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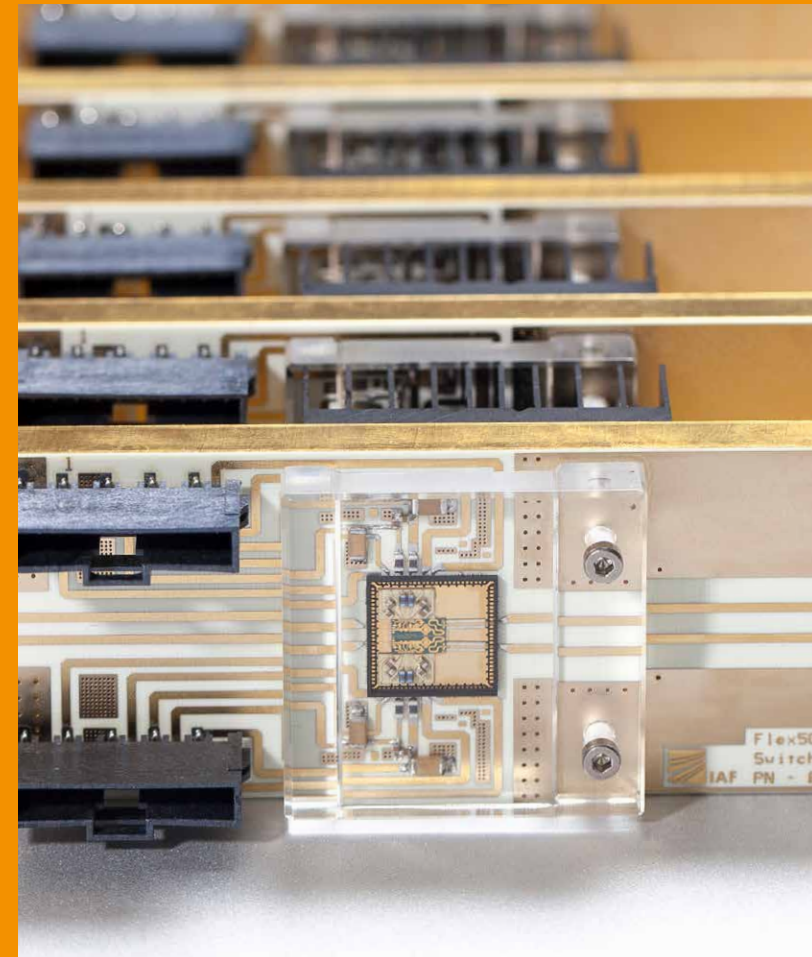
**Fraunhofer Institute for
Applied Solid State Physics IAF**

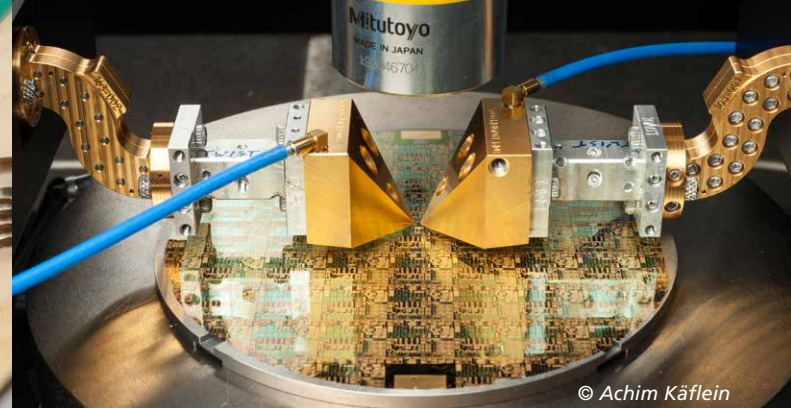
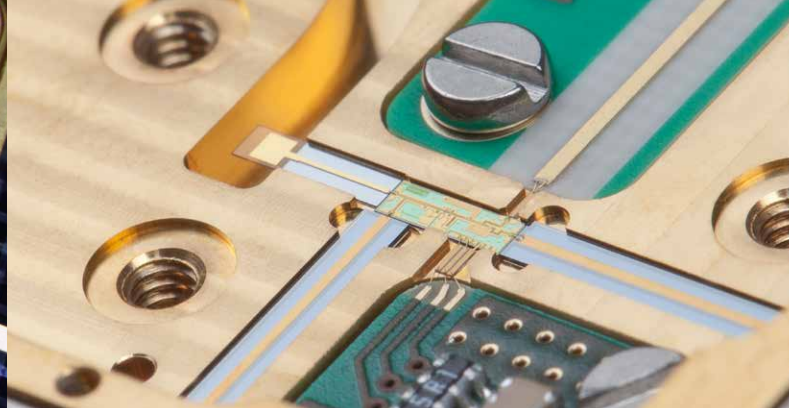
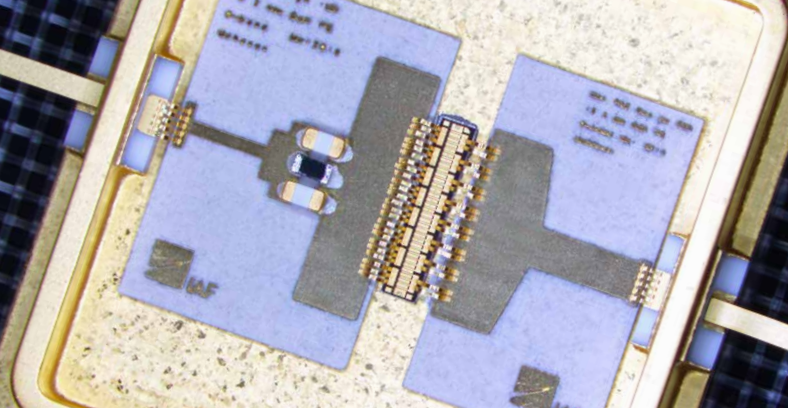
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Fraunhofer IAF is one of the leading research institutions world-wide in the area of III-V semiconductors and diamond. Fraunhofer IAF develops electronic and optoelectronic materials, technologies, devices, and components based on modern semiconductor materials.

The Institute's research and development work covers the entire value chain – from materials research through design, technology and circuits to modules and systems.

HIGH FREQUENCY ELECTRONICS





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III-V compound semiconductor technology for high-speed applications

Fraunhofer IAF develops monolithically integrated microwave and millimeter-wave circuits (MMICs) and modules based on III-V compound semiconductors for sensors and communication technology featuring the complete MMIC technology chain, including design, simulation, small volume manufacturing, module packaging, and characterization. Millimeter-waves enable precise geometrical resolution and also penetrate dust, fog, rain, snow and clothes. A larger bandwidth results in a higher image resolution and higher data rates of wireless communication. MMICs for frequencies up to 850 GHz are developed using InAlAs/InGaAs metamorphic HEMT technology on 4" GaAs substrates. For power amplifier applications from 1 GHz to 150 GHz, AlGaIn/GaN HEMT IC technology enables highest-power operation to at least 150 GHz.

SERVICE OFFER

Manufacturing

- MMIC design
- Device modeling
- Epitaxy
- MMIC processing
- Backside processing
- Packaging

Measurement setups

- S-parameter up to 1.1 THz
- Load-pull up to 1kW/110 GHz
- Noise parameters up to 50 GHz
- Noise figure up to 750 GHz
- Power up to 300 GHz
- Intermodulation up to 50 GHz

Integrated circuits and modules up to 850 GHz

Fraunhofer IAF is the European leader in the development of high frequency modules and integrated circuits. Amplifiers with ultra-low-noise, high gain and low power consumption can be provided. Metamorphic HEMT amplifiers set new records, one with 4.8 dB noise figure at 243 GHz and another featuring 850 GHz operating frequency. Furthermore, multi-functional MMICs are feasible, such as single-chip radars and transceiver circuits.

GaN HEMTs and ICs are used to manufacture power amplifiers, switches, and LNAs for frequencies between 1 GHz and 150 GHz, primarily used in radar systems, wireless applications, and data links. We develop in-package GaN microwave power transistors for radar and mobile communication with efficiency rates of more than 80 % and typical output power levels of up to 1 kW for frequencies up to 3 GHz

Our components are developed for applications in a variety of systems:

- Active and passive imaging systems
- Phased array radar
- Millimeter-wave sensors
- Wireless communication
- Space and earth observation
- Broadband and space communication

High frequency measurement facilities

High frequency and power electronic circuits are characterized using the following measurement facilities:

- S-parameters up to 1100 GHz (on-wafer and in waveguides)
- Pulsed S-parameters up to 50 GHz
- Noise parameters up to 50 GHz
- Noise figure in 50 Ω system up to 210 GHz
- Noise figure in waveguides (hot / cold) up to 750 GHz
- Mixer characterization
- DC and RF measurements at cryogenic temperatures

We also perform power and large signal characterizations:

- Active load-pull up to 50 GHz both on-wafer and in fixture
- Large-signal / load-pull time-domain up to 50 GHz
- Pulsed power (50 Ω) up to 30 W and 40 GHz
- Active and passive load-pull (1 kW to 6 GHz, 200 W/10 GHz, and Multi 10 W to 26 GHz and up to 50 GHz)
- Power in 50 Ω system up to 500 GHz (on-wafer, coax, waveguide)

Temperature accelerated lifetime tests are performed at DC and RF (48 slots available).

The measurement facilities are used to characterize a variety of MMICs and modules, e. g. amplifiers, mixers, frequency multipliers, oscillators, switches and phase shifters.