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Fast Advanced Scintillator Timing - COST Action TD1401

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Scintillator-based detectors have been very successful in high energy physics (HEP) calorimetry, medical imaging, and many other applications. In particular, the potential of such detectors to achieve precise timing information is of increasing importance for those applications. Already today, scintillator-based detectors coupled to high bandwidth amplifiers are capable of producing a timing precision of better than 200ps in coincidence time resolution (CTR). The demand to discriminate between closely spaced bunch trains in future highest luminosity accelerators and to deliver space points in addition to the traditional back-to-back line of response reconstruction algorithms of positron emission tomograph (PET), requires a further quantum step in time resolution, i.e. below 100ps. The implications of such a radical improvement in time resolution come with dramatic benefits in many domains. HEP will profit from a significant increase in detection efficiency and the health sector from an unprecedented improvement in imaging quality and image reconstruction time. Such a 'paradigm'change, however, must go hand-in-hand with a similar break in the interdisciplinary domain of photon detection. Therefore, new expertise must be gained in the fields of scintillators, photodetectors, as well as electronics to develop ultrafast timing scintillator-based detectors.

This Trans Domain COST Action (FAST, Fast Advanced Scintillator Timing) aims to establish a multidisciplinary network that brings together European experts from academia and industry to ultimately achieve scintillator-based detectors with time precision better than 100ps and provides an excellent training opportunity for researchers interested in this domain. The FAST COST (Action TD1401) started on November 20 2014 and will end on November 19 2018.

Summary

Scintillator-based detectors have been very successful in high energy physics (HEP) calorimetry, medical imaging, and many other applications. In particular, the potential of such detectors to achieve precise timing information is of increasing importance for those applications. Already today, scintillator-based detectors coupled to high bandwidth amplifiers are capable of producing a timing precision of better than 200ps in coincidence time resolution (CTR). The demand to discriminate between closely spaced bunch trains in future highest luminosity accelerators and to deliver space points in addition to the traditional back-to-back line of response reconstruction algorithms of positron emission tomograph (PET), requires a further quantum step in time resolution, i.e. below 100ps. The implications of such a radical improvement in time resolution come with dramatic benefits in many domains. HEP will profit from a significant increase in detection efficiency and the health sector from an unprecedented improvement in imaging quality and image reconstruction time. Such a 'paradigm'change, however, must go hand-in-hand with a similar break in the interdisciplinary domain of photon detection. Therefore, new expertise must be gained in the fields of scintillators, photodetectors, as well as electronics to develop ultrafast timing scintillator-based detectors.

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Co-author: Prof. C. TSOUMPAS, UNIVERSITY OF LEEDS (University of Leeds)

Presenter: Prof. C. TSOUMPAS, UNIVERSITY OF LEEDS (University of Leeds)

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