# Antenna design update, April 15

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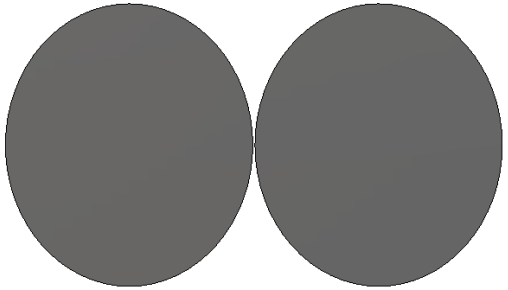
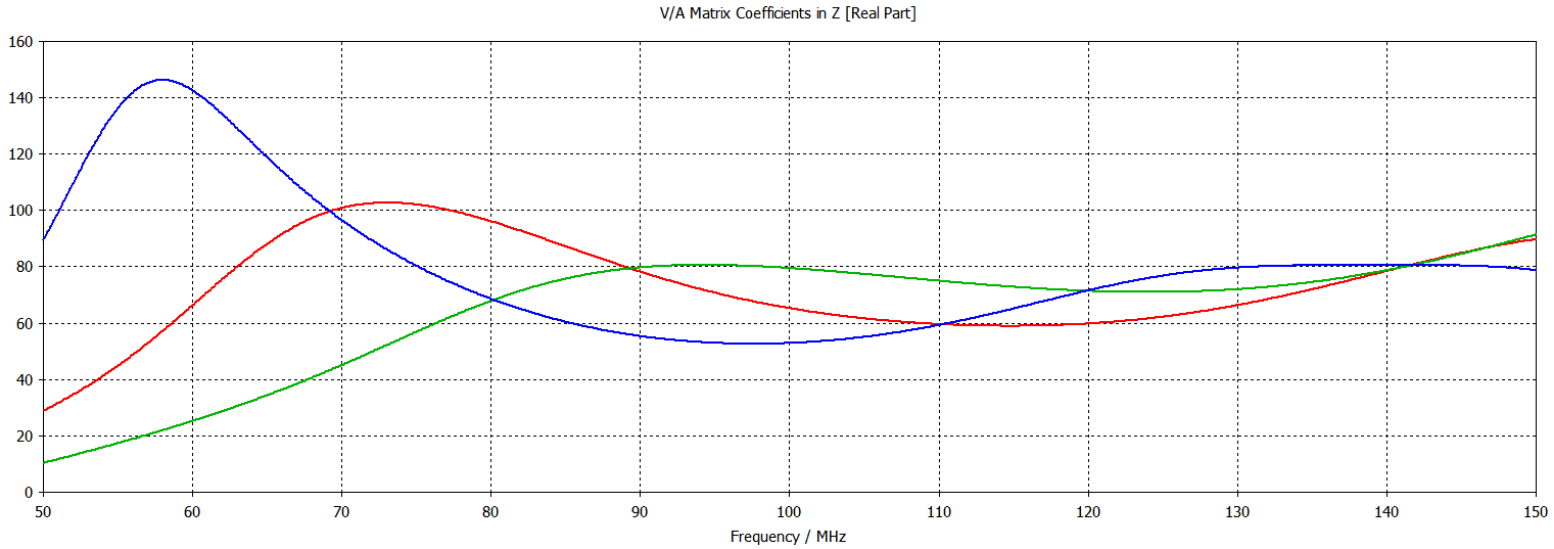
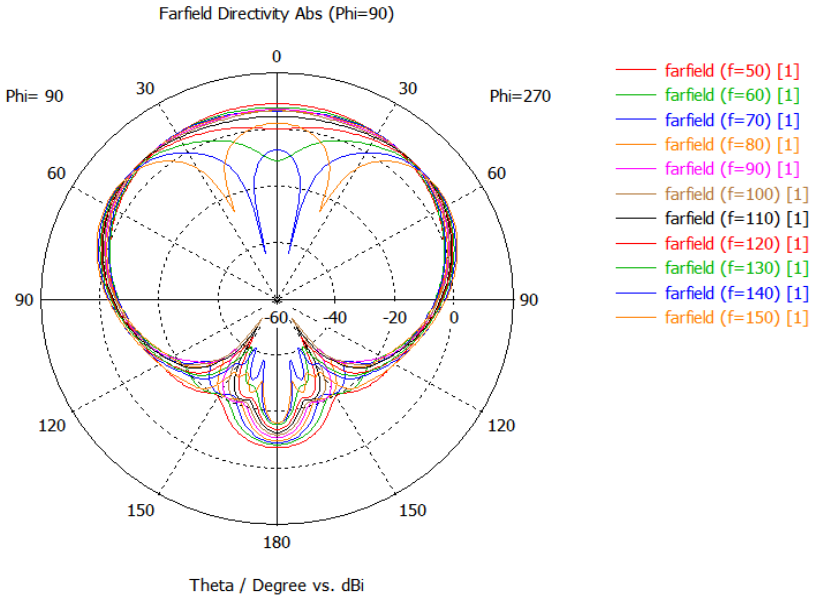
# Elliptical dipole





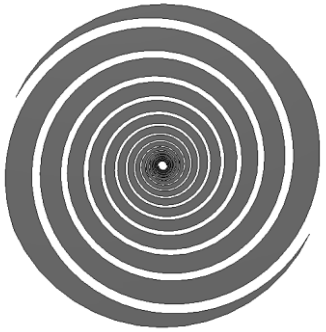

Impedances for a range of diameters:
1600/1400mm
1050/1330mm (Farfields shown)
1000/800mm
Farfields broadly similar, some increased smoothness for smaller dipoles
10m ground plane

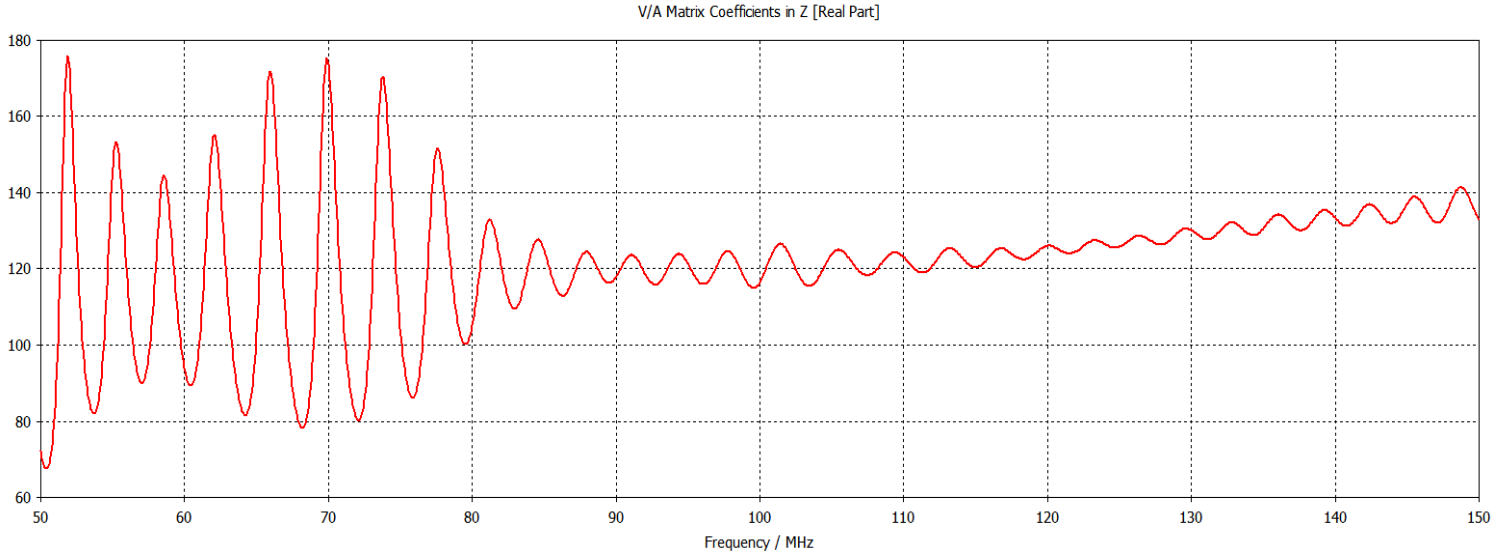
~10dB backwards, beams uniformity deteriorates at ~100MHz

# Elliptical dipole

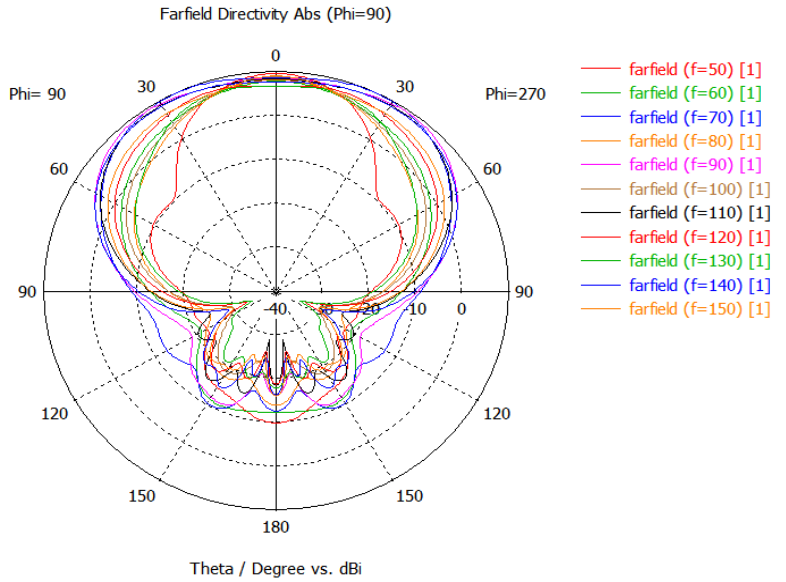
| PROs | CONs |
| --- | --- |
| Simple design | Requires ground plane |
| Flat input impedance | Requires balun |
| Low input impedance | Beam separates at top end of frequency band |
| Possible to expand to second polarization | |

# Flat log spiral





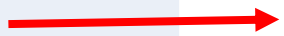

Quite a resonant impedance, this is from the size of the antenna.
Impedance about ~120Ω




10-20dB backwards. Closer beam uniformity, although rotational features can be seen.

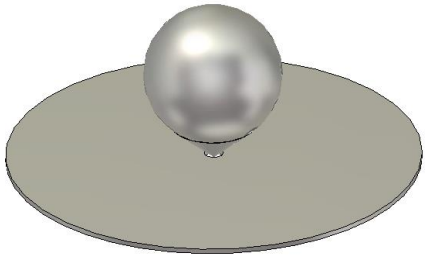
# Flat log spiral

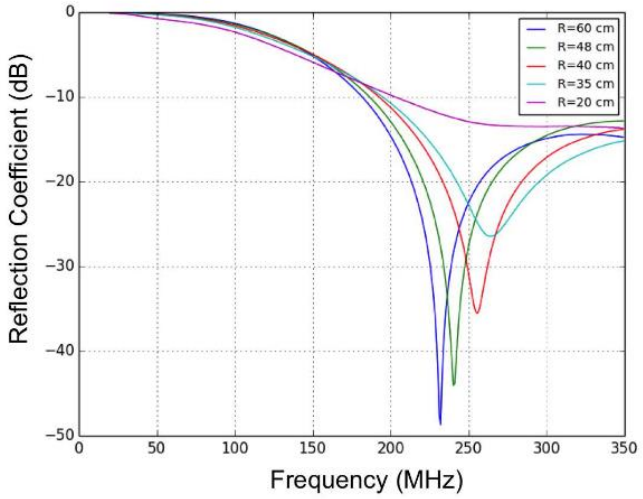
| PROs | CONs |
| --- | --- |
| Wide sky beam | Requires ground plane |
| Covers full band | Requires balun |
| Relatively low input impedance | Beam rotates with frequency |
| | Spiky input impedance |

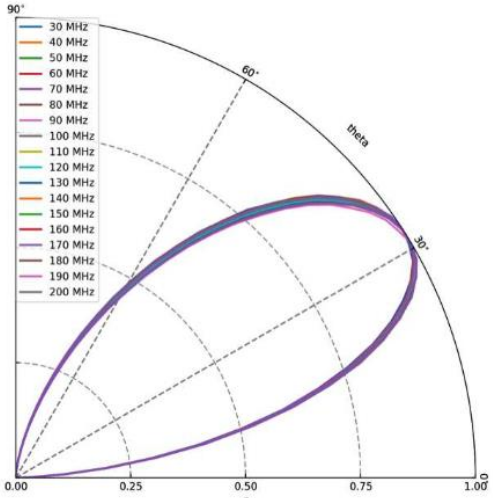


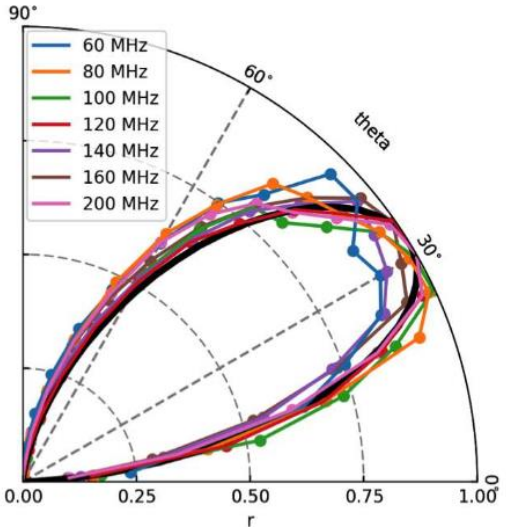
Could be designed without, have not yet looked into it

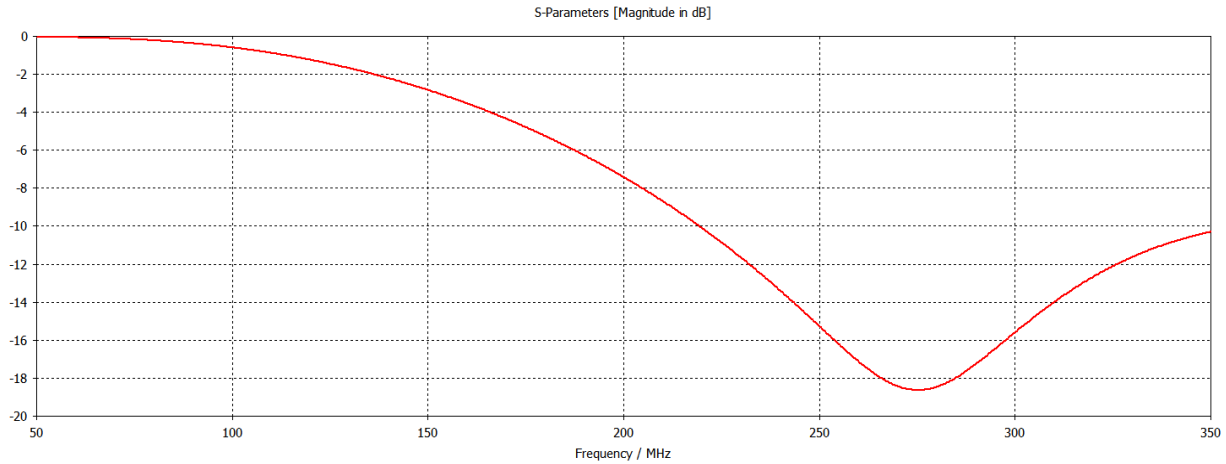
# SARAS2 monopole






Is designed to function higher than our frequency band, would need to be scaled up.
Possible -30dB S11m, and uniform farfields

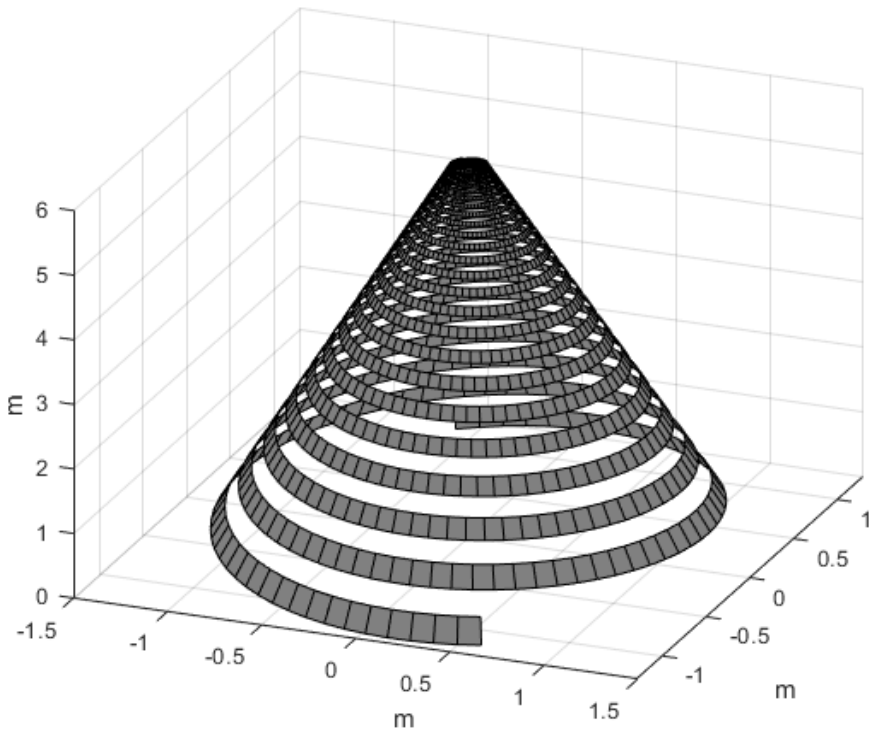
Taken from Singh et al 2017 https://arxiv.org/pdf/1710.01101.pdf

# SARAS2 monopole, style

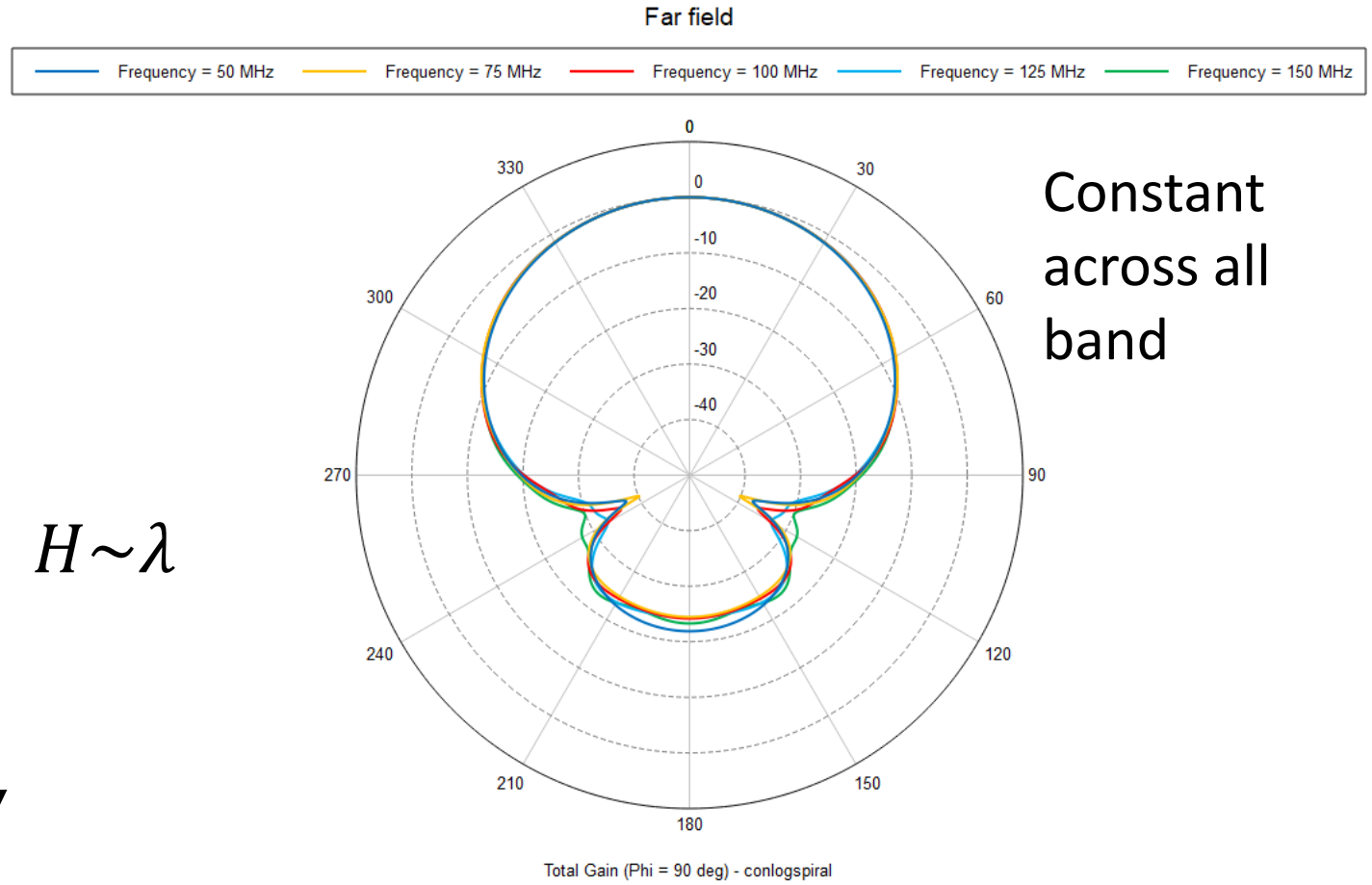
| PROs | CONs |
| --- | --- |
| Monopole, so no balun | Needs scaling to our band |
| Uniform farfields | Unpolarized |
| Match-able input impedance (at higher frequencies) | |
| Low feedpoint | |

# Conical log spiral

$D > \sim \lambda/\pi$




$H \sim \lambda$




Constant across all band

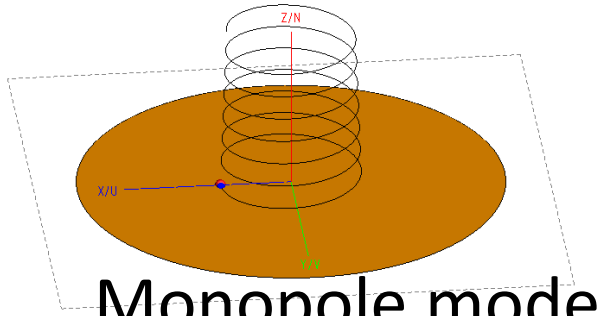
-20/30 dB backward -> better than a ground plane

# Conical log spiral

| PROs | CONs |
| --- | --- |
| Very low beam chromaticity | Matching circuit |
| No ground plane | 1 pol |
| Flat input impedance | Few meters high |
| Wire version (simple) | |
| Cover all band | |

lossless broadband tapered matching circuit along the apex of the cone (e.g. coax to parallel wire transformer)

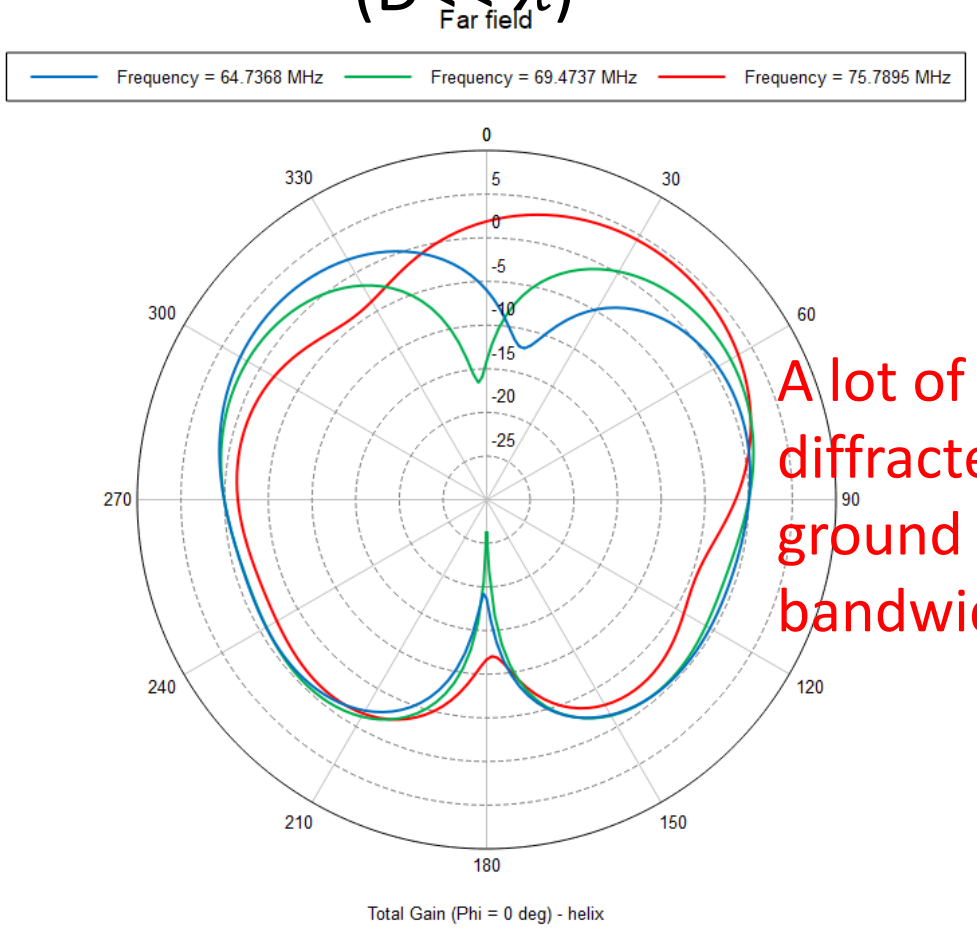
RF system on the ground inside the spiral ?




# Helical antenna

## Monopole mode

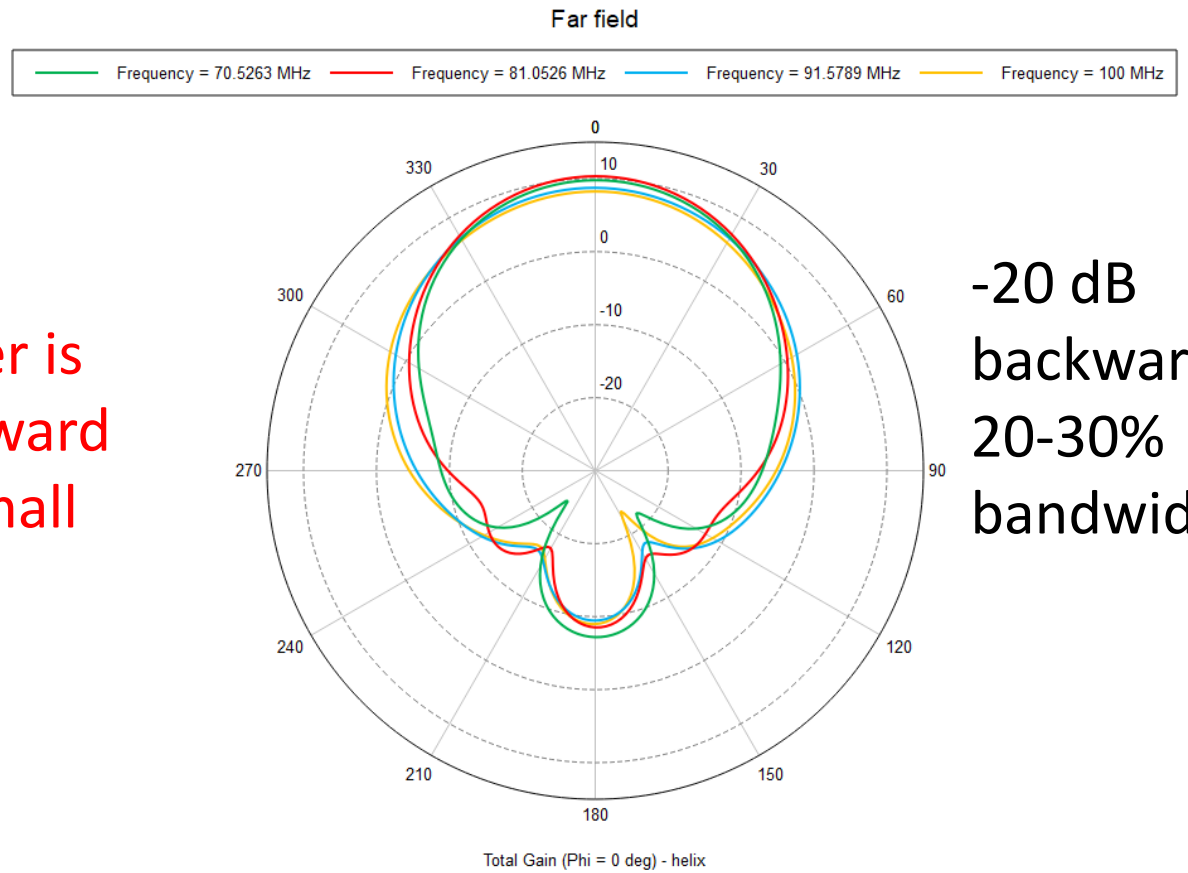
(D<< $\lambda$)




A lot of power is diffracted toward ground ! + small bandwidth

## Travelling wave mode

(D~ $\lambda/\pi$)



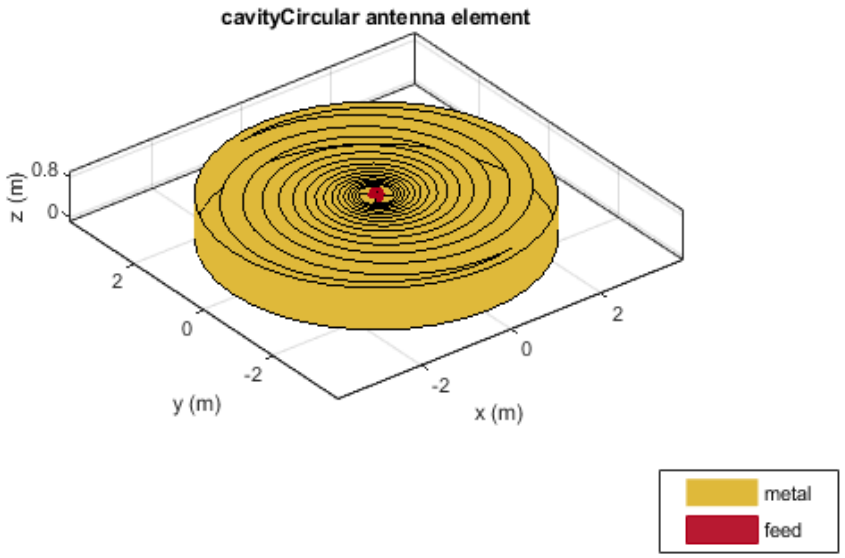

-20 dB backward

20-30% bandwidth

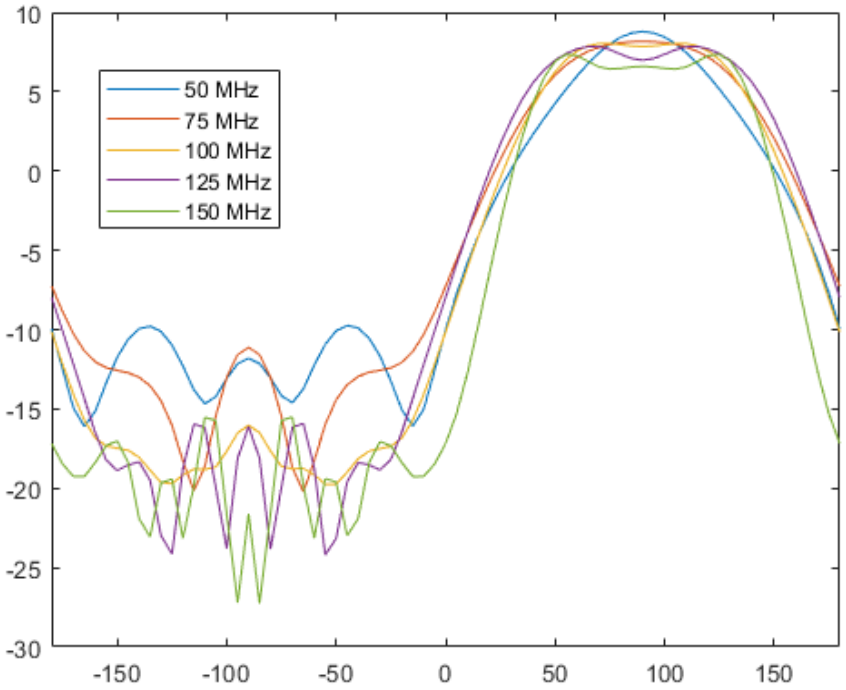
# Helical antenna (traveling wave mode)

| PROs | CONs |
| --- | --- |
| Smaller ground plane (directive antenna) | Bandwidth (S11=-15 dB) max 25-30 % |
| Input impedance potentially tunable down to 50 Ohm | 1 pol |
| Pencil beam | |

# Cavity-backed flat spiral




The cavity destroy the frequency independent property of the spiral



# Additional designs

- Sinuous antenna
- Inverted Vivaldi feed, possibly with shielding
- Horn antenna
- HIBiscus antenna (https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=8072391)