



# A fully-integrated conference content management system

## About

SPIE, the international society for optics and photonics, is the world's largest sponsor of optics and photonics conferences, holding 25 major international conferences congresses, and technical forums each year.

## Goals

To provide SPIE with a poster submission and display solution that augments SPIE's online conferences, automates poster collection, and preserves poster content as an integral part of the SPIE Digital Library.

## Our approach

Integrate poster submission and publishing technology into the SPIE Digital Library to increase the dissemination, discoverability, and impact of this content through a seamless interface.



## The Challenge

SPIE initially engaged Morressier as a hybrid conference solution to offer digital poster displays at its in-person conferences and online in the SPIE Digital Library. Platform processes and specs were initially developed with this solution in mind. Due to the COVID-19 crisis, however, the Society had to rapidly pivot in-person events to an online Digital Forum format within a short timeframe. This required a complete overhaul of existing project requirements and workflows. SPIE now required a poster submission system that would seamlessly integrate into its existing submission system and Digital Library site architecture, featuring the same branding, look and feel, and single sign-on functionality.

*Morressier has demonstrated remarkable agility and flexibility as we pivoted to an entirely new form of online meetings. **Our partnership is a tremendous asset** and we are happy to be working with them through these unusual times.*

Scott Ritchey, CTO at SPIE



## The Solution

Morressier quickly adapted to SPIE's changing needs and project specifications by providing an online workflow solution. Working in partnership with the SPIE technology team, Morressier launched an integrated and highly configurable submission tool to facilitate the collection of poster content within the SPIE platform. Under an accelerated schedule, the system launched in time to manage submissions for the SPIE Optics + Photonics Digital Forum. Each submission is fully searchable within the SPIE Digital Library and metadata will be discoverable through the Morressier platform, enhancing its global dissemination.

## By the numbers



5,500+  
yearly poster  
submissions



25  
conferences  
per year



40,000+  
attendees  
per year

**Rotationally Tunable Polarization-Insensitive Metasurfaces for generating Vortex Beams**

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**INTRODUCTION**

• We propose and design a compact, resonant, double-lens metasurface structure having two degrees of freedom: (i) variable phase profiles controlled by the rotation angle.

• Inspired by Moiré lenses, the proposed structure consists of two adjacent metasurfaces that are radially rotated around the optical axis to generate vortex beams.

**Fig. 1a** Unit Cell Structure **Fig. 1b** Metasurface Representation **Fig. 1c** Unit Cells of adjacent metasurfaces

• The diameter of a square unit cell is optimized with a period of 600.0 nm. Design wavelength is chosen as 532.0 nm.

**THEORY**

• Each metasurface is assumed to generate complex transmission factor as:

$$T_1(r, \theta) = \exp[i\phi_1(r)] \exp[i\theta_1(r)] \quad (1)$$

$$T_2(r, \theta) = \exp[i\phi_2(r)] \exp[i\theta_2(r) + \theta_0(r)] \quad (2)$$

• Assuming phase profiles of adjacent metasurfaces are designed to produce a total transmission function as:

$$T_{total}(r, \theta) = \exp\left\{i\left[\frac{\phi_1(r) + \phi_2(r)}{2} + \frac{\theta_1(r) + \theta_2(r) + \theta_0(r)}{2}\right]\right\}$$

1. Setting  $\theta_1(r) = \theta_2(r) = \theta_0(r) = \theta$  gives vortex beams as:

$$T_{total}(r, \theta) = \exp[i(\theta + 3\theta_0 + \phi(r))] \quad (4)$$

2. Setting  $\theta_1(r) = \theta = \theta_0$  and  $\theta_2(r) = \theta + \theta_0$  gives converging vortex beams:

$$T_{total}(r, \theta) = \exp[i(\theta + 3\theta_0 + \phi(r))] \quad (5)$$

**RESULTS**

• BESSIE BEAM GENERATION

**Fig. 2** Simulation results to BESSIE BEAM GENERATION. **Fig. 3** 3D visualization of the total phase profile of the metasurface. **Fig. 4** 3D visualization of the total phase profile of the metasurface. **Fig. 5** 3D visualization of the total phase profile of the metasurface.

**Fig. 6** Comparison of BESSIE BEAM and BESSIE BEAM DISTRIBUTION. **Fig. 7** Comparison of BESSIE BEAM and BESSIE BEAM DISTRIBUTION. **Fig. 8** Comparison of BESSIE BEAM and BESSIE BEAM DISTRIBUTION.

**AVERAGE BEAM IT**

- Mode Order:  $l = 0, 1, 2, 3, 4$
- Transmission Efficiency:  $\approx 71\%$
- Focusing Efficiency:  $\approx 20\%$

**Fig. 9** Comparison of BESSIE BEAM and BESSIE BEAM DISTRIBUTION. **Fig. 10** Comparison of BESSIE BEAM and BESSIE BEAM DISTRIBUTION. **Fig. 11** Comparison of BESSIE BEAM and BESSIE BEAM DISTRIBUTION.

• We demonstrate that the structure converts the input plane wave into the vortex beams with OAM modes as a function of the rotation angle.

**DISCUSSION**

**Rotationally tunable polarization-insensitive metasurfaces for generating vortex beams**

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**Abstract**

The orbital angular momentum (OAM) of light has been applied to a variety of areas such as optical tweezers, interferometry, and high-resolution microscopy<sup>1,2</sup>. Metasurfaces, two-dimensional engineered structures with subwavelength features, give access to tailored functionalities through highly efficient phase shifting and polarization conversion. However, conventional designs with a single metasurface element produce vortex beams with fixed OAM of  $l$ , which limits the potential application areas. In this study, we propose and design a metasurface doublet lens structure having the property of generating variable modes controlled by the rotation angle. Inspired by Moiré lenses, the proposed structure consists of two all-dielectric metasurfaces where the second lens has the reverse phase profile compared to the first one. This causes the cancellation of the total phase shift at the nominal position. In our design, we rotate the second element with a discrete set of angles from 0 to 5.6 degrees with respect to the optical axis and obtain a set of the modes from  $l = 0$  to 4. We demonstrate that the structure converts the input plane wave to the vortex beams with OAM modes as a function of the rotation angle. We model the unit cell structure working at wavelength 532 nm with circular cross-section, fixed height and variable radius titanium dioxide nanopillar on a fused-silica substrate. Nanopillar locations are distributed in a square lattice form with subwavelength periodicity which is suitable for conventional microelectronic's fabrication methods. We believe our design can be used in optical trapping to detect different sizes of micro-particles and to create reconfigurable microoptomechanical pumps.

## Results

### ***A rapid transformation***

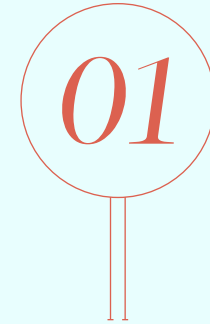
SPIE was able to successfully adapt existing workflows to integrate poster content into the Digital Forum experience. This was supported by a close, collaborative approach with the Morressier team.

### ***Fully integrated submission process***

The integration of Morressier's digital submission workflow within SPIE's submission system automated the poster management process and saved SPIE both time and resources to focus on other aspects of the Digital Forum experience. Researchers benefited from a simple, design-focused submission tool. In the future, the SPIE-Morressier integration will support both online Digital Forums and in-person conferences.

### ***Enhanced discoverability***

SPIE posters are now accessible to a global audience through the SPIE Digital Library, increasing the longevity and impact of the content, and extending engagement well after an individual conference concludes. At the same time, SPIE maintains full control over the dissemination of the content in its SPIE Digital Library and will enhance the discovery of this content by integrating conference metadata into Morressier's platform.



**SPIE successfully integrated digital poster content into its Optics + Photonics Digital Forum experience within an accelerated timeframe.**

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**Morressier integrated a poster submission workflow into SPIE's existing submission system, saving the SPIE team time and resources in the process.**

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**Posters can now be shared not just with attendees but with a broader global audience through the SPIE Digital Library.**





**Morressier**

Virtual and hybrid conference solutions that significantly increase content engagement and add new revenue streams – learn more about how your organization can benefit from Morressier’s support.