Non-invasive sample interrogation device

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TECHNOLOGY NEED
Several methods to identify the constituents of a liquid enclosed in a tightly sealed container have been developed for airport and port security to screen bottled milk or liquid medicine. One popular method is the use of x-ray or gamma-ray high energy photons to penetrate bottles. This method is expensive and poses radiation hazards. Another method is to use Raman scattering from ultra-violent light sources. This method is expensive, slow and would not suffice for applications where time is of the essence. A few products utilize Nuclear Magnetic Resonance (NMR) technology. For this, the generation of sufficient magnetic fields is expensive. Thus, a cheap, high efficient method to detect the characteristics of liquid or air in a mixture is needed.

INVENTION DESCRIPTION/SOLUTION
We have developed a non-invasive interrogation device to determine the nature of fluid present in the container. The device utilizes radio frequency (RF) energy to detect the characteristics of liquid or air in a bottle. A technique for dielectric spectroscopy utilizing self-resonance of a solenoid based sensor was also developed. The sensor is designed to detect self-resonance frequencies and reflection coefficients of unknown liquid in a plastic sealed bottle. Pattern recognition algorithms and classification methods were developed to characterize common liquids. A prototype has been developed, tested and found to be a low cost and faster alternative compared to currently available technologies.

APPLICATIONS
- Airport and Seaport security screening device
- Quality control device for fluidic products
- Lubricant monitoring

KEY BENEFITS
- Contactless and non-invasive inquiry of solutions
- Low cost without consumables
- Fast assessment

STAGE OF DEVELOPMENT
Prototype
Extensive tests done

INTELLECTUAL PROPERTY STATUS
US Patent Application Pending