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Synthesis of partially polarized Gaussian Schell-model sources

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Abstract

An experimental procedure for the synthesis of a class of partially polarized Gaussian Schell-model sources is proposed. The experimental set-up is based on Mach–Zehnder interferometer. This kind of sources give rise to not only a coherence degree and intensity profile that are both Gaussian but also a Gaussian local degree of polarization in each plane upon free propagation. Measurements of the local degree of polarization and the intensities in the far field are presented. It is shown that from these measurements some characteristic parameters of the source can be obtained. © 2002 Elsevier Science B.V. All rights reserved.

1. Introduction

Partially coherent Gaussian Schell-model sources [1] have been extensively studied within the scalar framework. Beams emitted by such sources often represent a good model to describe real beams, such as those radiated by multimode lasers [2–4]. Recently, increasing attention has been devoted toward light beams generated by sources that are both partially coherent and partially polarized [5–15]. In particular, a new class of sources, the so-called partially polarized Gaussian Schell-model sources, has recently been introduced [15]. The propagation of beams radiated by such sources

has been studied, within the paraxial approximation, through the formalism based on the Beam Coherence-Polarization matrix (BCP from now on) [10,11]. Furthermore, it has been theoretically found [15] that these beams exhibit interesting behavior upon free propagation when the polarization across their transverse sections is studied. In the present work we show experimental results concerning the synthesis of a partially polarized Gaussian Schell-model source. Such a source has been generated by exploiting the van Cittert–Zernike theorem for partially coherent, partially polarized beams [13], starting from two incoherent primary sources linearly polarized along orthogonal axes, and eventually superposed through a Mach–Zehnder interferometer [15]. The obtained partially polarized Gaussian Schell-model source has been characterized by means of measurements

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made on the radiated beam. In particular, from the far-field transverse intensity profiles of the beam, after passing through a linear polarizer rotated at two different angles, information about the coherence features of the source has been obtained. Furthermore, the state of polarization, as well as the local degree of polarization across the whole transverse section of the beam in the far field, has been studied and measured. It is shown that such kind of sources produce a Gaussian shaped distribution of the degree of polarization across the transverse section of the beam.

The paper is organized as follows. In Section 2 we recall definitions and formalism related to BCP matrix and partially polarized Gaussian Schell-model beams. In particular, the procedure synthesis is outlined and analytical expressions for the far-field matrix are given. In Section 3, the experimental set-up and two kind of measurements on the beam generated by a partially polarized Gaussian Schell-model source are presented. From these measurements some characteristic parameters of the source are obtained. Finally, in Section 4 the main conclusions are given.

2. Formalism and definitions

We shall use a reference frame in which the z -axis coincides with the mean propagation direction of the beam. In a transverse plane, $\mathbf{r}$ is used to specify the position of a point. For a quasi-monochromatic field, the BCP matrix is defined as [10,11]

$$\hat{J}(\mathbf{r}_1, \mathbf{r}_2, z) = \begin{pmatrix} J_{xx}(\mathbf{r}_1, \mathbf{r}_2, z) & J_{xy}(\mathbf{r}_1, \mathbf{r}_2, z) \\ J_{yx}(\mathbf{r}_1, \mathbf{r}_2, z) & J_{yy}(\mathbf{r}_1, \mathbf{r}_2, z) \end{pmatrix}, \quad (1)$$

where

$$J_{\alpha\beta}(\mathbf{r}_1, \mathbf{r}_2, z) = \langle E_{\alpha}^*(\mathbf{r}_1, z; t) E_{\beta}(\mathbf{r}_2, z; t) \rangle \quad (\alpha, \beta = x, y). \quad (2)$$

Here the asterisk denotes the complex conjugate, the angle brackets denote time average, and E_{α} ($\alpha = x, y$) is a cartesian component of the time-dependent electric field. The BCP matrix is given within the paraxial approximation and without taking into account the longitudinal component of the electric field.

The following relationships for the BCP matrix hold:

$$J_{xy}(\mathbf{r}_1, \mathbf{r}_2, z) = J_{yx}^*(\mathbf{r}_2, \mathbf{r}_1, z), \quad (3)$$

$$|J_{\alpha\beta}(\mathbf{r}_1, \mathbf{r}_2, z)|^2 \leq J_{\alpha\alpha}(\mathbf{r}_1, \mathbf{r}_1, z) J_{\beta\beta}(\mathbf{r}_2, \mathbf{r}_2, z) \quad (\alpha, \beta = x, y). \quad (4)$$

Furthermore, the following non-negativeness condition has to be satisfied:

$$\begin{aligned} & \int \int [f_1^*(\mathbf{r}_1) f_1(\mathbf{r}_2) J_{xx}(\mathbf{r}_1, \mathbf{r}_2, z) \\ & + f_1^*(\mathbf{r}_1) f_2(\mathbf{r}_2) J_{xy}(\mathbf{r}_1, \mathbf{r}_2, z) \\ & + f_2^*(\mathbf{r}_1) f_1(\mathbf{r}_2) J_{yx}(\mathbf{r}_1, \mathbf{r}_2, z) \\ & + f_2^*(\mathbf{r}_1) f_2(\mathbf{r}_2) J_{yy}(\mathbf{r}_1, \mathbf{r}_2, z)] d^2 r_1 d^2 r_2 \geq 0, \end{aligned} \quad (5)$$

where $f_1(\mathbf{r})$ and $f_2(\mathbf{r})$ are arbitrary functions.

The local polarization properties of the beam at a typical point of a cross section are specified by the BCP matrix with $\mathbf{r}_1 = \mathbf{r}_2 = \mathbf{r}$. We shall refer to it as the local polarization matrix. In particular, the degree of polarization [1] is given by [11]

$$P(\mathbf{r}, z) = \sqrt{1 - \frac{4 \det [\hat{J}(\mathbf{r}, \mathbf{r}, z)]}{\{\text{Tr} [\hat{J}(\mathbf{r}, \mathbf{r}, z)]\}^2}}, \quad (6)$$

where $\det$ stands for the determinant and Tr denotes the trace. In addition, we can define an equivalent mutual intensity as

$$\begin{aligned} J_{\text{eq}}(\mathbf{r}_1, \mathbf{r}_2, z) &= J_{xx}(\mathbf{r}_1, \mathbf{r}_2, z) + J_{yy}(\mathbf{r}_1, \mathbf{r}_2, z) \\ &= \text{Tr} [\hat{J}(\mathbf{r}_1, \mathbf{r}_2, z)]. \end{aligned} \quad (7)$$

In fact, if no anisotropic element is used, all propagation, diffraction, and interference phenomena are correctly described by replacing the actual beam by a scalar beam, provided that the mutual intensity of the latter is given by Eq. (7) [11,16]. In particular, the optical intensity at a typical point, say $I(\mathbf{r}, z)$, is given by

$$I(\mathbf{r}, z) = J_{\text{eq}}(\mathbf{r}, \mathbf{r}, z). \quad (8)$$

For the partially polarized Gaussian Schell-Model sources [15], the elements of the BCP matrix are given by

$$J_{\alpha\beta}(\mathbf{r}_1, \mathbf{r}_2, 0) = I_{0\alpha\beta} \exp \left[-\frac{r_1^2 + r_2^2}{4\sigma_{I_{0\alpha\beta}}^2} - \frac{|\mathbf{r}_1 - \mathbf{r}_2|^2}{2\sigma_{\mu_{0\alpha\beta}}^2} \right] \quad (9)$$

$$(\alpha, \beta = x, y),$$

where $\sigma_{I_{0\alpha\beta}}$ and $\sigma_{\mu_{0\alpha\beta}}$ are real, positive quantities. The parameters $\sigma_{I_{0xx}}$, $\sigma_{\mu_{0xx}}$ and I_{0xx} are related to the beam width, the transverse coherence length and the intensity of each component of the electric field (x or y) while I_{0xy} may be complex and satisfy $I_{0yx} = I_{0xy}^*$ due to Eq. (3). In physical terms, the argument of I_{0xy} accounts for a constant phase shift between the x - and y -components of the field. Such a phase difference could be eliminated using a suitable wave plate. Accordingly, for the sake of simplicity, the argument of I_{0xy} is set equal to zero. It is seen that the matrix formed by elements (9) is specified by a set of nine real parameters. Beams generated by this type of source have already been considered by some authors [8,12].

In the following we shall limit ourselves to the class of partially polarized Gaussian Schell-model sources described by the BCP matrix of the form

$$\hat{J}(\mathbf{r}_1, \mathbf{r}_2) = I_0 \exp \left(-\frac{r_1^2 + r_2^2}{4\sigma_{I_0}^2} \right) \times \begin{pmatrix} \exp \left[-\frac{|\mathbf{r}_1 - \mathbf{r}_2|^2}{2\sigma_{\mu_{0xx}}^2} \right] & \chi \exp \left[-\frac{|\mathbf{r}_1 - \mathbf{r}_2|^2}{2\sigma_{\mu_{0xy}}^2} \right] \\ \chi \exp \left[-\frac{|\mathbf{r}_1 - \mathbf{r}_2|^2}{2\sigma_{\mu_{0xy}}^2} \right] & \exp \left[-\frac{|\mathbf{r}_1 - \mathbf{r}_2|^2}{2\sigma_{\mu_{0xx}}^2} \right] \end{pmatrix}, \quad (10)$$

where χ is a parameter such that $0 \leq \chi \leq 1$. This kind of sources are indistinguishable from Gaussian Schell-model sources from a scalar viewpoint if no anisotropic elements are used. The parameters characterizing the source are σ_{I_0} , $\sigma_{\mu_{0xx}}$, $\sigma_{\mu_{0xy}}$ and χ . As we shall see in a moment, sources described by the matrix in Eq. (10) can be experimentally synthesized starting from a quasi-monochromatic spatially incoherent source endowed with suitable polarization features, by employing the generalization of the van Cittert–Zernike theorem to partially polarized Schell-model sources [13].

The BCP matrices with $J_{xx} = J_{yy}$ and $J_{xy} = J_{yx}$, like that in Eq. (10), can be diagonalized by means of a rotation of $\theta = -\pi/4$ of the polarization direction. In fact, the matrix (10) in the rotated frame is

$$\hat{J}' = \hat{R}^\dagger(\theta) \hat{J} \hat{R}(\theta), \quad (11)$$

where $\hat{R}(\theta)$ denotes the Jones matrix corresponding to a rotation of an angle θ , i.e., [18]

$$\hat{R}(\theta) = \begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix}. \quad (12)$$

On substituting from Eq. (12) into Eq. (11), $\hat{J}'$ turns out to be

$$\hat{J}' = \begin{pmatrix} J_{xx} - J_{xy} & 0 \\ 0 & J_{xx} + J_{xy} \end{pmatrix}, \quad (13)$$

which, on recalling Eq. (10), can be written as

$$\hat{J}'(\mathbf{r}_1, \mathbf{r}_2) = I_0 \exp \left(-\frac{r_1^2 + r_2^2}{4\sigma_{I_0}^2} \right) \times \begin{pmatrix} g_-(\mathbf{r}_1 - \mathbf{r}_2) & 0 \\ 0 & g_+(\mathbf{r}_1 - \mathbf{r}_2) \end{pmatrix}, \quad (14)$$

where

$$g_{\pm}(\mathbf{u}) = \exp \left[-\frac{|\mathbf{u}|^2}{2\sigma_{\mu_{0xx}}^2} \right] \pm \chi \exp \left[-\frac{|\mathbf{u}|^2}{2\sigma_{\mu_{0xy}}^2} \right]. \quad (15)$$

The sources of the form (10) can be experimentally realized starting from a quasi-monochromatic spatially incoherent source, say S , placed at the focal plane of a thin converging lens L , having focal length f . We assume that the incoherent source is characterized by the following BCP matrix:

$$\hat{J}_S(\boldsymbol{\rho}_1, \boldsymbol{\rho}_2) = I_{0S} \lambda^2 \delta(\boldsymbol{\rho}_1 - \boldsymbol{\rho}_2) \begin{pmatrix} F_-(\boldsymbol{\rho}_1) & 0 \\ 0 & F_+(\boldsymbol{\rho}_2) \end{pmatrix}, \quad (16)$$

where $\boldsymbol{\rho}$ is a vector used to specify a point in the source plane, $\delta(\cdot)$ is the three-dimensional Dirac function, λ is the mean wavelength of the light, I_{0S} is a positive constant, and $F_{\pm}(\boldsymbol{\rho})$ are two functions, defined as

$$F_{\pm}(\boldsymbol{\rho}) = \left[\exp \left(-\frac{\rho^2}{2\sigma_1^2} \right) \pm a \exp \left(-\frac{\rho^2}{2\sigma_2^2} \right) \right], \quad (17)$$

where σ_i ($i = 1, 2$) and a are three real, positive parameters satisfying the constraints:

$$a \leq 1, \quad \sigma_1 \geq \sigma_2 \quad (18)$$

in order to make the functions $F_{\pm}$ positive. The source defined by $\hat{J}_S$ can be thought of as arising from the superposition of two uncorrelated scalar sources having orthogonal linear polarization states and intensity profiles proportional to F_+ and F_- , respectively.

According to the van Cittert–Zernike theorem for partially polarized sources [13], the BCP matrix of the field at a distance f from the source is obtained as

$$\hat{J}_f(\mathbf{r}_1, \mathbf{r}_2) = I_{0S} \frac{\exp \left[\frac{i\pi(r_1^2 - r_2^2)}{\lambda f} \right]}{f^2} \times \begin{pmatrix} \tilde{F}_- \left(\frac{\mathbf{r}_1 - \mathbf{r}_2}{\lambda f} \right) & 0 \\ 0 & \tilde{F}_+ \left(\frac{\mathbf{r}_1 - \mathbf{r}_2}{\lambda f} \right) \end{pmatrix}, \quad (19)$$

where the tilde denotes the Fourier transform operation [17]. On inserting from Eq. (17) into Eq. (19), we find that the diagonal elements of $\hat{J}_f$ are given by

$$\begin{aligned} \hat{J}_{f,\alpha\alpha}(\mathbf{r}_1, \mathbf{r}_2) &= I_{0S} 2\pi \left(\frac{\sigma_1}{f} \right)^2 \exp \left[\frac{i\pi(r_1^2 - r_2^2)}{\lambda f} \right] \\ &\times \left\{ \exp \left[-2 \left(\frac{\pi\sigma_1}{\lambda f} \right)^2 |\mathbf{r}_1 - \mathbf{r}_2|^2 \right] \right. \\ &+ (-1)^\alpha a \left(\frac{\sigma_2}{\sigma_1} \right)^2 \\ &\times \exp \left[-2 \left(\frac{\pi\sigma_2}{\lambda f} \right)^2 |\mathbf{r}_1 - \mathbf{r}_2|^2 \right] \left. \right\}, \\ \alpha &= 1, 2. \end{aligned} \quad (20)$$

If lens L is covered with an amplitude filter having Gaussian amplitude transmission function, then the BCP matrix of the field emerging from the filter is

$$\hat{J}_0(\mathbf{r}_1, \mathbf{r}_2) = \tau^*(\mathbf{r}_1) \hat{J}_f(\mathbf{r}_1, \mathbf{r}_2) \tau(\mathbf{r}_2), \quad (21)$$

where

$$\tau(\mathbf{r}) = \exp \left[\left(\frac{i\pi}{\lambda f} \right) r^2 - \frac{r^2}{2\sigma_F^2} \right], \quad (22)$$

and σ_F is the rms width of the amplitude filter.

Now, from Eqs. (20)–(22) we see that the BCP matrix at the output of the filter F is that corre-

sponding to a partially polarized Gaussian Schell-model source of the form (13) with

$$\begin{aligned} I_0 &= 2I_{0S} \pi \left(\frac{\sigma_1}{f} \right)^2, \quad \sigma_{I_0} = \frac{\sigma_F}{\sqrt{2}}, \quad \sigma_{\mu_{0xx}} = \frac{\lambda f}{2\pi\sigma_1}, \\ \sigma_{\mu_{0xy}} &= \frac{\lambda f}{2\pi\sigma_2}, \quad \chi = a \left(\frac{\sigma_2}{\sigma_1} \right)^2. \end{aligned} \quad (23)$$

The matrix corresponding to the generated beam at the far field can be calculated by applying to each element of Eq. (10) the same propagation formula [11] used in the scalar case.

We denote by $K(\mathbf{r}'_1, \mathbf{r}_1, z)$ the kernel of propagation from the plane $z = 0$ to the plane $z = \text{constant} > 0$ [19]. Each element of Eq. (10) obeys a propagation formula of the form [1,16]

$$\begin{aligned} J_{\alpha\beta}(\mathbf{r}'_1, \mathbf{r}'_2, z) &= \int \int J_{0\alpha\beta}(\mathbf{r}_1, \mathbf{r}_2) K^*(\mathbf{r}'_1, \mathbf{r}_1, z) \\ &\times K(\mathbf{r}'_2, \mathbf{r}_2, z) d\mathbf{r}_1 d\mathbf{r}_2 \\ (\alpha, \beta &= x, y). \end{aligned} \quad (24)$$

For beam-like fields, the propagation kernel can be written in the paraxial approximation as

$$K(\mathbf{r}', \mathbf{r}, z) = \frac{-i \exp(ikz)}{\lambda z} \exp \left[\frac{ik}{2z} (\mathbf{r}' - \mathbf{r})^2 \right], \quad (25)$$

where $k = 2\pi/\lambda$. In Fraunhofer approximation, we have

$$\begin{aligned} J_{\alpha\beta}^\infty(\mathbf{r}'_1, \mathbf{r}'_2, z) &= \int \int J_{0\alpha\beta}(\mathbf{r}_1, \mathbf{r}_2) \\ &\times \exp \left[i \frac{k}{z} (\mathbf{r}'_1 \cdot \mathbf{r}_1 - \mathbf{r}'_2 \cdot \mathbf{r}_2) \right] d\mathbf{r}_1 d\mathbf{r}_2 \\ (\alpha, \beta &= x, y). \end{aligned} \quad (26)$$

On using Eqs. (10) and (26) we get

$$\begin{aligned} J_{xx}^\infty(\mathbf{r}'_1, \mathbf{r}'_2) &= J_{yy}^\infty(\mathbf{r}'_1, \mathbf{r}'_2) \\ &= \left(\frac{k}{f} \right)^2 \frac{I_0}{4\eta\gamma_{xx}} \exp \left[- \left(\frac{k}{f} \right)^2 \frac{|\mathbf{r}'_1 + \mathbf{r}'_2|^2}{16\gamma_{xx}} \right] \\ &\times \exp \left[- \left(\frac{k}{f} \right)^2 \frac{|\mathbf{r}'_1 - \mathbf{r}'_2|^2}{4\eta} \right], \end{aligned} \quad (27)$$

$$\begin{aligned} J_{xy}^\infty(\mathbf{r}'_1, \mathbf{r}'_2) &= \left(\frac{k}{f} \right)^2 \frac{I_{0xy}}{4\eta\gamma_{xy}} \exp \left[- \left(\frac{k}{f} \right)^2 \frac{|\mathbf{r}'_1 + \mathbf{r}'_2|^2}{16\gamma_{xy}} \right] \\ &\times \exp \left[- \left(\frac{k}{f} \right)^2 \frac{|\mathbf{r}'_1 - \mathbf{r}'_2|^2}{4\eta} \right] \end{aligned} \quad (28)$$

with

$$\gamma_{\alpha\beta} = \frac{1}{8\sigma_{I_0}^2} + \frac{1}{2\sigma_{\mu_{0\alpha\beta}}^2} \quad (\alpha, \beta = x, y), \quad (29)$$

$$\eta = \frac{1}{2\sigma_{I_0}^2}. \quad (30)$$

In particular, the far-field intensities of the beam after the passage through a polarizer oriented along two different axis, say 0° and 90° , will be useful for the comparison with experimental results. Such intensities turn out to be

$$I_{(0^\circ)}(r) \propto \exp \left[- \left(\frac{k}{f} \right)^2 \frac{r^2}{4\gamma_{xx}} \right] - \frac{\gamma_{xx}}{\gamma_{xy}} \chi \exp \left[- \left(\frac{k}{f} \right)^2 \frac{r^2}{4\gamma_{xy}} \right], \quad (31)$$

$$I_{(90^\circ)}(r) \propto \exp \left[- \left(\frac{k}{f} \right)^2 \frac{r^2}{4\gamma_{xx}} \right] + \frac{\gamma_{xx}}{\gamma_{xy}} \chi \exp \left[- \left(\frac{k}{f} \right)^2 \frac{r^2}{4\gamma_{xy}} \right] \quad (32)$$

with $\chi = I_{0xy}/I_0$. Furthermore, the degree of polarization in the far field is given by

$$P^\infty(\mathbf{r}) = \frac{\gamma_{xx}I_{0xy}}{\gamma_{xy}I_0} \exp \left[- \left(\frac{k}{f} \right)^2 \frac{r^2}{4} \left(\frac{1}{\gamma_{xy}} - \frac{1}{\gamma_{xx}} \right) \right], \quad (33)$$

which is a Gaussian function of r .

As can be seen from the foregoing development, from measurements of the intensities after a suitably orientated polarizer and of the degree of polarization in the far-field, it is possible to gain information about the transverse coherence lengths and the parameter χ of the source. In particular, if the following approximations hold:

$$\sigma_{I_0} \gg \sigma_{\mu_{0\alpha\beta}}, \quad (34)$$

and

$$\gamma_{\alpha\beta} \approx \frac{1}{2\sigma_{\mu_{0\alpha\beta}}^2} \quad (35)$$

from measurements of the widths of Gaussian functions given in Eqs. (31)–(33) a complete characterization of the source is achieved.

3. Experimental results

In this section a method for synthesizing sources of the type in Eq. (10) is given and experimental results on its characterization are presented.

The experimental set-up is shown in Fig. 1. In order to have two uniformly, linearly and orthogonally polarized sources, a Mach–Zehnder interferometer is used. The linearly polarized beam emitted by an Argon laser enters the interferometer. A half-wave plate rotates by 90° the polarization axis of the beam in one of the arms of the interferometer. Two microscope objectives (MOs) and two rotating ground glasses (RGGs) are used to produce two orthogonally polarized spatially incoherent sources. Two suitably shaped intensity filters cover each of such incoherent sources, which are superimposed at the output of the interferometer and imaged by another microscope objective (MO'). The image so obtained represents (approximately) a spatially incoherent source with Gaussian intensity profile and whose BCP matrix is given by Eq. (16). By means of a lens (L) placed at the distance f (corresponding to its focal length) from the above image, and using a Gaussian intensity filter (GF) just after the lens (see Fig. 1), a partially polarized Gaussian Schell-model source is obtained whose Beam Coherence Polarization matrix is given by Eq. (14). A rotation by 45° of the reference frame in the transverse plane leads to a BCP matrix of the form in Eq. (10).

The beam generated by such source is analyzed in the far field by means of a CCD camera. Another lens (L) and a microscope objective (MO'') are used to focus the image into the camera. Two different kinds of measurements have been performed: intensity profiles after a polarizer (P) oriented along two orthogonal axes, and local degree of polarization.

The intensity profiles are shown in Fig. 2. They are plotted together with the corresponding theoretical curves, given Eqs. (31) [Fig. 2(a)] and (32) [Fig. 2(b)]. The transverse coherence lengths and the ratio χ have been obtained by a fitting procedure as

Fig. 1. Experimental set-up. *B*, beam-splitter; *M*, mirror; *MO*, microscope objective 40 $\times$; *MO'*, microscope objective 40 $\times$; *GF*, Gaussian filter; *MO''*, microscope objective 10 $\times$; *L*, lens with $f = 10$ cm; $\lambda/4$ and $\lambda/2$, quarter-wave plates and half-wave plates, respectively.

Fig. 2. Far field beam intensity profiles after a polarizer with its transmission axis at $\theta = 0^\circ$ (a) with respect the incident plane and at $\theta = 90^\circ$ (b).

Fig. 3. Local degree of polarization versus x for $y = 0$ in the far field.

$$\sigma_{\mu_{0xx}} = 0.40 \text{ mm}, \quad \sigma_{\mu_{0xy}} = 1.18 \text{ mm}, \quad \chi = 0.03. \quad (36)$$

As far as polarization features are concerned, the local degree of polarization in the far field is plotted in Fig. 3. The procedure is analogous to that used for measuring the standard degree of polarization of light [19], but in this case measurements of the intensities after the polarizer and the quarter-wave plate must be performed for every point in the transverse plane, so that we used the CCD camera. In Fig. 3 the degree of polarization at each point of the transverse section has been plotted versus x for $y = 0$. Dots represent the experimental points and the line the theoretical curve calculated using the parameters given in Eq. (36). From this figure, it is seen that the local degree of polarization is Gaussian in the transverse section, as predicted by Eq. (33). In particular, the comparison between the theoretical and experimental results agrees quite well.

4. Conclusions

A method to experimentally synthesize a partially polarized Gaussian Schell-model source which is indistinguishable, as far as scalar measurements are concerned, from an ordinary

Gaussian Schell-model source, has been presented. This source has been characterized through measurements of the generated beam in the far-field. From such measurements, the values of the parameters of the BCP matrix of the source have been obtained. The local degree of polarization in the far field has also been measured. Experimental results are found to be in good agreement with theoretical prediction.

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