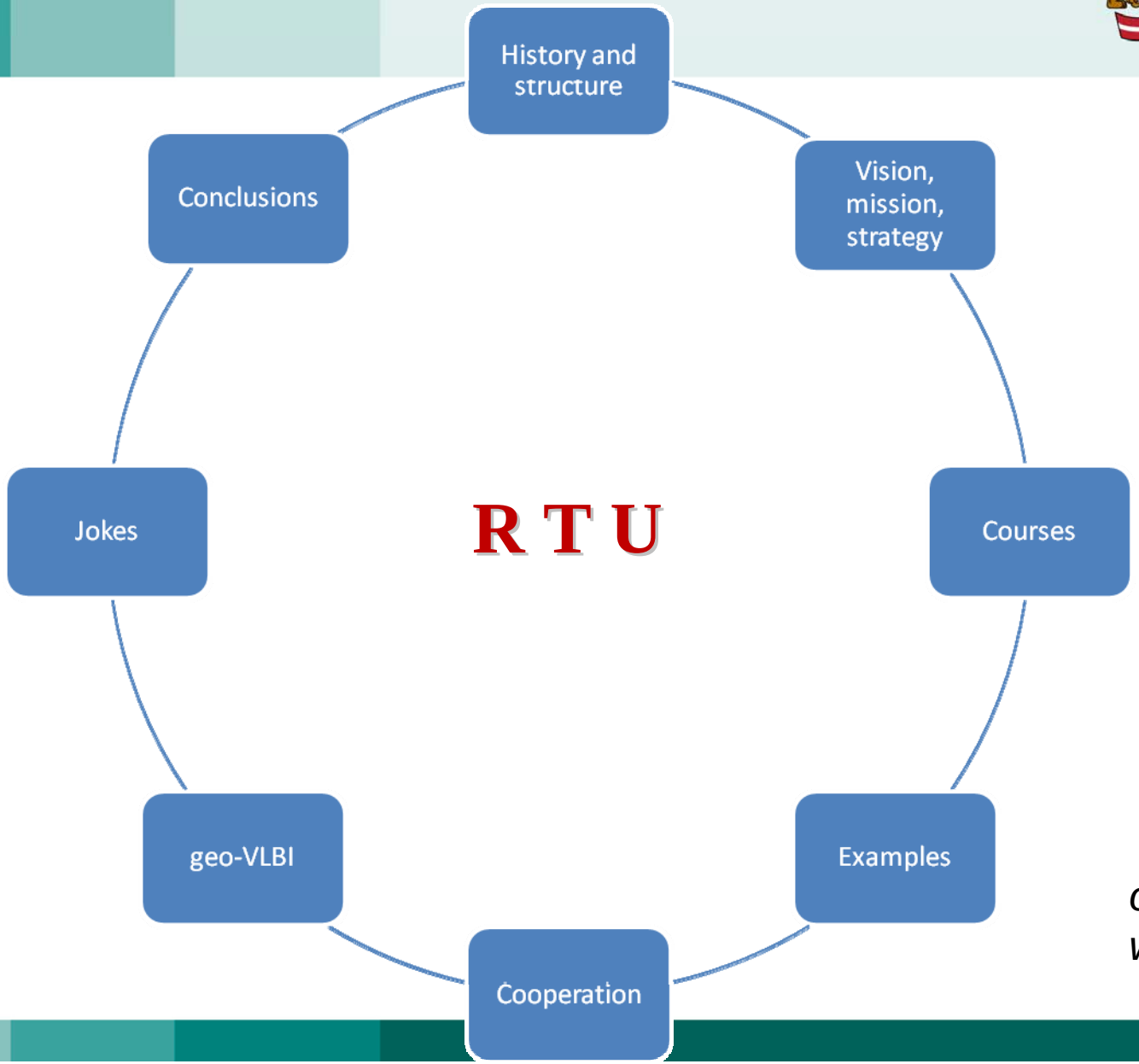
GNSS education and development in the Riga Technical University

Presented by Jānis Kaminskis

OUTLOOK



or Vienna wheel

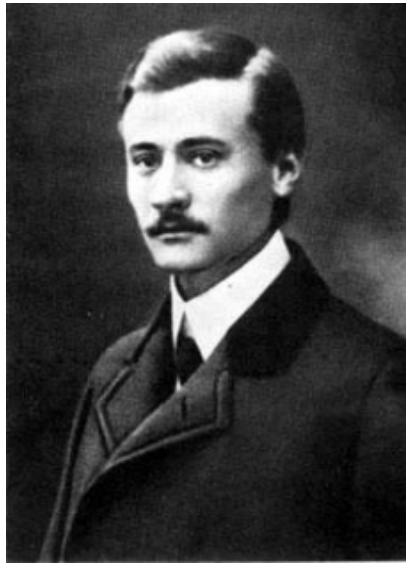
Riga Technical University

Photo of
main building

Riga
Politechnikum
first classes
started on
October 2, 1862

Next year
150 years
anniversary

ROOTS OF GNSS



FRIEDRICH ZANDER (1887 – 1933)

Riga Politechnikum Alumni

Pioneer of rocketry; calculated precise trajectory that a spacecraft would take to Mars

Designer of the first liquid-fuelled rocket

Faculties of RTU

- Architecture and Urban Planning
- Civil Engineering
- Computer Science and Information Technology
- Electronics and Telecommunication
- Power and Electrical Engineering
- Engineering Economy and Management
- Materials Science and Applied Chemistry
- Transport and Mechanical Engineering

RTU comprises (1/2)

- 8 faculties
- 35 institutes
- 49 departments
- 35 divisions
- 29 laboratories
- 29 research centers

RTU comprises (2/2)

- 900 academic staff
- including 500 researchers
- 867 involved in research work
- 400 doctoral students
- 17 000 students, mainly on Bachelor and Master

WE RTU (1/2)

VISION
RTU – modern, prestigious and internationally recognized university – European studies, research and innovation centre, a cornerstone of Latvia's development

MISSION
To provide Latvian national economy with qualified human resources for its stable growth and development

STRATEGY
Excellence in research,
Excellence in study process,
Organizational excellence and identity
Outstanding infrastructure

WE RTU (2/2)

- **excellence and recognition in science**: publications in leading journals of engineering, SCI

- **entrepreneurship and innovation** – to meet the needs of industry for research: to produce offspring for new companies: to encourage innovation flow

- **internationalization and cooperation**: to link with other research institutions: to integrate in ERA: share infrastructure; staff mobility

International Mobility

Kaspars Kalniņš

Dr.sc.ing. Kaspars Kalniņs, the docent of Riga Technical University Institute of Materials and Structures, is the first Latvian scientist to undergo international research fellowship at the European Space Agency European Space Research and Technology Centre in the Netherlands.

List of Courses with GNSS (1/2)

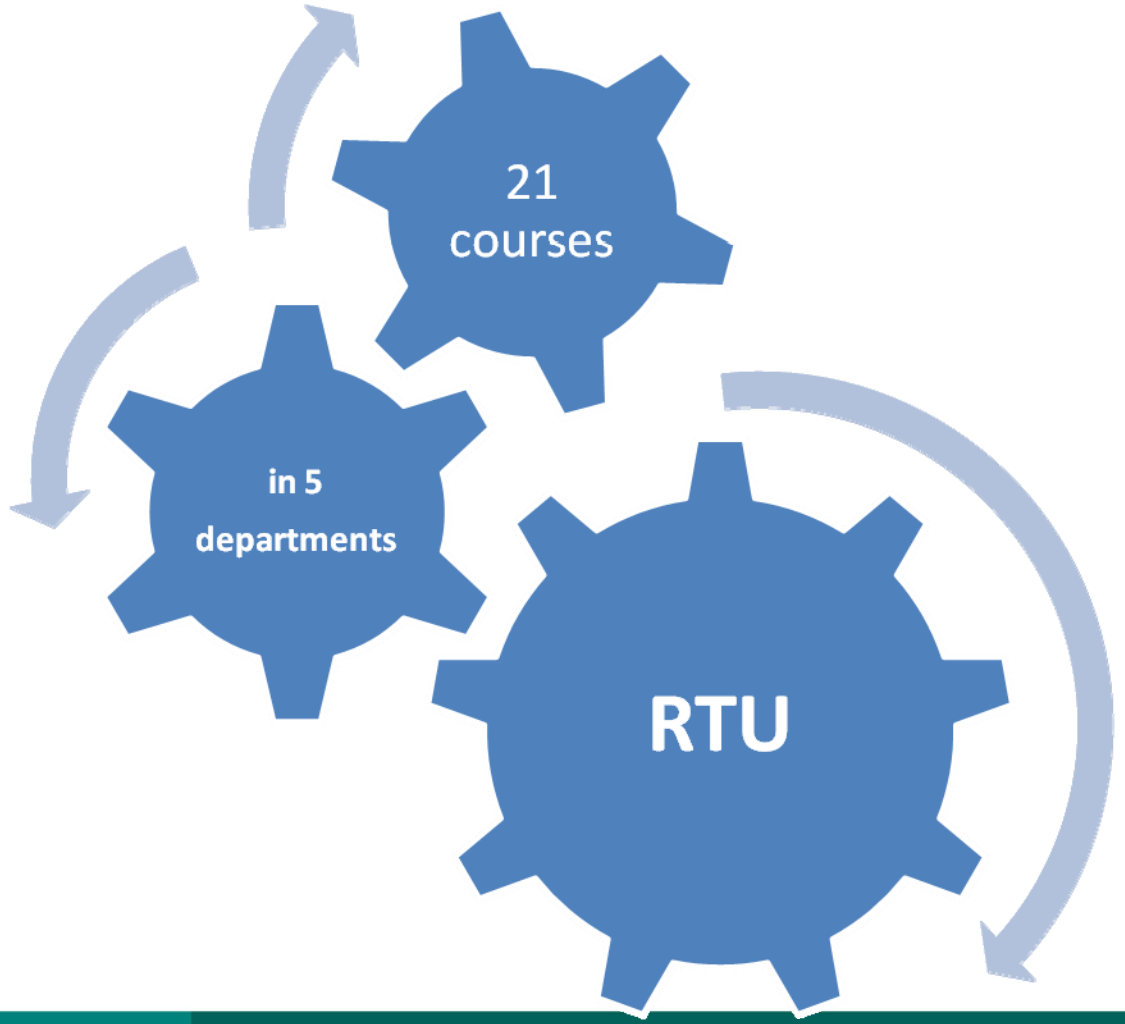
Nr.	Code	Name	Academic staff	CP	Structure*
1.	**BĢE316**	Geodetical Measurements Processing	Štrauhmanis Jānis	6.0	(3.0- 0.0- 3.0); E
			Part 1	3.0	(2.0- 0.0- 1.0); E
			Part 2	3.0	(1.0- 0.0- 2.0); E
	Latvian, Russian lang.				
2.	**BĢE330**	Geodetical Measurements Processing	Kaļinka Māris	5.0	(3.0- 0.0- 2.0); E
			Part 1	3.0	(2.0- 0.0- 1.0); E
			Part 2	2.0	(1.0- 0.0- 1.0); E
	Latvian, English lang.				
3.	**BĢE516**	GPS Heighting	Reiniks Mārtiņš	3.0	(1.0- 0.0- 2.0); E
	Latvian lang.				
4.	**BĢE603**	Geodynamics	Kaminskis Jānis	7.0	(3.0- 0.0- 4.0); T
	Latvian lang.				
5.	**BĢE604**	Photogrammetry and Remote Sensing	Kaļinka Māris	8.0	(4.0- 0.0- 4.0); E
	Latvian lang.				
6.	**BĢE607**	Global Navigation Satellite Systems in Geodesy	Kaminskis Jānis	5.0	(3.0- 0.0- 2.0); T
	Latvian lang.				
7.	**DMI374**	The Basics of Logistics Information Systems	Merkurjevs Jurijs	3.0	(2.0- 0.0- 1.0); E
	Latvian lang.				
8.	**DMI509**	Software of Computer Simulation	Merkurjeva Gaļina	3.0	(2.0- 0.0- 2.0); WE
	Latvian, English, Russian lang.				
9.	**DMI705**	Basics of Logistics and Supply Chain Management	Lektauers Arnis	4.0	(2.0- 0.0- 2.0); E
	Latvian, English, Russian lang.				
10.	**DMI706**	Information Technologies in Logistics	Romānovs Andrejs	4.0	(2.0- 0.0- 2.0); E
	Latvian, English, Russian lang.				
11.	**DST459**	High-speed Mobile Networks Architecture	Zagurskis Valerijs	3.0	(2.0- 0.0- 1.0); E
	Latvian, English, Russian lang.				
12.	**RTR407**	Radiowave propagation and signals in mobile telekommunication systems	Grēve Juris	2.5	(2.0- 1.0- 0.0); W
	Latvian, English, Russian lang.				

List of Courses with GNSS (2/2)

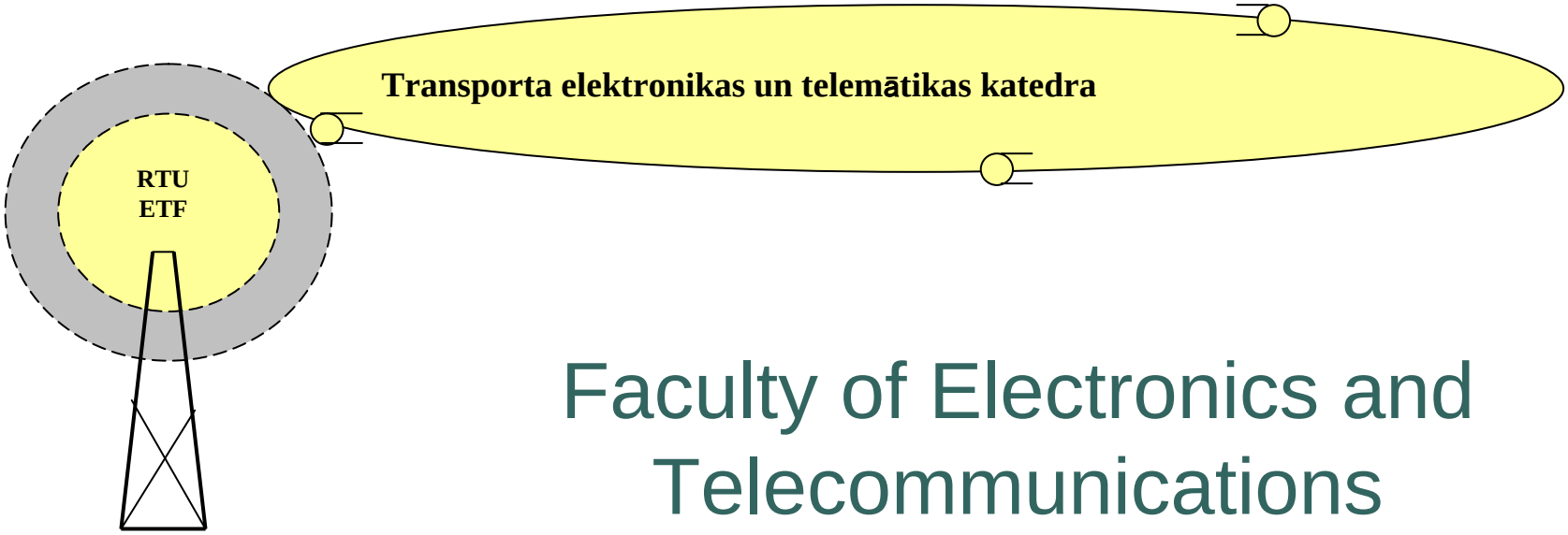
13.	**TAA102**	Digital Techniques. Electronic Instrument Systems of Aircraft	Trifonovs-Bogdanovs Pjotrs	3.0	(2.5- 0.0- 0.5); E
			Part 1	1.0	(1.0- 0.0- 0.0); E
			Part 2	2.0	(1.5- 0.0- 0.5); E
	Latvian, Russian lang.				
14.	**TAA512**	The Global Navigation and Air Traffic Control Systems	Pridanovs Vladimirs	2.0	(1.5- 0.5- 0.0); T
	Latvian, Russian lang.				
15.	**TAA530**	Global Navigation Satellite System	Trifonovs-Bogdanovs Pjotrs	2.0	(1.5- 0.5- 0.0); T
	Latvian, Russian lang.				
16.	**TMN218**	Computer Modeling of Transport Processes	Santalova Diāna	2.0	(1.5- 0.0- 0.5); E
	Latvian, English, Russian lang.				
17.	**TMN228**	Computer Modeling of Transport Processes (study project)	Santalova Diāna	2.0	(0.0- 1.0- 1.0); W
	Latvian, English, Russian lang.				
18.	**TRL523**	Communications System Models	Pētersons Ernests	3.0	(1.0- 0.0- 2.0); E
	Latvian, English, Russian lang.				
19.	**TRL641**	Computer Networks Quality of Service Theory and Approaches	Pētersons Ernests	8.0	(4.0- 2.0- 2.0); T
	Latvian, English, Russian lang.				
20.	**TRT439**	Aircraft Radionavigation Systems	Klūga Ansis	7.0	(5.5- 1.0- 2.5); E
			Part 1	5.0	(4.0- 0.0- 2.0); E
			Part 2	2.0	(1.5- 1.0- 0.5); E
	Latvian, English, Russian lang.				
21.	**TRT604**	Global Positioning Systems	Klūga Ansis	15.0	(15.0- 0.0- 0.0); E
			Part 1	8.0	(8.0- 0.0- 0.0); E
			Part 2	7.0	(7.0- 0.0- 0.0); E
	Latvian, English, Russian lang.				

* Structure: (Lectures-Practical-lab); tests [/tests for cources of free choice]

What to improve …



Excellent example within RTU



Faculty of Electronics and Telecommunications

Department of Transport Electronics and Telematics

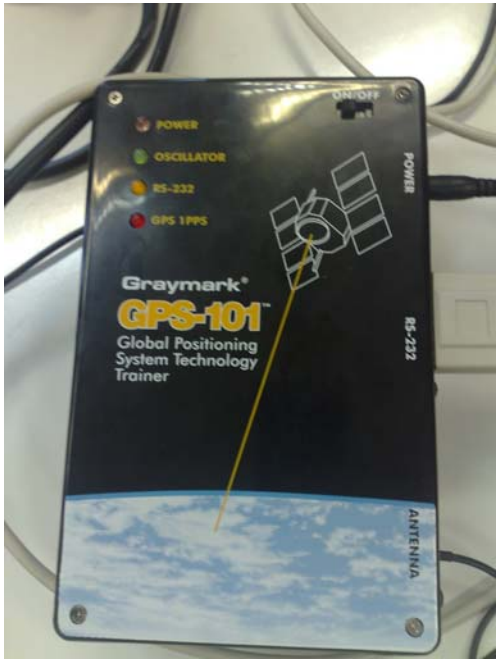
Head of department professor Ansis Kluga

Laboratory of Radio Navigation Systems

Receiver of satellite system “TRANZIT”

Re-reference system

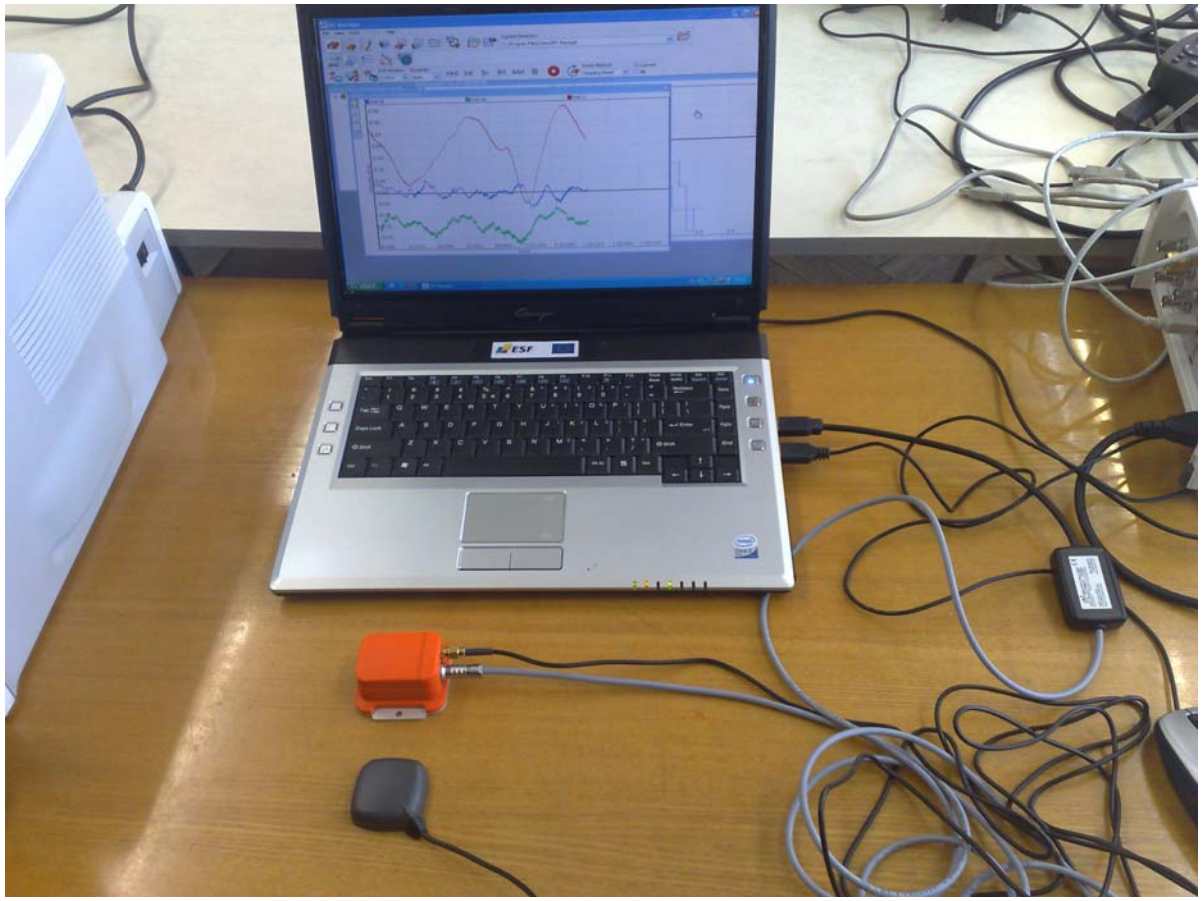
GNSS receivers'

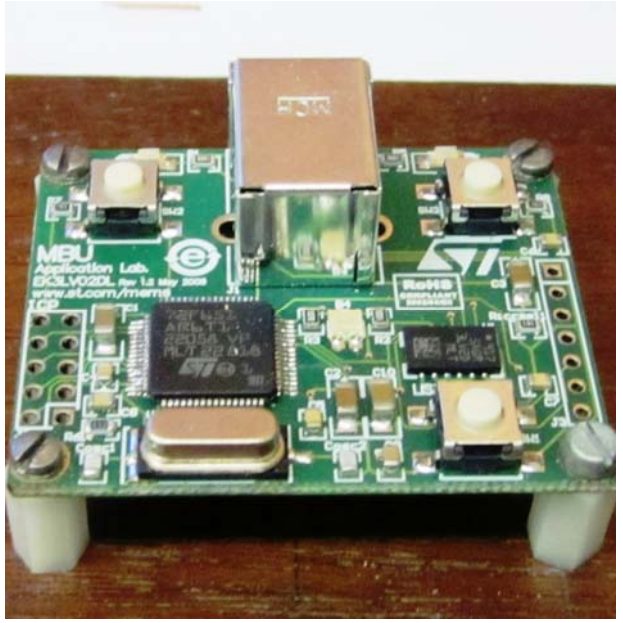


GNSS “ planetarium ”

Satellite signal simulator STR4500

GNSS + IMU



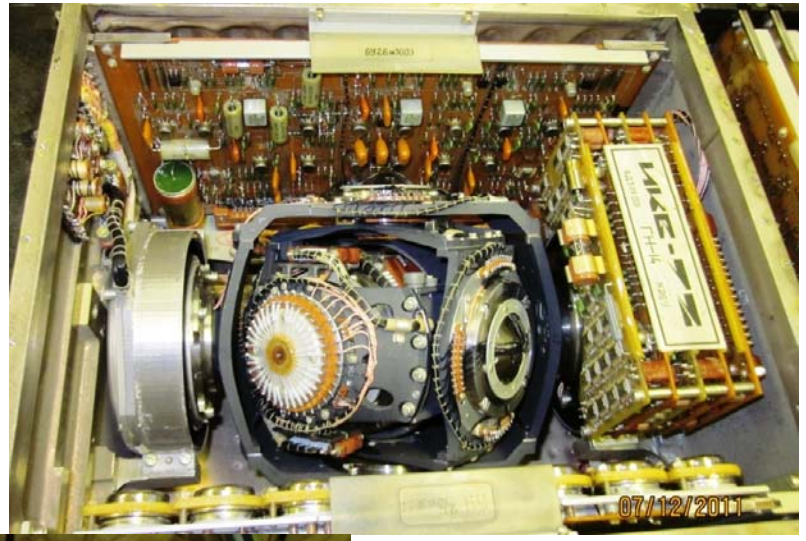


Research of complex navigation system GPS and Inertial Measurement Unit = **IMU** (Mti-G)

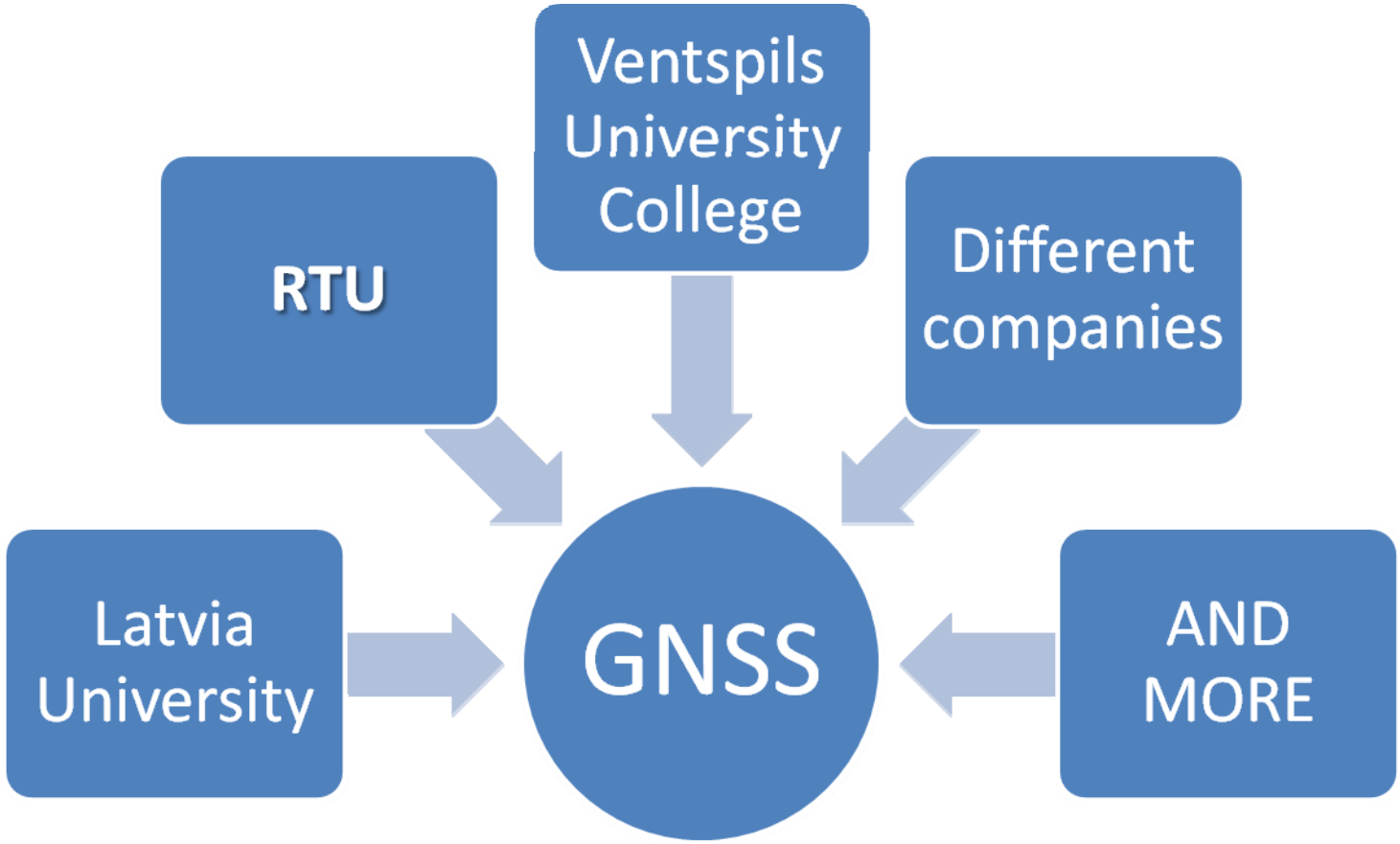
Professors fulfill curriculum

Students and professors researching
of satellite systems precision

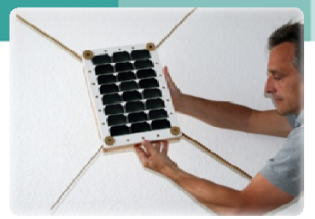
Historical IMU devices for students



Development and cooperation



AIS nanosatellite



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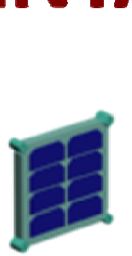
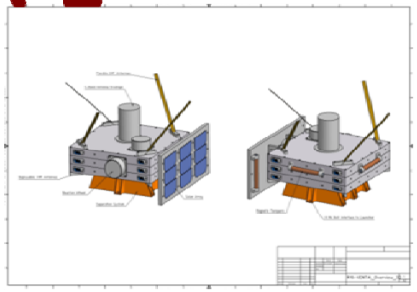
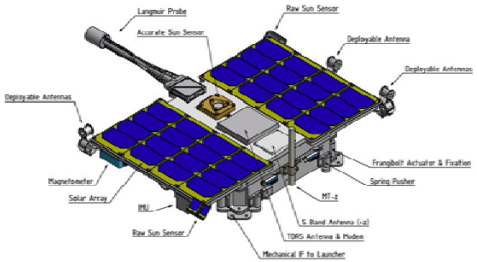
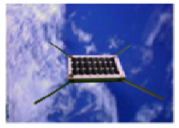





Tests

Frequencies

2008	2009	2010	2011

IZGLĪTĪBAS un ZINĀTNES MINISTRIJA

V H T P VENTSPILS HIGH TECHNOLOGY PARK

AAC Microtec

ViRAC DLR Institut für Raumfahrtsysteme OHB SYSTEM rubinX AISat

University Nanosatellite from Bremen for Maritime Space and AIS Technology Development AISat

Development and cooperation

Together
introduce
geodetic
VLBI =>
Important for
precise GNSS
positioning

Partners:
http://virac.venta.lv/en/

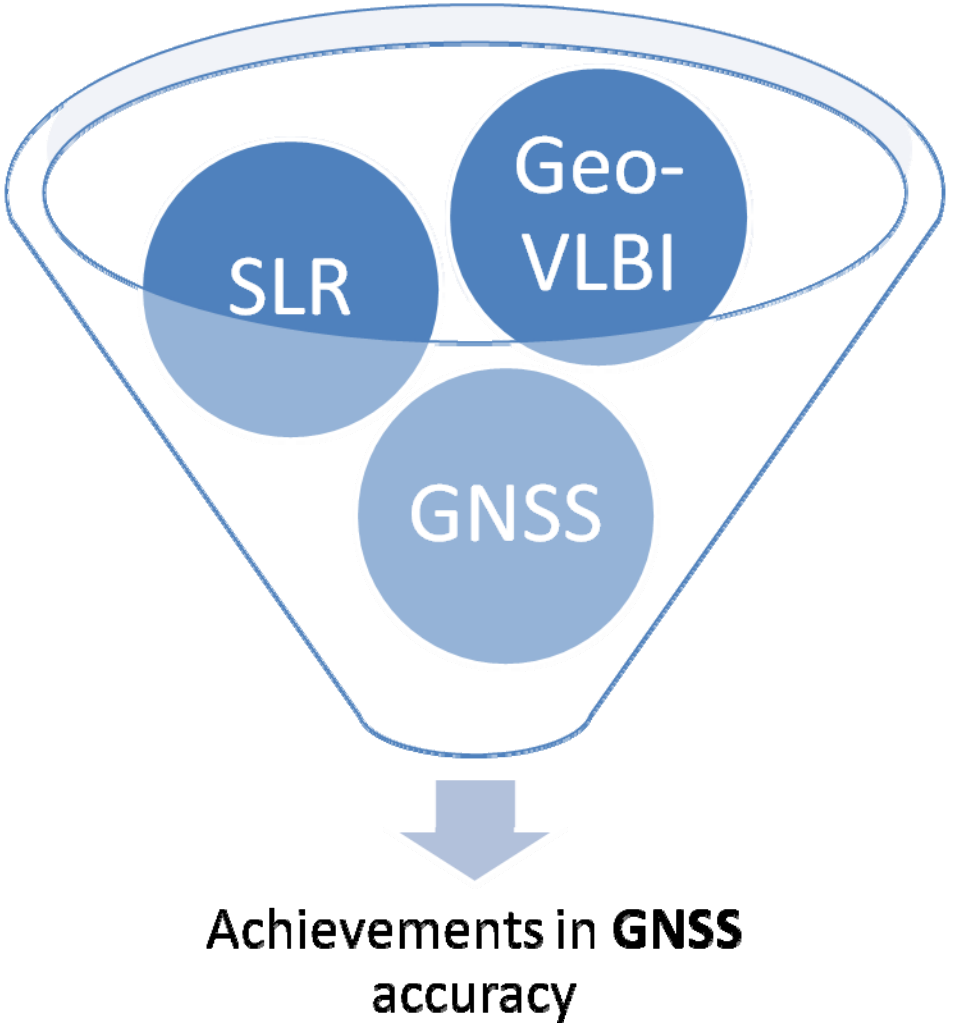
Development and cooperation / geo-VLBI

RT – 32 → D=32m

VIRAC has been founded in 1994 on base of former military site, contained two parabolic antennas with diameter 32 and 16 meters

Possible use in geo-VLBI

Combinations for development or future

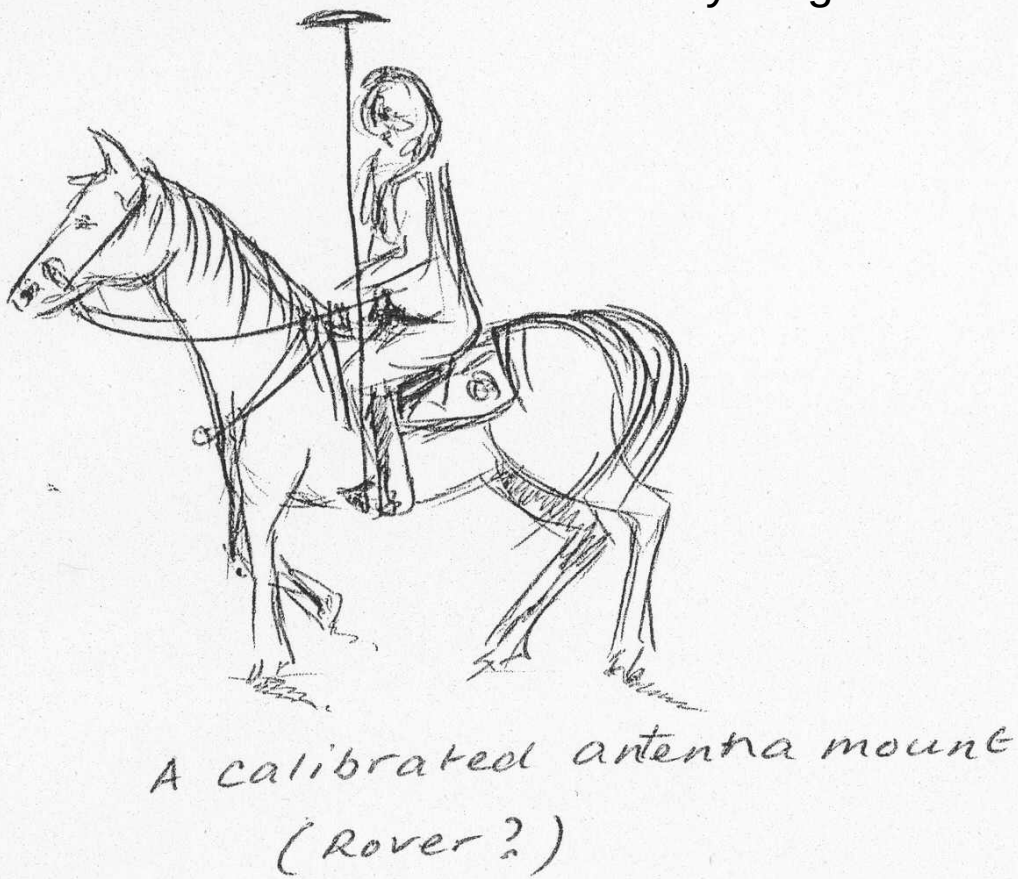


Jokes important:

- The professor of the earth science class was lecturing on map reading and GNSS. After explaining about latitude, longitude, degrees, minutes and seconds the teacher asked, "Suppose I asked you to meet me for lunch at 56 degrees, 57 minutes north latitude and 24 degrees, 4 minutes east longitude...?"
- After a confused silence, a voice volunteered, "I guess you'd be eating alone."

EUREF 2006 in Riga

Jokes for understanding of everything



Innovative GNSS rover

© Carl Calvert

http://www.euref.eu/symposia/2006Riga/Symposium2006-Riga.html

EUREF 2006 in Riga

© Carl Calvert

Innovative GNSS antenna in rainy or sunny weather

Because we had at EUREF 2006 to much rain or sun some days

CONCLUSIONS

- The capacity of research staff is increasing as number of doctoral students
- Scientific capacity of RTU is growing and cooperation with business enterprises in Latvia and abroad is expanding
- Structural changes in project management system ensure high level of research quality
- The cornerstone of faster development of cooperation with business enterprises is active involvement of alumni organizations
- Work all together and use innovations, + knowledge transfer
- Create regional centers, organize summer schools and centers of excellence for GNSS together with Nordic countries

Thank you for your attention!

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