

# Vector mode generator graphical user interface manual

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## 1 Overview

This software is a Matlab GUI to address the Holoeye Pluto spatial light modulator (SLM) in a split-screen configuration. The main goal is to provide an easy-to-use tool for the generation of cylindrical vector vortex beams as well as other instances of vector beams.

## 2 Software requirements

The vector mode generator GUI software has the following requisites:

- Working Matlab station (2011 version and newer).
- Java virtual machine must be installed.
- The SLM must be plugged before running the software.
- Video card that supports a resolution of  $1920 \times 1080$  pixels.

## 3 Interface

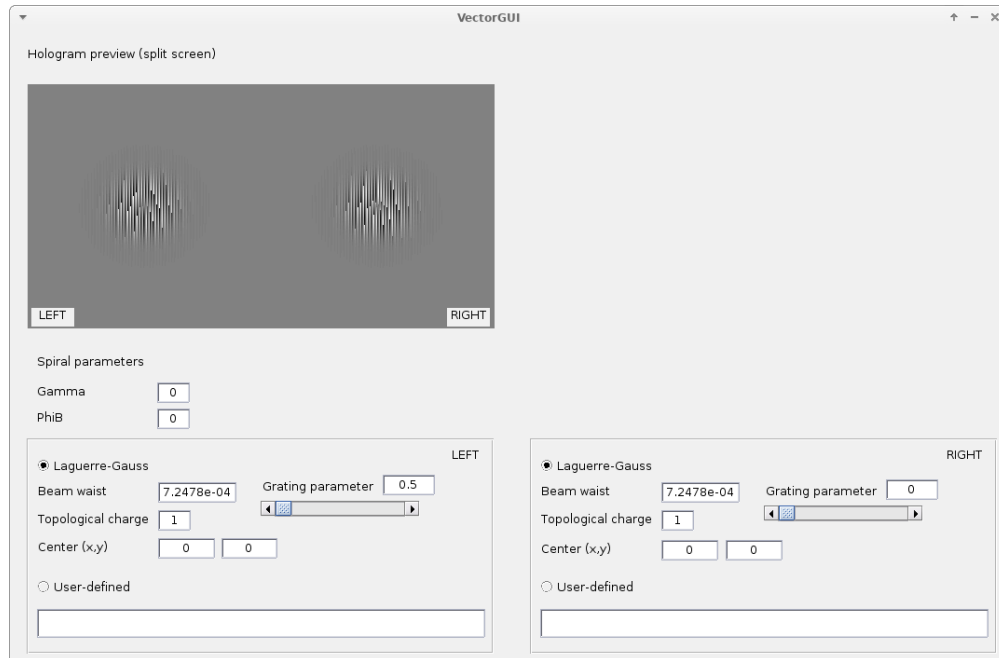


Figure 1: Screenshot of the GUI.

To run the GUI, execute the `VectorGUI.m` script inside Matlab. It will pop-up the interface as the one shown in Fig. 1. In the top-left corner of the GUI we show the displayed hologram in the SLM. As a default option, we use the Laguerre-Gaussian beams, where you can set the beam waist, topological charge and location of the beams for each half of the SLM. Indeed, we consider the components as

$$E_L = (\alpha - i\beta) \text{LG}_{\ell_L}, \quad (1)$$

$$E_R = (\alpha + i\beta) \text{LG}_{\ell_R}, \quad (2)$$

where  $\alpha = \cos \gamma$ ,  $\beta = \sin \gamma \exp(i\phi_B)$  and  $\text{LG}_\ell$  is the Laguerre-Gaussian beam of zeroth radial order and topological charge  $\ell$ , at the plane  $z = 0$ . To generate the well-known cylindrical vector beams we adjust the values of  $\gamma$ ,  $\phi_B$ ,  $\ell_L$  and  $\ell_R$  as:

$$\text{Radial} \rightarrow \gamma = 0, \phi_B = 0, \ell_L = -1, \ell_R = 1, \quad (3)$$

$$\text{Azimuthal} \rightarrow \gamma = \pi/2, \phi_B = 0, \ell_L = -1, \ell_R = 1, \quad (4)$$

$$\text{Hybrid even} \rightarrow \gamma = 0, \phi_B = 0, \ell_L = 1, \ell_R = -1, \quad (5)$$

$$\text{Hybrid odd} \rightarrow \gamma = \pi/2, \phi_B = 0, \ell_L = 1, \ell_R = -1. \quad (6)$$

The grating parameter adjusts the grating over-imposed to the hologram. There is also the option to use custom functions in the user-defined section. For this option, the variables  $X$ ,  $Y$  (capitals), are stored in memory for their use as the spatial coordinates. Each time you change a parameter in the GUI the hologram is refreshed in the SLM screen automatically.