



cleansat

BB#22
PCDU Passivation
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Description of proposed technology Building Block



- The Power Passivation of the electrical power sources, Solar Array (SA) and Battery is proposed to comply with the Space Debris Mitigation (SDM) requirements.
- The electrical passivation can be implemented via:
 - deactivation/disconnection of the SA, disconnection of the Battery, ...
- The passivation function has to be operative after mission completion for max 25 years and it has to be reliable enough to avoid the deactivation of the power system before the end of the mission and to keep it passivated afterwards.
- A trade-off is planned to define the Building Block (BB) between the following solutions:
 - Solar Array deactivation by short-circuit (SA permanent shunt),
 - SA disconnection (SA isolation),
 - Battery disconnection,
- and to select the most suitable technology to be used such as semi-conductors, relays, contactors, cable-cutters.



Description of proposed technology Building Block



- The proposed BB is conceived to be:
 - used on Medium and Large Spacecraft's operating in LEO region,
 - implemented in the power system either in the Power Conditioning and Distribution Unit (PCDU) or in a dedicated unit for passivation purpose.
- The proposed BB is also envisaged to be applied to different Main Bus (MB) architectures (e.g. Unregulated Bus or Fully Regulated Bus) and to different SA regulation topologies (e.g. S3R or MPPT).
- The implementation of the BB in the PCDU is considered the ***preferred solution*** in order to minimise the impacts at system level (e.g. mass, interface link, cost, etc.) providing also with better performances in terms of efficiency, reliability, etc.
- The realisation of the passivation externally to PCDU could be an intermediate way forward in order to re-use the available recurrent design, minimising the risk of new development and qualification.



- The following development plan up to flight ready hardware is proposed:
 - Confirmation of the proposed BB for power passivation according to the requirement's definition.
 - Preliminary design of the BB for its implementation into a PCDU product (*preferred solution*) or in a dedicated unit.
 - Selection of the devices to be used for the selected BB w.r.t. their availability for long duration and their qualification status.
 - Test at device level (e.g. RVT) to confirm its use in the application.
 - Finalisation of the BB design (electrical/mechanical/thermal), including all the relevant analyses.
 - Design validation based on the realisation of one Engineering Qualification Model (EQM) of the BB at module level.
- The cost of the development phase up to EQM is about 500 K€ and it is referred to a stand-alone board not packaged.

