Navigation Systems Laboratory

Moscow Power Engineering Institute

2019

Specs

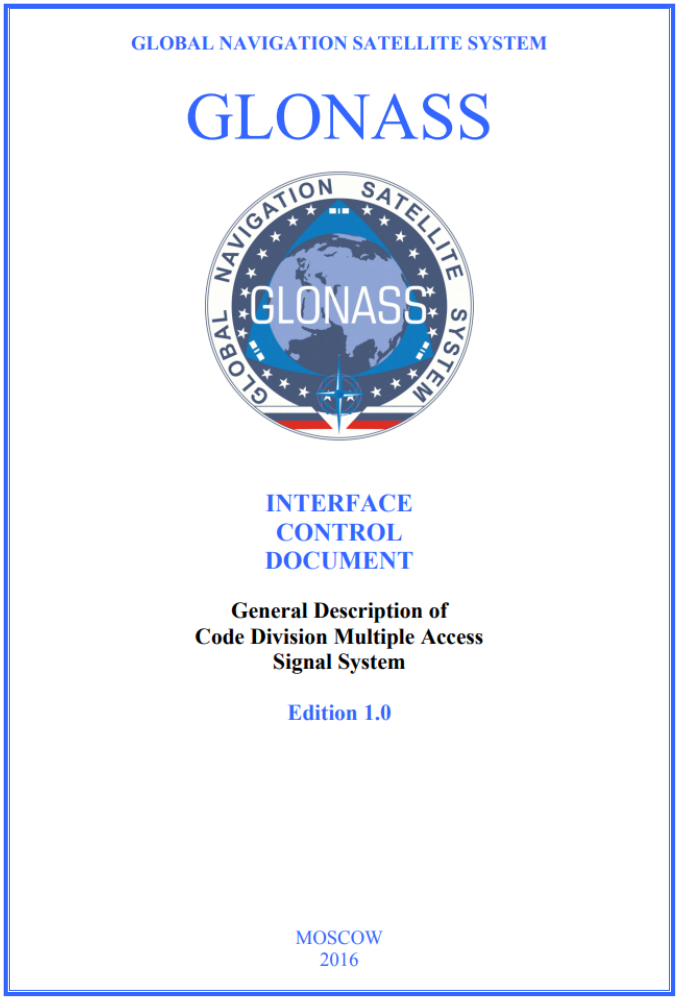
Short specs:

- young and high skilled team (10 guys and 1 supergirl)
- the main area - global navigation satellite systems
- established 2004, high-end laboratory equipment
- spectrum: from science to serial production
- the biggest R&D budget of MPEI, 5-8 R&D projects per year

New CDMA GLONASS signals

Our team designed next generation CDMA L1/L2 GLONASS signals:

- BOC and BPSK modulation
- overlay codes
- FEC coder
- security schemes
- processing algorithms


GLOBAL NAVIGATION SATELLITE SYSTEM

GLONASS

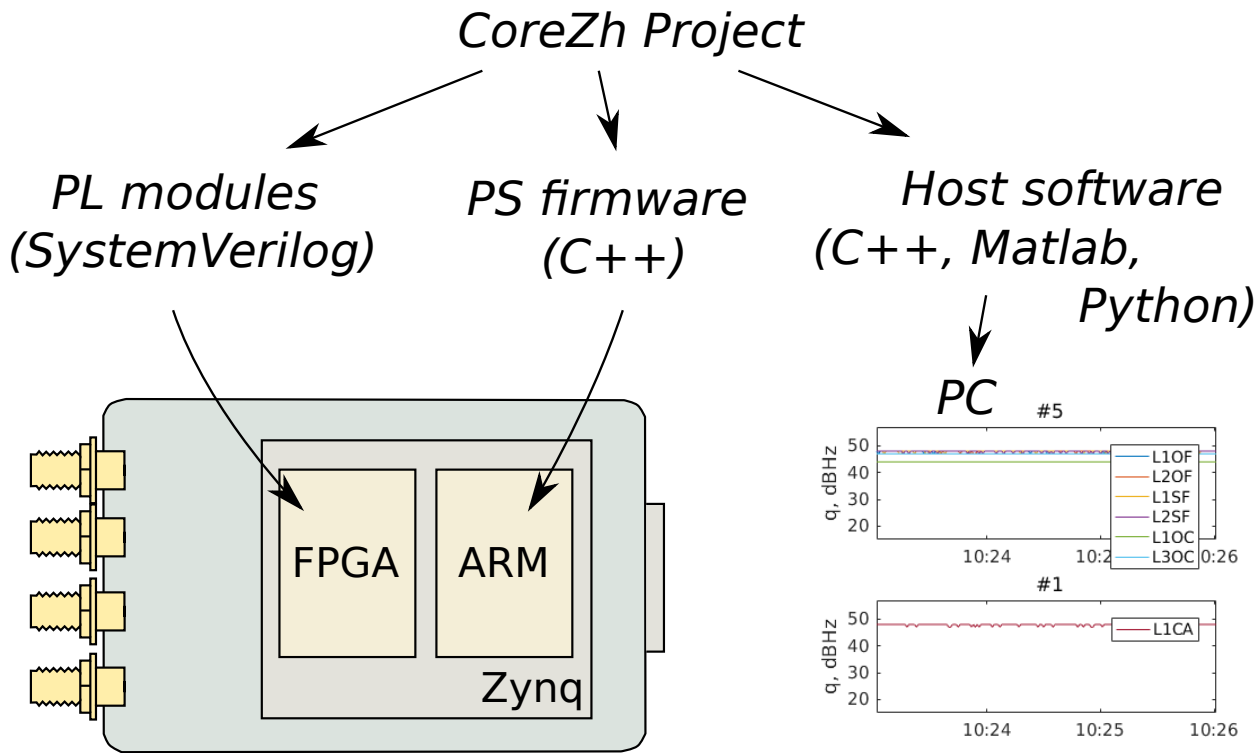
INTERFACE
CONTROL
DOCUMENT

General Description of
Code Division Multiple Access
Signal System

Edition 1.0

MOSCOW
2016

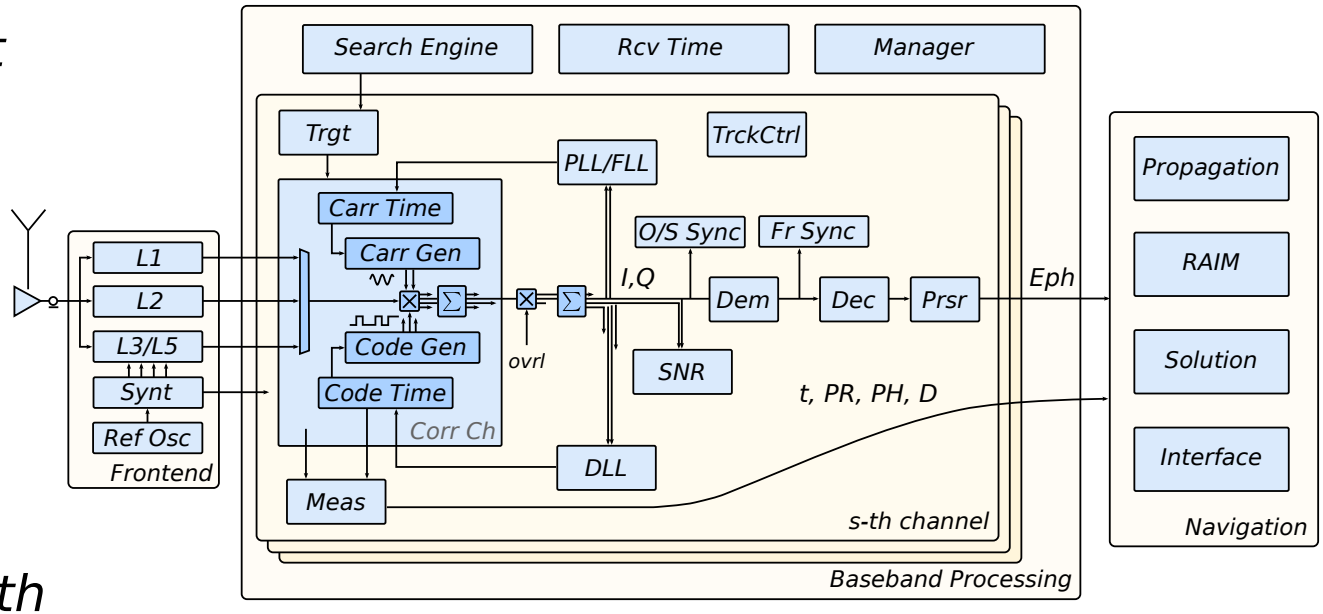
CoreZh Project



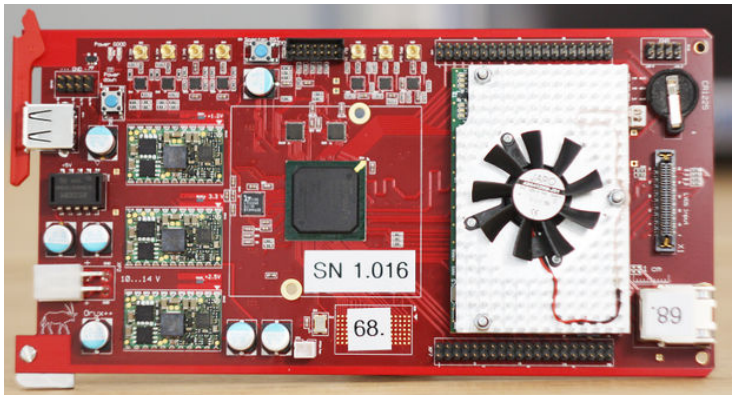
Our core, root and long-time project - CoreZh (since 2008)
It's an FPGA-based GNSS receiver/transmitter/spoofer/simulator/STAP
It combines our technologies and it's the base for our hardware projects

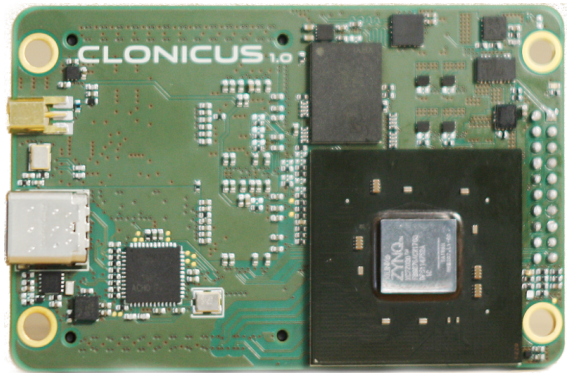
One Ring to rule them all

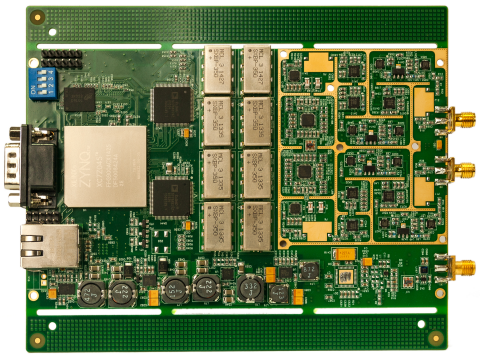
We combine different PS and PL modules to achieve a certain project goals



It's possible to use both our own boards or industry boards for a hardware implementation

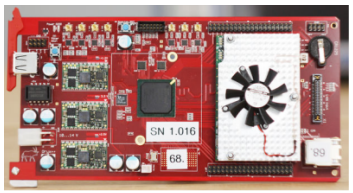


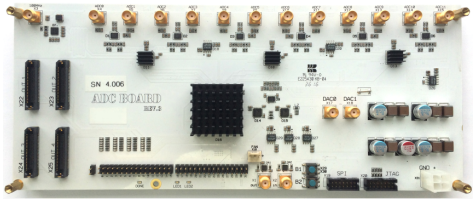


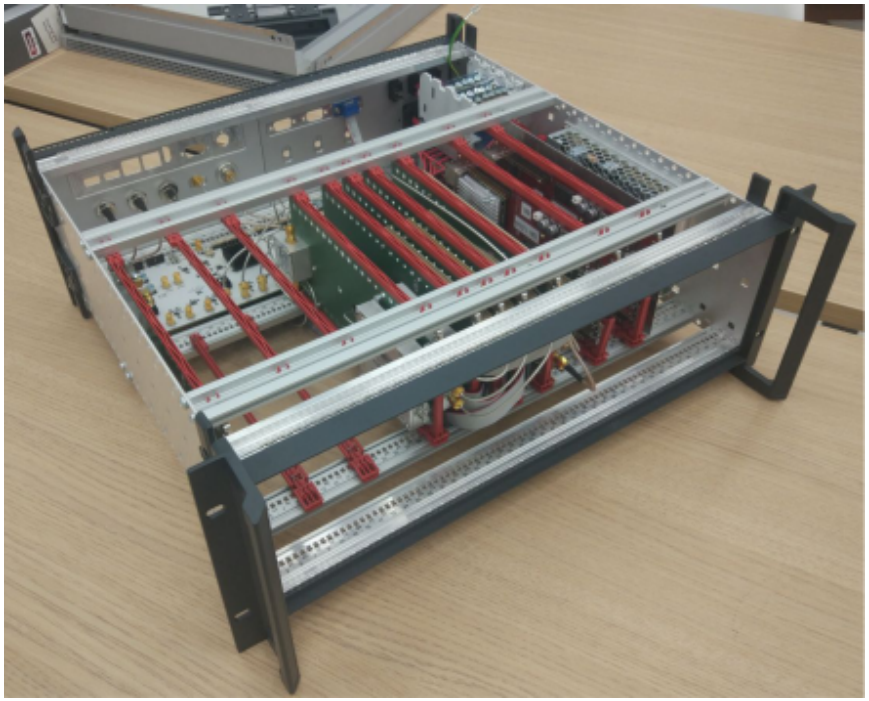


Centimeter is a GNSS receiver for GLONASS quantum-optical control stations:

- precise (50 ps) sync to laser
- all GNSS bands
- high linearity
- stable group delay
- small batch production
- several boards per unit
  3 Oryx and 1 ADC:



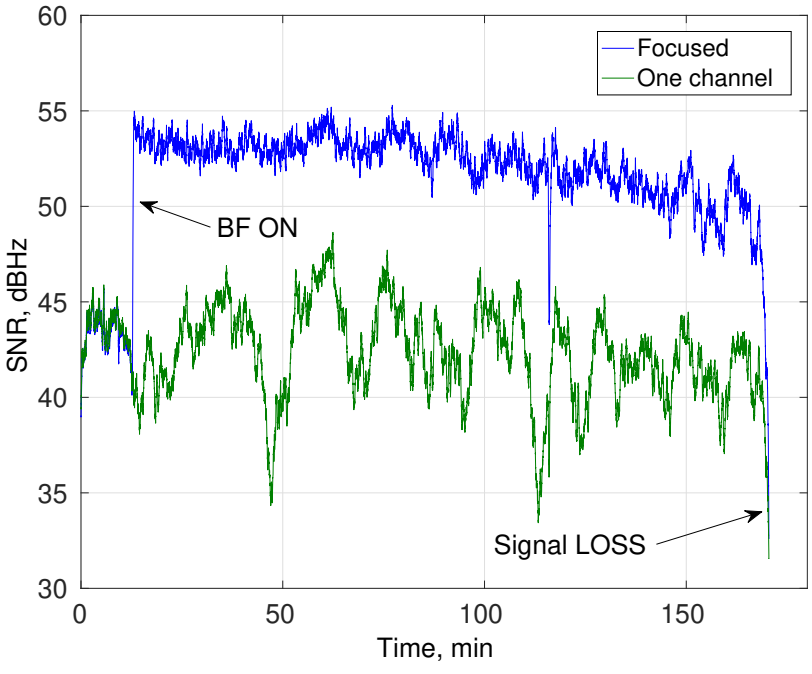


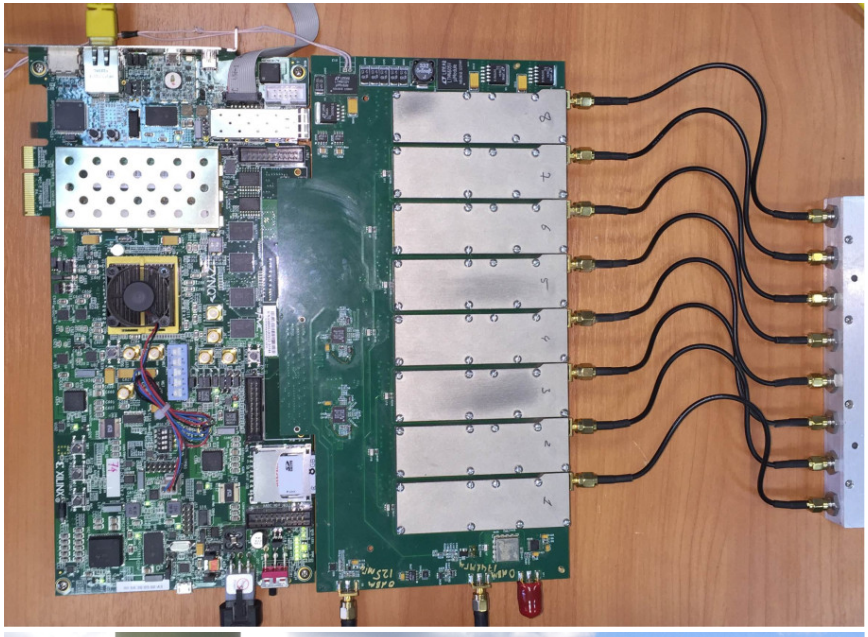


Spatial-time adaptive processing

Multiantenna receivers:

- nullforming for huge antijam capability
- beamforming for SNR gain and multipath
- spreaded antennas for attitude

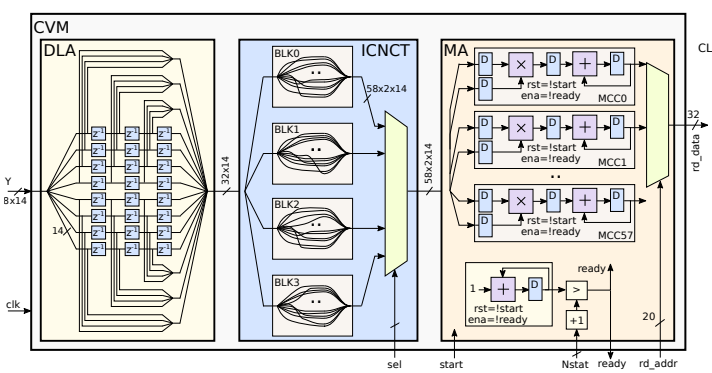


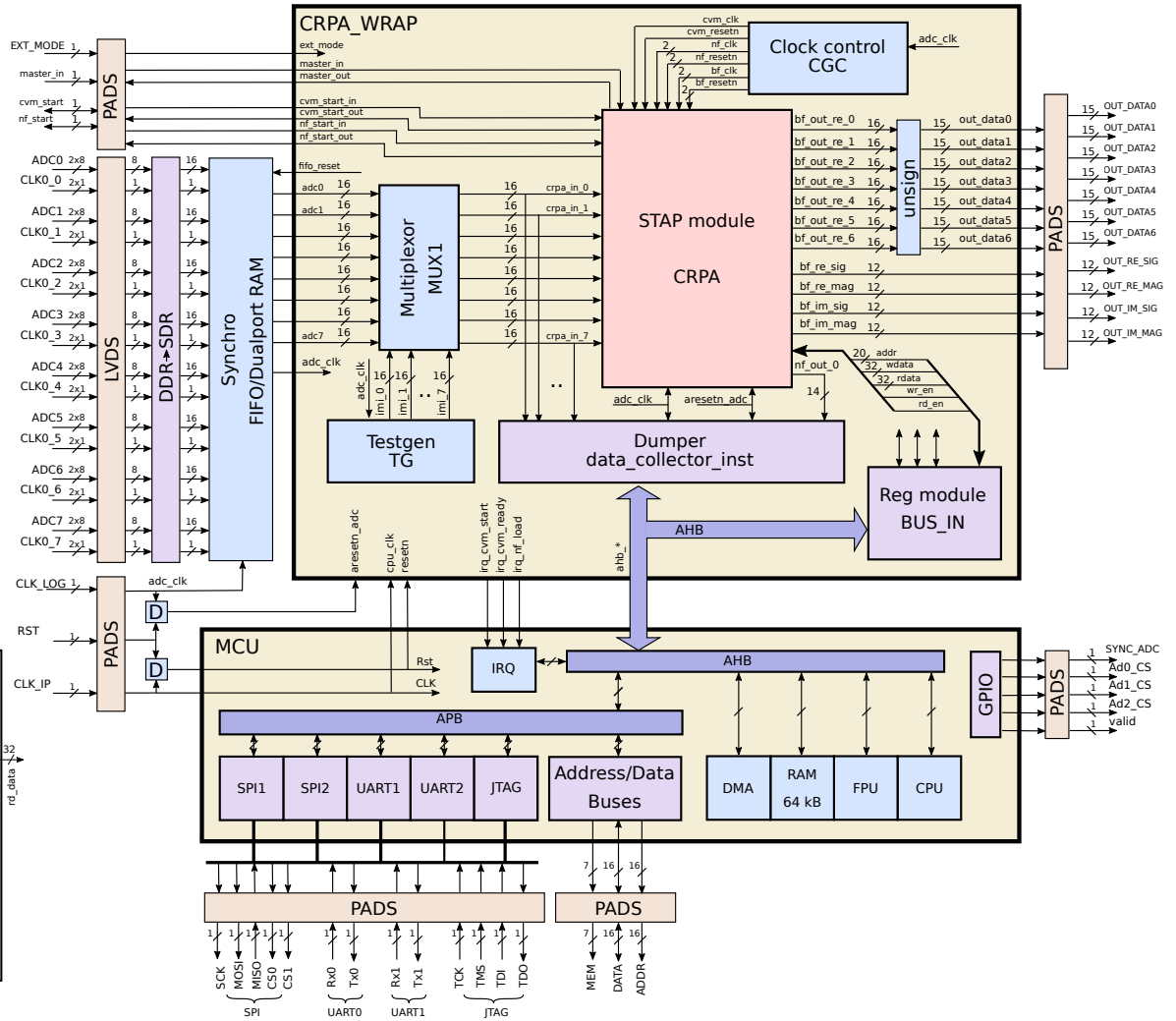


ASIC Experience

Two implemented ASICs:

- 8-input spatial-time adaptive processing
- GNSS and intersatellite navigation receiver



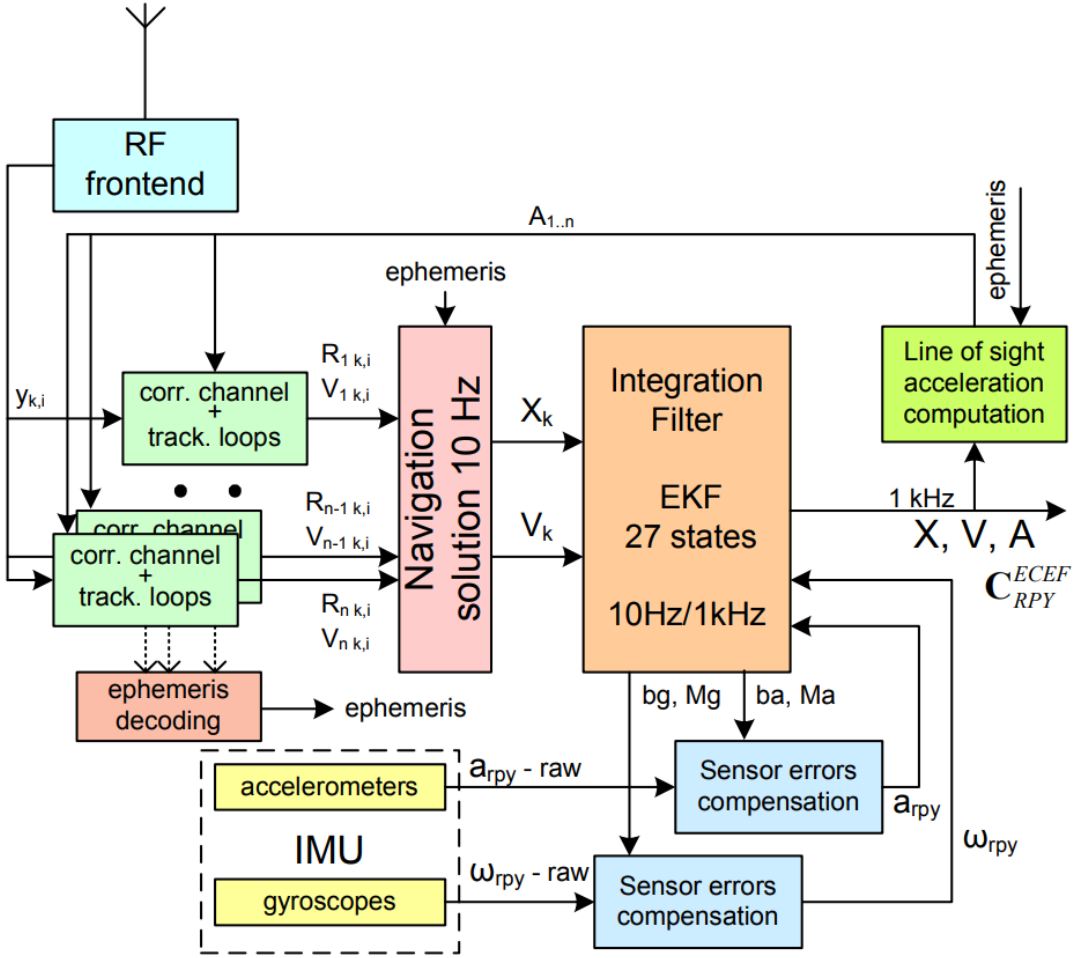


GNSS/INS integration

Integrated navigation:

- GNSS/MEMS (AD16405, STIM300)
- Dead reckoning (NV-08C and ABS)
- Pedestrian navigation

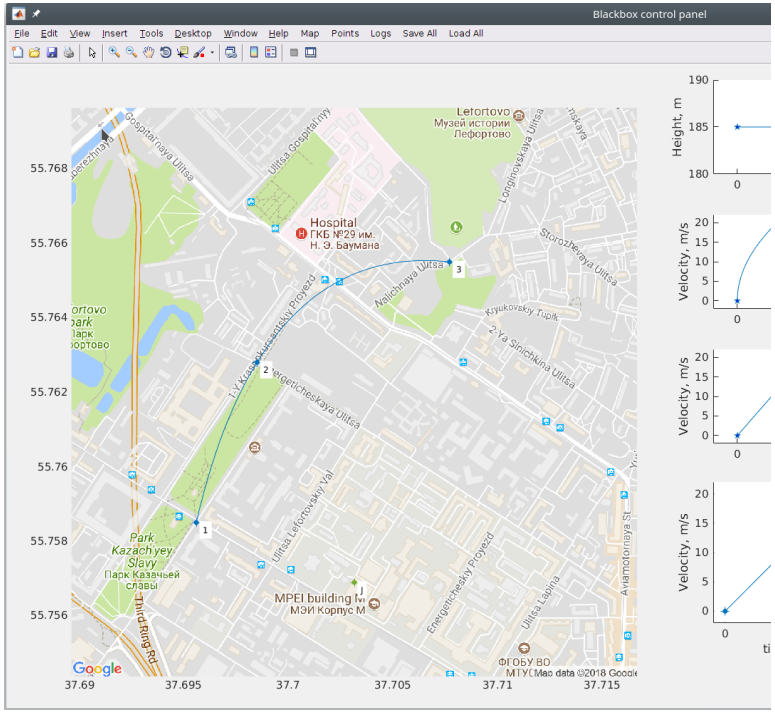
27-31 order EKF scheme for 600MHz CPU:

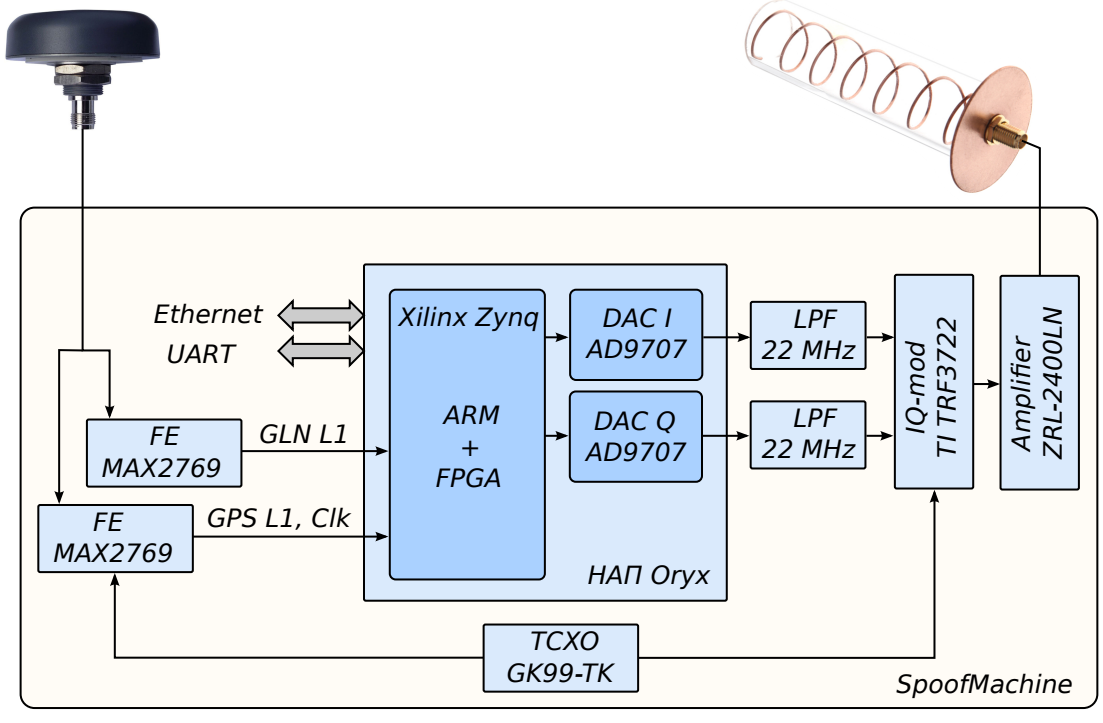


Not only receivers

L-band signals transceivers:

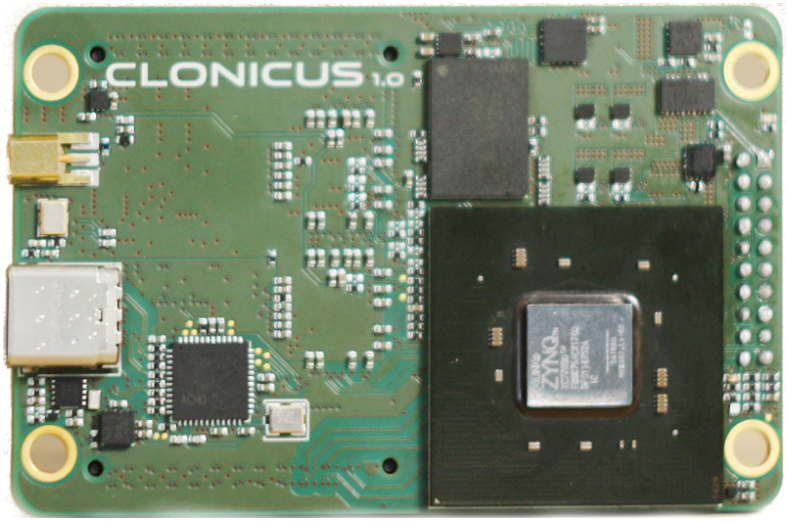
- GNSS simulator
- GNSS spoofer
- Pseudolites (local nav)





Clonicus is our new base board:

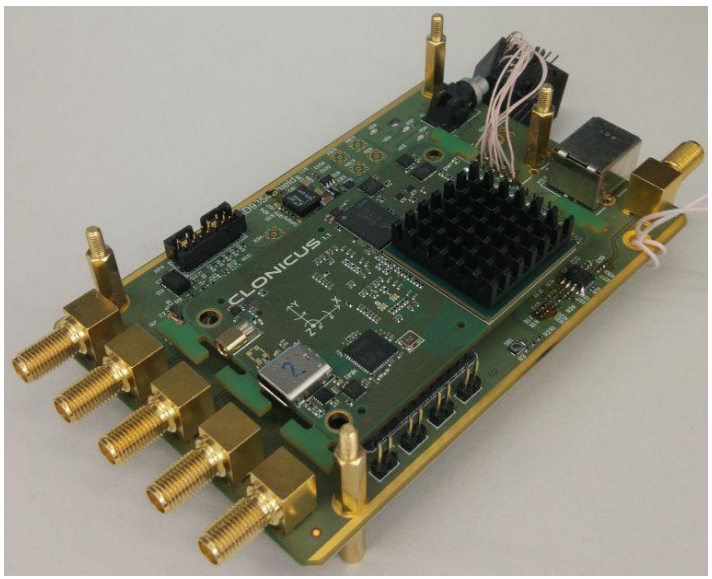
- Novatel OEM719 pin2pin (46x71 mm)
- L1/L2/L3/L5 GNSS bands
- Zynq 7030 or 7045
- MEMS IMU
- extension shields:
  - AD9364 transceiver,
  - time sync,
  - GNSS goniometer,
  - STAP

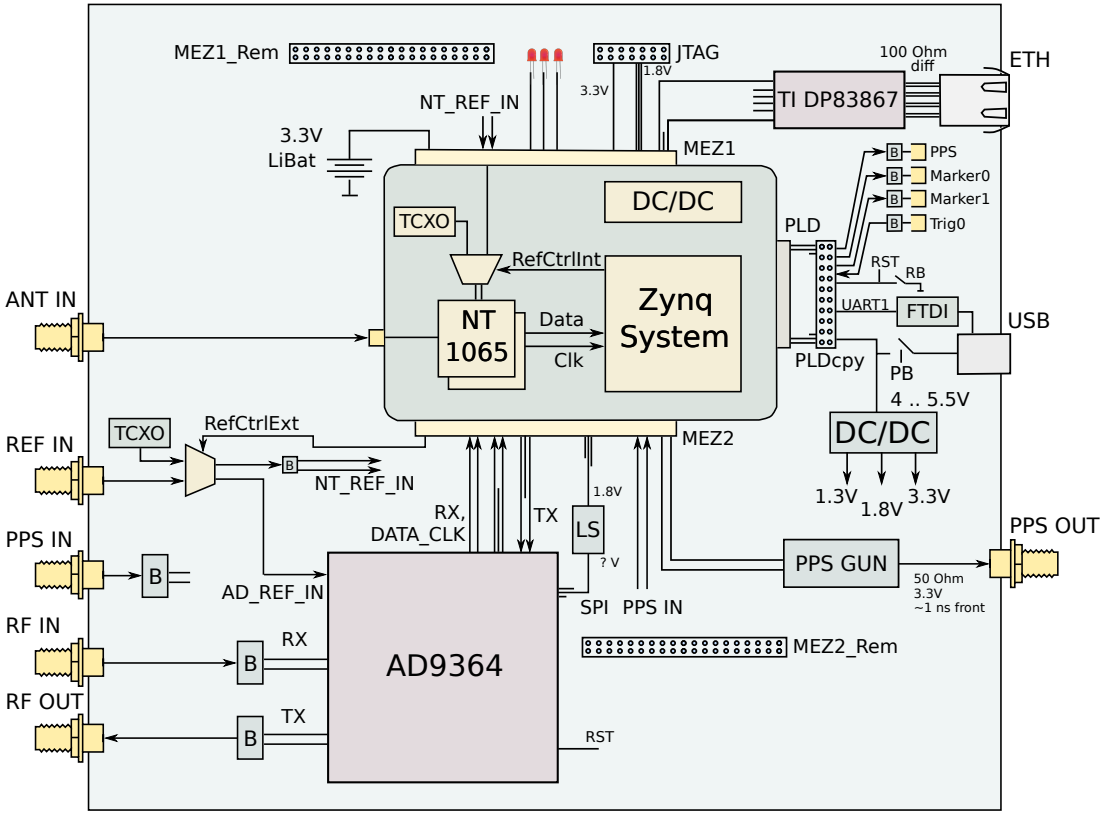


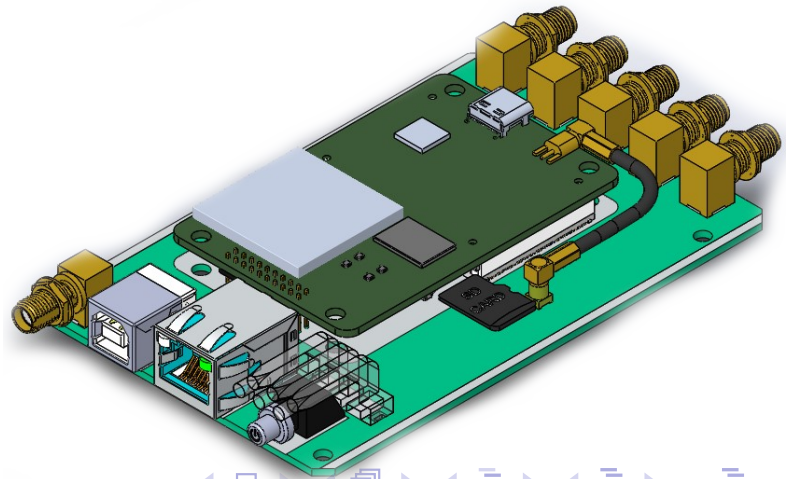
Clonicus AD9364Shield

AD9364Shield is an extension board:

- up to 6GHz transceiver
- time sync input/output
- designed for:
  - GNSS CORS
  - GNSS simulation
  - pseudolites







Thank you!

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