



Contribution ID: 131 Contribution code: MOP24

Type: Contributed Poster

## Optimization of Waveguide and Wire-Grid-Polarizer for Waveguide-Based Optical Resonator of Compact THz FEL

*Monday, 22 August 2022 17:10 (20 minutes)*

At KAERI we are developing compact Terahertz (THz) Free Electron Laser (FEL) for a commercial application like security inspection. We are using a waveguide-based optical resonator for our FEL system. Firstly, we report on the selection of low loss and small cross-section waveguide candidate to enhance the gain of THz FEL. We performed a detailed analysis of waveguides with different shapes and size via COMSOL Multiphysics simulation. Based on the simulation result, we found that a waveguide with a special eye-shaped cross-section has a very small cross-sectional area of  $4 \text{ mm}^2$  at full width at half maximum (FWHM) and a very low wave loss of less than 2.5% for 1-m propagation at an operating wavelength of 300–600  $\mu\text{m}$ . Secondly, we accomplished the optimization of the Wire-Grid-Polarizer (WGP) design parameter via COMSOL Multiphysics code, we calculated the optimized values of grating length and grating period of the WGP i.e., 20  $\mu\text{m}$  and 100  $\mu\text{m}$ , which have less than 10% of loss for the wavelength of 300–600  $\mu\text{m}$ . The material which we used for WGP simulation is Tungsten coated with gold because it has a high extinction ratio and transmission as compared with common grating material.

### I have read and accept the Privacy Policy Statement

Yes

**Primary author:** PATHANIA, Varun (Korea Atomic Energy Research Institute)**Co-authors:** BAE, Sangyoon (Korea Atomic Energy Research Institute); Dr KYU-HA, Jang (Korea Atomic Energy Research Institute); LEE, Kitae (Korea Atomic Energy Research Institute); JEONG, Young Uk (Korea Atomic Energy Research Institute)**Presenter:** PATHANIA, Varun (Korea Atomic Energy Research Institute)**Session Classification:** Monday posters**Track Classification:** FEL oscillators & IR-FEL