Ultrafast X-Ray Imager (UXI) Focal Plane Array Testing & Characterization

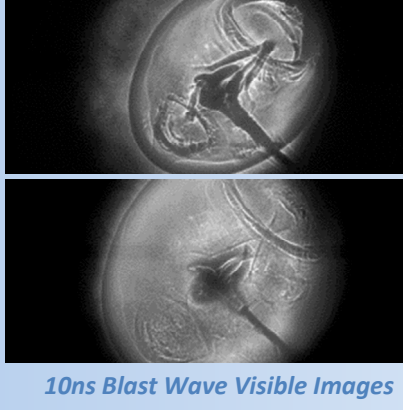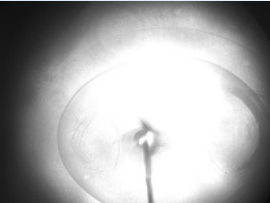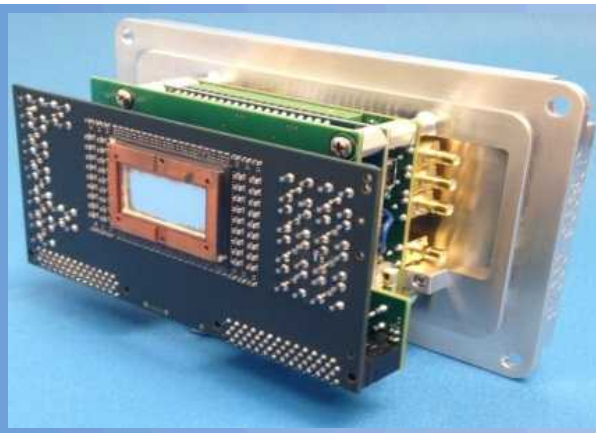## Sandia National Laboratories

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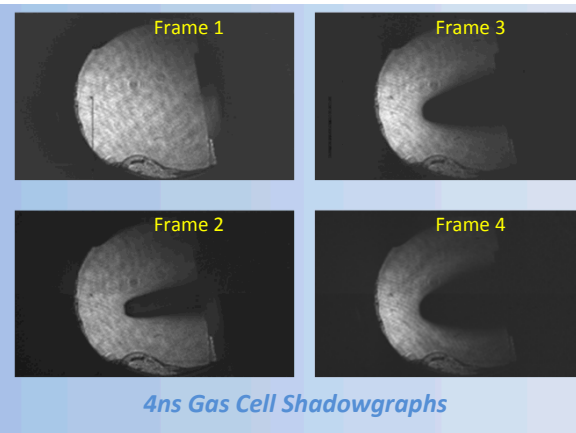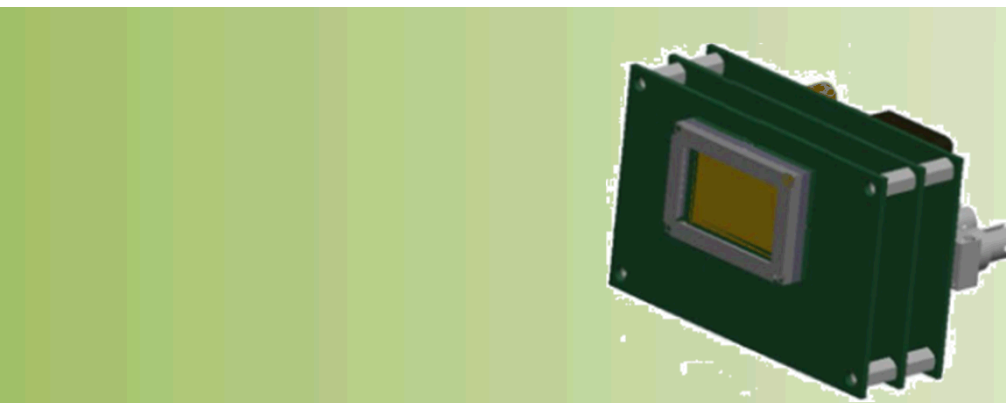
Overview

Name:	**Casey Petersen**
School:	**Arizona State University**
Degree:	**Bachelors of Science in Engineering (Electrical Systems)**
Graduating:	**December 2015**
Manager:	**Michael Holmes**
Mentor:	**Marcos Sanchez**
Organization:	**1753; Mixed Signal ASIC/SoC Products**
Location:	**Sandia National Laboratories - New Mexico**

UXI overview

The Ultra-Fast X-ray Imager (UXI) program is an ongoing effort to create high speed, multi-frame, time gated imagers for High Energy Density physics experiments. UXI enables the collection of higher quality data, produced faster, with a lower cost, resulting in improved weapon/fusion modeling and research.

UXI Focal Plane Arrays

FURI
1.5ns, 2 Frames
448x1024 pixels
350nm Sandia Process

VS.

10ns Blast Wave Visible Images

Commercial Double Exposed CCD

FY14

HIPPOGRIFF
1.5ns, 2-8 Frames (Interlacing)
448x1024 pixels
350nm Sandia Process

Frame 1   Frame 3
Frame 2   Frame 4

4ns Gas Cell Shadowgraphs

FY15

ICARUS
1.5ns, 4 Frames
512x1024 pixels
350nm Sandia Process

FY16

Main Project

Problem Statement: The UXI team needs automated test systems to assist in testing and characterizing Focal Plane Arrays (FPAs) at different stages in the assembly process

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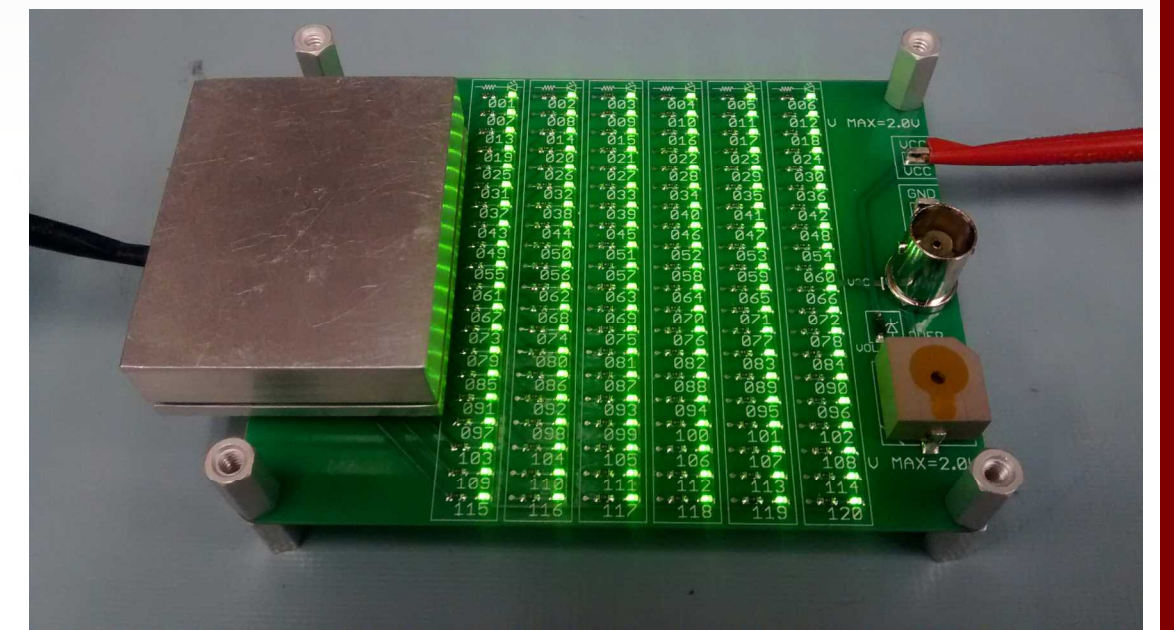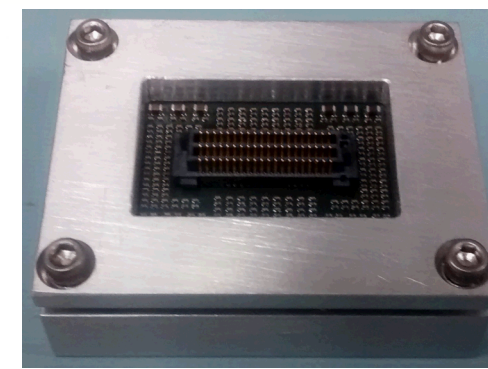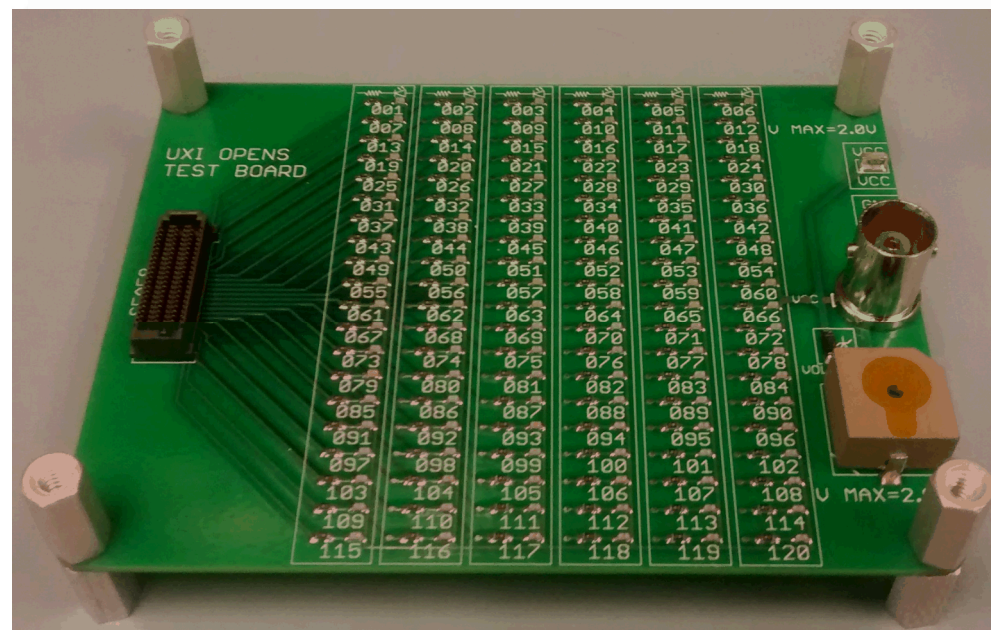**NNSA** National Nuclear Security Administration

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Projects

1. **UXI Small Outline Package Opens Test Board**
   - Developed a Printed Circuit Board that tests for open solder connections on the connector of an FPA package

   Impact: Previously there was no method in place to test for opens
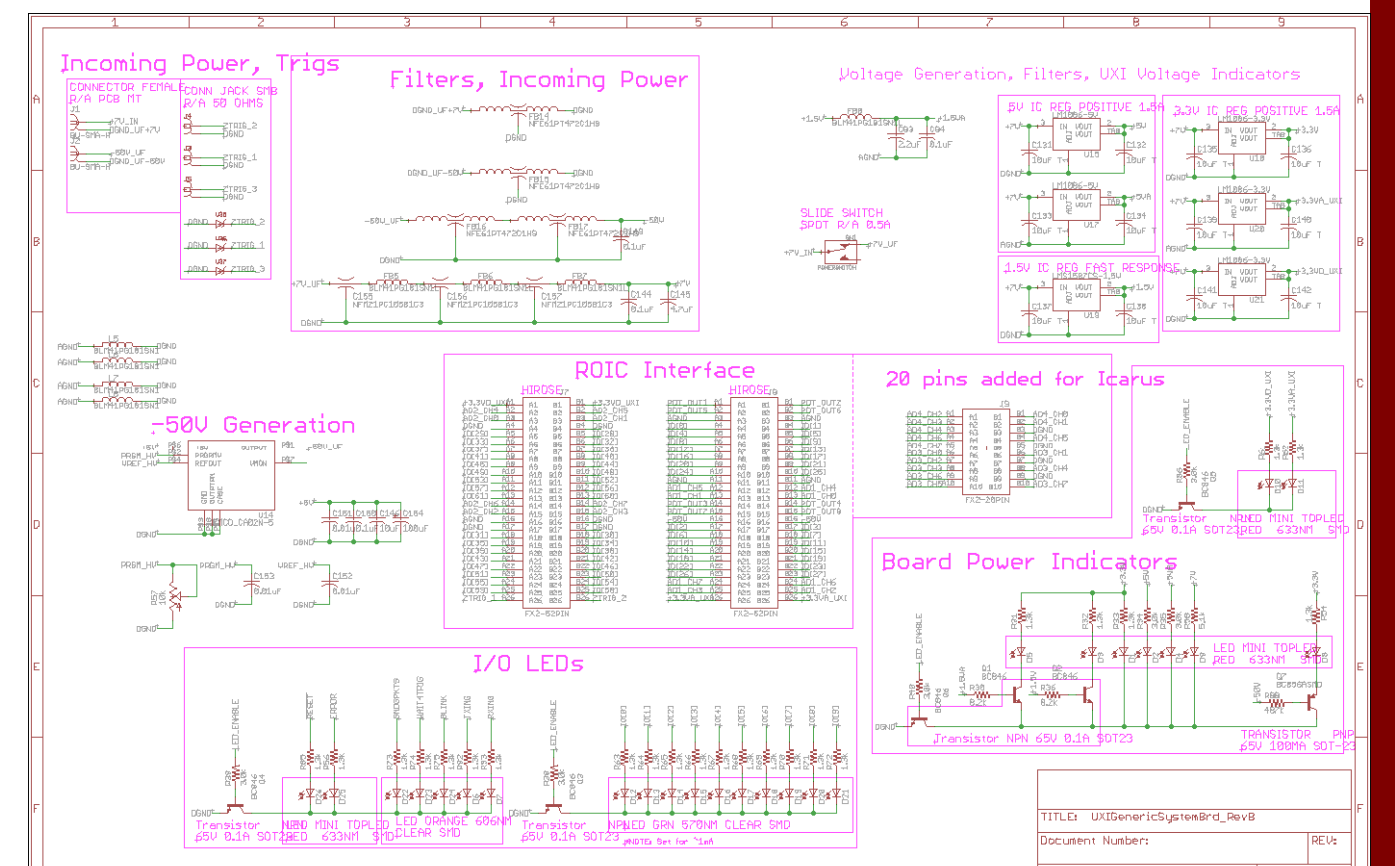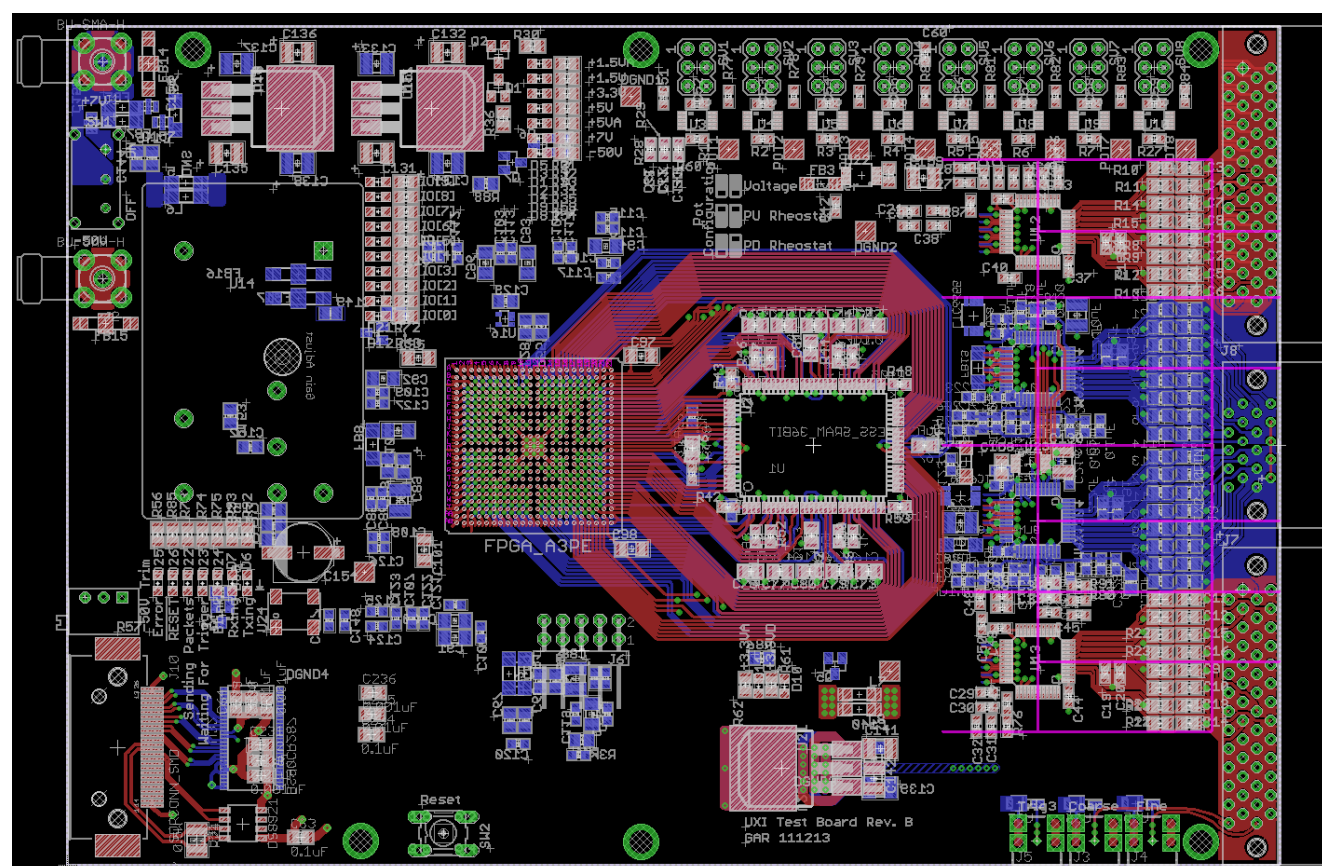

2. **UXI FPA Evaluation Board (Main Project)**
   - Designed an electrical system to test and characterize the focal plane arrays of the three most recent UXI FPAs

   Impact: Enables the UXI team to look at the FPAs In greater detail before shipping them to a customer

   - Allows the customer to test and characterize their system and troubleshoot it themselves if needed

2. Designing a vacuum feedthrough PCB for a pulse dilation camera capable of 20ps imaging
   - Revolutionary new camera for high energy density physics being developed with general atomics for use in the national ignition facility and z-machine

Conclusions

I worked in a team with one other intern under the direction of our mentor while Interfacing with customers, manufactures, and vendors to successfully complete our projects. I learned about Sandia's design process while strengthening my skills in circuit design and PCB layout; specifically in the areas of parallel data capture, signals shielding, signal buffering, and designing for testability (DFT).

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