TITLE: Instrumentation, control and monitoring of a bubble chamber for Dark Matter Searches at the Portuguese Research Reactor

Details:

1. Observations:
   The goals of the proposed research activity are a new, large active mass, high sensitivity dark matter search using a superheated liquid device (bubble chamber-BC). The activity is based on the production of a BC and its ultra-sonic microphone-based acoustic instrumentation, capable of discriminating a true nucleation event from all background acoustical noise. Verification of the particle discrimination capability of the BC instrumentation via temporal and shape analysis of recorded acoustic signals, of critical importance to the use of the BC, and to the transition from Superheated Droplet Detectors (SDDs) to bulk superheated liquid chambers in improving the active detector mass-to-volume ratio. This is to include investigation of a possible application for spatially-localizing the event registration, and development of a multi-detector DAQ platform that records each detector's pressure and temperature as well as outputs from acoustic monitors needed for anticoincidence rejection requirements of the BC.

2. Requirements:
   Knowledge of particle physics, instrumentation and programming

3. Goals:
   Chamber instrumentation, to include the monitoring and control of:
   - temperature and pressure,
   - freon injection,
   - construction and implementation of acoustic pickup & readout,
   - experiments to determine the optimal readout location of the microphones,
   - implementation of a software program platform environment for data storage and analyses.

4. Localization:
   Campus Tecnológico e Nuclear, IST

5. Degrees:
   MEFT