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Portable low-cost open-source wireless spectrophotometer for fast and reliable measurements

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ABSTRACT

We demonstrate a low-cost standalone portable spectrophotometer for fast and reliable measurement execution. The data acquired can be both displayed via a dedicated smartphone application or a computer interface, allowing users either to gather and view data on the move or set up a continuous experiment. All design and software files are open-source and are intended for the device to be easily replicable and further customizable to suit specific applications. The assembled device can measure absorption in the wavelength range from 450 nm to 750 nm with a resolution of 15 nm and is housed in a 90 × 85 × 58 mm casing. Validation of the device was carried out by assessing wavelength accuracy, dynamic range and the signal-to-noise ratio of the system, followed by testing in three different applications where limit of quantification, limit of detection and relative standard deviations were determined. The results indicated better performance than low-cost spectrophotometers, on average being comparable to moderate to high-cost spectrophotometers