

ABSTRACT

This project presents a comparative analysis of several Software Defined Radio (SDR) devices that are readily available in Indonesia, namely HackRF One, RTL-SDR, and RTL2832, as an alternative portable radio telescope receiver for outreach programs. Portable radio telescopes enable students and educators to explore radio astronomy at an affordable cost, providing scientific research opportunities for those constrained by financial or geographical limitations. The analysis focuses on performance metrics, such as frequency range, noise floor, and sensitivity, as well as practical metrics, such as operational temperature, features, and cost. This research was conducted through a literature review, measurements using various types of antennas, and analysis of the data collected using GNU Radio.

The findings indicate that, while HackRF One exhibited a slightly lower noise floor compared to RTL-SDR and RTL2832 in certain datasets, the difference is not significant overall. In terms of sensitivity, out of 40 datasets using antennas (excluding dummy loads), HackRF One successfully received signals in 17 datasets, RTL2832 in 6 datasets, and RTL-SDR in only 1 dataset, highlighting HackRF One's superior signal reception performance. Although HackRF One offers better performance and more features, RTL2832 and RTL-SDR, with their affordable prices and comparable noise floors, are recommended as educational tools for outreach programs. Meanwhile, HackRF One is more suitable for long-term observational use.

keywords: Software Defined Radio, Radio Astronomy, Antenna, GNU Radio