

**Appendix 5.2**

**[PROJECT TITLE]  
[Traveling to Field Test Sites]  
Report Form**

**I. Proposer:**

Name:	Lin Min Min Myint
Position:	Assistant Professor
Institution:	KMITL, Thailand

**II. Objective:**

To process the final step of installing a new GNSS receiver system and the data testing at the Cambodia Academy of Digital Technology (CADT), Phnom Penh, Cambodia

One of the project's targets is to install a GNSS receiver system at the Cambodia Academy of Digital Technology (CADT), Phnom Penh, Cambodia for expanding the GNSS and ionospheric monitoring infrastructure. Therefore, we have purchased and sent a set of the receiver system including the GNSS receiver, GNSS antenna, a small computer system, UPS, and cables to CADT, Cambodia since in March 2022. After arrival at CADT, the project partner from CADT installed the system at the CADT innovation center building in June 2022 and the system started to collect the GNSS measurements for testing. However, we still need to finalize the installation process such as calibrating the antenna and receiver settings and testing data for positioning and ionospheric monitoring on-site. We also need to install a router and other software into the computer for data collecting. Moreover, we need to discuss a plan for a maintenance plan and further joint research cooperation based on the collected data as well as to train on how to access/use the collected GNSS data to the researchers in CADT.

The pictures of the GNSS receiver installation's preparation and the installation are shown in Fig. 1 and Fig. 2. The building where the receiver system was installed, and its location are described in Fig. 3.



Fig. 1. Inspecting and testing the equipment at KMITL, Thailand before sending it to CADT, Cambodia



Fig. 2. GNSS receiver system equipment at CADT, Cambodia after setup.

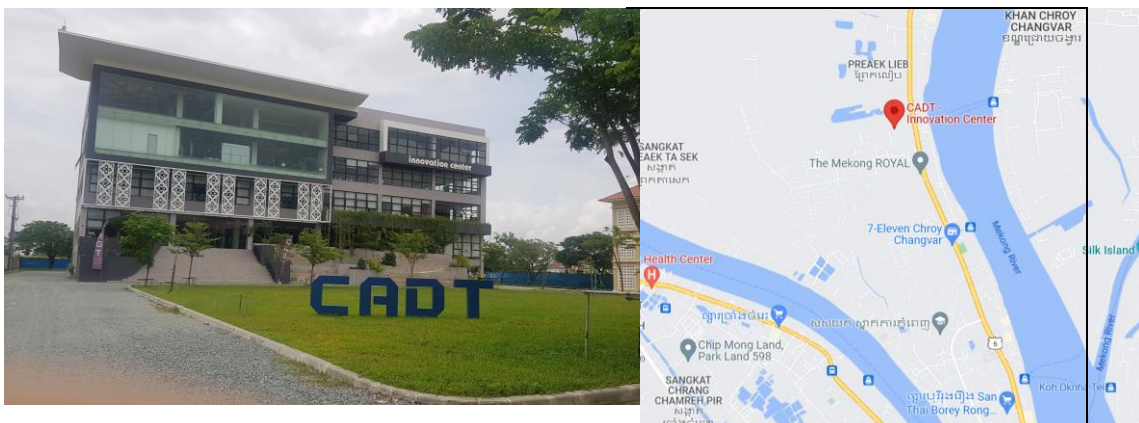


Fig. 3. CADT Innovation Center building where the GNSS receiver system was installed and its location.

**III. Schedule:**

Date	Location	Work	Person in charge
21/7/2022 9:30-10:00	CADT, Phnom Penh, Cambodia	Checked the location of GNSS antenna and receiver installation	Prof. P. Supnithi + 3 KMITL Mr. T. Nhem, CADT
21/7/2022 10:00-12:00	CADT, Phnom Penh, Cambodia	Installed a router between the receiver and the PC, and then upgraded the receiver and data collecting softwares	Prof. P. Supnithi + 3 KMITL Mr. T. Nhem, CADT
21/7/2022 13:00-13:45	CADT, Phnom Penh, Cambodia	Testing the data for positioning and ionospheric monitoring	Prof. P. Supnithi + 3 KMITL Mr. T. Nhem CADT
21/7/2022 14:00-16:00	CADT, Phnom Penh, Cambodia	Training on how to access and use GNSS data collected to CADT researchers	Prof. P. Supnithi + 3 KMITL Mr. T. Nhem CADT
21/7/2022 16:00-16:30	CADT, Phnom Penh, Cambodia	Meeting on receiver system maintenance and data usage	Prof. P. Supnithi + 3 KMITL Mr. T. Nhem CADT

**IV. Participants:**

No.	Name	Organization
1	Prof. Pornchai Supnithi	KMITL, Thailand
2	Asst. Prof. Lin Min Min Myint	KMITL, Thailand
3	Mr. Thayheng Nhem	CADT
4	Mr. Jirapoom Budtho*	KMITL, Thailand
5	Mr. Napat Tongkasem*	KMITL, Thailand

*(\*The expenses of these participants are funded by KMITL's GNSS and Space Weather Information Data Center)*

**V. Summary of the activities corresponding to the objectives**

For this trip, our KMITL group includes two project members: Prof. Pornchai Supnithi and Dr. Lin Min Min Myint. We also invited two doctoral student researchers from KMITL's GNSS and the space weather information data center: Mr. Jirapoom Budtho and Mr. Napat Tongkasem who oversee the data server and the homepage of the center because they can help us for setting up the new router and the network connection between the CADT and the main data server as well as testing the data. Since the existing USB connection between the receiver and the computer is sometimes unstable and unreliable, we often detected some data loss and error alarms due to the USB disconnection. Therefore, we decided to install the router between the receiver and the computer during the trip. The router option allows the remote server to check/access the receiver and the computer directly and to collect the data from the receiver in some cases.

Our group arrived in Phnom Penh, Cambodia by flight on Wednesday (July 20, 2022).

On Thursday (July 21, 2022), we went to the CADT campus in the morning. When we arrived at the CADT- Innovation Center building, we surveyed the GNSS antenna and its cable installation on the rooftop of the building accompanied by Mr. Thayheng Nhem from CADT (host institute project partner).

Then we proceed to the CADT's server room where the GNSS receiver, PC, and UPS system are located. After we have checked the equipment, we explained the installation plan for the new router to the CADT's project partner. Then, we started the installation of the new router with the help of Mr. Budtho and Mr. Tongkasem. After that, we configured the network connection between the CADT station and the KMITL main server via the new router for data collection. Before noon, we upgraded the software inside the computer.

In the afternoon, we tested the GNSS data collected from the CADT station by checking the plots of the signals' SNR and the satellite numbers, and then we configured the data collection software. Then we also checked the positioning errors and ionospheric parameters: Total Electron Content (TEC) and rate of TEC change Index (ROTI).

At 14:00 PM, we hold a small workshop on how to access and use the GNSS data collected from KMITL GNSS and Space Weather's Data Server for the CADT researchers who could apply the GNSS data in their own research or ASEAN-IVO project research. During the training, Prof. Supnithi gave a presentation on the ongoing research works related to GNSS and Space Weather as well as the possible research idea by using GNSS data in Cambodia. Then, Dr. Lin Myint explained and demonstrated how to access and use the GNSS data using RTK-lib software

together with Mr. Budtho and Mr. Tongkasem. Then we discussed the research ideas.

Finally, we discussed the receiver maintenance and future project activities together. Currently, the GNSS receiver system at CADT station, Phnom Penh, Cambodia is operating, and the data are collected and saved in the KMITL's main data center daily. Therefore, the data are available for GNSS and space weather monitoring applications, and other research works.

## VI. Others



Fig. 4. Checking the GNSS antenna and its cable installation at the rooftop of the CADT -Innovation Center.



Fig. 5. Looking at the GNSS receiver, the small computer, UPS, and their connection in the server room inside the CADT -Innovation Center and discussing installing a new router with the CADT project partner.





Fig. 6. Installing the new router and configuring the network connection between CADT station and KMITL's main data server.



Fig. 7. Giving the presentation and workshop on GNSS and Space Weather research and how to access and use the GNSS data from the data server.

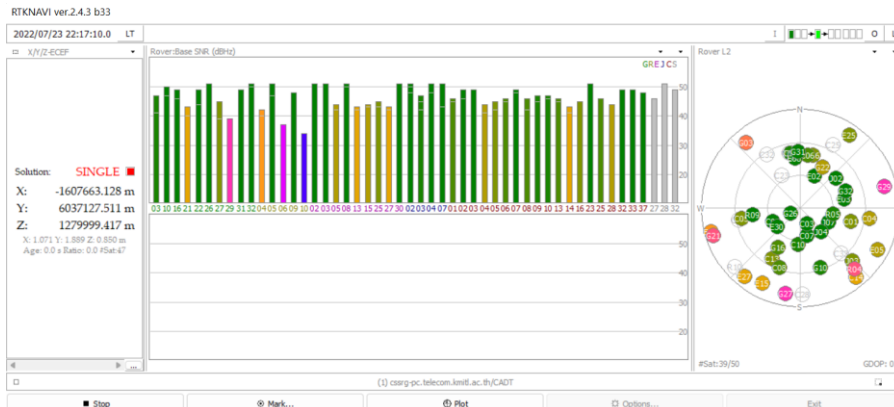


Fig. 8. Testing the GNSS receiver system with software by checking the signal's SNR and the numbers of the satellite.

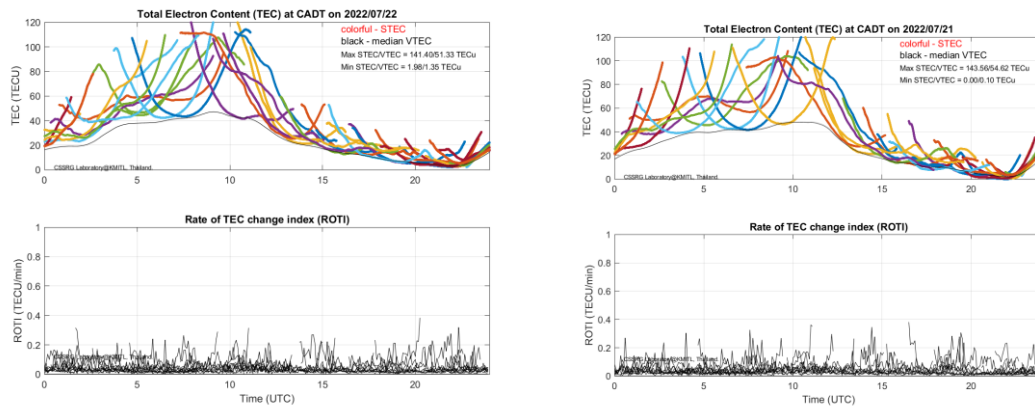


Fig. 9. Plots of Total electron content (TEC) and rate of TEC change Index (ROTI) using the GNSS data from the CADT station on 21 & 22 July 2022.

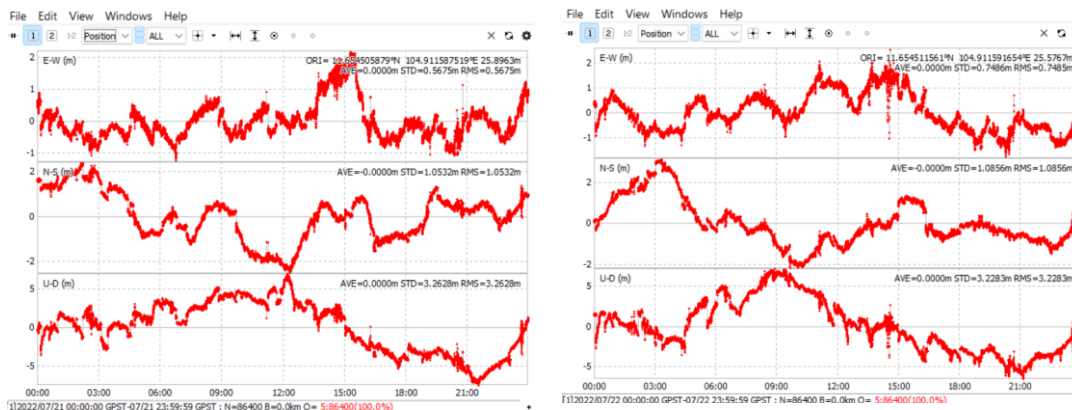


Fig. 9. Plots of Positioning Errors using the GNSS data from the CADT station on 21 & 22 July 2022.