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Studies Of X-Ray Multi-Beam Diffraction Moiré Patterns

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This paper presents an experimental study of the formation mechanism of X-ray multi-beam diffraction moiré patterns. A unique four-block interferometer was designed, manufactured, and tested, that enabled successfully obtaining moiré patterns. The results of experimental studies on the dependence of moiré pattern formation on the number and history of contributing waves are presented. Unlike conventional three-block (two-beam) interferometers, this study investigates X-ray diffraction moiré patterns formed with the involvement of three waves. We also examined a case when one of the two interfering waves contained a moiré pattern, while the other did not. Furthermore, the superposition of beams containing moiré patterns (interference of moiré patterns) was investigated using a specially designed and manufactured five-block interferometer. We demonstrated that the resulting interference pattern from the superposition of beams containing moiré patterns differed in character (period and visibility) from the individual moiré patterns. This difference indicates that after passing through the fifth block, the moiré patterns undergo diffraction superposition, rather than simple mechanical superposition. Finally, the study demonstrated that the presence of three beams significantly reduces the contrast of the moiré patterns, and in certain cases, allows for mutual compensation of misorientations.

Author: Prof. DRMEYAN, Henrik (IAPP NAS RA)

Co-authors: MARGARYAN, Hrayr; Dr NOREYAN, Serob (IAPP NAS RA); AGHABEKYAN, Vigen (IAPP NAS RA)

Presenter: MARGARYAN, Hrayr

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