DAFTAR PUSTAKA

[1] C. A. Balanis, *Antenna Theory: Analysis and Design*, 3rd ed. Hoboken, New Jersey, USA: John Wiley & Sons, 2016.

[2] Q. Shi, X.-W. Xuan, H.-K. Nie, Z.-Y. Wang, and W. Wang, "Antenna Sensor Based on AMC Array for Contactless Detection of Water and Ethanol in Oil," *IEEE Sens. J.*, vol. 21, no. 19, pp. 21503–21510, Oct. 2021, doi: 10.1109/JSEN.2021.3102294.

[3] G. N. A. Mohammed, K. Savarimuthu, V. Erattaiselvam, S. Rapuru, T. Yarasi, and N. Dommalapati, "A compact tri-band microwave resonator for ethanol gas detection," *Int. J. RF Microw. Comput.-Aided Eng.*, vol. 29, no. 10, p. e21895, Oct. 2019, doi: 10.1002/mmce.21895.

[4] M. Mohsen-Nia and H. Amiri, "Measurement and modelling of static dielectric constants of aqueous solutions of methanol, ethanol and acetic acid at T = 293.15 K and 91.3 kPa," *J. Chem. Thermodyn.*, vol. 57, pp. 67–70, Feb. 2013, doi: 10.1016/j.jct.2012.08.009.

[5] J. Yeo and J.-I. Lee, "High-Sensitivity Slot-Loaded Microstrip Patch Antenna for Sensing Microliter-Volume Liquid Chemicals with High Relative Permittivity and High Loss Tangent," *Sensors*, vol. 22, no. 24, Art. no. 24, Dec. 2022, doi: 10.3390/s22249748.

[6] Ö. Yavuz, "Nitel ve Nicel Araştırma Tasarımı Uygulamasıyla Etanol Kullanımını ve Etkilerinin Anlaşılması," *Eur. J. Sci. Technol.*, no. 32, pp. 40–49, 2021, doi: 10.31590/ejosat.1039621.

[7] S. Aji Purwoko, "12 Jenis Minuman Keras dan Kandungan Alkoholnya - Hello Sehat." Accessed: Feb. 15, 2025. [Online]. Available: https://hellosehat.com/mental/kecanduan/jenis-minuman-keras/

[8] V. Mulloni, G. Marchi, L. Lorenzelli, and M. Donelli, "Chipless RFID Sensing System for Precise Ethanol Determination in Alcoholic Solutions," *Electronics*, vol. 11, no. 5, Art. no. 5, Feb. 2022, doi: 10.3390/electronics11050735.

[9] Z. Hafdi, J. Tao, and A. Chaabi, "Microstrip coupled high sensitivity sensor for water ethanol mixture characterization," *Frequenz*, vol. 75, no. 1–2, pp. 1–7, Jan. 2021, doi: 10.1515/freq-2019-0226.

[10] A. Salim and S. Lim, "Complementary Split-Ring Resonator-Loaded Microfluidic Ethanol Chemical Sensor," *Sensors*, vol. 16, no. 11, Art. no. 11, Oct. 2016, doi: 10.3390/s16111802.

[11] J. Yeo and J.-I. Lee, "High-Sensitivity Microstrip Patch Sensor Antenna for Detecting Concentration of Ethanol-Water Solution in Microliter Volume," *J. Adv. Navig. Technol.*, vol. 26, no. 6, pp. 510–515, Dec. 2022, doi: https://doi.org/10.12673/jant.2022.26.6.510.

[12] R. N. Bates, "Design of microstrip spur-line band-stop filters," *IEE J. Microw. Opt. Acoust.*, vol. 1, no. 6, pp. 209–214, Nov. 1977, doi: 10.1049/ij-moa.1977.0029.

[13] S. Harnsoongnoen and B. Buranrat, "Glucose Concentration Monitoring Using Microstrip Spurline Sensor," *Meas. Sci. Rev.*, vol. 23, no. 4, pp. 168–174, 2023, doi: 10.2478/msr-2023-0022.

[14] Lu and Wong, "Single-feed dual-frequency equilateral-triangular microstrip antenna with pair of spur lines," *Electron. Lett.*, vol. 34, no. 12, pp. 1171–1173, Jun. 1998, doi: 10.1049/el:19980844.
[15] F. Ferreira Batista, L. L. de Souza, J. P. Fernandes da Silva, P. Henrique da Fonseca Silva, M. Alves de Oliveira, and G. Fontgalland, "Harmonic suppression in microstrip patch antenna using spur-line filter," in *2017 SBMO/IEEE MTT-S International Microwave and Optoelectronics Conference (IMOC)*, Aug. 2017, pp. 1–5. doi: 10.1109/IMOC.2017.8121138.
[16] C. Sarkar, C. Saha, L. A. Shaik, J. Y. Siddiqui, and Y. M. M. Antar, "Spur line integrated single-/dual-/triple-notched ultra-wideband monopole antenna," *Int. J. RF Microw. Comput.-Aided Eng.*, vol. 29, no. 12, p. e21995, 2019, doi: 10.1002/mmce.21995.
[17] R. Ganesan and R. Sankararajan, "Design of a miniaturized tri-band bandstop filter using spur microstrip lines and via-hole grounding," *Circuit World*, vol. 46, no. 4, pp. 347–354, Apr. 2020, doi: 10.1108/CW-06-2018-0046.
[18] A. M. Abbosh, "Ultra wideband planar antenna with spurline for subband rejection," *Microw. Opt. Technol. Lett.*, vol. 50, no. 3, pp. 725–728, 2008, doi: 10.1002/mop.23205.
[19] W. K. Chen, *The Electrical Engineering Handbook*. 200 Wheeler Road, 6th Floor, Burlington, MA 01803, USA: Elsevier Academic Press, 2004.
[20] T. C. Edwards and M. B. Steer, *Foundations for Microstrip Circuit Design*, 4th ed. The Atrium, Southern Gate, Chichester, West Sussex, United Kingdom: John Wiley & Sons, 2016.
[21] D. M. Pozar, *Microwave Engineering*, 4th ed. Hoboken, New Jersey, USA: John Wiley & Sons, 2012.
[22] G. S. Deepthy and M. Nesasudha, "Analysis of substrate materials in microstrip antenna for biomedical applications," in *Materials Today: Proceedings*, Elsevier, Jan. 2023, **In Press**. doi: 10.1016/j.matpr.2023.01.130.
[23] G. Ramadhan Herier, "Perancangan Antena Mikrostrip Rectangular Patch 2,4 Ghz Dengan Csrr (Complementery Split Ring Resonator) Sebagai Sensor Untuk Mendeteksi Konsentrasi Larutan Gula," Skripsi, Universitas Andalas, Padang, Sumatera Barat, Indonesia, 2024.
[24] Y. Liu *et al.*, "High-Performance SAW Resonator with Spurious Mode Suppression Using Hexagonal Weighted Electrode Structure," *Sensors*, vol. 23, no. 24, Art. no. 24, Jan. 2023, doi: 10.3390/s23249895.
[25] H.-Y. Gan, W.-S. Zhao, D.-W. Wang, J. Wang, Q. Liu, and Gaofeng Wang, "High-Q Active Microwave Sensor Based on Microstrip Complementary Split-Ring Resonator (MCSRR) Structure for Dielectric Characterization," *ACES J.*, vol. 36, no. 7, pp. 922–927, Oct. 2024, doi: 10.47037/2021.ACES.J.360715.
[26] I. M. Rusni, A. Ismail, A. R. Alhawary, M. N. Hamidon, and N. A. Yusof, "Aligned-gap multiple split ring resonator for dielectric sensing application," in *2014 4th International Conference on Engineering Technology and Technopreneuship (ICE2T)*, Aug. 2014, pp. 143–147. doi: 10.1109/ICE2T.2014.7006235.
[27] S. Kulkarni and M. Joshi, "Shielded vertically stack ring resonator for petroleum permittivity measurement," in *2014 IEEE International Microwave*

and RF Conference (IMaRC), Dec. 2014, pp. 162–165. doi: 10.1109/IMaRC.2014.7038998.
[28] S. Kiani, P. Rezaei, M. Navaei, and M. S. Abrishamian, "Microwave Sensor for Detection of Solid Material Permittivity in Single/Multilayer Samples With High Quality Factor," *IEEE Sens. J.*, vol. 18, no. 24, pp. 9971–9977, Dec. 2018, doi: 10.1109/JSEN.2018.2873544.
[29] X. Wang, H. Deng, and C. Liu, "High-Q sensor for permittivity detection based on spiral resonator," *Appl. Phys. A*, vol. 124, no. 11, Art. no. 11, Oct. 2018, doi: 10.1007/s00339-018-2152-x.
[30] Y. Usman, Rahman, and E. Papilaya, "Analisis Perbandingan Nilai Konstanta Dielektrik dari Minyak Goreng Kemasan, Minyak Goreng Curah dan Minyak Jelantah," *J. Fis. Papua*, vol. 2, no. 2, pp. 144–119, Aug. 2023, doi: 10.31957/jfp.v2i2.81.
[31] C. K. Alexander, M. Sadiku, and M. N. O. Sadiku, *Fundamentals of Electric Circuits*, 5th ed. New York, USA: McGraw-Hill Education, 2021.
[32] H. F. Hammad, "Dual And Broad Band Antennas Using Spur-Line Filters For Communication Systems," Thesis, Queen's University, Kingston, Ontario, Canada, 1997. [Online]. Available: https://www.nlc-bnc.ca/obj/s4/f2/dsk2/ftp04/mq22318.pdf
[33] J.-S. G. Hong and M. J. Lancaster, *Microstrip Filters for RF / Microwave Applications*. New York, USA: John Wiley & Sons, 2004.
[34] A. Roy, S. Bhunia, D. C. Sarkar, P. P. Sarkar, and S. K. Chowdhury, "Compact multi frequency strip loaded microstrip patch antenna with spur-lines | International Journal of Microwave and Wireless Technologies," *Int. J. Microw. Wirel. Technol.*, vol. 9, no. 5, pp. 1111–1121, 2017, doi: 10.1017/S1759078716001136.
[35] S. Kiani, P. Rezaei, M. Navaei, and M. S. Abrishamian, "Microwave Sensor for Detection of Solid Material Permittivity in Single/Multilayer Samples With High Quality Factor," *IEEE Sens. J.*, vol. 18, no. 24, pp. 9971–9977, Dec. 2018, doi: 10.1109/JSEN.2018.2873544.
[36] K. Kalantar-zadeh and B. Fry, *Nanotechnology-Enabled Sensors*, 1st ed. New York, USA: Springer New York, 2007.
[37] "Accuracy, Precision, and Significant Figures," Chemistry LibreTexts. Accessed: Apr. 15, 2025. [Online]. Available: https://chem.libretexts.org/Courses/Ontario_Tech_University/ON_Tech_CHEM_1010/01%3A_Chemical_Tools-_Experimentation_and_Measurement/1.09%3A_Accuracy_Precision_and_Significant_Figures
[38] S. Karim, *Sensor & Aktuator*. Malang, Jawa Timur, Indonesia: Kementerian Pendidikan & Kebudayaan, 2013.
[39] M. Mohsen-Nia, H. Amiri, and B. Jazi, "Dielectric Constants of Water, Methanol, Ethanol, Butanol and Acetone: Measurement and Computational Study," *J. Solut. Chem.*, vol. 39, no. 5, pp. 701–708, May 2010, doi: 10.1007/s10953-010-9538-5.
[40] "Concentrations: Volume Percent," Chemistry LibreTexts. Accessed: Feb. 15, 2025. [Online]. Available: https://chem.libretexts.org/Courses/Heartland_Community_College/CHEM_

120%3A_Fundamentals_of_Chemistry/07%3A_Solutions/7.14%3A__Concentrations%3A__Volume_Percent
[41] Z. Li, Vijaya G.S. Raghavan, James McGill, Ning Wang, and Jinglong Zhao, "Assessment of a Chinese Spirit Using Electronic Sensory Tools," in *2007 ASABE Annual International Meeting*, Minneapolis, Minnesota: American Society of Agricultural and Biological Engineers (ASABE), Jun. 2007, pp. 2–15. doi: 10.13031/2013.23003.
[42] H.-Y. Wen and Y.-T. Hsu, "The Nanosilver Imprinted Cross-Channel Film used in Microfluidic Chips Based on Microcavity Resonator for Mercury Assessment," *Adv. Sens. Res.*, vol. 3, no. 4, pp. 1–12, 2024, doi: 10.1002/adsr.202300133.
[43] Y. Seo, M. U. Memon, and S. Lim, "Microfluidic Eighth-Mode Substrate-Integrated-Waveguide Antenna for Compact Ethanol Chemical Sensor Application," *IEEE Trans. Antennas Propag.*, vol. 64, no. 7, pp. 3218–3222, Jul. 2016, doi: 10.1109/TAP.2016.2559581.
[44] M. A. M. Ahmed, K. M. Jurczak, N. S. Lynn, J.-P. S. H. Mulder, E. M. J. Verpoorte, and A. Nagelkerke, "Rapid prototyping of PMMA-based microfluidic spheroid-on-a-chip models using micromilling and vapour-assisted thermal bonding," *Sci. Rep.*, vol. 14, no. 2831, pp. 1–14, Feb. 2024, doi: 10.1038/s41598-024-53266-y.
[45] "CST Studio Suite," Dassault Systèmes. Accessed: Feb. 14, 2025. [Online]. Available: https://www.3ds.com/products/simulia/cst-studio-suite
[46] Google, "Regresi linear | Machine Learning," Google for Developers. Accessed: Feb. 15, 2025. [Online]. Available: https://developers.google.com/machine-learning/crash-course/linear-regression?hl=id
[47] E. T. E. Handayani, "Korelasi dan Koefisien Determinasi," in *Statistika Dasar*, 1st ed., vol. 12, Yogyakarta: Pena Muda Media, 2024, pp. 161–182.
[48] V. R. Prasetyo, H. Lazuardi, A. A. Mulyono, and C. Lauw, "Penerapan Aplikasi RapidMiner Untuk Prediksi Nilai Tukar Rupiah Terhadap US Dollar Dengan Metode Linear Regression," *J. Nas. Teknol. Dan Sist. Inf.*, vol. 7, no. 1, pp. 8–17, May 2021, doi: 10.25077/TEKNOSI.v7i1.2021.8-17.
[49] W. Sulistiyowati and C. C. Astuti, *Buku Ajar Statistika Dasar*, 2nd ed. Sidoarjo, Jawa Timur: Umsida Press, 2017. doi: 10.21070/2017/978-979-3401-73-7.
[50] J. H. McDonald, "Coefficient of Variation," Statistics LibreTexts. Accessed: Jun. 24, 2025. [Online]. Available: https://stats.libretexts.org/Courses/Las_Positas_College/Math_40%3A_Statistics_and_Probability/03%3A_Data_Description/3.02%3A_Measures_of_Variation/3.2.01%3A_Coefficient_of_Variation
[51] "MegiQ RF Development Tools VNA0440-VNA0440e User Manual." MegiQ BV, 2013. [Online]. Available: https://www.megiq.com/images/Manuals/MegiQ%20VNA0440-VNA0460%20Manual%20V3.1.pdf
[52] matmake, "Polymethyl Methacrylate (PMMA) - Properties." Accessed: May 23, 2025. [Online]. Available: https://matmake.com/materials-data/polymethyl-methacrylate-properties.html

[53] Professional Plastics, “Electrical Properties of Plastic Material.” Professional Plastics. [Online]. Available: https://www.professionalplastics.com/professionalplastics/ElectricalPropertiesofPlastics.pdf
[54] matmake, “Polyvinyl Chloride (PVC) - Properties.” Accessed: May 31, 2025. [Online]. Available: https://matmake.com/materials-data/polyvinyl-chloride-properties.html
[55] “Ethanol - Thermophysical properties.” Accessed: May 23, 2025. [Online]. Available: https://www.engineeringtoolbox.com/ethanol-ethyl-alcohol-properties-C2H6O-d_2027.html
[56] T. Chen, S. Li, and H. Sun, “Metamaterials Application in Sensing,” *Sensors*, vol. 12, no. 3, pp. 2742–2765, Mar. 2012, doi: 10.3390/s120302742.
[57] B. K. Tay, S. Kapoor, W. Yu, and S. Y. Huang, “High-Q non-invasive Glucose Sensor using MicrostripLine Main Field and Split Ring Resonator,” Mar. 02, 2025, *arXiv*: arXiv:2503.00920. doi: 10.48550/arXiv.2503.00920.
[58] R. A. Alahnomi *et al.*, “Review of Recent Microwave Planar Resonator-Based Sensors: Techniques of Complex Permittivity Extraction, Applications, Open Challenges and Future Research Directions,” *Sensors*, vol. 21, no. 7, p. 2267, Jan. 2021, doi: 10.3390/s21072267.
[59] J. Erfkamp, M. Guenther, and G. Gerlach, “Hydrogel-Based Sensors for Ethanol Detection in Alcoholic Beverages,” *Sensors*, vol. 19, no. 5, Art. no. 1199, Jan. 2019, doi: 10.3390/s19051199.
[60] P. Peterka, “Coefficient of Variation: Mastering Relative Variability in Statistics,” SixSigma.us. Accessed: Jul. 13, 2025. [Online]. Available: https://www.6sigma.us/six-sigma-in-focus/coefficient-of-variation/
[61] “Monitoring PM2.5 in Ambient Air Using Designated Reference or Class I Equivalent Methods.” U.S. Environmental Protection Agency, 2016. [Online]. Available: https://www3.epa.gov/ttnamti1/files/ambient/pm25/qa/m212.pdf