Poster Example

InP-Based Mach-Zehnder Modulator Integrated with Planar Antenna

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Abstract

Millimeter-wave (MMW) has attracted much attention for its application to high resolution radar, remote sensing, broadband wireless communications. The radio-over-fiber (RoF) system is effective for MMW signal transmission since it enables us to transfer and to relay MMW signals over low-loss silica optical fiber We proposed an InP-based Mach-Zehnder modulator integrated with planar antennas for 60-GHz-band RoF systems. The device is driven by an electric field induced from the planar antenna when MMW signals are received. Compared to conventional planar-antenna-integrated phase modulators based on lithium niobate or nonlinear polymers, the proposed device length is very small of less than 3 mm and its driving power of 50 W/m^2 is comparable to them.

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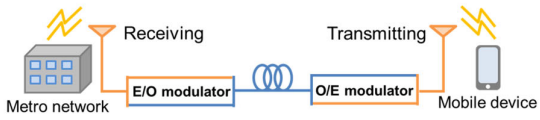
Introduction

Radio-over-fiver (RoF) technology

Transferring and relaying MMB signals over low-loss silica fibers

➡ **Electro-optic (EO) modulator** is essential as converter

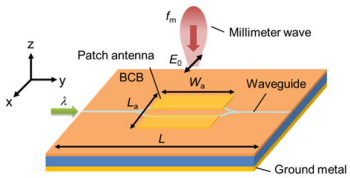


Schematic of RoF system

Mach-Zehnder modulator with planar antenna

Proposed device

Device structure

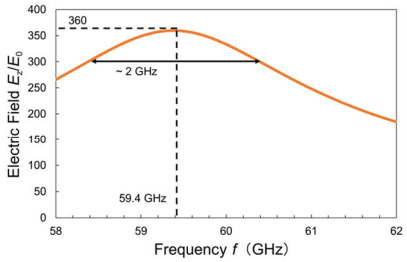


Birds view of proposed device

- Gap embedded patch antenna is adopted as planar one
- Semi-insulating InP (Fe doped InP: Fe-InP)

Results and Discussion

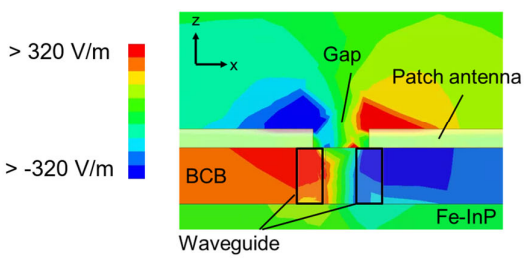
Antenna characteristics



Resonance characteristics

- Applied electric field was 360 times lager compared to input one
- As gap gets larger, peak frequency shifts to shorter wavelength

Electric field distribution of proposed device



Field distribution in modulator

- Z-component of electric field was induced in gap
- The field was uniformly applied to entire waveguide