ECE 490-ST :: Wireless Computing

- Lesson 18
  - Making Sense of the Harvester Characteristics

Valparaiso
University

… at this point

- Board (mostly) soldered
- Can get measureable DC voltage out of chip
  - Should be see about 1.2V when at -6 dBm input
- Can confirm "goodness" of analog frontend from Smith chart
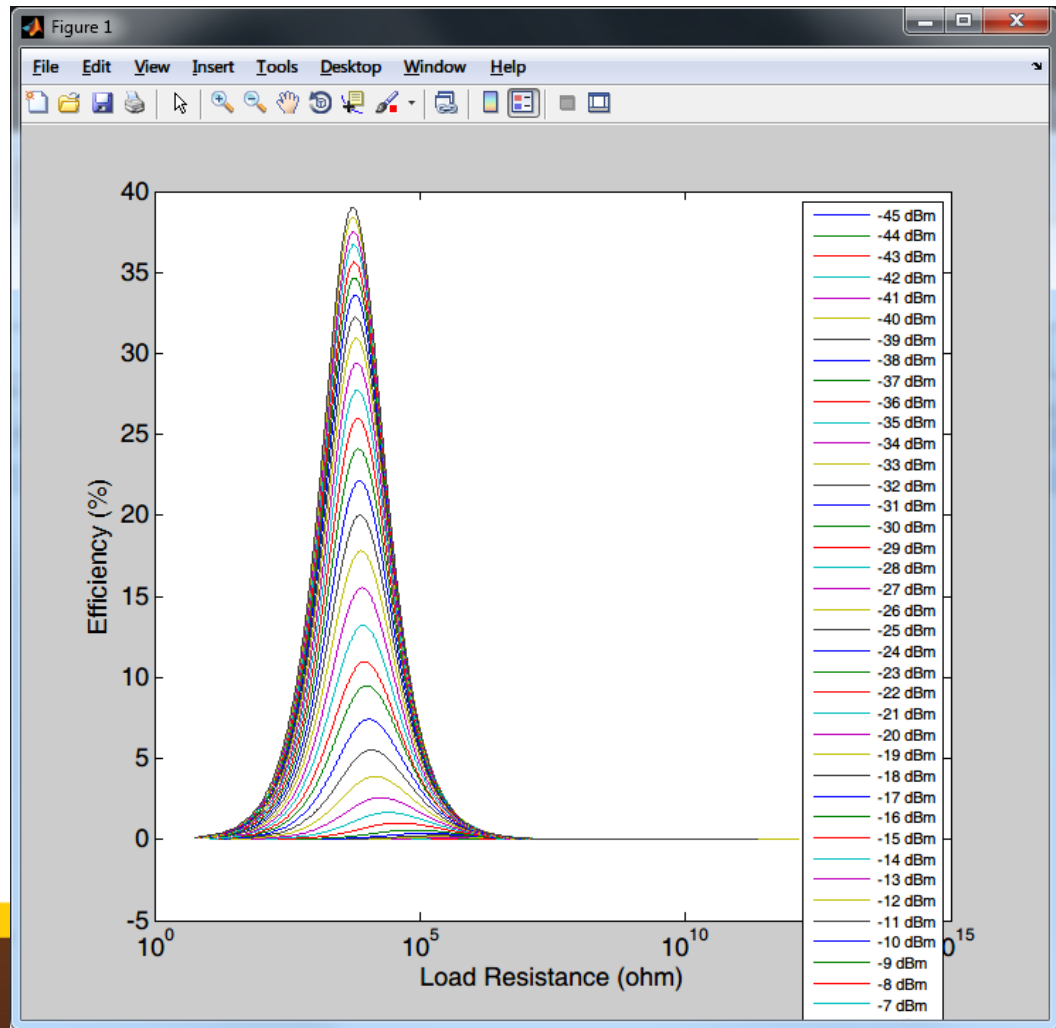- Harvester has a maximum efficiency curve
- So what?

Valparaiso University

1:Harvester Eff.

X-axis is Load Resistance (log scale)

Y-Axis is efficiency (%) defined as P(load) / P(RF-in)
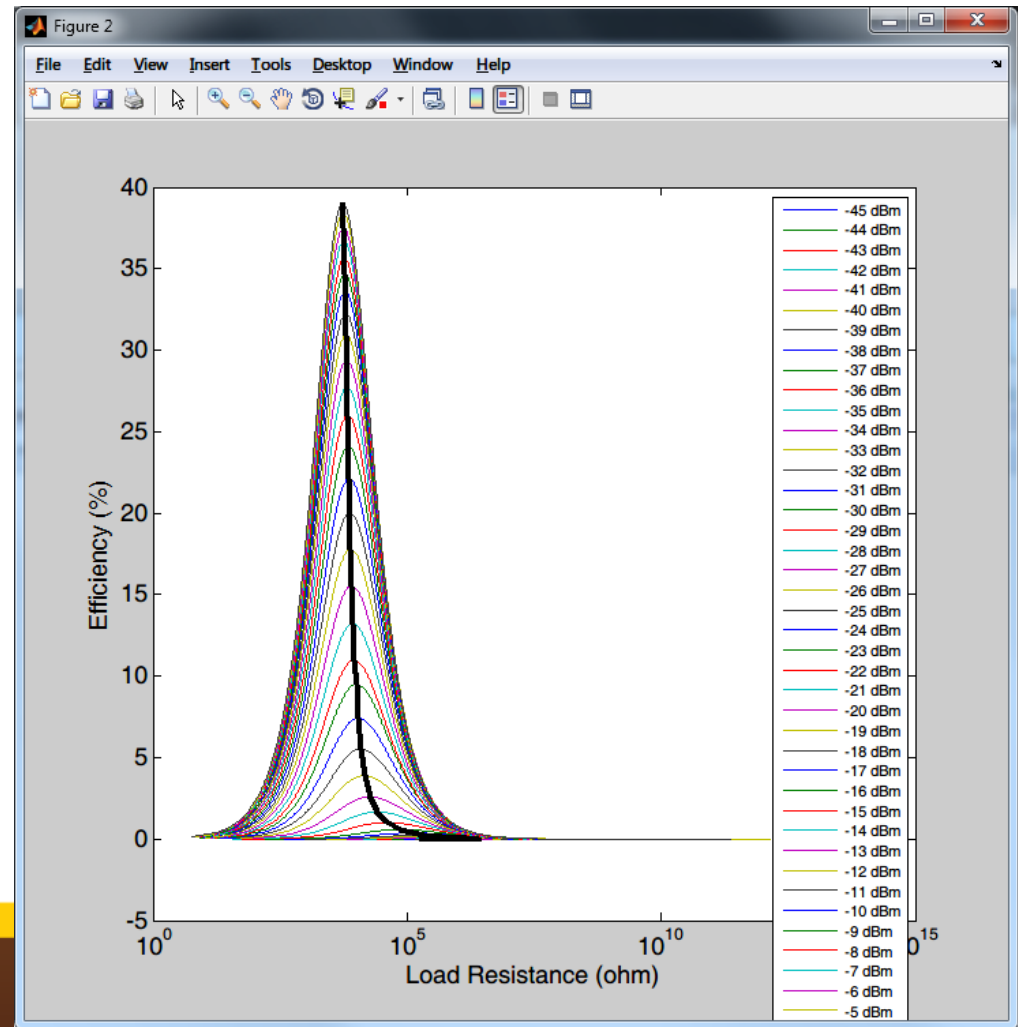
As RF power increases:

1) Maximum efficiency improves
2) Voltage goes up
3) Most efficient load goes down
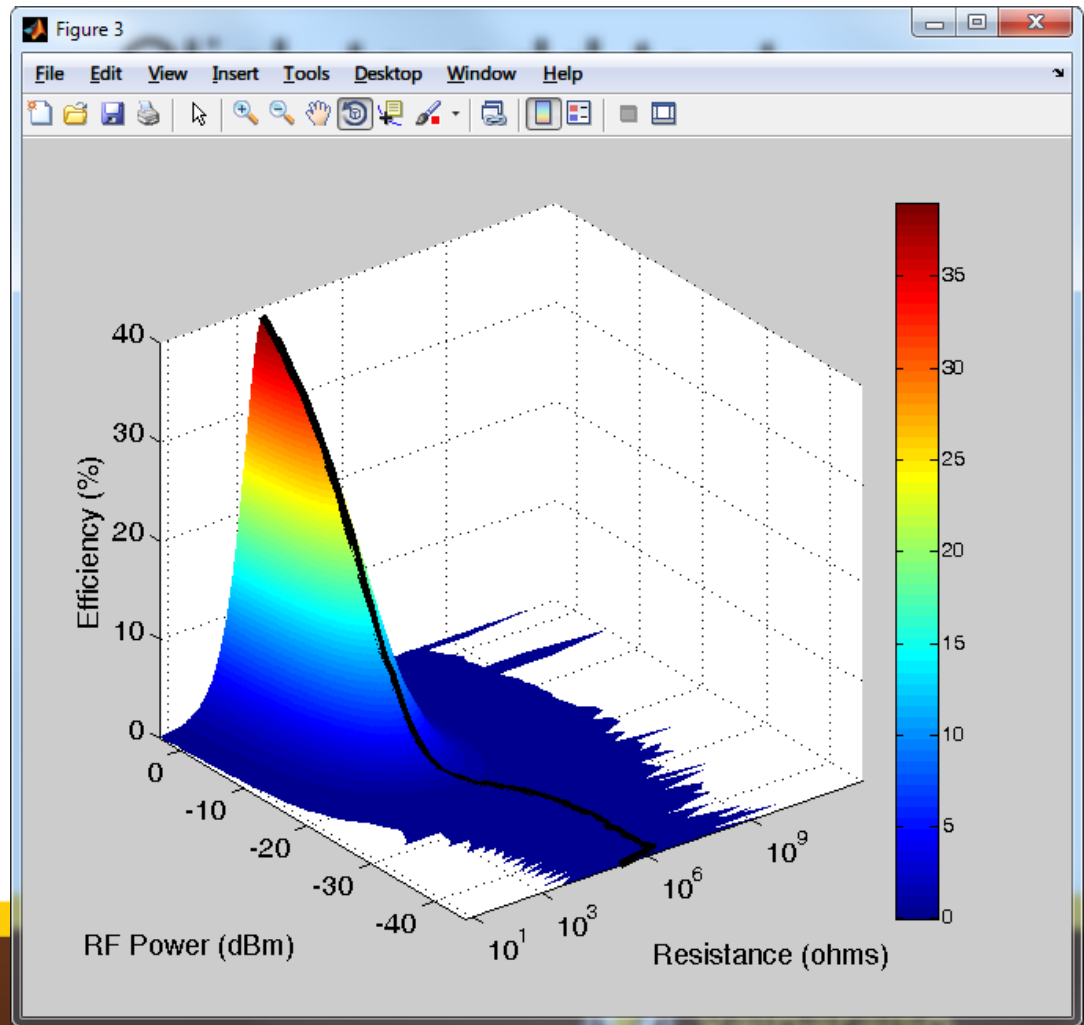4) What does this mean?

SJT

Valparaiso University

2:Harvester Eff.

1) If we know the input power, we can determine the best load to use

2) It's gonna be in the 10's to 100's of kOhm range

3) But Prof. Thomas! How do we know our input power levels???

3: Oooh Pretty

So what?

- So the harvester has a maximum efficiency curve corresponding to some load

- We're using a microcontroller! How do we change the load!???!?!??!!? !?!? !??!? !?! ?!??!!??! Eleven

So what?

- So the harvester has a maximum efficiency curve corresponding to some load

- We're using a microcontroller! How do we change the load!???!?!??!!? !?!? !??!? !?! ?!??!!??! Eleven

- What is a resistor?

Valparaiso
University

So what?

- So the harvester has a maximum efficiency curve corresponding to some load

- We're using a microcontroller! How do we change the load!???!?!??!!? !?!? !??!? !?! ?!??!!??! Eleven

- What is a resistor?

- What is resistance?

Valparaiso
University
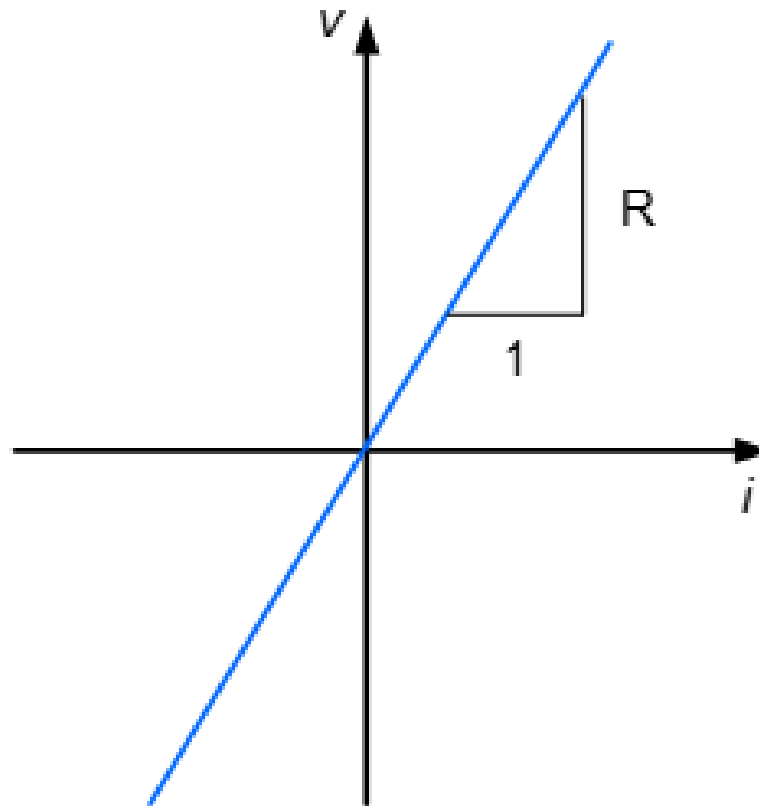
- So if resistance is the current drawn for a given voltage, if we change how much current a device draws (on average) we can generate an effective resistor.
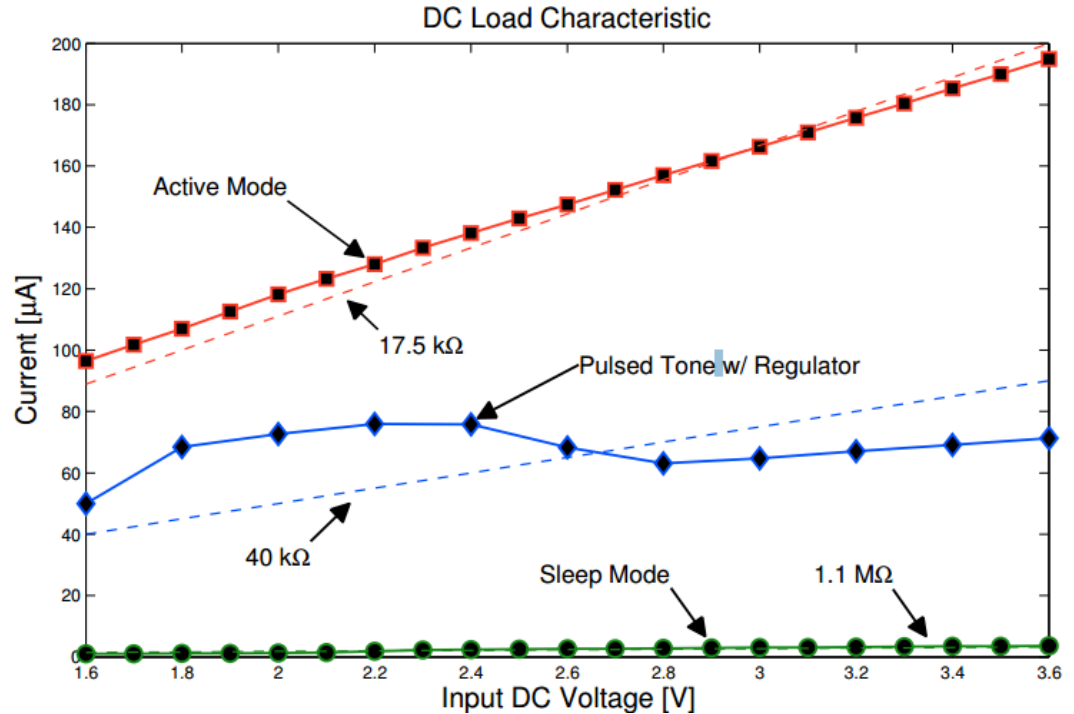
- That's cool!

- I agree.

Valparaiso University

Example

RED trace: MSP430 generating a tone

GREEN trace: MSP430 in LOW-POWER mode (twiddle thumbs mode)

Blue Trace: Pulsed tone generation.

ACTS AS A 40 kOHM RESISTOR!

DC Load Characteristic

SJT

These wires will program our microcontroller
Remove jumpers and connect as follows:

Valparaiso University

These wires will program our microcontroller
Remove jumpers and connect as follows:

- GND → GND on 490 board

These wires will program our microcontroller
Remove jumpers and connect as follows:

- GND → GND on 490 board
- 3V3 -> VDD on 490 board

Valparaiso University

These wires will program our microcontroller
Remove jumpers and connect as follows:

- GND → GND on 490 board
- 3V3 -> VDD on 490 board
- SBWTCK -> TEST

Valparaiso
University

These wires will program our microcontroller
Remove jumpers and connect as follows:

- GND → GND on 490 board
- 3V3 -> VDD on 490 board
- SBWTCK -> TEST
- SBWTDIO -> RST

These wires will program our microcontroller
Remove jumpers and connect as follows:

- ON 490 BOARD, make sure that the power jumper is between pins 2 and 3. This will let the Launchpad power our MCU.

Valparaiso University

Make a new CCS project

- You'll probably need a new workspace for ECE 490
- We will be programming either the MSP430F2012 or the MSP430F2011 (which one did you put on your board?)

Use the provided program to make your MCU beep.