

## DAFTAR PUSTAKA

- Aggarwal, L. 2014. Biological Effects of Ionizing Radiation. *Shodh Prerak*, 4(1), 342-348.
- Ardenfors, O., Dasu, A., Kopeć, M., & Gudowska, I. 2017. Modelling of A Proton Spot Scanning System Using MCNP6. In *Journal of Physics: Conference Series*, 860(1), p. 012025. doi: 10.1088/1742-6596/860/1/012025.
- Badan Pengawas Tenaga Nuklir (BAPETEN). 2013. Peraturan Kepala Badan Pengawas Tenaga Nuklir Nomor 3 Tahun 2013, tentang Keselamatan Radiasi dalam Penggunaan Radioterapi.
- Barazzuol, L., Coppes, R. P., & van Luijk, P. 2020. Prevention and Treatment of Radiotherapy-Induced Side Effects. *Molecular oncology*, 14(7), 1538-1554. <https://doi.org/10.1002/1878-0261.12750>.
- Baumann, K. S., Flatten, V., Weber, U., Lautenschläger, S., Eberle, F., Zink, K., & Engenhart-Cabillic, R. 2019. Effects of the Bragg Peak Degradation due to Lung Tissue in Proton Therapy of Lung Cancer Patients. *Radiation Oncology*, 14(1), 1-15. <https://doi.org/10.1186/s13014-019-1375-0>.
- Bekelman, J. E., Denicoff, A., & Buchsbaum, J. 2018. Randomized Trials of Proton Therapy: Why They Are at Risk, Proposed Solutions, and Implications for Evaluating Advanced Technologies to Diagnose and Treat Cancer. *Journal of Clinical Oncology*, 36(24), 2461-2464. doi: 10.1200/JCO.2018.77.7078.
- Bielajew, A. F. 2021. *Monte Carlo Techniques in Radiation Therapy*, CRC Press, Boca Raton, Florida.
- Brown, J. S., Amend, S. R., Austin, R. H., Gatenby, R. A., Hammarlund, E. U., & Pienta, K. J. 2023. Updating the definition of cancer. *Molecular Cancer Research*, 21(11), 1142-1147.
- Bushberg, J. T., Seibert, J. A., Leidholdt, E. M., & Boone, J. M. 2012. *The Essential Physics of Medical Imaging Third Edition*, Lippincott Williams & Wilkins (LWW), Philadelphia, USA.
- Chaturvedi, A., & Jain, V. 2019. Effect of Ionizing Radiation on Human Health. *International journal of plant and environment*, 5(03), 200-205.
- Collins, C. 2017. *Radiation Therapy Medical Physics Review – Delivery, Interactions, Safety, Feasibility, and Head to Head Comparisons of the Leading Radiation Therapy Techniques*, Thesis Departement of Physics, University of New Hampshire, Durham.

- Desouky, O., Ding, N., & Zhou, G. 2015. Targeted and Non-Targeted Effects of Ionizing Radiation. *Journal of Radiation Research and Applied Sciences*, 8(2), 247-254. <https://doi.org/10.1016/j.jrras.2015.03.003>.
- Devicienti, S., Strigari, L., D'Andrea, M., Benassi, M., Dimiccoli, V., & Portaluri, M. 2010. Patient Positioning in the Proton Radiotherapy Era. *Journal of Experimental & Clinical Cancer Research*, 29(47). <https://doi.org/10.1186/1756-9966-29-47>.
- Dudhe, S. S., Mishra, G., Parihar, P., Nimodia, D., Kumari, A., & Mishra, G. V. 2024. Radiation Dose Optimization in Radiology: A Comprehensive Review of Safeguarding Patients and Preserving Image Fidelity. *Cureus*, 16(5), e60846.
- El Bardouni, T., Mohammed, M., Chakir, E., Elhajjaji, O., Boukhal, H., & Chham, E. 2019. Conversion Coefficients for Photon Exposure of the Human Lens Eye: EGSnrc and MCNP6 Monte Carlo Simulation. *Radiation Physics and Chemistry*, 156, 159-168.
- Engelsman, M., Schwarz, M., & Dong, L. 2013. Physics Controversies in Proton Therapy. In *Seminars in radiation oncology*, 23(2), 88-96. <https://doi.org/10.1016/j.semradonc.2012.11.003>.
- Ferlay, J., Ervik, M., Lam, F., Laversanne, M., Colombet, M., Mery, L., Piñeros, M., Znaor, A., Soerjomataram, I., & Bray, F. 2024. *Global Cancer Observatory: Cancer Today*. Lyon, France: International Agency for Research on Cancer. Available from: <https://gco.iarc.who.int/today>, accessed [20 July 2025]
- García-Fernandez, G. F., Gallego, E., Gomez-Ros, J. M., Vega-Carrillo, H. R., Garcia-Baonza, R., Cevallos-Robalino, L. E., & Guzman-Garcia, K. A. 2021. Neutron dosimetry and Shielding Verification in Commissioning of Compact Proton Therapy Centers (CPTC) Using MCNP6.2 Monte Carlo Code. *Applied Radiation and Isotopes*, 169, 109272. <https://doi.org/10.1016/j.apradiso.2020.109279>.
- García-Fernandez, G. F., Gallego, E., Gómez-Ros, J. M., Vega-Carrillo, H. R., Guzman-García, K. A., Cevallos-Robalino, L. E., García-Baonza, R., & Hernández, E. F. 2023. Benchmarking of stray neutron fields produced by synchrocyclotrons and synchrotrons in compact protontherapy centers (CPTC) using MCNP6 Monte Carlo code. *Applied Radiation and Isotopes*, 193, 110645. <https://doi.org/10.1016/j.apradiso.2022.110645>.
- Gili, E. 2022. *The Issue of Radioprotection in A Proton Therapy Facility: A Critical Analysis*, Doctoral dissertation, Politecnico di Torino, Italy.

- Goorley, T., James, M., Booth, T., Brown, F., Bull, J., Cox, L.J., Durkee, J., Elson, J., Fensin, M., Forster, R.A., Hendricks, J., Hughes, H.G., Johns, R., Kiedrowski, B., Martz, R., Mashnik, S., McKinney, G., Pelowitz, D., Prael, R., Sweezy, J., Waters, L., Wilcox, T., & Zukaitis, T. 2014. Features of MCNP6. *Annals of Nuclear Energy*, 87, 772-783. <https://doi.org/10.1051/snamc/201406011>.
- Haghighat, A. 2020. *Monte Carlo Methods for Particle Transport*, Crc Press, Boca Raton, Florida.
- Hälg, R. A., & Schneider, U. 2020. Neutron Dose and Its Measurement in Proton Therapy—Current State of Knowledge. *The British journal of radiology*, 93(1107), 20190412. <https://doi.org/10.1259/bjr.20190412>.
- Handayani, R. S., & Udani, G. 2017. Kualitas Tidur dan Distress Pada Pasien Kanker yang Menjalani Kemoterapi. *Jurnal Ilmiah Keperawatan Sai Betik*, 12(1), 66-72.
- Haume, K., Rosa, S., Grellet, S., Śmiałek, M. A., Butterworth, K. T., Solov'yov, A. V., Prise, K. M., Golding, J., & Mason, N. J. 2016. Gold Nanoparticles for Cancer Radiotherapy: A Review. *Cancer nanotechnology*, 7(1), 1-20. <https://doi.org/10.1186/s12645-016-0021-x>.
- Hubert, M. D. S., Vargas, C. S., Hoey, O. V., Schoonjans, W., Smet, V. D., Mathot, G., Stichelbaut, F., Manessi, G., Dinar, N., Aza, E., Cassell, C., Silari, M., Vanhavere, F. 2016. Secondary Neutron Doses in A Proton Therapy Center, *Radiation Protection Dosimetry*, 170(4), 336-341. <https://doi.org/10.1093/rpd/ncv458>.
- Hussein, M., Heijmen, B. J., Verellen, D., & Nisbet, A. 2018. Automation in Intensity Modulated Radiotherapy Treatment Planning—A Review of Recent Innovations. *The British journal of radiology*, 91(1092), 20180270. <https://doi.org/10.1259/bjr.20180270>.
- IAEA, 2006. *Radiation Protection in the Design of Radiotherapy Facilities*. International Atomic Energy Agency, Safety Reports Series 47. Vienna, Austria.
- IAEA. 2014. *IAEA Safety Standards Series: Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards*, No. GSR Part 3, ISBN 978-92-0-135310-8. Vienna, Austria.
- IAEA. 2020. *IAEA TECDOC Series: Regulatory Control of the Safety of Ion Radiotherapy Facility*, ISBN: 978-92-0-163119-0, ISSN 1011-4289. Vienna, Austria.

- ICRP, 1984. *Nonstochastic Effects of Ionizing Radiation*. ICRP Publication 41. Ann. ICRP 14 (3).
- ICRP. 2007. *The 2007 Recommendations of the International Commission on Radiological Protection*. ICRP Publication 103. Ann. ICRP 37 (2-4).
- ICRP. 2010. *Conversion Coefficients for Radiological Protection Quantities for External Radiation Exposures*. ICRP Publication 116, Ann. ICRP 40(2-5).
- IBA. 2023. *ProteusONE Upgrades Digital Brochure*. Online. Agustus 2023.
- James, S. S., Grassberger, C., & Lu, H. M. 2018. Considerations When Treating Lung Cancer with Passive Scatter or Active Scanning Proton Therapy. *Translational lung cancer research*, 7(2), 210-215. doi: 10.21037/tlcr.2018.04.01.
- Junior, L. B. M. 2021. *Preliminary Research on Machine Learning for X-ray CT Calibration in Proton Therapy*, Thesis Departement of Experimental Physiscs-Medical Physics Ludwig Maximilians, University of Munich, Munchen.
- Keat, Y. C., bin Mohd Zin, M. H., & Aziz, M. Z. B. M. A. 2020. Proton Therapy: Malaysian Perspective. *Malaysian Journal of Medicine and Health Sciences*, 16(4), 344-352.
- Khakim, A. 2019. Konsep Perhitungan Laju Radiolisis dengan Code MCNP. In *Pontianak: Prosiding Seminar Nasional Infrastruktur Energi Nuklir*. 181-186.
- Kim, J., Wells, C., Khangura, S., Alexander, C., Mulla, S., & Farrah, K. 2017. *Proton Beam Therapy for the Treatment of Cancer in Children and Adults: A Health Technology Assessment*, Canadian Agency for Drugs and Technologies in Health (CADTH), Ottawa, Ontario, Canada.
- Kobeissi, J. M., Simone, C. B., Lin, H., Hilal, L., & Hajj, C. 2022. Proton Therapy in The Management of Pancreatic Cancer. *Cancers*, 14(11), 2789. <https://doi.org/10.3390/cancers14112789>.
- Kowalczyk, A. 2008. Proton induced spallation reactions in the energy range 0.1-10 GeV. Doctoral dissertation, Jagiellonian University, Cracow. <https://doi.org/10.48550/arXiv.0801.0700>
- Lee, S. B. 2020. Proton Therapy Review: Proton Therapy from a Medical. *Progress in Medical Physics*, 31(3), 99-110.

- Lesmana, H. 2023. *Dosimetri dan Verifikasi Shielding Bunker Compact Proton Therapy Center (CPTC) Berbasis Monte Carlo*, Tesis, Program Studi Magister Fisika Universitas Diponegoro, Semarang.
- Liu, H., & Chang, J. Y. 2011. Proton therapy in clinical practice. *Chinese journal of cancer*, 30(5), 315-326. doi: 10.5732/cjc.010.10529.
- Lutfin, H. A. 2020. A Modelling of Paraffin Shielding for BNCT Facility at Kartini Reactor Research using MCNPX. *Indonesian Journal of Physics and Nuclear Applications*, 5(2), 31-37. <https://doi.org/10.24246/ijpna.v5i2.31-37>.
- Marsanti, M., Febriana, C. A., Ibrahim, A., & Rahmawati, D. 2016. Karakteristik Dan Pola Pengobatan Pasien Kanker Payudara di RSUD Abdul Wahab Sjahranie. In *Proceeding of Mulawarman Pharmaceuticals Conferences*, 3, 1-8.
- Mohan, R., & Grosshans, D. 2017. Proton Therapy—Present and Future. *Advanced drug delivery reviews*, 109, 26-44.
- Newhauser, W. D., & Zhang, R. 2015. The physics of Proton Therapy. *Physics in Medicine & Biology*, 60(8), R155-R209. doi: 10.1088/0031-9155/60/8/R155.
- Nichelatti, E., Ronsivalle, C., Picardi, L., & Montereali, R. M. 2021. Optimization of The Theoretical Dose Distribution in The “Spread Out Bragg Peak” (SOBP) Region in Proton Therapy by Means of Semi-Analytical Techniques. *Il nuovo cimento C*, 44(4-5), 1-4.
- Nida, D. A., Suranto, C. N., Santoso, A, A, B., Haryoto. 2021. A Review: Sitotoksitas Senyawa Bromelain Pada Nanas (*Ananas comosus* L.) Terhadap Sel Kanker MCF-7. *Jurnal Indonesia Sosial Sains*, 2(3), 368-375.
- Onat, F., & Bozkurt, A. 2022. Effective Dose Rate Conversion Coefficients for Photons from Radionuclides Calculated Using The Monte Carlo Method and Adult Voxel Phantoms. *Radiation Physics and Chemistry*, 201, 110392. <https://doi.org/10.1016/j.radphyschem.2022.110392>.
- Paganetti, H., Beltran, C., Both, S., Dong, L., Flanz, J., Furutani, K., Grassberger, C., Grosshans, D. R., Knopf, A. C., Langendijk, J. A., Nystrom, H., Parodi, K., Raaymakers, B. W., Richter, C., Sawakuchi, G. O., Schippers, M., Shaitelman, S. F., Teo, B. K. K., Unkelbach, J., Wohlfahrt, P., & Lomax, T. 2021. Roadmap: Proton Therapy Physics and Biology. *Physics in Medicine & Biology*, 66(5), 05RM01. doi: 10.1088/1361-6560/abcd16.
- Park, S. H., & Kang, J. O. 2011. Basics of Particle Therapy I: Physics. *Radiation oncology journal*, 29(3), 135-146. doi: 10.3857/roj.2011.29.3.135.

- Paterson, L. C., Festarini, A., Stuart, M., Ali, F., Costello, C., Boyer, C., Rogge, R., Ybarra, N., Kildea, J., & Richardson, R. B. 2022. High-Accuracy Relative Biological Effectiveness Values Following Low-Dose Thermal Neutron Exposures Support Bimodal Quality Factor Response with Neutron Energy. *International Journal of Molecular Sciences*, 23(2), 878. <https://doi.org/10.3390/ijms23020878>.
- Patyal, B. 2007. Dosimetry Aspects of Proton Therapy. *Technology in cancer research & treatment*, 6(4), 17-23.
- Peach, K., Wilson, P., & Jones, B. 2011. Accelerator Science in Medical Physics. *The British journal of radiology*, 84(1), S4-S10. <https://doi.org/10.1259/bjr/16022594>.
- Pearson, E., De Wilde, O., Doyen, R., Forton, E., Jongen, Y., Krier, G., Neuvéglise, D., & Zaremba, S. 2014. Magnet Developments and Commissioning for The IBA Compact Gantry. *IEEE Transactions on Applied Superconductivity*, 24(3), pp. 1-4. doi: 10.1109/TASC.2013.2284719.
- Raychaudhuri, S. 2008. Introduction to Monte Carlo Simulation. In *Proceedings of The 2008 Winter Simulation Conference*, 91-100. doi: 10.1109/WSC.2008.4736059.
- Rosidah, S., Sardjono, Y., & Sumardi, Y. 2017. Dose Analyze of Boron Neutron Capture Therapy (BNCT) at Skin Cancer Melanoma Using MCNPX with Neutron Source from Thermal Column of Kartini Reactor. *Indonesian Journal of Physics and Nuclear Applications*, 2(3), 111-123.
- Rutenberg, M. S., & Nichols, R. C. 2020. Proton Beam Radiotherapy for Pancreas Cancer. *Journal of Gastrointestinal Oncology*, 11(1), 166. doi: 10.21037/jgo.2019.03.02.
- Sabol, J., & Šesták, B. 2017. Quantification of the risk-reflecting stochastic and deterministic radiation effects. In *RAD Conference Proceedings*, 2, 104-108.
- Saeed, A., Nafee, S. S., Shaheen, S. A., Raouf, G. A., Al-Hadeethi, Y., Kamal, S. M., & Razvi, M. A. N. 2016. Calculating the ambient dose equivalent of fast neutrons using elemental composition of human body. *Applied Mathematics and Computation*, 274, 604-610. <https://doi.org/10.1016/j.amc.2015.11.037>.
- Schippers, J. M., Lomax, A., Garonna, A., & Parodi, K. 2018. Can Technological Improvements Reduce the Cost of Proton Radiation Therapy?. In *Seminars in radiation oncology*, 28(2), 150-159.

- Seekamp, J. M. 2020. *A Patient Specific Treatment Planning Method for BNCT Utilizing MCNP and RayStation*, Doctoral dissertation, The University of Toledo, Ohio, Amerika Serikat.
- Stricklin, D. L., VanHorne-Sealy, J., Rios, C. I., Scott Carnell, L. A., & Taliaferro, L. P. 2021. Neutron Radiobiology and Dosimetry. *Radiation Research*, 195, 480-496. <https://doi.org/10.1667/RADE-20-00213.1>.
- Tanzifi, G., & Koshki, A. A. 2024. Translation of Radiation Protection in Nuclear Medicine. *Eurasian Journal of Chemical, Medicinal and Petroleum Research*, 3(3), 775-781.
- Tesse, R. 2019. *Quantitative Methods to Evaluate the Radioprotection and Shielding Activation Impacts of Industrial and Medical Applications Using Particle Accelerators*, Thesis, Departement of Engineering Sciences and Technology, Université Libre de Bruxelles, Belgia.
- Titt, U., Pera, E., & Gillin, M. T. 2020. Monte Carlo Simulations of Neutron Ambient Dose Equivalent in A Novel Proton Therapy Facility Design. *International Journal of Particle Therapy*, 6(4), 29-37. <https://doi.org/10.14338/IJPT-19-00071.1>.
- Van De Walle, J., Forton, E., Nuttens, V., Kleeven, W., Mandrillon, J., & Van Der Kraaij, E. 2018. Beam Dynamics Simulations of Medical Cyclotrons and Beam Transfer Lines at IBA. In *13<sup>th</sup> International Computational Accelerator Physics Conference*, 104-109.
- Verma, V., Mishra, M. V., & Mehta, M. P. 2016. A Systematic Review of the Cost and Cost-Effectiveness Studies of Proton Radiotherapy. *Cancer*, 122 (10), 1483-1501. <https://doi.org/10.1002/cncr.29882>.
- Wang, D. 2015. A Critical Appraisal of The Clinical Utility of Proton Therapy in Oncology. *Medical Devices: Evidence and Research*, 8, 439-446. <https://doi.org/10.2147/MDER.S65594>.
- Weinrich, U. 2006. Gantry Design for Proton and Carbon Hadrontherapy Facilities. *Proceedings of EPAC 2006*, 964-968.