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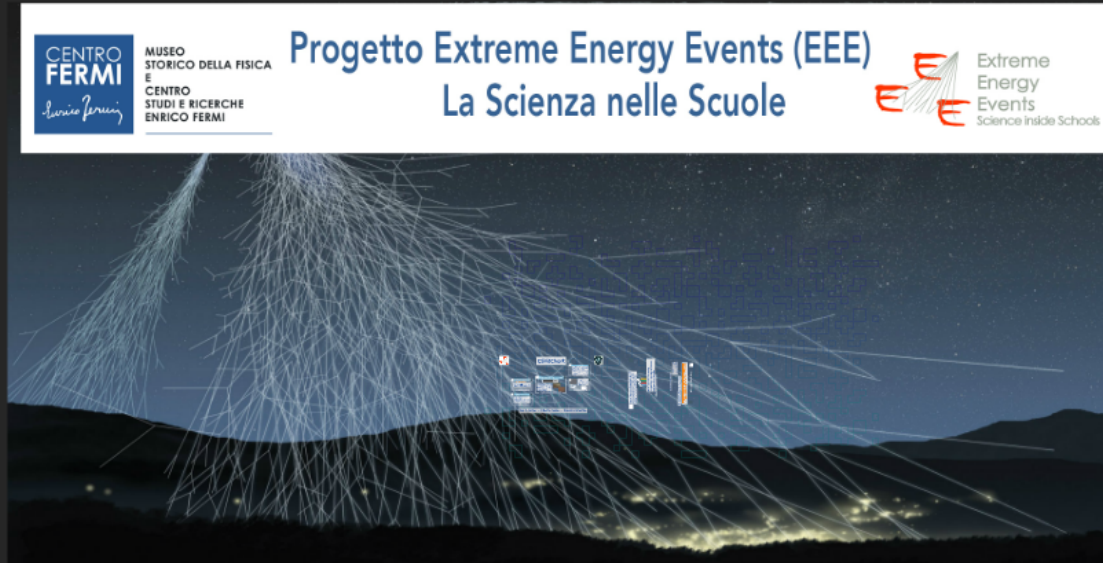
Liceo Scientifico
 Via Carlo Pisacane - Tel. 0961 737678 - Fax 0961 737204
 Liceo Scientifico Sportivo
 Liceo delle Scienze umane
 Liceo delle Scienze umane
 Liceo Linguistico
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How a source code can simplify an analysis task:

CSV2Chart

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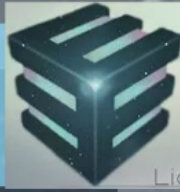
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 e
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Progetto Extreme Energy Events (EEE)
 La Scienza nelle Scuole

Extreme Energy Events
 Science Inside Schools



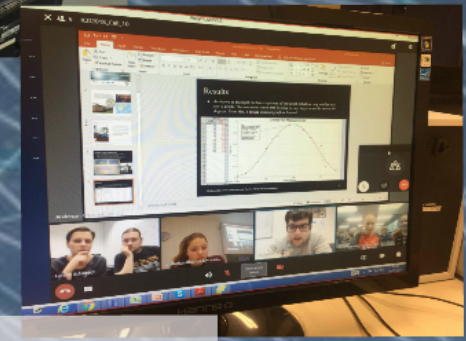
How did we get the idea to make this software?



**INTERNATIONAL
COSMIC DAY**

2018
November, 29

The students have ventured into a data analysis activity aimed at extracting the angular distribution of the cosmic muons revealed by the EEE Project's telescopes.



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We started by following these guidelines:



- 1) Download data from E.E.E. website
- 2) Import .CSV file in Excel
- 3) Enable the needed plug-in
- 4) Create a .xls file that contains MC and Experimental Data
- 5) Create charts with complicated formulas
- 6) Well done! Our chart is ready...

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but...

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What if we create a software that does all of this for us?



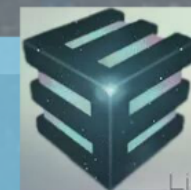
Let's look the steps for the user

- 1) Login
- 2) Select a Telescope  or
- 2) Import a .CSV file
- 3) Choose chart kind you want to see
- 4) Well done... Your chart is ready to download!

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How we proceeded:

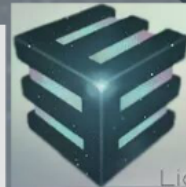


We started thinking how we could make real our ideas and we established that our software should be accessible from all the E.E.E. Schools and the data we analyze should be stored on our servers.

We decided to use PHP and JS as programming languages.

- PHP processes the files uploaded by the users and indexes them into a MySQL database to simplify the search for each file.
- JS elaborates the data locally and generates the charts we need.

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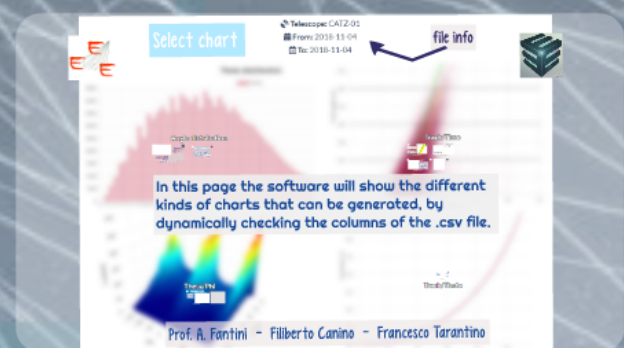


```

graph_select.php
-ec-transform: translate(-50%, -50%);
color: white;
font-size: 10px;
border: none;
cursor: pointer;
text-shadow: -1px 0 black, 0 1px black, 1px 0 black, 0 -1px black;
}
.ingbtn .btn: hover {
text-decoration: underline;
}
</style>
</head>
<body>
<div class="container" id="page">
<?php echo $navbar; ?>
<center>
<p id="csv_details"></p>
<div id="error_loading" style="color: #e74c3c;"></div>
</center>
<div class="container">
<div class="row">
<div class="col-6" id="div_angles" style="display: none;">
<div class="ingbtn" onmouseover="$('angledis').css('filter', 'blur(0px)'); $('graph_angle_distribution.php?id=<?php echo $_GET['id']; ?>')<br>
<img src='inc/img/angle.png' alt='Show' id='angledis'">
<div class="btn">Anglo distribution</div>

```

We coded for more than 60 hours and, finally, this is what we have done...



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Login page



CSV2Chart



CATZ-01



.....



Log in

Through this page anyone can login into our software using his elog username and password. CSV2Chart checks whether the elog server response is positive or not. So there's no need for other schools to register.

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Home page



Search by telescope:

Telescope ID **Here you can search for stored .csv files by telescope name**

Ex: CATZ-01, BOLO-01

Send EEE .zip file: **Here you can send a .zip file directly from the E.E.E. website without downloading it on your PC**

Insert URL MC

Ex: [https://iatw.cnaf.infn.it/eee/elog/Query/\[...\]/\[...\]csv.zip](https://iatw.cnaf.infn.it/eee/elog/Query/[...]/[...]csv.zip)

Upload .csv or .zip file:

Here you can upload a .zip or .csv file from your PC, but you'll have to insert manually dates and telescope ID

Telescope ID MC

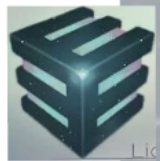
Date



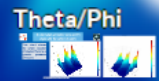
Select chart

Telescope: CATZ-01
From: 2018-11-04
To: 2018-11-04

file info



In this page the software will show the different kinds of charts that can be generated, by dynamically checking the columns of the .csv file.



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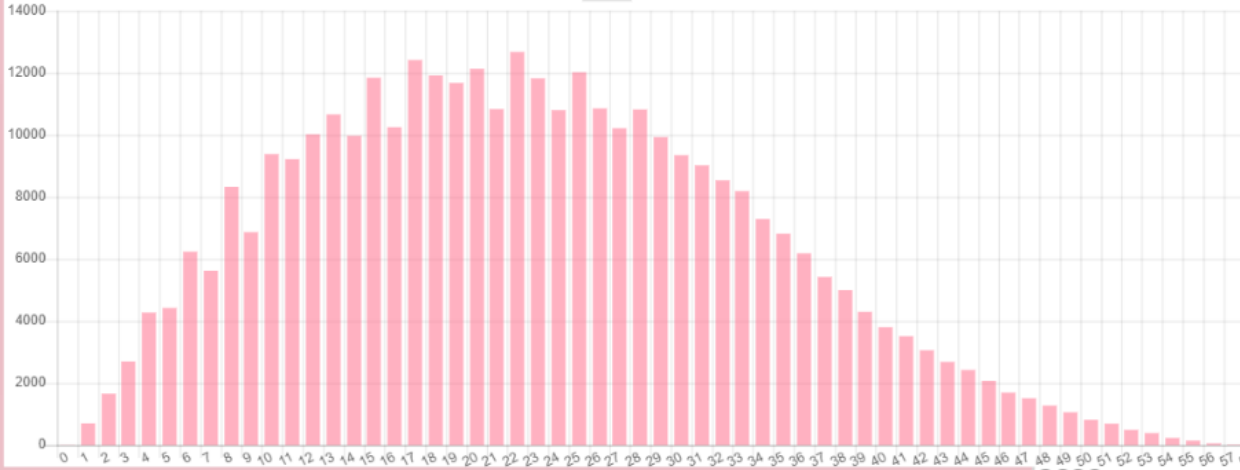
Telescope: CATZ-01

From: 2018-11-04

To: 2018-11-04

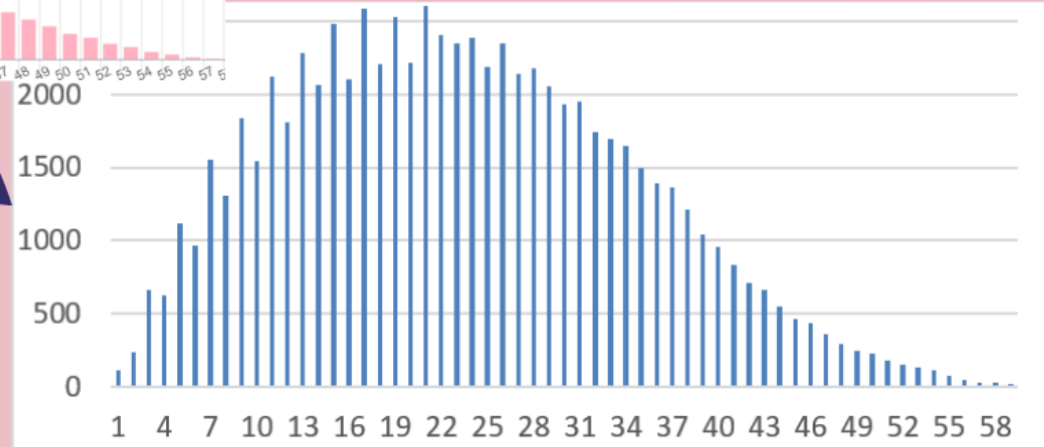
Theta distribution

Events



This is an example of Theta distribution chart generated by our software.

This chart is generated by Excel, following the ICD guidelines.



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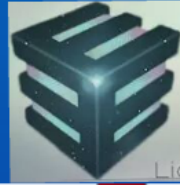
OUR SOFTWARE WORKS FINE!

**Now let's make it possible to
generate more complex and
interesting charts!**

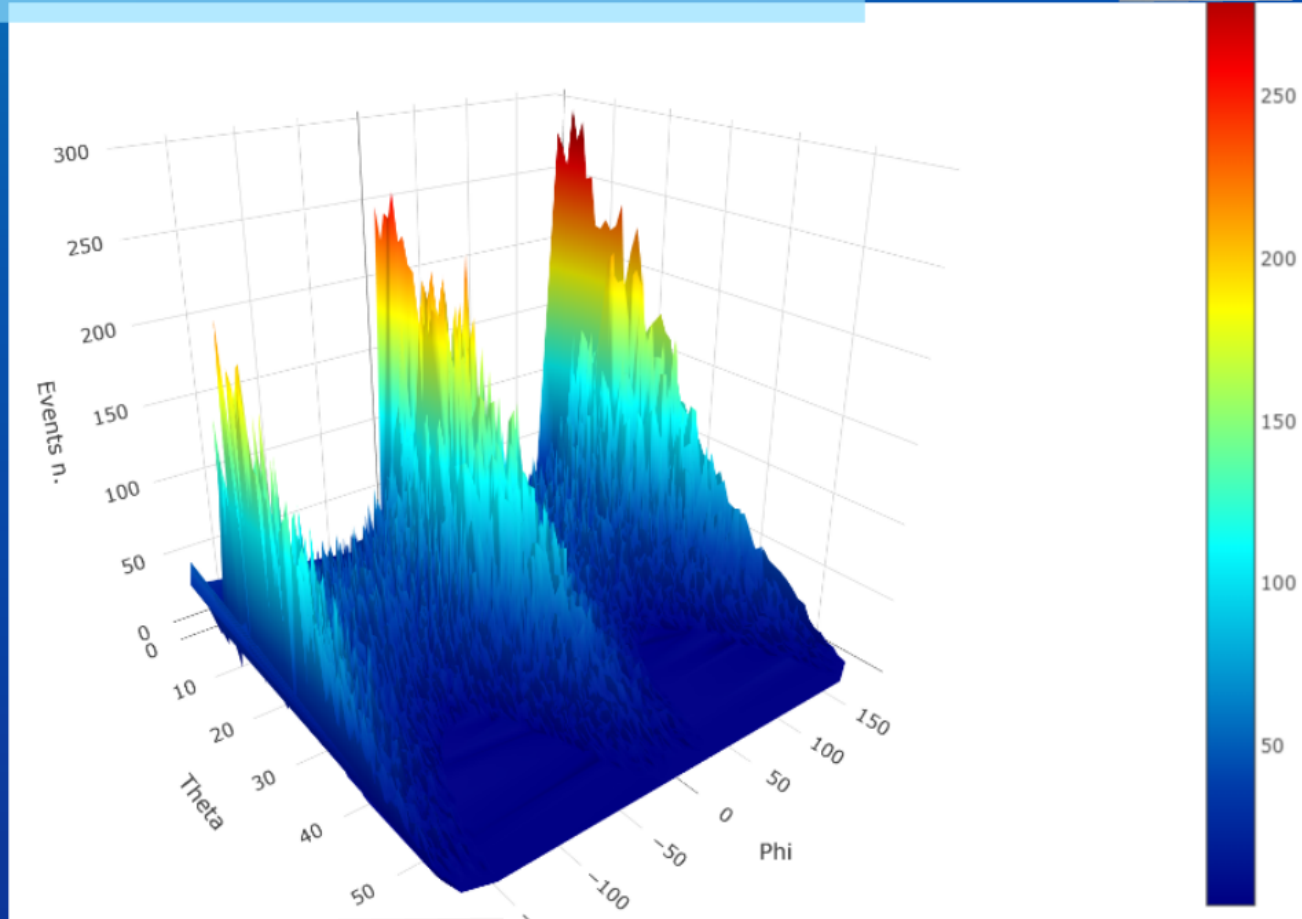
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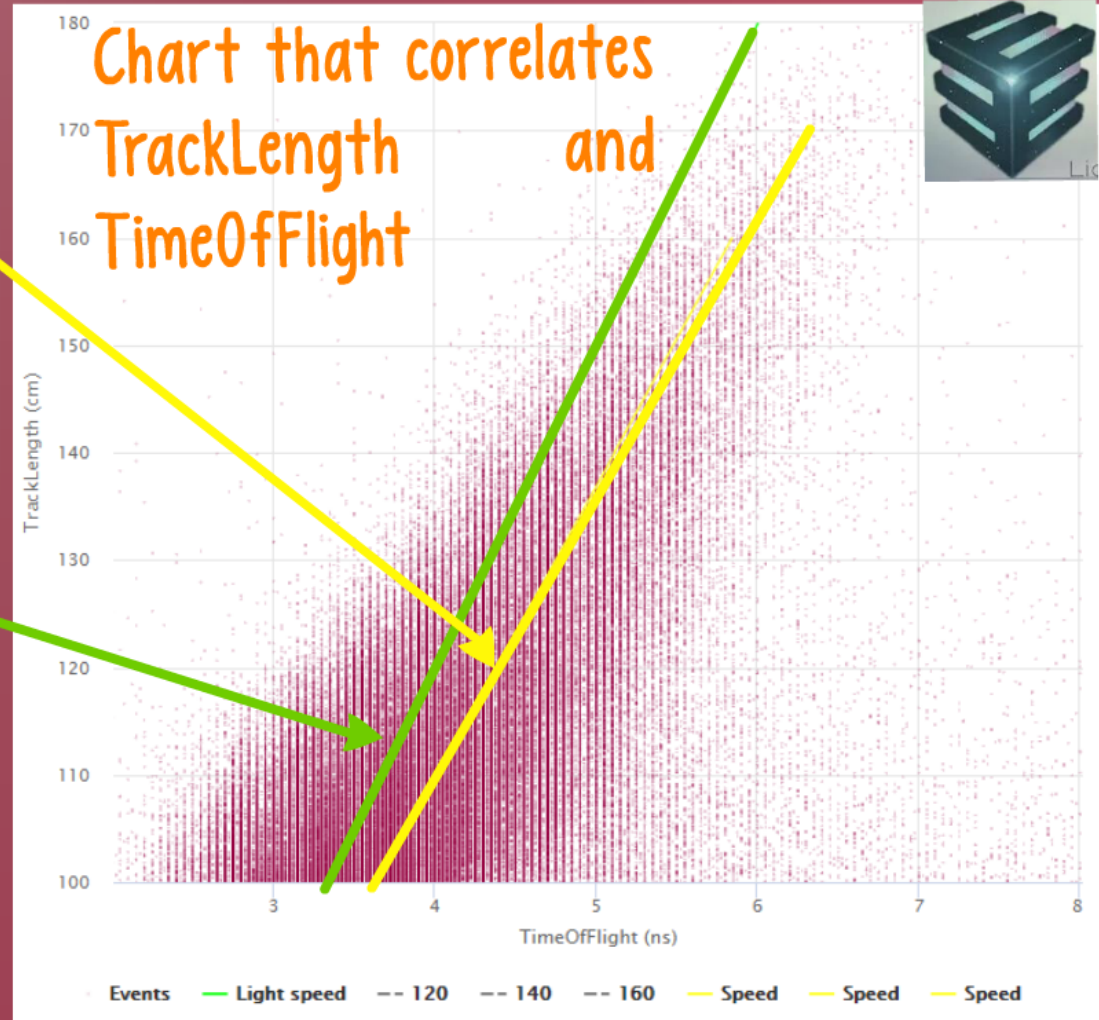


3D chart which correlates Theta and Phi angles with the number of events



This chart shows for which couples of angles there is a greater presence of muons

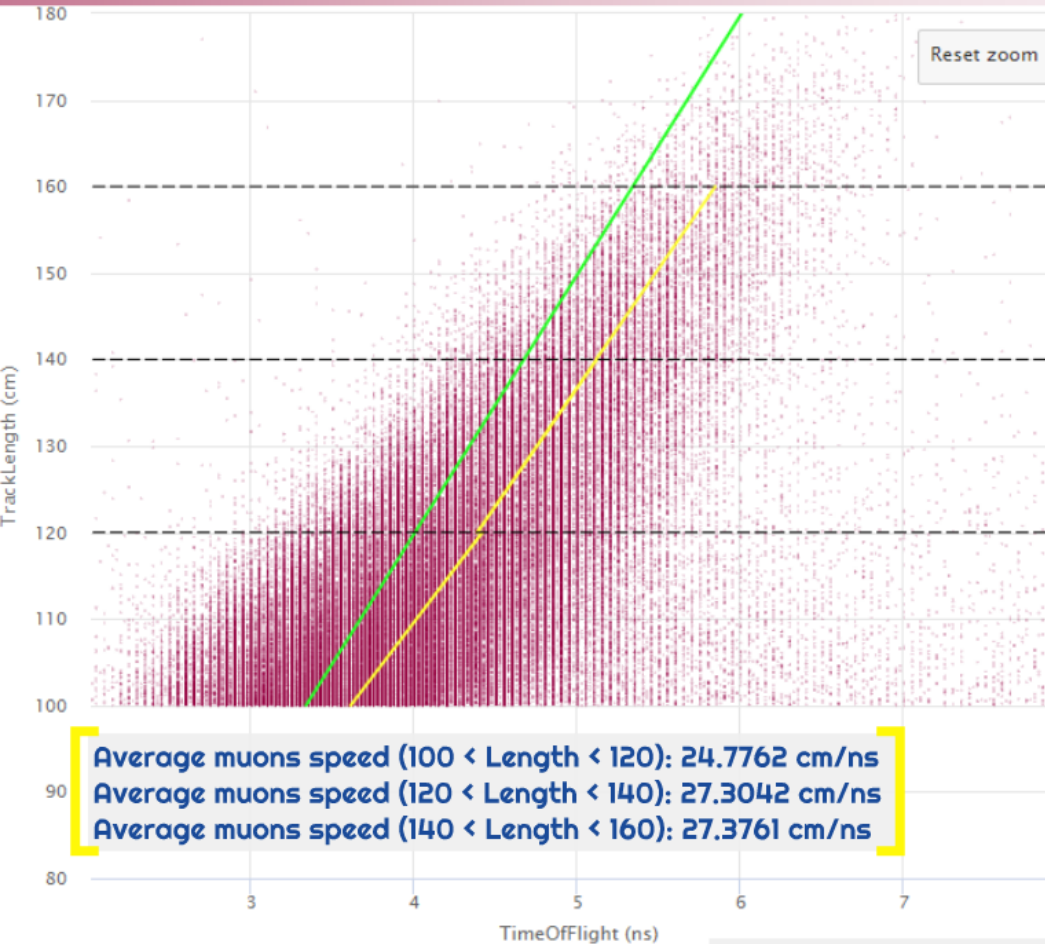




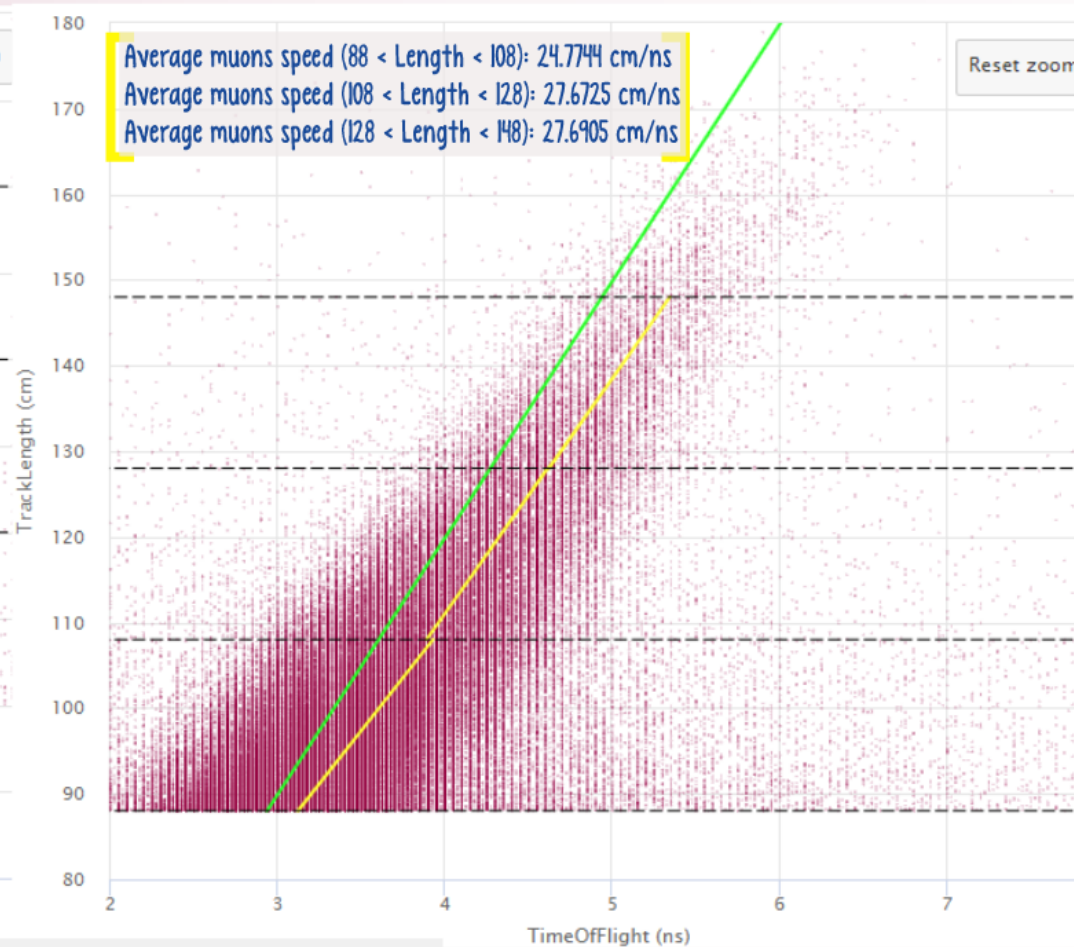
Average muons speed ($100 < \text{Length} < 120$): 24.7762 cm/ns
Average muons speed ($120 < \text{Length} < 140$): 27.3042 cm/ns
Average muons speed ($140 < \text{Length} < 160$): 27.3761 cm/ns
Light speed: 29.9792 cm/ns

Muons speed should be approximately 9/10 of the light speed.

CATZ-01, 356129 events, 04-11-18



CERN-01, 431139 events, 02-10-18

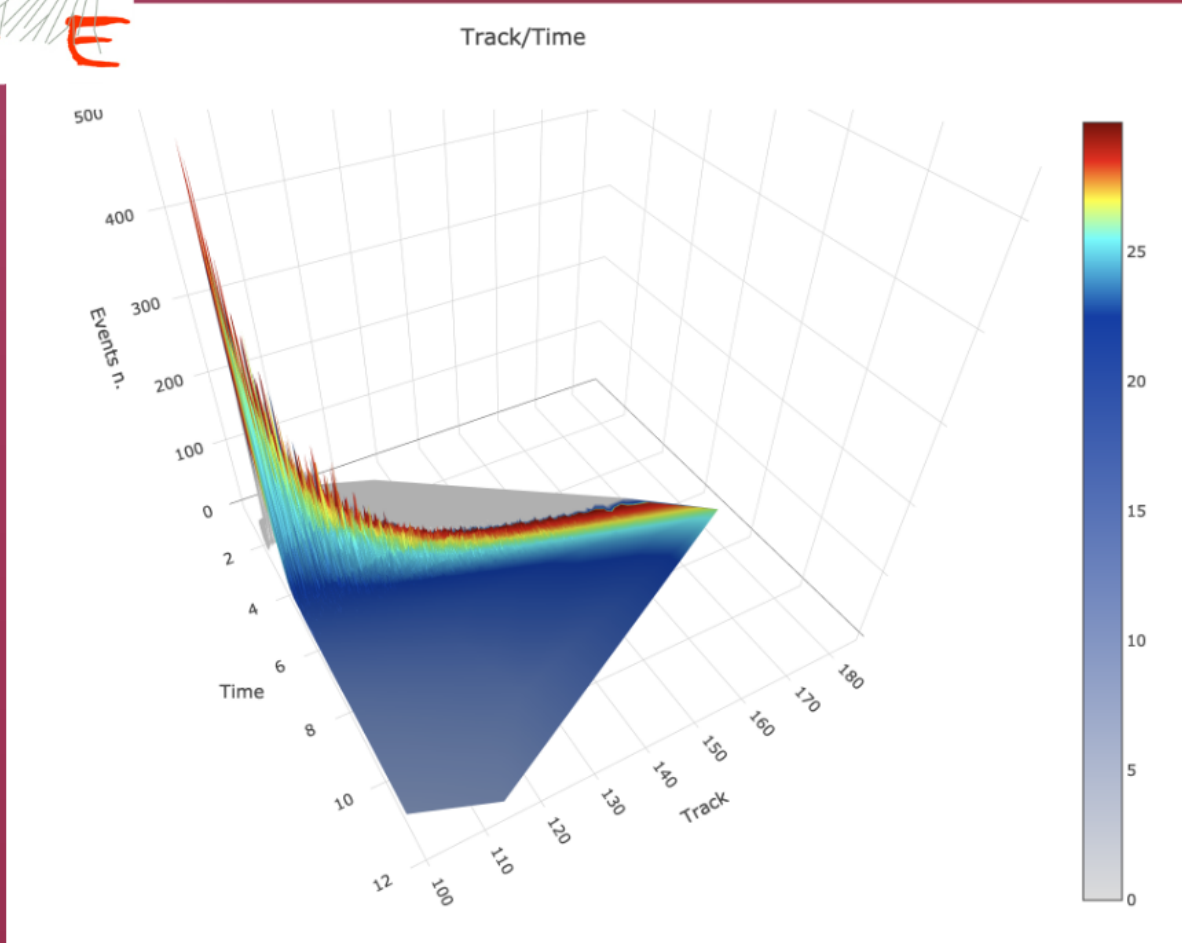


Light speed: 29.9792 cm/ns



3D chart which correlates track length and time of flight with the events number.

- The colors refers to the speed:**
- gray means the speed is higher than the light speed;
 - blue means the speed is lower than the light speed;
 - red means the speed is close to the light speed.



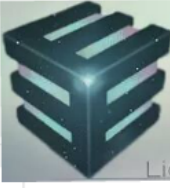
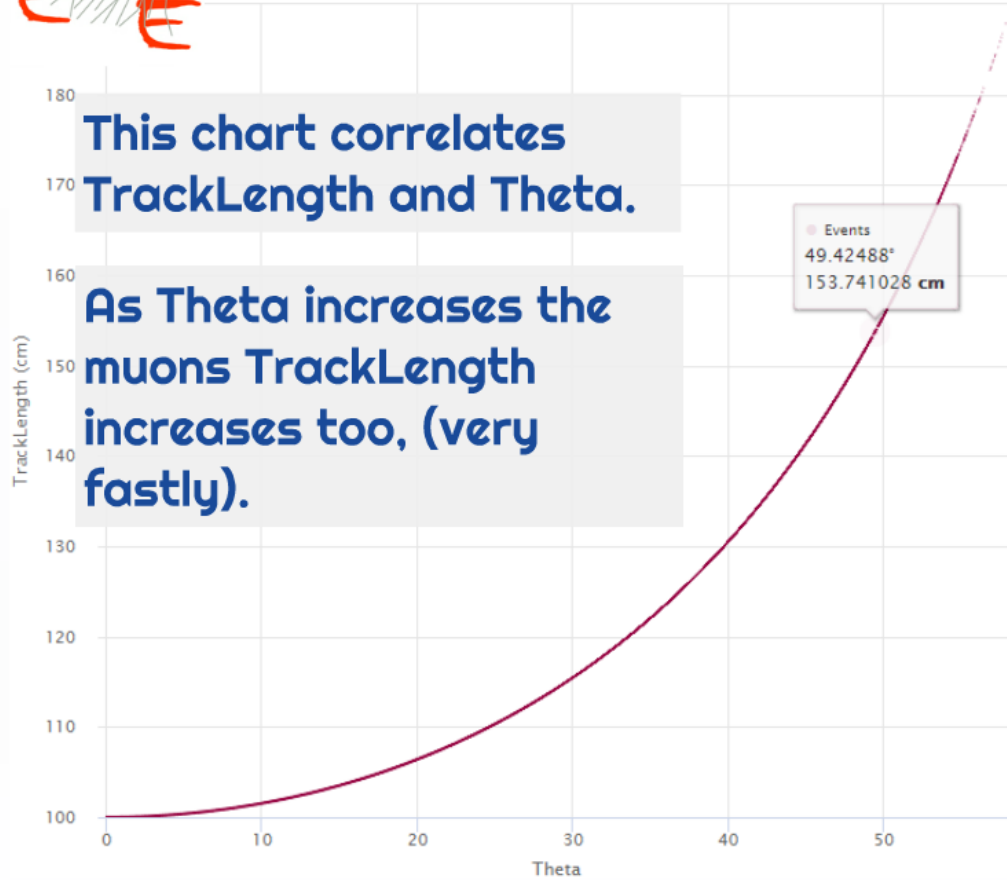


Track length / Theta



This chart correlates TrackLength and Theta.

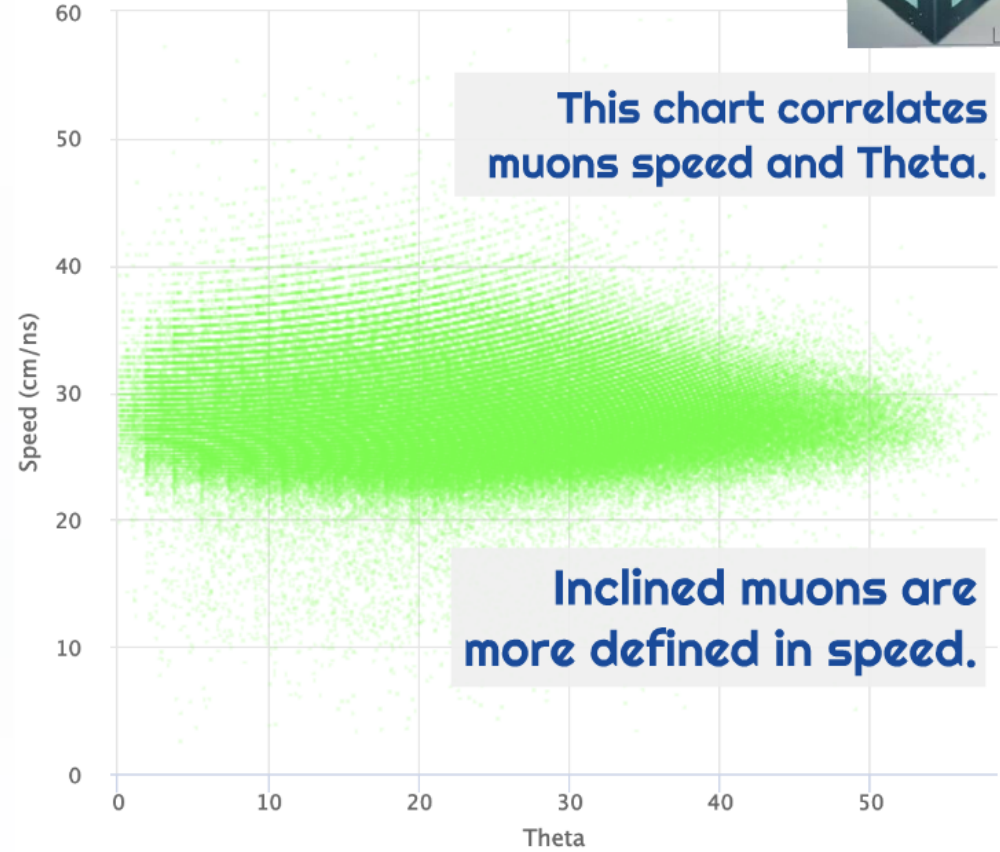
As Theta increases the muons TrackLength increases too, (very fastly).



Muons speed / Theta

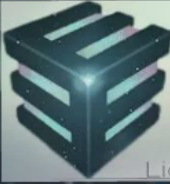
This chart correlates muons speed and Theta.

Inclined muons are more defined in speed.





Our software is brand new and it will be updated over time, so the number of charts will grow up.



All of you can help us by suggesting new type of charts and new functionality.



If you want, you can try it:



<https://catz01.tk/>

More info: csv2chart@catz01.tk

Tested on the newest versions of

- Google Chrome
- Safari

Works on Windows, Mac, Android, iOS

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Thanks for your attention!

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