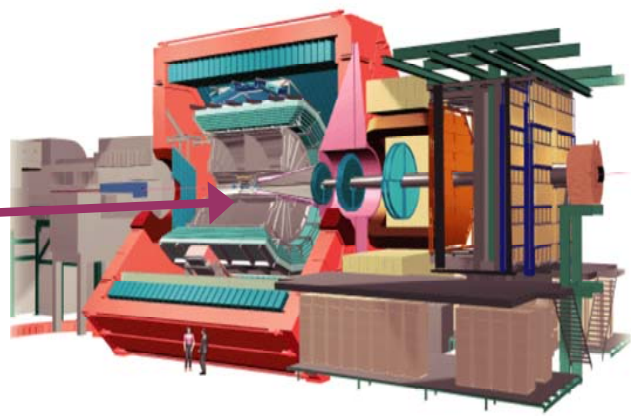
Alice

ALICE is a general-purpose heavy-ion experiment designed to study the physics of strongly interacting matter and the quark-gluon plasma in nucleus-nucleus collisions at the LHC. The ALICE collaboration currently includes more than 1000 physicists and engineers -both from nuclear and high-energy physics - from about 90 institutions in 30 countries.
The detector is designed to cope with the highest particle multiplicities for Pb-Pb reactions; it will be operational at the start-up of LHC.
ALICE consists of a central part, which measures event-by-event hadrons, electrons and photons, and of a forward spectrometer to measure muons.
The central part, which covers polar angles from 45° to 135° over the full azimuth, is embedded in the large L3 solenoidal magnet.
It consists of an inner tracking system (ITS) of high-resolution silicon detectors, a cylindrical TPC, three particle identification arrays of Time-of-Flight (TOF), Ring Imaging Cherenkov (HMPID) and Transition Radiation (TRD) detectors and a single-arm electromagnetic calorimeter (PHOS).
The forward muon arm (2°-9°) consists of a complex arrangement of absorbers, a large dipole magnet, and 14 planes of tracking and triggering chambers. Several smaller detectors (ZDC, PMD, FMD, T0, V0) for global event characterization and triggering are located at forward angles.
An array of scintillators (ACCORDE) on top of the L3 magnet will be used to trigger on cosmic rays. In 2006, several USA institutions and a team from INFN-LNF joined the ALICE Collaboration with the responsibility to design and built a large area calorimeter (EMCAL) designed to measure and trigger on high energy jets.

ITS



Alice

Inner tracking System (ITS)

Silicon Pixel Detector

The production and testing of detector ladders, the mounting of the ladders in half-staves and the assembly of half-staves into sectors was completed; two spare sectors are under construction. The readout electronic modules have all been produced and tested. The first half-barrel (5 sectors) is fully integrated and under test in the CERN DSF clean room with final electronics, DAQ, DCS, power supplies and services. The pixel trigger has been designed and a prototype is under test.

Silicon Drift Detector

Detector production, characterization and assembly of the transition HV cables were completed. Assembly of the front-end electronics, production of micro-cables, and mounting of detectors, electronics and cables into modules was also completed. The modules have been tested and assembly into ladders is finished. Assembly of ladders onto the mechanical support structure and testing was accomplished for the inner SDD layer and is ongoing for the outer layer.

Silicon Strip Detector.

Production of detectors, electronic components (sub-hybrids) and microcables was completed.
The components were assembled into modules and ladders.
The ladders were mounted and tested on the support cone including all electronics and ladder cables.
The detector was delivered to CERN in December and is ready for integration with the SDD.
All cables and patch panels inside the experiment are ready and installation is under way. The read-out crates (FEROM) have all produced, with half of them at CERN awaiting installation.

Finuda

Study of the production and decay of single Λ-Hypernuclei. The Λ-Hypernuclei will be produced by stopping the low-energy (~ 16 MeV) K^- from Φ decay at DAΦNE in very thin nuclear targets. A high-acceptance (> 2π sr) magnetic spectrometer will be used to perform spectroscopy of Λ-Hypernuclei, with emphasis on the spin-orbit splitting of different single particle states, and, mainly, a precise and systematic study of the non-mesonic decay of Λ-Hypernuclei, which is the only source of information about the four baryon weak process Λ + N -> N + N.
A further very important field of research was the study of the existence and of the properties of the so-called deeply-bound Kaon states. FINUDA discovered the K-pp deeply bound Kaon state and will continue vigorously this activity in the next run.
The preparation for the run was started in April 2006; the roll-in of the detector was done on July 2006.
The data taking was started in November 2006.

Installation of the new set of targets for the new data taking.
Roll-in of the Detector.
Debugging of the new DAQ with the full detector.
Calibration and alignement of the sub-detectors with cosmic rays.
Calibration of the new TOFINO with beams.
Start of the data taking.
Completion of the major part of the Physics analyses of the data collected in 2003/2004.

- ✓ Nuclear Physics A775 35
- ✓ Physics Letters B640 145
- ✓ Nuclear Physics A779 116

n_TOF

The experiment aims at measuring neutron cross-sections relevant to Nuclear Astrophysics and to applications to Accelerator Driven Systems, at the time-of-fligh facility n_TOF at CERN. The innovative features of the n_TOF neutron beam, in particular the high instantaneous flux, allow to measure with high accuracy capture cross-sections of importance for the modelling of Stellar Nucleosynthesis of heavy elements. Furthermore, the n_TOF experimental program includes measurements of capture cross-sections on long-lived fission fragments, and capture and fission cross-sections of minor actinides, needed for projects of nuclear waste transmutation.

During 2006 there were no measurements, due to the discovery of a level of radioactivity in the refrigeration water of the spallation target higher than allowed. It was therefore decided to replace the Pb spallation target with a new one, provided with an Al cladding. The design and construction of the target was initiated in 2006 and it is still in progress.
The activity of the INFN group in 2006 was therefore concentrated on data analysis of data collected in 2004 and on few measurements performed at the neutron facility GELINA at JRC-Geel. The analysis of La was completed and the relative publication prepared and accepted by Phys. Rev. C (the article will appear in the first issues of 2007). Other data completed were the capture cross-sections of ^{204}Pb and ^{207}Pb.
During 2006 continued the analysis of the neutron capture cross-sections of minor actinides measured with the 4pi total absorption calorimeter. The resonance parameters have been extracted for Au, with the aim on one hand to provide reference for other measurements, and on the other hand to provide new, more accurate data on this isotope used as standard for all capture cross-section measurements. The analysis of minor actinides (^{233}U, ^{237}Np, ^{240}Pu and ^{243}Am) is in progress and results are expected to be available within a few months.
In 2006, the INFN group initiated the analysis of neutron-induced fission reactions measured in 2004 with the Fast Ionization Chamber. Isotopes measured included ^{233}U, ^{241}Am, ^{243}Am, ^{245}Cm, as well as the standard ^{235}U and ^{238}U, used as reference. The data on all mentioned isotopes are very important for their implications in projects of nuclear waste transmutation, and for the Th/U fuel cycle. The analysis is in progress, and for some isotopes should be completed within 2007.

- ✓ NIC IX – CERN – Nuclei in the cosmos
- ✓ NURT V – Symposium on Nuclear and related techniques

Nucl-ex / PANDA / VIP

Nucl-ex

Investigation of thermodynamical aspects of hot and excited systems formed in heavy ion central collisions. Detailed investigation of signals of phase transition and coexistence. Investigation of dynamical aspects of heavy ion interactions: reaction mechanisms and mid-rapidity emission. Investigation of hardware and software improvement of apparatuses. Development of digital electronics and detailed study of present and future applications for data acquisition and pre-processing.

PANDA

PANDA will be a fixed target experiment caried out at the HESR antiproton machine of FAIR. The main topics of PANDA scientific program are:

- Charmonium spectroscopy;
- Search for Glueballs and Hybrids;
- Charm in Nuclei;
- Gamma spectroscopy of double-lambda hypernuclei;

Additional topics also included in the research program:

- D meson spctroscopy;
- CP-violation (D, and Lambda mesons);
- Generalized Parton distribution (via reversed DVCS);
- transversity (asimmetry in Drell-Yan cross-section);
- time-like electromagnetic form factor of the proton.

VIP

The VIP experiment aims to improve the current limit on the violation of the Pauli Exclusion Principle for electrons, seen as the probability of PEP violation, (P<1.7 x 10**-26), by four orders of magnitude (P< 10**-30), exploring a region where new theories (for example related with the possible existence of compactified extra-dimensions) might allow for a possible PEP violation.

New experimental limit on the Pauli exclusion principle violation by electrons
Physics Letters B641 18

Consuntivo economico

(sigle a TS)	Assegnato (€)	Speso (€)	Avanzo (%)
Alice	257350,00	249980,75	2,86
Finuda	78250,00	70632,35	9,74
n_TOF	19750,00	19746,53	0,02
Nucl-ex	4450,00	3962,55	10,95
Dot.3 TS	85050,00	79096,98	7,00
Dot.3 UD	19950,00	15497,74	22,32