Track Parameters and Computer Live Times

Ali Usman

Computer Live Times

- The report files generated from template file calculates computer live times from different independent parameters.
- Investigated 4 different parameter for calculation of computer live times.
  - Trig1 (SHMS ¾ pre-scaler)
  - Trig3 (HMS el_real pre-scaler)
  - Trig5 (SHMS ¾ and HMS el_real pre-scaler)
  - EDTM
- The report files are not optimized for the first 3 methods because it looks into singles DAQs instead of coin DAQ.
- The template file has some weird way of connecting singles DAQ variables to coin DAQ variables.
- EDTM is the most reliable way of calculating computer live times.

Report Files

- Screenshots from an online 50k replay from a summer run

```
TRIG1 Pre-Scaler  : 4097
TRIG1 Scaler      : 42824386
TRIG1 Passed      : 48703
Scaler/Pre-Scaler : 10452.620454

TRIG3 Pre-Scaler  : 513
TRIG3 Scaler      : 1056348
TRIG3 Passed      : 39663
Scaler/Pre-Scaler : 2059.157895

TRIG5 Pre-Scaler  : 1
TRIG5 Scaler      : 37580
TRIG5 Passed      : 37576
Scaler/Pre-Scaler : 37580
```

```
hTRIG1 :        6222229          [ 60.498 kHz ]
hTRIG2 :        1056348          [ 10.271 kHz ]
hTRIG3 :        499809   [ 4.860 kHz ]
hTRIG4 :        0        [ 0.000 kHz ]
hTRIG5 :        0        [ 0.000 kHz ]
hTRIG6 :        0        [ 0.000 kHz ]
```

```
pTRIG1 :        42824386         [ 416.374 kHz ]
pTRIG2 :        11989384         [ 116.571 kHz ]
pTRIG3 :        1056348          [ 10.271 kHz ]
pTRIG4 :        6220937          [ 60.485 kHz ]
pTRIG5 :        37580    [ 0.365 kHz ]
pTRIG6 :        306455   [ 2.980 kHz ]
```

Updating Template Files

- For now the EDTM is best way to calculate the computer live times.
- A quick solution to this is to fix the DEF-Files and DEF-cuts for directly looking at the coin DAQ parameters.
- These variables can be used to calculate the computer live times.

- A long term goal is to update everything specifically for our Pion-LT Experiment.
- This will include writing an online coin replay script and writing a new Template file for the generation of Report files.

SHMS Track Parameter Comparison

Parameter	Mark's Values	Default Values
pmin_hit	4, 4	5, 5
pmin_combos	3, 3	4, 4
pspace_point_criterion	1.2, 1.2	1.2, 1.2
pxt_track_criterion	100.0	100.0
pyt_track_criterion	20.0	20.0
pxpt_track_criterion	1.0	1.0
pypt_track_criterion	1.0	1.0
pSmallAngleApprox	0	1
pstub_max_xpdiff	0.2	0.2

Mark's Parameter Optimization

Optimize tracking parameters

- Use SHMS run 1583 with 0.5% carbon at 25 deg and -1.6 GeV. Ebeam=2.2
- Rate of HODO = 2.7 kHz. P1X = 16 kHz
- Used pSmallAngleApprox = 0

Xt_track	Yt_track	Xpt_track	Stub_max_xpdiff	Track eff
100	100	1	1000	97.2%
100	100	1	0.2	99.3
20	5	0.4	1000	89.6
20	5	0.2	0.2	98.5

SHMS Tracking Parameter Optimization

- Run # 8499 E = 2.7 GeV I = 20 uA
- P = +2.30 GeV Angle = 5.70 Rate ¾ = 244.41 kHz

Xt_track	Yt_track	Xpt_track	Stub_max_xpdiff	Efficiency
100	100	1	1000	98.87 ± 0.21
100	100	1	0.2	99.65 ± 0.12
100	100	0.2	0.2	97.89 ± 0.29
100	100	0.4	0.2	99.30 ± 0.17
100	100	0.4	1000	95.23 ± 0.43
100	100	0.2	1000	89.05 ± 0.65
20	5	0.4	1000	91.59 ± 0.57
20	5	0.2	0.2	96.95 ± 0.35
20	5	0.2	1000	83.93 ± 0.79
20	5	0.4	0.2	99 .02 ± 0.20

SHMS Tracking Parameter Optimization

- Run # 8498 E = 2.7 GeV I = 35 uA
- P = +2.30 GeV Angle = 5.70 Rate ¾ = 528.71 kHz

Xt_track	Yt_track	Xpt_track	Stub_max_xpdiff	Efficiency
100	100	1	1000	98.42 ± 0.19
100	100	1	0.2	99.58 ± 0.10
100	100	0.2	0.2	97.54 ± 0.24
100	100	0.4	0.2	99.37 ± 0.12
100	100	0.4	1000	94.85 ± 0.35
100	100	0.2	1000	88.27 ± 0.52
20	5	0.4	1000	89.96 ± 0.48
20	5	0.2	0.2	95.83 ± 0.31
20	5	0.2	1000	81.78 ± 0.65
20	5	0.4	0.2	98.63 ± 0.18

Outlook

- The quick test for track parameters shows similar trend to Mark's analysis.
- Need to confirm about the optimization of other track parameters.
- Need to scale this study to a more wider range of running conditions and rates.
- Also need to optimize the HMS track parameters as well.
- Will look into optimization of specific parameters within different tracking algorithms.

SHMS Hadron Efficiencies (E = 2.77)

Run #	I (uA)	P , Angle	¾ Trig (KHz)	Efficiency	Should Counts	Did Counts
8493	30	+2.30, 5.70	416.37	99.03 ± 0.14	4968	4920
8494	35	+2.30, 5.70	523.65	0	0	0
8495	37	+2.30, 5.70	582.42	1.56 ± 1.47	4556	71
8496	25	+2.30, 5.70	452.64	99.07 ± 0.17	3209	3179
8497	20	+2.30, 5.70	472.16	98.72 ± 0.18	4138	4085
8498	35	+2.30, 5.70	528.71	98.98 ± 0.15	4313	4269
8499	20	+2.30, 5.70	244.41	98.94 ± 0.20	2558	2531
8500	16	+2.30, 5.70	376.06	98.95 ± 0.15	4490	4443