Report of the RCNP Collaboration Research Network (RCNP-COREnet)

COREnet019 PI: PELLEGRI Luna

1	Title of research		Electric Dipole Response of Nuclei for the Study of Extra-Galactic Propagation of Ultra High-Energy Cosmic Rays (PANDORA project)
2	List of Participants (Name and affiliation)		L. Pellegri, iThemba LABS and University of the Witwatersrand (South Africa)
			R. Neveling, iThemba LABS (South Africa)
			A. Tamii, RCNP (Japan)
			P-A Söderström, ELI-NP (Romania)
			Theory supports: D. Allard (Laboratoire Astroparticule et Cosmologie, France), E. Khan, (IPN Orsay, France), S. Nagataki (RIKEN, Japan), M. Kimura (Hokkaido Univ., Japan)
3	Period of research		From May 2020 to March 2022
4	Main location of collaboration implementation		iThemba LABS (South Africa)
5	Publication list (Please include DOI if available)	Articles	N/A
		Talks	N/A
		Theses	N/A
6	Description of the results and outputs		The PANDORA (Photo-Absorption of Nuclei and Decay Observation for Reactions in Astrophysics) project aims at systematic measurements of the electric dipole excitation strengths and decay properties of stable nuclei below the mass of A=56. The first experiment of the project was approved by the PAC of iThemba LABS in December 2019. The aim is to study the electric dipole response and decays of 12C and 27Al using proton scattering. Due to the global pandemic the experimented couldn't be performed so far and it is now scheduled for September/October 2021. A second proposal to study additional nuclei (10-11B, 12-12C, 24-26Mg and 27Al) was submitted to the RCNP PAC in December 2020. The proposal was approved and we expect to perform the experiment in 2022. The theoretical groups involved in the project are developing and improving the nuclear models available to predict the electric dipole response and the branching ratios for particle emission in the nuclei of interest. In particular, Dr T. Inakura is calculating the photo-absorption cross section of several relevant nuclei while the corresponding particle decays are calculated by Prof M. Kimura's group using the Antisymmetric Molecular Dynamics (AMD) model. These results will be used by Dr S. Nagataki and collaborators as inputs in the astrophysics calculations for the propagation of the UHECRs. Prediction of the electric dipole response calculated with the AMD model are also being performed by Prof M. Kimura and collaborators. A collaboration with Prof Y. Utsuno and Prof N. Shimizu was established to implement the calculations obtained using the large-scale shell model in the PANDORA project. The predictability of these models will be verified by comparing the results obtain with the experimental data extracted from the proposed measurements. The first PANDORA workshop was organized in July 2020 in order to discuss within the collaboration the key points of the project and the updates of the work performed. The workshop was held virtually via the Zoom platform. Forty (40) participants attended the workshop. A second workshop will be organised this year.