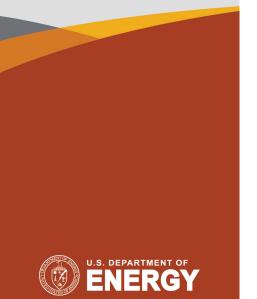# Millimeter Wave Technology Meets the Market

Picture yourself walking into your favorite department store, stepping into a specialized fitting room for a moment, and then stepping out to retrieve a print-out that provides the "best fit" for your clothing—from style to size to brand. Or imagine the ability to go to the airport and quickly proceed through an accurate and safe security check. These are just two of the many applications using PNNL's award-winning holographic imaging technology.

The $210 billion U.S. apparel market loses tens of billions of dollars per year to markdowns, returns, and alterations because the clothes they manufacture don't fit their customers. The Intellifit System, a commercialization of the Pacific Northwest National Laboratory's (PNNL's) millimeter wave holographic scanning technology, provides a breakthrough technology that will inexpensively solve a large portion of this problem for apparel retailers, manufacturers, and the consumers who are buying and returning their clothing.

The Intellifit scanner uses a millimeter wave array/transceiver technology which "illuminates" the body with extremely low-powered millimeter waves – a class of non-ionizing radiation not harmful to humans. More than 200,000 reflected signals are collected and sent to a high-speed, image-processing computer where they form a high-resolution 3D image of the body accurate to within one-quarter of an inch. From this "point cloud," body measurement software calculates dozens of precise physical measurements.

The Intellifit Corporation licensed this PNNL technology and partnered it with computer software applications to create a body scanning system that enables shoppers to step fully clothed into a first-of-its-kind cylindrical holographic imaging booth, obtain precise head-to-toe body measurements in less than 10 seconds, and receive a confidential computer printout listing the brands and sizes that fit best. Shoppers can then visit the Intellifit website at www.intellifit.com, with their unique identification number and receive personalized clothing recommendations. This not only helps consumers with both custom or best-fitting brands and sizes but also helps manufacturers develop better-fitting off-the-rack clothing and aids retailers in buying, stocking and selling clothes that fit their customers.

DIVERSE APPLICATIONS

Researchers at PNNL originally developed this millimeter wave holographic screening device for national security applications, including airport security, to penetrate clothing and nonmetallic objects for the purpose of detecting concealed objects. Upon investigating other applications, the technology was soon transferred to the custom-fit apparel industry and is expected to make a potentially "disruptive" entry into these two diverse markets that have not recently enjoyed significant technical innovation.

SCIENCE -BASED SOLUTIONS FOR NATIONAL SECURITY

Other applications currently being pursued include:

▶ *Medical*: *provide accurate measurements of individuals who are not mobile and may be difficult to measure for prosthetic devices*

▶ *Ergonomic*: *provide measurements and images for manufacturing better office chairs, form-fitting car and aviation seats, cockpits, and custom sports equipment*

▶ *Safety Equipment*: *create tailor-made airbags for cars, helmets, facemasks, respirators and life jackets*

▶ *Entertainment and Gaming*: *create avatars for gaming, interactive human animation, and virtual environment interaction*

▶ *Non-Destructive Evaluation*: *provide moisture measurements; detection of moisture in wood products fabrication process, integration of microwave holographic imaging sensor into production process*

▶ *In-wall Structure Detection*: *detect concealed structures behind building walls such as plastic conduit, wires, and pipes*

▶ *Fitness*: *provide personal measurements and weight scale for health and fitness monitoring.*

PROTECTING THE PUBLIC

In addition to providing measurements for "best-fit" style, size, and brand clothing, this technology brings a new level of safety and security to public arenas such as airports and subway terminals from potential terrorists. This same technology, applied in a security application by L-3 SafeView—a global leader in safe, non-invasive security systems—scans the body to detect any item worn in or under clothing, including plastics and ceramics, without exposing the body to ionizing radiation. No other scanner is as safe, as thorough, or has the capacity to detect as broad an array of items that might be concealed.

SAFE AND NON-INVASIVE

The technology used with the Intellifit System is safer than using a cell phone. The millimeter waves are a form of non-ionizing radiation, which are similar to cell phone signals but less than 1/350th of the power of those signals, and they do not penetrate the skin. The Intellifit System does not produce any pictures or images of the person and a person's measurement data is completely confidential.

Intellifit is truly a revolutionary way to safely, quickly, and unobtrusively find what fits.

ABOUT PNNL

Pacific Northwest National Laboratory, a U.S. Department of Energy Office of Science laboratory, solves complex problems in energy, the environment, and national security by advancing the understanding of science. PNNL employs more than 4000 staff, has a business volume of $750 million, and has been managed by Ohio-based Battelle since the lab's inception in 1965.

For more information about the Millimeter Wave Technology, contact:

Doug McMakin
Pacific Northwest National Laboratory
P.O. Box 999, K2-31
Richland, WA 99352
(509) 375-2206
doug.mcmakin@pnl.gov
www.pnl.gov

Pacific Northwest
NATIONAL LABORATORY