



# Microscopic Taggant Technology Protecting the DoD Supply Chain from Counterfeit Electronics

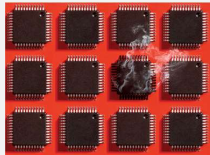
Brian Griffiths (PI NGC), Richard Calatayud (NGC), Parrish Ralston (NGC), Scott Suko (NGC), Thomas Gurrieri (Sandia), Venkatesh Sundaram (GT), Dennis Landi (RFID Global)



## Driving Applications: Supply Chain Hardware Integrity for Electronics Defense (SHIELD)

### Electronics Counterfeiting a Threat to Military Electronics Integrity

"Over a two year period, from 2009 to 2010, approximately 1,800 cases of suspect counterfeit parts were uncovered"  
Inquiry Into Counterfeit Electronic Parts in the Department of Defense Supply Chain, May 2012

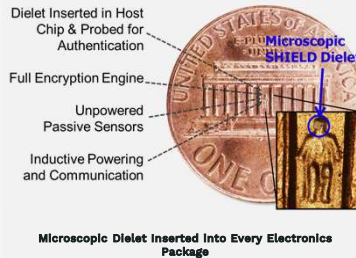
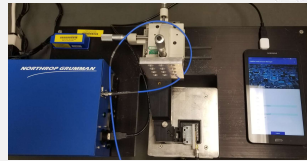


### SHIELD Dielet Provides Hardware Root of Trust and Full Authentication Functionality in the Smallest Monolithic ASIC Ever Made

#### SHIELD Defeats Counterfeiting by Building a Complete Electronics Authentication System

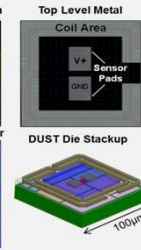
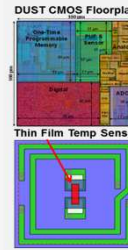
Domain expertise assembled for SHIELD team  
Northrop Grumman Corporation  
RFID Global  
Georgia Tech  
Sandia National Labs  
Kilopass  
Noise Figure  
Corwill Technology

Global Asset Tracking Management Network

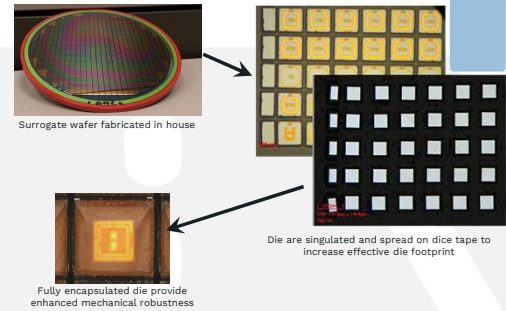


Microscopic Dielet inserted into Every Electronics Package

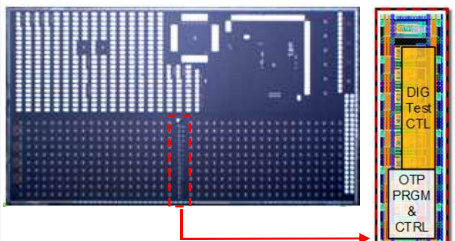
#### Each Dielet Supports a High Level of Functionality; Developed in 14nm CMOS



### Dielet Stretching and Encapsulation Protects Dielets and Allows Handling with Standard Tooling

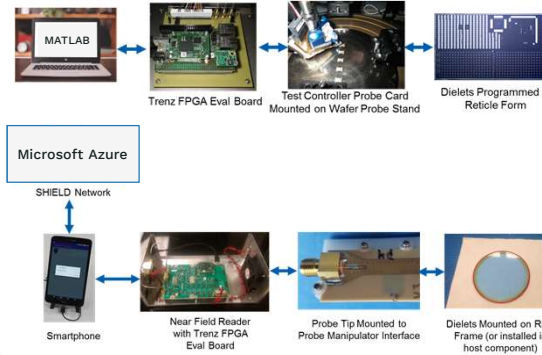


### Wafer Scale Probing of Dielets uses Test Controller, Maximizing Dielet Density on Wafer, Minimizing Test Time and Cost

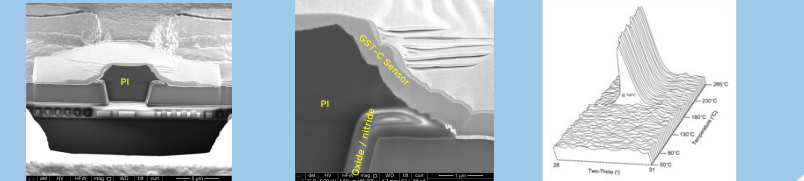
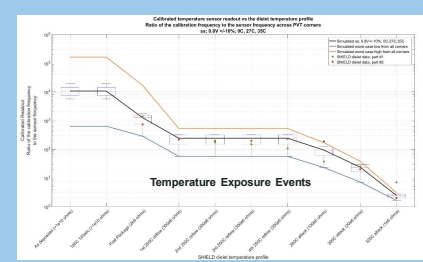
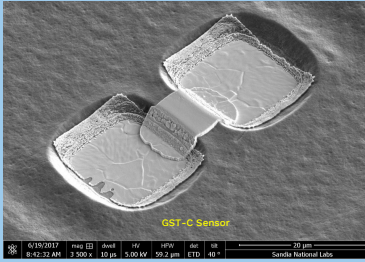


- Dielet Array**
- Local decoding allows single dielet power On/Communication
  - Simultaneous ATPG scan of entire row (20 dielets) also possible
- Test Controller**
- Programs and reads back 400 OTP S/Ns with single touch-down
  - Reads raw PUF bits to form a bit mask
  - Integrates with Probe functionality to allow full authentication
  - Provides visibility into each dielet's digital core

### Development of an FPGA Controller for SHIELD ASIC Testing Provides a Standardized Platform for all Dielet Testing on Wafer which can be Parallelized and Scaled for Production Testing in the Future



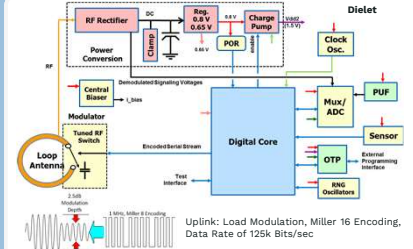
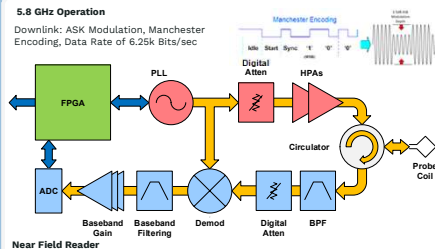
### Temperature Sensor Detects Whether Part Has Experienced Reflow Temperatures



### Near Field Reader Architecture Uses Single Coil, Single Frequency System for Simultaneous Power Transfer and Bidirectional Communications

#### Standards Based SHIELD Network Scales with Full Deployment

#### FedRAMP IETF FIPS 140-2



This research was developed with funding from the Defense Advanced Research Projects Agency (DARPA). The views, opinions and/or findings expressed are those of the author and should not be interpreted as representing the official views or policies of the Department of Defense or the U.S. Government.

### Prototype Near Field Reader Board Assembly Designed for Ease of Testing and Debug



### Mechanical Installation ICD Defined by Simulated NFR to Dielet Link

