

Extreme Energy Events: impacts on didactic and science awarness

Ivan Gnesi on behalf of EEE collaboration



February 15-16th, Centro Fermi, Rome

IPP0G 2107

EEE: Frontier Science and Outreach



Il Progetto EEE prevede la messa in funzione nelle Scuole italiane di rivelatori di particelle per studiare i raggi cosmici. Noi viviamo immersi in un flusso di raggi detti cosmici in quanto vengono dalle zone più lontane dello spazio. Questi raggi, che viaggiano per milioni e milioni di anni, sono essenzialmente protoni e sono la "cenere" del Big Bang. Alla loro esistenza sono legati temi di straordinario interesse, come il clima e l'origine ed evoluzione della vita. Gli apparati installati nelle Scuole riveleranno gli sciami di particelle sub-atomiche e sub-nucleari prodotte dall'interazione dei raggi cosmici con gli atomi dell'atmosfera terrestre. Si potranno identificare sciami di grande estensione in correlazione temporale (anche su un'intera città e su città diverse) originati da raggi cosmici di altissima energia. Questa ricerca aiuterà a comprendere la loro - ancora misteriosa - origine. Gli studenti e i loro insegnanti potranno partecipare a questa impresa scientifica in tutte le varie fasi: dalla costruzione del loro rivelatore, che effettueranno al CERN a Ginevra (il più importante laboratorio mondiale di ricerca sulla fisica sub-nucleare), alla sua messa in operazione, alla raccolta dei dati, alla loro interpretazione, presentazione e pubblicazione.

The EEE observatory was born in 2004 with a the challenging scope of both

Studying the Cosmic Radiation at extreme energies never observed before

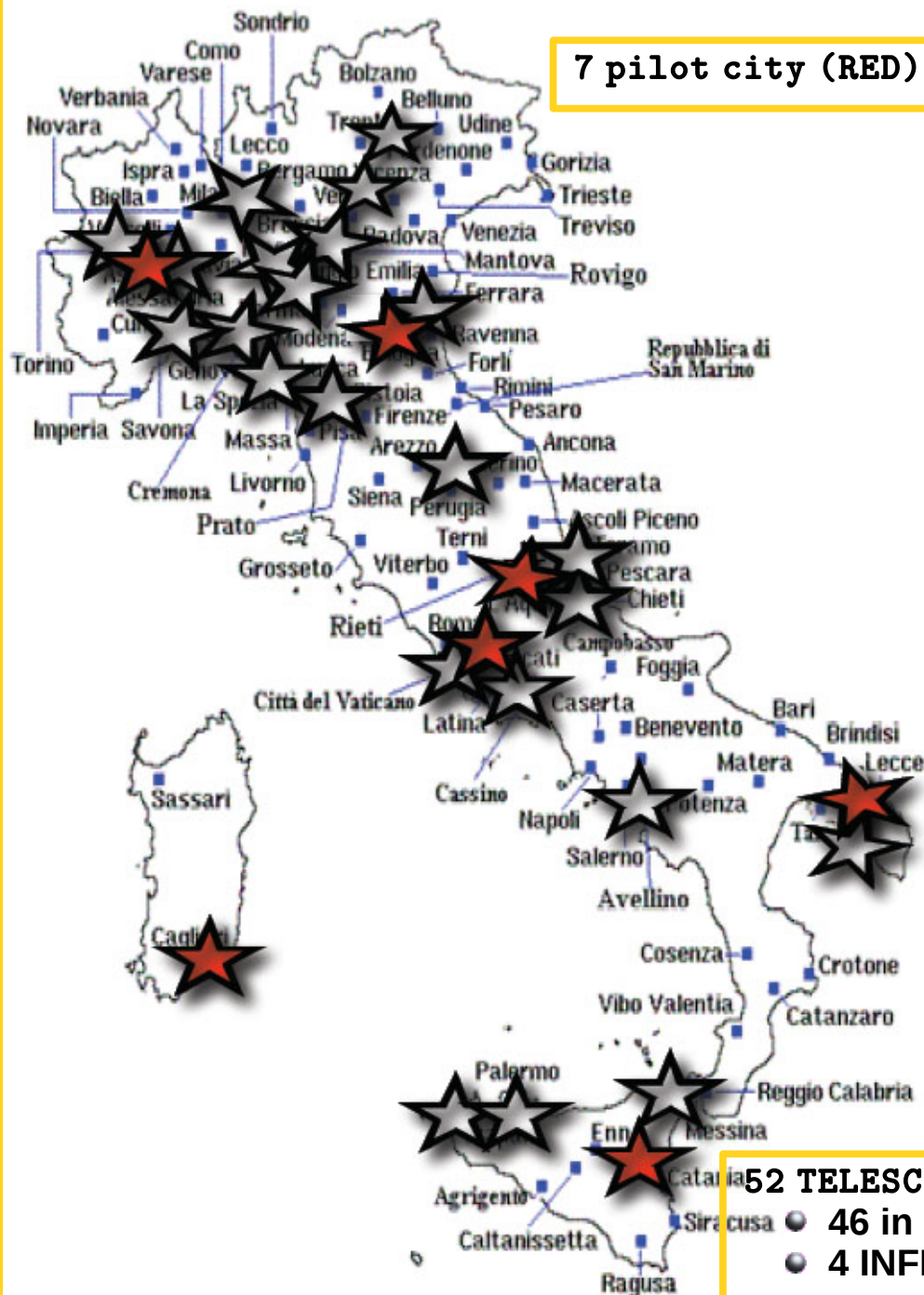
- **Addressing phenomena related to cosmic radiation**

- ◆ Environment and climate
- ◆ Life
- ◆ Solar and Interplanetary effects

- **Enhancing Science Awareness by**

- ◆ **Involving High Schools into the Project**
- ◆ **Bringing students to participate to a real experiment and to the Research environment**
- ◆ **Giving teacher and students new tools to teach and learn Science**
- ◆ **Driving directly teachers update and science perception**

From early times to EEE 2017: the observatory expansion



| | |
|--------------------|------------------------------------|
| Altamura (BA) | Liceo Cagnazzi |
| Ancona | Liceo Classico C. Rinaldini |
| Arezzo | ITIS G. Galilei |
| Bari | Liceo Scientifico A. Scacchi |
| Bologna | Liceo Scientifico E. Fermi |
| | Liceo Classico L. Galvani |
| Cagliari | Liceo Scientifico L.B. Alberti |
| | Liceo Scientifico Michelangelo |
| | Liceo Scientifico A. Pacinotti |
| | ITIS S.Cannizzaro |
| Catania | IIS E. Fermi |
| Catanzaro | Liceo Scientifico G.B. Scorza |
| Cosenza | Istituto Tecnico E. Fermi |
| Frascati (RM) | Istituto Salesiano Villa Sora |
| | IIS A.Manetti (2 telescopes) |
| Grosseto | Liceo Scientifico B. Touschek |
| Grottaferrata (RM) | Liceo Scientifico A. Bafile |
| L'Aquila | ITIS A. D'Aosta |
| Lecce | Liceo Scientifico G.Banzi Bazoli |
| | ITIS E. Fermi |
| | Liceo Classico Palmieri |
| Lodi | Liceo Scientifico G. Gandini |
| Lodi | ITIS Volta |
| Parma | Liceo Scientifico G. Marconi |
| Paternò (CT) | Liceo Scientifico E. Fermi |
| Reggio Emilia | IIS L. Nobili |
| Roma | ITIS H. Hertz |
| | Liceo Classico P. Albertelli |
| Salerno | Liceo Scientifico G. Da Procida |
| Salerno | Liceo Stat. "Regina Margherita" |
| Savona | Liceo Chiabrera - Martini |
| | ITIS Ferraris-Pancaldo |
| | Liceo Scientifico O. Grassi |
| Siena | Liceo Galilei - Istituto Sarrocchi |
| Teramo | IIS Alessandrini - Marino - Forti |
| Torino | Liceo Classico M. d'Azeglio |
| | Liceo Scientifico G. Ferraris |
| | Liceo Scientifico G. Bruno |
| | Liceo Scientifico A. Volta |
| Trapani | Liceo Scientifico V.Fardella |
| Treviso | Liceo Duca degli Abruzzi |
| Trinitapoli (BAT) | IIS S. Staffa |
| Viareggio (LU) | IIS Galilei - Artiglio |
| | Liceo Sc. Barsanti e Matteucci |
| Vicenza | Liceo Quadri |

The unexpected (and very welcome) case of the online EEE schools

Since 2012

- **Requests for joining EEE overtake the telescopes construction rate!**
- **New EEE Phase with “telematic” access to the experiment has been open**



+ 43 schools! ...growing

| | |
|----------------------------|-----------------------------------|
| ALTAMURA (BA) | IISS Nervi Gailei |
| ANCONA | Liceo Scientifico Galilei |
| BITETTO (BA) | Liceo Statale E. Amaldi |
| BRA (CN) | Liceo Giolitti Gandino |
| CALTANISSETTA | Liceo Scientifico Volta |
| CARCARE (SV) | Liceo Giuseppe Calasanzio |
| CARIATI (CS) | Liceo Scientifico Stefano Patrizi |
| CASTELVETR. (TP) | Pantaleo-Gentile-Cipolla |
| CASTROLIB. (CS) | Liceo Scientifico S. Valentini |
| CATANIA | IISIT Marconi |
| COLLEFERRO (RM) | ITI Cannizzaro |
| GARDONE V.T. (BS) | IIS Carlo Beretta |
| ISEO (BS) | IIS Giacomo Antonietti |
| LAMPEDUSA-LINOSA (AG) | Ist. Pirandello |
| LANCIANO (CH) | Liceo Scientifico "Galilei" |
| LIVORNO | Liceo Scientifico Enriques |
| MAGLIE (LE) | Liceo Leonardo da Vinci |
| MILANO | Liceo Vittorio Veneto |
| MONCALIERI (TO) | IIS Majorana-Marro |
| MONTEROTONDO (RM) | Liceo Scientifico Peano |
| OSIMO (AN) | Liceo Campana Osimo |
| PALERMO | Liceo Benedetto Croce |
| PALERMO | Liceo Garibaldi |
| PALERMO | ITIS Vittorio Emanuele III |
| PARABIAGO (MI) | Liceo Scientifico Cavalleri |
| PETRALIA (PA) | ITIS Pietro Domina |
| POTENZA | Liceo Scientifico Pasolini |
| QUARTU (CA) | IISS Primo Levi |
| RAPALLO | IIS Giovanni da Vigo Recco |
| REGGIO CAL. | Liceo Scientifico A. Volta |
| RIMINI | Liceo Statale "Serpieri" |
| ROMA | Liceo Scientifico Righi |
| ROMA | Liceo Giulio Cesare |
| ROMA | Liceo Scientifico Fr. D'Assisi |
| SAN GIOVANNI IN FIORE (CS) | Liceo S. Giovanni in Fiore |
| SAN GIOVANNI VALDARNO (AR) | ITIS G. Ferraris |
| SALUZZO | Liceo Bodoni |
| SASSUOLO | Liceo A.F. Formiggini |
| SEREGNO (MB) | Collegio Ballerini |
| TORINO | Liceo Gobetti Segrè |
| TRENTO | Liceo Sc. Leonardo da Vinci |
| VIMERCATE (MB) | Liceo Scientifico A. Banfi |
| VOGHERA (PV) | Liceo Scientifico OSA Maserati |

Didactic and Research activities: Phase I: when a school enters EEE



A group of

- 4 students
- 1 or 2 teachers

build at CERN their 3 MRPCs

**They work together with researchers
in a real physics experiment
environment.**

**Students live this experience
enthusiastically.**

Didactic and Research activities: Phase I: when a school enters EEE

After MRPCs construction at CERN

Students
Local responsables
Teachers

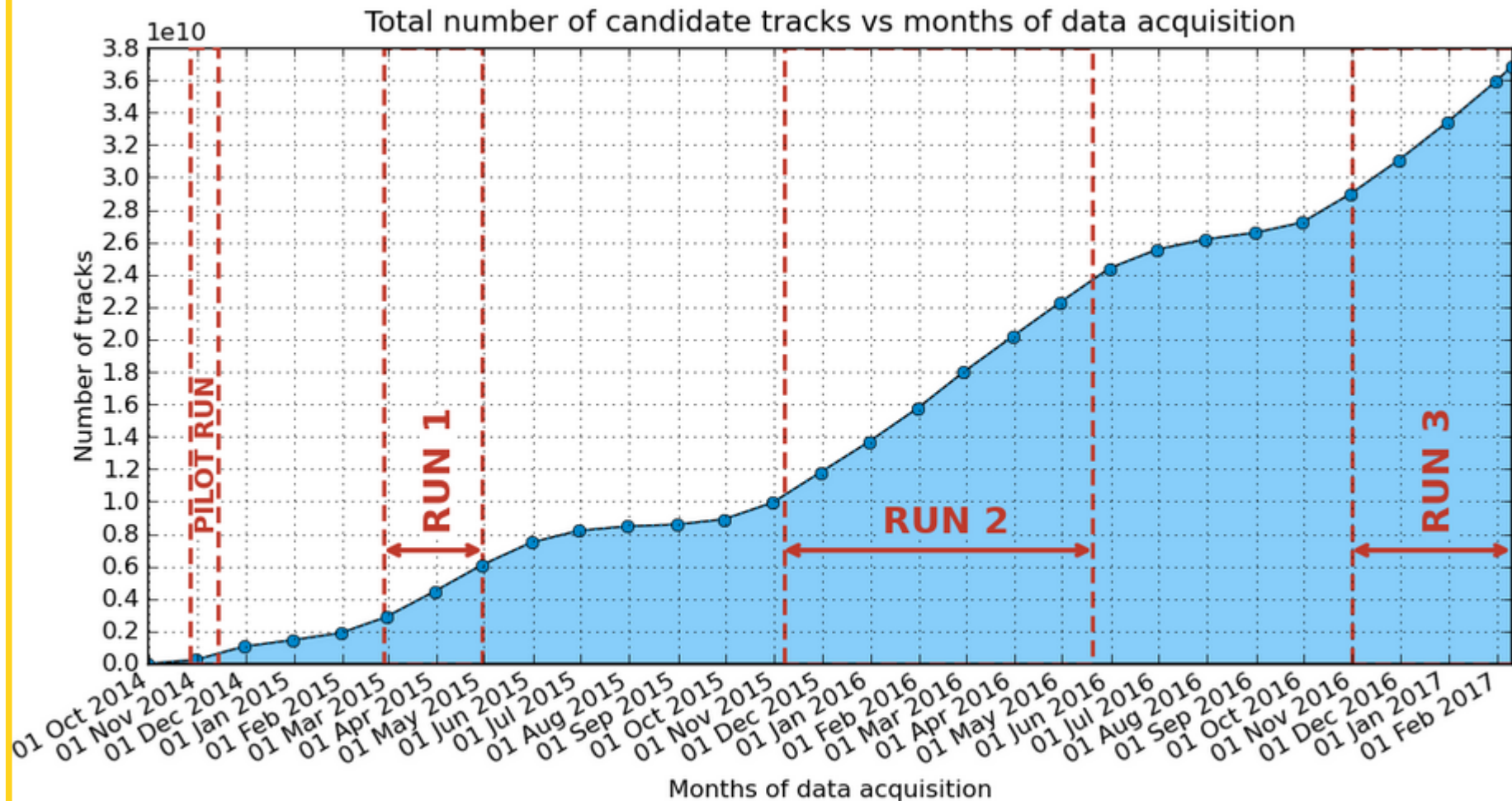
**complete the telescope installation
and put it into operation**

This is a second **challenging and stimulating experience** for both students and teachers, where they realize they are **taking in charge a station of a wide cosmic ray observatory**.

Many of them will **feel the commitment** for the whole studies and **also at the University** they keep being involved, Especially the ones choosing scientific degrees.



Didactic and Research activities: Phase II: when a school enters the RUN

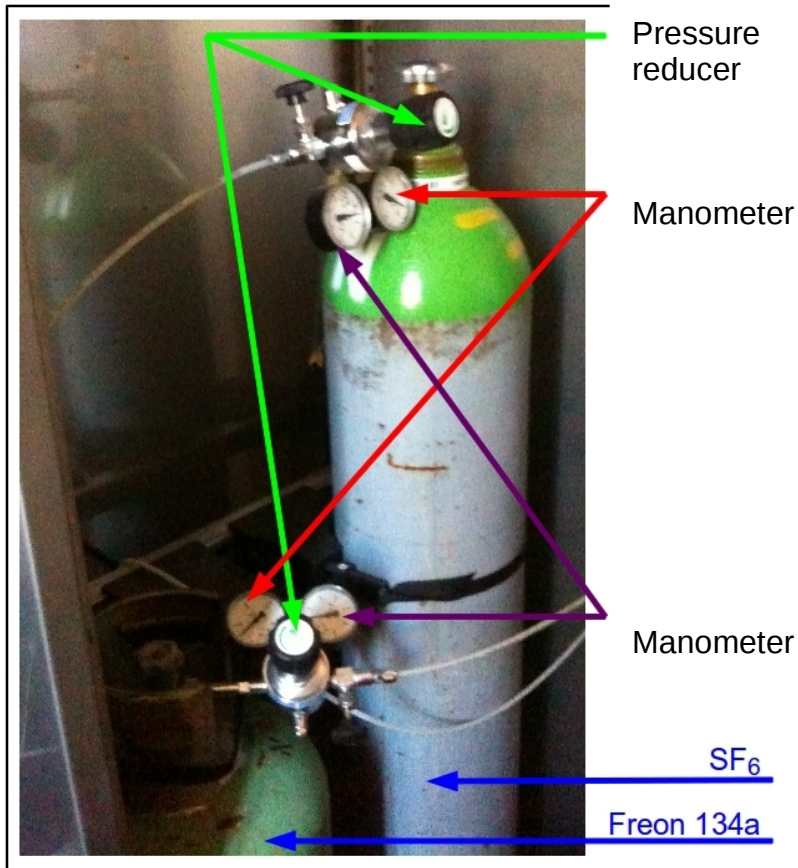


Since 2014 EEE is taking **coordinated RUN** with the whole set of operative stations involved.

Students are a key point which brought to the 100 Mtracks/day threshold reached!

Phase II: when a school enters the RUN

Data taking and Shifting like a researcher



Each day students **check**:

- Data Acquisition
- Gas System
- High and Low Voltages

And **solve simple issues** while **informing researchers about unexpected behaviours** or out of range values

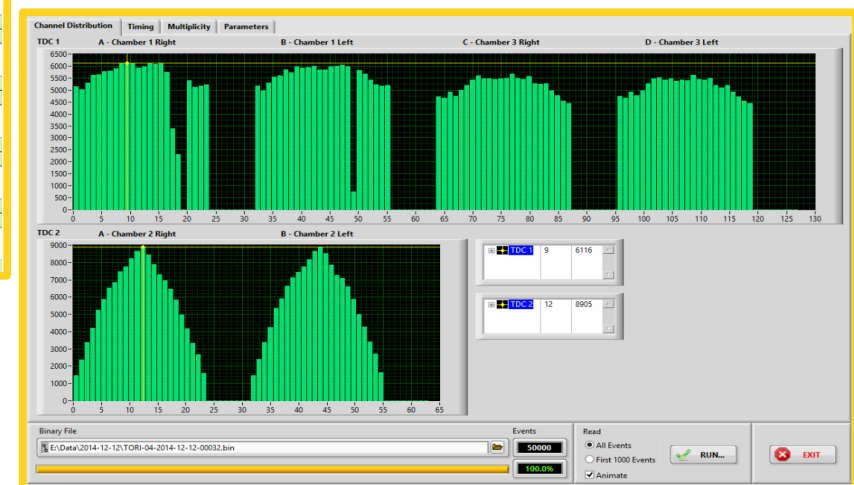
Phase II: when a school enters the RUN

Data taking and Shifting like a researcher

| | |
|--|------------|
| Scuola: | TORI-04 |
| Codice EEE dell'Istituto Scolastico | |
| Operatore: | Ivan Gnesi |
| Nome e Cognome di chi inserisce i dati | |
| MRPC1 HV_POS (V): | 8043 |
| MRPC1: misura Alta Tensione [+] (valore di esempio: 9100) | |
| MRPC1 HV_NEG (V): | 8432 |
| MRPC1: misura Alta Tensione [-] (valore di esempio: 9100) | |
| MRPC1 I_POS (microA): | 0.121 |
| MRPC1: misura Corrente [+] (valore di esempio: 0.03 [usare il punto per i decimali]) | |
| MRPC1 I_NEG (microA): | 0.160 |
| MRPC1: misura Corrente [-] (valore di esempio: 0.03 [usare il punto per i decimali]) | |
| MRPC1 LV (V): | 4.2 |
| MRPC1: misura Bassa Tensione (valore di esempio: 4.5 [usare il punto per i decimali]) | |
| Front-End LV (V): | 2.7 |
| valore di tensione applicato ai front end (campo "SenseLowVolt") (es.: 2.03) | |
| SF6 (press): | 9.2 |
| Pressione del Gas SF6 (letta sul mixer nel display n.1) (valore di esempio: 3.5) | |
| C2H2F4 (press): | 10.5 |
| Pressione del Gas C2H2F4 (letta sul mixer nel display n.2) (valore di esempio: 4.1) | |
| SF6 (flusso): | 30.5 |
| Flusso del Gas SF6 (letto sul mixer nel display n.3) (valore di esempio: 30.0) | |
| C2H2F4 (flusso): | 30.6 |
| Flusso del Gas C2H2F4 (letto sul mixer nel display n.4) (valore di esempio: 30.2) | |
| Temp (C): | 22.6 |
| Temperatura nella stanza del Telescopio (esempio: 22.3 [non mettere l'unita' di misura]) | |
| Press (mbar): | 982 |
| Pressione Atmosferica (inserire il valore in mbar, ad esempio 980) | |
| Rate (Hz): | 56 |
| Rate indicativo di acquisizione del Telescopio (valore di esempio 32) | |

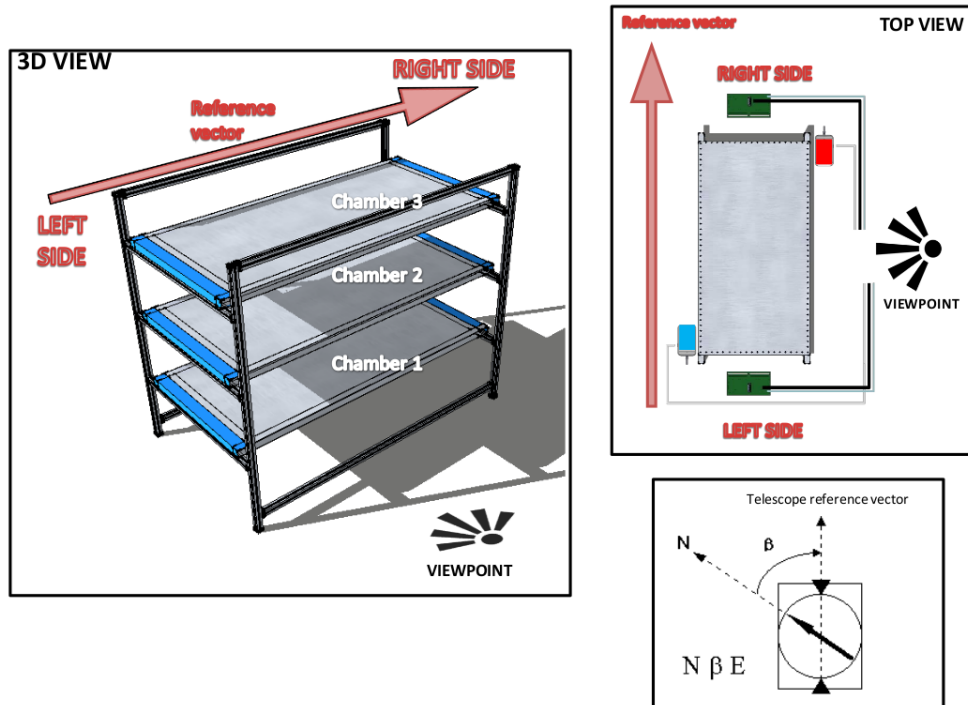
The data are saved on a online eelog where all school are searchable

Students check also strip distribution and env. parameters



Phase III: students measuring fundamental parameters for data analysis

EEE Telescope: orientation respect to magnetic nord (β angle)



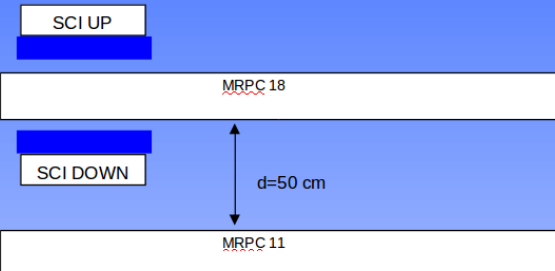
Students and teachers, together with researchers, perform the measurements of

- telescope orientation
- chambers efficiency

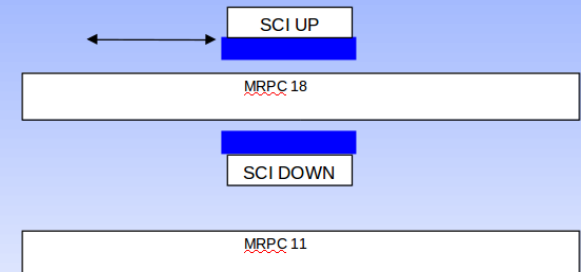
which are then included in **EEE telescope parameters** and used for analysis



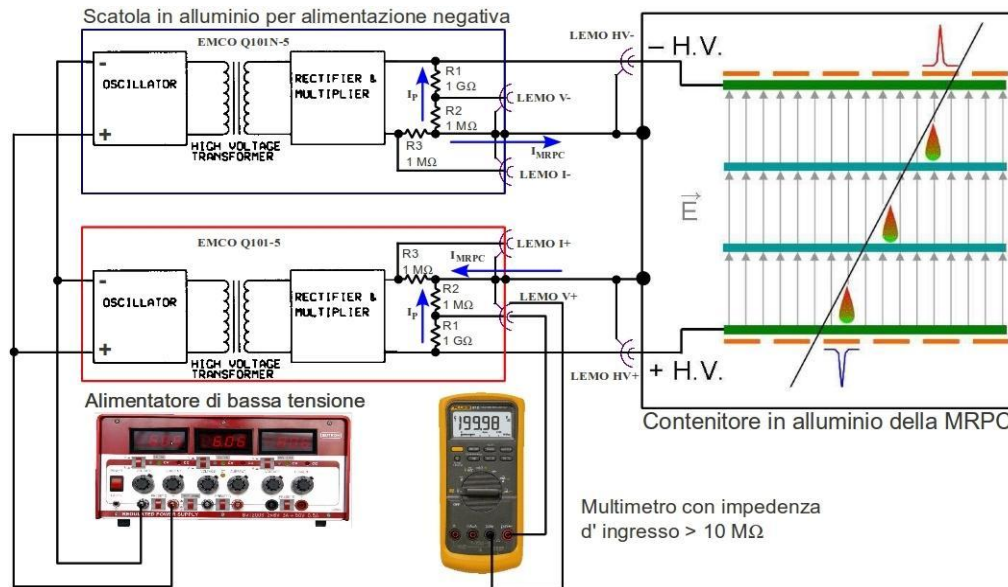
Scintillators in position 1



Scintillators in position 2



Hw and Sw controbutions from schools



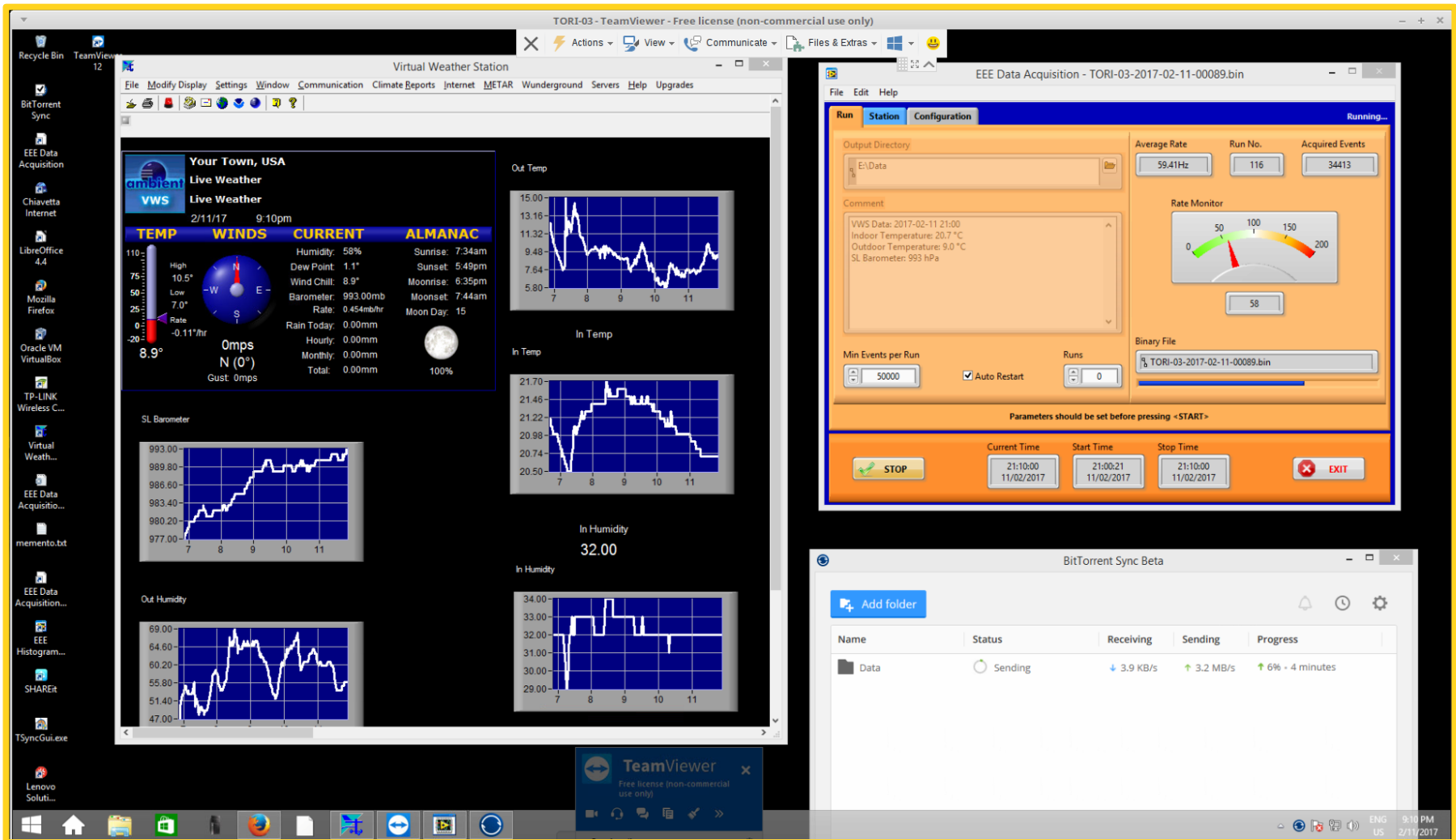
Teachers and students often also take in charge activities according to their specific courses.

The outcomes often serve as a solutions and upgrades for the observatory.

- A feedback system for controlling the telescope MRPCs High Voltage (ongoing)
- An automated scale for checking the remaining gas and automatically plan bottles turnover



Phase IV: “telematic” school activities: Remote Shifting



Telematic schools often start **shifting on existing telescopes** by remote access. This helps creating

- **joint venture** among schools
- **group working**
- enhancing the **perception of participating to a wide, non-local experiment.**

Phase IV: “telematic” school activities: Portable cosmic rays detectors



COSMIC BOXES

Are 2 plane
scintillator
detectors read
by SiPM

6 schools are
regularly
using since
2010.

20 more CB are
being built

- Stat & Prob
- Acceptance
- CR flux
- CR ang. Distr
- EEE telescope acceptance
- Electronics and sw development



Phase V: bringing the students to Data Analysis: The Open Data Quality Monitor

Progetto Extreme Energy Events - La Scienza nelle Scuole

EEE Monitor

Ultimo aggiornamento: ore 10:35 - domenica 12 febbraio 2017 [by e3monitor]

Last data transfer

Daily report

[ELOGBOOK delle SCUOLE per il RUN 3](#)

[ELOGBOOK dello SHIFTER](#)

[Automatic Shift REPORT](#)

[Automatic Shift Report ARCHIVE](#)

[Home Page EEE](#)

[Masterclass](#)

[Download the Excel Sheet](#)

[New DB Interface](#)

[Connectivity Report](#)

Telescope name

[EEE Monitor] **RUN 3 - Data taking - Day number: 104**
Total number of candidate tracks ($X^2 < 10$) in the database: 36970959853

Run report

Questa tabella mostra la situazione dei telescopi in acquisizione:

In **verde** sono indicati i telescopi in presa dati e trasferimento nelle ultime 3 ore e con parametri di acquisizione ragionevoli nell'ultimo run analizzato.

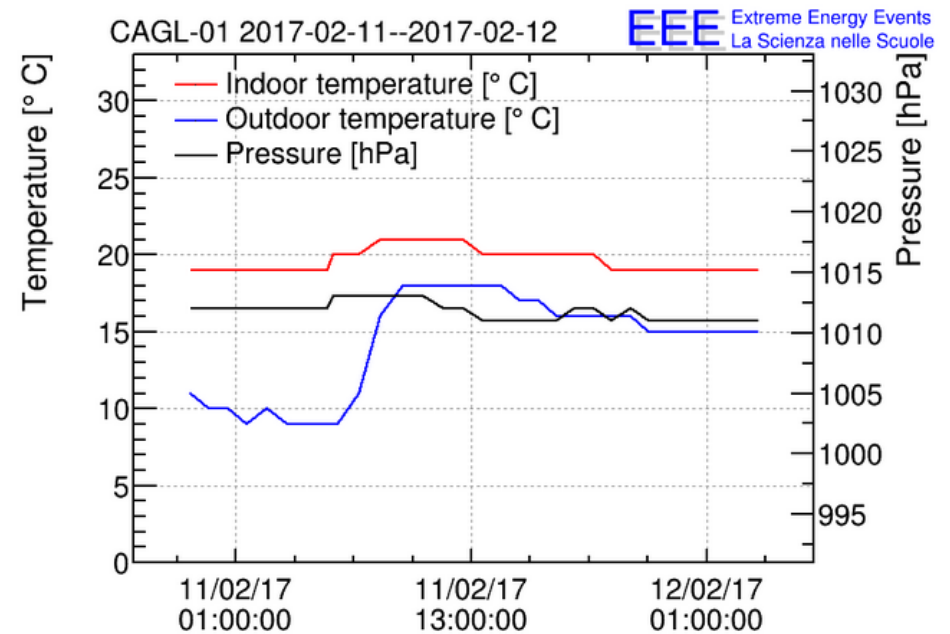
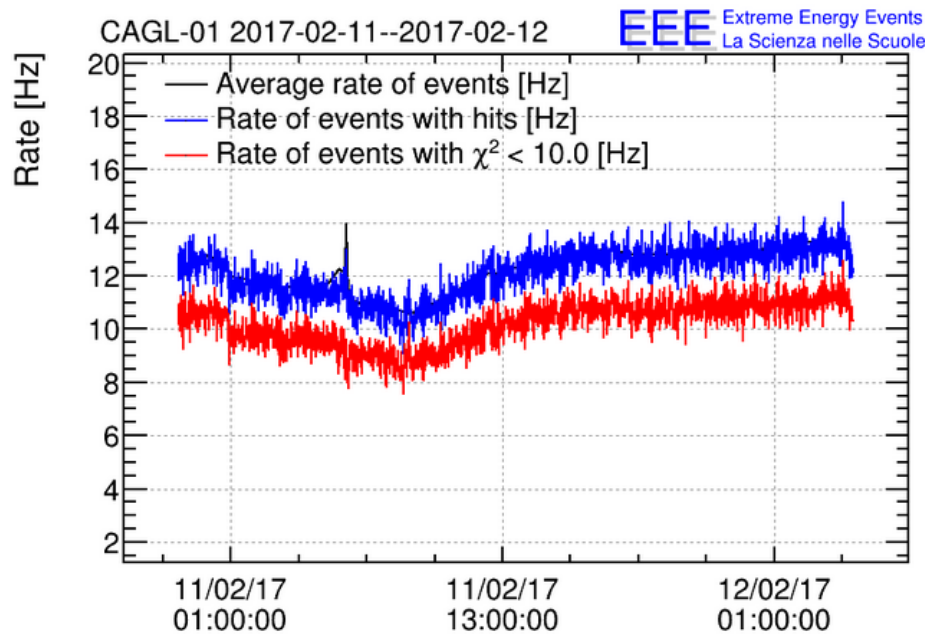
In **giallo** sono indicati i telescopi in cui trasferimento e/o acquisizione sono sospesi da più di 3 ore o con tracce ($X^2 < 10$) minori di 10 Hz nell'ultimo run analizzato.

In **rosso** sono indicati i telescopi in cui trasferimento e/o acquisizione sono sospesi da più di due giorni o con tracce ($X^2 < 10$) minori di 5Hz nell'ultimo run analizzato.

| Scuola | Giorno | Ora | Nome dell'ultimo File trasferito | Numero Files trasferiti oggi | Ultima Entry nell'e-logbook delle Scuole del Run | Nome dell'ultimo File analizzato dal DQM | Report giornaliero DQM | RATE of Triggers for the last Run in DQM | RATE of Tracks for the last Run in DQM | Link DQM |
|---------|-----------------|-------|----------------------------------|------------------------------|--|--|------------------------|--|--|----------|
| BOLO-03 | dom 12 febbraio | 10:19 | BOLO-03-2017-02-12-00032.bin | 35 [History] | 10:09 11/02/2017 | BOLO-03-2017-02-12-00032.bin | 12/02 [History] | 45.0 | 41.0 | BOLO-03 |
| BOLO-04 | dom 12 febbraio | 09:59 | BOLO-04-2017-02-12-00034.bin | 36 [History] | 16:11 04/02/2017 | BOLO-04-2017-02-12-00034.bin | 12/02 [History] | 47.0 | 44.0 | BOLO-04 |
| CAGL-01 | dom 12 febbraio | 09:43 | CAGL-01-2017-02-12-00011.bin | 12 [History] | 08:16 10/02/2017 | CAGL-01-2017-02-12-00011.bin | 12/02 [History] | 19.0 | 16.0 | CAGL-01 |
| CAGL-02 | ven 10 febbraio | 12:00 | CAGL-02-2017-02-10-00051.bin | 0 [History] | 11:05 11/02/2017 | CAGL-02-2017-02-10-00051.bin | 11/02 [History] | 41.0 | 36.0 | CAGL-02 |
| CAGL-03 | dom 12 febbraio | 09:52 | CAGL-03-2017-02-12-00022.bin | 24 [History] | 18:46 11/02/2017 | CAGL-03-2017-02-12-00022.bin | 12/02 [History] | 25.0 | 21.0 | CAGL-03 |
| CATA-01 | dom 12 febbraio | 10:11 | CATA-01-2017-02-12-00025.bin | 25 [History] | 09:15 10/02/2017 | CATA-01-2017-02-12-00025.bin | 12/02 [History] | 25.0 | 15.0 | CATA-01 |
| CATA-02 | dom 12 febbraio | 10:13 | CATA-02-2017-02-12-00016.bin | 18 [History] | 13:46 11/02/2017 | CATA-02-2017-02-12-00015.bin | 12/02 [History] | 21.0 | 12.0 | CATA-02 |

Phase V: bringing the students to Data Analysis: The Open Data Quality Monitor

EEE DQM summary report



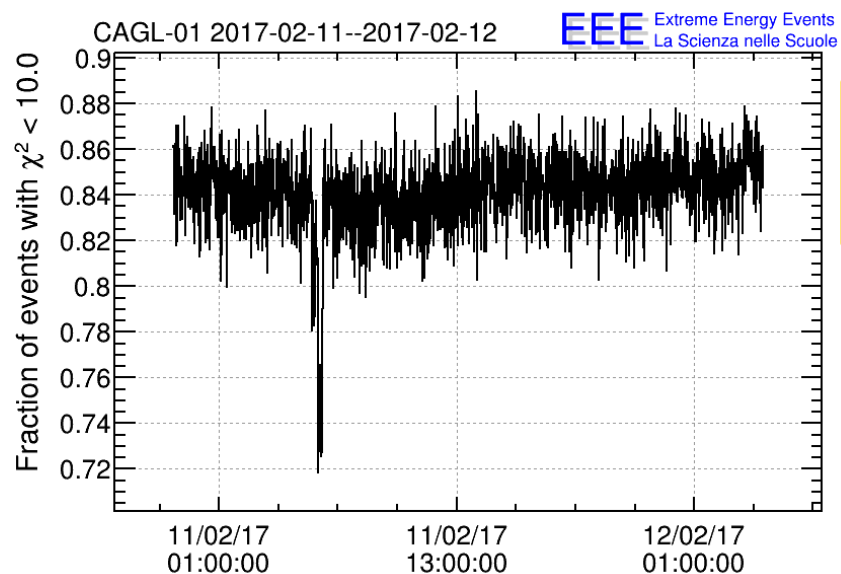
Students and teachers can **access the EEE DAQ** as the researchers do for checking the telescope data quality and problems.

A wide **set of informations** is available:

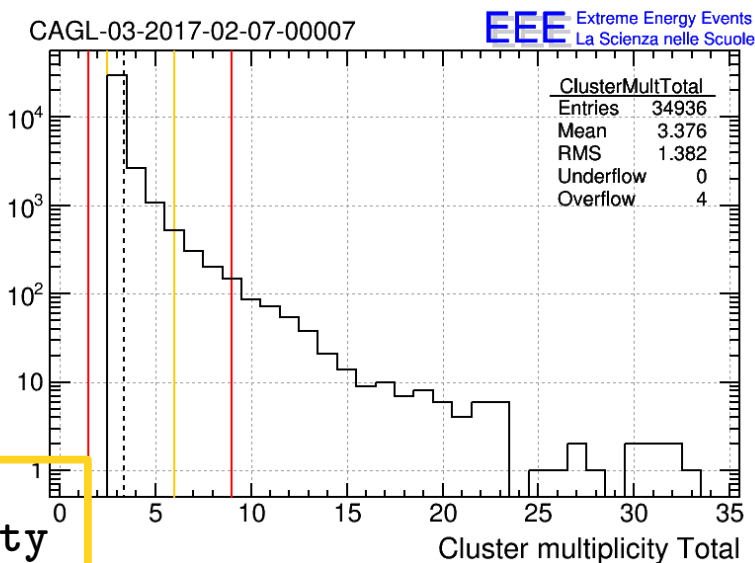


- Telescope rates
 - ◆ trigger
 - ◆ Hits
 - ◆ Tracks ($X^2 < 10$)
- Pressure
- Temperature
- ...many others

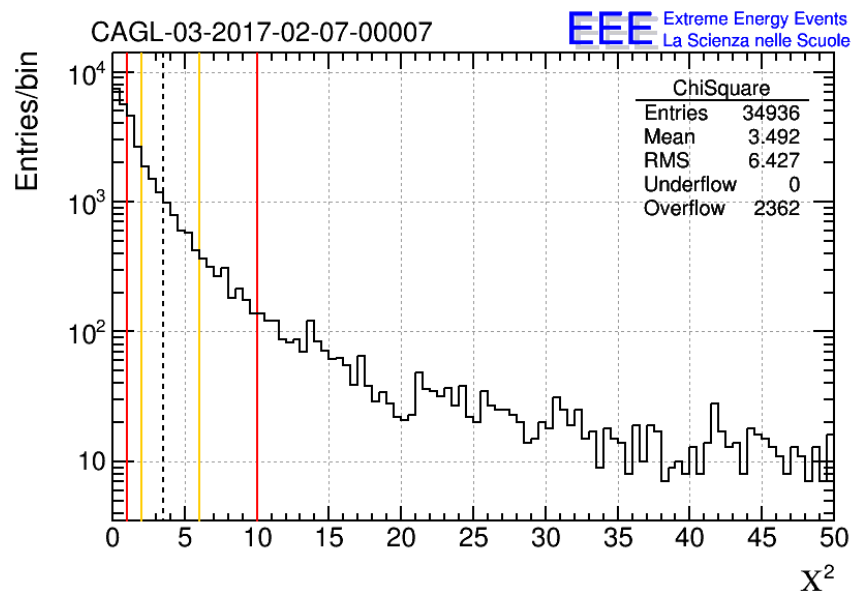
Phase V: bringing the students to Data Analysis: The Open Data Quality Monitor



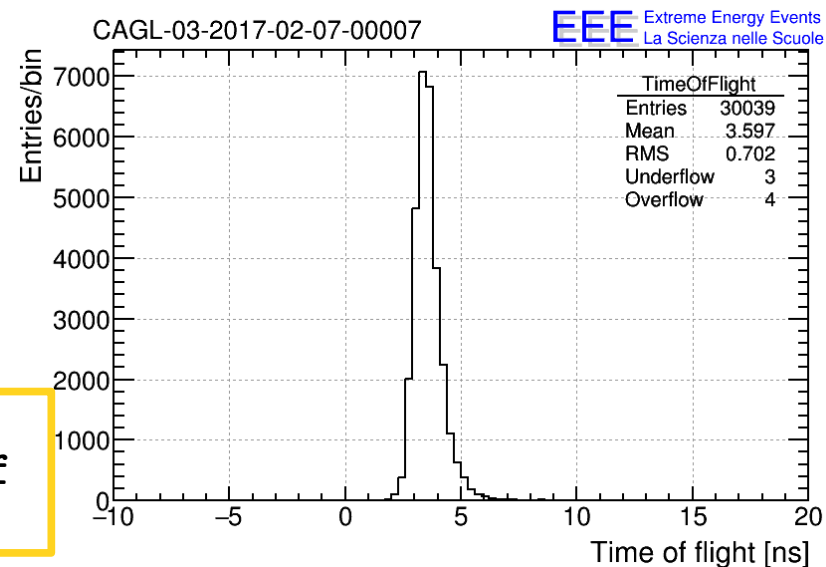
Fraction
of good
tracks



Cluster
multiplicity



Tracks χ^2



Tracks
Time of
Flight

Phase V: bringing the students to Data Analysis: CSV Flux Data : Open for Schools!

SUMMARY

- Station: BOLO-04
- Time period: 2017-02-11--2017-02-12
- Number of runs processed: 109
- Total number of events: 5212086
- Number of events with hits: 5098823
- Number of events with a track: 4830366
- Data files: [root](#), [csv header](#), [csv trending](#), [csv weather](#)

A 1 minute binned track flux rate is available as open data for the participating schools

- for the **whole telescope set**
- for **any period** of reconstructed data

| | A | B | C | D | E | F | G | H | I | J | K | L |
|----|-----------|-----------|---------------|------------------|-----------------|--------------------|---------------------|------------------------|-------------------|--------------------|----------|-------------|
| 1 | #BinStart | BinEnd | RateHitEvents | RateHitEventsErr | RateTrackEvents | RateTrackEventsErr | FractionTrackEvents | FractionTrackEventsErr | IndoorTemperature | OutdoorTemperature | Pressure | UniqueRunId |
| 2 | 319158751 | 319158812 | 46.55738 | 0.8736336 | 44.03279 | 0.8496169 | 0.9457747 | 0.00424948 | 23 | 18 | 1013 | 8369300001 |
| 3 | 319158812 | 319158873 | 46.34426 | 0.8716318 | 43.93443 | 0.8486674 | 0.9480014 | 0.004175776 | 23 | 18 | 1013 | 8369300001 |
| 4 | 319158873 | 319158934 | 45.70492 | 0.8655986 | 43.14754 | 0.8410331 | 0.9440459 | 0.004352774 | 23 | 18 | 1013 | 8369300001 |
| 5 | 319158934 | 319158995 | 46.34426 | 0.8716318 | 44.09836 | 0.8502494 | 0.9515387 | 0.004038756 | 23 | 18 | 1013 | 8369300001 |
| 6 | 319158995 | 319159056 | 48.18033 | 0.8887302 | 45.62295 | 0.8648221 | 0.9469207 | 0.00413542 | 23 | 18 | 1013 | 8369300001 |
| 7 | 319159056 | 319159117 | 46.04918 | 0.8688524 | 43.26229 | 0.8421507 | 0.9394802 | 0.004499006 | 23 | 18 | 1013 | 8369300001 |
| 8 | 319159117 | 319159178 | 47.5082 | 0.8825095 | 44.95082 | 0.858428 | 0.9461698 | 0.004192261 | 23 | 18 | 1013 | 8369300001 |
| 9 | 319159178 | 319159239 | 48.44262 | 0.8911461 | 46.2459 | 0.8707063 | 0.9546531 | 0.003827522 | 23 | 18 | 1013 | 8369300001 |
| 10 | 319159239 | 319159300 | 48.19672 | 0.8888814 | 46.01639 | 0.85431 | 0.9547619 | 0.003832886 | 23 | 18 | 1013 | 8369300001 |
| 11 | 319159300 | 319159361 | 45.98361 | 0.8682336 | 43.60656 | 0.844949 | 0.9483066 | 0.004180473 | 23 | 18 | 1013 | 8369300001 |
| 12 | 319159361 | 319159422 | 44.7541 | 0.8565475 | 42.4918 | 0.8346179 | 0.9494506 | 0.004192886 | 23 | 18 | 1013 | 8369300001 |
| 13 | 319159422 | 319159483 | 48.13115 | 0.8882765 | 46 | 0.8683884 | 0.9557221 | 0.003796482 | 23 | 18 | 1013 | 8369300001 |
| 14 | 319159483 | 319159544 | 46.60656 | 0.8740949 | 44.26229 | 0.8518283 | 0.949701 | 0.004099064 | 23 | 18 | 1013 | 8369300001 |
| 15 | 319159544 | 319159605 | 47.14754 | 0.8791533 | 44.59016 | 0.8549774 | 0.945758 | 0.004223412 | 23 | 18 | 1013 | 8369300001 |
| 16 | 319159605 | 319159666 | 45.83607 | 0.8668396 | 43.26229 | 0.8454949 | 0.9513591 | 0.00406822 | 23 | 18 | 1013 | 8369300001 |
| 17 | 319159666 | 319159727 | 47.40984 | 0.8815954 | 44.26229 | 0.8621766 | 0.9564315 | 0.003795894 | 23 | 18 | 1013 | 8369300001 |
| 18 | 319159727 | 319159788 | 46.68853 | 0.8748632 | 43.26229 | 0.8530893 | 0.9508427 | 0.004051151 | 23 | 18 | 1013 | 8369300002 |
| 19 | 319159788 | 319159849 | 46.16393 | 0.8699344 | 43.26229 | 0.8467653 | 0.9474432 | 0.004205085 | 23 | 18 | 1013 | 8369300002 |
| 20 | 319159849 | 319159910 | 47.59016 | 0.8832704 | 44.26229 | 0.8581149 | 0.9438512 | 0.004272663 | 23 | 18 | 1013 | 8369300002 |
| 21 | 319159910 | 319160001 | 45.59016 | 0.8645113 | 43.34426 | 0.8429482 | 0.9507371 | 0.004103832 | 23 | 18 | 1013 | 8369300002 |
| 22 | 319160001 | 319160062 | 47.45901 | 0.8820525 | 44.77049 | 0.8567045 | 0.9433506 | 0.004296451 | 23 | 18 | 1013 | 8369300002 |
| 23 | 319160062 | 319160123 | 46.26229 | 0.8708607 | 43.98361 | 0.8491424 | 0.9507442 | 0.004073636 | 23 | 18 | 1013 | 8369300002 |
| 24 | 319160123 | 319160184 | 46.09836 | 0.8693163 | 43.80328 | 0.8473998 | 0.9502134 | 0.004101656 | 23 | 18 | 1013 | 8369300002 |
| 25 | 319160184 | 319160245 | 44.22951 | 0.8515127 | 41.90164 | 0.8288016 | 0.9473684 | 0.004298942 | 23 | 18 | 1013 | 8369300002 |
| 26 | 319160245 | 319160306 | 47.39344 | 0.881443 | 44.96721 | 0.8585845 | 0.9488066 | 0.004098941 | 23 | 18 | 1013 | 8369300002 |
| 27 | 319160306 | 319160367 | 45.21312 | 0.8609289 | 43.01639 | 0.839754 | 0.951414 | 0.004093954 | 23 | 18 | 1013 | 8369300002 |
| 28 | 319160367 | 319160428 | 47.60656 | 0.8834226 | 45.26229 | 0.861397 | 0.9507576 | 0.004015192 | 23 | 18 | 1013 | 8369300002 |

Environmental parameters

Track rate

Time

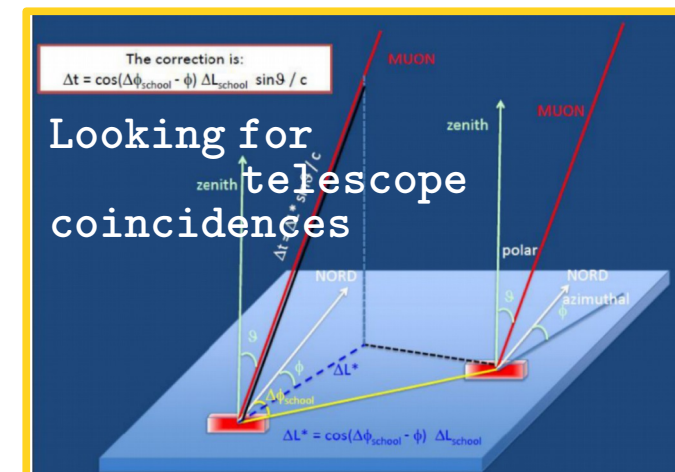
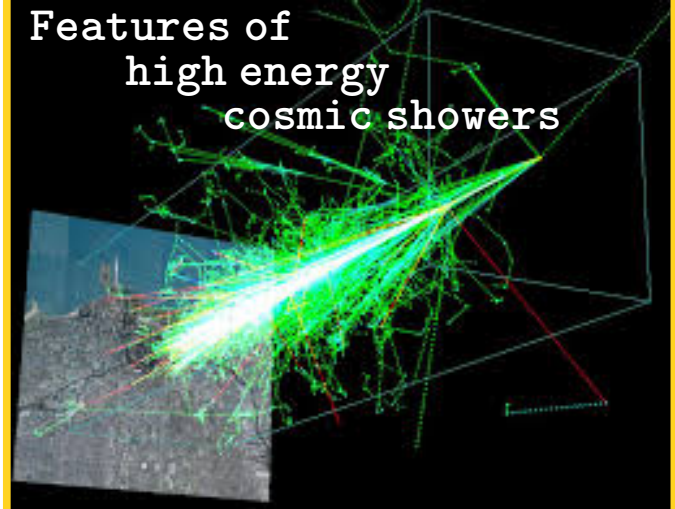
Phase V: bringing the students to Data Analysis: EEE MasterClasses

EEE Masterclasses are meant to be tools for teachers and students to

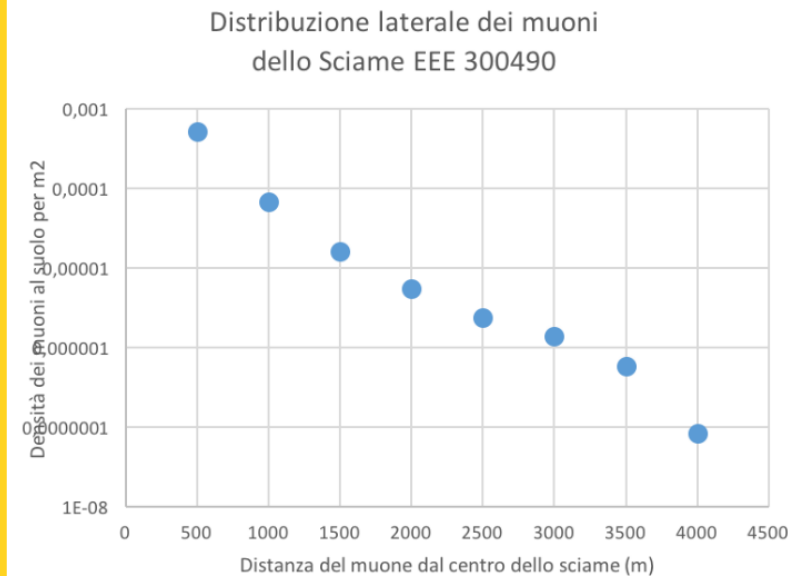
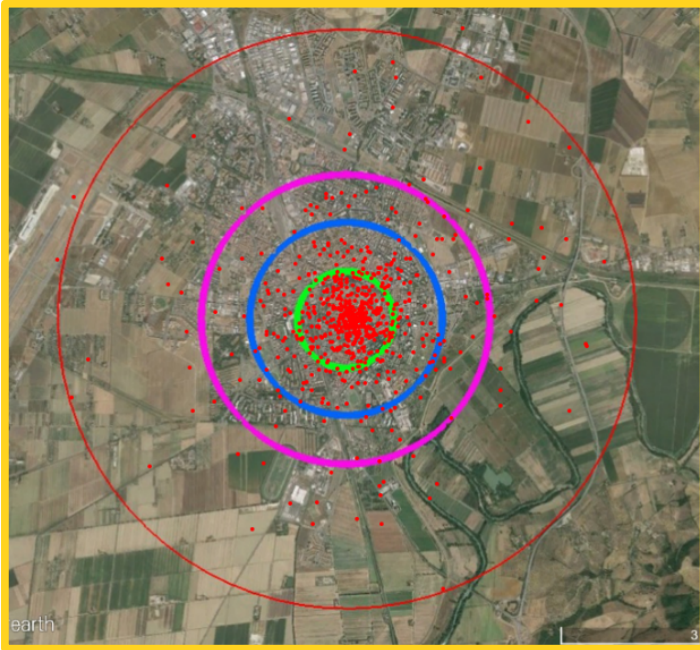
- get **involved in real experiment** data analysis
- introduce students to **physics and mathematics with a “direct”** approach

A complete set of **instructions for telescope shifting** while

- learning the physics by **in-depth reading of plots and parameters**
- Performing **collateral activities** during and after the shifting



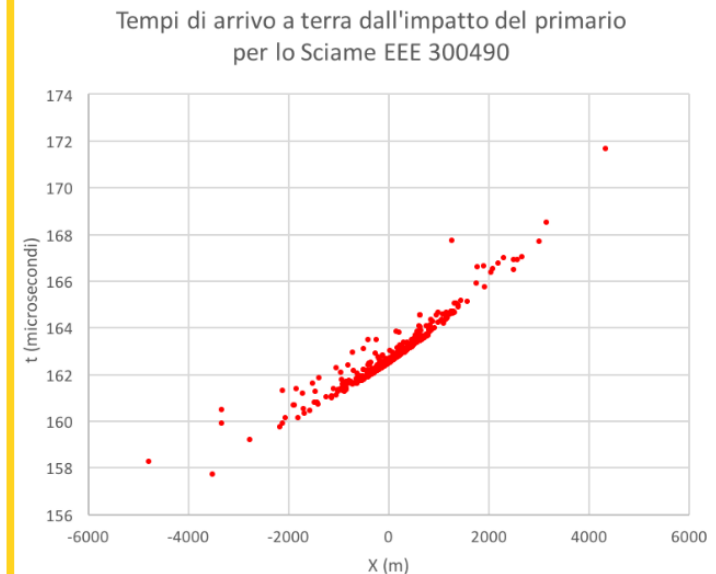
Phase V: bringing the students to Data Analysis: MasterClasses - Features of High Energy Cosmic Showers



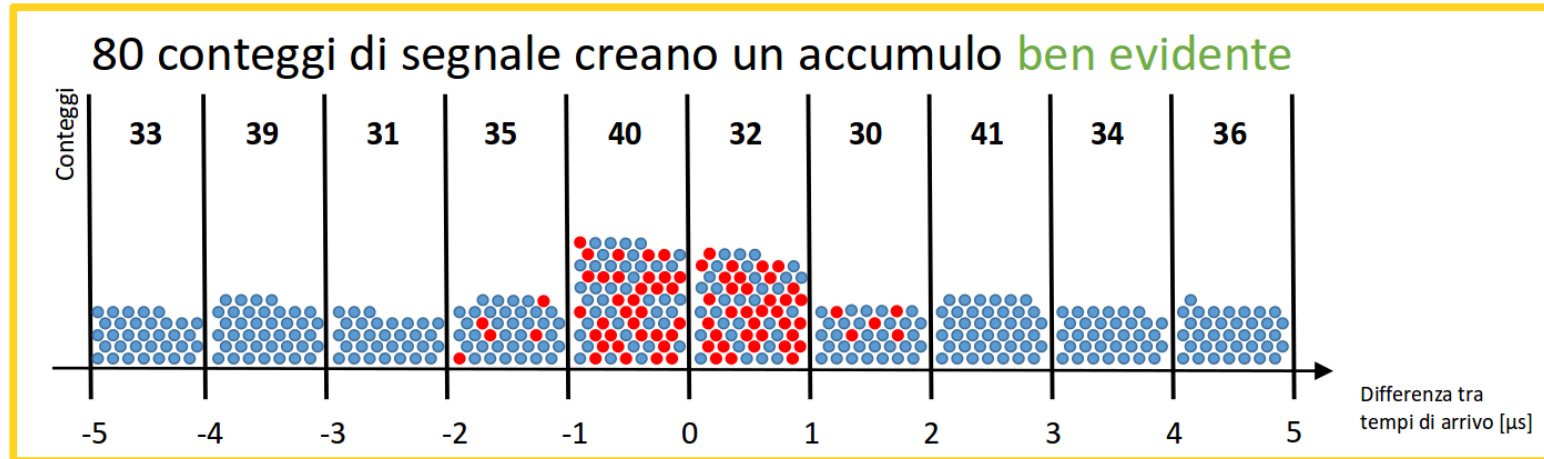
The Masterclass give a complete tool for studying showers parameters

- Lateral distribution
- Arrival time and direction

out of a MC shower dataset



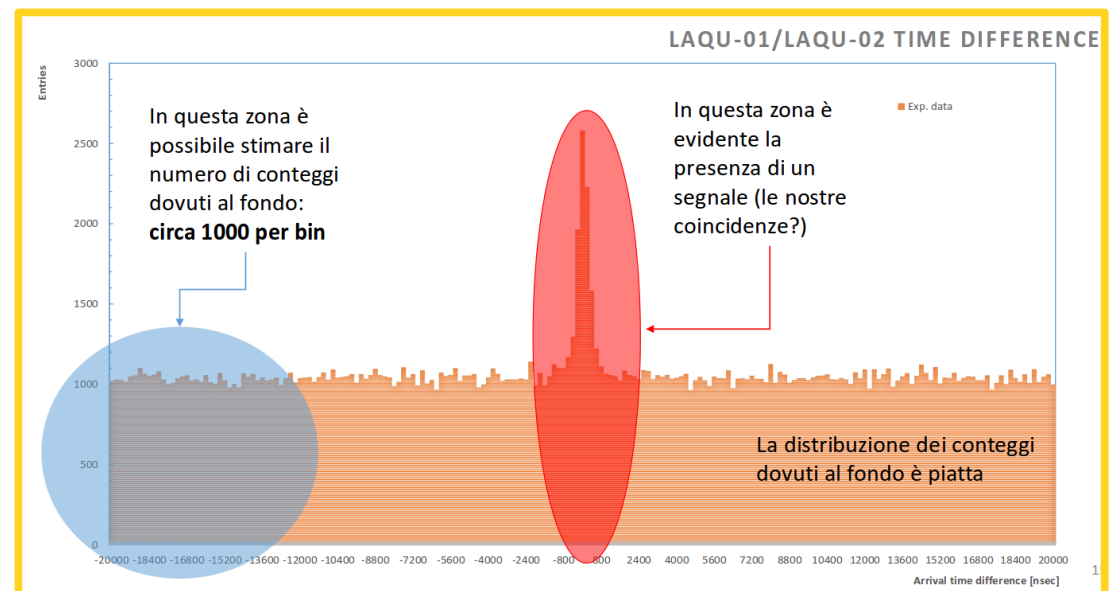
Phase V: bringing the students to Data Analysis: MasterClasses - Looking for Telescope Coincidences



The Masterclass give a complete tool for studying Muon Coincidences among telescopes.

Learning

- Basis in **Statistics and Probability**
- Identifying both
 - **Signal**
 - **Background**



Phase VI: how a real Scientific Collaboration works Symposia

Since the beginning of the Project **Symposia** and Open Run Coordination Meetings are organized where students and teachers

- are kept **up-to-date on scientific results** and activities
- **Present their own analysis** and works.



Last Symposia:

Bologna, November 6-7th
for Northern Italy Schools

Grosseto April 15-16th
for Central Italy Schools

Bari, October 13-14th
for Southern Italy Schools

Erice → May 29-31st

Phase VI: how a real Scientific Collaboration works

Open Analysis Meeting

The screenshot displays the VidyoDesktop interface for a meeting titled "EEE_run_coordination_meeting_-_open_to_schools@vidyoportal.cem.ch". On the left, a sidebar lists 57 participants, with the count "Partecipanti: 57" circled in red. The main area shows three video feeds:

- Top Left:** A group of students in a classroom, labeled "Fabrizio Coccetti".
- Top Right:** A black screen with a red "X" icon, labeled "prof. R. zingoni liceo scientifico F. d'Assis".
- Bottom Left:** A presentation slide titled "Statistica accumulata" by Francesco Noferini. The slide features a line graph showing cumulative data over time, with a red line and a blue shaded area. Text on the slide includes: "Del 2014 EEE è in acquisizione coordinata. Tutti i dati sono tracciati e ricostruiti in un unico centro (CNAH). In questo momento abbiamo accumulato circa 33 miliardi di tracce candidate." and "A sommare tutti i dati sono stati e processati per includere nella analisi le informazioni su tracce multiple all'interno dello stesso evento!".
- Bottom Right:** A group of students in a classroom, labeled "LiceoPasoliniPotenza".

At the bottom of the sidebar, a speaker icon indicates audio from "Francesco Noferini".

Using Vidyo Conference: schools connect to a dedicated virtual room, hundreds of participants!

EEE Outreach - Next:

Spontaneous Initiatives

Several local initiatives:

- Workshops
- Schools
- Meeting among teachers for didactic material exchange
-

Some of them going national through streaming...



I.I.S.S. Scipione Staffa Istituto di Istruzione Secondaria Superiore "Scipione Staffa" Via Cappuccini, 23 - 06048 Trinitapoli (BT)

**A scuola di raggi cosmici
giornata di studio**

Venerdì 2 dicembre 2016 ore 17,00
Aula Magna Istituto "STAFFA"
Trinitapoli (BT) - Via dei Cappuccini 23

Relatori:
Cosimo Antonino Strazzeri (Dirigente Scolastico)
"IL LICEO CLASSICO E LA RICERCA SCIENTIFICA"

G. di Staso - M. Lafata (Referenti Progetto EEE)
"DIECI ANNI DI FISICA NUCLEARE ALLO STAFFA"

Marcello Abbrescia (Dipartimento Interateneo di Fisica - Bari)
"EXTREME ENERGY EVENTS _ RUN3"

Interventi degli studenti:
Cristina di Lecce (Studentessa Universitaria Corso di Laurea in Fisica)
Daniele Monterisi (Studente Universitario Corso di Laurea in Informatica)

Dalle ore 9,00 alle 13,00 e dalle 16,00 alle ore 20,00
sarà possibile effettuare la **visita guidata al telescopio**
per lo studio dei raggi cosmici al primo piano dell'Istituto
e la mostra fotografica sulle attività relative al progetto EEE

Il Dirigente Scolastico
prof. Cosimo Antonino Strazzeri



EEE Outreach - Next: Building a Wide Outreach Network in Science

Science awareness is a fundamental aspect of Research itself:

- because of the strong economical impact of Science, the role of Society in taking decision on Science is growing
- ◆ Science can (and should) also drive the upgrade on how Science is taught
- Europe (and not only Europe) is strongly asking for
 - direct contacts among Science and Society (industry, school, communication, welfare)
 - New ways of teaching and making Science (pushing on the need for interdisciplinarity)

Real experiments directly involving Society are the most effective way of

- getting many of these requirements
- opening for new ideas and activities

EEE Outreach – Next: Building a Wide Outreach Network in Science

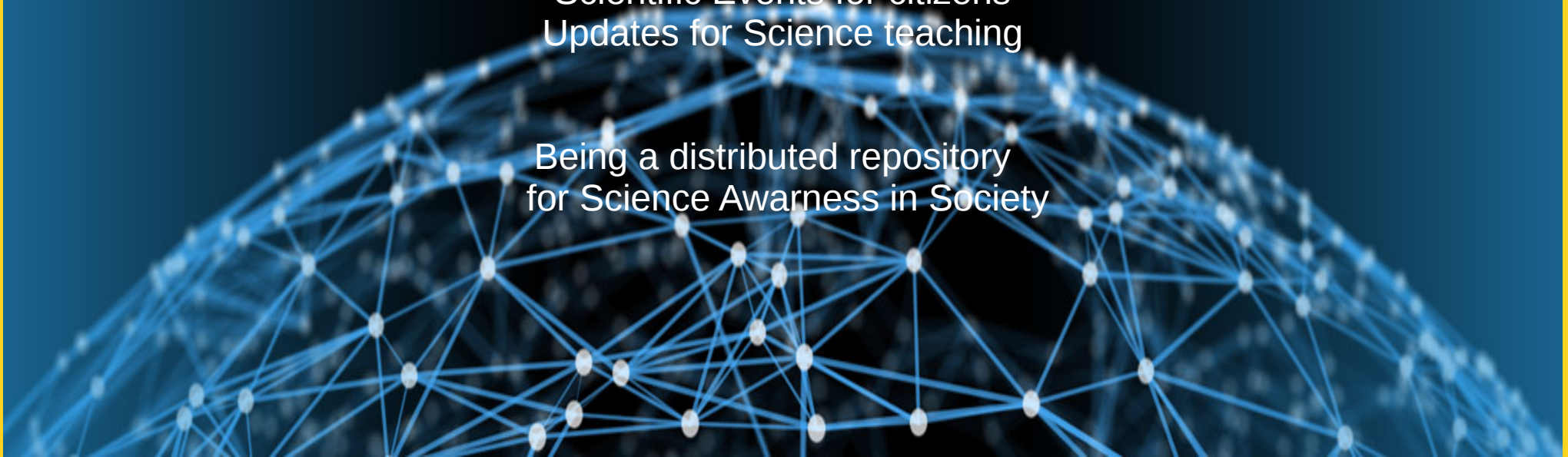
The community of Experiments involving schools and students is growing,
Reaching almost the whole Europe and more....

A beautiful idea of Science as the real Global Community
Can be reached working together for:

A connected net of experiments
Open data
European+ Web Portals for

Direct Science Communication
Scientific Events for citizens
Updates for Science teaching

Being a distributed repository
for Science Awareness in Society



Backup

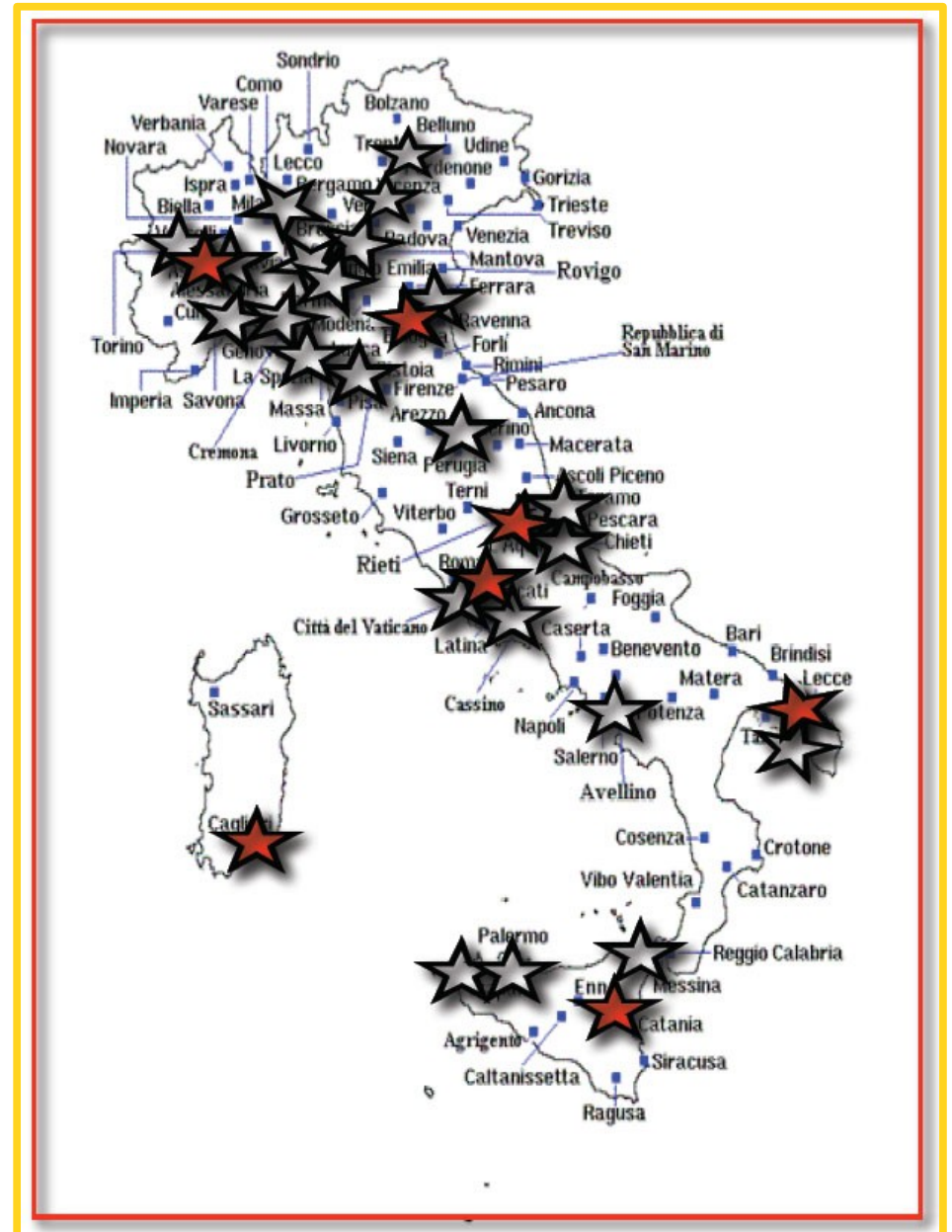
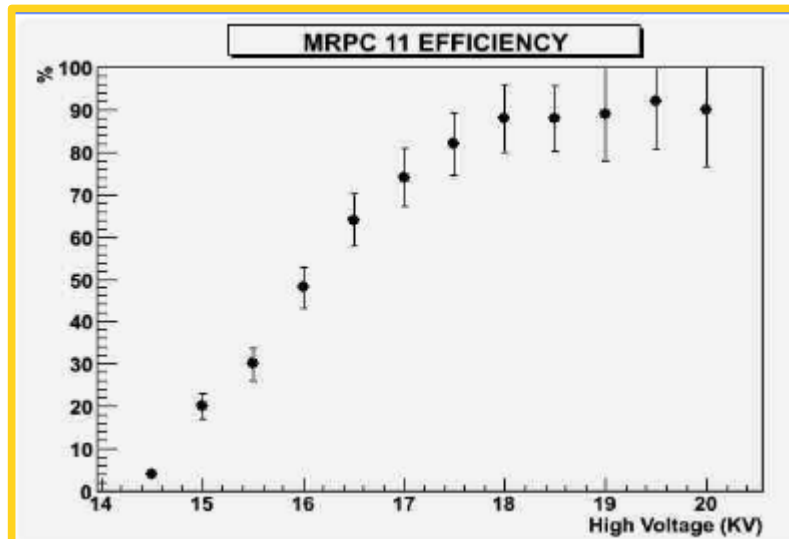
EEE: the early times



2004-2005

7 pilot sites

- Bologna
- Cagliari
- Catania
- Lecce
- Bari
- LNF
- Torino



The present status of EEE observatory



The 52 telescopes are organized both in

- Single station
- 2/4 telescope clusters installed in nearby schools

Other

10 schools/ Universities

are being equipped with telescopes within the year

Phase II: when a school enters the RUN Data taking and Shifting like a researcher

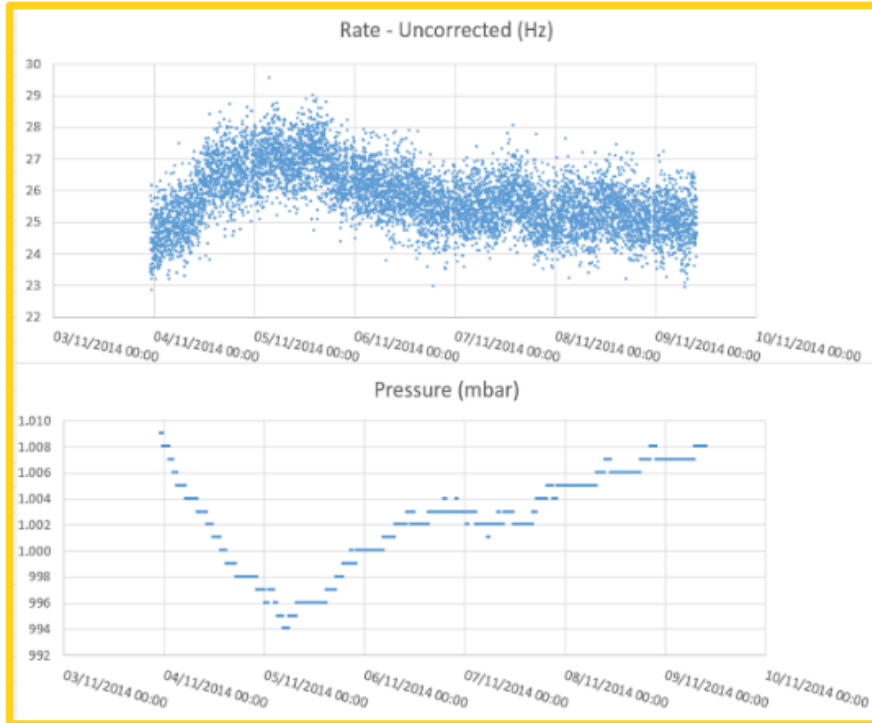
The screenshot shows the 'EEE Data Acquisition' software window, titled 'TORI-04-2014-12-10-00021.bin'. The interface is divided into several sections:

- Run Tab:** The active tab, showing the 'Output Directory' set to 'E:\Data' and a 'Comment' box containing weather data: 'VWS Data: 2014-12-10 11:26', 'Indoor Temperature: 21,0 °C', 'Outdoor Temperature: 10,0 °C', and 'SL Barometer: 992 hPa'.
- Configuration Tab:** Shows 'Min Events per Run' set to 50000, 'Auto Restart' checked, and 'Runs' set to 0.
- Rate Monitor:** A gauge showing the 'Average Rate' as 56,17Hz and the 'Run No.' as 2. The gauge itself shows a 'Real time muon rate' of 56.
- Acquired Events:** A box showing 14134 events.
- Binary File:** A text box showing the file path 'TORI-04-2014-12-10-00021.bin'.
- Bottom Panel:** Includes a 'STOP' button, 'Current Time' (11:30:46 10/12/2014), 'Start Time' (11:26:34 10/12/2014), 'Stop Time' (11:30:46 10/12/2014), and an 'EXIT' button.

Annotations with arrows point to the following elements:

- Data folder:** Points to the 'Output Directory' field.
- Data from weather station:** Points to the 'Comment' box.
- # per run:** Points to the 'Min Events per Run' field.
- Continuous data taking:** Points to the 'Auto Restart' checkbox.
- Average muon rate:** Points to the 'Average Rate' display.
- Real time muon rate:** Points to the 'Rate Monitor' gauge.
- Data file:** Points to the 'Binary File' text box.

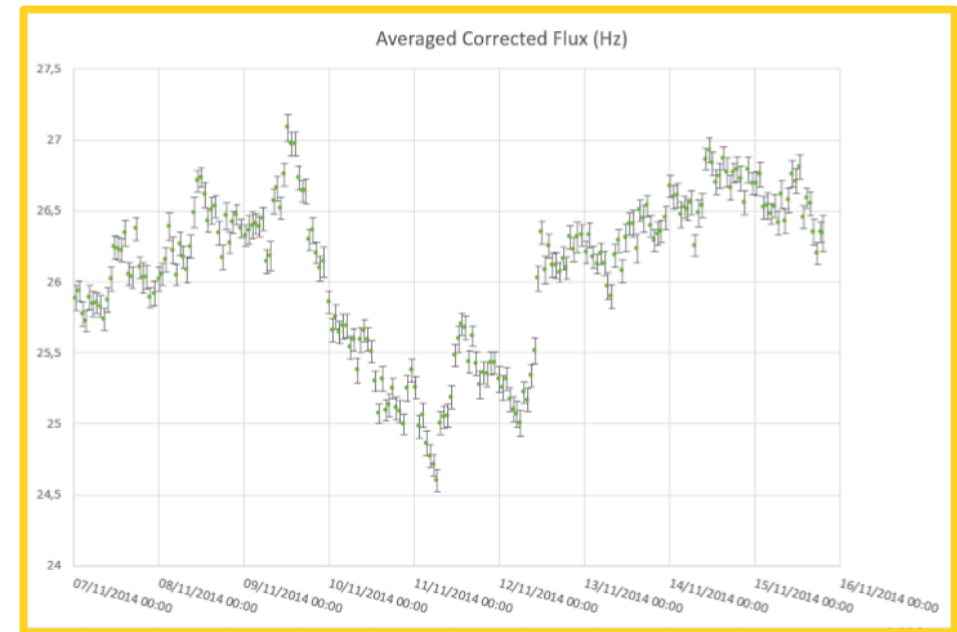
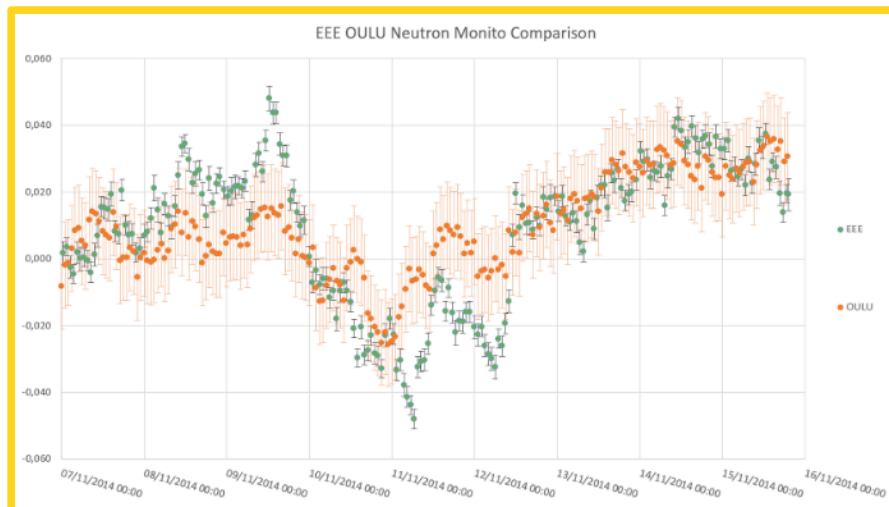
Phase V: bringing the students to Data Analysis: MasterClasses - Hunting for Extreme Events on Sun



The Masterclass give a complete tool for studying
Galactic Cosmic Ray Flux
Decreases due to Coronal Mass
Ejections on Sun.

Learning how to

- **Correct data**
- **Manage Uncertainties**
- **Compare different experiments**



Phase V: how a real Scientific Collaboration works

Open Analysis Meeting

Already 3 Open Run
Coordination Meetings

November 30th, 2016

January 11th, 2017

February 8th, 2017

Using Vido platform

Reaching all the schools
of the Collaboration

- Updates
- New telescopes
- Lectures
- Run Coordination decisions
- Analysis status
- Data Taking
- Students presenting their results
-

EEE run meeting open to schools


Wednesday, 11 January 2017 from 14:30 to 18:00 (Europe/Rome)

Wednesday, 11 January 2017

14:30 - 14:40

Introduction and news 10'

Speaker: Marcello Abbrescia (Università di Bari)

Material: [Slides](#) 

14:40 - 14:50

Update of Statistics from Run-3 10'


Speaker: Fabrizio Coccetti (Centro Fermi)

Material: [Slides](#) 

14:50 - 15:10

EEE Cosmic box 20'


Speaker: Mr. Ivan Gnesi (Centro Fermi)

Material: [Slides](#) 

15:10 - 15:25

Analisi dello sciame EEE 400019 15'

Speaker: Barbara Maria Balcon (Liceo "S.G. Calasanzio" di Carcare (SV))

Material: [Slides](#) 

15:25 - 15:35

Discussion 10'

Speaker: ALL