

SearchPath

**A tool for investigating the magnetic field
produced by a buried avalanche transceiver**

History

- **1971** first transceiver: 2.275 kHz
- **1972** VS68: 457 kHz
- **1972 – 1986** "frequency war"
- **1995+** going digital
- **1997+** 2 antenna devices
- **2003+** 3 antenna devices



**John Lawton on
Berthoud Pass, CO
November 1968**

**Note circular loop
antenna**

The "Hot Dog"



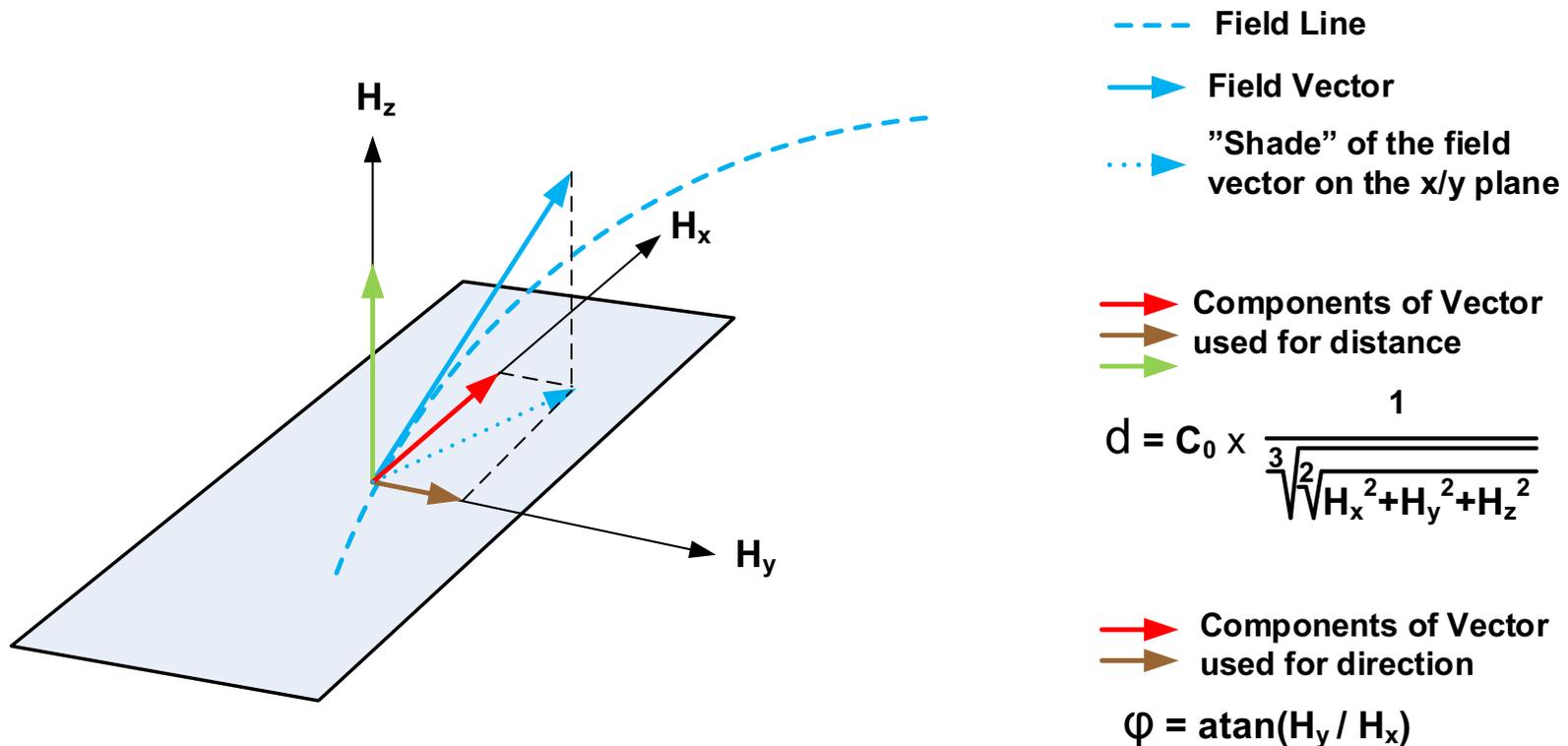
Display Information

on a searching transceiver (distance and direction) is derived from

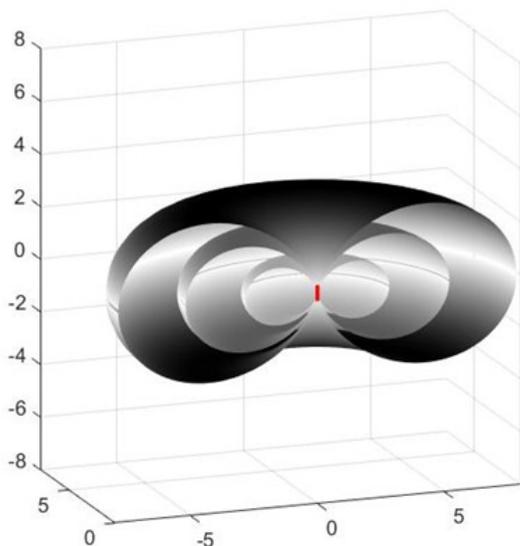
- **Strength**
- **Direction**

of the incident magnetic field lines at the searching transceiver

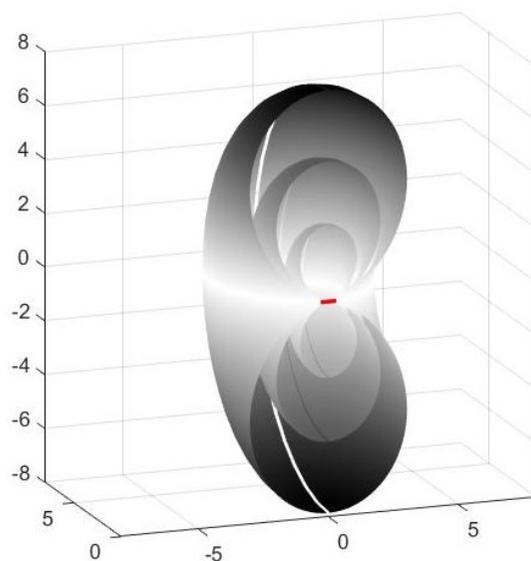
Field Lines at Searching Transceiver



Homogeneous Space



Vertical Antenna



Horizontal Antenna

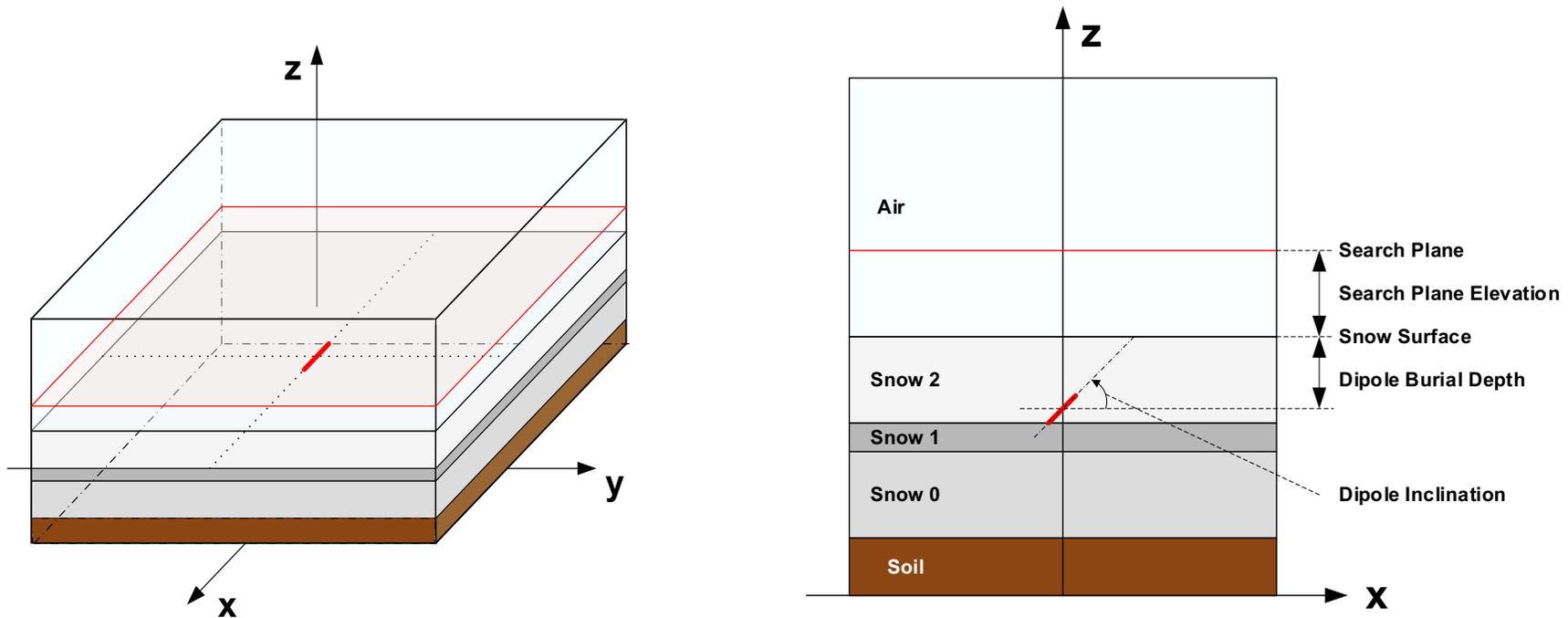
$$\frac{dy}{dx} = \frac{3 \cdot x \cdot y}{2 \cdot x^2 - y^2}$$

Integrated :

$$x^2 + y^2 = C \cdot y^{\frac{4}{3}}$$

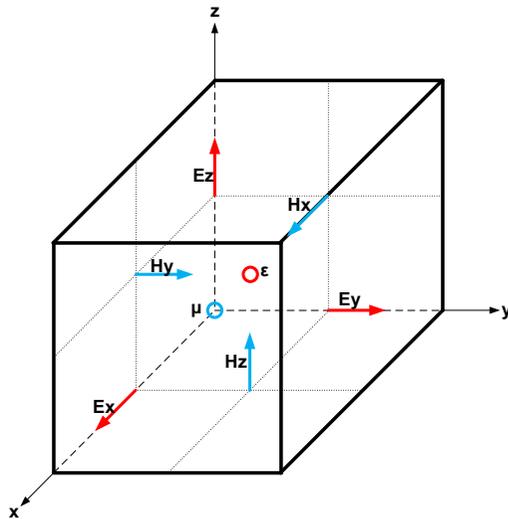
Closed Form Solution

Layered (inhomogeneous) Space



No closed form solution available !

FDTD (Finite Difference Time Domain) Algorithm

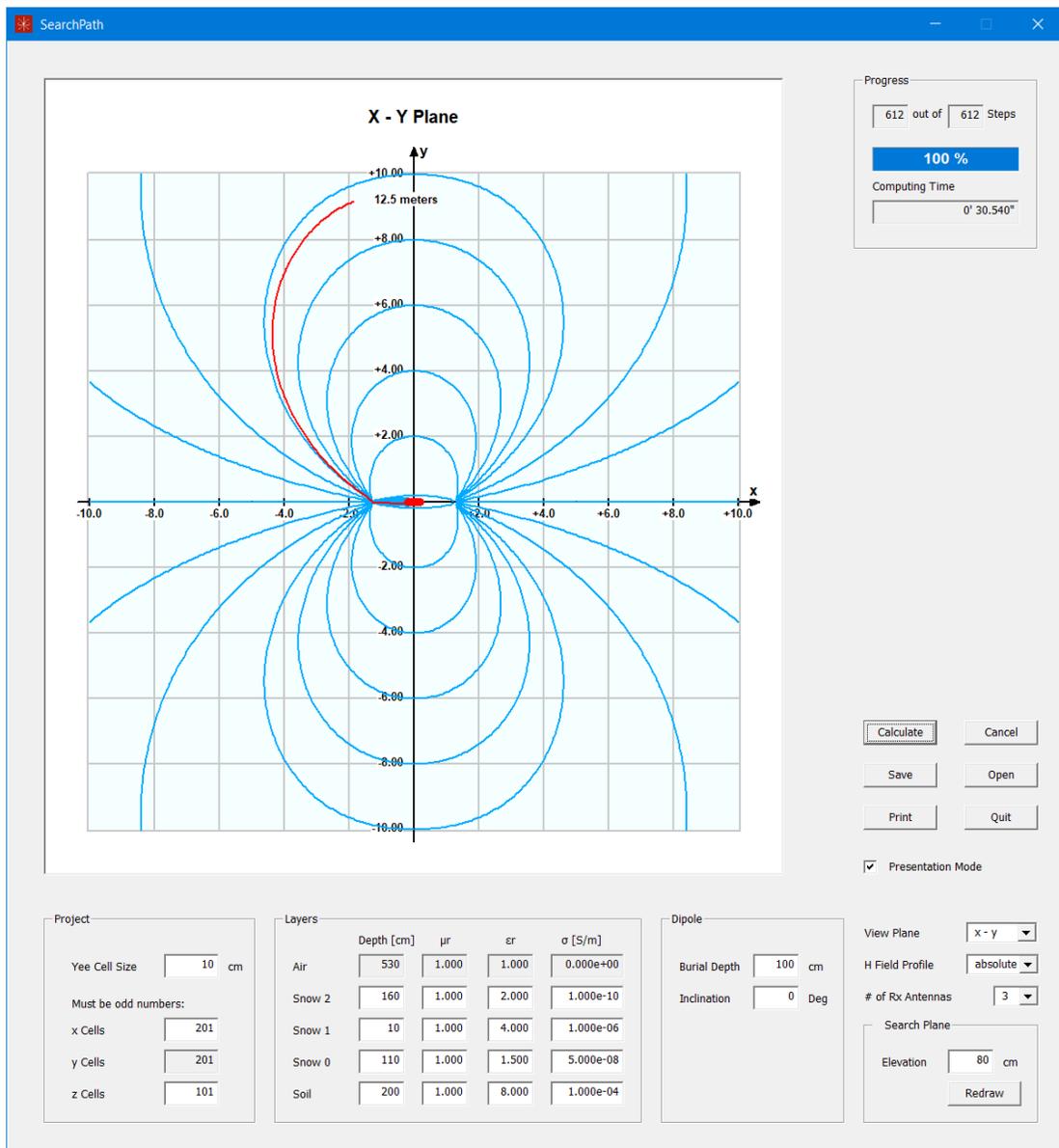


The Maxwell Equations:

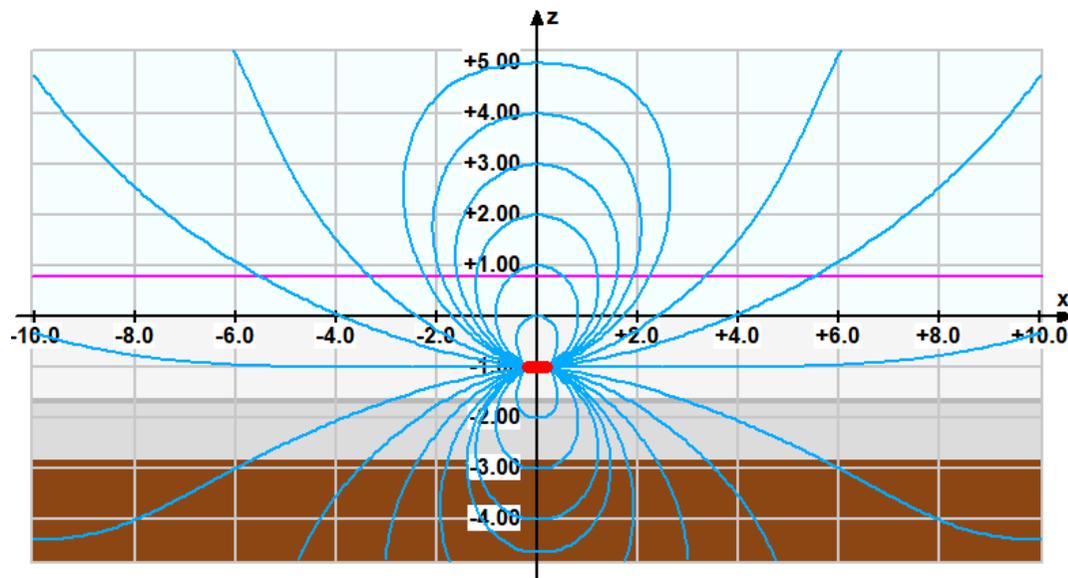
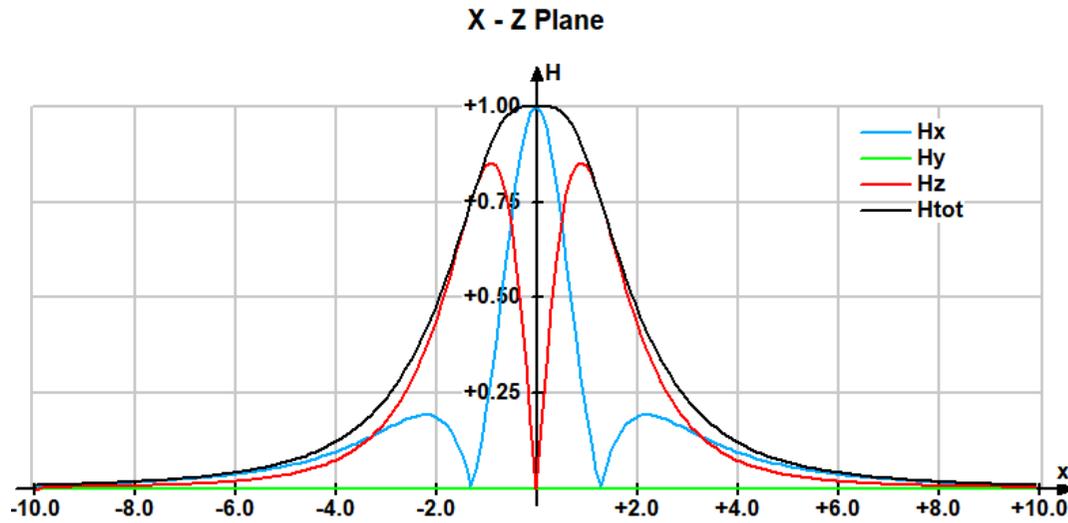
$$\frac{\partial \vec{E}}{\partial t} = -\frac{\sigma}{\epsilon} \vec{E} + \frac{1}{\epsilon} (\nabla \times \vec{H}) - \frac{1}{\epsilon} \vec{J}_s$$

$$\frac{\partial \vec{H}}{\partial t} = -\frac{\sigma_m}{\mu} \vec{H} - \frac{1}{\mu} (\nabla \times \vec{E}) - \frac{1}{\mu} \vec{J}_{ms}$$

**Stepwise numerical integration of differential equations,
similar to weather forecast algorithms**

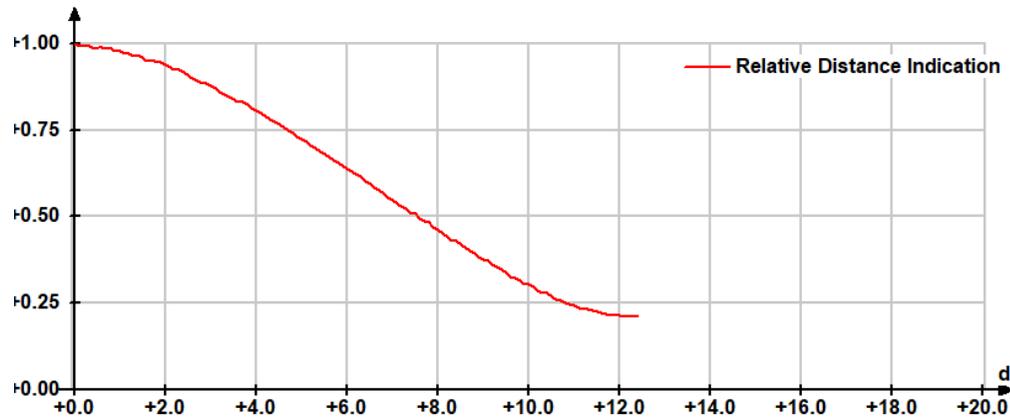


Horizontal Antenna

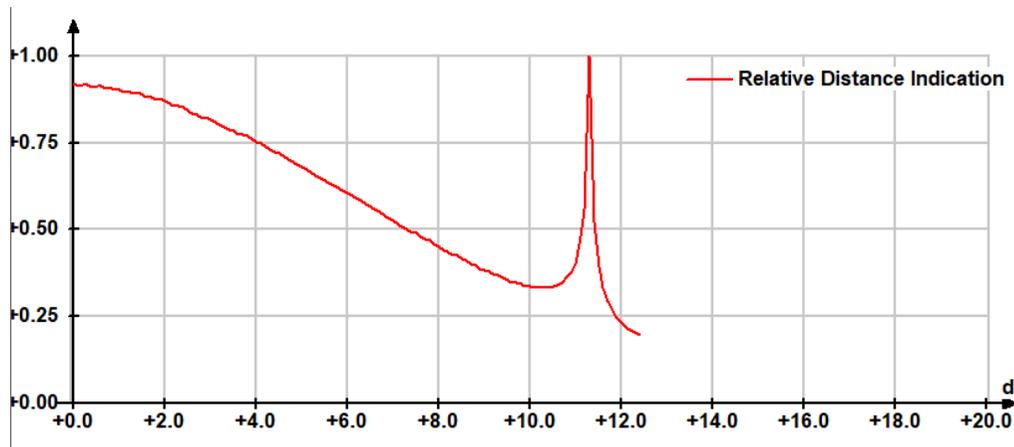


Horizontal Antenna

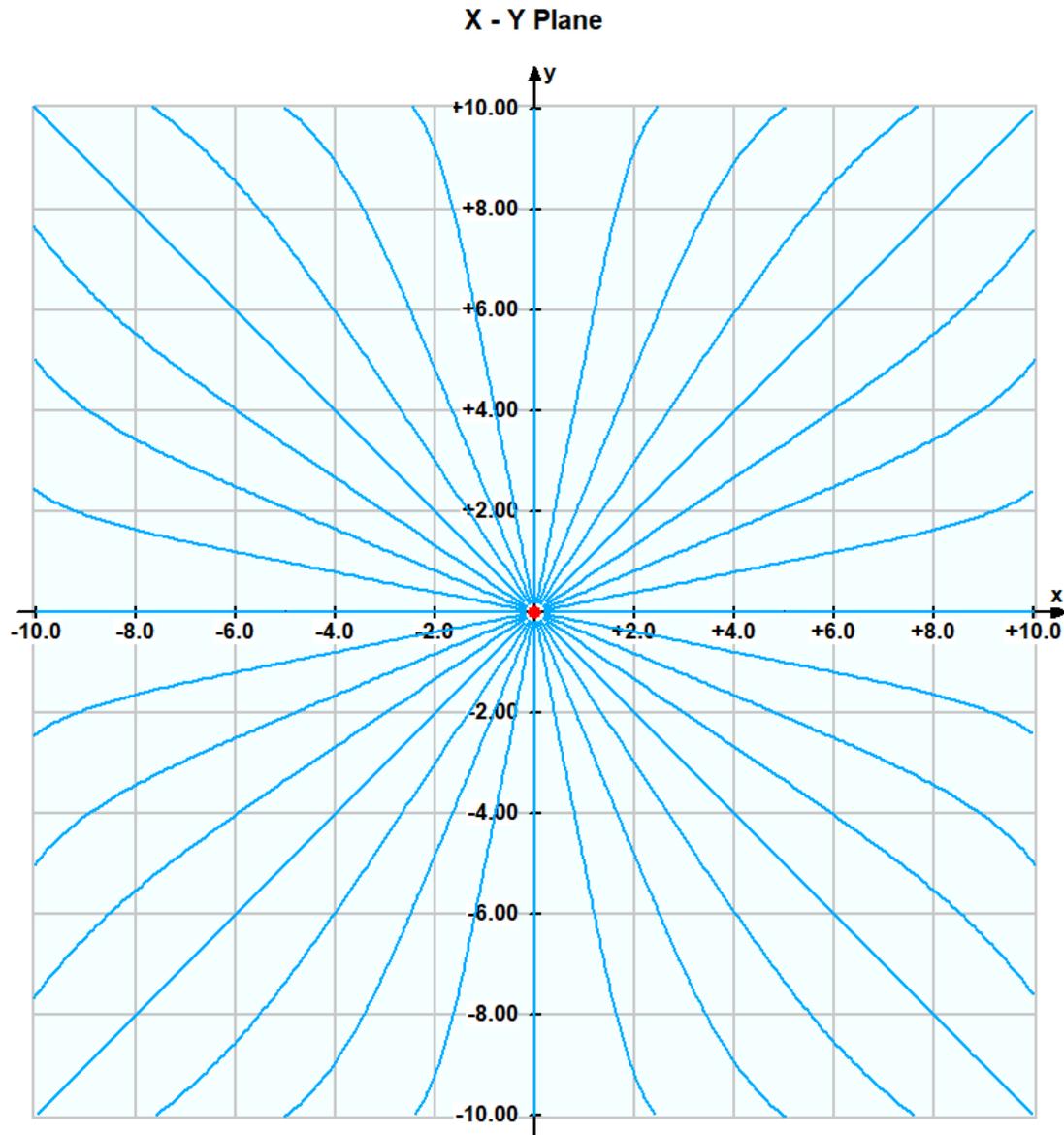
The 3rd Antenna does make a difference !



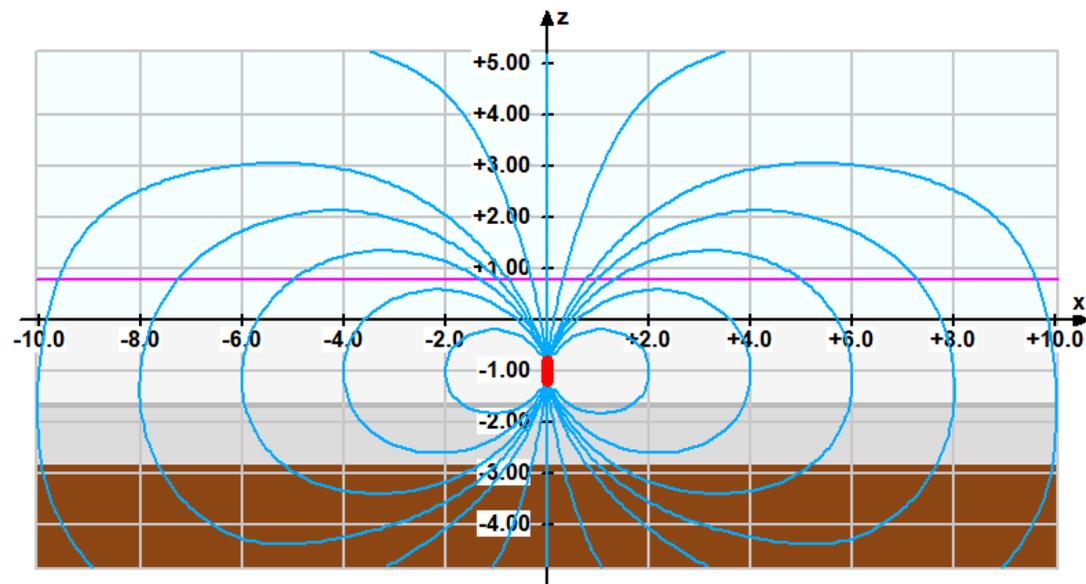
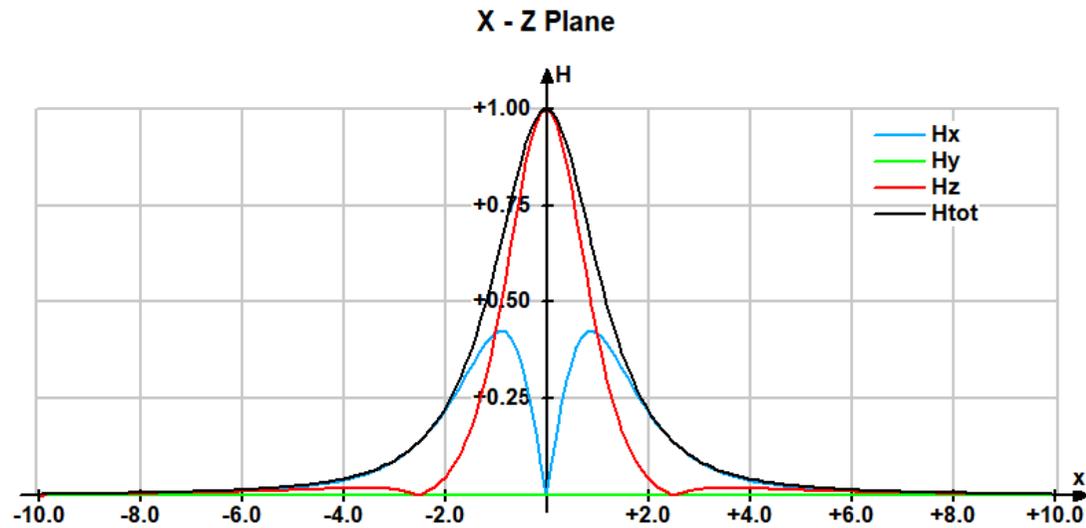
3 Antennas



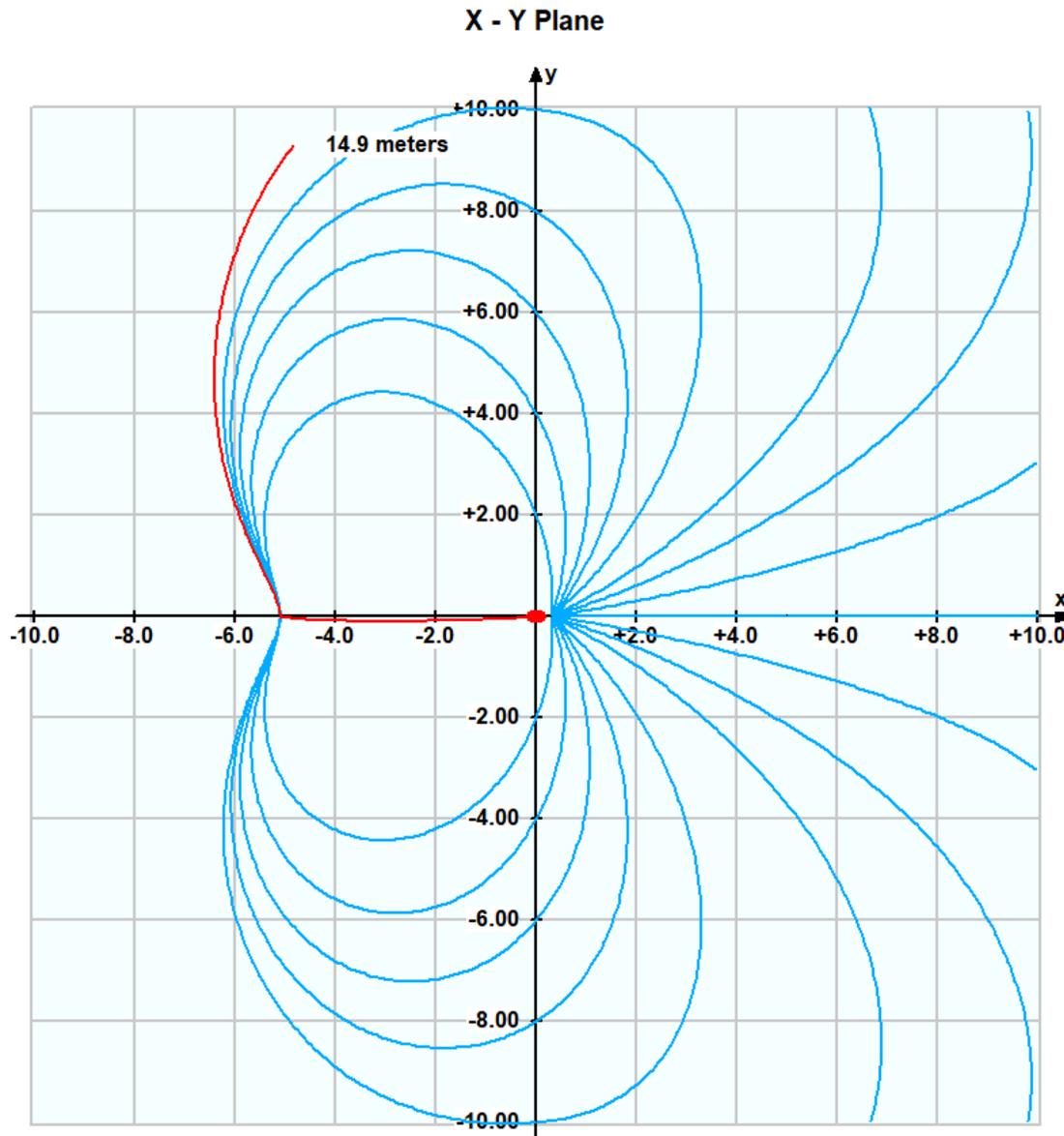
2 Antennas



Vertical Antenna

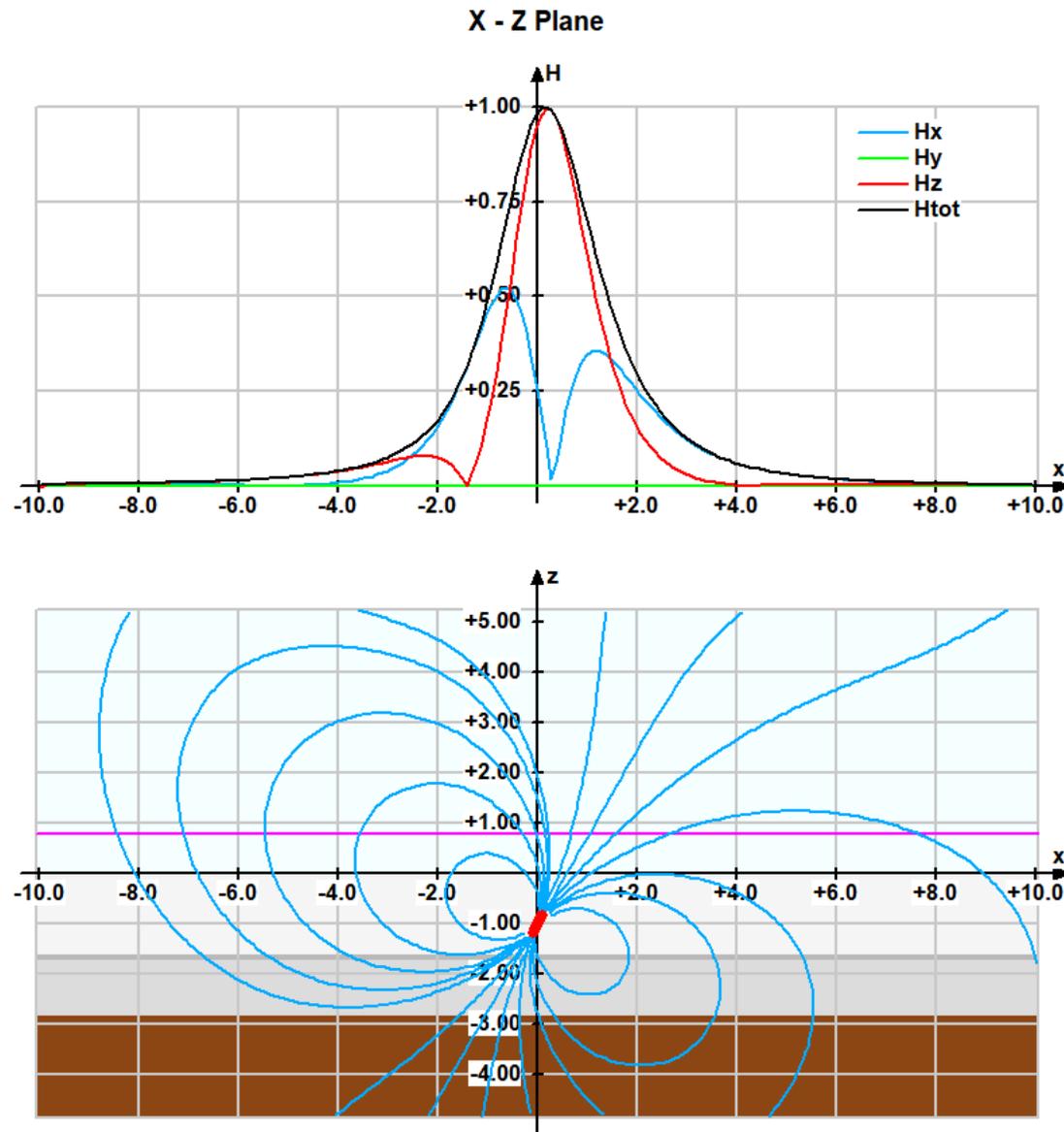


Vertical Antenna



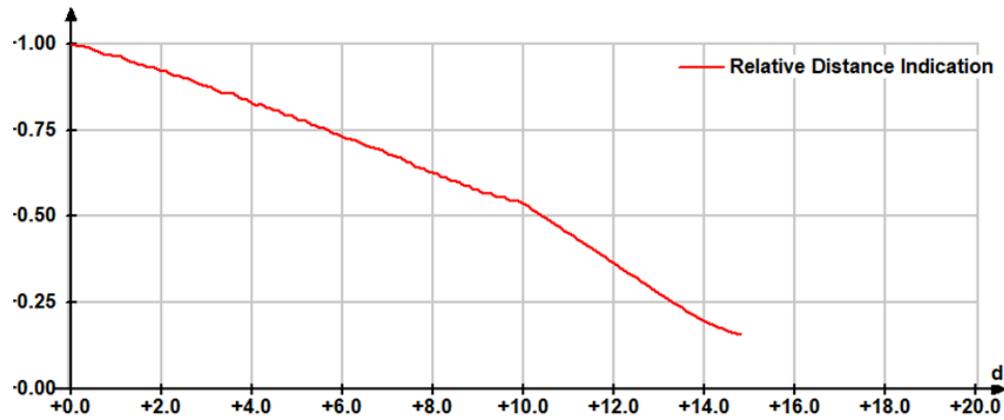
60° Inclined Antenna

— Search Path

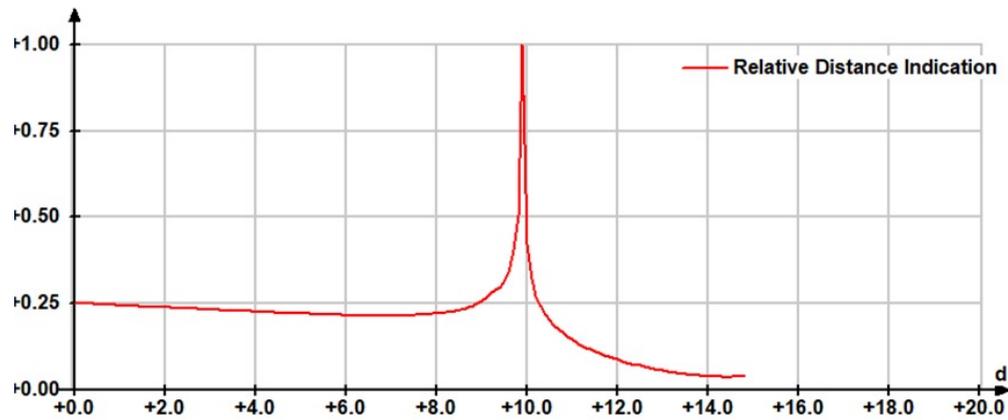


60° Inclined Antenna

60° Inclined Antenna



3 Antennas



2 Antennas

Use this program for

- **personal investigations / studies**
- **designing challenging training scenarios**
- **preparing graphics for documentation and manuals**
- **developing new (better?) transceivers**

To download the program, the user manual and the technical documentation, go to

<https://felmeier.com/en/software/SearchPath>

It's all free !

Thank you for your attention !