Ідентифікатор подання: **16** Тип: **не вказано**

Scintillators for particle physics in the frame of TWISMA European project

середа, 28 січня 2026 р. 15:00 (20 хвилин)

The collaboration between ISMA and CERN began in the early 1990s when ISMA (then part of the Institute for Single Crystals), played a pioneering role in the development of lead tungstate (PbWO4), a scintillator implemented in detectors at the Large Hadron Collider (LHC). Works by L. Nagornaya and co-authors demonstrated the feasibility of achieving an extremely fast scintillation response and growing highly uniform large PbWO4 crystals with a high radiation tolerance [1].

The works continued with the INTELUM European project (2015-2019), which focused on the fabrication technology of garnet scintillation fibers for high-granularity calorimeters. Ce-doped Y3Al5O12 (YAG:Ce) and Lu3Al5O12 (LuAG:Ce) fibers with 1-2 mm cross-section and lengths of up to 55 cm were produced using the micro-pulling-down method in collaboration with the Institute of Light and Matter (ILM). The luminescence attenuation length in LuAG:Ce fibers reached 1 m, meeting transparency requirements [2]. Meanwhile, it was realized that although the micro-pulling-down technology could provide ready-to-use fiber-shaped crystals without post-growth mechanical treatment, the growth of bulk crystals and cutting them into fibers proved to be a more reliable approach for producing many thousands of fibers required for large-scale experiments at colliders.

The Horizon Europe TWISMA project (2023-2025) involving ISMA, CERN, and ILM was focused on bulk crystals produced by the Czochralski method. It addressed rare earth garnets such as YAG:Ce and Gd3(Al,Ga)5O12:Ce (GAGG:Ce) with accelerated luminescence rise/decay times and enhanced time resolution. LHCb detectors at the high-luminosity LHC must provide no pileup of signals at the frequency of particle collision of 25 ns, hence scintillators with a decay time of <15 ns and an approximate light yield over 15000 phot/MeV are required. Various codoping schemes of garnet crystals were verified to achieve a balance between a faster decay and reasonable light yield. Another focus of TWISMA was crystals for dual-readout detectors for simultaneous registration of scintillation and Cherenkov light at future colliders. Bi4Si3O12 (BSO) and Bi4(Ge1-xSix)3O12 have been proposed [3] as monolithic crystals capable of registering both scintillation light emitted in the visible band and providing a wide transparency window in the UV at >290 nm for Cherenkov light registration. Tests of calorimeter prototypes based on BSO and garnet scintillators are underway in CERN.

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[3] R. Cala', N. Kratochwil, L. Martinazzoli, M.T. Lucchini, S. Gundacker, E. Galenin, I. Gerasymov, O. Sidletskiy, M. Nikl, E. Auffray, NIM. A 1032 (2022) 166527.

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Тип засідання: Institutions, ideas, people