

# The Fast-Timing Array for DESPEC at GSI

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FATIMA (FAst TIMing Array) [1] is the fast-timing detector system for measurements of nuclear lifetimes at the DESPEC (DEcay SPECtroscopy) station [2] of the radioactive beam facility GSI. The array is composed of 36  $\text{LaBr}_3(\text{Ce})$  scintillator detectors coupled to photomultiplier tubes and the GSI-developed fast-timing data acquisition system TAMEX, making possible lifetime measurements on the order of several picoseconds with the  $\gamma - \gamma$  fast-timing method. At DESPEC, FATIMA is employed in conjunction with a suite of ancillary detectors; the fast-timing array surrounds a stack of highly pixelated implantation detectors and plastic scintillators, which allow for  $\beta - \gamma$  coincidence measurements, while a series of high-purity germanium detectors provide excellent energy resolution. \\\

Since its manufacture FATIMA has been involved in numerous DESPEC experimental campaigns, allowing for precision measurements of excited state lifetimes in a range of exotic nuclei produced by the fragment separator of GSI. These include a range of isotopes in the mass $\sim$ 100 and mass $\sim$ 190 regions for fundamental investigations of seniority structure, shape coexistence and transition. In upcoming years, FATIMA will be used as part of the IDATEN array at the Radioactive Isotope Beam Facility (RIBF) at RIKEN, in addition to taking part in further experimental campaigns as part of the DESPEC setup. \\\

In this talk an introduction to both DESPEC and FATIMA will be given, highlighting recent developments with the array, followed by a summary of several key results that have been published in recent years. \\\

[1] Rudigier, M. \textit{et al.}, “\textit{FATIMA —FAst TIMing Array for DESPEC at FAIR}” (2018), NIM A \textbf{969} (163967). \newline

[2] Mistry, A. \textit{et al.}, “\textit{The DESPEC setup for GSI and FAIR}” (2022), NIM A \textbf{1033} (166662).

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