Training Course Outline

ITU AND UNIVERSITI TEKNOLOGI MALAYSIA

Title	Human Exposure to 5th Generation (5G) Electromagnetic Fields: Guidelines, Measurements and Case Studies
Modality	Online instructor led
Dates	10 - 16 October 2022
Duration	1 week
Registration deadline	9 October 2022
Training fees	Regular Fee : USD 100 per pax Discounted Fees (Subject to Terms and Conditions) : Group Registration with minimum 4 pax: USD 70 per pax Large group Registration with minimum 10 pax: USD 50 per pax Returning participant : USD 70 per pax Student : USD 50 per pax
Description	5th Generation (5G) network is currently in implementation phase. The implementation of key 5G radio technologies such as millimetre wave, beamforming and small cell requires specific guidelines, standards and measurement and methodology if compared to legacy technology. Meanwhile, misunderstanding of the public regarding human exposure to 5G EMF results in public resistance to 5G roll-outs. The course aims to provide a systematic view of the 5G EMF covering guidelines, standards, measurement methodology and case studies in order to address the misunderstanding of the human exposure to 5G EMF.
Code	22OI27829ASP-E

1.LEARNING OBJECTIVES

The learning objectives of the course are

- To equip participants with an understanding of the fundamental of EMF emission and the relation between the 5G radio technology and EMF.
- To equip participants with an understanding of international guidelines and standards on human exposure to 5G EMF.
- To equip participants with practical laboratory EMF and SAR measurement techniques.

- To equip participants with practical on-site 5G EMF measurement and monitoring techniques.
- To equip participants with best practices through measurement case study.
- To expose participants on the public education strategy related to 5G EMF exposure and health concern.

2. LEARNING OUTCOMES

Upon completion of this training course, participants will be able to acquire the following:

- Describe the mobile base stations and devices EMF emission
- Explain the relationship between 5G radio technology and EMF
- Specify international guidelines and standards on 5G EMF exposure limits
- Discuss public education strategy for public acceptance of 5G
- Stipulate the in-lab EMF and SAR measurement methodology
- Establish the on-site EMF measurement methodology
- Identify best practices through 5G EMF measurement case study

3.TARGET POPULATION

This course will bring together leading specialists in the field; executives, managers, officials, engineers, employees from policy makers, regulators, government organisation, telecom operators, vertical industries, telecom investment companies, researchers and academia in the field of 5G and EMF. Other institutions and individuals are also welcomed to participate.

4.ENTRY REQUIREMENTS

Participants are expected to have background understanding of modern mobile communication networks.

5.TUTORS/INSTRUCTORS

Name of tutor(s)/instructor(s)	Contact details
Prof. Dr. Jafri Din, UTM	jafri@utm.my
Dr. Chee Yen (Bruce) Leow, UTM	bruceleow@utm.my
Dr. Norhudah Seman, UTM	norhudah@utm.my
Mr. Tien Han Chua, UTM	thchua@utm.my
Mr. Aamir Riaz, ITU	aamir.riaz@itu.int
External Speaker TBC	TBC

6.TRAINING COURSE CONTENTS

Module	Scope
1. Review of Base Stations and Devices EMF Emission	• Mobile base stations radiated power • Device radiated power • Near field vs far field • Antenna Array • E-Field and H-Field • Power density • Ionizing and non-ionizing radiation
2. 5G Radio Technology and EMF Emission	• 5G FR 1 and FR2 • Millimetre wave • Beamforming • Cell densification • Massive IoT
3. 5G EMF Policies, Guidelines and Standards Overview	• Overview of International Organizations involved in EMF related activities (ITU, ICNIRP, WHO, IEEE) • Safety factors • Exposure Limits • ITU standards, reports and guidelines • Report ITU-D Question 23/1, Question 7/2 • ITU-R Handbook - Spectrum Monitoring • ITU-R Report SM.2452
4. Public Education on 5G EMF Exposure and Public Health Concerns	• Reasons for Public Resistance • Public education strategy • Myths of EMF exposure and its impact on public health • Case study
5. EMF Lab Measurement	• IEC Measurement standard • Measurement equipment and setup • RF field strength and Power Density measurement methodology & procedure • SAR measurement methodology & procedure
6. Base Station EMF Compliance	• 5G base station compliance • Implications of massive MIMO, beamforming and mmWave. • Case study
7. On-site EMF Measurement	• IEC measurement standard • Measurement equipment and measurement setup • Broadband in-situ measurement methodology

Module	Scope
	• Frequency selective measurement methodology • Code selective measurement methodology • Evaluation location selection criteria • Ambient field level determination • Postprocessing: extrapolation, interpolation & scaling • Averaging: spatial and time • Measurement demo
8. EMF Measurement Case Study	• Sharing of 5G EMF measurement case study

7.TRAINING COURSE SCHEDULE

Date and Time (Kuala Lumpur Time Zone GMT +8)	Module	Activity
10 Oct 2022 (Mon) 2.30pm to 4.30pm	1. Review of Base Stations and Devices EMF Emission	Live lecture and Q&A
	2. 5G Radio Technology and EMF Emission	Live lecture and Q&A
11 Oct 2022 (Tue) 2.30pm to 4.30pm	3. 5G EMF Policies, Guidelines and Standards Overview	Live lecture and Q&A
	4. Public Education on 5G EMF Exposure and Public Health Concerns	Live lecture and Q&A
12 Oct 2022 (Wed) 2.30pm to 4.30pm	5. EMF Lab Measurement	Live lecture and Q&A
	6. Base Station EMF Compliance	Live lecture and Q&A
13 Oct 2022 (Thu) 2.30pm to 4.30pm	7. On-site EMF Measurement	Live lecture and Q&A
	8. EMF Measurement Case Study	Live lecture and Q&A
14-16 Oct 2022 (Fri-Sun)	e-learning Activities	Quiz 1 (Module 1-4, 30%) Quiz 2 (Module 5-8, 30%) Discussion Forum (20%)

8.METHODOLOGY (Didactic approach)

The online instructor-led training course will include:

- Instructor-led live-streamed lectures
- Multimedia presentations
- Discussion forums

The lectures will be presented by modules. Live lectures will be scheduled throughout the week from Monday to Thursday. Recorded lectures will be made available for those who cannot attend the live sessions. Each session will last up to 2 hours, including Q&A interaction. The exact schedule for live lectures will be published on the course e-learning page on ITU Academy.

Discussion forums will be used to allow participants to interact with the trainers and allow participants to exchange knowledge. Discussion topics can be posted by trainers and participants.

All official announcements will be made through the Announcement Forum in the e-learning course page.

9.EVALUATION AND GRADING

The assessment of the participants shall be based on the -time spent on the training and the following parameters:

Evaluation Parameter	Weightage (in %)
Quizzes	60 %
Participation in Discussion Forum	20 %
Participation in live lecture and Q&A interaction sessions (10% per session)	20 %

10.TRAINING COURSE COORDINATION

Course coordinator:	ITU coordinator:
Dr. Chee Yen Leow (Bruce) Course Coordinator, Wireless Communication Centre, UTM. Tel: +607-5536087 Fax: +607-5535252 Email: bruceleow@utm.my **Mdm. Hasline Binti Mohamad** Secretariat, Wireless Communication Centre, UTM. Tel: +607-5536106 Fax: +607-5535252 Email: hasline@utm.my	**Mr. Sean Doral** Program Officer, ITU Regional Office for Asia-Pacific 5th Floor, Thailand Post Training Centre, 111 Moo3 Chaengwattana Road,Laksi Bankok 10210,Thailand sean.doral@itu.int (Email) +41 2273 05438 (Works) +66 257 535 07 (Fax)