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ESSvSB - The ESS neutrino facility for CP violation discovery

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The comparatively large value of the neutrino mixing angle θ_{13} measured in 2012 by neutrino reactor experiments has opened the possibility to observe for the first time CP violation in the leptonic sector. The measured value of θ_{13} also privileges the 2nd oscillation maximum for the discovery of CP violation instead of the usually used 1st oscillation maximum. The sensitivity at the 2nd oscillation maximum is about three times higher than at the 1st oscillation maximum implying a significantly lower sensitivity to systematic errors. Measuring at the 2nd oscillation maximum necessitates a very intense neutrino beam with the appropriate energy. The world's most intense pulsed spallation neutron source, the European Spallation Source, has a proton linac with 5 MW power and 2 GeV energy. This linac also has the potential to become the proton driver of the world's most intense neutrino beam with very high potential for the discovery of neutrino CP violation. The physics performance of that neutrino super beam in conjunction with a megaton water Cherenkov neutrino detector installed ca. 1000 m down in a mine at a distance of about 500 km from ESS has been evaluated. In addition, the use of such a detector will make it possible to extent the physics program to proton-decay, atmospheric neutrinos and astrophysics searches. The ESS proton linac upgrade, the accumulator ring needed for proton pulse compression, the target station optimization and the physics potential are described. In addition to the production of neutrinos, this facility will also be a copious source of muons which could be used to feed a low energy nuSTORM facility, a future neutrino factory or a muon collider. The ESS linac, under construction, will reach full operation at 5 MW by 2023 after which the upgrades for the neutrino facility could start.

Biography

Marcos Dracos obtained his PhD in 1987 with a thesis entitled, "Identification des Particules dans l'Expérience LEP-DELPHI, Étude Expérimentale de la Détection de Photoélectrons et de la Résolution sur l'angle Cerenkov avec le Prototype du Barrel RICH" at Université Louis Pasteur Strasbourg. He has been awarded the ADRERUS prize (Association pour le développement des relations entre l'économie et les universités d'Alsace) for his contribution to the research of new techniques in particle detection and identification. He was Assistant Professor between 1987 and 1988 at the University Louis Pasteur, Strasbourg. He got a fellowship from CERN between 1990 and 1992. He is permanent Researcher in CNRS since 1988. He is currently Director of Research 1st class in Particle Physics at IPHC-IN2P3 in Strasbourg (France).

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