A FAMILY OF SOLUTIONS BASED ON THE srx-10, A SW DEFINED MULTICONSTELLATION GNSS RECEIVER

Teresa Ferreira, Manuel Toledo, José María López, GMV
GMV has been working in GNSS receivers technology since 1996.

Now, GMV has its own line of proprietary receivers for niche applications, including:
- Front-end
- Signal processing + PVT + local integrity algorithms SW

Main products:
- **srx-10FE**: L1 radio frequency Front End
- **srx-10**: L1 GPS/GLONASS/SBAS/GALILEO SW Receiver

Main Applications:
- **srx-10i**: srx-10 evolution customized L1/E1 interference detection and analysis
srx10

MOTIVATION
WHY srx-10, A SW RECEIVER SOLUTION?

- Low cost GPS chipsets are widely available. However:
  - They provide PVT solutions, but usually not “raw” data
  - Even then, there is a risk of discontinuation of raw data availability that jeopardizes:
    - Efforts on R&D
    - Efforts in development of innovative products for the future GNSS applications to exploit multiconstellation (e.g. regulated applications)

- This has motivated GMV to develop its own products line:
  - To hold full autonomy for applications development
  - To cover from low end to advanced solutions
  - To afford use cases not feasible with COTS market receivers

- Key features of GMV GNSS SW Receivers:
  - Fully functional on urban scenarios, as mass-market receivers
  - Fully available output: PVT and raw data (including carrier-phase),...
  - Long term flexibility for upgrades, only by SW without HW changes
  - Optimized versions run on low cost CPU platforms (e.g. Atom, ARM9)
SRX10

SPECIFICATIONS AND PERFORMANCES
srx-10FE FRONT-END SPECIFICATIONS

- Based on FE Maxim2769 (compatible with any other low cost FE)
- Low cost (BOM < 1€)
- USB 2.0 interface

High Configuration capability:
- RF Bandwidth:
  - 2.5, 4, 8 and 18 MHz
- Sampling frequency:
  - 4, 8, 16 and 32 Msps
- Quantization:
  - 1-3 bits
- I or I+Q signal representation
- Input/Output clock reference
**srx-10 SPECIFICATIONS (1/2)**

- Fully hosted SW Defined Receiver for general purpose CPUs working in real time
- L1 GPS/SBAS/GLONASS/Galileo
- Supported CPUs:
  - Intel Pentium
  - Intel Atom
  - XScale (PXA270)
  - ARM9 (SAMSUNG 2440)
- Supported host computer OS:
  - Windows XP, 7
  - Linux
srx-10 SPECIFICATIONS (2/2)

- Navigation update rate: 10 Hz to 0.1 Hz

- TTFF (@ -130 dBm):
  - Cold start: < 1 min
  - Warm start < 6 s (with extended ephemeris)
  - On-line assisted start < 1 s
  - Hot Start: < 1 s

- Fast Reacquisition

- Accuracy:
  - Open sky (95%) GPS < 3 m
    - SBAS < 1 m
  - Deep urban environment
    - GPS GPS/GLONASS
      - 50%: <10 m
      - 90%: <25 m
    - CP smoothed (100 s)
      - 1-sigma = 1.7 m
      - 95% = 2.6 m

- NMEA/ RINEX/ SISNET
srx-10 URBAN PERFORMANCES (1/2)
srX-10 URBAN PERFORMANCES (2/2)

- Horizontal error percentiles in systematic urban campaign.

![Graph showing horizontal error percentiles in systematic urban campaign](image-url)

- Reference trajectory: Novatel's SPAN

- Low-cost state-of-the-art chipset
Srx10-based
SPECIALIZED APPLICATIONS
srx-10 INTEGRATION WITH magicGEMINI

- Visual performance analysis
srx-10 USING GMV’s PREDICTED PRODUCTS

Use of assisted extrapolated GNSS Ephemeris
srX-10 PERFORMANCES WITH CORRECTIONS

**SBAS Augmentation**
- srX-10 EGNOS processing
- EGNOS corrections applied on srX-10 GPS channels

**GPS L1 single frequency**
- SrX-10 as “rover”
- L1 Carrier Phase Integer ambiguity resolution

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[Image: Graphs showing navigation errors and positioning.]
srx-10 TRITON MULTI-FE

- Platform for R&D Activities
- Multiple front-ends
- Common clock reference
- Flexibility for advanced processing:
  - Multi-constellation
  - Multi-antenna
SRX-10i: PRODUCT OVERVIEW

- **srx-10i** is a complete GNSS Interference Detection and Analysis System, to assess ICAO SARPS & doc. 8071 compliance.
GSRLab
SUPPORTING FRAMEWORK FOR GENERATION & SIMULATION OF GNSS SIGNALS
GSRLab (1/2)

- Framework to support the development and validation of signal processing algorithms and core products

- Digital Signal Generator at Baseband:
  - GPS/ Galileo L1/E1, L5/ E5a / E5b
  - Front end filter (configurable filter, order and bandwidth)
  - Integration with different models, such as interference, multipath and ionospheric scintillation

- Receiver Simulators working in two different modes:
  - Semi-Analytical: for statistical characterization of the techniques performance assessment
  - (...)
GSRLab (2/2)

- Receiver Simulators working in two different modes (...):
  - Bit true: for detailed performance assessment of advanced signal processing techniques

- Methodology:
  - Signal generator samples are used transversally to support development and validation activities
  - R&D activities to investigate innovative advanced signal processing techniques with support from key partners using the gsRLab framework
  - Possible injection of know-how onto our product line
GMV’S OWN LINE OF PROPRIETARY RECEIVERS

- Low Cost
- Niche Applications
- Multi-Constellation
Thank you