



R&D on Novel Inorganic Scintillators for Future HEP Calorimeters

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R&D On-going at Caltech



Fast/ultrafast, radiation hard and cost-effective heavy scintillators

Bright, fast and radiation hard inorganic scintillators for the severe radiation environment expected by the proposed FCC_{hh}. YAG, LuAG, GGAG, GYAG and GLuAG suffer from slow scintillation component.

Ultrafast inorganic scintillators: Cross-luminescence. Wide gap semiconductor-based scintillators with sub-ns decay time and quantum confinement-based inorganic $CsPbX_3$ (X = Cl, Br, I, mixed Cl/Br and Br/I), halide perovskite quantum dots may help to break the ps timing barrier for future HEP TOF.

Dense, UV-transparent, cost-effective heavy inorganic scintillators for the homogeneous hadron calorimeter (HHCAL) concept for the Higgs factory.

Compact UV sensitive photodetectors with sufficient dynamic range for ultrafast calorimeters.

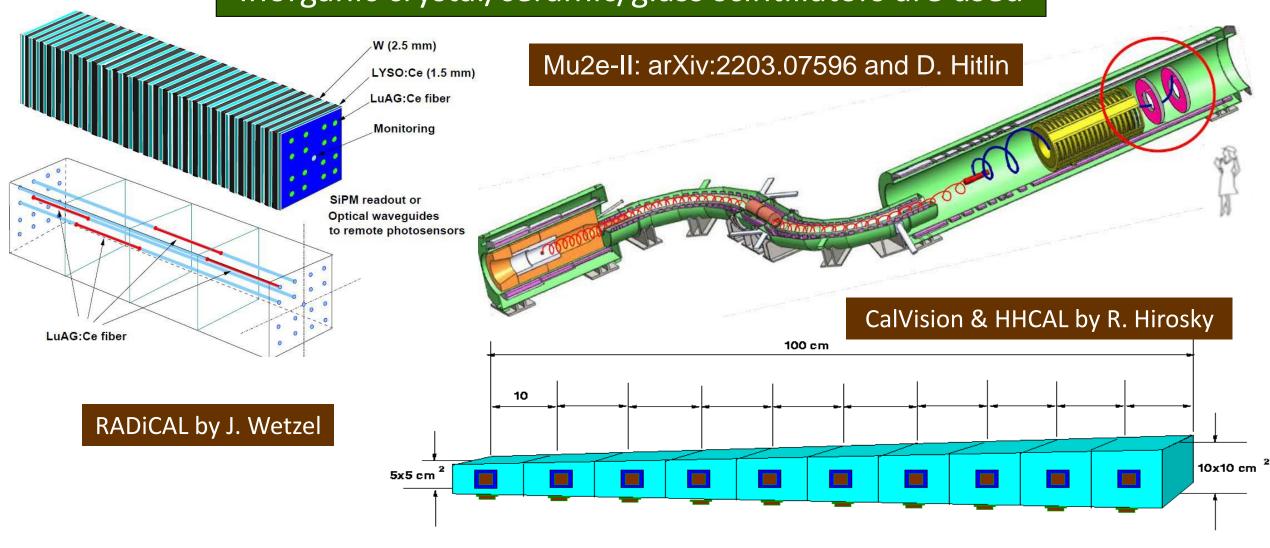
Collaboration with labs and industry is crucial



Calorimeter Concepts in Workshop



Inorganic crystal/ceramic/glass scintillators are used





Novel Inorganic Scintillators

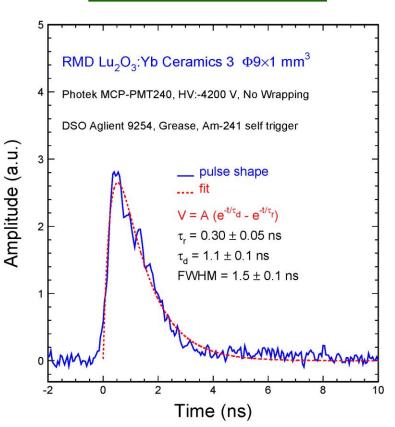


Inorganic ceramic and glass scintillators by industry

Radiation Hard LuAG:Ce ceramic fiber of Φ0.6 ×120 mm³

SIC LuAG:Ce 120×\phi0.6 mm³, #2, B end coupling Ex. 420 nm LED, Em. F4500 Spectrophotometer Ex. at 15 mm, Int.PN=35400 at 30 mm, Int.PN=36200 at 45 mm, Int.PN=34400 at 60 mm, Int.PN=32800 Ex. at 75 mm, Int.PN=32100 Ex. at 90 mm, Int.PN=32200 Photon Numbers Ex. at 105 mm, Int.PN=34100 Ava Int.PN=33900 500 450 500 550 600 700 Wavelength (nm)

Ultrafast Lu₂O₃:Yb ceramics of 9.4 g/cc



Cost-effective
ABS Glass of 6 g/cc

