# Virtual Atom Smasher

*A game for doing real high-energy physics analysis*

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citizen cyberLab

INTERNATIONAL MASTERCLASSES
hands on particle physics

International Particle Physics Outreach Group

CERN

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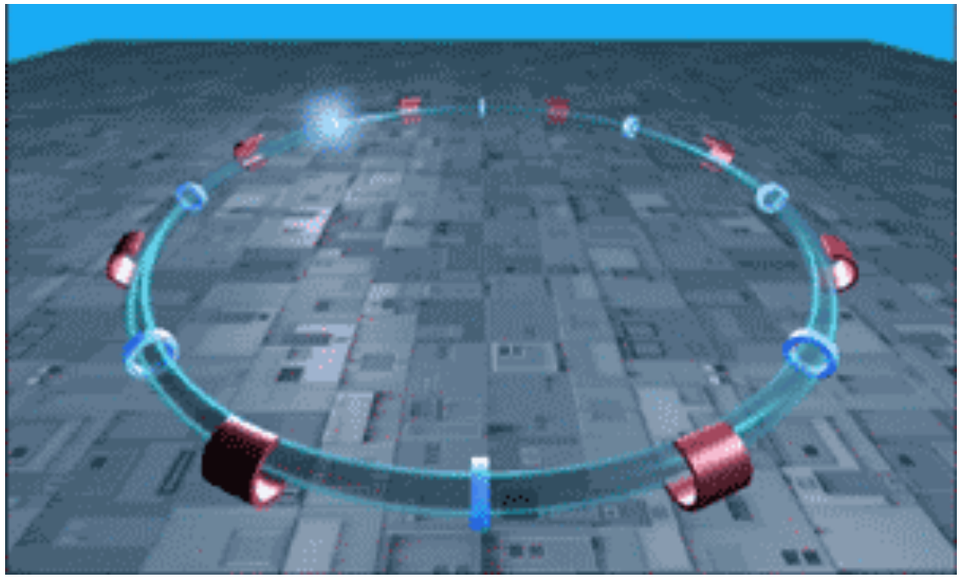
# A Context

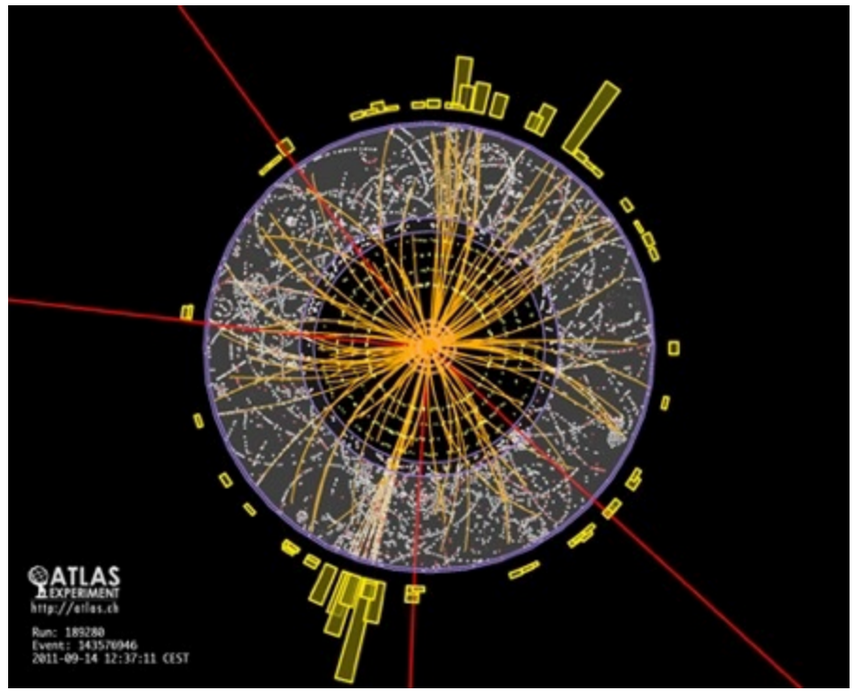


In 2004, CERN launched “volunteer computing” project LHC@home running the application Sixtrack.

To date >100,000 people have downloaded and run the software.

They have contributed processing power to simulations of proton orbit stability in the LHC.

# A Context




In 2011, CERN launches new LHC@home volunteer computing application Test4Theory,

First volunteer computing application to use virtual machine (VM) technology, CernVM. Enables HEP simulation to run in laptop/desktop environments.

# A Context

In 2010, Peter Skands gives 15-year-old summer intern a challenge: tune parameters for Monte Carlo simulation.

In a week, Mikkel Jeppson gets excellent tune quality, suggesting analogy with protein folding game FoldIt.

2012: Virtual Atom Smasher conceived as pilot application for EC project about learning and creativity in citizen science, called Citizen Cyberlab.

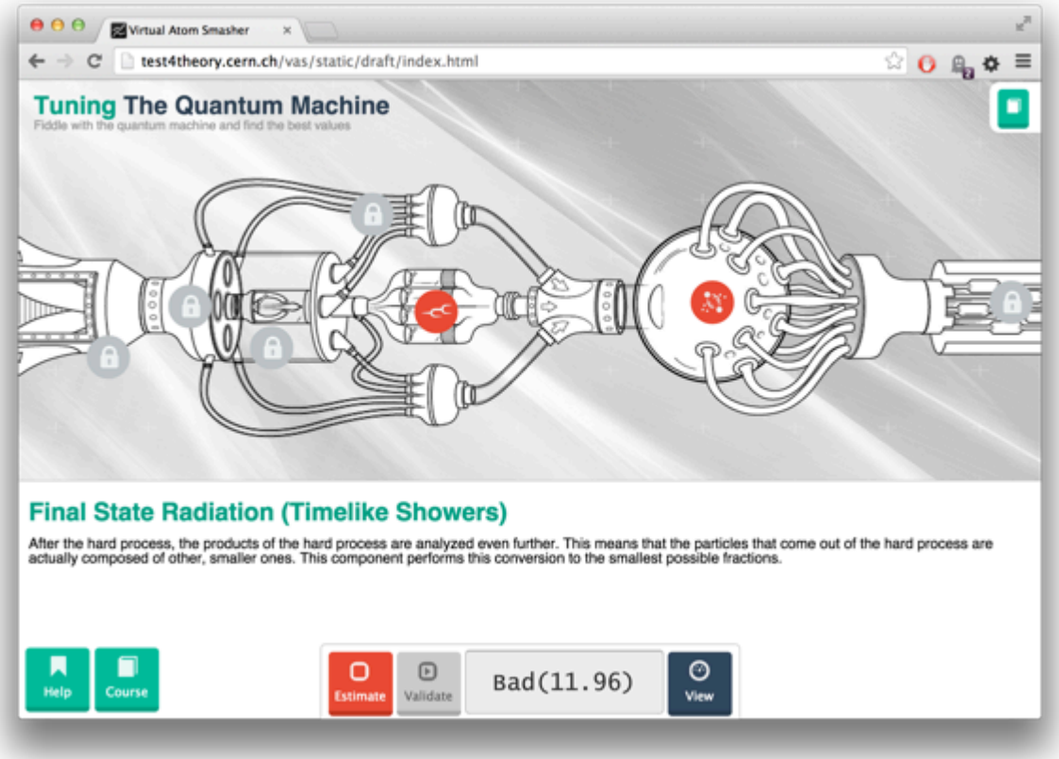
# B Prototype

CERN Public Computing Challenge 12/2014 tests simpler approach to VM distribution, CernVM WebAPI.

Behind the scenes: analytics of site traffic to track user behaviour and improve experience.

In 12 days, 8000 users, 16,000 session 5400 run VMs, >80% finish a simulation successfully.

# B Prototype




Development of Virtual Atom Smasher by Ioannis Charalampidis at CERN, with input from interface and online learning experts in Citizen Cyberlab.

Core concept: turn abstract tuning process into concrete “Quantum Machine”, lead player through learning activities to unlock levels of the game.

# B Prototype

Institutions

Citizen Grid

Volunteer

Players

Worker

Web Browser

Virtual Atom Smasher

Distributed Computing Framework

Game Interface

Mini-games Framework

Tracking Framework

CERN

Scientific Results

Educational Content

Cyberlab

Learning Results

C

- Help us test this pilot project for measuring learning and creativity in citizen science.
  - **Basic level:** Give us feedback to improve the way players learn how to tune Monte-Carlo simulations.
  - **Team level:** build a team and help us test a new approach to volunteer computing.
  - **Advanced level:** Use tools in the game to make your own tutorials and mini-games to teach others.

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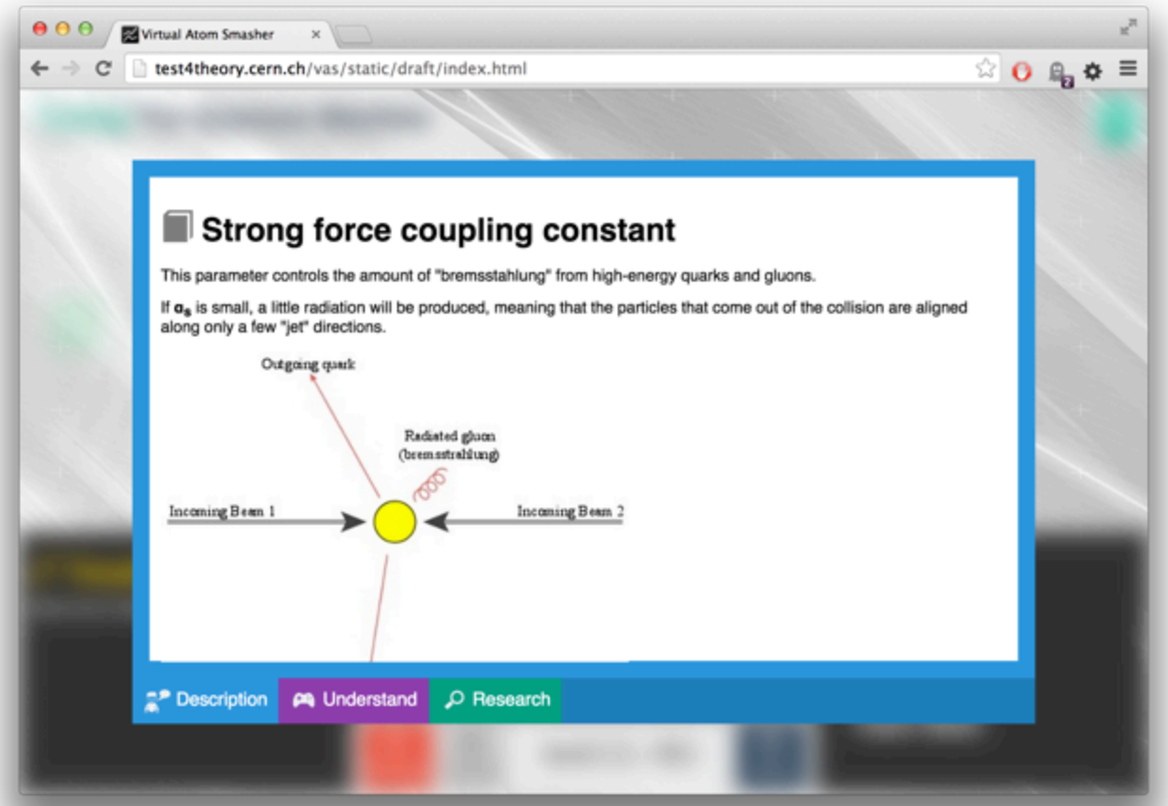


# Evaluate Information On Demand

The user can pick the depth of information (s)he is comfortable with.

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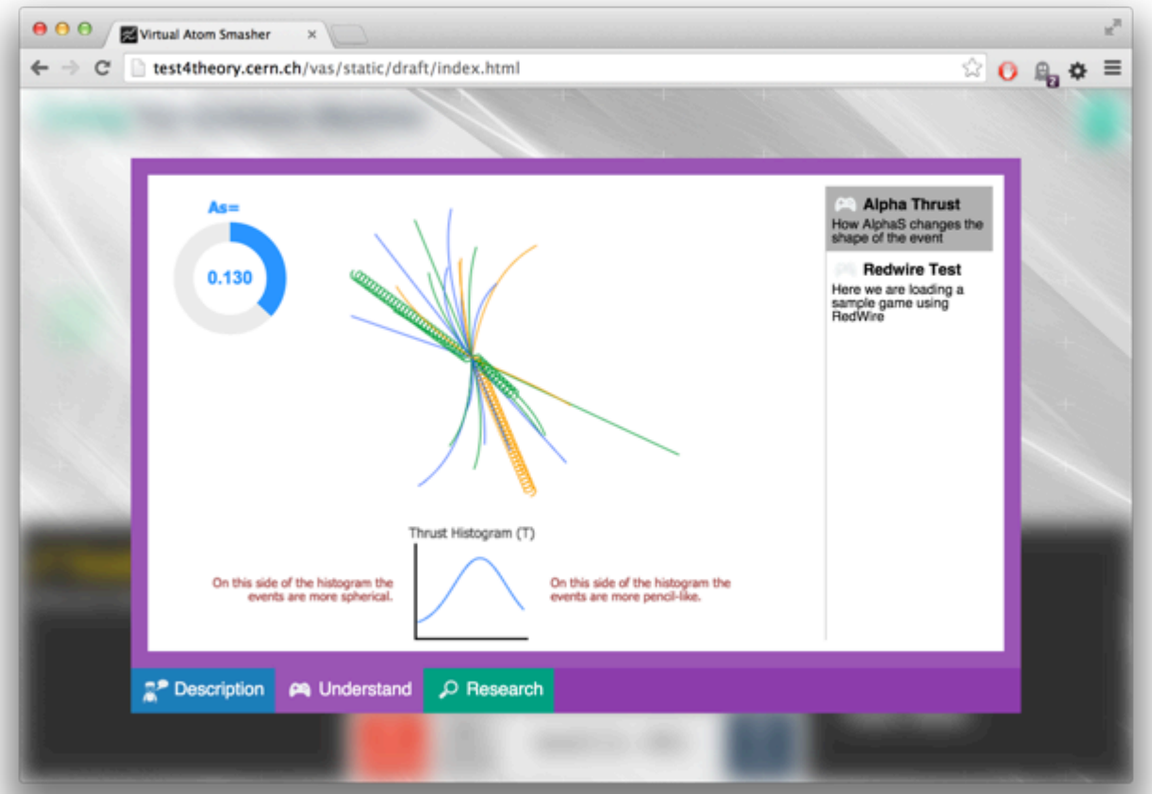


# Play Mini Games

For the user to understand the particular topics, using open source mini-game design platform RedWire.

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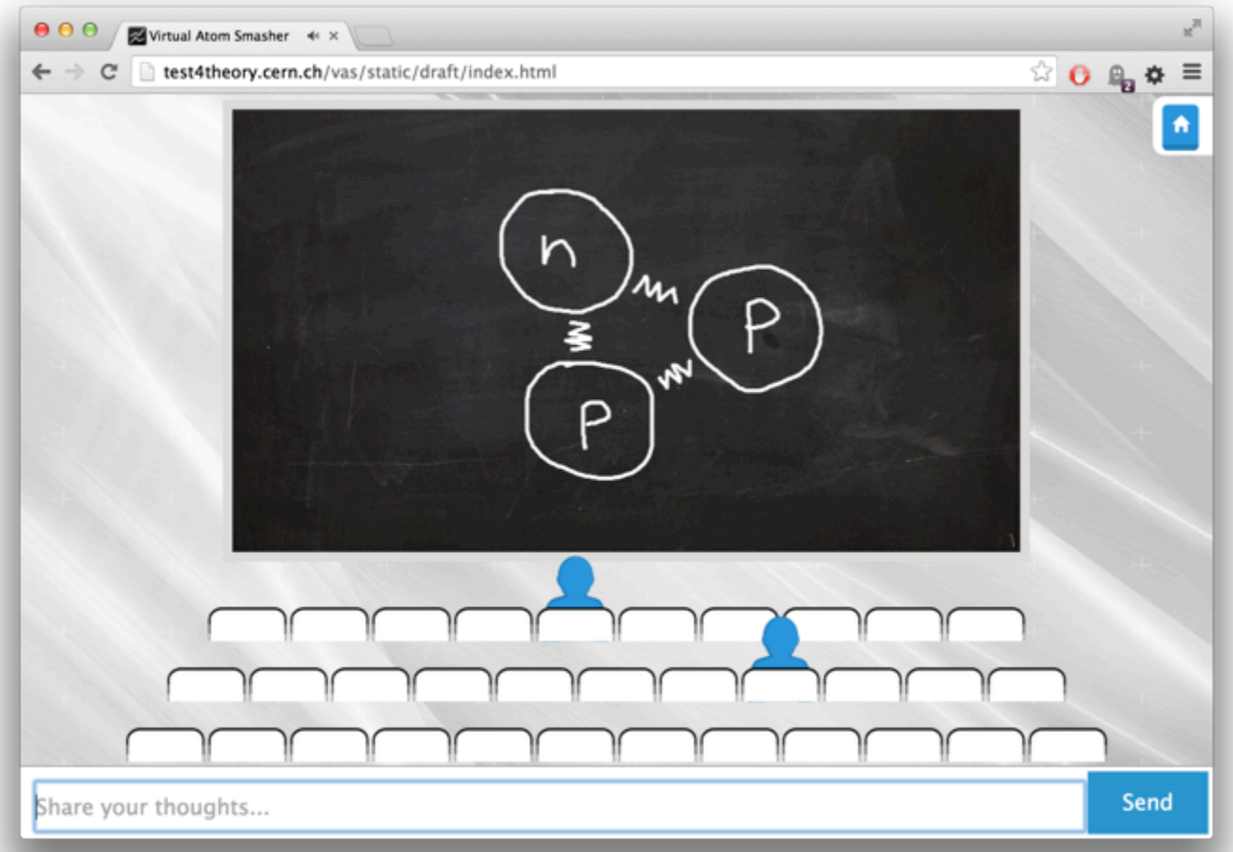


# Follow Mini Tutorials

Using Tootr, a procedural presentation framework which players can use to edit, improve explanations.

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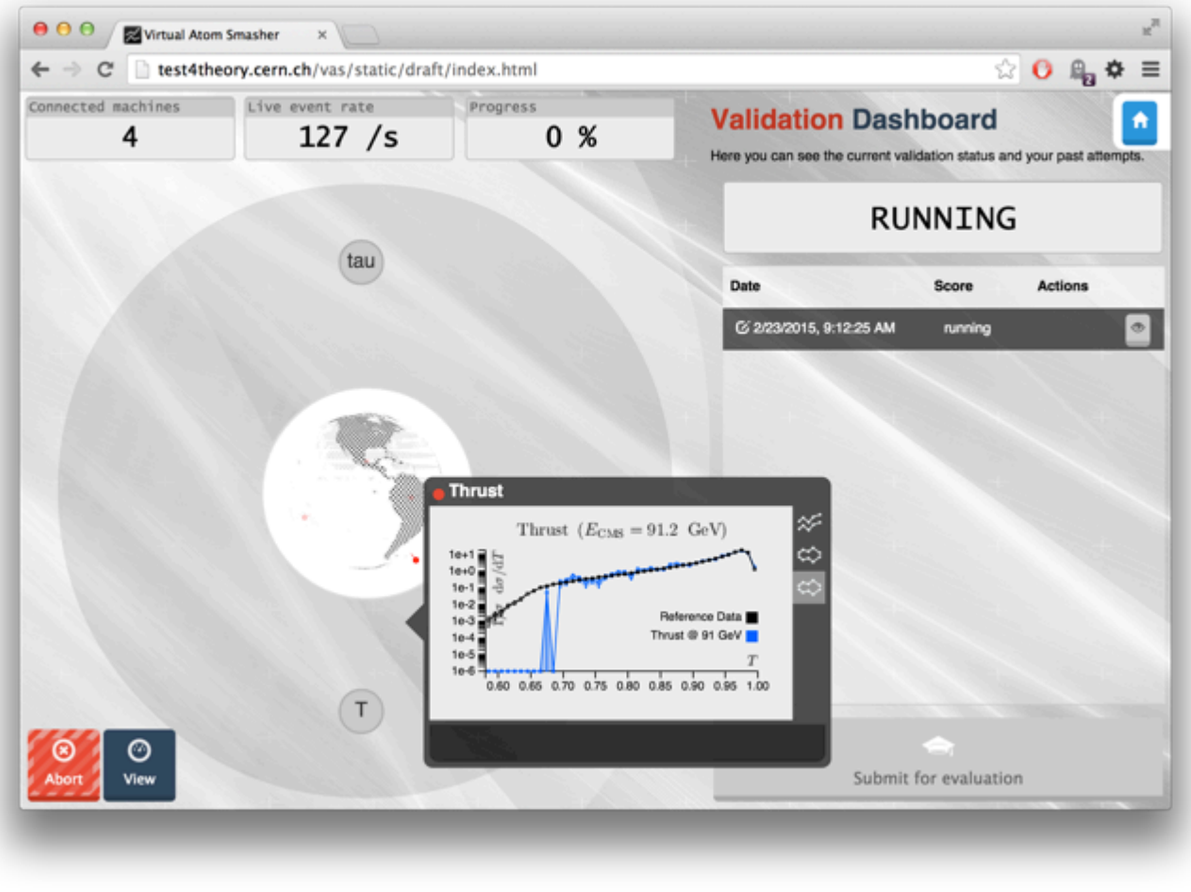


# Build volunteer computing teams

Run simulation jobs on a network of computers shared by friends and family. (In future) add resources from major institutions to your network.

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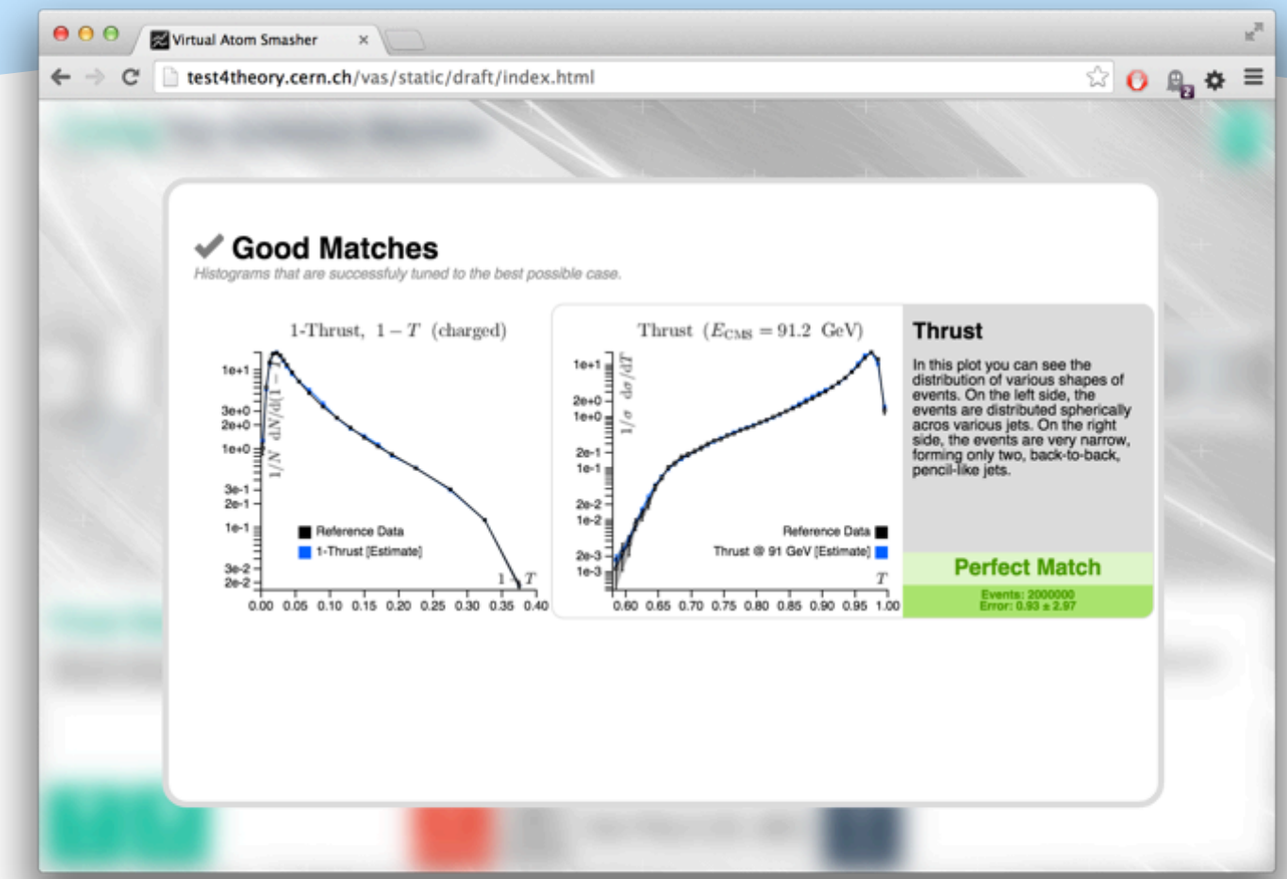


# Compare your simulations with real HEP data

Ultimately, the game will allow you and your team to provide fits that scientists at CERN and partner institutes will use in their research.

# C Mission

Get started

Sign up to be an alpha tester:
https://test4theory.cern.ch/vas/

View the introduction video:
https://www.youtube.com/watch?v=KPHdkRFTtOU

Read more background about the project:

http://skands.web.cern.ch/skands/slides/13/13-CERN-HSTcitizenScience.pdf