

EE 3113

INTRODUCTION INTO RF

CIRCUIT DESIGN

Lecture Notes for A-term 1999

LECTURE 1

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EE 3113: Lecture 1

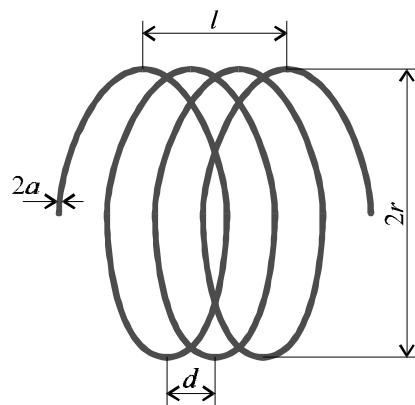
- Importance of RF circuit design
 - wireless communications (explosive growth of cell phones)
 - global positioning systems (GPS)
 - computer engineering (bus systems, CPU, peripherals exceeding 600 MHz)
- **Why this course???**
 - lumped circuit representation no longer applies!

What do we mean by going from lumped to distributed theory?

- Example: **INDUCTOR**

Low-frequency

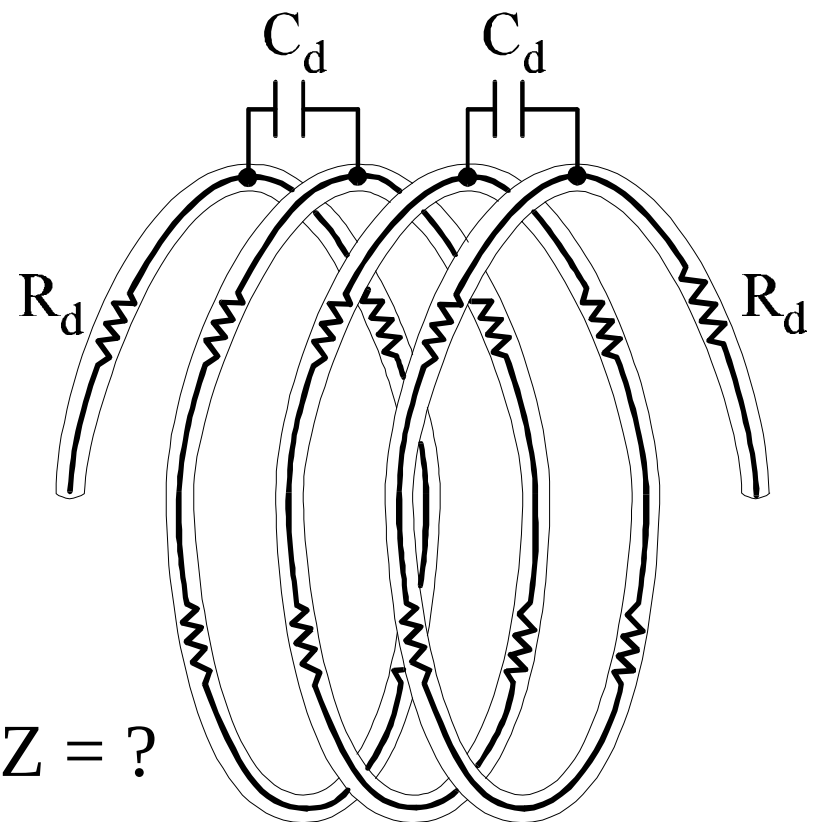
(lumped)



$$Z = R + j\omega L$$

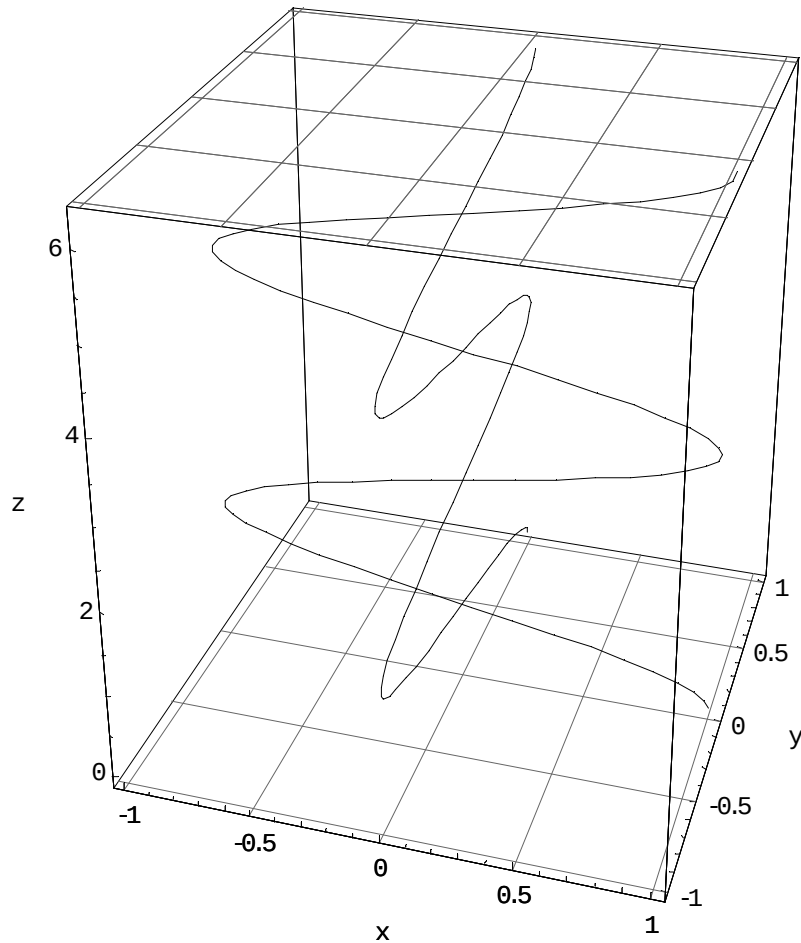
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High-frequency

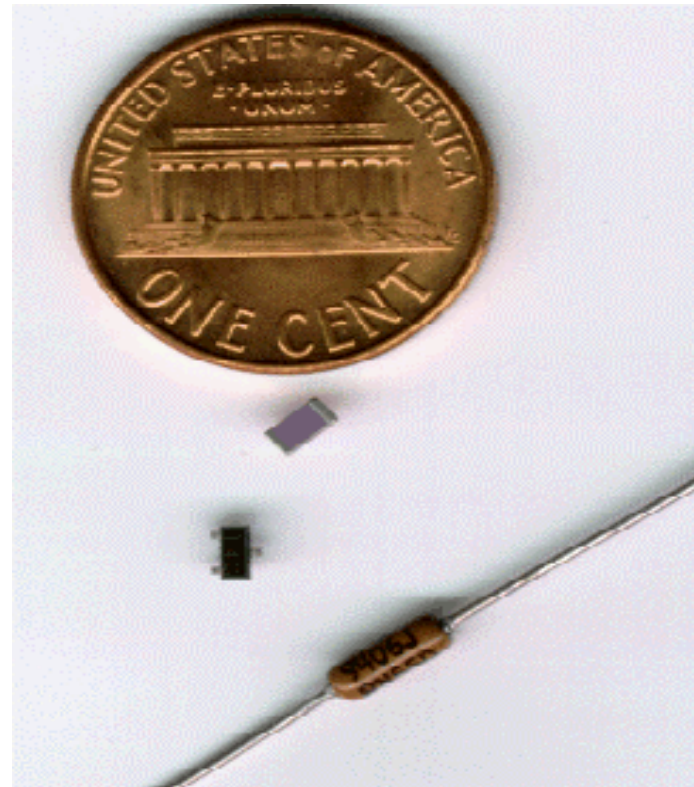


Current and voltage vary spatially over the component size

E (or V) and H (or I) fields



Upper MHz to GHz range

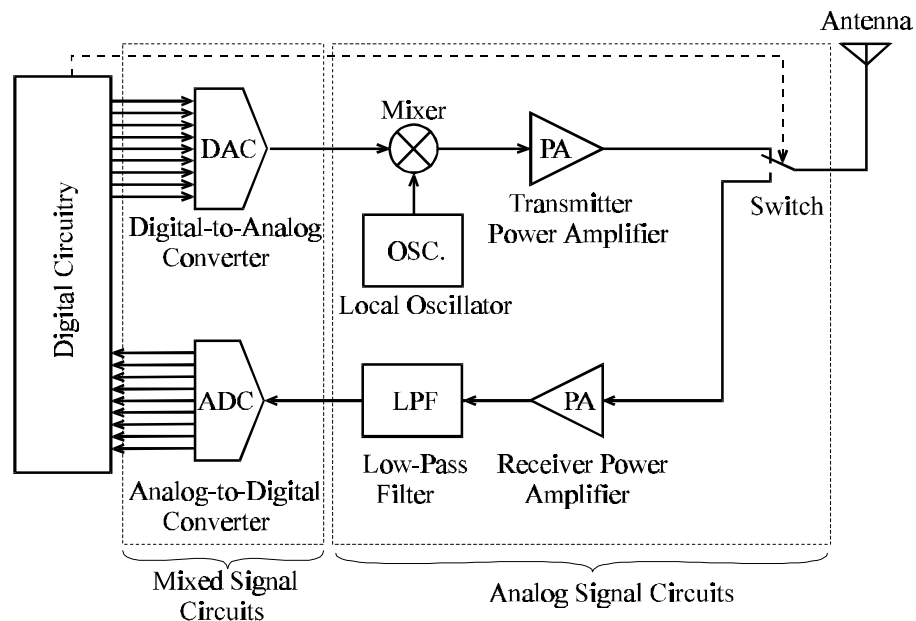


Frequency spectrum

- RadioFrequency (RF)
 - TV, wireless phones, GPS
 - 300 MHz ... 3 GHz operational frequency
 - 1 m ... 10 cm wavelength in **air**
- MicroWave (MW)
 - RADAR, remote sensing
 - 8 GHz ... 40 GHz operational frequency
 - 3.75 cm ... 7.5 mm wavelength in **air**

Design Focus

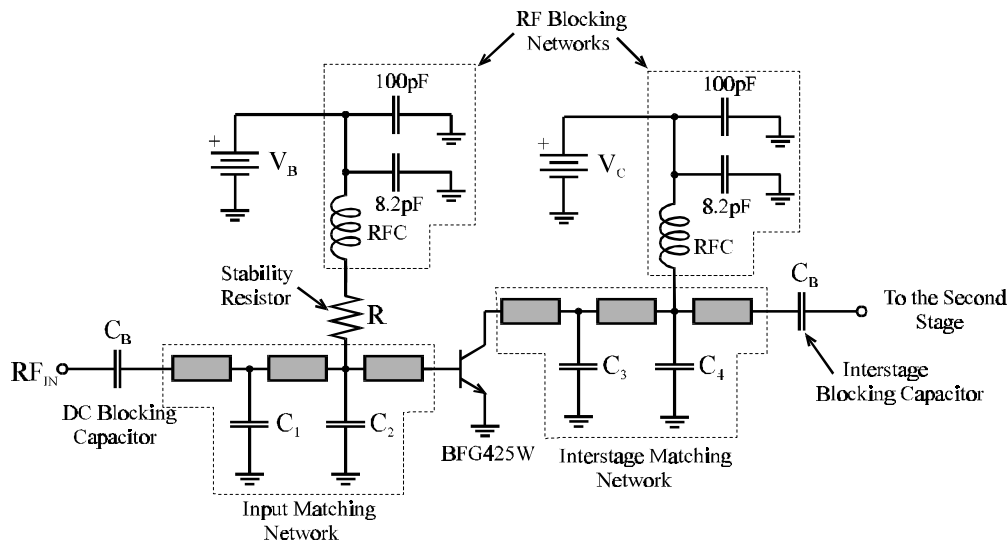
Cell phone transceiver circuit



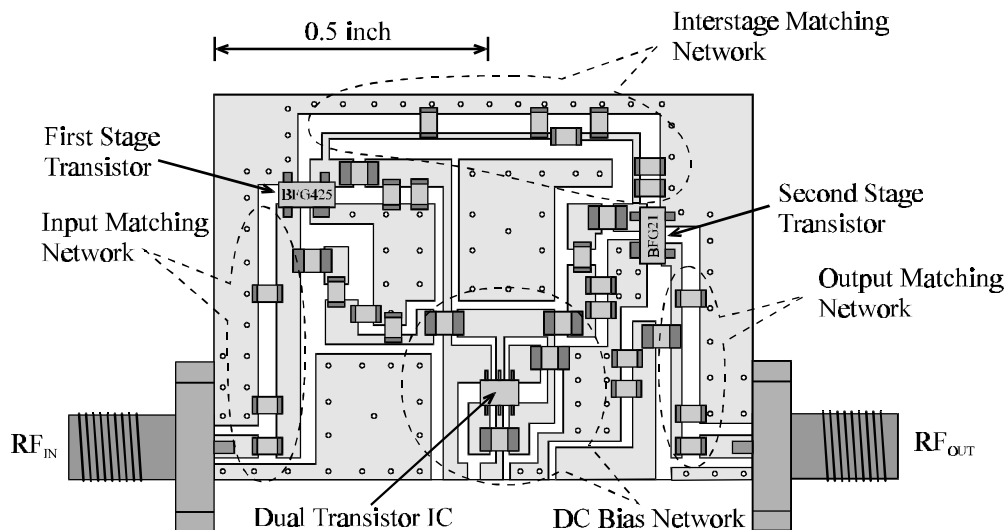
Typical frequency range:

- 950 MHz
- 1.9 GHz

Implementation



- matching networks
- BJT/FET active devices
- biasing circuits



- printed circuit board
- microstripline realization
- surface mount technology