Tommaso Tabarelli de Fatis **1964, March 7th – Trento, Italy**

Curriculum and research activities **2021, December – Milano, Italy**

Professor in experimental physics at *Milano-Bicocca* (2006-), I was researcher (1996-06) and post-doc-fellow (1993-05) at the *Istituto Nazionale di Fisica Nucleare*, after the Ph.D. (1990-92, supervisor prof. A. Pullia) and the M.Sc. in Physics (1988, supervisor prof. E. Fiorini) at the *Università di Milano*.

I am co-author of over 1000 peer-reviewed papers in particle physics spanning design, operation, and data analysis in experiments at the CERN LHC and LEP colliders, neutrino physics, fixed target experiments, and detector R&D studies. They include renowned collaborative works like the observation of the Higgs boson (2012), the precision measurement of the Higgs boson mass and couplings at the LHC (2014-2020), and the precision determination of the Z and W bosons mass and couplings at LEP (1990-2000). Well-known papers in neutrino physics include studies of neutrino beams (2001), mass-hierarchy effects in atmospheric neutrino oscillations (2002), and an out-of-the-blue proposal of a novel method for background rejection in double-beta decay searches (2010).

Within the CMS experiment at the LHC proton-proton collider (2003-current), I have been giving leading contributions to the construction, commissioning, and operation of the electromagnetic calorimeter (ECAL), to the precision measurement of the Higgs boson mass, decay in two photons, coupling to top pairs and self-coupling, and to the design of the CMS detector upgrade for the future high-luminosity (HL-LHC) phase. In 2011-12, as ECAL project leader appointed by prof. G. Tonelli (CMS spokesperson), I led ECAL to achieve its design performance and contributed significantly to the scientific success of CMS culminated in the observation of the Higgs boson. I participated to its characterization through the study of the decays in two photons. In 2014-17, I coordinated the Italian participation to the CMS ECAL and served as member of the CMS Higgs Publication Committee. In 2017, after leading contributions to CMS upgrade studies, I was appointed project manager of a novel MIP Timing Detector (MTD) by Dr. J. Butler (CMS spokesperson). The MTD is designed to boost event reconstruction during the HL-LHC phase with the addition of track-time information. I am currently leading the international effort for its construction and integration into CMS.

In the DELPHI experiment at the LEP collider (1991-2001), I made a key impact with an original method for calibration and monitoring of the analog response of the electromagnetic calorimeter (HPC), which ensured complete control throughout operation of the unexpected HPC response-loss with time, thereby solving one of the most critical issues faced after construction. In data analysis, I contributed to the characterization of the Z boson with measurements of its decay into b quarks (1991-95) and of the W boson (1996-99). In 1999-2001, I served as member of the DELPHI Editorial Board.

In the field of neutrino oscillations, I provided leading contributions to the design of the NA56/SPY experiment at CERN (1995-99, spokesperson S. Ragazzi), aimed to consolidate the experimental input to the prediction of neutrino beam fluxes. I coordinated the data analysis through publications. In this context, I developed the well-known BMPT fast-simulation code for the calculation of the neutrino fluxes. These studies helped optimize the neutrino beams from CERN to Gran Sasso Laboratory (LNGS) and NuMi at FNAL, which corroborated the observation of atmospheric neutrino oscillations. In 1998-2001, I coordinated the simulation and optimization of a proposal for a magnetized-iron detector for precision studies of atmospheric neutrino oscillations (MONOLITH, spokesperson S. Ragazzi), which would have by now established the neutrino mass hierarchy exploiting the Earth-induced asymmetry in neutrino and anti-neutrino oscillations. As someone commented, the method – discussed in well-known paper of mine (2002) – was ahead of its time. The project was rejected. Twenty years later, the neutrino mass hierarchy remains an open question in fundamental physics.

In my youth (1987-90), I participated in a search for the neutrino-less double-beta decay of ^{136}Xe with a high-pressure gas detector at LNGS (spokesperson E. Fiorini). With a beginner's naivety, I identified a gas-purification deficiency, which prompted a refurbishment of the apparatus and helped achieve the best sensitivity of the time for this isotope. Later, growing evidence for non-vanishing neutrino masses moved the physics case for double-beta decay searches from being a mere curiosity to one of the leading concepts for probing neutrino properties. In this context, I proposed that Cerenkov emission from beta rays can provide a positive tag of double-beta decays and suppress the dominant background from alpha decays in bolometers (2010). This effect, overlooked for several years, spurred a lively R&D activity for next-generation experiments, which confirmed the viability of my proposal.