Site Attenuation of Limited-Size Ground Planes for Vertical Polarisation

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Vertical is Different - Vertical is Difficult

- Site performance in VP is generally worse than in HP
- Standards:
  - RE testing and NSA: HP + VP
  - Antenna calibration and CALTS validation: HP only

- Why?

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Consequences of VP Imperfections

- RE testing uncertainty

- Antenna calibration

- Substitution measurements

⇨ HP procedures = VP procedures ?

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We need a better understanding of VP wave propagation for:
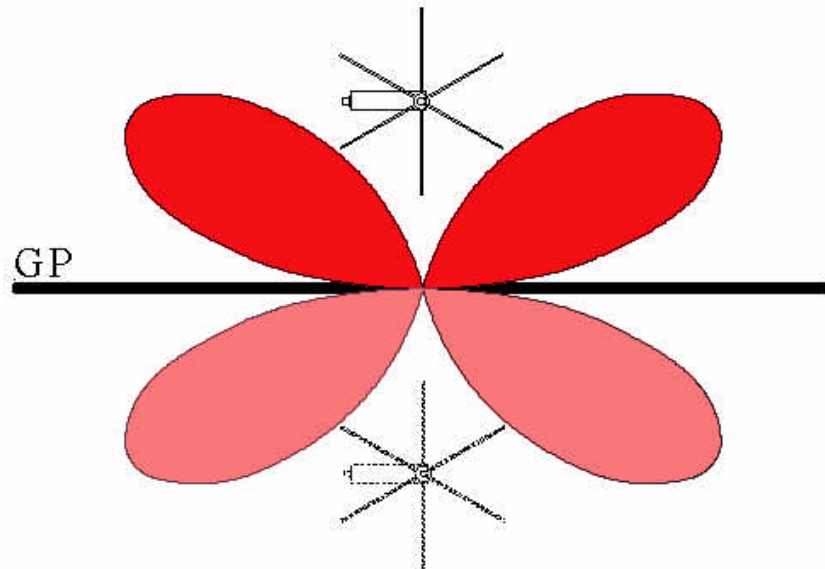
- ◆ **higher accuracy in RE testing**
- ◆ **higher accuracy in NSA measurement**
- ◆ **higher accuracy in antenna calibration**

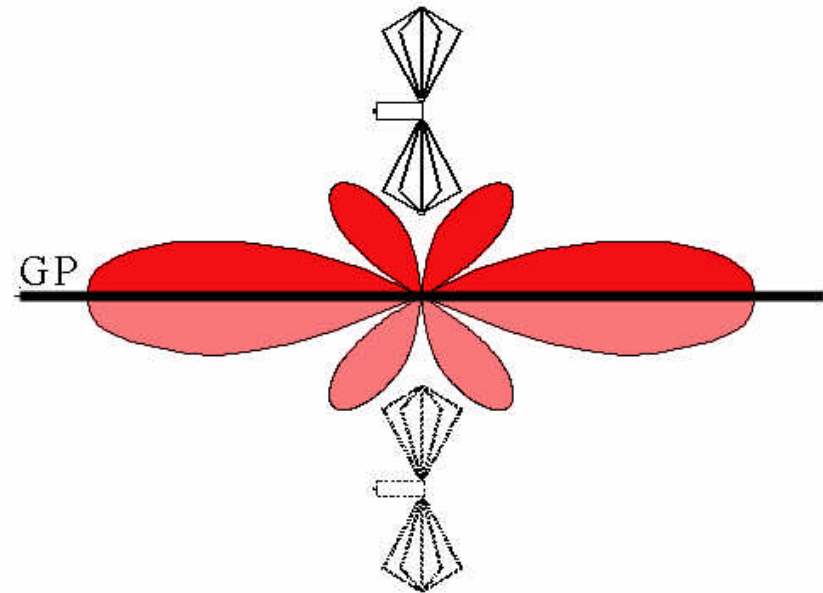**AUSTRIAN RESEARCH CENTERS**

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Our Investigations

- Simulation of finite GP with FDTD
- Comparison of results with NEC and measurements
- Definition of DSA for site performance
- Detailed investigation of

  - material below / beside the GP
  - SA measurement methods fixed/scanned height
  - influence of GP size
  - influence of test distance
  - influence of antenna volume

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Antenna Above Ground Plane
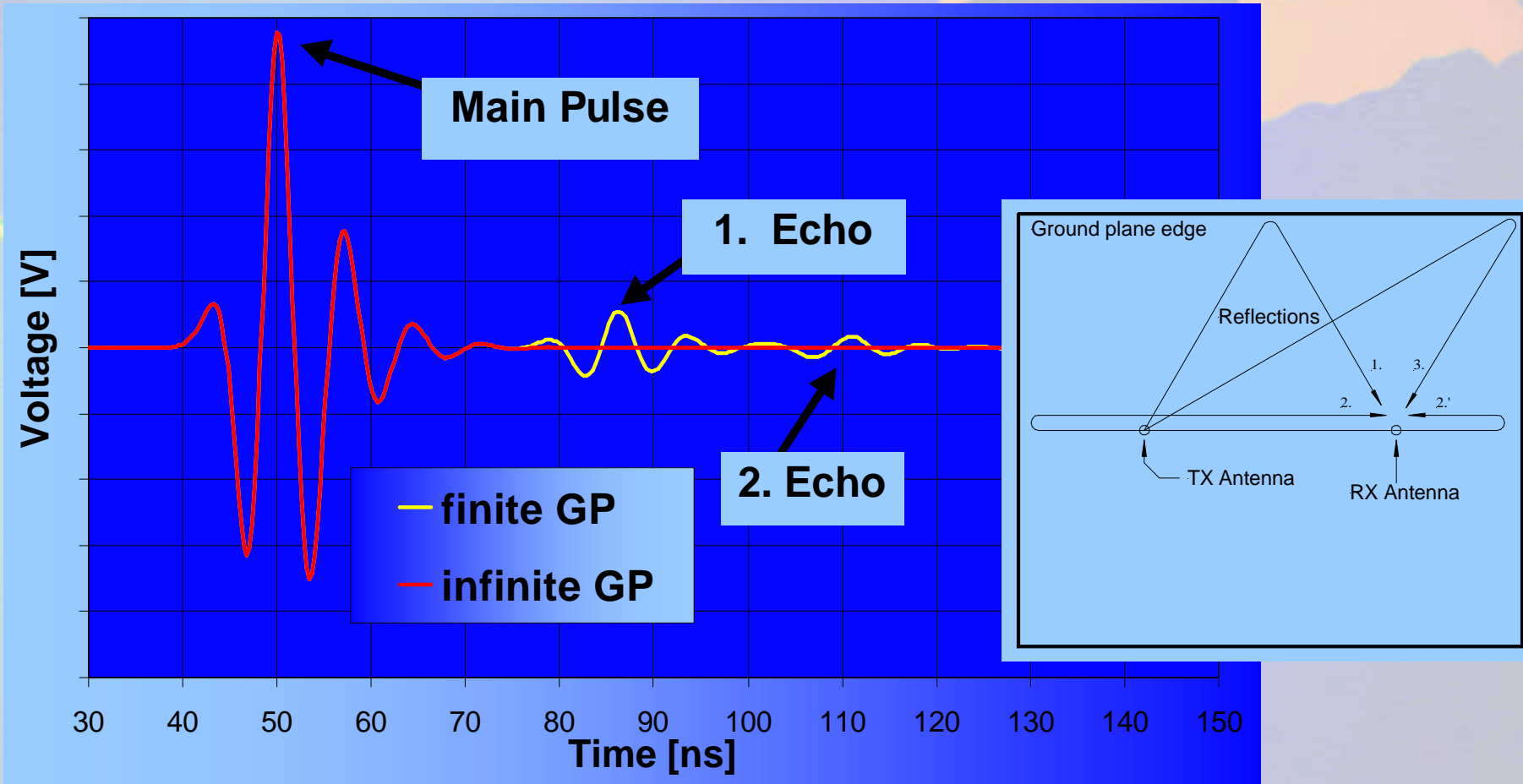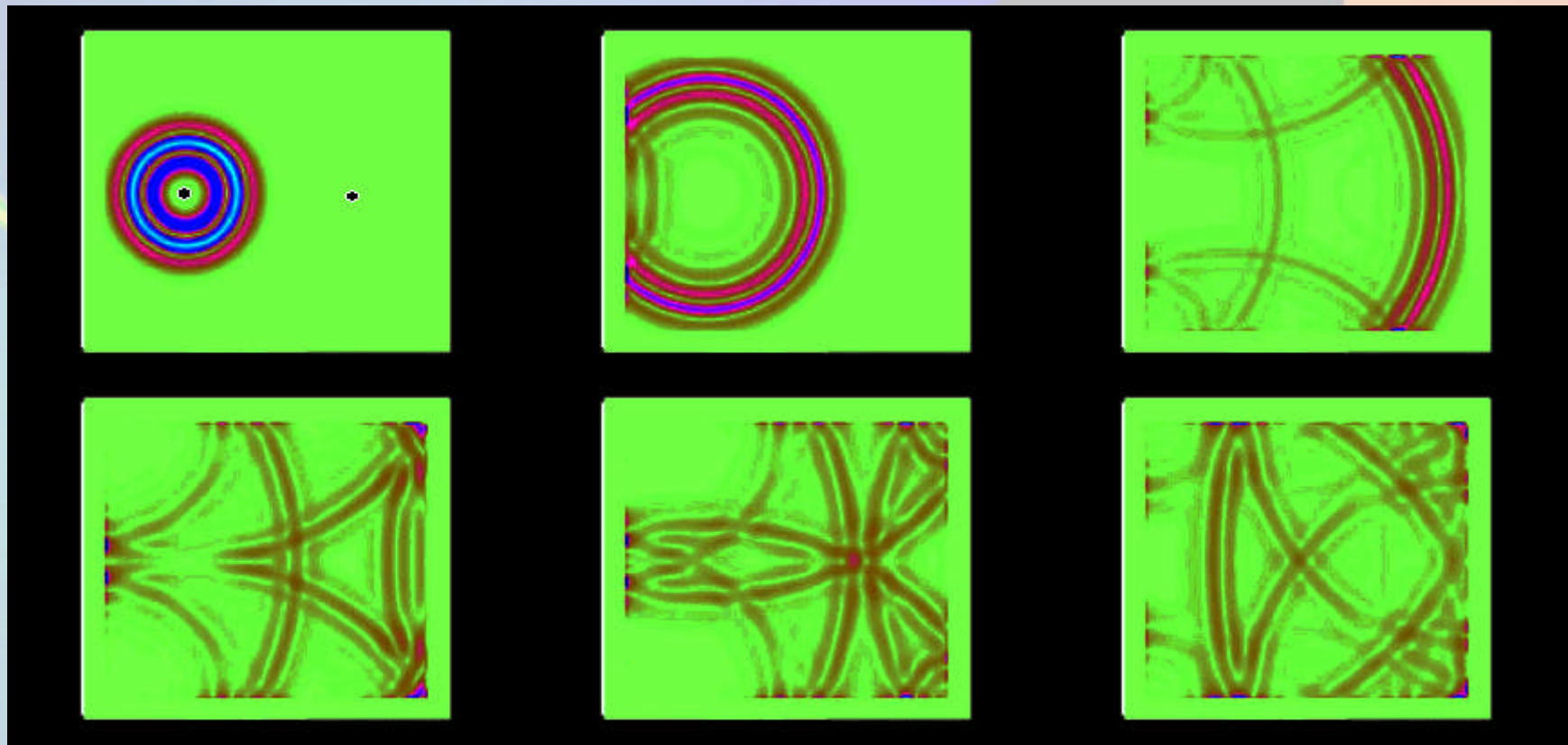

HP

VP

GP

GP

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Simulation of Ground Plane Induced Currents

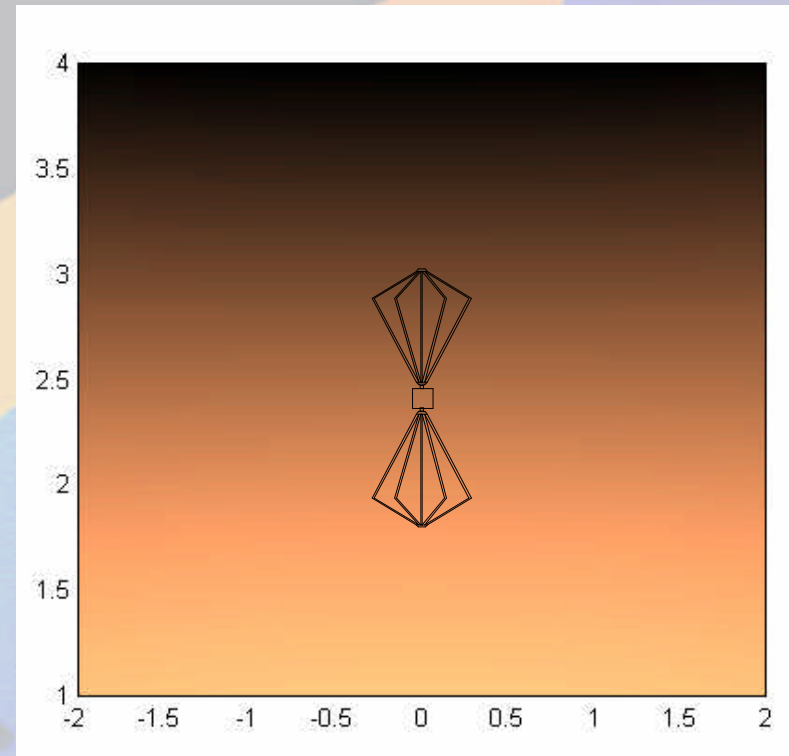# Simulation Result: Ground Plane Induced Currents

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Field Distribution at RX antenna (infinite GP)

HP

VP

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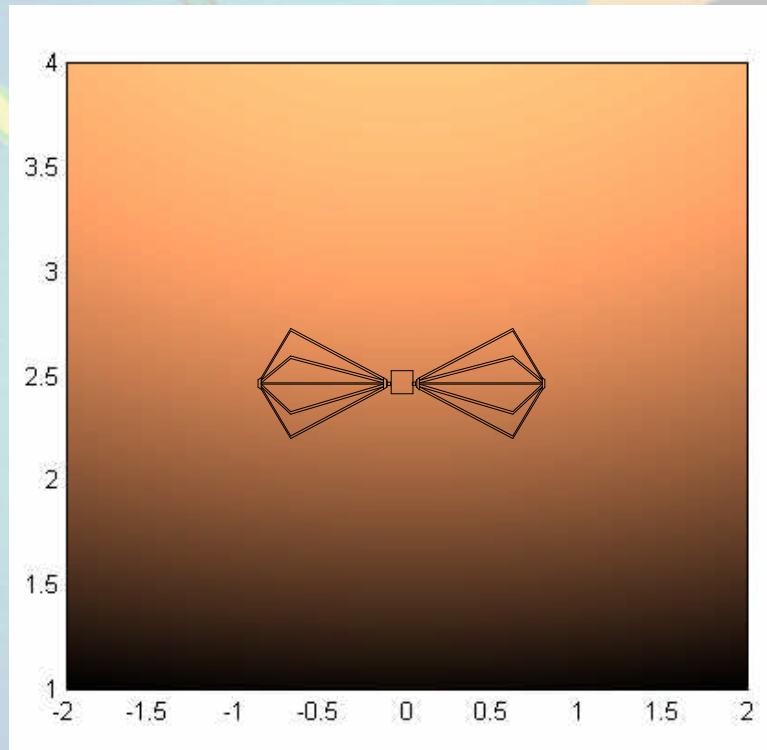
Field Distribution at RX antenna (finite GP)

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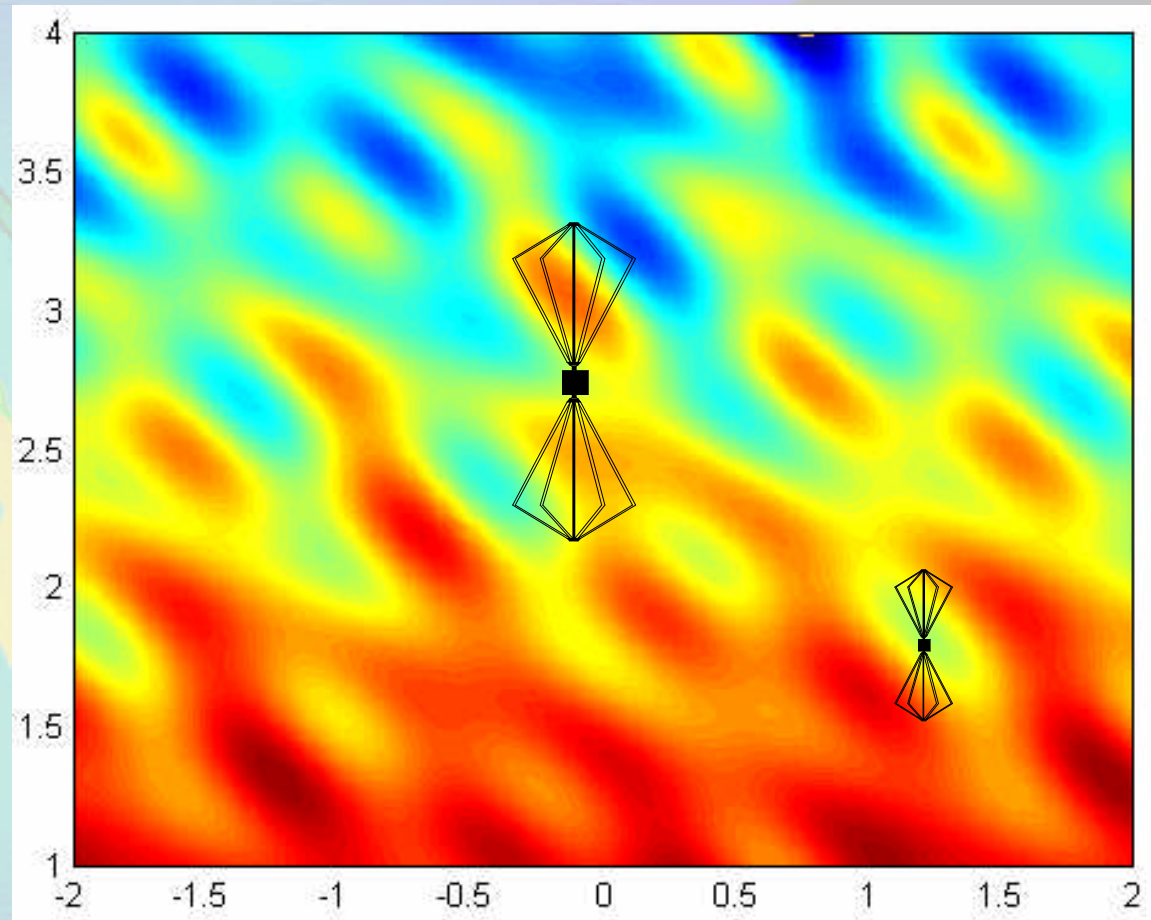
Influence on SA, RX antenna fixed height

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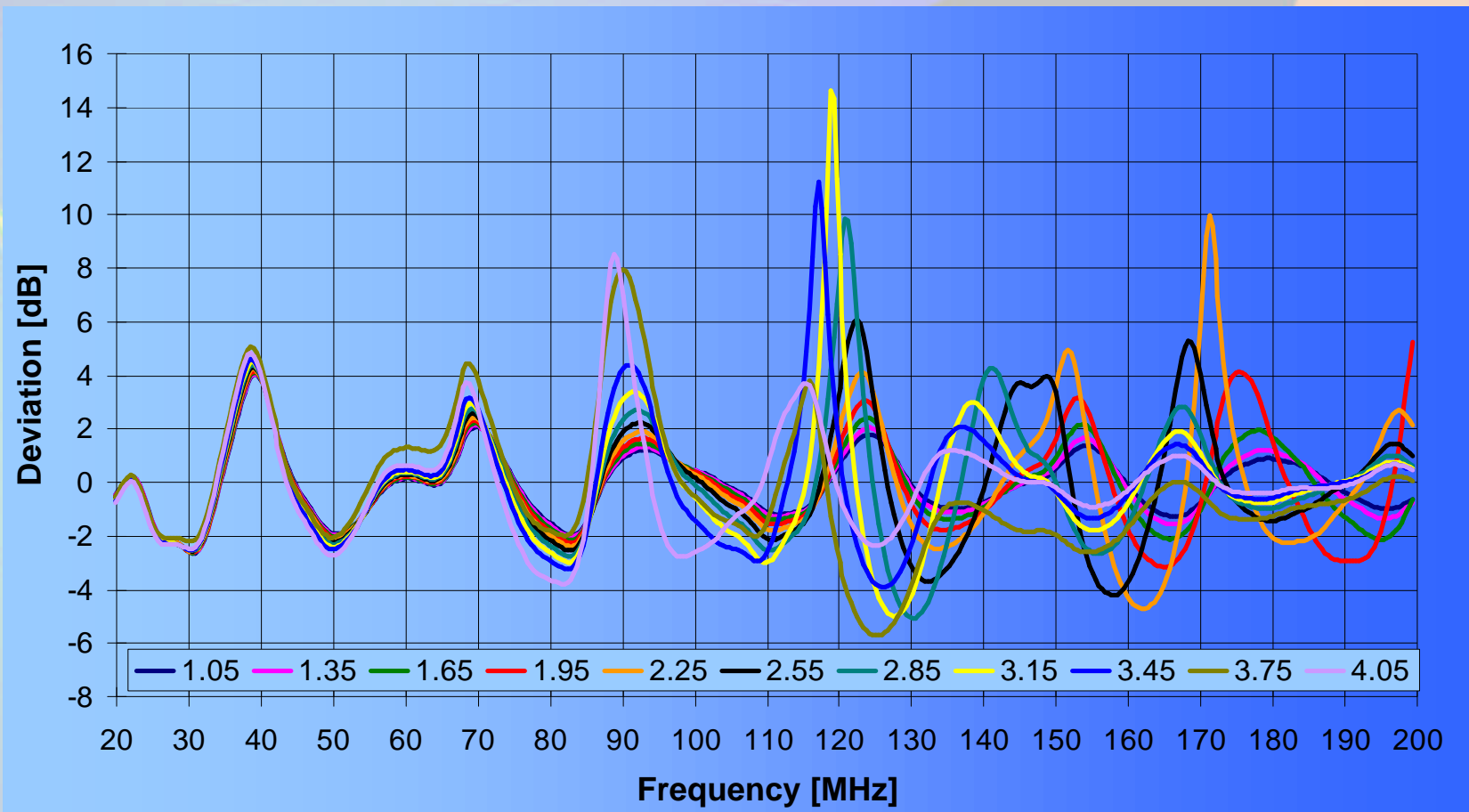
Influence on SA, distance variations

10 m distance +/- 90 cm

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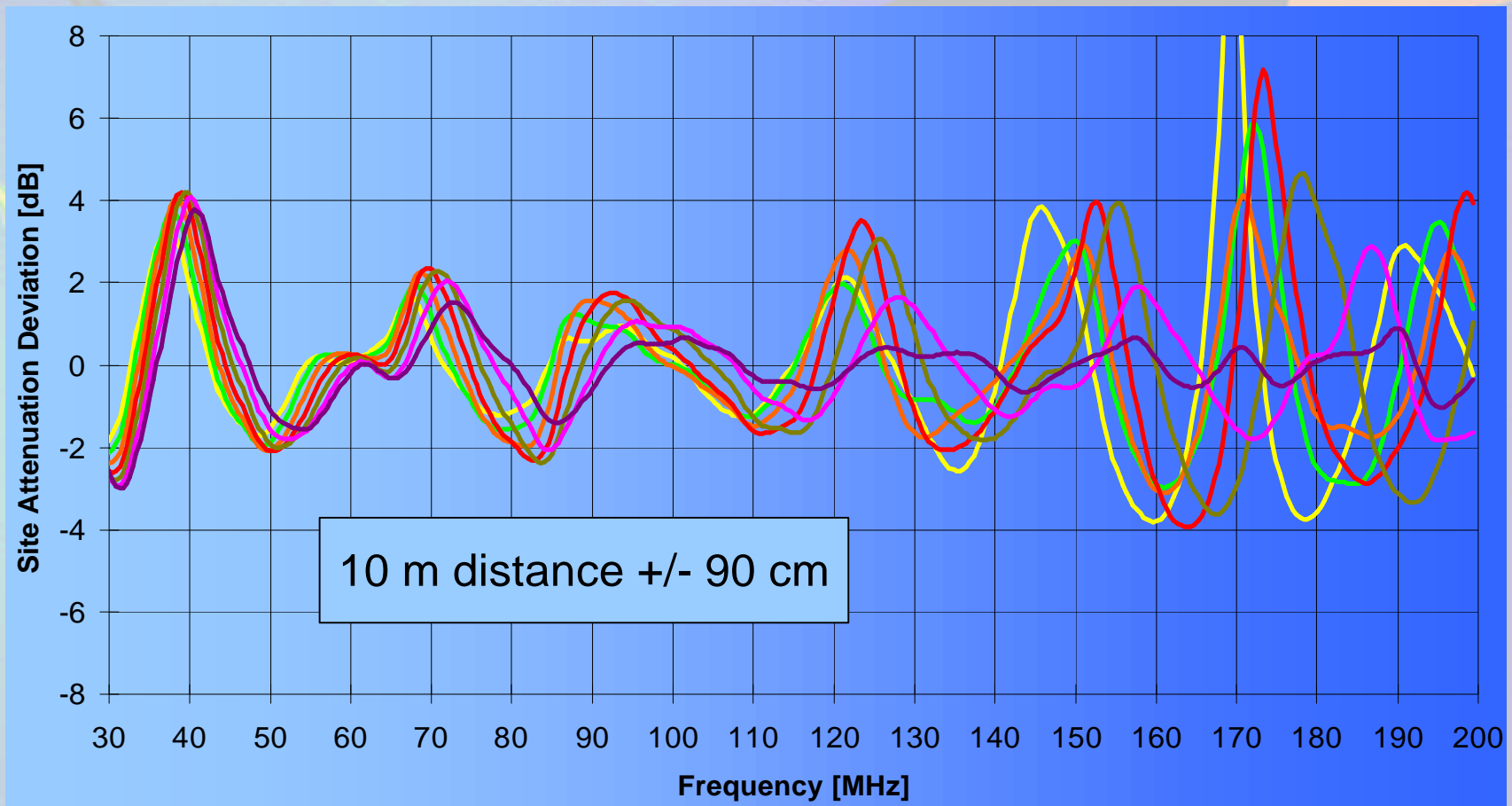
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Consequences

- VP procedures $\frac{1}{}$ HP procedures

- VP uncertainties >> HP uncertainties

- VP Site attenuation testing procedure

  - height of RX antenna off maximum: NO

  - height scan of RX antenna (= maximum): YES

  - result depends on the antenna type and size

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Consequences Antenna Calibration

- Standard Site Method:

    ◆ quality of site is largest uncertainty contribution

- Reference Antenna Method:

    ◆ good for identical antennas only!

    ◆ large errors possible - depending on the dimensions difference of the antennas

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Relevance of Results

- RE testing, intercomparison of results
- Construction of sites
  - ◆ shape
  - ◆ antenna/EUT position
  - ◆ edge design
- Standardisation
- Uncertainty calculation in RE testing, SA measurement and antenna calibration

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