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Licensable Technologies

Movies of eXtreme Imaging Experiments (MOXIE)

Applications:

- Aircraft industry in analyzing turbulent flows and jets
- Automotive industry in fuel injection research
- Defense industry in large-scale detonics, armor penetration studies
- Scientific research on material equations of state, fusion plasma, discharge formation, shock physics and fracture mechanics
- Non-destructive testing
- Medical imaging
- Homeland security applications such as container screening
- Schlieren photography and shadowgraphy

Benefits:

- Virtually unlimited frame depth
- Ability to image most difficult transient events from start to finish
- Extreme sensitivity reduces the cost and size of flash sources by at least one order of magnitude
- Dynamic range imaging of virtually any particle type, from visible light to x-rays, protons, and gamma rays.

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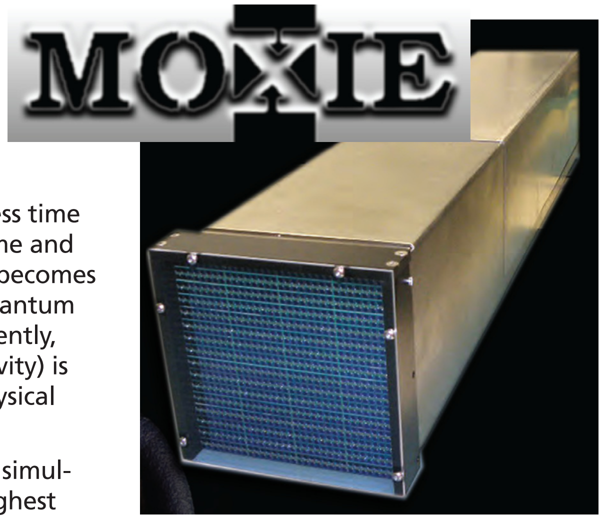
ESTABLISHED 1943

Summary:



The MOXIE camera images fast, transient events like a sparkplug firing or a flash x-ray by taking as many as 20 million frames per second.

The fundamental problem in high-speed imaging is that the camera becomes less and less sensitive at higher and higher speeds. At high frame rates, there is less time to collect photons in each frame and the light signal in each frame becomes weaker and more prone to quantum and electronic noise. Consequently, photographic “speed” (sensitivity) is usually inversely related to physical “speed” (frame rate).

MOXIE is unique in that it can simultaneously provide both the highest photographic speed and the highest physical speed without compromising either. Because MOXIE pixels are very large, the focal-plane array created has far more collection area than competing technologies and is correspondingly large and thus extremely sensitive. By way of comparison, a conventional argon-candle-flash light source used to properly expose film on a rotating-mirror-framing camera is often brighter than the explosive experiment itself. On the other hand, MOXIE is so sensitive that the flashed light source used is often barely visible to the naked eye. This increased sensitivity enables MOXIE to handle a broad range of tasks at much lower cost.

MOXIE can record virtually every photon over a wide area at unprecedented speed of 20 million frames per second, with a movie-loop memory set at 4,096 frames. In the blink of an eye, MOXIE enables imaging transient events from start to finish.

To increase speed, MOXIE uses a highly parallel architecture in a manner similar to the way a supercomputer uses many thousands of processors. With more than 1,000 channels operating in parallel on each module, MOXIE can simultaneously achieve unprecedented frame rates, as well as any desired number of frames. Whereas a supercomputer uses thousands of parallel processors to simulate a complicated dynamic event, such as an explosion, MOXIE uses thousands of parallel detector channels to rapidly measure the actual events in real time.

MOXIE received the prestigious R&D 100 Award in 2010 and is patent-protected.

Status: LANL is seeking partnership opportunities to leverage the Laboratory’s unique MOXIE capabilities.