

A broadband antenna for on-chip integrated spectrometers at 300-1000 GHz

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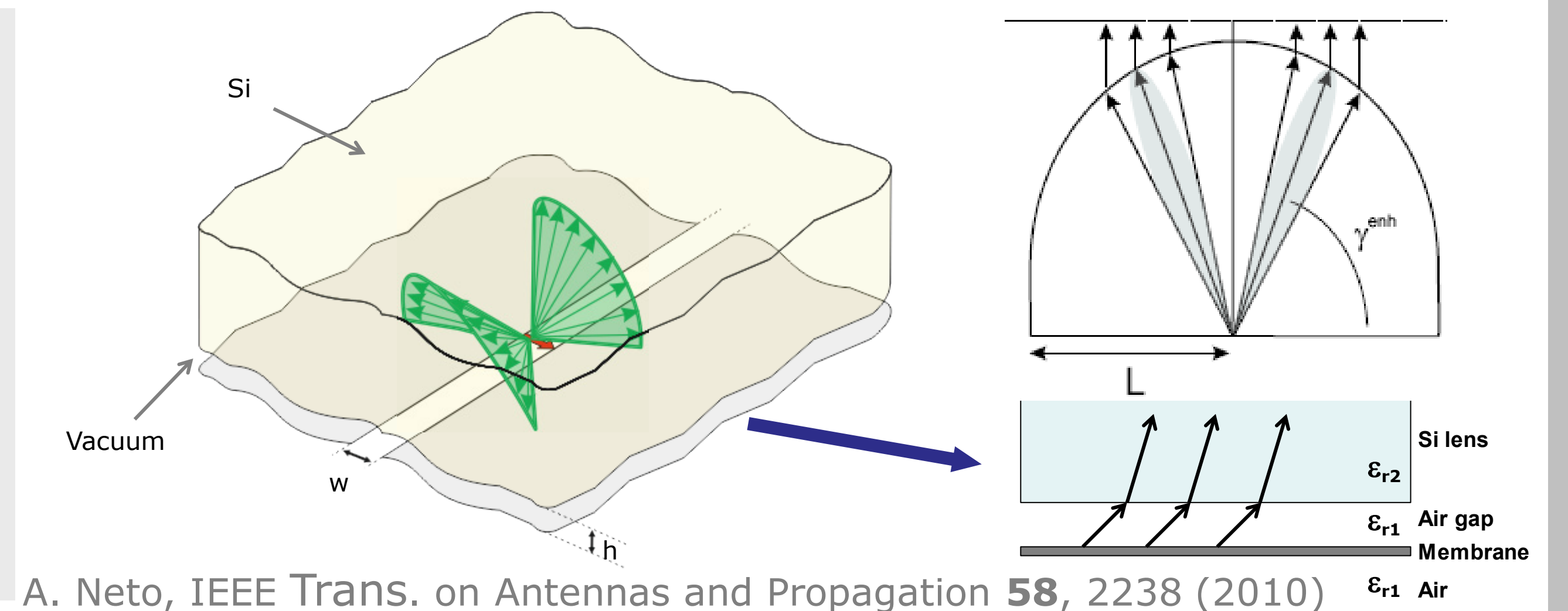
Motivation

The leaky lens antenna is ideally suited for the use in integrated on-chip spectrometers:

- Large bandwidth (>1:3)
- Large minimal feature size ($\lambda/100$)
→ Feedline width > 1 μm @ 1 THz
- linear polarization, can be extended to a dual polarization configuration

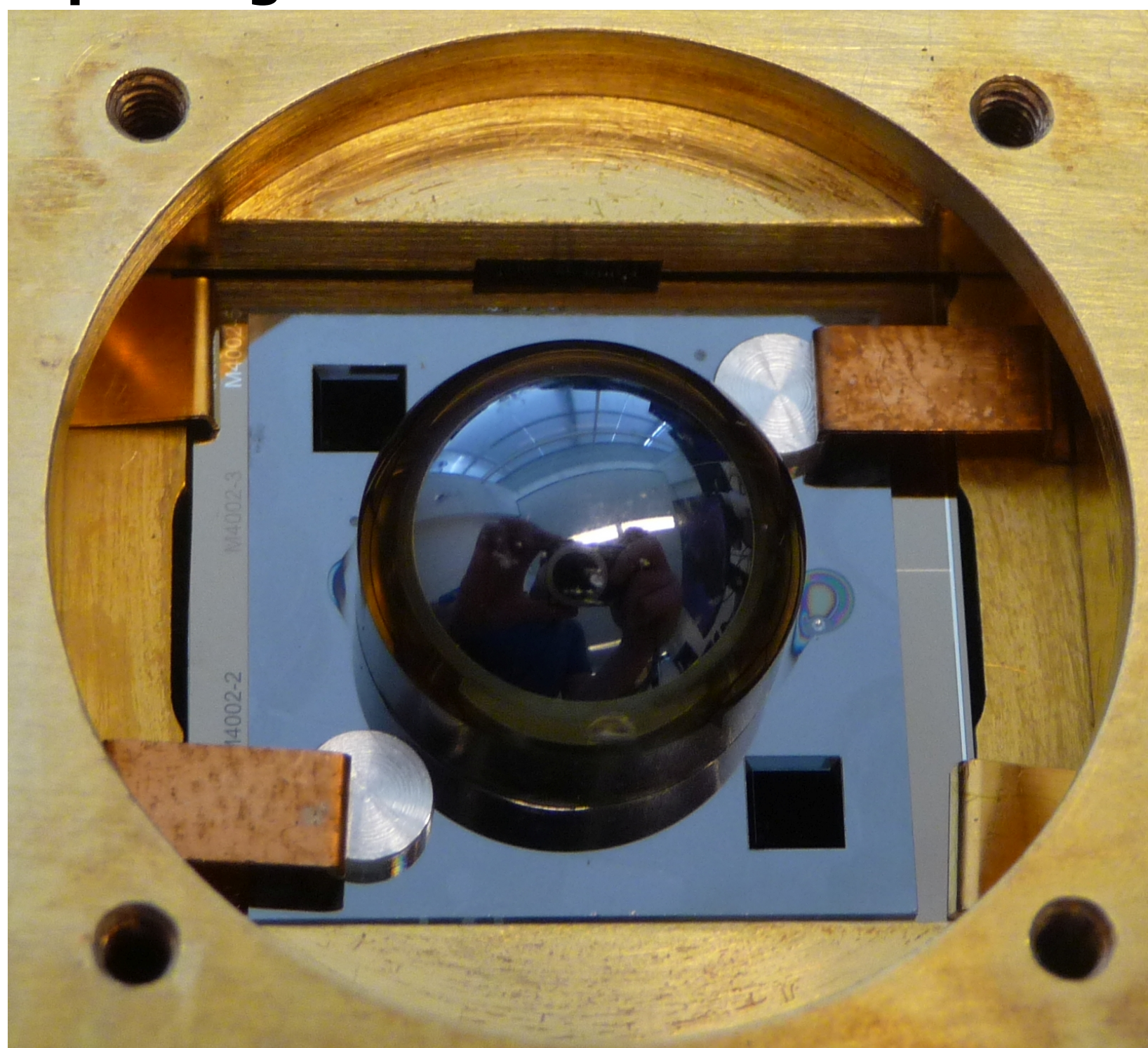
Leaky wave antenna principle

- Non-resonant antenna with broad bandwidth
- Air gap between the lens and the antenna increases directivity, leading to a better illumination of the lens surface

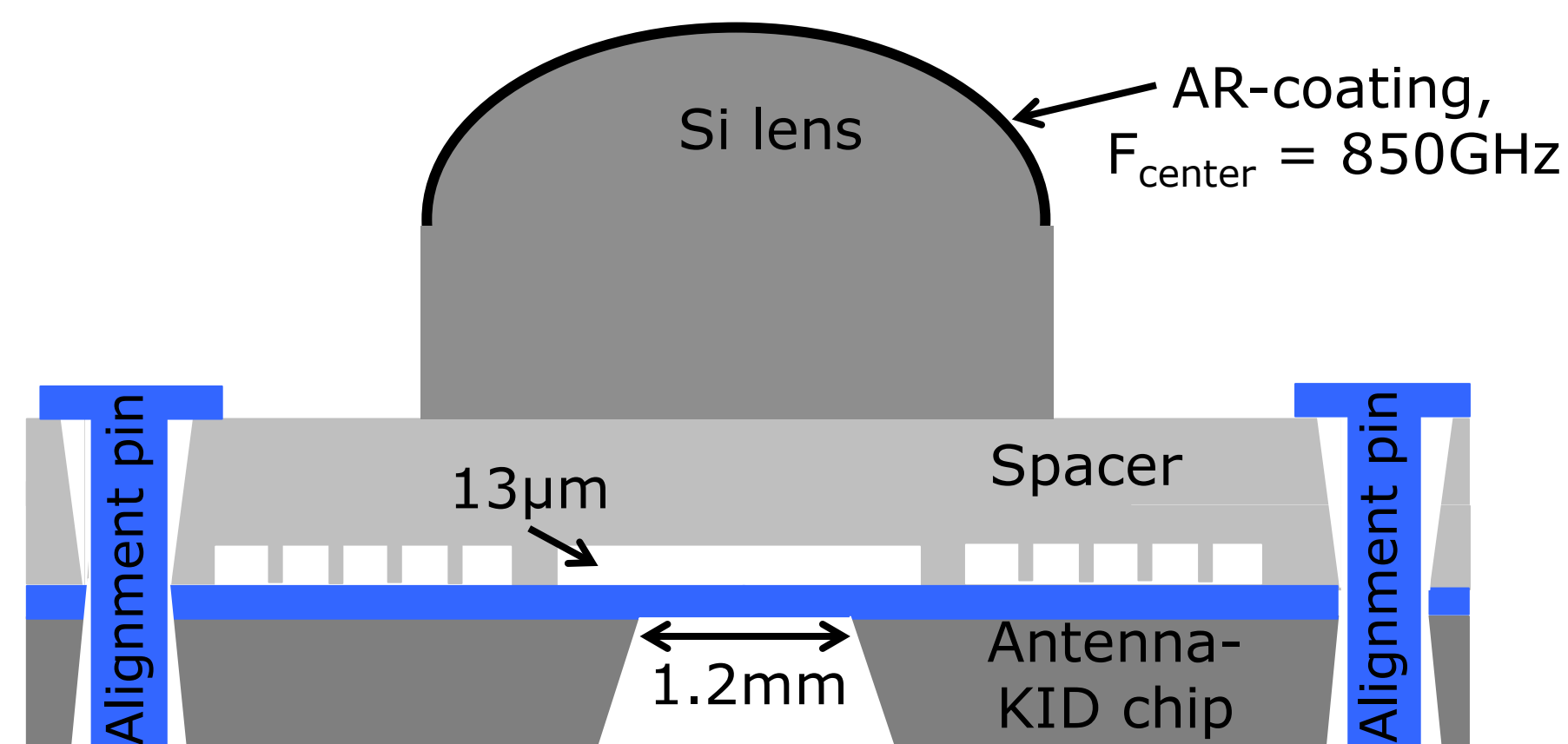


A. Neto, IEEE Trans. on Antennas and Propagation **58**, 2238 (2010)

Chip Design for Antenna characterization

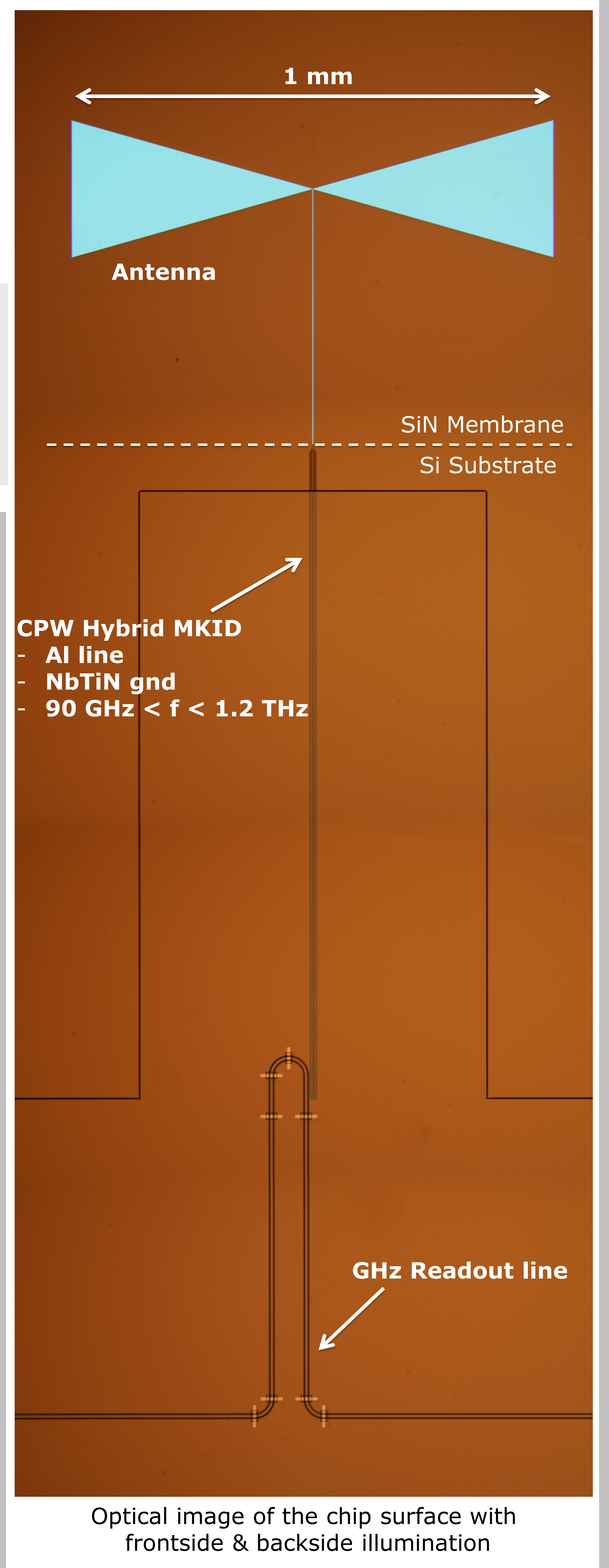


Assembled chip in copper sample holder.

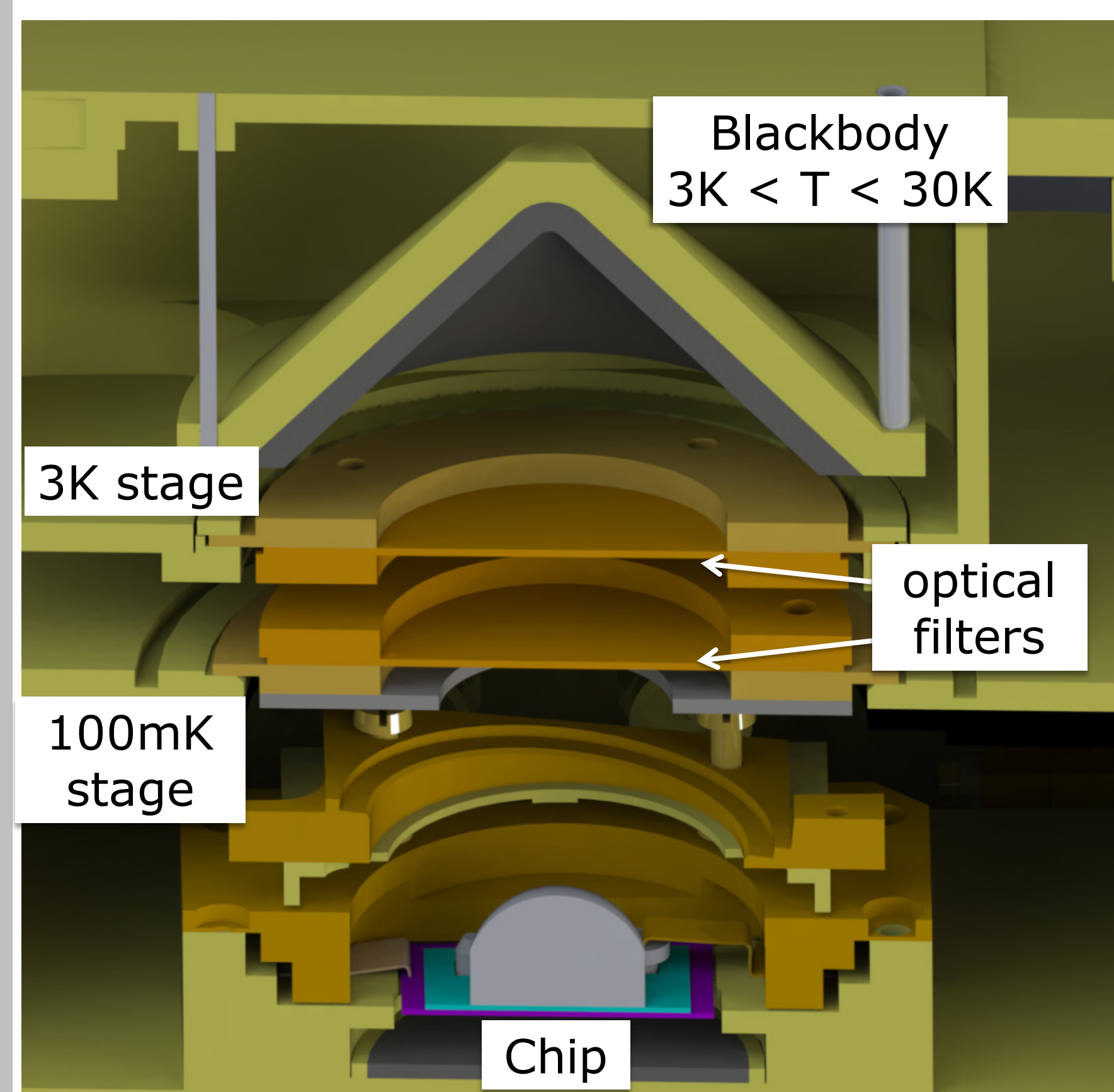


Chip Assembly:

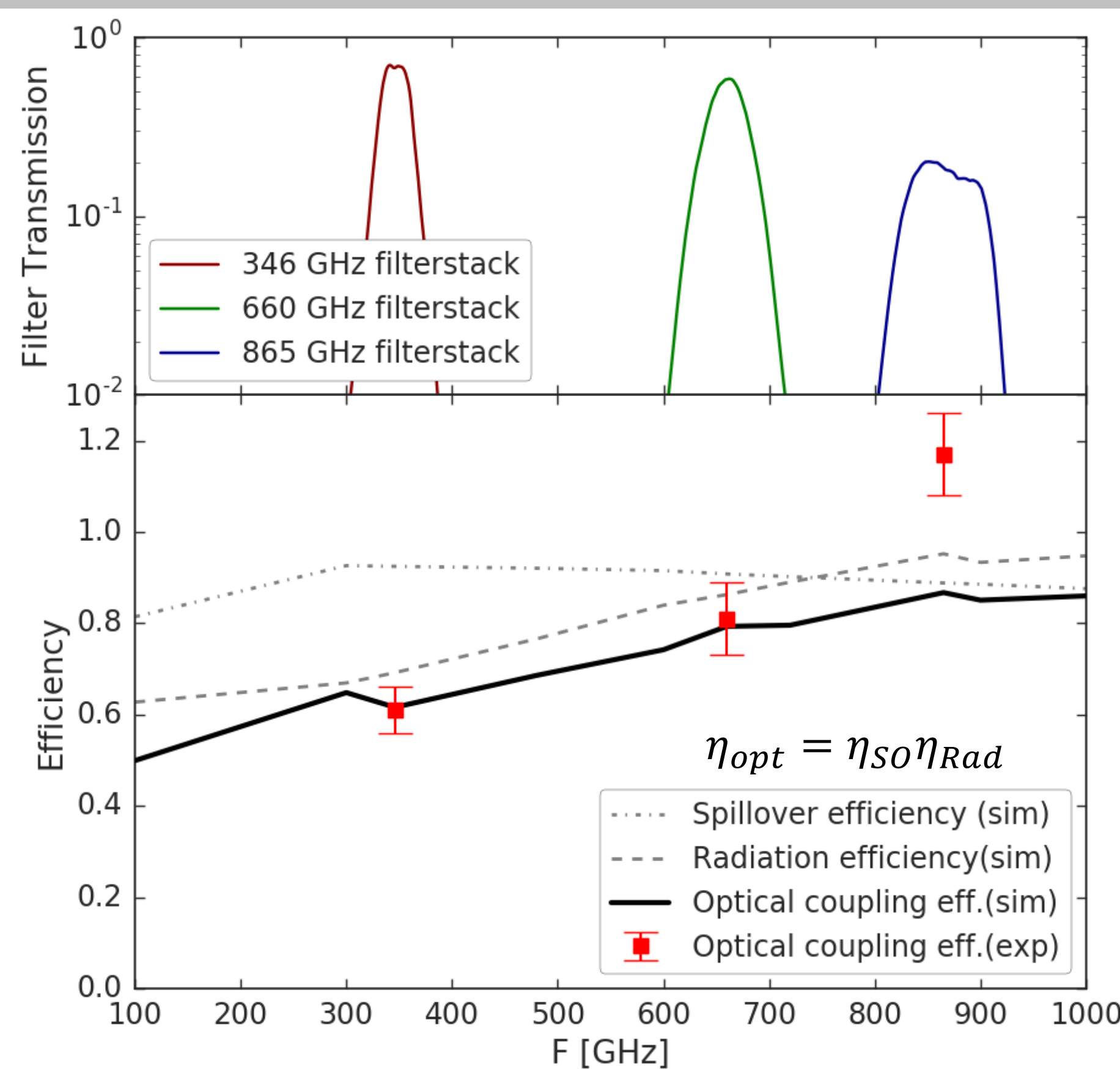
1. Antenna + MKID on Si-wafer with SiN-membrane
2. A separate spacerwafer is clamped with alignment pins to realize the 13 μm leaky-gap.
3. Silicon lens glued to spacerwafer



Optical efficiency

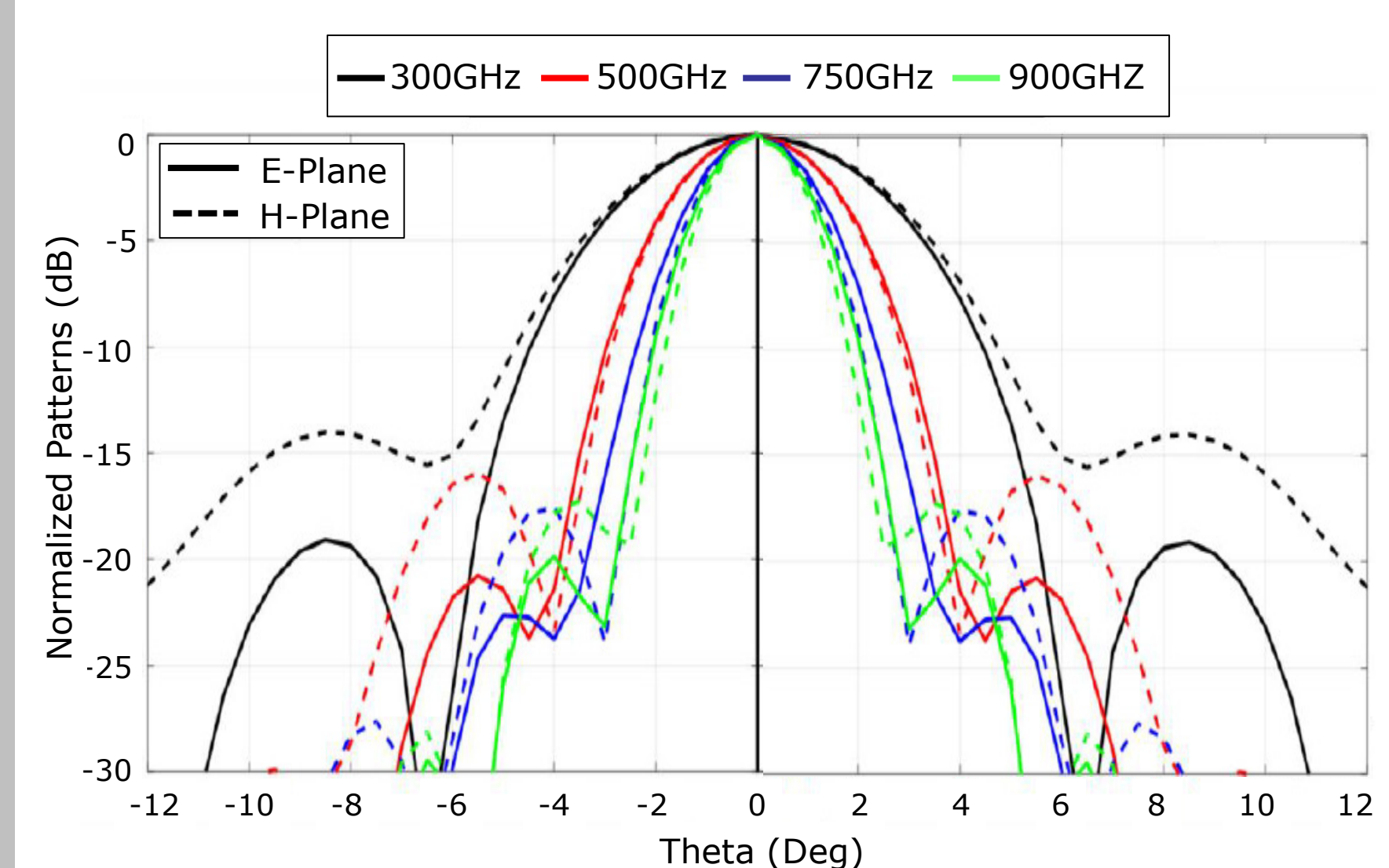


Cross section of the setup inside the cryostat



Optical Coupling efficiency measured with 3 different filter stacks: 346, 660 & 865 GHz

Beam Patterns



Beam pattern simulations

Summary

A leaky lens antenna operating between 300-1000 GHz has been designed and fabricated.

Optical efficiency measurements at 350, 660 and 865 GHz show good performance and agreement with simulations over the whole frequency range.

Outlook

- Further validation of simulations with:
- Beam pattern measurements
 - Polarization sensitive measurements