Docket #: S16-173

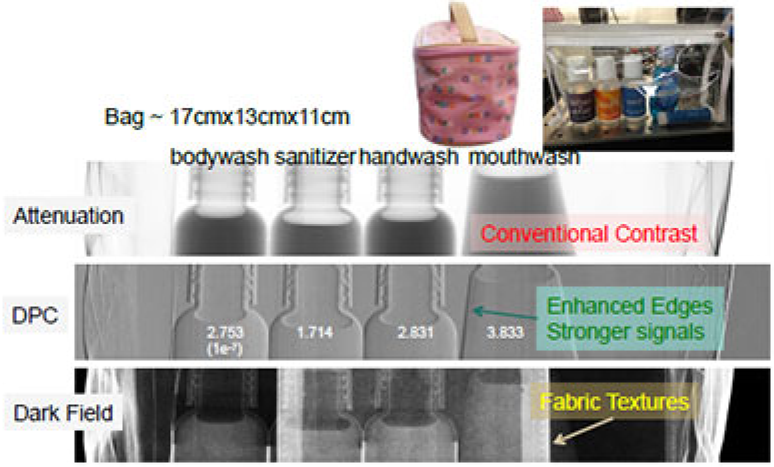
Fates - Compact, Sensitive X-ray Differential Phase Contrast Imaging System

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

- Published Application: 20170307549
- Issued: 10,859,517 (USA)

Innovators

- Lambertus Hesselink
- Max Yuen
- Yao-Te Cheng
- Yuzuru Takashima

Licensing Contact

David Mallin

Licensing Manager, Physical Sciences

Email