Precise automatic SW for SLR-station and complex analysis of SLR data

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Abstract

As a result of a joint effort of the Institute for Precision Instrument Engineering (IPIE), and the Laser Group of the Russian Mission Control Center (MCC) as an Analysis Center (Lageos's data precise analysis) and an Operation Center of the Russian SLR network (QL-NP preparation for the Russian stations), summarizing the experience of Russian SLR-stations during the last 10 years, a new software has been developed combining high-accuracy data analysis methods, calculation automatization, extended capabilities for graphical monitoring of SLR data quality, as well as modern level of SW implementation. The SW consists of four interrelated parts and may be used at SLR-stations in an automatic mode for building up observation plans and complex processing of measurement results, as well as for a more detailed analysis of measurements made by the worldwide SLR network. There is an implementation of the SW at a single Pentium PC and at several PC's within a network with an access to the common database. The implementation means are: Borland C++ Bilder, DRC FORTRAN 6.00, OS Windows 95/98/etc.; the operational interface language is English. The SW may be proposed for installation at SLR-stations, operational centers monitoring the stations operation, and for use in precision data analysis groups.

The STARK program package may be used on SLR-stations as a basic or supplementary software, as well as in the SLR Data Analysis Centers and Operational Centers for monitoring of the network stations operation quality.

This package has the following basic functions:

- Day-long operation planning for a given station, based on IRVS data and the satellite tracking priority list, with an account for a wide set of limitations for particular sessions (elevation angles, angles between the satellite line-of-sight and the Moon or Sun, time of transition to another target tracking, required session duration, etc.).

- Data computation in the GL-NP format based on "raw" measurements with a reliable sorting out of anomalous data in an automatic operation mode.

- Complex analysis of any SLR-station measurements quality, based on broad capabilities for visualization of results; computation of range and time biases, measurement conditions (elevation, azimuth, etc.).

- High-accuracy orbit determination of satellites based on SLR measurements.

- Graphical analysis of satellite ephemeris computation accuracy (monitoring of the IRVS computation accuracy).

- Computation of SLR-stations operation quality statistics.

The package is founded on a database, which can be used in a monopolistic mode, as well as in a multi-user network option. The operator interface is implemented in English language. A fully automatic package operation mode is implemented in accordance with standard options of its using, as well as an investigation mode for complex data analysis.

As an illustration, screen forms of the package are presented, obtained as a result of the LAGEOS-1 satellite measurements quality analysis (the measurements have been made by the US 7105, 7124, and 7090 SLR-stations in October 2000) – see Figures 1, 2, 3, as well as results of comparison of two different (adjacent) IRVS sets at similar time intervals – Figure 4. Besides this, in Figure 5 an example is presented of a day-long measurement session planning computation results.

It is planned to include in the package a capability for processing of GLONASS /GPS navigation receiver signals. The package is open for modification and introduction of complementary functions and capabilities, and may be passed over for use in other organizations, if they are interested in its use. A more detailed information on the STARK program package is available from the authors on the following e-mail address:
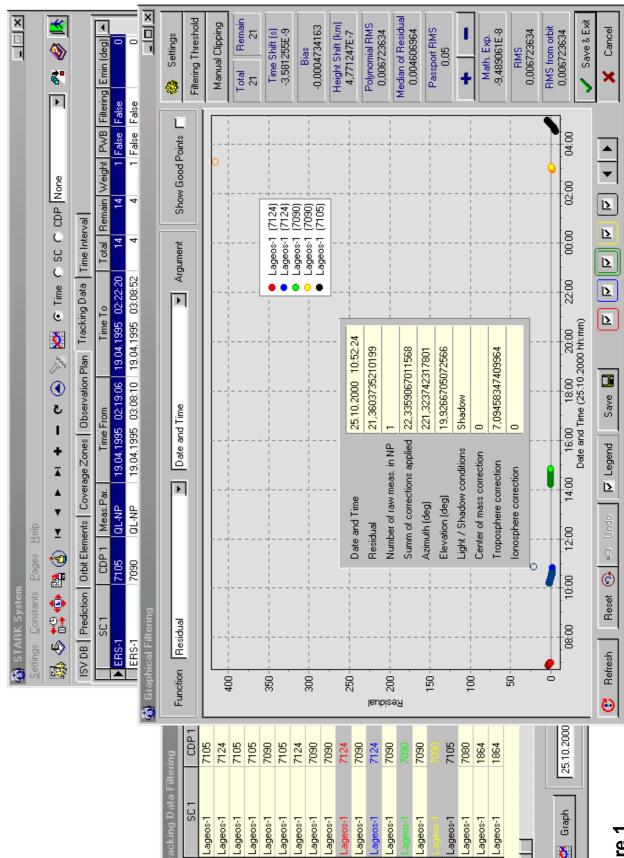
cnss@mcc.rsa.ru
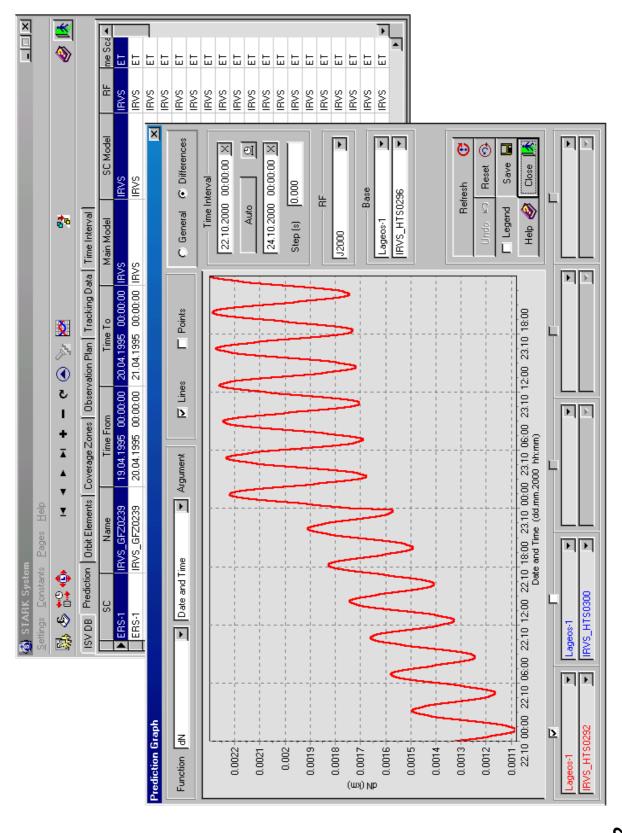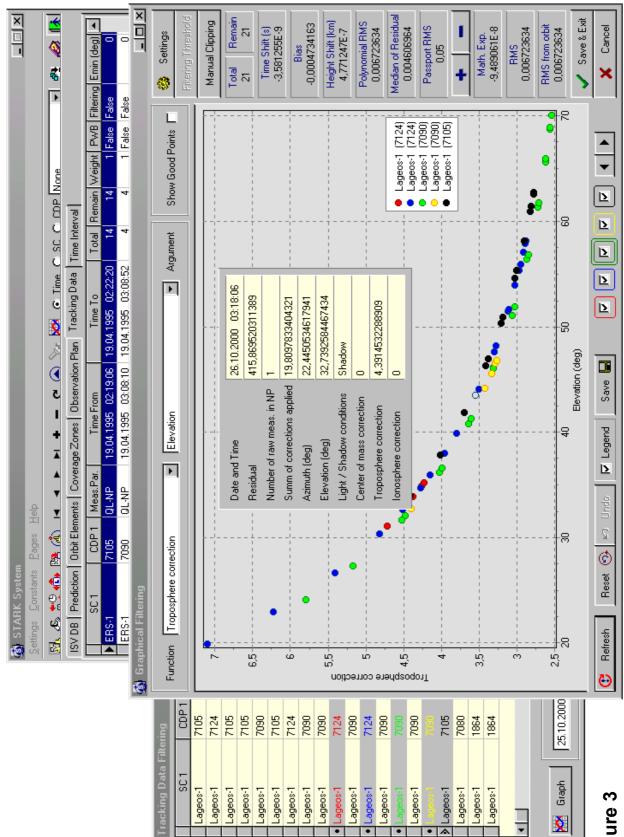
or

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Figure 1
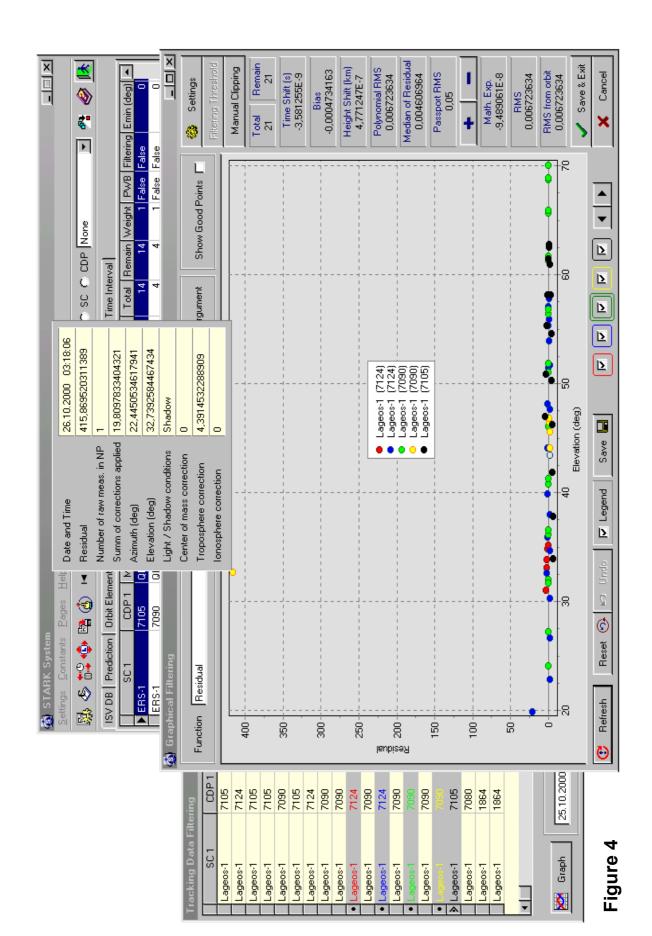
Figure 2

Figure 3

Figure 4

Figure 5