Explore the next sense

RS-1933 Optimized reflectors

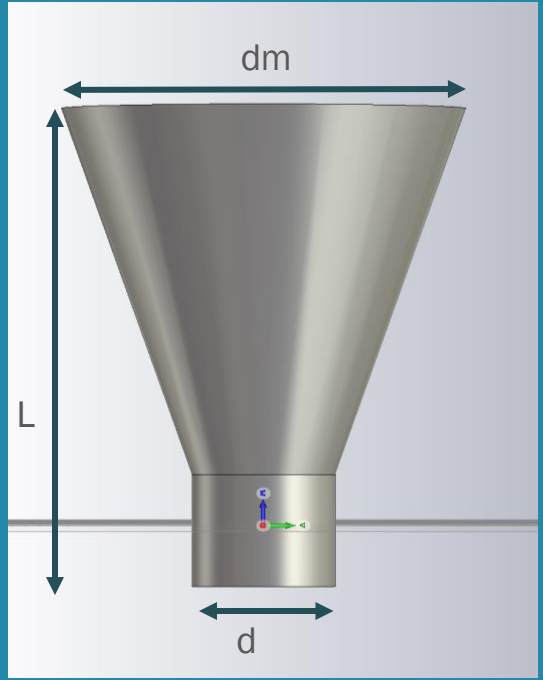
2018

Goal

- Question to answer:
  - How narrow HPBW can get with reflectors?
  - Gain analysis

- HPBW is characterized with simulation
- Gain is characterized both with simulation and measurement
  - Measurement consist of comparing the reflected signal strength of a rod in free-space and with reflectors.

- d = 10mm is fixed
- L varies
- dm = (L*lambda/0.3)^0.5

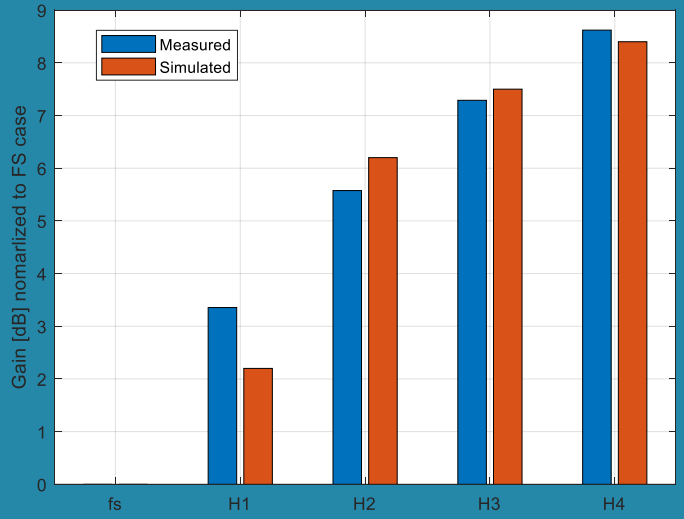


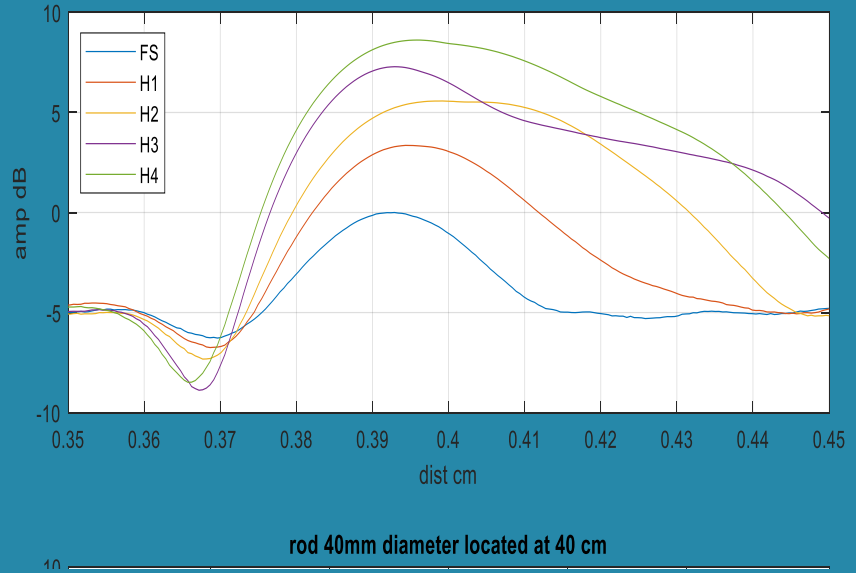
Printed horn antennas

H1: Square shaped horn, L = 5mm,dm = 21mm
H2: L = 18mm, dm = 18.7mm
H3: L= 25 mm, dm = 23mm
H4: L= 43 mm, dm = 30mm

Results

H1: Square shaped horn, L = 5mm,dm = 21mm
H2: L = 18mm, dm = 18.7mm
H3: L= 25 mm, dm = 23mm
H4: L= 43 mm, dm = 30mm





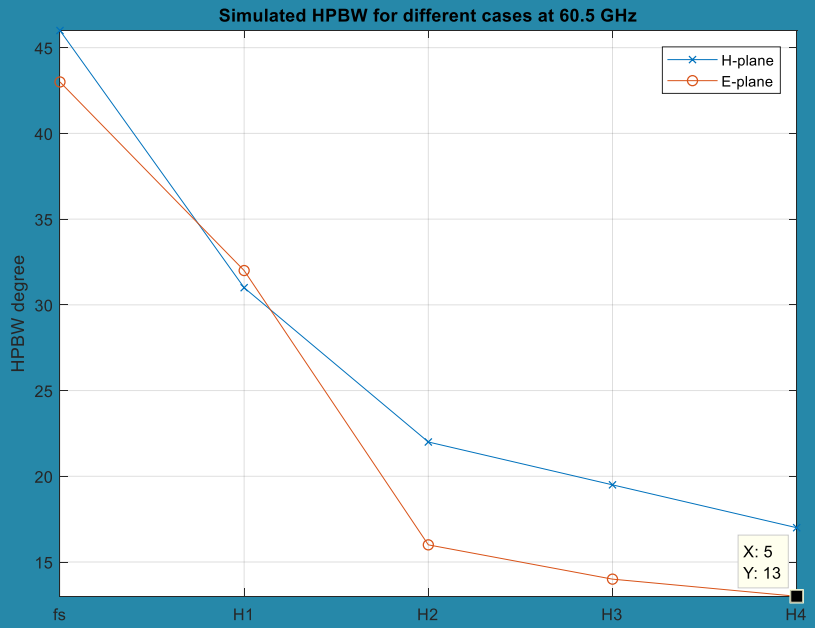
rod 40mm diameter located at 40 cm

Simulated HPBW

The figure shows the simulated HPBW for
Different cases at 60.5 GHz.

HPBW range on H-plane = 28
HPBW range on E-plane = 30

However, the radar measurement could should different results since This a evaualted at a single frequency.



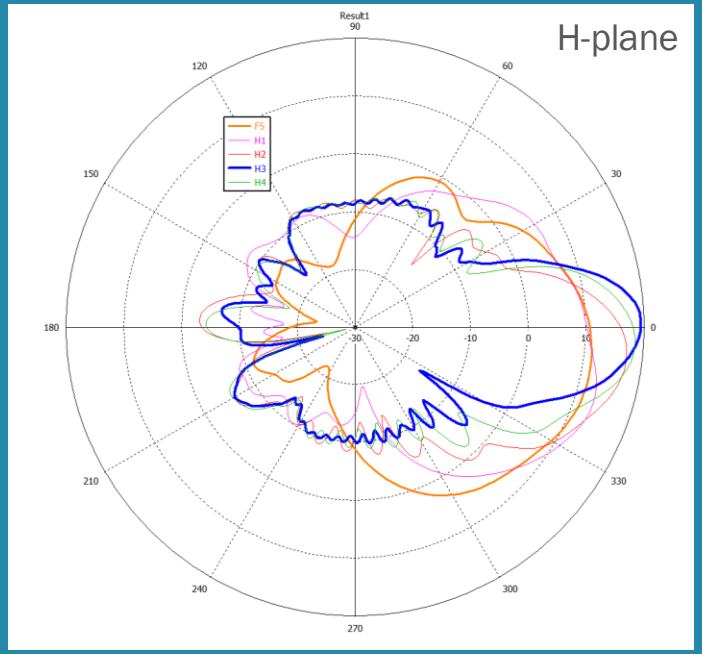
Conclusion

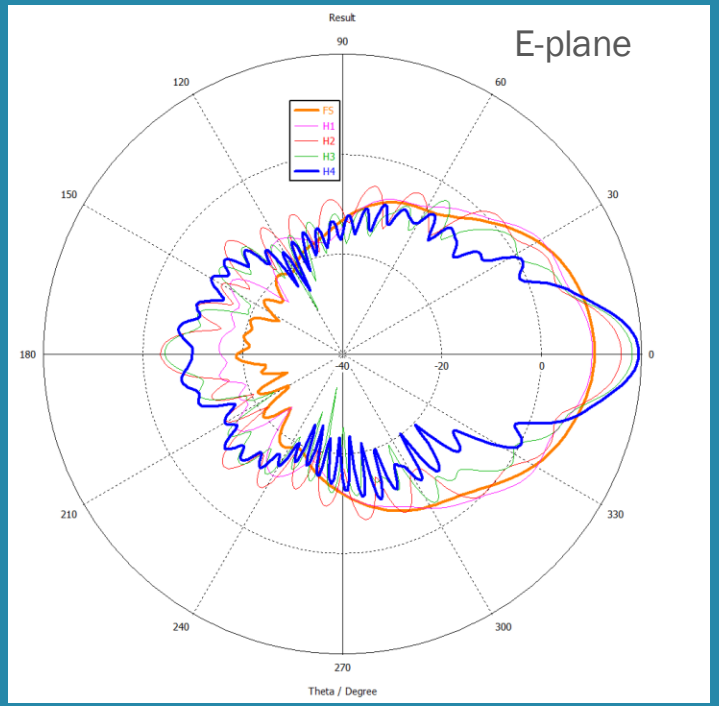
- Simulation show that we can acheive narrowbeam-width < 20
- Maximum gain/HPBW can vary depending the horn antenna dimensions
- If we want narrowbeamwdith the price is
  - Size
  - Close-range performance degradiation < 15cm
- Compromise solution: H1 case, low-profile, close-range performance is good and HPBW slightly narrower then FS

Remarks

- To certify the reflectors for reference-usecases/regulation/data sheet, accurate validation is necessary.

Appendix, Simulated radiation pattern @ 60.5 GHz





Conical horn is used with different length.

Optimum length and diameter of the horn is Choosen according to the figure [1] for maximum Gain.

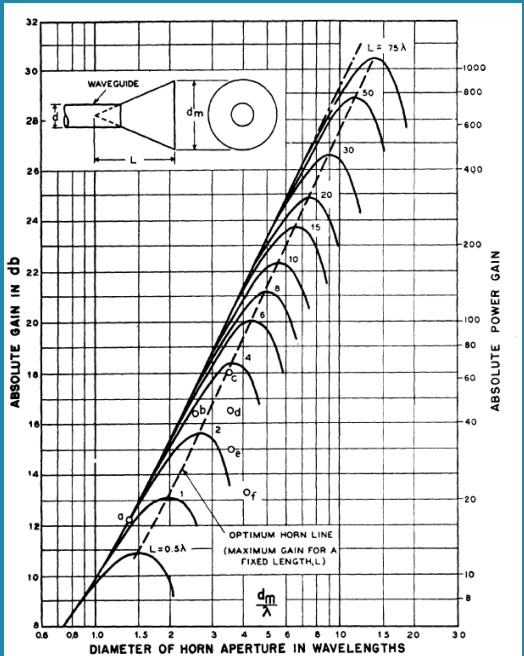


Fig. 2—The absolute gain of a conical horn as a function of aperture diameter (d_m/λ) for a series of axial lengths, L.

[1] "The radiation characteristics of conical horn antennas" A. P. KING