

DAFTAR PUSTAKA

- [1] F. Cocker, K. Chien Yee, A. J. Palmer, and B. de Graaff, "Increasing incidence and mortality related to liver cancer in Australia: time to turn the tide," *Aust NZ J Public Health*, vol. 43, no. 3, pp. 267–273, Jun. 2019, doi: 10.1111/1753-6405.12889.
- [2] S. Y. Su, C. J. Chiang, Y. W. Yang, and W. C. Lee, "Secular trends in liver cancer incidence from 1997 to 2014 in Taiwan and projection to 2035: An age-period-cohort analysis," *Journal of the Formosan Medical Association*, vol. 118, no. 1P3, pp. 444–449, Jan. 2019, doi: 10.1016/j.jfma.2018.07.001.
- [3] J. Ferlay et al., "Global Cancer Observatory: Cancer Today," International Agency for Research on Cancer. Accessed: Mar. 06, 2024. [Online]. Available: <https://gco.iarc.fr/today>
- [4] Hyuna Sung, Jacques Ferlay, Rebecca L. Siegel, Mathieu Laversanne, Isabelle Soerjomataram, Ahmedin Jemal and Freddie Bray. "Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries". CA: A Cancer Journal for Clinicians, 0:1–41, 2021
- [5] Jessica L. Petrick and Katherine A. McGlynn. "The Changing Epidemiology of Primary Liver Cancer". Current Epidemiology Reports, 6:104–111, 2019.
- [6] Muhammad Begawan Bestari, Ignatius Ronaldi Joewono, Ivonne Golda Palungkun and Siti Aminah Abdurachman. "Hepatocellular Carcinoma Arising After Hepatitis B Seroconversion without Cirrhosis, When and How Surveillance is done?". Gastroenterology and Hepatology Research, 9:3234–3237, 2020.
- [7] Noha E. Ibrahim, Wael M. Aboulthana and Ram Kumar Sahu. "Hepatocellular Carcinoma : Causes and Prevention". Pharmaceutical and Biosciences Journal, 6:48–55, 2018.
- [8] Chyntia Olivia, Maurine Jasirwan, Irsan Hasan, Andri Sanityoso Sulaiman and Cosmas Rinaldi A. Lesmana. "Risk factors of mortality in the patients with hepatocellular carcinoma : A multicenter study in Indonesia Risk factors of mortality in the patients with hepatocellular carcinoma : A multicenter study in Indonesia". Current Problems in Cancer, 44:1–11, 2019.
- [9] Muhammad Miftahussurur, Diah Priyantini, Isna Mahmudah, Ricky Indra Alfaray and Amie Vidyani. "Quality of Life and Related Factors Among Hepatitis B Virus Infected Individuals". Systematic Reviews in Pharmacy, 11:960–964, 2020.
- [10] Julius Balogh, David Victor Iii, Sherilyn Gordon, Xian Li, R. Mark Ghobrial and Howard P. Monsour Jr. "Hepatocellular carcinoma : a review". Hepatocellular Carcinoma, 3:41–53, 2016.



- [11] Nobuyoshi Fukumitsu, Toshiyuki Okumura and Hideyuki Sakurai. "Radiotherapy for liver cancer". J Gen Fam Med, 18:126–130, 2017.
- [12] M. V. Varaksin *et al.*, "Synthesis, characterization, and in vitro assessment of cytotoxicity for novel azaheterocyclic nido-carboranes – Candidates in agents for *Boron Neutron Capture Therapy* (BNCT) of cancer," *Tetrahedron*, vol. 102, Dec. 2021, doi: 10.1016/j.tet.2021.132525.
- [13] H. Crane, Eugene J. Koay, Christine Eyler, Thomas F. Delaney, Andrew X. Zhu, Jennifer Y. Wo, Clemens Grassberger and Theodore S. Hong. "Protons versus Photons for Unresectable Hepatocellular Carcinoma : Liver Decompensation and Overall Survival". Radiation Oncology Biology, 2019.
- [14] Lovisa Westlund Gotby. "Intensity Modulated Proton Therapy for Hepatocellular Carcinoma". , 2017.
- [15] Yizheng Chen, Clemens Grassberger, Junli Li, Theodore S. Hong and Harald Paganetti. "Impact of potentially variable RBE in liver proton therapy". Physics in Medicine and Biology, 63:2018.
- [16] M. Suzuki, "*Boron Neutron Capture Therapy* (BNCT): a unique role in radiotherapy with a view to entering the accelerator-based BNCT era," *Int. J. Clin. Oncol.*, vol. 25, no. 1, pp. 43–50, 2020, doi: 10.1007/s10147-019-01480-4.
- [17] B. W. Cheon *et al.*, "Optimization of target, moderator, and collimator in the accelerator-based *Boron Neutron Capture Therapy* system: A Monte Carlo study," *Nucl. Eng. Technol.*, vol. 53, no. 6, pp. 1970–1978, 2021, doi: 10.1016/j.net.2020.12.006.
- [18] N. C. Therapy, "cells A Model for Estimating Dose-Rate Effects on Cell- Killing of Human Melanoma after Boron," pp. 1–16, 2020.
- [19] M. Suzuki *et al.*, "First attempt of *Boron Neutron Capture Therapy* (BNCT) for hepatocellular carcinoma," *Jpn J Clin Oncol*, vol. 37, no. 5, pp. 376–381, May 2007, doi: 10.1093/jjco/hym039.
- [20] R.-T. Chiang, "Analysis of Radiation Interactions and Biological Effects for *Boron Neutron Capture Therapy*," *ASEAN Journal on Science and Technology for Development*, vol. 35, no. 3, pp. 203–207, Dec. 2018, doi: 10.29037/AJSTD.535.
- [21] N. Hu, H. Tanaka, R. Kakino, S. Yoshikawa, M. Miyao, K. Akita, "Improvement in the neutron beam collimation for application in *Boron Neutron Capture Therapy* of the head and neck region," *Scientific Reports* 2022 12:1, vol. 12, no. 1, pp. 1–12, Aug. 2022, doi: 10.1038/s41598-022-17974-7.
- [22] N. Hu, H. Tanaka, T. Takata, S. Endo, S. Masunaga, "Evaluation of PHITS for microdosimetry in BNCT to support radiobiological research," *Applied Radiation*



- and Isotopes, vol. 161, p. 109148, Jul. 2020, doi: 10.1016/J.APRADISO.2020.109148.
- [23] Y. S. Yeom, M. C. Han, C. Choi, H. Han, B. Shin, T. Furuta, "Computation Speeds and Memory Requirements of Mesh-Type ICRP Reference Computational Phantoms in Geant4, MCNP6, and PHITS," *Health Phys*, vol. 116, no. 5, pp. 664–676, May 2019, doi: 10.1097/HP.0000000000000999.
 - [24] Jevas C. Ozougwu. "Physiology of the liver". *International Journal of Research in Pharmacy and Biosciences*, 4:13–24, 2017.
 - [25] Mohd. Aftab Siddiqui, Hefazat Hussain Siddiqui, Anuradha Mishra and Afreen Usmani. "Epidemiology of Hepatocellular Carcinoma". *International Journal of Pharmaceutical Sciences and Research*, 9:5050–5059, 2018.
 - [26] Vishy Mahadevan. "Anatomy of the liver". *Surgery*, 38:1–5, 2014.
 - [27] Man Hu, Liyang Jiang, Xiangli Cui, Jianguang Zhang and Jinming Yu. "Proton beam therapy for cancer in the era of precision medicine". *Journal of Hematology & Oncology*, 11:1–16, 2018.
 - [28] Florence K. Keane and Theodore S. Hong. "Role and Future Directions of External Beam Radiotherapy for Primary Liver Cancer". *Cancer Control*, 24:1–12, 2017.
 - [29] Nitin Ohri, Laura A. Dawson, Sunil Krishnan, Jinsil Seong, Jason C. Cheng, Shiv K. Sarin, Milan Kinkhabwala, Mansoor M. Ahmed, Bhadrasain Vikram, C. Norman Coleman and Chandan Guha. "Radiotherapy for Hepatocellular Carcinoma : New Indications and Directions for Future Study". *JNCI J Natl Cancer Inst*, 108:1–10, 2016.
 - [30] Adeel Kaiser, John G. Eley, Nasarachi E. Onyeuku, Stephanie R. Rice, Carleen C. Wright, Nathan E. Mcgovern, Megan Sank, Mingyao Zhu, Zeljko Vujaskovic, Charles B. Simone and Arif Hussain. "Proton Therapy Delivery and Its Clinical Application in Select Solid Tumor Malignancies". *Journal of Visualized Experiments*, 144:1–12, 2019.
 - [31] Jen-yu Cheng, Chieh-min Liu, Yu-ming Wang, Hsuan-chih Hsu, Eng-yen Huang, Tzu-ting Huang, Ching-hsin Lee, Sheng-ping Hung and Bing-shen Huang. "Proton versus photon radiotherapy for primary hepatocellular carcinoma : a propensity-matched analysis". *Radiation Oncology*, 15:1–10, 2020.
 - [32] Pablo de Vera, Isabel Abril and Rafael Garcia-Molina. "Excitation and ionisation cross-sections in condensed-phase biomaterials by electrons down to very low energy: application to liquid water and genetic building blocks". *Physical Chemistry Chemical Physics*, 23:5079–5095, 2021.
 - [33] Sakshi Painuli and Navin Kumar. "Prospects in the development of natural radioprotective therapeutics with anti-cancer properties from the plants of



- Uttarakhand region of India". *Journal of Ayurveda and Integrative Medicine*, 7:62–68, 2016.
- [34] Jin song Wang, Hai juan Wang and Hai li Qian. "Biological effects of radiation on cancer cells". *Military Medical Research*, 5:1–10, 2018.
- [35] Changhoon Choi, Arang Son, Ga-haeng Lee, Sung-won Shin, Sohee Park, Hee Ahn, Yoonsun Chung, Jeong Il Yu, Hee Chul and Park Id. "Targeting DNA-dependent protein kinase sensitizes hepatocellular carcinoma cells to proton beam irradiation through apoptosis induction". *PLoS ONE*, 14:1–17, 2019
- [36] Rachel J. Carter, Catherine M. Nickson, James M. Thompson, Andrzej Kacperek, Mark A. Hill and Jason L. Parsons. "Complex DNA damage induced by high-LET α -particles and protons triggers a specific cellular DNA damage response". *International Journal of Radiation Oncology • Biology • Physics*, 2017.
- [37] American Cancer Society. "The Science Behind Radiation Therapy". . 2016. radiation in modern radiation oncology". *Physics in Medicine and Biology*, 61:R167–R205, 2016.
- [38] Tomas Kron, Joerg Lehmann and Peter B. Greer. "Dosimetry of ionizing radiation in modern radiation oncology". *Physics in Medicine and Biology*, 61:R167–R205, 2016.
- [39] Rosanna H. Yeung, Tobias R. Chapman, Stephen R. Bowen, Rosanna H. Yeung, Tobias R. Chapman, Stephen R. Bowen and Smith Apisarnthanarax. "Expert Review of Anticancer Therapy Proton beam therapy for hepatocellular carcinoma". *Expert Review of Anticancer Therapy*, 00:1–14, 2017.
- [40] Masashi Mizumoto, Yoshiko Oshiro and Toshiyuki Okumura. "Proton Beam Therapy for Hepatocellular Carcinoma : A Review of the University of Tsukuba Experience". *International Journal of Particle Therapy*, 570–578, 2016.
- [41] M. A. Dymova, S. Y. Taskaev, V. A. Richter, and E. V. Kuligina, "Boron Neutron Capture Therapy: Current status and future perspectives," *Cancer Communications*, vol. 40, no. 9. John Wiley and Sons Inc, pp. 406–421, Sep. 01, 2020. doi: 10.1002/cac2.12089.
- [42] N. Fitriatuzzakiyyah, R. K. Sinuraya, and I. M. Puspitasari, "Cancer Therapy with Radiation: The Basic Concept of Radiotherapy and Its Development in Indonesia," *Indones. J. Clin. Pharm.*, vol. 6, no. 4, pp. 311–320, 2017, doi: 10.15416/ijcp.2017.6.4.311.
- [43] T. Itoh et al., "Design and synthesis of boron containing monosaccharides by the hydroboration of D-glucal for use in *Boron Neutron Capture Therapy* (BNCT)," *Bioorganic Med. Chem.*, vol. 26, no. 22, pp. 5922–5933, 2018, doi: 10.1016/j.bmc.2018.10.041.



- [44] J. G. Fantidis and G. Nicolaou, "Optimization of Beam Shaping Assembly design for *Boron Neutron Capture Therapy* based on a transportable proton accelerator," *Alexandria Eng. J.*, vol. 57, no. 4, pp. 2333–2342, 2018, doi: 10.1016/j.aej.2017.08.004.
- [45] P. Wongthai et al., "Boronophenylalanine, a boron delivery agent for *Boron Neutron Capture Therapy*, is transported by ATB0,+, LAT1 and LAT2," *Cancer Sci.*, vol. 106, no. 3, pp. 279–286, 2015, doi: 10.1111/cas.12602.
- [46] Britannica, "Cyclotron," 8 Februari 2018. [Online].
Available: <https://www.britannica.com/technology/cyclotron>. [Diakses 10 Mei 2024].
- [47] Kepala Badan Pengawas Tenaga Nuklir Republik Indonesia, "PERATURAN KEPALA BADAN PENGAWAS TENAGA NUKLIR NOMOR 6 TAHUN 2010," 2010.
- [48] Y. B. Wang, G. Pei, D. J. Jiang, and M. S. Zhou, "Economic estimation of boron isotope production by gas diffusion method using BF₃ as processing gas," *J. Phys. Conf. Ser.*, vol. 1696, no. 1, p. 012006, Dec. 2020, doi: 10.1088/1742-6596/1696/1/012006
- [49] H. He, J. Li, P. Jiang, S. Tian, H. Wang, R. Fan, J. Liu, Y. Yang, Z. Liu, and J. Wang, "The basis and advances in clinical application of *Boron Neutron Capture Therapy*," *Radiat. Oncol. Lond. Engl.*, vol. 16, no. 1, p. 216, Dec. 2021, doi: 10.1186/S13014-021-01939-7
- [50] H. Kumada, & K. Takada, "Treatment planning system and patient positioning for boron neutron capture therapy," *Therapeutic Radiology and Oncology*, vol. 2, p. 50, 2018
- [51] S. Mallick, G. K. Rath, and R. Benson, Eds., *Practical Radiation Oncology*. Singapore: Springer Singapore, 2020. doi: 10.1007/978-981-15-0073-2.
- [52] I. M. Ardana and Y. Sardjono, "Optimization of a Neutron Beam Shaping Assembly Design for Bnct and Its Dosimetry Simulation Based on Mcnpx," *J. Teknol. Reakt. Nukl. Tri Dasa Mega*, vol. 19, no. 3, p. 121, 2017, doi: 10.17146/tdm.2017.19.3.3582.
- [53] G. Li, dkk, "Design of Beam Shaping Assemblies for Accelerator-Based BNCT With Multi-Terminals," *Frontiers in Public Health*, pp. 1-10, 2021.
- [54] IAEA, *Advances in Boron Neutron Capture Therapy*, Vienna: IAEA, 2023.
- [55] JAEA, *Particle and Heavy Ion Transport code System User's Manual Ver.3.30 English version*, Ibaraki: JAEA



- [56] L. D. Fitriani, ANALISIS DOSIS PADA TERAPI KANKER PARU-PARU DENGAN METODE *BORON NEUTRON CAPTURE THERAPY* (BNCT) MENGGUNAKAN PHITS 3.26, Yogyakarta: Universitas Gadjah Mada, 2022
- [57] A. Pratiwi, ANALISIS DOSIS PADA *BORON NEUTRON CAPTURE THERAPY* (BNCT) UNTUK PENANGANAN METASTASIS KANKER OVARIUM MENGGUNAKAN PHITS 3.26, Yogyakarta: Universitas Gadjah Mada, 2022.
- [58] L. Zaidi, M. Belgaid, S. Taskaev, and R. Khelifi, “Beam shaping assembly design of $7\text{Li}(p,n)7\text{Be}$ neutron source for *Boron Neutron Capture Therapy* of deep-seated tumor,” *Appl. Radiat. Isot.*, vol. 139, no. April 2017, pp. 316–333, 2018, doi: 10.1016/j.apradiso.2018.05.029.
- [59] H. Cember and T. E. Jonhson, *Introduction To Health Physics*, 4th ed. The McGraw-Hill Companies, 1976.
- [60] K. Alikaniotis, O. Borla, V. Monti, G. Vivaldo, A. Zanini, and G. Giannini, “Radiotherapy dose enhancement using BNCT in conventional LINACs high-energy treatment: Simulation and experiment,” *Reports Pract. Oncol. Radiother.*, vol. 21, no. 2, pp. 117–122, 2016, doi: 10.1016/j.rpor.2015.07.003.
- [61] “The 2007 Recommendations of the International Commission on Radiological Protection. ICRP publication 103.,” *Ann. ICRP*, vol. 37, no. 2–4, pp. 1–332, 2007, doi: 10.1016/j.icrp.2007.10.003.
- [62] A. D. P. Ramadhani *et al.*, “Dose Estimation of the BNCT Water Phantom Based on MCNPX Computer Code Simulation,” *J. Teknol. Reakt. Nukl. Tri Dasa Mega*, vol. 22, no. 1, p. 23, 2020, doi: 10.17146/tdm.2020.22.1.5780
- [63] R. Ramdani, S. Yani, M. F. Rhani, and I. Arif, “Commissioning Linear Accelerator Varian Clinax iX Foton Beam 10 MV Menggunakan Simulasi Monte Carlo EGSnrc Code System,” vol. 2015, no. Snips, pp. 653–656, 2015.
- [64] L. P. Hong, “Review on Some Computational Aspects of *Boron Neutron Capture Therapy*,” *Indones. J. Phys. Nucl. Appl.*, vol. 3, no. 2, pp. 56–63, 2018.
- [65] O. D. Rahayuningsih, S. Susilo, and Y. Sardjono, “Neutron Chareacterization of BNCT Water Phantom Based on 30 MeV Cyclotron Using PHITS Computational Code,” *Indones. J. Phys. Nucl. Appl.*, vol. 4, no. 1, pp. 22–26, 2019, doi: 10.33336/ijpna.v4i1.22-26.
- [66] T. Sato *et al.*, “Overview of particle and heavy ion transport code system PHITS,” *Ann. Nucl. Energy*, vol. 82, pp. 110–115, 2015, doi: 10.1016/j.anucene.2014.08.023.
- [67] “Ver. 3.33 User’s Manual,” p. 334, 2021



- [68] D. Krstić and D. Nikezić. "Input files with ORNL-mathematical phantoms of the human body for MCNP-4B". *Computer Physics Communications*, 176:33–37, 2007
- [69] Jian Zhou, Huichuan Sun, Zheng Wang, Wenming Cong, Jianhua Wang, et al., "Guidelines for the Diagnosis and Treatment of Hepatocellular Carcinoma (2019 Edition)". *Liver Cancer*, 9:682–720, 2020
- [70] Arpit M. Chhabra, Melissa A. Frick, Tejan Diwanji, Jason K. Molitoris and Charles B. Simone II. "Charged Particle Stereotactic Body Radiation Therapy". 217–233, 2019
- [71] Japanese Society of Neutron Capture Therapy, "What is BNCT?", Available : http://www.jsnct.jp/e/about_nct/, [Diakses 10 Mei 2024].

