

# Antennenmesstechnik

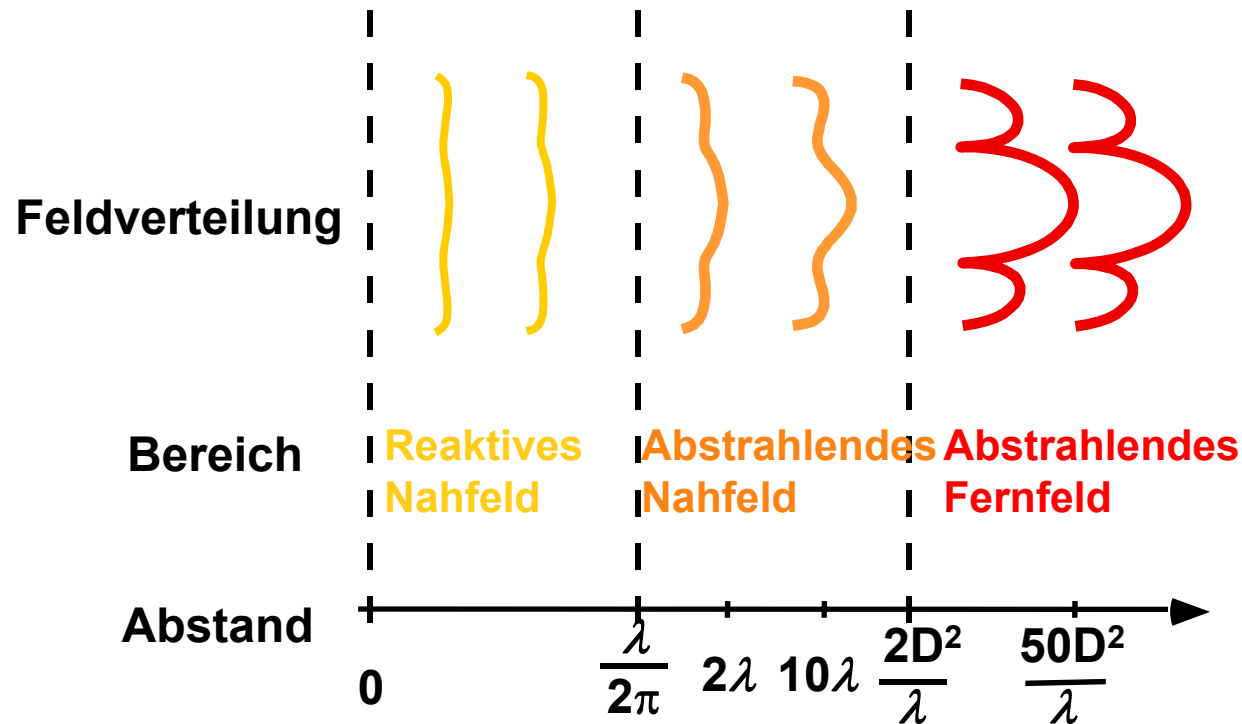
by Thomas Zwick

INSTITUT FÜR HOCHFREQUENZTECHNIK UND ELEKTRONIK

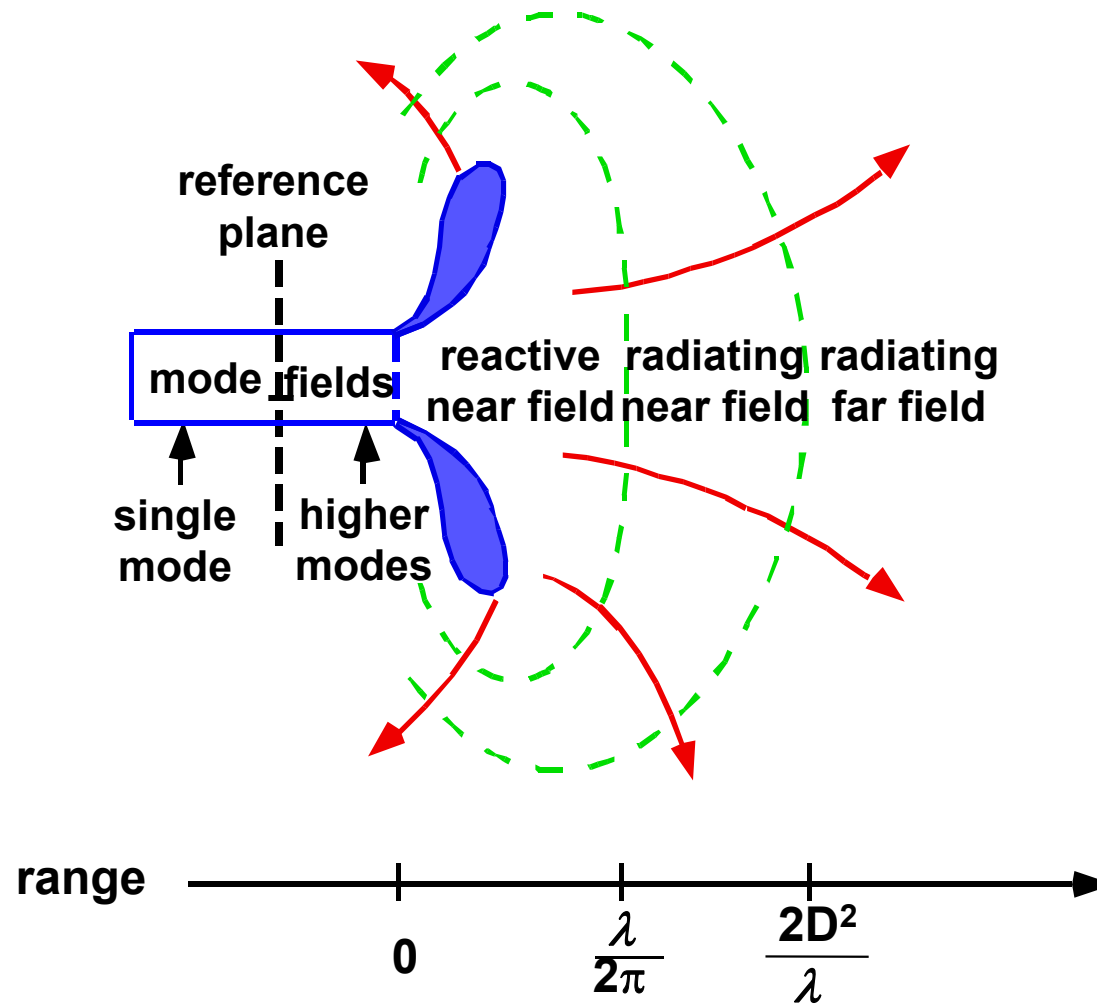


- **Antennenmessplatz**
- **Feldregionen**
- **Messfehler**
- **Absorberräume**
- **Gewinnmessung**

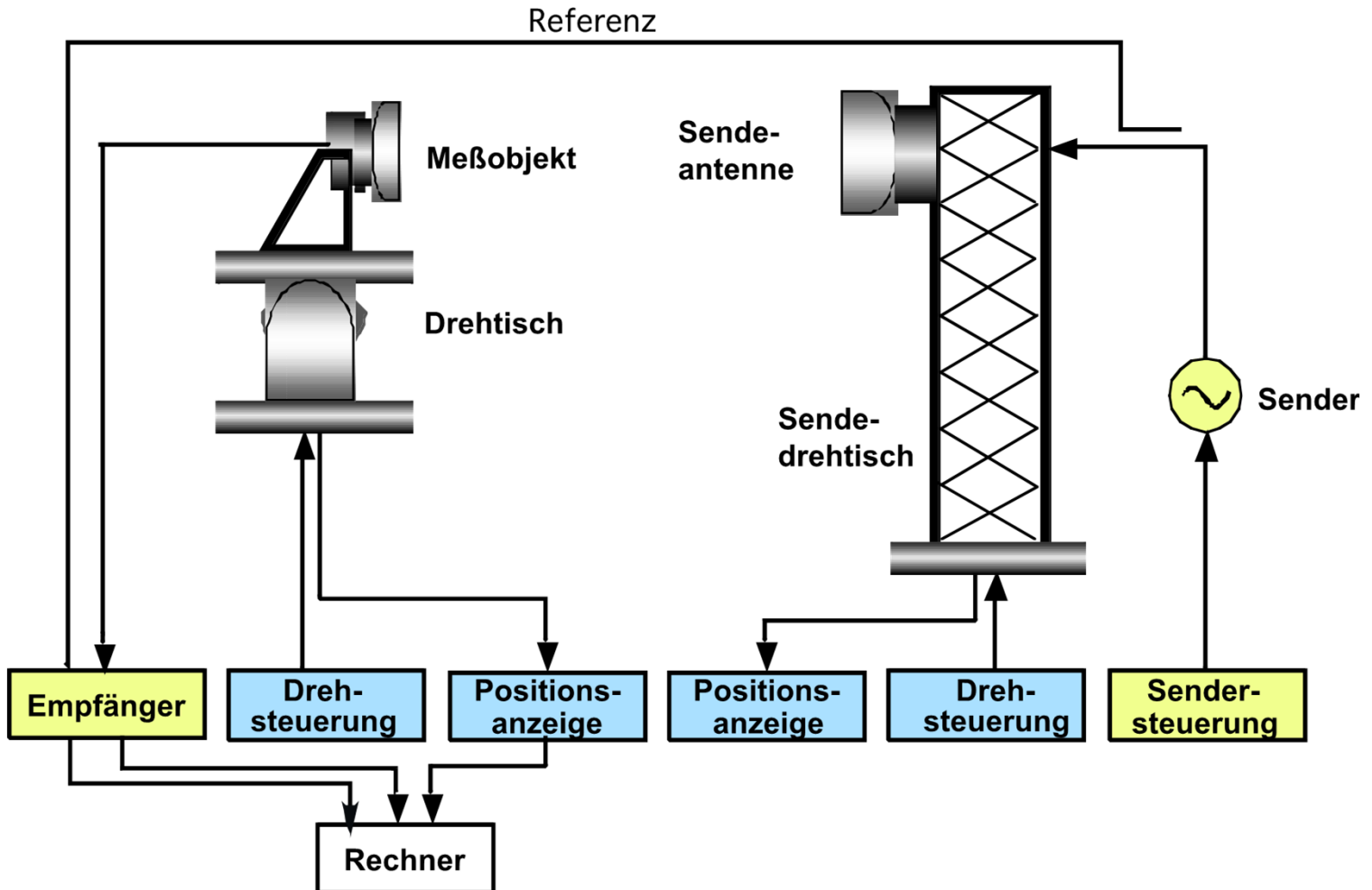
# Feldverteilung in den Feldregionen



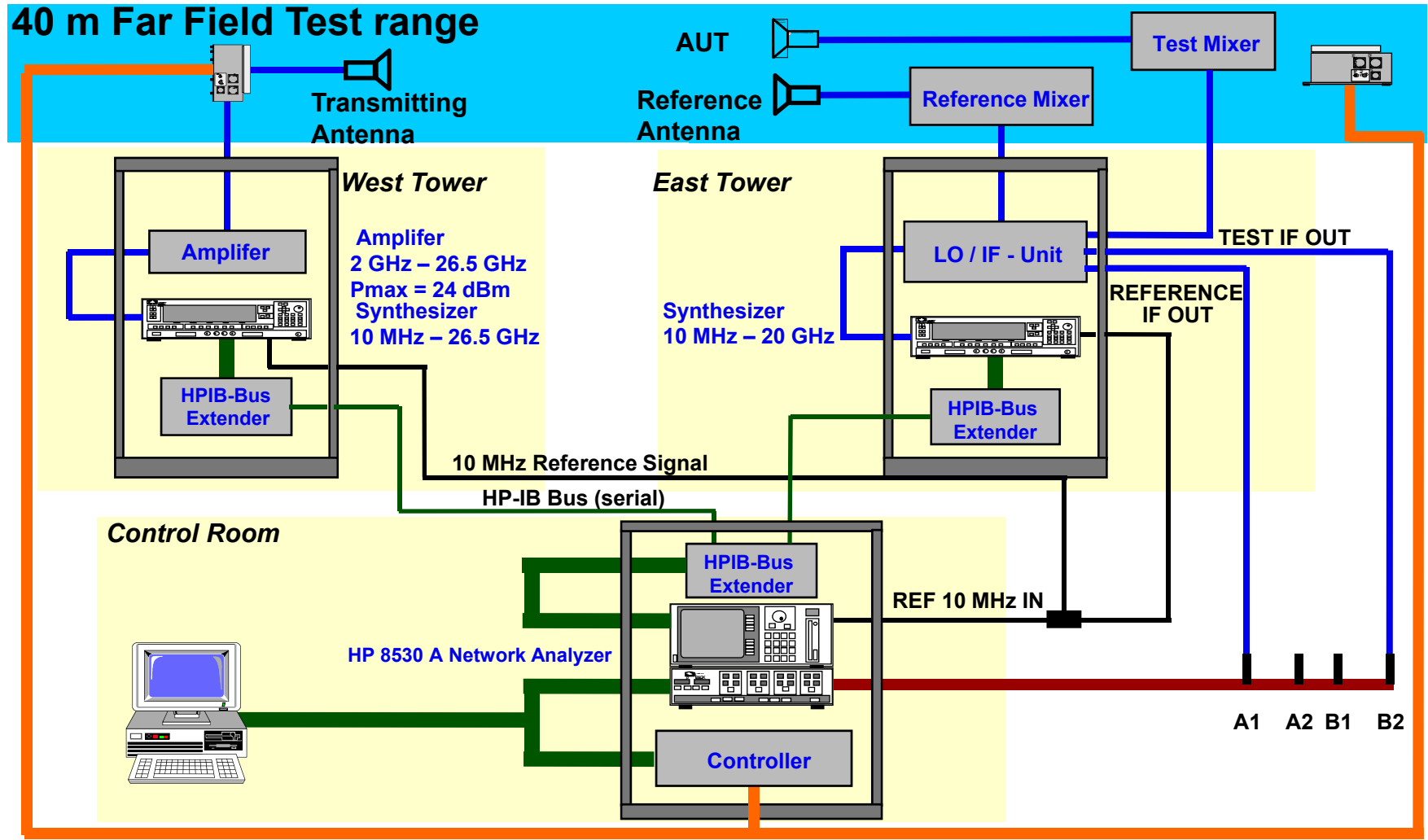
# Field Regions of an Antenna



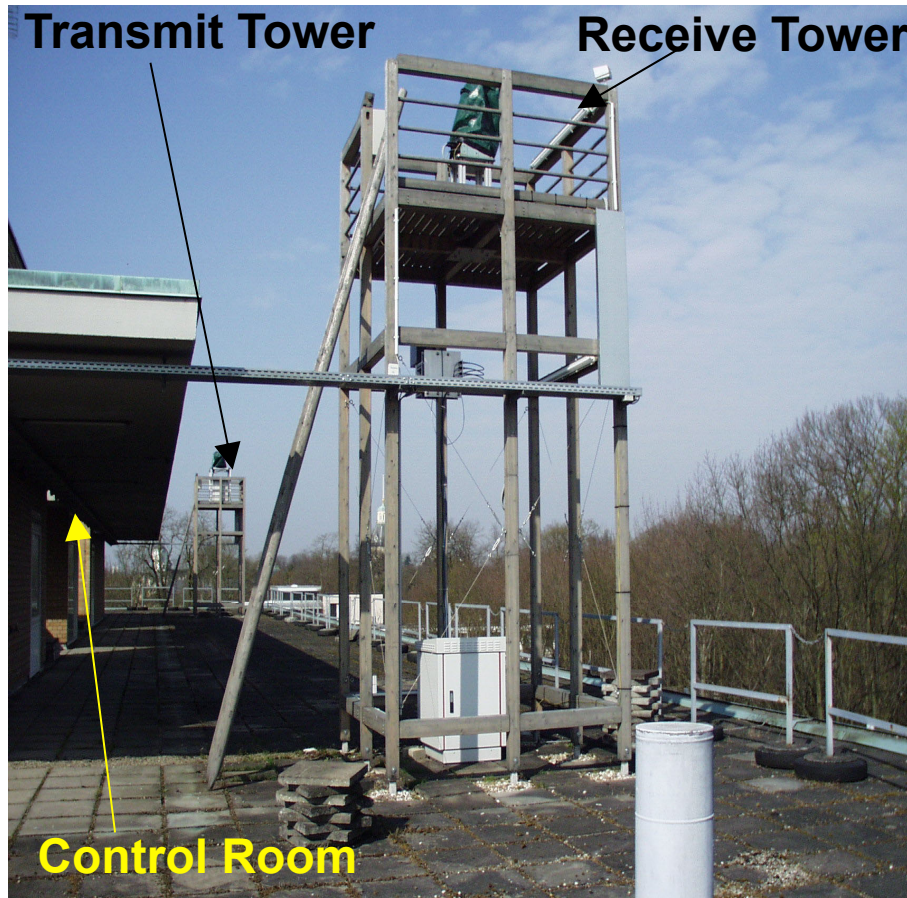
# Prinzip Schaltbild eines Antennenmessplatzes



# 40 m IHE Test Range: Electrical Set-Up

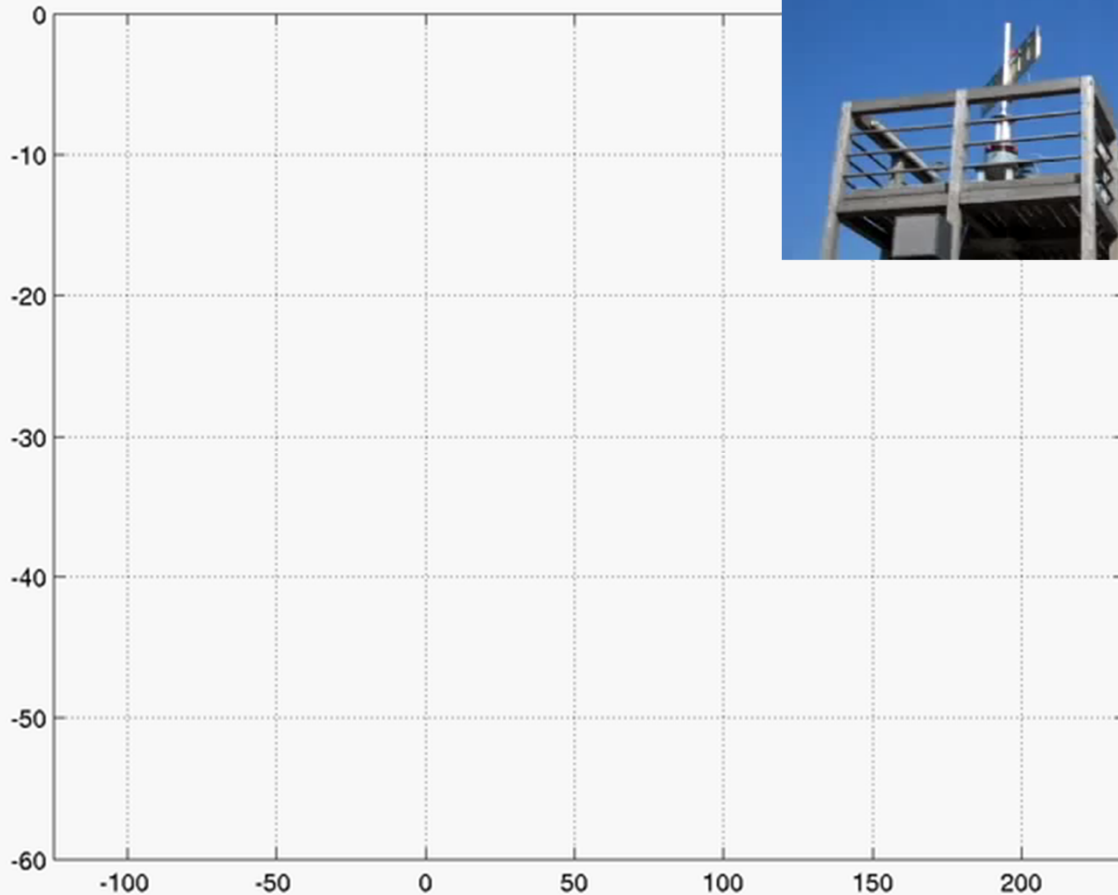


# 40 m IHE Test Range



- ➔ Pattern measurement
- ➔ Gain measurement
- ➔ Frequency range:  
300 MHz - 18 GHz
- ➔ max load: 120 kg
- ➔ Test set: Agilent 8530

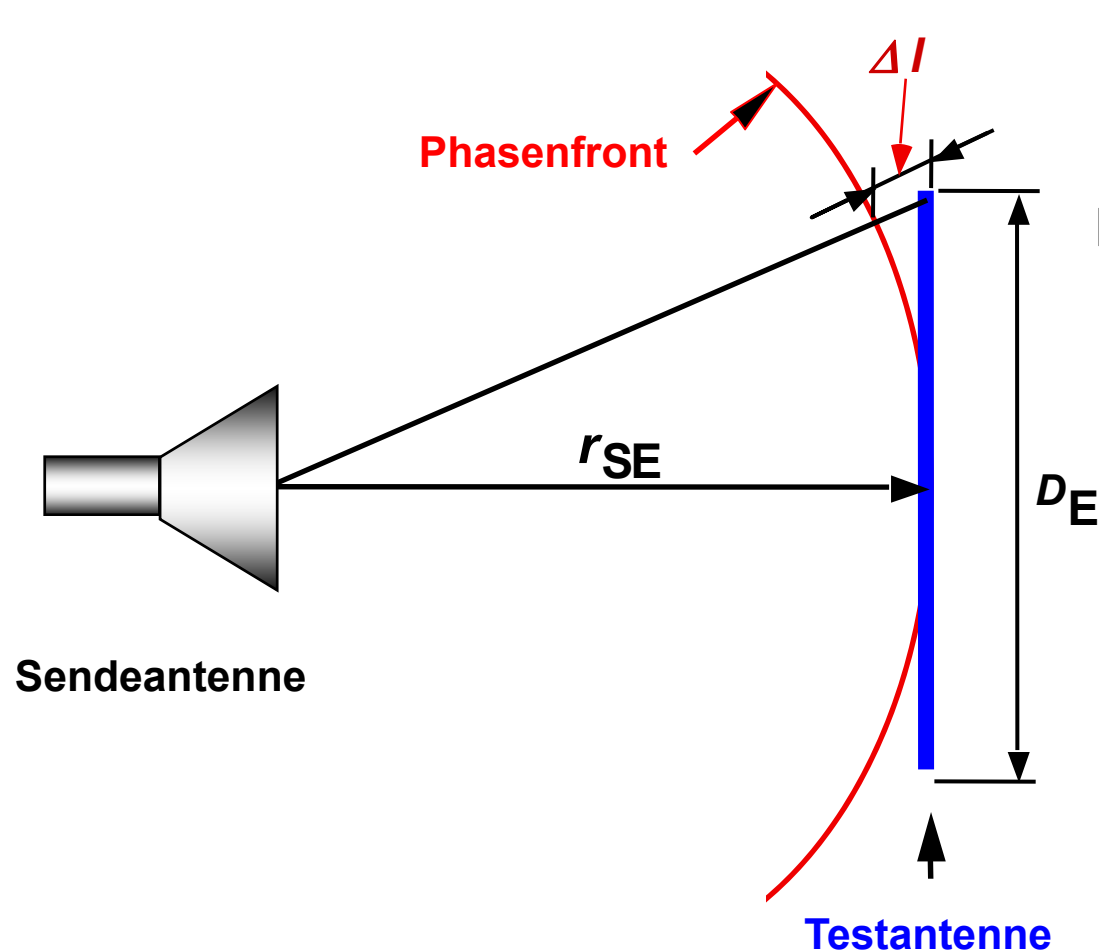
# Messung der Antennenrichtcharakteristik



**Messung auf dem  
Dach des Instituts**



# Phasenfehler $\Delta\phi$ als Funktion von Entfernung/Apertur



$$r_{SE}^2 + \left(\frac{D_E}{2}\right)^2 = (r_{SE} + \Delta l)^2$$

Beispiel:

$$\Delta\phi_{max} < 22,5^\circ$$

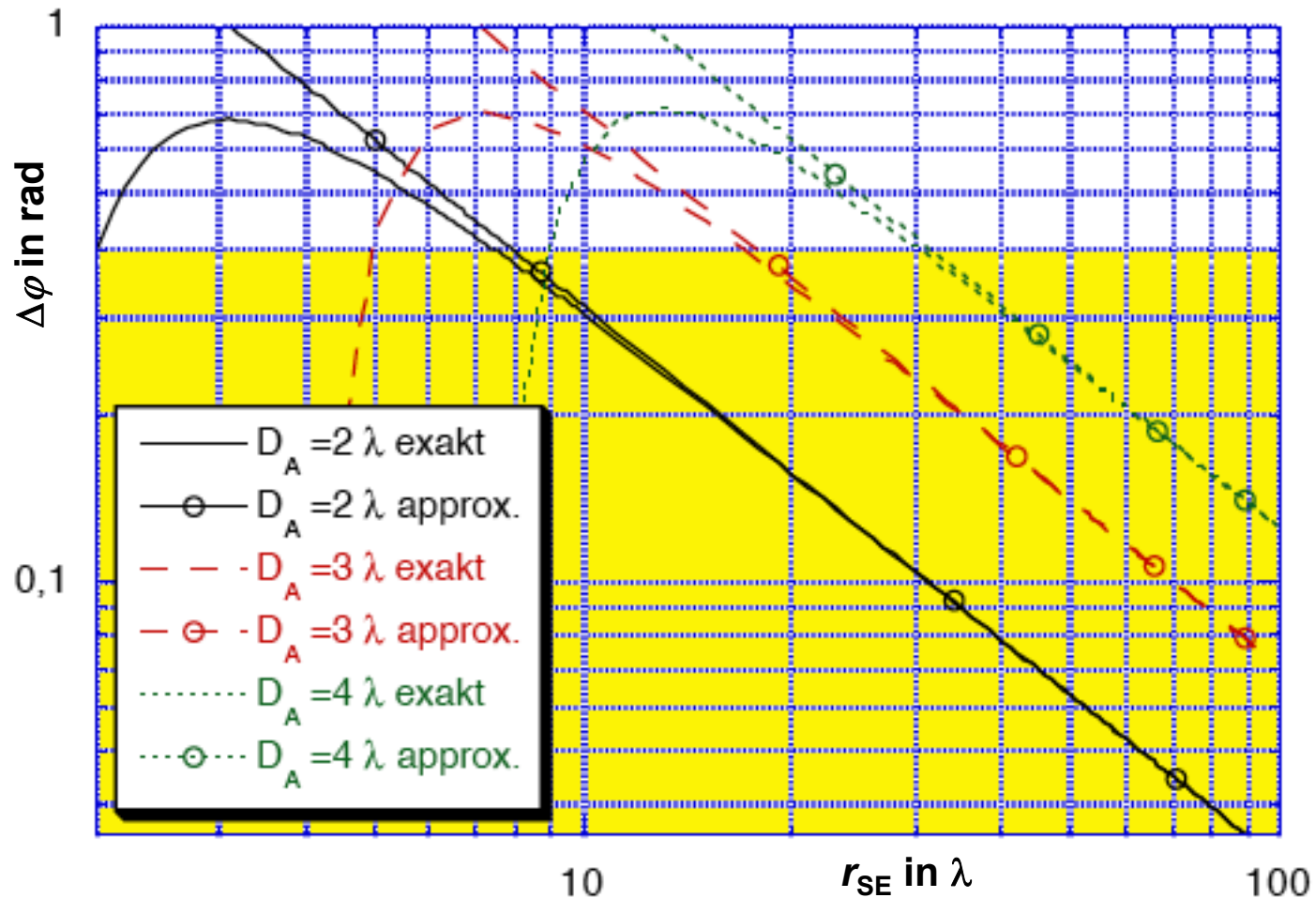
$$r_{SE} \geq 2 \cdot \frac{D_E^2}{\lambda}$$

$$D_E = 2.0\text{m}$$

$$f = 900\text{ MHz}$$

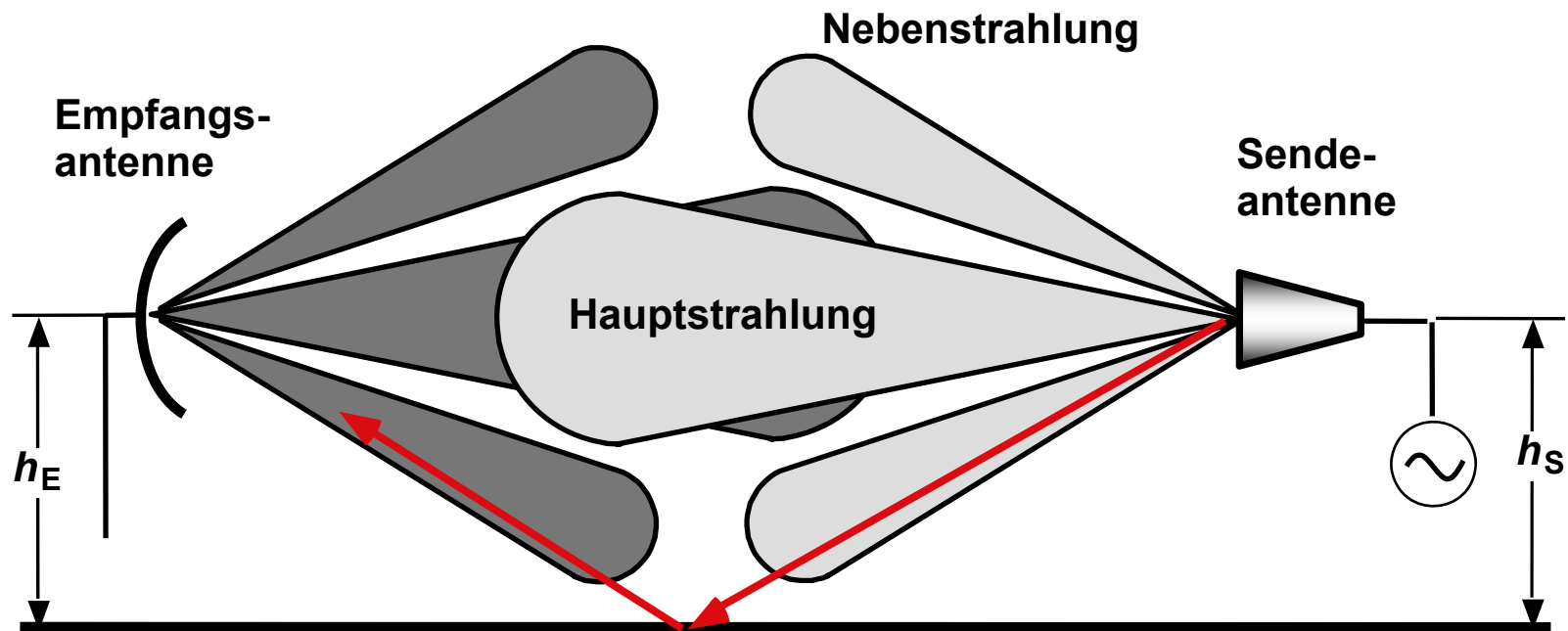
$$r_{SE} > 26\text{ m}$$

# Phasenfehler $\Delta\phi$ als Funktion von Entfernung/Apertur

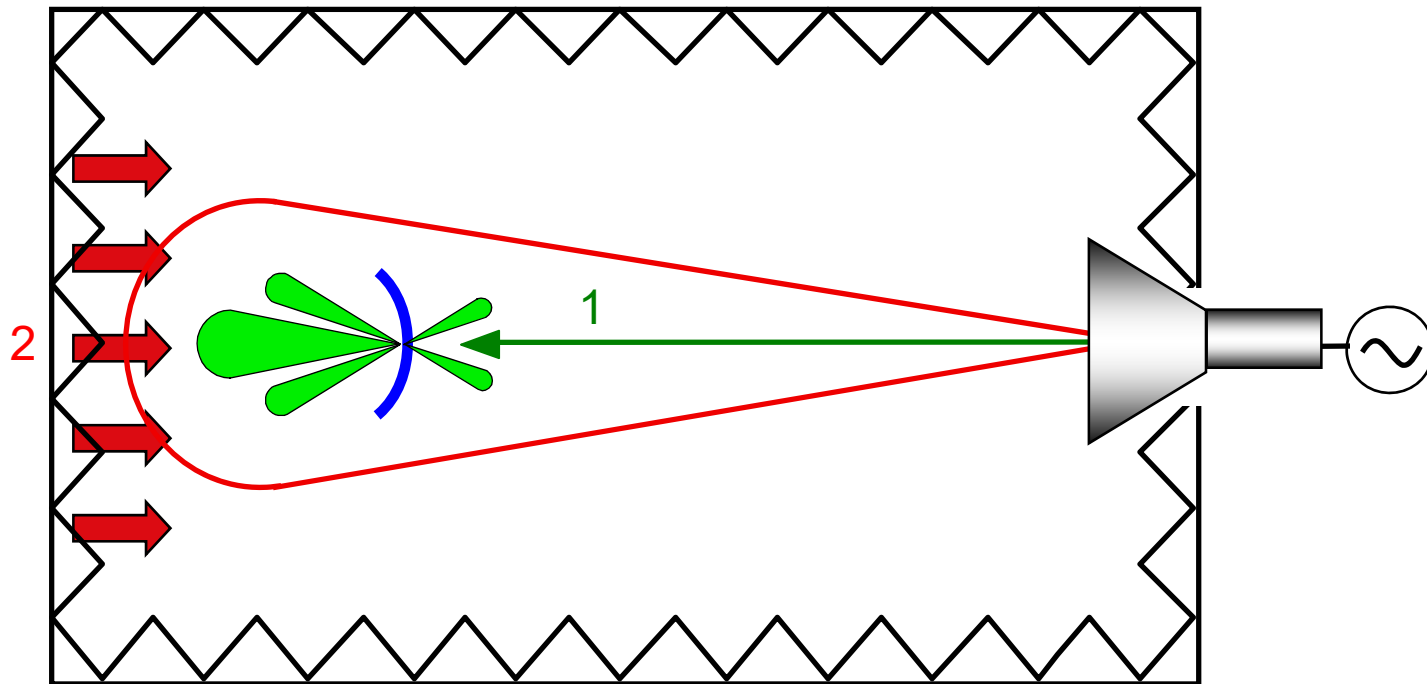


$$D_A = D_E$$

# Meßfehler durch Bodenreflexion

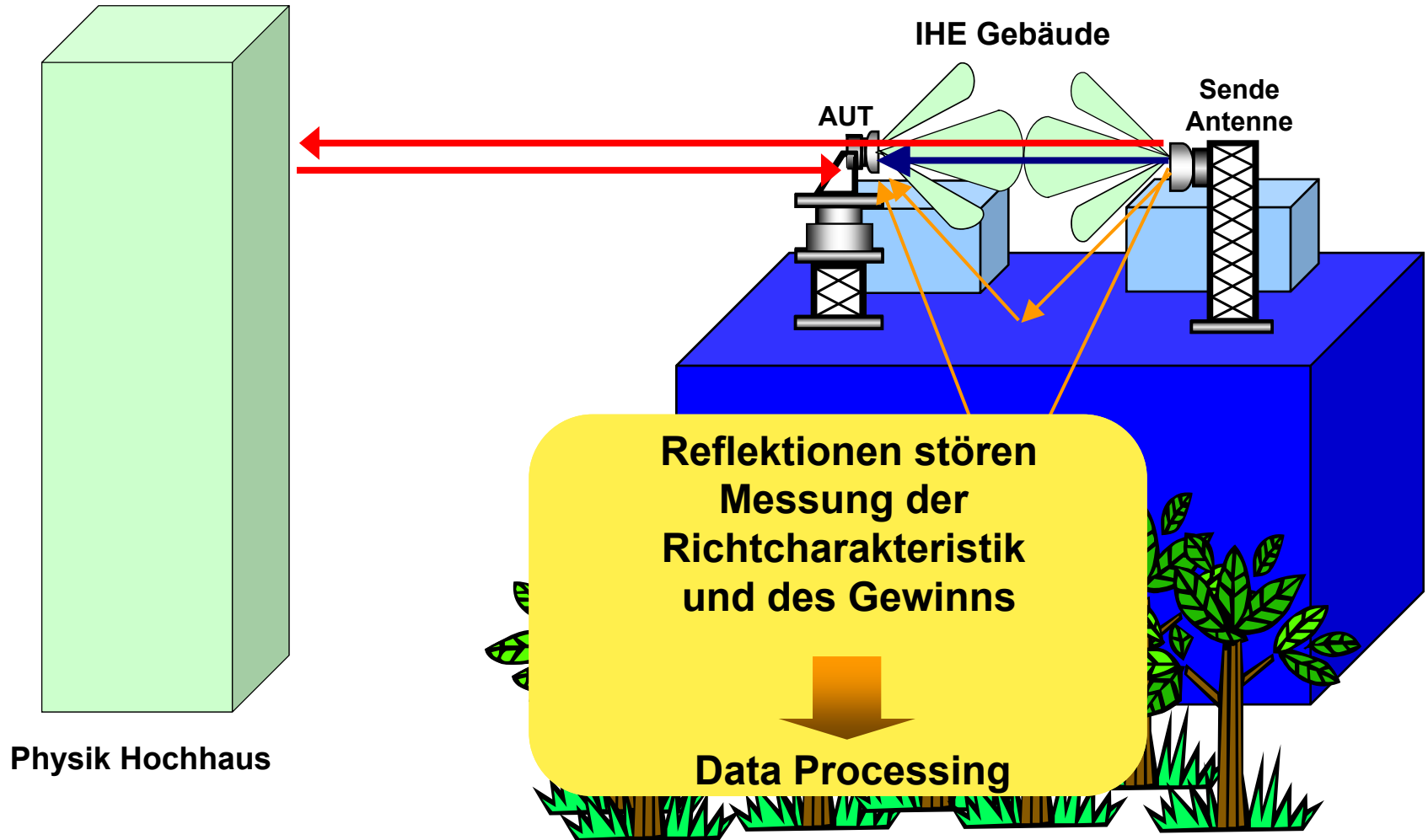


# Meßfehler durch Rückwandreflexion



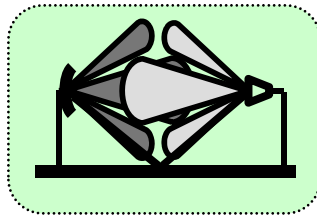
**2 - Reflexionsweg** **1 - direkter Weg**

# 40 m IHE Test Range: Problems

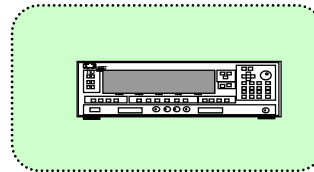


## Evaluation of the Radiation Pattern

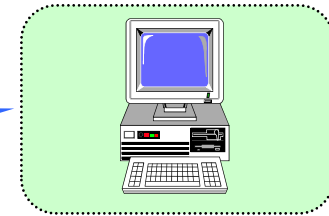
## Creation of a Cal-Kit for Gain Calibration



Measurement



Data acquisition by NWA



Data Post processing

Data in Frequency  
Domain from  
NWA

IFFT

Gating  
in Time  
Domain

Data corrected  
in Frequency  
Domain

FFT

# Reflektionen im Zeitbereich

Bandwidth required 200 MHz

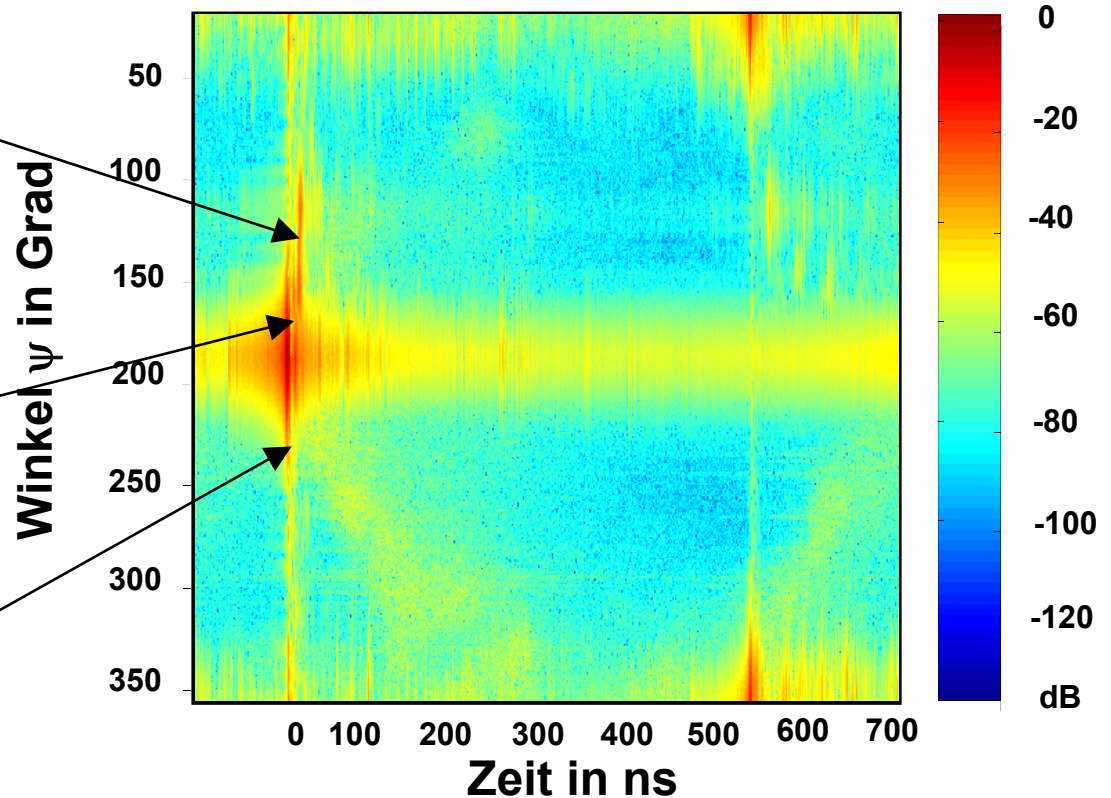


- Ground Reflection 3m path difference
- 10 ns delay from direct signal

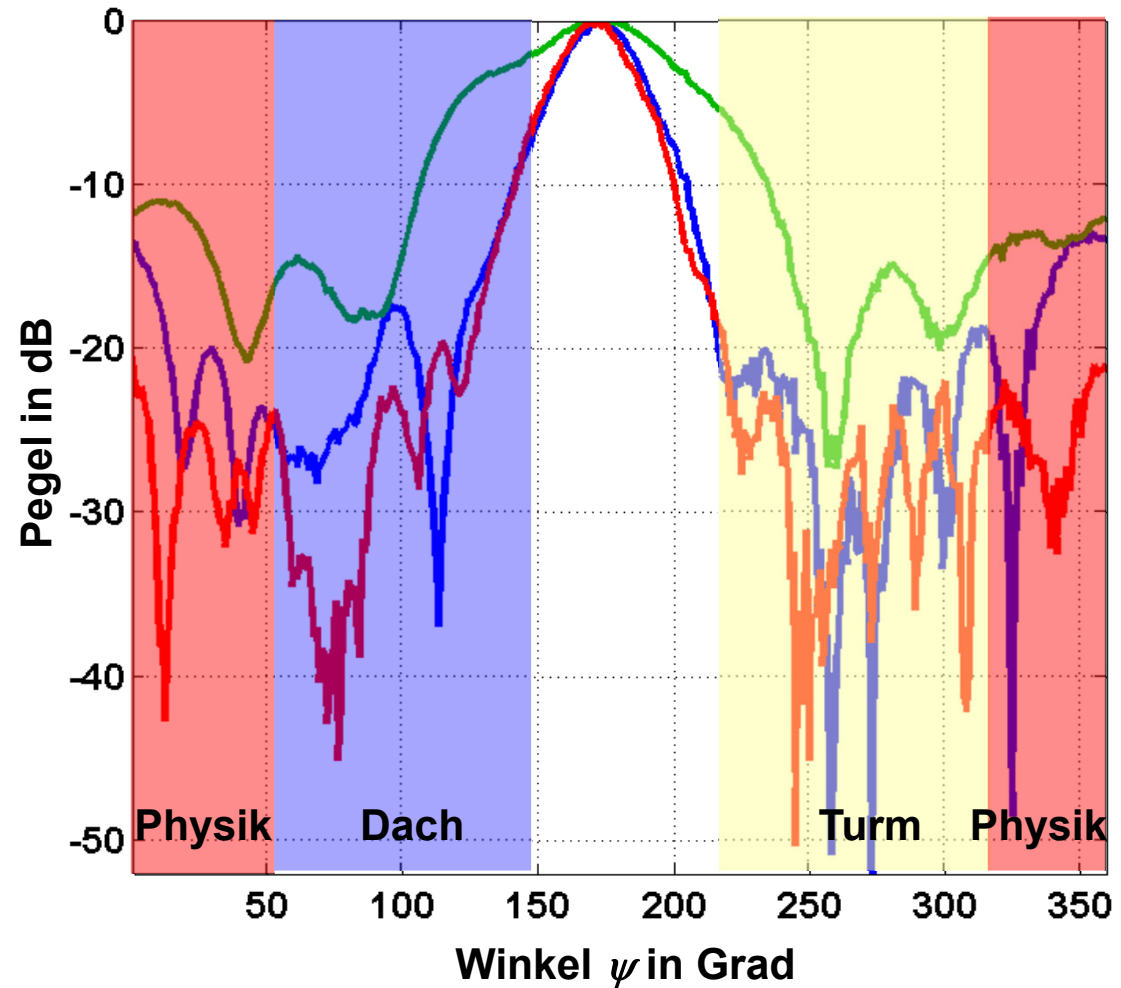
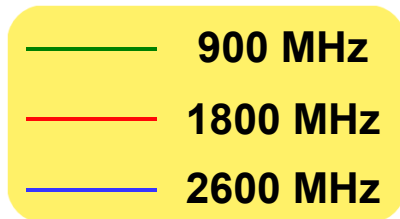
Frequency resolution  
relate to long line effect 1.25 MHz



- Longest reflection path:  
• 240 m = 800 ns

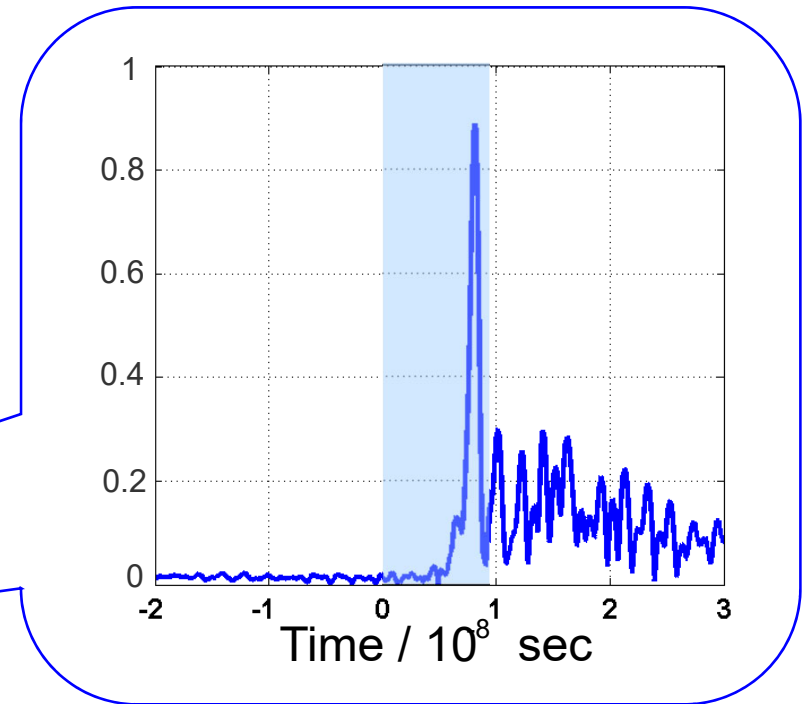
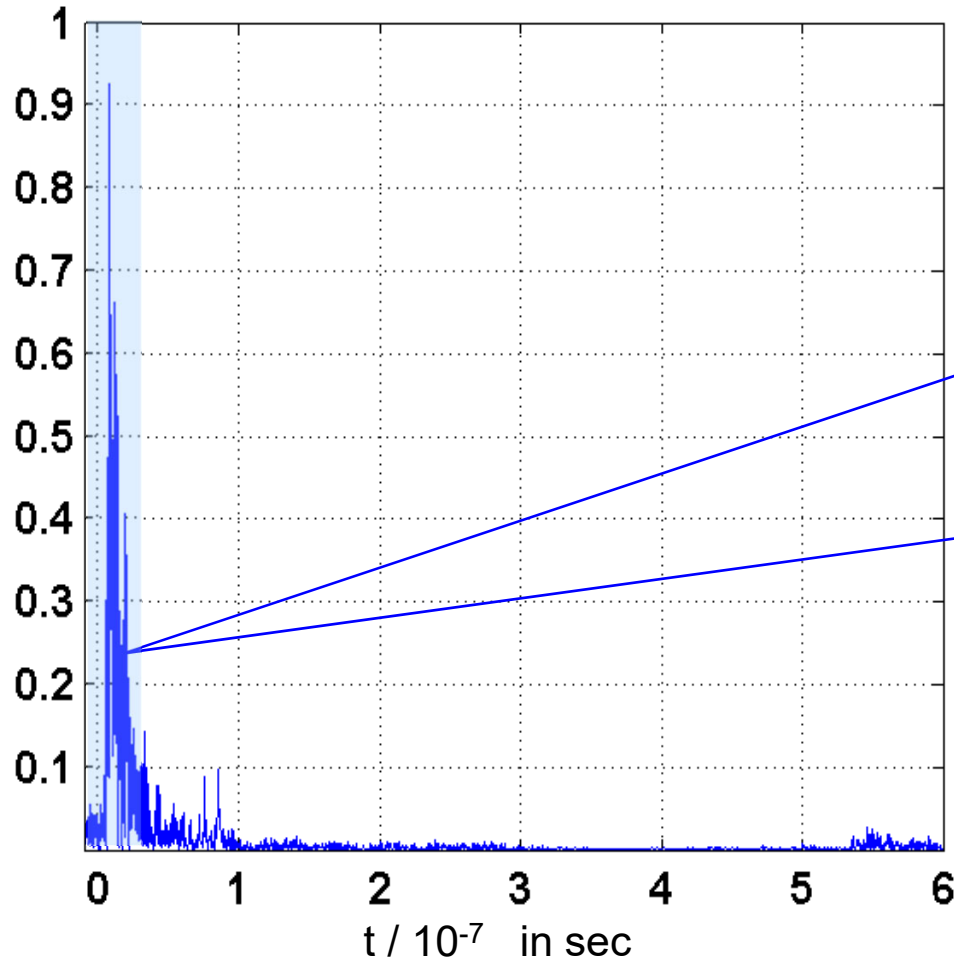


# Messung der Richtcharakteristik mit Störungen





# Setzen des Zeitfensters (gate)

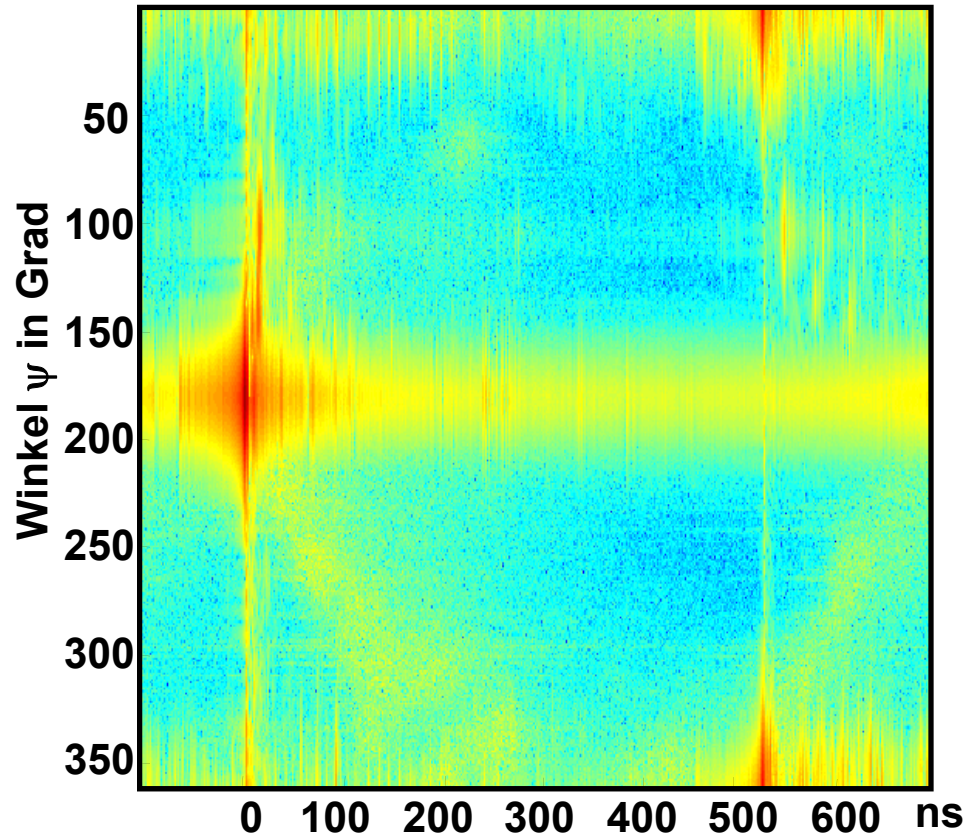


Gate: 0 ÷ 9 ns

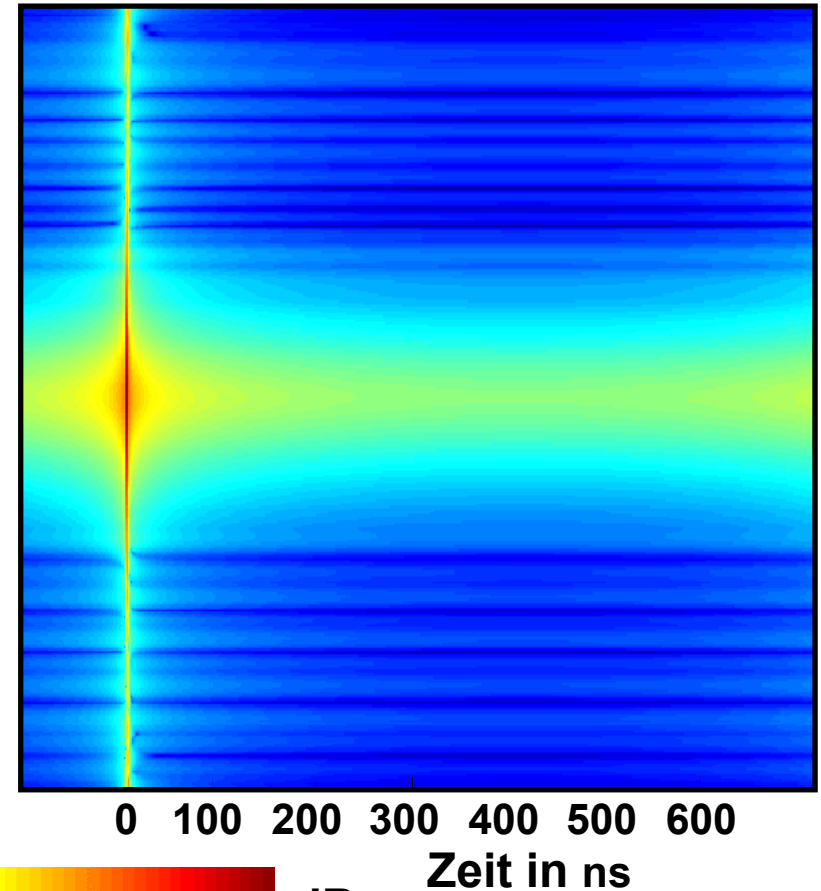
Direktes Signal

# Corrected Measurement

Vor Zeitfensterung (gating)

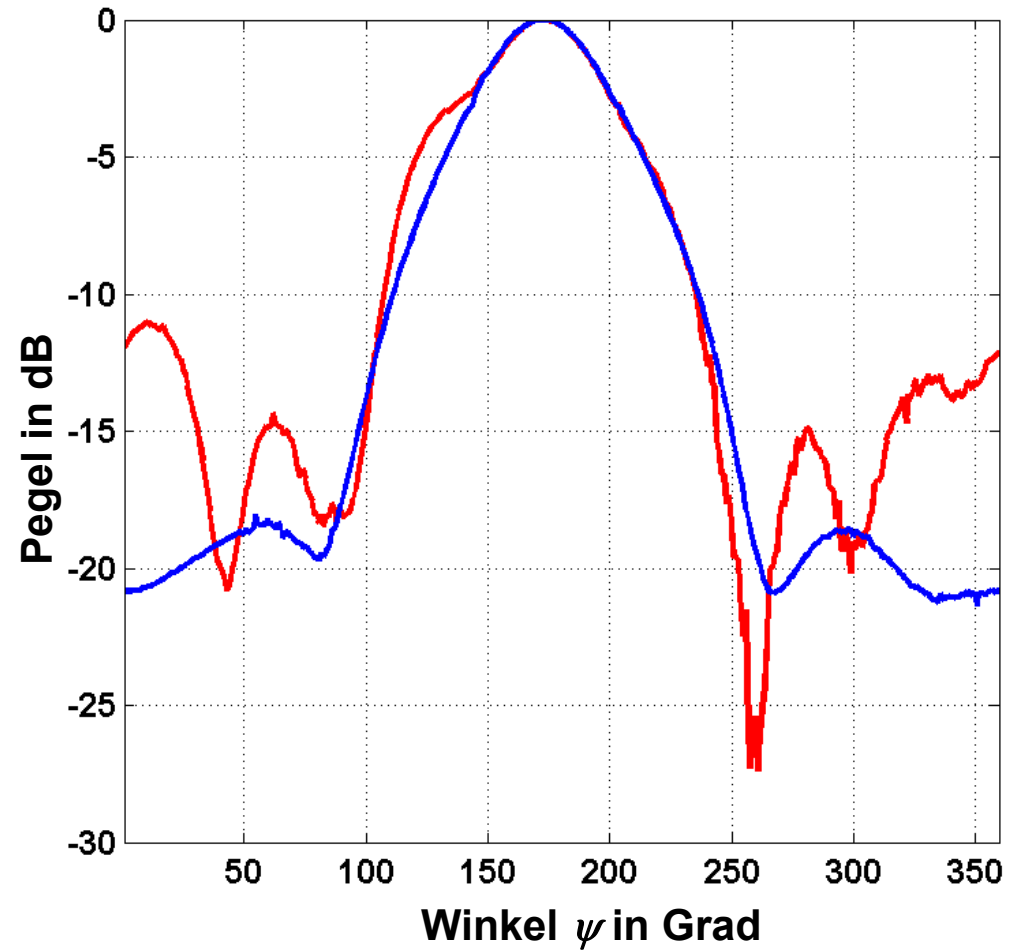


Nach Zeitfensterung (gating)



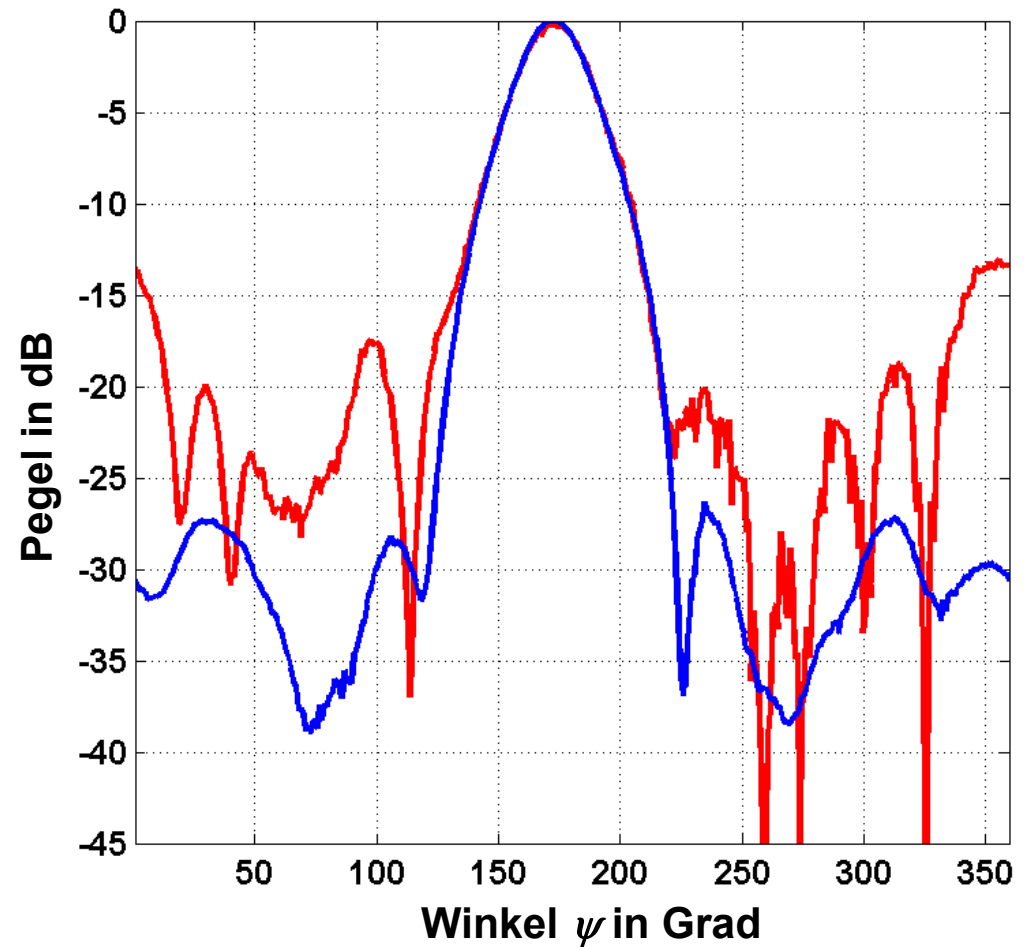
-60 -40 -20 0 dB

— 900 MHz  
— 900 MHz  
korrigiert



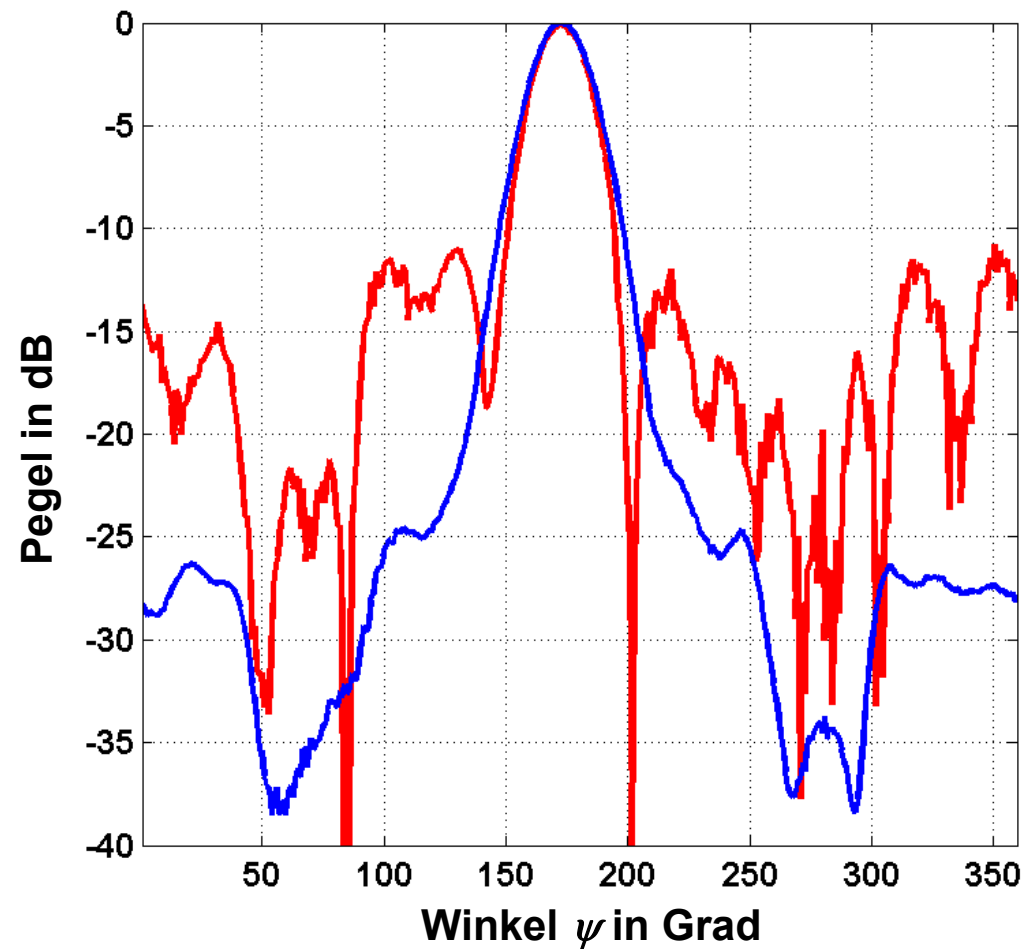
# Korrekturverbesserung der Messung bei 1800 MHz

— 1800 MHz  
— 1800 MHz  
korrigiert



# Korrekturverbesserung der Messung bei 2100 MHz

— 2100 MHz  
— 2100 MHz  
korrigiert



# Korrekturverbesserung der Messung bei 2600 MHz

— 2600 MHz  
— 2600 MHz  
korrigiert

