

## Harmonic Radar MMICs at 61/122 GHz

Transceiver MMIC: FHRHR1R  
Transponder MMIC: FHRTAGH1

### Contact:

Jan Wessel,  
Jan.wessel@fhr.fraunhofer.de

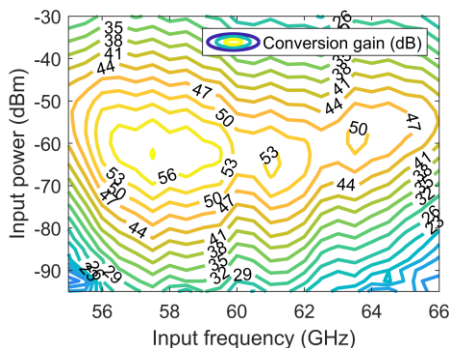
## Description

The harmonic radar chipset is specifically designed for clutter-resilient radar measurements in the license-free millimeter-wave ISM bands at 61 and 122 GHz. All RF components are integrated into two chips. The transceiver generates the signal with its VCO, which is transmitted to the transponder with high output power. The RF signal at the active transponder is amplified, frequency-doubled, and transmitted back to the transceiver. A receiver at the harmonic frequency converts the signal into the IF band. This is made possible by a frequency doubler in the LO path.

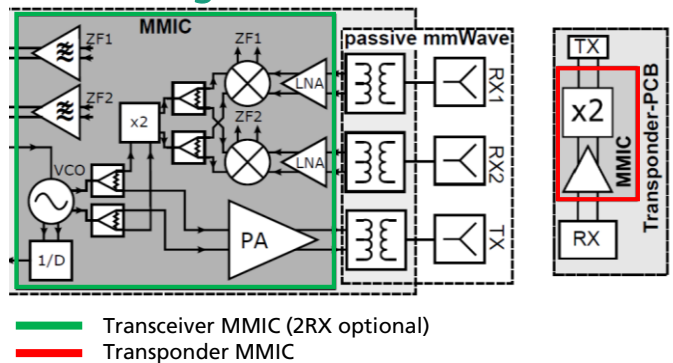
## Specifications

Technology	Infineon B11HFC, SiGe-BiCMOS
Center Frequency [GHz]	TX: 61 GHz, RX: 122 GHz
Bandwidth [GHz]	TX: 7 GHz, RX: 14 GHz
Architecture	bistatic
Channels	1 TX / 2RX or 1 TX/1 RX
$P_{out,Transceiver}$ [dBm]	19.7
$P_{DC,MMIC}$ [mW]	transceiver: 840 transponder: 145
Dimension [ $\mu\text{m}$ ]	transceiver: 1996 x 1448 transponder: 1448 x 948

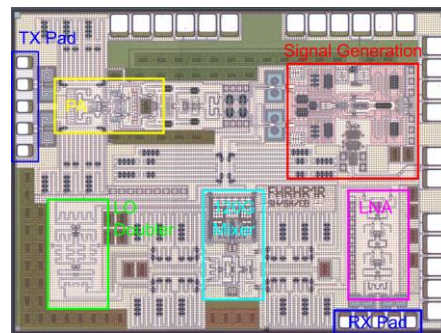
## Characteristics of transponder



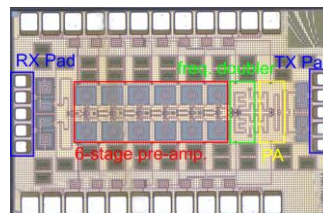
## Block Diagram



## Microphotograph



Transceiver MMIC (here: 1TX and 1RX)



Transponder MMIC

## Further Reading

S. Hansen, C. Bredendiek, G. Briese and N. Pohl, "A Compact Harmonic Radar System With Active Tags at 61/122 GHz ISM Band in SiGe BiCMOS for Precise Localization," in *IEEE Transactions on Microwave Theory and Techniques*, vol. 69, no. 1, pp. 906-915, Jan. 2021, doi: 10.1109/TMTT.2020.3026353.