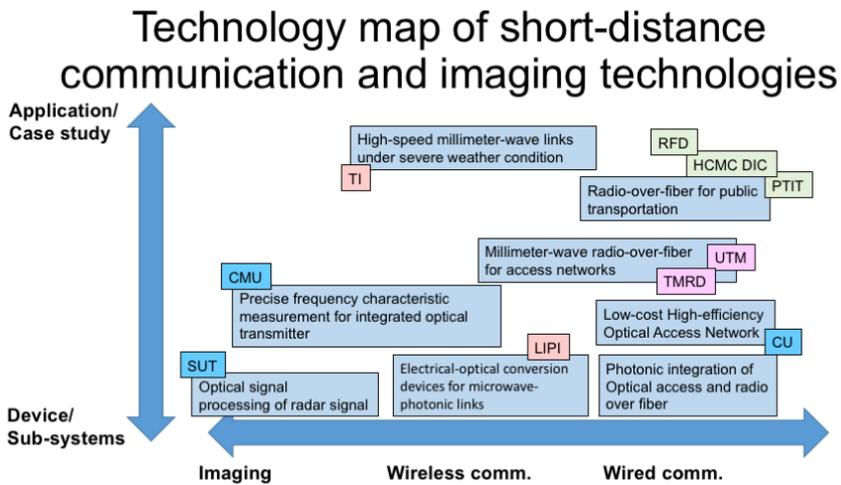


Background :



Targets:

- ❑ **Target #1: Evaluation** of the short-distance communication and imaging technologies independently first.
- ❑ **Target #2: Design, evaluation, testing and demonstration** of developed devices and subsystems are performed by each institute with their expertise.
- ❑ **Target #3: Integration** of these technologies will be also discussed in the project through the meetings, the seminars or the workshops.
- ❑ **Target #4: Sharing** the knowledge by publishing the paper and presenting the advanced research results in conferences:
- ❑ **Target #5: Providing** contributions to international standardization bodies for societies in the ASEAN region

Speaker: Vo Nguyen Quoc Bao (PTIT, Vietnam)

Project Members: 10

- National Institute of Information and Communications Technology (NICT, Japan)
- Posts and Telecommunications Institute of Technology (PTIT, Vietnam),
- HCM city Department of Information and Communications (DIC, Vietnam),
- Radio Frequency Department (RFD, Vietnam),
- Chiang Mai University (CMU, Thailand),
- Chulalongkorn University (CU, Thailand),
- Suranaree University of Technology (SUT, Thailand),
- Universiti Teknologi Malaysia (UTM, Malaysia),
- Telekom Malaysia R&D (TMRD, Malaysia),
- Indonesian Institute of Science (LIPI, Indonesia),
- Telkom Indonesia (TI, Indonesia).

Project Duration: 36 months starting from April 2016



Chulalongkorn University  
จุฬาลงกรณ์มหาวิทยาลัย



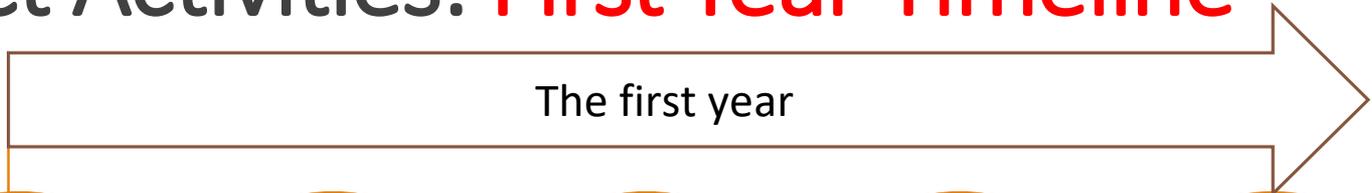
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LEMBAGA ILMU  
PENGETAHUAN  
INDONESIA  
INDONESIAN INSTITUTE OF SCIENCES



# Project Activities: **First Year Timeline**



Kickoff meeting



Kickoff meeting



Workshop on CRO

## Project Activities: **Second Year Timeline**



IVO meeting in Bangkok



ISAP 2017 SS on "Linear Cell Technology"

# Project Activities: **Third Year Timeline**

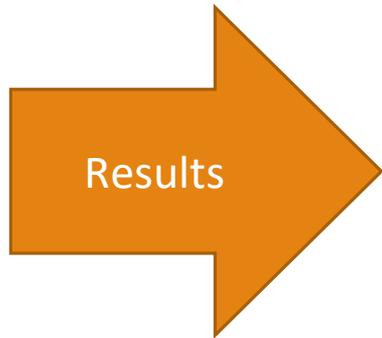


CRO workshop in Malaysia



Project meeting in Matsue

- ❑ **Target #1: Evaluation** of the short-distance communication and imaging technologies independently first.
- ❑ **Target #2: Design, evaluation, testing and demonstration** of developed devices and subsystems are performed by each institute with their expertise.



## **Two** Field trial of mm-wave radio system in HCMC, Vietnam

# The first Field trial of mm-wave radio system in HCMC, Vietnam

### Investigators

- PTITHCM, HCMC DIC, NICT



PTIT HCM



### Purpose of Field Trial

- To investigate the possibility of millimeter-wave radio communication for urban railway systems as a backhaul network to 4G and future 5G mobile communications.

**Duration:** Jan. 2, 2017 – Jan. 10, 2017

### Vietnam side:

- Dr. Quoc Cuong [HCMC DIC]
- Prof. Vo Nguyen Quoc Bao [PTIT]
- Mr. Pham Minh Quang [PTIT]
- Ms. Nguyen Phuong Thao [PTIT]

- Prof. Tan Hanh [PTIT]
- Ms. Pham Thi Dan Ngoc [PTIT]
- Mr. Nguyen Toan Van [PTIT]

### Japan side:

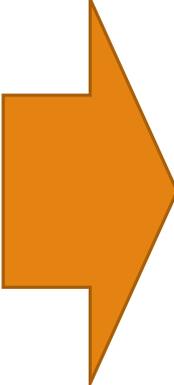
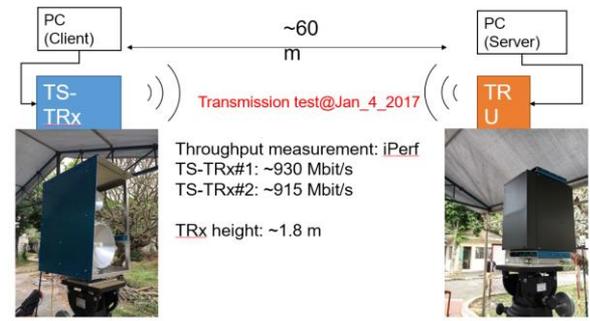
- Prof. Tetsuya Kawanishi [NICT/Waseda-U]
- Dr. Naruto Yonemoto [ENRI]
- Mr. Nobuhiko Shibagaki [Hitachi]
- Mr. Kyosuke Ishikawa [HiKE]
- Mr. Wataru Sawada [HiKE]
- Mr. Kosei Naito [Variable Energy]

- Dr. Pham Tien Dat [NICT]
- Mr. Kenichi Kashima [HiKE]
- Dr. Yosuke Sato [HiKE]
- Mr. Yudai Takahashi [Link Technology]



# The first Field trial of mm-wave radio system in HCMC, Vietnam

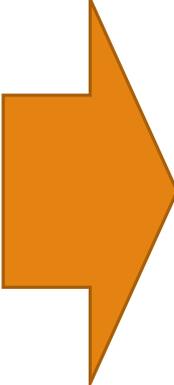
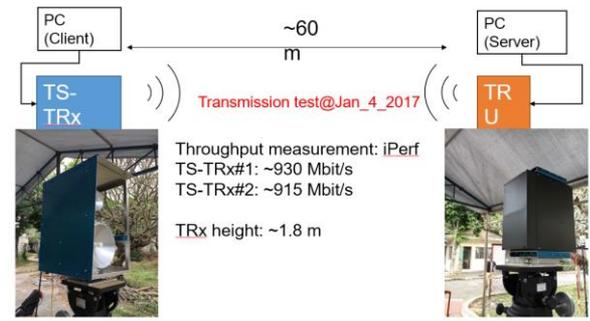
- Two investigation sites:
  - Site #1: PTIT campus in District 9, Ho Chi Minh City
  - Site #2: Van Thanh Station, Metro line #1, Binh Thanh District, Ho Chi Minh City



- Planned experiments have been successfully done.
- The field trial clarifies issues of configuration of cells and possible suggestion for direction how to configure for railway systems
- The current transceiver system is not enough for railway systems. It will be optimized and redesigned.

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# The second field trial of mm-wave radio system in HCMC, Vietnam

**Investigators**

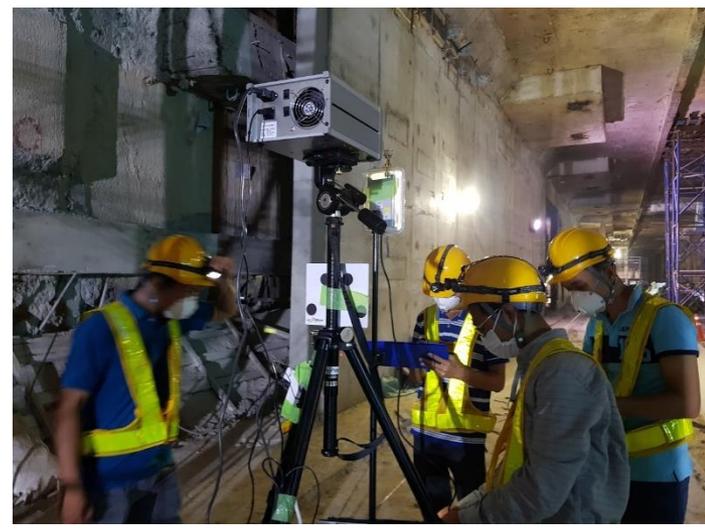
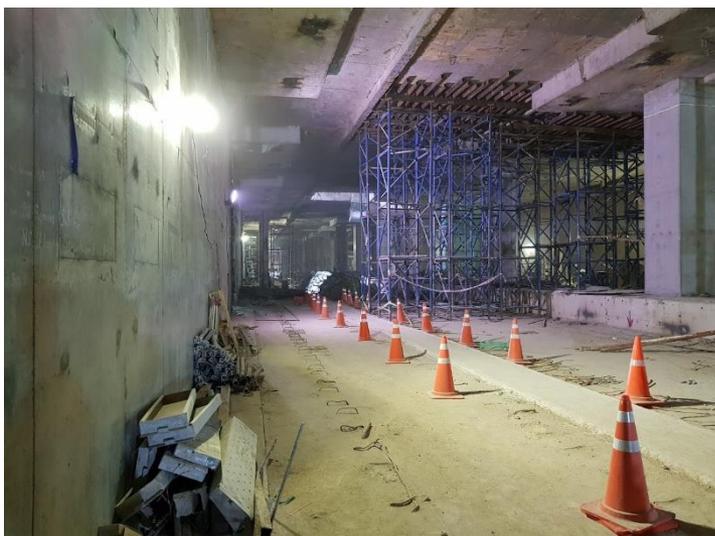
- PTITHCM, HCMC DIC, NICT



**Purpose of Field Trial**

Propagation characteristic measurement for clear understandings. In January 2018, radio propagation characteristics will be measured for understanding fundamental properties in the millimeter-wave bands.

**Duration:** Jan. 8, 2018 – Jan. 12, 2018



# The second field trial of mm-wave radio system in HCMC, Vietnam

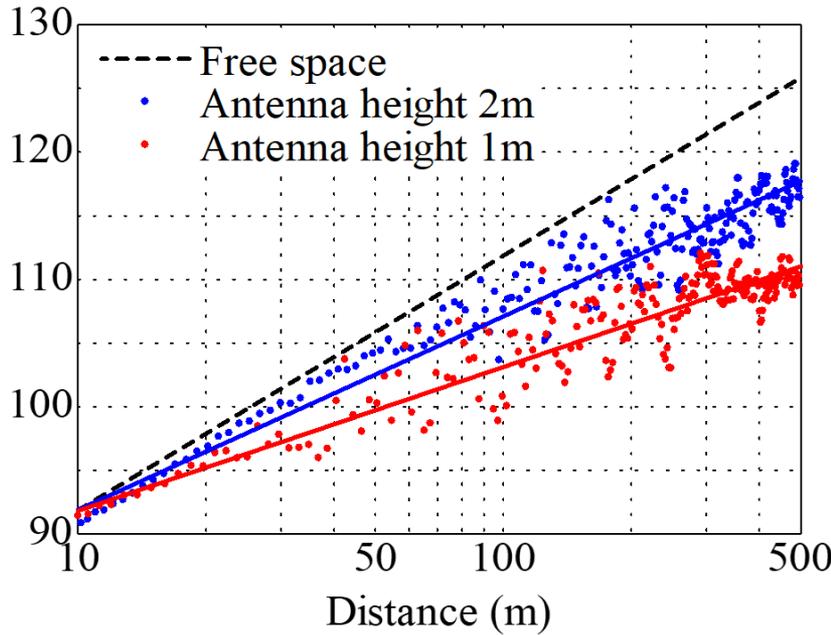
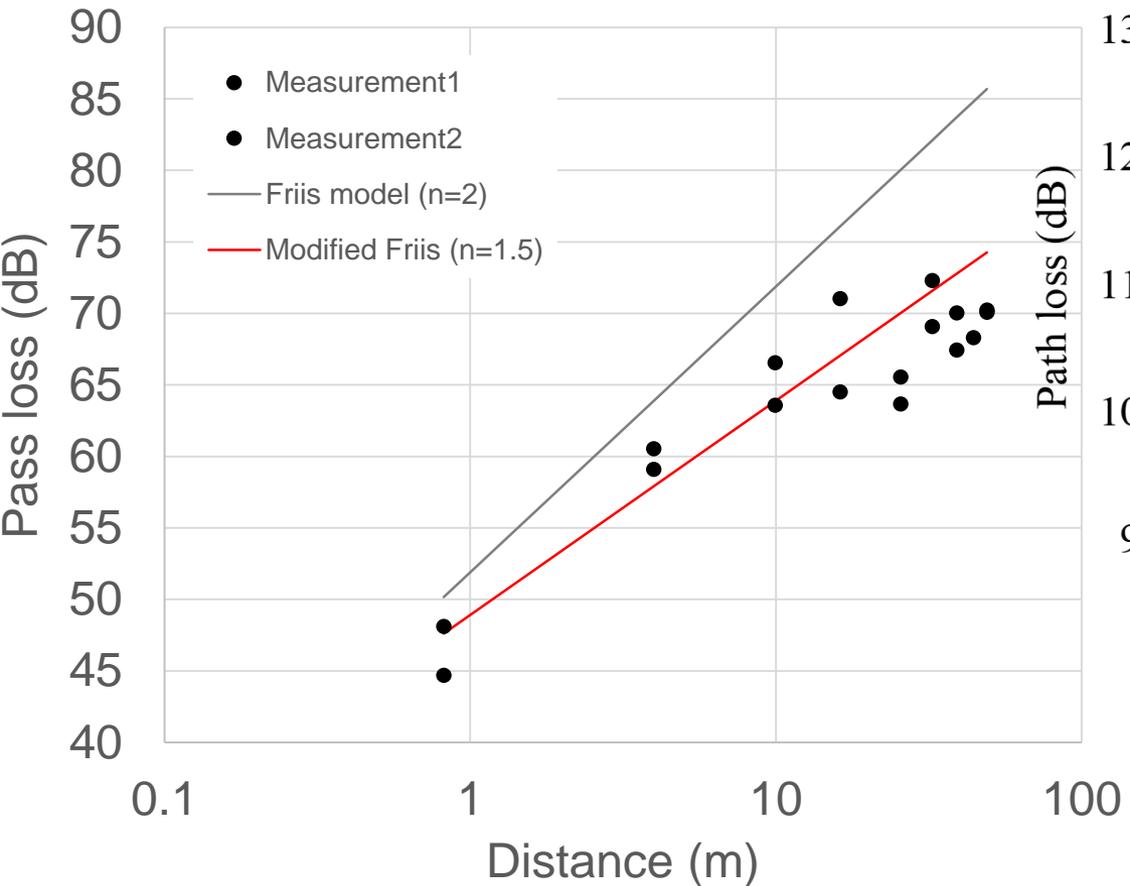


Figure from New elements towards a REVISION TO RECOMMENDATION ITU-R

- ❑ **Target #3: Integration** of these technologies will be also discussed in the project through the meetings, the seminars or the workshops.
- ✓ **Event 1:** Project Kickoff meeting collocated with IEEE ICCE 2016, July 27 – 29, 2016 at Novotel, Ha Long, Vietnam.
- ✓ **Event 2:** Workshop on Convergence of radio and optical technologies at Chiang Mai University, February 27<sup>th</sup>, 2017, The Empress Hotel, Chiang Mai, Thailand
- ✓ **Event 3:** IVO Project meeting in Bangkok, May 3, 2017, Hotel Pullman Bangkok Grande Sukhumvit Asok, Bangkok, Thailand
- ✓ **Event 4:** Special Session “*Linear Cell Technology*” on ISAP 2017, Nov. 2, 2017, Phuket Graceland Resort & Spa, Phuket, Thailand
- ✓ **Event 5:** Special Session on ISEE 2017, Nov. 2017, Ho Chi Minh City University of Technology, Ho Chi Minh City, Vietnam
- ✓ **Event 6:** The 6th International Workshop on CRO, Feb. 22, 2018, Malaysia
- ✓ **Event 7:** The first fiscal year of 2018 Project meeting, Matsue, Japan

Target #4: **Sharing** the knowledge by publishing the paper and presenting the advanced research results in conferences:



2 papers



5 papers  
(2 joint papers with PTIT)



2 papers

PUSAT PEMBINAAN  
PENDIDIKAN DAN PELATIHAN PENELITI  
LEMBAGA ILMU PENGETAHUAN INDONESIA  
THE NATIONAL TRAINING  
EDUCATION CENTER  
FOR RESEARCHERS DEVELOPMENT

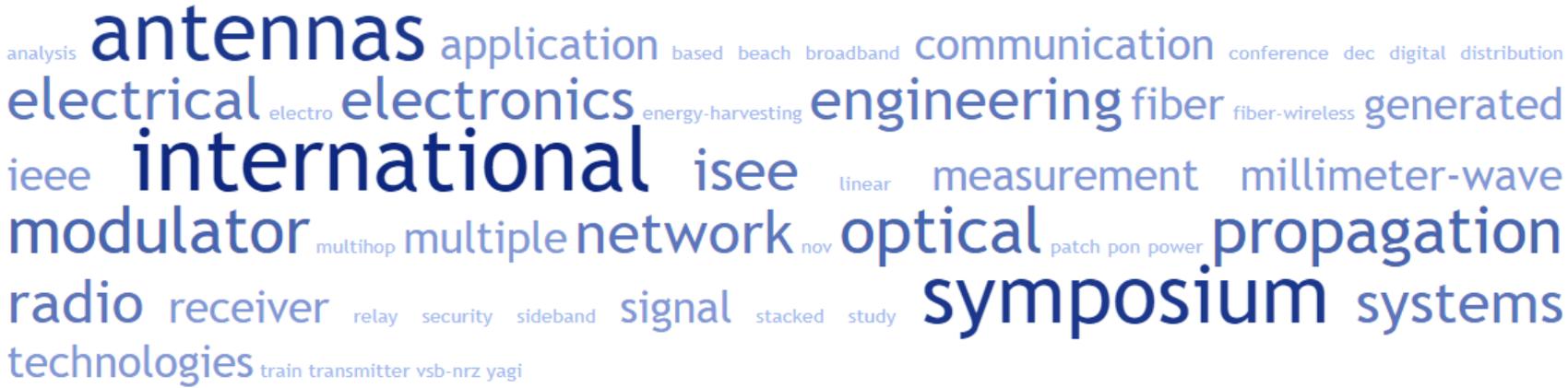


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1 papers



10 international conference and some technical reports



□ **Target #5: Providing** contributions to international standardization bodies for societies in the ASEAN region

- Propose preliminary work item on Millimeter-Wave Radio over Fiber Backbone for Train Communication Networks
- Study on Rain Attenuation Effects to millimeter wave in Indonesia: Dr. Hazim Ahmadi (in the next APT-AWG meeting)

The presentations at International Conference:

No:	Paper title:	Author names	Affiliation	Conference name:	The date of the conference	The venue of the conference
1	Radio over fiber signal generation and distribution and its application to train communication network	Atsushi Kanno, Pham Tien Dat, Naokatsu Yamamoto, Tetsuya Kawanishi, Naruto Yonemoto, Vo Nguyen Quoc Bao, Tan Hanh, Le Quoc Cuong, Kenichi Kashima, Nobuhiko Shibagaki	NICT, PTIT, HCMC DIC	CLEO-PR, OECC and PGC 2017	2017	Singapore
2	Digital Coherent Transmitter Using Electro absorption Modulator Integrated Laser	P. Mekbunwan, U. Mankong, K. Inagaki, A. Kanno and T. Kawanishi	NICT	2015 IEEE International Topical Meeting on Microwave Photonics (MWP)	31 Oct – 3 Nov 2016	Long Beach, USA
3	Radio over Fiber Network Technologies for Linear Cell Systems in Millimeter-Wave Bands	Atsushi Kanno, Pham Tien Dat, Naokatsu Yamamoto, Tetsuya Kawanishi	NICT	2017 International Symposium on Antennas and Propagation	30 Oct. – 2 Nov., 2017	Phuket, Thailand
4	Instantaneous Frequency Measurement for Broadband Radio Signals Using Optical Single Sideband Modulation	Tetsuya Kawanishi, Hideki Hayashi, Keizo Inagaki, Atsushi Kanno, Naokatsu Yamamoto	NICT	2017 International Symposium on Antennas and Propagation	30 Oct. – 2 Nov., 2017	Phuket, Thailand
5	Outage Analysis of Energy-Harvesting based Multihop Cognitive Relay Networks with Multiple Primary Receivers and Multiple Power Beacons	Nguyen Toan Van, Tran Trung Duy, Tan Hanh, and Vo Nguyen Quoc Bao	PTIT	2017 International Symposium on Antennas and Propagation	30 Oct. – 2 Nov., 2017	Phuket, Thailand

The presentations at International Conference:

No:	Paper title:	Author names	Affiliation	Conference name:	The date of the conference	The venue of the conference
6	28GHz Microstrip Yagi Antenna Stacked with Optical Modulator for 5G Wireless Communication	Yusuf Nur Wijayanto, Yahya Sukri, Fajri Darwis, Atsushi Kanno, Hiroshi Murata, Tetsuya Kawanishi, Dadin Mahmudin, Pamungkas Daud, Purwoko Adhi	LIPI, NICT	2017 International Symposium on Antennas and Propagation	30 Oct. – 2 Nov., 2017	Phuket, Thailand
7	Demonstration of Receiver Generated Optical Doubinary and VSB-NRZ for Next-Generation PON	Sevia Idrus	UTM	The 2017 International Symposium on Electrical and Electronics Engineering (ISEE)	Nov. 28 – Nov. 30, 2017	Ho Chi Minh City, Vietnam
8	A Study on WiFi Hotspot Model for Vietnam Cities	Vo Nguyen Quoc Bao, Le Quoc Cuong, Tran Trung Duy	PTIT, HCMC DIC	The 2017 International Symposium on Electrical and Electronics Engineering (ISEE 2017)	Nov. 28 – Nov. 30, 2017	Ho Chi Minh City, Vietnam
9	Converged Fiber-Wireless Technologies for Future Access and Radar Systems	Atsushi Kanno	NICT	The 2017 International Symposium on Electrical and Electronics Engineering (ISEE 2017)	Nov. 28 – Nov. 30, 2017	Ho Chi Minh City, Vietnam
10	W-Band Millimeter-Wave Patch Antennas on Optical Modulator for Runway Security Systems	Yusuf Nur Wijayanto, Atsushi Kanno, Hiroshi Murata, Tetsuya Kawanishi, Purwoko Adhi	LIPI, NICT	2017 IEEE Conference on Antenna Measurements and Applications,	Dec. 4-6, 2017	Tsukuba, Japan

- ❑ Propose preliminary work Items on millimeter-wave radio over fiber backbone for train communication networks
- ❑ Study on Rain Attenuation Effects to millimeter wave in Indonesia:  
Dr. Hazim Ahmadi (in the next APT-AWG meeting)

- ❑ **Short distance communication and imaging will be the key technologies for near future communications networks and applications.**
- ❑ **The research project has provided basic guidelines for**
  - Design of photonic integrated devices
  - Millimeter-wave propagation, channelization, and its availability
  - Device evaluation technique
  - Feasibility of short-distance communication by both optical and radio technology in access networks numerically and experimentally
  - Feasibility of short-distance imaging by optical and radio, and their combination techniques
  - New hardware implementations for short-distance communication and imaging based on radio-over-fiber and its related technologies.

❑ **The collaboration among ASEAN institutes including universities, manufactures, operators and government**

- Increasing the number of research scientists, engineers in the field of the convergence of radio and optical technologies for realization of 5G networks.
- Enhancing civil security and safety by imaging as well as to increase user experiences in future networks.
- Harmonizing the fundamental research based on the seeds for innovative technologies and strong demands from the operators, and finally, the institutes and governments can organize for international standardizations by these outputs.

- ❑ Short-distance communication and imaging technologies are very potential with many future applications and networks. Their applications and performance can be improved if can be combined with other advanced technologies, such as AI and ML
- ❑ More research collaboration activities are expected to make the project cooperation more efficient, i.e., trial tests and workshops are not enough.