Active quasi-optical devices

Article Overview

Active quasi-optical devices are systems that combine multiple solid-state components into a single quasi-optical structure to efficiently generate and amplify microwave and millimeter-wave signals.

Overview

Active quasi-optical devices integrate solid-state transistors or diodes into a quasi-optical framework, allowing all components to operate in unison. Unlike conventional transmission-line combiners, quasi-optical systems can combine the output of hundreds or thousands of devices with minimal loss, making them ideal for high-frequency applications where individual solid-state devices cannot provide sufficient power . These devices are particularly effective at millimeter and sub-terahertz wavelengths, where traditional waveguides suffer from high insertion losses .

Key Components and Technologies

• Monolithic Grid Amplifiers: These amplifiers use a grid of transistors, such as HBTs (Heterojunction Bipolar Transistors) or pHEMTs (pseudomorphic High Electron Mobility Transistors), to achieve coherent amplification. For example, a monolithic grid amplifier demonstrated 5 dB gain at 40 GHz with an output of 600 mW .
• Diode Doubler Grids: These devices can generate terahertz signals, with record outputs of 24 mW at 1 THz, by combining multiple diodes in a quasi-optical array .
• Class-E Amplifiers: High-efficiency RF amplifiers based on power MOSFETs, capable of operating in HF, VHF, and UHF bands with efficiencies up to 90%, often without active cooling ....

Article Content

Jul 05, 2026

Active Antennas and Quasi-Optical Arrays

"Whether communications, radar, transportation, or defense drives your interest in solid-state devices at microwave and millimeter

Jul 08, 2026

(PDF) QUASI-OPTICAL DISTRIBUTION SYSTEM FOR MULTI-BEAM ACTIVE

A geometric interpretation is proposed for synthesis of a quasi-optical system employed in multi-beam active phased

Feb 27, 2026

Quasi-optical techniques | IEEE Journals & Magazine | IEEE Xplore

Passive components in the terahertz frequency range based on quasi-optical propagation, including polarization processors, filters,

Aug 15, 2025

QUASI-OPTICAL CIRCUITS

Two devices, the multi-quantum-barrier varactor (MQBV) and the Schottky-quantum-barrier varactor (SQBV), have

Oct 10, 2025

Hybrid and monolithic active quasi-optical grids

Over the past five years, however, active quasi-optical devices—namely oscillators and amplifiers—have evolved.

Aug 02, 2025

Recent Advances in Quasi-Zero Stiffness Vibration Isolation ...

In recent decades, quasi-zero stiffness (QZS) vibration isolation systems with nonlinear characteristics have aroused

Mar 15, 2026

All-optical permittivity-asymmetric quasi-bound states in the continuum

This facilitates the dynamic modulation of devices, as it reduces—or, in principle, completely circumvents—the need

Dec 06, 2025

Ultrafast laser state active controlling based on anisotropic quasi-1D ...

Laser state active controlling is challenging under the influence of inherent loss and other nonlinear effects in ultrafast

Jan 05, 2026

DTIC ADA370115: Active Quasi-Optical Devices

In active quasi-optics, we demonstrated the first successful monolithic HBT and pHEMT millimeter-wave grid amplifiers. In addition,

May 16, 2026

Active optical modulation of quasi-BICs in Si–VO2 hybrid metasurfaces

Active optical modulation breaks the limitation of a passive device, providing a new, to the best of our knowledge,

Sep 19, 2025

Analysis and CAD | part of Active Antennas and Quasi-Optical Arrays ...

Full-Wave Analysis of Quasi-Optical Structures A Generalized Scattering Matrix Approach for Analysis of Quasi-Optical Grids and De

Dec 14, 2025

Active Antennas and Quasi-Optical Arrays

Active Antennas and Quasi-Optical Arrays Book Abstract: "Whether communications, radar, transportation, or defense drives your

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Active quasioptical Ka-band rf pulse compressor switched by a ...

Results of numerical calculations and experimental investigations of an active Ka-band microwave pulse compressor

Feb 15, 2026

Q-switches – acousto-optic, electro-optic, Q-switched laser

Active types include acousto-optic, electro-optic, and mechanical devices. Passive Q-switches are based

Apr 11, 2026

Plasmon-enhanced exciton relocalization in quasi-2D ...

This device leverages a unique exciton relocalization effect in quasi-2D Ruddlesden-Popper perovskites with

Nov 21, 2025

Dual Quasi-Bound States in the Continuum Modes for Optical Activity ...

More importantly, the dual quasi-BIC modes demonstrate the extraordinary capability in controlling the optical activity.

Jan 29, 2026

Active optical modulation of quasi-BICs in Si–VO

Active optical modulation breaks the limitation of a passive device, providing a new, to the best of our knowledge,

Feb 26, 2026

Basic Interpretation Of Optical Active Components

Common optical active components in optical communications include: semiconductor light sources, semiconductor

Feb 20, 2026

Active and Quasi-Optical Arrays for Solid-State Power Combining

This book definesand describes active quasi-optical arrays, reviews the currentstate of the art, and answers numerous basic and

Apr 20, 2026

Active optical modulation of quasi-BICs in Si–VO

The phase-change material vanadium dioxide (VO2) plays an important role in the active device due to its unique

Oct 28, 2025

Active and Quasi-Optical Arrays for Solid-State Power Combining

A detailed and timely overview of recent developments in activequasi-optical arrays

 In recent years, active quasi-optics has

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DTIC ADA370115: Active Quasi-Optical Devices

In this contract, we developed active quasi-optical devices that combine the power of many transistors or diodes to achieve a large

Aug 28, 2025

Ultrafast laser state active controlling based on anisotropic quasi-1D ...

Active controlling of the laser state of ultrafast systems using the polarized optical response of anisotropic materials,

Jun 24, 2026

Active Optical Devices

Thorlabs'' collection of components and systems below are designed to actively manipulate the properties of input light.

Jan 06, 2026

Active quasi-BIC optical vortex generators for ultrafast switching

We note that, since the proposed BIC-based active OV generators are based on the topological properties of the

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Active quasi-BIC optical vortex generators for ultrafast switching

Picosecond switching of OV beams at near-infrared wavelengths are observed. The demonstrated nontrivial

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Active and Quasi-Optical Arrays for Solid-State Power ...

This copiously illustrated reference/textbook summarizes approximately one decade of work in the emerging field of

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Active Quasi-Optical Devices

In active quasi-optics, we demonstrated the first successful monolithic HBT and pHEMT millimeter-wave grid amplifiers. In addition,

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Development of Quasi-Two-Dimensional Perovskites and Their

Quasi-two-dimensional (quasi-2D) perovskites have attracted much attention due to their outstanding properties, such

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D-Band Active Antenna Array with Lens Enabling Quasi-Optical and ...

In this paper, a proof-of-concept at D-band (110-170 GHz) is presented for a hybrid quasi-optic and analogue beamforming approach,

Aug 19, 2025

Active quasi-BIC optical vortex generators for ultrafast switching

The demonstrated nontrivial topological nature of the active generators can significantly expand the application of BIC

Apr 30, 2026

All-optical permittivity-asymmetric quasi-bound states in the continuum

Resonances are usually associated with finite systems—the vibrations of clamped strings in a guitar or the optical

Mar 15, 2026

Active and Quasi-Optical Arrays for Solid-State Power Combining

In recent years, active quasi-optics has emerged as one of the mostdynamic fields of contemporary research--a highly

Jul 14, 2026

Quasi-optical techniques

Passive components in the terahertz frequency range based on quasi-optical propagation, including polarization

Aug 13, 2025

What is Active and Adaptive Optics?

What is Active and Adaptive Optics? Ground-based Optical/Near-Infrared large Telescopes are crucial tools for the

Sep 07, 2025

Quasi-optical Systems Based on Periodic Structures

2. The coupled quasi-optical systems based on open resonators This section is dedicated to the analysis of simple (regular) resonant

May 30, 2026

Quasi-optical and spatial power combining

Quasi-optical power-combining techniques have been developed to address fundamental limitations in solid-state devices and

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