Low-noise design is not always costly…

**Why would a Class D Instrument care about EMI/EMC?**
- Resource Prospector = Rover = Drills, motors, high-noise environment
- Good EMI/EMC Performance ~ Measurement insensitivity to noise
- Ames Procedural Requirement (APR 8070.2), Section 4.4.2
- Fixing noise problems is more difficult & costly late in the project cycle

**What are some low-cost techniques to improve EMI/EMC Performance?**
- Document grounding design, know all (or eliminate) loops
- Electrical & mechanical co-design, focus on packaging (minimize slots & seams)
- Shield the major noise sources
- Differential signaling, proper termination, twisted pair & outer cable shields (minimum)
- Power filtering
- Pre-compliance testing at each stage of development

**What is pre-compliance testing?**
- Bench / lab level, “poor man's” EMI characterization (conducted & radiated)
- Equipment: Spectrum analyzer, current probe (~$1-4k), EMI sniffer probe set (~$1k)
- Test time: <1 day

We have used these approaches successfully on the RP NIRVSS Instrument
- Characterized prototype via test, implemented design changes, repeated test
- Improved conducted emissions performance by ~59dB
- Identified minor design issues that affect emissions

**Next Steps:**
- Implemented revision to NIRVSS Power Board, build ETU #2, retest!

**Funding / Timeline**
- **2013:** Engineering Development Unit (prototype) built & tested
- **Mar 2015** Engineering Test Unit (ETU) #1 built & tested
- Future work (e.g. next proposal): ETU #2 (FY15-16), flight model (FY17?)

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**Readiness level:**
- ☐ TRL 1-3: Concept
- ☑ TRL 4-6: Prototype
- ☐ TRL 7-9: Demonstrated