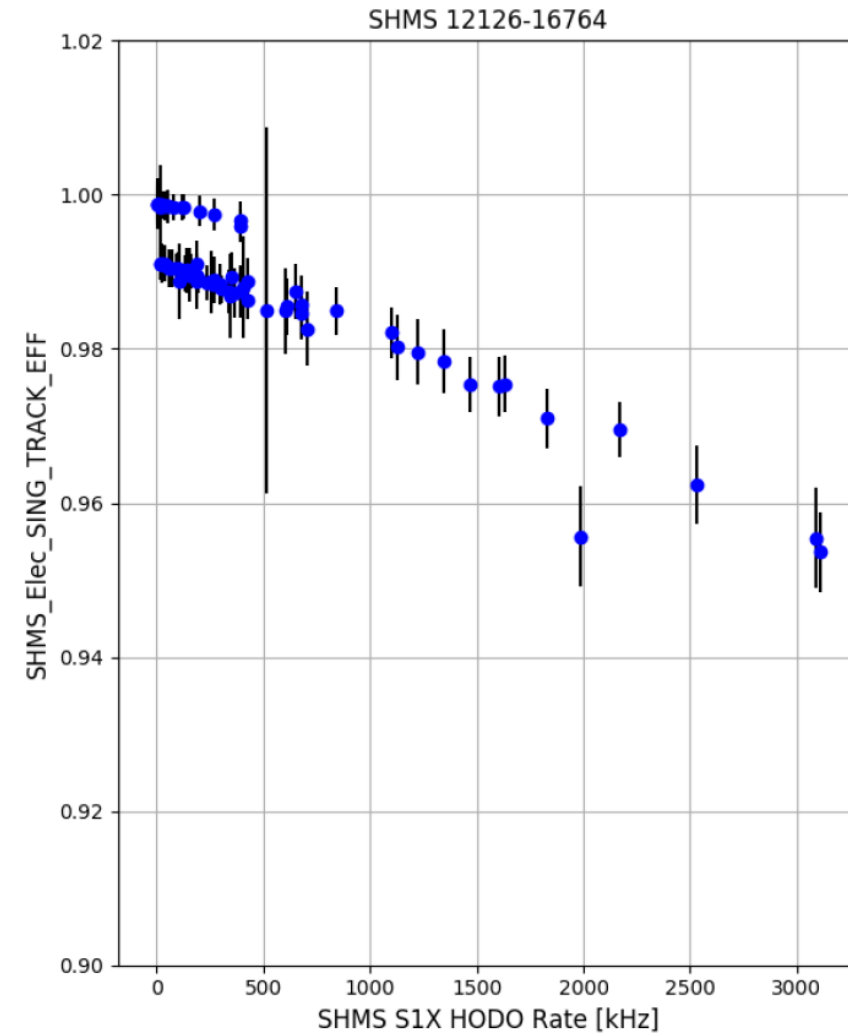
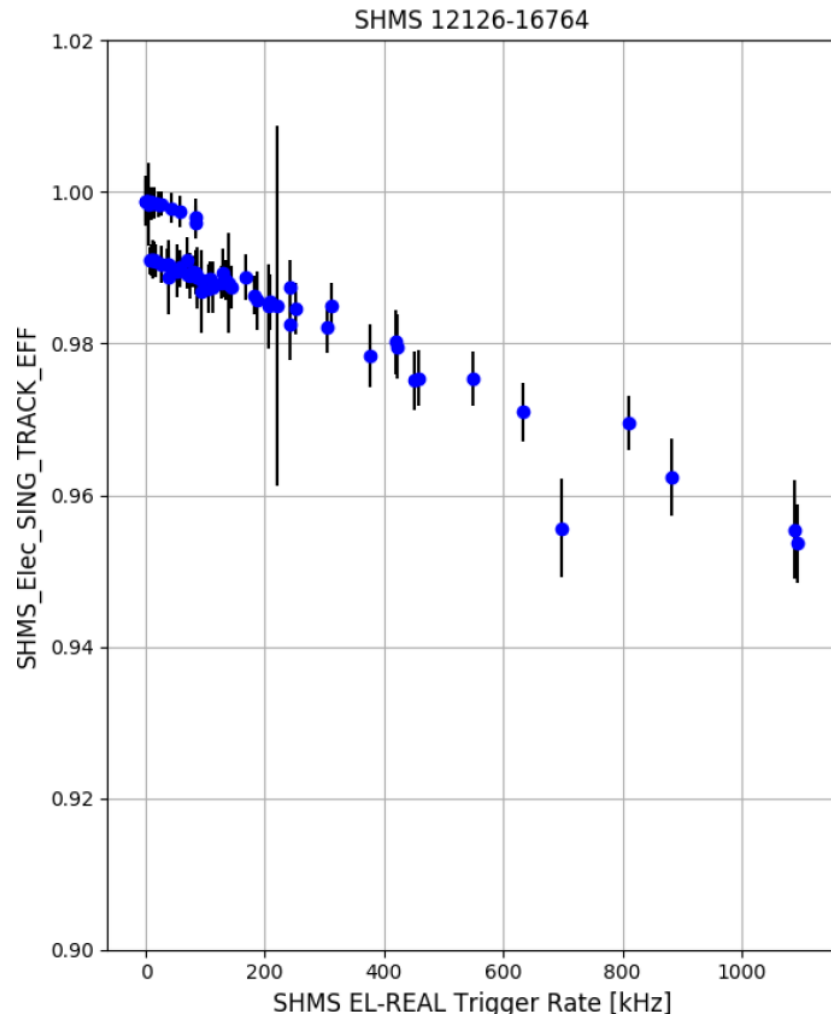
- Tracking efficiency plots for **LumiCoin data**:



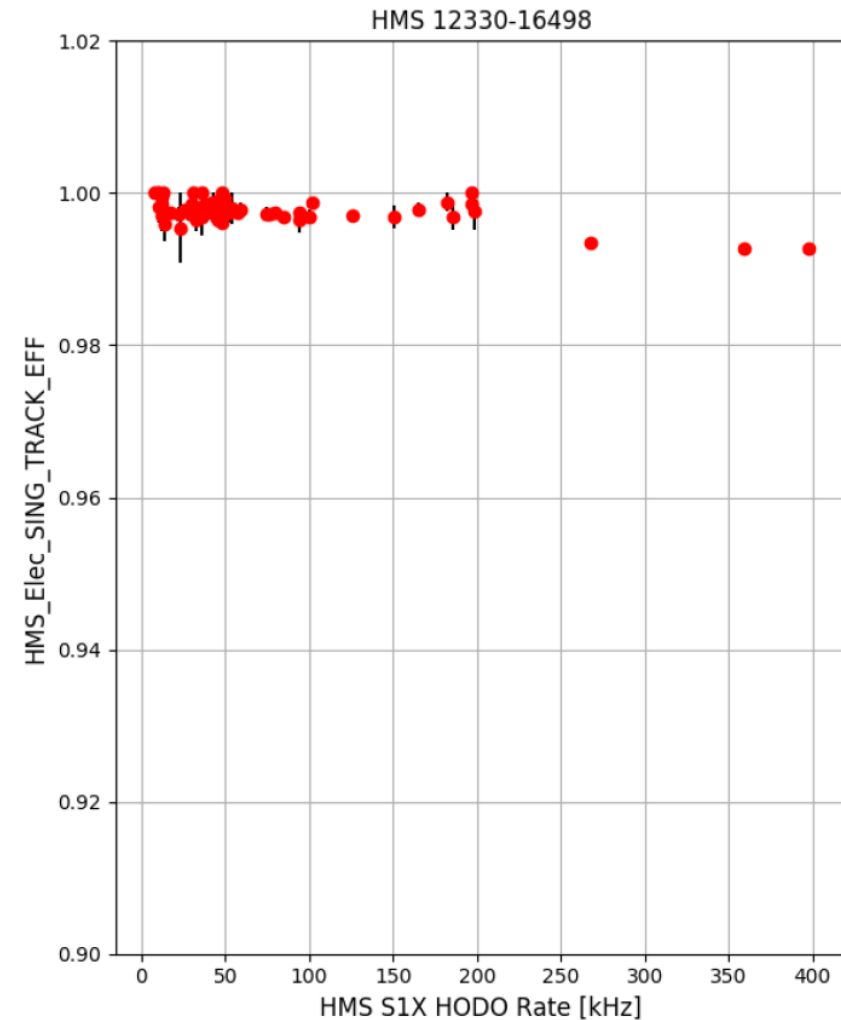
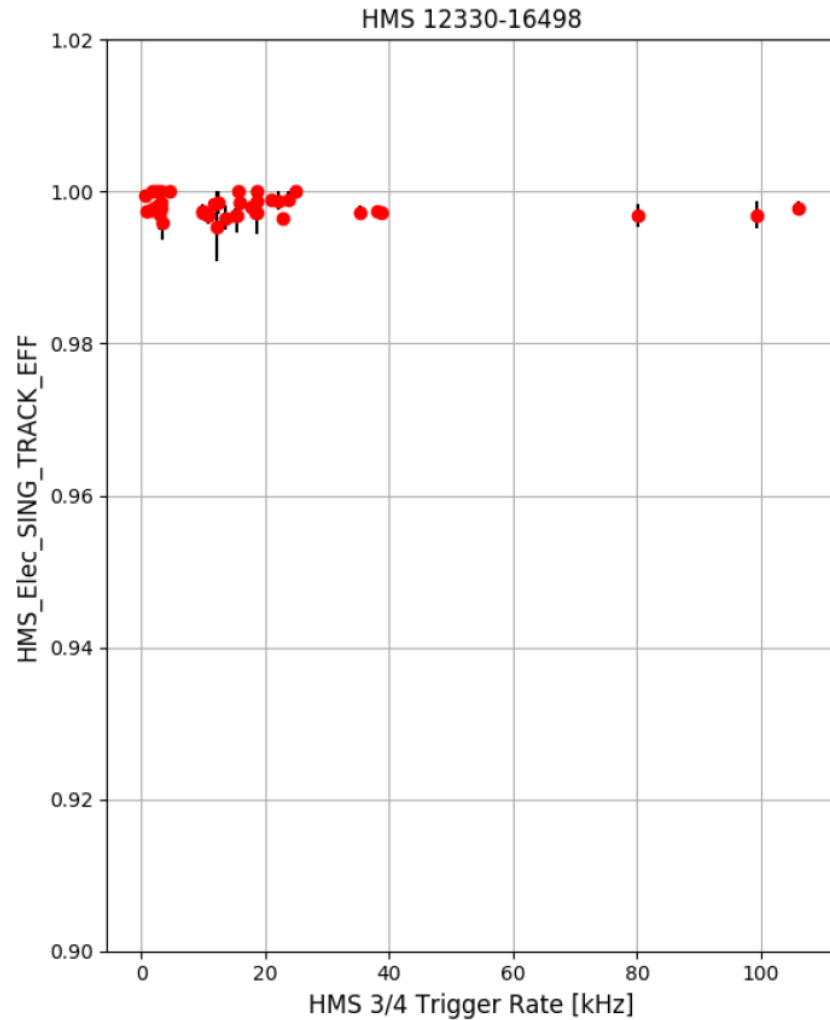
- Tracking efficiency plots for HMS LumiSing data:



- Tracking efficiency plots for **SHMS LumiSing data**:



- Tracking efficiency plots for **pTRIG6** data:



- Tracking efficiency plots for pTRIG6 data:

