



DAFTAR PUSTAKA

- [1] A. Asgari, S. A. Hosseini, M. H. Choopan Dastjerdi, and J. Mokhtari, “Determination of the linear behavior of FC detectors in Isfahan MNSR using ex-core offline and online experiments,” *Nuclear Engineering and Design*, vol. 415, Dec. 2023, doi: 10.1016/j.nucengdes.2023.112681.
- [2] H. R. Armozd, M. Gharib, H. Afarideh, M. Ghergherehchi, A. A. Niar, and M. Jafarzadeh, “Determination of tehran research reactor power by ^{16}N gamma detection,” *Ann Nucl Energy*, vol. 38, no. 12, pp. 2667–2672, Dec. 2011, doi: 10.1016/j.anucene.2011.08.003.
- [3] M. Jalali, M. R. Abdi, and M. Mostajaboddavati, “Reactor power measurement by gamma and neutron radiation in Heavy Water Zero Power Reactor (HWZPR),” *Ann Nucl Energy*, vol. 57, pp. 368–374, 2013, doi: 10.1016/j.anucene.2013.02.013.
- [4] M. jalali, M. R. Abdi, and M. M. davati, “Prompt gamma radiation as a new tool to measure reactor power,” *Radiation Physics and Chemistry*, vol. 91, pp. 19–27, Oct. 2013, doi: 10.1016/j.radphyschem.2013.05.033.
- [5] Y. Abbassi, S. Mohammad Mirvakili, and J. Mokhtari, “Development of a fast thermal-hydraulic model to simulate heat and fluid flow in MNSR,” *Ann Nucl Energy*, vol. 178, Dec. 2022, doi: 10.1016/j.anucene.2022.109371.
- [6] M. Arkani and M. Gharib, “Reactor core power measurement using Cherenkov radiation and its application in Tehran Research Reactor,” *Ann Nucl Energy*, vol. 36, no. 7, pp. 896–900, Jul. 2009, doi: 10.1016/j.anucene.2009.03.009.
- [7] J. Peric, V. Radulović, L. Barbot, and G. De Izarra, “Radiation measurements in reactor pulse mode at the JSI TRIGA reactor – Power meter based on Cherenkov light intensity measurements,” *EPJ Web Conf*, vol. 288, p. 04020, 2023, doi: 10.1051/epjconf/202328804020.
- [8] M. Lei *et al.*, “Measurement of HFETR reactor power by improved ^{16}N gamma spectrum analysis method,” *Ann Nucl Energy*, vol. 164, Dec. 2021, doi: 10.1016/j.anucene.2021.108604.
- [9] I. G. Alekseev *et al.*, “Industrial Reactor Power Monitoring Using Antineutrino Counts in the DANSS Detector,” *Physics of Atomic Nuclei*, vol. 82, no. 5, pp. 415–424, Sep. 2019, doi: 10.1134/S1063778819050041.
- [10] S. Joo, J. B. Lee, and S. M. Seo, “Calibration of digital wide-range neutron power measurement channel for open-pool type research reactor,” *Nuclear Engineering and Technology*, vol. 50, no. 1, pp. 203–210, Feb. 2018, doi: 10.1016/j.net.2017.10.011.
- [11] G. Žerovnik, L. Snoj, A. Trkov, L. Barbot, D. Fourmentel, and J. F. Villard, “Measurements of thermal power at the TRIGA Mark II reactor in Ljubljana using





- multiple detectors,” *IEEE Trans Nucl Sci*, vol. 61, no. 5, pp. 2527–2531, Oct. 2014, doi: 10.1109/TNS.2014.2356014.
- [12] A. I. Mogil’ner and D. M. Shvetsov, “Statistical methods of measuring the absolute power of a reactor,” *Journal of Nuclear Energy*, vol. 21, no. 1, pp. 87–95, 1967, doi: [https://doi.org/10.1016/0022-3107\(67\)90039-1](https://doi.org/10.1016/0022-3107(67)90039-1).
- [13] M. Ferrarini, V. Varoli, A. Favalli, M. Caresana, and B. Pedersen, “A wide dynamic range BF₃ neutron monitor with front-end electronics based on a logarithmic amplifier,” *Nucl Instrum Methods Phys Res A*, vol. 613, no. 2, pp. 272–276, Feb. 2010, doi: 10.1016/j.nima.2009.11.078.
- [14] N. Sung and H. R. Kim, “Review study on variables for performance improvement of BF₃ combination detector,” *Transactions of the Korean Nuclear Society Spring Meeting Jeju*, 2017.
- [15] B. Riyono, R. Pulungan, A. Dharmawan, and A. R. Antariksawan, “Experimental investigation on the thermohydraulic parameters of Kartini research reactor under variation of the primary pump flow,” *Appl Therm Eng*, vol. 213, Aug. 2022, doi: 10.1016/j.applthermaleng.2022.118674.
- [16] General Atomics Technologies, *Wide Range Log Power Channel Operation And Maintenance Manual*. USA: General Atomics Technologies, 1983.
- [17] Juan Alarcón, Leandro Marzano, Silvia Thorp, and Claudio Verrastro, “FPGA Based Wide Range Neutron Flux Monitoring System using Campbell Mode,” in *2019 X Southern Conference on Programmable Logic (SPL)*, 2019, pp. 77–81.
- [18] M.-H. Hsieh and H.-P. Chou, “A digital neutron monitoring system for Tsing Hua Open-Pool Reactor (tHOR),” in *IEEE Nuclear Science Symposium & Medical Imaging Conference*, 2010, pp. 443–446. doi: 10.1109/NSSMIC.2010.5873798.
- [19] E. W. Pontes and A. Ferreira, “A new method of current switching for linear wide-range measurement systems,” *IEEE Trans Instrum Meas*, vol. 61, no. 2, pp. 496–504, Feb. 2012, doi: 10.1109/TIM.2011.2169181.
- [20] International Atomic Energy Agency, “Research Reactors Purpose and Future,” 2016.
- [21] B. Lescop *et al.*, “Marine : a Fast Fully Digitalized Wide Range Neutron Monitor System,” in *2000 IEEE Nuclear Science Symposium. Conference Record (Cat. No.00CH37149)*, Lyon, France, 2000, pp. 5/86-5/90.
- [22] M. T. Khaleeq, I. Zaka, H. Qaiser, B. H. Nayyar, I. A. Ghuman, and A. Ali, “A New Wide-Range Reactor Power-Measuring Channel,” *IEEE Trans Nucl Sci*, vol. 50, no. 6, pp. 2445–2451, 2003, doi: 10.1109/TNS.2003.820619.
- [23] R. J. Zhu *et al.*, “High-precision and wide-range real-time neutron flux monitor system through multipoint linear calibration,” *Nuclear Science and Techniques*, vol. 31, no. 9, Sep. 2020, doi: 10.1007/s41365-020-00798-3.



- [24] B. Lescop *et al.*, “A new system for in-core wide range neutron monitoring,” in *IEEE Symposium Conference Record Nuclear Science 2004.*, 2004, pp. 1567–1570 Vol. 3. doi: 10.1109/NSSMIC.2004.1462539.
- [25] D. Ito *et al.*, “Development of a Wide Dynamic Range Neutron Flux Measurement Instrument Having Fast Time Response for Fusion Experiments,” *Plasma and Fusion Research*, vol. 16, pp. 1–12, 2021, doi: 10.1585/pfr.16.1405018.
- [26] S. K. Lee, S. Lee, M. Kang, K. Woo, S. W. Yang, and J. Lee, “Development of fission 99Mo production process using HANARO,” *Nuclear Engineering and Technology*, vol. 52, no. 7, pp. 1517–1523, Jul. 2020, doi: 10.1016/j.net.2019.12.019.
- [27] A. Pungerčič, D. Čalič, and L. Snoj, “Computational burnup analysis of the TRIGA Mark II research reactor fuel,” *Progress in Nuclear Energy*, vol. 130, Dec. 2020, doi: 10.1016/j.pnucene.2020.103536.
- [28] A. Pietropaolo *et al.*, “Neutron detection techniques from μeV to GeV,” Sep. 03, 2020, *Elsevier B.V.* doi: 10.1016/j.physrep.2020.06.003.
- [29] M. Ishikawa, T. Kondoh, T. Nishitani, and Y. Kusama, “Design of microfission chamber for ITER operations,” in *Review of Scientific Instruments*, 2008. doi: 10.1063/1.2969286.
- [30] G. Žerovnik *et al.*, “Validation of the neutron and gamma fields in the JSI TRIGA reactor using in-core fission and ionization chambers,” *Applied Radiation and Isotopes*, vol. 96, pp. 27–35, Feb. 2015, doi: 10.1016/j.apradiso.2014.10.026.
- [31] G. F. Knoll, *Radiation detection and measurement*. Wiley, 2000.
- [32] Józef Andrzejewski, Yuri M. Gledenov, Andrzej Korejwo, Kamil Sobczak, and Paweł J. Szałański, “Compensated ionization chamber for (n, α) reaction measurements at a spallation neutron source,” *NUKLEONIKA*, vol. 52, no. 2, pp. 51–57, 2007.
- [33] D. Bisiach, M. Cargnelutti, S. Zorzut, L. Barbot, G. De Izarra, and C. Destouches, “Industrialization of a Digital Acquisition System Dedicated to Miniature Fission Chamber Measurements in Research Reactors ,” 2021.
- [34] M. Kumngern, “High frequency and high precision CMOS full-wave rectifier,” in *2010 IEEE International Conference on Communication Systems*, 2010, pp. 5–8. doi: 10.1109/ICCS.2010.5686166.
- [35] U.S. Department of Energy, *DOE Fundamentals Handbook Instrumentation and Control Volume 2 of 2*. 1992.
- [36] B. Carter and T. R. Brown, “Handbook of Operational Amplifier Applications,” 2001.
- [37] C. D. Holdenried, J. W. Haslett, J. G. McRory, R. D. Beards, and A. J. Bergsma, “A DC-4-GHz true logarithmic amplifier: theory and implementation,” *IEEE J*



Solid-State Circuits, vol. 37, no. 10, pp. 1290–1299, 2002, doi: 10.1109/JSSC.2002.803059.

- [38] W. L. Barber and E. R. Brown, “A true logarithmic amplifier for radar IF applications,” *IEEE J Solid-State Circuits*, vol. 15, no. 3, pp. 291–295, 1980, doi: 10.1109/JSSC.1980.1051386.
- [39] Widarto, “Analisis dan Penentuan Distribusi Fluks Neutron Saluran Tembus Radial Untuk Pelayanan Reaktor Kartini,” *Ganendra*, vol. 5, no. 1, pp. 31–37, 2002.
- [40] R. R. Greenberg, P. Bode, and E. A. De Nadai Fernandes, “Neutron activation analysis: A primary method of measurement,” 2011, Elsevier B.V. doi: 10.1016/j.sab.2010.12.011.
- [41] K. Amgarou, V. Lacoste, H. Muller, and F. Fernández, “Set-up of a passive Bonner sphere system for neutron spectrometry at mixed fields with predominant photon component based on activation detector,” *Radiat Prot Dosimetry*, vol. 126, no. 1–4, pp. 337–341, 2007, doi: 10.1093/rpd/ncm070.
- [42] F. Mathew, C. Chilian, L. Montgomery, and J. Kildea, “Development of a passive gold-foil Nested Neutron Spectrometer to validate the active current-mode He-3 measurements in a high neutron fluence rate radiotherapy environment,” *Nucl Instrum Methods Phys Res A*, vol. 985, Jan. 2021, doi: 10.1016/j.nima.2020.164662.
- [43] National Nuclear Energy Agency of Indonesia, *Kartini Reactor Safety Analysis Report Rev.2 Vol.2*. Yogyakarta, 2019.
- [44] Photonis, “Fission chamber for out-of-core use with integral cable CFUL08,” 2017.
- [45] Xp-Power, *F Series High Voltage Datasheet*. 2022.
- [46] Tektronix, “TDS2000C and TDS1000C-EDU Series Digital Storage Oscilloscopes User Manual,” 2011. [Online]. Available: www.tektronix.com
- [47] Espressif Systems, *ESP32 Series Datasheet*. 2024. [Online]. Available: www.espressif.com
- [48] Texas Instrument, “ADS111x Ultra-Small, Low-Power, I₂C-Compatible, 860-SPS, 16-Bit ADCs With Internal Reference, Oscillator, and Programmable Comparator,” 2018. Accessed: Sep. 17, 2024. [Online]. Available: <https://www.ti.com/>
- [49] Texas Instruments, “TL08xx FET-Input Operational Amplifiers,” 2024. [Online]. Available: www.ti.com
- [50] BL Galaxy, “BL Galaxy Electrical NPN Silicon Epitaxial Planar Transistor S9014 J6.” Accessed: Sep. 18, 2024. [Online]. Available: www.galaxyen.com
- [51] Canberra, “Detector Specification and Performance Data,” CT USA, 1997.



UNIVERSITAS
GADJAH MADA

**Pengembangan Sistem Pengukuran Fluks Neutron dan Daya Jangkauan Lebar Reaktor Kartini
dengan Mode
Campbell**

Zulfikar Elran Bhagaskara, Dr.-Ing. Ir. Awang Noor Indra Wardana, S.T., M.T., M.Sc., IPM. ; Prof. Dr. Ir. Anhar Riza A

Universitas Gadjah Mada, 2024 | Diunduh dari <http://etd.repository.ugm.ac.id/>

- [52] Z. E. Bhagaskara, A. Noor Indra Wardana, A. R. Antariksawan, and I. Shobari, "Analysis of Single Operation Mode for Wide-range Nuclear Power Channel," in *2024 International Seminar on Intelligent Technology and Its Applications (ISITIA)*, IEEE, Jul. 2024, pp. 799–804. doi: 10.1109/ISITIA63062.2024.10668186.
- [53] Z. E. Bhagaskara, A. N. I. Wardana, A. R. Antariksawan, and I. Shobari, "Development of Microcontroller Based Low Level Nuclear Reactor Power Measurement," in *2024 International Seminar on Intelligent Technology and Its Applications (ISITIA)*, IEEE, Jul. 2024, pp. 413–417. doi: 10.1109/ISITIA63062.2024.10667754.

