Curriculum Vitae

Tomoaki Nagaoka, Ph.D.
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1. Professional Summary

I am a research manager at the National Institute of Information and Communications Technology (NICT), Japan, with more than twenty years of professional experience in bioelectromagnetics, electromagnetic exposure assessment, numerical dosimetry, and international standardization. Over the course of my career, I have made substantial contributions to the development of high-resolution anatomical human models, advanced computational methods for exposure evaluation, and measurement techniques for SAR and APD, as well as to exposure assessment frameworks for 5G, Beyond 5G/6G, and terahertz systems. I have authored numerous peer-reviewed publications, consistently contributed presentations to BioEM annual conferences, and have been actively involved in IEC/IEEE standardization activities.

2. Research Experience

October 2004 – April 2007: Researcher in Bio-EMC Group, Radio Communication Systems Department, National Institute of Information and Communications Technology (NICT), Japan.

May 2007 – March 2011: Researcher in Division 3, EMC Group, Electromagnetic Wave Measurement Research Center, NICT, Japan.

April 2011 – March 2013: Researcher in Electromagnetic Environment Laboratory, Electromagnetic Wave Measurement Institute, NICT, Japan.

April 2013 – June 2023: Senior Researcher in Electromagnetic Environment Laboratory, Electromagnetic Wave Measurement Institute, NICT, Japan.

July 2023 – Current: Research Manager in Electromagnetic Compatibility Laboratory, Electromagnetic Standards Research Center, Radio Research Institute, NICT, Japan.

3. Scientific Key Activities

- 2010 – 2013
  Project title: Development of Exposure Assessment Models for Pregnant Women and Fetuses under Emerging Wireless Communication Usage Scenarios
  Funding: Japan Science and Technology Agency (JST)
  Role: Task Leader for fetal numerical model development and establishment of deformation techniques
- 2021 – 2025
  Project title: Research on Radio Wave Exposure Assessment Technologies for New Diversified Wireless Systems such as 5G/6G
  Funding: Ministry of Internal Affairs and Communications (MIC), Japan
  Role: Principal Investigator
- Technical Expert, IEC Technical Committee 106 (TC 106)

4. Awards

- Best Paper Award, *Physics in Medicine and Biology (PMB)* （2004）
- Young Researcher Award, Institute of Electronics, Information and Communication Engineers (IEICE) （2007）
- Young Scientist Award, International Scientific Radio Union (URSI) （2008）
- Outstanding Paper Award, IEEE AFRICON （2011）
- Best Paper Award, International Symposium on Applied Sciences in Biomedical and Communication Technologies (ISABEL) （2011）
- Maejima Hisoka Award, The Telecommunications Advancement Foundation, Japan （2013）
- Award of the Chairman of the Board, Association of Radio Industries and Businesses (ARIB), Japan （2022）

5. Selected Publications (Related Work)

1. S. Yamazaki, M. Fukunari, Y. Tatematsu, Y. Kushiyama, **T. Nagaoka**, M. Mizuno,

"Investigation of Reflectance, Transmittance, and Thermal Response of Skin and Surface-textured Skin-equivalent Phantoms in the Terahertz Frequency Range Around 0.3 THz", Scientific Reports. (Accepted)

2. Y. Yanaga, Y. Shimizu, T. Arima, **T. Nagaoka**, “Development of Human-Equivalent Phantom for Induced Electric field Measurements in EV-WPT Exposure Assessment”, IEEE Transaction on Electromagnetic Compatibility. (Accepted)

3. M. Fukunari, M. Mizuno, Y. Tatematsu, Y. Yamaguchi, S. Yamazaki, **T.Nagaoka**, “Development of a 600 GHz Optical System for Electromagnetic Field Exposure Assessment Using a Gyrotron”, IEEE Transactions on Terahertz Science and Technology,1-8,2025.

4. Y. Kushiyama, **T. Nagaoka**, “Numerical Calculation of Whole-Body Exposure to Beams From mmWave Base Stations Using Superposition of Spherical Waves”, IEEE Access, 13, 154021-154030, 2025.

5. S. Yamazaki, M. Mizuno, **T. Nagaoka**, “Development of a cornea-equivalent phantom in the terahertz frequency region for 3D temperature rise assessment”, Scientific Reports, 15, 17088, 2025.

6. Y. Tatematsu, Y. Yamaguchi, M. Fukunari, M. Hayakawa, R. Kai, Y. Kawai, R. Matoba, K. Sasaki, T. Shirotori, G. Suzuki, J. Tanaka, M. Mizuno, **T. Nagaoka**, “First Experiment of a 600-GHz CW Gyrotron Developed as Light Source for EMF Exposure Assessment, IEEE Electron Device Letters”, 46,310-313, 2025.

7. K. Kimura, K. Saito, M. Takahashi, T. Nagaoka, “Evaluation of Radio Wave Exposure of the Human Head at Multiple Frequencies of Up to 6 GHz” ,67, 778-785, 2025.

8. D. Nishihara, K. Sasaki, Binti Mohd Baharin Rasyidah Hanan, **T. Nagaoka** ,O. Hashiomoto, R. Suga, “Development of Measurement Phantom for Absorbed Power Density Assessment by Human Exposure at 28 GHz Band”, IEEE Journal of Electromagnetics, RF and Microwaves in Medicine and Biology (IEEE J-ERM)", 2024.

9. R. Okada, M. Mizuno, **T. Nagaoka**, H. Takehara, M. Haruta, H. Tashiro, J. Ohta, K. Sasagawa, “Millimeter-Wave Band Electro-Optical Imaging System Using Polarization CMOS Image Sensor and Amplified Optical Local Oscillator Source”, Sensors, 24, 4138,

2024.

10. M. Mizuno, S. Yamazaki, **T. Nagaoka**, “Spectroscopic Evaluation of Epidermis-equivalent Phantom in Terahertz-frequency Region”, Radio Science, 59, 1-6, 2024.

11. R. Okada, M. Mizuno, **T. Nagaoka**, H. Takehara, M. Haruta, H. Tashiro, J .Ohta, K .Sasagawa, “THz near-field intensity distribution imaging in the 0.3 THz band using a highly sensitive polarization CMOS image sensor using a 0.35 μm CMOS process”, Japanese Journal of Applied Physics, 63,1-7,2024.

12. Y. Shimizu, N. Ishii, **T. Nagaoka**, S. Watanabe, “Measurement Method for Dielectric Property of Lossy Liquid Using Waveguide Well for SAR Probe Calibration”, IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT, 72, 1-12, 2023.
10. K. Sasaki, **T. Nagaoka**, “Dielectric Modeling of Adipose Tissue as a Function of Water Content From 1 GHz to 100 GHz”, URSI Radio Science Letters, 4, 1-4, 2022.

13. C. Takasaka, K. Saito, M. Takahashi, **T. Nagaoka**, K. Wake, “Specific Absorption Rate (SAR) Calculations in the Abdomen of the Human Body Caused by Smartphone at Various Tilt Angles, IEICE TRANSACTIONS ON COMMUNICATIONS”, E105-B, 295-301, 2022.

14. A. Andrii, Y. Shimizu, T. Nagaoka, “Specific Absorption Rate Measurement Method for Exposure Assessment and Conformity Evaluation of 2.45 GHz RF Wireless Power Transfer System”, URSI Radio Science Letters, 2022.

15. Y. Shimizu, K. Sasaki, **T. Nagaoka**, “Design of Coaxial Sensor for Dielectric Measurement of Biological Tissues Below 100 MHz Frequency Range, URSI Radio Science Letter”, 3, 2021.

16. **T. Nagaoka**, S. Watanabe, “Development of voxel models adjusted to ICRP reference children and their whole-body averaged SARs for whole-body exposure to electromagnetic fields from 10 MHz to 6 GHz”, IEEE Access, 7, 135909-135916, 2019.

17. T. Iyama, T. Onishi, K. Sasaki, **T. Nagaoka**, R. Hamada, S. Watanabe, “Whole-body average SAR measurement using flat phantoms for radio base station antennas and its applicability to adult and child human models”, Annals of Telecommunications,1-10, 2018.

18. R. Takei, **T. Nagaoka**, K. Saito, H. Nishino, S. Watanabe, M. Takahashi, "Specific absorption rate and temperature increase in pregnant women at 13, 18, and 26 weeks of gestation due to electromagnetic wave radiation from a smartphone", IEICE Communications Express, 1,1-6, 2018.

19. R. Takei, **T. Nagaoka**, K. Saito, H. Nishino, S. Watanabe, M. Takahash, “SAR Variation Due to Exposure From a Smartphone Held at Various Positions Near the Torso”, 59, 747-753, 2017.

20. R. Takei, **T. Nagaoka**, K. Saito, S. Watanabe, M. Takahashi, “SAR Variation Due to Exposure from a Smartphone Held at Various Positions Near the Torso”, IEEE Transactions on Electromagnetic Compatibility, 59, 747-753, 2017.

21. S. Tateno, **T. Nagaoka**, K. Saito, S. Watanabe, M. Takahashi, K. Wake, “Variability of Specific Absorption Rate of Human Body for Various Configurations of Tablet Computer in Vicinity of Abdomen”, IEICE Transactions on Communications, E98-B, 1173-1181, 2015.

22. **T. Nagaoka**, T. Niwa, S. Watanabe, “Specific Absorption Rate in Mothers and Fetuses in the Second and Third Trimesters of Pregnancy”, International Journal of Microwave and Optical Technology, 9, 34-38,2014.

23. A. Tateno, S. Akimoto, **T. Nagaoka** et al., “Specific absorption rates and temperature elevations due to wireless radio terminals in proximity to a fetus at gestational ages of 13, 18, 26 weeks”, IEICE Transactions on Communications, E97-B, pp.2175-2183, 2014.

24. S. Tateno, K. Tanaka, **T. Nagaoka**, K. Saito, S. Watanabe, M. Takahashi and K. Ito, “Specific absorption rates of pregnant females and their fetuses from simple and realistic electromagnetic sources”, IEICE Communications Express, 3, pp.55-60,2014.

25. K. Sasaki, T. Sakai, **T. Nagaoka** et al., “Dosimetry using a localized exposure system in the millimeter wave band for in vivo studies on ocular effects”, IEEE Transactions on Microwave Theory and Techniques, 62, pp. 1554-1564, 2014.

26. **T. Nagaoka**, “Voxel-Based Harmonic Map for Voxel-Model Deformation/Manipulation, Advances in Visual Computing, Lecture Notes in Computer Science, 8034, pp.633-642, 2013.

27. A. Hirata, K. Yanase, I. Laakso, KH Chan, O. Fujiwara, **T. Nagaoka** et al., “Estimation of the whole-body averaged SAR of grounded human models for plane wave exposure at respective resonance frequencies”, Physics in Medicine and Biology, 57, pp.8427-8442, 2012.

28. S. Akimoto, S. Kikuchi, **T. Nagaoka**, K. Saito, S. Watanabe, M. Takahashi and K. Ito, “Evaluation of Specific Absorption Rate for a Fetus by Portable Radio Terminal Close to the Abdomen of a Pregnant Woman”, IEEE Transactions on Microwave Theory and Techniques, 58, pp. 3859-3865, 2010.

29. A. Hirata, O. Fujiwara, **T. Nagaoka**, S. Watanabe, Estimation of Whole-Body Average SAR in Human Models Due to Plane-Wave Exposure at Resonance Frequency, IEEE Transactions on Electromagnetic Compatibility, 52, pp.41-48, 2010.

30. H. Kawai, **T. Nagaoka** et al., “Computational dosimetry in embryos exposed to electromagnetic plane waves over the frequency range of 10 MHz-1.5 GHz”, Physics in Medicine and Biology, 55, pp. N1-11, 2010.

31. **T. Nagaoka**, S.Watanabe, “Voxel-based variable posture models of human Anatomy,” Proceedings of the IEEE, 97, pp.2015-2025, 2009.

32. PJ. Dimbylow, **T. Nagaoka**, XG Xu, “A comparison of foetal SAR in three sets of pregnant female models”, Physics in Medicine and Biology, 54, pp.2755-2767, 2009.

33. PJ. Dimbylow, A. Hirata, **T. Nagaoka**, “Intercomparison of whole-body averaged SAR in European and Japanese voxel phantoms”, Physics in Medicine and Biology, 53, pp.5883-5897, 2008.

34. **T. Nagaoka**, S.Watanabe, “Postured voxel-based human models for electromagnetic dosimetry”, Physics in Medicine and Biology, 53, pp.7047-7061, 2008.

35. A. Hirata, N. Ito, O. Fujiwara, **T.Nagaoka**, S.Watanabe, “Conservative estimation of whole-body-averaged SARs in infants with a homogeneous and simple-shaped phantom in the GHz region”, Physics in Medicine and Biology, 53, pp.7215-7223, 2008.

36. **T.Nagaoka**, E.Kunieda, S. Watanabe, “Proportion-corrected scaled voxel models for Japanese children and their application to the numerical dosimetry of specific absorption rate for frequencies from 30 MHz to 3 GHz”, Physics in Medicine and Biology, 53, pp.6695-6711, 2008.

37. T. Togashi, **T. Nagaoka**, S. Kikuchi, K. Saito, S. Watanabe, M. Takahashi and K. Ito, ”FDTD calculations of specific absorption rate in fetus caused by electromagnetic waves from mobile radio terminal using pregnant woman model”, IEEE Transactions on Microwave Theory and Techniques, 56, pp.554- 559, 2008.

38.**T. Nagaoka**, et al., “An Anatomically Realistic Whole-Body Pregnant-Woman Model and Specific Absorption Rates for Pregnant-Woman Exposure to Electromagnetic Plane Waves from 10 MHz to 2 GHz”, Physics in Medicine and Biology, 52, pp.6731-6745, 2007.

39. C. Lee, **T. Nagaoka**, JK. Lee, “Implementation of Japanese Male and Female Tomographic Phantoms to Multi-particle Monte Carlo Code for Ionizing Radiation Dosimetry”, Journal of Nuclear Science and Technology, 56, pp.937- 945, 2006.

40. **T. Nagaoka** et al., “Development of realistic high-resolution whole-body voxel models of Japanese adult males and females of average height and weight, and application of models to radio-frequency electromagnetic-field dosimetry”, Physics in Medicine and Biology, 49, pp.1-15, 2004.