**PhD Physics course at Bari University (XXXIII - Cycle)**

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| **Title** | Detector Physics  Scintillators, Silicon Photomultipliers, Gaseous Detectors |
| **Proponent** | Elisabetta Bissaldi  Rosamaria Venditti |
| **# CFU**  **(1 CFU = 8 hours)** | 2 |
| **Schedule** | April-May |
| **Brief Summary of the course** | Part 1:  This course aims to provide the student with advanced knowledge of radiation measurements and detection techniques, from the classic scintillation detectors to the more recent Silicon Photomultiplier devices. It requires an elementary background in radiation measurements, radiation matter interactions and basic electronics.  Part 2:  The course will provide the students with advanced knowledge on the working principles of gaseous detectors. The course will be both theoretical as hands on in the lab and with computer simulations. A basic knowledge on radiation matter interactions is required. |
| **Programme** | Part 1:  Absorption of radiation in scintillation materials. Light yield, organic and inorganic scintillators. Optical coupling. Solid state photodetectors. The pn junction, the Photodiode, the SPAD, the SiPM. Single photoelectrons resolution, gain, signal to noise ratio. Temperature dependence. The Equivalent circuit of a SiPM. Optimal front-end: current feedback, pole zero cancellation network.  Part 2:  Creation of free electrons by ionization of a gas.  Gaseous collisions, mean free path, diffusion, drift  Multiplication, Townsend avalanche, discharge, streamer. Historical account of gaseous detectors: from Ionization chamber to Geiger-Mueller counter, Wire chamber, Multi-Wire Proportional chamber to the current Micro Pattern Gaseous Detectors. Applications and Limits of Gaseous detectors in High Energy Physics. |
| **Assessment methods** | Lessons, laboratory sessions, final report |