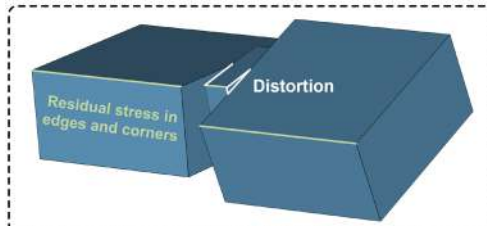


A Monolithically 3-D Printed Waveguide Filter Based on Elliptic Cylindrical Resonators With Enhanced Polarization Rotation Flexibility

Yuhong Ye^{1,2}, Jin Li^{1,2}, Sicheng Chen^{1,2}, Zhihong Xu^{1,2}, Tao Yuan^{1,2}

STATUS QUO

Conventional twisted BPFs



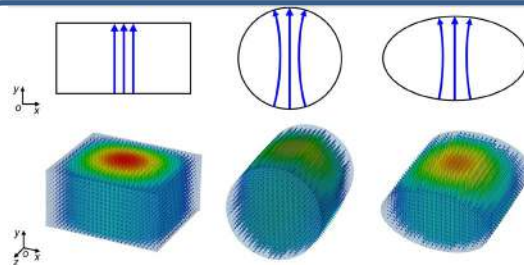
Features of polarization-rotated BPFs:

- Frequency selection
- Polarization rotation

Drawbacks of conventional twisted BPFs:

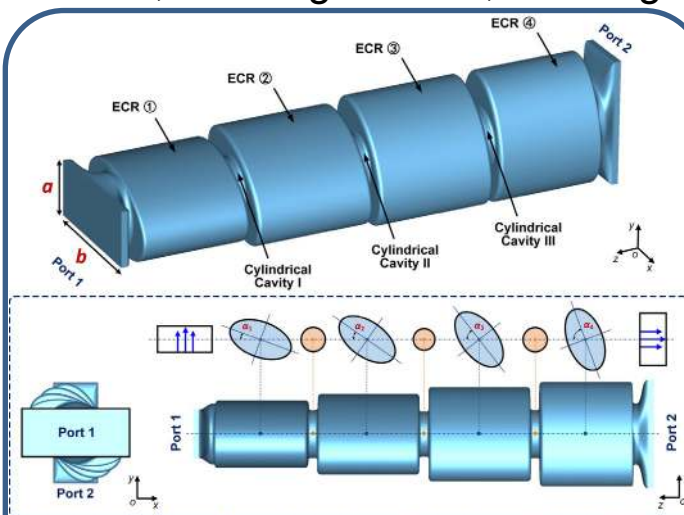
- Geometrical distortion
- Difficult to analyze
- Cascaded with filters and twists (bulky & lossy)

NEW INSIGHTS



- **Similar field distribution** : TE_{10} , TE_{11} and TE_{c11}
- **Rotational symmetry** of Elliptical cylindrical resonators (ECRs) and cylindrical coupling cavities
- Waveguide **continuous closed contour**
 - Avoid edges and corners
 - Avoid internal supporting, monolithic integration

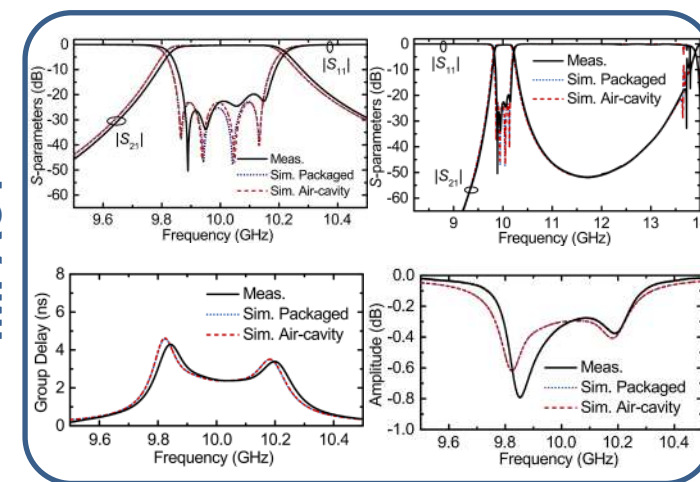
DESCRIPTION



Inline ECR polarization-rotated BPFs

- Design flexibility of any polarization rotation angle between 0° – 90°
- Compatible with 3-D Printing without any distortion
- Monolithic integration
- **Coupling Structures**
 - Inter-resonator coupling: cylindrical cavity
 - External coupling: cylindrical cavity
- **RF design specification**
 - Center frequency $f_0 = 10$ GHz, FBW = 3%, RL > 20dB
 - $M_{S1} = M_{A1} = 0.0318$, $M_{12} = M_{34} = 0.0280$, $M_{23} = 0.0214$

QUANTITATIVE IMPACT



PROPOSED CONCEPT GOALS

- **Excellent passband performance** (RL: > 20 dB; IL: ~0.4 dB; Δf : ~0.2%)
- **Enhanced design of flexibility and structural compatibility with 3-D printing process**
- **Elimination of geometrical distortion**
- Future work:
 - Improving stopband performance and enhancing freedom of polarization orientations

¹College of Electronics and Information Engineering, Shenzhen University, China

²Guangdong-Hong Kong Joint Laboratory for Big Data Imaging and Communication, China

Contact: Yuhong Ye
yeyuhong2021@email.szu.edu.cn