

## DAFTAR PUSTAKA

- [1] I. Nur Rifai, P. A. Sejati, S. Akita, and M. Takei, “FPGA-Based Planar Sensor Electrical Impedance Tomography (FPGA-psEIT) System Characterized by Double Feedback Howland Constant- Current Pump and Programmable Front-End Measurement,” *IEEE Trans Instrum Meas*, vol. 73, 2024, doi: 10.1109/TIM.2024.3441023.
- [2] S. Mansouri, Y. Alharbi, F. Haddad, S. Chabcoub, A. Alshrouf, and A. A. Abd-Elghany, “Electrical Impedance tomography – recent applications and developments,” *J Electr Bioimpedance*, vol. 12, no. 1, pp. 50–62, Jan. 2021, doi: 10.2478/joeb-2021-0007.
- [3] D. D. Stupin *et al.*, “Bioimpedance Spectroscopy: Basics and Applications,” *ACS Biomater Sci Eng*, vol. 7, no. 6, pp. 1962–1986, Jun. 2021, doi: 10.1021/acsbiomaterials.0c01570.
- [4] A. Ch. Lazanas and M. I. Prodromidis, “Electrochemical Impedance Spectroscopy—A Tutorial,” *ACS Measurement Science Au*, vol. 3, no. 3, pp. 162–193, Jun. 2023, doi: 10.1021/acsmesuresciau.2c00070.
- [5] I. N. Rifai, M. R. Baidillah, R. Wicaksono, S. Akita, and M. Takei, “Quantification of dermis sodium concentration in skin layers by power spectral density drop of square-wave electrical impedance spectroscopy (PSDd-sEIS),” *Meas Sci Technol*, vol. 34, no. 7, Jul. 2023, doi: 10.1088/1361-6501/acc752.
- [6] H. S. Magar, R. Y. A. Hassan, and A. Mulchandani, “Electrochemical Impedance Spectroscopy (EIS): Principles, Construction, and Biosensing Applications,” *Sensors*, vol. 21, no. 19, p. 6578, Oct. 2021, doi: 10.3390/s21196578.
- [7] H. S. Magar, R. Y. A. Hassan, and A. Mulchandani, “Electrochemical Impedance Spectroscopy (EIS): Principles, Construction, and Biosensing

- Applications,” *Sensors*, vol. 21, no. 19, p. 6578, Oct. 2021, doi: 10.3390/s21196578.
- [8] T. Bertok *et al.*, “Electrochemical Impedance Spectroscopy Based Biosensors: Mechanistic Principles, Analytical Examples and Challenges towards Commercialization for Assays of Protein Cancer Biomarkers,” *ChemElectroChem*, vol. 6, no. 4, pp. 989–1003, Feb. 2019, doi: 10.1002/celec.201800848.
- [9] R. Onet, A. Rusu, and S. Rodriguez, “High-Purity and Wide-Range Signal Generator for Bioimpedance Spectroscopy,” *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 65, no. 12, pp. 1884–1888, Dec. 2018, doi: 10.1109/TCSII.2018.2817479.
- [10] Y.-K. Lai, C.-Y. Ho, C.-L. Lai, C.-Y. Taun, and K.-C. Hsieh, “Assessment of Standing Multi-Frequency Bioimpedance Analyzer to Measure Body Composition of the Whole Body and Limbs in Elite Male Wrestlers,” *Int J Environ Res Public Health*, vol. 19, no. 23, p. 15807, Nov. 2022, doi: 10.3390/ijerph192315807.
- [11] W.-Y. Chung, A. A. Silverio, V. F. S. Tsai, S.-Y. Chang, M.-Y. Zhou, and S.-Y. Chen, “Design of a Multi-Frequency Bio-Impedance Spectroscopy System Analog Front-End and Digital Back-End with On-Chip Implementation.”
- [12] Y. Wang *et al.*, “Equivalent Circuit Modeling and Analysis for Microfluidic Electrical Impedance Monitoring of Single-Cell Growth,” *Biosensors (Basel)*, vol. 15, no. 2, p. 113, Feb. 2025, doi: 10.3390/bios15020113.
- [13] M. K. Schoutteten *et al.*, “The Feasibility of Semi-Continuous and Multi-Frequency Thoracic Bioimpedance Measurements by a Wearable Device during Fluid Changes in Hemodialysis Patients,” *Sensors*, vol. 24, no. 6, p. 1890, Mar. 2024, doi: 10.3390/s24061890.

- [14] S. M. Abie *et al.*, “Feasibility of using electrical impedance spectroscopy for assessing biological cell damage during freezing and thawing,” *Sensors*, vol. 21, no. 12, Jun. 2021, doi: 10.3390/s21124129.
- [15] J. Ojarand and M. Min, “Controllable Limiter of Signal Amplitudes for Bioimpedance Measurements,” 2018, pp. 920–923. doi: 10.1007/978-981-10-5122-7\_230.
- [16] P. Kassanos, H. M. D. Ip, and G.-Z. Yang, “A tetrapolar bio-impedance sensing system for gastrointestinal tract monitoring,” in *2015 IEEE 12th International Conference on Wearable and Implantable Body Sensor Networks (BSN)*, IEEE, Jun. 2015, pp. 1–6. doi: 10.1109/BSN.2015.7299403.
- [17] H. Nahrstaedt and T. Schauer, “A bioimpedance measurement device for sensing force and position in neuroprosthetic systems,” 2008. [Online]. Available: [www.springerlink.com](http://www.springerlink.com)
- [18] C. O’Brien, A. J. Young, and M. N. Sawka, “Bioelectrical Impedance to Estimate Changes in Hydration Status,” *Int J Sports Med*, vol. 23, no. 5, pp. 361–366, Jul. 2002, doi: 10.1055/s-2002-33145.
- [19] I. N. Rifai, M. R. Baidillah, R. Wicaksono, S. Akita, and M. Takei, “Sodium concentration imaging in dermis layer by square-wave open electrical impedance tomography (SW-oEIT) with spatial voltage thresholding (SVT),” *Biomed Phys Eng Express*, vol. 9, no. 4, Jul. 2023, doi: 10.1088/2057-1976/acd4c6.
- [20] N. Mitsides *et al.*, “Extracellular resistance is sensitive to tissue sodium status; implications for bioimpedance-derived fluid volume parameters in chronic kidney disease,” *J Nephrol*, vol. 33, no. 1, pp. 119–127, Feb. 2020, doi: 10.1007/s40620-019-00620-3.
- [21] A. N. Muthouwali, A. Riyadi, and T. Prakoso, “RANCANG BANGUN ALAT PENGUKUR PERSENTASE LEMAK TUBUH DENGAN

METODE WHOLE BODY MEASUREMENT BIOELECTRICAL IMPEDANCE ANALYSIS (BIA) EMPAT ELEKTRODA DENGAN SAKLAR OTOMATIS BERBASIS MIKROKONTROLER ATMEGA 32,” Semarang, Apr. 2017.

- [22] C. Erinwingbovo and F. La Mantia, “Estimation and correction of instrument artefacts in dynamic impedance spectra,” *Sci Rep*, vol. 11, no. 1, p. 1362, Jan. 2021, doi: 10.1038/s41598-020-80468-x.
- [23] K. G. Boone and D. S. Holder, “Effect of skin impedance on image quality and variability in electrical impedance tomography: a model study,” *Med Biol Eng Comput*, vol. 34, no. 5, pp. 351–354, Sep. 1996, doi: 10.1007/BF02520003.
- [24] P. Kassanos, F. Seichepine, and G. Z. Yang, “A Comparison of Front-End Amplifiers for Tetrapolar Bioimpedance Measurements,” *IEEE Trans Instrum Meas*, vol. 70, 2021, doi: 10.1109/TIM.2020.3015605.
- [25] I. Corbacho, J. M. Carrillo, J. L. Ausin, M. A. Dominguez, R. Perez-Aloe, and J. F. Duque-Carrillo, “Wide-Bandwidth Electronically Programmable CMOS Instrumentation Amplifier for Bioimpedance Spectroscopy,” *IEEE Access*, vol. 10, pp. 95604–95612, 2022, doi: 10.1109/ACCESS.2022.3204868.
- [26] K. Sel, S. A. G. Asgar, D. Osman, P. Wu, and R. Jafari, “Wearable Bioimpedance Sensor Characterization for Blood Flow Monitoring,” in *BioCAS 2023 - 2023 IEEE Biomedical Circuits and Systems Conference, Conference Proceedings*, Institute of Electrical and Electronics Engineers Inc., 2023. doi: 10.1109/BioCAS58349.2023.10388901.
- [27] L. C. Ward and S. Brantlov, “Bioimpedance basics and phase angle fundamentals,” *Rev Endocr Metab Disord*, vol. 24, no. 3, pp. 381–391, Jun. 2023, doi: 10.1007/s11154-022-09780-3.

- [28] S. F. Scagliusi *et al.*, “Enhancing the Precision of AD5940 Segmental Bioimpedance Measurements through Self-Calibration,” in *2023 IEEE BioSensors Conference, BioSensors 2023 - Proceedings*, Institute of Electrical and Electronics Engineers Inc., 2023. doi: 10.1109/BioSensors58001.2023.10280870.
- [29] T. J. Freeborn and B. Fu, “Fatigue-Induced Cole Electrical Impedance Model Changes of Biceps Tissue Bioimpedance,” *Fractal and Fractional*, vol. 2, no. 4, p. 27, Oct. 2018, doi: 10.3390/fractalfract2040027.
- [30] A. S. Sedra and K. C. Smith, *Microelectronic Circuits*, 7th ed. New York: Oxford University Press, 2014.
- [31] J. M. Fiore, *Operational Amplifiers & Linear Integrated Circuits: Theory and Application*, 3rd ed. New York: Dissidents, 2021.
- [32] Electronics Tutorial, “Introduction to Amplifier.” Accessed: Jul. 02, 2025. [Online]. Available: <https://www.electronics-tutorials.ws/>
- [33] Learning about Electronics, “What is the Difference Between a Single and Dual Supply Op Amp?” Accessed: Jul. 02, 2025. [Online]. Available: <https://www.learningaboutelectronics.com/>
- [34] Texas Instruments, “Single-Supply Op Amp Design Techniques,” 2001. Accessed: Jul. 02, 2025. [Online]. Available: [www.ti.com](http://www.ti.com)
- [35] All About Circuits, “Issues relates capacitance in a high pass filter/ac coupling.” Accessed: Jul. 02, 2025. [Online]. Available: <https://forum.allaboutcircuits.com>
- [36] J. Karki, “Active Low-Pass Filter Design,” 2023. [Online]. Available: [www.ti.com](http://www.ti.com)
- [37] Okawa Denshi, “Sallen-Key Low-pass Filter Design Tool.” Accessed: Jul. 02, 2025. [Online]. Available: <http://sim.okawa-denshi.jp/en/Fkeisan.htm>

- [38] Analog Devices, “Analog Switches and Multiplexers Basics,” 2009. Accessed: Jul. 02, 2025. [Online]. Available: <https://www.analog.com/media/en/training-seminars/tutorials/MT-088.pdf>
- [39] STMicroelectronics, “Discover the STM32 family of microcontrollers & microprocessors.” Accessed: Jul. 02, 2025. [Online]. Available: [www.st.com](http://www.st.com)
- [40] STMicroelectronics, “STM32 Nucleo-64 boards,” Amsterdam, May 2025. [Online]. Available: [www.st.com](http://www.st.com)
- [41] Microchip Technology, “MCP6001/1R/1U/2/4,” 2020. Accessed: Jul. 02, 2025. [Online]. Available: <https://ww1.microchip.com/downloads/en/DeviceDoc/MCP6001-1R-1U-2-4-1-MHz-Low-Power-Op-Amp-DS20001733L.pdf>
- [42] Analog Devices, “ADG1406/ADG1407,” 2016. [Online]. Available: [www.analog.com](http://www.analog.com)
- [43] Yuxiang Yang, Jian Wang, Zonghai Gao, and Yali Liu, “Accuracy improvement by A three-reference calibration algorithm for a bioimpedance spectrometer,” in *2010 International Conference on Bioinformatics and Biomedical Technology*, IEEE, 2010, pp. 253–256. doi: 10.1109/ICBBT.2010.5478966.
- [44] L. Giannini, R. Asquini, M. Vitelli, and E. PiuZZi, “Investigation of Wearable SENSIPLUS Chip for Bioimpedance Measurements,” in *2024 47th MIPRO ICT and Electronics Convention (MIPRO)*, IEEE, May 2024, pp. 1643–1648. doi: 10.1109/MIPRO60963.2024.10569853.
- [45] M. Morin *et al.*, “Skin hydration dynamics investigated by electrical impedance techniques in vivo and in vitro,” *Sci Rep*, vol. 10, no. 1, p. 17218, Oct. 2020, doi: 10.1038/s41598-020-73684-y.