

## Approach to Remote Participation in the ITER experimental program. Experience from model of Russian Remote Participation Center.

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The model of Russian Remote Participation Center (RPC) was created under the contract between Russian Federation Domestic Agency (RF DA) and ROSATOM as the prototype of full-scale Remote Participation Center for ITER experiments and for coordination activities in the field of Russian thermonuclear research.

1. Investigation of the high-speed data transfer via existing public networks (reliability, speed accuracy, latency)
2. Test of ITER remote participation interfaces (Unified Data Access, Data Visualization and Analysis tool, etc.)
3. Local Large-capacity data storage system (storage capacity more than 10 TB and disk I/O speed 300 MB/s)
4. Remote monitoring of Russian plasma diagnostics and technical systems
5. Security (Access to ITER S3 zone IT infrastructure (S3 –XPOZ (External to Plant Operation Zone)) in accordance with the requirements of cyber security and IEC 62645 standard.
6. Participation in ITER main control room activities (remote copy of central screens and diagnostics HMI)
7. Access to experimental data
8. Local data processing with integration of existing data processing software (visualization, analysis, etc.)
9. Scientific data analysis remotely by ITER remote participation interfaces

In the presented report, the data transfer processes (latency, speed, stability, single and multi-stream etc.) and security issues within 2 separate L3 connection to IO over public internet exchange point and GIANT were investigated. In addition, we have tested various ITER tools for direct remote participations, such as screen sharing, data browsing etc. at the distance from RF RPC to ITER IO (about 3000 kilometers).

Experiments have shown that the most stable and flexible option for live data demonstration and creation of a control room effect is the EPICS gateway. Together with the ITER dashboard, the usage of these tools makes it possible to emulate almost any functional part of the MCR at the side of a remote participant. This approach allows us to create our own mimics and customize the CSS studio HMIs for ourselves. Today using these tools, we can integrate various systems remotely without any major restrictions.

For data mirroring tasks UDA server replication is an option. It may improve performance for usage of the data browsing tools and some other tasks with archive data. To obtain the best performance it is very important to find multithreading (multi streams) data replication solution between UDA servers.

Network setup connection strategy still under development with IO now.

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### Member State or IGO

Russian Federation

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