

CURRICULUM VITAE of ITALO MANNELLI

Born in Florence, Italy, on July 17th 1933.

After completing secondary education in Florence he applied for admission to the Scuola Normale Superiore of Pisa and was classified first in the 1953 national competition.

In 1957 he obtained the Laurea in Fisica cum Laude at the University of Pisa, with Marcello Conversi as thesis advisor, and the following year the Diploma di Licenza of the Scuola Normale.

In 1961 he was awarded a NATO fellowship for study and research in the USA. For the three following years he worked at Brookhaven National Laboratory as part of an MIT team, lead by David H. Frisch.

After becoming Assistant Professor of Physics at the University of Pisa he obtained the Libera Docenza in 1964.

In November 1968 he was nominated full Professor of Elementary particle Physics.

During the years 1969-71 he was Chairman of the advisory Committee of INFN for experiments with electronics techniques (Gruppo I).

Subsequently for a period of four years he was Director of the Physics Institute of the University of Pisa and Director of the local Sezione of INFN. As such he was in charge of the design, supervision of the construction and initial operation of the San Piero Laboratory of INFN. He was also appointed Chairman of the Electronic Experiment Committee of CERN.

From 1976 to 1978 he was elected Vice-Chairman of INFN.

In 1976 he was awarded a staff contract as senior physicist at CERN where he remained till 1986 on leave of absence from Pisa University.

In 1978 he was nominated Chairman of ECFA but declined to serve in that capacity and accepted instead the nomination as CERN Research Director (beginning of 1979 till July 1981).

From 1976 till 1982 he was a member of the Extended Scientific Council of DESY.

For the years 1985-1987 he served as Chairman of the Commission C11 on Particle and Fields of the IUPAP.

After returning to the University of Pisa he was elected Member of the Scientific Policy Committee of CERN and for the years 1988-1990 was its Chairman.

In 1987 he was called at the Scuola Normale, where he taught till his nomination as Emeritus Professor in 2008.

During 1999-2002 was Dean of the Classe di Scienze.

In 1999-2001 he was Member of the Scientific Council of the Italian Space

Agency ASI.

In November 2001 he was asked by the CERN Council to take part in the work of the External Review Committee on LHC, which presented its final report to Council in June 2002.

At the end of July 2002 he was elected Socio Corrispondente of the Accademia dei Lincei and in 2012 Socio Nazionale.

Italo Mannelli has been the recipient in 1958 and again in 1964 of a Prize by the Societa' Italiana di Fisica, in 1994 of the triennial National Prize for Physics by the Fondazione Somaini and in 2000 the Tartufari Prize for Chemistry and Physics by the Accademia dei Lincei.

In 2001 the President of the Italian Republic nominated him Commendatore of the Republic.

He was awarded in 2007 the American Physical Society Panofsky Prize for Experimental Particle Physics and, again in 2007, the Fermi prize of the Societa' Italiana di Fisica.

Brief summary of the research carried out by Italo Mannelli

From the beginning of 1957 till 1962 he worked with bubble chambers and contributed to some technical developments.

The first scientific result was obtained in 1957 with the thesis work and consisted in the demonstration that parity violation occurred also in the hadronic decays of lambda hyperons and hence was not restricted only to processes involving neutrinos. Later on, with a novel type of bubble chamber, working with a supersaturated solution of gaseous ethane in liquid propane and operating at 5 cycles per second, he contributed to the measurement of the polarization of recoil protons from neutral pion photoproduction at the Frascati Electron Synchrotron.

During 1962-1964 he worked with optical spark chamber and developed the technique for efficient detection and precise localization of high energy gamma rays using plates of high-Z material. This was applied quite successfully at the Brookhaven AGS to the systematic study of pion charge exchange and to the detection of neutral resonances.

Back in Italy he initiated a collaboration in 1965 with the Saclay group, lead by Paul Falk-Vairant. This resulted in the very first experiment carried out at CERN by a fully external team.

The most significant result was obtained using a polarized target and showing the presence of a spin dependence of pion charge exchange. This was contrary to the expectation based on single Regge Pole exchange which had been used to fit the differential cross-section as a function of the energy.

The work on pion charge exchange was continued at CERN and subsequently expanded at Serpukov, where a fully electronic setup was used. It was also extended to the study of kaons and to the production of neutral resonances.

After joining the CERN staff he worked at the ISR, participating to the experiments R806-R807 which detected the single photon production at high momentum transverse and which provided the first confirmation of the Ypsilon 4S, just detected at FNAL as decaying into two muons, by observing its decay in e^+e^- .

Since the early eighties the research activity of Italo Mannelli has been focussed on the NA31, NA48 and now NA62 experiments at CERN, on all of which he has played a central role.

These experiments are devoted to the study of the origin of CP violation in K mesons.

The main theme of NA31 and NA48 has been the detection of the so called Direct CP violation, occurring in the Kaon decay interaction. Barring accidental cancellations, this effect is predicted to exist by the Standard Model with 3 families of quarks, which describes quark mixing in terms of the coefficients of the CKM unitary matrix containing a physically meaningful complex phase, accounting for the CP violation observed in K-antiK oscillations.

To reach the level of systematic and statistical accuracy required it has been necessary to conceive and construct specialized beams and detectors and to adopt ad-hoc strategies of data taking and analysis.

The first evidence for the Direct CP violation in two-pion neutral Kaon decays was announced at the International Symposium on Lepton and Photon Interaction at High Energies in 1987 at the level of 3-standard deviations.

The final result of NA31 was:

$$\text{Re}(\epsilon'/\epsilon) = (23. \pm 6.5) \cdot 10^{-4}$$

At about the same time the result of an experiment at FNAL, with a quoted accuracy very similar to the one of NA31, gave a result compatible with zero within one standard deviation.

To clarify this unsatisfactory situation, both the CERN group and the FNAL one designed separate new experiments with all improvements suggested by the accumulated experience and exploiting newly available techniques for detectors and electronics.

It took about ten years of dedicated work to reach the final result published by NA48 in 2002:

$$\text{Re}(\epsilon'/\epsilon) = (14.7 \pm 2.2) \cdot 10^{-4}$$

In 1999 the FNAL group has published the result:

$$\text{Re}(\epsilon'/\epsilon) = (28. \pm 4.1) \cdot 10^{-4}$$

later revised, following a more accurate analysis to:

$$\text{Re}(\epsilon'/\epsilon) = (23.2 \pm 4.3) \cdot 10^{-4}$$

The two results are again somewhat different (in the opposite direction!) but much better compatible and clearly establish the existence of Direct CP violation in neutral K two pion decays.

A number of other results have been obtained by NA31 and NA48 on rare decays of kaons and hyperons, in particular for final states with photons and electrons.

NA48 was then switched to study, with a novel beam of momentum selected K^+ and K^- , present at the same time and overlapping in space, with a fixed intensity ratio. More than 10^9 3-charged pion decays have been recorded and carefully analysed in an attempt to detect a possible difference in the Dalitz plot density distribution between K^+ and K^- events. Given the built in charge symmetry of the setup and the possibility of changing polarity of the magnetic field of the spectrometer while also averaging results of decays with the odd-charged pion going to the right or to the left of the beam, it was possible to keep the systematic uncertainty at less than the statistical one. The result allows to exclude any such difference, which would be a new manifestation of Direct CP Violation.

In the parallel study of the Dalitz plots of the 3-pion decays with two neutrals pions, a discontinuity in the derivative of the π^0 - π^0 invariant mass has been detected, thanks to the unprecedented capability for gamma ray energy and angle measurement of each of the 4 gammas in the final state. The theoretical interpretation of this "cusp" effect by Nicola Cabibbo (in 2005 he was at CERN and we worked closely together along the progress of the fitting procedure) has allowed the best determination of the pion-pion s-wave scattering length. To quote only one more result of interest as Test of the Standard Model and the muon universality, the NA62 collaboration (currently dedicated to the precise measurement of super rare K^+ decays, in primis $K^+ \rightarrow \pi^+ \nu \bar{\nu}$) has collected more than 150.000 Ke_2 (the previous world total being 1500) decays (and many millions $K_{\mu 2}$) determining the $Ke_2/K_{\mu 2}$ ratio with an error of 0.5 per cent.

In addition to planning experiments, establishing the strategy most suitable for carrying them out and contributing to the analysis, Italo Mannelli, in practically all experiments on which he has worked, has designed and taken care of the construction of relevant parts of the apparatus. For instance for NA48 he was the driving force behind the conception and realization of the Liquid Krypton calorimeter, with superior capability for accurate detection of multi simultaneous gamma rays, an instrument which 25 years after its construction continues to be at the heart of the Kaon Physics series of experiments at the CERN SPS. And very recently the design and construction of a large Muon detector and of a new bidimensional hodoscope with SiPMs readout for the current phase of NA62.

Publications

A (slightly partial) list of references to 234 publications can be found easily by clicking on:

<http://inspirehep.net/search?ln=en&p=find+author+I+Mannelli&jrec=51&sf=earliestdate>