Horizontal Radiation Pattern from a 2.4GHz Waist Mounted Beacon for Indoor Basketball Player Positioning

James A. Kirkup¹, David D. Rowlands¹,², David V. Thiel¹

¹ Centre for Wireless Monitoring and Applications, Griffith University, Nathan, Qld, Australia, Email: j.kirkup@griffith.edu.au
² Queensland Sports Technology Cluster

ABSTRACT

The game of indoor basketball is played at the professional level in many countries around the world where state of the art facilities and technologies assist basketball players and coaches improve their team’s performance [1, 2, 3]. Technologies for detecting, tracking and positioning of players within indoor team sports have attracted a growing interest in recent years [4,5]. The ability to provide real and recorded movement of players provides valuable information for coaches to analyse and improve the performance of their offensive and defensive plays.

Within these locating systems there are a number of key components that engineers need to consider during the design, such as the communications methodology, the positioning technique, the placement of the wearable beacon and the receiver locations. For radio signal positioning systems in indoor sports, a small transmitting beacon is worn by the player. The location of this beacon on the player will contribute to the overall horizontal radiation pattern produced and the resulting lobes and nulls will affect the position determination of transmitted location. The knowledge of these lobes and nulls in the radiation pattern is important in the positioning system design.

Triangulation or trilateration is a common mathematical technique used in these locating systems to approximate the player’s position and is based on the calculated or known distances from the player towards two or more known locations (receivers). Approximate distances to each receiver can be determined mathematically from the steady signal strength or time delay recorded at each of the receivers. By measuring and considering the transmitting radiation pattern in the design we can attempt to minimise signal strength variations in the signal path due to lobes and nulls in the pattern. This will improve the estimated distance accuracy.

In the sport of basketball during offensive play, the players will mostly be facing towards their basketball ring (i.e. towards one end), while during defensive play the players will be facing the opposite direction or in the same
direction when a defensive rebound is required. The players undertake a wide range of movements which influence the positional accuracy (eg bending during dribbling). These are some of the factors considered along with the radiation pattern in the design of the location system and the preferred placement on the body of the transmitting beacon.

This paper reports the horizontal radiation pattern of a waist mounted vertically polarised beacon transmitting at 2.4GHz, the influence of the body on the radiation pattern and discusses the radiation pattern for employment in a wireless indoor basketball positioning system. The technique appears viable if four receiving sites are deployed around the court.

REFERENCES


