Final Publishable Summary: The True Path Beyond (No. 297557)

The Standard Model (SM) of elementary particle physics is one of the best descriptions of Nature we know. Yet observations and experiments tell us that it must be incomplete, since it cannot account for some phenomena, such as Dark Matter, and suffers from internal problems.

The goal of the FP7-PEOPLE-IEF-2011 project *Finding the True Path Beyond the Standard Model* was to support the search for the successor of the SM by classifying many of its possible extensions in terms of their phenomenological predictions. This has been achieved for neutrino mass and flavour models by investigating their predictions in the light of all available data, taking into account both ground-based experiments and astronomical observations. By this strategy, we have been able to identify classes of models which can be tested in the near future and by this advance the state of the art. Furthermore, the connections to cosmology, in particular Dark Matter, have been taken into account to identify further promising directions for future research.
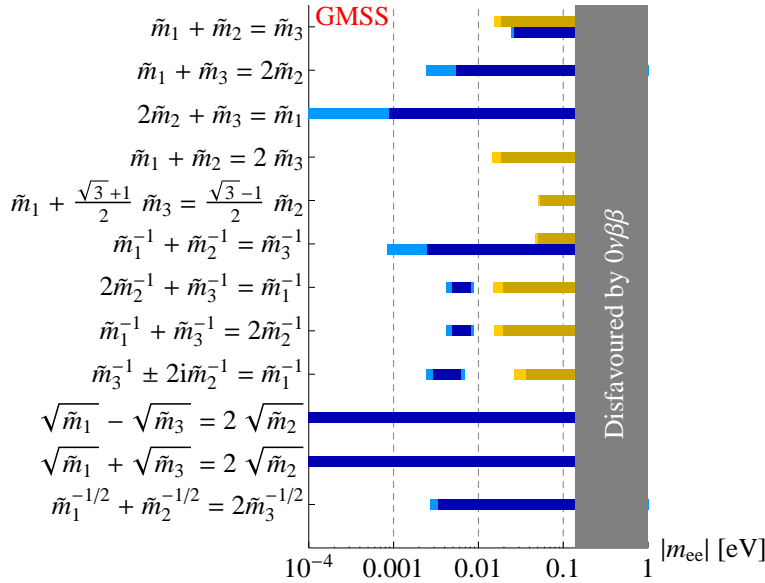

Fig. Predictions of classes of neutrino mass and flavour models for neutrinoless double beta decay. The *mass sum rules* on the left allow to falsify groups of models with similar predictions. More than 50 models can be tested simultaneously by only 12 mass sum rules. This shows how to classify many models, to find the true path to the new fundamental theory. [*Figure from JHEP* **1312** *(2013) 005.*]

After the completion of the Marie Curie IEF Action, the work on many of the aspects investigated continues. Studies closer to experiments are on the way, the possibility of models to account for non-standard Dark Matter candidates is pursued further, and in particular the explorations of classes of models which connect low and high energy phenomenology are extended. We have come several steps further on *The True Path Beyond* the SM.

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