Next-Generation Millimeter Wave Imaging for Retail Inventory

Today’s omni-channel retailers require actionable insights to keep them moving at top speed and accuracy to maximize customer satisfaction. At the product level, visibility is key. ThruWave’s technology enables a completely different class of visualization beyond what is possible from cameras alone: Our sensors can see through and behind the front row of goods on a shelf, enabling you to automatically verify shelf inventory and detect damaged or missing items.

**Inventory verification**
ABI Research¹ has reported that using traditional inventory counting methods yield inventory accuracies of around 65%, leading to frequent stock-outs.

A CNBC report² estimates the total value of lost sales for retail businesses due to stock-out issues was $634.1 billion in 2015.

**Return fraud prevention**
According to NRF’s 2015 retail return fraud survey³, almost 4 percent of total returns are fraudulent. Annual merchandise return fraud and abuse combined is estimated to be between $9.1 billion and $15.9 billion for the entire retail industry.

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² https://www.cnbc.com/2015/11/30/retailers-are-losing-nearly-2-trillion-over-this.html
³ https://nrf.com/blog/omnichannels-pervasiveness-requires-efficient-strategy-processing-returns
What are Millimeter Waves?

Millimeter waves are radio waves at frequencies between approximately 17.5 GHz and 200+ GHz, corresponding to wavelengths between 20 mm and 1 mm. mmWaves are human safe, but penetrate most non-metallic surfaces (e.g., cardboard, plastic, wood, foam, etc.).
Shelf Stock Management Reimagined

ThruWave’s mmWave sensors see through packaging materials to make 3D images of both the packaging and contents of goods in real-time. ThruWave 3D datasets are similar to a CT scan, but without the health hazard and size/cost of an X-ray system.

**Automatic inventory verification**
In a retail environment, as shoppers remove items and associates replace them on the shelves, errors can accrue leading to stock-outs. Scanning through the first layer of product to the back of the shelf gives visibility into the real item counts.

**Detect damaged items**
Delivering damaged products to customers is highly undesirable and can cause reputation damage. Scanning items prior to purchase prevents broken items from being sold and facilitates removal of them from the shelves.

“ThruWave’s ability to see through the first layer of products on the shelf provides the missing link in inventory visibility.” — Senior Director, Fortune 10 retailer
Technology Stack and Integration With Existing Systems

The ThruWave Technology stack includes sensor hardware to emit and detect reflected mmWave signals, machine learning software to reconstruct 3D images and analyze the data, and an API to access these actionable items.

The ThruWave API seamlessly integrates with existing data flows into Warehouse Management System and Manufacturing Execution System software platforms. These data can be integrated with other sensor modalities (e.g., cameras, bar codes, weight sensors, etc.) to enhance visibility at the Enterprise Resource Planning software level.

ThruWave Core Technology Advantage

ThruWave leverages existing mmWave chipsets from the 5G and automotive radar markets. Our patent-pending PAIR and OCAI IP enable 100X signal-to-noise enhancement and over 300X faster image reconstruction vs. conventional approaches.