

2025 IEEE Africon, Protea Hotel Polokwane Ranch Resort, Polokwane, South Africa, 10-12  
December 2025

Experimental comparison of CW radar modules for estimating soccer ball speed

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**Abstract**

This paper presents a comparative study of two continuous-wave (CW) radar modules, the IPM-365 and the uRAD, for estimating the speed of a kicked soccer ball in resourceconstrained environments such as schools. A signal processing pipeline was developed to generate spectrograms, isolate the ball's return signal and estimate its peak velocity. Experimental testing was conducted in a controlled indoor environment, with ground truth ball speeds obtained through video analysis for validation. The IPM-365 produced clearer spectrograms and demonstrated more consistent performance for short-range measurements, with radar-based speed estimates deviating less than 10% from the video-based values. This study investigates the comparison between these radar modules for soccer applications, highlighting the IPM-365's potential for low-cost, accurate ball speed measurements in amateur sports settings.