Azimuthal Decomposition of Optical Modes

Angela Dudley¹, Igor Litvin¹, Filippus S. Roux¹ and Andrew Forbes¹,²,³

¹ CSIR National Laser Centre, Pretoria, South Africa
² School of Physics, University of KwaZulu-Natal, Durban, South Africa
³ Laser Research Institute, University of Stellenbosch, Stellenbosch, South Africa

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To decompose the azimuthal modes we need two steps: generation and decomposition.
An azimuthally-varying phase (bounded by a ring-slit) placed in the spatial frequency domain produces a higher-order Bessel beam.
To decompose the azimuthal modes as a function of the radial coordinate, an annular ring restricts the azimuthal match-filter

\[ u(r, \phi, z) = \frac{1}{\sqrt{2\pi}} \sum_{l} a_l(r, z) \exp(il\phi) \]

\[ u(\phi) = a_1 + a_2 + a_3 \]

\[ u(r, \phi) = a_1(r) + a_2(r) + a_3(r) \]

\[ a_n(r, z) = \frac{1}{\sqrt{2\pi}} \int_{0}^{2\pi} u(r, \theta, z) t(r, \theta) d\theta \]
The experiment for extracting the local azimuthal modes requires only two SLMs.
Although the field has no global azimuthal mode, its local azimuthal modes vary radially across the field.
The phase delay is extracted by interfering a selected azimuthal mode with a reference mode

\[ I_i(\Delta \theta_i) = |a_i(R) + g|^2 = a_i^2(R) + |g|^2 + 2a_i(R)|g|\cos[\Delta \theta_i(R) - \alpha] \]

\[ g = |g|\exp(i\alpha) \]
The experiment for extracting the phase delays for each azimuthal mode requires only two SLMs.
The technique was tested by scanning through a phase shift from 0 to $2\pi$ in one of the azimuthal modes.
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We can construct the spatial distribution, phase and OAM density of the initial mode

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Thank You
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<tr>
<th>Dates</th>
<th>31 August – 2 September 2012</th>
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<tr>
<td>Venue</td>
<td>Cathedral Peak Hotel, Drakensberg, South Africa</td>
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<tr>
<td>Topics</td>
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**IMPORTANT DATES**

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<tr>
<td>28 May 2012</td>
<td>Abstract submission opens</td>
</tr>
<tr>
<td>15 June 2012</td>
<td>Abstract submission closes</td>
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<td>1 July 2012</td>
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<td>31 July 2012</td>
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