



IPPOG – BRASIL

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Context - Disclaimer

- NOT EVERY outreach activity about particle physics in Brazil is included in this presentation!
- NOT EVERY person that organizes great outreach activities in the country are mentioned!
- Focus on the **Working Group of Particle Physicists and Science Education Experts** created during the process of the Brazilian association to IPPOG in 2017
 - *51 members*
 - *We call it IPPOG-Brasil*



Goals of the Working Group IPPOG - Brasil

- Represent Brazil in IPPOG
- Promote contact between the various actors (researchers, teachers, interested public in general) involved in outreach activities and teaching of high energy physics
- Disseminate IPPOG activities and actions in the entire country
- Disseminate local initiatives for outreach and teaching of high energy physics among the members
- Motivate broader and inter-institutional projects



Activities

- Periodic remote meetings to discuss activities and actions
- An annual face-to-face meeting
 - *Editions in 2018 and 2019*
 - Hans Peter participation in 2019
- Main activities so far:
 - *Masterclasses Hands On Particle Physics*
 - *Cosmic ray detectors in the schools*
 - *Some more localized and group initiatives*

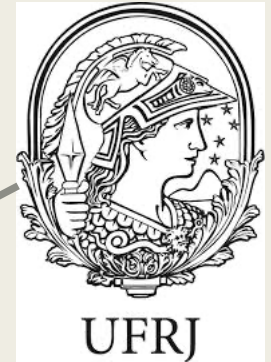
IPPOG-Brasil: Main participants



IPPOG-Brasil: Main participants



Brazil is a “continental” country!
Need to expand!



Masterclasses in Brazil



- National Coordinator:
Marcia Begalli (UERJ) →
- Started in 2008 (UERJ and
UNESP, *Sandra Padula*)



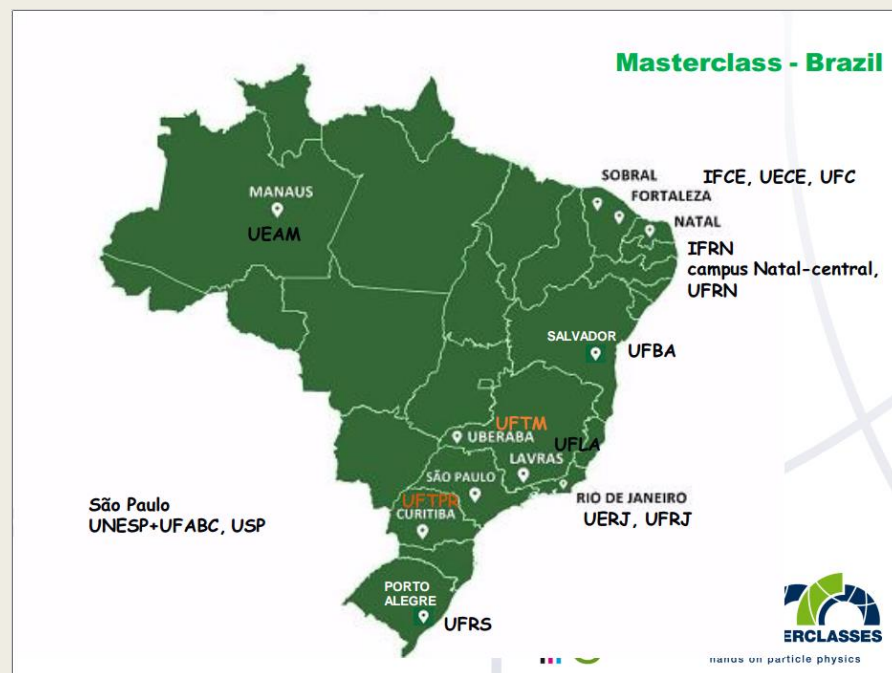
In "*Particuleiro Nordestino*" →
something like *Particle Guy from the North East* (of Brazil)

<https://www.facebook.com/ParticleAstroparticleNatal/>

Masterclasses in Brazil



- National Coordinator:
Marcia Begalli (UERJ)
- Started in 2008 (UERJ and UNESP, *Sandra Padula*)
- Nowadays, it is organized in 16 institutions of 9 Brazilian states, reaching around 1000 students every year
- Several courses are organized for high school teachers in different institutions
- Several academic works, like thesis, papers, etc.
- Discussion about an strategy to expand the activity through the country (a National Masterclasses?)



Cosmic Ray Detectors in Schools



- Create a cosmic ray detector network in high schools involving students and teachers in the detector assembly and data analysis, motivating them in studying particle physics topics and spinoff technologies.

Cosmic Ray Detectors in Schools



- Create a cosmic ray detector network in high schools involving students and teachers in the detector assembly and data analysis, motivating them in studying particle physics topics and spinoff technologies.
- Maybe we can fix this?



Cosmic Ray Detectors in Schools



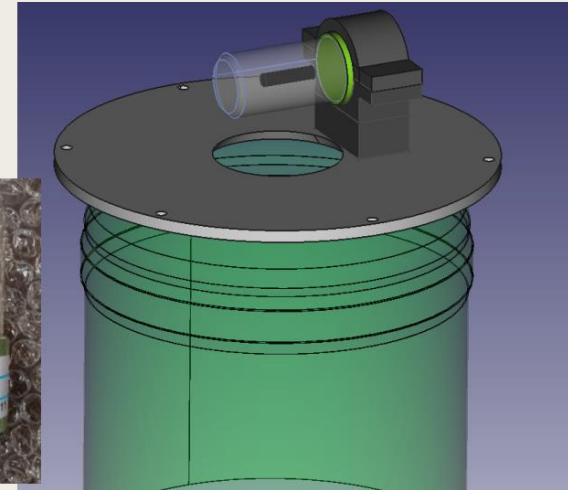
- First steps with CERN Cosmic π^0 s
 - *Gustavo Silveira, Rafael Pezzi (UFRGS)*
 - *Miriam Gandelmann and Irina Nasteva (UFRJ)*
 - *André Massafferri, Arthur Moraes (CBPF)*



Cosmic Ray Detectors in Schools



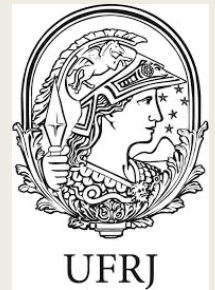
- Initial proposal from UFRGS
 - *Gustavo Silveira and Rafael Pezzi*
 - PMT with water tank
 - Hamamatsu R446
 - DAQ system for PMT and read module with Arduino
 - Interface for PMT signal integration to Arduino



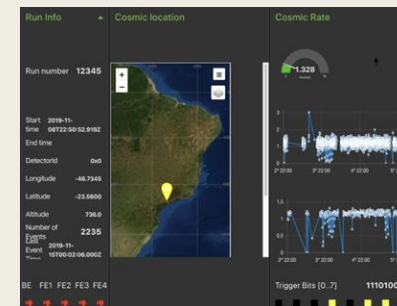
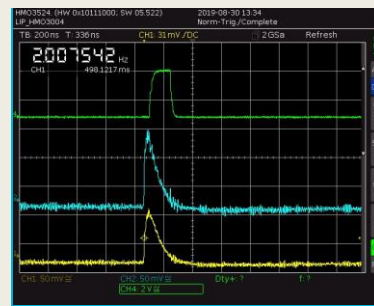
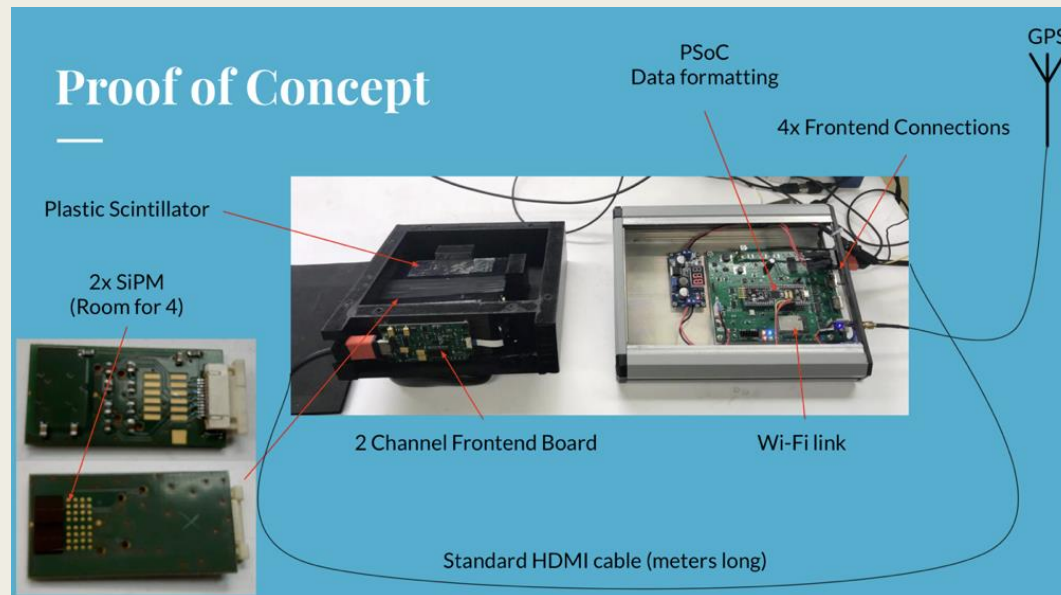
<http://cta.if.ufrgs.br/projects/detector-de-raios-cosmicos/wiki>

Cosmic Ray Detectors in Schools

- Proposal lead by USP (Marco Leite):
 - *Low cost, based on plastic scintillator + SIPM*
 - *Simple operation*
 - *Safe*
 - *Associated to a long term pedagogical proposal*
 - *Flexible: one backend control up to 8 individual detectors for different trigger configurations*
- Project was awarded with funds from RENAFAE and the Brazilian National Funding Agency - CNPq (fellowships)



Cosmic Ray Detectors in Schools



BL4S

- Contact person: *André Massafferri*
- Two Brazilian groups pre-selected:
 - [2017] Campinas (SP)
Dispersion and Absorption of muons: a new methodology for analysis of one of the largest environmental disasters of Brazil
 - [2019] Rio de Janeiro
The Particle's song that uses hydrophones to detect the DESY electron beam.
- Masterbeam in CBPF: program that merges BL4S and Masterclass, since 2017 with 2h/week for 8 months.

Year	Teams	Countries	Brazil(%)
2014	292	50	2(0.7)
2015	119	28	0(0)
2016	150	37	3(2)
2017	180	43	5(2.8)
2018	195	42	12(6.2)
2019	178	50	8(4.5)



ATLAS + CMS Virtual Visits

- National initiative since 2012 (ATLAS Brazil)
 - *Around 5000 participants*



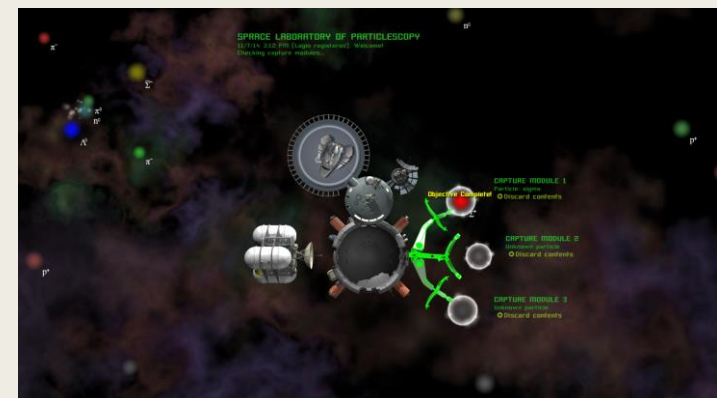
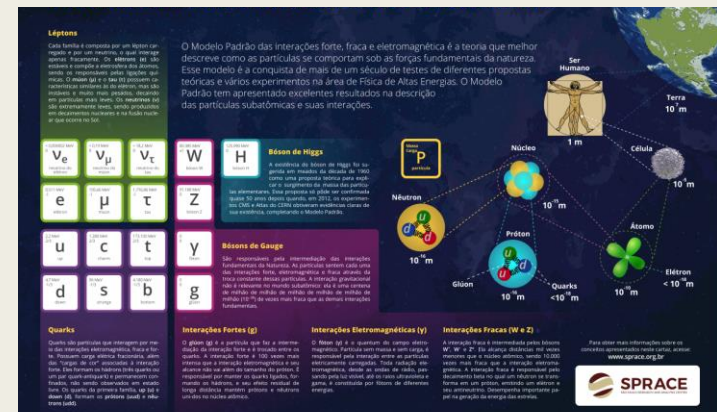
ATLAS Virtual Visits

- Regular visits in UFRJ (José Seixas) since 2014
 - Around 4500 students and 100 school teachers
 - Schools can book the visits through the web
 - The university offers a bus (46 seats) to bring the students and teachers from public schools and a coffee break



SPRACE-UNESP/UFABC

- Largest Masterclasses event organized in the country (almost 400 students in 2018)
- 50.000 posters distributed to Brazilian Schools (1st version) and there is a 2nd version now
- SPRACE Game (translated to English and German)





Perspectives

- **Main message:** Working group of particle physicists and science education experts organized during the process of the Brazilian association to IPPOG in 2017
- Common projects starting to be organized!
- But we still need to expand the number of active people/institutions in the group and the number/scope of the projects. Some ideas:
 - *Create a meeting point in the web for particle physicists interested in outreach and the public*
 - Can IPPOG help us?
 - *Create a network with school teachers*
 - *Enhance social and traditional media presence*

Cosmic rays detector for schools

- ❖ Based on plastic scintillator + SiPM
- ❖ Up to 8 detector channels per station
- ❖ Wireless connection
- ❖ GPS timestamp for inter-station synchronisation
- ❖ Access to operation conditions readout and control
- ❖ Remote testing/calibration
- ❖ Local data storage (several days)
- ❖ Dynamic trigger configuration
- ❖ Communication by MQTT protocol
- ❖ Data stored in a SQL database
- ❖ Remote data access/monitoring
 - ❖ Nodered
 - ❖ Jupyter notebook
 - ❖ any other framework (access to DB or MQTT broker)
- ❖ Prototype operating non-stop for about 3 months now
- ❖ Several hardware conditions information for data quality

