Name: ________________________________

43 pts. (Lab is 25 pts. and Prelab is 18 pts.)

1 Goal
The student will further develop concepts learned in the modules by measuring the nominal read range for a given power and antenna gain and experimenting with materials that interfere with passive UHF tags.

2 Assessment
A student should:

- Be able to measure the nominal read range of a tag for a given power and antenna gain
- Know how different materials may interfere with passive UHF tags

3 Equipment
- Reader with antenna, preferable a linear polarized antenna such as a patch antenna
- Antenna stand
- Tag stand
- Several tags
- PC to communicate with reader
- Materials to test
  - Cardboard
  - Aluminum foil
  - Bottled water
  - Canned food like soup or beans in a metal can
  - Quart of motor oil in plastic bottle

4 Software
- Reader software

5 Prelab

5.1 Preparation
- Read the TagSense Help File for the reader available at the class website
- Review the TagSense documentation for the reader available at the class website

5.2 Prelab Questions
- Answer the Prelab Questions at the end of this document and turn them in before the lab.
6 Experiments

6.1 Experiment 1: Nominal Read Range

6.1.1 Exercises

- For three different tags, determine the EPC number and maximum read range. Describe the tag orientation. (1 pt. each for a total of 9 pts.)
  
  - Tag 1
    - EPC: __________________________________________________________
    - Distance: ______________________________________________________
    - Tag orientation: ________________________________________________
  
  - Tag 2
    - EPC: __________________________________________________________
    - Distance: ______________________________________________________
    - Tag orientation: ________________________________________________
  
  - Tag 3
    - EPC: __________________________________________________________
    - Distance: ______________________________________________________
    - Tag orientation: ________________________________________________

- Record the power of the reader and the maximum read range for one tag.
  
  - Power: __________________________________________________________ (1 pt.)
  - Maximum read range: _____________________________________________ (1 pt.)

- Pick one tag. Set the power level of the reader to a very low value. Determine the maximum read range.
  
  - Power level: _____________________________________________________ (1 pt.)
  - Maximum read range: _____________________________________________ (1 pt.)
6.2 Experiment 2: Shielding

6.2.1 Configuration
- Various materials such as cardboard, aluminum foil, aluminum foil pan, water bottle, canned food, and quart of motor oil will be provided.

6.2.2 Exercises
- Determine if cardboard prevents the reader from reading a tag. Experiment with placement and distance of the tag. Place the material in front and behind of the tag. Describe the results. (2 pts.)

- Determine if aluminum foil prevents the reader from reading a tag. Experiment with placement and distance of the tag. Place the material in front and behind of the tag. Describe the results. (2 pts.)

- Experiment reading the tag on the water bottle. Experiment with orientation such that the material is between the tag and the reader. Experiment with the material behind the tag. Describe the results. (2 pts.)

- Experiment reading the tag on the metal can of food. Experiment with orientation such that the material is between the tag and the reader. Experiment with the material behind the tag. Describe the results. (2 pts.)
• Experiment reading the tag on the quart of motor oil. Experiment with orientation such that the material is between the tag and the reader. Experiment with the material behind the tag. Describe the results. (2 pts.)

• Determine if the human body prevents the reader from reading a tag. Experiment with placement and distance of the tag. Place the material in front and behind of the tag. Describe the results. (2 pts.)
7 Checklist

- Turn in answers to Prelab.
- Turn in answers to Experiments.
- Complete and turn in Feedback sheet.
- Notify instructor lab is complete.
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Feedback

• Complete this form after completing the lab exercises and turn it in to the instructor.
• Do not put your name on the form and keep it separate from the lab report.

• What did you like about the lab?

• What did you dislike about the lab?

• Make a suggestion on how to improve the lab.
Prelab Questions

18 pts.

Answer the following questions and turn them in before the lab.

1. Do passive UHF tags typically use inductive or radiative coupling? (1 pt.)

2. What is the wavelength of a 915 MHz signal in centimeters? (2 pts.)

3. Calculate the power in milliwatts for each of the following. (2 pts. each)
   a. 30 dBm
   b. 25 dBm
   c. 20 dBm
   d. 15 dBm
   e. 10 dBm

4. A reader is connected to an antenna with a coaxial cable. The reader output power is 27 dBm. The antenna gain is 8 dBi. The coaxial cable is one foot long. The loss is the coaxial cable is 1 dB per foot. What is the EIRP in watts? (5 pts.)