

International FLAP Collaboration: From Fundamental Research to Applied Solutions in Accelerator Physics

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FLAP is an international collaboration of researchers from Armenia, Belarus, the UK, China, Russia, and Chile focused on studying the fundamental electromagnetic interactions of relativistic beams to develop novel diagnostic methods and applied radiation sources. This summary highlights key progress at JINR facilities (LINAC-200, MT-25, IREN) toward these goals [1]. Research on radiation mechanisms has yielded a high-resolution coherent transition radiation technique at the MT-25 microtron for femtosecond-to-picosecond longitudinal bunch diagnostics. Studies of superradiant Cherenkov Diffraction Radiation have validated theory and provided a new method for analyzing extended bunch trains [2]. Efforts to find new radiation applications include: 1) proposing an optimized semi-parabolic target geometry to generate a collimated terahertz beam with an on-axis intensity peak, paving the way for compact sources [3]; and 2) conducting experiments at LINAC-200 that demonstrate a viable pulsed neutron source, with achieved neutron fluxes showing good agreement (less than 30 percent) with simulations [4]. These results exemplify how FLAP's fundamental inquiry into radiation from relativistic electrons directly enables practical diagnostics and prototypes for new facilities, enhancing international scientific and technical cooperation.