BRIDG Overview

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BRIDG Proprietary – BD 57/2019.6.04 – DOES NOT CONTAIN EAR TECHNOLOGY OR ITAR CONTROLLED TECHNICAL DATA

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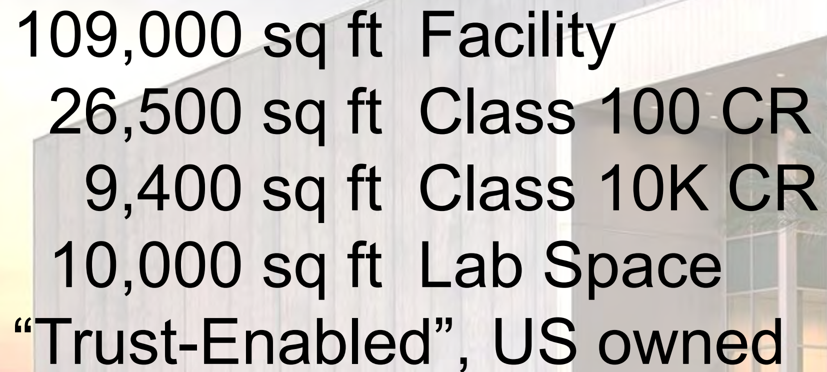
Bridging the Innovation Development Gap

BRIDG is a New 200mm Wafer Fab in Florida



Nano-Electronics Fabrication Facility: Cleanrooms and Labs
Located within a new 500-acre high-technology campus in Osceola County, FL

Our Purpose

Purpose:

BRIDG's community purpose is to create a more financially sound and diverse economy in Central Florida by serving as a catalyst for creating high wage job opportunities for residents and the broader Southeast region of United States.

As a not-for-profit, public-private partnership, and as good stewards of our region's infrastructure investment, our single largest metric of success is the creation of high wage jobs in the region.

Approximately $300M Invested to Date

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NEOCITY

“Florida grown” infrastructure investment with roots deeply embedded in the region and state.

Founding Visionaries

THE CORRIDOR
FLORIDA HIGH TECH

KUA Sub-Station

NeoCity Academy
Choice STEM High School

Class A Office

BRIDG Fab

Trust and Facility Clearance

+ **BRIDG is "Trust Ready"**
    - Heading towards DMEA Trusted Supplier Accreditation

+ **DSS Facility Clearance at SECRET level**
    - **Received July 2018**

+ **ITAR Qualified**
    - Fab, Lab, Office and IT infrastructures

+ **BRIDG has been sponsored by AT Program Office to become a cleared facility early 2018**

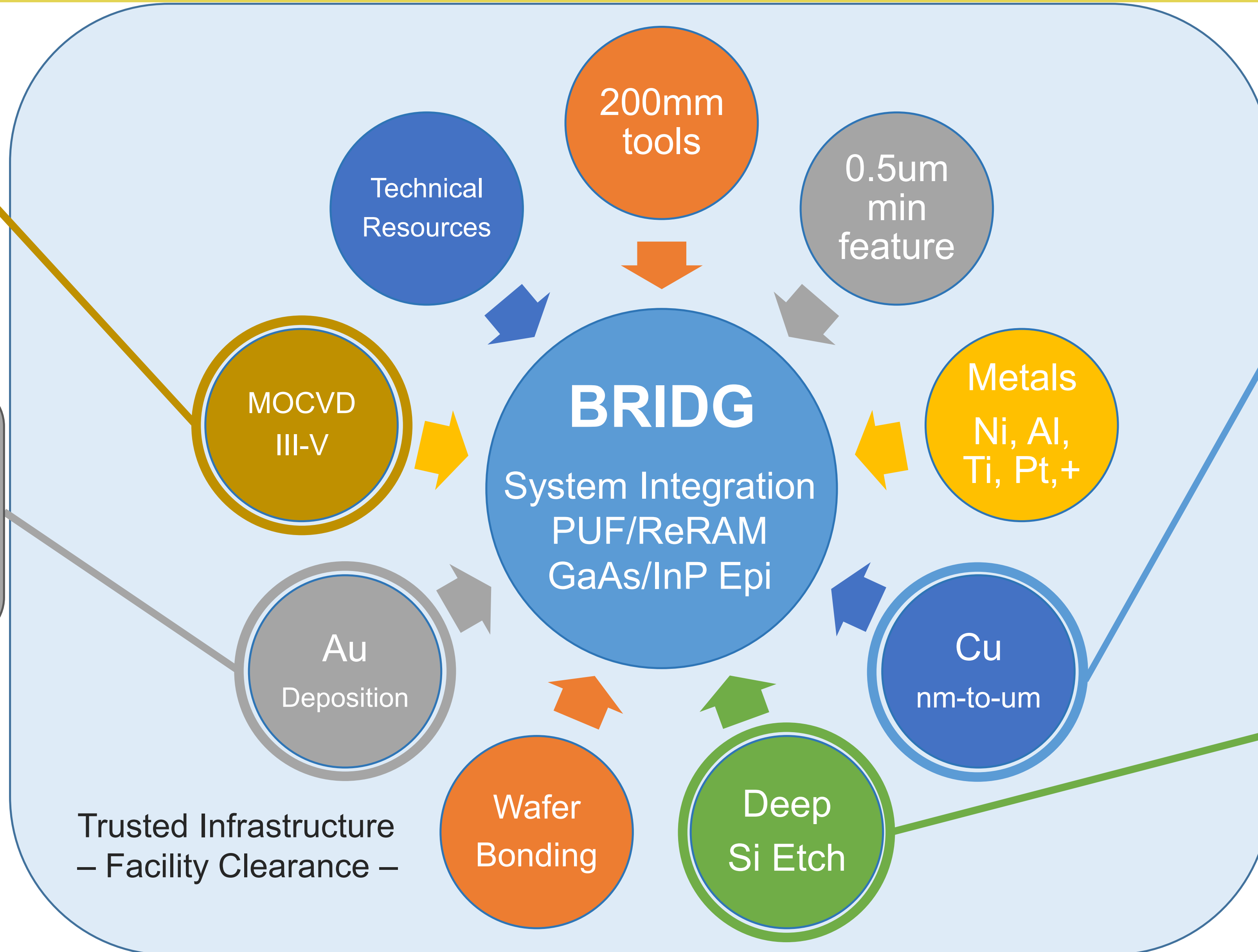
U.S. Department of Defense
DEFENSE SECURITY SERVICE

ITAR
Registered
International Traffic
in Arms Regulations

Near Term Capabilities

- Lasers
- Detectors
- High mobility transistors
- Advanced Systems

- I/O Pads
- Micro-contacts
- Stud bumps
- Advanced packaging



- Low resistance
- Faster chips
- Thru-wafer connections
- Stud-bumps

- Thru-wafer vias
- MEMS structures
- Irregular chip dicing
- Capacitor trenches

Tool Installation Completed End of June'18

Current and Future Tool Set

Existing Tools

Lithography
Stepper –Nikon i-Line i12
Coater / Developer – TEL ACT8
Deposition
CVD HDP – AMAT Centura
CVD – AMAT Centura (W)
CVD – Novellus C2 Sequel (SiN, SiO2)
PVD – AMAT Endura (Cu, TaN, Al, TiN, RPC)
Evaporator – Temescal UEFC-4900 (Au, Pt, Ti, Al, Ni, etc.)
Furnaces – Tel Alpha 8s (Oxide, Nitride, Poly, Diffusion)
Anneal
Furnaces – Tel Alpha 8s Anneal
RTA – SSI Solaris
Etch
AMAT CENTURA (Metal Etch)
AMAT CENTURA (Oxide Etch)
AMAT CENTURA (Poly Etch)
Deep Silicon Etch – SPTS Rapier
Asher – Trion Apollo III
Plating and Wet Processes
Batch Solvent Tool – Bold Technologies
SEMSYSCO Triton (Electroplating, Liftoff, Solvent Strip and Acid Clean)
Wafer Scrubber – OnTrak DSS2
Wet Bench – JST (Acid, Base)
Wet Bench – Bold (Solvent)
Material Preparation
Laser Scribe – Lumonics GSI
Box Washer – Flouroware HTC-810

CMP
CMP – AMAT Mirra Trak (Cu)
CMP – AMAT Mirra Trak (Oxide/W)
Implant
Ion Implant – Varian E500 (Medium Current)
Wafer Bonding / Die Bonding
Bond Aligner / Mask Aligner – SUSS MABA8
Bond Alignment Metrology – SUSS DSM8/200 Gen2
Bonder, Permanent – SUSS XB8
Print Transfer – Xceleprint
Metrology / Inspection/Test
CD SEM – SEM5 Hitachi 9320
XRD, XRR, XRT – Panalytical X'PERT3MRD
Defect Inspection – KLA 2139 - Bright Field
Ellipsometer, Stress Measure – KLA F5x
Goniometer – Rame-Hart
Defect Measure – KLA Candela CS920
Profiler – KLA P-170
Digital Microscope - Keyence
Overlay – Inspectrology
4-Point Probe – CDE
SEM-FIB-EDX
FormFactor Summit 200 Prober
Epi Growth
III/V MOCVD – Veeco D180
Hall and PL Systems

Partner Demo Labs

Demo Lab
ALD Oxide
Dismount solvent cleaner
Wafer De-bonder, Mechanical
Wafer De-bonder, Laser
High Accuracy Wafer Bonder <100nm
Ancillary Material Track
Nano-imprint
Spray Coater

Future Tools

Processing
Plating system Ni, Au, SAC, SnAg
Polymer Curing Oven
Solder ball deposition
Wafer thinning tool
Dicing saw & mounting
Edge Grinder
ALD metal

Test & Reliability
RF Test Equipment
Reliability / Stress ovens

Lithography
Direct Write Photolithography
Fine Line Lithography
ebeam

Assembly
High Accuracy Die Bonder

Metrology
Sonoscan
Surfscan
XRF/VPD
CV Measurement
TEM

Legend
Operational
Planning in process
Not installed

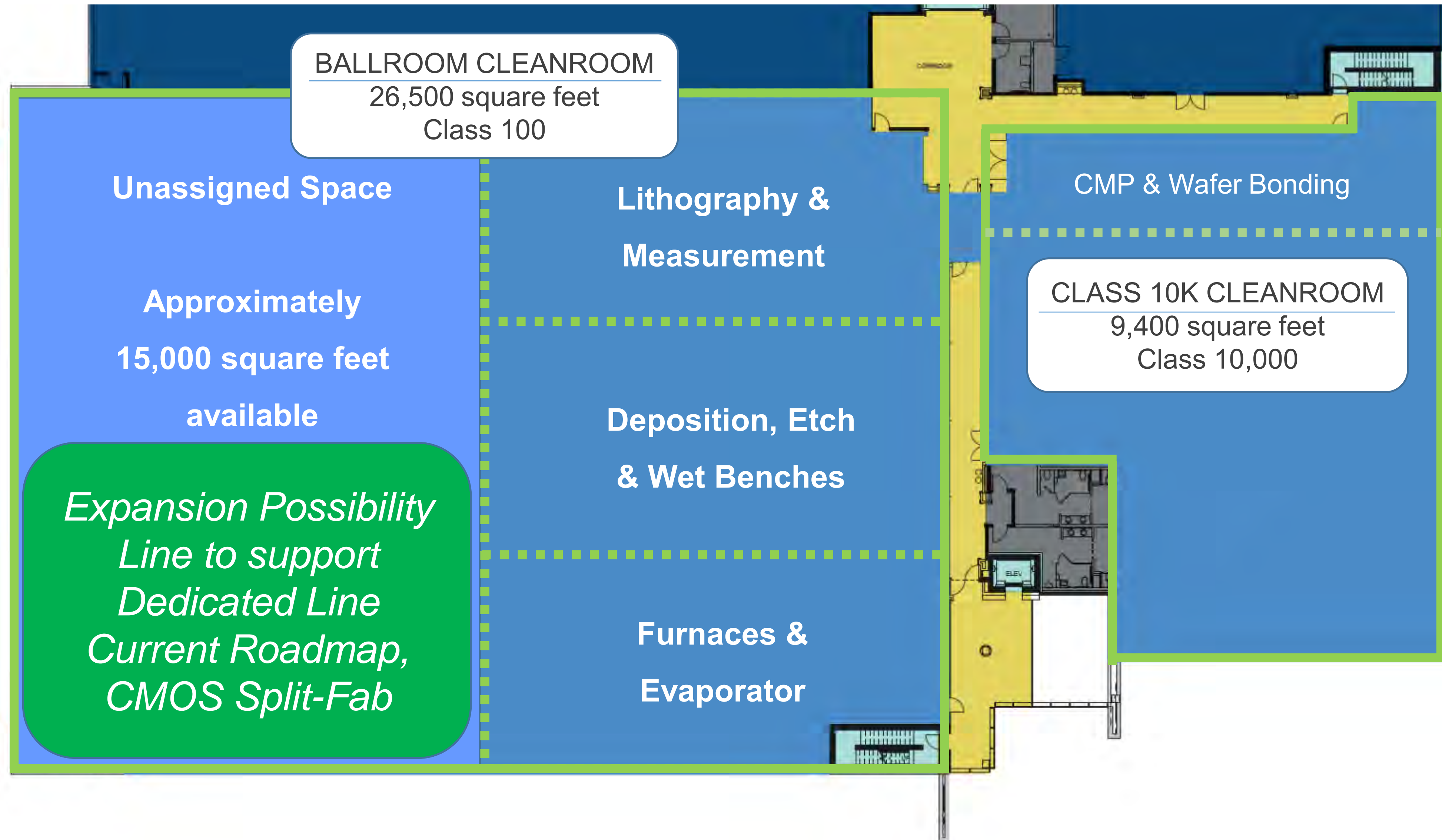
BRIDG Proprietary – INSERT APPROVED ID (i.e. BD 001/2018.02.06) – DOES NOT CONTAIN EAR TECHNOLOGY OR ITAR CONTROLLED TECHNICAL DATA

Cleanroom Opportunities for Partners

Leverage $239M+ in Local Investment

Building can be incrementally expanded or fully mirrored along this axis

- **Permitting Complete**
- **Support Infrastructure Built for this Expansion**
- **$80M for Full Mirroring**
- **1 year start-to-finish**



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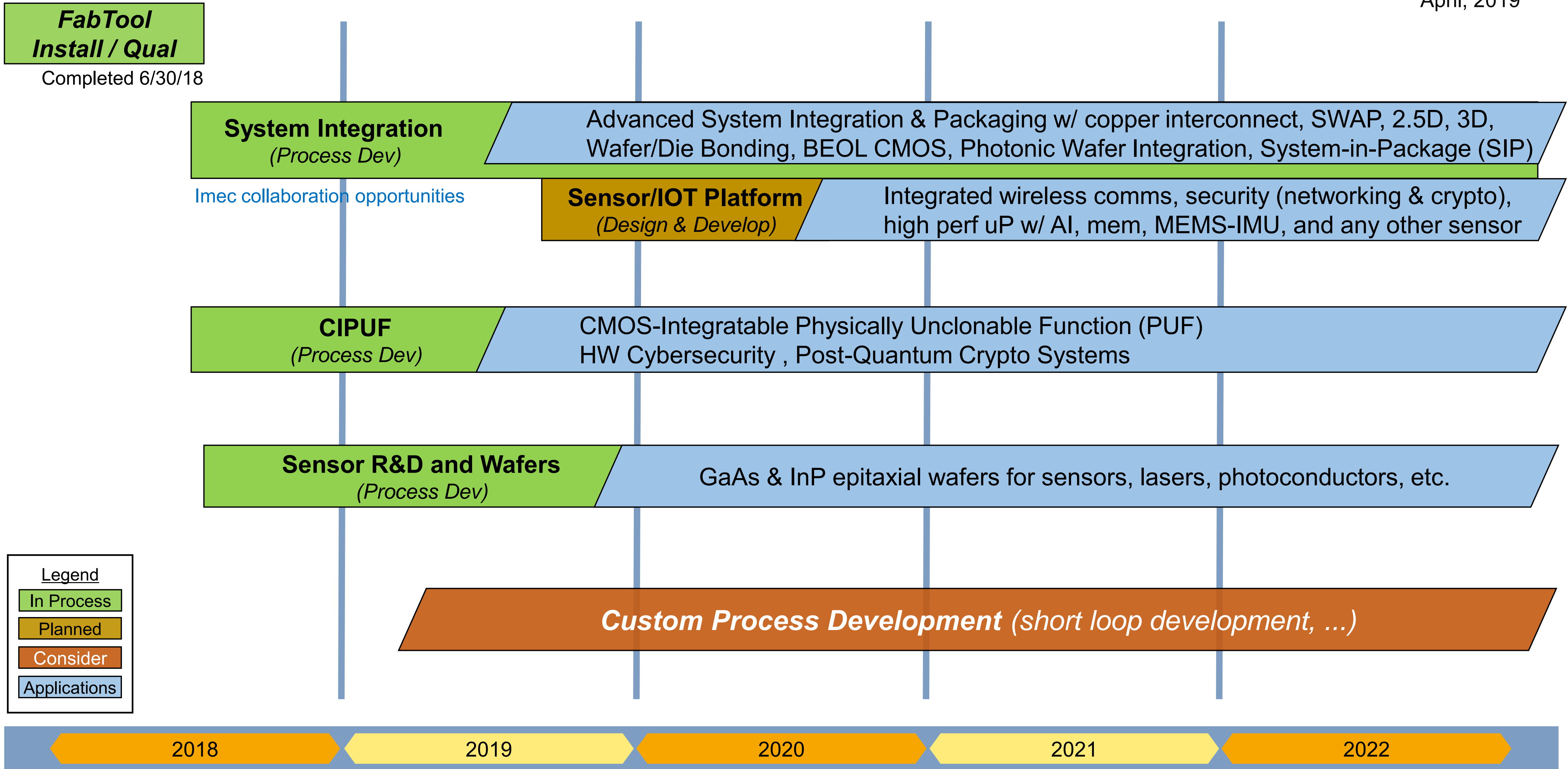
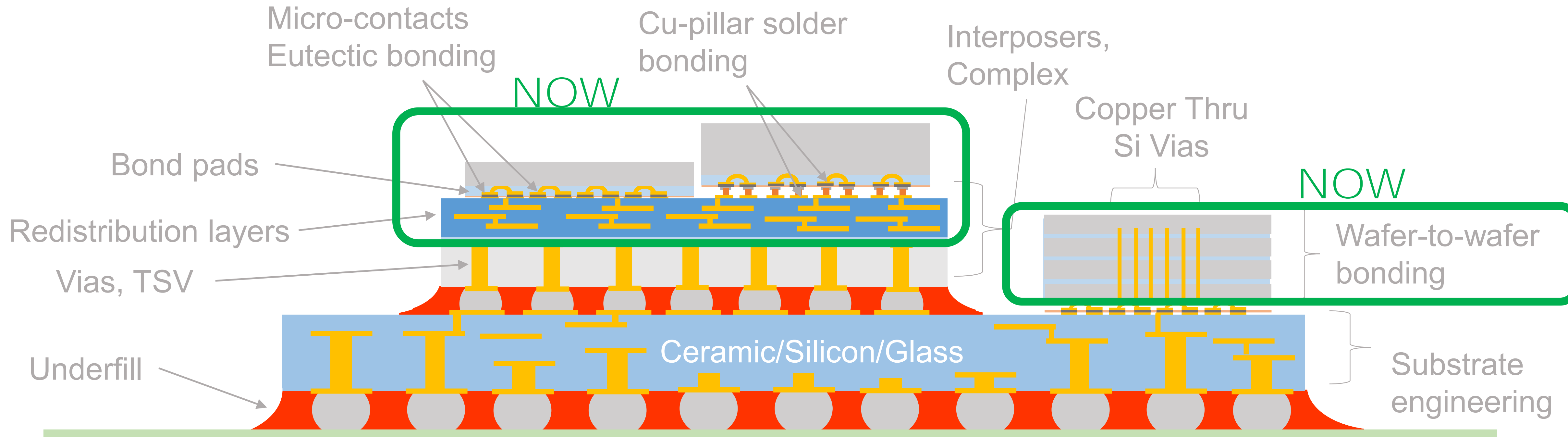
Class 100 and 10K Floorplans

BRIDG Technology Roadmap



Advanced System Integration

Providing solutions for size, weight and power reduction to address challenges faced by conventional scaling



Improved performance

- Heterogeneous Integration (Si, III/V, Photonics)
- Ultra-High Density (Wide I/O - 10^6)
- Power Consumption and System Response Time
- Robust Operating Temperature Range (77K to 673K)

Improved Form Factor

Transform traditional sensing techniques allowing continuous monitoring and the ability to monitor more…

Enabling System Miniaturization

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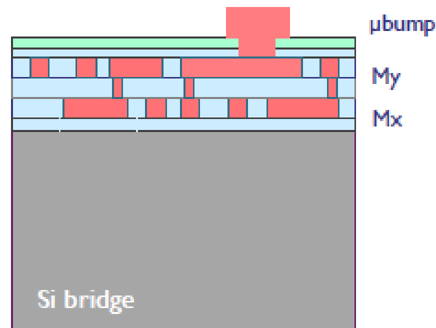
imec Si-Interposer – Tech Transfer to BRIDG

FLEXIBLE SI INTERPOSER TECHNOLOGY

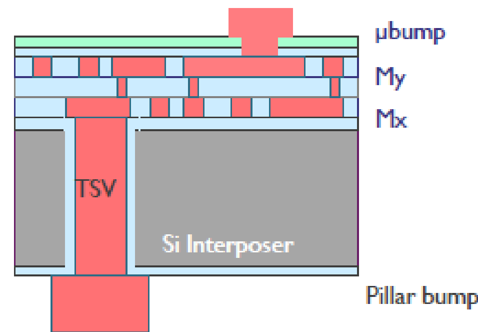
FOR HIGH DENSITY INTEGRATION OF RF AND MIXED ANALOG/DIGITAL MSYSTEMS

- Modular approach, topology by application requirements

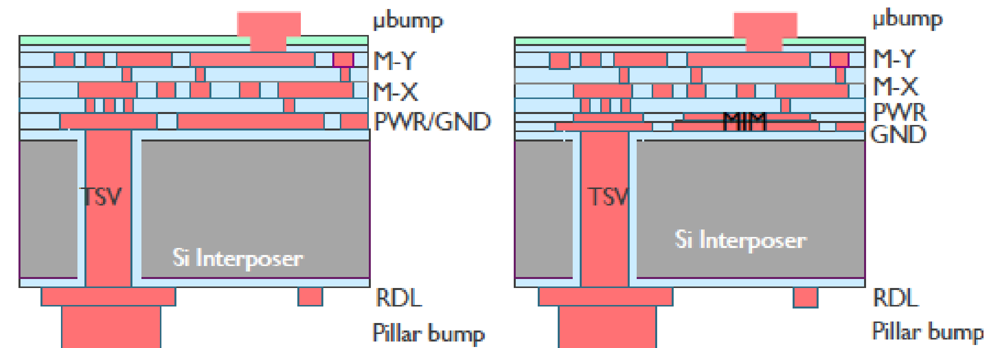
Si-bridge interposer



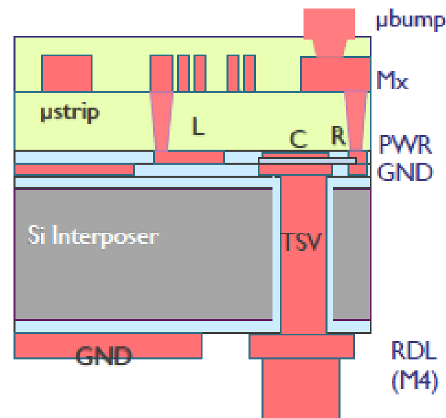
Digital high density interconnect interposer



High bandwidth, high speed digital interconnect interposer



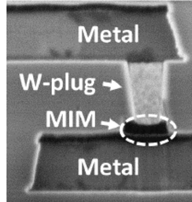
Rf interposer with integrated passive components



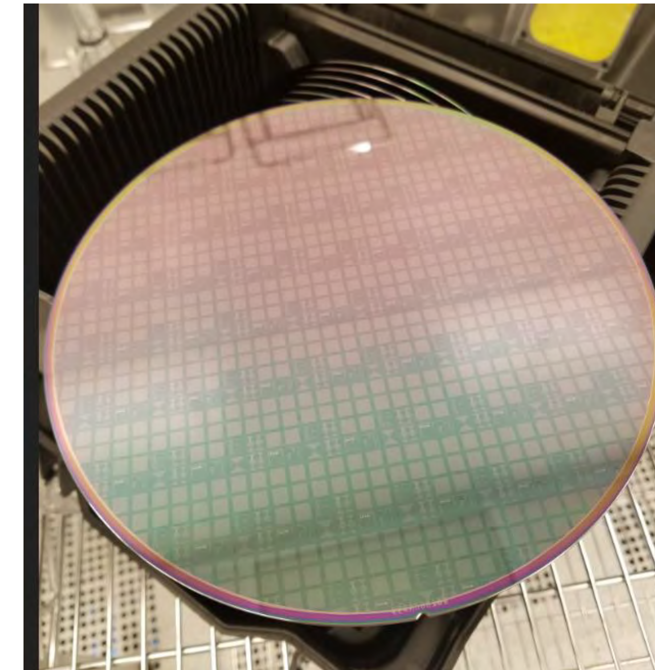
- Key Modules
  - 10x100µm or 5x50µm via-middle Cu TSV
  - 0.5 to 2µm thick Cu/oxide damascene
  - MIM Decoupling capacitors (5 nF/mm^2)
  - Thick polymer RDL for rf
    - lower loss µstrip or CPW interconnect
    - High Q inductors

ReRAM-PUF Technology– BRIDG Differentiators

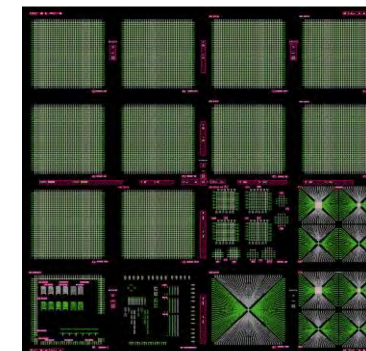
+ **CMOS compatible Physically Unclonable Function (PUF)**
  - Newly discovered (Feb'17) PUF capability leaves no trace or residue in hardware – extremely hard to discover



+ **Applications: Secure the IOT, validate payment systems, ensure safe connectivity, smartcards, authenticate sensors, and protect sensitive military data and systems**
+ **Significance: provides a root-of-trust for multiple layers of security that is**
  - Extremely **low power** (femto-Joules to read)
  - Highly integrate-able into any computer system, ASIC, SoC and FPGA
  - **Exceptionally difficult to hack;** non-detectable element
  - Very high source of entropy with stability, reliability and performance
  - Provides Anti-Tamper protection against cloning, counterfeiting, overbuilding, reverse engineering and data leakage
  - Key storage, key management and crypto functionality
  - Radiation hardened
  - Requires specific methodology for using it



BRIDG ReRAM-PUF Wafer



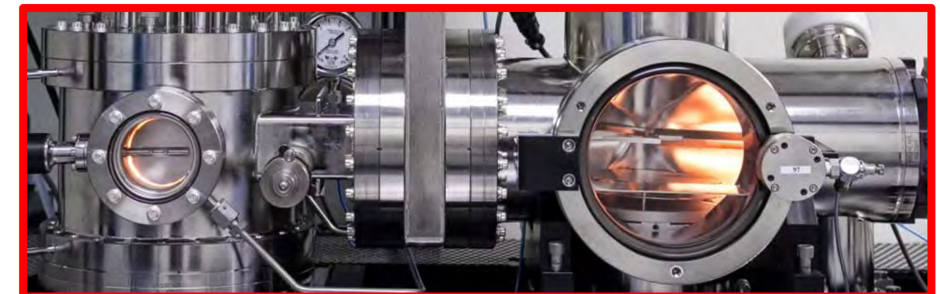
BRIDG Design-of-Experiments Mask Design

Sensor R&D and Wafers

BRIDG offers MOCVD growth of GaAs, InP and GaSb based III-V binary, ternary and quaternary epitaxial structures for the fabrication of high performance electronic and optoelectronic devices with high yield.

MOCVD System

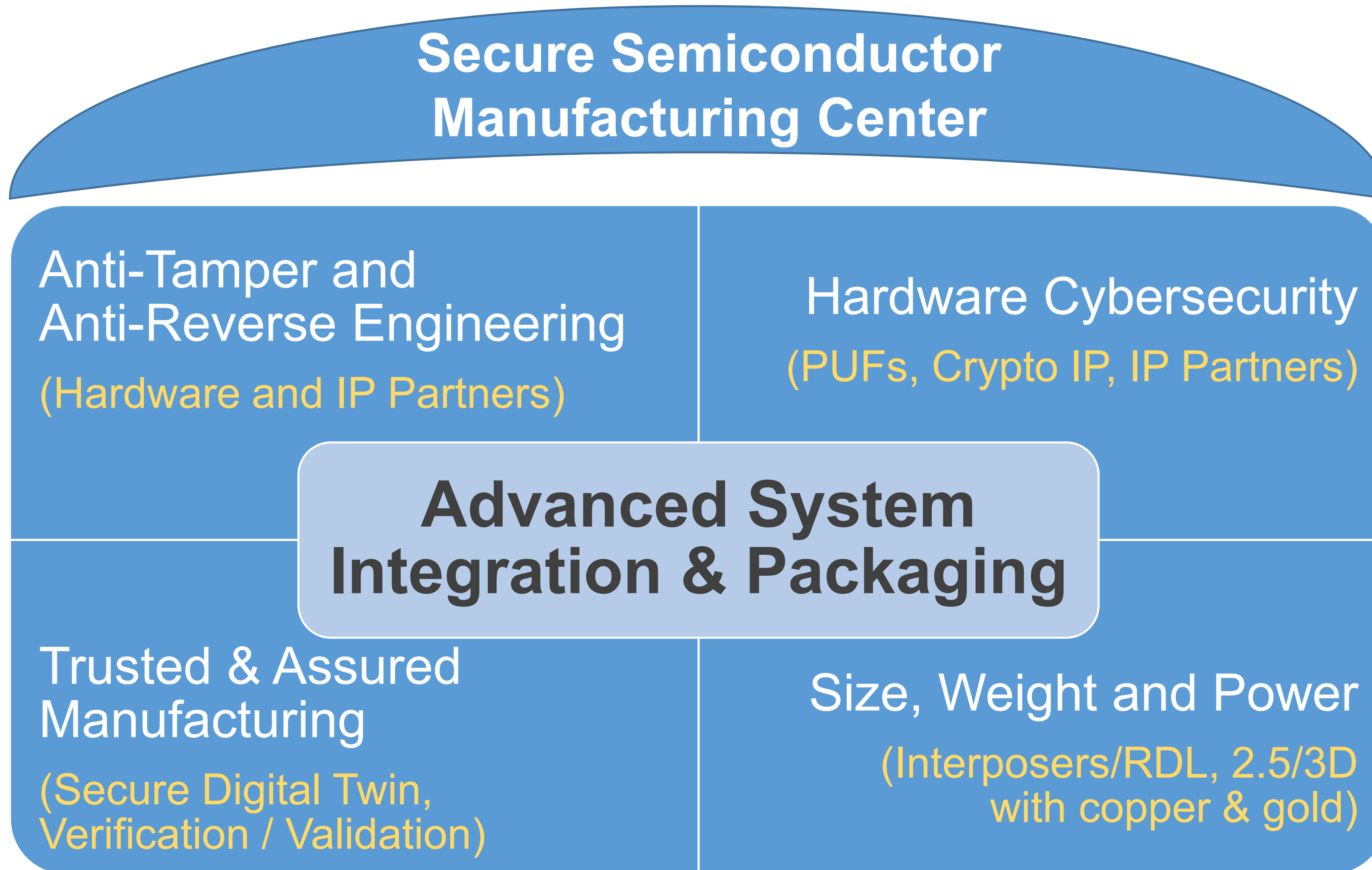
- High throughput multiple wafer system
- Wafer size: 2”- 6”
- In-situ control systems to grow high thickness/composition uniformity structures (<1%) and doping control



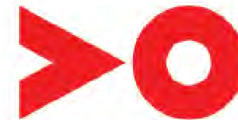
Applications

- Light Emitting Diodes (LED)
- Edge Emitting Lasers
- Photodetectors
- Sensors and Detectors
- Solar Cells
- HFETs/HEMTs/HBTs/Gunn Diodes

Secure Semiconductor Manufacturing Concepts



Momentum!!



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Join Us

Join us in the next evolution of innovation!

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