Luminosity 2009 progress

Nicolas du Fresne von Hohenesche
Institut für Kernphysik, Mainz
CERN

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Overview

- Definition of luminosity
- Target density
- Flux determination
- Scaler Method
- True Random Trigger Methode
- Comparsion

Data

- 2009 DVCS data taking
- Muon beam
- LH_2 target
- W38 μ^+ data 3900 spills
- W40 μ^+ data 8700 spills
- W39 μ^- data

Luminosity

$$L = \text{flux through target } [\text{s}^{-1}] \times \text{numbers of nucleon in target } [\text{cm}^{-2}]$$

Numbers for target density

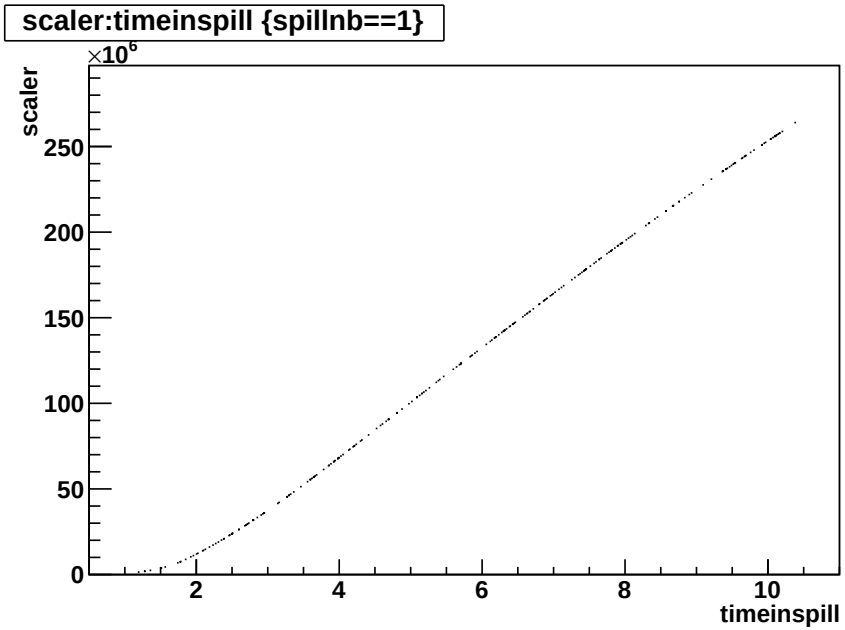
- Density LH_2: 0.07079 $\frac{g}{cm^3}$ @ 1130mbar and 15K
- Length: 40 cm
- A: 1.01 $\frac{g}{mol}$

$\rightarrow$ Target density : $1.6916 \cdot 10^{24}\text{cm}^{-2}$
Now spill by spill flux determination

$\rightarrow$ Total integrated luminosity!

Scaler of SF02X

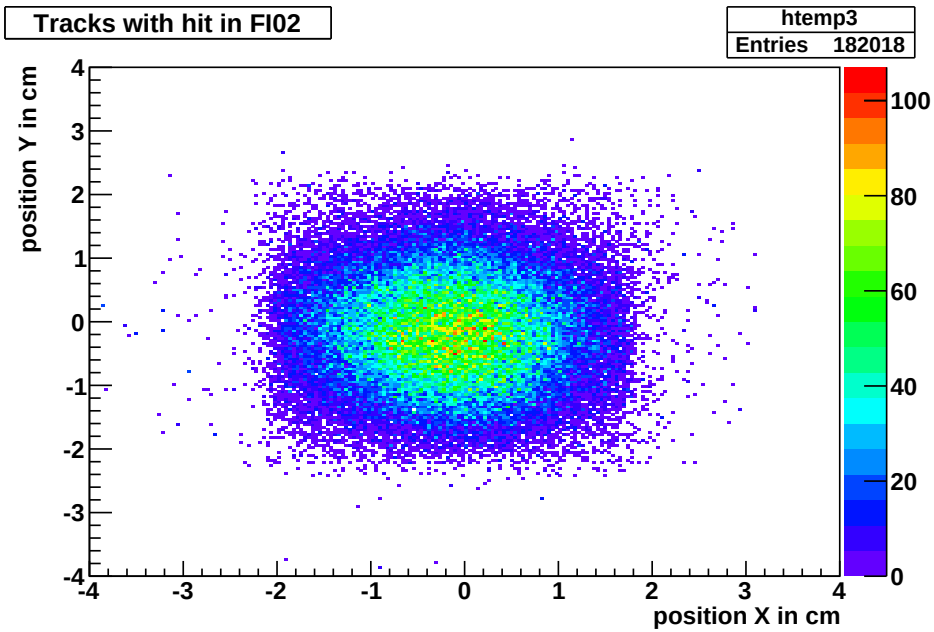
- 96 channels read out by 6 PMT
- Dynode output of SF02X
- 6 scaler channels
- Gated with DAQ busy
- Rate written to database

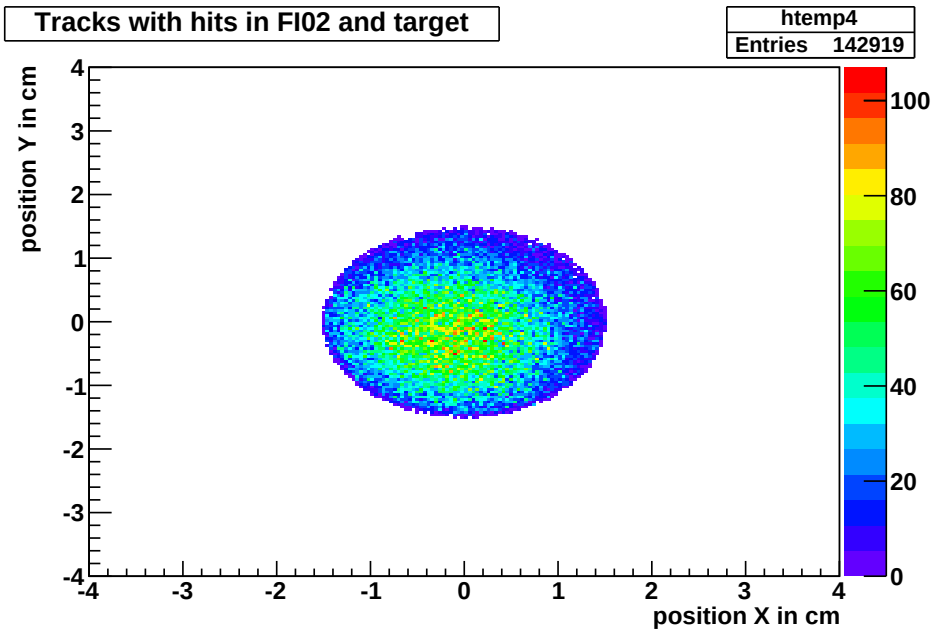


Summation of the six scaler parts

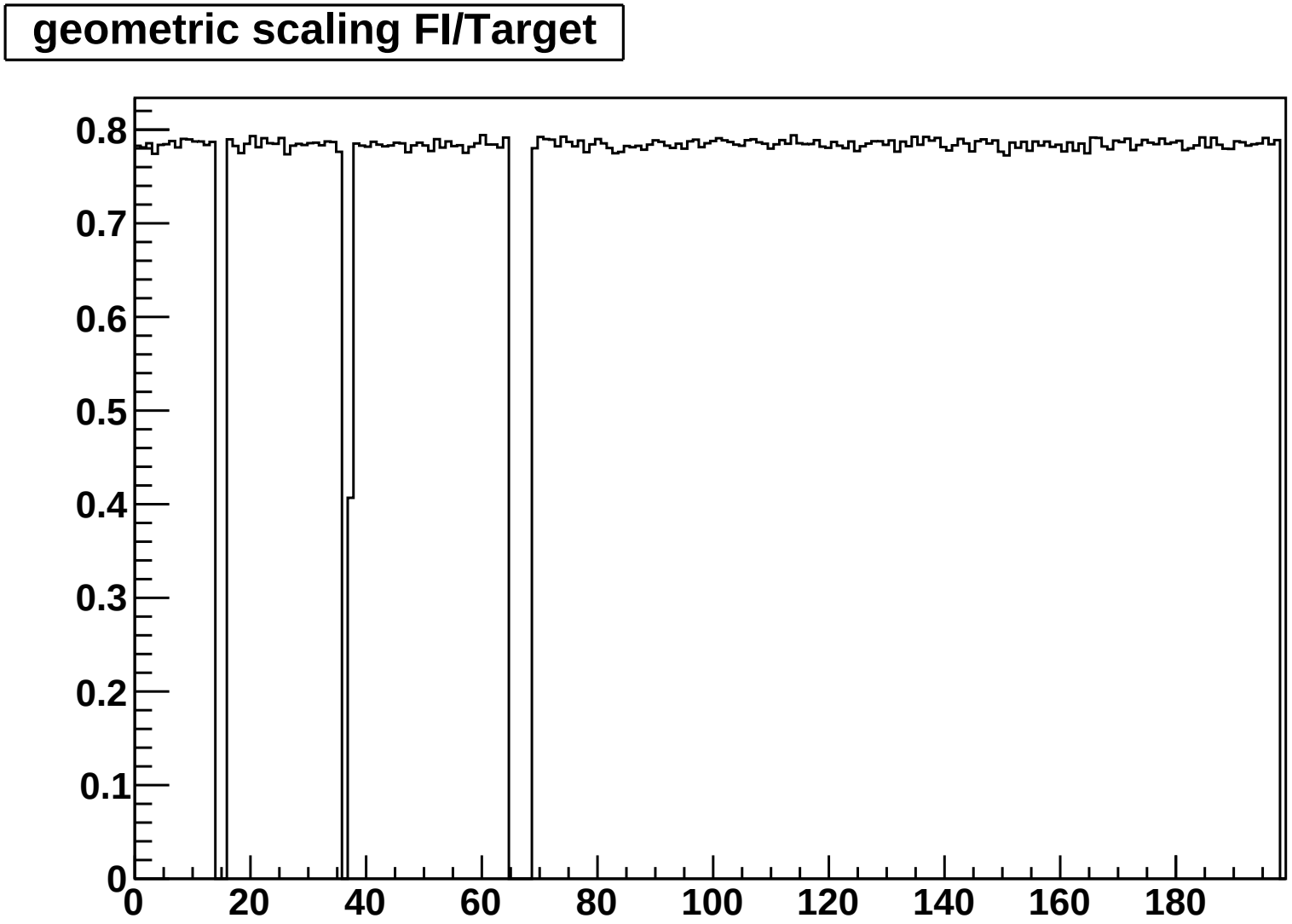
Geometric correction

FI02 is larger than the target $\longrightarrow$ correction needed
Using beam tracks (TR Trigger) for defining fraction

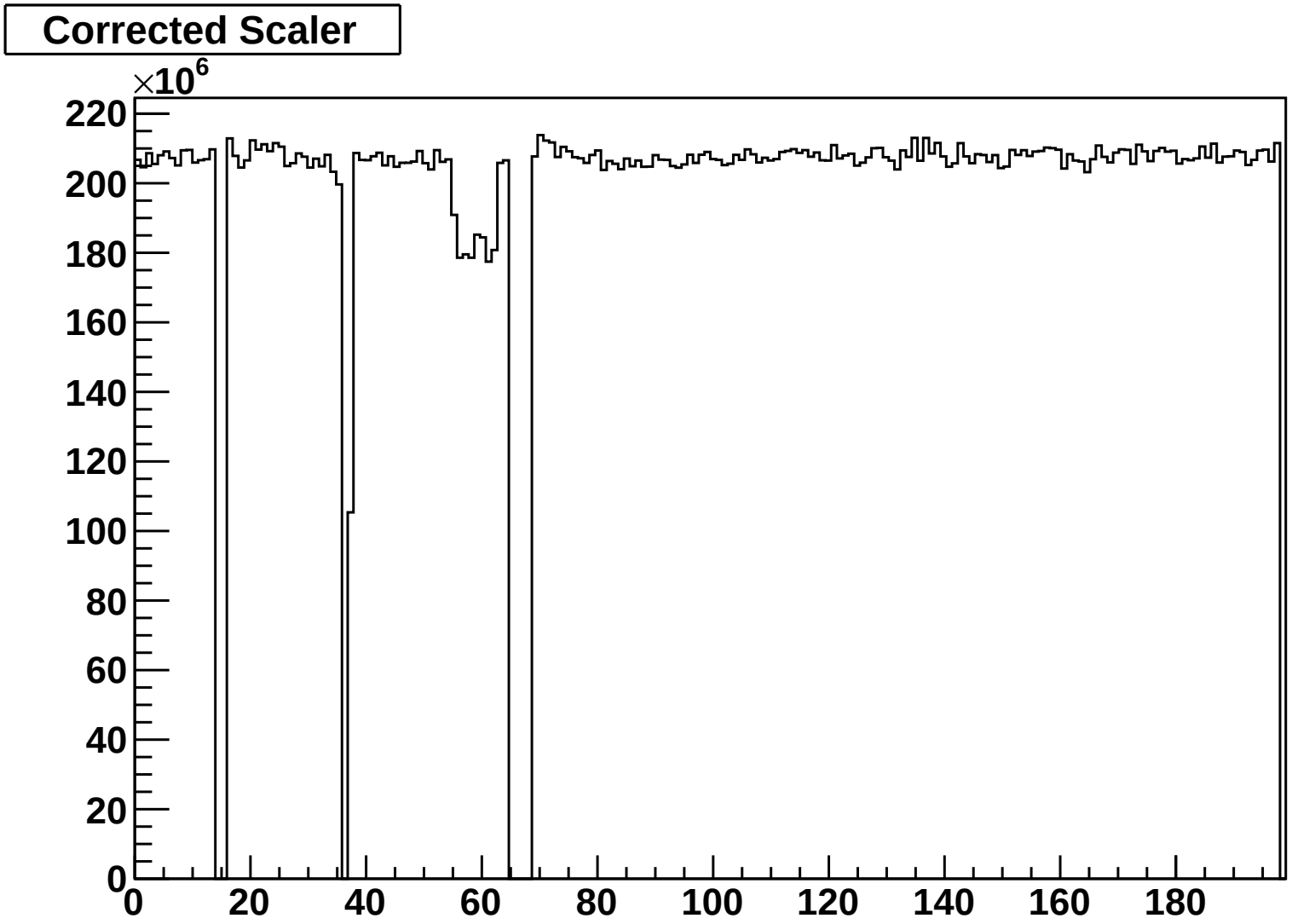




Geometric correction example

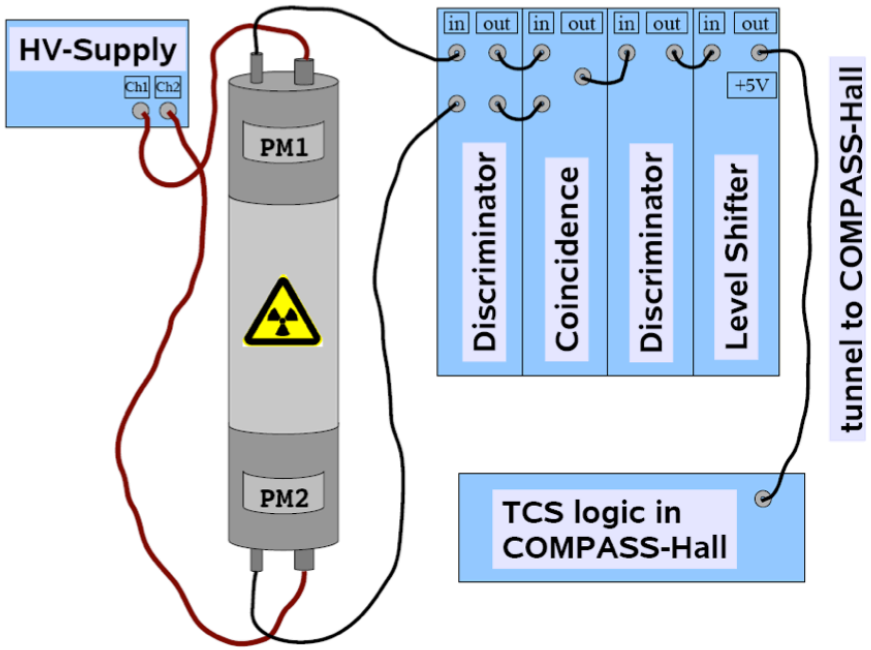


Corrected scaler flux



Random Trigger at COMPASS

- Radioactive β^+source
- Away from experiment
- Decay of ^{22}Na measured
- Coincidence rate $\approx$ 3kHz



$$^{22}Na \rightarrow ^{22} Ne + e^+ + \nu_e$$

True Random Trigger Method

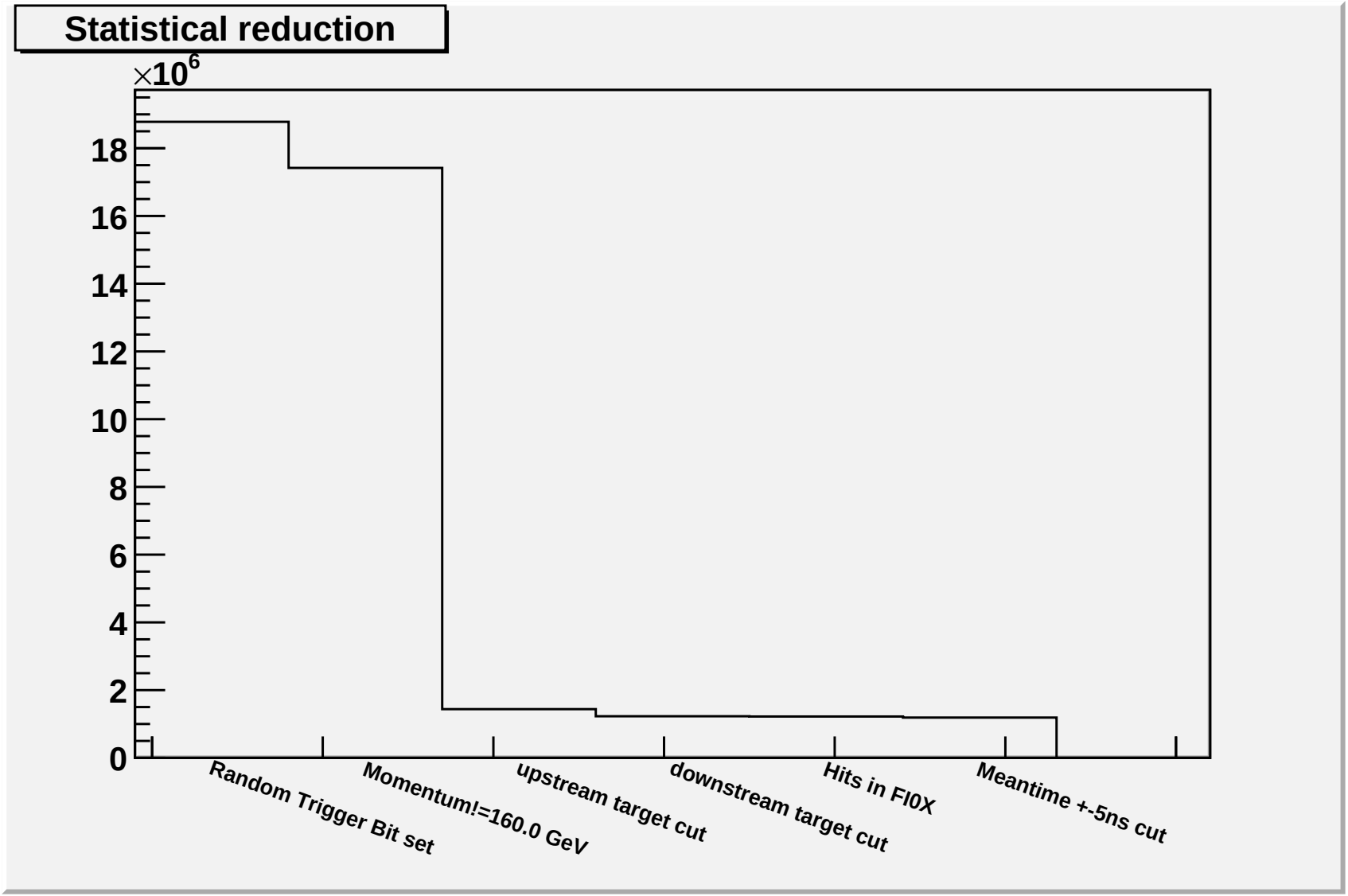
$$\text{Flux} = \frac{\#\text{ of random tracks}}{\#\text{ of random trigger} \times \text{time gate}}$$

Event Selection:

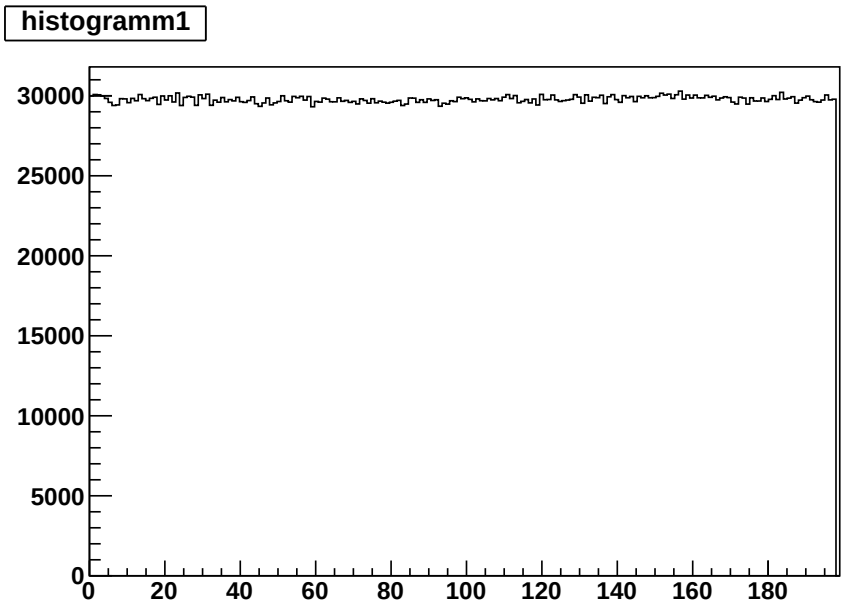
- True Random Trigger Bit set (Trigger10) 100%
- Momentum!=160.00 92.8%
- Target cut 7.6%
- Hits in SiFi01 and SiFi02 6.5%
- Meantime cut ± 5 ns (see previous talks) 6.3%

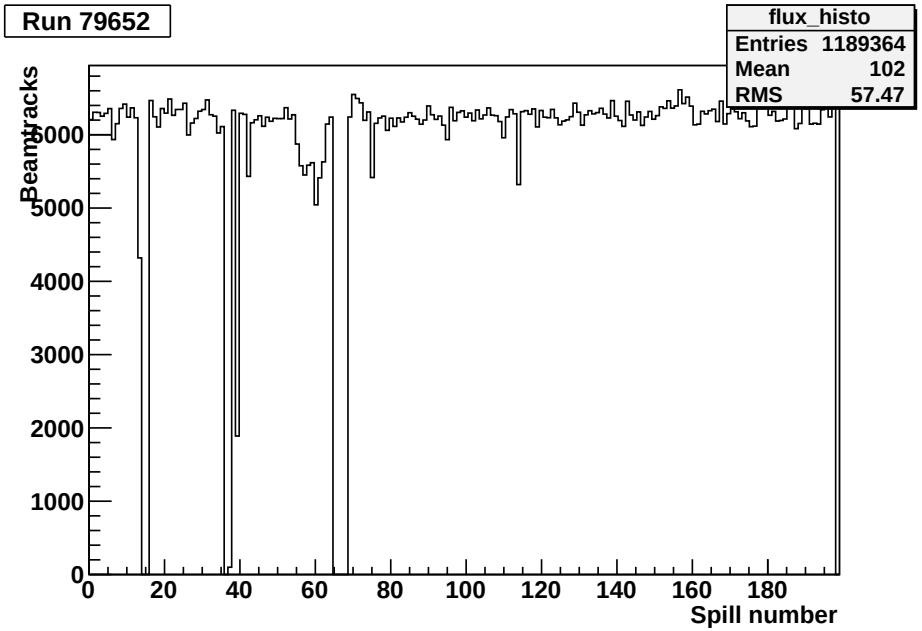
- 100%
- 92.8%
- 7.6%
- 6.5%
- 6.3%

Statistical reduction

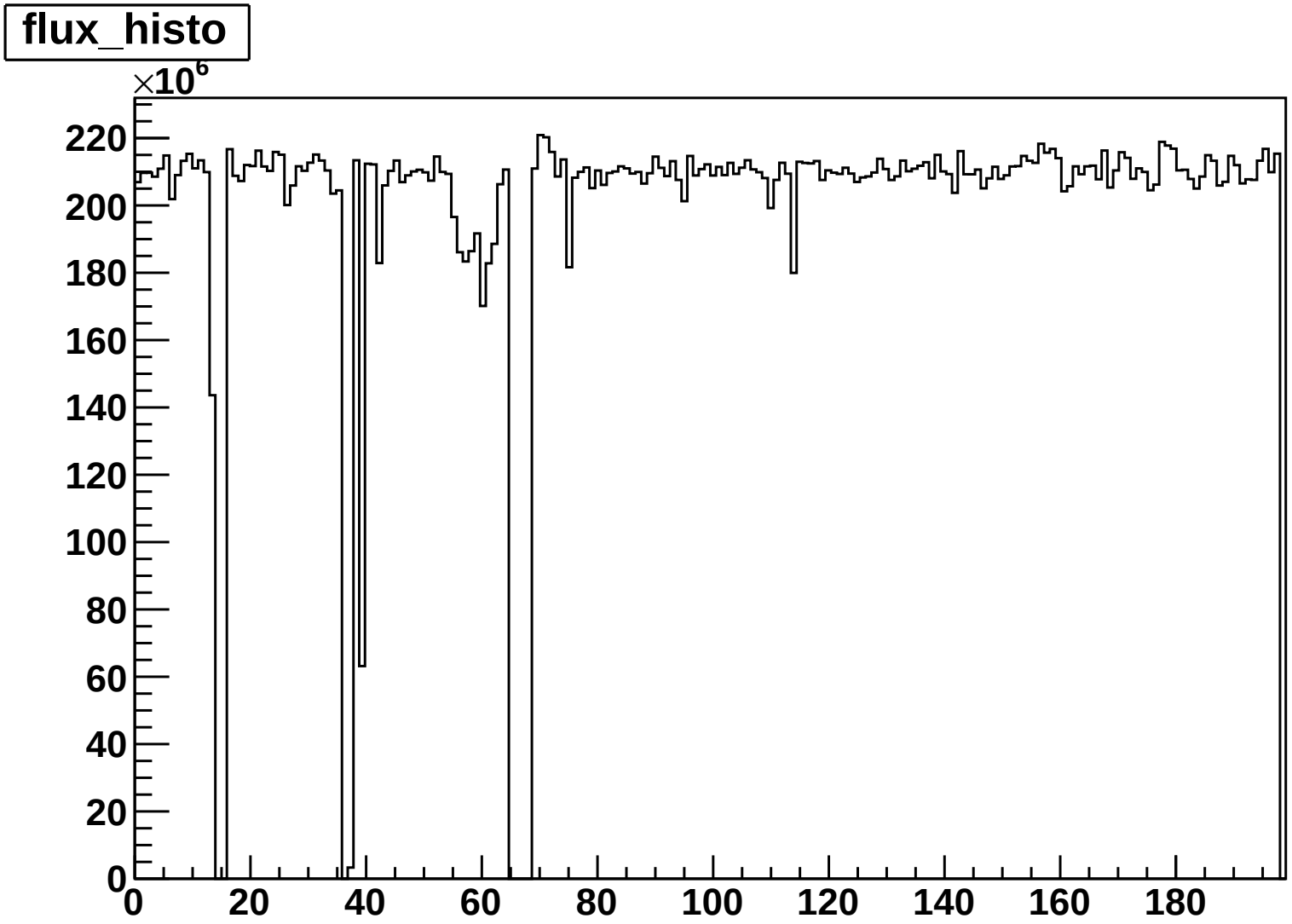


Trigger 10 and beamtracks

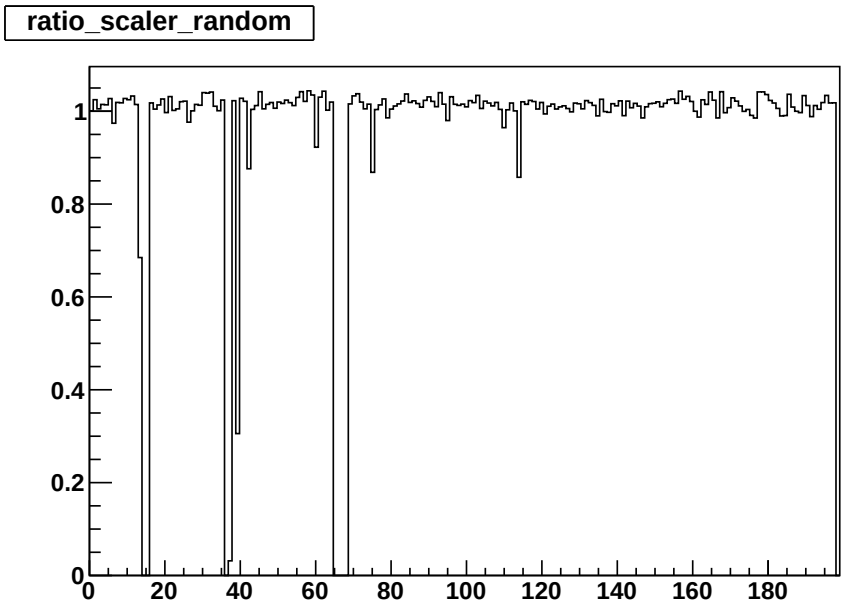


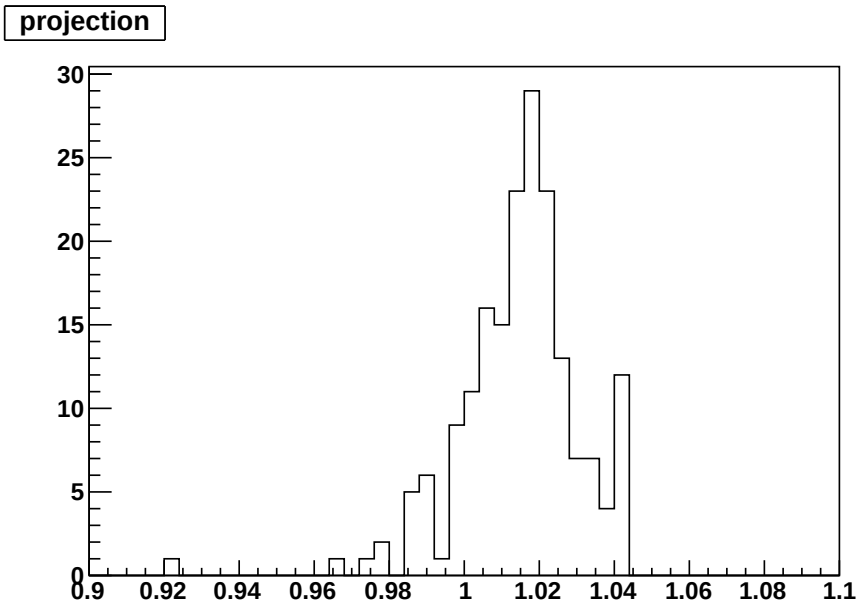


Random Trigger Flux



Ratio of both methodes





Results and Issues

- No Random Trigger Rate for half of the runs in W38
- Slight different number of spills

Average random trigger rate->29403
Results: W38

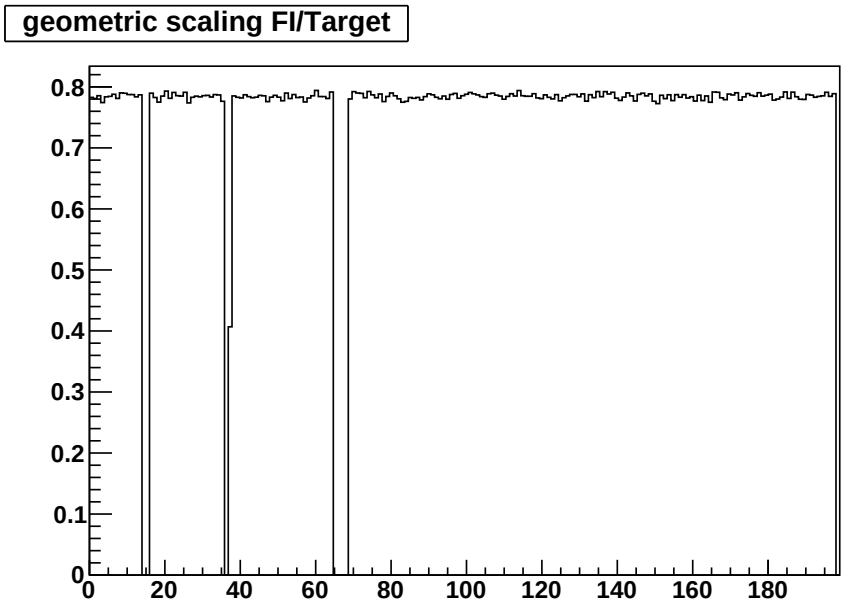
- $7.972 \cdot 10^{11}$ random trigger (added RT rates)
- $7.588 \cdot 10^{11}$ scaler

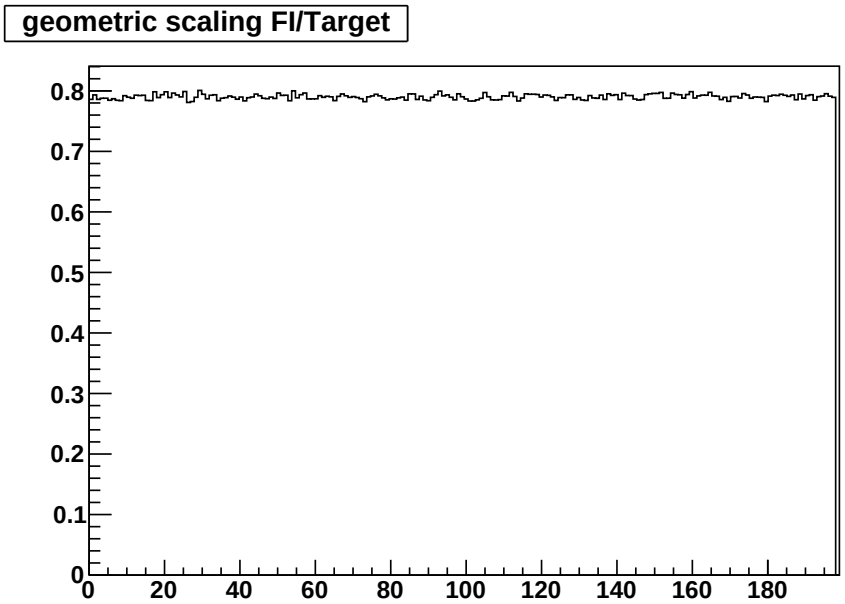
Results: W40

- $1.712 \cdot 10^{12}$ random trigger
- $1.781 \cdot 10^{12}$ scaler

Comparsion 79652 (W38) and 79834 (W40)

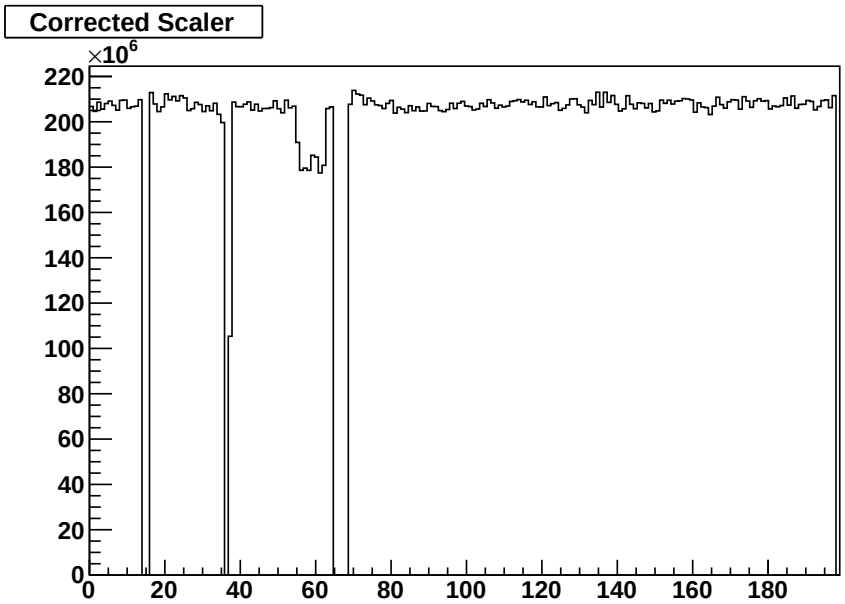
Geometric factor for scaler

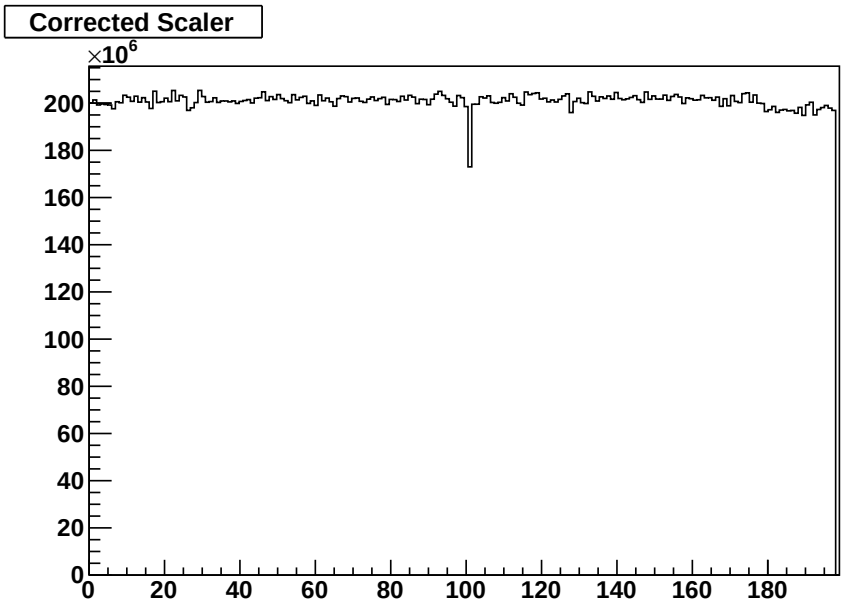




Comparsion 79652 (W38) and 79834 (W40)

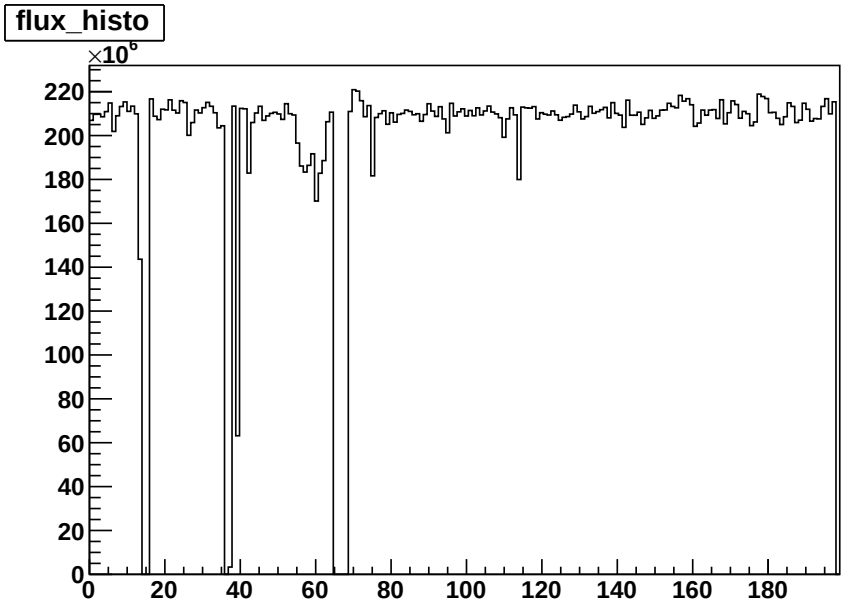
Corrected scaler rate

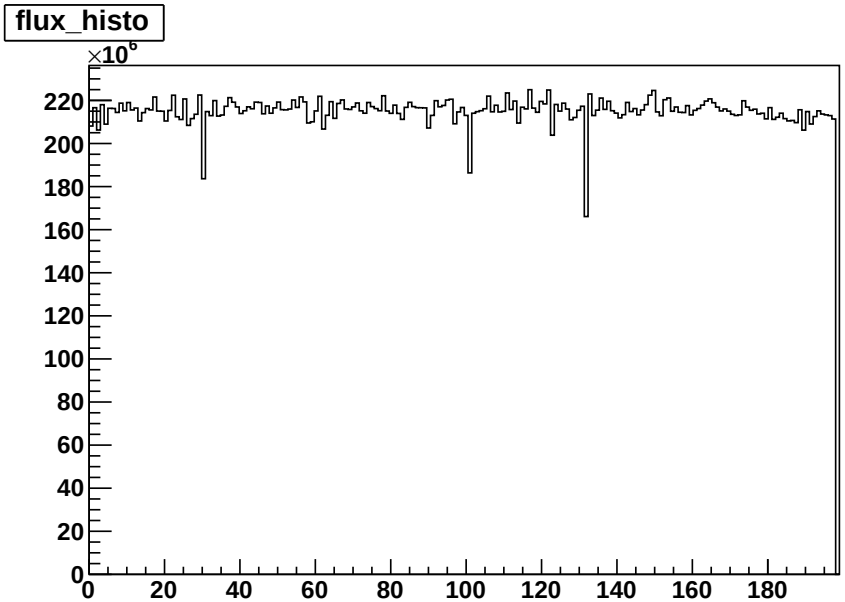




Comparsion 79652 (W38) and 79834 (W40)

Random trigger flux





Comparsion 79652 (W38) and 79834 (W40)

Projection ratio