

Project Title: GNSS and Ionospheric Data  
Products for Disaster Prevention and Aviation  
in Magnetic Low-Latitude Regions (Phase II)

Project Activities in 2021-2022



# Project Title: GNSS and Ionospheric Data Products for Disaster Prevention and Aviation in Magnetic Low- Latitude Regions (Phase II)

Project Members : 6 Institutes from 4 countries

Party	Name	Party	Name
NICT, Japan	TSUGAWA Takuya	CMU, Thailand	Tharadol Komolmis
	HOZUMI Kornyanat		Prayoonsak Praychan
KMITL, Thailand	Pornchai Supnithi	NUOL, Lao	Donekeo Lakanchan
	Watid Phakphisut		Phutsavanh Thogphanh
	Punyawi Jamjareegulgarn		Phouthong Southisombath
	Prasert Kenpankho	CADT, Cambodia	Khema Van
GISTDA, Thailand	Sittiporn Channums		Thayheng Nhem

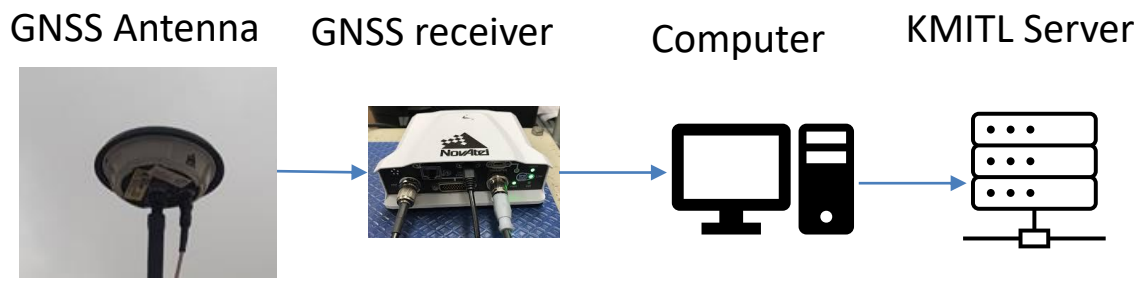
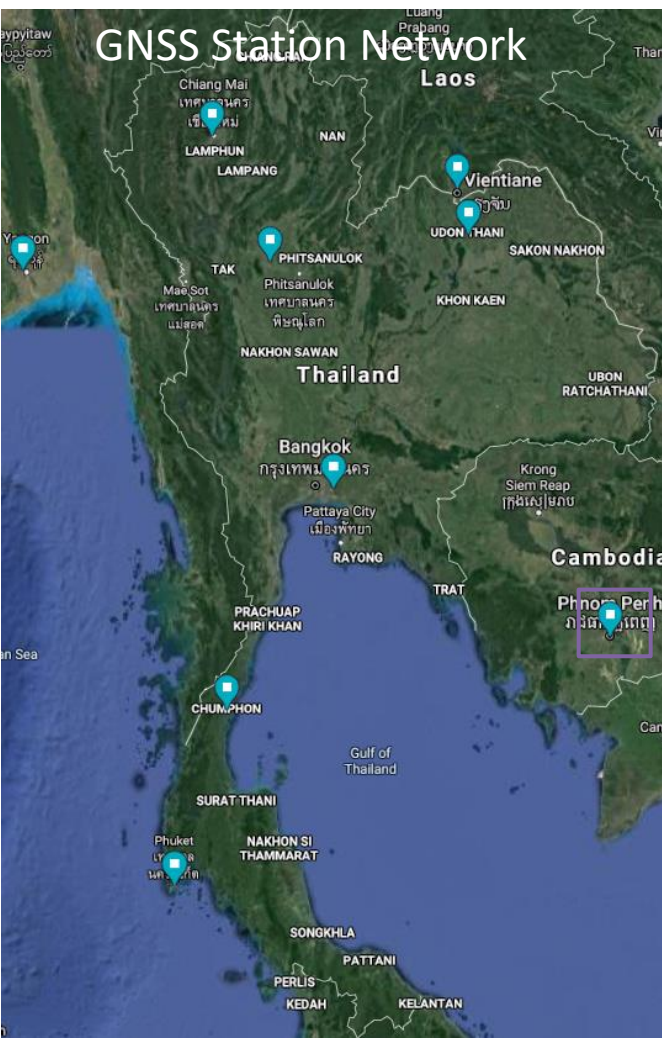
6 Associate Project Members.

Project Duration : April 1<sup>st</sup>, 2021 - March 31<sup>st</sup>, 2023 (24 Months)

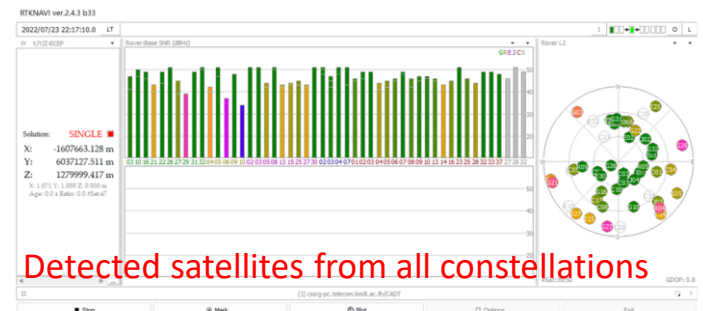
Project Budget: First year (April 1<sup>st</sup>, 2021 – March 31<sup>st</sup>, 2022) : 39,880 USD  
 Second year (April 1<sup>st</sup>, 2022 – March 31<sup>st</sup>, 2023) : 39,980 USD

R&D description		Subcategories		Responsible members
A :	To Install dual-frequency GNSS receiver in Cambodia			KMITL, CADT, NICT
B:	To upgrade daily GNSS and SW data products for disaster and aviation	a:	Modify daily GNSS data such as 2-D TEC maps, ROTI data products including the data from Laos, Cambodia	KMITL, CADT, NUOL
		b:	Upgrade daily ionospheric data products for Communications and Aviation.	KMITL, NICT, CADT, GISTDA, CMU
		c:	Develop AI and Machine learning model the applications of GNSS and Aviation	KMITL, NICT
C	To develop and test a real-time kinematics (RTK) positioning system using the post- processed data from newly installed GNSS network.			KMITL, NUOL, CADT
D	To support capacity- building for domestic network and partnered institutions on GNSS technology, ionosphere, basic space weather			ALL

# Project Activities: A: Expanding GNSS and Ionospheric Monitoring System into Cambodia



Checking satellites availability and received signal SNR



CADT Innovation Center Building

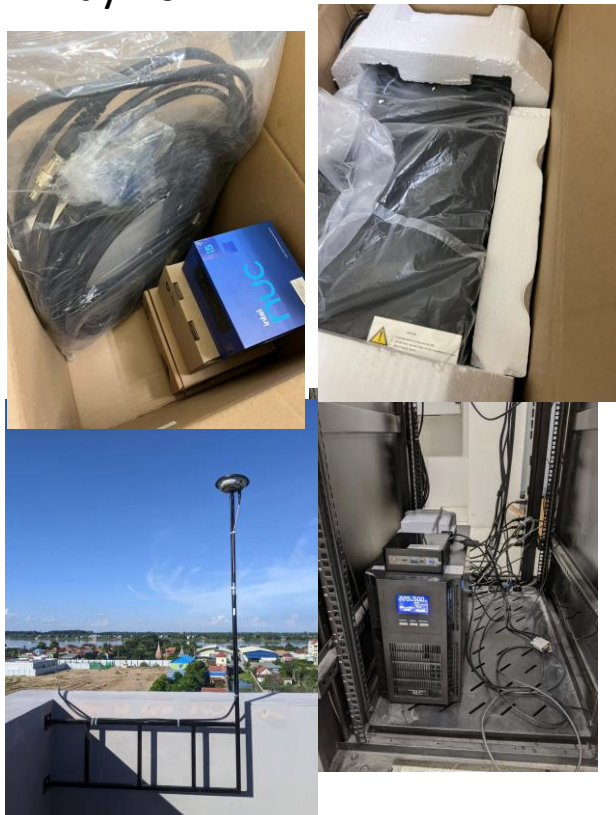


Budget: \$20,221.70 GNSS Receiver Set (in 2021) + \$800.00 Installation Trip Expense

Testing the system in KMITL, Thailand  
Before Sending to CADT, Cambodia in  
Feb 2022.



Installing the system at CADT, Cambodia  
in May 2022



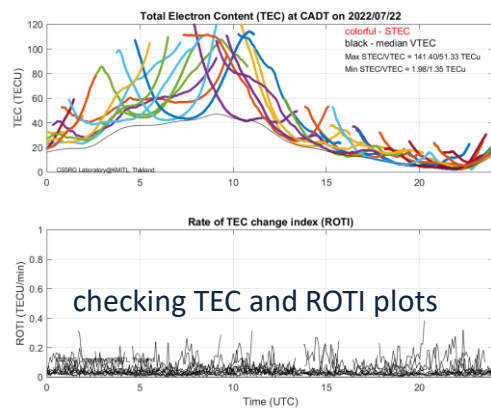
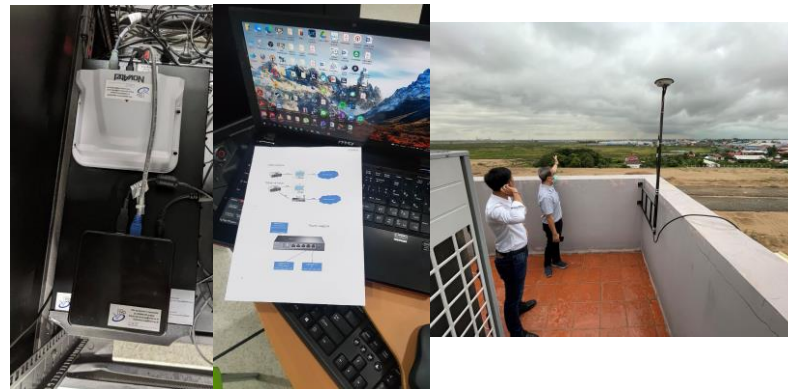
Due to various problems such as Covid 19 epidemic, IC shortage, custom clearance process, the GNSS receiver installation was conducted successfully in the project's 2<sup>nd</sup> year period even though we started purchasing process in 1<sup>st</sup> year period



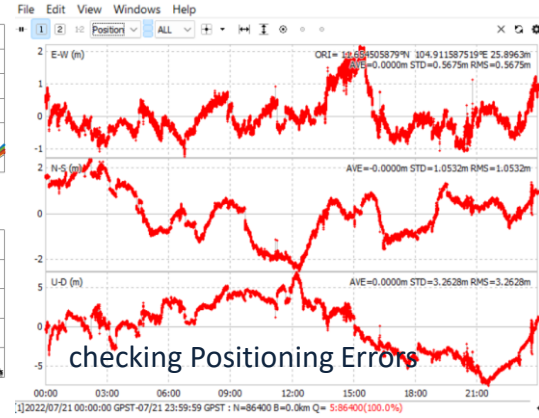
System setup and field-testing processing in CADT, Cambodia in July 2022.



Checking satellites availability and received signal SNR

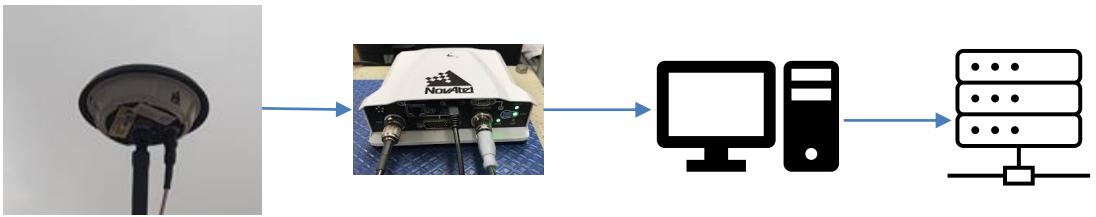


checking TEC and ROTI plots



checking Positioning Errors

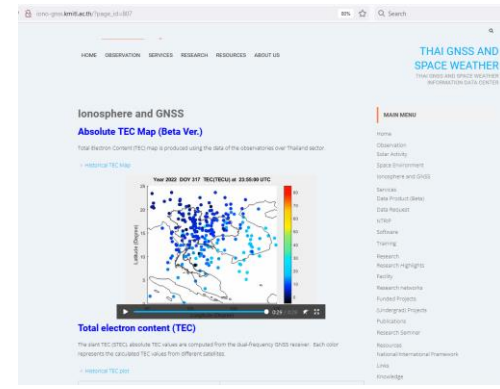
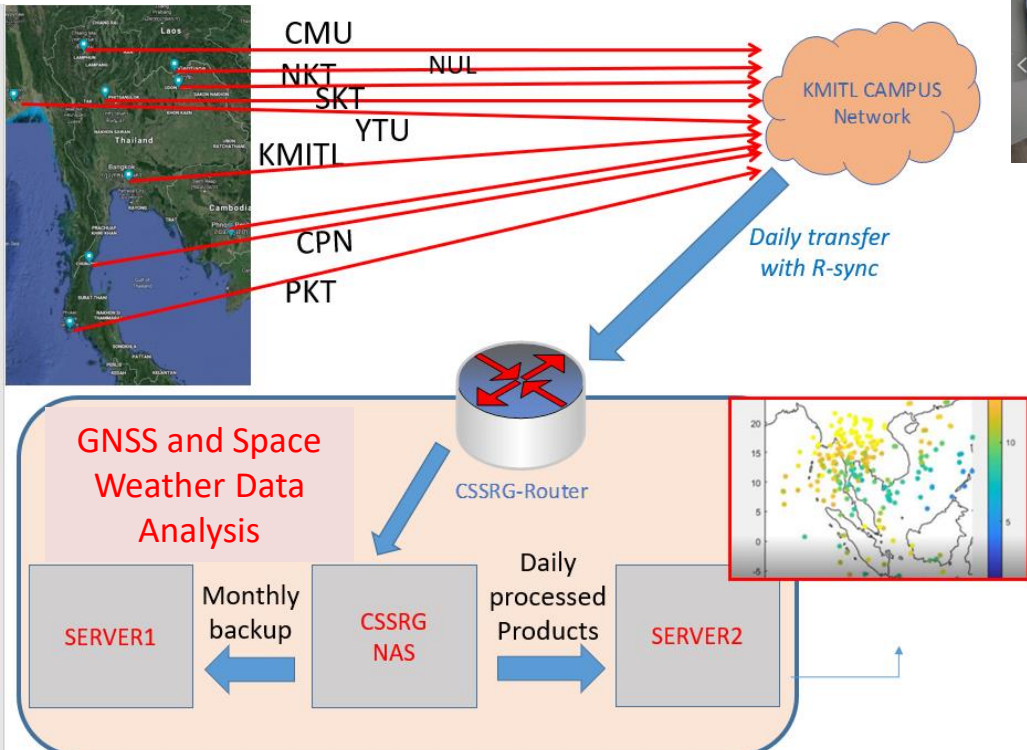
GNSS Antenna    GNSS receiver    Computer    KMITL Server



GNSS data from CADT, Cambodia is daily collected from KMITL's server and available for research and data product. The data products including those data can be observed at [http://iono-gnss.kmitl.ac.th/?page\\_id=807](http://iono-gnss.kmitl.ac.th/?page_id=807)

# GNSS and SW Excellence Center at KMITL

The objective of the Excellence Center is to provide not only the data from our observation networks, but also disseminate the knowledge and research information on GNSS, Ionosphere and Space Weather Effects through various media and channels such as seminars, trainings, online materials etc. to academic institutes and industries in Thailand and the neighboring ASEAN countries.



<http://iono-gnss.kmitl.ac.th/>

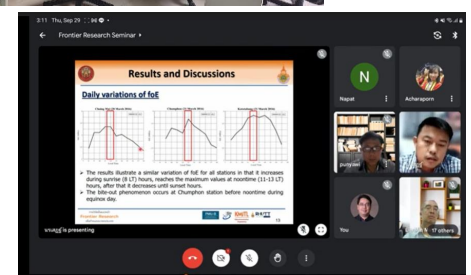
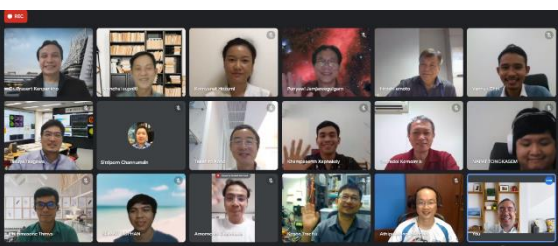
Excellence Center participated in the National Science and Technology Fair, Thailand in 2021 and 2022 by establishing a booth to share knowledge and information about Space Weather and GNSS technology. Many high schools and young people joined this event every year.





# Project Activities: D: Capacity Building and Knowledge Sharing

No.	Activity	Mode/Location	Date	# Participant
1	Project Kick-Off Meeting and Technical Workshop	Online	July 29 <sup>th</sup> , 2021	35
2	GNSS & S/W Training Workshop	Onsite, at CADT in Cambodia	July 21 <sup>st</sup> , 2022	20
3	PMU-B Frontier Research & ASEAN-IVO Seminar	Hybrid, at KMITL in Thailand	Sept. 29 <sup>th</sup> , 2022	40



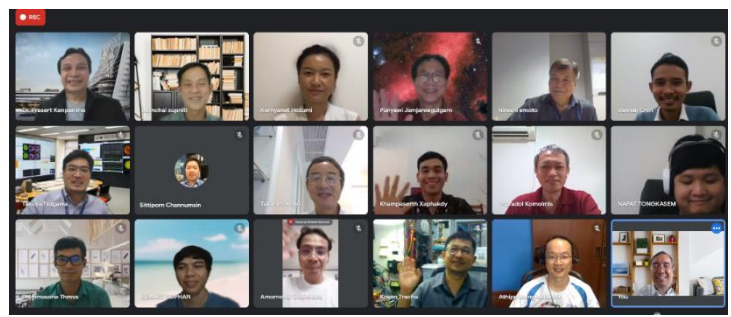
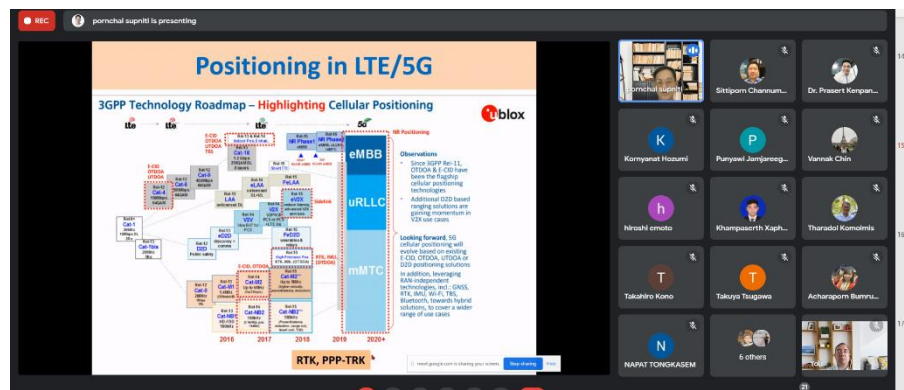
# Online Project Kick-Off Meeting and Technical Workshop #1

The online project kick-off meeting and technical workshop was organized on Thursday, July 29<sup>th</sup>, 2021.

All project members attended and discussed project's plan during kick-off meeting.

The presenters list

1. Dr. TSUGAWA Takuya and Dr. HOZUMI Kornyanat, NICT, Japan.
2. Prof. Pronchai Supnithi and Assoc. Prof. Prasert Kenpankho, KMITL, Thailand
3. Assoc. Prof. Punyawai Jamjareegulgarn, KMITL Chumphon campus, Thailand
4. Dr. Sittiporn Channumsin, GISTDA, Thailand
5. Dr. Khampaserth Xaphakdy, NUOL, Laos
6. Dr. Vannak Chin, CADT, Cambodia



# Project Activities: GNSS Space Weather Presentation and Workshop at CADT in Cambodia

During the installation trip, a small workshop for CADT researchers was organized on Thursday, July 21<sup>st</sup>, 2022. Prof. Pornchai Supnithi talked about GNSS and Space weather research activities and Asst. Prof. Lin M. Myint explained how GNSS data can be applied in Positioning and Space Weather Monitoring. All project members and researchers from KMITL and CADT attended and discussed the research collaboration in the ongoing research activities.

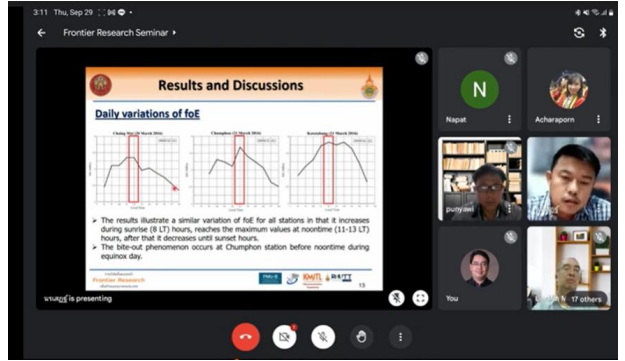




# Project Activities:

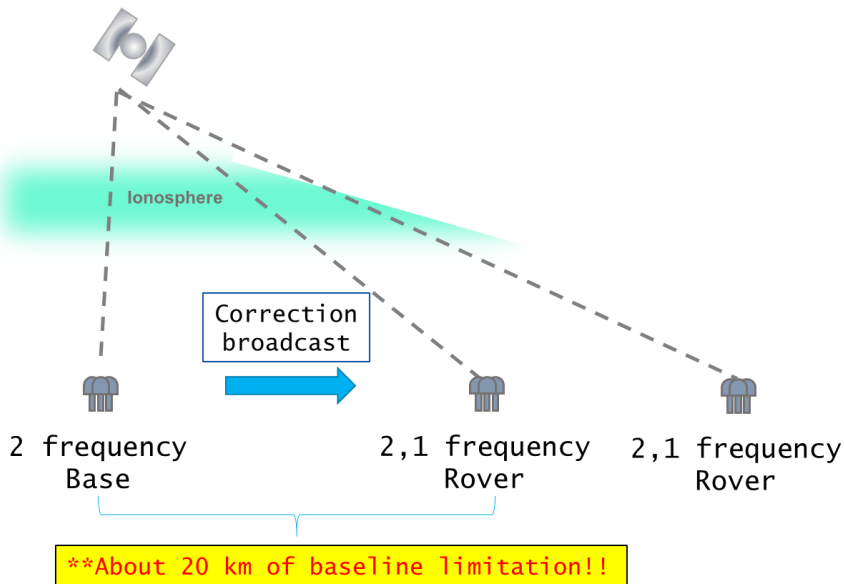
## PMU-B Frontier Research & ASEAN-IVO Seminar “Study of Equatorial Plasma Bubbles and Effects on Advanced Technology” Thursday, 29 September, 2022 (Online Mode)

	Presentation Title (including Q&A)
13.00-13.10	Welcome (Prof. Dr. Pornchai Supnithi, Dr. Lin Min Min Myint)
13:10-13:40	“Mitigate the effect of plasma bubbles on positioning accuracy based on wavelet transformation over Southeast Asian region” (Assoc. Prof. Dr. Punyawit Jarnjareegulgarn, KMITL Chumphon campus)
13:40-14:00	“Scintillation effects on L1/L5 frequencies and its relation to VHF radar images” Ms. Acharaporn Bumrungrit (KMITL), Dr. Susumu Saito (ENRI, Japan)
14:00-14:20	“Delay gradient analysis and multipath models for GBAS” Mr. Jirapoom Budho (KMITL), Mr. Phyo (KMITL), Dr. Susumu Saito (ENRI, Japan)
14:20-14.40	“DFMC SBAS Analysis and Demo in Thailand Region” (Mr. Somkit Sophan, KMITL)
14:40 - 15:00	<b>Break</b>
15:00-15:30	“Statistical analysis of foE and foEs over Southeast Asia” Asst. Prof. Dr. Noraset Wichaipanich (RMUTT), Dr. Kornyanat Hozumi (NICT, Japan),
15.30-15.50	“Spread F statistics and Deep Learning prediction” Mr. Phimmasone Thammavongsy (KMITL, NUOL - Laos), Dr. Kornyanat Hozumi (NICT, Japan)
16:00-16:30	“Analysis Local Kp index and EEJ phenomenon from Phuket Magnetometer Station” Asst. Prof. Dr. Lin M.M. Myint, KMITL, Pornchai Supnithi (KMITL)
16:30-16:50	“EPB characterization and classification using Support Vector Machines” Ms. Thananphat Thanakulketsarat (KMITL), Dr. Kornyanat Hozumi (NICT, Japan)





To develop and test a real-time kinematics (RTK) positioning system using the post-processed data from a newly installed GNSS station in Laos and Cambodia.



## Methods

- ✓ Implement a low-cost RTK receiver system.
- ✓ Test the system using the collected data from our station networks, particularly newly installed in Phase I.

To establish Space Weather and GNSS technologies Learning Centers in National University of Laos in Laos and KMITL Chumphon Campus, Thailand.