PRETTY- ESA's GNSS Reflectometry CubeSat – Design and configuration of the payload

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PRETTY (Passive REflecTometry and dosimeTrY) is a European Space Agency (ESA) In-Orbit Demonstration (IOD) CubeSat funded by Austria under the Fly element of ESA General Support Technology Programme. It demonstrates for the first time Global Navigation Satellite Systems (GNSS) reflectometry (GNSS-R) at low grazing angles using the E5/L5 frequency, transmitted by the European Galileo and American GPS constellations. The GNSS-R payload design originates from the PARIS IoD study. The goal was to apply the interferometric method in space. This method uses the direct signal from the GNSS transmitter and correlates it with the reflected signal from earth surface. In addition, PRETTY supports the clean replica approach, where a replica of the transmitted code is generated locally on-board. This allows to compare both approaches from the same instrument in space. The GNSS-R payload produces a high resolution complex waveform, a high resolution power waveform and a Delay-Doppler Map (DDM, 66 Taps, 9 Frequencies) concurrently for the tracked reflection event. The data is stored on the payload as netCDF file for easy post-processing on ground.

Due to the complex configuration options of the PRETTY GNSS-R payload, it is necessary to have deeper understanding on the possibilities of the options available for the measurement. The signal processing chain and its various settings, including those autonomously derived, will be presented along with results from the instrument in space.

Topic group: (1) New instruments, concepts and recent missions
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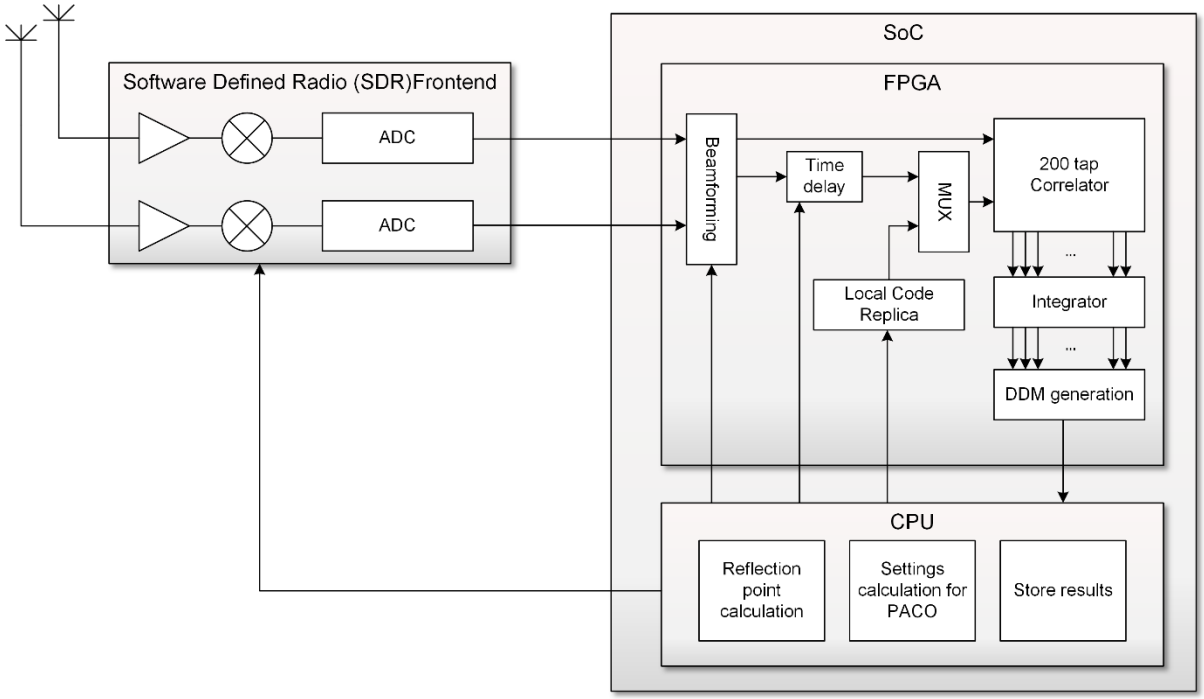
Software Defined Radio (SDR)Frontend
ADC
ADC
SoC
FPGA
Beamforming
Time delay
MUX
200 tap Correlator
Local Code Replica
Integrator
DDM generation
CPU
Reflection point calculation
Settings calculation for PACO
Store results