EMI / EMC Design for Class D Payloads (Resource Prospector / NIRVSS)

Ames Research Center

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

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Technology / Application

Low-noise design is not always costly…

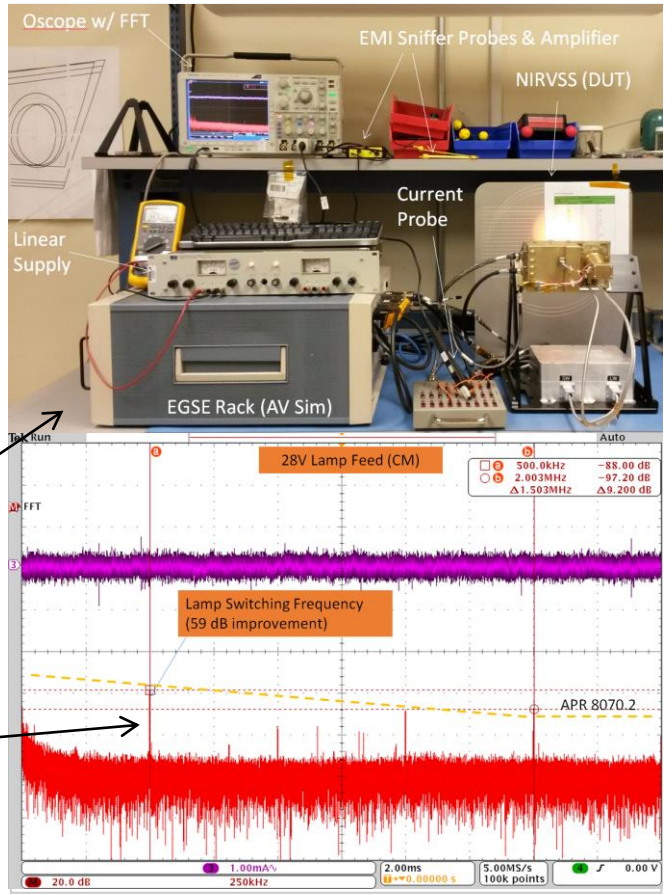
Why would a Class D Instrument care about EMI/EMC?
- Resource Prospector = Rover = Drills, motors, high-noise environment
- Good EMI/EMC Performance ~ Measurement insensitivity to noise
- Ames Procedural Requirement (APR 8070.2), Section 4.4.2
- Fixing noise problems is more difficult & costly late in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

Put proposal history of instrument here. Use this format:
- **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?)

POC

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