



SLOVAKIA
HSSIP 2019

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SIMULATION OF ALICE TRIGGER SYSTEM & TESTING OF TRIGGER INPUTS TO CTP

INTRODUCTION

LHC ALICE TRIGGER

LHC

Large Hadron Collider

ALICE

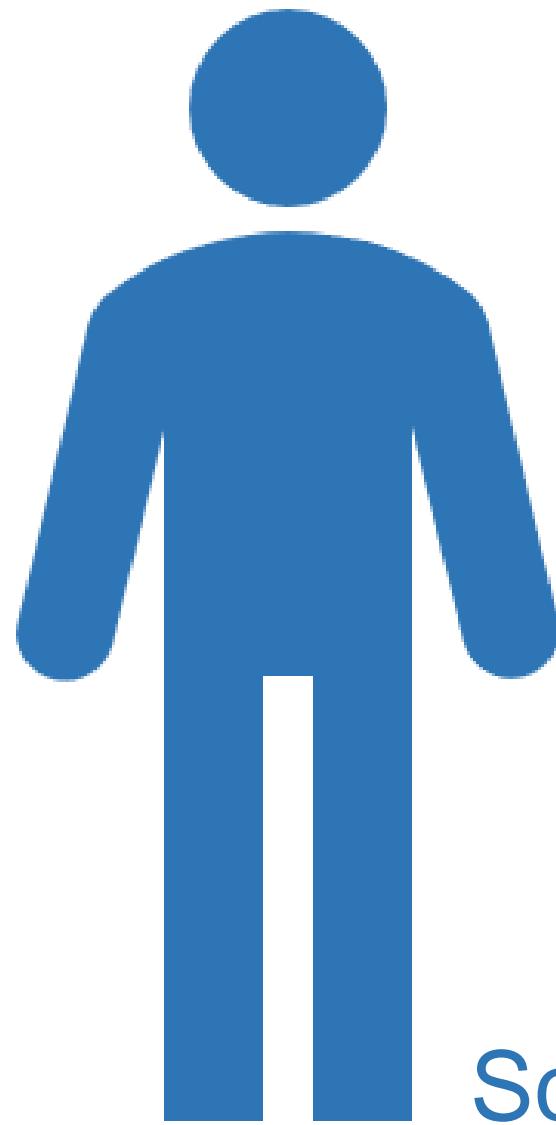
Scientist

ATLAS

CMS

LHC – b

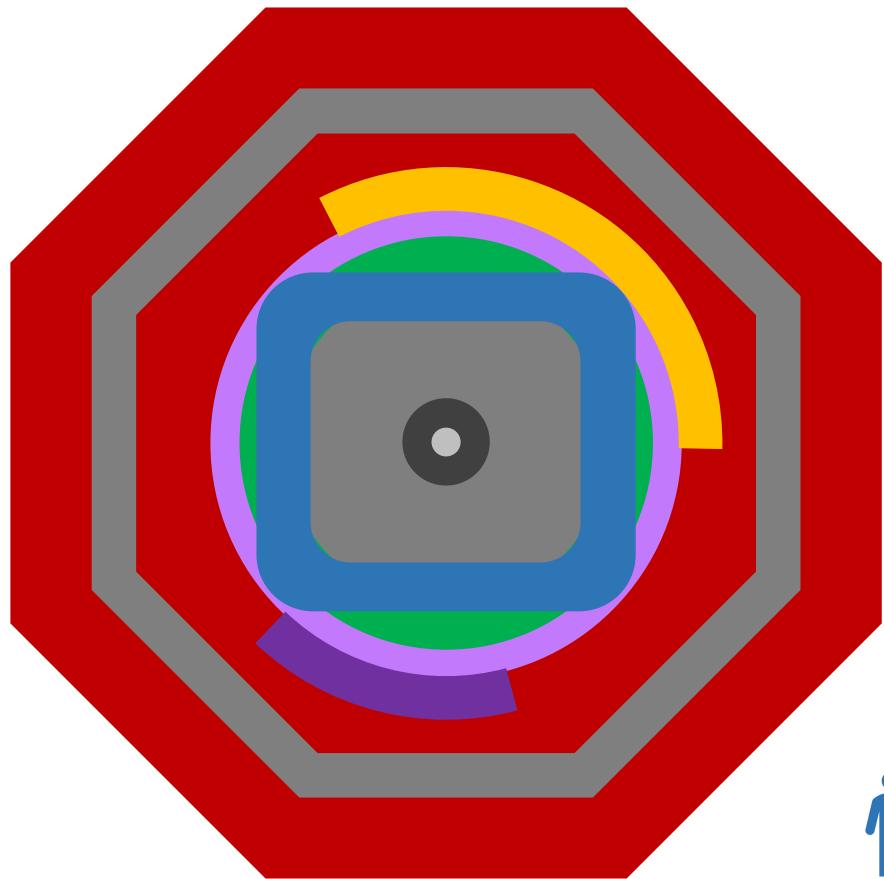
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Scientist

ALICE

A Large Ion Collider Experiment



PHOS CPV

TRD

EMCAL

MAGNET

TRACKER CHAMBER

SPD

DIPOLE MAGNET

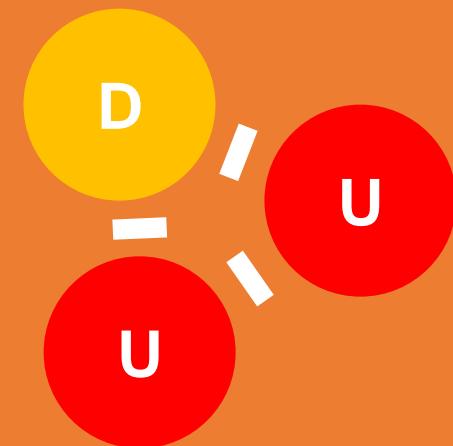
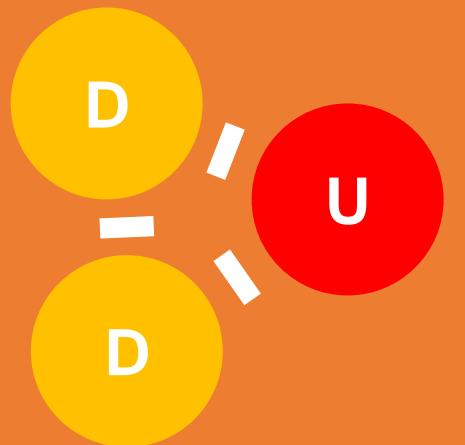
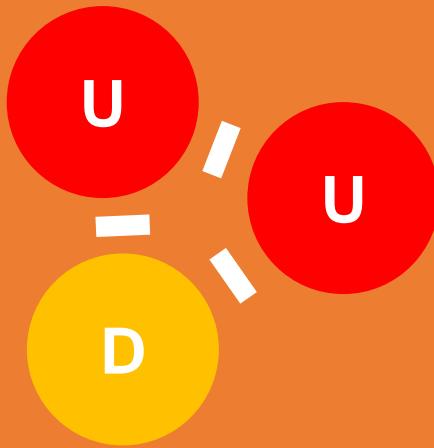
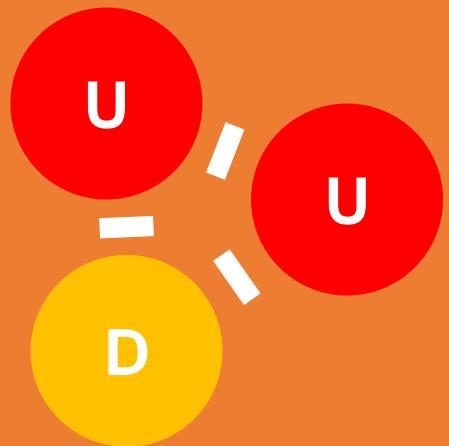
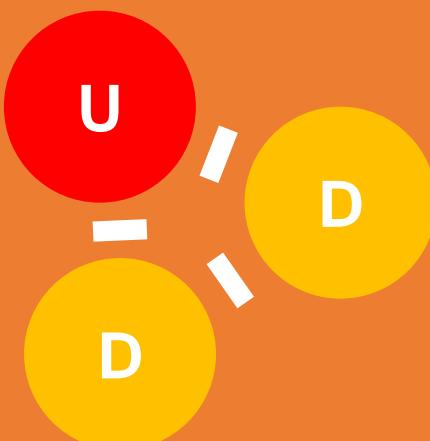
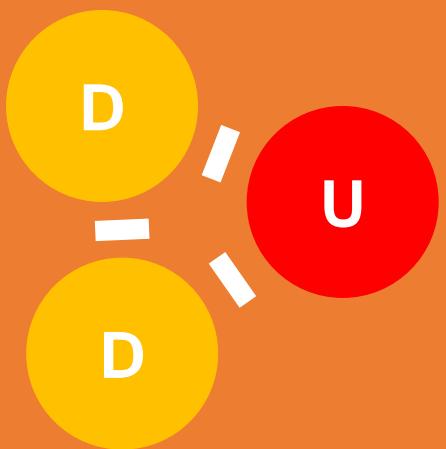
BEAM PIPEY

A diagram illustrating a nuclear fission chain reaction. At the center is a large orange starburst shape with a yellow outline, representing an exploding atomic nucleus. Above the starburst is a blue speech bubble containing the word "BOOM" in white capital letters. To the left and right of the starburst are two small clusters of black and grey spheres, representing groups of neutrons. A horizontal blue scale bar at the bottom left is labeled $10^{-15}m$, indicating the scale of the particles shown.

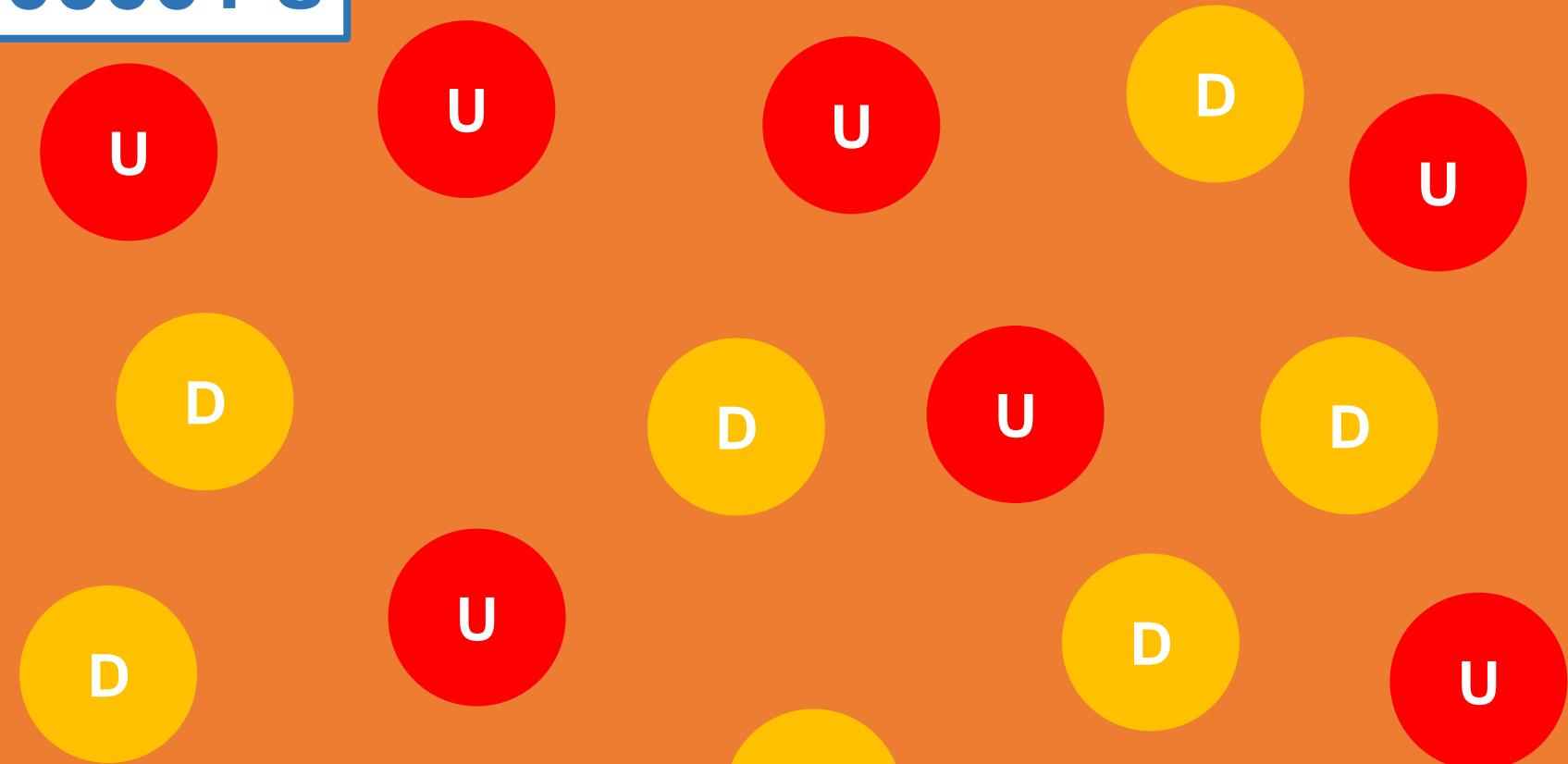
BOOM



$10^{-15}m$



0.000001 s

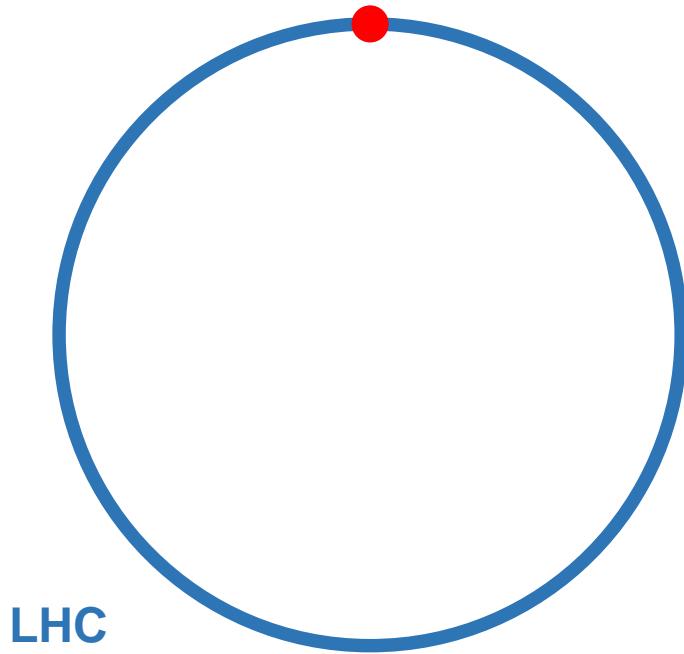


WHAT HAPPENS THEN?



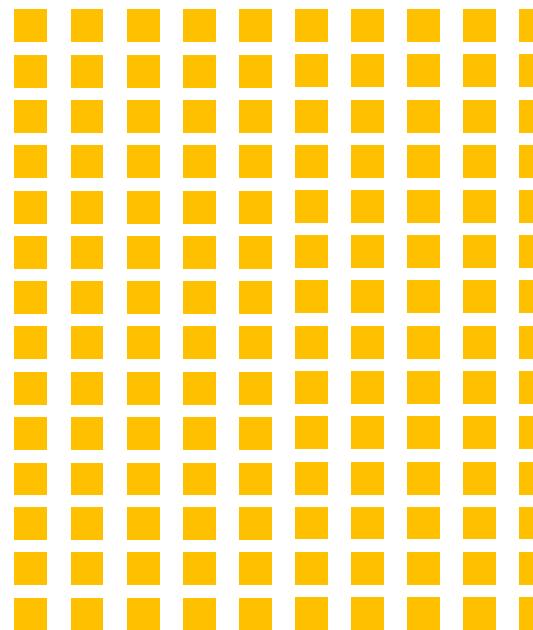
SIMULATION OF ALICE TRIGGER SYSTEM

TRIGGER



$$f = 11 \text{ MHz}$$

Beam travels through the LHC with frequency of 11 MHz



DATA FILTRATION

10

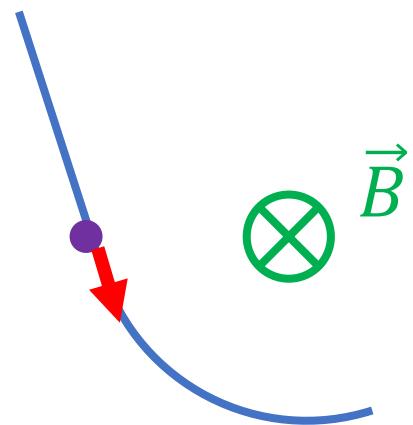
PARTICLE BEHAVIOUR

Physics

\vec{p}

Q

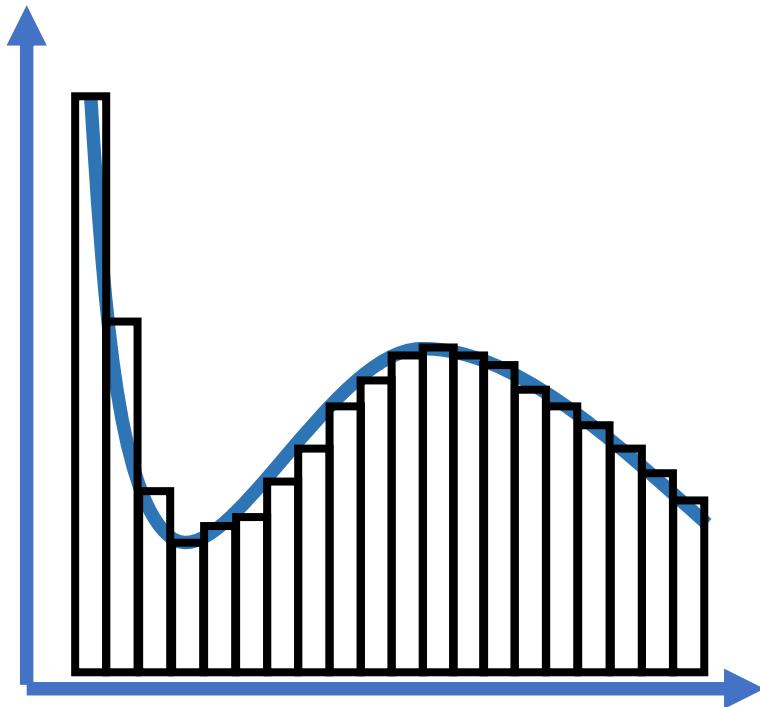
E



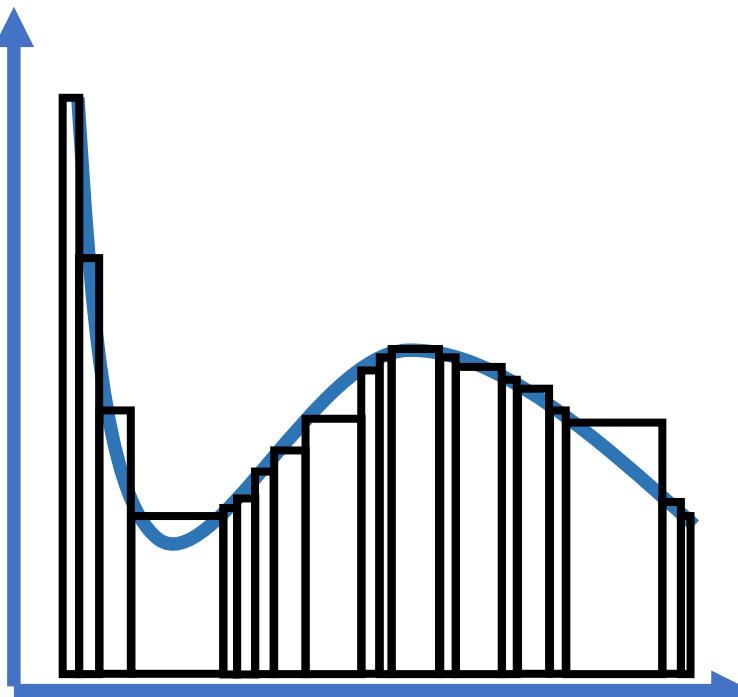
SIMULATION

Monte Carlo

... for multivariable functions $f(x, y, z, \dots)$



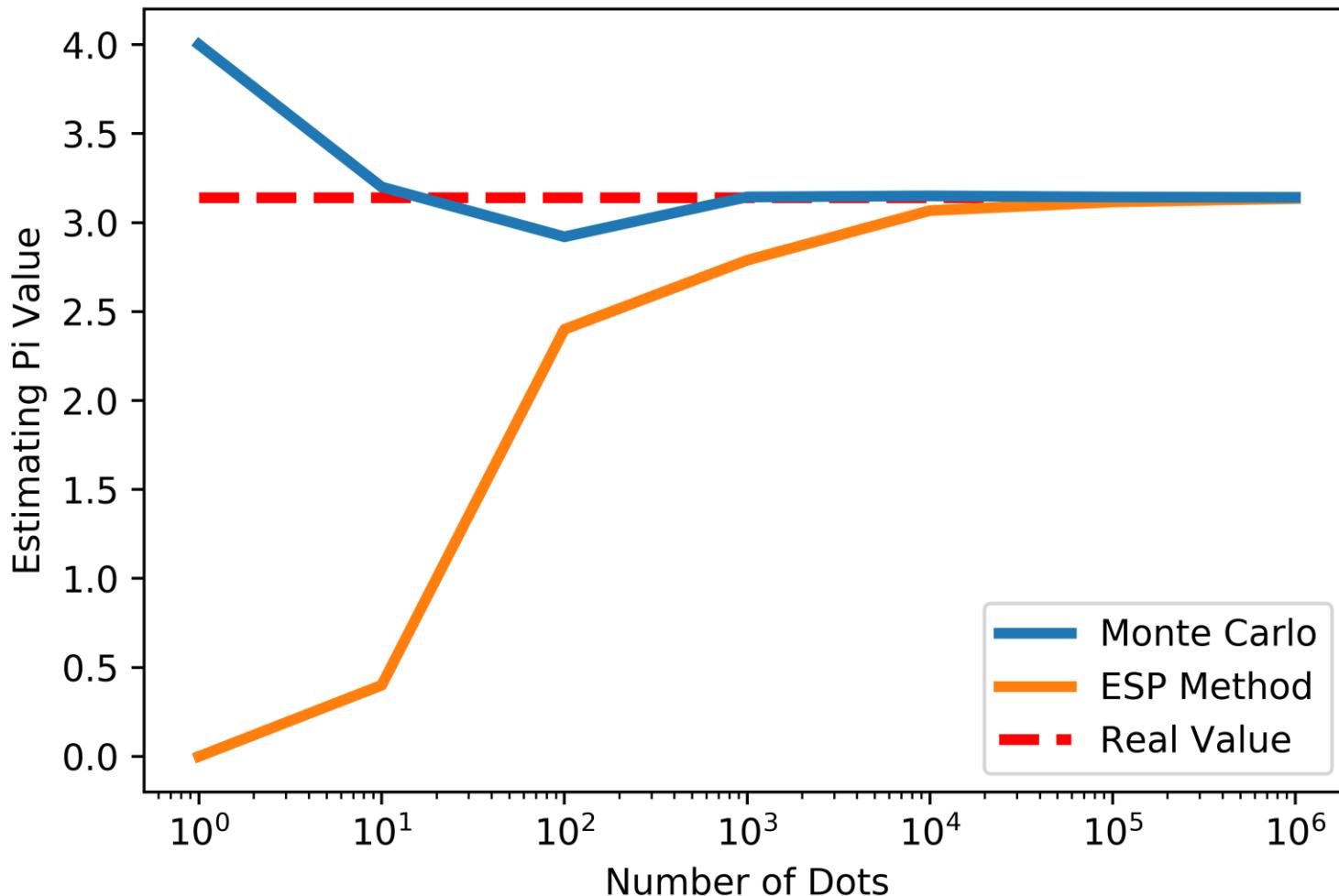
Numerical Integration



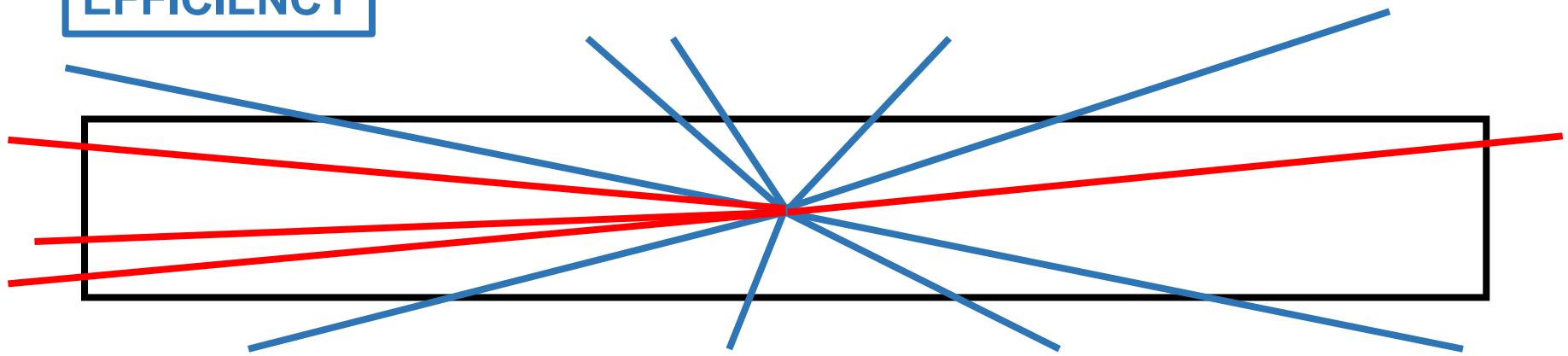
Monte Carlo Integration

SIMULATION

Monte Carlo



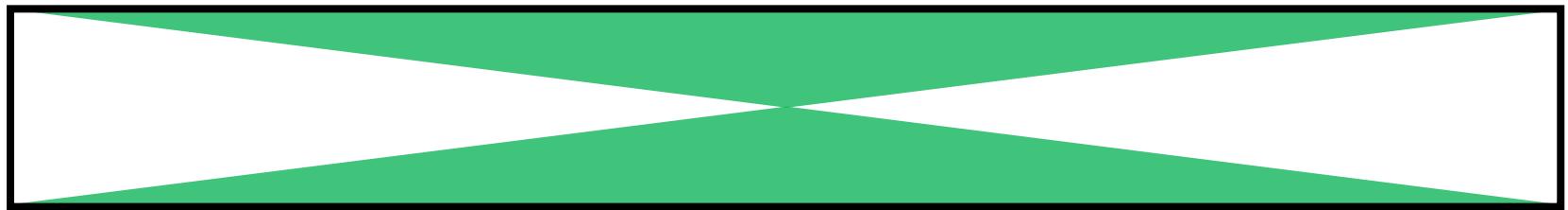
EFFICIENCY



$$\text{Efficiency} = \frac{\text{Particles detected}}{\text{All particles}}$$

ACCEPTANCE

$$a_{SPD} = \langle -2.99, 2.99 \rangle$$



Rapidity

$$y = \frac{1}{2} \ln \frac{E + p_z}{E - p_z}$$

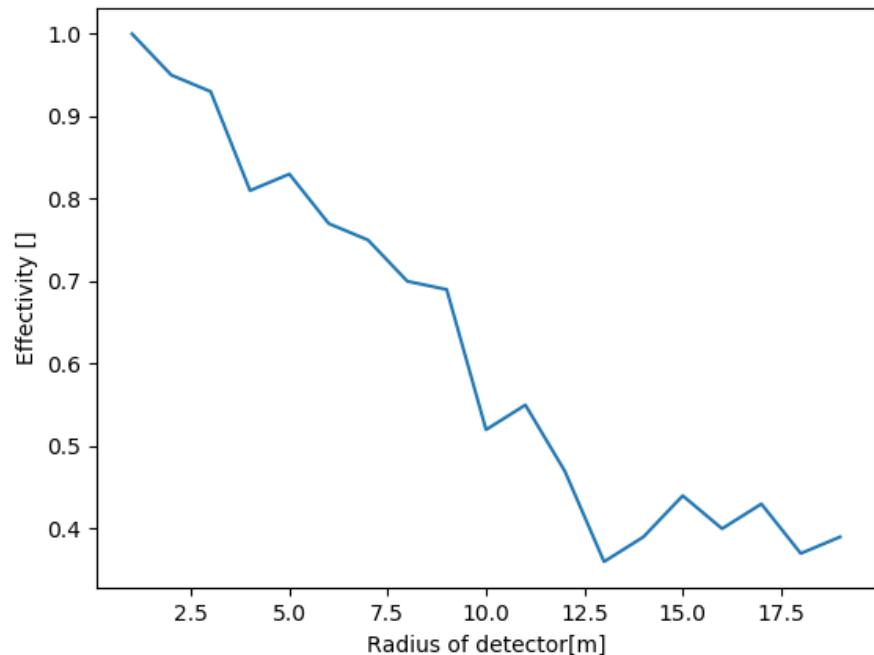
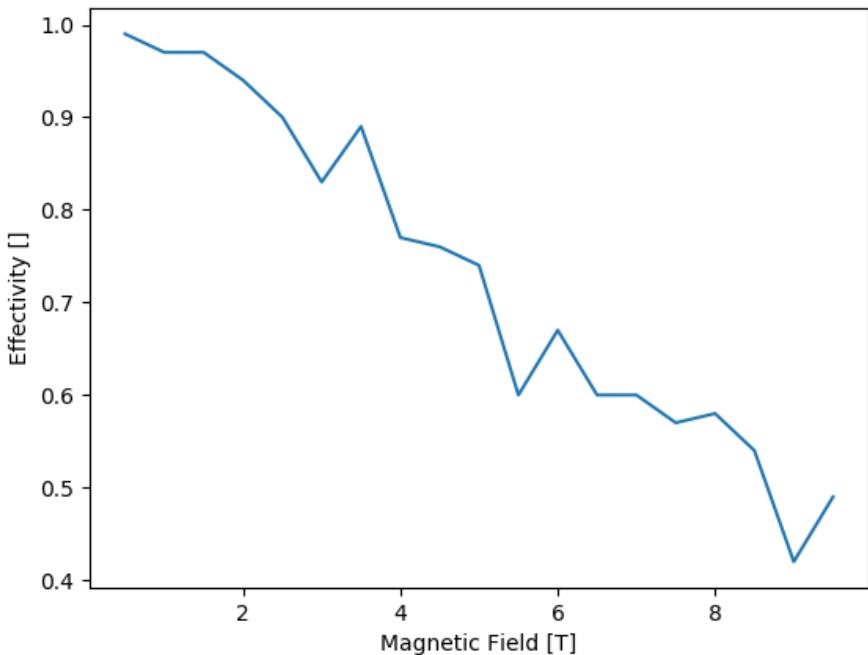
Pseudorapidity

$$\eta = \ln \frac{p + p_z}{p - p_z}$$

$$\eta = -\ln \left(\tan \frac{\theta}{2} \right)$$

SIMULATION

ACCEPTANCE & EFFICIENCY



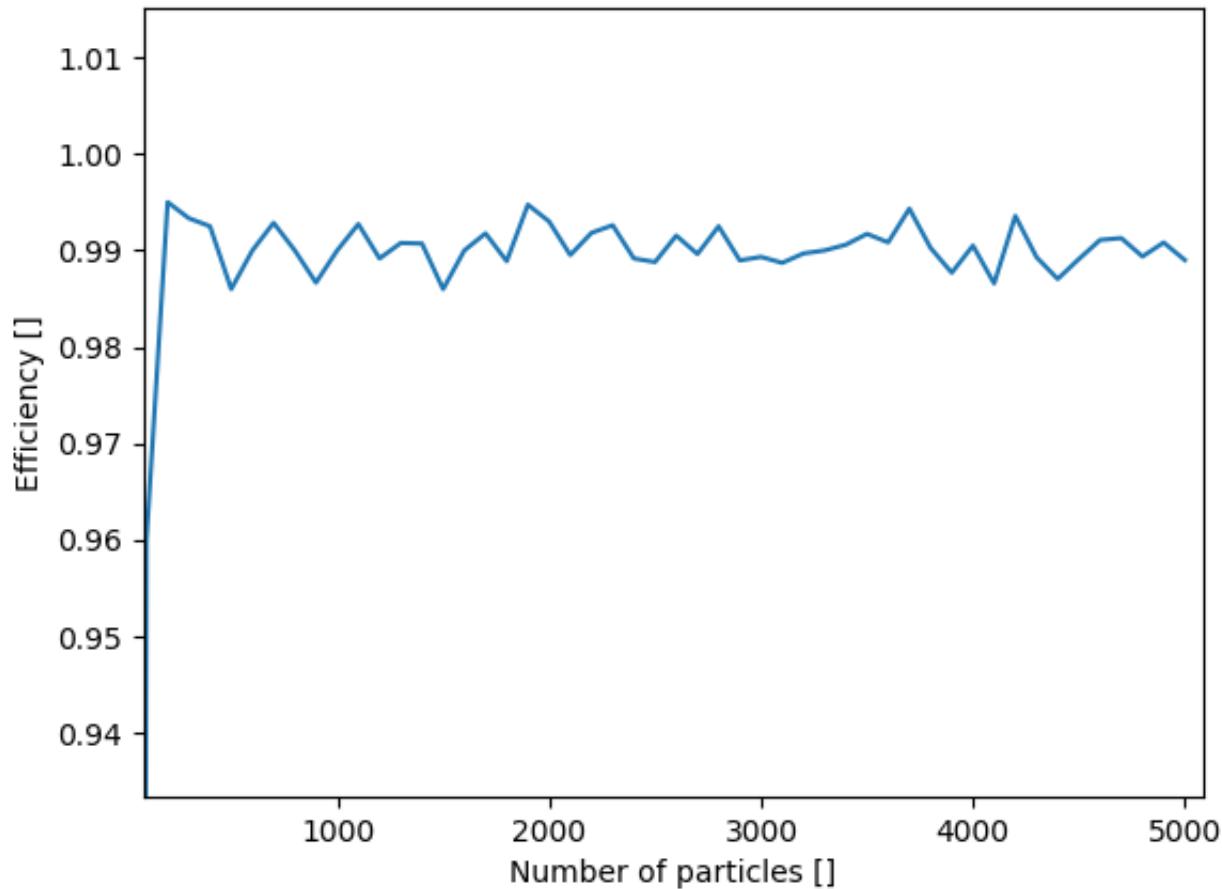
MAGNETIC FIELD

RADIUS OF SPD

15

SIMULATION

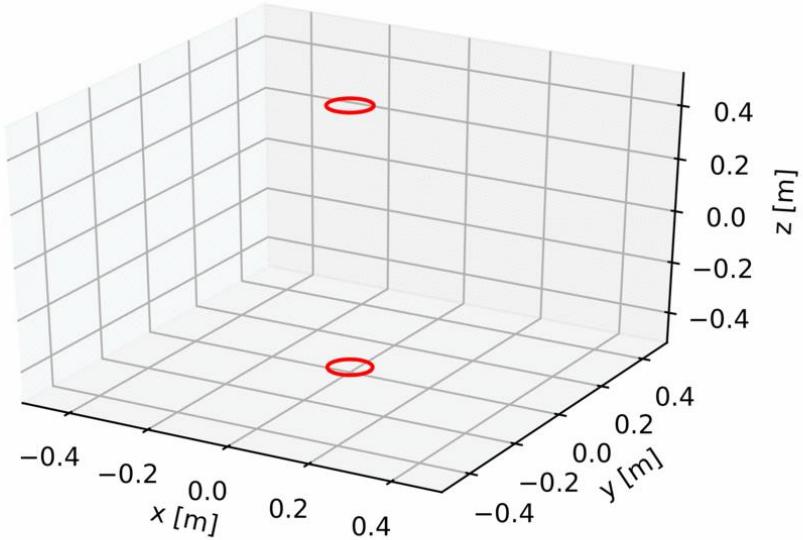
ACCEPTANCE & EFFICIENCY



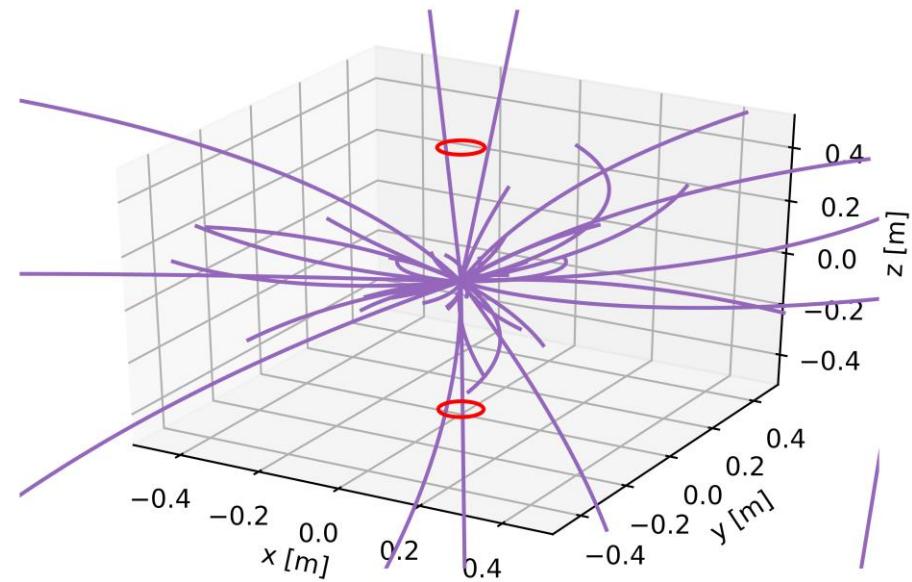
NUMBER OF PARTICLES

SIMULATION

Trajectory

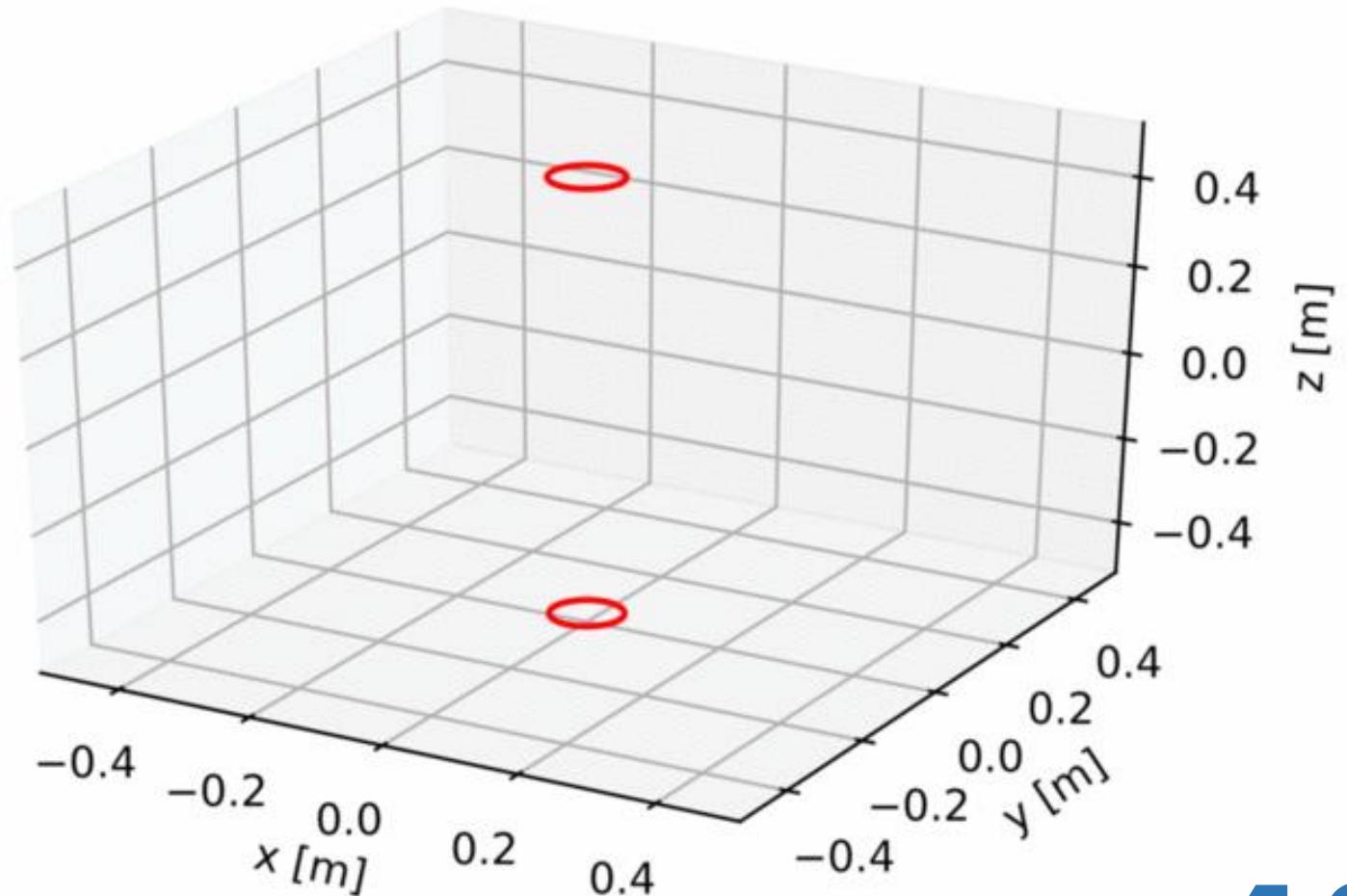


BEFORE TRIGGER



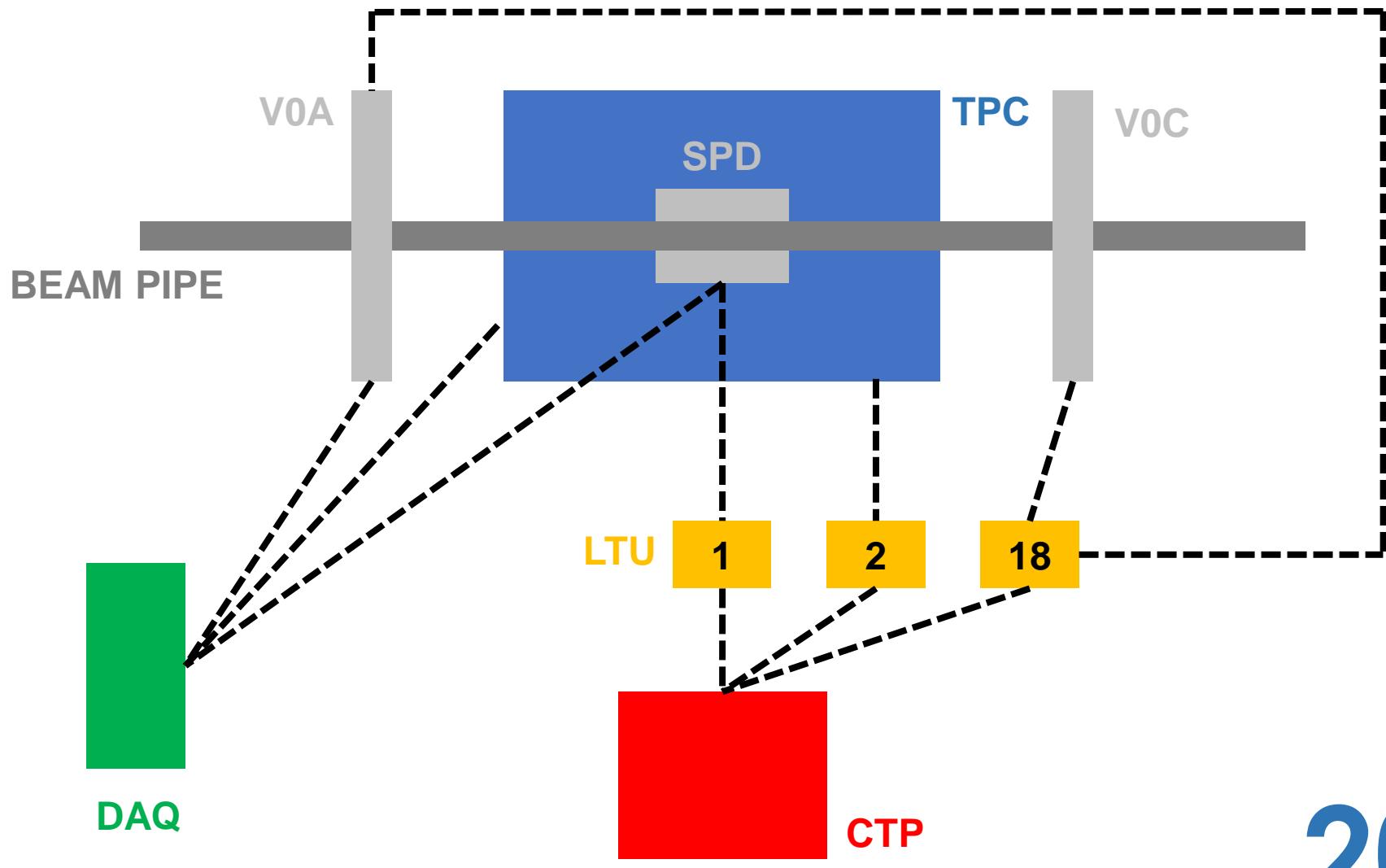
AFTER TRIGGER

SIMULATION - OUTPUT

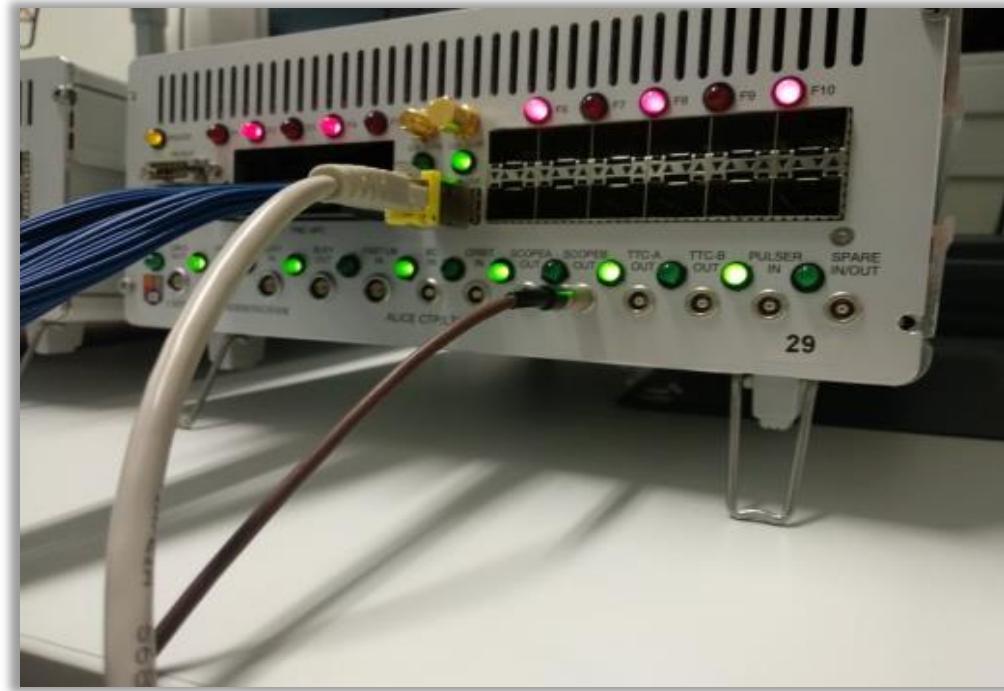


TESTING OF TRIGGER INPUTS TO CTP

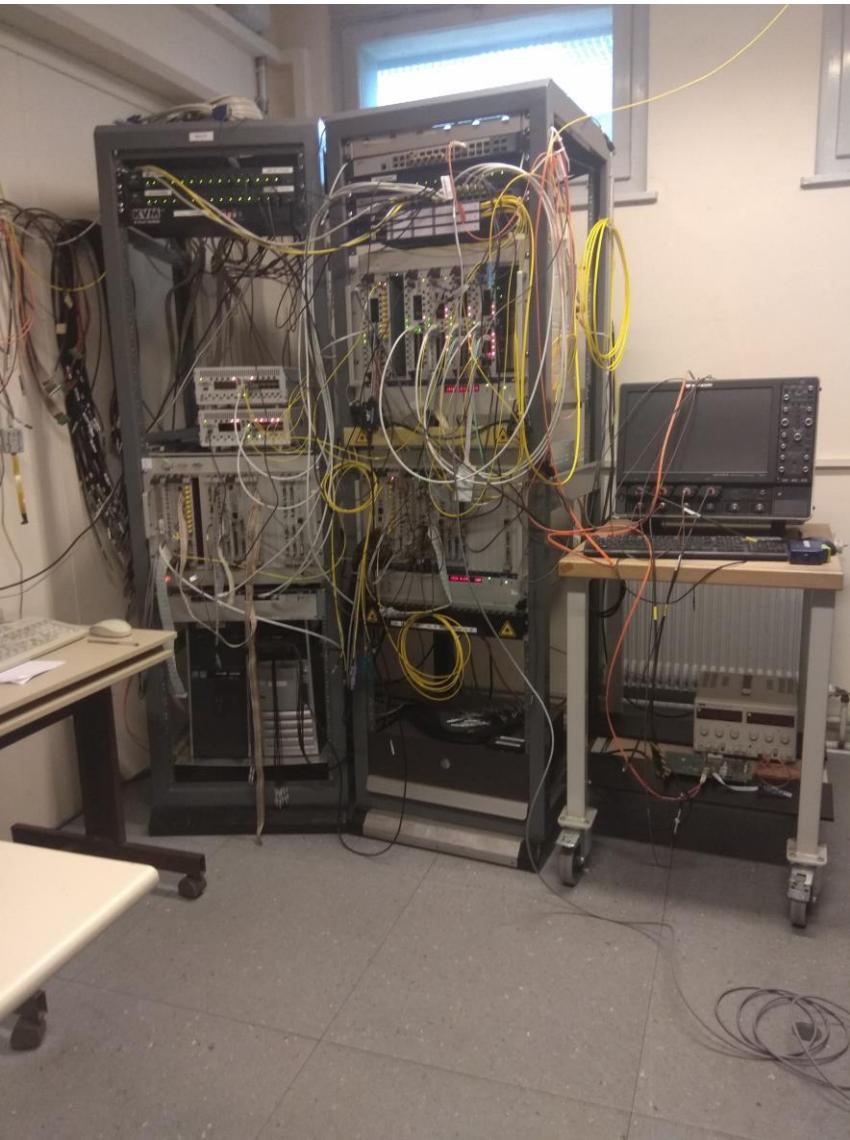
DATA PROCESSING



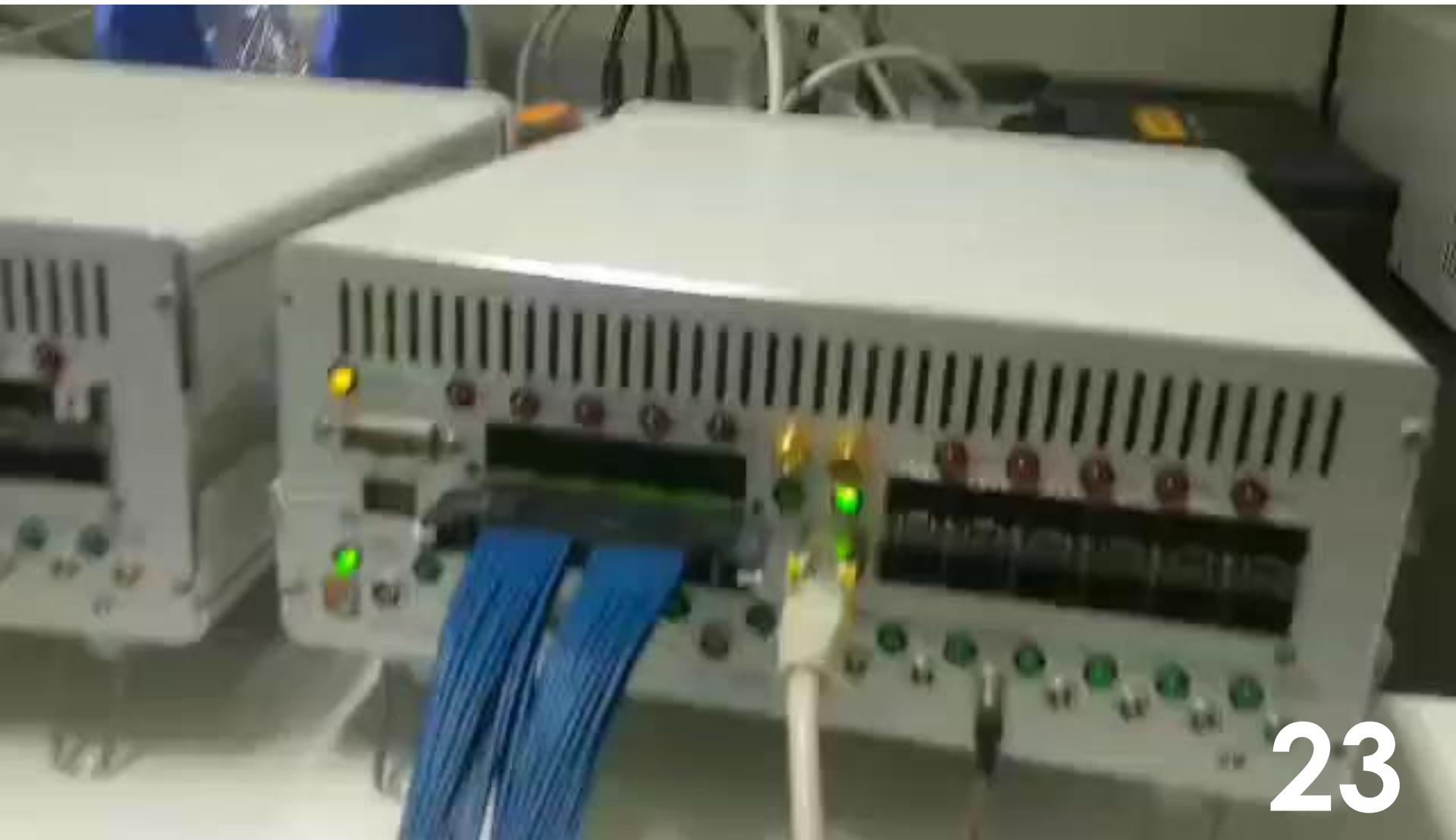
CTP / LTU BOARD



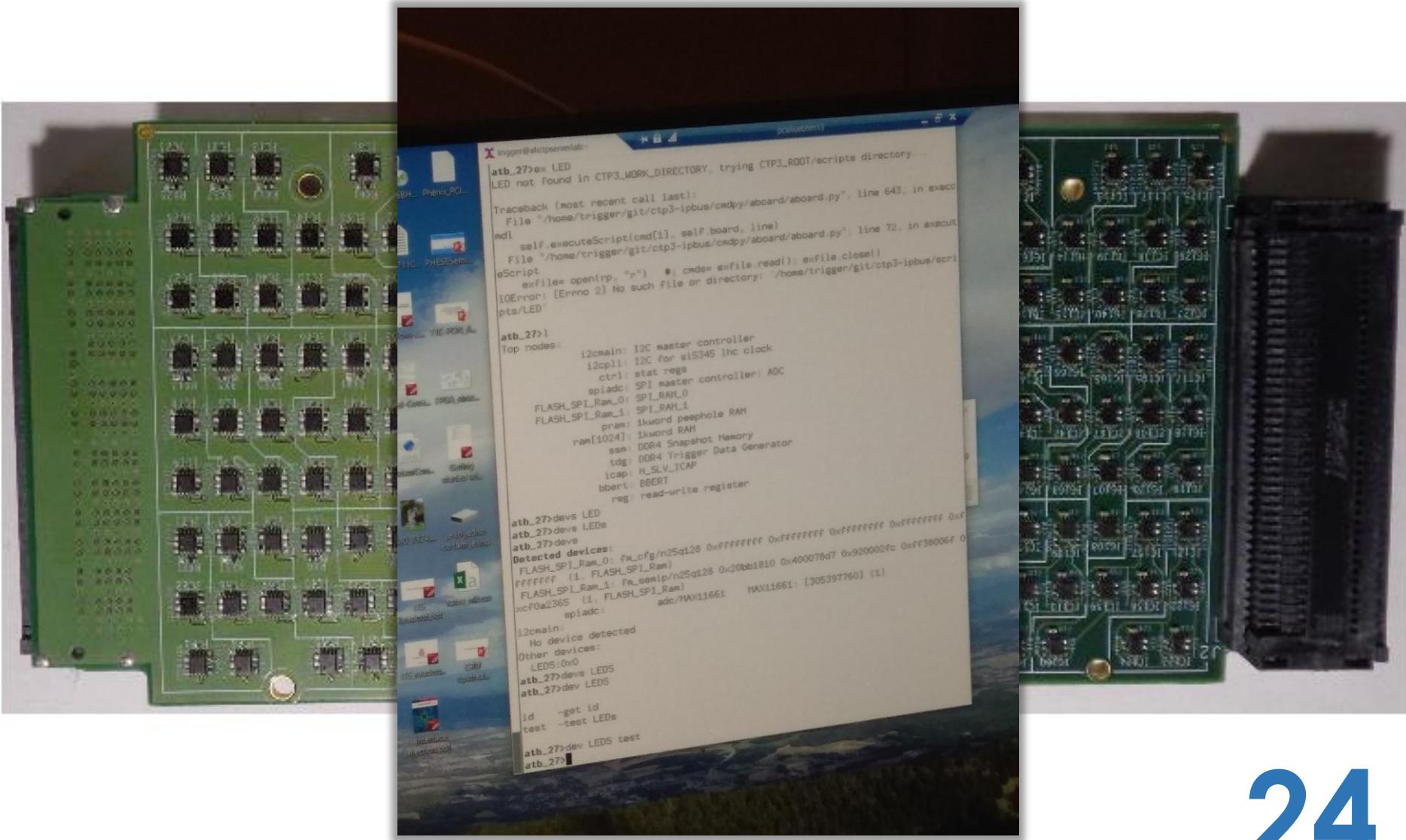
MIGHTY TRIGGER BOX



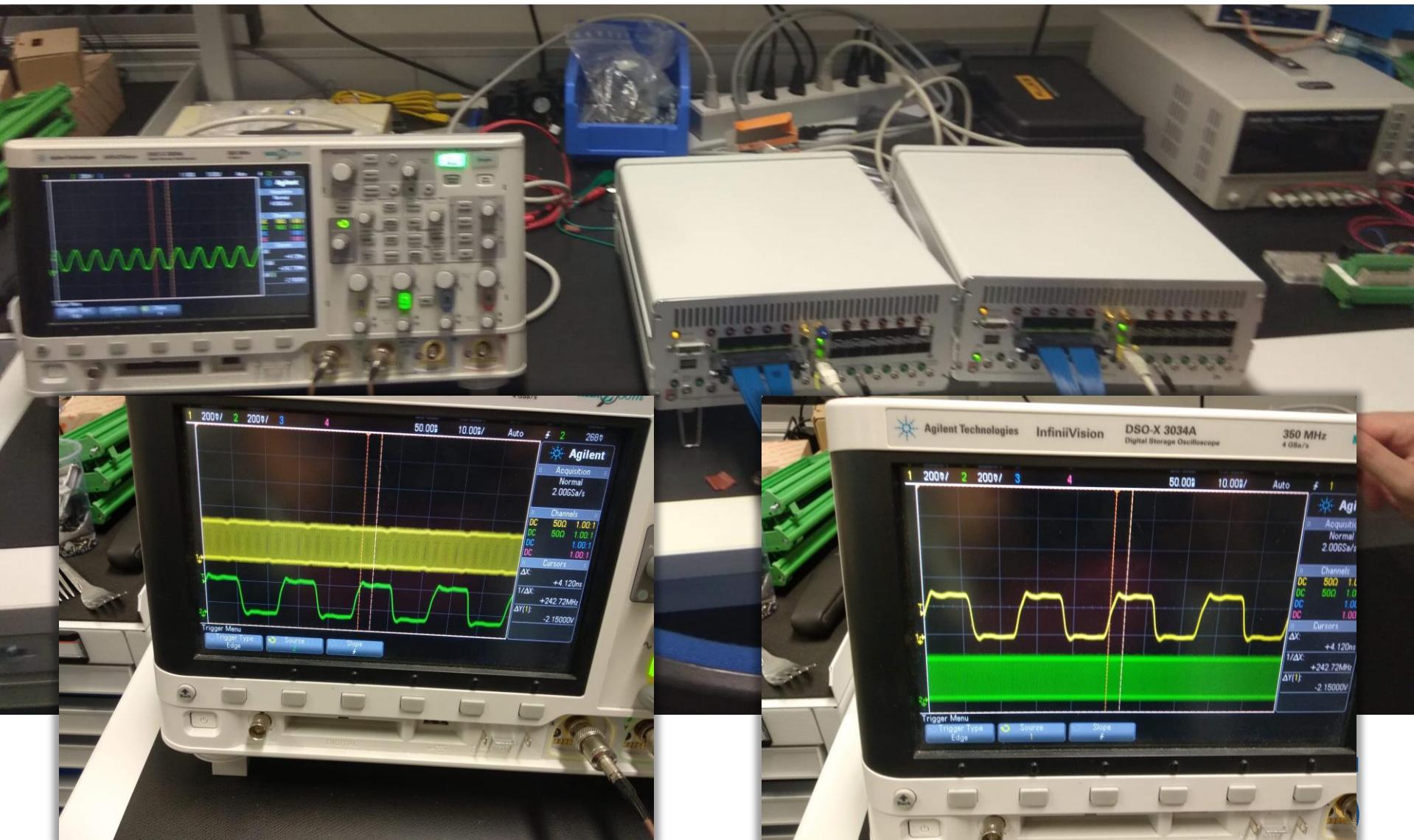
ACTION



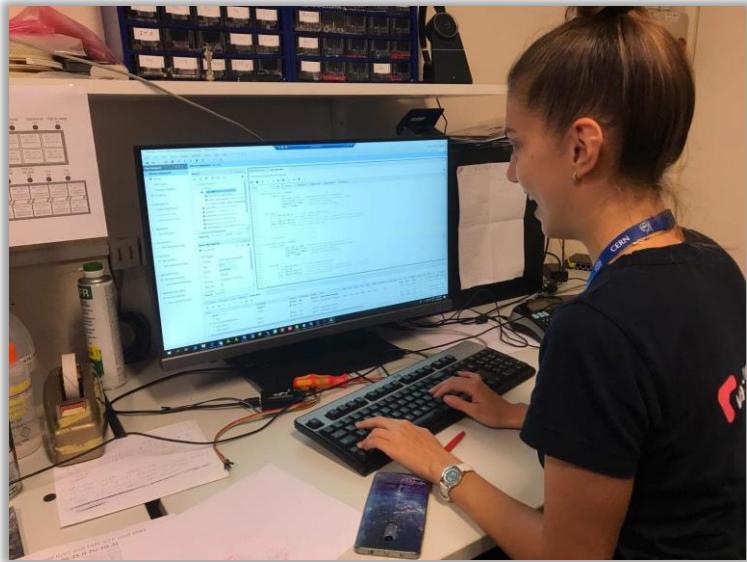
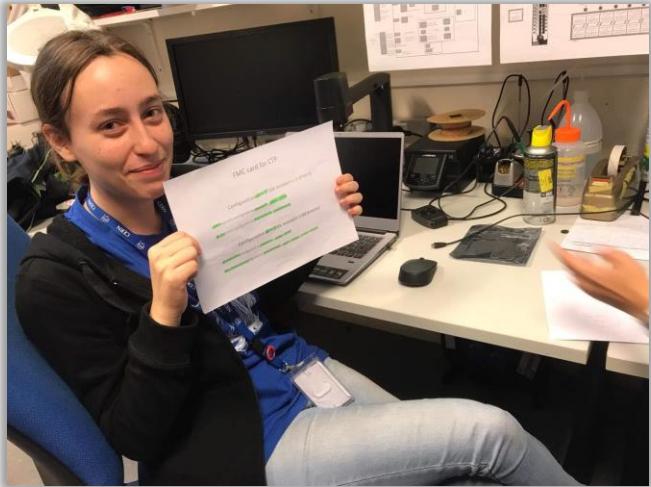
FMC CARD



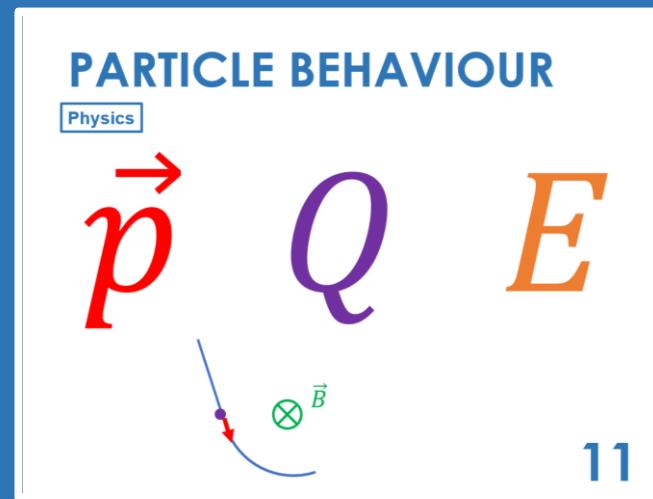
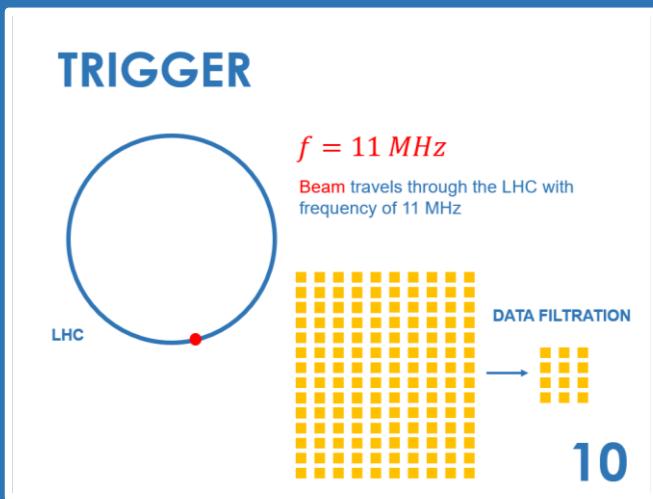
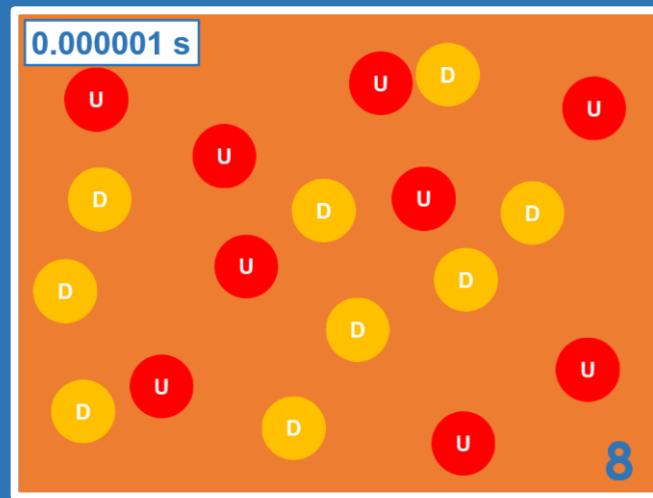
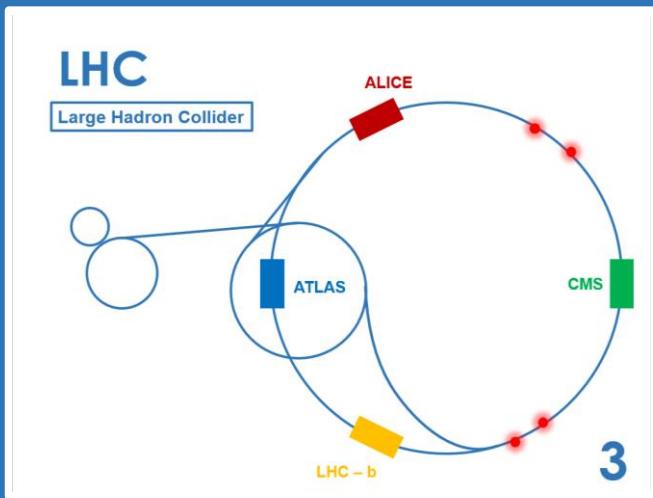
TESTING



TEAM

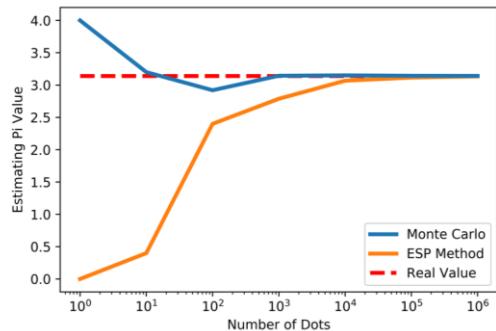


CONCLUSION



SIMULATION

Monte Carlo



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EFFICIENCY

$$\text{Efficiency} = \frac{\text{Particles detected}}{\text{All particles}}$$

ACCEPTANCE



$$y = \frac{1}{2} \ln \frac{E + p_z}{E - p_z}$$

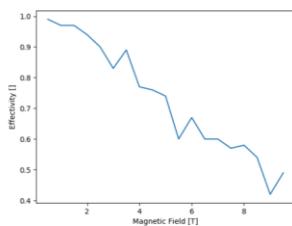
$$\eta = \ln \frac{p + p_z}{p - p_z}$$

$$y = -\ln\left(\tan\frac{\theta}{2}\right)$$

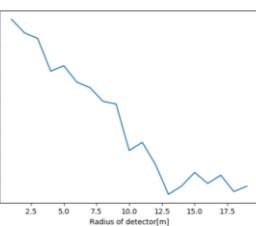
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SIMULATION

ACCEPTANCE & EFFICIENCY



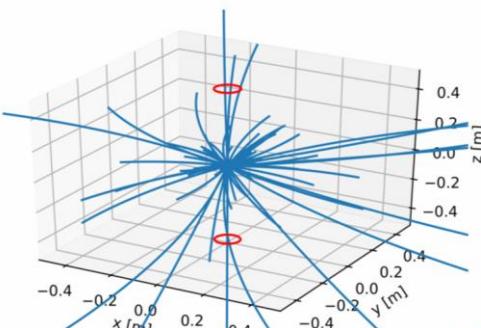
MAGNETIC FIELD



RADIUS OF SPD

15

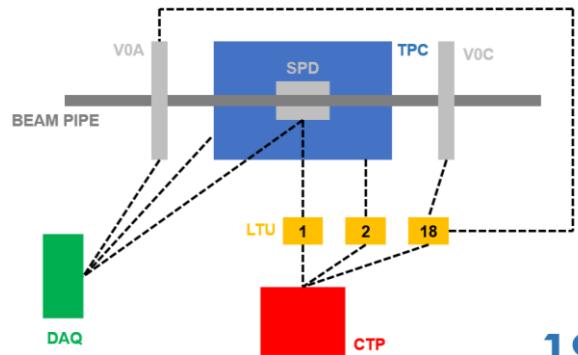
SIMULATION - OUTPUT



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DATA PROCESSING

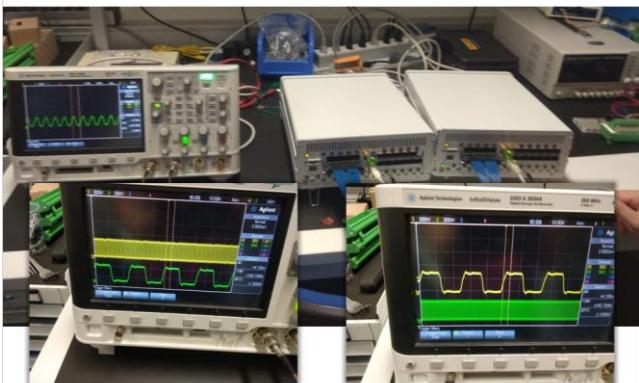


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MIGHTY TRIGGER BOX



TESTING



TEAM



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THANK YOU FOR YOUR ATTENTION