
3rd Workshop on RFID Systems and Technologies: Position Localization for Object Management with the Aid of passive RFID tags



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Contents

- Potentials of RFID-Technology in Robotics
- The Principle of „Radio Frequency Object Location“ (RFOL)
- System Overview
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- Summary



Quelle: UPM Rafiatac, 200



Quelle: Balzfulland, 2007

Potential of the RFOL-Technology in Robotics

The „Pick into the Box“

Localization of

- Pallets
- Assets

- Detection of Orientation

Automatic Picking



Quelle: Balsfulland, 2007

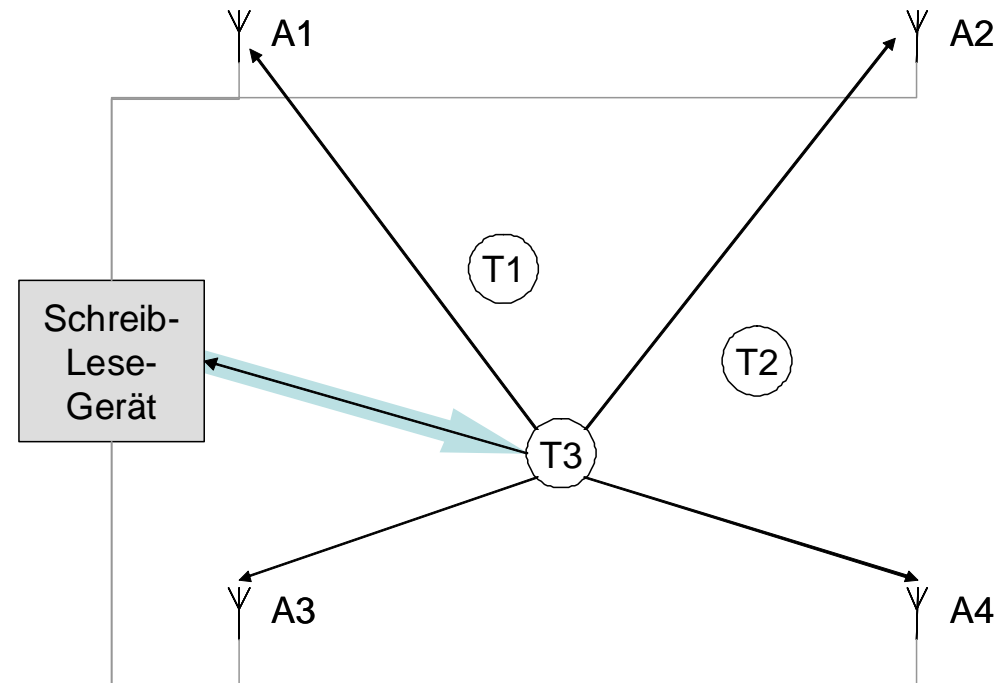
New RFID-Function: Localization of Objects with RFID

Principle

- Measurement of Phase difference (appropriate for RFID)

Properties

- IT-aid necessary
- high Resolution (1 cm)
- Under Development



Arrangement of antennas for the Localization of passive Tags

(Fraunhofer IMS, IPM, IPA)

Localization with two Receiver-Antennas

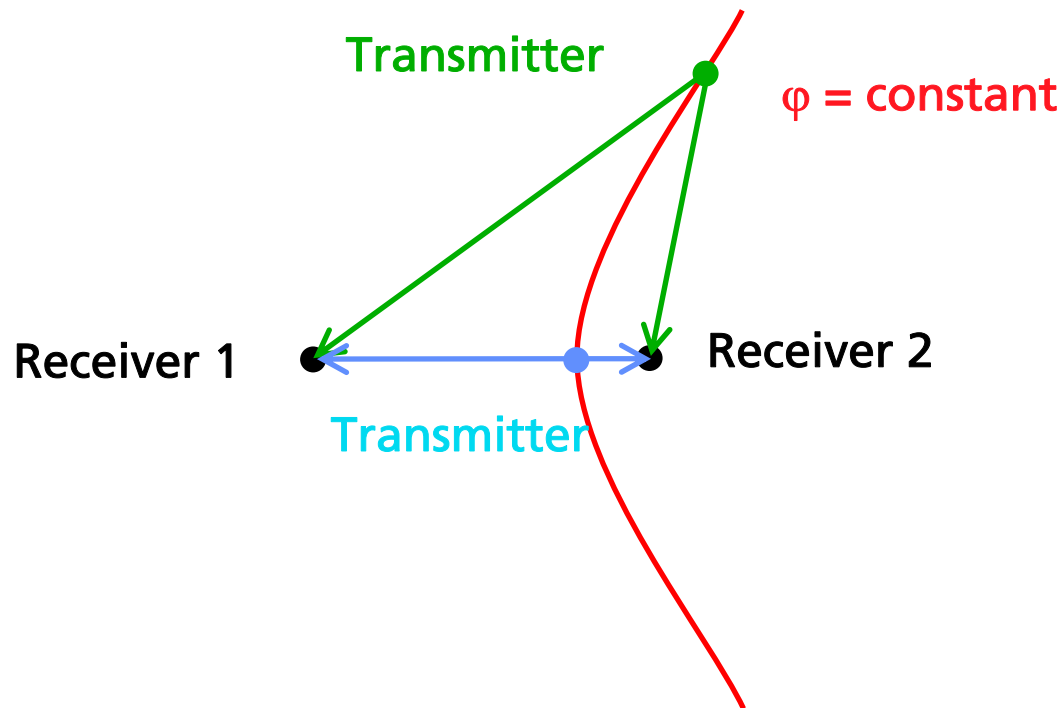
Challenge: Where is the Transmitter located, if you can measure the Phase-Difference φ ?

Receiver 1 ●

● Receiver 2

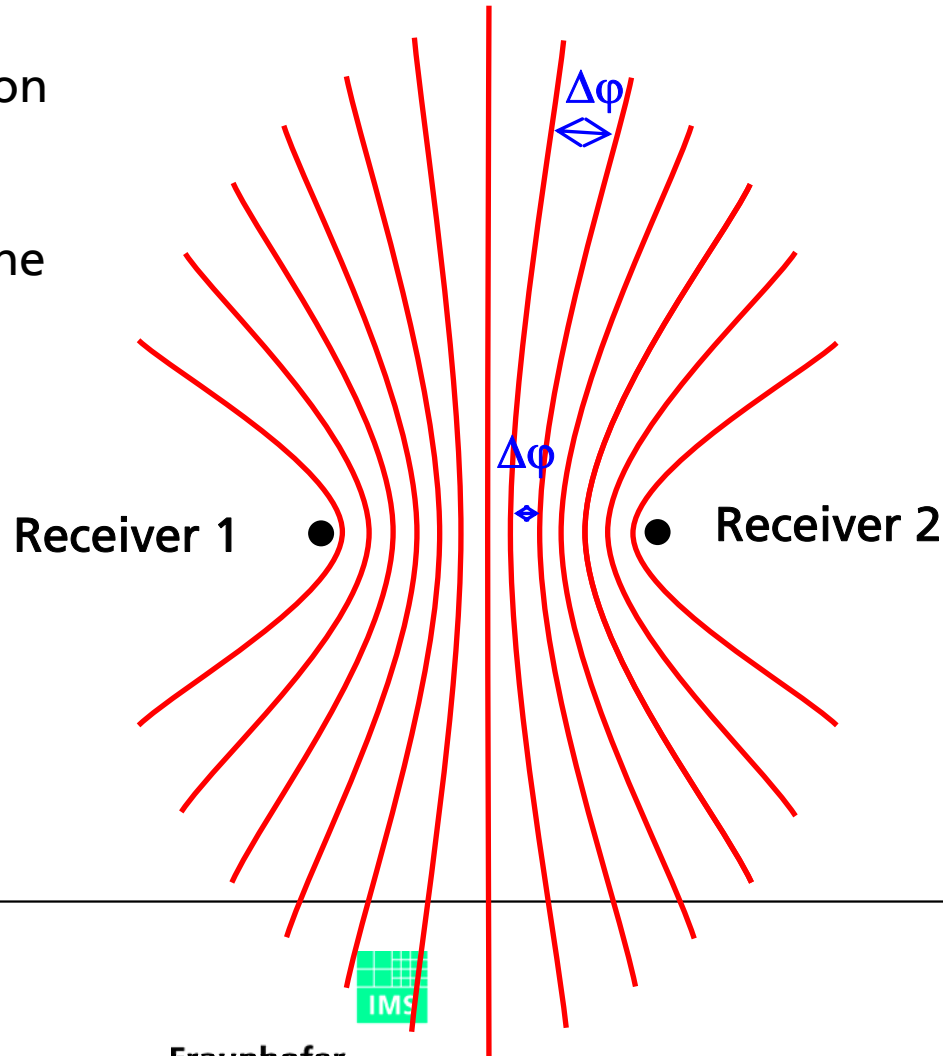
Localization with two Receiver-Antennas

The Phase-Difference between two Receivers is constant, if the Transmitter resides on a Hyperbola; $\varphi = \varphi$

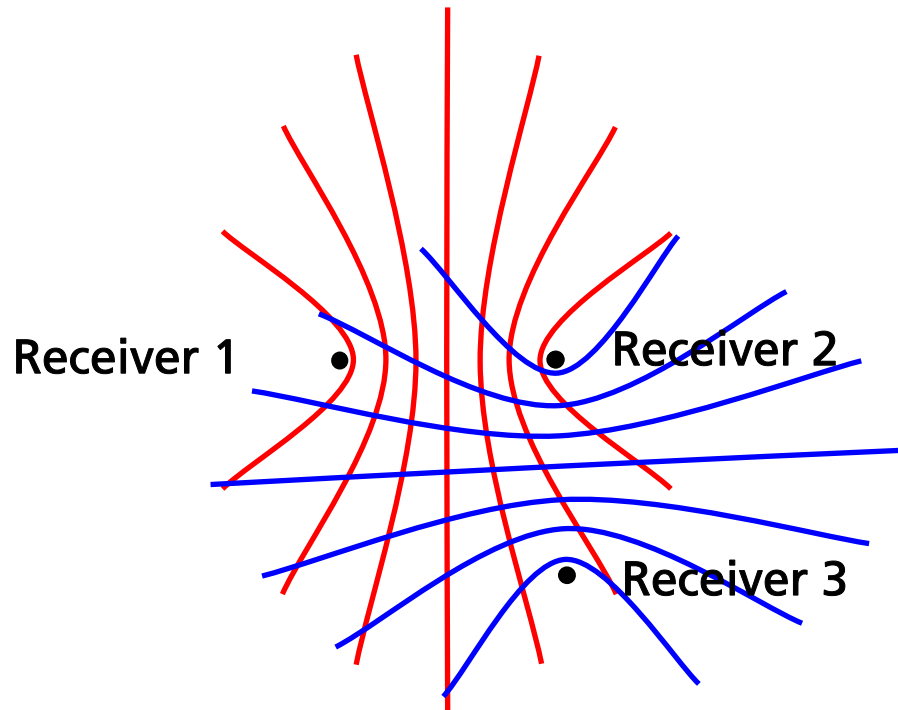


Localization with two Receiver-Antennas

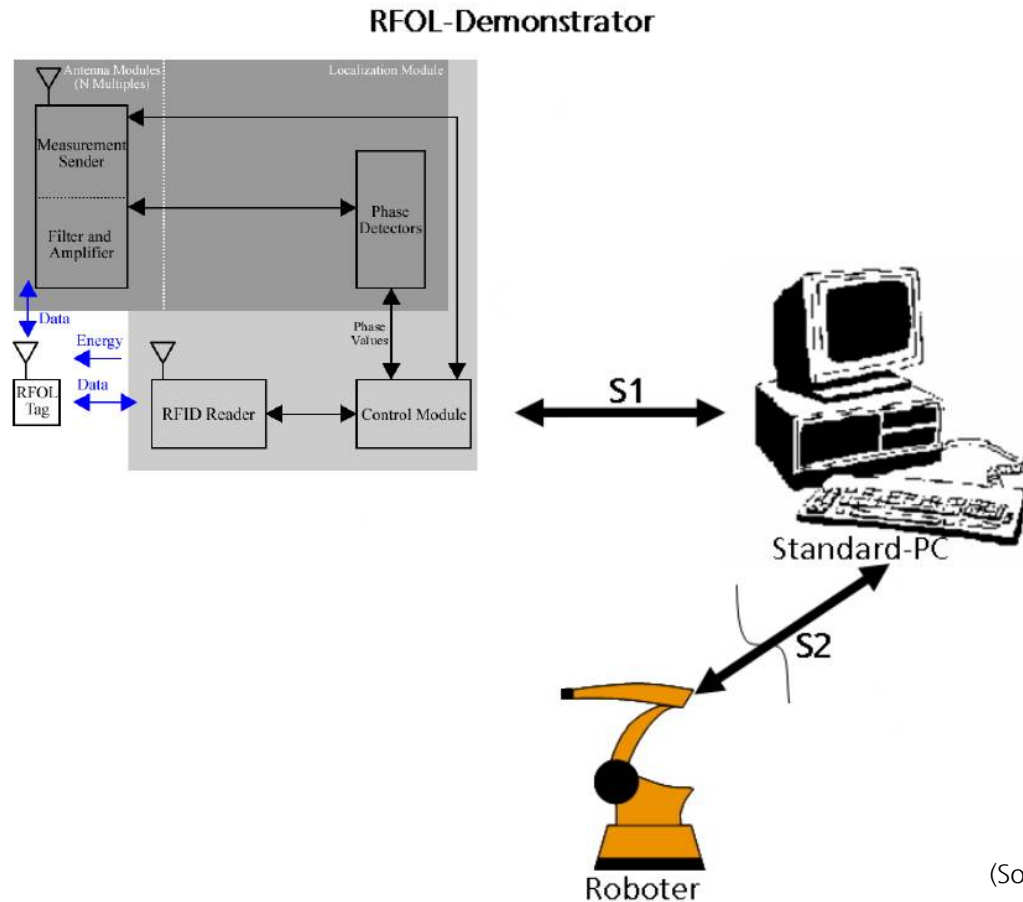
Angle-Resolution of $\Delta\phi$ gives the best Position-Resolution, if the Transmitter resides direct between the Receivers.



Three Receivers for definite 2D-Localization



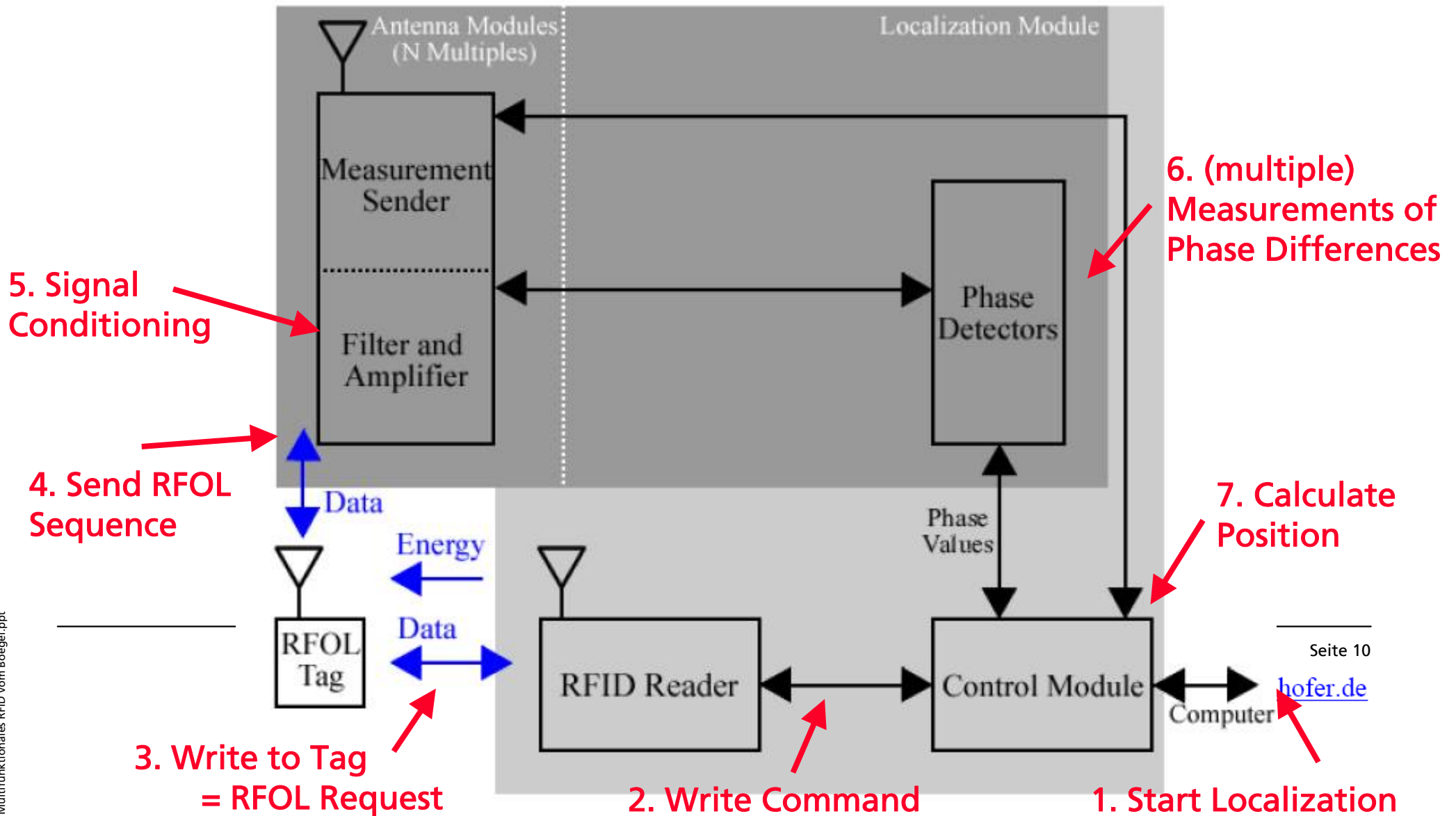
Components of the RFOL-System



(Source: Fraunhofer IMS, IPM, IPA)

Block Diagram of a RFOL Reader

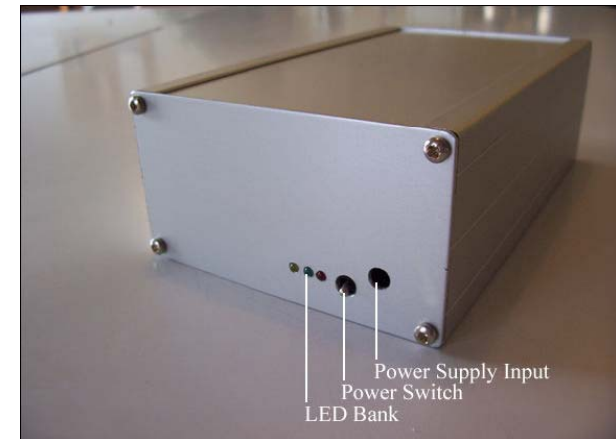
(Source: Fraunhofer IMS, IPM, IPA)



Control Unit

Hardware

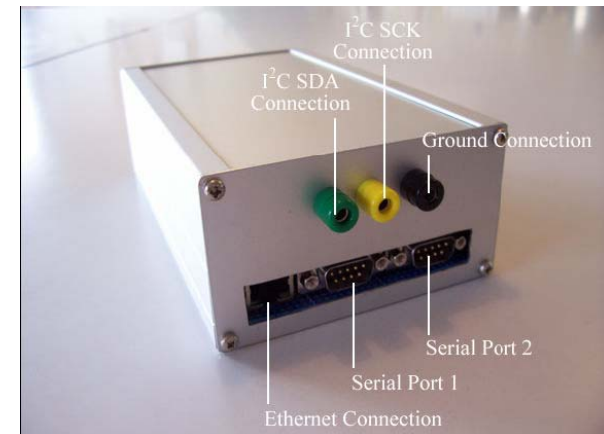
Portux Board
ARM 9



Interfaces:

RS232
Ethernet
I2C

HF Reader
UHF Reader / PC
Antenna Module
Phase Detector



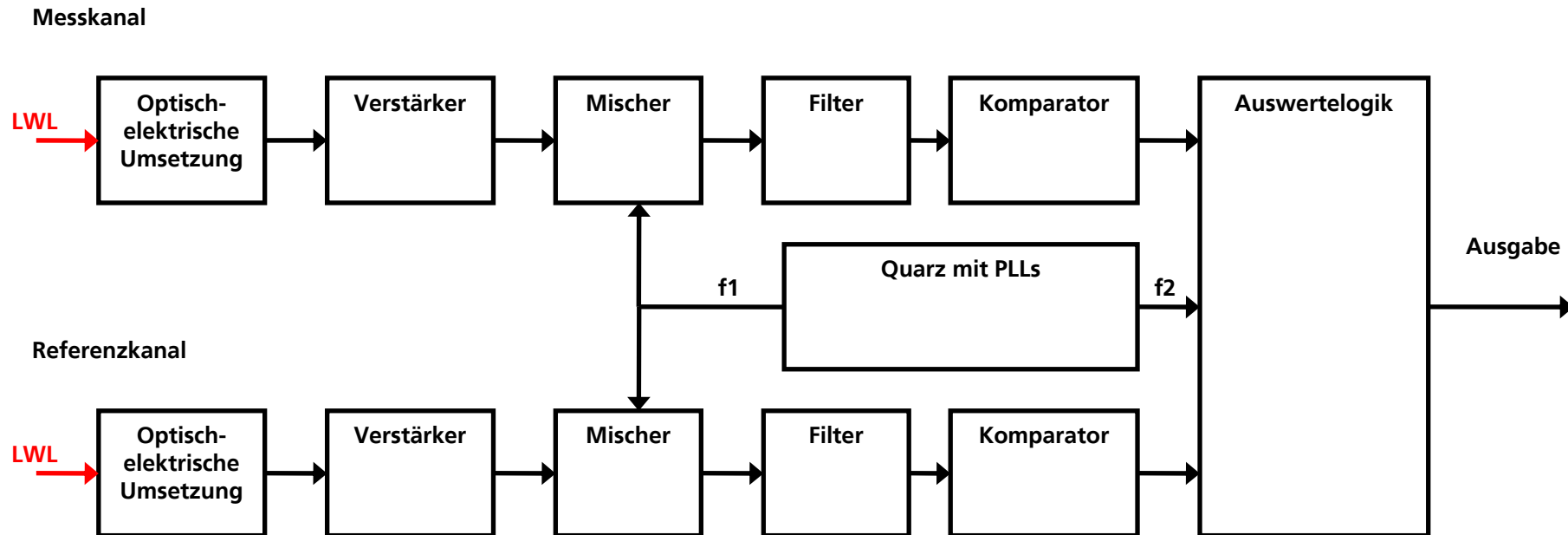
(Source: Fraunhofer IMS, IPM, IPA)

Antenna Module

- HF Antennamodule
 - Amplifier with Automatic Gain Control
- UHF Antennamodule
 - SAW Bandpassfilter
 - Low Noise Amplifier
 - Mixer
 - Voltage Controlled Oszillator
 - HF Antennamodule
- next development step: including a phased looked loop for Carriersynchronisation

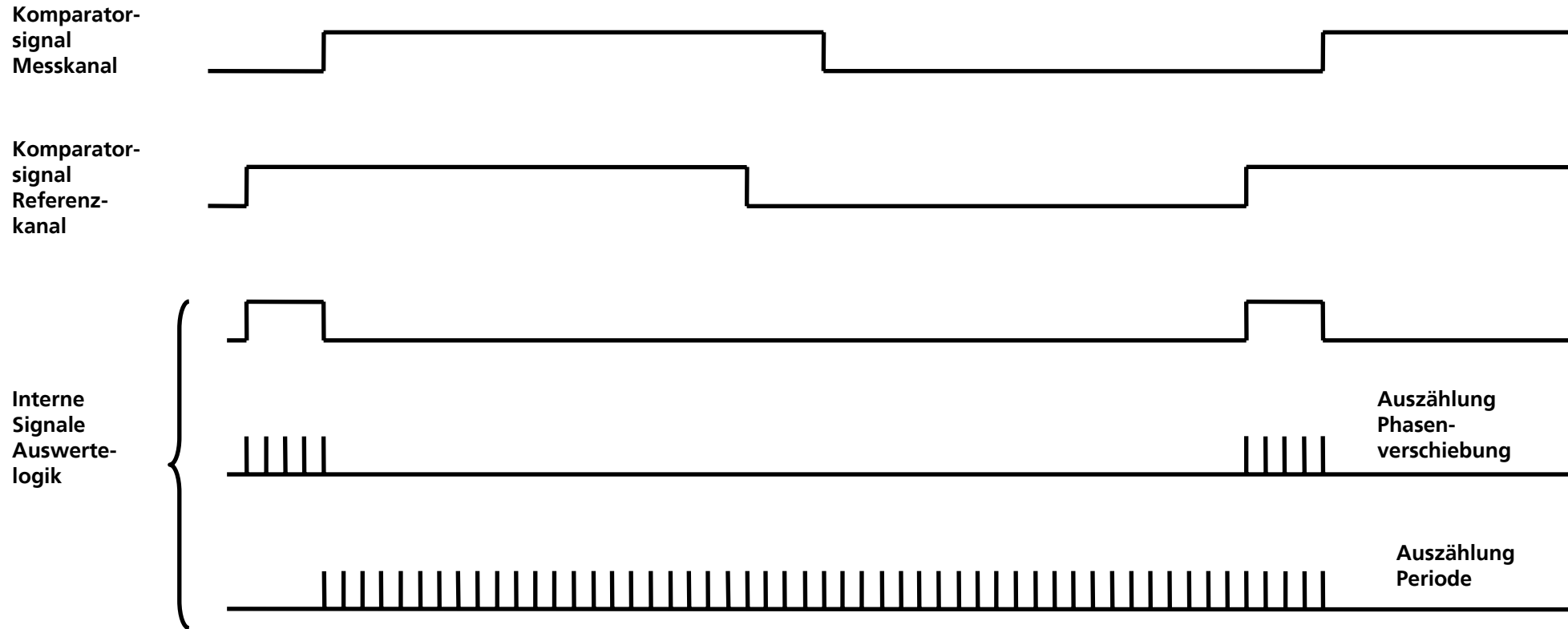


Phase Detector



(Source: Fraunhofer IMS, IPM, IPA)

Signal Diagram



Summary

- Localization of passive Tags is possible
- Working in HF and UHF Bands
- 4 Antennas necessary for 3D Localization
- Half-automatic self-calibration

