

## **Selection of a LG<sub>p0</sub>-shaped fundamental mode in a laser cavity: Phase versus amplitude masks**

Abdelkrim Hasnaoui **a**, Thomas Godin **b**, Emmanuel Cagniot **b**, Michael Fromager **b**,  
Andrew Forbes **d,e**, Kamel Aït-Ameur **b,c,n**

*a* Faculté de Physique, Université des Sciences et de la Technologie Houari Boume'di\_ene, B.P. no 32, El Alia, 16111 Algiers, Algeria

*b* Centre de Recherche sur les Ions, les Matériaux et la Photonique, Unité Mixte de Recherche de Recherche 6252, Commissariat à l'Energie Atomique, Centre National de la Recherche Scientifique, Université de Caen, Ecole Nationale Supérieure des Ingénieurs de Caen, Boulevard Marechal Juin, F14050 Caen, France

*c* Centre de Développement des Techniques Avancées, Division Milieux Ionisés et Lasers, PO Box 17 Baba Hassan, 16303 Algiers, Algeria

*d* Council for Scientific and Industrial Research, National Laser Centre, PO Box 395, Pretoria 0001, South Africa

*e* School of Physics, University of KwaZulu-Natal, Private Bag X54001, Durban 4000, South Africa

### **Abstract**

Laser beams of a single high-order transverse mode have been of interest to the laser community for several years now. In order to achieve such a mode as the fundamental mode of the cavity, mode selecting elements in the form of a phase or amplitude mask are often placed inside the resonator. Such elements have the role to impose one or several zeros of intensity of the desired mode. In this paper, we consider the use of the most simple phase (amplitude) mask which is a transparent p-plate (absorbing ring) set inside a diaphragmed laser cavity for selecting a pure LG<sub>p0</sub> mode of radial order,  $p$ . We analyse, for each type of mask, the origin of the transverse mode selection, and contrary to what one might expect we find that it is not necessary the absorbing mask that results in the highest losses.