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Upgrade and recapitalization of seismic station AKASG

Authors: Mr. Viktor Hurynchuk, National Space Facilities Control and Test Center, Kyiv, Ukraine
Mr. Marian Jusko, CTBTO Preparatory Commission, Vienna, Austria
Mr. Sergelen Bazarragchaa, CTBTO Preparatory Commission, Vienna, Austria

P4.4-049

POSTER

SEISMIC STATION 1975 MALYN

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ABSTRACT

The AKASG seismic station (PS45) is located at the territory of Ukraine. From 2000 to 2002, the station was being upgraded according to the CTBTO requirements.

From 2003 to 2010, the station was operating within IMS, the most important problem in the station data presence during that period was the radio link system, used at the station.

From 2010 to 2011, the new modernization project of the station was being developed, which was implemented from 2013 to 2016.

In the course of its implementation, the following works were performed:

- the existed data transferring system from the station elements, which was constructed of both the copper lines and the radio link tools as well, was replaced with the new one, fiber optic communication lines;

- all the equipment, installed by SAIC, except of the sensors, was replaced with the new ones;

- both the power supply system and the lighting protection system were upgraded.

The station modernization allowed to increase the data presence from the station elements from 86% in 2015 to 99,9% in 2020.

Nowadays, the process of the fiber lines installation at the 8 sites and a new alarm and video surveillance system is being developed.

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INTRODUCTION

Fig. 1. The location of the AKASG station and the view of the CF-AKASG site.

The AKASG (PS45) station is located near the town of Malyn, at the distance of 100 km from Kyiv (Fig. 1). It was originally built in 1976-1979. Until 1992, it had been a member of the Special Control Service of the Soviet Union. The station consists of 24 sites (23 boreholes and 1 vault site) and a central information collection point CF-AKASG.

On September 24, 1996, Ukraine signed and on June 30, 2000 ratified the Comprehensive Nuclear Test Ban Treaty. In 1998, it was decided to develop a project for the modernization of the station, which was carried out in 2000-2002.

On December 16, 2002, the station was certified, and in January 2003 it was put into operation.

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INTRODUCTION

The functioning of the station in 2003-2010 revealed the main problem - the data availability from the station's sites was below 98%, which did not meet the requirements of the CTBTO Operational Manual.

This problem was associated with the scheme of the data transmission from the remote sites to the central site of the station (Fig. 2), which had the following disadvantages:

- unstable operation of the radio communication channels during heavy rain and snowfall, as well as in the morning hours in the spring and autumn periods of the year;
- The radio communication equipment failures and the failures of the data transmission equipment over cable lines during the period of active thunderstorm activity at the station location (April-August).

As a result of the analysis of the operation of the station in 2003-2010, it was decided to prepare a new project for the upgrade of the station.

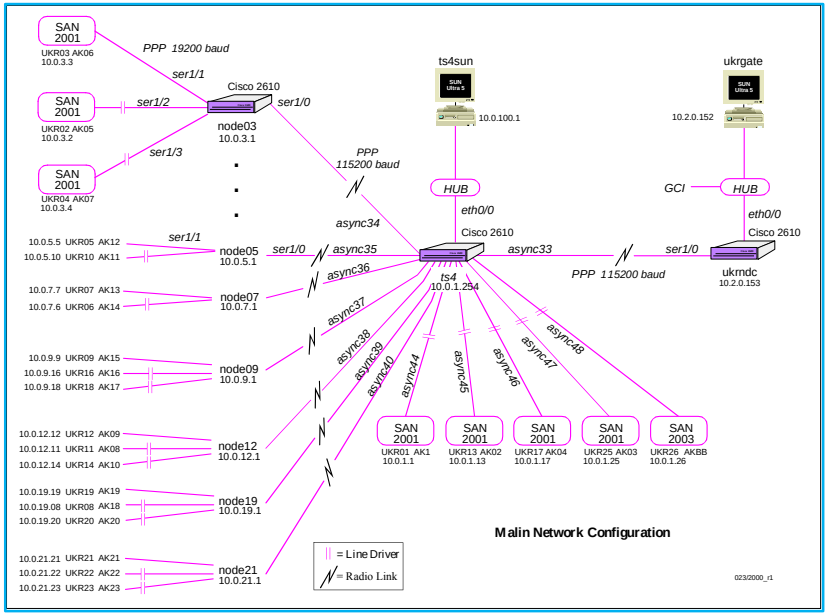

Fig. 2. Scheme of the data transmission in 2003-2016.

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METHODS

The project for the station upgrade and recapitalization was developed in 2010-2011 and included the following stages:

- replacement of the radio communication lines with the fiber-optic communication lines between station sites;
- improvement of the grounding and lightning protection system at the station sites;
- replacement of the power supply equipment at the station site;
- replacement of the communication equipment at the station site;
- replacement of the digitizers on the station sites;
- replacement of the workstations and their software at the central site of the station;
- dismantling and disposal of the radio communication masts.

The project was implemented in the following order:

- In 2011-2012, the required work was carried out to improve the grounding and the lightning protection system at the station sites;
- In 2013, the required work was carried out to install the fiber-optic communication lines between the sites of the station;
- in 2014-2015, the required work was carried out to install new power supply and communication equipment at the station sites;
- In April 2016, the required work was carried out to replace the digitizers and the workstations;
- In the summer 2016, the required work was carried out to dismount and dispose the radio communication masts at the station's sites.

The process of carrying out the listed works is displayed on the following slides of this presentation.

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Upgrade of the grounding and the lightning protection system at both the CF-AKASG and the remote sites of the station

Fig. 3. The upgrade process of the grounding and the lightning protection system at the station sites.

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The fiber-optic communication lines installation

Fig. 4. The process of the fiber-optic communication lines installation.

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METHODS

Installation of both the power supply and the communication equipment




Fig. 5. The view of two of the remote station sites (the AK02 and AKBB sites).



6. The power supply unit at one of the station site.


Fig. 7. The communication equipment at one of the sites of the station.

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Replacing both the digitizers and the workstations at the station

Equipment remoted from the station








Equipment installed at the station

Fig. 8. The photo of both the removed and the installed equipment.

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METHODS

Dismantling of the radio communication masts

Fig. 9. The photo of dismantling of the radio communication masts.

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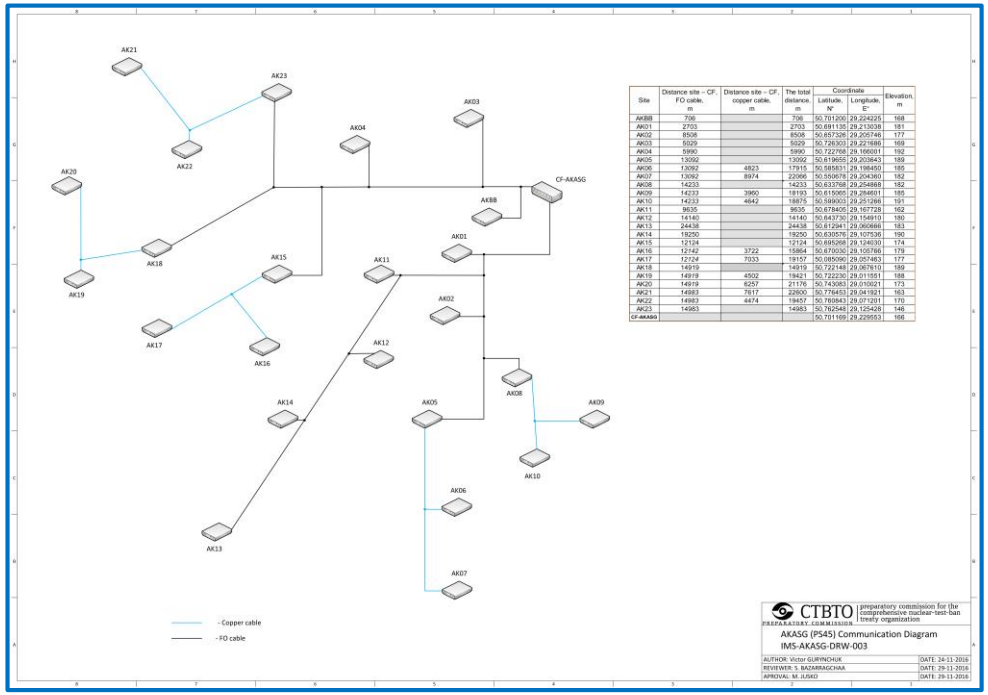
RESULTS



Site	Distance site – CF, FO cable, m	Distance site – CF, copper cable, m	The total distance, m	Coordinate Latitude, N°	Coordinate Longitude, E°	Elevation, m
AK88	798		798	50,701200	29,224225	168
AK01	2703		2703	50,691135	29,213038	181
AK02	8508		8508	50,657326	29,205746	177
AK03	5029		5029	50,726303	29,221686	169
AK04	5990		5990	50,722768	29,166091	192
AK05	13092		13092	50,619655	29,203643	189
AK06	13092	4823	17915	50,585831	29,198450	185
AK07	13092	8974	22066	50,550678	29,204360	182
AK08	14233		14233	50,633768	29,254868	182
AK09	14233	3960	18193	50,615065	29,284601	185
AK10	14233	4642	18875	50,599303	29,251266	191
AK11	9635		9635	50,678405	29,167728	162
AK12	14140		14140	50,643730	29,154910	180
AK13	24438		24438	50,812941	29,060686	183
AK14	19250		19250	50,630576	29,107536	190
AK15	12124		12124	50,695268	29,124630	174
AK16	12142	3722	15864	50,670030	29,105786	179
AK17	12724	7033	19157	50,685090	29,057463	177
AK18	14919		14919	50,722148	29,067610	189
AK19	14919	4502	19421	50,722230	29,011551	188
AK20	14919	6257	21176	50,743083	29,010021	173
AK21	14983	7817	22800	50,776453	29,041921	163
AK22	14983	4474	19457	50,760843	29,071201	170
AK23	14983		14983	50,762548	29,125428	146
CF-AKASG				50,701168	29,229553	166

Fig. 10. The data transmission scheme from April 2016.

As a result of the work carried out under the project of modernization and recapitalization of the station in 2011-2016, the data transmission scheme (Fig. 10) between the elements of the Malyn (AKASG, PS45) station had been changed, which led to:

- a significant decrease in the number of cases of the equipment damages during the period of thunderstorm activity at the location of the station;
- a significant reduction of the time of the communication absence between the remote elements and the central element of the station;
- the data presence from the elements of the station is above 98%, which meets the requirements of the CTBTO Operational Manual.

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CONCLUSIONS

Conclusions:

- the result obtained after finishing the works planned according to the station modernization project has reached the required goal;
- the operational reliability of the station has been increased;
- the availability of the data from the station elements meets the requirements of the CTBTO Operational Manual.

THANK YOU!

Fig. 11. The photo of the CTBTO representative and the station personnel involved to the upgrade process.

Point of contacts: Mr. M. Jusko, e-mail: marian.jusko@ctbto.org
Mr. V. Hurynchuk, e-mail: gurynchuk@ukr.net