- The **Radar, Communications, and Microelectronics (RCM)** group performs focused research and development across the RCM space to unlock unexpected value within ordinary parts. Primary focus areas of development have been on hybrid analog-digital systems that defy conventional approaches in order to increase bandwidth, reduce latency, and provide novel capabilities. Examples include unclocked FPGAs used as tapped delay line matched filters in radar receivers and microelectronics fingerprinting. The group specializes in connecting foundational theoretical concepts from physics and mathematics to numerical models, bench tests, and quick-turn prototypes.

- The **RCM** group is outfitted with state-of-the-art oscilloscopes, wideband probes, RF sources, arbitrary waveform generators, antennas, as well as both spectrum and network analyzers. A large (4.5ft × 4.5ft × 4.5 ft) RF reverberant cavity is also used for complex scattering measurements and characterization. A library of field-programmable gate arrays (FPGAs) and mini-circuits connectorized components allows for rapid prototyping and data acquisition. Skilled technician and other support is also available for circuit population, wiring power systems, prototyping, and 3D printing. This small, yet agile team prides itself on adding immediate technical value and R&D when tasked by customers.
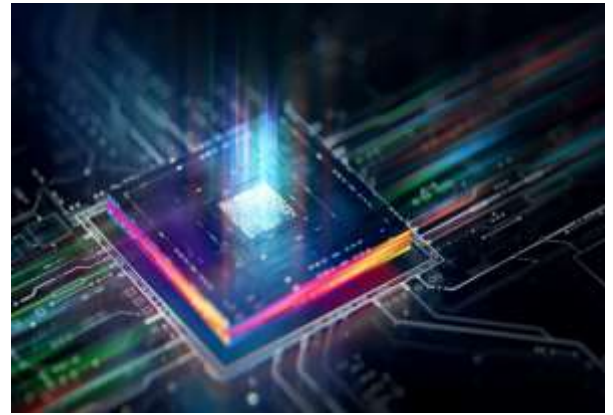
Novel approaches for waveform development include:

- Operating Commercial Off The Shelf (COTS) components in nonlinear, normally non-ideal regimes,
- Engineering waveforms from noise and chaos,
- Low Probability of Intercept (LPI) and Low Probability of Detection (LPD) theory and techniques,
- Machine learning and genetic algorithms for finding new waveforms of interest,
- Specialized waveforms tailored for low SWaP matched filters, and
- Jam resistant and noise tolerant waveforms.

Unconventional and modern approaches to signal processing include:

- Hybrid clocked and unclocked FPGAs,
- Nonlinear time series analysis techniques,
- Machine learning prediction,
- Small neural networks for fast classification, and
- Reinforcement learning.
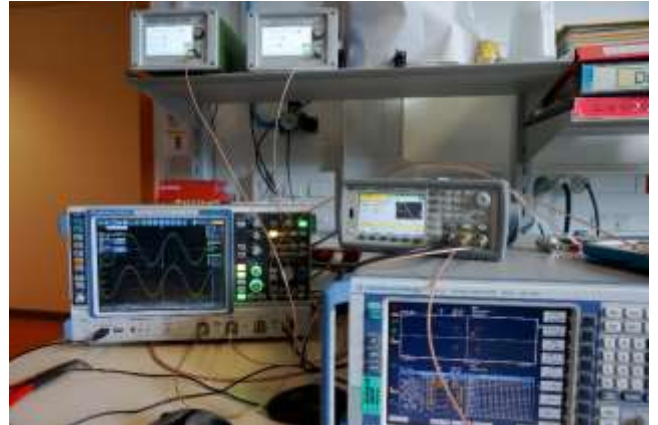
Designed/Tested proof-of-concept systems include:

- Wideband radar sources,
- True random number generators,
- Physically unclonable functions,
- Unclocked, software-defined filters, and
- Portable RF spectral monitoring systems.

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