The OPERA Experiment

- G. Giacomelli University and INFN, Bologna Vulcano 26/5/2006 -CNGS neutrino beam from CERN to GS -lybrid Detector Clectors
- Hybrid Detector at GS
 Electronic Detectors
 Passive ECCs
- Main purpose: Appearance oscillation experiment: direct observation of $v_{\mu} \rightarrow v_{\tau}$

Collaboration: Belgium [1], Bulgaria [1], China [2], Croatia
[1], France [4], Germany [5], Israel [1], Italy [9], Japan [5],
Korea [1], Russia, [4], Switzerland [3], Turkey [1]







CNGS: the main components



Muon Profiles

Example: 6 mm horn neck lateral displacement



CERN-LNGS UTC clocks intercalibration

Performed in collaboration among: J.Serrano. P.Alvarez, J.Lewis (CERN), D.Autiero (OPERA), S.Parlati, G.Di Carlo(LNGS):

Put the two UTC systems side by side:

CERN system brougth to LNGS on and reinstalled with its own antenna and a DAQ chain and a time interval counter (300 ps res.) in order to monitor the time difference of the output of the two systems as a function of time. Data taking performed under various conditions

The CERN system was calibrated vs UTC by the Swiss metrology institute METAS (including antenna and 30m of cable) The cable delay is correctly accounted in the configuration Both CERN and LNGS will have a system with double units







Structure. Electronic Detectors

- Two equal supermodules, each made of:
- Target: 31 planes of bricks and 31 of scintillators
- Target tracker: 32000 scintillator strips with wavelength shifting fibers and 64 ch PMTs
- Muon spectrometer: twelve 5 cm iron slabs interleaved with RPC planes [B~1.55 T]
 plus precision tracker made of 12 planes of drift

tubes

- Two planes of glass RPCs [XPCs]
- Anticoincidence plane



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OPERA installation in pictures

April 2006

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SM1 Spectrometer

HPT6 will be installed as soon as the Target of SM2 will be completed (May 15th)

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Electronics installation on top platform





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Electronics and DAQ installation





TT DAQ network and Clock Ready for SM1 &SM2 HPT electronics Slow control installed TDC being installed Missing : front end

RPC electronics Installation started Today

Emulsion Cloud Chamber (ECC)

- Made of one 1mm Pb and two 44 μm emulsions
- Brick: 56 lead sheets and 56+56 emulsion layers (8kg)
- 2 changeable sheets in front of a brick
- One target: $\sim 10^5$ bricks = 0.9 kt
- Bricks assembled automatically with BAM
- Moved automatically with BMS
- Test of lead radioactivity \rightarrow Pb Ca colaminated
- Automatic scanning/measuring projectors with scanning speed of 20 cm²/h, $\Delta x=1\mu m$, $\Delta teta=2mr$





Scanning in Europe





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Parameters. Rates

∆m₂₃² MACRO 2.3 10⁻³ eV² SuperK 2.4 Soudan2 5.2 K2K 2.7 MINOS 3.05

Proton Beam $4.5 \ 10^{19} \text{ p/y} \rightarrow \times 1.5$

Rates $v_{\mu} \rightarrow \text{muon} 2600/\text{y kt} \times 1.5$ Rates for $v_{\mu} \rightarrow v_{\tau} 2-3 \text{ ev/y} \rightarrow 3-4$

Minimum teta₁₃ 7 degrees \rightarrow 6



Neutrino beam : tests will start in one month

Electronic detectors are essentially ready: final intercalibration will be done with v beam. They will be used with and without beam

ECC: only first SM will be filled this year

Scanning and measuring projectors are ready