**RHA Definition and Consideration**

RHA consists of all activities undertaken to ensure that the electronics and materials of a space system perform to their design specifications after exposure to the space environment. The subset of interests for NPP and the RAG is, EEE parts. It is important to register that all of these undertakings are in a feedback loop and require constant iteration and updating throughout the mission life. More detail can be found in the reference materials on applicable test data for usage on parts.

**Reference Materials**

- National Instruments to CubeSats
- Guidelines and Lessons Learned found on radhome
- Military Performance Specifications
- MIL-STD-750, MIL-STD-883
- Military Test Methods
- DTRA Documents
- ASTM Standards by Subcommittee
- EIA/JDEC Test Methods and Guides
- NASA Test Methods and Guides

**Often Utilized Tools**

- Radiation Databases
- GSF's Cadence, IRL radcentral, ESA escies
- Environment Modeling
- SPENVIS, CRÈME, OMERE, NOVICE
- Radiation effects in devices/materials

**Drivers for a new approach and Future Considerations**

**Varied Missions – National Assets to CubeSats**

- Risk Tolerant vs. Risk Avoidance
- Low budget, shortened schedule
- Short mission duration
- High data rates
- On-board processing
- Multi-instrument dependent datasets
- Data continuity from one satellite to the next

**Emerging Technologies and COTS parts usage increasing**

- System on a chip solutions, COTS parts are meeting complex needs
- Highly cost-effective performance
- 3D structures
- Complex radiation response

**Acronyms**

- NASDA: National Space Development Agency
- NASA: National Aeronautics and Space Administration
- NIST: National Institute of Standards and Technology
- OSI: Open Systems Initiative
- PNRA: Peninsula Nucleare della Sardegna
- RAI: Relativa Alla Industria
- RAE: Radiation Effects on Aerospace
- RHA: Radiation Hardness Assurance
- RHEA: Radiation Hardness Evaluation Agency
- JSP: Japan Space Program
- JAXA: Japan Aerospace Exploration Agency
- KEK: Japan National Laboratory for High Energy Physics
- NASA: National Aeronautics and Space Administration
- NSRE: Nuclear Systems Research and Engineering
- NHM: National High Magnetic Field Laboratory
- INRIM: National Institute of Metrology
- CEC: Centre d’Emission de Courant
- LAM: Laboratoire d’Astroparticule et de Cosmologie
- JPL: Jet Propulsion Laboratory
- JAXA: Japan Aerospace Exploration Agency
- CERN: European Organization for Nuclear Research
- INRIM: National Institute of Metrology
- CEC: Centre d’Emission de Courant
- LAM: Laboratoire d’Astroparticule et de Cosmologie

**Acronym Details**

- **RHA**
  - Radiation Hardness Assurance
- **RHEA**
  - Radiation Hardness Evaluation Agency
- **JSP**
  - Japan Space Program
- **JAXA**
  - Japanese National Laboratory for High Energy Physics
- **NASDA**
  - National Space Development Agency
- **EIA**
  - Electronic Industries Alliance
- **JEDEC**
  - Japan Electronics and Information Technology Industry
- **ETW**
  - European Telecommunications
- **NOTREV**
  - National Space and Telecommunications Research and Development
- **NASA**
  - National Aeronautics and Space Administration
- **RRA**
  - Radiation Effects on Aerospace
- **RAI**
  - Relativa Alla Industria
- **PNRA**
  - Peninsula Nucleare della Sardegna
- **OSI**
  - Open Systems Initiative
- **RLA**
  - Radiation List Acceptance

**Mission Timeline and Deliverables**

- During the Propose/Viability Phase
  - Final Environment definition
  - Draft Hardness assurance requirement
  - Preliminary studies
  - Preliminary design
  - Preliminary design review (PDR)
  - Final Environment definition
  - Electronic design approach
- At the Critical Design Review (CDR)
  - Radiation test results
  - Final hardness analysis
  - Final design analysis
- After CDR
  - Revisiting Radiation List Acceptance tests
  -Approved as Built Parts List
  - Parts Procurement
  - Final Acceptance
  - Critical Risk Review

**System Impact**

- Mission Continuity
- Risk Mitigation

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