

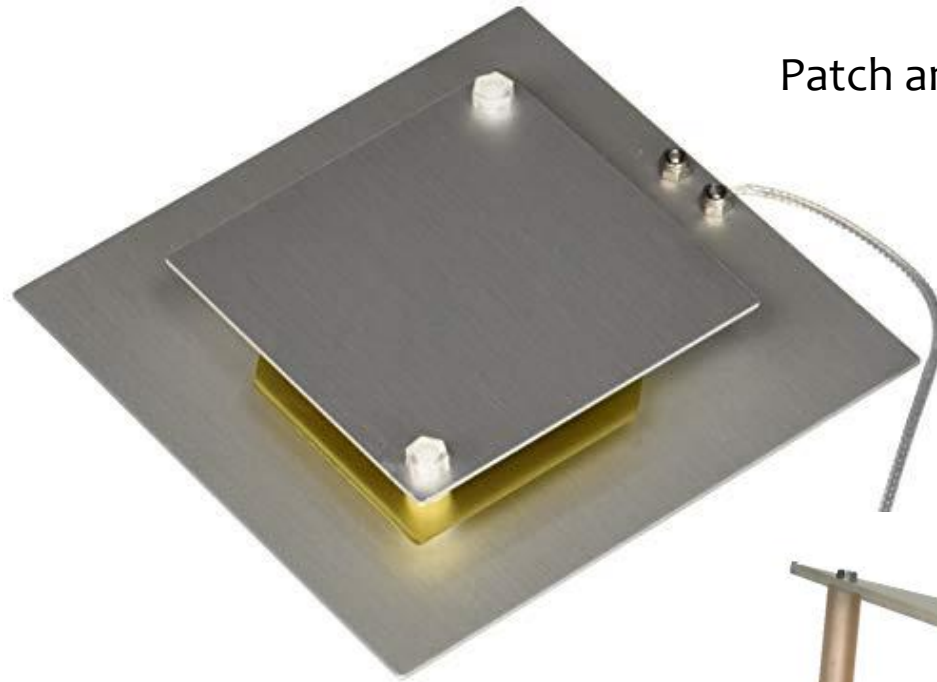
# ANTENNAS, INTRODUCTION

Definition of antenna (according to IEEE):

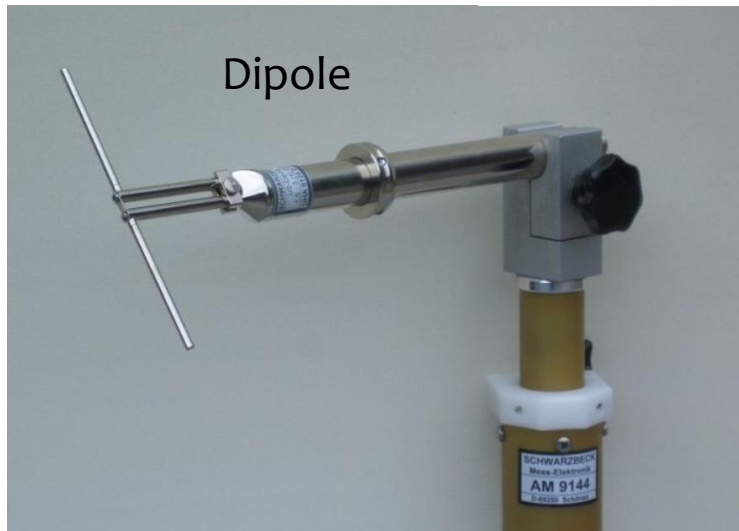
that part of a transmitting or receiving system that is designed to radiate or to receive electromagnetic waves.



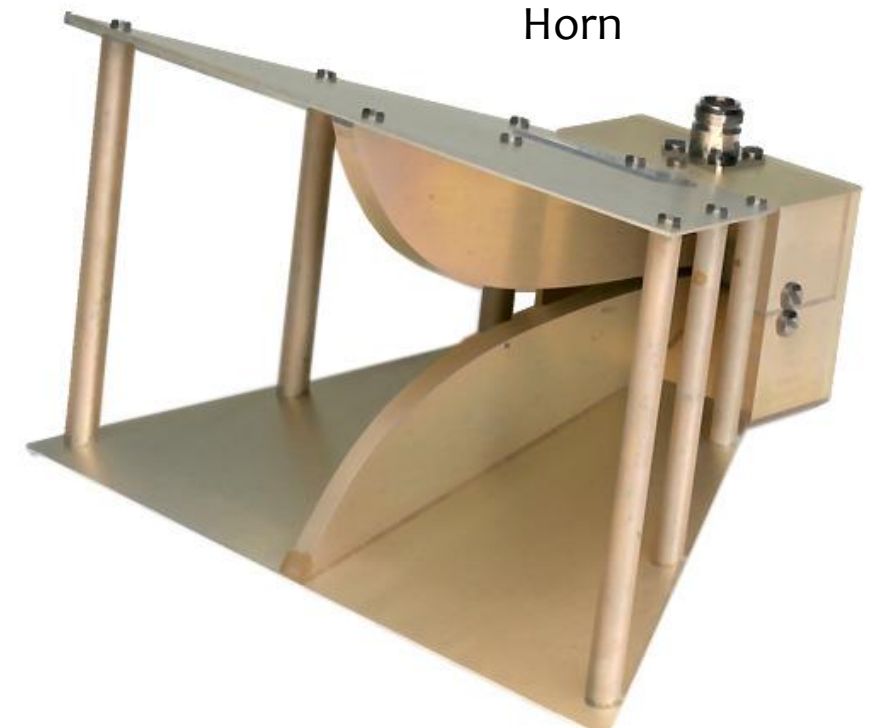
Monopole



Patch antenna



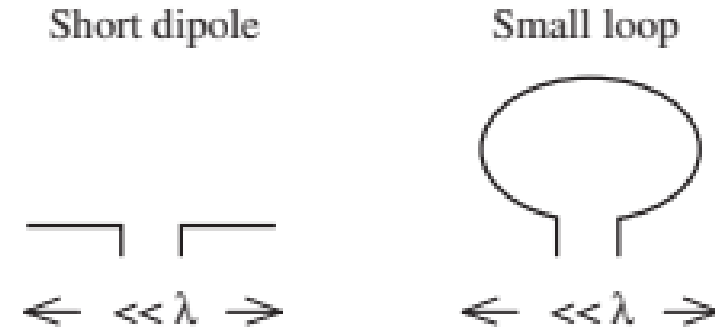
Dipole



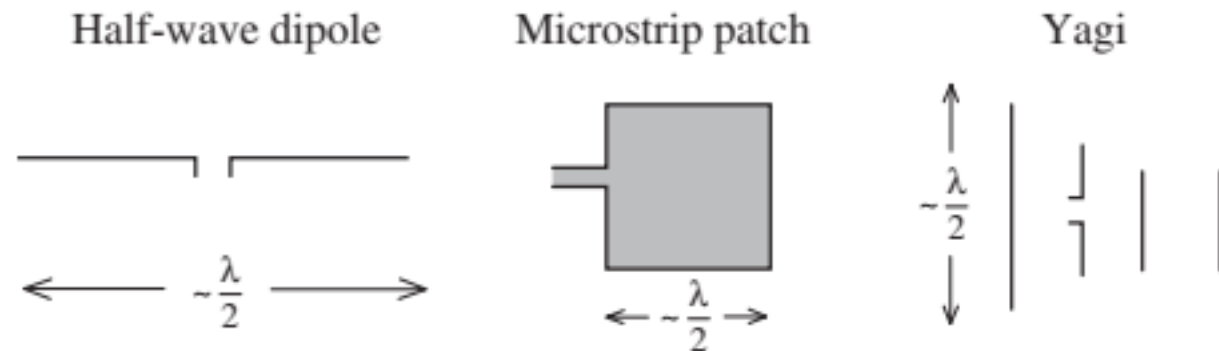
Horn

# ANTENNA TYPES

- Electrically small antennas: the extent of the antenna structure is much less than a wavelength
  - Low directivity
  - Low input resistance and high input reactance
  - Low radiation efficiency



- Resonant antennas: these antennas operate well at a single or selected narrow frequency bands
  - Low to moderate gain
  - Real input impedance
  - Narrow bandwidth



# ANTENNA TYPES

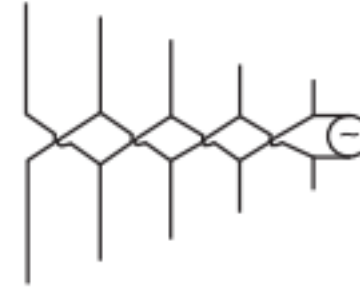
- Broadband antennas: the pattern, gain, and input impedance remain acceptable and are nearly constant over a wide frequency range

- Low to moderate constant gain
- Real input impedance
- Wide bandwidth

Spiral



Log Periodic Dipole Array



- Aperture antennas: these antennas have a physical aperture (or opening) through which electromagnetic waves flow

- High gain, which increases with frequency
- Moderate bandwidth

Horn



Reflector



# PRELIMINARY COURSE OUTLINE (the content of the course may be different from that of the previous accademic year!)

- Fundamentals of electromagnetics and radiation
- Radiation patterns and antenna parameters
- Simple radiating systems: small dipole, half-wave dipole, small loop
- Communication links
- Wire antennas
- Array antennas
- Aperture antennas (horns)

## ASSESSMENT METHOD

Mandatory written examination comprising theoretical questions and exercises on antenna analysis or design.

## REFERENCE MATERIAL

Lesson slides available for download from the E-learning platform



Starting from <https://elearning.unibs.it/> look for [ANTENNAS \(A.A. 2021\)](#), which refers to the academic year 2021/22

### Reccomended bibliography

- Antenna Theory and Design, W.L. Stutzman, G.A. Thiele, 2<sup>nd</sup> edition, New York, John Wiley & Sons, 1998
- Antenna Theory: Analysis and Design, C.A. Balanis, 4<sup>th</sup> edition, Hoboken, Wiley, 2016
- Antennas for All Applications, J.D. Kraus, R. Marhefka, 3<sup>rd</sup> edition, New York, Mc-Graw-Hill, 2002
- Microwave Engineering, D.M. Pozar, 4<sup>th</sup> edition, Hoboken, Wiley, 2012
- Electromagnetic Waves, C.G. Someda, 2<sup>nd</sup> editon, Boca Raton, Taylor & Francis, 2006