

# Example Antenna Types

## Rectangular Patch Antennas

Developed by Kathryn L. Smith, PhD





## Sources

*The material presented herein is from the following sources:*

***“Elements of Electromagnetics,” by Matthew N.O Sadiku, 5<sup>th</sup> ed. (2010)***

***“Engineering Electromagnetics,” by Nathan Ida, 3<sup>rd</sup> ed. (2015)***

***“Microwave Engineering,” by David Pozar, 4<sup>th</sup> ed. (2012)***

***“Antenna Theory,” by Constantine A. Balanis, 4<sup>th</sup> ed. (2016)***

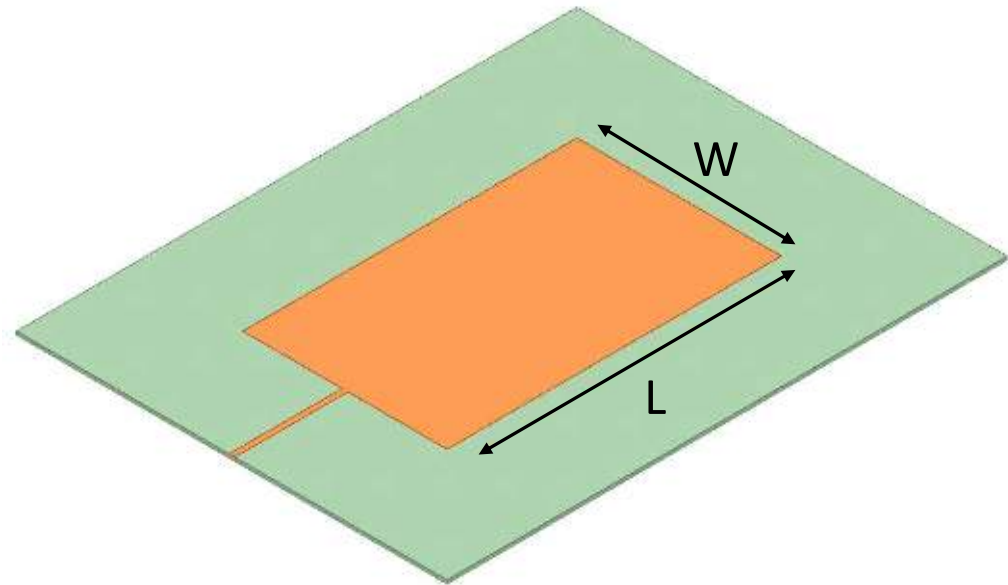
***“Antenna Engineering Handbook,” by John L. Volakis, 4<sup>th</sup> ed. (2007)***

## Rectangular Patch Antennas

Rectangular patch antennas consist of a rectangular conductive element of width  $W$  and length  $L$ , which rests on the surface of a dielectric slab of thickness  $d$  and relative permittivity  $\epsilon_r$ , with conductive backing.

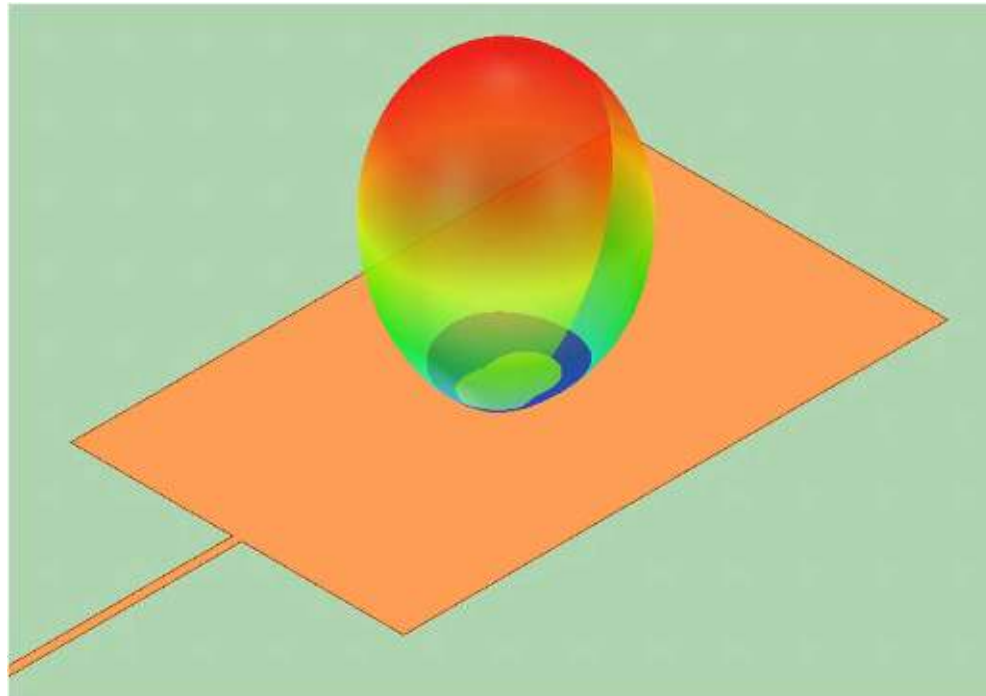
The radiation of the patch antenna occurs due to resonance of the fields in the cavity under the patch.

This resonance occurs when the length  $L$  of the antenna is slightly less than half the length of the guided wave, because field fringing at the ends of the patch makes the patch “appear” longer than it physically is.



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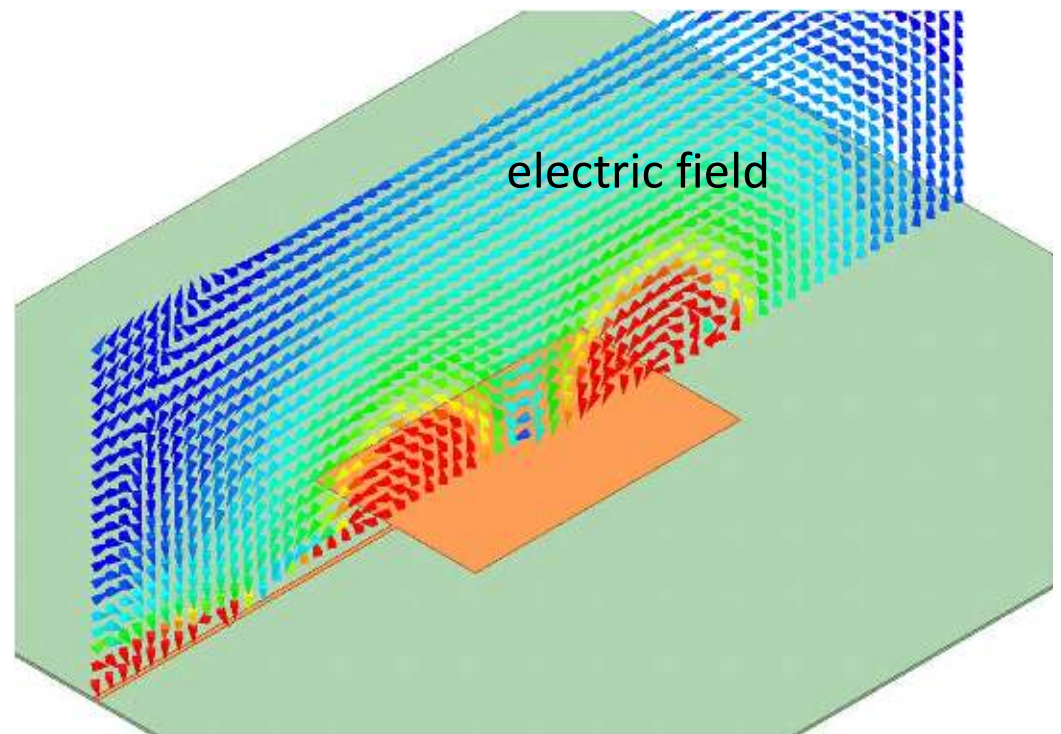
Rectangular Patch antennas radiate broadside, normal to the plane of the patch.



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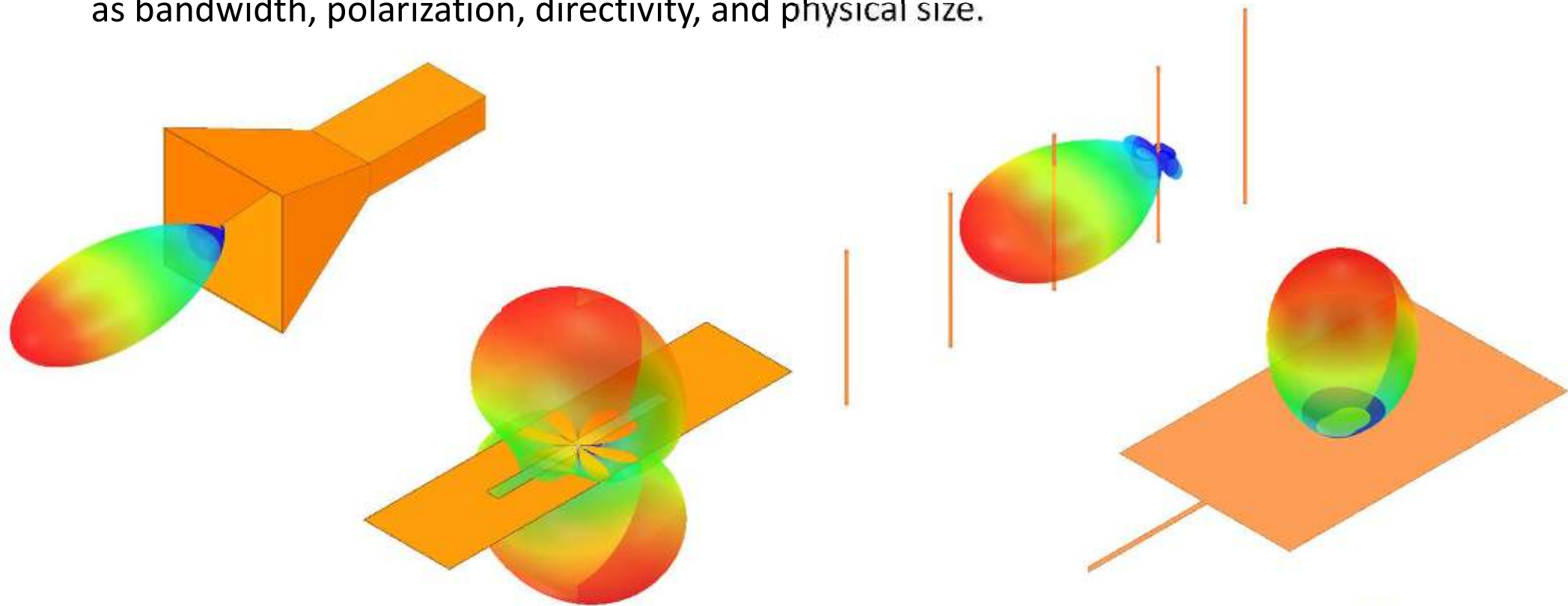
The polarization of an unmodified rectangular patch antenna is **linear**, with electric field oriented in the direction of the L dimension.

Rectangular patch antennas are commonly fed by **microstrip** (as shown here), or by a **coaxial probe** coming up through the dielectric, or by **coupling** with a resonant cavity or other proximate resonator.



## Example Antenna Types

The selection of one antenna over another will depend on the desired application. The choice will involve judging the merit of each topology based on a variety of factors such as bandwidth, polarization, directivity, and physical size.



 **Ansys**

