Spokesperson report
OPERA Collaboration Meeting
Anacapri, May 31st – June 1st 2018

Giovanni De Lellis

PHYSICAL REVIEW LETTERS **120,** 211801 (2018)

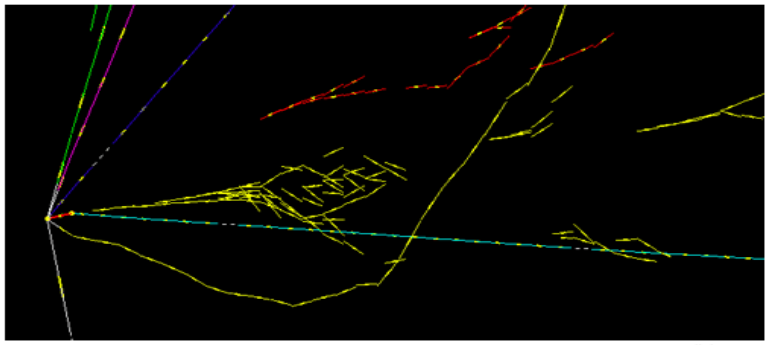
Editors' Suggestion | Featured in Physics

Final Results of the OPERA Experiment on ν_τ Appearance in the CNGS Neutrino Beam

Synopsis: OPERA's Final Stamp on Neutrino Oscillations

May 22, 2018

The final analysis of data collected by the OPERA experiment improves the precision of measurements of neutrinos oscillating between muon and tau flavors.



OPERA Collaboration

Final Results of the OPERA Experiment on ν_τ Appearance in the CNGS Neutrino Beam

N. Agafonova *et al.* (OPERA Collaboration)

Phys. Rev. Lett. 120, 211801 (2018)

Published May 22, 2018

Features

Meetings: WIMP Alternatives Come Out of the Shadows

At an annual physics meeting in the Alps, WIMPs appeared to lose their foothold as the favored dark matter candidate, making room for a slew of new ideas.

Q&A: Looking for Failure

Karen Daniels explains how force maps in

https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.120.211801
https://physics.aps.org/synopsis-for/10.1103/PhysRevLett.120.211801

The OPERA experiment at the Gran Sasso National Laboratory in Italy was designed to detect the type of neutrino oscillation in which a muon-flavored neutrino changes into a tau-flavored neutrino. The experiment, which ran between 2008 and 2012, searched for tau neutrinos appearing within a beam of muon neutrinos generated at CERN in Switzerland. The detection of five tau neutrinos allowed OPERA to claim the discovery of muon-tau neutrino oscillations in 2015. The same collaboration now reports an updated analysis showing that OPERA detectors actually caught sight of ten tau neutrinos. The new results also provide more accurate estimates of parameters describing neutrino oscillations and tau neutrino properties.

Oscillations between neutrinos of different flavors are only possible if neutrinos have mass. While several experiments have seen neutrino oscillations, researchers are still striving to improve the precision of measurements of the process, which could reveal details of the mechanisms that give neutrinos their mass. OPERA's final analysis of their data relies on a strategy that, compared with the previous strategy, is better optimized to discriminate between tau neutrinos and muon neutrinos. The new analysis suggests that out of 19,505 detected neutrinos, ten were tau neutrinos, which boosts the statistical confidence in the oscillation detection compared with the 2015 report. The reduction of the statistical uncertainties also allowed the collaboration to improve on their previous estimate of the mass difference between neutrino types and of the probability for a tau neutrino to interact with matter and produce a tau lepton.

This research is published in ***Physical Review Letters***.

–Matteo Rini

1/4 success rate of papers submitted to PRL
1/6 Editor suggestions

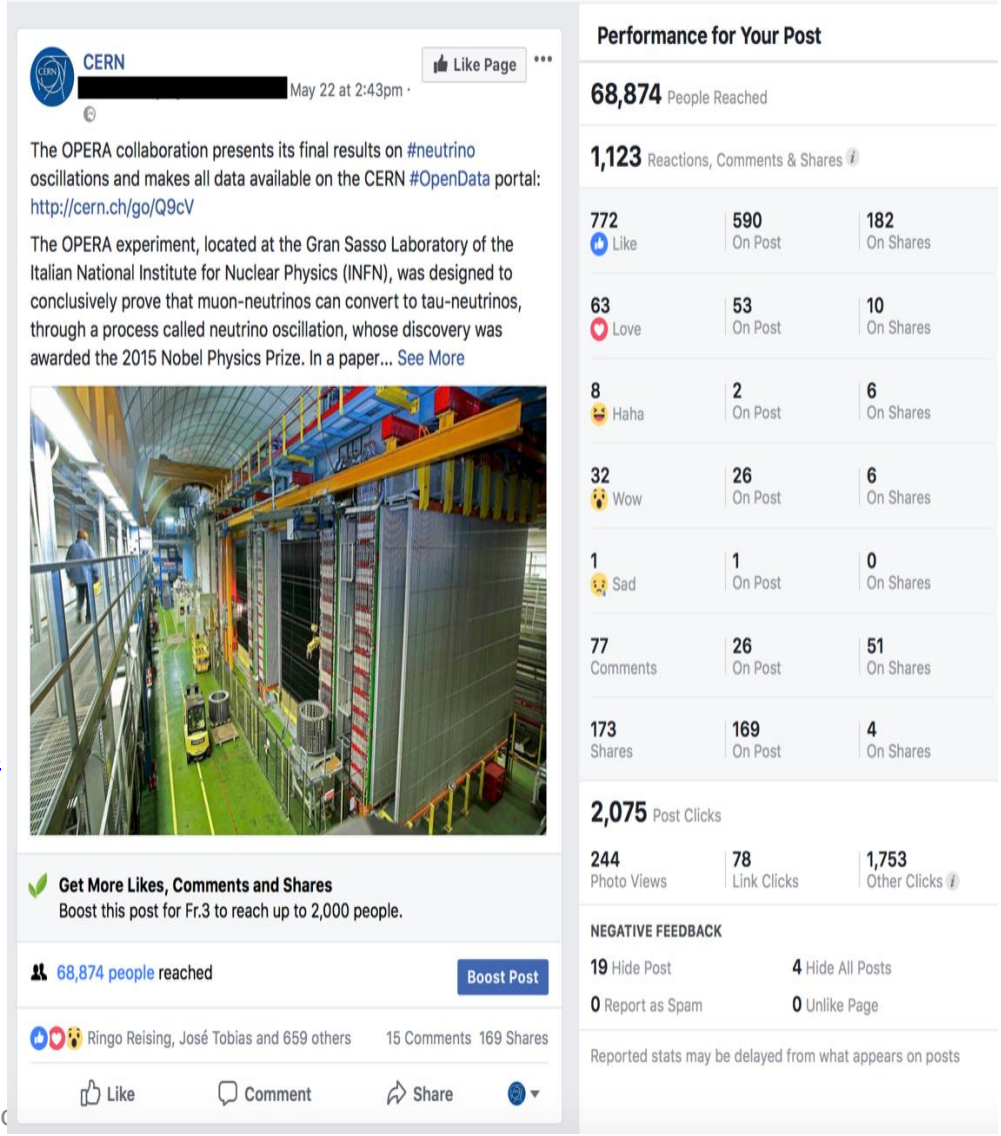
CERN press and social media

as of May 30th

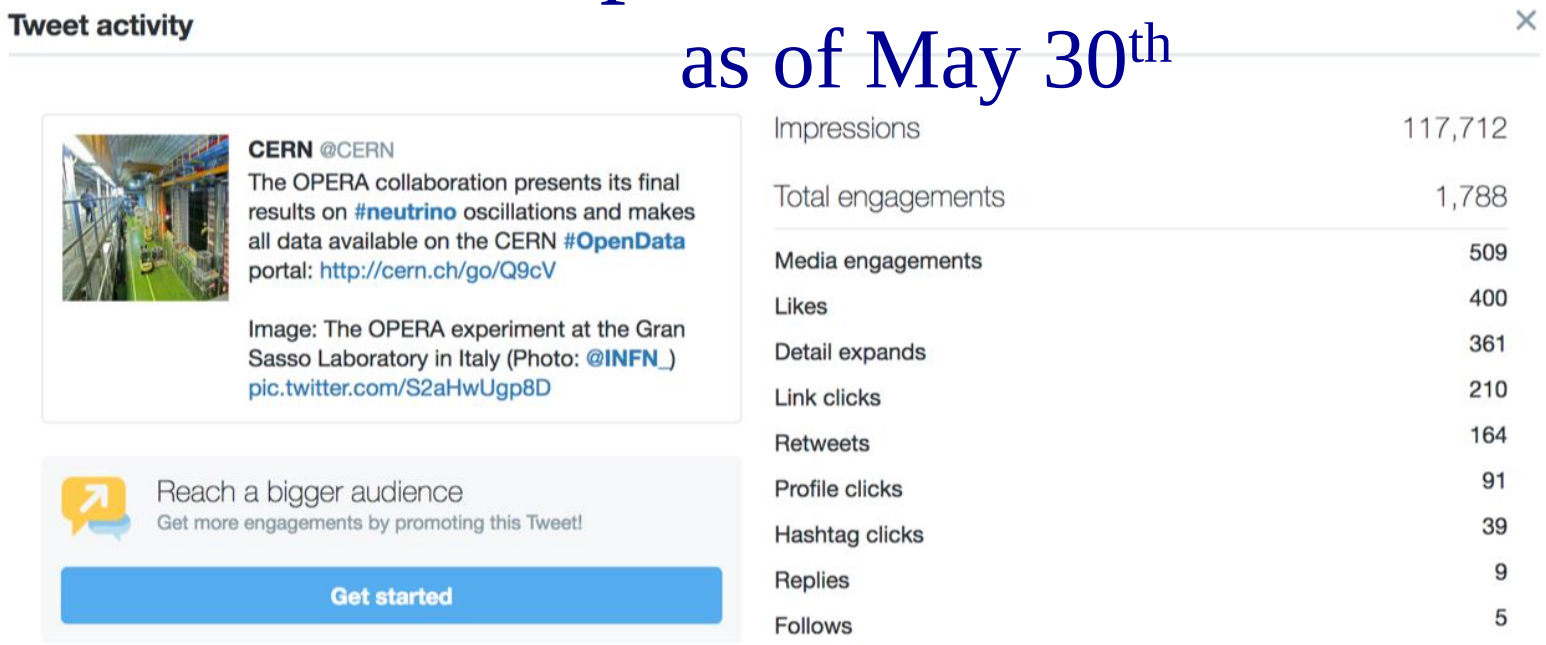
The article on the CERN home page (not the press website) has received 2263 unique pageviews so far, with readers spending an average of 04:54 on it.

The Facebook post has received 169 re-shares and 661 likes: https://www.facebook.com/cern/photos/a.173272186093468.45199.169005736520113/1708316059255732/

The Instagram post has received 6039 likes: https://www.instagram.com/p/BjFITsMlHAg/



CERN press and social media as of May 30th



The Twitter post has received 164 re-tweets and 400 likes: https://twitter.com/CERN/status/998907266521862144

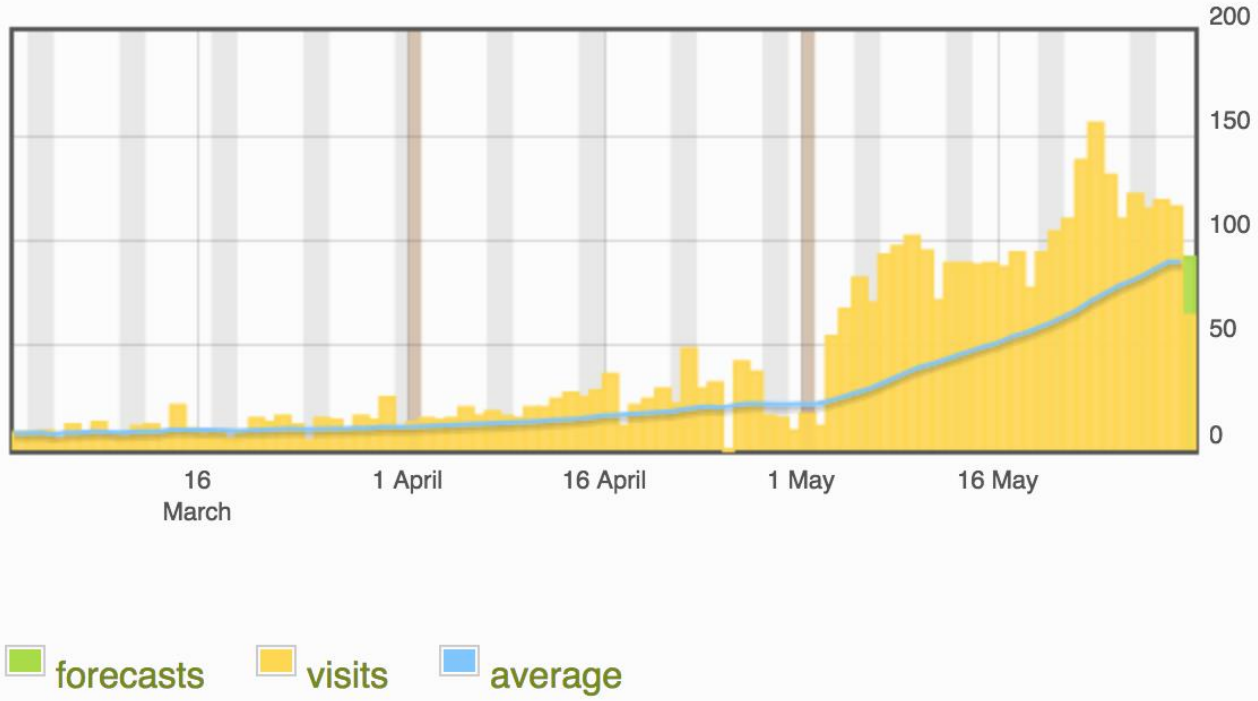
Around 2700 people view the article in just one week

2000 is considered the threshould above which the paper is considered a good and successful one by CERN Website standard

OPERA web site (Yuri)

Visitor Statistics

Number of visits per day csv | 90 days |



Resume

Maximum	**156**
Average	**90**
Today	64
Yesterday	116
Total	484364
Site popularity	31

Δm^2 measurement in the PDG

- I have informed the editors of the chapter: they are willing to include it
- Deadline for Summer 2018 already passed, but they will include it in the next round of update

OPERA Open Data at CERN

- OPERA is the first non-LHC experiment joining the educational and research program of the Open Data Portal service
- Two samples of muon and tau neutrino interactions are now available at CERN: data & event display (effective for education)

Education

The CMS (Compact Muon Solenoid) experiment is one of two large general-purpose detectors built on the Large Hadron Collider (LHC). Its goal is to investigate a wide range of physics such as the characteristics of the Higgs boson, extra dimensions or dark matter

Explore CMS >

ALICE (A Large Ion Collider Experiment) is a heavy-ion detector designed to study the physics of strongly interacting matter at extreme energy densities, where a phase of matter called quark-gluon plasma forms. More than 1000 scientists are part of the collaboration

Explore ALICE >

The ATLAS (A Toroidal LHC ApparatuS) experiment is a general-purpose detector exploring topics like the properties of the Higgs-like particle, extra dimensions of space, unification of fundamental forces and evidence for dark matter candidates in the Universe

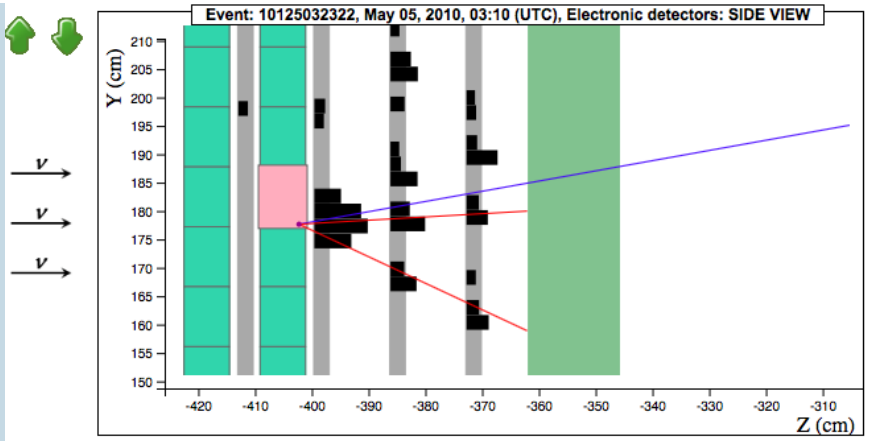
Explore ATLAS >

The LHCb (Large Hadron Collider beauty) experiment aims to record the decay of particles containing b and anti-b quarks, known as B mesons. The detector is designed to gather information about the identity, trajectory, momentum and energy of each

Explore LHCb >

The Oscillation Project with Emulsion-tRacking Apparatus (OPERA) is a scientific experiment for detecting tau neutrinos from muon neutrino oscillations. The experiment is a collaboration between CERN in Geneva, Switzerland, and the Laboratori Nazionali d

Explore OPERA >



Use of OPERA Open Data
as of May 30th

- about 3100 accesses to the news item http://opendata.cern.ch/docs/opera-news-first-release-2018

- about 1800 searches for OPERA related terms

- about 750 accesses to the "About OPERA" page

- about 500 accesses to the OPERA event display

- about 70 downloads of zipped multiplicity and tau datasets

Open Data is part of the OPERA legacy

- Multiplicity sample and tau neutrino events are already published
- First muon and tau neutrino interactions ever
- Agreed already to publish Monte Carlo simulated data for electron showers and an empty volume (real data) to be used to train machine learning algorithms. Giuliana has provided the data. A tutorial will be provided by Andrey Ustyuzhanin
- See whether we can publish also our 35 electron neutrino events (see Svetlana's talk)
- Cosmic-ray annual modulation data could also be published (Nicoletta/Alessandro)

OPERA data preservation

- Each lab has copied/is copying data from the local database to IN2P3
- Cristiano is copying the data to CERN (see Cristiano's talk)

What OPERA can do in the near future

See Komatsu's talk for more details

- Complete ongoing papers
  - Cosmic-ray annual modulation
  - Event with three vertices
- Sterile neutrino search in the muon to tau neutrino channel (10 events instead of 4!)
- Combine electron and tau appearance (OPERA is unique in doing that) and report also muon disappearance
- Study of non-standard interactions
- Lorentz invariance violation study

Next appointments

- Seminar at CERN on July 31st
- Committees:
  - SPSC final report on 16-17 October 2018