

Promotion of 5G Field Trials and Reflections

— Path of 5GMF/5G Trial Promotion Group Activities —



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1. Introduction

The Fifth Generation Mobile Communications Promotion Forum (5GMF) was established in September, 2014, to promote implementation of 5th Generation mobile communications systems (5G). It proposed that system integrated verification trials of 5G linking wireless communication, network applications and user devices (UE), be conducted starting in FY2017, and established a task force and then a 5G trial promotion group to study specific content of such trials. This article discusses the path taken by the promotion group in its activities, and reflects on promotion of system trials on 5G.

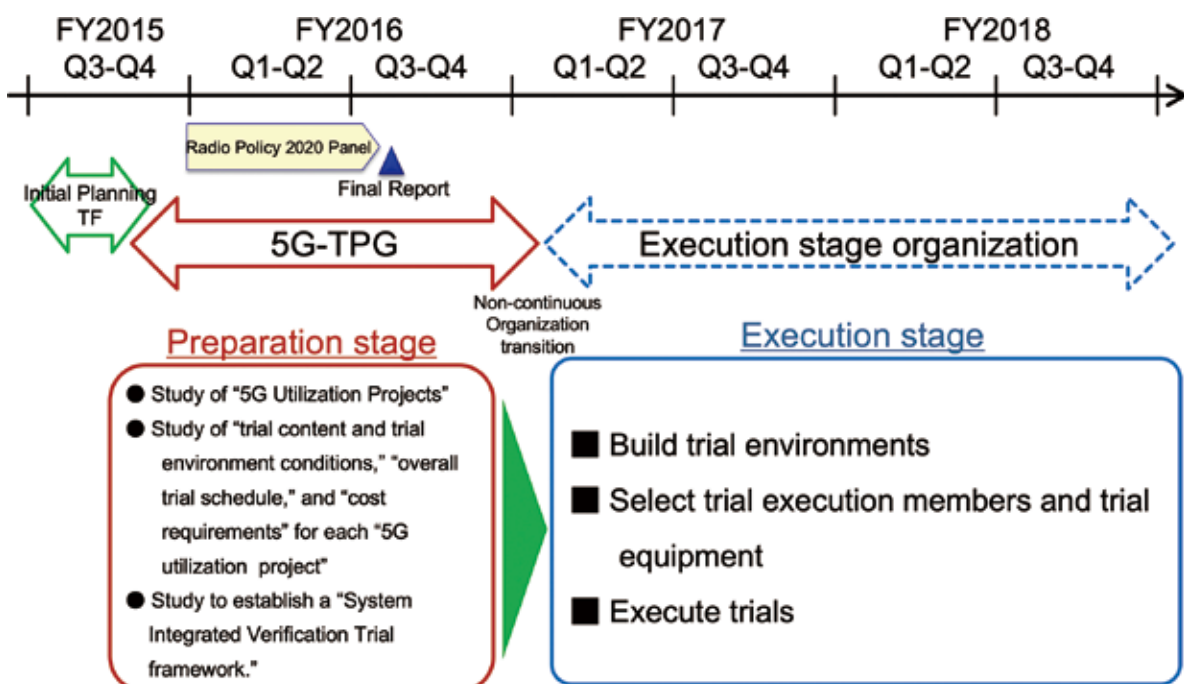
2. Preparation for System Trials on 5G

In September, 2015, the 5GMF planning committee established the System Integrated Verification Trial Initial Planning Task Force (called the “Initial Planning TF”) as a subcommittee, to draft a plan for conducting system integrated verification trials of 5G. Based on the results of hearings with 5GMF members, the Initial Planning TF created a draft plan enumerating trial items, details, equipment, and examples of applications and services that could be tested, for three categories

of radio communication trials. These included a trial of high speed and capacity of the low-SHF band (below 6 GHz) communication, of high-speed and ultra-high-speed (ultra-low-latency) high-SHF band (over 6 GHz) communication, and of device-to-device communication with different types of wireless systems. Later, in January 2016, the 5G Trial Promotion Group (5G-TPG) was established within the 5GMF, to study a concrete plan and framework for conducting system trials across the various 5GMF committees, for technology, networks and applications. The 5G-TPG was composed of members elected from each committee (from 28 5GMF ordinary members as of June 2016). In the FY2016 preparation stage of the 5G-TPG activities schedule at the time (Figure 1), the group promoted advance preparation and planning for conducting system integrated verification trials based on results from the Initial Planning TF, and in the FY2017 and later execution stage, the reorganized group promoted building the actual trial environments, selecting trial execution members and trial equipment, and executing the trials.

In the actual preparation stage, the 5G-TPG solicited proposals for concrete 5G utilization projects (suitable as trial themes) from the constituent members. After organizing the

■ Figure 1: 5G-TPG activity schedule



proposed projects in terms of trial content, trial environments, trial time-frames, related organizations and other factors, the results were published in a report (5G Utilization Project Plan – English Edition)^[1] in September, 2017. The report mentions a wide range of use cases in a total of 35 5G utilization projects, which are categorized into six fields such as Entertainment, Automobile-related, Crime prevention, and Disaster prevention. It lists trial environments associated with each use case, such as stadiums, shopping malls, theme parks, train stations, and airports; and gives specific locations with consideration for regional balance, and a desire to build trial environments in all regions, and not just the Tokyo area.

3. Execution stage for 5G Field Trials

The 5G-TPG later identified several projects desirable to execute as the system integrated verification trials of 5G at the beginning of FY2017, and began study with the goal of creating concrete execution plans and frameworks for each of the projects by the end of 2016.

On the other hand, the Ministry of Internal Affairs and Communications (MIC) had been promoting research and development on 5G radio communication technologies to realize ultra-high speed, high capacity, low latency and massive connectivity since FY2015. The basic framework for conducting the 5G Field Trials also incorporated this 5G research and development, and so called, “Technical Examination Service” work by the MIC, on systems that combined new applications and services envisioned for 5G, to identify any issues in implementing 5G systems and to perform studies necessary for creating the technical standards.

The trial items and content of these 5G Field Trials by the MIC also referred to the 5G-TPG report (5G Utilization Project Plan) mentioned earlier and conducted trials anticipating 5G utilization in various fields, while including study of the radio propagation characteristics of the new frequency bands for 5G and evaluation of system performance. After the MIC established the new trial framework, the 5G-TPG has continued its activities since FY2017, actively supporting implementation of the 5G Field Trials.

Table: Domestic and international presentations and exhibits

Date	Title	Sponsor	Type	Format
Oct. 2016	5th Generation Mobile Communication Systems (5G) Workshop 2016 @ CEATEC2016 “5G System Trials for Realizing 5G Systems”	MIC, 5GMF	Domestic event	Presentation (5G-TPG Sub-leader)
Oct. 2016	5G Technology Workshop “5G Key Concept and System Trial in Japan”	TAICS	International event	Presentation (5G-TPG Sub-leader)
May 2017	The 3rd Global 5G Event in Tokyo, Japan Session 3: “Overview of 5G System Trial Concept & Plan in Japan”	5GMF	International event	Presentation (5G-TPG Leader)
Oct. 2017	5th Generation Mobile Communication Systems(5G) Workshop 2017 @ CEATEC2017 “Activity Status of 5G Trial Promotion Group in 5GMF”/“Overview of 5G System Trials Project Execution”	MIC, 5GMF	Domestic event	Presentation (5G-TPG Leader/ Test Groups)
Nov. 2017	The 4th Global 5G Event in Seoul, Korea “Recent Activities on 5G System Trials in 5GMF”	5G Forum	International event	Presentation (5G-TPG Leader)
Nov. 2017	MWE2017 Microwave Workshop/Microwave Exhibition “5th Generation Mobile Communication Systems System Trials for Realizing 5G”	IEICE APMC Japan Committee	Domestic conference	Presentation/Exhibit (Test groups)
Mar. 2018	5G International Symposium 2018 Part 1: What can we do with 5G? — Results from the 5G System Trials —	MIC, 5GMF, ARIB	Domestic event	Presentation/Exhibit (Test Groups)
Mar. 2018	2018 General Conference BP-1 “System Trials for Realizing 5G and Future Expectations”	IEICE	Domestic conference	Presentation (Test Groups)
May 2018	The 5th Global 5G Event in Austin, USA “5G System Trials in Japan -Activities of 5G Trial Promotion Group (5G-TPG) in 5GMF-”	5G Americas	International event	Presentation (5G-TPG Leader)
Nov. 2018	APMC2018 Workshop “5G System Trials in Japan”	IEICE	International meeting	Presentation (5G-TPG Leader)
Nov. 2018	The 6th Global 5G Event in Rio de Janeiro, Brazil Panel 7: “5G System Trials in Japan”	5G Brazil	International event	Presentation (5G-TPG Leader)
Nov. 2018	MWE2018 Microwave Workshop/Microwave Exhibition “5th Generation Mobile Communication Systems System Trials for Realizing 5G II”	IEICE APMC Japan Committee	Domestic conference	Presentation/Exhibit (Test Groups)
Jan. 2019	5G International Symposium 2019 Part 2: 5G System Trial Results Presentation	MIC, 5GMF, ARIB	Domestic event	Presentation/Exhibit (Test Groups)

Date	Title	Sponsor	Type	Format
Mar. 2019	2019 General Conference BI-4 “[5G Day] Part II, 5G System Trial Results and Development for the Future”	IEICE	Domestic conference	Presentation (Test Groups)
June 2019	The 7th Global 5G Event in Valencia, Spain Session 2: “5G System Trials in Japan”	5G-IA	International event	Presentation (5G-TPG Leader)
Aug. 2019	2019 Next-Generation Mobile Communication Technology and Application Workshop “R&D Activities and Field Trials toward 5G Actualization in Japan”	FuTURE Forum	International meeting	Presentation (5G-TPG Leader)
Sept. 2019	IEEE VTC2019-Fall WS-TPoC5GE2019 “Outcomes of Korea - Japan Joint 5G Collaboration -5G Field Trials in Japan-”	IEEE VTS	International meeting	Presentation (5G-TPG Leader)
Oct. 2019	5G International Seminar 2019 @CEATEC2019 “5G System Trials in Japan”	MIC, 5GMF, ARIB	Domestic event	Presentation (5G-TPG Leader)
Nov. 2019	MWE2019 Microwave Workshop/Microwave Exhibition “5th Generation Mobile Communication Systems System Trials for Realizing 5G III”	IEICE APMC Japan Committee	Domestic conference	Presentation/Exhibit (Test Groups)
Dec. 2019	Shimane Prefecture 5G Utilization Workshop “5G Overview and Use Cases – Overview of 5G System Trials–”	Shimane Prefecture	Domestic event	Presentation (5GMF Office)
Jan.-Feb. 2020	IoT/ICT Implementation Seminar	MIC Bureau of Telecommunications at 11 locations throughout Japan	Domestic event	Presentation (5GMF Office)
Feb. 2020	5G International Symposium 2020 Part 1: 5G System Trial Results	MIC, 5GMF, ARIB	Domestic event	Presentation/Exhibit (Test Groups)
Mar. 2020	2020 General Conference TK-5 “5G System Trial Results and Future Expectations”	IEICE	Domestic conference	Presentation (Test Groups)
Jun. 2020	CSA Japan Summit 2020 “Trends in Testing New 5G Services in Japan—MIC 5G System Trial Results for Starting 5G Commercial Services—”	CSA Japan	Domestic event	Presentation (5G-TPG Leader)
July 2020	Yamaguchi Prefecture 5G Research Conference and Lectures “5G/Local 5G Utilization— 5G System Trial Results (3 years) —”	Yamaguchi Prefecture	Domestic event	Lecture (5GMF Office)
Oct. 2020	CEATEC 2020 ONLINE “5G Special Day II/ 5G Workshop” Session 1 “5G System Trials Review”	ARIB, 5GMF, CIAJ	Domestic event	Presentation (5G-TPG Leader)

■ Figure 2: Global 5G Event



The 5G Field Trials begun in FY2017 are introduced in the MIC articles in this Special Feature, and were conducted for three years until FY2019, with participation from people in various utilization fields, to help create new markets through implementation of 5G. Each year, six trial groups conducted trials throughout Japan specializing on their respective themes. Technical objectives for ultra-high speed, high-capacity, low latency and massive connectivity were set for different areas;

whether urban or rural, indoor or outdoor; and testing was done using the new frequency bands introduced for 5G (3.7/4.5/28 GHz), through collaboration among partners from a wide range of industries, application fields and participants involved in the mobile communications industry. Articles from each of the trial groups are included in this special feature, introducing specific themes tested in FY2019 and results from those trials.

4. Support for performing 5G Field Trials

The latest trial conditions being implemented by each trial group (trial plans, results) are being reported quickly at domestic and international conferences and other events as shown in the Table. The 5G-TPG has been supporting each trial group with their presentations and exhibits as well as coordinating and summarizing each group's results. The goal of these activities is to inform people from a wide range of industries and businesses, not limited to telecommunications, of the details of the trials and to provide an opportunity to feedback their comments and opinions to the trial members, so this appeal is also being spread with articles in academic journals^[2]. At the Global 5G Events (Figure 2), held twice yearly by 5G promotion organizations in various countries and regions, the 5G-TPG introduces the latest

■ Figure 3: 5G-TPG reports (booklets)



trial results from each trial group, spreading the development and testing of 5G use cases in Japan across various regions, and promoting the use of 5G to find solutions to various societal issues faced, not only by Japan, but by countries around the world.

The 5G-TPG also creates the 5G-TPG Report (Figure 3), which can be considered its annual report, and distributes it as a booklet at the Global 5G Event. The first and second editions of this report are also published on the 5GMF web site^[3]. The “General Report on 5G System Trials in Japan from 2017 to 2020,” can be considered the third edition and is currently in progress. It includes results from trials conducted in FY2017 and FY2018 as well as the FY2019 Trials introduced in this special feature, and will be published on the 5GMF web site before the end of 2020, after the booklet is completed and arrangements are made.

5. Conclusion

Commercial 5G services were started by operators in Japan towards the end of March, 2020, but several operators outside of Japan announced that they had started the world’s first commercial 5G services about one year earlier. This has led to suggestions that Japan is lagging the rest of the world in 5G, but a new generation of mobile communication system has evolved about every decade in the past. We expect that 5G will also spread and use of services will continue to expand in the next decade, and we are confident that the system integrated verification trials of 5G, discussed and implemented by the 5GMF and 5G-TPG over the five years from 2015 until commercial services began, will be a driving force behind this expansion.

Acknowledgements

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References

- [1] 5GMF, “5G System Integrated Verification Trial Report—5G Utilization Project Plan—Ver. 1.0 English Edition,” <https://5gmf.jp/whitepaper/5g-tpg-report-1-0/>, Sept. 2017.
- [2] Y. Okumura, M. Minowa, S. Suyama, “5G System Trials by All Japan,” *IEICE Journal*, Vol. 101, No. 11, pp.1058-1065, Nov. 2018.
- [3] 5GMF, “The First Report on 5G System Trials in Japan 2018 Rev.1,” “The Second Report on 5G System Trials in Japan 2019,” <https://5gmf.jp/whitepaper/>, Apr. 2018/June 2019.

Cover Art



**Eight Views in the Environs of Edo
Clearing Weather at Shibaura**
Utagawa Hiroshige (1797~1858)

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