

Special Physics Division Seminar

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**The Application of LaBr₃(Ce) Gamma-ray
Detectors for Precision Nuclear Spectroscopy,
Radiation Standards and Quantitative Imaging**

Host: Filip Kondev

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An overview of the exploitation of discrete energy gamma-ray detectors based on cerium-doped LaBr₃ (halide) scintillators for use in nuclear spectroscopy and quantitative spectrometry will be presented. This includes examples in mixed, hybrid gamma-ray coincidence arrays for precision nuclear spectroscopy measurements, including the ROSPHERE at IFIN-HH, Bucharest, Romania; GAMMASPHERE + FATIMA at Argonne National Laboratory; FATIMA + EURICA, at RIKEN, Japan; NuBALL at IPN – Orsay, France and the National Nuclear Array (NANA) at the UK's National Physical Laboratory. Some of the unique capabilities and limitations of using these sub-nanosecond 'fast-timing', medium-resolution gamma-ray detectors for both nuclear structure research and radionuclide standardisation will be highlighted. A general overview of the fast-timing technique, instrumentation, signal processing and coincidence gating analysis methods will be given, together with examples of nuclear structure physics research studies focussed on investigations of the evolution of nuclear quadrupole collectivity for radioactive 'stable+2n' species such as ¹⁶⁶Dy, ¹⁸⁸W and ¹⁹⁴Os. If time permits, the parallel application of such coincidence scintillator arrays in assay measurements of civilian nuclear fuel waste evaluation (^{134,7}Cs), absolute radionuclide standardisation (⁶⁰Co) and quantitative radiation imaging of (near)-'pure' b⁻ emitters (⁹⁰Sr → ⁹⁰Y) will also be presented.