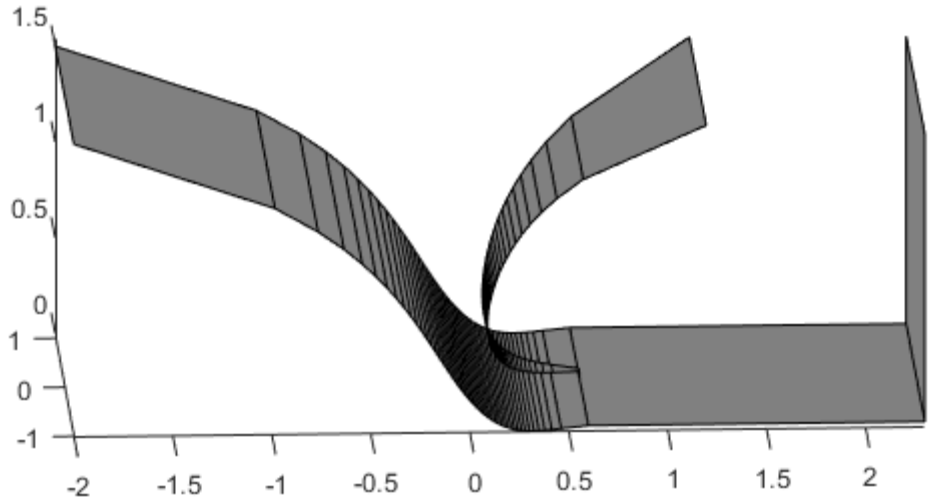
1. Tongue antenna

Optimal design (for min S11)



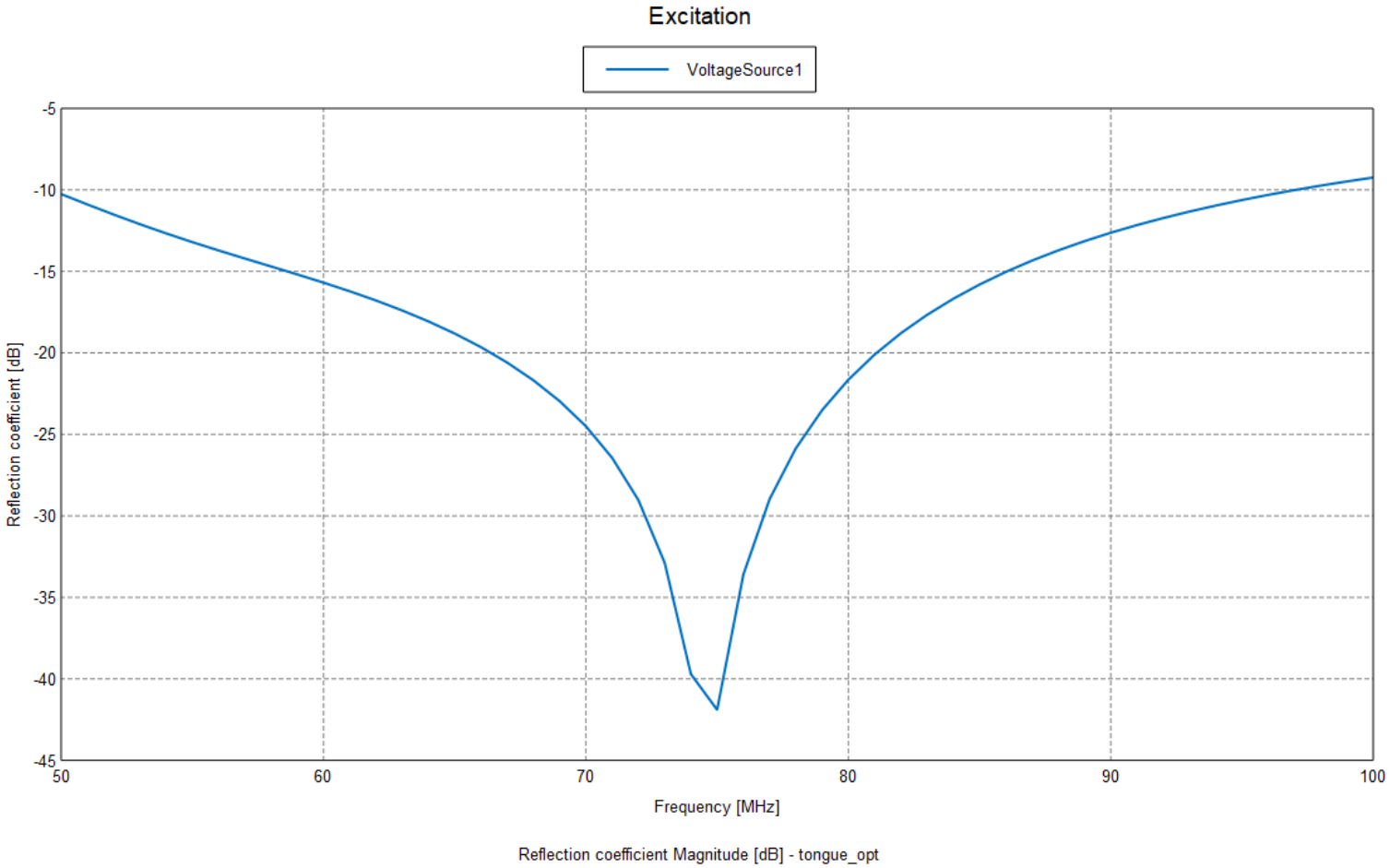
List of fixed and optimized parameters

```
% fixed parameters
lambda = 6; % highest wavelength
Lg = lambda/3; % lateral extent of ground
Lt = lambda/5; % lateral extent of tongue
Lf = lambda/10; % distance of feed point
H = lambda/4; % antenna height
Wg = lambda/3; % width of ground plane
m = 1; % power factor of tongue

% design variables
Hf = linspace(0.2,10,1)*10^-2; % height of feed point
n = linspace(2,6,1); % power factor of reference center curve
Wmint = linspace(2,6,1)*10^-2; % minimum width of tongue
Wmaxt = linspace(0.02,0.3,1)*lambda; % maximum width of tongue
Rg = linspace(2,5,1); % exponential rate of opening of ground and tongue
```

Optimal design : Return loss

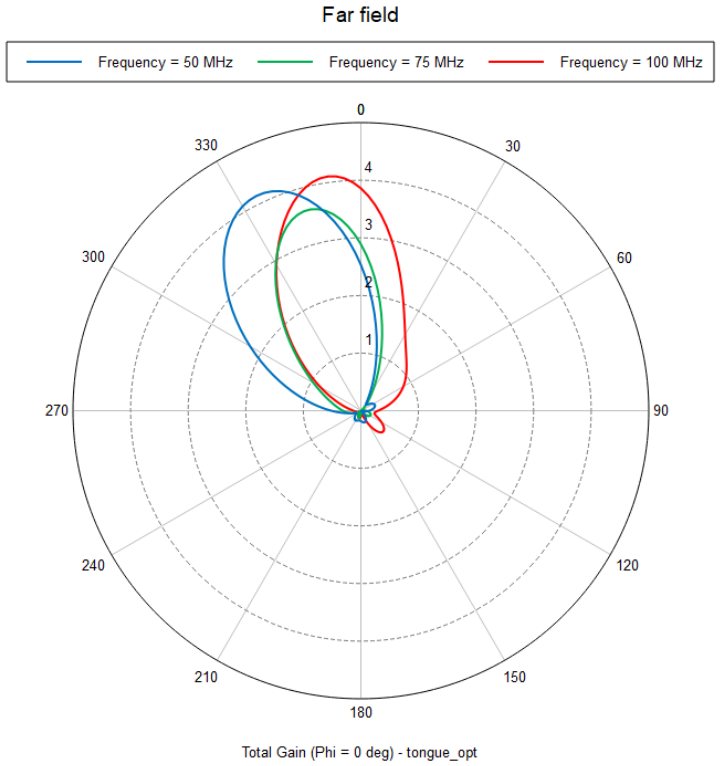
S11 < -10dB over 2:1 band



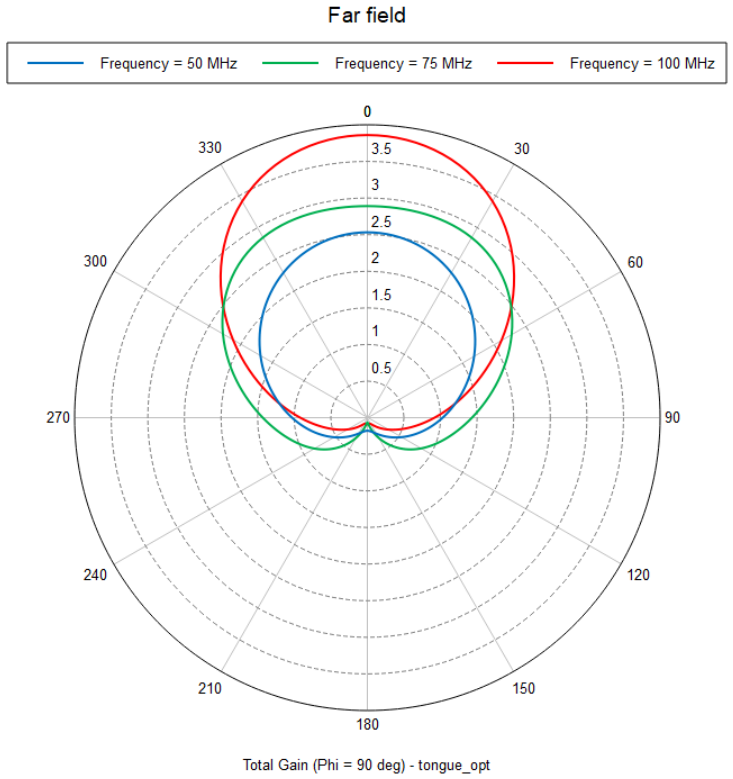
Optimal Design : Patterns

Linear scale, un-normalized

Phi = 0 deg

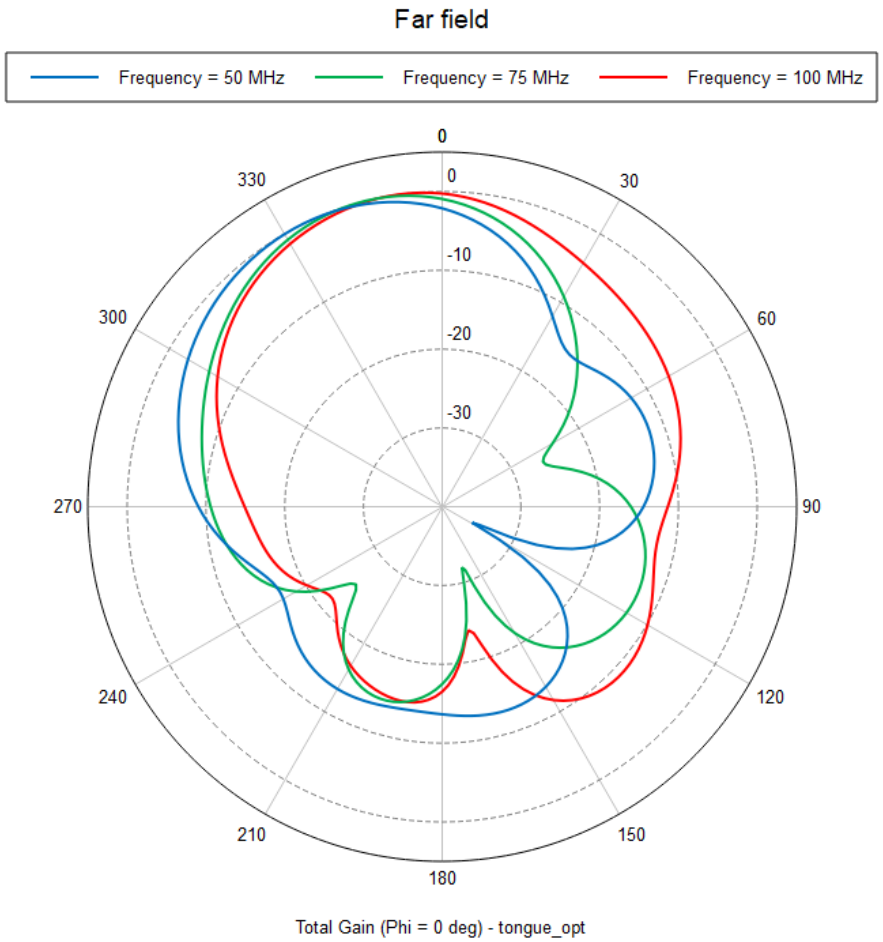


Phi = 90 deg



Optimal Design : Patterns

dB scale, normalized, phi = 0 deg



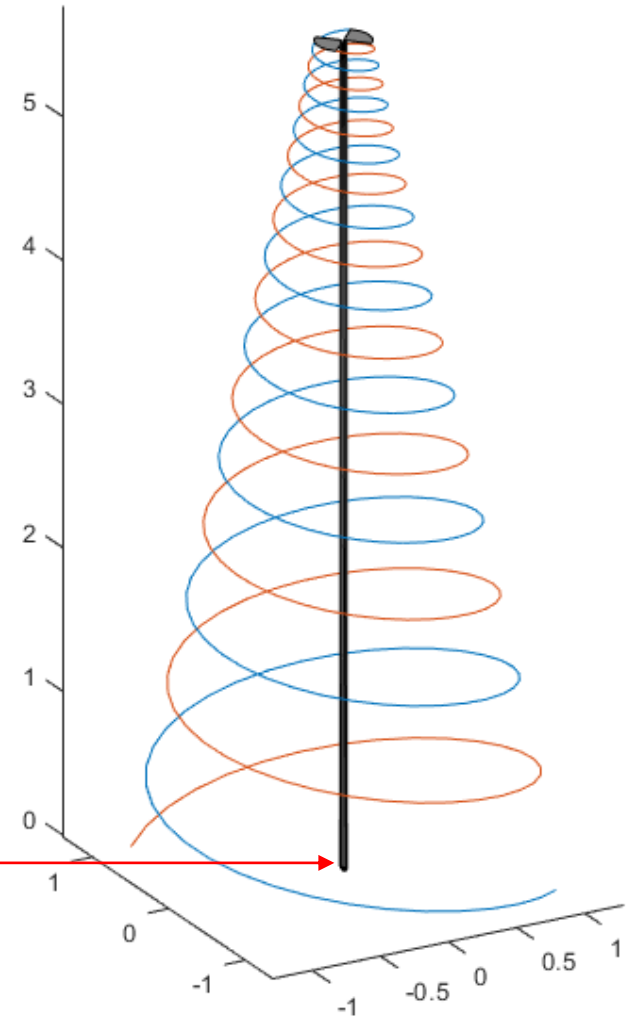
-10 dB backward -> need a much bigger ground plane ?

2. Conical log spiral antenna

=(: High impedance (200 Ohms), tall (H = 6m), heavy, fed at the top

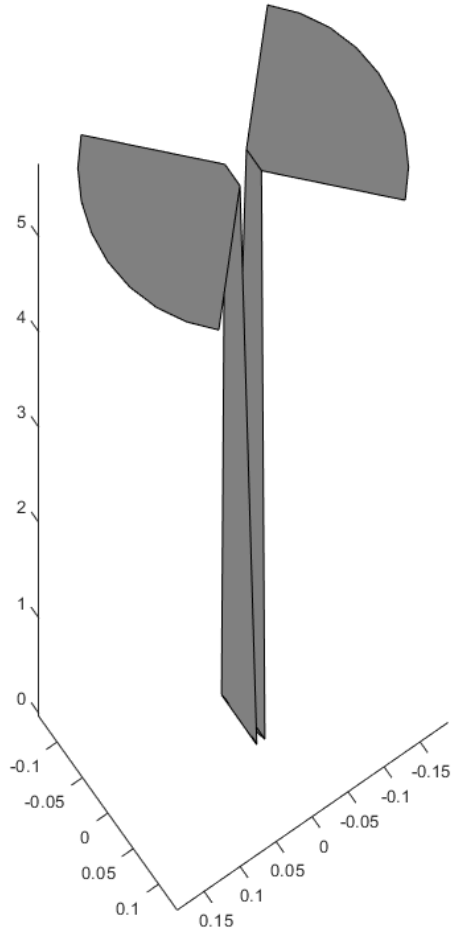
1. Tapered metallic impedance transformer along the cone axis
2. Wired version

Bottom feed



Tapered impedance transformer

Impedance of spiral is high but frequency-flat and has low reactive part

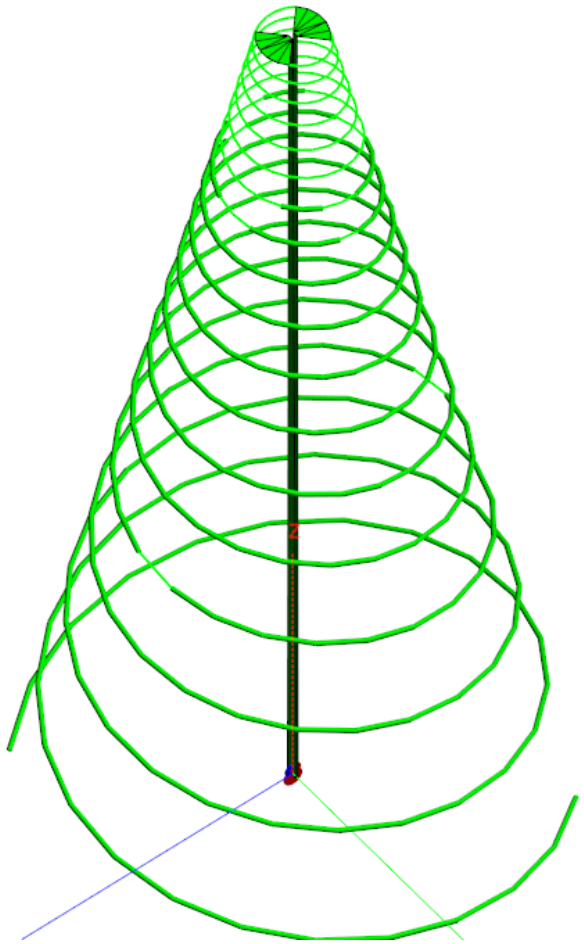


Idea : lower impedance to **50 Ohms** with a transmission line made of two **metallic parallel plates** with **linear taper** of L/H ratio

Characteristic impedance Z_0 of a transmission line made of two parallel metallic plate :

$$Z_0 = 377\,\frac{H}{L}$$

Optimal design



Wire diameter 2 cm

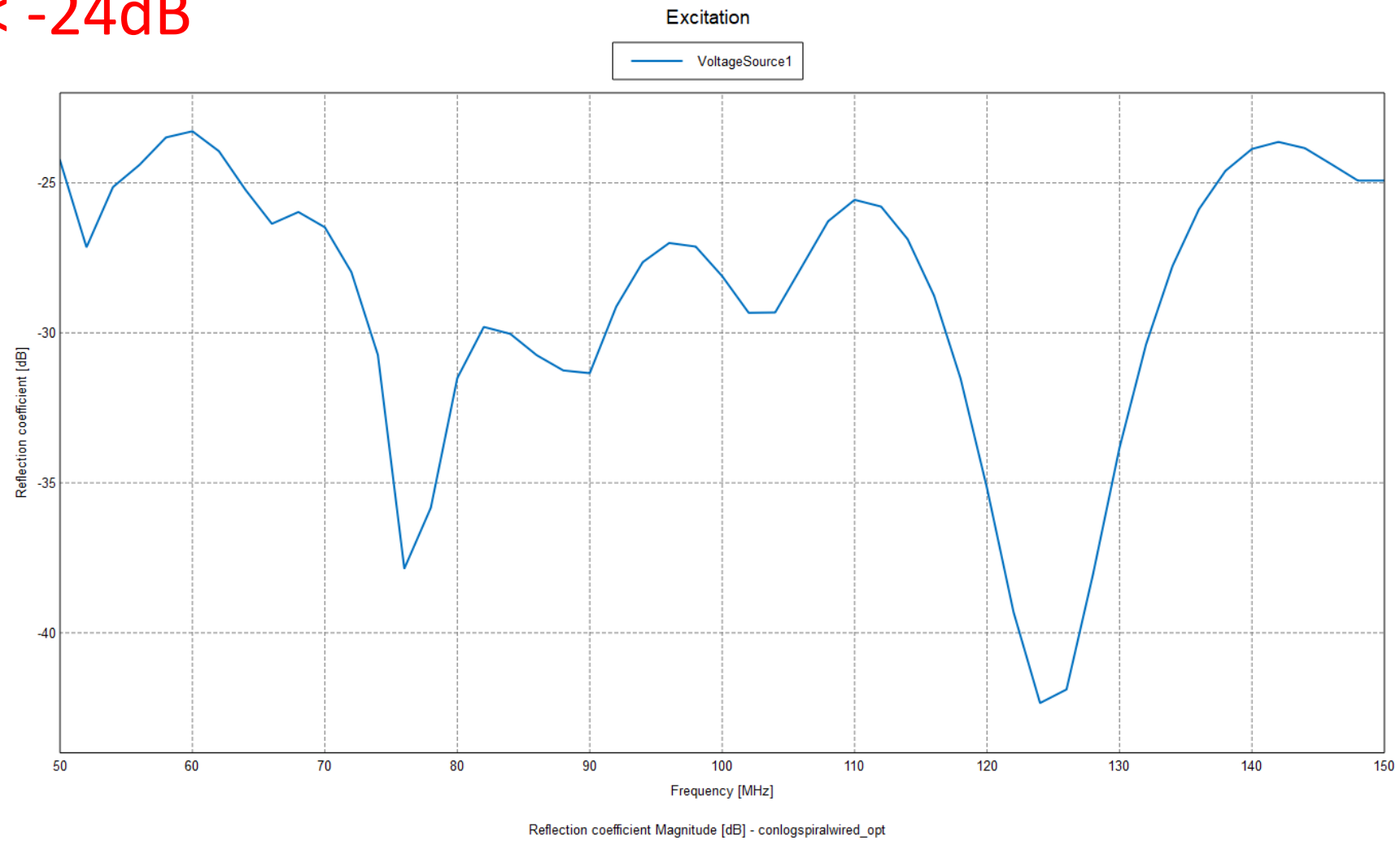
Metal strip :

Edge 1 (spiral) : H = 3 cm, L = 3 cm

Edge 2 (feed) : H = 1 cm, L = 6 cm

Optimal design : Return loss

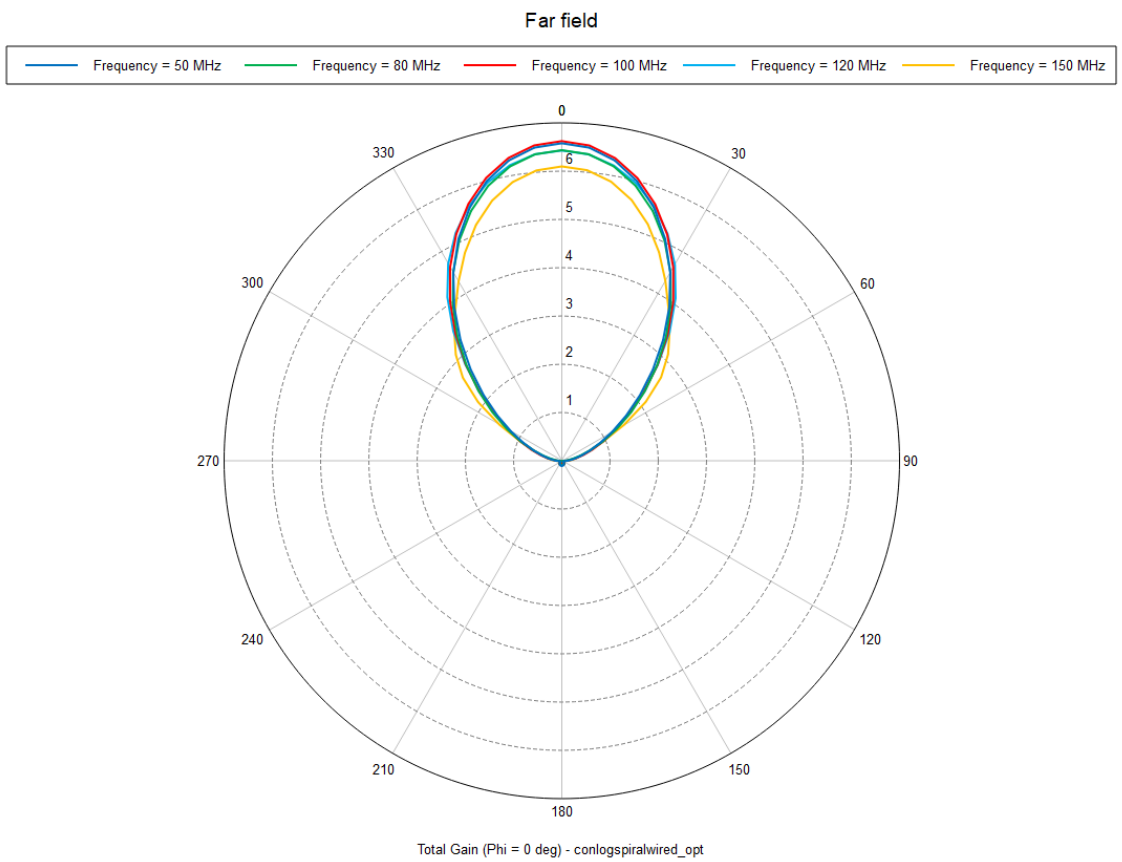
S11 < -24dB



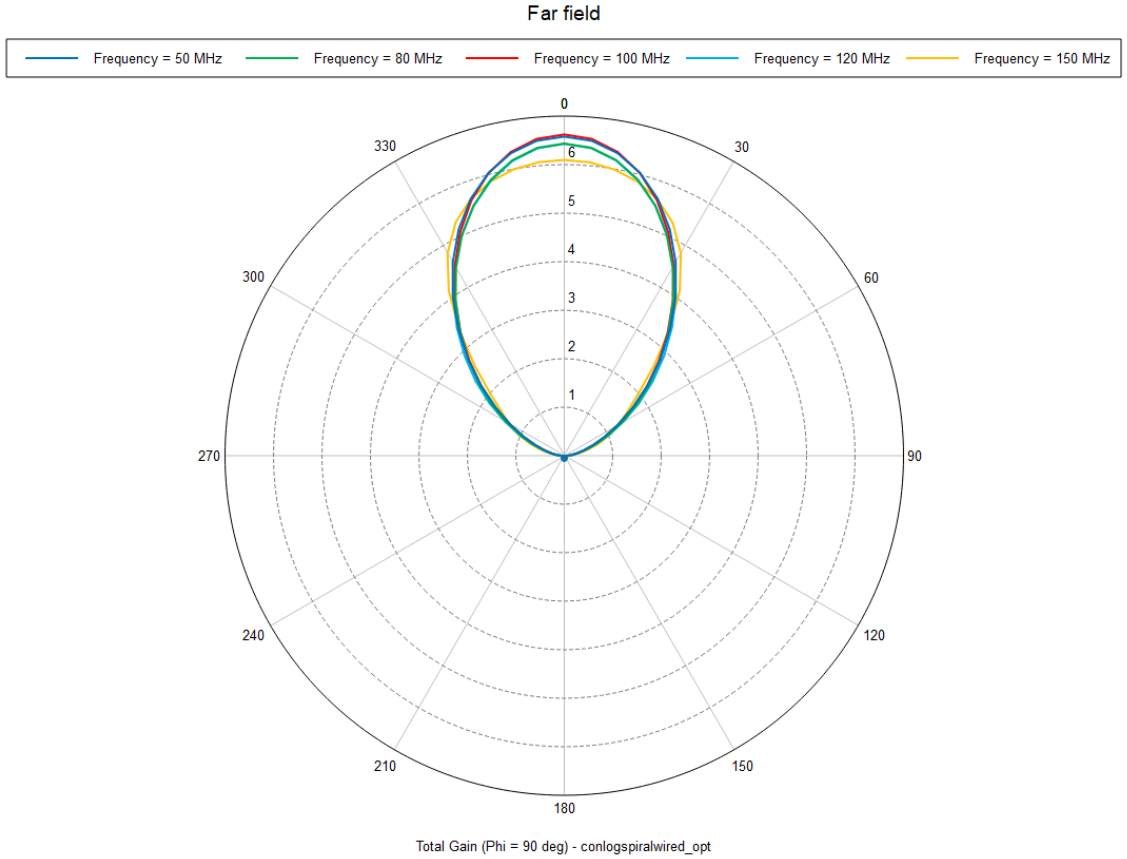
Optimal design : Patterns

Linear scale, un-normalized

Phi = 0 deg

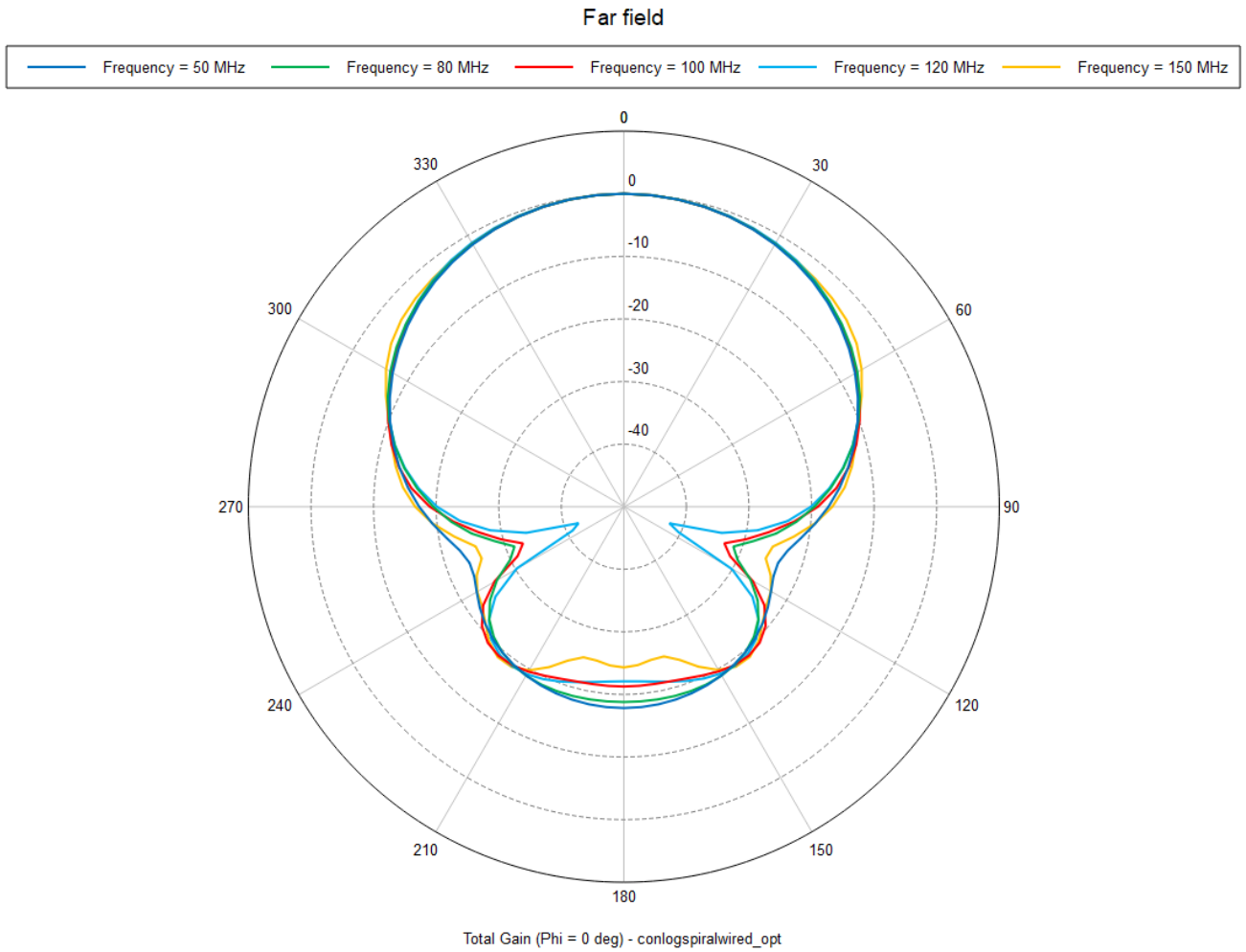


Phi = 90 deg



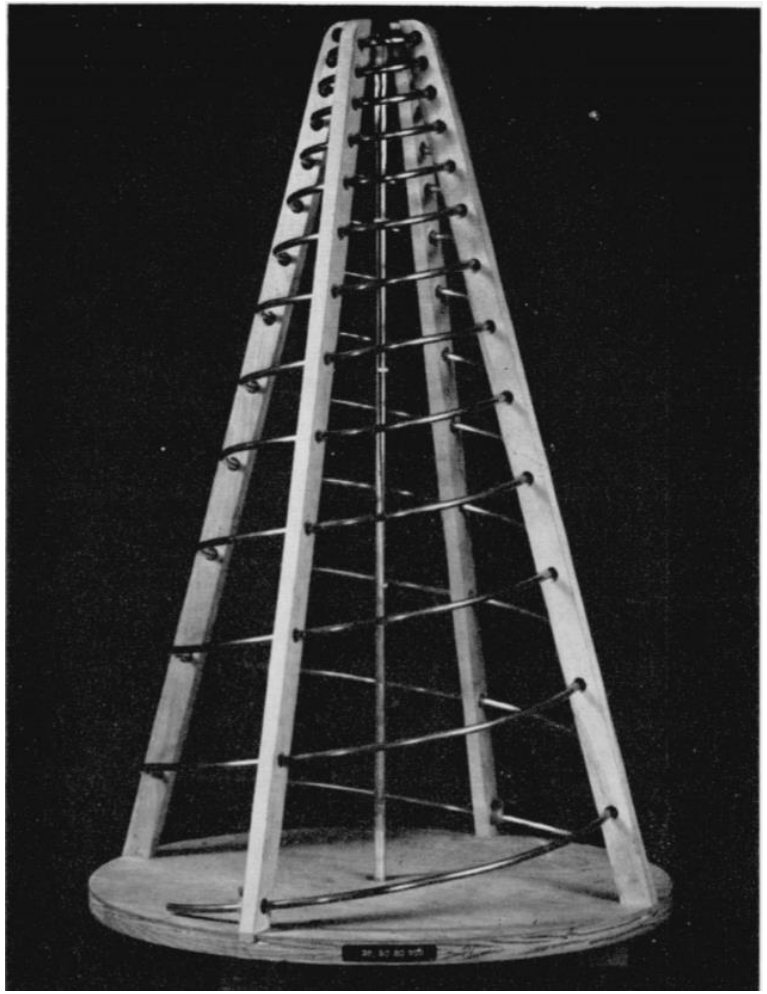
Optimal Design : Patterns

dB scale, normalized, phi = 0 deg



-20 dB backward

How to build it ?



- Two wires or tubes
- A tripod
- Two metal strips

Dyson 1965, A Survey of the Very Wide Band and Frequency Independent Antennas-1945 to the Present