

**Docket #:** S16-173

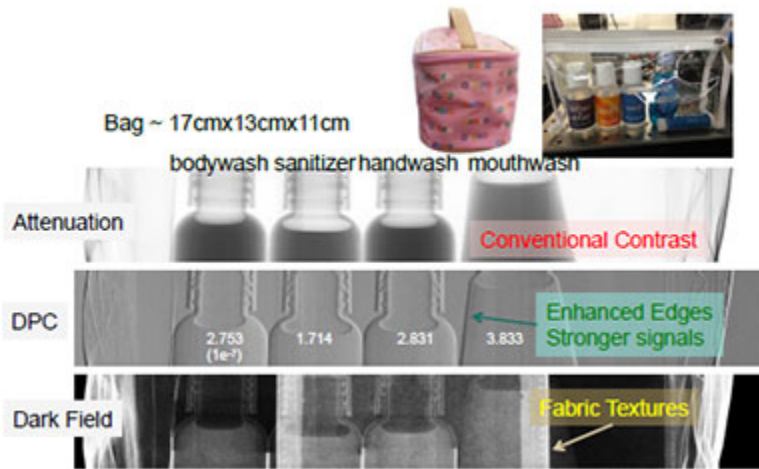
# **Fates - Compact, Sensitive X-ray Differential Phase Contrast Imaging System**

Researchers in Prof. Lambertus Hesselink's laboratory have developed a compact, sensitive X-ray differential phase contrast (DPC) imaging system that improves field of view, increases fringe visibility and shortens imaging times. This technology, called Fates, replaces the standard 3-grating system architecture with a single grating that is combined with a specialized, patterned x-ray source ([PexSA - described in Stanford Docket S12-318](#)) and x-ray detector ([PcXDa - described in Stanford Docket S15-291](#)). By eliminating two expensive grating components, the overall size and potential cost of the system is reduced. Furthermore, this configuration enables a single-step image acquisition with a field-of-view of approximately 35 degrees and fringe contrast approaching 50%. This technology could allow users to distinguish between hazardous and non-hazardous materials in baggage inspection applications or to identify tumors in medical imaging applications.

## **Stage of Research**

The inventors are building a prototype Fates system with preliminary results in the following applications:

- Aviation security - improved object identification (see figure)
- Medical imaging - improved detection and imaging of soft tissue density and tumors



*DPC at 40keV reveals liquids and powders in cluttered carry-on bag environment*

## Applications

- **Industrial X-ray inspection:**
  - baggage and container inspection for homeland security
  - non-destructive testing
- **Medical imaging**

## Advantages

- **Compact** - this DPC system is smaller because it has fewer components (one grating instead of the three gratings typically found in DPC systems)
- **Sensitive:**
  - field of view typically exceeds 35 degrees (compared to a few degrees for a standard DPC system)
  - fringe contrast approaches 50% (2-3x improvement over conventional DPC systems)
  - users can distinguish between hazardous and non-hazardous materials based on refractive indexes
- **Fast:**
  - single step data acquisition
  - enhanced visibility from the x-ray source and detector eliminates the need for long image acquisition

- **Reduced cost** - eliminates two high-aspect ratio amplitude gratings which are relatively difficult and expensive to fabricate

## Patents

- Issued: [10,859,517 \(USA\)](#)

## Innovators

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