USSF AFRL

RIE, Intelligence Systems
RIG, Information Warfare
RIO, Integration & Operations
RIS, Information Systems
RIT, Computing & Communications

FACILITIES BOOK

FY 25

Air Force Research Laboratory
Information Directorate


AFRL
AFRESEARCHLAB.COM

RI

$1.5B Facility Net Assets

AIR FORCE RESEARCH LABORATORY (AFRL)

INFORMATION DIRECTORATE (RI)

To discover, demonstrate, and deliver high-impact C5ISRT technologies that enhance capabilities and assure technical superiority for the Department of the Air Force and its partners.

Dominate the information age.

Rome Research Site Main Campus

- **4** buildings with additional small support buildings and structures
- **900,000** sq ft building area
- **100** acre campus

Stockbridge Off-Site Facilities

- **2** main buildings with additional small support buildings and structures
- **13,585** sq ft building area
- **295** acres

Newport Off-Site Facilities

- **4** main buildings with additional small support buildings and structures
- **25,000** sq ft building area
- **167** acres

Verona Off-Site Facilities

- **18** buildings with additional small support buildings and structures
- **61,000** sq ft building area
- **495** acres

30 Laboratories within the main campus and off-site facilities

POC: Frank Tallarino, RIOC


INFORMATION DIRECTORATE
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AFRL

Contents


RIE

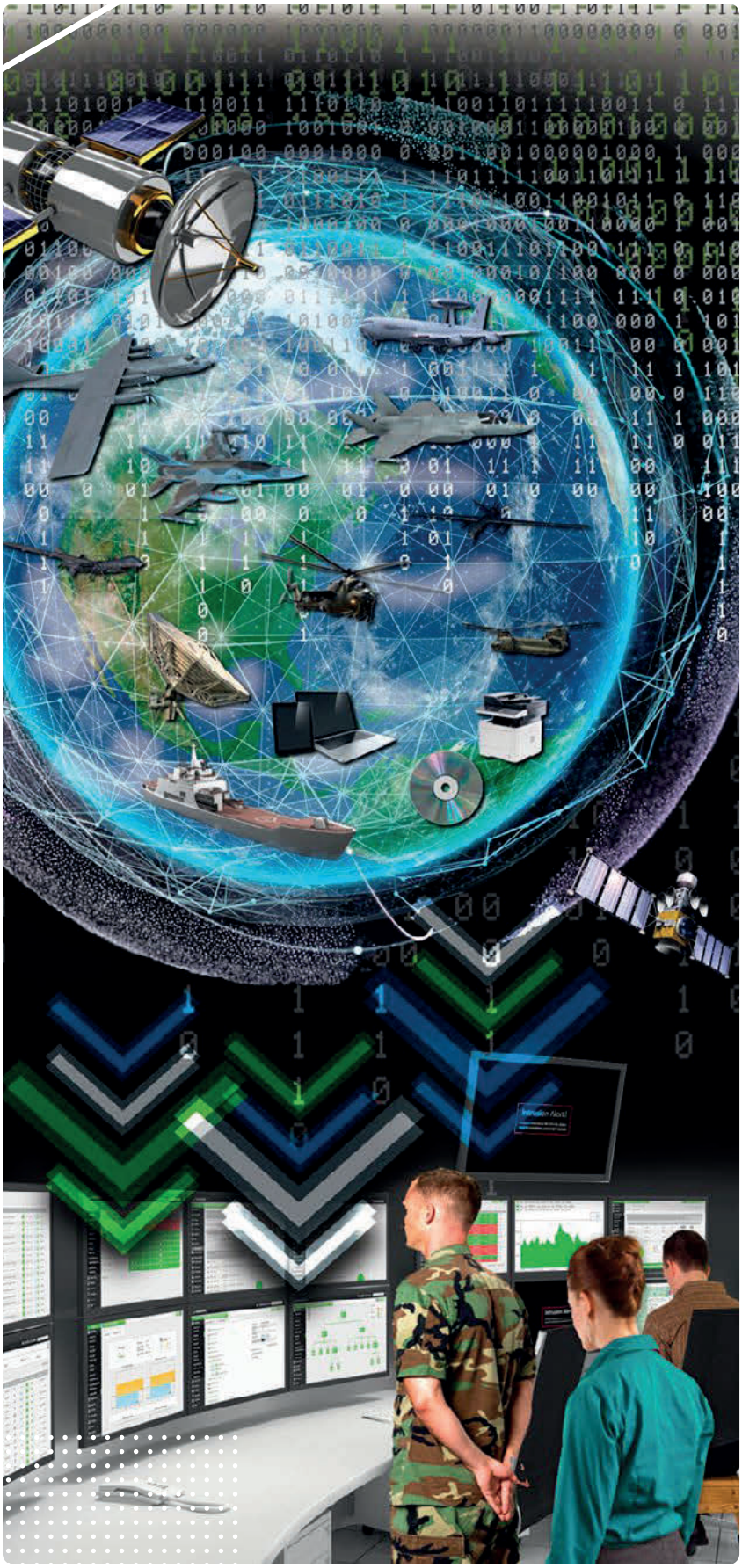
INTELLIGENCE SYSTEMS

Operational focused information technology driven by innovation.

Leading the discovery, development, and integration of affordable products addressing intelligence community technology requirements for our air, space, and cyberspace force. The division also conducts selected acquisition programs for low-volume, limited quantity systems for the intelligence community.

RIE Chief, Col Alan Louie
RIE Deputy Chief, Mr. Scott Patrick
RIE Technical Advisor, Mr. Matthew Kochan

315.330.4336



AUTOMATED PROCESSING AND EXPLOITATION (APEX) CENTER

Understand, measure, and advance state-of-the-art with sensor data exploitation technology.

Established in 1996, the APEX Center's mission is to understand, measure, and advance Processing and Exploitation (PEX) technology. The current focus is on moving target engagement in denied areas with optimized sensor orchestration for target custody.

The facility is also used to perform analysis for seedling and AoA efforts, baseline tool development for major programs, and to provide realistic operational systems, networks, and databases for integration efforts.

The APEX Center can act as an Intelligence Systems Integration Laboratory (ISIL) and is currently being established to address current and future challenges in the following areas: Ground Moving Target Indicator (GMTI) from emerging sensors, Machine Learning, Artificial Intelligence, interactive question answering, multiphase Processing, Exploitation, and Dissemination (PED) in denied environments, assessment (fusion), tactical reporting from intelligence, surveillance, and reconnaissance (ISR), and the Air Force Distributed Common Ground System (AF DCGS).

APEX
Automated Processing & Exploitation

POC: Andrew Bialy, RIEA

Resources

With over 2ØØ computers, including two large compute clusters, the APEX Center resources are substantial.

These systems operate a wide range of operating systems and software, from the standard Air Force desktop to the Tactical Tomahawk-specific Linux kernel.

It primarily operates at a classified level on multiple networks, but also includes systems, capabilities, and development environments on unclassified systems, including the Defense Research and Engineering Network (DREN). The Center also provides connectivity to coalition partners.

Various ISR Platforms: 57,ØØØ Operational Mission Data Sets

Live data available from operational sensors.

- Full motion video (FMV) spanning three years
- Global Situational Awareness data (Force XXI Battle Command)
- Brigade and Below (FBCB2)
- Electronic Intelligence (ELINT)
- Federal Aviation Administration (FAA)
- Etc

Facility Equipment: $2.8 Million

Size of Facility: 2,16Ø Square feet

Capabilities

Test beds (classified, unclassified, coalition) within the Air Force Research Laboratory (AFRL) can define metrics, develop standards, integrate, evaluate, and demonstrate technologies to support and facilitate the processing, exploitation, and dissemination of data from a variety of sensors.

The capability is used to support analytical studies, on-site and network distributed simulation exercises, and the processing of real-world, multi-Intelligence (multi-INT) data. The APEX Center efforts facilitate research and development across a broad area of command and control (C2) as well as Global ISR. All applicable INTs are investigated with emphasis on Ground Moving Target Indicator (GMTI), ELINT, Signals Intelligence (SIGINT) and Measurement and Signatures Intelligence (MASINT). The facility feeds global GMTI to the Advanced Battle Management System (ABMS).

Examples

- Autonomous Sensor Exploitation (ASX)
- Multi-Domain Dynamic Targeting, and Multi-Source, Multi-Domain Information Fusion Analytics (M2IFA)
- Multi-source Analytics for Conversational Intelligence (MACI)
- Neuromorphic Fusion of Timely Intel (NFTI)
- Resolute Sentry

INTEGRATED INTELLIGENCE INNOVATION FACILITY (I3F)

Supports warfighters with disruptive war-winning technologies focused on rapid multi-domain information sharing, fusion, and dissemination.

The I3F enables information handling research, development, integration, test and evaluation of solutions for Air Force, Department of Defense and intelligence community secure information sharing and analytic requirements.

The facility, which is state-of-the-art and access-controlled, allows for the delivery of Cross Domain Information Sharing solutions, science and technology programs, and operational cross domain information sharing and analytic capabilities. These capabilities are currently being used across the Air Force, Department of Defense, intelligence community, and various branches of the Armed Forces.

Additionally, Operational Information Handling (RIEB) branch programs are supported with integrated organic product support functions (e.g., incident reporting management, software configuration management) delivered from the facility.

POC: David DeProspero, RIEBA

Resources

The nearly 6ØØØ sqft I3F facility houses four programs classified as National Security Systems.

The facility contains numerous computer systems, segregated development and test networks, meeting facilities, a 3ØØ sqft. unclassified server room with dedicated cooling and power, a centralized help desk, and more.

Additional fiber optic connectivity to the Air Force Research Laboratory/Information Directorate corporate consolidated server environment that enables the rapid horizontal scalability to address wide ranging and complex operationally relevant environments.

The laboratory can be rapidly reconfigured to support simulations on a wide variety of heterogeneous platforms;

- Virtual Desktop Infrastructures
- Wired networking
- Wireless and tunneled networking
- Various monitor setups to emulate operations center configurations
- High performance teaming room to support technology planning, integration and test and evaluation
- Isolated and Raise-The-Bar compliant cross-domain development network

Capabilities

The I3F enables RIEB research, development, integration, test and evaluation of solutions for Air Force, Department of Defense and intelligence community secure information sharing and analytic requirements.

The capability to emulate operational environments at simulated multiple levels of security is critical to delivering real technology capability on-time to our customers.

Examples

- ABMS-DeviceOne SecureView (ADSV), a classified telework solution
- Core Configuration Management (CCM)
- Cross-Domain Development Network (CD2N)
- Information Support Server Environment (ISSE), a Cross domain transfer system
- SecureView, a multi-level access system
- Voice and Video Cross Domain Solution (V2CDS)
- Cross Domain Innovation and Science research projects (VDIS)
- X-Domain Agile Rules-Based Information Transfer Orchestrator (XARBITOR)

INTELLIGENCE COMMUNITY - INTELLIGENCE SURVEILLANCE RECONNAISSANCE (IC-ISR) LABORATORY

The IC-ISR Laboratory is a 28,ØØØ square foot digital engineering laboratory accredited as a Sensitive Compartmented Information Facility (SCIF) that supports classified research in multi-domain as well as development of associated information system and software use.

The IC-ISR laboratory delivers sensitive compartmented information (SCI) video teleconferencing (VTC), telecommunications, briefings and presentations, desktop processing, data search and retrieval, document creation, software development, testing, and operations support to the Information Directorate. Facility access is granted to cleared AFRL scientists, engineers, technical developers and contractors who conduct R&D activities with the intelligence community.

The Special Security Office (SSO) delivers a rich and collaborative environment for classified R&D, demonstration and digital aptitude for a variety of capabilities; assures availability of robust network and communications connectivity with various intelligence community inter-service and agencies.

POC: Bryan Bossert, RIEE

Resources

This facility houses hardware, software and data at the SCI level.

Capabilities

AFRL scientists, engineers, managers and government contractors utilize the SCIF for various functions;

AFRL/RI SCI Final Technical Report Repository

Providing researchers, scientists, and engineers timely access to restricted SCI publications covering several collection subject areas

Access

- Computer or network resources
- Briefing systems
- Secure VTCs
- Secure Voice over Internet Protocol telephones

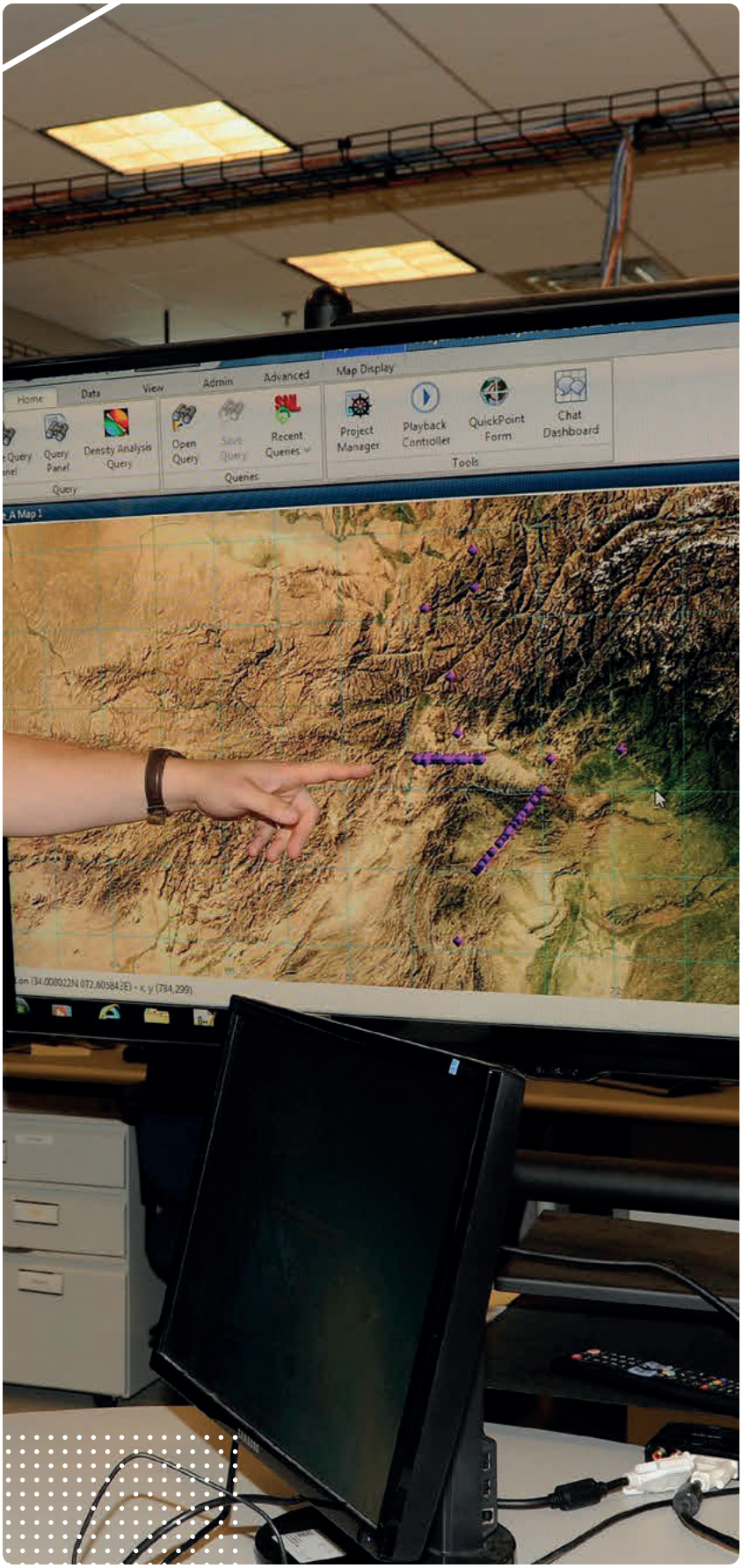
Research and Development

- For new and existing intelligence community systems
- Digital engineering initiatives
- Cross-domain solutions for multi-domain programs and projects

Large Auditorium

Hosted within the facility to foster classified collaboration among AFRL researchers and intelligence organizations.

- Technology conferences
- Training seminars
- Classroom VTC



SITUATION AWARENESS (SA) LABORATORY

Perform research and development of technologies for Text Analysis and Network Discovery technology products and resources.

The Situation Awareness Laboratory provides an environment for research scientists and engineers to evaluate, demonstrate, and develop software-based capabilities and perform basic research.

The In-House Research Team (iHURT) and support contractors perform research and development of technologies utilizing a suite of in-house hardware/software tools. This includes existing Information Intelligence System and Analysis (RIE) contractor products as well as outside commercial applications. This corporate in-house capability is vital in providing functional and valuable products to the Department of Defense and Air Force Intelligence Communities. Collaborators from other Information Directorate divisions and branches as well as summer students use the facility to conduct research.

POC: John Spina, RIEA

Resources

- Windows desktop computers
- Flat panel monitors
- Laptop computers
- Big screen LCD/LED TV's
- Windows Computer Servers

Capabilities

- Technology and application evaluations & experimentation
- Data and scenario generation
- Technology integration
- System administration

Examples

- NIPRGPT
  NIPRGPT is an AI chatbot that allows users to have human-like conversations to complete various tasks. It hosts Large Language Models (LLMs) for the DoD on a secure platform (Dark Saber), provides a Retrieval Augmented Generation (RAG) capability to enable usage of DoD domain specific data and the opportunity for DAF leaders to learn how users interact with LLMs.
- DARPA's ECOLE Support
  Advance image categorization techniques by employing feature-based embeddings derived from images, using the capabilities of GPT-4Vision for feature extraction. The goal is to determine which extracted image features play a crucial role in accurately predicting an image's category, thereby refining the model's precision and interpretability in class assignments.
- Multi-Source Analytics for Conversational Intelligence (MACI)
  Minimizing data harvesting and dissemination to enable more time for analysis. Making disparate sources and analytics easily accessible using a conversational agent with a natural language interface.
- Visual-to-Language Semantic Extraction (VODQA)
  Employing multiple onsite contractors and in-house researchers to construct AF datasets, explore cutting edge ML algorithms, and employ Visual Language Pretraining for ML models to distinctly perform Visual Question Answering and Image captioning over AF overhead imagery data.
- iHURT
  Rapidly prototyping new capabilities or investigating interesting research questions. To date, the team has completed projects for Space Situational Awareness, the Moving Target Intelligence Client, the Visual Media Reasoning system, and more including:
  - Enabling AFRL to train Semantex Statistical Models. Gain knowledge and insight into how to train Semantex Statistical Models, verify that existing software/resources are sufficient to train/re-train the models, and learn how to affect certain aspects of training (manipulating performance parameters, and augmenting lexicons) to enhance model performance.
  - Using publicly available information (PAI) exploitation to determine how AFRL's PAI related software tools (and potentially other GOTS or open-source software)can be used to provide a greater situational awareness about particular scenarios. Identifying capability gaps in current PAI tools while demonstrating the existing ones and contributing to the overall vision of an integrated Processing and Exploitation (PEX) demo.


RIG

INFORMATION WARFARE

Leveraging and shaping the cyber domain to the nation's advantage.

Lead research, development, and integration of affordable information warfare technologies for transition to our air, space and cyberspace forces.

Chief, Mr. Scott Shyne
Deputy Chief, Mr. James Perretta
Technical Advisor, Dr. Ryan Luley

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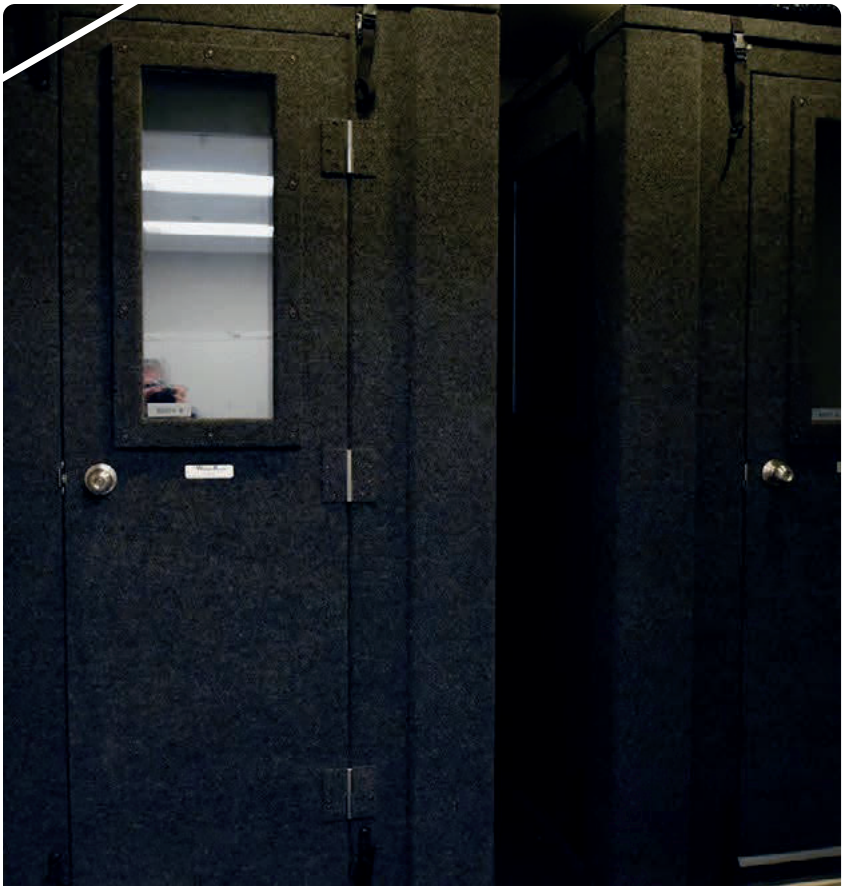
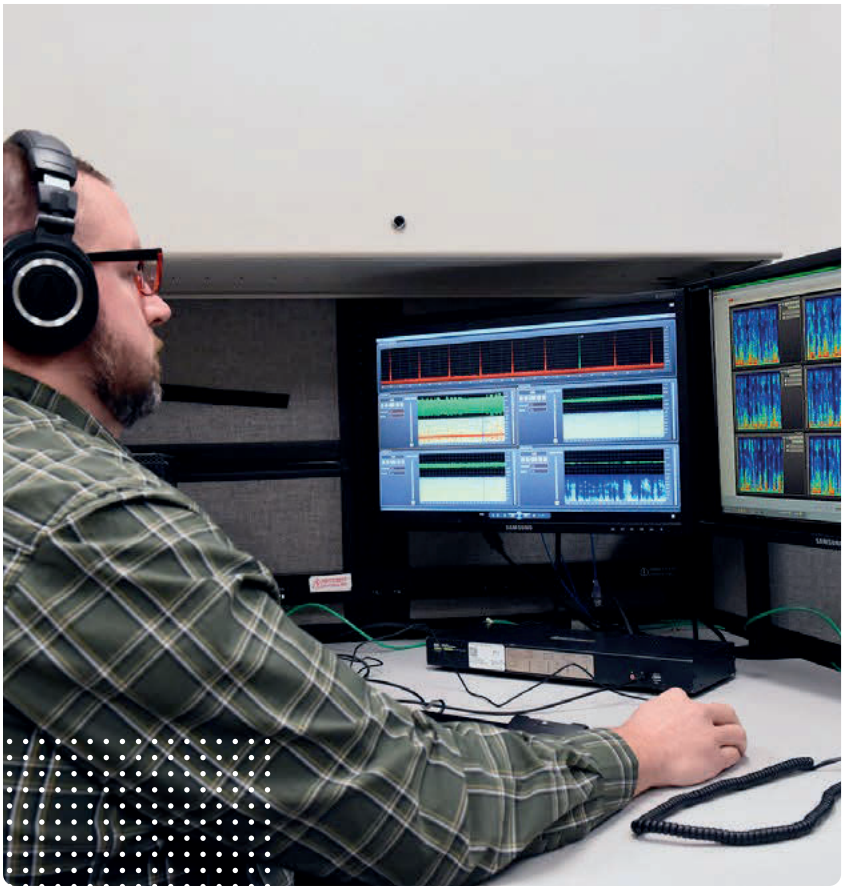




AUDIO PROCESSING LABORATORY

Conduct audio processing research and development initiatives from technology readiness level (TRL) 2-TRL 7.

The Information Directorate provides the Audio Processing Group with laboratory areas at various classification levels to support research and development in the audio and signal processing field.

Research and development efforts provide algorithmic and software solutions that support operational requirements for off-line processing, pre-mission preparation and postmission production, bulk data processing, and real-time processing of streaming audio.

POC: Wayne Bray, RIGC

Resources

Our Laboratory has unclassified access to the Defense Research and Engineering Network, Air Force Network, and internal standalone networks supporting algorithm and software development. Networks include high performance computing resources, Graphical Processing Unit servers, high-capacity storage, cloud-based collaboration tools, and test and evaluation environments.

Permanent and portable audiometric facilities are available to collect, test, and analyze gathered data using measurement and recording tools such as microphones, transmitters, and receivers.

This facility houses and maintains an expansive and diverse library of audio corpora supporting research, development, and testing of new algorithms and software at multiple classification levels.

Capabilities

- Rome Audio Processing Tool (RAPT-R)
- Rapid Audio Batch Tool (RABT)
- Voice Processing Engine (VPE)
- Speech Processing Toolkit (SPTK)

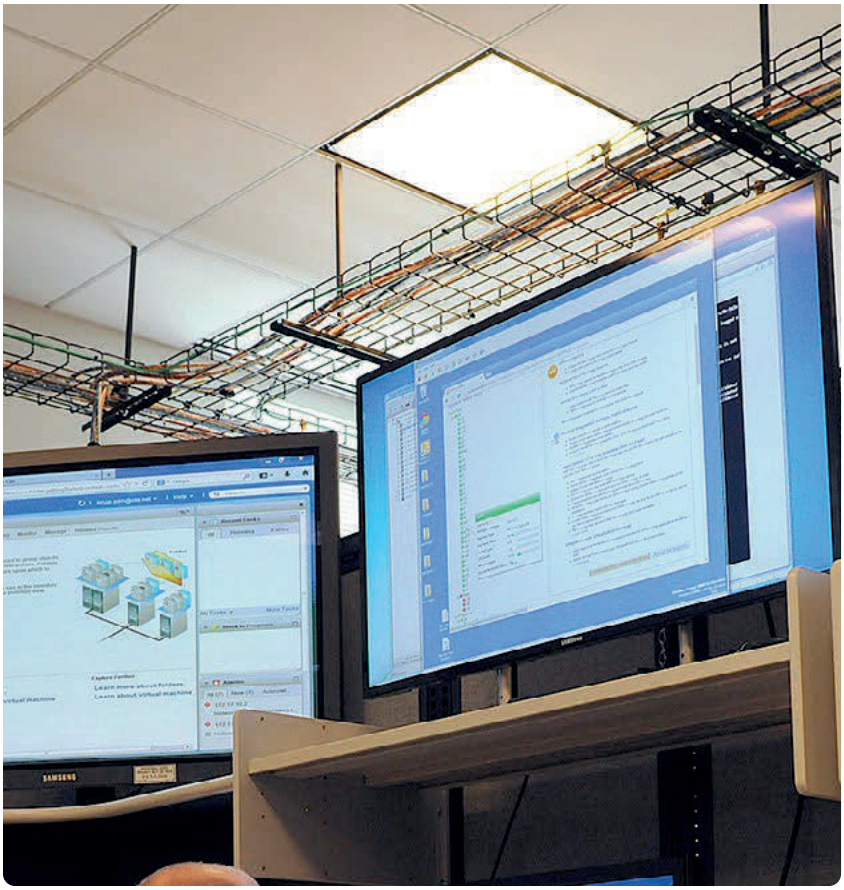
A comprehensive speech and audio processing software library used for post-mission analysis, bulk processing, and real-time analysis of customer capabilities.

Examples

Algorithmic development and software demonstrations have been delivered under the Military Intelligence, Tactical Signals Intelligence Technology, Air Force Compass Bright, and the Intelligence Advanced Development programs.

Featured algorithm development has consisted of work in natural language processing, speaker and language identification, speech enhancement and detection of signals of interest.

- Haystack Audio/Video Enhancement (HAVEN)
- Audio Clustering for Information Discovery (ACID)
- Comprehensive Audio Data Enhancement Tool (CADET)
- Foreign Audio and Video Operations (FAVOR)
- Rome Audio Processing Tool (RABT)
- RAPT-R



ICE-T (INTEGRATING CYBER EXPERIMENTS FOR TRANSITION)

ICE-T is a stand-alone unclassified cyber environment that enables research, development and experimentation, leading to successful technology transitions to the warfighter.

This environment provides a robust infrastructure necessary for rapidly developing, maturing, experimenting and securing cyber capabilities that are used operationally throughout the Air Force, DoD and intelligence communities (IC).

Primary POC: Williams Kahler, RIGA
Primary Alternate POC: Jason Taillon, RIGB

Resources

This scalable and feature-rich environment consisting of isolated and interconnected test beds, configuration management, and enterprise services includes:

- 3.1+ THz CPU bandwidth
- 1Ø+ TB Memory
- 9ØØ+ TB Disk Storage
- 2Ø Gbps Network
- Extensive Virtualization Capabilities

Capabilities

ICE-T provides the ability for collaborative research and development, test and evaluation of cyber technologies on an unclassified stand-alone environment and provides users significant computing resources and virtualization capabilities. These resources also enable researchers and developers to experiment, test and evaluate capabilities using robust and novel techniques before being transitioned to the war fighter.

ICE-T also works in tandem with the Air Force Research and Development Mission Infrastructure (AFRDMI), a classified environment for cyber capability testing and evaluation. Leveraging the collaboration with AFRDMI enables the transition of cyber capabilities from an unclassified to classified environment.

Examples

- BLACK ALERT: Big Bang-based DevSecOps Platform with Baked In AFRL Cyber Capabilities
- Mockingbird: Dynamic Virtual Analysis Scalability Experimentation
- Metasponse: Malware Hunting Application Experimentation
- CAMEL Malware Analysis: Development and Experimentation
- Cyber Quantification Framework (CQF) Scalability Experimentation
- Media Control: Next-Gen Scanning and Analysis for Untrusted/Unverified Data Artifacts
- SilentWeb: Offline Internet Simulation for Cyber Capability Experimentation

CYBER OPERATIONS TECHNOLOGY FACILITY (COTF)

Cyber Offensive-Defensive Information Warfare Facility for tactical and fixed technology advancement, operational demonstration and assessment, including experimentation capabilities.

A secure research and development facility for collaborative meetings, briefings, secure voice, secure video teleconferences, testing, specialized document creation and editing software capabilities, experimentation concept development and deployment, data analysis, software code development, and exercise support including associated operational and standalone information systems end-use.

The facility is available to all directorate personnel, including authorized visitors and remote end-users.

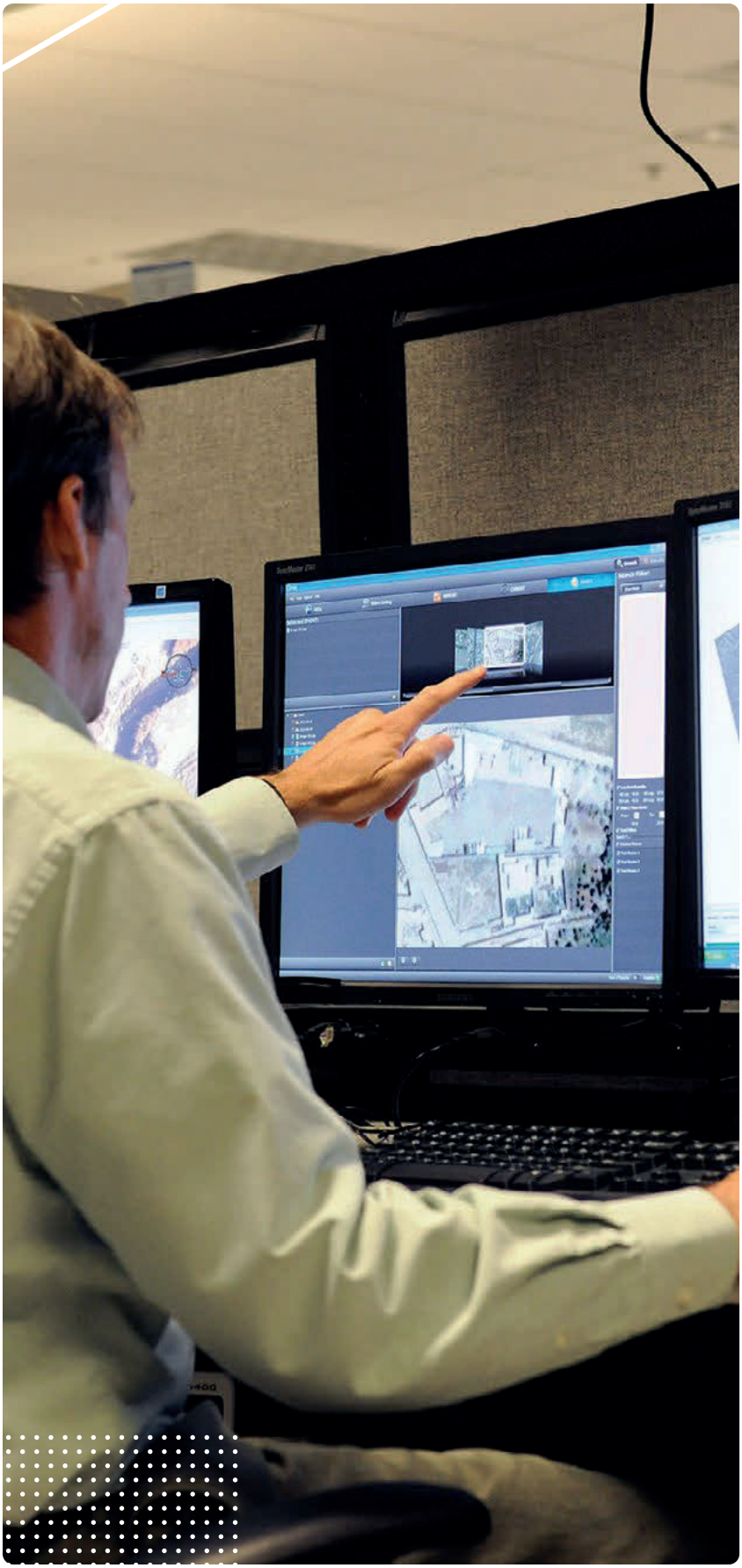
POC: Alan Robinson, RIG

Resources & Capabilities

- Secure Internet Protocol Router Network (SIPRNET)
- Classified Standalone enclaves and Infrastructure Testbeds
- Customizable workstations for specialized research partner projects
- Systems Engineering and information support
- Software Management support
- Controlled Access
- Voice over Secure Internet Protocol (VOSIP)/video telecommunications services
- Secure e-Mail
- Secure Web browsing
- Test bed Calendar Management for experimentation scheduling/testing
- Secure Conference Room
- Secure RF Chamber

Examples

- S-Vision: Modeling and Simulation
- Hardened Secure Processor
- Software Defined Radios
- Battlefield Information Collection and Exploitation System
- Mission Centric Cyber Assurance
- Cyber Agility System
- Cyber Survivability and Recovery System
- Mission Aware Cyber Command and Control
- Cyber Mission Framework
- Cyber Intelligence, Surveillance, and Reconnaissance
- Digital Embedded Technologies



IMAGERY AND SIGNALS EXPLOITATION LABORATORY

Experimentation and evaluation of large-scale data exploitation and correlation techniques.

The Imagery and Signals Exploitation Laboratory is an unclassified, standalone, collaborative workspace for conducting information exploitation research. The lab supports experimentation and evaluation of large-scale data signatures, exploitation, forensics, and correlation techniques with a focus on the needs of the DoD and Intelligence Community (IC). It maintains DoD and intelligence community software architectures and standards as integral parts of the environment. This facility houses large data holdings, including the ESCAPE (ELINT Signal Collection, Analysis, Processing, & Exploitation+) I and II data collections, National Geospatial-Intelligence Agency (NGA) reference products, operational Full Motion Video (FMV) data, large media collections and truth data. It maintains various software applications and services. It supports testing both internally and externally developed software in an operationally relevant environment. Current focus areas include testing and evaluating integrity analytics using manipulated media products.

POC: Todd Howlett, RIGC

Resources

Our standalone network provides desktop workstations for testing and evaluating exploitation software. Some workstations are connected via gigabit Ethernet in a standalone network configuration and others are standalone workstations.

- Hardware - high end PCs with GPUs
- Software – primarily contractor deliverables, prototypes
- Data – Government owned multi sensor data and ancillary data (truth, annotation, etc.)

Capabilities

Current capabilities include test bed and demonstration environments for imagery, multi-intelligence (multi-INT) exploitation tools, and evaluation of detection, attribution, and characterization analytics for deep fake detection.

Recent accomplishments have included:

- Development of a media testbed with archives of manipulated media products ranging from simple splicing edits to complex Deepfakes
- Archival of performer-developed state of the art detection algorithms (DARPA MediFor Demonstration System) for exploitation of publicly available information
- Topological Data Analysis and intrinsic mode techniques to create a processing and exploitation tool for multimodal sensing grids and upstream data fusion within contested environments
- Development environment for DARPA Semafor analytic tools for deepfake detection and integration into AFRL/RH's Haystack tool

Examples

- Autonomous Sensing Grid Exploitation (ASX)
- Multimodal Threat Forecasting (MOTEAF)
- Publicly Available and Non-exquisite Data Analytics (PANDA)
- Tactical Reconnaissance Unmanned Expeditionary Detect and Target (TINNART)
- Listening UAS for Acoustic Surveillance, Hostile UAS Detection, Tracking and Classification (LUAS)

SMALL UNMANNED AERIAL SYSTEM EXPERIMENTAL CAPABILITY (SUAS-EC)

A baseline centralized capability to operate a fleet of assorted, small Unmanned Aerial System platforms.

This facility supports research and development by providing a large inventory of sUAS of various types and the supporting equipment necessary for agile and affordable small Unmanned Aerial System (sUAS) flight test execution.

The facility is staffed by a cadre of certified sUAS Operators (SUAS-Os) who are trained and capable of performing flight test operations with these aircraft.

Additionally, the facility personnel perform tasks necessary to keep the sUAS aircraft and operators compliant with flight test regulations and approved for flight test operations.

The facility is outfitted to provide a flexible sUAS flight test capability which can be employed across a variety of technical areas, including counter UAS technology testing and development, multi-sensor fusion and exploitation, tactical communications and mesh-networking research, and automated command and control. While housed at the Stockbridge Site Airfield, the facility's capability can be extended to support sUAS flight test execution at alternative locations.

Hosted at the Stockbridge Site Airfield, with the ability to extend to alternative locations.

POC: Michael Muccio, RIGD

The facility staff have a multitude of sUAS experience and can assist facility users in the area of sUAS operations and payload integration. They have Certified operators for a wide range of small UAS platforms, with the ability to train and certify operators in-house. The SUAS Experimental Capability (SUAS-EC) also has the capabilities and expertise to perform integration of payloads and maintain all aspects of a flight test compliance and approval.

Resources

UAS inventory

400 sUAS aircraft of various sizes and types, including both fixed-wing and rotorcraft to support a variety of agile and affordable sUAS flight testing operations. A large portion of the inventory is comprised of unmodified, commercial-off-the-shelf systems, which are ideal systems to use as targets in counter UAS and cyber exploitation testing.

Payload lifting capability

Payload ranges from a few grams up to 15+ lbs maximum on the largest aircraft in the inventory with little or no modification required (generally do not exceed 55 lbs gross take-off weight) Most UAS in the inventory are equipped with autopilots, allowing for preprogrammed or scripted flight operations (payload capabilities vary by platform).

Capabilities

- A large inventory of Group 1 and 2 sUAS (fixed-wing and rotorcraft) to support a variety of agile and affordable sUAS flight testing operations
- Support for experimental payloads, up to approximately 15 lbs maximum (payload capabilities vary by platform)
- Certified operators for a wide range of small UAS platforms, with the ability to train and certify operators in-house
- Capabilities and expertise to perform integration of payloads and maintain all aspects of a flight test compliance and approval
- Hosted at the Stockbridge Site Airfield, with the ability to extend to alternative locations

Examples

- ESCAPE I/II: Multi-sensor collection and fusion program
- Counter UAS and cyber exploitation programs including:
    - Small Unmanned Aircraft Defense System (SUADS).
    - Paladin counter UAS interceptor, the Low Collateral Effects Interceptor (LCEI)
    - Ninja: Counter UAS system
    - Paladin: Counter UAS interceptor
- Communications research programs including:
    - Swarming Approaches to Autonomous Systems (SAAS)


RIO

INTEGRATION & OPERATIONS

Providing facilities and services to deliver effective operation support.

Sustain and support installation operations for the Rome Research Site community by delivering quality facilities, environmental services, communication and information systems, logistics activities, force protection, and human resource services, enabling the AFRL Information Directorate to develop, field, facilitate and sustain war-winning capabilities and provide effective mission support.

Chief, Mr. Scott Podkowka
Deputy Chief, Vacant
Supervisor for Fabrication, Mr. Tom Hoover

315.330.4321

FABRICATION

315.330.2881

AIR FORCE RESEARCH LABORATORY MODELING AND FABRICATION SHOPS

Comprised of seven specialty areas and 19 multi-disciplined craftsmen.

The Fabrication Shop produces high quality modifications, fabrications and components to support all facets of research and development and concurrent engineering efforts undertaken by the Information Directorate.

POC: Robert Hoover, RIOLF

Resources

The Fabrication facility has complete shops of various trades as well as an expansive high bay and open area to facilitate numerous projects of all sizes and duration.

Each trade has a full shop of the latest equipment to handle most any project.

Capabilities

- Full electric shop
- Paint
- Pattern making
- Plastic fabrication
- Metal machining
- Sheet metal work
- Welding
- Woodworking

Examples

- Rebuilding of a crashed F-22 used for testing purposes
- Joint Strike Fighter
- Predator work
- Replicated various versions of bombs and missiles used in test projects
- Built numerous laboratory spaces for different projects
- Fabricated research test beds using Humvees and trailers
- Numerous machining projects for laser and camera mounted experiments


RIS

INFORMATION SYSTEMS

Inventing technologies to realize truly integrated, resilient, and robust command and control systems.

To lead research, development, prototyping and demonstration of innovative technologies and systems that enable understanding and application of technologies to enable joint all-domain command and control for Air Force and joint warfighters.

Chief, Ms. Julie Brichacek
Deputy Chief, Ms. Michelle Grieco
Technical Advisor, Mr. Richard Metzger

315.330.4175

Black Room

Multi-purpose facility for research, demonstrations, and presentations.

The Black Room represents a multi-purpose facility for research, demonstrations, and presentations.

The facility offers a unique opportunity to bring high-end computer graphics resources and high-resolution displays into a shared and interactive space. It supports many demonstrations of Information Directorate technologies in a consolidated fashion and can provide a place and means for tight development integration with projects spanning many divisions and directorates.

Primary POC: Pete Jedrysik, RISB
Alternate POC: David Kaveney, RISB

Resources

- Planar Clarity Matrix Video Wall with fourteen 55 inch 1920 x 1080 LCDs in a 7 x 2 matrix
- Two Planar 55 inch 1920 x 1080 LCDs; one on each side of the video wall to display additional content
- Height-adjustable operator console with four 32 inch 3840 x 2160 LCDs
- Integrated plug-and-play Logitech Rally Video Conferencing System, supporting video projection, microphone array, sound system integration, and HD adjustable zoom camera
- Four height-adjustable Ergonomic Workstations each with a 65 inch 3840 x 2160 multi-touch LCD
- Planar 98 inch 3840 x 2160 multi-touch LCD with passive stereoscopic 3D and electric heightadjustment
- 48 core High Performance Workstation w/two NVIDIA Quadro RTX5000 graphics cards
- Evertz EQX Video Router configured w/90 inputs x 268 outputs; combination of fiber, coax, and Evertz X-Link high density interconnects; expandable to 576 x 864
- Evertz VIP Multi-Image Display Processor
- 5.1 channel audio system, table and lapel microphones, and audio mixer

Capabilities

This environment integrates multiple technologies including high-end computer graphics workstations, video router with dynamically switchable hardware via fiber and copper interconnections, audio system, multi-screen operator console, a mobile 98 inch UHD multi-touch screen that supports 3D viewing with passive stereoscopic glasses. However, the highlight is a high-resolution 27 foot wide video wall with 3.5 times the resolution of a UHD screen. This provides a unique presentation capability, as the integrated high performance workstations are able the drive the display as a continuous screen, allowing a presentation to fully encompass the view of the audience. Laptop input is supported by tiling their displays on the video wall.

The facility has upgraded with plug-and-play VTC capabilities through an integrated Logitech Rally Video Conferencing System. Users can expand their Teams meetings (or any other conferencing software) by bringing their own laptop and having access to the room's HD adjustable zoom camera, microphone array, sound system and project their display to the video wall. This is achieved through a single USB and HDMI connection and requires no special computer setup.

Also offered are ergonomic workstations; in-house developed, mobile, adjustable, large-screen workstations to provide an unprecedented level of flexibility and reconfigurability. These are perfect in supporting digital poster sessions.

Examples

- AUKUS/RAAIT (Resilient Autonomous AI Technologies)
- AI Task Force (AITF)
- Adaptive Reconfigurable C2 (ARC2)
- Interactive JASSM Mission Planning (IJMP)
- Shared Context Planning (SCP)
- Coordinating Austere Nodes through Virtualization and Analysis of Streams (CANVAS)

Also used throughout the directorate for a variety of presentations, demonstrations, events and training.

COMMAND AND CONTROL CONCEPT CENTER (C2CC)

Provides an environment to conduct system-level experimentation on information systems.

The Command and Control Concept Center (C2CC) is a fundamental capability for the Information Directorate. It provides risk mitigation and developmental test capabilities for Advanced Technology Demonstrations, critical experiments, and demonstrations.

The C2CC provides an environment (emulated and/or simulated) to conduct system-level experimentation on information systems for not only C2, but also connectivity and dissemination, and intelligence processing and experimentation.

Primary POC: Andrew Howe, RISA
Alternate POC: David Kaveney, RISB

Resources

- Over 1,ØØØ computers (laptops, desktops, and servers)
- Unclassified and classified research networks
- Classified computer laboratory
    - Secret Internet Protocol Router Network (SIPRNet)
    - Classified communications
    - Safes
    - Cryptography

The following systems of record with accompanying data sets:

- Air Warfare Simulation Model (AWSIM)
- Command and Control Weapon System Part Task Trainer (C2WSPTT)
- Master Air Attack Planner Toolkit (MAAPTK)
- Theater Battle Management Core Systems Force Level (TBMCS)

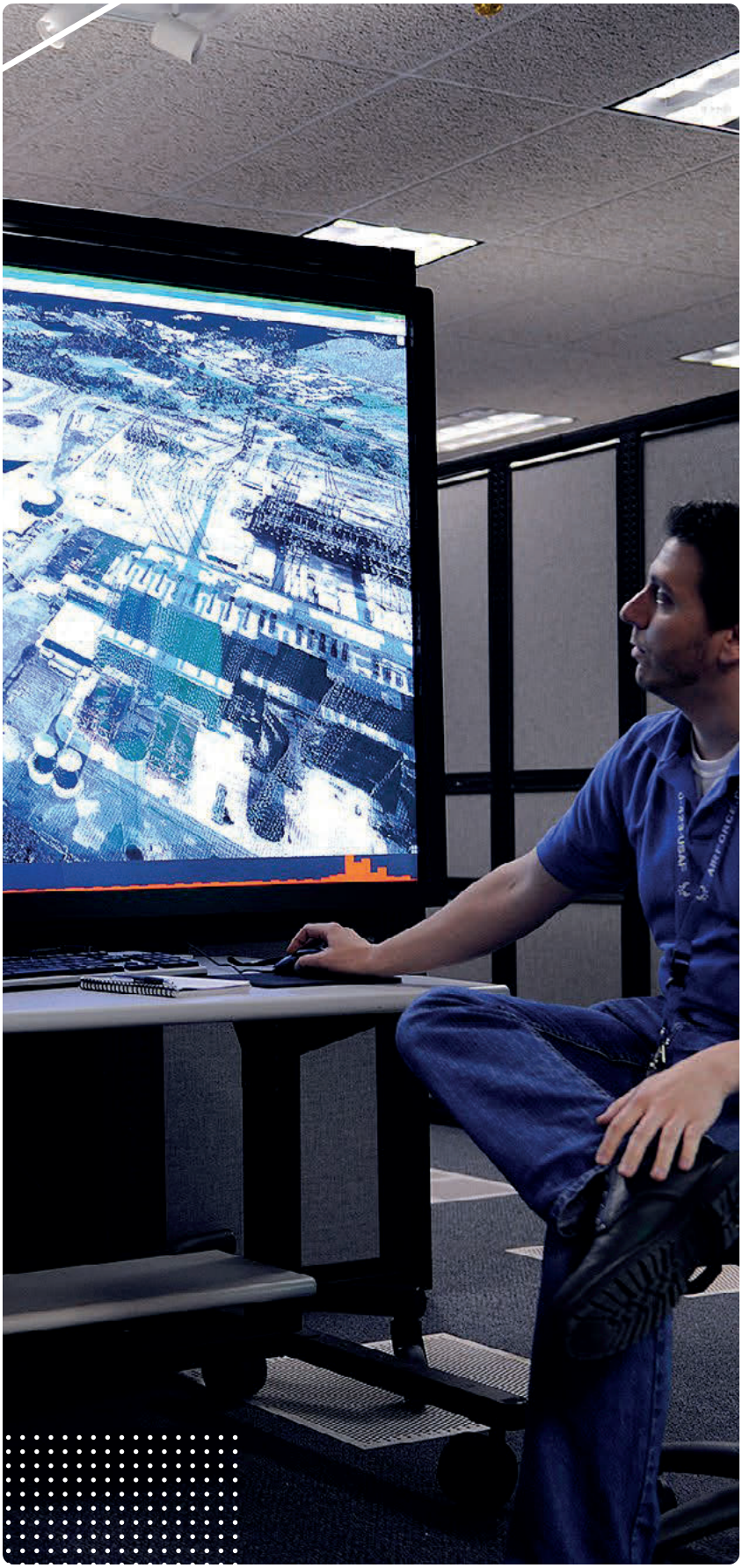
Capabilities

The C2CC provides AFRL/RI many research and development opportunities, including an evaluation laboratory used for fielding C2 systems of record and their related data sets. This facility is cleared to SECRET with access to SIPRNet.

Examples

Supported transitions of:

- Cyber Technology Maturation Framework
- Joint Effects Operations
- Cyber Quantification Framework
- Space C2 demonstrations
- Trusted Network Environment
- Information Support Server Environment
- Air Force Satellite Control Network
- Trusted Gateway System
- Tactical intelligence, surveillance, and reconnaissance, Processing, Exploitation, Dissemination system
- Multi-level Thin Client
- AFRL/RI Research and Development Mission Infrastructure (AFRDMI)
- AI Task Force (AITFC)
- Coordinating Austere Nodes through the Virtualization and Analysis of Streams (CANVS)
- C4ISR in-house Government ProgramsFight Tonight
- Generative C4I (GENC4I)
- I nteractive JASSM Mission Planning (IJMP)
- Independent Testing and Evaluation Certification (ITEC)
- LegatusAI (LEGAI)
- Primary, Alternate, Contingency, and Emergency 4 Agile Combat Employment (PACE4ACE)
- Resilient Autonomous and Artificial Intelligence Technologies (RAAIT)
- Rapidly Distributed Air Operations Center (RDAOC)
- Resolute Sentry
- Robust Logistics (ROLOG)



COMMAND AND CONTROL TECHNOLOGY CENTER (C2TC)

Develops advanced visualization, interactive displays and AI/ML technologies.

The C2TC supports research and development of advanced visualization and interactive displays, artificial intelligence/machine learning (AI/ML), Know ML, modeling and simulation, and collaborative tools for operational needs.

Primary POC: David Kaveney, RISB
Alternate POC: Andrew Howe, RISA

Resources

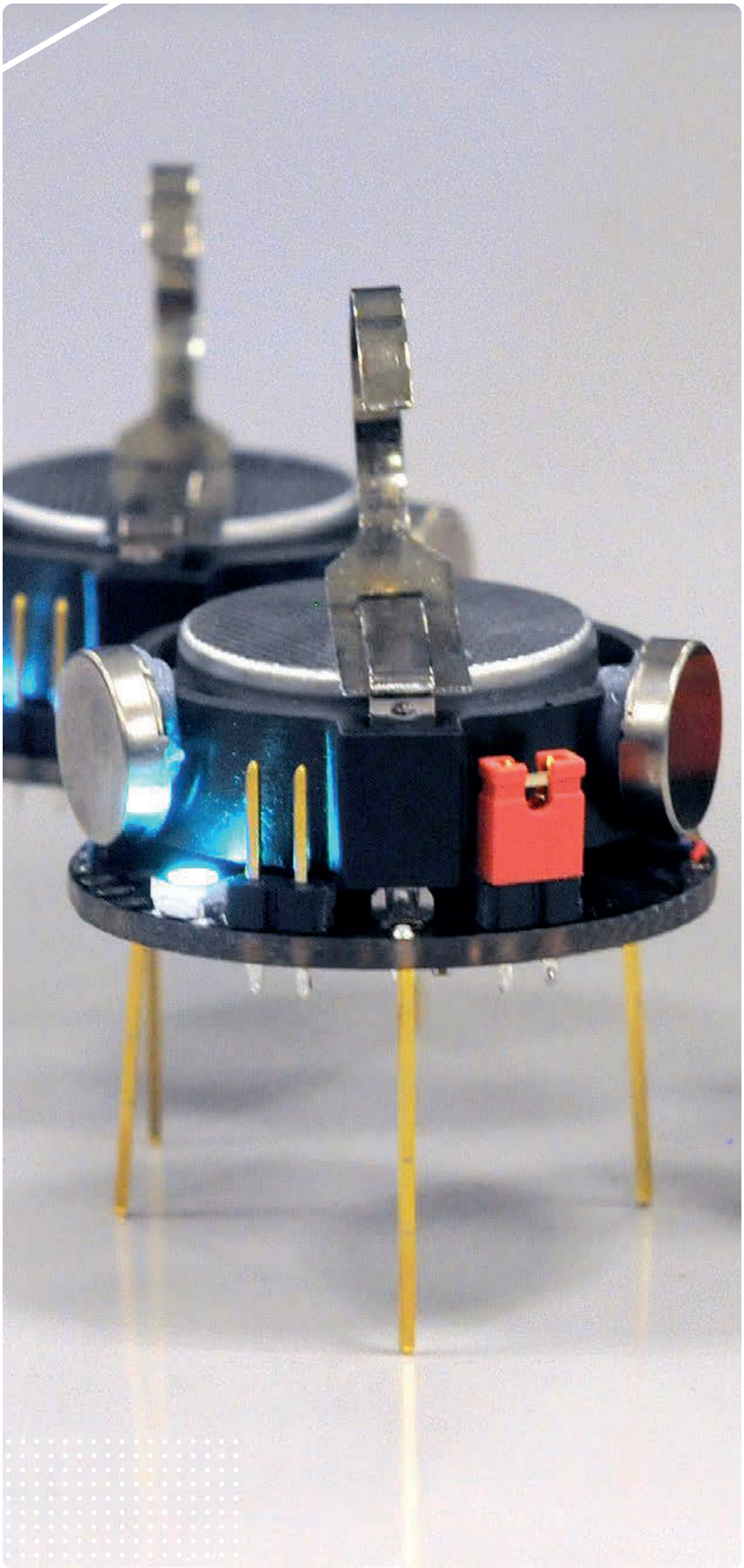
- 98 inch quad HD passive 3D multi-touch screens
- Three portable 84 inch 4K Microsoft Surface HUB digital whiteboard and collaboration device
- Multiple high-end multi-core workstations with dual 4K displays
- Developer workspace with access to Defense Research and Engineering Network and office automation networks
- Video routing and interactive displays test and development area.

Capabilities

A modern software development environment with tools, data, computation and displays that provide a state-of-the-art set of capabilities and data for information visualization, modeling and simulation and AI/ML development. The laboratory is reconfigurable to support presentations, demonstrations or host workshops using its various portable displays. Workspaces are laid out to encourage teaming and collaboration.

Examples

- Research on graph visualization techniques
- Information discovery and exploration
- Semantic Lifting of Integrated Messages (SLIM)
- Evaluation Vector Analysis (EVA)
- Learning the Essence of Data (LED)
- Research in storage, analysis, and dissemination of massive point cloud data
- Research on massive point cloud level-of-detail and visualization
- Web based and thick client point visualization techniques Composable visualization research
- Cross-domain relaxed What You See Is What I See visualization
- Semantic Web information exploration, processing, analytics and visualization
- AUKUS/RAAIT (Resilient Autonomous AI Technologies) international partnership fostering the reuse of AI assets and the composition of customized AI's
- AI Task Force (AITF), AI battle management and detection of AI drift
- IO Fabric – zero latency, zero compression sharing/remoting of workstation resources
- Surface HUB – collaborative digital whiteboard
- Supporting development of visualizations for NC3
- Shared Context Planning (SCP) remote, collaborative planning for the development of operational plans (OPLAN)



K-5 LABORATORY

Supports unclassified research and provides space, network infrastructure, and laboratory support.

This laboratory is utilized by the Information Directorate and supports the work units RIS, RIG, and RIE for research and development in Information Systems, Information Exploitation and Operations, and Information Intelligence Systems and Analysis.

The K-5 Laboratory supports unclassified research and provides space, network infrastructure, and laboratory support.

Primary POC: Andrew Howe, RISA
Alternate POC: James Faso, RISA

Resources

The facility supports desktop computing research with network connections to server capabilities via Defense Research and Engineering Network (DREN) or Private Research Domain (PRD). Groups that work in the facility provide their own computers and software to conduct research and development.

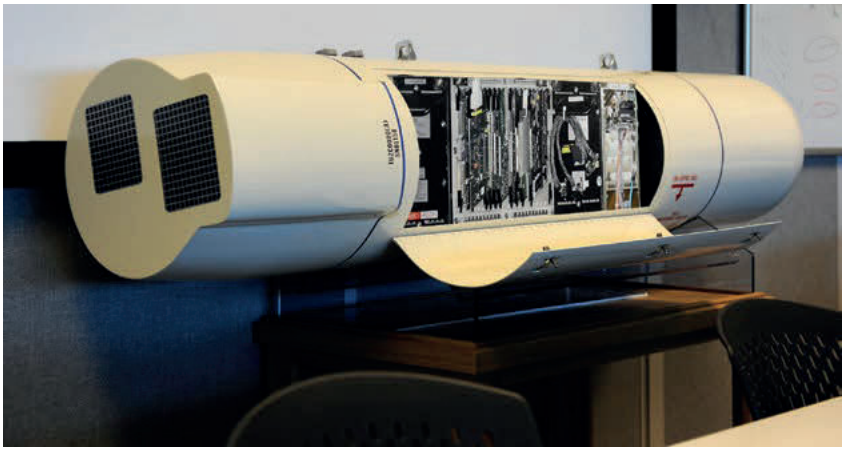
The facility provides basic office infrastructure such as phones, two conference rooms, office automation, and DREN printers, storage, etc.

Capabilities

The facility provides ten areas of space for unclassified in-house research to be conducted with seating for around 200 people. The space can be utilized to access networks such as PRD, DREN, or setup as standalone.

Examples

- AI Task Force (AITFC)
- Autonomy Capability Team (ACT3)
- Cyber Operations Integration Lifecycle (COIL)
- LegatusAI (LEGAI)
- Rapidly Distributed Air Operations Center (RDAOC)
- RIB Summer Interns
- Independent Testing and Evaluation Certification (ITEC)
- Integrated Information Management System - Cyber Technology Maturation Framework (IIMS-CTMF)
- Resilient Synchronized Planning and Assessment for the Contested Environment (RSPACE)



OPERATIONAL INFORMATION MANAGEMENT (OIM) FACILITY — RESEARCH DEVELOPMENT TEST AND EVALUATION ENCLAVE

Capabilities to research, develop, prototype, experiment, and demonstrate advanced Multi-Domain C2, mobile application development, and Information Management technologies.

The OIM Facility addresses current and future Air Force Net-Centric information interoperability requirements to maximize the effectiveness of joint and combined military operations in both enterprise and tactical operational environments.

Primary POC: Dan Kemp, RISD
Alternate POC: Andrew Howe, RISA

Resources

The 3Ø+ workstation laboratory has various development environments including cloud-processing emulation.

Capabilities

Research, develop, and prototype advanced Multi-Domain C2, mobile application development, and Information Management technologies. Devices in this space can be utilized to access networks such as DREN, NIPR, TID, or set up as standalone.

Examples

- Application of Managed Mission Orientation (AMMO)
- Adaptive Reconfigurable Command and Control (ARC2)
- Android Tactical Assault Kit (ATAK)
- Bridging Across Network Domains Information Technology (BANDIT)
- Command and Control Line of Effort for Corporate Model Analyze (C2LoE4CMA)
- Fight Tonight
- Global Operational Tactical Information Technology (GOT-IT)
- FLYLEAF
- Interactive Learning Mission Planning (ILMP)
- Open Pod Broker
- Robust Evasion and Search Technologies for Orchestration of Rescue and Escape (RESTORE)
- Phoenix Prime Information Management Middleware
- UNITY
- Command and Control Synergy for Combined Operations
- Tactical Information Broker


RIT

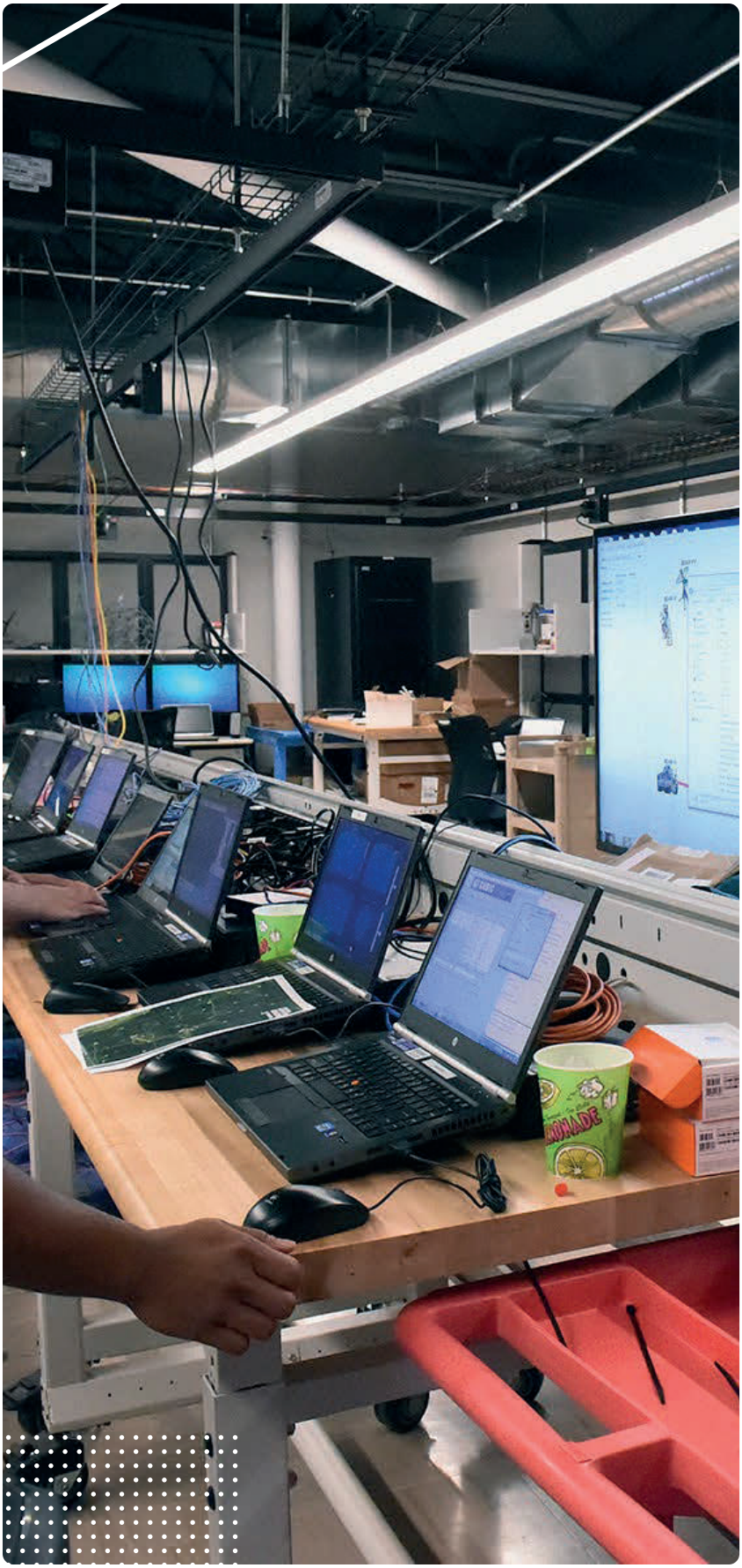
COMPUTING & COMMUNICATIONS

Putting the right information into the right hands at the right time.

To explore, prototype, and demonstrate high-impact, game changing computing, communications and networking technologies that enable the Air Force and Nation to maintain its superior technical advantage.

Chief, Mr. Greg Zagar
Deputy Chief, Mr. Michael Hartnett
Technical Advisor, Dr. Lauren Huie-Seversky

315.330.7753



STOCKBRIDGE EXPERIMENTATION AND TEST FACILITY

- Controllable Contested Environment (CCE)
- Small Unmanned Aerial System-Experimental Capability (sUAS-EC) Airfield

The Stockbridge Experimentation and Test Facility is a world class facility providing a truly unique capability to support real world, outdoor and tactical edge experimentation for a wide range of technologies.

Our certification by the FAA provides us with the ability to conduct airborne testing utilizing our fleet of sUAS providing the ability for controlled experiments in a dynamic environment. This infrastructure supports the cost-effective testing and development of technologies envisioned for use in ground based and/or airborne configurations.

The Stockbridge Facility is available to both Government and commercial customers for test purposes. Stockbridge provides an agile, flexible experimentation and developmental test environment capable of supporting a wide range of ground or airborne testing. Our unique configuration of test nodes greatly reduces set up time and allows for greater time spent on testing. Experimental and test range services are performed on a cost reimbursable basis through various agreement mechanisms.

Primary POC: John Heinig, RIT
Primary Alternate POC: Pete Ricci, RITGA
Alternate POC: Greg Zagar, RIT
Alternate POC: Mike Hartnett, RIT

Controllable Contested Environment Small Unmanned Aircraft System (SUAS) Experimentation Range.

Stockbridge provides a truly unique capability to support real world, outdoor, and tactical edge experimentation for a wide range of technologies. The 24 remote nodes, or “pads” spread across Stockbridge’s 3ØØ acres provide shelter, power, antenna/towers, fiber optic, and network connectivity to a control center located in our Main building. This infrastructure supports cost effective, rapid performance of experiments and tests to support multiple technology areas, including Radio Frequency (RF) communications, spectrum, networking, cyber, sensor and information.

Highlights

- 24 Locations with power and network
- 3ØØ Acres of rural land
- Buildings to support experimentation
- Diverse set of small UAS platforms
- Electromagnetically quiet environment
- Existing towers for antenna mounting
- Flexible frequency authorizations
- Flexible network architecture
- Trained and experienced personnel

Capabilities

- Cyber assessment and experimentation
- Dynamic Spectrum access
- Mobile Network experimentation
- Network testing
- Protocol analysis
- Radio and link performance testing
- RF measurements
- SUAS Flight testing

CCE

The Controllable Contested Environment (CCE) capability supports the creation of a repeatable and configurable RF environment. Supports R&D and experimentation on many technology areas, including dynamic spectrum access techniques, policy-based routing approaches, and cognitive network node performance in challenging environments.

12Ø Foot Walk up Tower

Located adjacent to the Main building this tower provides line of sight capability to Rome and Newport sites. Equipped with power, network connectivity and flexible equipment and antenna mounting, the tower provides elevated experimentation with easy walk-up access.

Spectrum Assessment

Collection of scalable spectrum assessment hardware and tools, enabling collection and characterization of RF spectrum. Provides
valuable experimental data to support analysis
and testing of all types of communications, information and cyber systems.

RF Control

An evolving distributed management and control architecture enables flexible, repeatable and configurable RF and spectrum assets. Using a combination of assets including signal generators, commercial and military radios, the environment provides signal sources over wide range of frequencies to support and control a variety of RF testing.

Buildings

Two permanent buildings support wide range of capabilities. Building 1477 has laboratory space, meeting space, and serves as hub for communications and management. Building 148Ø provides storage and larger experiment workspace.

SUAS Airfield

Two 6Øx6ØØ foot runways, and a wide variety of fixed wing and VTOL platforms enable airborne testing of payloads up to 15 pounds. Current flight approvals enable testing within a 16 square mile area surrounding the site.

Examples

A Multi-domain interoperability demonstration showcased

- Multi-domain interoperability Robust Information Provisioning Layer (RIPL).
  RIPL's ability for multi-domain interoperability and information dissemination at the tactical edge across heterogeneous waveforms and links. This included a secure Starlink connection between our Stockbridge Test Facility and Rome Research Site through the incorporation of High Assurance Internet Protocol Encryptors (HAIPEs), integration with the
    - BRAT: AFRL/RIE Baseline Road Assistance Tracker fusion algorithm
    - HPC: AFRL/RIT Agile Condor High Performance Computing hardware

This demo was in support of

- Combat Cloud Vision: ACC program
- Resolute Sentry: AFRL/RY's program
- HCB: AFLCMC/HNA's High-Capacity Backbone Development Strategy
- 5G Experimentation at the AFRL Stockbridge Test Site.
  AFRL develops effective methodologies (hardware, software and systems) to allow the sharing or coexistence between airborne radar systems and 5G cellular telephony systems in the shared (completely or partially overlapping) 3.1 - 3.4 GHz band (Target Band). The 5G experimentation will result in the advancement of 5G-enabled technologies to support dynamic spectrum sharing (DSS)
- HF high frequency Mission-Oriented Investigation and Experimentation support.
  Remote testing location utilizing the CCE to experiment with HF frequencies to include multiple users: L3/Harries Corporation, MITRE, MIT/LL and AFRL

NEWPORT ANTENNA RADIATION MEASUREMENT FACILITY

The Newport Facility is located 3Ø miles southeast of the AFRL/RI Rome, NY campus.

The Newport Facility is split between two hilltop locations: Irish Hill and Tanner Hill. The hilltops are separated by a distance of 1.5 miles with a 4ØØ-foot-deep intervening valley. These hilltops, and the facilities on them, have been developed by AFRL into a state-of-the-art RF Communications Experimentation Facility centered around the 'far-field, elevated' outdoor antenna test ranges. The total facility consists of 181 acres of land with over 25,ØØØ sq. feet of laboratory, office, maintenance, and aircraft modification space.

The antenna ranges are routinely used to measure radio frequency (RF) antenna radiation patterns, antenna to antenna RF isolation, full up RF communications system performance and for the development of state-of-the-art RF communications and antenna measurement technologies.

Primary POC: Pete Ricci, RITGA
Primary Alternate POC: John Heinig, RIT
Alternate POC: Greg Zagar, RIT
Alternate POC: Mike Hartnett, RIT

The Facility

The uniqueness of this facility lies in the techniques, developed by AFRL, for measuring the effects of airframe effects on RF Communications systems and aircraft mounted antenna radiation patterns in a simulated flight environment.

Interactions include those caused by metallic structures such as external weapons, electronics pods, and fuel tanks. The data obtained is used to: characterize RF Communication systems and antenna performance for various aircraft configurations, to optimize an antenna design or physical placement to achieve specific performance levels, or to validate antenna modeling and simulation software.

The site is open and operational year-round and can operate up to the secret level. Newport, as part of AFRL Rome, is included in the NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management as an “Experimental Station” with the inherent broad range of frequency authorizations and flexibility.

Range Testing

There are many significant beneficial features associated with range testing at Newport.

Specifically, data collected at the Newport facility can be done for a fraction of the cost of data collected via flight testing. These tests are repeatable with a high level of accuracy which allows for comparative evaluations following system design changes or modifications.

Newport is a developmental environment with an emphasis on flexibility. Customers are not locked into a formal Test Plan and are able to modify their requirements as needed. To support this flexibility AFRL has a complete fabrication facility located in Rome, NY. The craftsmen are capable of building antenna mounts, whole airframe sections, including fuselages, wings, and tail sections. A wide variety of mock weapons, pods and fuel tanks have also been fabricated.

Available Aircraft

Airframes currently available for use at the Newport site include

- The A-10, F-16C, F-15E, F-18 A, F-22, F-35 (CTOL, STOVL, CV)
- Five-foot, 14 foot, and 40 foot Ground Planes are available and may be installed as required.

Additional Airframe Program Offices Supported

- B1-B, A-10, AH-1, F-16, and F-15

Measurements

Measuring aircraft antenna radiation patterns

- Illuminating the antennas mounted on the specified airframe with a uniform RF field at the frequencies of interest. The airframe is then slowly rotated or tipped as data is continuously collected to produce patterns of amplitude and phase versus azimuth angle or elevation angle.
- AFRL uses a state-of-the-art FARO laser location system (a 3D measurement system with accuracy of .001 inches at approximately 30 feet) to precisely position antennas on the full-sized airframes.
- Characterizing installed system level performance parameters
- The performance of direction finding systems, communications systems, EW systems, and experimental systems can be assessed in a realistic free-space environment with both the antenna and the system hardware in the loop.

Seven independent measurement ranges at the Newport facility

- The seven ranges are fully instrumented with signal sources, antennas, amplifiers, receivers, computers, displays, recording systems, fiber optic interfaces, positioner controllers, and high-speed multiplex systems covering the frequency ranges of 5Ø MHz to 6Ø GHz. The ranges are typically operated with full-size airframes installed on special heavy-duty, high angular accuracy (+/- .Ø5°), 3-axis positioners to accurately simulate all possible flight attitudes.
- All ranges and both hills are interconnected with a fiber optic network which interfaces the range control centers to range instrumentation as well as to a high-speed link connection back to the AFRL facilities in Rome, NY.

Newport Ranges

Main Range

- Physical Characteristics: across Tanner and Irish Hills; 76Ø2’ long with a 4ØØ’ valley between
- Transmit Sources: Tanner Hill; 4’, 6’, 8’, 1Ø’, and 28’ parabolic reflectors
- Receive: Irish Hill; 5Ø’ tower with 3-axis positioner
- Weight capacity: 5Ø,ØØØ lbs
- Frequency Range: Ø.5 - 6Ø GHz

Experimentation Range

- Physical Characteristics: across Tanner and Irish Hills; 68Ø2’ long with a 4ØØ’ valley between
- Purpose: this range can be configured for transmission in either direction. It is also optimized for optical experiments.

Site-X Range

- Physical Characteristics: across Tanner and Irish Hills; 5559’ long with a 4ØØ’ valley between
- Transmit Sources: Tanner Hill; 4’, 6’, 8’, 1Ø’, and 28’ parabolic reflectors
- Receive: Irish Hill; Site-X 5Ø’ tower with 3-axis positioner
- Weight capacity: 5Ø,ØØØ lbs
- Frequency Range: 2 - 6Ø GHz

Isolation Range

- Physical Characteristics: Irish Hill; 2Ø’ Tower with 3-axis positioner
- Weight Capacity: 5Ø,ØØØ lbs
- Purpose: measure inter/intra system antenna isolation and coupling data

14ØØ’ Range

- Physical Characteristics: Irish Hill; 14Ø8’ long with a 2Ø’ valley between
- Transmit Sources: Irish Hill; 8’, and 15’ parabolic reflectors
- Receive: Irish Hill; Site-X 5Ø’ tower with 3-axis positioner
- Weight capacity: 5Ø,ØØØ lbs
- Frequency Range: Ø.5 - 2.Ø GHz

Main Ground Reflection Range

- Physical Characteristics: Irish Hill; adjacent to Bldg. 1624 and Range 1
- Transmit Sources: Tanner Hill; various log-periodic transmit antennas mounted to a variable height tower
- Receive: Irish Hill; 5Ø’ tower with 3-axis positioner (see range 1)
- Frequency Range: 3Ø-5ØØ MHz

Site X-Ground Reflection Range

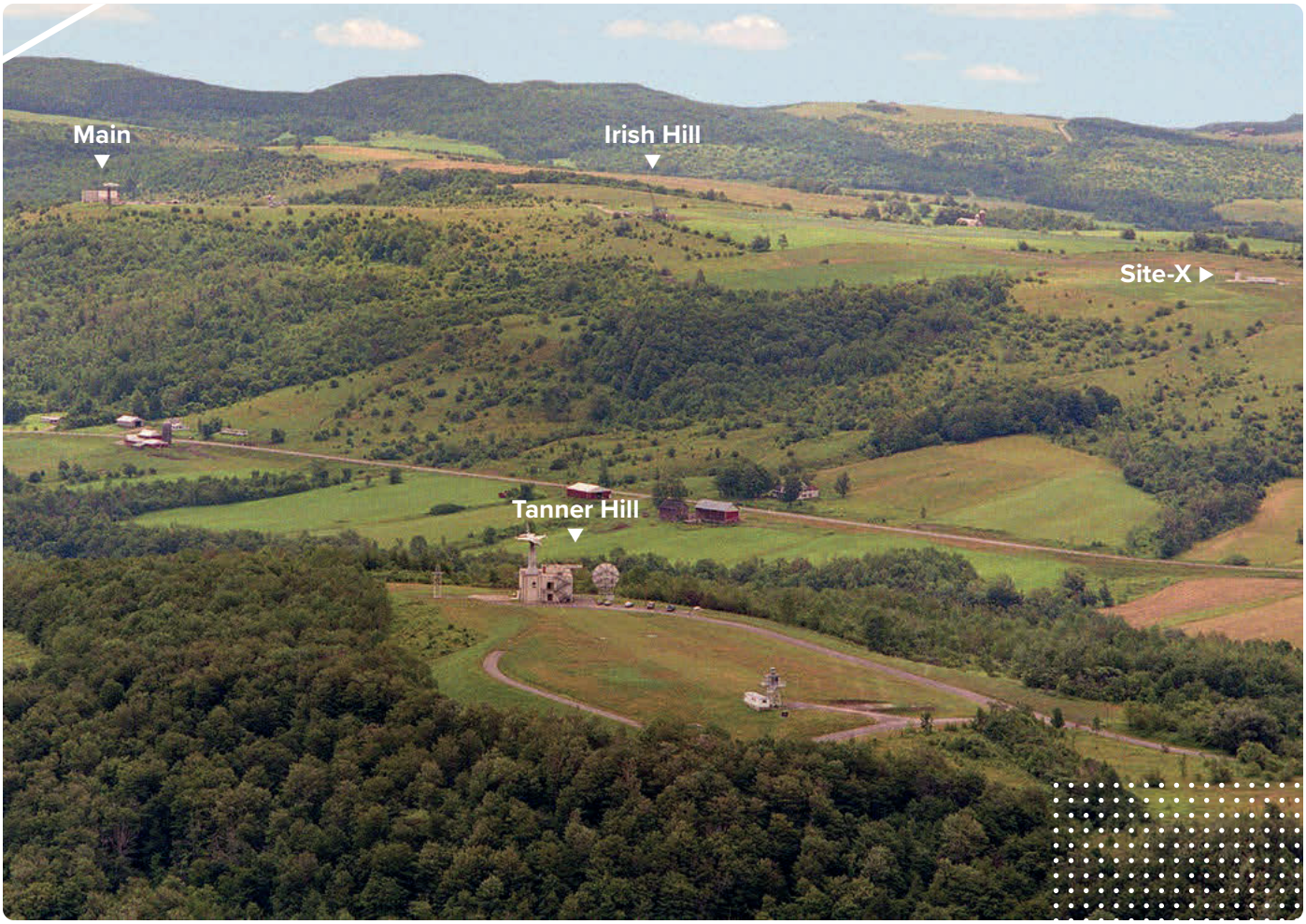
- Physical Characteristics: Irish Hill; adjacent to Site-X and Range 3
- Transmit Sources: Tanner Hill; various log-periodic transmit antennas mounted to a variable height tower
- Receive: Irish Hill; Site-X 5Ø’ tower with 3-axis positioner
- Frequency Range: 3Ø-5ØØ MHz

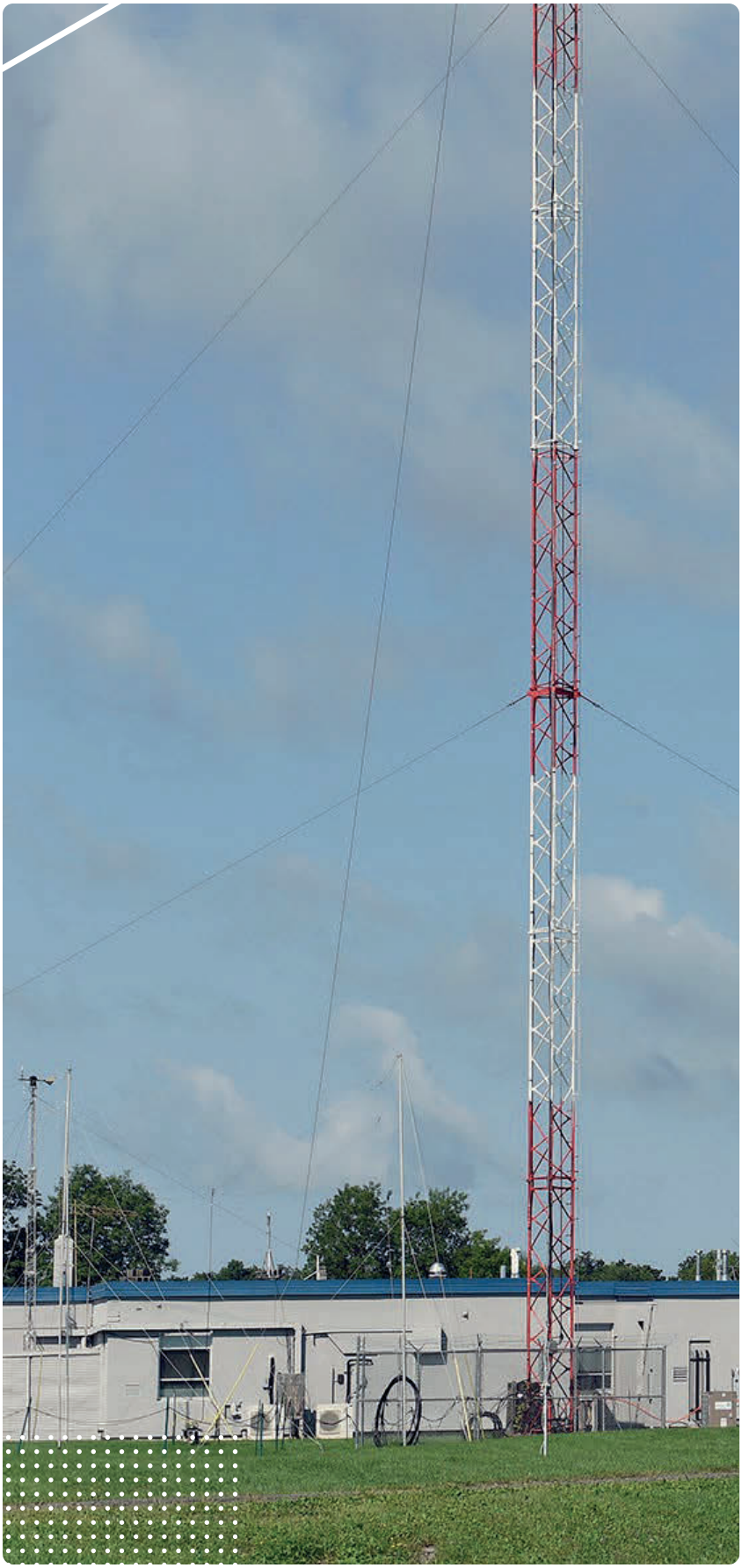
Examples

- Terahertz Experimentation
  Work is leveraging the Newport Antenna Measurement Test Ranges as the ideal location to conduct groundbreaking communications link experiments in the Terahertz frequency range. Experimentation can lead the development of new equipment and methodologies.
- HF Experimentation
  The work at Newport will contribute to the working being performed at the Stockbridge Facility - HF high frequency Mission-Oriented Investigation and Experimentation support. Remote testing location utilizing the CCE to experiment with HF frequencies to include multiple users: L3/Harries Corporation, MITRE, MIT/LL and AFRL.
- JSF Development Antenna Pattern/Isolation Measurements
  F-35 Development since 2ØØ3 and Block.
- Ground-to-Air Transmit and Receive Communications Testing

Upgrades

- F-22 Development Antenna Pattern/Isolation Measurements
- Multiple-input multiple-output MIMO Experiments
- AN/ALQ-184 and 131 ECM Pods AFMC AFLCMC/WNYEC





MICROWAVE AND OPTICAL COMMUNICATION RANGES

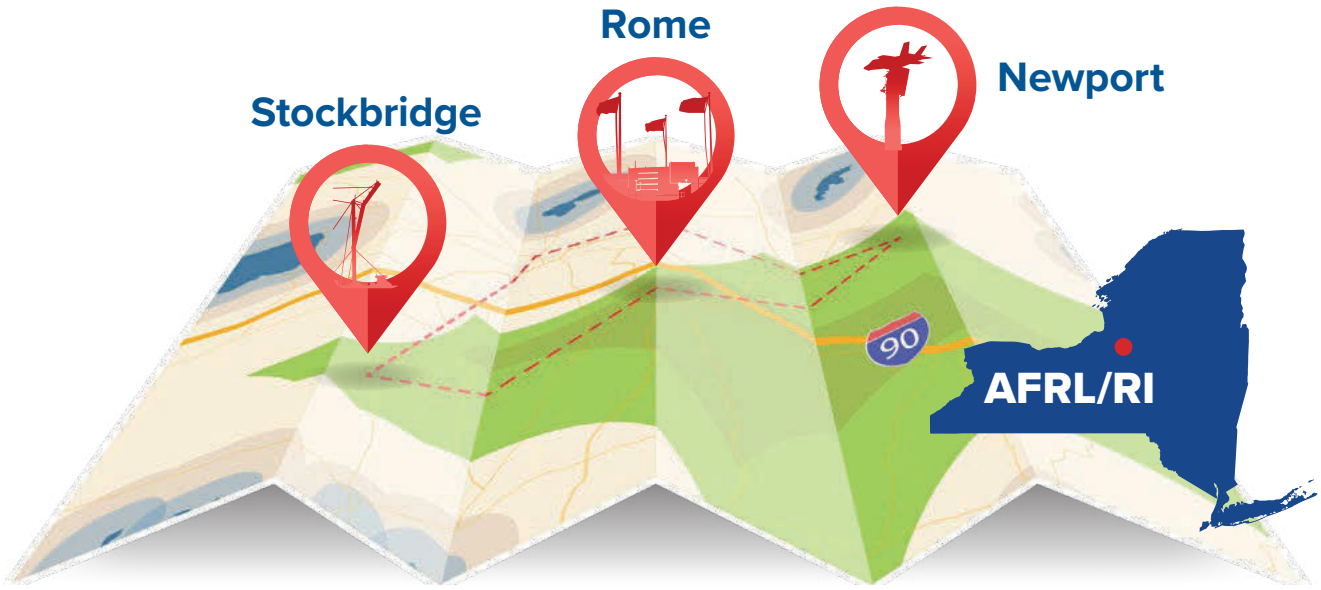
- **ROME**
- **STOCKBRIDGE**
- **NEWPORT**

The Microwave and Optical Communication Range has walk-up towers on each end of the link with heated and cooled experimentation rooms that provide hands-on access to- equipment and antennas.

The first tower in Rome, NY provides antenna mounting and workspace at 100 feet above ground level (AGL), while the second tower in Stockbridge, NY provides working levels at 60 and 120 feet AGL. Additionally, fiber connectivity to the ground provides remote control of equipment for long-term data gathering.

Multiple line of sight experimentation ranges for RF communications and optical over-the-air experimentation.

Primary POC: George Brost, RITGA
Primary Alternate POC: Dave Marks, RITGA
Alternate POC: Lt. Col Yarnell, RITG
Alternate POC: John Perretta, RITGA
Alternate POC: Joe Suprenant, RITGB



Resources

Stockbridge and Rome

There are 18 miles between AFRL/RI Rome and AFRL Stockbridge Research Facility

- 1ØØ+ feet walk-up towers

Stockbridge and Newport

There are 32 Miles, between AFRL Stockbridge Research Facility and AFRL Newport Research Facility (Irish Hill)

- Spectrally quiet radio frequency environment for low-noise experimentation

Rome and Newport

There are 19 miles between AFRL/RI Rome and AFRL Newport Research Facility (Tanner Hill)

- 5Ø feet heated and cooled building with experimentation rooms that have direct access to equipment and antennas

Capabilities

Our Facilities Provide

- Long term data gathering
- Weather and atmospheric related analysis
- Far-field wireless communication link verification
- Flexible experimentation environment

Examples

- RF Adaptive Persistent, intelligence surveillance and reconnaissance Data Link high-bandwidth backhaul
- Optical communication experimentation
- E-band long-term atmospheric analysis

SATELLITE COMMUNICATIONS (SATCOM) FACILITY

The SATCOM facility supports the development and field testing of communications technologies.

Because of its outdoor location and virtually unobstructed view of the southern horizon, this area is optimally positioned to provide for convenient geosynchronous satellite access, as well as an uninterrupted, all season view of the solar arc.

The latter is required for passive radiometric measurements of solar radiation through the atmosphere in support of the development of atmospheric propagation models for future satellite communications at very high radio frequencies, such as V/W band. (71 GHz to 86 GHz). This facility also provides test bed support for atmospheric propagation testing for the development of free-space optical communications technologies.

Primary POC: Dave Marks, RITGA
Primary Alternate POC: Lt. Col Yarnell, RITG
Alternate POC: John Perretta, RITGA
Alternate POC: Joe Suprenant, RITGB

Resources

The SATCOM Facility recently added A multiband (X, Ku, Ka band) Ground Terminal and ground station SATCOM terminals which will allow new terminal technology testing, evaluation, and exercise support over operational Department of Defense SATCOM networks. It also has:

- Optical and Long Wavelength Infrared
- Radiometers for Ka, X, and V/W bands
- Receivers
- Transmitters

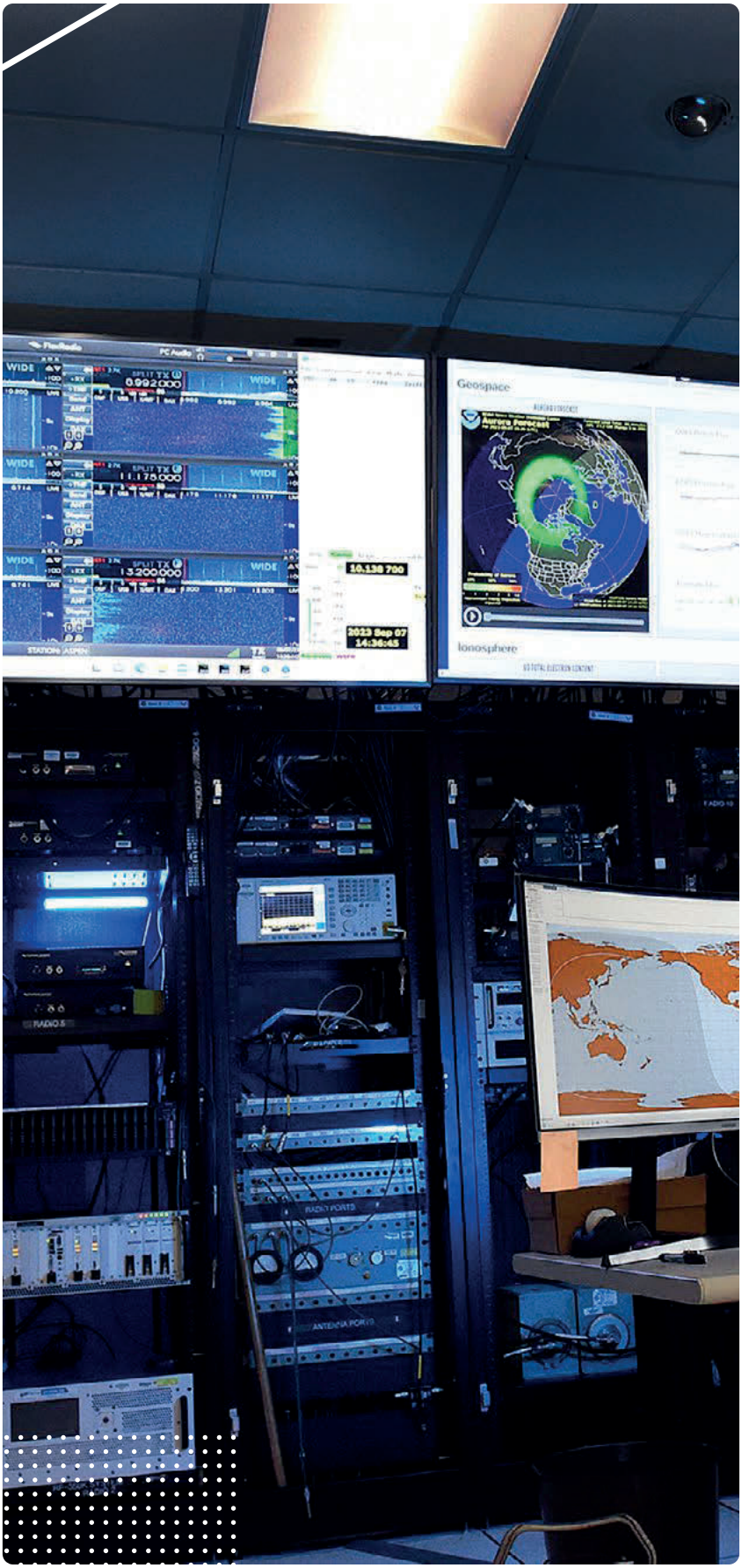
Capabilities

- Testing radio frequency satellite
- Testing optical communications technologies

Examples

A number of satellite terminal in-house products have been developed in this facility, they include:

- High Mobility Multipurpose Wheeled Vehicle mounted Ka-Band Comm-on-the-move Terminal
- Ka-Band suitcase terminal
  Self-acquiring Ka-Band portable terminal for Federal Emergency Management Agency
- X-Band manpack terminals
  United States Special Operations Command
- A sun-tracking radiometer
- Atmospheric propagation experiments
  Short and long-wave infrared bands are also being conducted at this site to develop future high-availability optical communication systems
- V/W band slant-path radio link, and weather data collection equipment
  On site to support V/W band atmospheric propagation studies for future SATCOM systems



COMMUNICATION SYSTEMS & TECHNOLOGIES (COMM-PLEX) LABORATORY

The Comm-Plex supports research and development, analysis, and integration of a wide range of communications and networking technologies.

Hosting not only AFRL engineers but multiple interns and visiting professors throughout the year. It provides a flexible environment for a variety of work in emerging network centric capabilities as well as the ability to perform cabled and over the air testing of RF systems. The Comm-Plex also provides remote connections to facilities at the Stockbridge test site to enable large scale experimentation of network and communications related technologies.

Primary POC: Saxxon Gonzalez, RITGB
Alternate POC: Mike Gudaitis, RIT
Alternate POC: Ngwe Thawdar, RITGA
Alternate POC: Matt Anderson, RITA
Alternate POC: Lt. Col Yarnell, RITG
Alternate POC: John Perretta, RITGA
Alternate POC: Joe Suprenant, RITGB
Alternate POC: Courtney Raymond, RITA

Resources

The approximately 4,600 square foot facility is comprised of a main lab and two adjoining facilities which are utilized for research and development in various radio spectrum and network connectivity technologies as well as housing a SUAS fleet that is used for performing air-to-air and air-to ground communication testing. To support experiments and demonstrations requiring communications with remote locations, there is an antenna field on the roof above the facility as well as a walk up tower with both RF and networking links to Labs easy to access patch panel.

Capabilities

The Comm-Plex includes network capabilities, computing platforms, network emulation and simulation, and RF and optical communications capabilities. The facility has capabilities for test, evaluation, and development of communications networking, architectures, and protocols. This includes real-time traffic generation, network monitoring, interface testing, and performance analysis capabilities for local area networks, Internet communications and communications from our Stockbridge site; both wired and wireless. In FY24 the Comm-Plex will also have a anechoic chamber that unique EM environment to conduct RF systems and antenna systems integration, demonstration, test, and evaluations.

Examples

- Tactical Wireless Connectivity
- Heterogeneous Operationally Responsive Networks
- Policy Enabled Coalition Communications
- Cyber Vulnerability Testing
- Heterogeneous Integrated Network Technologies
- Video Experimentation
- Evaluation of Cellular Technologies
- Software Defined Radio Research
- Software Defined Networking Research
- Network Emulation for Tactical Communications

RADIO FREQUENCY TECHNOLOGY CENTER (RFTC)

A unique electromagnetic (EM) environment to conduct radio frequency (RF) systems and antenna systems integration, demonstration, test and evaluations.

The RFTC provides a unique EM environment to conduct RF systems and antenna systems integration, demonstration, test, and evaluations.

The facilities supplement and support measurement activities at the remote Newport and Stockbridge Research Facilities.

Primary POC: David Overrocker, RITGB
Primary Alternate POC: Dave Marks, RITGA
Alternate POC: Lt. Col Yarnell, RITG
Alternate POC: John Perretta, RITGA
Alternate POC: Joe Suprenant, RITGB

Resources

The facilities consist of two EM anechoic chambers and associated RF sources, instrumentation, and support equipment and a SATCOM walk up tower with transmit and receive capabilities with RF, fiber optics and copper links through the RFTC and main campus. The two anechoic chambers (4Ø x 32 x 48 and 12 x 12 x 36) provide a free space EM for detailed antenna pattern measurements and evaluation of RF systems and interfaces. Systems as large as an air launched cruise missile (16 foot long) can be accommodated in the large anechoic chamber. The nearby Systems Demonstration Laboratory is available to be used in conjunction with the anechoic chamber facilities.

The Systems Demonstration Laboratory

Located in the RFTC is an RF and general purpose, multi-use, 5,628 square foot laboratory with electronic prototyping/repair benches, test equipment, instrumentation, network analyzer calibration area, software/hardware development area, equipment storage areas.

The laboratory supports the development, integration and installation, test, evaluation, and analysis of breadboards, prototypes, and/or advanced development models (hardware/software) required to support various technical tasks.

Furthermore, it supplements and supports measurement activities at the High Bay Anechoic Chamber Facilities and is used as a staging area to support demonstrations and field exercises at other locations.

The laboratory has fiber optic connectivity to the inter-site microwave radio system from the main campus to the Stockbridge Research Facility and Newport Research Facility.

Capabilities

- High average power densities of +21 dBm/cm2 (7ØØ V/m)
- Fully automated data acquisition and control systems

5Ø MHz-18 GHz

Examples

- Distributed signals
- Network Modeling and Simulation Environment
- Rapid Link
- Remote Radio

Tactical Targeting Network Technology

ADVANCE COMPUTING LABORATORY (ACL)

Support various in-house projects using non-traditional computing technologies (Neuromorphic and advanced architectures).

The ACL Laboratory supports various in-house projects within the High-Performance Systems Branch and RIT division.

Primary POC: Mark Barnell, RITB
Primary Alternate POC: Cameron Baker (CTR), RIT
Alternate POC: Pete Lamonica, RITB
Alternate POC: Courtney Raymond, RITA

Resources

Various types of computer hardware from small single board embedded systems to high end workstations, including remote connections to the Air Force Research Laboratory Information Directorate, Affiliated Resource Center, and High- Performance Computers.

Capabilities

The types of capabilities in the ACL Laboratory include the following:

- Research, develop, and test specialized advanced computing technologies included Neuromorphic Computing (TrueNorth and Loihi) and hybrid architectures.
- Electrical and mechanical integration of components and hardware into working systems or sub-systems
- Emulation and testing for field experiments
- Software Development and Deep Learning Toolkits
- Advanced management of HPC systems

Examples

In-house accomplishments in this facility have supported various Office of the Secretary of Defense, Defense Advanced Research Projects Agency, Air Force Office of Scientific Research, and AFRL programs.

EXTREME COMPUTING FACILITY

Research and development of unconventional computing and communications architectures and paradigms, trusted systems and edge processing.

A 7,100 Sq. foot multi discipline lab housing 7 Laboratories: Embedded Edge Computing, Nanocomputing, Trusted Systems, Agile Software Development, and 3 Quantum Labs along with a Video Wall for demonstrations focused on research and development of unconventional computing architectures, networks, and processing that is secure, trusted, and can be done at the tactical edge.

$6.5 Million laboratory possesses world class capabilities in Neuromorphic based hardware characterization and testing, secure processing and Quantum based Communication, Networking, and Computing.

Chief, Mr. Greg Zagar
Deputy Chief, Mr. Michael Hartnett

315.330.7753

ECF EMBEDDED EDGE COMPUTING LABORATORY

Enables high performance embedded AI/ML processing on-board airborne platforms and space platforms.

427 Sq Ft laboratory is supporting high performance Edge processing R&D programs and projects. These efforts are all Domain and the advanced computing architectures directly support ground, Air and Space missions. The chips and boards being tested include neuromorphic multi-chip processing boards and large scale edge processing.

The equipment includes IBM TrueNorth, Intel Loihi, 3UVPX distributed heterogenous computing and test beds for space experiments. The HPC systems in the facility are connected more HPC resources in G-7 and G-6 over 1ØØGb/s fiber. This capability allows access to many resources and large data sets used to develop, train and evaluate performance.

Resources

The equipment includes IBM TrueNorth, Intel Loihi, 3UVPX distributed heterogenous computing and test beds for space experiments. The HPC systems in the facility are connected more HPC resources in G-7 and G-6 over 1ØØGb/s fiber. This capability allows access to many resources and large data sets used to develop, train and evaluate performance.

Examples

The AFRL 6.3 SE3PO and 6.2 NICS+ programs leverage the facility for many of their S&T efforts. The integration of the Secure Processor is in the adjacent laboratory and allows for better testing and demonstration in this facility.

Primary POC: Mark Barnell, RITB
Primary Alternate POC: Pete Lamonica


NASC
NAVMAR APPLIED SCIENCES CORPORATION
EXPERIMENTAL
EXTERNAL POWER
28 VOLT DC

ECF NANOCOMPUTING LABORATORY

Research and development of unconventional computing architectures and paradigms.

724 Sq ft. the Nanotechnology Laboratory focuses on the research and development of unconventional computing architectures and paradigms. This laboratory possesses world class capabilities in nanodevice and neuromorphic based hardware characterization and testing.

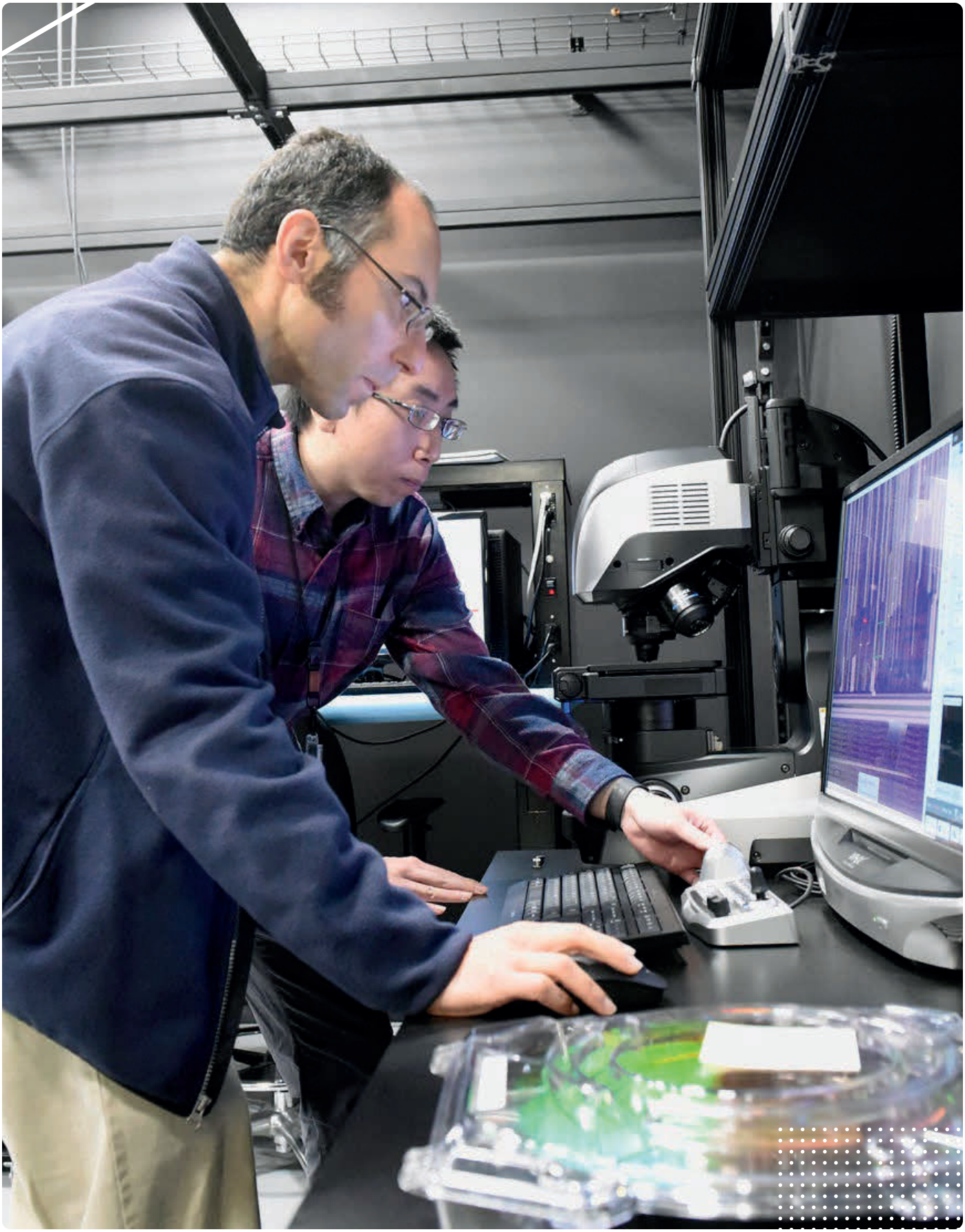
Equipment

Semi-automatic probe station, variable temperature stage, and device analyzer; Circuit design, test, and evaluation; Neuromorphic computing architecture test and evaluation; Semi-automatic wire bonder; Digital microscope, up to 6,ØØØx magnification; and Laser scanning microscope, up to 28,ØØØx magnification.

Examples

- Computational Diversity for Cyber Security.
    - Physically Unclonable Functions measurements
- In-house Neuromorphic computing for very large test and evaluation data analysis.
- Laboratory Research Initiation Request (LRIR).
    - Reservoir computing for process perception, prediction, and control
    - Understanding and analyzing entropy sources in metal oxide memristive devices for use in security primitives
    - Methods for developing secure nonlinear computer architectures
- Tri-Service Advanced Research for the Advancement of S&T Priorities (ARAP) Program.
    - A Combined Development Pipeline for Novel Neuromorphic Hardware (NeuroPipe)

Primary POC: Clare Thiem, RITB
Primary Alternate POC: Nathan McDonald, RITB
Alternate POC: Kang Jun Bai, RITB
Alternate POC: Pete Lamonica, RITB



ECF TRUSTED SYSTEMS LABORATORY

Used for test and evaluation of custom Processor chips, packages, sockets, and printed circuit boards.

482 Sq ft. electrostatic discharge (ESD) restricted area with ESD benches, computer benches, and a conference table. Room is equipped room with access to NIPRnet and DREN.

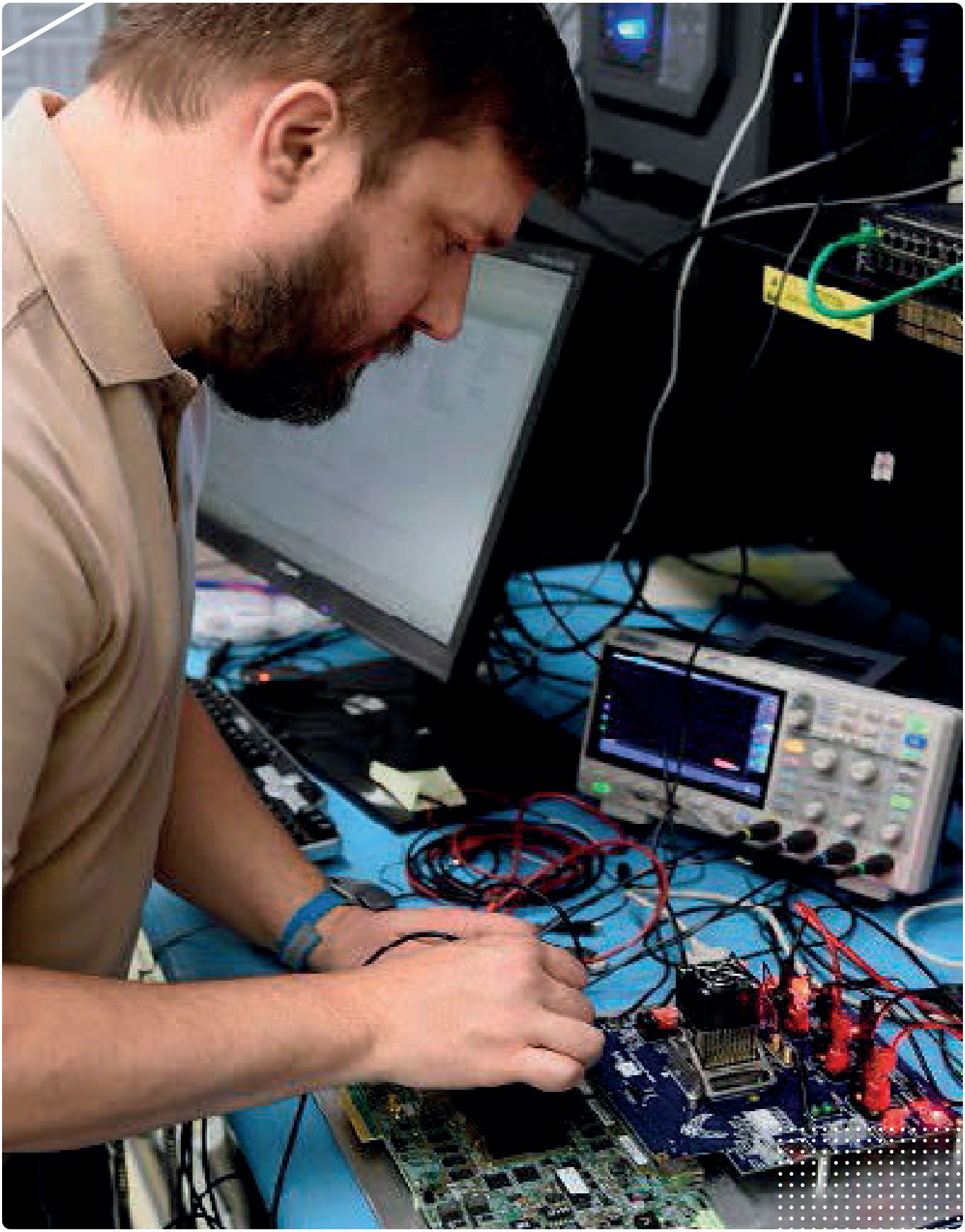
This laboratory contains power supplies, 1 GHz/5Gsps mixed domain oscilloscope with full serial decoding and triggering suite, field-effect transistor (FET) and 1GHz differential probes, digital multimeters, high-end developer workstations, custom processor chips, packages, FPGA kits and boards.

In the laboratory scientist and engineers perform test and evaluation of custom processor chips, testing of ESD sensitive components and processors, and testing and demonstration of 3U VPX based systems.

Examples

- T-CORE
  - A Military-grade secure processor with built-in cyber defensive capabilities, eliminating large classes of cyber threat, developed by AFRL.
- T-CORE Secure Processor
  - Version 1 chip, package, and board are debugged and demonstrated in the Trusted Systems Laboratory.
- The 3U VPX board
  - With embedded Version 1 chip undergoes testing and demonstration in the Trusted Systems Laboratory as well as ongoing T-CORE Version 2 design and emulation.

Primary POC: Matthew Gaalswyk, RITA
Primary Alternate POC: John Rooks, RITA
Alternate POC: Courtney Raymond, RITA



ECF AGILE SOFTWARE DEVELOPMENT LAB

An agile workspace to enable state-of-the-art team approach for rapid software prototyping and testing.

425 sq ft. space featuring six adjustable workstations each with a high-performance laptop computer. Each workstation is wired to a dedicated 55-inch wall monitor for pair programming. Two cameras and a mobile whiteboard for teaming needs. Six lounge chairs and small work tables around the outer perimeter. Selectable (Opaque/Clear) privacy glass surrounds entire lab.

Resources

Scientists and engineers have access to high-performance laptop computer at each of six adjustable workstations, six 55-inch wall monitors for pair programming and agile software prototyping, wired connectivity to RRS R&D network, capable of connecting securely to RRS High Performance Computing Affiliated Resource Center (HPC-ARC) resources as well as to DoD Supercomputing Resource Centers (DSRCs), and wireless connectivity to the RRS OA network.

Capabilities

This laboratories capabilities include rapid prototyping and testing of high performance edge computing software applications, robust and secure artificial intelligence/ machine learning (AI/ML) software development, and guided by agile and DevSecOps principle.

Examples

- AFRL Commander's R&D Fund (CRDF) project
  - Robust and Secure Machine Learning
  - ML model development and testing
- Secure Extreme Embedded Exploitation and Processing On-board (SE3PO) program
  - MLOps
  - DevSecOps application development

Primary POC: Pete Lamonica, RITB

ECF QUANTUM TAU (A)

Connecting trapped-ion based quantum memory nodes with photon- based interconnects for quantum networking and distributed quantum information processing.

877 Sq Ft. (TAU A and TAU B) ECF Quantum Lab Tau (A) research focuses on interfacing trapped-ion based quantum memory nodes with photon-based interconnects to realize communication protocols over a quantum network. The quantum memory nodes consist of linear arrays of trapped-ion quantum bits (qubits) that are manipulated with laser and microwave fields. Remote memory nodes are connected via photon-based interconnects through remote entangling schemes and/ or entanglement swapping techniques. Within the memory nodes, quantum information processing tasks are carried out using phonon- mediated entangling protocols. Extending the size and number of these network nodes enables distributed quantum information processing capabilities.

Capabilities

- Ultrahigh vacuum chambers
- Trapping ions in surface electrode ion traps
- Photon-mediated entanglement in a trapped ion system
- Phonon-mediated entanglement in a trapped ion system
- Entanglement mapping/swapping for quantum networking protocols
- PC board processing
- 3D printing

Examples

- Connecting Quantum Capabilities
- Established trapped-ion memory node capability
- Quantum Information Science

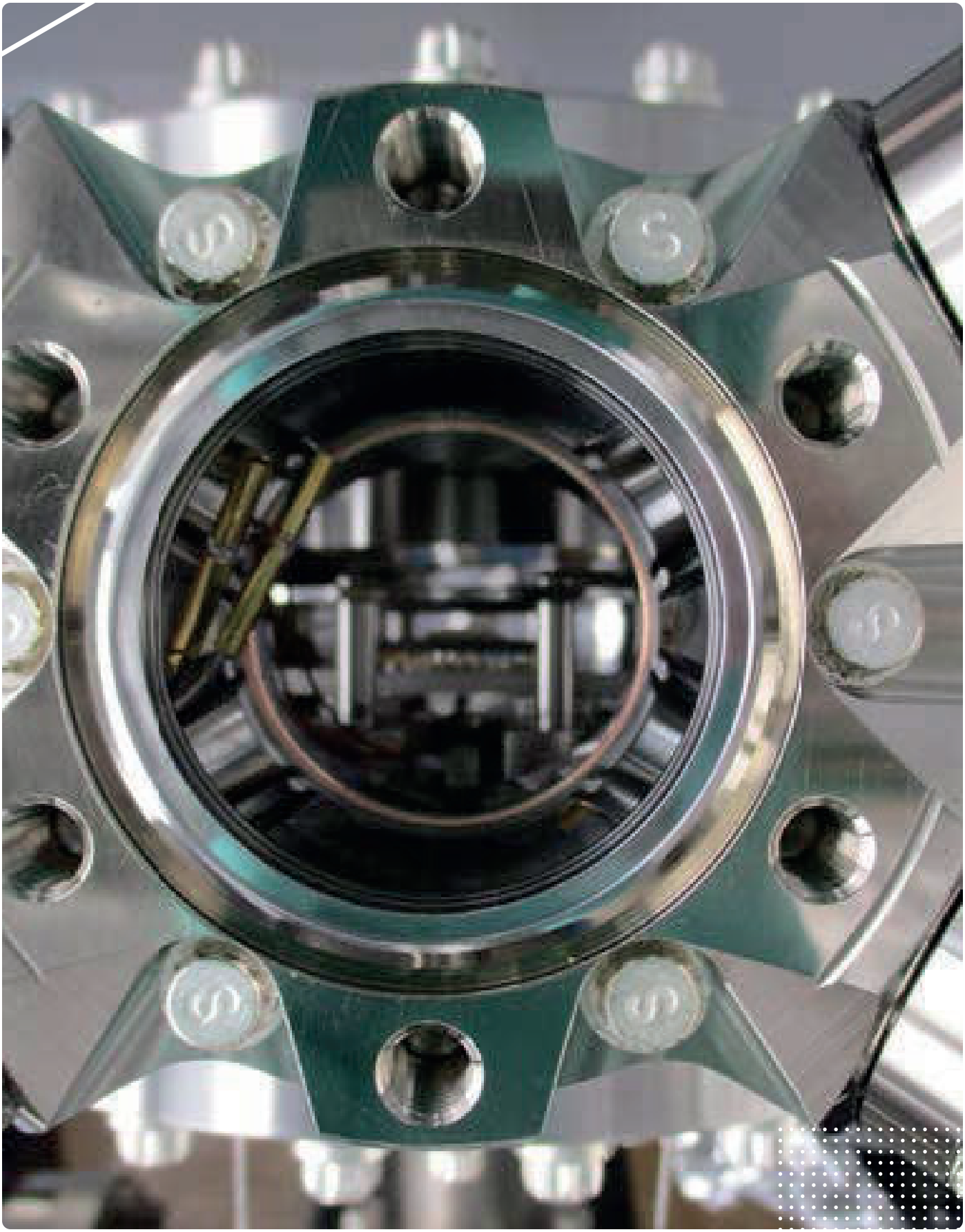
Resources

This state-of-the-art laboratory includes multiple frequencies of continuous wave lasers for ion trapping, manipulation, entanglement, and detection for both ytterbium and barium atoms; the accompanying acousto- and electro-optic modulators for frequency shifting; a pulsed laser system for remote-ion entangling operations and multiple radio frequency and microwave sources.

The laboratory also includes the other experimental infrastructure needed for the research including oscilloscopes, network analyzer, spectrum analyzer, computers, custom-electronics for trapped ion experimental control, electron-multiplying charge coupled device (EMCCD) camera, photon multiplier tubes, wavemeter, fiber optics, various optical components, and ultrahigh vacuum chambers with the necessary ion pump and getter technologies.

A clean room/bake-out facility contains a Class 1ØØ clean room for ultrahigh vacuum component cleaning, surface ion trap installation, and final vacuum chamber assembly. A modified computer-controlled bake-out oven with a pumping manifold allows preparation of the ultrahigh (1Ø-12 Torr) vacuum environment. In addition, the clean room/bake-out facility includes ultrasonic cleaners, storage cabinets, soldering tools, and a spot welder.

Primary POC: David Hucul, RITQ
Primary Alternate POC: Zach Smith, RITQ
Alternate POC: Vijit Bedi, RITGA
Alternate POC: Don Telesca, RITQ
Alternate POC: John Perretta, RITGA



ECF QUANTUM LAB TAU (B)

Focused on integrating quantum data encryption and quantum key distribution with high data rate. Focused on integrating quantum and classical channels to determine how best to transmit quantum information over a standard network link.

877 Sq Ft. (TAU A and TAU B) ECF Quantum Lab Tau (B) is focused on integrating quantum data encryption and quantum key distribution with high data rate, free space optical communications to reduce size, weight and power for secure, high capacity communication links. The atmospheric distortion inherent in the free space channel is compensated by the use many methods, including the use of adaptive optics. To understand distortion and jitter across optical links, the laboratory supports a stationary link from the main campus to the test site at the Stockbridge Research Facility, a 30km straight line distance; point to point links between nodes at Stockbridge Research Facility, and an atmospheric-controlled benchtop point to point link in ECF Quantum Lab Tau (B). These links are used to characterize the atmospheric effects on the optical channel and correlate the environmental conditions with link performance.

Resources

- Tektronix OM4106D Coherent Lightwave Signal Analyzer
- High speed oscilloscopes
- Arbitrary waveform generation
- NuCrypt Alpha-Eta optical encoding system
- A Optix free space optical communication terminal with adaptive optics

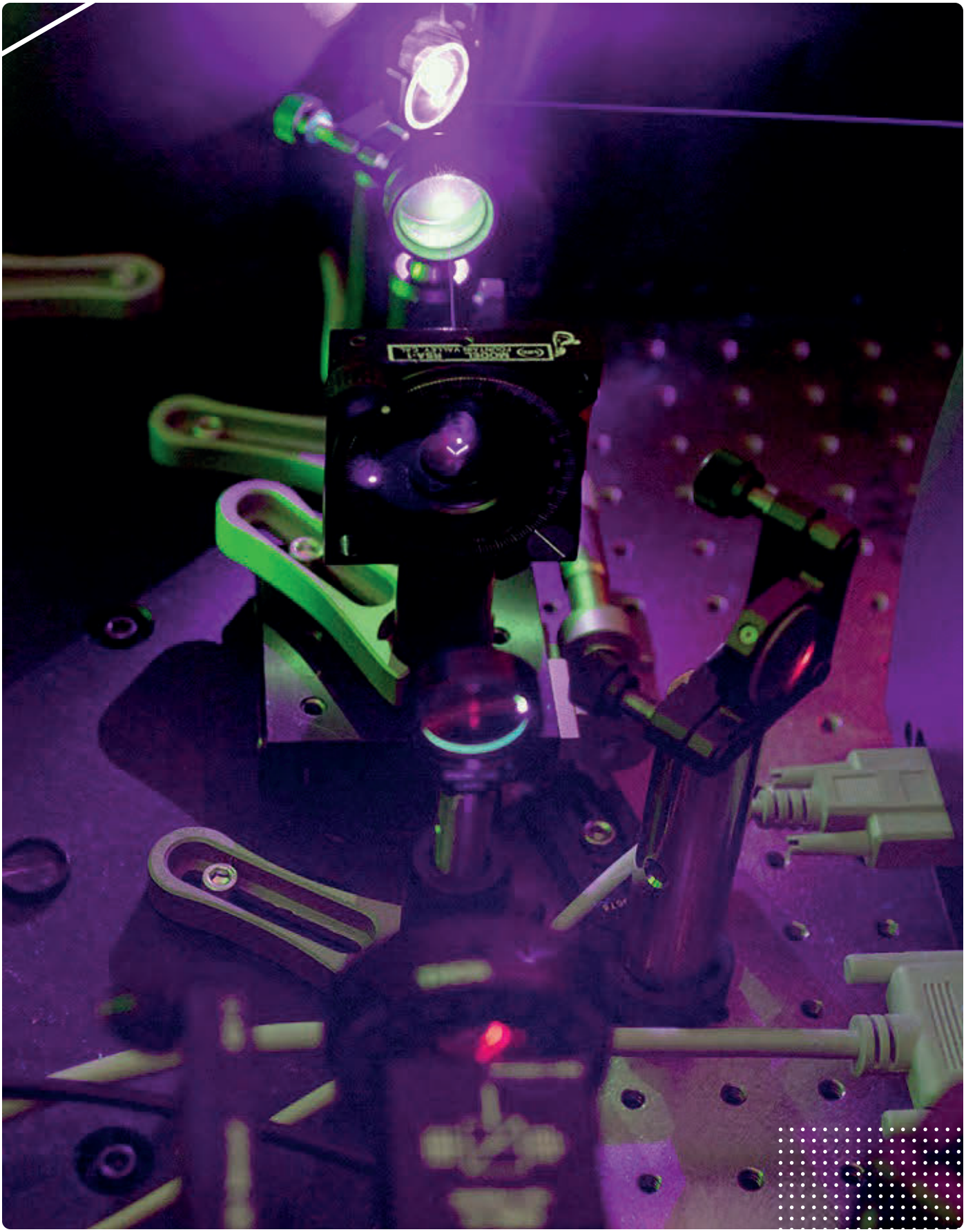
Capabilities

- Coherent signal analysis
- Secure optical communications testing over a 30km free space optical range

Examples

- Secure high capacity information transport via optical wireless links
- Measuring quantum data encrypted modulation states

Primary POC: David Hucul, RITQ
Primary Alternate POC: Zach Smith, RITQ
Alternate POC: Vijit Bedi, RITGA
Alternate POC: Don Telesca, RITQ
Alternate POC: John Perretta, RITGA



ECF QUANTUM LABORATORY LAMBDA

Developing systems that utilize photon-based entangled states for entanglement distribution, distributed quantum information processing, quantum transduction, and quantum networking.

This one-of-a-kind-in-the-Air Force laboratory supports research and development in the fields of high-dimensional entanglement, quantum transduction, entanglement distribution, quantum information processing, distributed information processing, and quantum networking. The Information Directorate Quantum Information Processing group focuses on research in linear optics quantum computing, quantum gates and circuits, implementation of quantum algorithms on photon-based hardware, quantum information processing, entangled photon generation, quantum cluster state generation, continuous variable cluster state generation, quantum transduction, efficient quantification of quantum states, and foundry level fabrication of scalable quantum systems. This research encompasses both bulk optics, fiber-optics, and integrated photonics. The overarching goal of all these research areas is to construct systems that can perform both local and distributed quantum networking, quantum information processing, and entanglement distribution.

Resources

The 891 square foot Class 4 laser facility contains continuous wave and pulsed lasers for conducting photon-based quantum experimental research implemented in bulk and integrated optics. The facility spans the gamut of photon-based quantum information processing with the ability to create photon quantum bits (qubits), entangle these qubits into larger quantum states, quantify the quantum state, perform quantum state manipulation/ information processing, and transduce between different qubit modalities. The Quantum Information Processing Laboratory has numerous testbeds for experiments with quantum integrated circuits and the accompanying set of classical (photon number >>1) and quantum (photon number ~1) measurement tools.

- RF synthesizers/generators
- Spectrum analyzers
- Network analyzers
- Power meters (pulsed and continuous)
- Automated Data Acquisition System
- Antenna positioner system
- Communications/radio sets
- Infrared Thermal Imaging System
- RF and microwave signal sources
- Very High Frequency/Ultra High Frequency, microwave, and millimeter wave antennas
- Video cameras/monitoring equipment
- Oscilloscopes
- Variable frequency “S” parameter vector network analyzer
- Frequency, voltage, current and resistance instrumentation
- Fiber optic telemetry equipment
- Pick-N-Place machine
- Re-flow oven
- SMD rework station
- PCB milling machine
- Environmental chamber
- Electrostatic discharge approved work area
- 3D Plastic printing

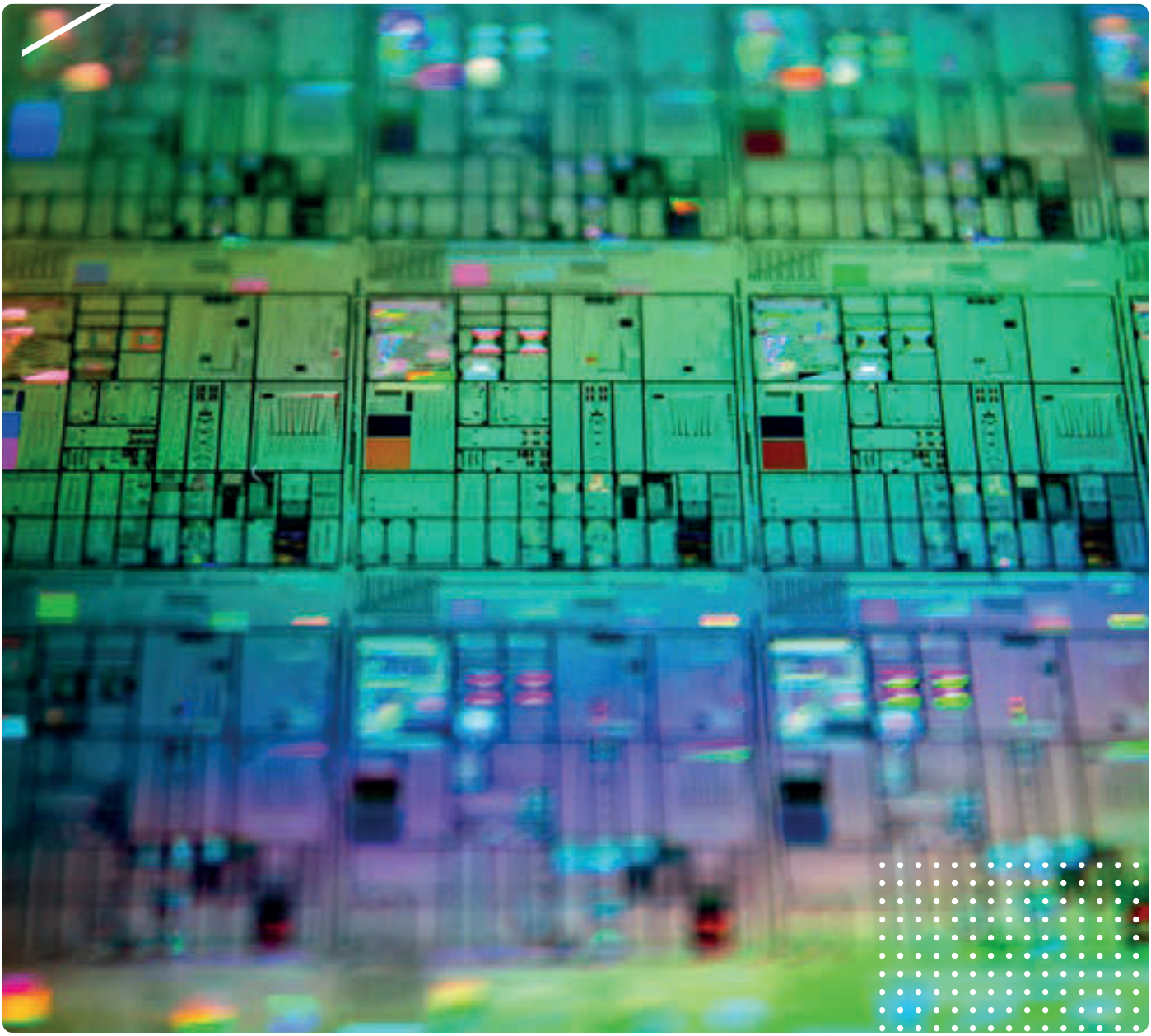
Primary POC: Amos Smith, RITQ
Primary Alternate POC: Chris Tison, RITQ
Alternate POC: Don Telesca, RITQ

Capabilities

- Single and entangled photon generation
- High quantum efficiency single and entangled photon detection
- Optical/Electrical chip probing
- Multi-wavelength photon analysis
- Quantum circuit testing and analysis
- PC board processing
- 3-D printing of components

Examples

- Connecting Quantum Capabilities
- Quantum Compressed Sensing
- Integrated Quantum Photonic Circuits
- Quantum Entanglement Witnesses
- Cluster State Quantum Computing



ECF QUANTUM LAB DELTA

The goal is to develop superconducting and heterogeneous quantum hardware for (1) utilizing entanglement as a resource for quantum networking and distributed quantum information processing; and (2).

The 877 square foot laboratory focuses on interfacing different qubit modalities to maximize the distribution of quantum information. This research has applications for the areas of quantum information science, particularly quantum networking and distributed quantum information processing. The Superconducting and Hybrid Quantum Systems Group focuses on designing, characterizing, and investigating the properties of novel superconducting circuitry, quantum electromechanical and optomechanical devices, microwave- optical converters, and quantum interfaces between trapped-ions, integrated photonics, and superconducting circuits. As well, the group aims to investigate 3D-integrated heterogeneous quantum architectures; modular superconducting qubit architectures; and approaches to implementing quantum interfaces across large temperature gradients – such as between milli-Kelvin and Kelvin or ambient temperatures. The overarching goal of this research is to develop the building blocks for field-deployable quantum networking and information processing technology.

Resources

This state of the art facility includes multiple cryogen-free refrigerators for performing low frequency, microwave, and optical measurements at milli-Kelvin temperatures; vacuum equipment including turbo pumps and helium leak detectors; FPGA-based data acquisition and quantum measurement control hardware, including arbitrary waveform generators and digitizers; baseband generators and IQ mixing hardware; ultra-low phase noise analog and vector microwave generators; precision lock-in amplifiers; vector network analyzers; spectrum analyzers; ultra-low noise cryogenic amplifiers; and cryogenic microwave filters, circulators, isolators, switches and attenuators.

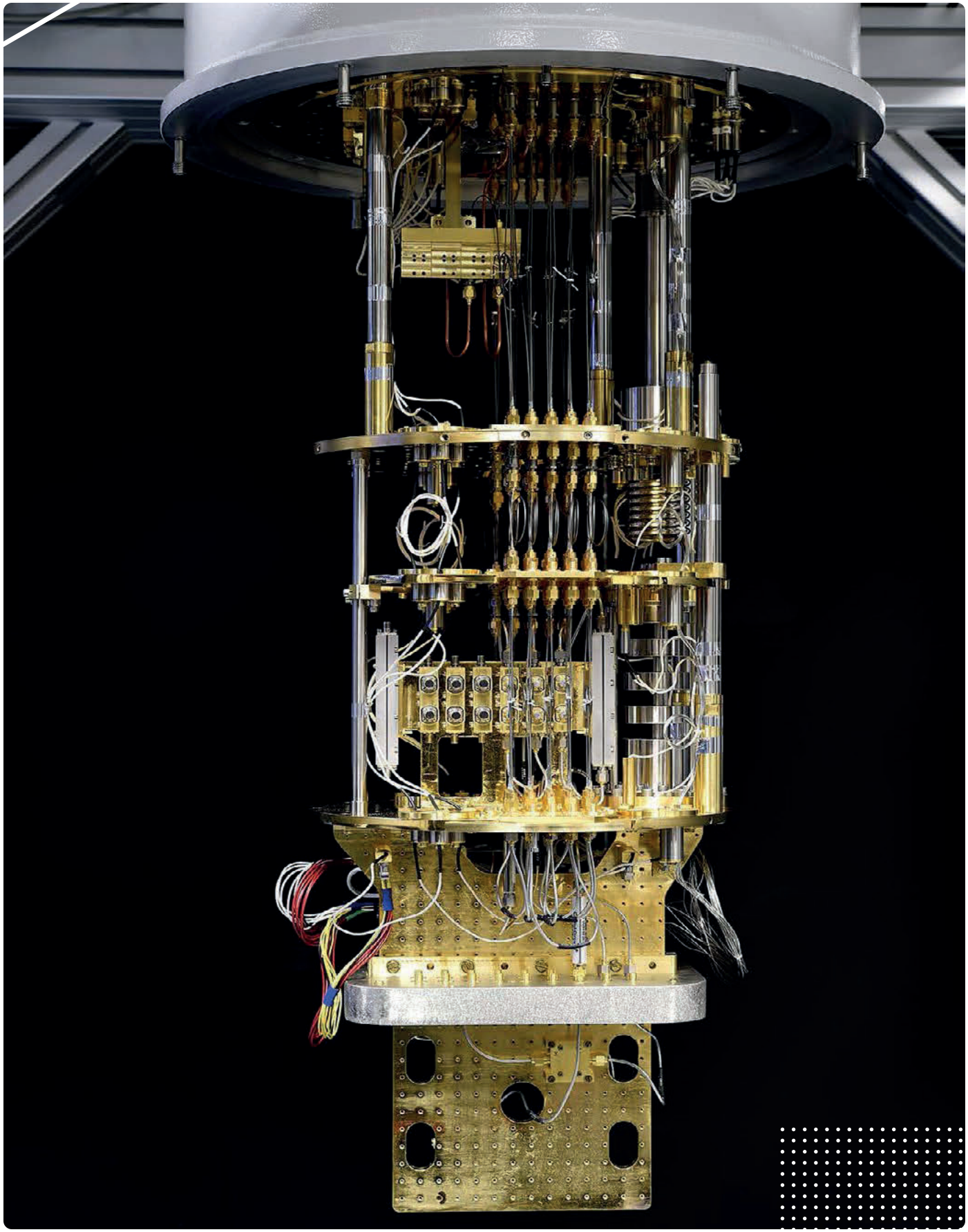
Capabilities

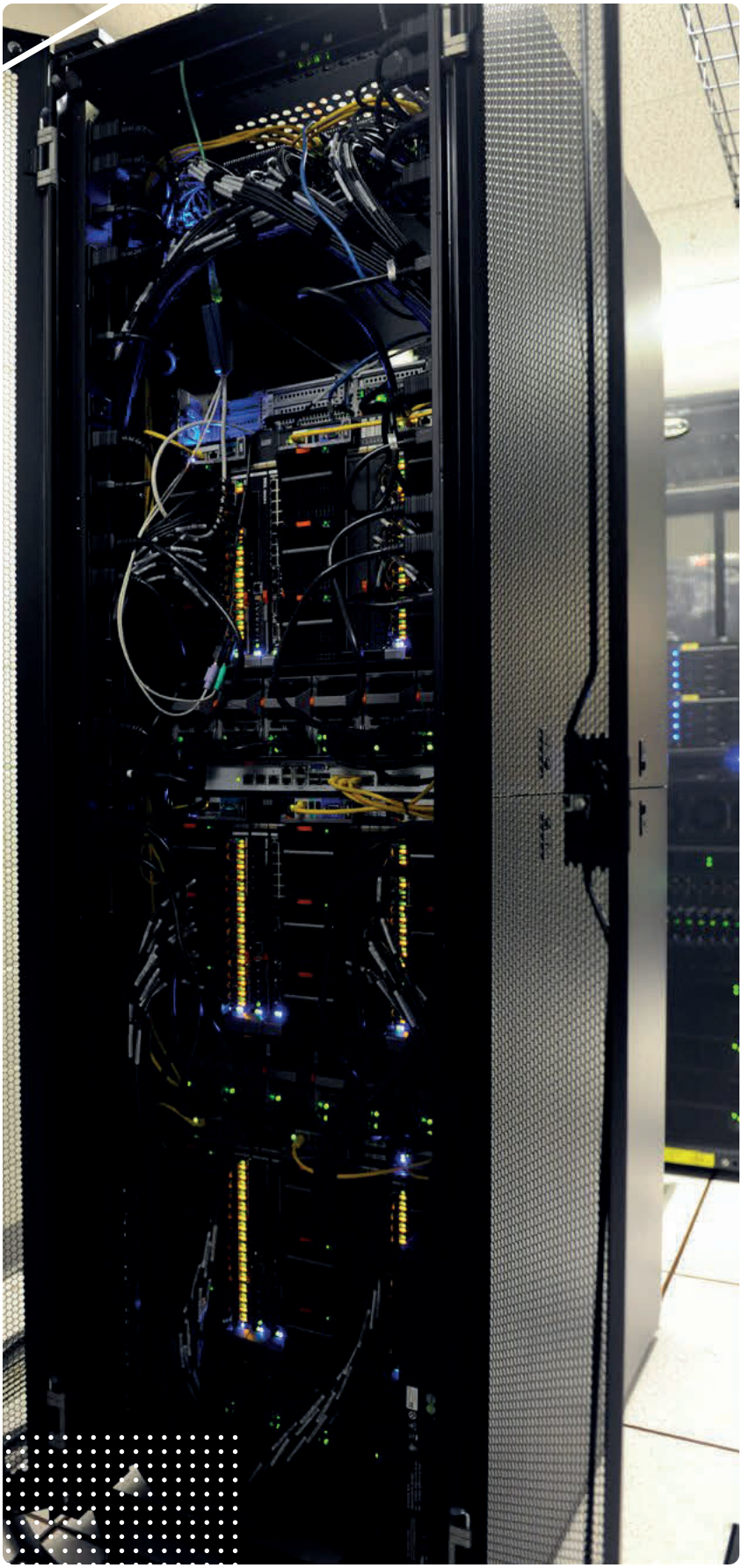
- Quantum measurement of superconducting qubits, super conducting circuitry, electromechanical and optomechanical systems, trapped-ion systems (future), and integrated photonic systems (future)
- Milli-Kelvin electronic measurements of thin films and novel materials
- Finite element simulation of microwave and electro mechanical systems
- Open-quantum systems simulation of quantum devices

Examples

- Connecting Quantum Capabilities
- Entrepreneurial Research Fund – Development of Super conducting Metamaterials for Quantum Networking

Primary POC: Matt Lahaye, RITQ
Primary Alternate POC: Erin Sheridan, RITQ
Alternate POC: Dan Campbell, RITQ
Alternate POC: Mike Senatore, RITQ
Alternate POC: Don Telesca, RITQ





HIGH PERFORMANCE COMPUTING-AFFILIATED RESOURCE CENTER (HPC-ARC)

Provides tomorrow's Air Force with massively scalable HPC applications and connectivity to the HPCMP Defense Research and Engineering Network (DREN) and Secret Defense Research and Engineering Network (SDREN).

Affiliated Resource Centers (ARCs) are Department of Defense (DoD) laboratories and test centers that acquire and manage HPC resources as a part of their local infrastructure.

ARCs share their HPC resources with the broader DoD HPC user community via a High Performance Computing Modernization Program (HPCMP) through coordinated allocation of their HPC resources.

In order to provide tomorrow's Air Force with massively scalable HPC applications, the software must be developed on large clusters. Unlike typical HPC clusters, all Air Force Research Laboratory Information Directorate clusters allow for interactive development and testing.

Primary POC: Mark Barnell, RITB
Primary Alternate POC: Pete Lamonica, RITB

Resources

The HPC-ARC has several super computers that have been designed, integrated and are operational.

- OFFSPRING Cluster
  - 1ØØTflop/s (Dense Heterogeneous Computing):22 Servers (1U – Xeon E5-266Ø and E5v269Ø, (dual) NVIDIA TeslaP1ØØs GPUs, 128GB RAM, 4ØGbE (Lustre 48ØTB), 56Gb/s FDR Infiniband). Supports the Neuromorphic applications and runs the TrueNorth software development suite and compass emulator.
- ASID
  - 48 node blade server HPC, heterogeneous dense computing, each blade server has an Intel Xeon dual socket 8core E5-267ØV2, with 128GB of Ram. The network and file system have Dual 1ØGbE.
- Blue Raven
  - World's largest Neuro-Synaptic supercomputer enabling large-scale AI/ML applications: 64M Neurons and 16.3 billion Synapses, Max 67 Watts (15 Watts per NS16e), 4 x PCIe optical connector - 5ØØ Mbytes/s, 4 x 1 Gb/s Ethernet.
- Athena
  - 1Ø node 1U blade server HPC, heterogeneous dense computing, each blade server has an Intel Xeon dual socket 12core E5-267ØV2 and 4 V1ØØGPUs with 256GB of Ram. The network and file system have Dual 1ØØGbE for large AI/ML models and big data efforts.
- Minerva
  - OUSD funded GPGPU cluster supports large scale AI/ML applications from hundreds of data sources. 8 large HPC nodes with 8 Nvidia GPUs, ingesting hundreds of 4Kdata streams, combining large memory and dual rail 1ØGbE to scale/fan out data and processing in parallel.

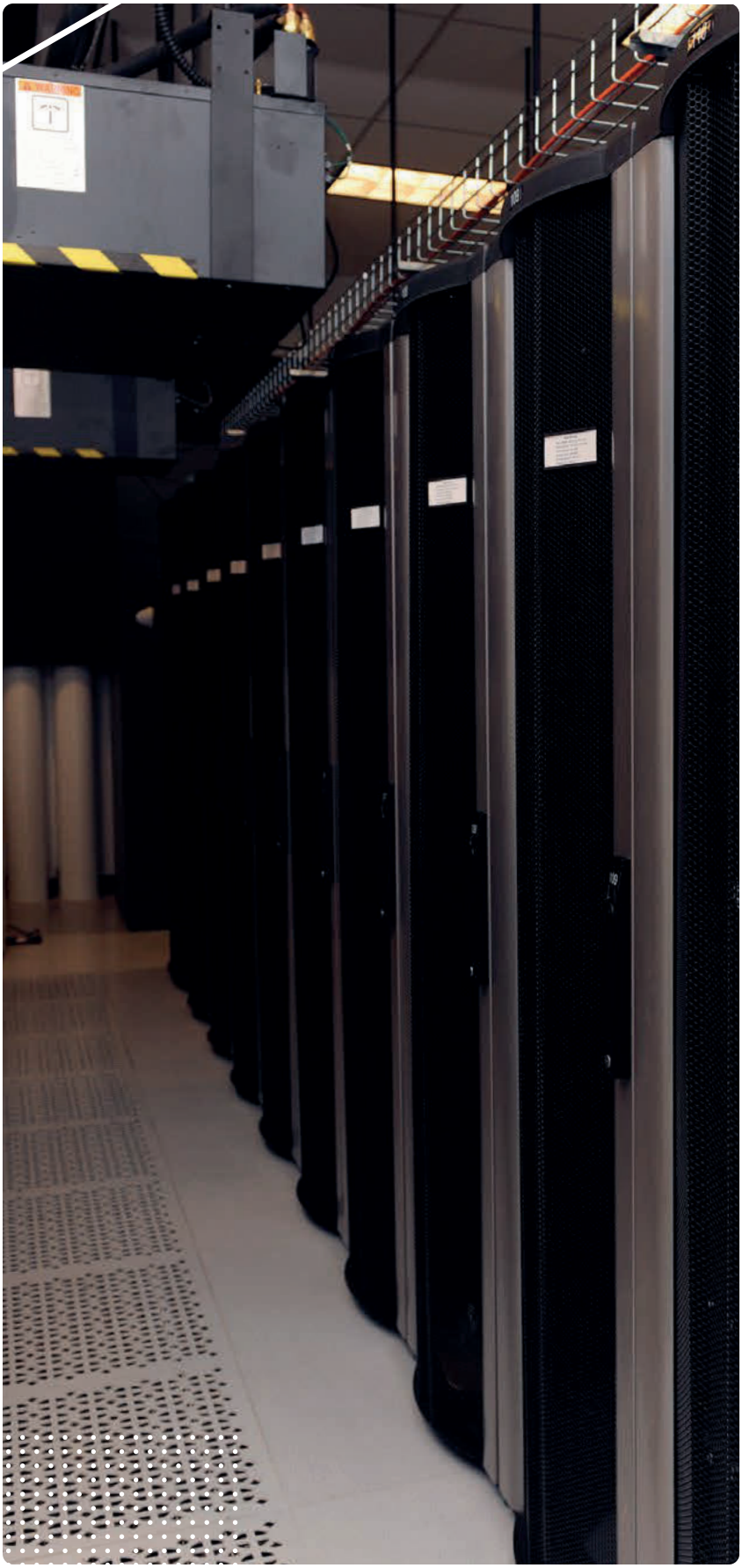
Capabilities

Authorization to Operate which will include the Owl Technology DIODE, allowing file transfers and streaming of User Datagram Protocol packets into the HPC-ARC real time from Stockbridge Facility.

Defense Research and Engineering Network (DREN) Internet service provider (ISP) Benefit ($2ØØK/yr), the HPC-ARC DREN connection/DREN III/IV (1Gbs future 1ØGbs) and security assessment is covered by the HPCMP.

Examples

- Advanced Computing at the Edge (ACE+ & S3PEO) and NICS+
- Visual Media Reasoning
- Neuromorphic Fusion for Timely Intelligence and FuelAI
- Airborne Wide Area Synthetic Aperture Radar Processing
- Computational Intelligence and Neuromorphic Computing
- Several of the Commander's Research and Development Fund (CRDF)and SDCP projects including Robust ML
- Stockbridge (High-Bay) Rapid-Link to HPC Experiment and T&E support



CORPORATE RESEARCH AND DEVELOPMENT SERVER FACILITY (CRDSF)

Logical and physical connectivity requirements.

Description. The CRDSF is an access controlled unclassified space hosting 63 racks in an American Society of Heating Refrigerating and Air-Conditioning Engineers Class I environment.

The CRDSF connectivity infrastructure addresses logical and physical connectivity requirements such as isolation of VLANs.

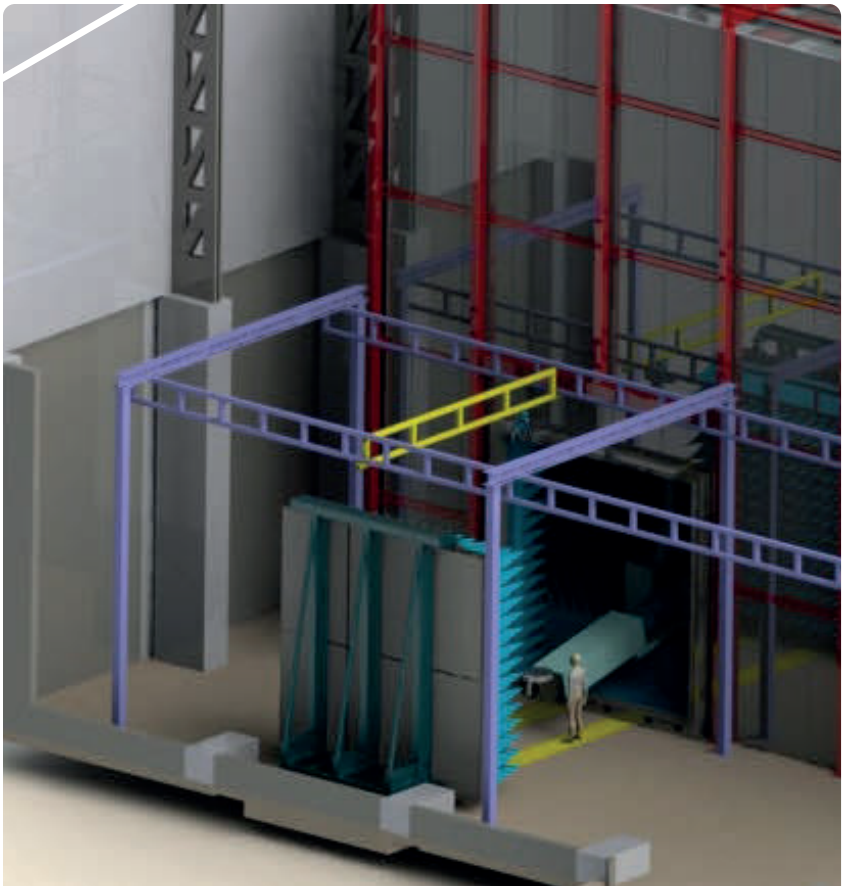
Primary POC: John Heinig, RIT
Primary Alternate POC: Greg Zagar, RIT
Alternate POC: Mike Hartnett, RIT

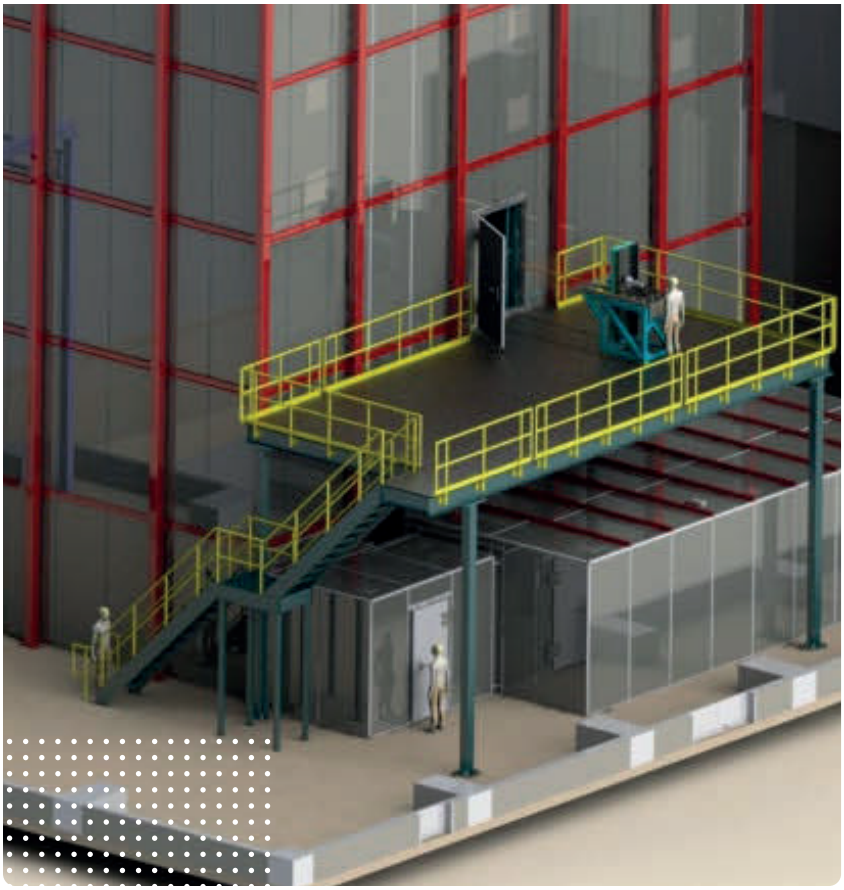
Capabilities

- An unclassified controlled access server environment for the Air Force Research Laboratory programs to expand capabilities and enhance applied technologies
- ASHRAE Class I environment
- Conditioned and protected electrical service

Examples

- Command and Control Concept Center
- Cyber Command and Control Test Bed
- Open Architecture Distributed Common Ground System
- Exploitation of Audio
- High Performance Computing Affiliated Resource Center Clusters
- Independent Testing and Evaluation Center
- Multi Level Security View
- Trusted Network Environment
- Rome - Stockbridge - Newport Networking
- Web Enabled Temporal Analysis System-Tool Kit





CORPORATE AGILE SPECTRUM ENVIRONMENT (CASE) FACILITY

COMING IN FY25

Fast. Efficient. Adaptable. Capable.

The CASE Multi-Domain Secure Facility (MDSF) has been designed from the outset to serve the RF measurement and Network needs of the Air Force. Targets large and small are safely handled from arrival on a truck to positioned in the Quiet Zone with unprecedented levels of automation. Data acquisition and reduction can be configured per customer needs. Security levels can be rapidly changed across the spectrum. If it radiates and you want to know more about it, let's talk.

Primary POC: John Heinig, RIT
Primary Alternate POC: Greg Zagar, RIT
Alternate POC: Mike Hartnett, RIT

Resources

- Anechoic Chamber: 95.5’ (L) x 47.25’ (W) x 46.5’ (H)
- Shielding Level: 1ØØ dB
- Frequency Range: 5ØØ MHz – 36 GHz
- Microwave Absorber: 4’ Pyramid (3’ Pyramid on Feed Wall)
- Feed Antenna System: Roll Mounted Access from External Mezzanine
- Fire Protection: ECARO - 25 Clean Agent with VESDA Detection
- Control Room: 1ØØ dB Shielding with Secure RF and Data Access 15’ (L) x 37’(W) x 12’(H)

Capabilities

Multi-Domain Secure Facility

CASE will be unique in the AF in that it will be able to operate at adjustable classification levels spanning unclassified to special access depending on the type of technology being tested in it. Technology at various classification levels can then be tested regularly, timely, while keeping cost down. Ultimately, CASE will accelerate transition of RF related technology to our Warfighters.

CASE will support technical research and development in areas that include System Cyber Assessments, Secure Satellite Design, 5G/ Future G Operations, Contested Environment Operations, Counter UAS, Nuclear Deterrence, and Joint All Domain Command and Control (JADC2).

CASE is a state-of-the-art RF MDSF measurement facility designed to the most stringent physical, electromagnetic, and security standards. Its broadband architecture and test zone purity provide the optimal environment for quality antenna characterizations, GPS simulations, and generalized free-space RF measurements. The facility is equipped with a one-of-a-kind target positioning system, which enables operators to place even the most complex targets within the test zone from the safety of ground level.

A multi-axis target support places targets accurately, efficiently, and with superior repeatability. The chamber feed system enables the operator to utilize a wide array of interchangeable antennas that are easily accessible with direct pathways to control room equipment. Interior chamber walkways provide ample space for test equipment placement, including remote antenna towers for diverse RF testing scenarios. Equipment load safety factors and fire protection technologies have been implemented to ensure personnel safety during every facet of facility operation. The MDSF has been designed to provide safe, accurate, and complex measurements for years to come.

Right on Target

- Target Access: Fully Automated Kneeling Tower via 4.8m Automated Door
- Target Max: Payload: 5ØØ lbs., Size: up to 2Ø feet
- Target Positioner: Roll/Yaw/Pitch/Translation
- Target Handling: 1-Ton Gantry Crane


AC

INNOVARE ADVANCEMENT CENTER

A front door to the Air Force Research Laboratory, Information Directorate, Rome, NY.

The Innovare Advancement Center is owned by Oneida County, leased by the Griffiss Institute, and used by the Information Directorate to foster collaboration with foreign and domestic academia, government, and industry partners to carry out technology transition/transfer and workforce development. It provides joint research space for discovery and technology advancement of scientific research through synergistic partnerships with researchers, academics, entrepreneurs and innovators.

The Innovare Advancement Center is just outside the gates (within easy walking distance) of the Information Directorate, located at 592 Hangar Road in Rome, NY – the heart of New York State's Mohawk Valley.

Open Innovations Opportunity Lead: John Gancasz, RIBA
IAC RIT Occupied Labs POC: Greg Zagar, RIT
IAC RIT Occupied Labs POC: Mike Hartnett, RIT

315-330-4061


INNOVARE
ADVANCEMENT CENTER

INNOVARE ADVANCEMENT CENTER

A front door to the Air Force Research Laboratory, Information Directorate | Rome, NY

An open and collaborative business model facilitating:

- Basic research collaboration with partners in command, control, communications, computers, intelligence and cyber technologies
- Rapid prototyping to assess viability
- Commercialization and technology spinout from the Information Directorate
- Workforce development and exploration
- Non-traditional and small business outreach
- Science, technology, engineering and mathematics (STEM) youth development
- Collaboration and event space
- Innovation incubation

An agile and transformative ecosystem that connects global technology leaders to collaborate and solve complex Air Force computing challenges. Situated in a single location, with a robust environment which co-locates partners, offices, labs, and event spaces.

Innovare Advancement Center ecosystem:

- Academia
- Defense institutions
- Local, regional, and state government
- Non-traditional industry
- Corporate entities
- International partners
- Local cohorts

State-of-the-art research and development enablers:

- Quantum information science laboratory facilities
- Small unmanned aerial systems testing
- Computing and communication science laboratory facilities
- Open campus engagement zones with collaborative work and meeting Spaces

Let's innovate together! Join us at the Innovare Advancement Center ecosystem

IAC-RIT OCCUPIED
QUANTUM LABORATORY NORTH AND SOUTH

Open research environment for research into quantum networking and quantum information processing by hybridizing trapped-ion and superconducting based quantum memory nodes with photon- based interconnects.

The Innovare Advancement Center quantum labs support research and development with the Air Force Research Laboratory that is easily accessible to academia and industry partners.

The quantum laboratories focus on quantum networking and distributed information processing with ion-trapping, superconducting circuit, and integrated photonic quantum technologies. All three technologies co-occupy a single 1,500 sq. ft. laboratory space to enhance collaborative opportunities. A second 1,500 sq. ft. laboratory contains additional ion-trapping setups, a drone testing environment, soldering workbenches, chip packaging capabilities, and an ultrahigh vacuum preparation area.

Resources

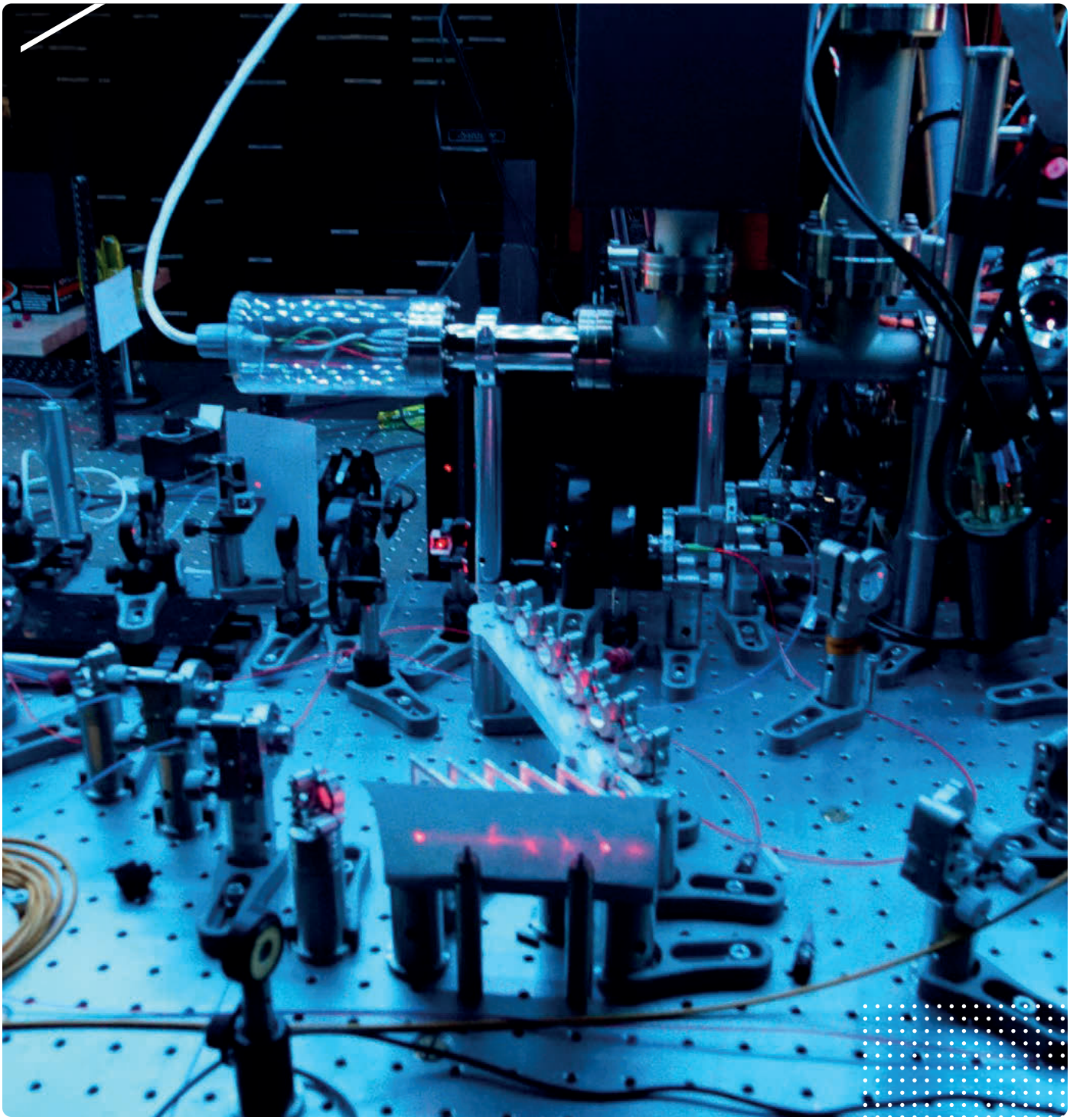
- Cryogen-free adiabatic demagnitization refrigerator (ADR)
- Cryogen-free dilution refrigerator
- FPGA-based data acquisition and quantum measurement control hardware, including arbitrary waveform generators and digitizers
- Ultra-low phase noise analog and vector microwave generators
- Precision lock-in amplifiers, vector and spectrum analyzers
- Multiple frequencies of continuous wave lasers for integrated photonics and ion trapping; manipulation, entanglement, and detection for photonic qubits, ytterbium atoms, and barium atoms
- Acousto- and electro-optic modulators for frequency shifting
- Pulsed laser system for remote-ion entangling operations
- Custom-electronics for trapped ion experimental control,
- Electron-multiplying charge coupled device (EMCCD) camera,
- Photon multiplier tubes,
- Wavemeter, fiber optics, various optical components
- Ultrahigh vacuum chambers with the necessary ion pump and getter technologies.

Capabilities

- Trapping ions in surface electrode ion traps
- Photon-mediated entanglement in a trapped ion system
- Phonon-mediated entanglement in a trapped ion system
- Entanglement mapping/swapping for quantum networking protocols
- 3D printing
- Milli-Kelvin dc measurements
- Milli-Kelvin microwave measurements
- Superconducting circuit characterization

Primary POC: Zach Smith, RITQ
Primary Alternate POC: David Hucul, RITQ
Alternate POC: Matt LaHaye, RITQ
Alternate POC: Dan Campbell, RITQ
Alternate POC: Garrett Percevault, RITQ
Alternate POC: Clayton Craft, RITQ
Alternate POC: Don Telesca, RITQ

- Finite element simulation of microwave and electromechanical systems
- Single and entangled photon generation
- High quantum efficiency single and entangled photon detection
- Optical/Electrical chip probing
- Multi-wavelength photon analysis
- Quantum circuit testing and analysis
- Photon quantum bit generation; entangling these into larger quantum states
- Quantify photonic quantum states
- State manipulation/information processing
- Transduce between different qubit modalities



IAC-RIT OCCUPIED

COMMERCIAL QUANTUM COMPUTER ACCESS

Open research environment for quantum algorithm development and testing on commercial quantum computing hardware.

Quantum Computing research focuses on algorithmic development and testing on commercial quantum computing hardware, and fostering a collaborative government, industry and academic research environment.

Resources

AFRL/IBMQ quantum hub, with access up to IBM's 127-qubit superconducting qubit quantum computer.

Examples

- Quantum Computing Tutorial Development
- Quantum Circuit Design and Characterization
- Multidimensional Quantum Walks and Oracles
- Quantum Machine Learning
    - Quantum Auto Encoders for quantum data compression
    - Constrained Optimization for Job Shop Scheduling

Academic Outreach Opportunities.

- AFOSR Summer Faculty Fellowship Program (SFFP)
- AFRL/RI Visiting Faculty Research Program (VFRP)
- Undergraduate student coops, internships
- Master and PhD graduate student internships and joint thesis research
- Postdoctoral research through e.g., National Research Council (NRC) and Griffiss Institute (GI)
- Industry and academic collaborations through Cooperative Research and Development Agreements (CRADA) and Educational Partnership Agreements (EPA)

Primary POC: Laura Wessing, RITQ
Primary Alternate POC: Dan Koch, RITQ
Alternate POC: Don Telesca, RITQ

IAC-RIT OCCUPIED
COMPUTING LAB

An open place where AFRL and leading external researchers can meet and work together on basic research challenges related to neuromorphic computing and assured systems. This lab provides space and basic support for collaborative investigations on electronics and computing.

This lab supports basic research and demonstrations of electronics and systems.

Neuromorphic computing, artificial intelligence, and machine learning, are investigated spanning from onwafer test of emerging devices to demonstration of systems and algorithms on robotic platforms.

Investigation of assured systems, which may include learning enabled modules, including, but not limited to, automated assurance analysis, testing and monitoring technologies compatible with DevSecOps approaches, will be pursued.

Formal modeling, constraint solving, and automated synthesis techniques will be investigated to capture the intent of software as a separate layer of abstraction from the software itself and drive requirements for verification and bounding of a software model.

Features such as generation of assurance cases, composition techniques, and verification scaling would be investigated, with synthesis and dynamic evaluation techniques to automate as much of the process as is feasible, reducing the cognitive load on engineers to enable modern agile development.

Resources

Full complement of equipment for electronics test and development, from emerging device to full systems. Small scale testbeds for software and algorithms also available. Resources for electronics test include: DC power supplies, waveform generators, oscilloscopes, source meters, breadboards and supplies. 150mm manual probe station for on-wafer electrical test. Resources for prototyping and demonstration include: Xilinx FPGAs, ViperX robotic arm, LIMO mobile robot and test track, NVIDIA Nano development bords. Resources for prototyping and demonstrating cybersecurity and assurance on autonomous systems and vehicles including quadcopters, rovers, dSpace Hardware-in-Loop vehicle simulator and nvidia Jetson boards. PCs and laptops are available for general development, test support and automation.

Capabilities

Electronics test, from on-wafer devices using the probe station to prototype systems. Demonstration of prototype hardware and software/algorithms with robotic platforms, including using ViperX robotic arm to grasp and manipulate objects and LIMO mobile robot to navigate and map in lab test track. Software Assurance tools, approaches, and toolchains for cyber-physical embedded systems – including those composed with learning enabled components.

Primary POC: Clare Thiem, RITB
Primary Alternate POC: Jack Lombardi, RITB
Alternate POC: Qasim Zafar, RITA
Alternate POC: Matt Anderson, RITA
Alternate POC: Courtney Raymond, RITA
Alternate POC: Pete Lamonica, RITB

Examples

- NeuroPipe ARAP program
- Collaboration with Stony Brook University
- AFOSR Lab Task “Novel Test Coverage for Max Operational Capability in Autonomous Systems”
- Collaboration with GE Research and Syracuse University

IAC-RIT OCCUPIED
COMMUNICATIONS LAB

State-of-the-art testbed and laboratory residing at Innovare as a hub for innovations in next generation wireless communications and networking technologies in the emerging spectrum bands such as millimeter wave, sub-millimeter wave and terahertz frequencies.

Current trends of increasing demand in higher data rates and ubiquitous connectivity have motivated research and development in frequency bands above 100 GHz. AFRL has established a state-of-the-art laboratory at Innovare Advancement Center to enable ultra-broadband communications and networking technologies at this new spectrum frontier, to promote community engagement with our small-business, academic and industry partners, and to contribute to the development of next generation wireless communications scientists and engineers.

In higher frequency bands such as millimeter wave and terahertz, where channel properties are affected by mobility and atmospheric conditions, an agile system with a flexible, resilient architecture and the ability to adapt to the changing environment is required. At this state-of-the-art laboratory, a team of AFRL researchers collaborate with academia and industry to develop advanced technologies in architecture, waveform and signal processing that enable access to the emerging spectrum bands for next generation wireless applications. The laboratory also functions as a space for AFRL to showcase government-funded research to the broader commercial and defense communities, to further facilitate partnerships and tech transitions between academia and industry.

Resources

Our advanced testbed consists of radio frequency front-ends capable of at least 10 GHz ultra-broadband bandwidth at 140 GHz, 240 GHz and 340 GHz frequency bands. The laboratory also houses high-end equipment such as arbitrary waveform generator capable of 120 Giga-samples per second with 32 GHz analog bandwidth and digital storage oscilloscopes capable of sampling rate such as 160 Giga-samples per second with 63 GHz of real-time bandwidth.

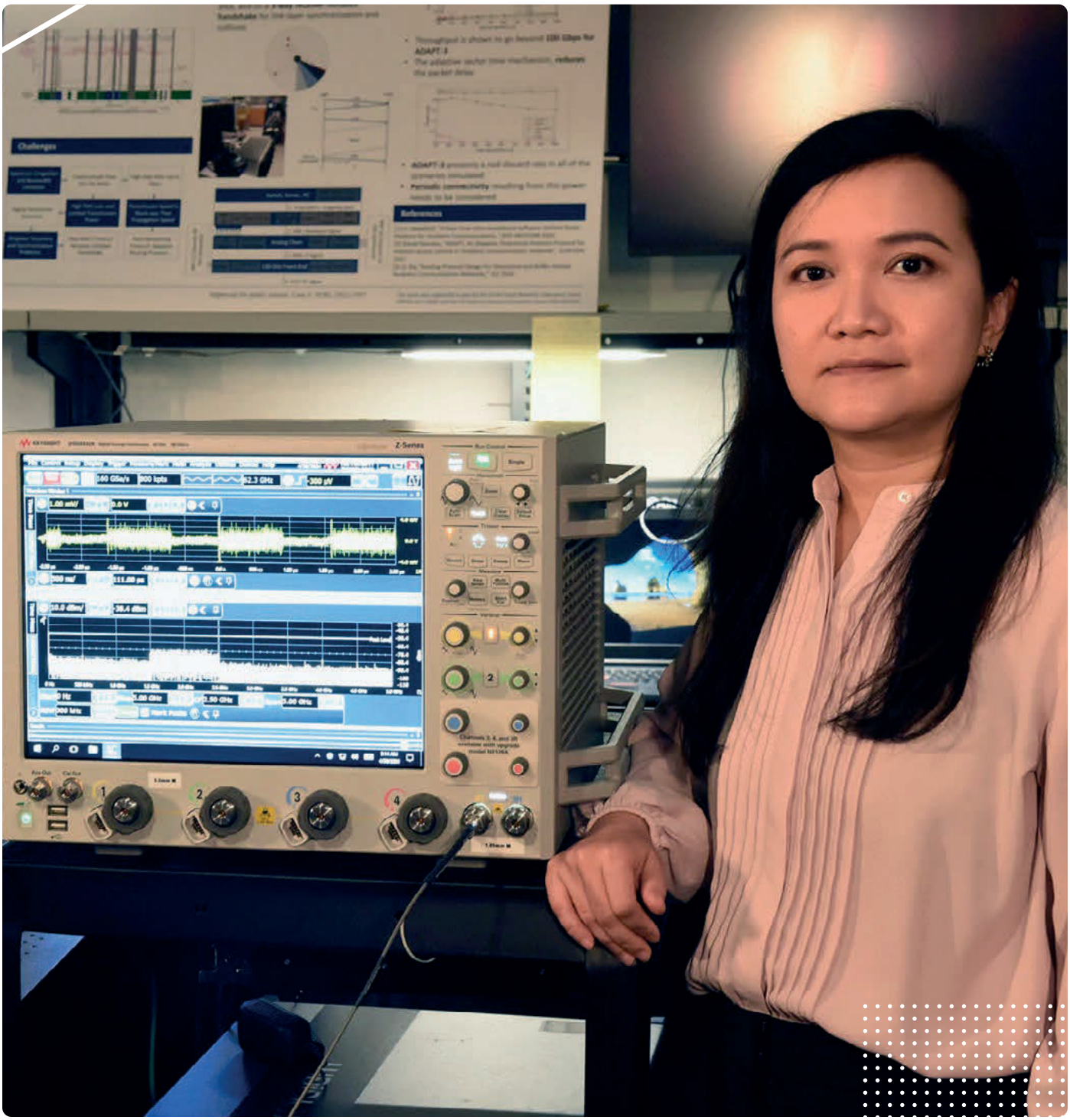
Capabilities

- Characterization, modeling and analysis of communications waveforms above 100 GHz
- Codebase for multiple modulation schemes with spreading and OFDM overlays
- Channel-sounding capabilities at 140, 240 and 340 GHz with custom antenna positioner
- Automated equipment control and data collection with remote access

Primary POC: Ngwe Thawdar, RITGA
Primary Alternate POC: Claire Parisi, RITGA
Alternate POC: Steve Arborgast, RITGA
Alternate POC: Lt. Col Yarnell, RITG
Alternate POC: John Perretta, RITGA
Alternate POC: Joe Suprenant, RITGB

Examples

- Protocol Stack Design for Frequency-agile Ultra-broadband Airborne Networks in the THz band
- Physics Guided Adversarial Learning for Modeling Terahertz Communication Systems
- AFRL Visiting Faculty Research Program: A Case for OFDM in Ultra-broadband Terahertz
- Communication: An Experimental Approach
- AFRL-NSF Internship: Demonstration of Absolute Security in a Wireless Transmission



20250313-F-NJ426-001

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