ESA SpW-10X LVDS Signalling Discrepancies Experienced in BepiColombo Project

Context

- **BepiC Solid State Mass Memory**
  - The SSMM is required to provide nine (9) Payload SpaceWire interfaces.
  - In addition SpaceWire is used to interface to the OBC (computer and TFGs)

- **Proposed design**
  – SSMM Design Implementation was based on ESA SpaceWire Router SpW-10x to comply to power, mass and size requirements.

- **SpW-10X Datasheet**
  – SpW-10X (AT7910E in ATMEL catalogue) datasheet indicates the following :
    - Section 4. Interfaces " The AT7910E provides a routing capability between **eight SpaceWire links according to the SpaceWire Standard ECSS-E-50-12A**. "
    - <u>Section 4.1 Spacewire ports</u> The SpaceWire router has eight bi-directional **SpaceWire links each compliant with the Space- Wire standard ECSS-E-50-12A**.

BepiC SSMM Unit

- *General requirement on LVDS interfaces*
  - *Low Voltage Digital Signal interface: The (sub-)contractor shall design his side of the interface to be compliant to the characteristics as defined for* LVDS driver and receiver to ANSI/TIA/EIA-644 as requested by SpW standard ECSS-E-50-12A

- Problem with SpaceWire Router
  - The output offset voltage range of the LVDS output buffer of a SpW router ASIC is 0,945 ÷1,559V (as measured) against the required 1,125V ÷1,45V

- ESA BepiC project has asked ESTEC TEC for specific SpW-10X tests
  - Confirmation of ESA SpW-10x router none compliance to SpW standard ECSS-E-50-12A as claimed in the datasheet
  - Tests against other LVDS driver / receivers
  - ? No final test report has been issued as yet

Consequences

- SSMM unit is interfacing to 10 units with SpW drivers and receivers compliant to *EXSS-E-50-12A ANSI/TIA/EIA-644*

- As the ESA SpW-10X router is not compliant to ECSS-E-50-12A

? This may require extra work to adapt the SSMM to the 10 SpW drivers and receivers of all the units it interfaces too

- Possible Consequences:
  - Extra costs supported by BC program
  - SSMM delivery schedule impact

On a more general note

- LVDS may bring high speed and low power
- But it also brings extra risk. When the two sides of the interface are built by different organizations even when working from the same specification
- It is recommended that a standard (ECSS like) set of tests be defined for these interfaces
- These should be performed at unit level on all projects