

Pemisah Daya Optik Berstruktur Multimode-Interference 1 x 8 Berbasis Galium Nitrida = Design of 1 x 8 Multimode Interference-Based Optical Power Splitter In GaN/Sapphire Semiconductor

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Abstrak

In line with the increasing need for higher performance for optical and photonic telecommunications equipment at the lowest possible cost, the need for supporting equipment is also increasing. One of these components is an optical power splitter. This component is needed in network systems to distribute light to other components, especially multi-channel optical power separators to support larger network systems. One of the materials developed as a photonic device material from group III-nitride is gallium nitride (GaN). Besides having a large direct bandgap (3.4eV), GaN also has good resistance to temperature changes. Thus, GaN-based power splitters are an interesting research topic to obtain more improvements, innovations and inventions for future demands. In this research, an optical power splitter design is proposed based on the 1 × 8 multimode interference (MMI) structure. The design has been carried out theoretically using 3D FD-OptiBPM on GaN material. Structural modeling using 300 nm AlN and 200 nm AlGaIn as a buffer layer on a sapphire substrate material. Numerical experiments were carried out at the optical telecommunications wavelength at $\lambda = 1.55 \mu\text{m}$ with the effective refractive index of the coating used $n_{\text{eff}} = 2.279 \pm 0.001$ and $n_{\text{eff}} = 2.316 \pm 0.001$. The results showed that the optimum width and thickness of the rectangular input channel and taper-shaped output channel was 4 μm , and only supported single mode propagation. From the experimental simulation results, it is shown that the MMI-based optical power separator with a total length of 2010 μm and a width of 85 μm is the best result. It is also shown that the output power is split almost uniformly into eight output channels with a relative output power of 0.96 on the output channel, 0.28 dB of excess loss and 0.28 dB of power imbalance. 13 dB.