



# **RFID Alliance Lab: Gen 2 vs. Gen 1**

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Daniel Deavours  
Research Assistant Professor  
Director of Research, RFID Alliance Lab  
ITTC, University of Kansas  
[deavours@ittc.ku.edu](mailto:deavours@ittc.ku.edu)



# Who We Are

## RFID Alliance Lab

- ◆ Evaluate RFID products in a *scientific* way
- ◆ Provide useful, timely, credible, and unbiased data to end users of RFID products
- ◆ Constituents
  - ◆ **University of Kansas / ITTC:** Primary research contributor
  - ◆ **RFID Journal:** Initial funding, distributor, advertisement
  - ◆ **Rush Tracking Systems:** Initiator, industry lesion
- ◆ Business model
  - ◆ Sell reports (~\$1,000 / report) to finance future reports
  - ◆ Sponsorships

## ITTC/KU Applied Research Labs

- ◆ Helping companies solve hard problems
  - ◆ Tagging small electronics devices
  - ◆ Seknion: direction of travel through portal
  - ◆ Tagging metal assets
- ◆ Adamas: high performance low profile metal tag
- ◆ Basic research
  - ◆ RFID privacy using CDMA
- ◆ We would like to talk with you about your hard problems



## Gen 2 Advantages

- ◆ Variable data rates (40-640 kbps)
- ◆ Variable coding (FM0, Miller M=2, M=4, M=8)
- ◆ Dense interrogator mode
  - ◆ Prescribed RF channels
- ◆ Locking and unlocking
- ◆ Scalable: works well with few or many tags
- ◆ Stronger passwords



# Observations

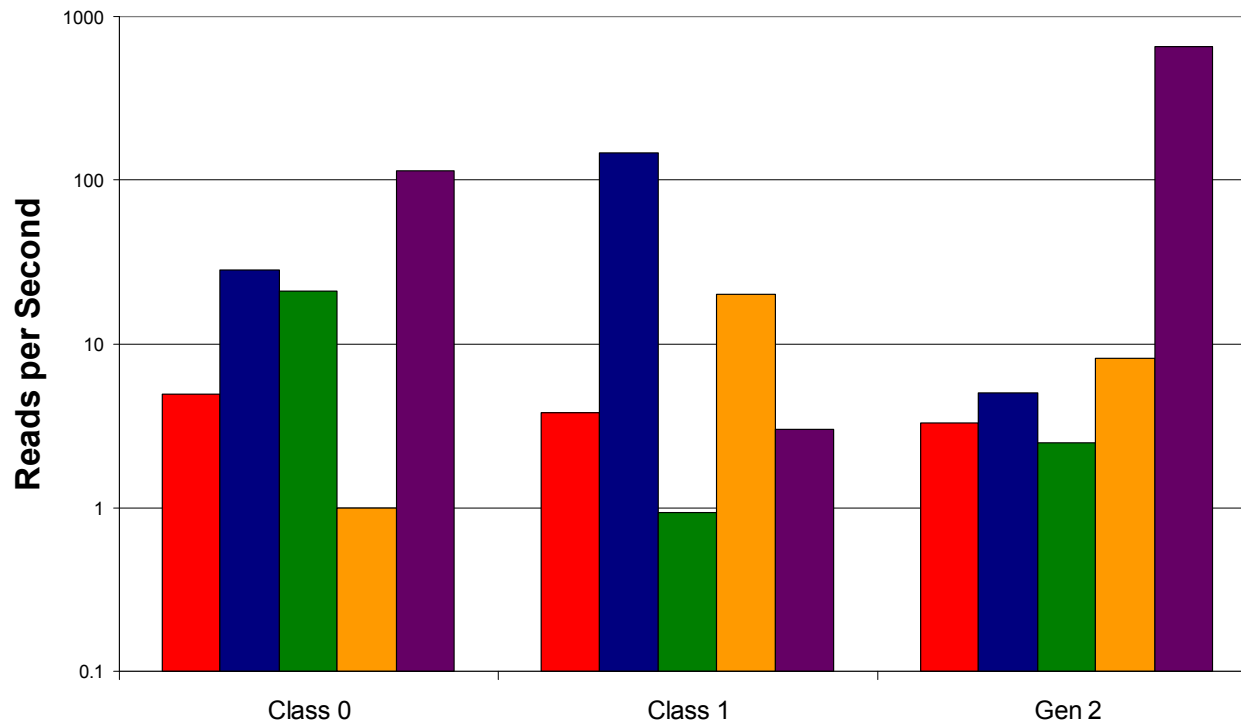
In theory, there is no difference between theory and practice. In practice, there is a difference.

- ◆ Gen 2 implementations are on par with Gen 1
  - ◆ Speeds: reads / second
  - ◆ Distance: feet
  - ◆ Material affects: largely determined by antenna



# Speeds with Multi-Protocol Readers

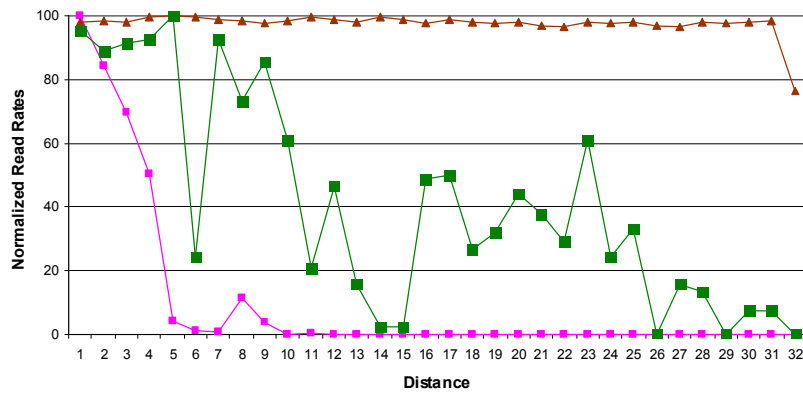
Comparison of Read Speeds



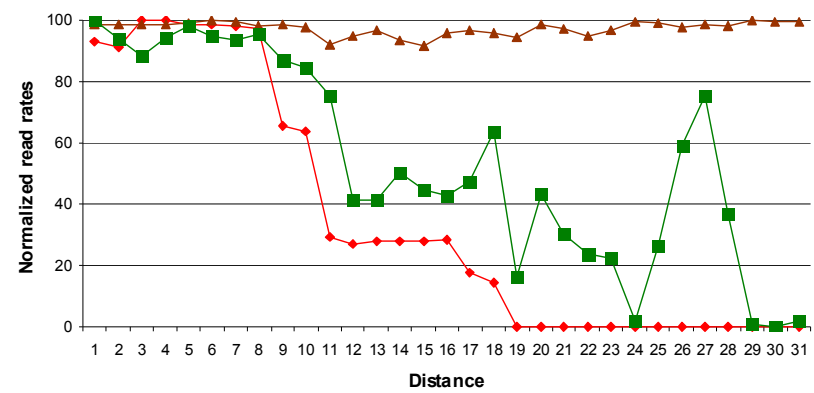


# Distance Comparisons

Excalibur Gen 2

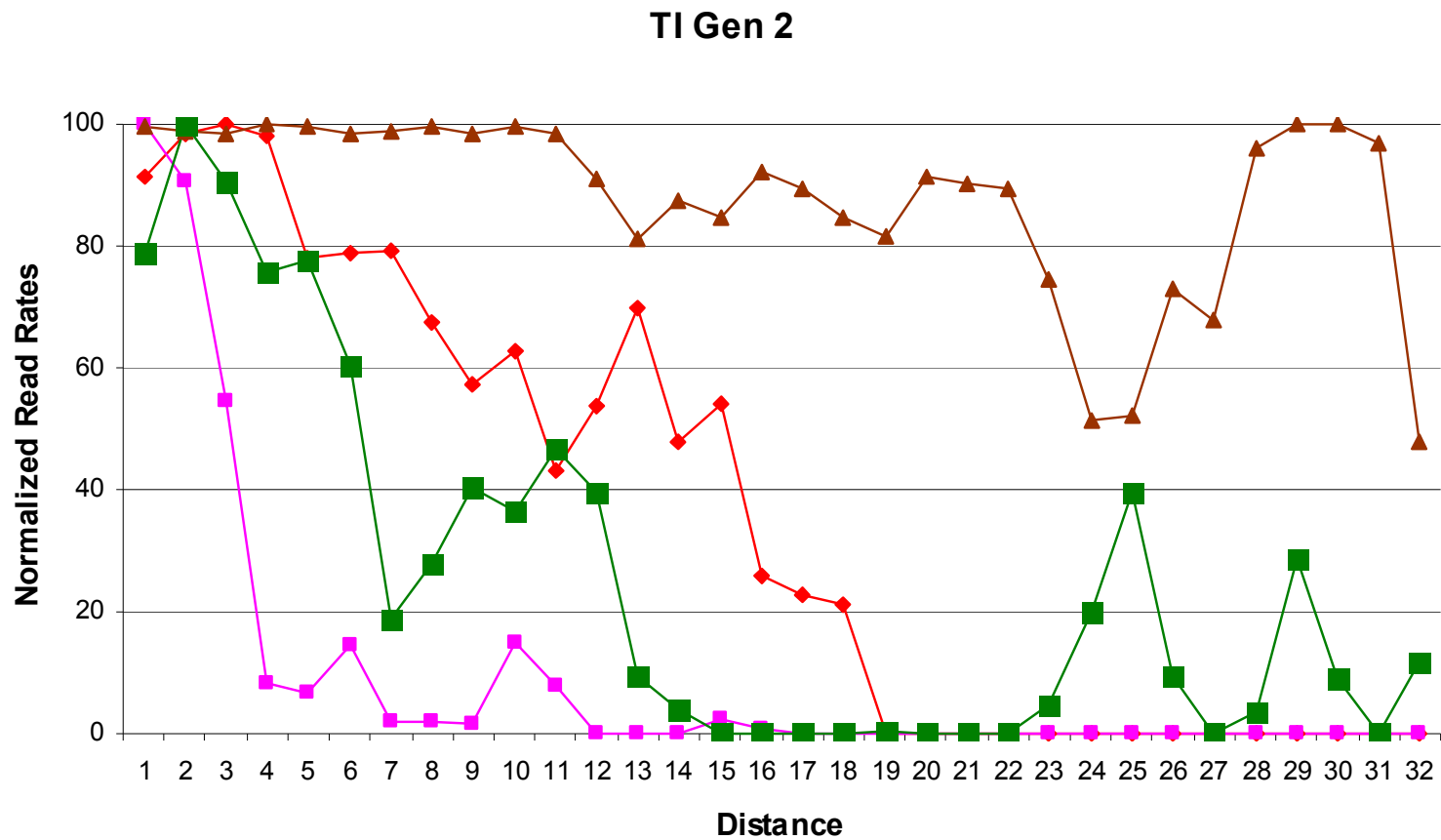


Symbol "4x4" Class 0+





# Largest Variance Among Readers





# Experiment

- ◆ Observe read speeds for
  - ◆ Class 0
  - ◆ Class 1
  - ◆ Gen 2



# Experiment



# Conclusions

- ◆ We observe Gen 2 performance “on par” with Gen 1 technology
  - ◆ Gen 1 has more time for improvements
  - ◆ E.g., Mercury4 Class 0 goes from 8 to 100 rps
- ◆ Gen 2 features still superior
  - ◆ Dense interrogator mode
  - ◆ Locking / unlocking
  - ◆ Passwords
- ◆ Best of Gen 2 to come