SpW Hardware implementation for ASTRO-H in JAXA

consideration about DC offsets in the ground level and common-mode noise suppression

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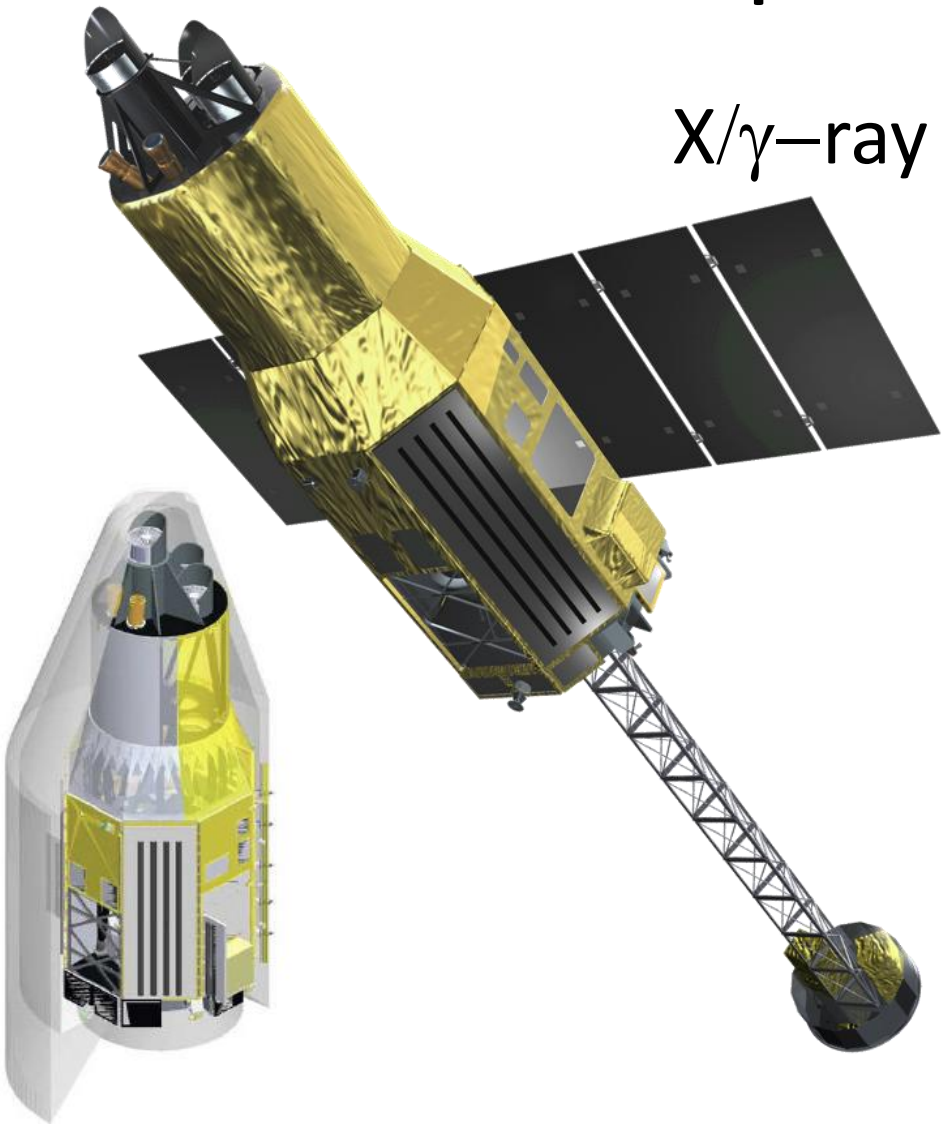
ASTRO-H space observatory



X/γ–ray astronomy observatory

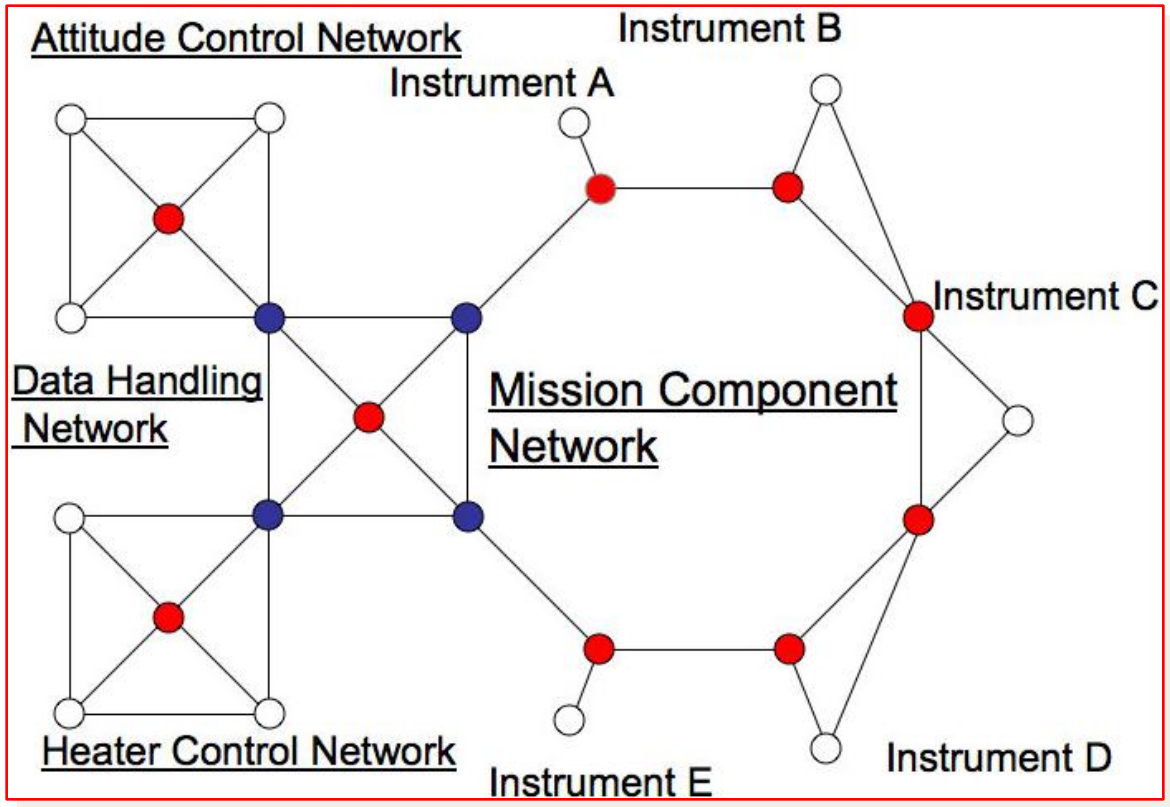
- FY2013 launch (scheduled)
- Alt. 550km, Inc. 31 deg
- Total mass: 2.5t
- Length (on orbit): 14m
- Total power: 3150W

ASTRO-H information network

SpW intelligent node

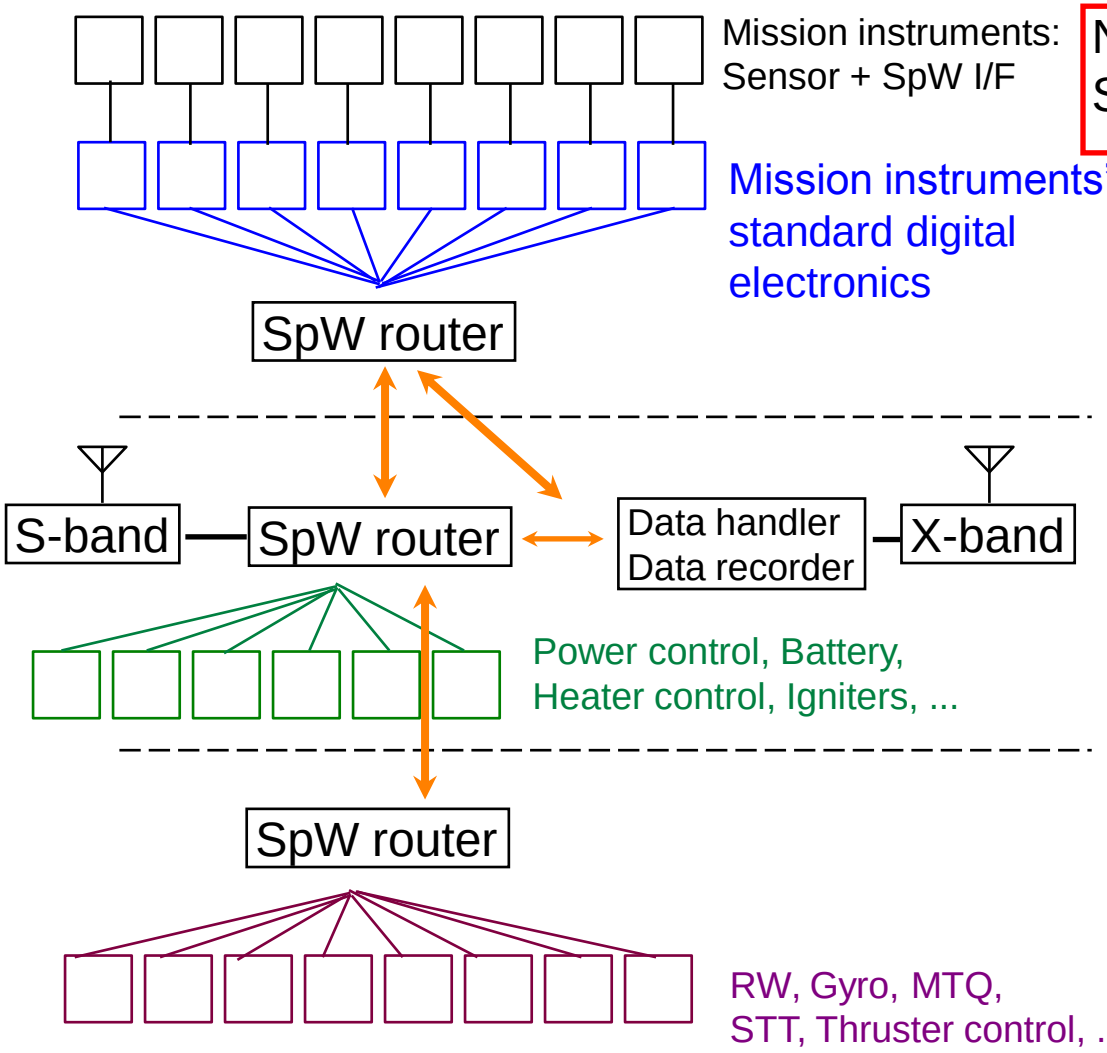
SpW router

SpW non-intelligent node



Full-SpW network

ASTRO-H SpW network



Network segmentation using SpW routers

Mission-instrument SpW network

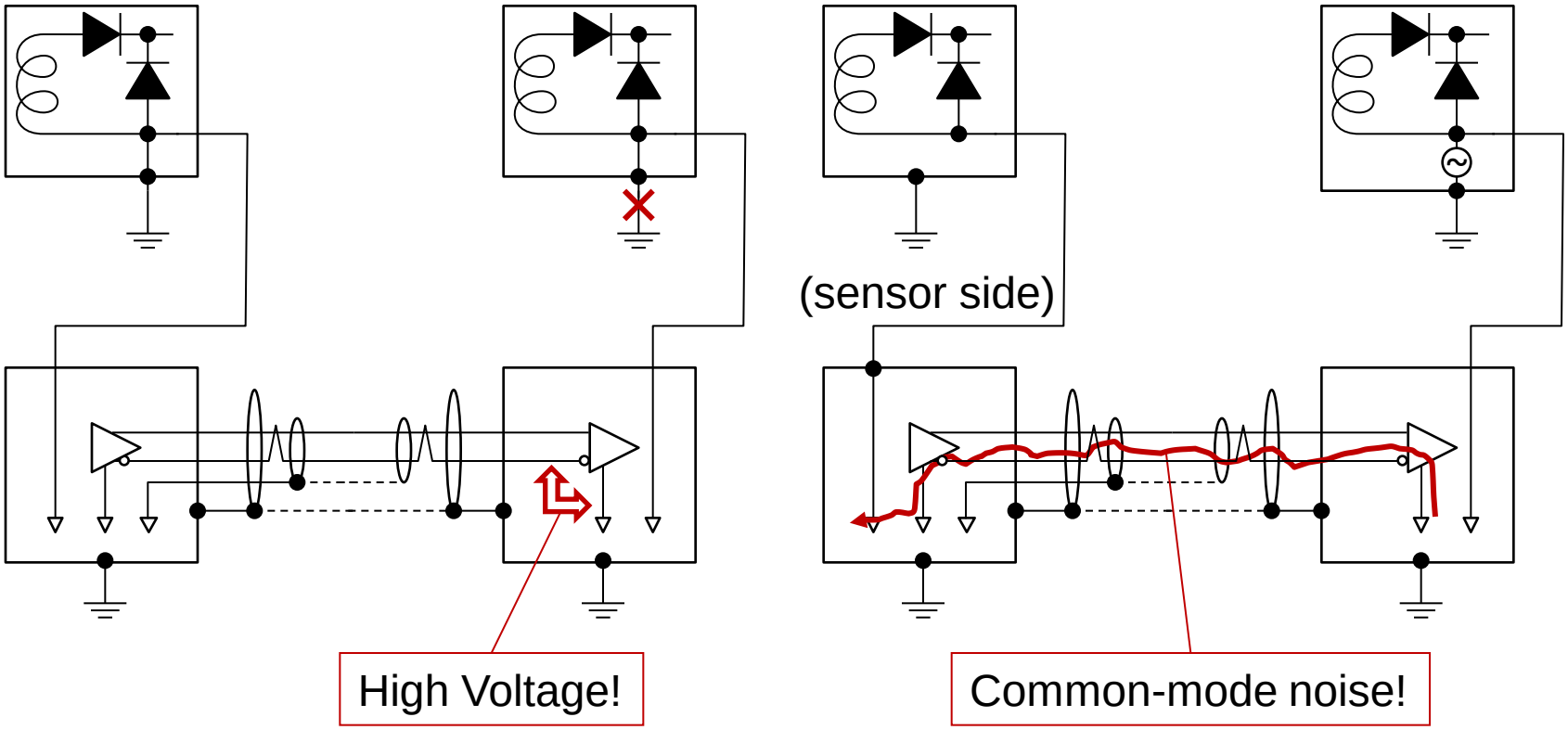
Satellite bus SpW network

Attitude control system SpW network

What are the problems?

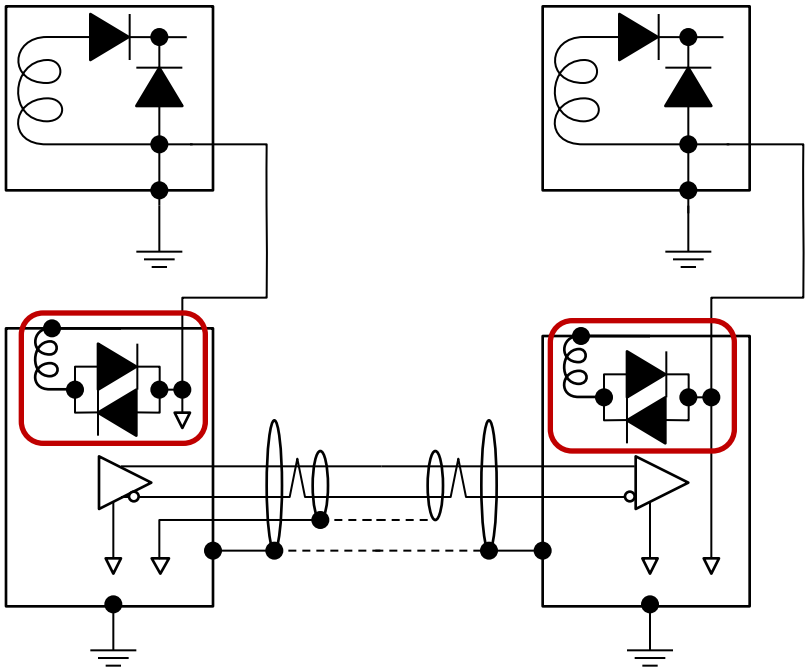
Hazard during component test phases.

Noise penetration from data lines (at least in RS-422 case).



Possible solutions (DC offset)

1. Force signal-ground voltage nearly equal to the chassis voltage



Merit:

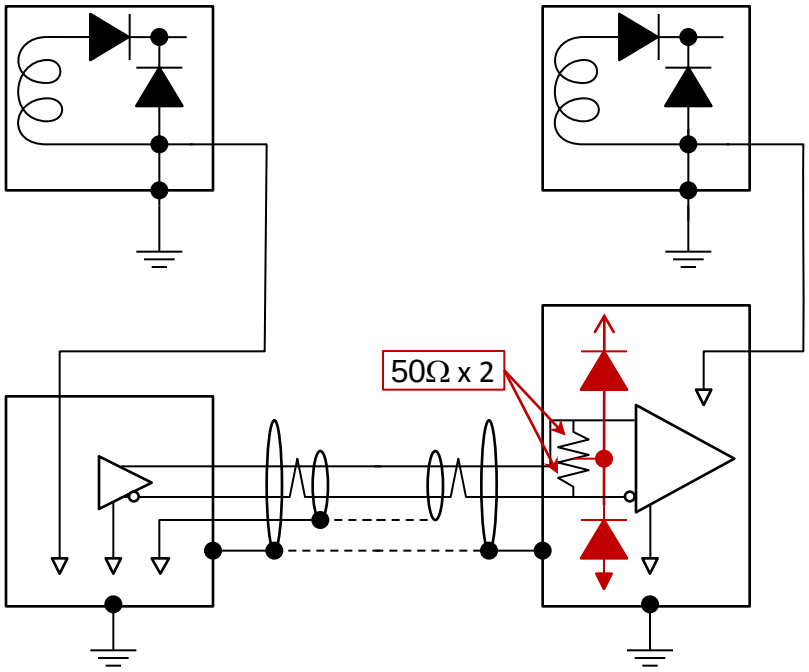
- Robust for low-Z DC offset, as far as the chassis-to-chassis shield is connected.

Demerits:

- Weak isolation between signal ground and chassis.
- Even non-flight LVDS cable MUST has a chassis-to-chassis connection.

Possible solutions (DC offset)

2. Guard diodes from the LVDS terminators



Merit:

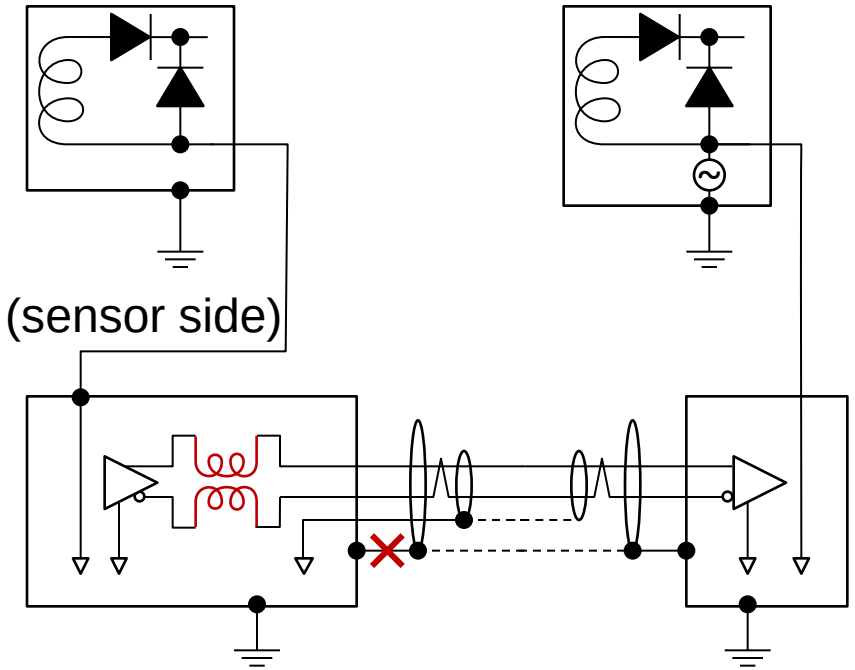
- Good isolation between signal ground and chassis.

Demerit:

- Over-voltage protection on the power line is mandatory: the power line MUST discharge the offset (report by Lansdtroem & Gasti, 11th meeting).
  - Availability of space-qualified parts for OVP?

Possible solution (common-mode noise)

Common-mode choke and broken bundle shield



- Candidate for non-SpW slow LVDS lines of ASTRO-H calorimeter.

Merit:

- Heritage from Suzaku calorimeter (but RS-422).

Demerits:

- Not clear yet if the bundle shield should be broken or not.
- BW should be examined for common-mode choke?

Conclusion

- DC offset and AC common-mode noise protection/suppression methods for LVDS lines were discussed.
- None of them have not been examined enough for the real LVDS products. Further study is required.
  - BW, typical test environment, space-qualified parts availability, ...

Thank you very much.