Aquarius Digital Processing Unit

Three documents provide information on a digital processing unit (DPU) for the planned Aquarius mission, in which a radiometer aboard a spacecraft orbiting Earth is to measure radiometric temperatures from which data on sea-surface salinity are to be deduced. The DPU is the interface between the radiometer and an instrument-command-and-data system aboard the spacecraft. The DPU cycles the radiometer through a programmable sequence of states, collects and processes all radiometric data, and collects all housekeeping data pertaining to operation of the radiometer. The documents summarize the DPU design, with emphasis on innovative aspects that include mainly the following:

- In the radiometer and the DPU, conversion from analog voltages to digital data is effected by means of asynchronous voltage-to-frequency converters in combination with a frequency-measurement scheme implemented in field-programmable gate arrays (FPGAs).

- A scheme to compensate for aging and changes in the temperature of the DPU in order to provide an overall temperature-measurement accuracy within 0.01 K includes a high-precision, inexpensive DC temperature-measurement scheme and a drift-compensation scheme that was used on the Cassini radar system.

- An interface among multiple FPGAs in the DPU guarantees setup and hold times.