



Proposed Changes to SpaceWire Physical Layer

Shaune S. Allen

NASA Goddard Space Flight Center



Problem Statement

- **Chapter 5 Of the SpaceWire Standard (ECSS-50-E-12A) provides a good basis for the SpaceWire Physical Layer**
- **SpW standard is overly restrictive in many areas**
- **Some statements confusing or vague**



Solution

- **Make appropriate changes to the SpW standard to allow for new Physical Layer configurations**
- **Make associated changes to the referenced documents in the SpW Standard**



Changes to SpW Cable Construction

- **Add 26 AWG SpW cable to the standard**
 - Make appropriate additions to Detail Specification 3902/003
 - When necessary add a separate statement regarding the 26 AWG version
- **Alternative create a chart which lists the critical parameters**



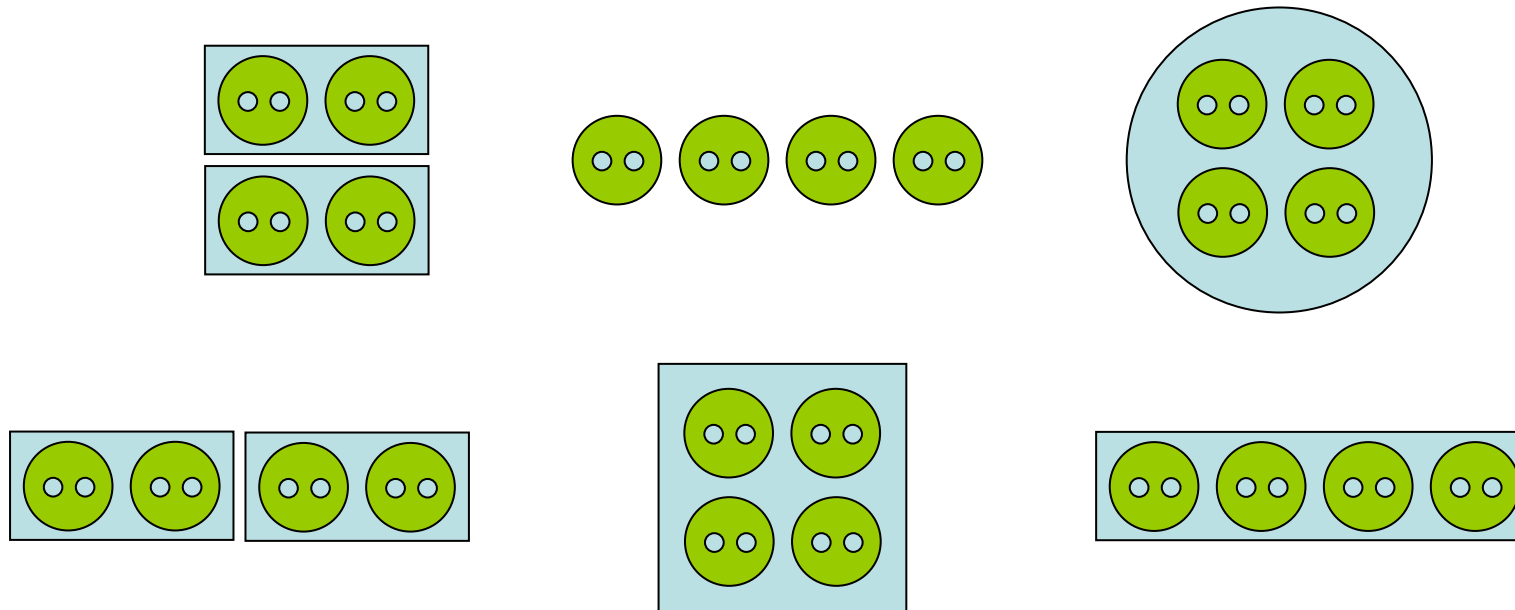
Changes to SpaceWire Connectors

- **SpaceWire Standard specifies MDM-9 connector**
 - Mismatched to 100Ω differential impedance of SpaceWire cable
 - Mechanical issues (mate/demate)
 - Inner shields (signal ground) pass through a single pin
 - Unable to pass inner shields through bulkheads
 - Near-end Crosstalk (NEXT)



Use of Twinax Connectors

- **Can provide a matched-impedance interface**
 - Twinax connector can be matched to cable impedance
 - Reduces reflections at connector
- **Reduce crosstalk between pairs**
- **Can provide 360° shield coverage through connector**
- **Provides method of going through bulkhead or TVAC chambers without breaking the shield configuration**





Use of Additional MDM Connectors

- **Allow use of other connectors**
- **Allows use of additional ground pins**



Additional Considerations

- **Specify target specifications in lieu of actual connector**
 - Low crosstalk
 - Matched impedance
 - Good EMI
 - Mechanically sound
 - Space Qualified
 - Signal Integrity
 - Grounding
 - Balanced interconnect
 - Path lengths within tolerance



Suggested Changes

- **Add 26 AWG version of SpW cable to detail spec**
- **Change SpW standard to be less restrictive regarding the connector**
 - Allow use of twinaxial connectors
 - Allow more than 9 pins in the MDM connectors to provide additional ground pins
 - Establish based guidelines for use of connectors
 - Length of flying leads
 - Right-angle connectors discouraged; Straight lead connectors ok.
 - Maintain balance
 - Maintain impedance
- **Remove RC parallel network connection to ground**
- **Add statements regarding the use of common mode chokes or ferrite beads and ESD protection diodes**



Conclusion

- **Standard should encourage compliant application**