

SEKIGUCHI Toshio

“Systematization of Electromagnetic boundary value problems and Their Application to Antenna Engineering”

1. Biography

1923-9 Birth, 1944-9 Taga Tech. Highschool, 1944 Mitsubishi Electric Co., Ltd., 1945-1 Army Communications School, 1946-5 Tokyo Institute of Technology, 1949-3 Bachelor Tokyo Tech., 1949-4 Research Student, 1954-4 Research Student in Morita laboratory, 1954-12 Research Assistant Tokyo Tech, 1957-1 Doctor of Engineering, 1957-11 Assistant Prof., 1963-12 Professor, 1980-4 Dean Faculty of Engineering, 1983-1 President Tokyo Kosen, 1984-4 Prof. Emeritus TIT, 1989-4 Prof. Emeritus Tokyo Kosen, 1989-4 Prof. Musashi Institute of Technology, 1994-3 Retired, 1997-11 the Order of the Rising Sun, Gold Rays with Neck Ribbon, 2008-11 Pass away (85 years old)



(SEKIGUCHI Toshio)

2. Summary

SEKIGUCHI Toshio achieved distinguished works in 1960s, firstly, Mechanism Extraction and Physical Interpretation of Electromagnetic Scattering and their application to Microwave Wireless Systems and secondly, analyses of waveguiding Phenomena in antenna arrays for Radiation Pattern Synthesis. By leading and systematizing the researches in Electromagnetic waves, SEKIGUCHI established and organized the academic and engineering fields of Antennas and Propagation (AP) and Wireless Communications. He also contributed to human resource development in the relevant fields.

3. Research Summary

3.1 Achievement in Analysis of Electromagnetic Waves Scattering and Application of Microwave Wireless Systems.

SEKIGUCHI pushed forward the study of Microwave Wireless Systems by Prof. Kiyoshi Morita (Emeritus) and the diffraction by mountain ridges is scale modeled by using He-Ne laser [1]. Universal and common phenomena of waves, such as Fermat's principle and Fresnel zones, are visualized and interpreted, which led to the later advancement of Geometrical Theory of Diffraction, Sidelobe suppression of Reflector antennas and Radio propagation in lossy environment. Scaled experiments Mathematical studies of surface wave excitation from the truncated periodic structures provided the foundation of

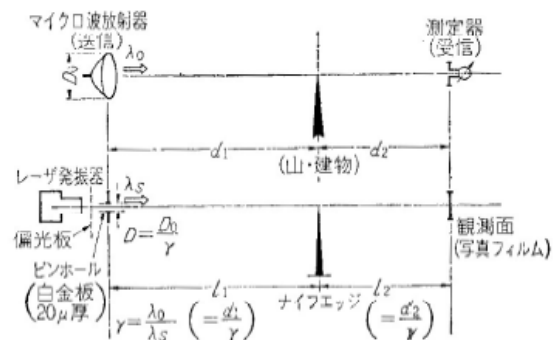


図1 レーザシミュレーション対応図
(マイクロ波通信回線のシミュレーション)

Fig.1 Setup of the Laser
Simulation Experiments [1]

analysis/synthesis of array antennas. These works won the distinguished achievement and contributions award from Institute of Electronics, Information and Communication Engineers (IEICE) in 1993.

3.2 Analysis and Pattern Synthesis of Array Antennas

Analyses of waveguiding properties of circular loop arrays and periodic structures were utilized to design a Yagi-Uda array of one wavelength circular loop for receiving UHF TV broadcast. Another accomplishment is pattern synthesis of arrays where mathematical solvers such as improved circuit theory (ICT)[2] and nonlinear planning method are adopted for computer-aided design of arrays; variety of design policies as well as synthesis tools were derived. These works have been continued by his successors Prof. GOTO Naohisa (Emeritus), the inventor of a Radial Line Slot Antenna (RLSA), which were used for BS receiving, plasma processing for large semi-conductors and recently satellite on-board of HAYABUSA2.

3.3 Systematization of Field Analysis and Array Pattern Synthesis

A Unique feature of SEKIGUCHI's approaches is to derive/extract the universal wave phenomena from the rigorous mathematical analysis and then to apply them for the engineering in computer-aided forms. On the way, SEKIGUCHI systematized existing approaches for electromagnetic wave scattering. Scattering from simple and hard-to-find canonical objects given in terms of series expansion consisting of special functions are reviewed, compared and systematized, where the pros and cons as well as consistency of various methods are clearly illustrated. His graduate course lecture notes were published as "Electromagnetic Waves" from Asakura in 1976 and won the Book Award from IEICE. "Field Analyses in Engineering" Kyoritsu in 1977 extended the Systemization from Asakura in 1976[3] beyond electromagnetic waves.



4. Remarks

SEKIGUCHI, firmly kept the policy of non-interference in education. He valued the process than the result, the effort than the talent. He always stimulated the students to make good questions as the response for the excellent presentation by others in the meeting. He fostered competitive human resources inside or outside of AP community. Awards for Fellow of IEEE, Paper(1974-5), book(1977-5) and distinguished achievement and contribution(1993-5) from IEICE, all reflected the contribution as educator.

5. References

- [1] Toshio Sekiguchi, "Observation and Measurements of Diffraction Patterns by Laser Simulation," IECE Vol.56, No.6, PP.795, June 1973
- [2] Toshio Sekiguchi, Naoki INAGAKI, "Antenna Radiation Pattern Synthesis," Institute of Electrical Communication Engineers of Japan, Vol.48, No.4 pp.541-551 April 196
- [3] Sekiguchi Toshio, "Electromagnetic Waves" from Asakura in 1976
- [4] "Field Analyses in Engineering" from Kyoritsu in 1977

(2021-6-26 ANDO Makoto)