

Internship proposal 2009-2010

Laboratory : Optics Laboratory	
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Synthesis of partially coherent optical fields.

Scientific project :

In principle, the synthesis of any perfectly coherent (from the spatial viewpoint) scalar light field can be performed by illuminating a suitable space-varying transparency (possibly complex) with a coherent light beam. This is used, for instance, when a particular field profile is required in practical applications. Using holographic techniques, the same task can be even performed using real-valued transparencies.

The same approach cannot be followed for the synthesis of partially coherent light sources, because in such case the field correlation at any pairs of points has to be imposed to the illuminating beam and no transparencies are able to perform the task. Significant exceptions are sources whose degree of spatial coherence depends only on the difference between the position vectors of the two points, in which case the synthesis is always possible by virtue of the van Citter-Zernike theorem, starting from a suitably shaped spatially incoherent light source.

It can be shown, however, that any partially coherent field (the source) can be obtained by superimposing a set of perfectly coherent, mutually uncorrelated fields (the modes), with suitable powers. The shape of the modes and their power can be evaluated from the analytical expression of the correlation function across the source.

Aim of the project is to perform the synthesis of a partially coherent source using its modal expansion. In the proposed approach, the mode fields are generated by means of a single computer-controlled spatial light modulator, illuminated by a coherent light beam. The partially coherent source is then obtained by sequentially illuminating the source plane with such fields.

Techniques in use :
Spatial light modulation, numerical data processing

Applicant skills :
Disposition to experimental work in Optics and data processing

Granted internship : yes
C'nano IdF laboratory (France only) : yes / no
Possibility for a thesis : yes, financial support possible after selection according to national rules.
Amount of the grant: approximately 13640 €/year (previdential contribution shall be deducted).