

ALICE MasterClass on Nuclear Modification Factor

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International Particle Physics
Outreach Group



Kolymbari, Greece, Sep 2013

Few personal considerations

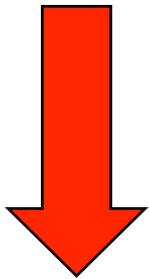
The communication is the
social institution of the science

Few personal considerations

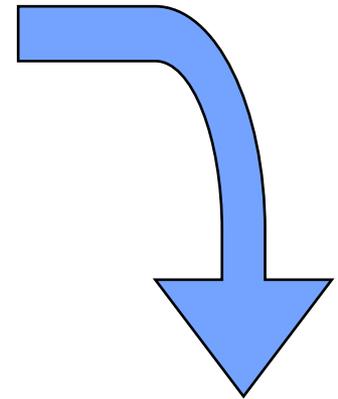
The communication is the social institution of the science

-The need to communicate science

-The need to educate to the science



To communicate in order
to create a scientific
consciousness



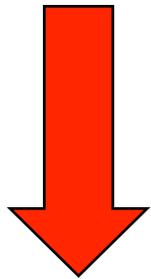
To collect scientific results
and transfer them to the
public

Few personal considerations

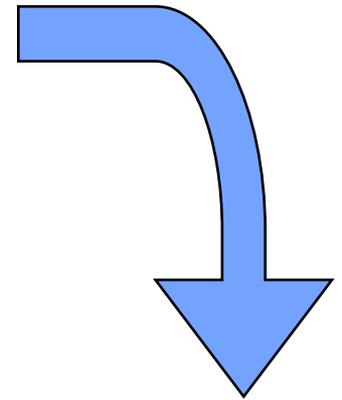
The communication is the social institution of the science

-The need to communicate science

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Scientist



Science journalist,
Scientist, ...

Why the scientist?

He/she has a dynamical knowledge of the science



Is the first ring of the
communication chain

Knows the “long term” implications of the research work

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He/she has a dynamical knowledge of the science



Is the first ring of the communication chain

Knows the “long term” implications of the research work

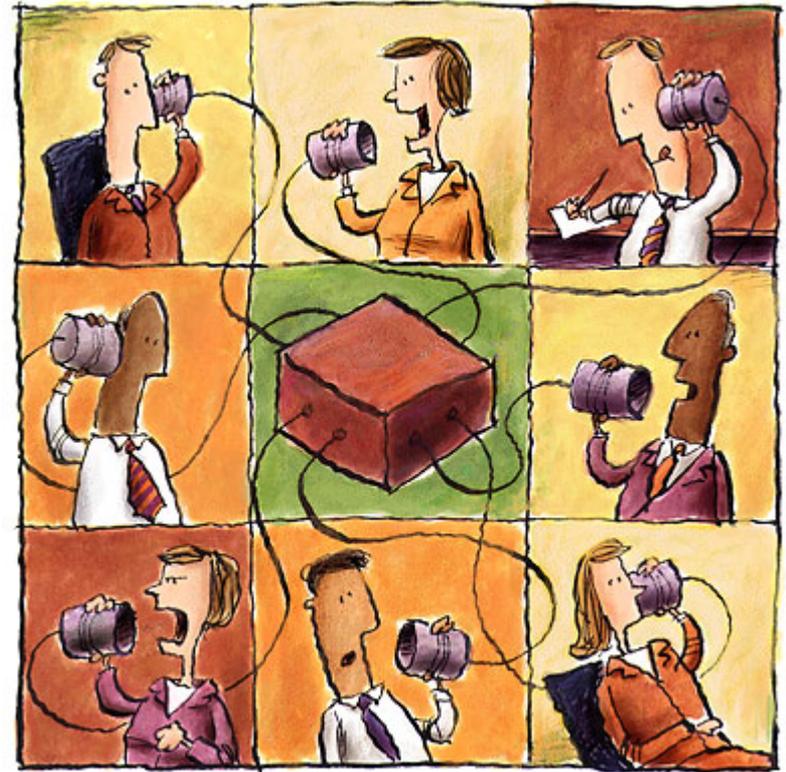
- What did you like more?
- Wow... I met and spoke to a real physicist/scientist

... scaffolding

To communicate moving the learning responsibility to the audience



Interactive methods

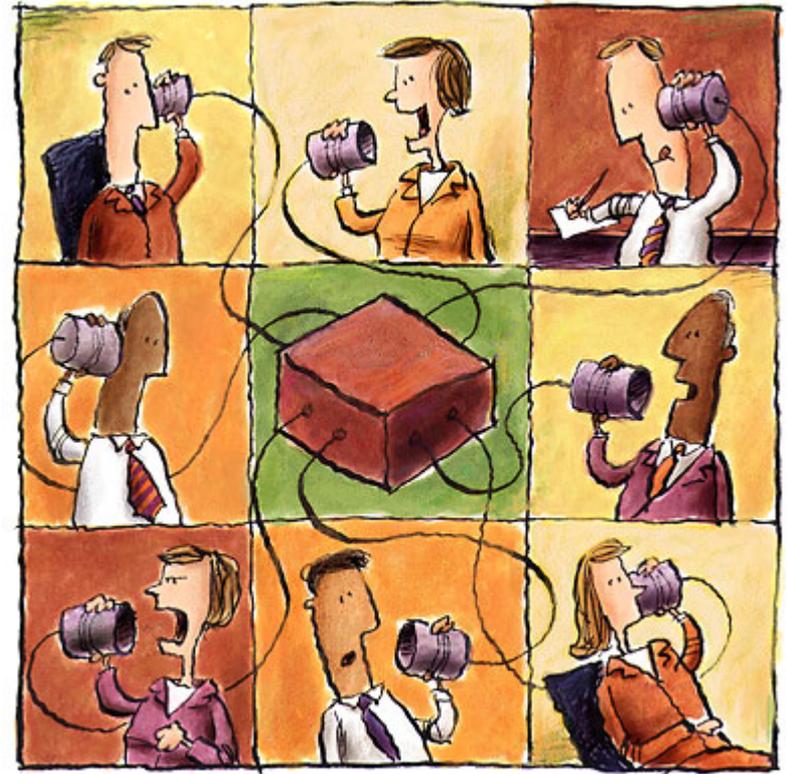


... scaffolding

To communicate moving the learning responsibility to the audience



Interactive methods



ALICE MasterClass

Nuclear Modification Factor

(3rd generation exercise)

● physics objectives

- LHC \leftrightarrow ALICE \leftrightarrow QGP
- geometry of Pb-Pb collisions
- nuclear modification factor: R_{AA} (R_{CP})

Hands-on exercise

- step 1: visual analysis of pp and Pb-Pb collisions
- step 2: large scale analysis

Code nicely developed by:

Ralf Averbeck¹, Friederike Bock², Benjamin Doenigus¹, Yiota Foka¹,
Philipp Luettig³, Kilian Schwarz¹, Reinhard Simon¹, Jochen Thaeeder¹

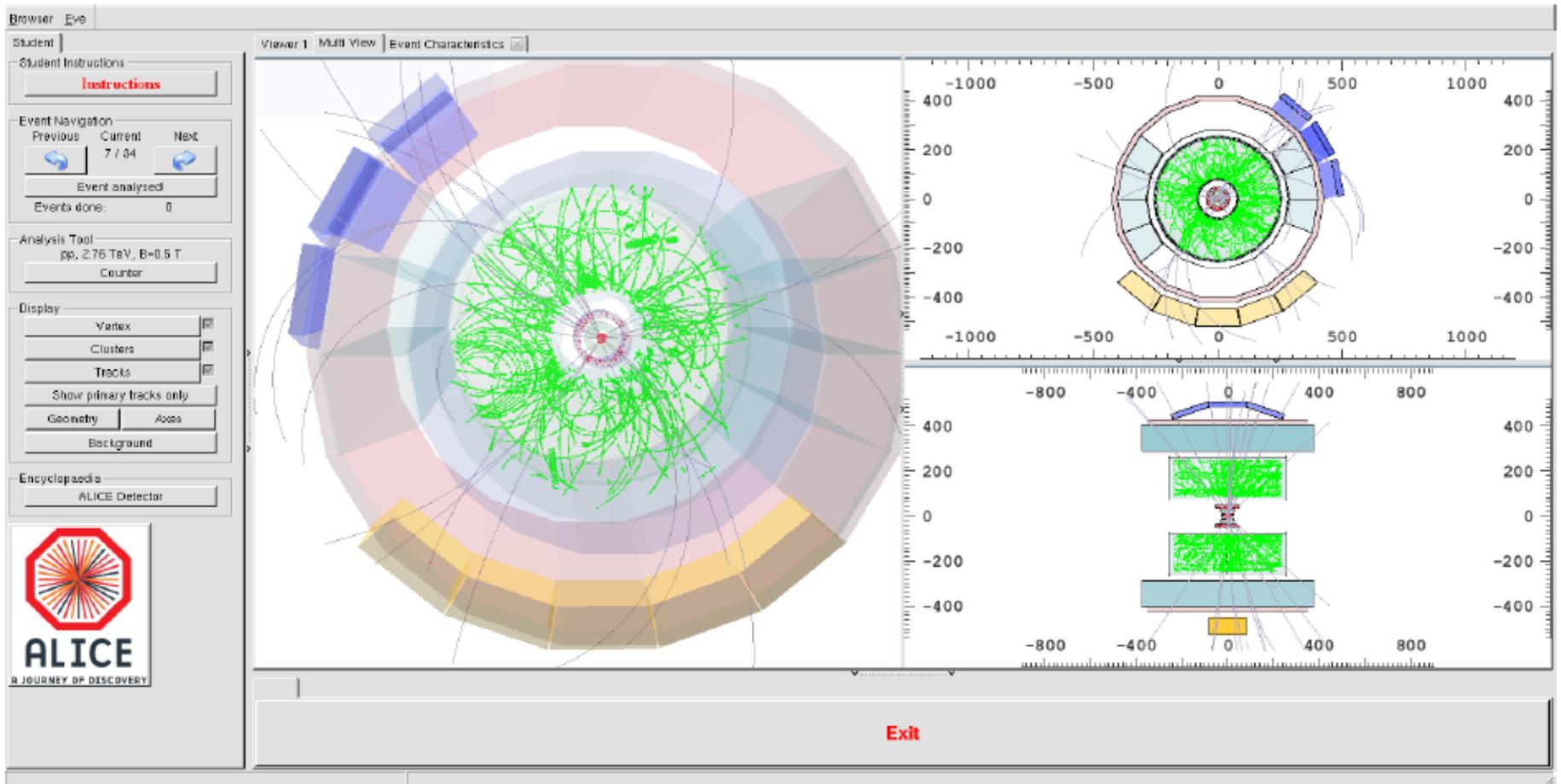
1 ExtreMe Matter Institute EMMI, GSI Darmstadt,

2 Physikalisches Institut, University Heidelberg,

3 Institut für Kernphysik, University Frankfurt

Visual analysis

tool: ALICE event display (pp)



Several datasets available

Visual analysis

tool: ALICE event display (pp)

Counter pp

Counter Instructions
Instructions

Particle Properties

Properties

px (GeV/c)	-0.192518
py (GeV/c)	-0.0434971
pz (GeV/c)	-0.123486
pt (GeV/c)	0.19737
charge	-1

Multiplicity
1

Multiplicity for pt > 1.0 GeV/c
0

Options

Clear

Publish to Mult Histogram

Close

ALICE MasterClass - STUDENT MODE

Browser Eye

Student Instructions
Instructions

Event Navigation
Previous Current Next
2 / 34
Event analysed!
Events done: 0

Analysis Tool
pp, 2.76 TeV, B=0.5 T
Counter

Display
Vertex
Clusters
Tracks
Show primary tracks only
Geometry Axes
Background

Encyclopaedia
ALICE Detector

ALICE
A JOURNEY OF DISCOVERY

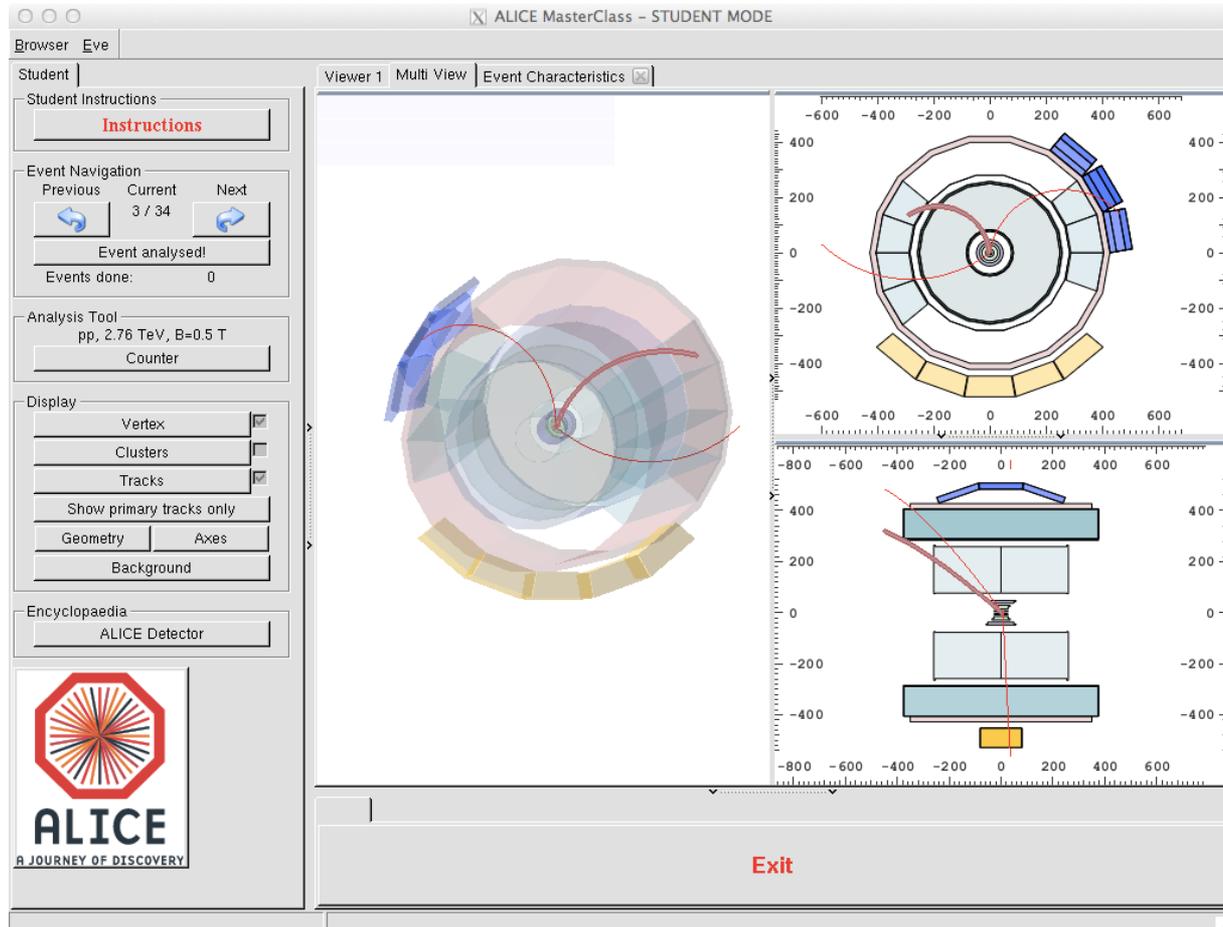
Viewer 1 | Multi View | Event Characteristics

Exit

Measuring transverse momenta

Visual analysis

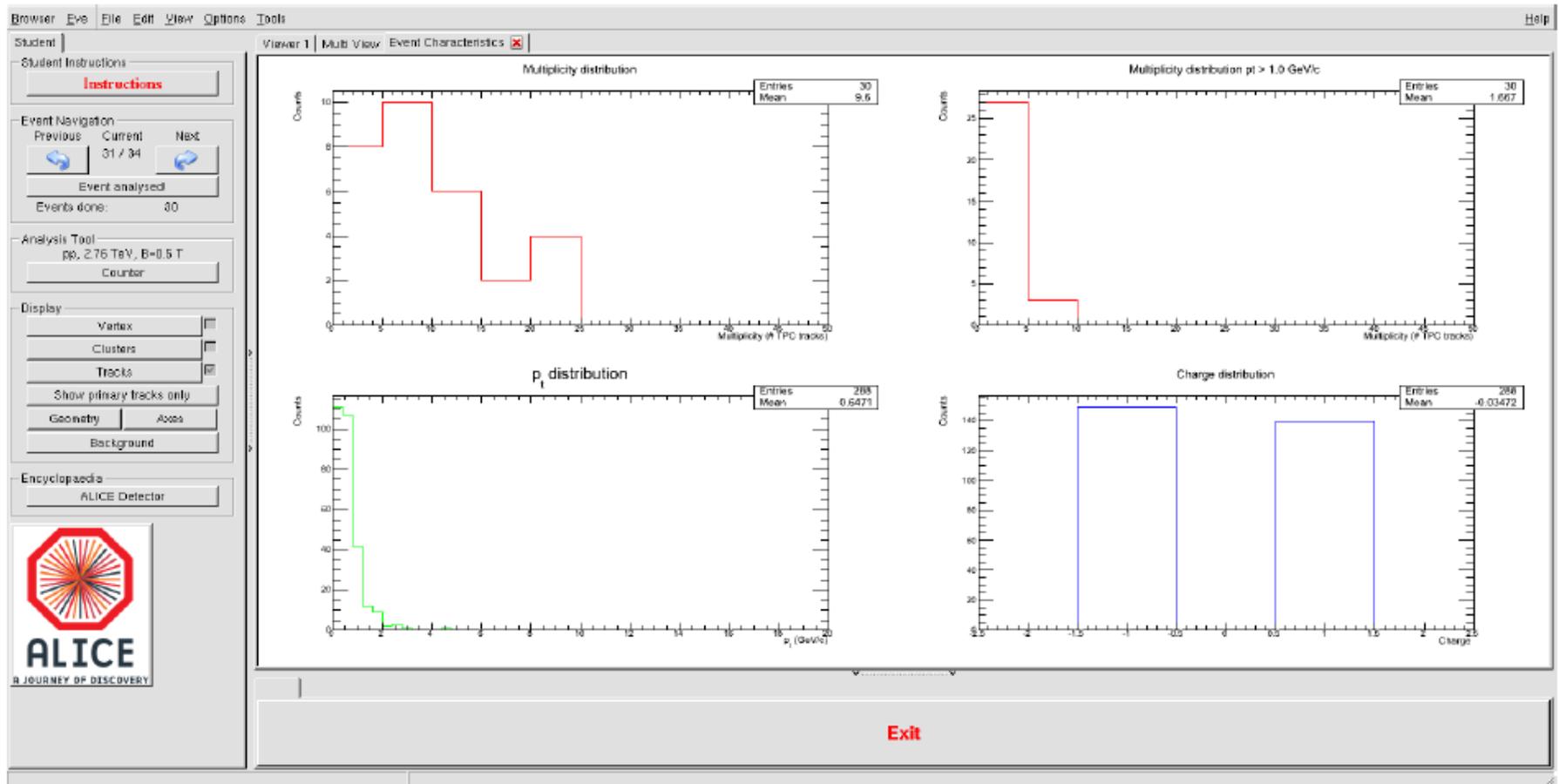
tool: ALICE event display (pp)



Measuring transverse momenta

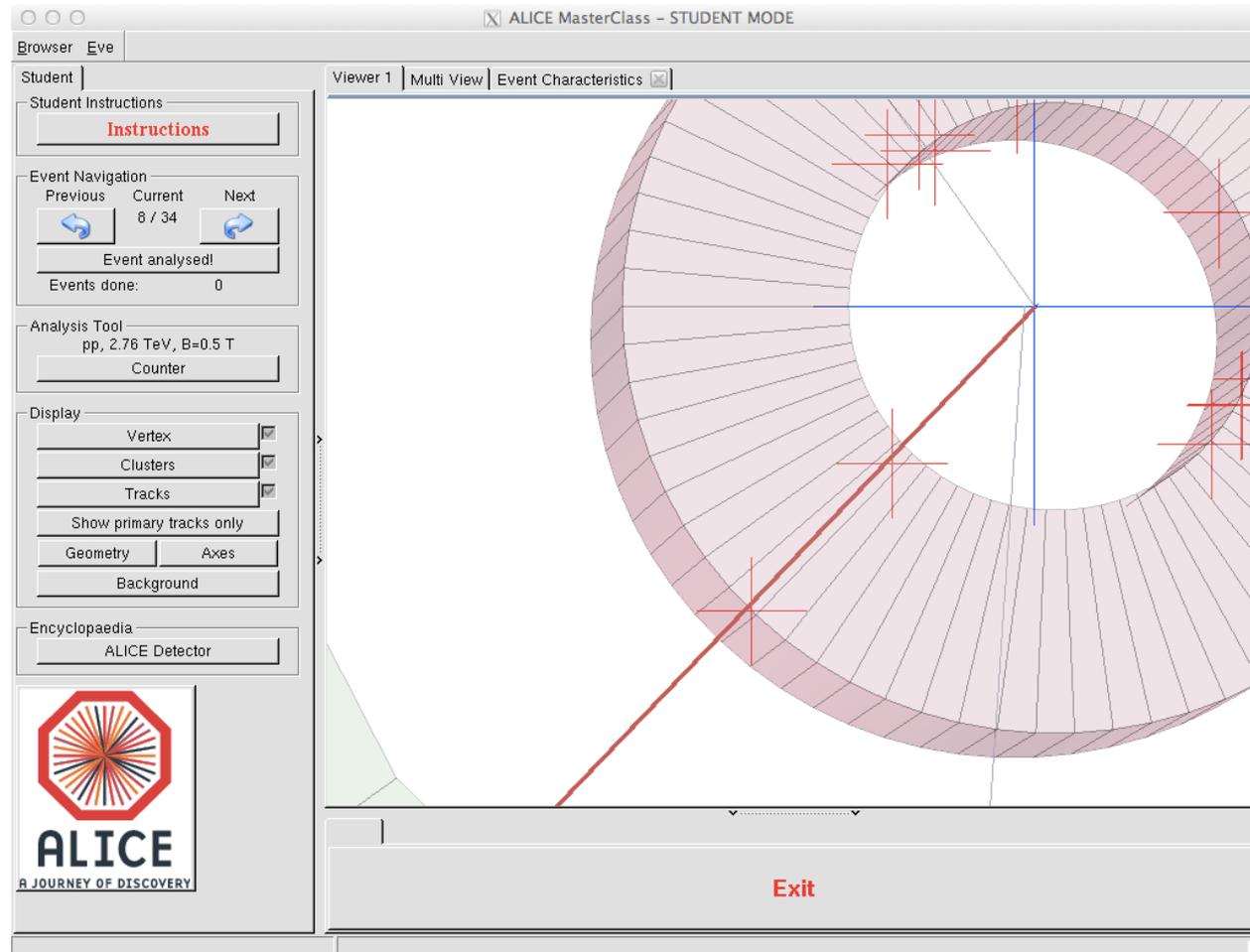
Visual analysis

tool: ALICE event display (pp)



Visual analysis

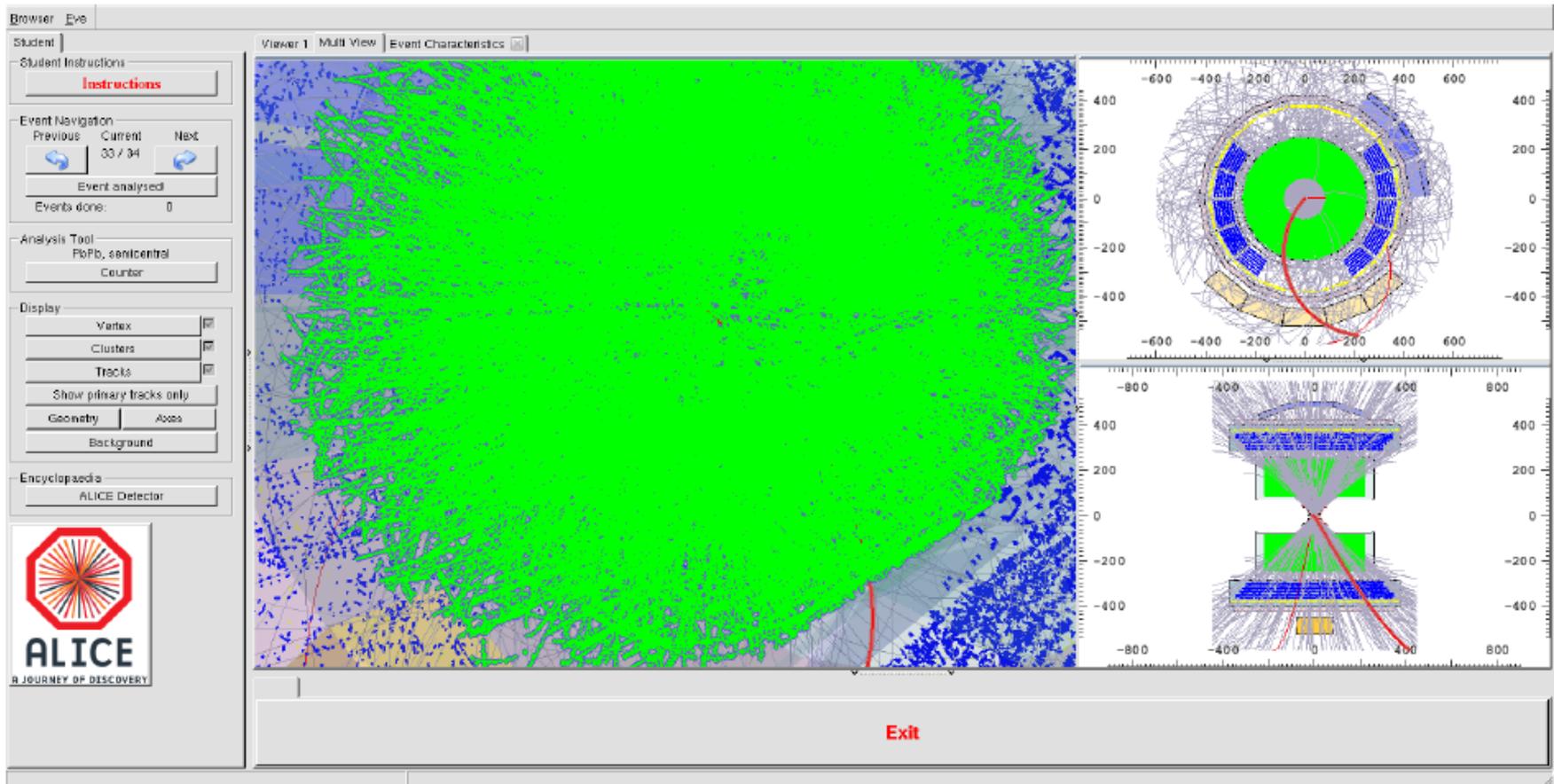
tool: ALICE event display (pp)



Zooming into the spectrometer ... hit by hit

Visual analysis

tool: ALICE event display (Pb-Pb)



Visual analysis

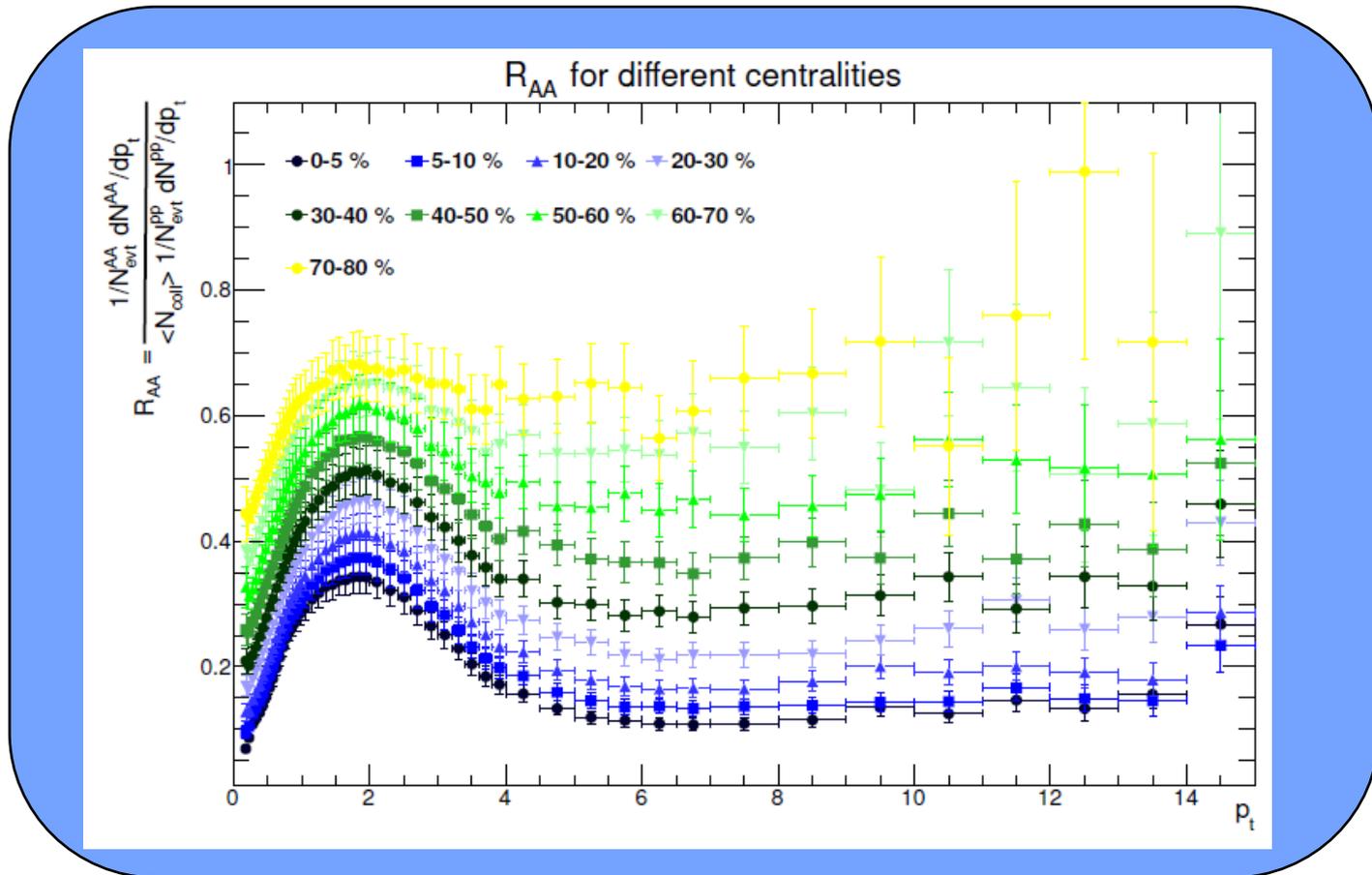
- calculate R_{AA} for the given peripheral, semicentral, and central Pb-Pb event per hand from
 - mean number of tracks in 30 pp events (from students)
 - number of tracks in the 3 Pb-Pb events (from students)
 - number of equivalent pp collisions $\langle N_{coll} \rangle$ (provided)
 - correction factor of 0.6 to account for efficiency differences in pp and Pb-Pb collisions (provided)

Event class	Mean number of charged particles	N_{coll}	R_{AA}
pp	9.6		
PbPb (80- 90%)	15	6.32	0.41
PbPb (20- 40%)	850	438.80	0.33
PbPb (0- 5%)	2000	1686.87	0.20

- typical results (but large variations between the student groups due to low statistics) ... opportunity to introduce the concepts of error and uncertainty

Large scale analysis

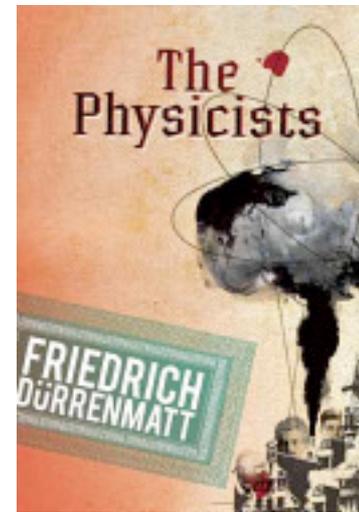
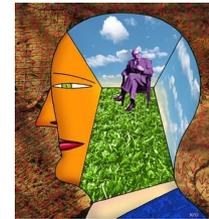
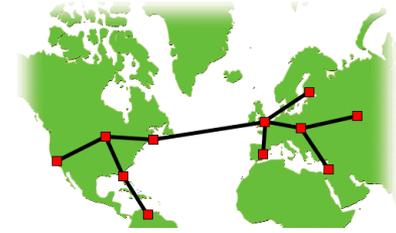
- Nuclear Attenuation Ratio results produced by a macro (partially) written by a student group



→ very close to the published result!

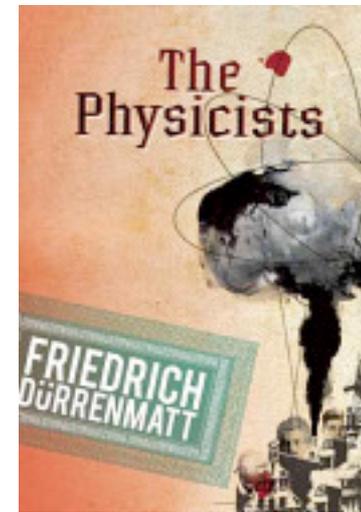
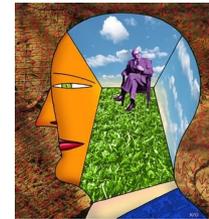
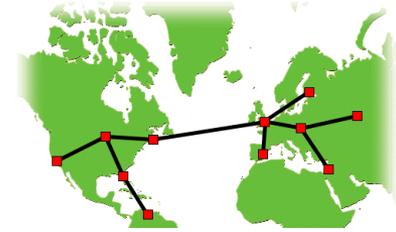
Do we earn something?

- Research networks ask for “Dissemination”
- In the research work, the communication:
 - identifies
 - justifies
 - creates consensus
- Scientists must share the responsibility of the results achieved and the future paths to follow



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- The Frascati National Laboratory (Rome) of the INFN joined the MasterClass project in 2007
- Each year ~50 students in the last class of the high school come from over all Italy
 - ➡ ~10% of these students goes to physics! (Biased sample?)

It is the researcher who creates the "scientific knowledge" and he/she has the duty to communicate it

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Think seriously to join the (Alice) MasterClass

Pioneer, 1977 - F. Drake, physicist

