**Appendix 4.2**

**Research and development for precise positioning with Artificial Intelligence (AI) during ionospheric disturbances in low-latitude region in ASEAN**

**“Project Kick-off Meeting”**

**Report/Minutes Form**

**I. Organizer:**

|  |  |
| --- | --- |
| Name: | Prof. Dr. Pornchai Supnithi |
| Position: | Professor |
| Institution: | King Mongkut’s Institute of Technology Ladkrabang (KMITL),  Thailand |

**II. Program:**

Date: 2nd – 4th August 2023

Venue: A Building, School of Engineering, King Mongkut’s Institute of Technology Ladkrabang (KMITL), Thailand

**Program Agenda:**

**Wednesday, 2nd August 2023**

Participants will arrive Bangkok and check in the hotel from late afternoon to evening.

Canalis Suvarnabhumi Airport Hotel

**Thursday, 3rd August 2023**

|  |  |
| --- | --- |
| 08.15 | Registration |
| 08.30 | Welcome speech by Dean of School of Engineering, KMITL |
| 08.40 | Group photo |
| 08.50 | Project Introduction/Timeline by Prof. Pornchai Supnithi, KMITL |
| 09.10 | Member Introduction Presentation (not more than 10 min./ institute)   1. Chiang Mai University 2. King Mongkut's University of Technology Thonburi 3. National University of Laos 4. Institute of Geophysics 5. Cambodia Academy of Digital Technology 6. Institute of Technology of Cambodia 7. National Institute of Information and Communication Technology 8. King Mongkut's Institute of Technology Ladkrabang, Prince of Chumphon Campus 9. Le Quy Don Technical University (Online) 10. Asian Office NICT, Thailand |
| 10.30 | Welcome and Administrative Issues by Dr. Hiroshi Emoto (ASEAN-IVO) |
| 11.00 | Coffee Break |
| 11.15 | Discussion Time for Role play of each institute, annual progress schedule, budget allocation of each member |
| 12.15 | Lunch |
| 13.30 | Hands-on Training session (Precise positioning technique using real-time kinematic (RTK) system) by KMITL |
| 16.00 | Lab Tour to KMITL’s Excellence Center in GNSS and Space Weather Lab |
| 16.30 | Return to Hotel |
| 18.30 | Dinner at Suvarnabhumi Suite Hotel |

**Friday, 4th August 2023**

|  |  |
| --- | --- |
| 09.00 | Presentation of the SEALION Project and NICT’s SW research by NICT team |
| 10.00 | Hands-on training session on Total Electron Content computation by KMITL |
| 12:15 | Lunch |
| 12:45 | Return to the hotel. |

Participants will depart Bangkok from afternoon to evening.

**III. Participants:**

|  |  |  |
| --- | --- | --- |
| **No.** | **Name** | **Organization** |
| 1 | Somyot Kiatvanijwilai  Dean of School of Engineering | KMITL, Thailand |
| 2 | Uma Seeboonruang  Sn. Vice Dean of School of Engineering, | KMITL, Thailand |
| 3 | Varesa Chuwattanakul  Vice Dean of School of Engineering, | KMITL, Thailand |
| 4 | Watid Phakphisut  Head of Telecommunications  Engineering Department | KMITL, Thailand |
| 5 | Narong Hemakon  Former Head of Telecommunications Engineering Department and Space Weather Expert | KMITL, Thailand |
| 6 | Pornchai Supnithi  Project Leader | KMITL, Thailand |
| 7 | Punyawi Jamjureegulgarn | Chumphon campus  KMITL, Thailand |
| 8 | Kasemsuk Sepsirisuk | Chumphon campus  KMITL, Thailand |
| 9 | Lin Min Min Myint | KMITL, Thailand |
| 10 | Prasert Kenpankho | KMITL, Thailand |
| 11 | Jirapoom Budtho | KMITL, Thailand |
| 12 | Somkit Sophan | KMITL, Thailand |
| 13 | Napat Tongkasem | KMITL, Thailand |
| 14 | Thananphat Thankulketsarat | KMITL, Thailand |
| 15 | Alisa Kongthon | KMUTT, Thailand |
| 16 | Phimmasone Thammavongsy | NUOL, Laos |
| 17 | Tick Sengthipphany\* | NUOL, Laos |
| 18 | Phouthong Southisombath\* | NUOL, Laos |
| 19 | Tharadol Komolmis | CMU, Chiang Mai, Thailand |
| 20 | Witsarut Achariyaviriya | CMU, Chiang Mai, Thailand |
| 21 | Phutphalla Kong | CADT, Cambodia |
| 22 | Soklay Heng | CADT, Cambodia |
| 23 | Sainglong Kaing | ITC, Cambodia |
| 24 | Hoang Van Phuc\* | LQDTU, Vietnam |
| 25 | Nguyen Van Trung\* | LQDTU, Vietnam |
| 26 | Dung Nguyen Thanh | IGP, Vietnam |
| 27 | Ha Thanh Nguyen | IGP, Vietnam |
| 28 | Takuya TSUGAWA | NICT, Japan |
| 29 | Michi Nishioka | NICT, Japan |
| 30 | Septi Perwitasari | NICT, Japan |
| 31 | Hiroshi Emoto | ASEAN-IVO, NICT, Japan |
| 32 | Nishino Hisanori | Asian Center, NICT, (Thailand) |
| 33 | Takahara Minoru | Asian Center, NICT, (Thailand) |
| 34 | Phyo C Thu\*\* | KMITL, Thailand |
| 35 | Waritsara Rungsawang\*\* | KMITL, Thailand |
| 36 | Efren Martin Alban Cuestas\*\* | KMITL, Thailand |
| 37 | Gleb Mutasov\*\* | KMITL, Thailand |

*\*Online participant \*\* Observer*

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

The project kick-off meeting is a vital function for a research project collaborated by many institutes from various countries. Therefore, KMITL planned to organize an on-site meeting with the project members. However, some members joined the meeting through an online platform due to their time constraints. The objectives of the meeting are as follows:

* To familiarize all members with the project description, budgetary and administrative guidelines,
* To discuss how to implement the project and to distribute the tasks among the project members and institutes,
* To share ideas and opinions among the project members from different countries.
* To decide the time and location of a next project meeting for project progress discussion.

The revised research plans and share of collaborative research and developments according to the discussion of the meeting are as below,

Overall Timeline

|  |  |  |
| --- | --- | --- |
| Activity/Deadlines | Apr 2023 - Sept 2023 | Apr 2023 - Sept 2023 |
| CRDA Signing | X |  |
| Kick-off Meeting | X |  |
| GNSS receiver purchase and RTK Setup and Test(RTK and TEC Workshop) | X | X |
| First Progress Meeting/ EPB and Applications Workshop |  | X |
| (6-month) Progress Report |  | November 20th |
| Annual ASEAN IVO Forum (2023) |  | X |
| (1-year) Progress Report |  | March 15th 2024 |

Share of Collaborative Research and Development

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Research and Development Description | | Subcategories | | NICT | KMITL | CMU | NUOL | CADT | ITC | IGP | KMUTT | ISI-LQDTU |
| A : | To Install GNSS receivers in Cambodia and Vietnam |  |  | 2 | 1 | - | - | 2 | 1 | 2 | - | - |
|  |  |
| B: | To analyze the EPB statistics during the solar maximum and mitigate the EPB effects | a: | Analyze ionospheric parameters such as foF2, h’F, spread F | 2 | 1 | 1 | 1 | - | - | 2 | - | - |
| b: | Analyze TEC and ROTI | 2 | 1 | 1 | 2 | 2 | - | 2 | - | - |
| c: | Mitigate the effects of EPB in positioning system | 2 | 1 | - | - | - | - | 2 | - | - |
| C | To develop forecasting models for EPB occurrences | a: | AI model from VHF radar system | 2 | 1 | - | - | - | - | - | - | - |
| b: | AI model from 2-D TEC map | 2 | 1 | - | - | - | - | 2 | - | - |
| D | To develop and test RTK (Real Time Kinematics) receivers for various applications | a: | RTK system test | 2 | 1 | 2 | 2 | 2 | 2 | 2 | - | 2 |
| b: | RTK base station setup | 2 | 1 | - | - | - | 1 | - | - | 2 |
| c | RTK application development | 2 | 1 | 1 | 2 | 2 | 1 | 2 | - | - |
| E | To identify trends and emerging topics in EPB and RTK research using data mining |  |  | 2 | 2 | - | - | - | - | - | 1 | - |

- “1” indicates the Party that takes the primary responsibility, and “2”, secondary responsibility.

Detail Project Timeline

A screenshot of a computer

Description automatically generated

The main purpose of the hands-on training sessions is to dissimilate the knowledge of precise positioning techniques such as Real-time kinematics (RTK), and Ionospheric error or total electron content (TEC), as part of the project goals. After the training, the participants are expected to implement the project activities efficiently in their own institutes and communities.

**V. Others**

|  |  |
| --- | --- |
| A group of people in a meeting  Description automatically generated  Figure 1. First day of Kick-off meeting | *A group of people standing in a room  Description automatically generated*  Figure 2. Group photos during the early part of the Kick-off meeting. |
| *A person sitting at a desk with laptops and a microphone  Description automatically generated*  Figure 3. Presentation and Discussion by Project leader Prof. Pornchai Supnithi, KMITL | *A group of people in front of a projector screen  Description automatically generated*  Figure 4. Presentations and Online participants |
| *A group of people in a room  Description automatically generated*  Figure 5. RTK hands-on training and discussion | *A group of people sitting at tables in a room  Description automatically generated*  Figure 6. Second day of Kick-off meeting |
| *A group of people sitting at a table  Description automatically generated*  Figure 7. Kick-off meeting’s Dinner Reception | *A group of people in a room  Description automatically generated*  Figure 8. TEC Analysis hands-on training and discussion |