



European Test Centre for Receiver Performance Evaluation

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Structure

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Introduction

- **Main Objective of EUTERPE will be to:**
 - provide the receiver manufacturers with a “statement of compliance” and in this way
 - offer them the support needed for the compatibility of the receivers with European GNSS
- **In an initial phase this centre is being setup at ESTEC within the facilities of the European Navigation Laboratory**



Introduction

- **Challenges:**

1. Limited availability of information to application designers
 - Lack of Standardization has translated into a difficult work when comparing receivers
2. Future objective: testing of all kinds of receivers

- **EUTERPE Approach:**

1. Complete Set of Reference Tests
2. Comprehensive and easy-to-compare Review of Rx
3. GPS/EGNOS Rx for non-SoL applications

Introduction

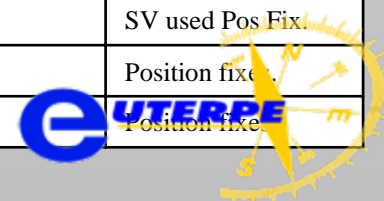
- **Baseline for GPS/EGNOS Rx for non-SoL applications:**
 - Testing of compatibility of the GNSS receivers with the EGNOS system, i.e. proper implementation of EGNOS message processing algorithms
- **Extension of Tests depending on manufacturers needs:**
 - Positioning errors
 - Acquisition and tracking thresholds
 - Performance under interfering scenarios
 - Multipath and near-far mitigation
 - Indoor performance
 - etc.

Description of current tests

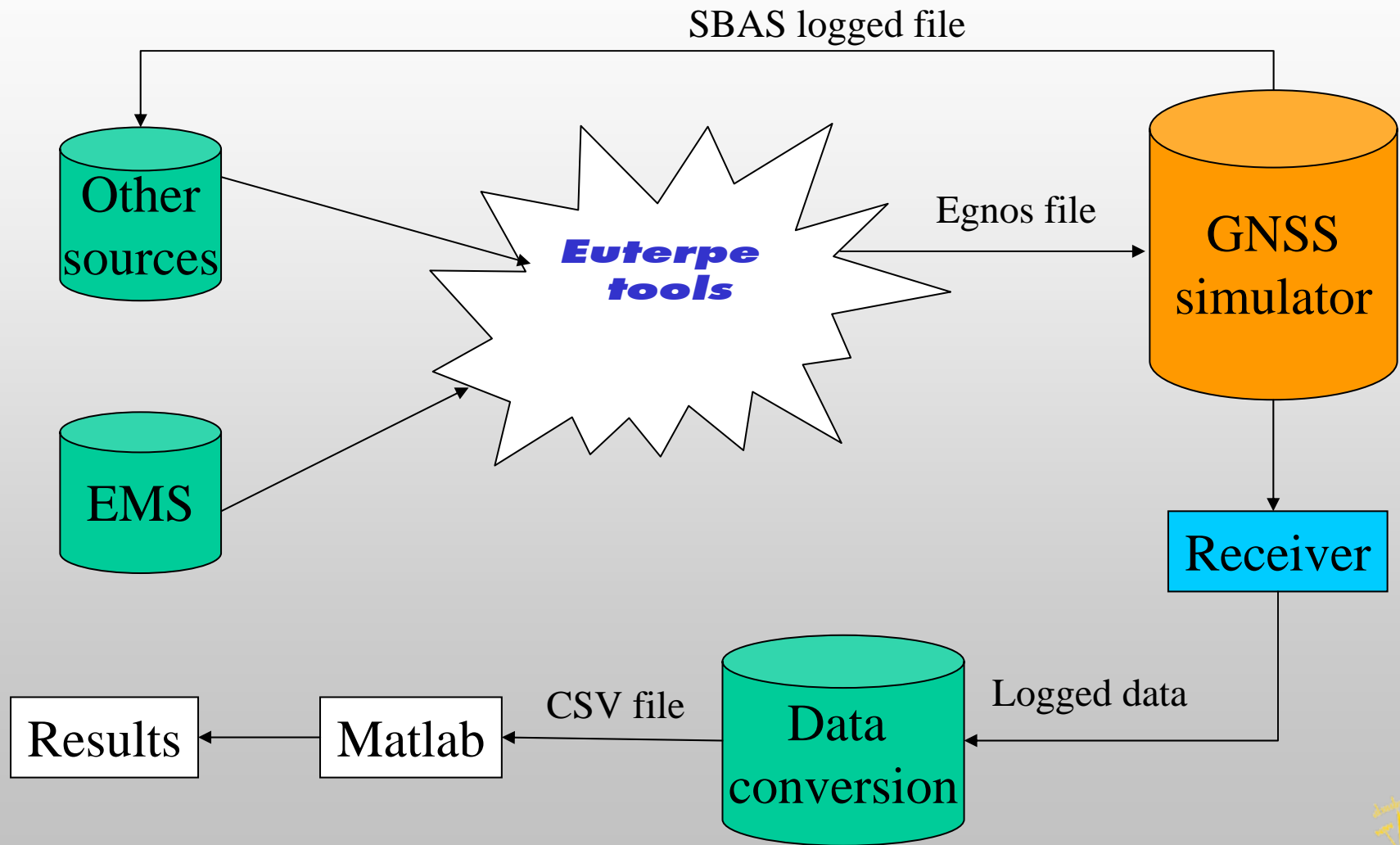
- Testing the compatibility of Rx with EGNOS broadcast from and End user point of view
- End-To-End Testing of correct algorithms implementation to decode the EGNOS messages

Test	SBAS Message	Purpose	Type of result
2	MT2-5	Fast corrections (Use of PRC and RRC).	Position fixes.
3	MT2-5	Satellites set to “do not use” or “not monitored”.	Position fixes.
10	MT25	USE of IODI.	Position fixes.
11	MT25	Time out of slow corrections.	Position fixes.
12	MT24	Use of mixed fast and slow corrections.	Position fixes.
13	MT18	Ionospheric grid definition. Change in monitored grid points.	Implicitly taken care in test 16.
14	MT26	Use of GIVD.	Position fixes.
15	MT26	Grid “do not use” / “not monitored”.	Position fixes.
16	MT26	USE of IODI.	Position fixes.
17	MT26	Time out of ionospheric corrections.	Position fixes.
18	MT26	Interpolation of IGPs.	SV used Pos Fix.
19	MT2-5	Switching GEO Satellites.	Position fixes.
20	MT2-5	Switching SBAS Operator	Position fixes.

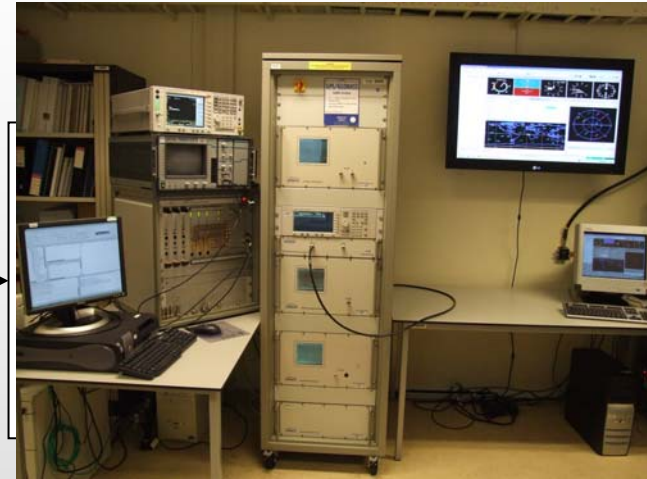
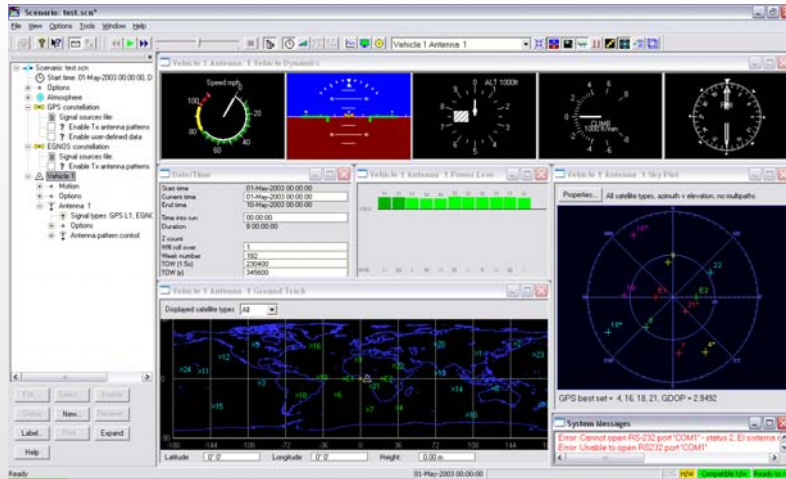
Indirect
Algorithm



Current test procedure



Testing tools



Eutерpe Tools v.0.1 - Nav data converter

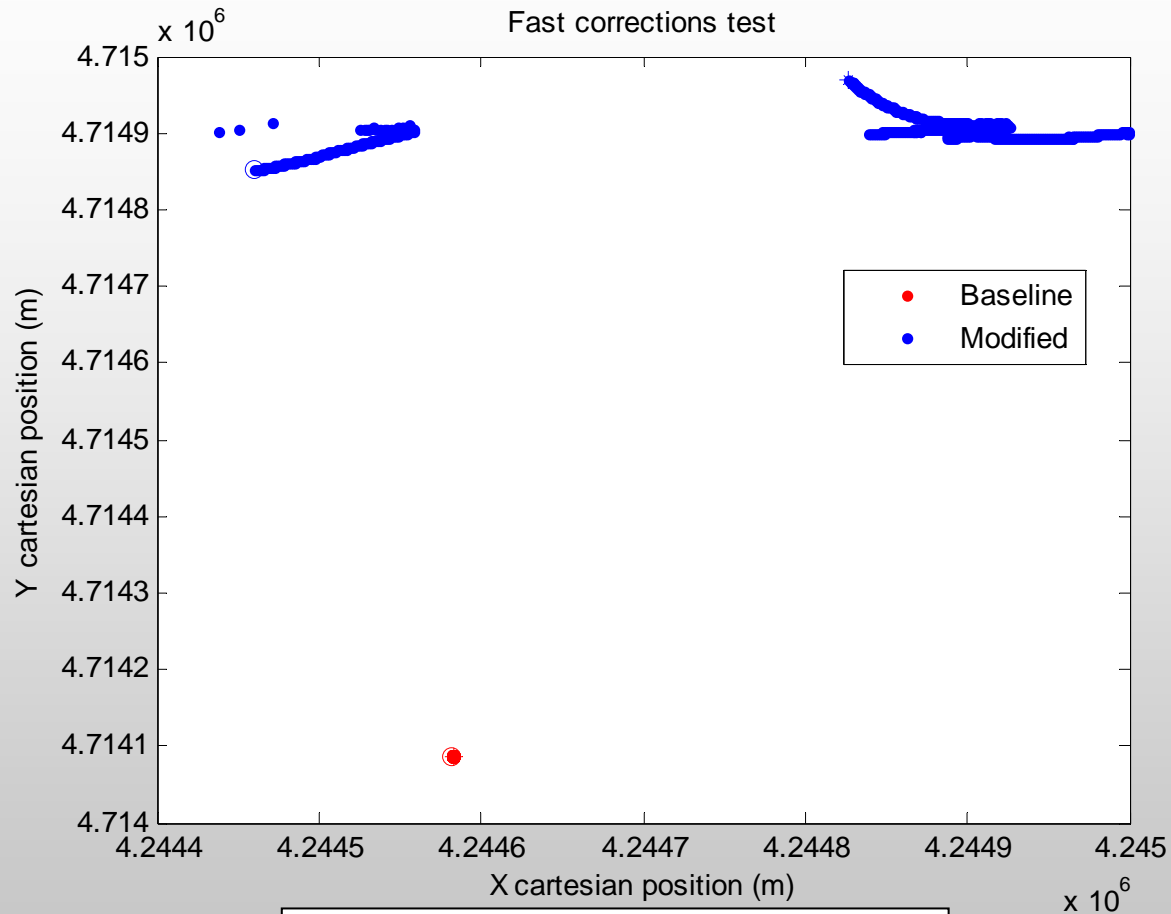
EUTERPE Tools - Nav Data converter

EGNOS file: and Settings\andri\jerez\barros\My Documents\Eutерpe\eutерpe tools\ems files\pr1 26V03.ems

Message	Preamble	MT ID	Data field	Party	
1	C6	0	80000000180000000000001F00000002000000E4EE4EEEEE	22300	Edit
2	C6	0	00000000000000004EEEEE2402404C0630014F09040702DF90	22300	Edit
3	9A	18	S30000000000000000000F00000F0000F00007F00007F	000000	Edit
4	C6	3	8FFFFF000AFF8000009FF00000000000A0004448E4EE4E	03CAF4	Edit
5	S3	0	00000001800000000000020000000000000000E4EE4EEEEE	22300	Edit
6	9A	24	0070000000000000004EEEEE2609A8503217008850FB10CB6F50	03CAF4	Edit
7	C6	7	30FFFFFFF00	41900	Edit
8	S3	3	0FFFFFFF000AFF8000009FF000000000100A0004448E4EE4E	03CAF4	Edit
9	9A	0	40000001800000000000001E00000000000000000E4EE4EEEEE	03CAF4	Edit
10	C6	24	007000000000000000004EEEEE200A1A848E64CFD0367057069F90	760001	Edit
11	S3	17	1F041CB91AD6FD000436A7F307F540000000157204601400000A9	017C31	Edit
12	9A	3	4FFFFFFF000AFF8000009FF000000000100A0004448E4EE4E	03CAF4	Edit
13	C6	0	80000001800000000000AD1F0000000000000000E4EE4EEEEE	77000	Edit
14	S3	24	007000000000000000004EEEEE240C4F0A41038FE4BEE000001F88	0C00A	Edit
15	9A	12	000	03CAF4	Edit

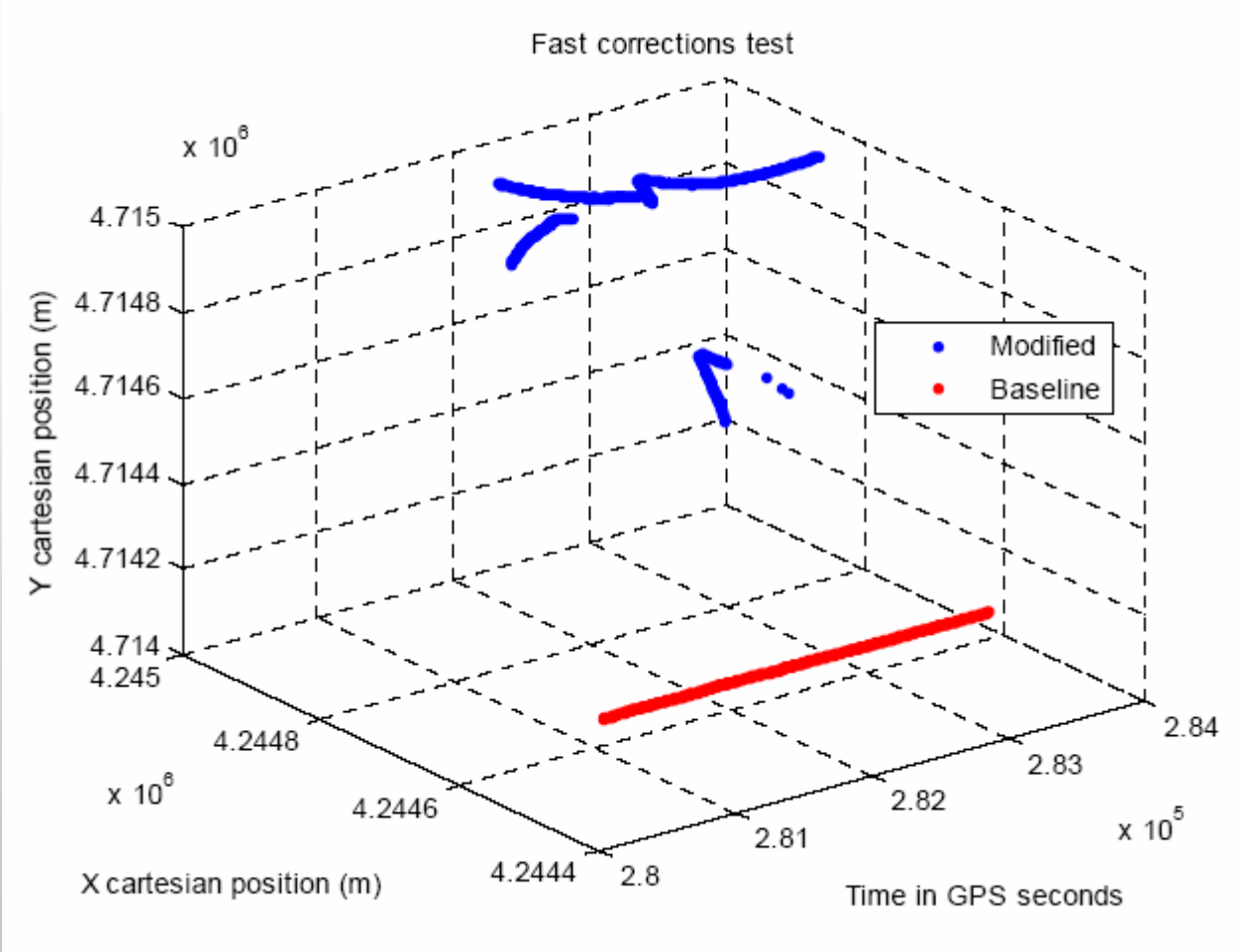


Results - Test 2

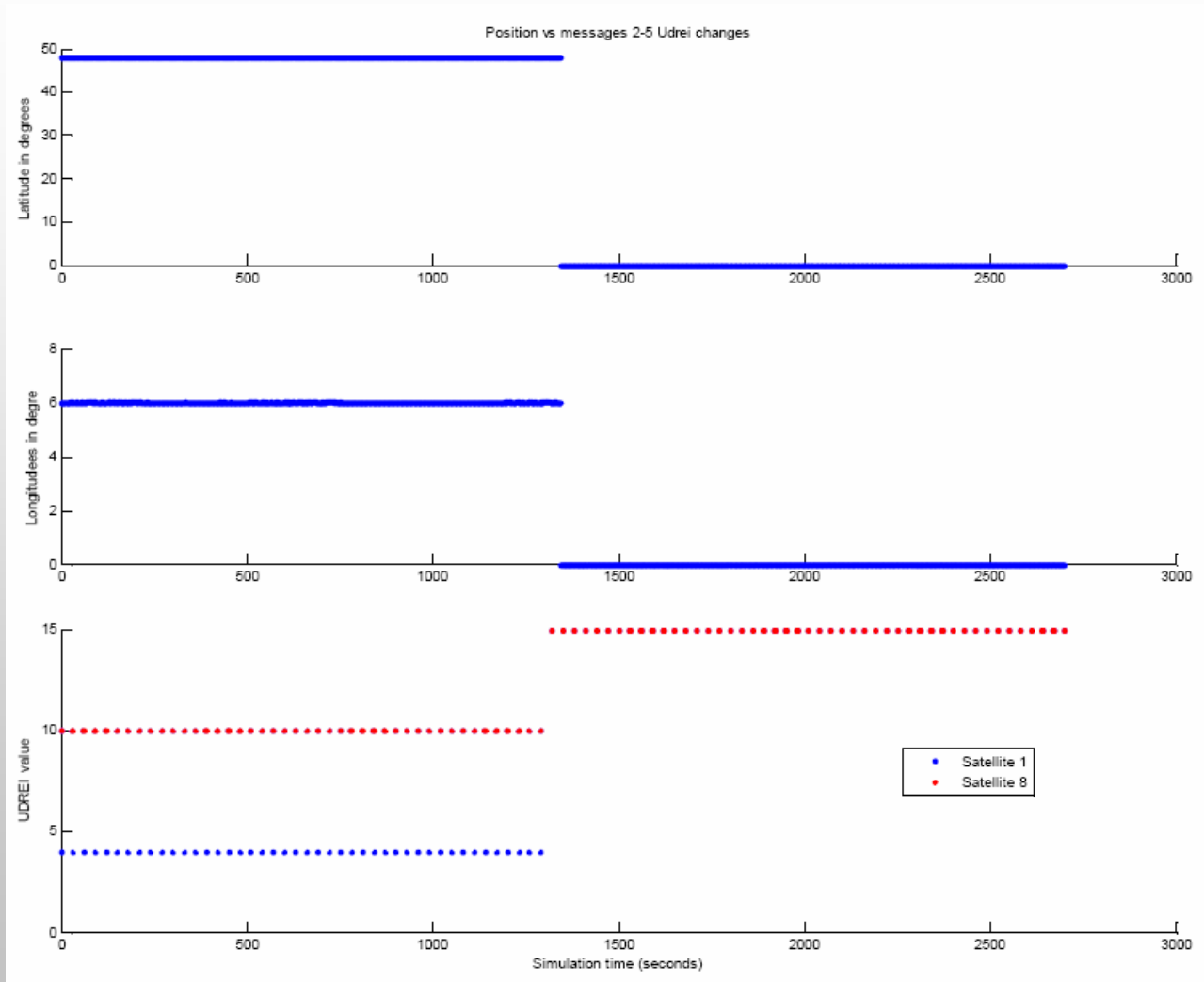


Mean diff X = 255.73 m
Mean diff Y = 820.25 m

Results - Test 2



Results - Test 3



Calibration and results publication

- **EUTERPE is in an initial phase**
 - Tools and test methodology still under validation
 - Key element: Collaboration with manufacturers
- **Tests and results will be discussed with the manufacturers before their publication**
- **Calibration and validation of the equipment and testing tools to achieve consistency**
 - Crosschecking the results
 - Periodical calibration tests
 - the STR4760 simulator is tested and calibrated periodically by the manufacturer Spirent communications Ltd.

GNSS User Equipment testing covering future modernisations

- **Constant evolution of test methodology:**
 - Pegasus Convertor will eventually be discarded in favour of using NMEA messages.
- **Extension to broader range of receivers**
 - Standalone GPS receivers
 - Indoor GNSS receivers
 - Handheld GNSS receivers
 - **Galileo receivers**
 - etc

Conclusions

- **Sophisticated tools and a consolidated test strategy is a must for comparing Rx**
- **Reducing human interaction**
 - Eliminate subjectivity (the tests are either a pass or a not pass)
- **Interaction with manufacturers**
 - Maintain good relations
 - Remain independent
 - Identify receivers to test and discussing the results has proven useful for both parties
- **Galileo receiver testing in the coming years**

**Thank you for your
attention**