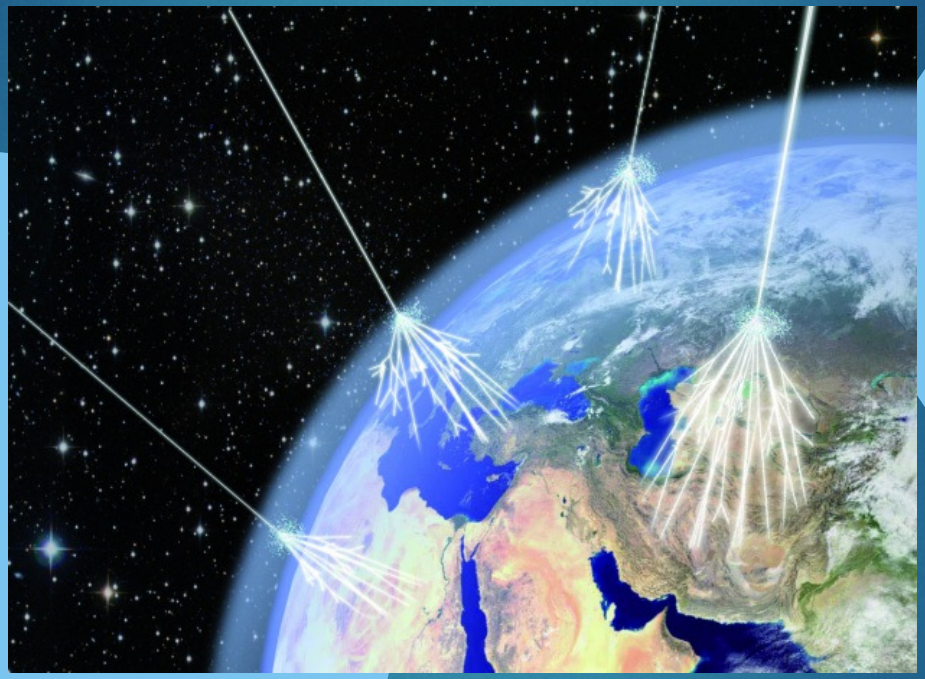
E.E.E. L'AQUILA TELESCOPES: A PRELIMINARY STUDY OF CORRELATION



I.I.S. Amedeo d'Aosta L'Aquila

ERICE MEETING 6-8 DECEMBER 2018

Telescope LAQU-02

L'Aquila (Italy) (42°21'19'' N - 13°24'49'' E)

- **THE LAQU-02 TELESCOPE HAS BEEN ONLINE SINCE MARCH 2009 INSIDE THE «D'AOSTA» INSTITUTE.**
- **IT'S VERY CLOSE TO THE OTHER TELESCOPE LAQU-01 (184m)**

THE DAILY ACTIVITIES ARE:

- Ordinary maintenance
- Data Analysis
- Tutoring and training

DATA ANALYSIS of Telescopes LAQU-01 - LAQU-02

- **From JUNE 2015 to OCTOBER 2016 the telescopes registered 2.6 million events.**

- ***We analysed one week data between 8th and 14th October 2016 (73122 events).***

- ***We analysed the track length and the time of flight of the events.***

- ***The arrival time difference of the events in the two telescopes was also investigated.***

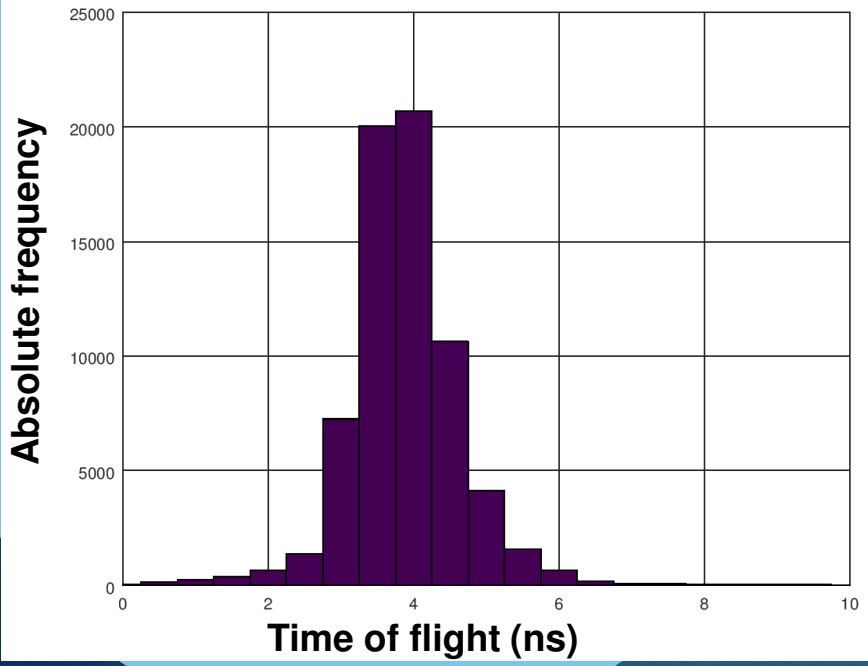
TIME OF FLIGHT Distribution

LAQU-01-LAQU-02 – 8-14/10/2016

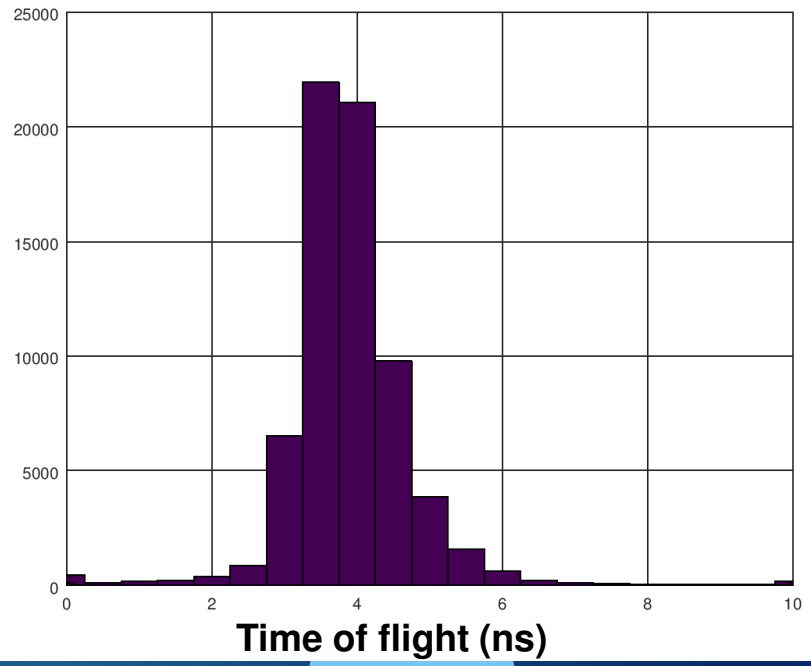
Mean TIME OF FLIGHT ≈ 3,9 ns
Standard deviation of TIME of FLIGHT ≈ 0,8 ns

Mean of TIME OF FLIGHT ≈ 3,9 ns
Standard Deviation of TIME of FLIGHT ≈ 0,7 ns

LAQU -1



LAQU -2

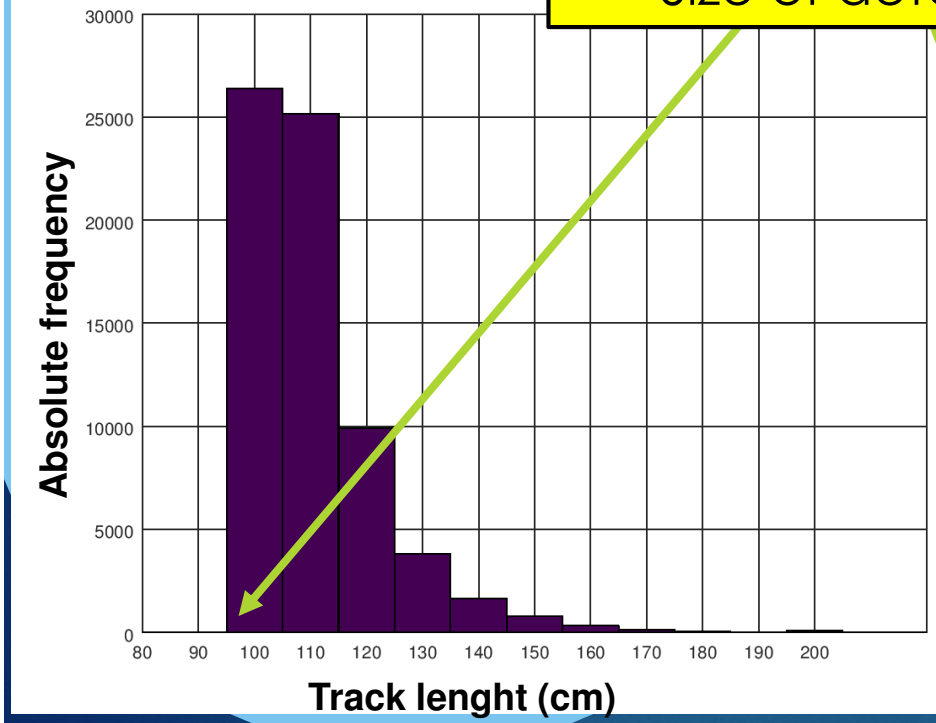


TRACK LENGTH Distribution

LAQU-01-LAQU-02 – 8-14/10/2016

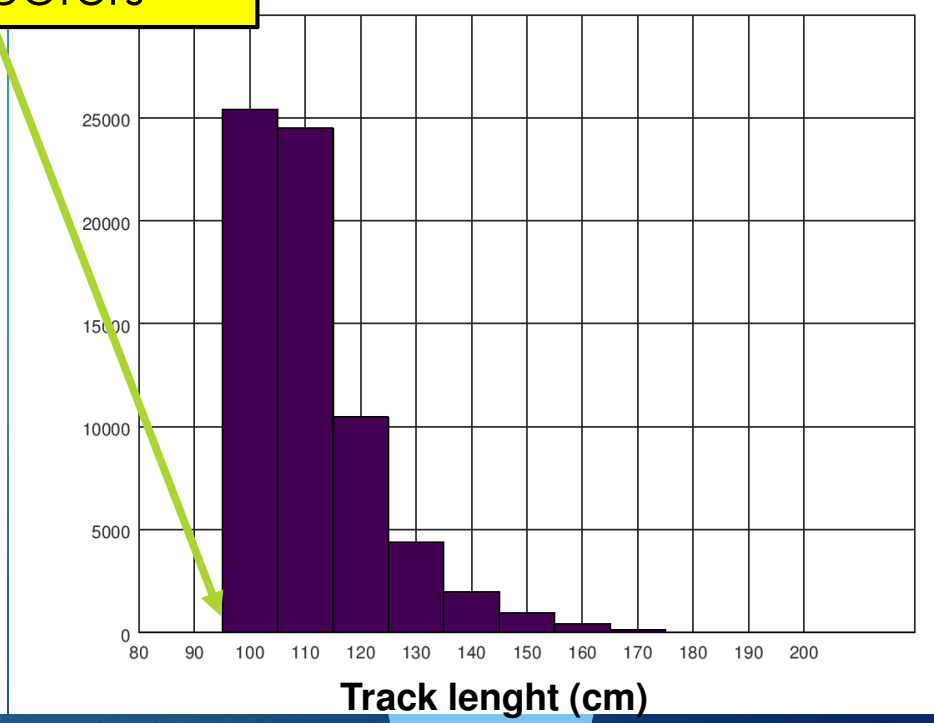
Mean of TRACK LENGTH ≈ 111 cm
Standard Deviation of TRACK LENGTH ≈ 12 cm

LAQU -1



Mean of TRACK LENGTH ≈ 111 cm
Standard Deviation of TRACK LENGTH ≈ 11 cm

LAQU -2



Size of detectors

SPEED ANALYSIS

$$v = \frac{s}{t} = \frac{<track\ lenght>}{<time\ of\ flight>}$$

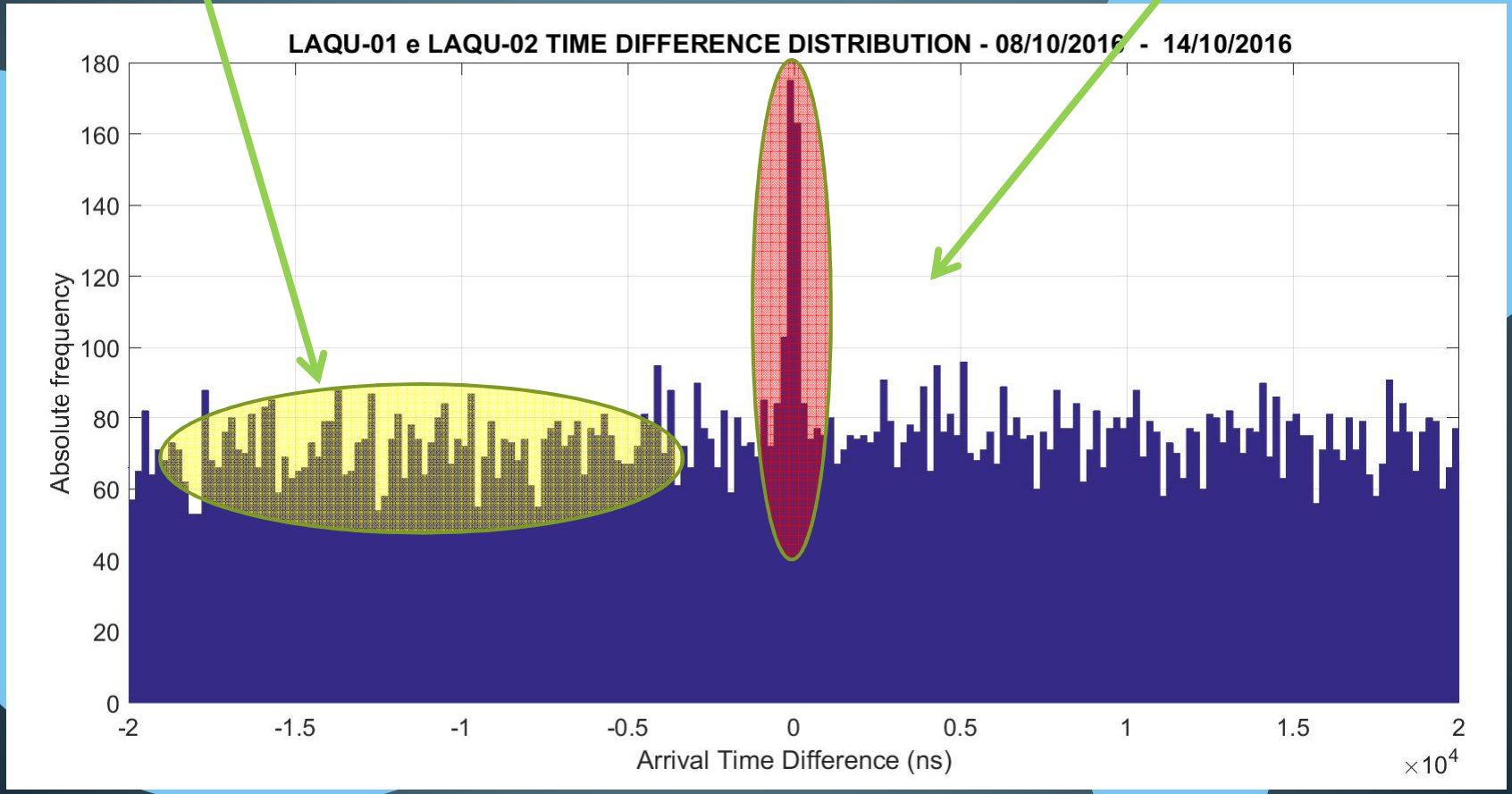
$$v = \frac{111}{3,9} = 28\,\frac{cm}{ns} \cong 0,95\,c$$

WORK IN PROGRESS ABOUT VELOCITY AND ENERGY

Arrival Time Difference Distribution

BIN WIDTH =200 ns
BACKGROUND MEAN = 73
BACKGROUND STANDARD DEVIATION =10

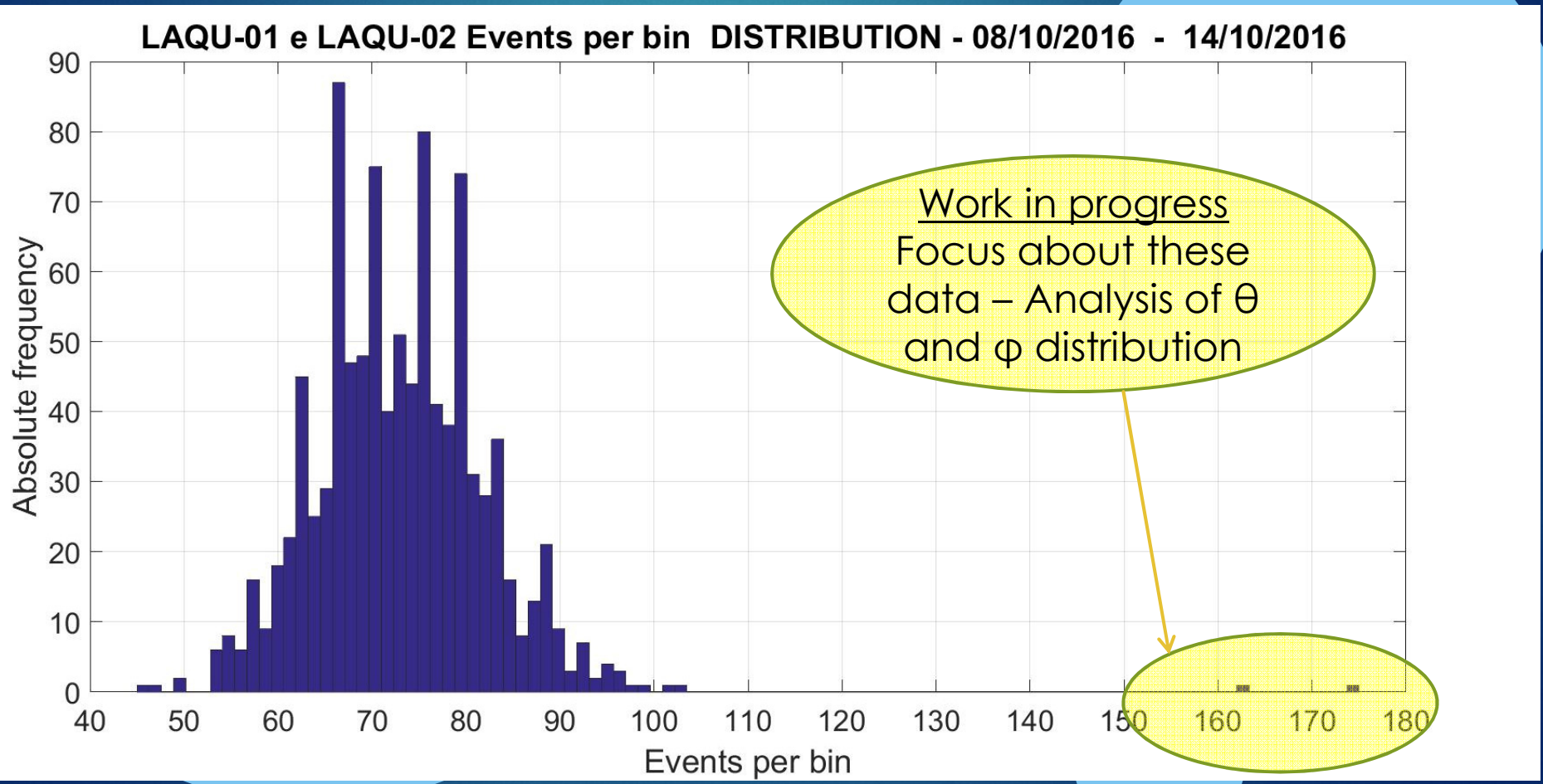
606 EVENTS IN THE RANGE [-500 500] ns (5 BIN)



ANALYSIS OF COINCIDENCES

Telescopes LAQU-01 - LAQU-02

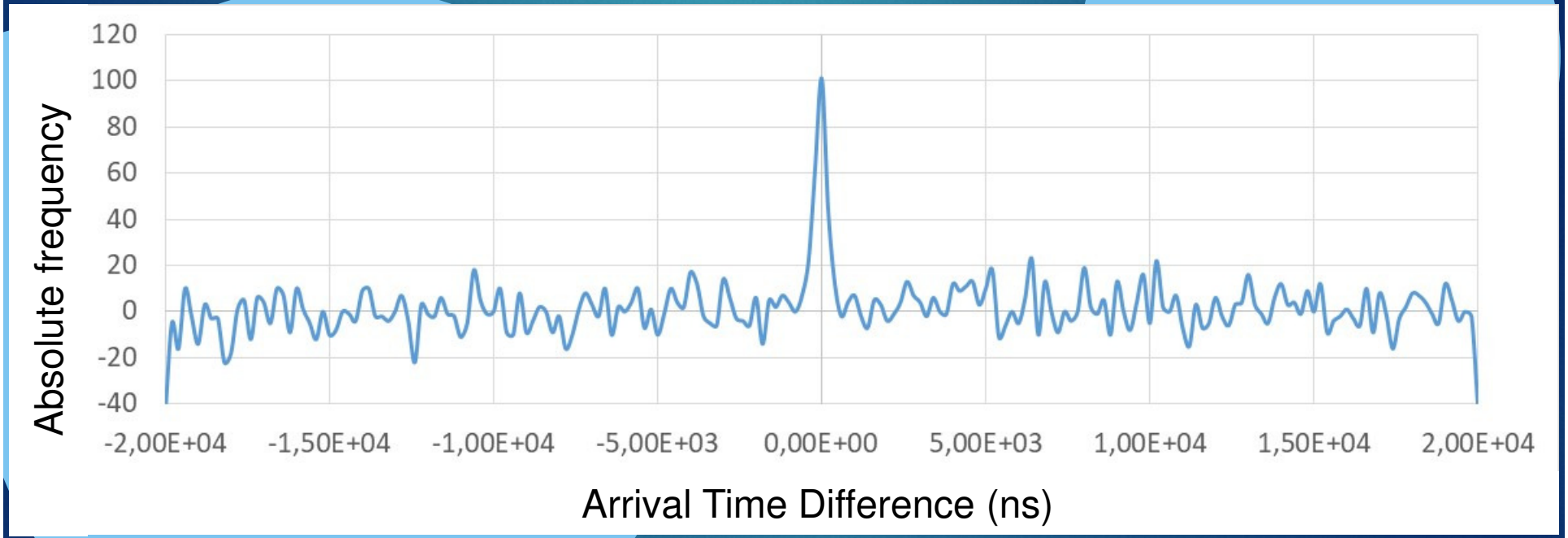
- The distribution shows 2 bins (central bins) particularly interesting.



Arrival Time Difference Distribution signal-background

241 EVENTS IN THE RANGE [-500 500] ns (5 BIN)

corresponding to about 60 events for day



DATA ANALYSIS of COINCIDENCES

Telescopes LAQU-01 - LAQU-02

- We analysed the events of telescopes with a arrival time difference between -500 and 500 ns.

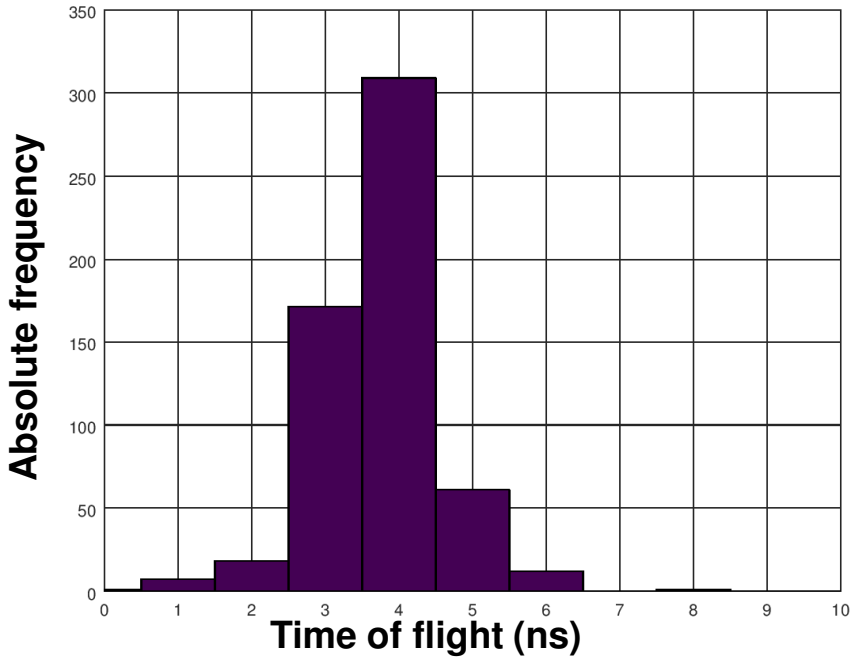
TIME OF FLIGHT Distribution

LAQU-01-LAQU-02 – 8-14/10/2016

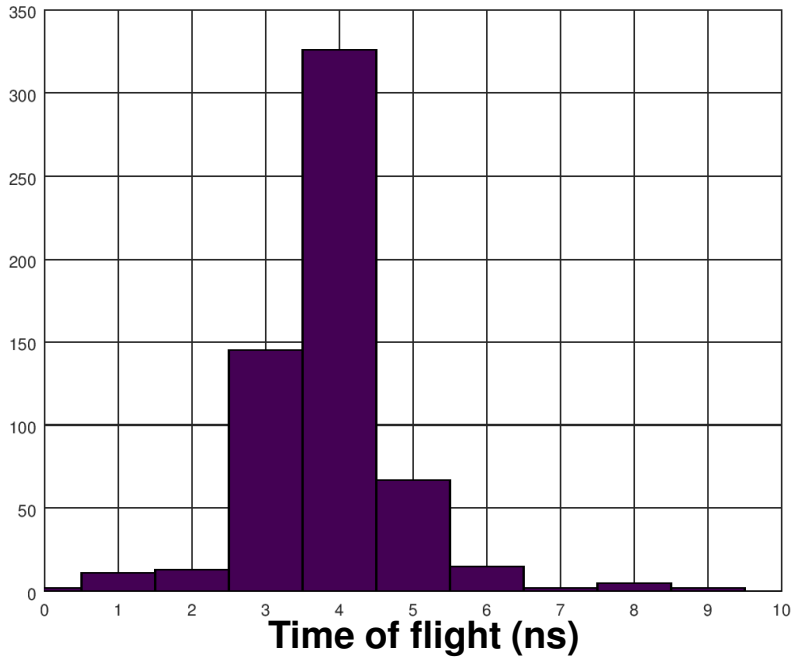
Mean of TIME OF FLIGHT ≈ 3.8 ns
Standard deviation of TIME of FLIGHT ≈ 0.8 ns

Mean of TIME OF FLIGHT ≈ 3.9 ns
Standard deviation of TIME of FLIGHT ≈ 0.9 ns

LAQU -1



LAQU -2



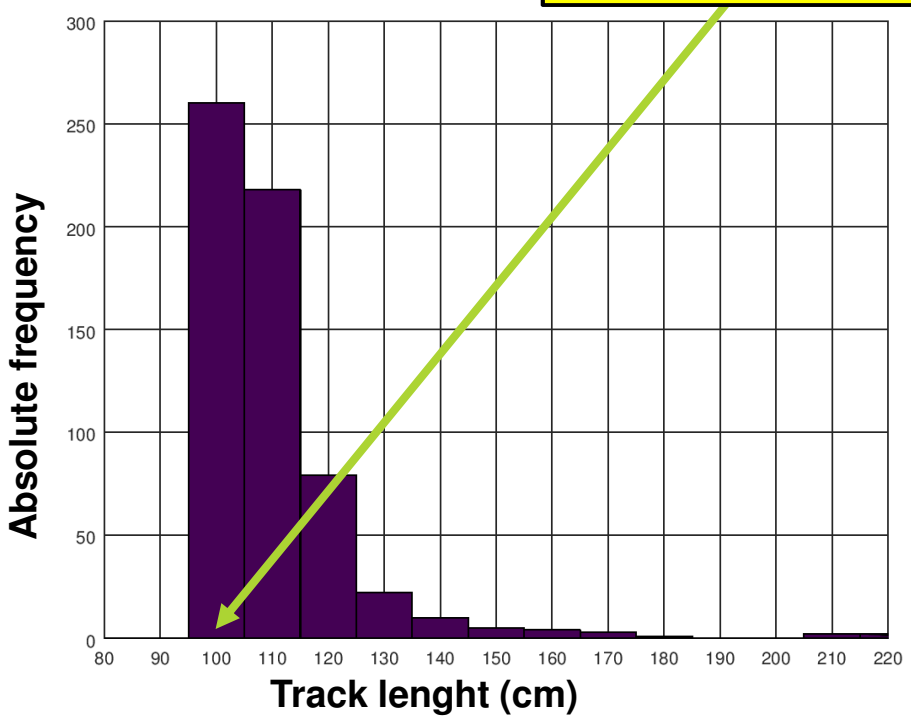
TRACK LENGTH Distribution

LAQU-01-LAQU-02 – 8-14/10/2016

Mean of TRACK LENGTH ≈ 111 cm
Standard deviation of TRACK LENGTH ≈ 12 cm

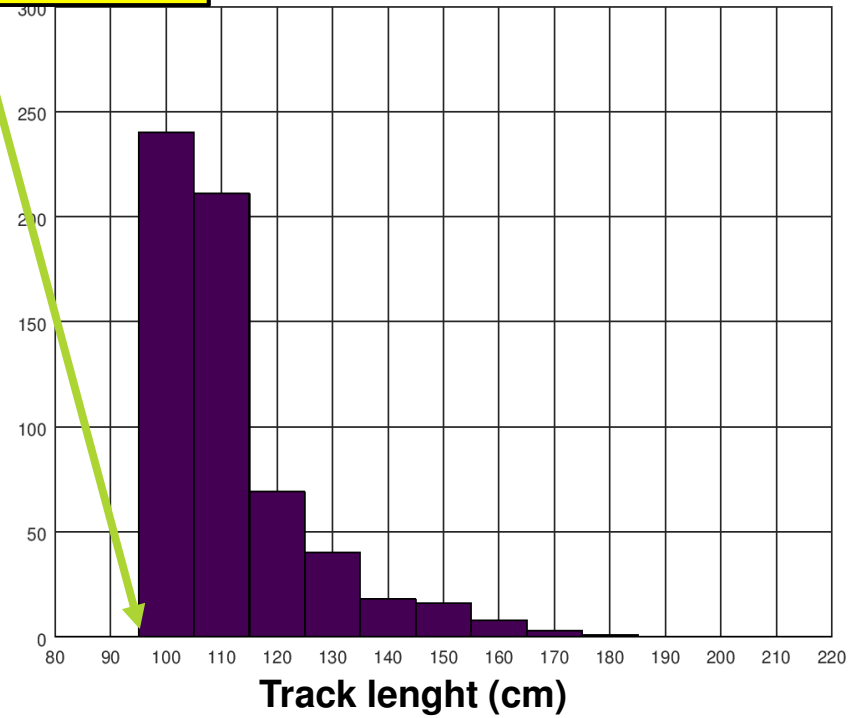
LAQU -1

Size of detectors



Mean of TRACK LENGTH ≈ 111 cm
Standard deviation of TRACK LENGTH ≈ 12 cm

LAQU -2



SPEED ANALYSIS

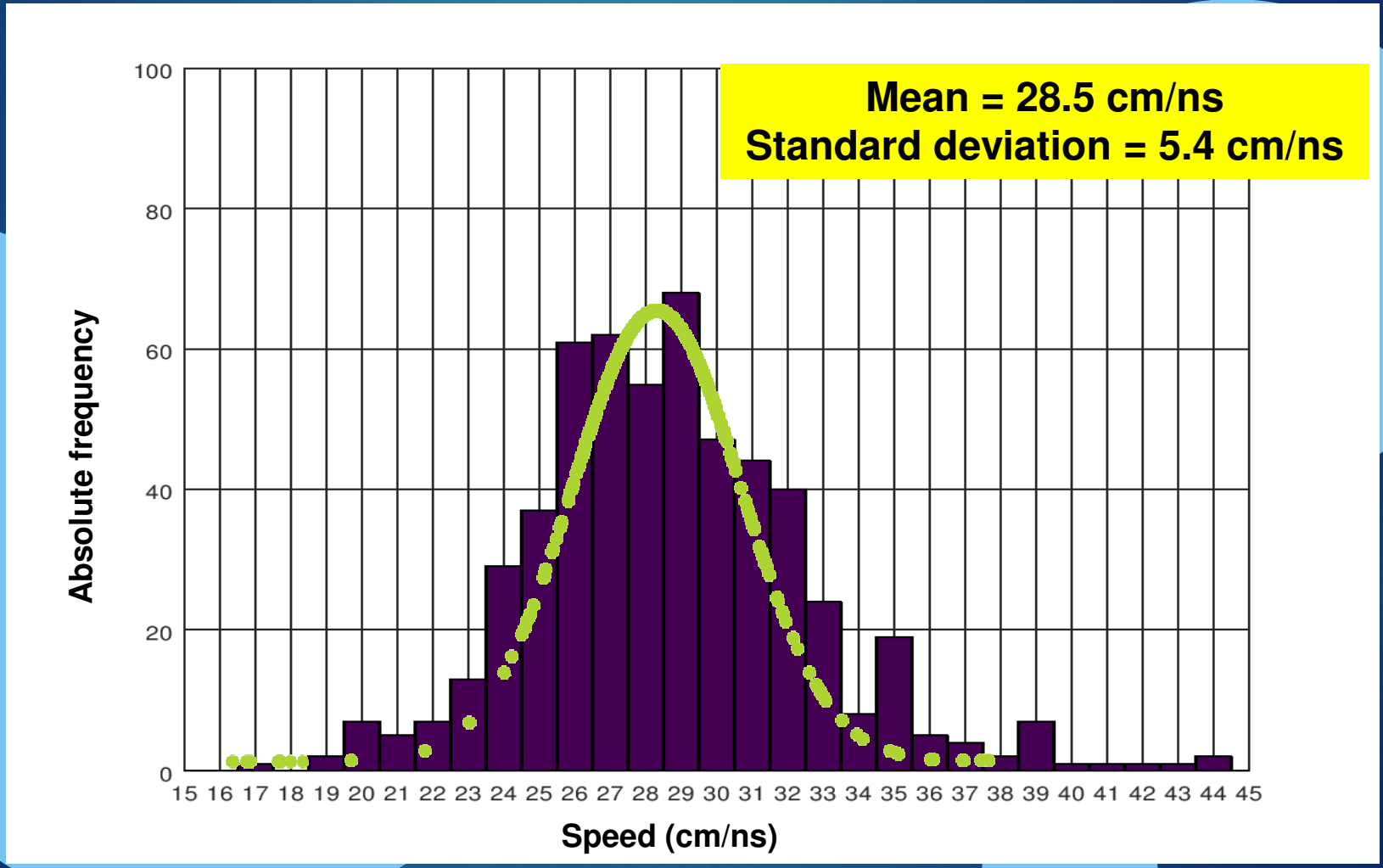
$$v = \frac{s}{t} = \frac{<track\ lenght>}{<time\ of\ flight>}$$

The speed of muons has been calculated by the ratio of track lenght and time of flight for each track

WORK IN PROGRESS ABOUT VELOCITY AND ENERGY

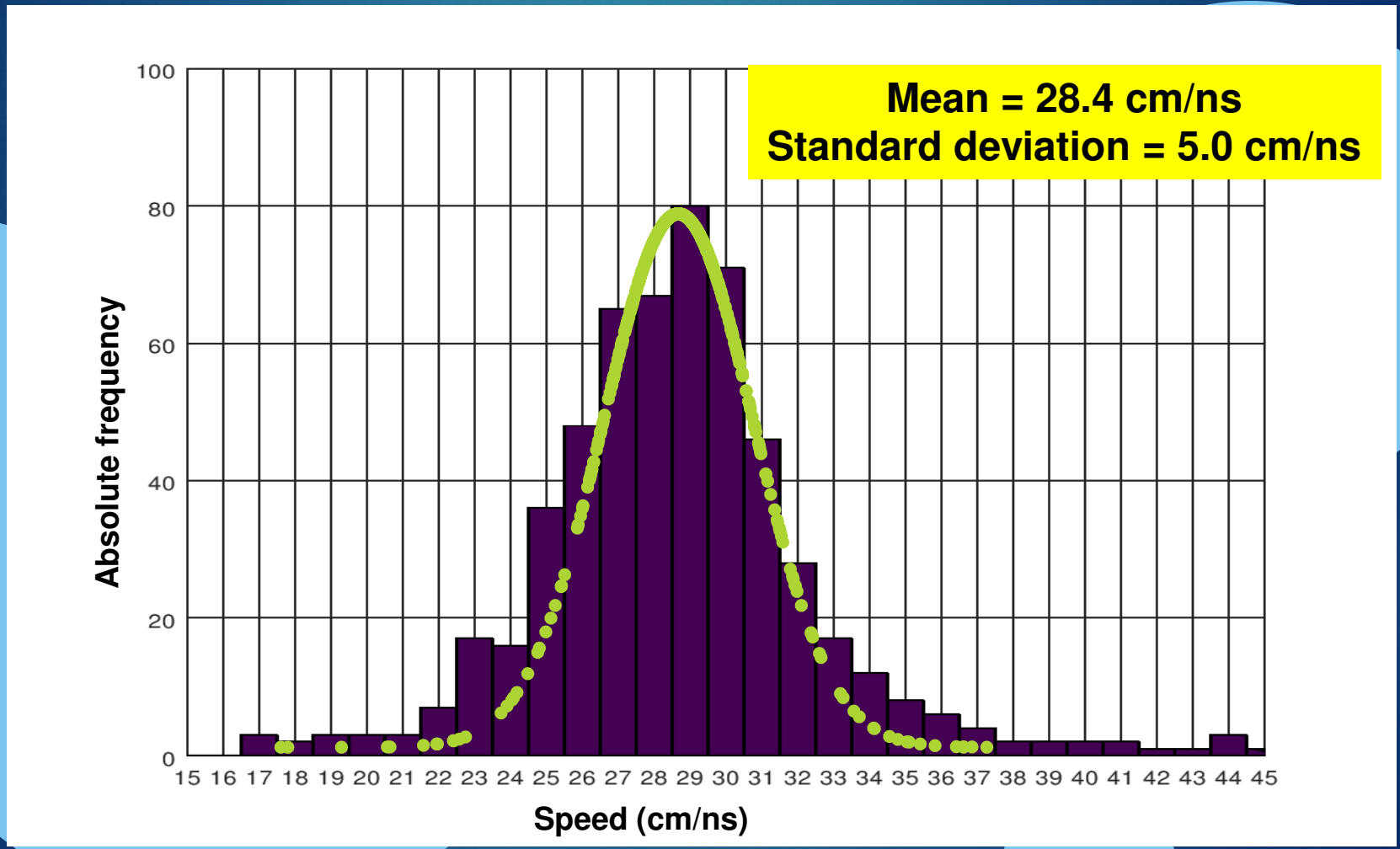
SPEED ANALYSIS LAQU – 1

8-14/10/2016



SPEED ANALYSIS LAQU – 2

8-14/10/2016



THANKS FOR YOUR ATTENTION

I.I.S. Amedeo D'Aosta L'Aquila

Martina Coccia

Alessia Pucci

Cristiana Pallotta

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