

**NEPP Workshop at NASA Goddard  
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**Are New Risk Mitigation Approaches Needed for  
Automotive and Commercial EEE Parts Options,  
Intended for New Classes and more Affordable  
Missions?**

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# General Trend

## □ General Trend

- PEMs and Cu bond wire products are becoming more prevalent
- Desire is to reduce cost within Space community
  - Part acquisition cost
  - Qual cost
  - Mitigation cost
- More and more interest in automotive and commercial grade parts
- Question has been asked “why cant we use empirical data to judge long term reliability”
- Question not being asked often:
  - Given mission duration, orbit and application reliability requirements; can I use commercial or automotive grade products?



# Industry Trends The Way We Are Seeing It

## □ What does Integra see

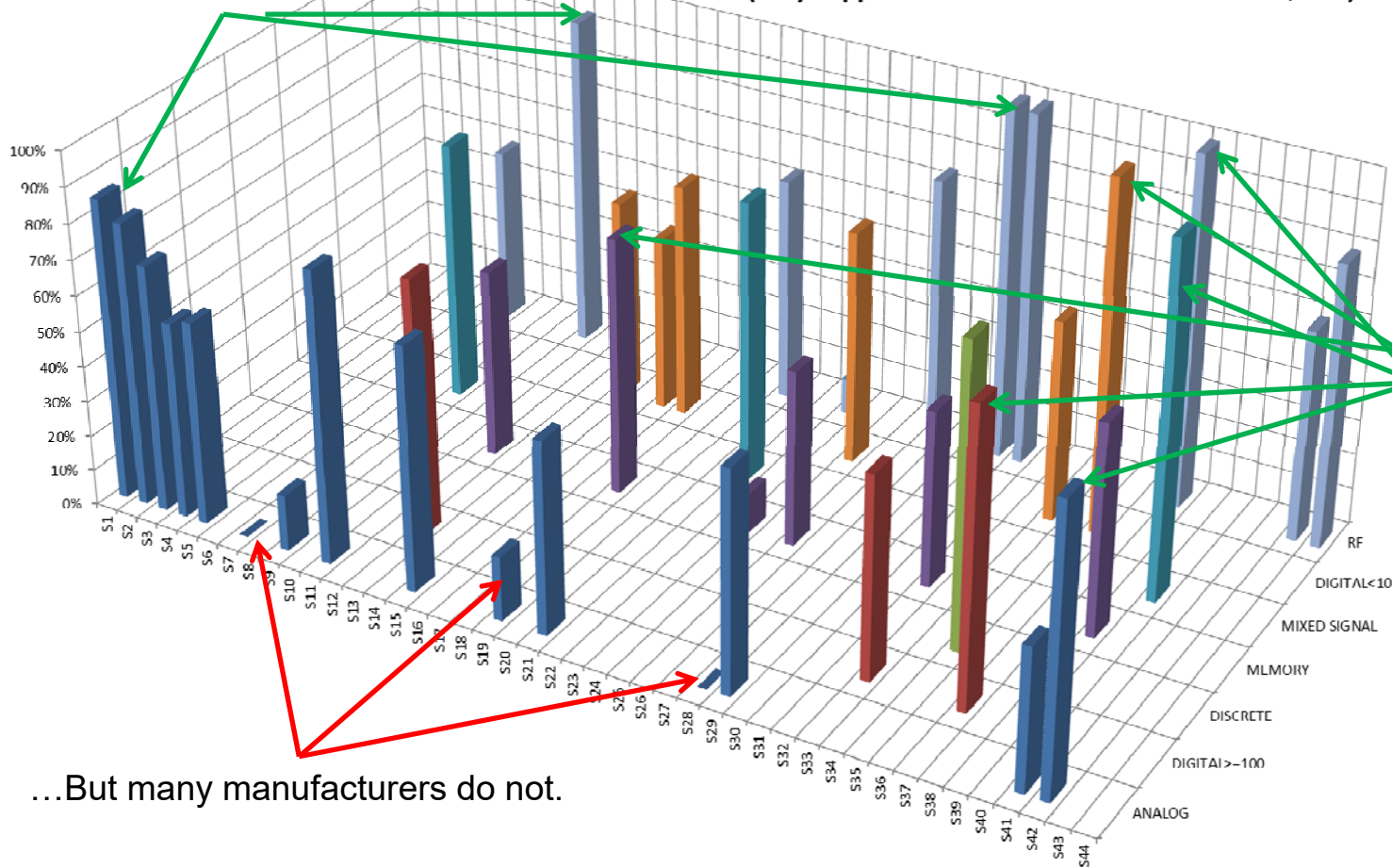
- Rush to use automotive grade product with no or minimal consideration to orbit or mission duration reliability considerations
  - Integra has seen infant mortality failures even for automotive grade products (as recently as late 2016)
- Commercial PEMs are extensively used in many Space applications
  - With quals in critical application
  - With minimal quals in Level 2 and Level 3 applications
- Cu bond wire products has potential reliability issues for Hi-Rel applications
  - manufacturer to manufacturer and lot to lot variability when using sequential testing (like PEM-INST-001 qual flow).
- No two manufacturers are alike – manufacturer maturity matters
  - There are tiers of manufacturers based on maturity of process



# Overall PEM Qual Success Rate by Device Technology by manufacturer

PEM Qual Pass/Fail Rate by Supplier by Technology  
(only suppliers with data for at least 5 PEM Quals)

Many manufacturers have good PEM Qual results....

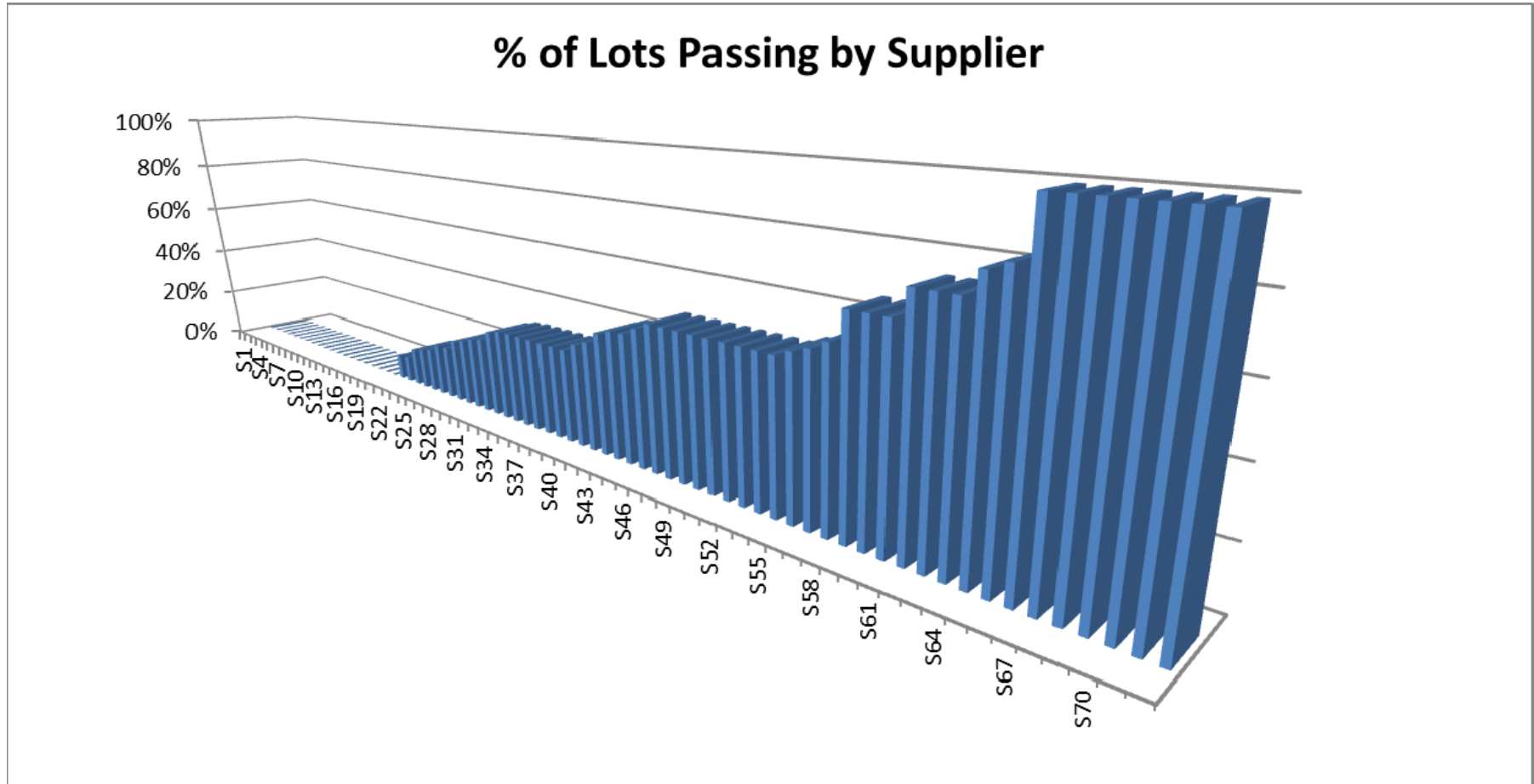


...But many manufacturers do not.

Acceptable manufacturers can be found for most technologies.



## Overall PEM Qual Success Rate by manufacturer



This is arguably the most important point of this data analysis – that PEM Qual success rates vary dramatically from manufacturer to manufacturer.



## Industry Trends The Way We Are Seeing It

### ❑ What does Integra see (continued)

- Commonly used risk mitigation techniques by users
  - More Construction Analysis (CA) instead of Mil Std 1580 DPAs
  - More failure analysis for all failures across supply chain
  - Desire to use more automotive grade product with no additional quals
  - Desire to use commercial parts with upscreening and quals
  - Use manufacturer data without much consideration to tier of manufacturer
  - Three temperature testing



# Industry Trends The Way We Are Seeing It

## ❑ Danger Signs

- Not a well thought out strategy for risk mitigation – not always application or mission dependent
- Inability to recognize what process or design is the data taken for or what to do with it
- Long term reliability data is not being taken
  - Not advocating burn-in or life test but need ability to see drifts (automotive approach)

