

**THE GLOBAL NAVIGATING
SATELLITE SYSTEMS:
EXPERIENCE IN
PREPARATIONS AND IMPROVEMENTS OF
PROFESSIONAL SKILL OF SPECIALISTS
IN THE BMSTU**

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Now in curriculums of the majority of the Russian high schools **there is no specialty or specialization in satellite navigation**, as an independent field of knowledge.

Since 2000 in BMSTU the course **“Radio navigating systems”** is read by total amount of 120 hours, including:

- course of lectures - 50 hours,
- laboratory works - 20 hours,
- themselves work of students - 50 hours.

At studying of a course students use monographers and textbooks by Russian authors, and also **the manual prepared in BMSTU on GNSS**.

The manual

“Global navigating satellite systems”



- Principles of radio navigation, construction and functioning GNSS, methods of measurement of navigating parameters.
- Subsystem of the control and management, system of time and coordinates, structure of signals and messages GNSS.
- Navigating equipment of the consumer, including angular (space) orientation.

- Navigation-time Accuracy of definitions, differential correction and relative measurements.
- Complexes systems of navigation.
- The project "Galileo".

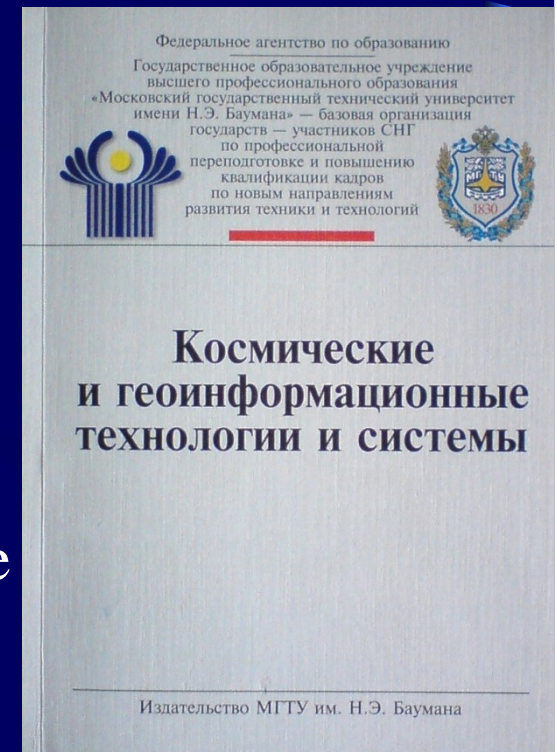
Educational-methodical complex for professional retraining and professional skill improvement

Set A “Space both a geo information technology and systems”. (674 hours)

- Electrodynamics, distribution of radio-waves, bases of antenna techniques.
- Antenna systems for geostationary and low-altitude space vehicles.
- Satellite navigating systems.
- Mobile and fixed satellite communication systems
- Geo information systems

Set B “Outer-space communication and navigation Systems”. (72 hours)

- Antenna systems for geostationary and low-altitude space vehicles.
- Satellite navigating systems.



Distance learning in BMSTU

Since 2007 at Interbranch institute of improvement of professional skill of shots in new directions of development of technics and technology remote training about 2000 civil servants is carried out.

After drawing up of the individual curriculum the listener receives login and password for access on the educational portal and opens access to an individual set of modules of a course (usually from 1 to 6) for studying.

In process of passage and upon termination of each educational module the listener answers questions. The score on all modules and points of total testing defines an estimation for the theory at all course.

In process of passage of a course on the basis of materials of educational modules the practical task is carried out.

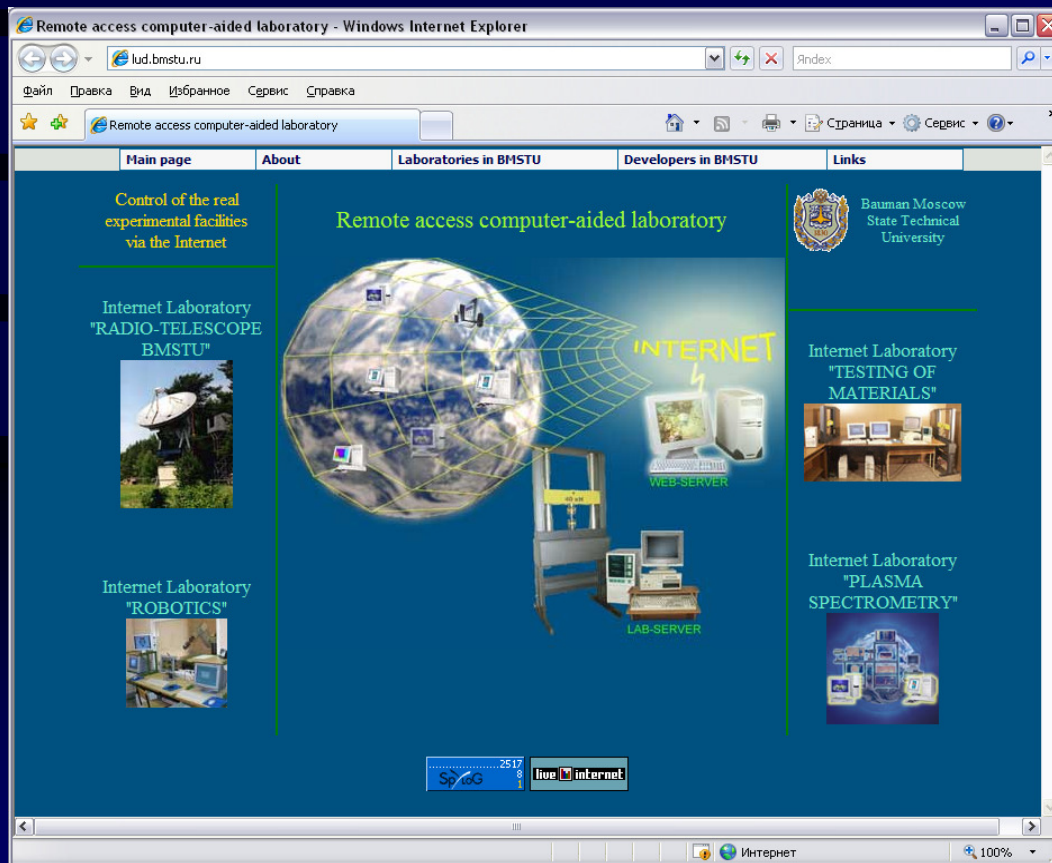
Distance learning in BMSTU

For the period of training to each listener the tutor who is ready to answer all questions under the course maintenance, performance of practical tasks and work in system of remote training is appointed, it supervises performance of the schedule of training. The forum, chat, e-mail are for this purpose used.

To the listener who has successfully finished a course of remote training, the tutor appoints day and passing an examination time in the institute.

At examination protection by the listener of the practical task and an estimation of level of studying of a course taking into account an estimation for a theoretical part then the document on the termination of training stands out is made and the contract is closed.

The Remote Interactive Dialogue System RIDS is developed at the BMSTU for carrying out practical trainings via the Internet



There are four Internet-laboratories based on RIDS:

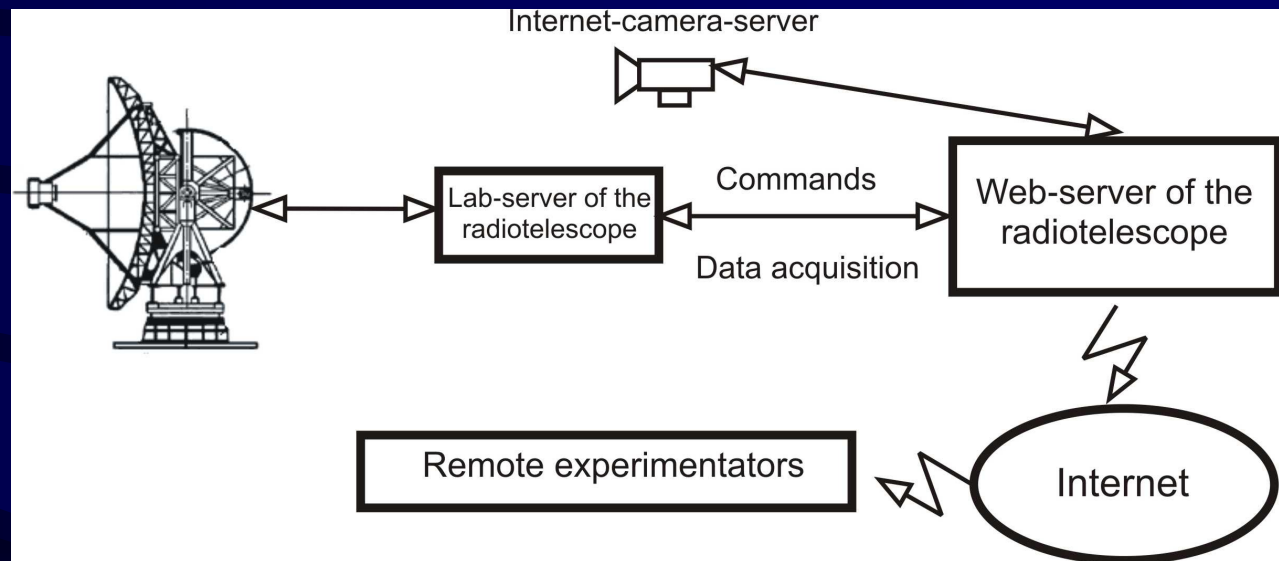
- “Plasma Spectrometry”
- “Testing of Materials”
- “Bauman University Radiotelescope”
- “Robotics”

<http://lud.bmstu.ru>

Internet-laboratory

“Bauman University Radiotelescope”

Bauman University Radiotelescope is one of the largest in Europe (antenna diameter - 7,75 m, weight – about 20 tones) of the millimeter wavelength range (1-4 mm)



Created remote access system allows carrying out experiments by individual scenarios via global network.

Internet laboratory “Bauman University Radiotelescope”

**Internet - Laboratory
Bauman University Radiotelescope**

INFORMATION ON RADIOTELESCOPE

- General information
- General arrangement
- Receiver arrangement
- Maintenance personnel
- Photo Gallery

EXPERIMENT DATA

- Visualization example
- Data base

CARRYING OUT EXPERIMENTS

- Remote experiment scheme
- Conditions
- Control interface Execution

REMOTE PRACTICAL WORKS

- Radiophysical objects equipment and solar scanning techniques
- Others

USER ACCOUNTS

- Registration
- Log in
- Scripts
- Log out

[Welcome to the site of one of the unique millimeter-range Radiotelescope!]

The Radiotelescope is located on the bank of the Moscow Channel, between the towns Dmitrov and Dubna, 90 km from Moscow. At this site you can get acquainted with the Radiotelescope arrangement, have a look at the solar maps registered in the mm-wavelength range, and study them with the help of built-in network tools.

The Radiotelescope is available via the Internet to students and post-graduate students of the RF for laboratory training and research. On entering the section "Remote training" you can carry out the laboratory work "Radiophysical Objects Equipment and Scanning Techniques". You will be able to create your own experiment scenarios and work with real equipment sitting at your own computer far away from the Radiotelescope!

Remember, that you are running a real experiment on the unique equipment with the mass of mobileparts about of 20 tons! It is not a simulation program!

The experiment can only be carried out in case of favorable weather conditions. Information on the progress of you experiment scenario is available in the section "Your scenarios".

T, K	P, MM
288	760
288	760
287	760
285	760
285	760

UT "КОЛЬЦЕВОЙ СКАН"

89.97

96.47

Местная интрасеть 100%

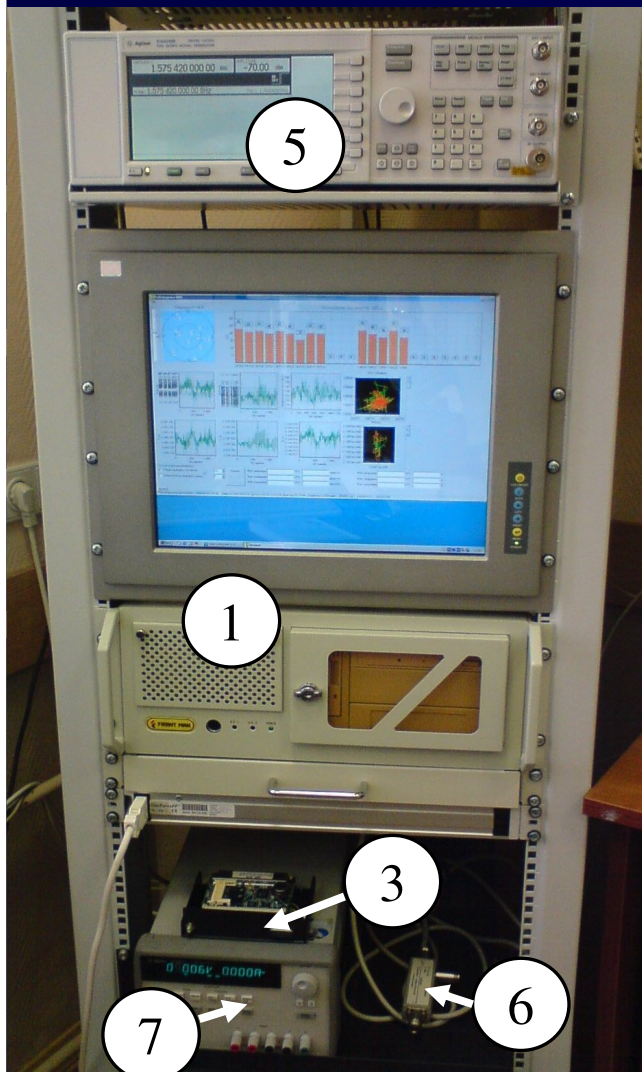
RT-7.5 MSTU

http://rtelescope.bmstu.ru/html/view_user_exp.html#

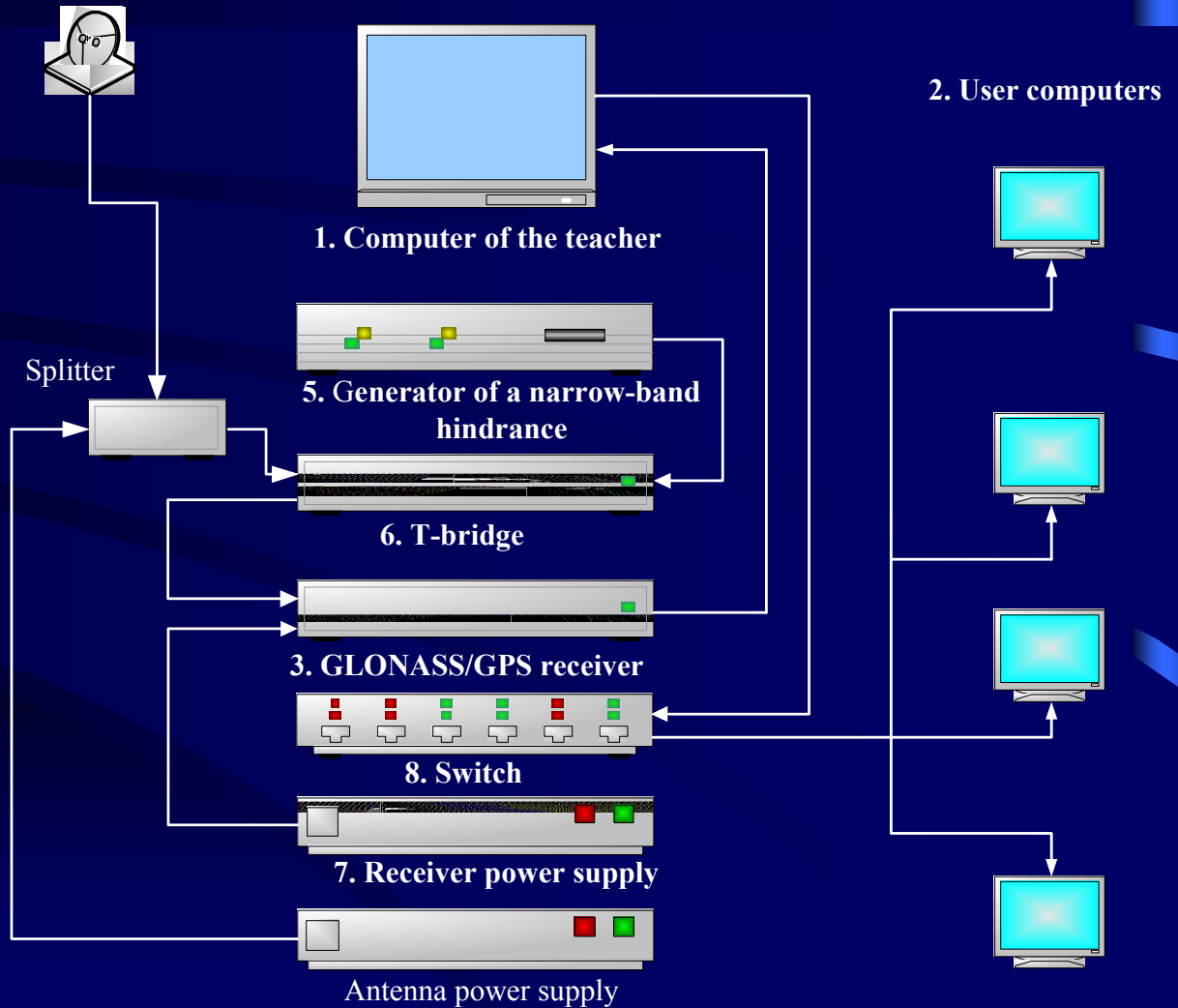
Интернет

Remote control allows abroad using of the unique equipment in science and educational aims.

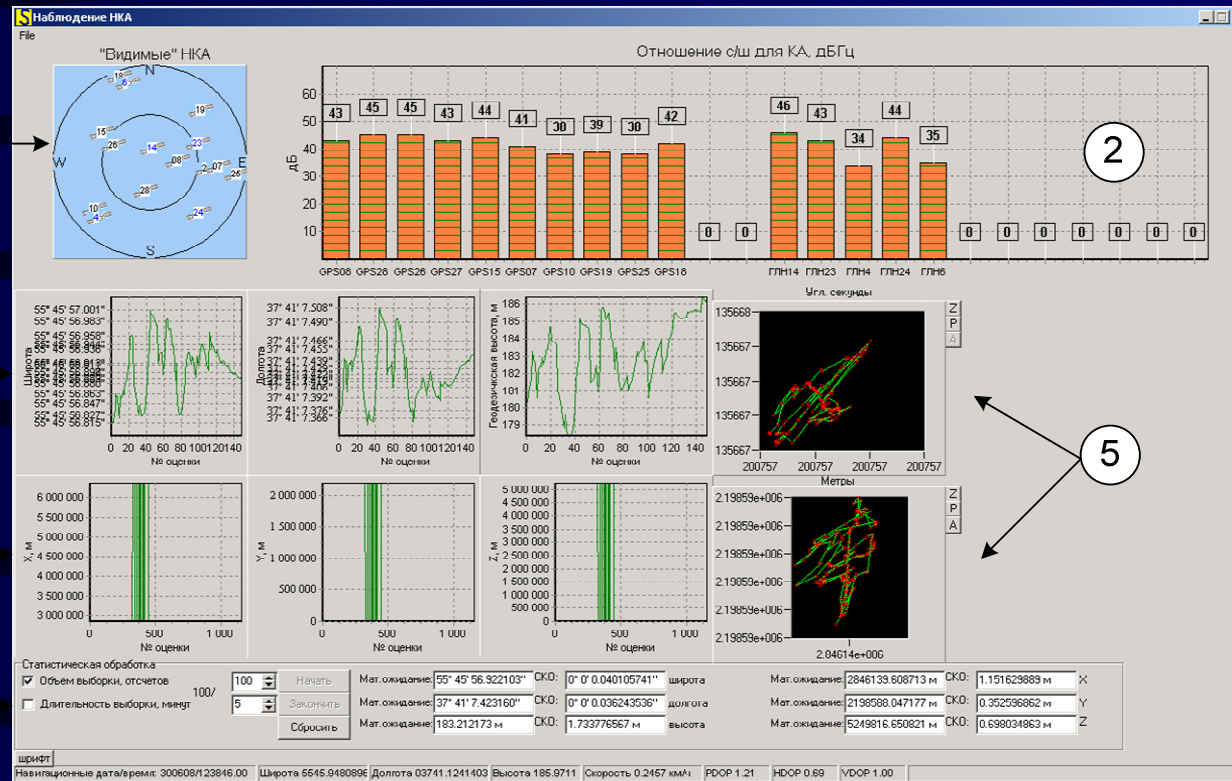
Laboratory practical work “Research of the basic characteristics of navigating equipment of the consumer”



4. Active antenna



User interface



1 - the visible satellite diagram

2 – signal-to-noise ratio in channels of the receiver,

3 - geodesic coordinates,

4 - geocentric coordinates,

5 - coordinates disorder in the plan,

6 - results of statistical processing,

7 - current date and time,

8 - consumer condition vector,

9 - GDOP.

The stand software allows:

- to control operating modes of the navigating receiver;
- to work with one system GLONASS or GPS, and also in the combined mode;
- to change quantity of used navigation-space vehicles and geometry of observable constellation;
- to investigate in real time receiver precision characteristics at presence and absence of the director of hindrances.

On the basis of the stand **creation of practical works of remote access** “*Research of the basic characteristics of navigating equipment of the consumer*” and “*Satellite navigating equipment with the goniometric channel*” is planned.

Thank you very much for
attention!