

# Dynamic beam steering

White paper



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“Dynamic beam steering is essential to reliably interpret merchandise movements”

## 1 Executive Summary

Fixed RFID readers play an important role in the RFID deployment in retail stores for goods receiving, stock room to sales floor movements and loss prevention (EAS). To ensure an optimum performance, each of these role demands a different set of features.

Fixed RFID readers with beam steering offer significant advantages for RFID-based loss prevention. Using RFID overhead readers for EAS, the beam steering enables reliable stray tag filtering and direction detection, thereby boosting the reader’s effectiveness for EAS. Nedap’s !D Top with the new Aerial update uses the beam steering for an improved performance.

## 2 RFID in retail stores

### 2.1 Traditional Challenges

Traditionally, RFID antennas have a single beam to register if a label is in the field. With the single beam technology however, it is not possible to make reliable judgments on the exact position or movement of a RFID label.

Typical challenges of RFID readers for EAS include:

- Distinguishing between people that walk along the system from people that walk under or through the system.
- Effective filtering of stray tags that are really close to the system.

## 3 Dynamic beam steering principles

With Dynamic Beam Steering, the beams of the antenna can be steered electronically in multiple directions.

To determine the direction of a RFID label you can use the different beams to find a label’s direction: it needs to be read multiple times, first on beam 1, then on beam 2 and finally on beam 3. If this happens, we can assume that the label is moving in the direction of beam 3 (from beam 1). This is how beam steering in its basic functionality works.

Nedap’s ceiling mounted RFID reader, the !D Top, is equipped with an antenna array that dynamically creates a multitude of independent beams in different directions. That makes it possible to determine whether a label is really passing the system or is just a stray tag read. Using the dynamic beam steering the !D Top also detects in which direction a RFID label is moving, which makes it possible to reliably monitor whether the tag is leaving the store.



## 4 Aerial update

The new Aerial update improves the basic beam steering algorithm in great extent. In practice the different beams have an overlap with each other. This results that a static tag can be seen by multiple beams which can result in unwanted behavior. The new algorithm not only detects in which beam the tag has been seen but combines this with the strength of the signal to give an estimated location of the tag. By monitoring the change in the location of the label the !D Top is able to determine the direction of the label. Combining the strength of the signal with the beam information results in an improved direction determination which leads to an improved performance.



## 5 Advantages for Loss Prevention

When using Dynamic Beam Steering in the EAS role, we can reduce the following issues:

- People walking along the system, but not under or through the system. Previously this caused false alarms.
- Items that were only read due to reflections (e.g. people with metallic shopping carts or suitcases), causing false alarms.
- Merchandise stored outside of the store, taken into the store. Previously this caused alarms, now we are able to distinguish between outgoing and incoming labels.



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