

Detector stability studies

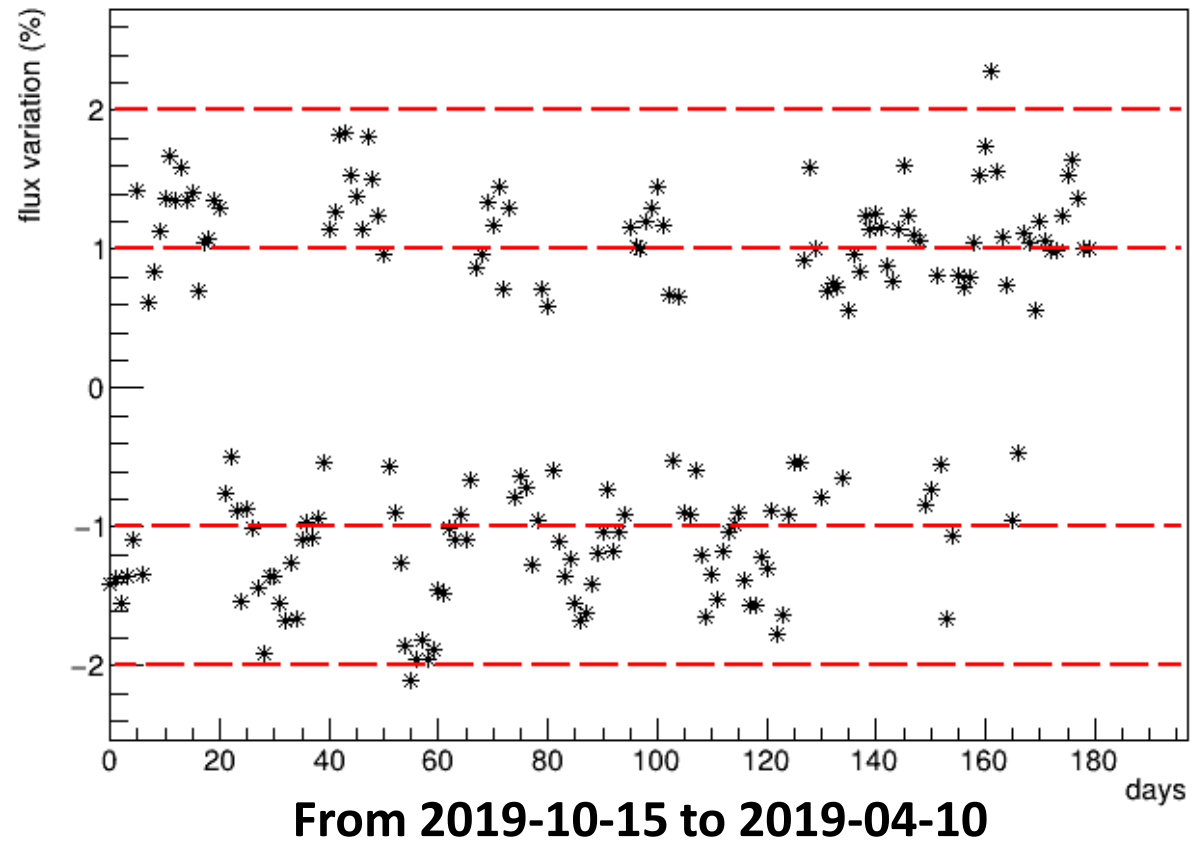
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24-04-2019

CR flux stability

Points represent maximum flux variation (average value on one hour) during day

OULU flux variation during run 5



Detector stability – parameters

- Rate variation (corrected for atmospheric pressure) – average on one hour (0,3% of statistical uncertainties with 30 Hz of rate)?

Two possibilities:

1. Average and RMS variation:

- θ and ϕ
- TOF
- χ^2

2. χ^2 test result w.r.t. to time on the same distributions

- We need to define some reference values for each telescope

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First step: χ^2 test of one run file w.r.t. to the previous one

Pro:

- Simple to be implemented

Cons:

- Is not sensitive to slow variations (pro: CR flux variation shouldn't effect results)

χ^2 definition:
$$\chi^2 = \frac{\sum_{i=1}^{N_{bins}} \left(v_i - N \cdot \frac{v_{prev,i}}{N_{prev}} \right)^2}{N \cdot \frac{v_{prev,i}}{N_{prev}}}$$

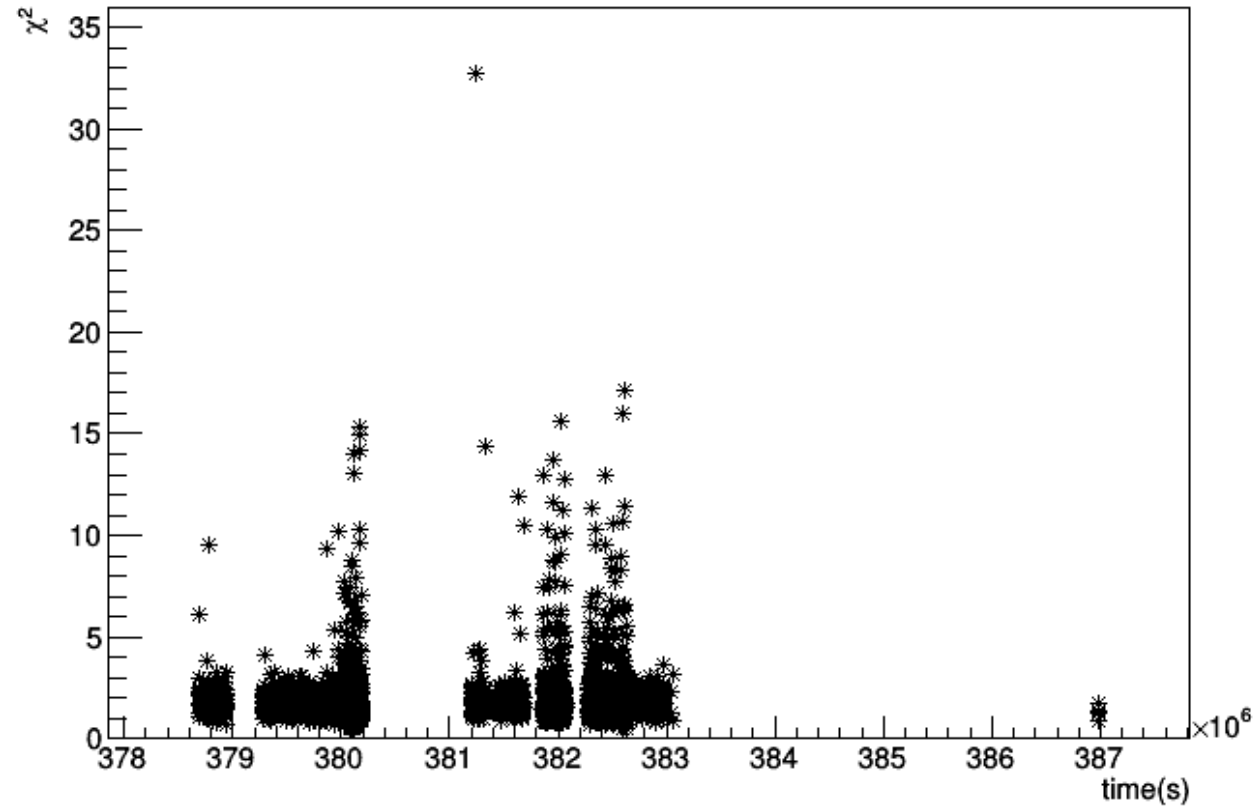
Reference histograms define a kind of P.D.F.

Always $\chi^2/n.d.f.$ is represented

CERN-01 example

From 2019-01-01 to 2019-02-28

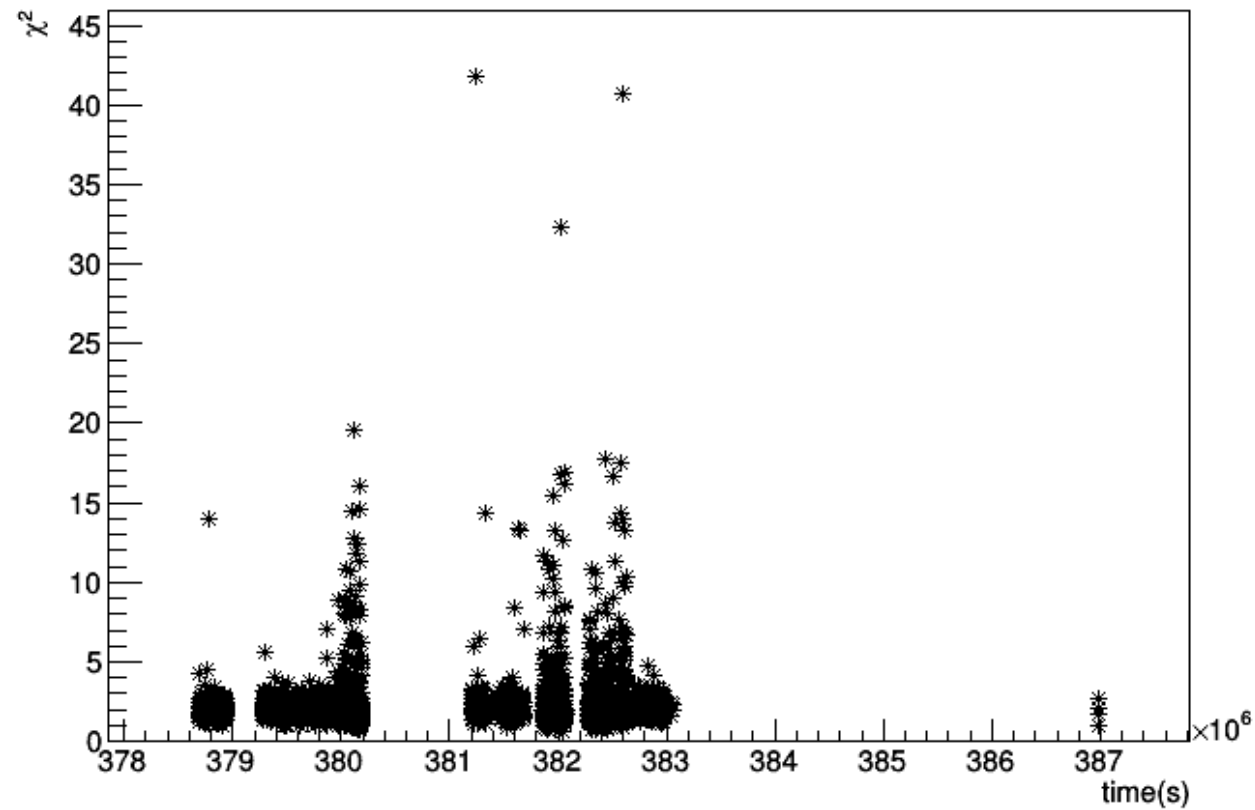
$\chi^2 \theta$ vs time



CERN-01 example

From 2019-01-01 to 2019-02-28

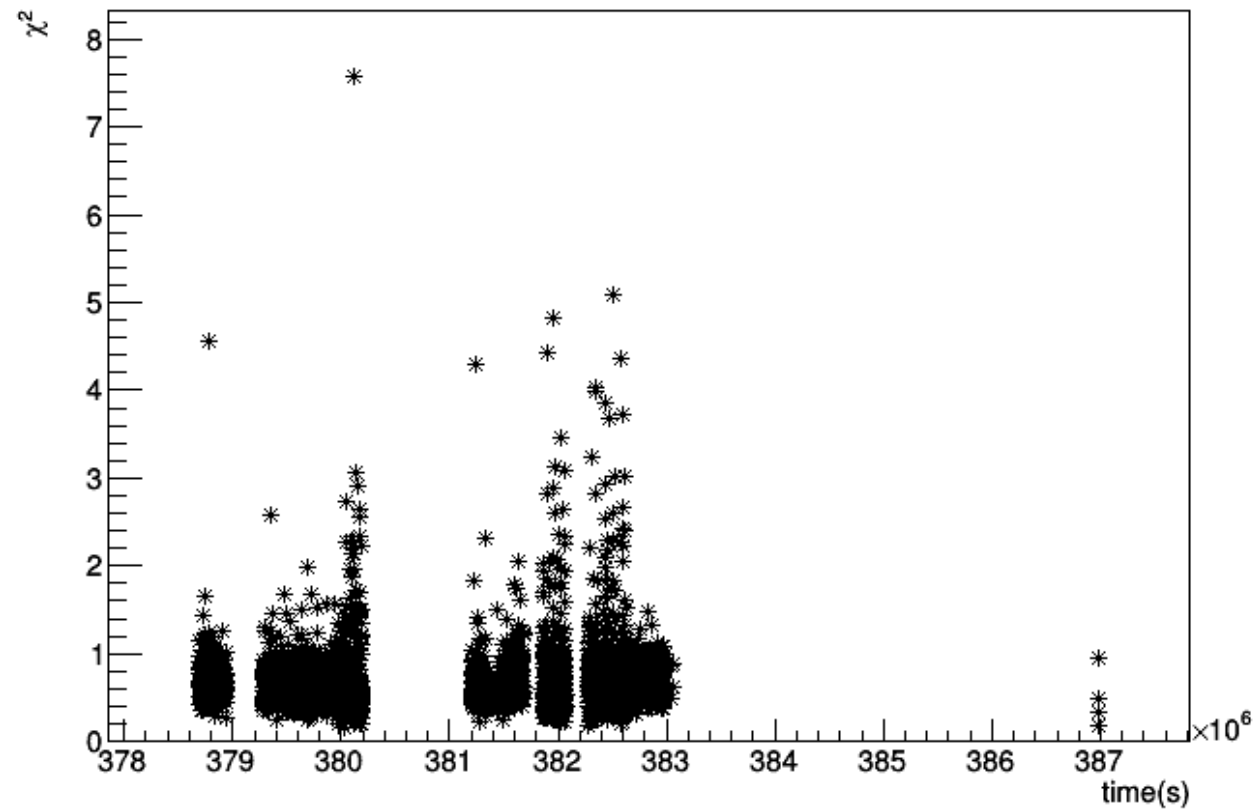
$\chi^2 \phi$ vs time



CERN-01 example

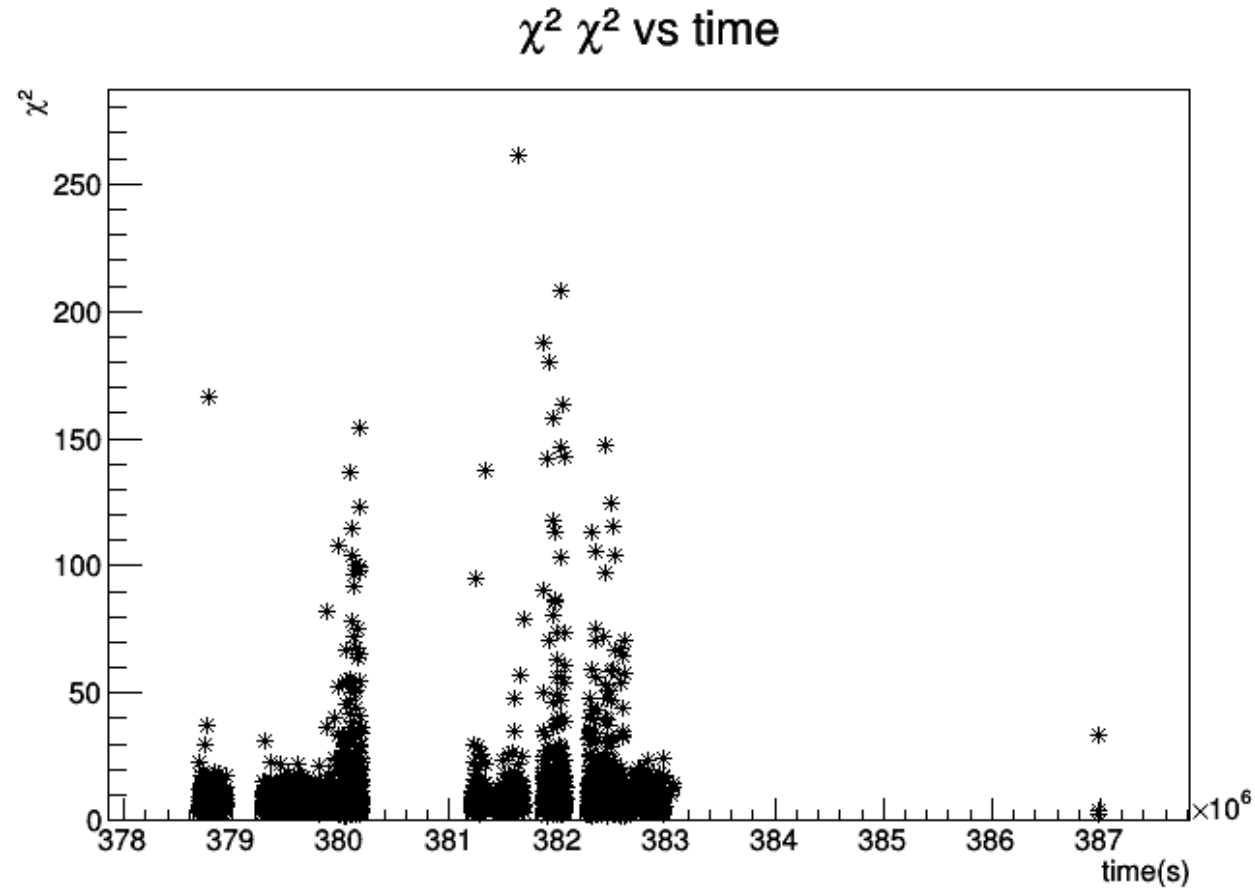
From 2019-01-01 to 2019-02-28

$\chi^2 \Delta t$ vs time



CERN-01 example

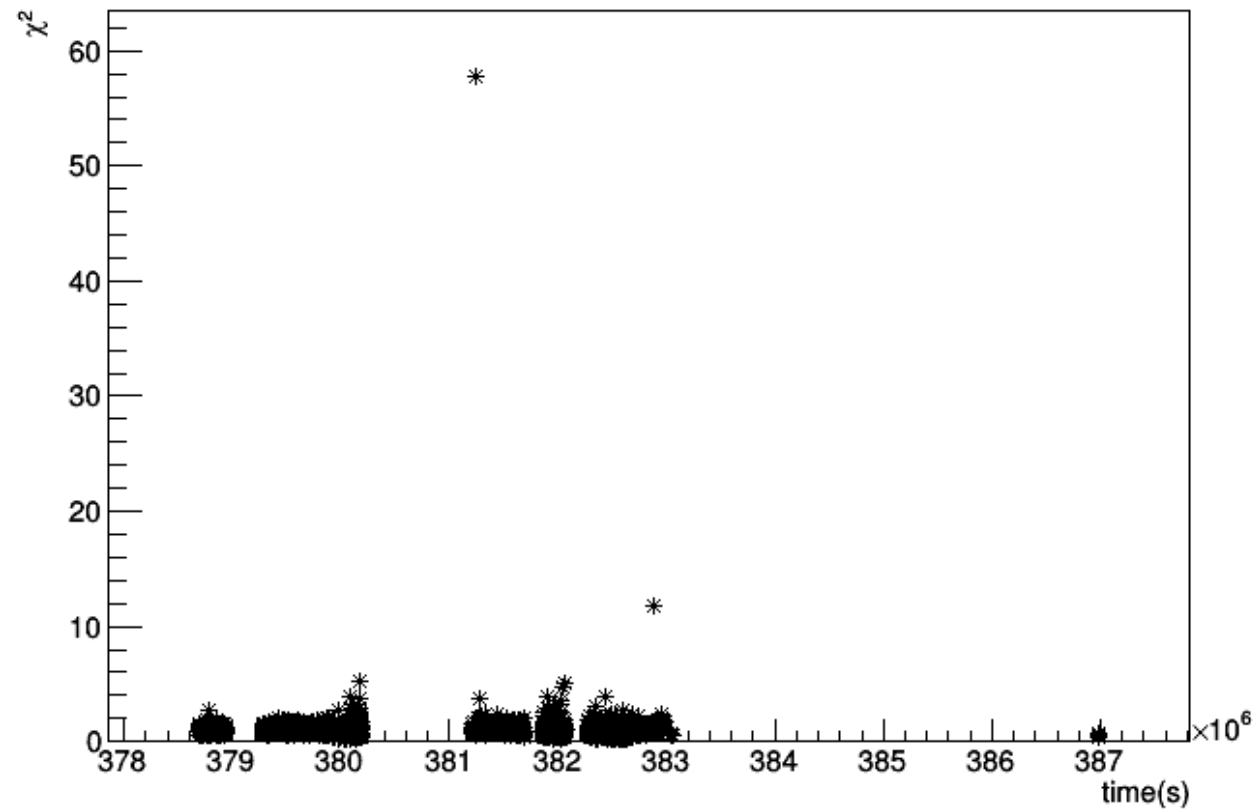
From 2019-01-01 to 2019-02-28



CERN-01 example

From 2019-01-01 to 2019-02-28

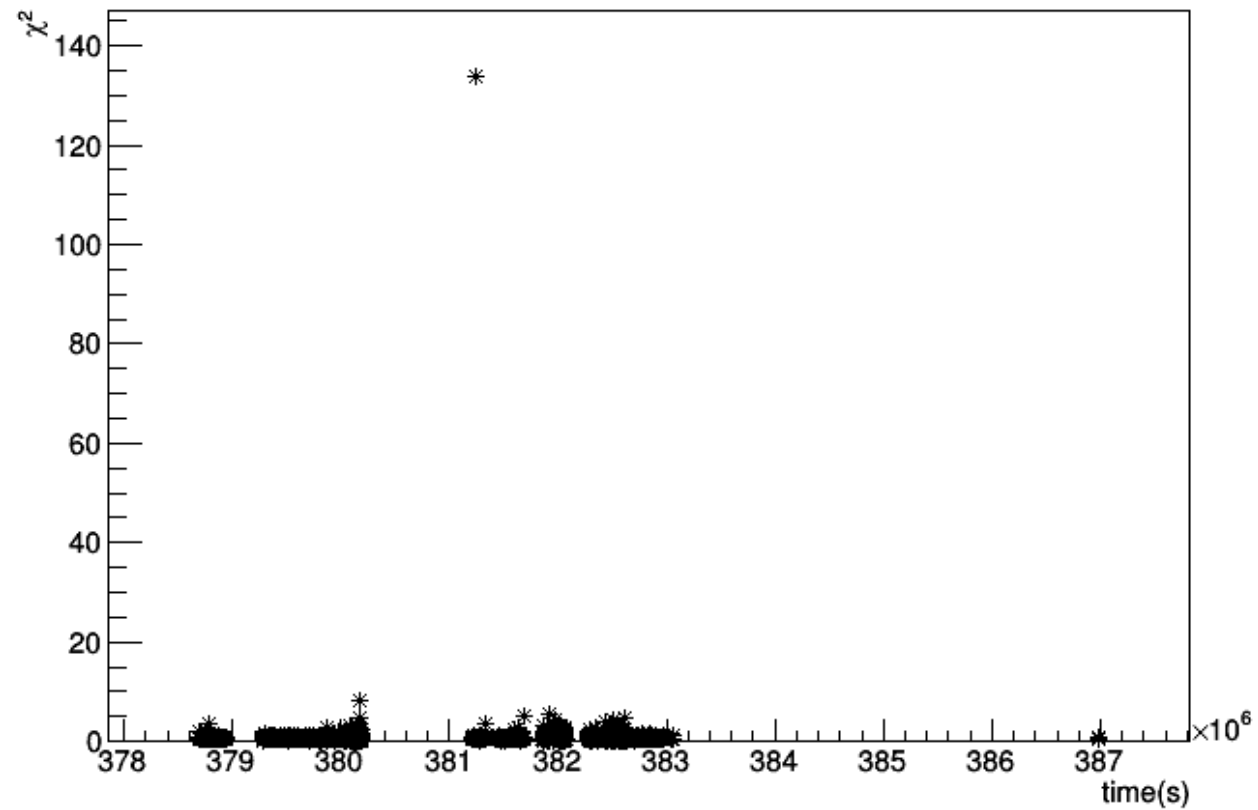
χ^2 tof vs time



CERN-01 example

From 2019-01-01 to 2019-02-28

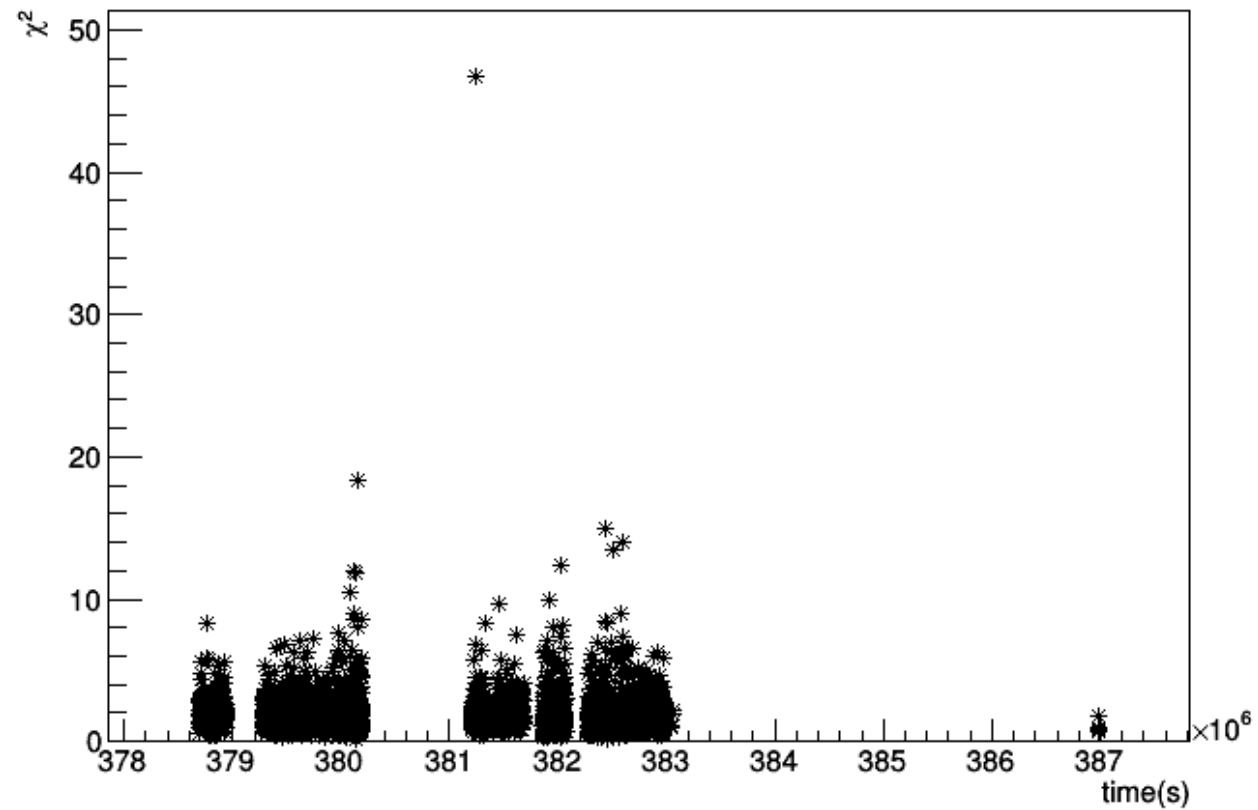
χ^2 track length vs time



CERN-01 example

From 2019-01-01 to 2019-02-28

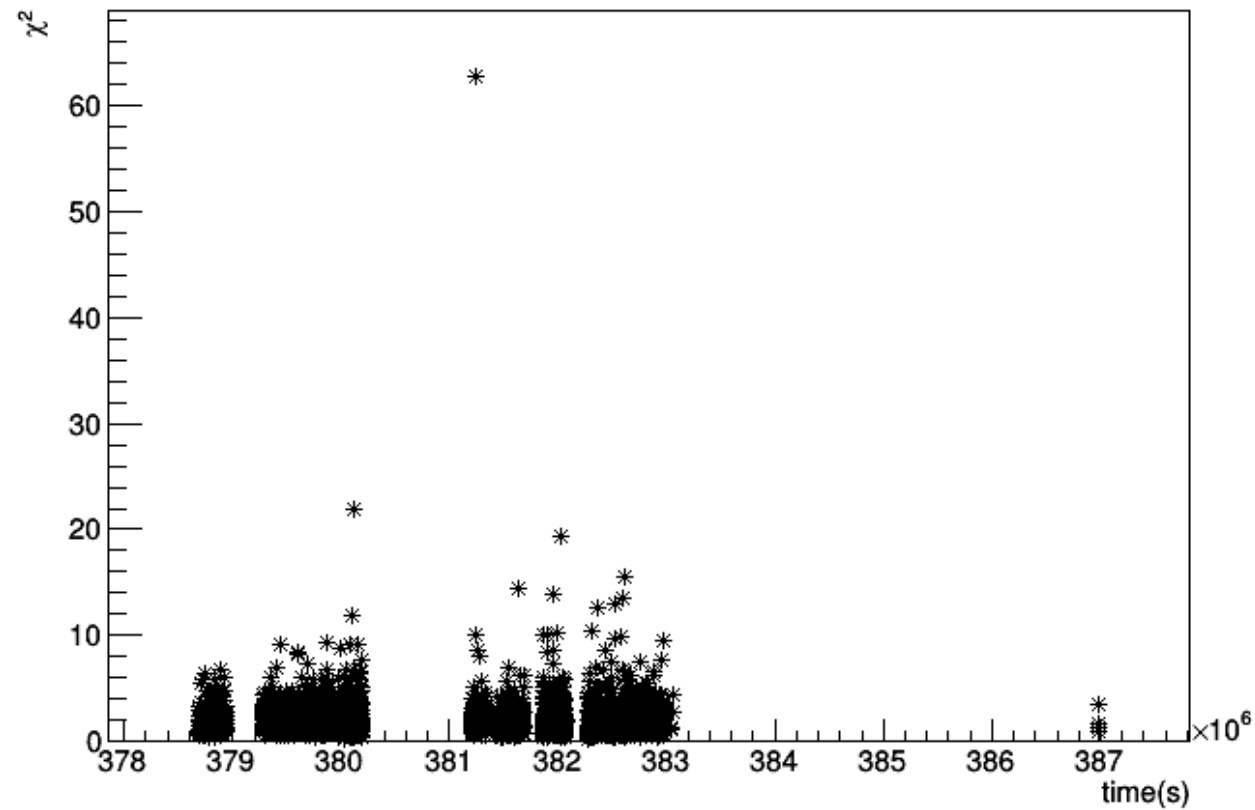
χ^2 hit multiplicity bottom vs time



CERN-01 example

From 2019-01-01 to 2019-02-28

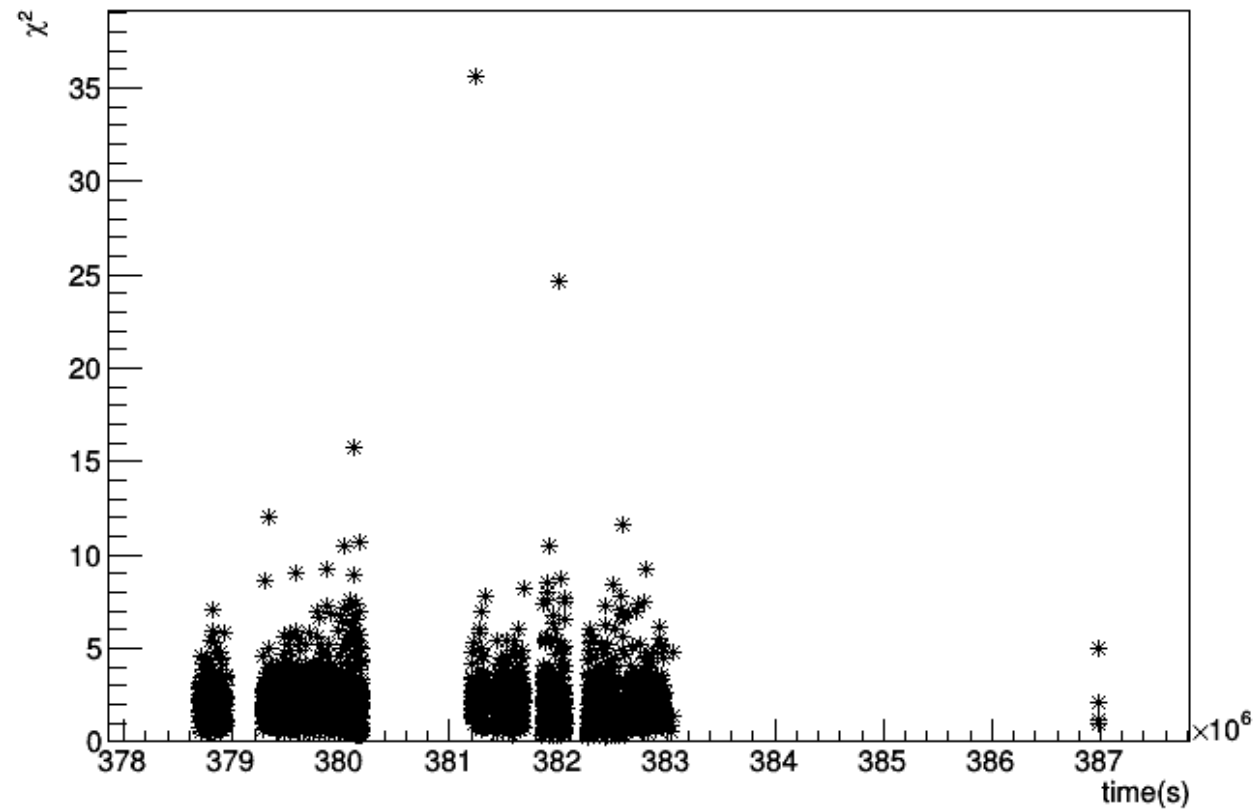
χ^2 hit multiplicity center vs time



CERN-01 example

From 2019-01-01 to 2019-02-28

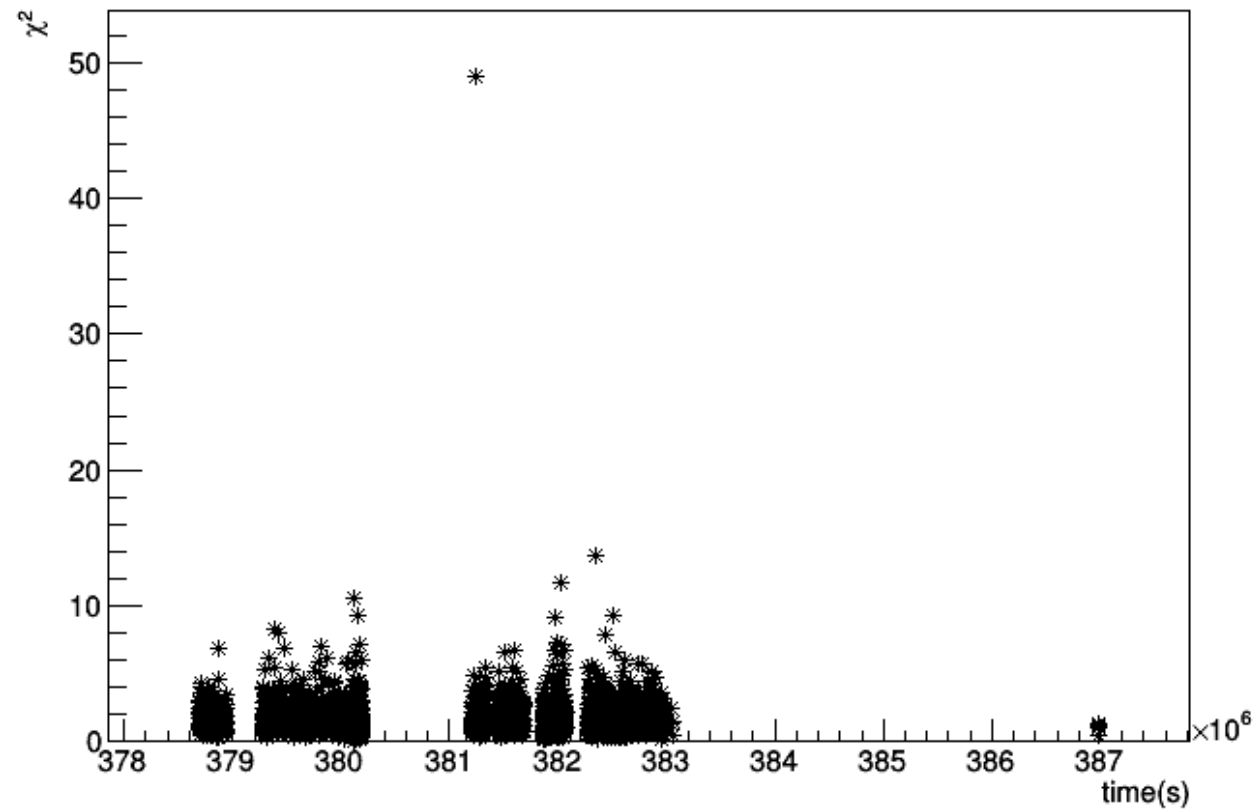
χ^2 hit multiplicity top vs time



CERN-01 example

From 2019-01-01 to 2019-02-28

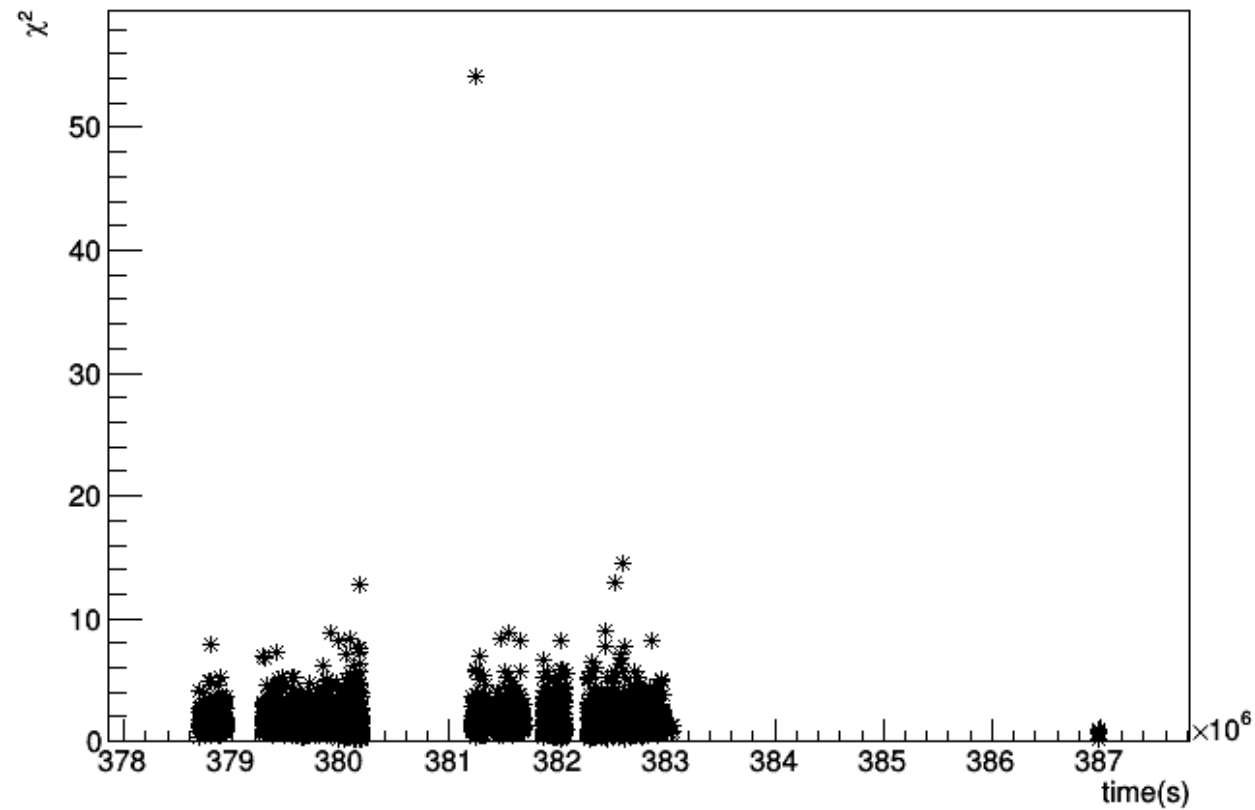
χ^2 cluster multiplicity bottom vs time



CERN-01 example

From 2019-01-01 to 2019-02-28

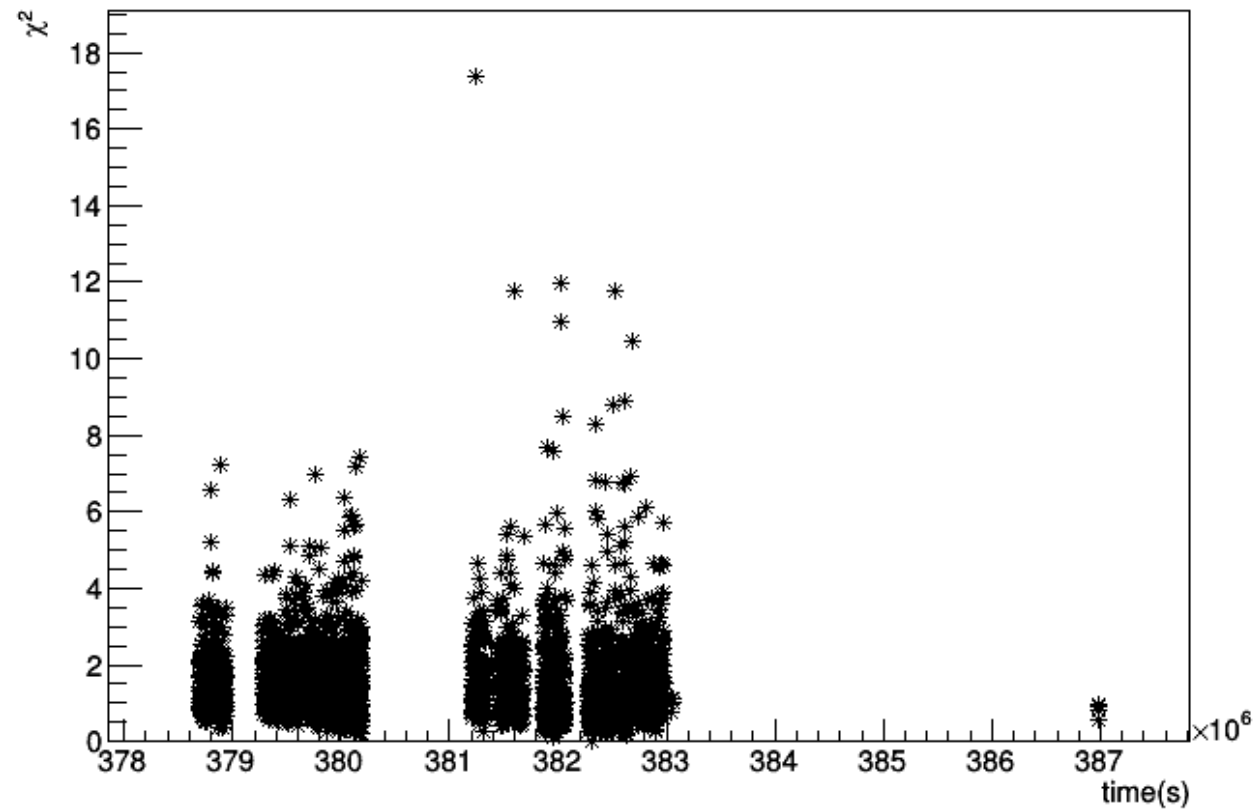
χ^2 cluster multiplicity center vs time



CERN-01 example

From 2019-01-01 to 2019-02-28

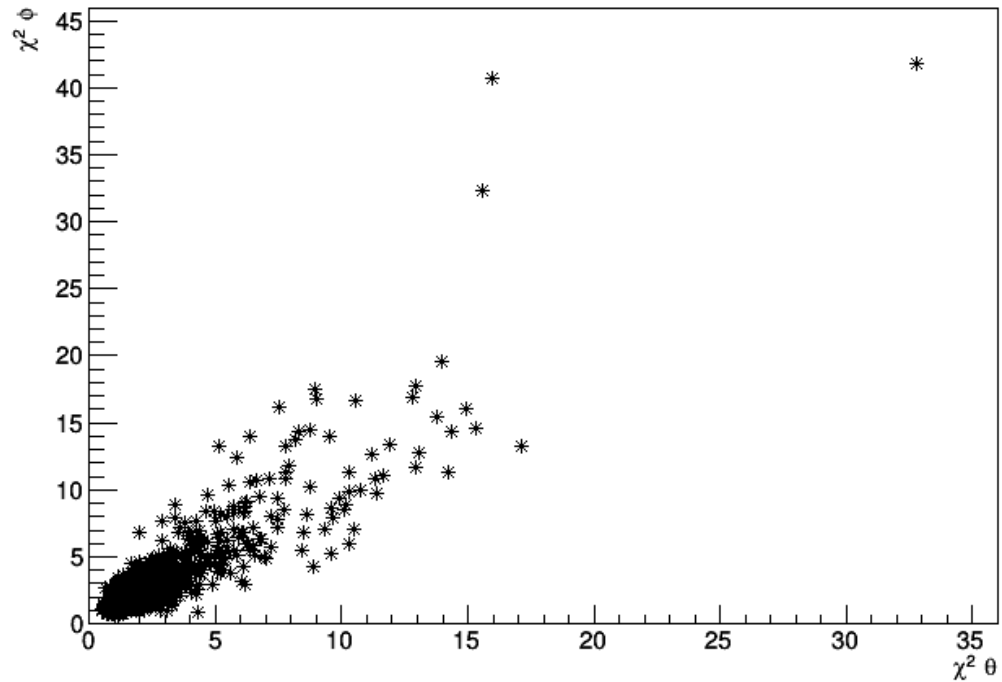
χ^2 cluster multiplicity top vs time



CERN-01 example

From 2019-01-01 to 2019-02-28

$\chi^2 \phi$ vs $\chi^2 \theta$



$\chi^2 \chi^2$ vs $\chi^2 \theta$

