

# Virtual Atom Smasher

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S'Cool LAB, CERN, 2015



# Welcome!

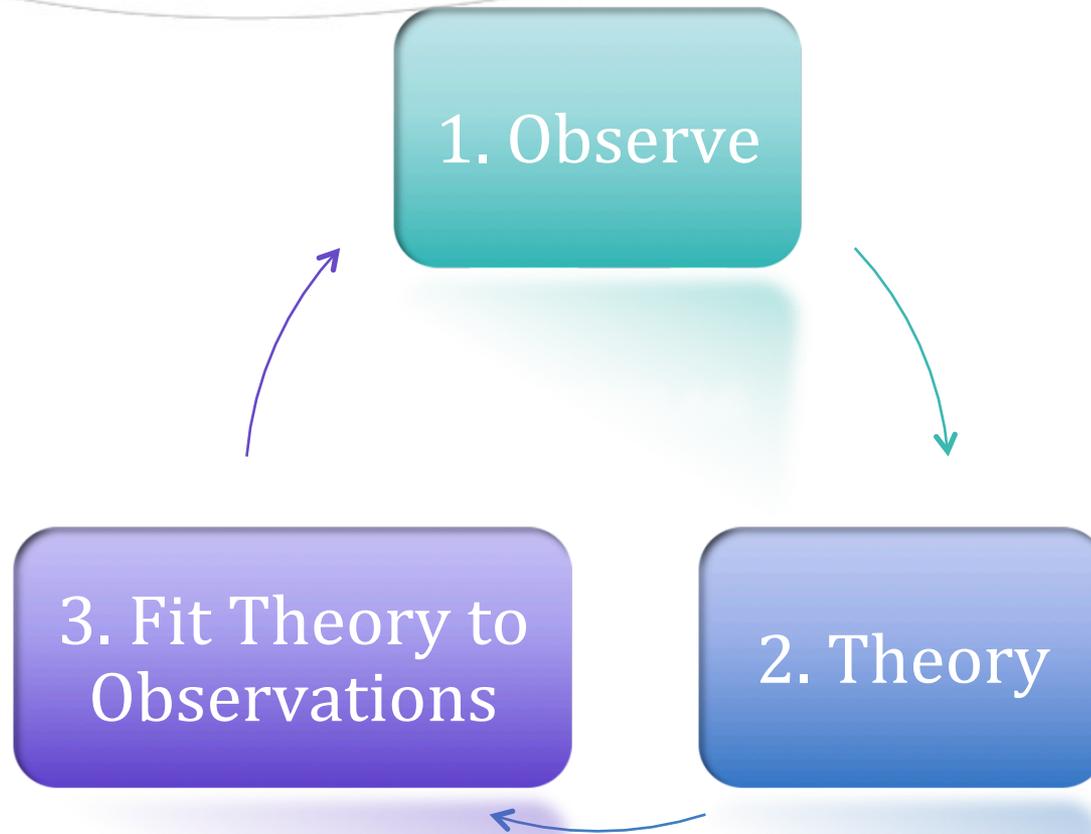


# We do *Research*

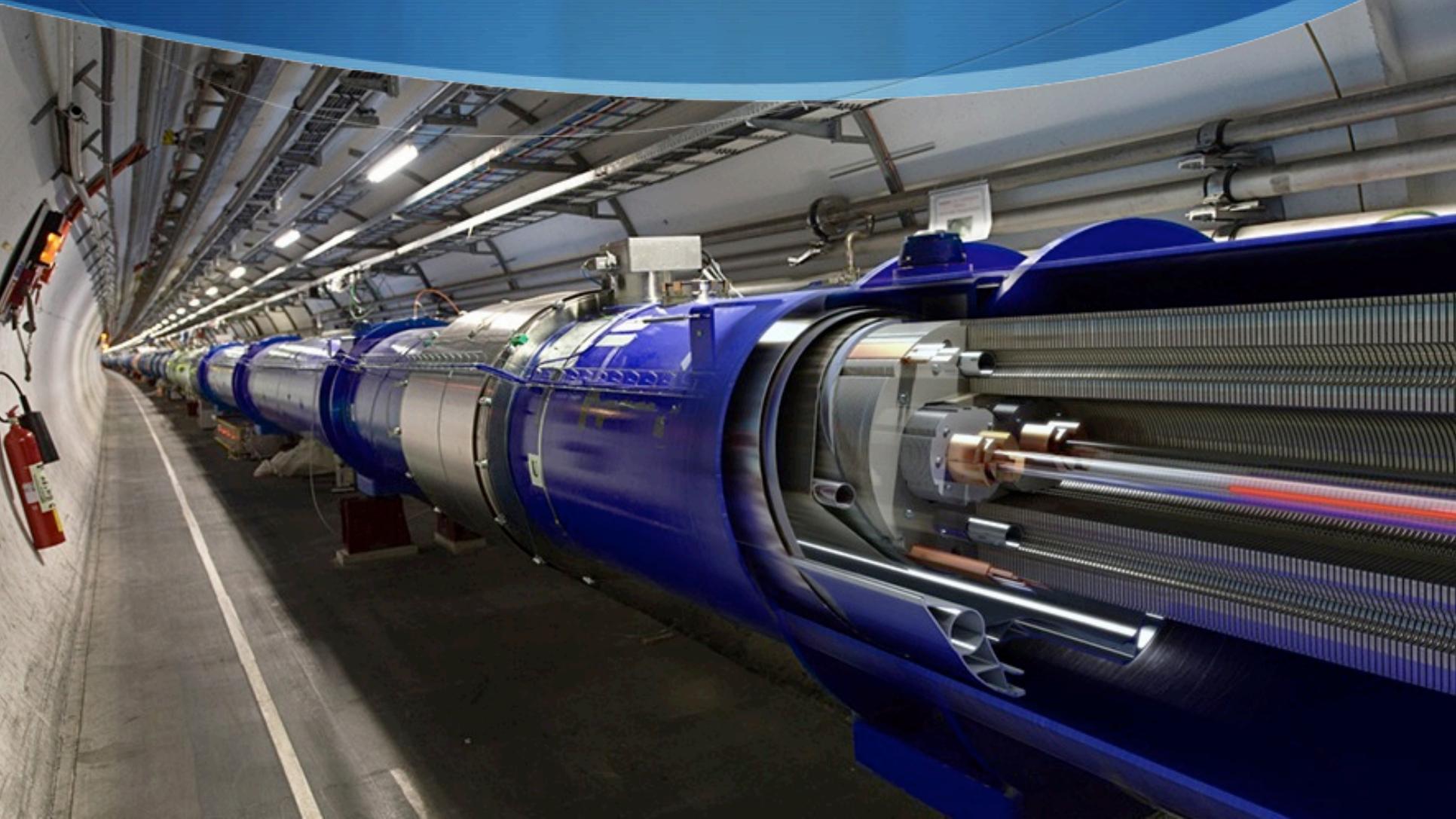


*“What is matter composed of?”*

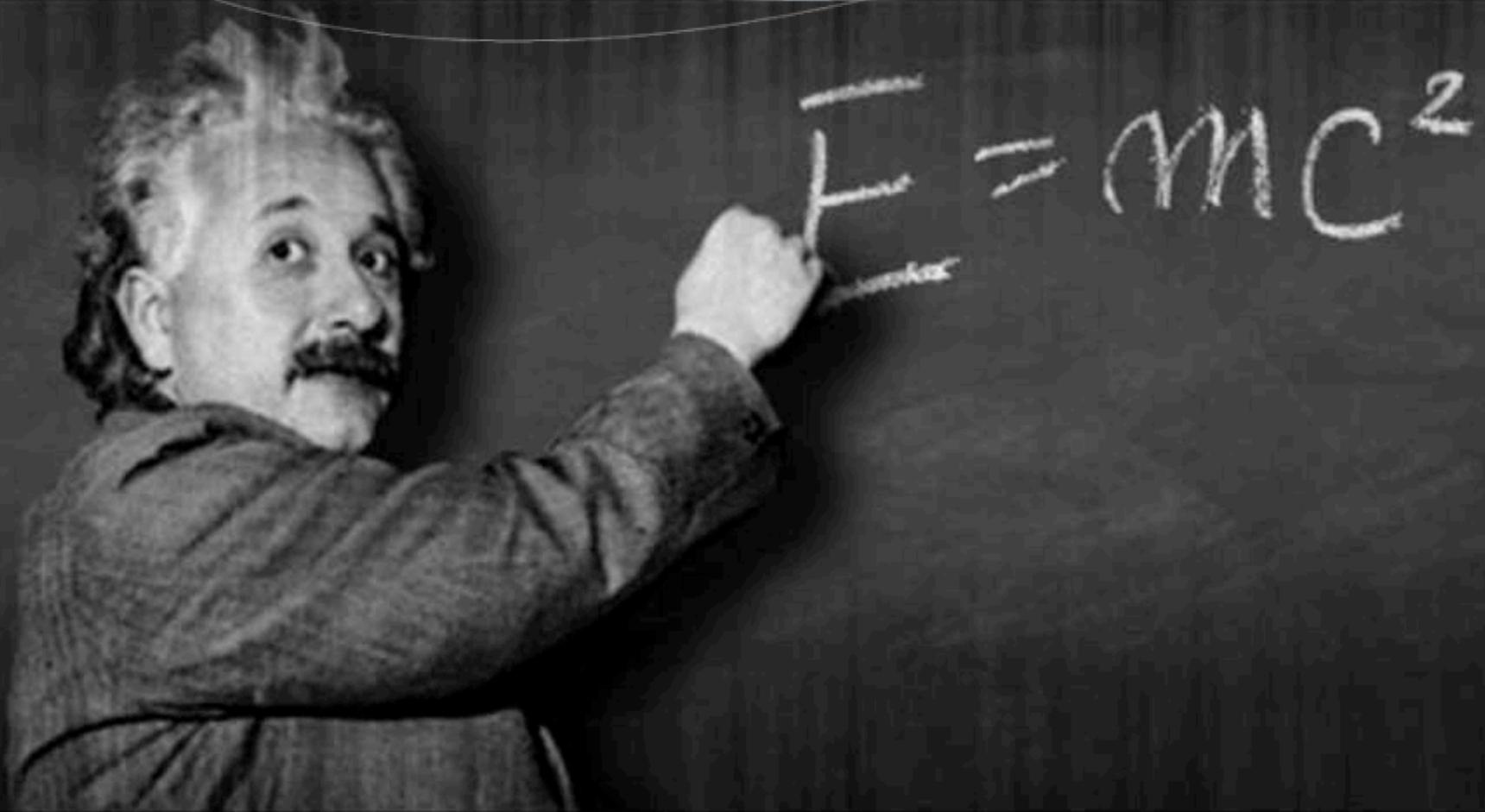
# Scientific Cycle



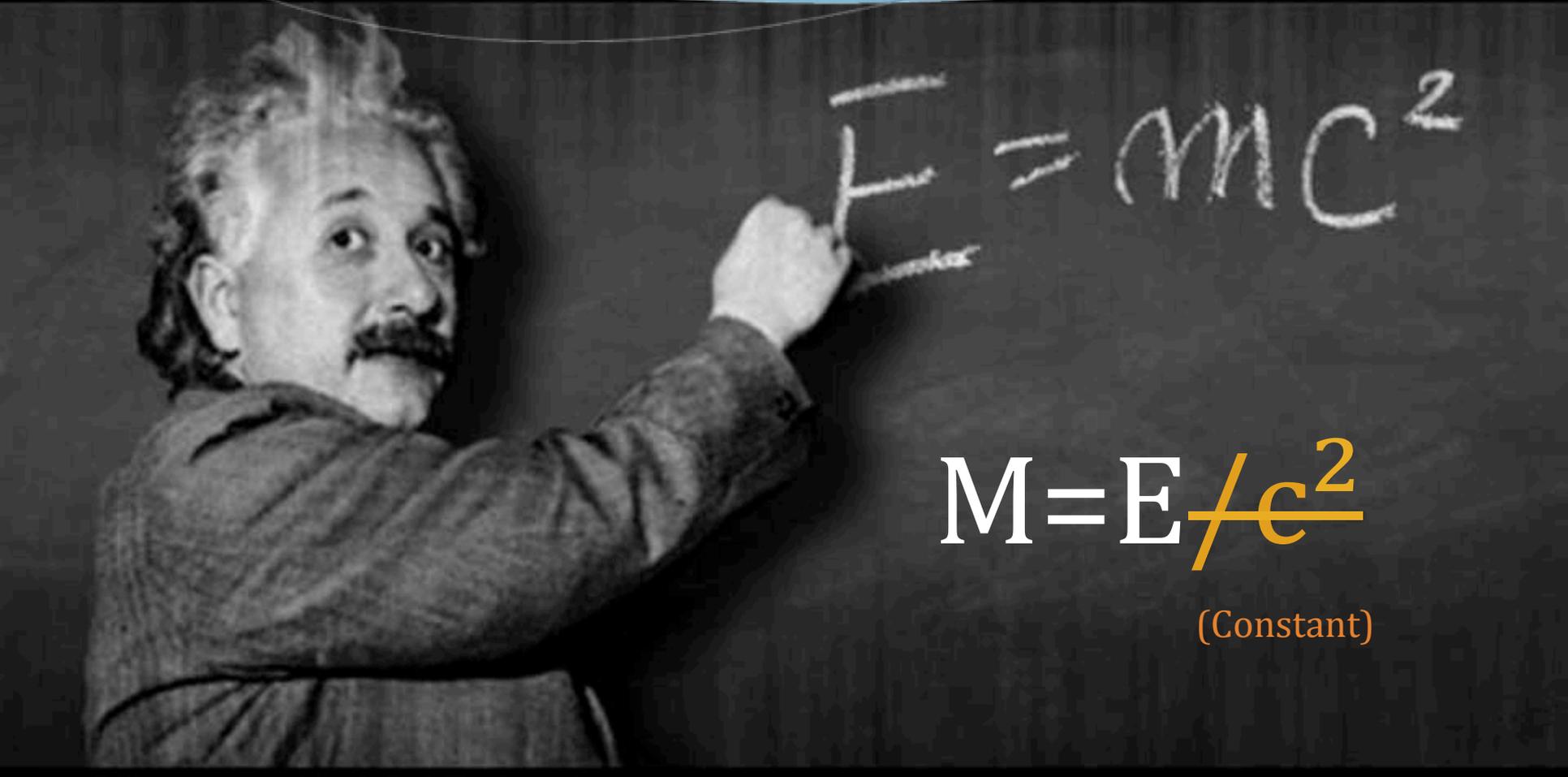
# 1. Collisions = Observe



Remember this guy?



Remember this guy?


$$E = mc^2$$

$$M = E / c^2$$

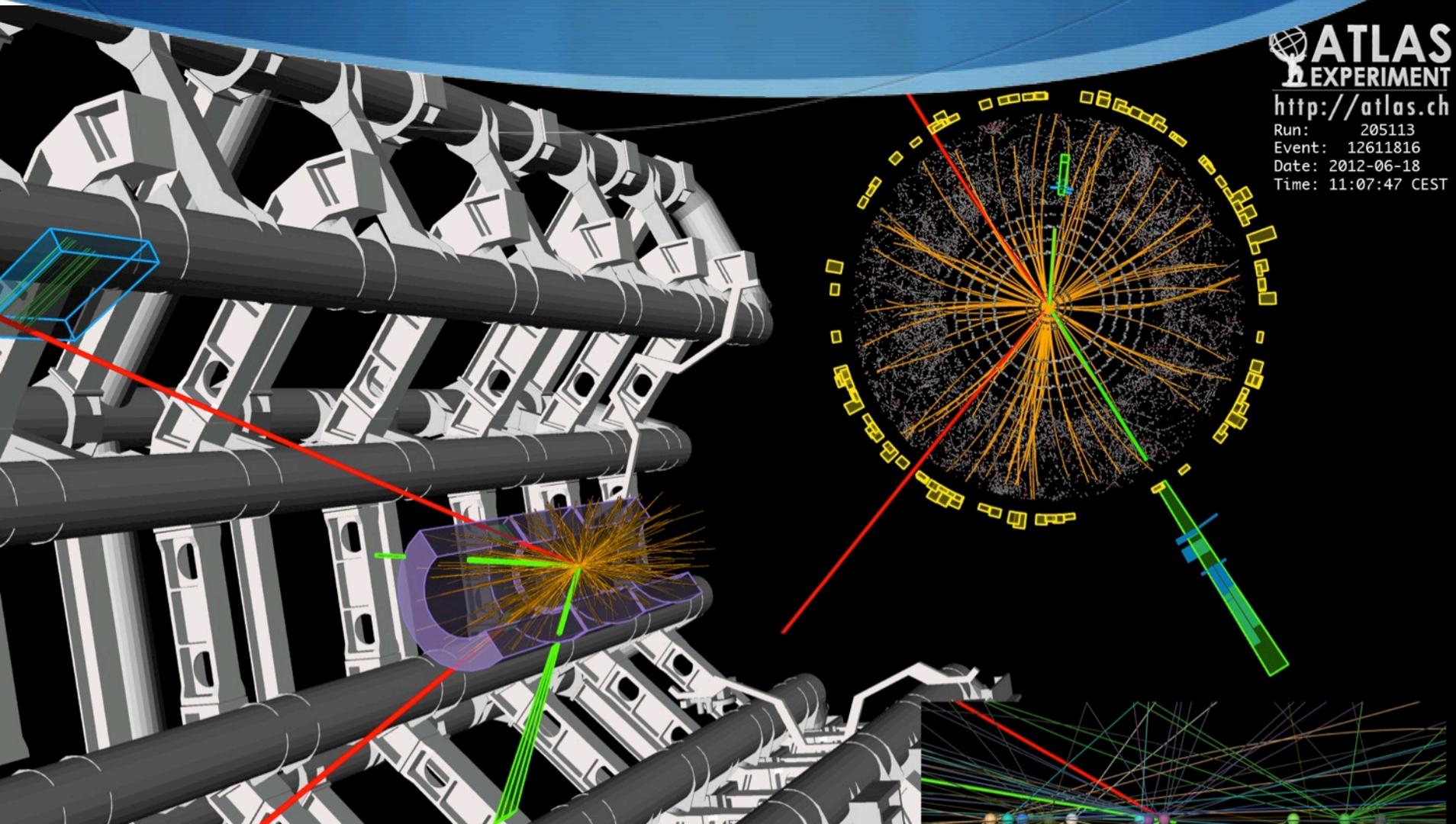
(Constant)

# An "Event"

 **ATLAS**  
EXPERIMENT

<http://atlas.ch>

Run: 205113  
Event: 12611816  
Date: 2012-06-18  
Time: 11:07:47 CEST





# Store the observations



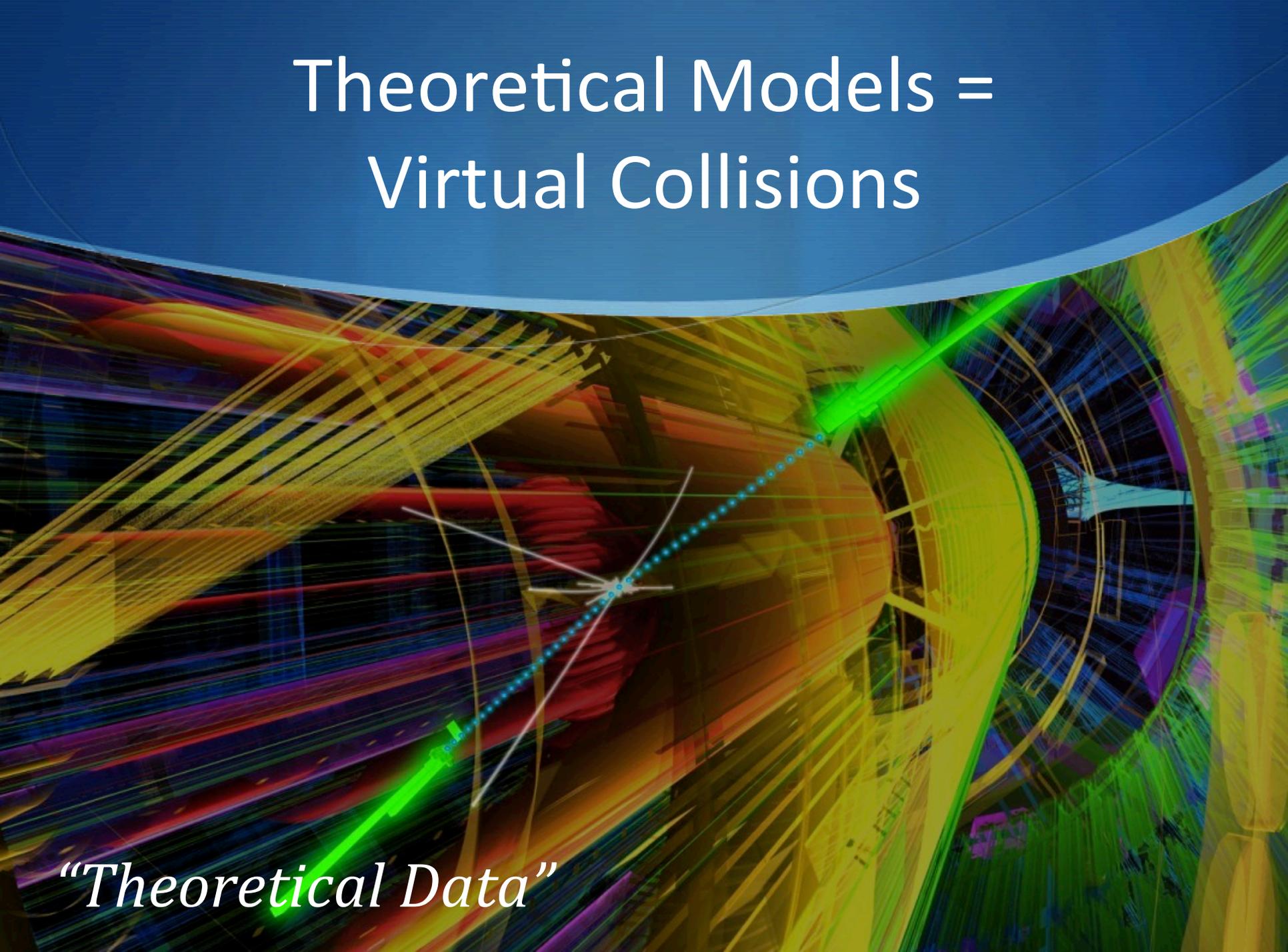
*“Reference Data”*

## 2. Theories

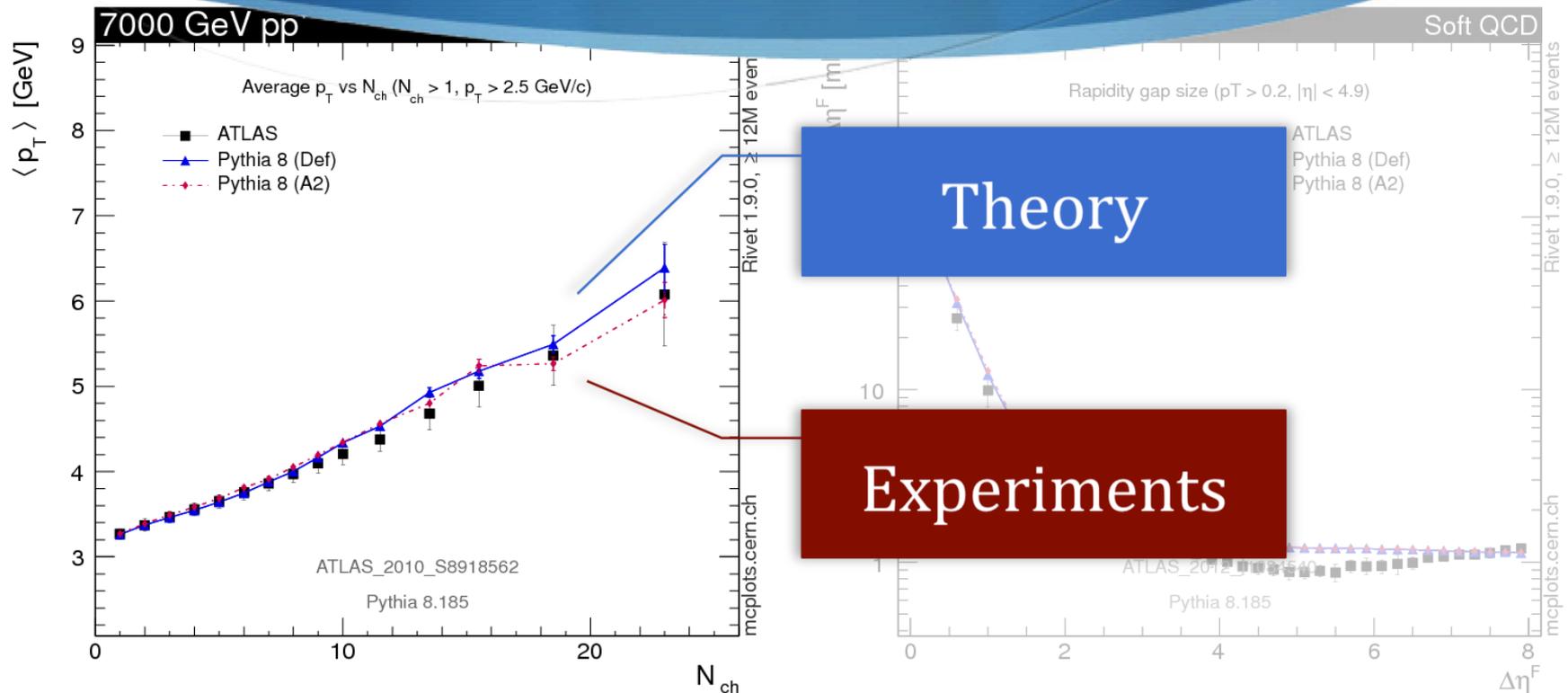


# Theoretical Models = Virtual Collisions

*“Theoretical Data”*

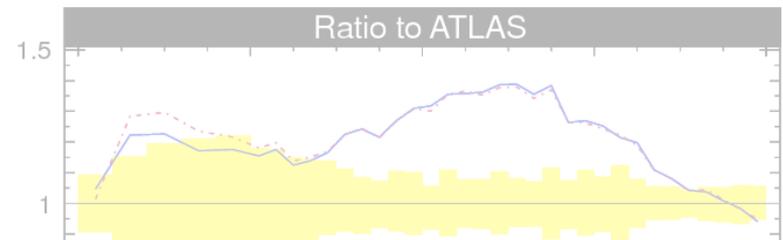
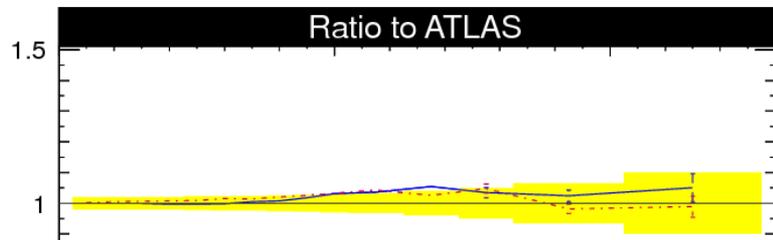
The background of the slide is a complex, abstract visualization. It features a dense network of overlapping, semi-transparent lines in various colors, including yellow, orange, red, purple, and green. These lines appear to be moving or vibrating, creating a sense of dynamic energy. In the center of the image, there is a small, bright blue point from which several lines radiate outwards. The overall composition is layered and intricate, suggesting a complex theoretical model or data set.

# 3. Fit theory to observations



Theory

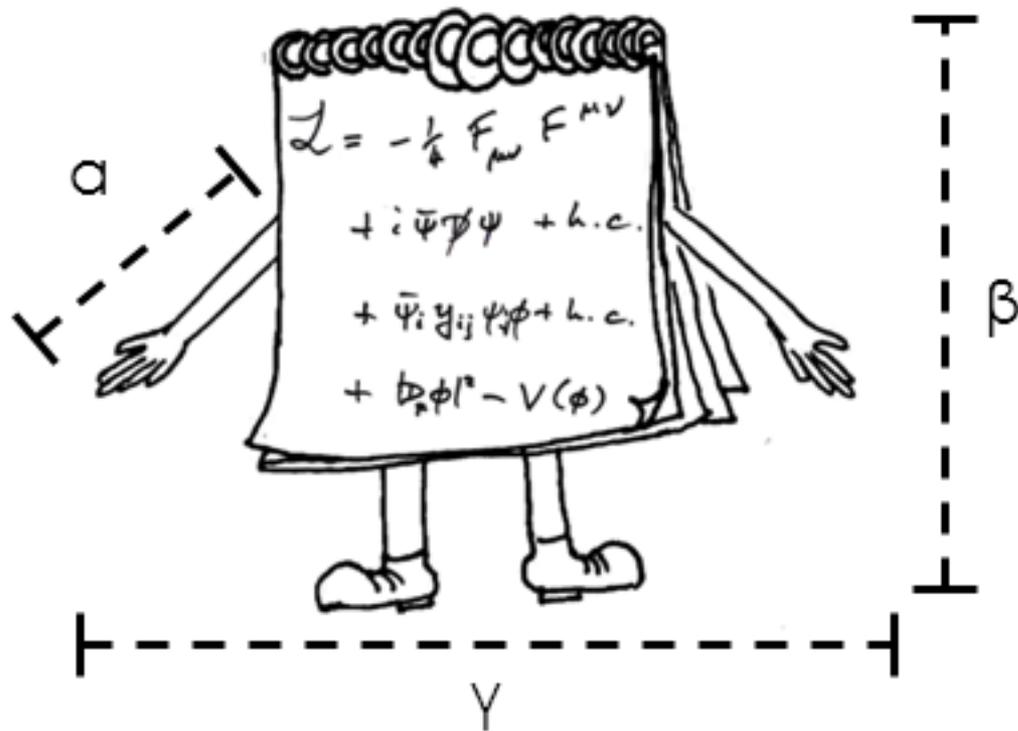
Experiments



Nope, they don't match



# Let's make them "tunable"



A 15 y/o could do it!

Mikkel  
Jeppson



# Let's make it a game!



## Virtual Atom Smasher

Learn particle physics & help scientists at CERN

### Welcome visitor!

Virtual Atom Smasher is a revolutionary educational game that brings you along with the theoretical physicists inside CERN!

Playing this game you are not only learning about particle physics, but you are actively helping scientists with their research!

### Welcome fellow scientist!

E-Mail:

Password:

Create an account

Login



# Tune model parameters

**Tuning The Quantum Machine**  
Fiddle with the quantum machine and find the best values

**Ioannis first paper**

Average fit score: **4.228** Best fit score: **4.228**

Job #478 (selected) 4.2280

Observable	Fit
Log of scaled momentum, $\log(1/x_p)$ (charged)	4.6298
Charged multiplicity distribution	4.7862
$uds$ events scaled momentum	1.6386
Thrust, $1 - T$ , at 91 GeV	4.3840
Durham jet $2 \rightarrow 3$ transition parameter, $\gamma_{23}$	4.8765
$D$ parameter at 91 GeV	5.0530

Here are the tunable values that you used. Click on any value to apply it to your current configuration:

Tunable	Value
StringZ:bLund	0.6
StringPT:sigma	0.35
StringZ:aLund	0.5

**Hadronization**

- SptS: 0.318
- SzAl: 0.500
- SzBl: 0.600

View Histograms Select

Description Unlock Current Results Papers

Estimate Validate Fair(2.01) View

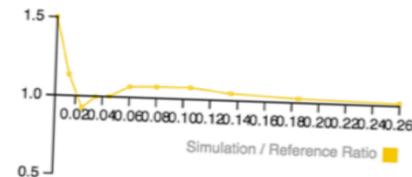
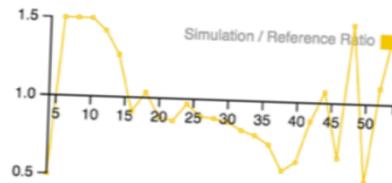
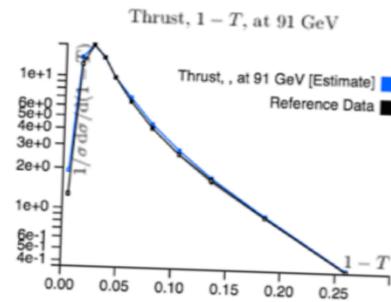
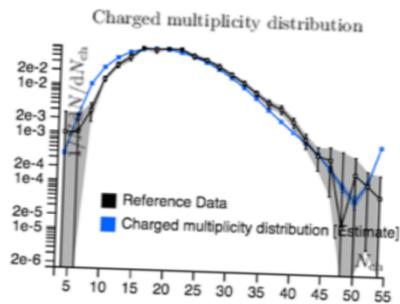
Help

Science Points: 2

# Validate your results

## ! Fair Matches

Histograms that are fairly good, but still have some minor issues to fix (error bigger than 3 sigma).



# Learn

Knowledge explored: That's the first time you see the term *Quark*

## Quark

Quarks are fundamental structural elements of matter. They are found inside the particles of the nucleus, that is of **protons** and **neutrons**. Protons and neutrons are composed of two types of quarks. Up quarks and down quarks. However nature designed for each type of quark two similar replicas that are heavier than the original, up and down quarks. The heavier replicas of an up quark are called charm and top and the heavier replicas of a down quark are called strange and bottom.

( this explanation is from Jay Hubisz, from Fermilab)

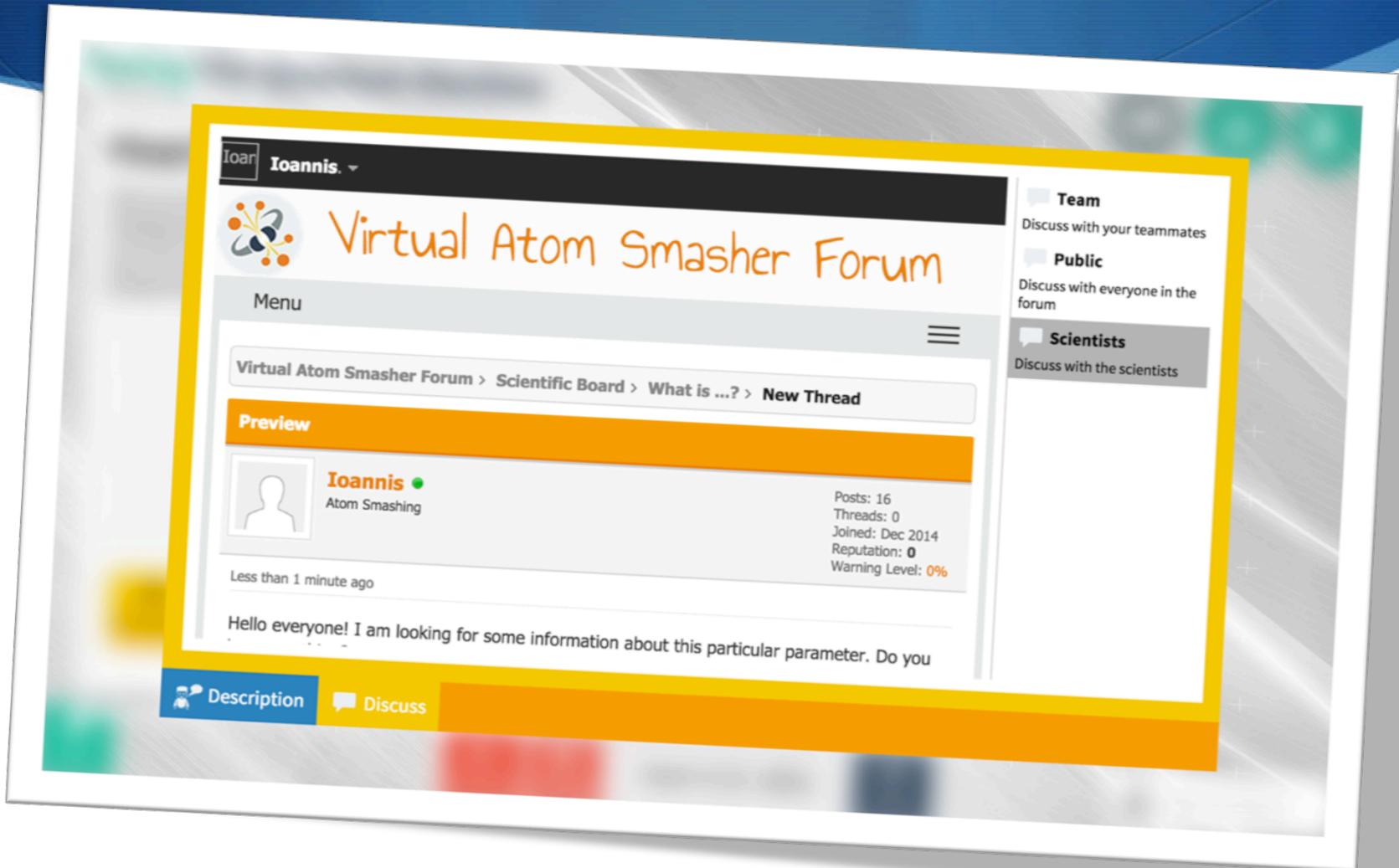


Description



Discuss

# Collaborate



You can get your name in a  
CERN publication!



[http://  
test4theory.cern.ch/vas](http://test4theory.cern.ch/vas)