Energy Efficient Electronics

S&T Campaign: Materials Research
Electronics
Energy Efficient

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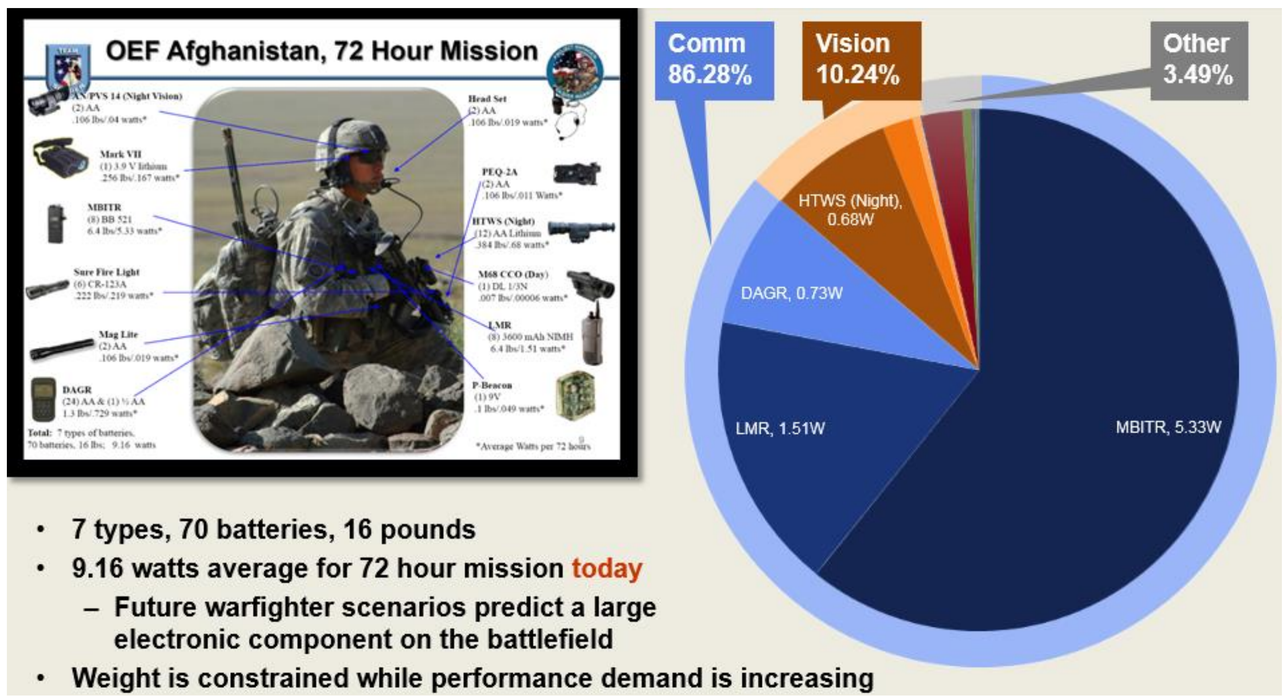
Research Objective

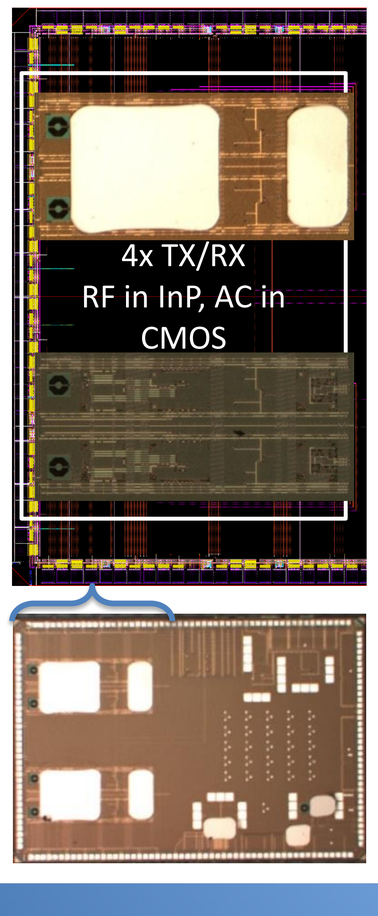
- **Long Term: Order of magnitude reduction in power draw across all Soldier & squad level electronic functions**
- **Near Term: Order of magnitude reduction in power draw of the Solider radio**



- **7 types, 70 batteries, 16 pounds**
- **9.16 watts average for 72 hour mission today**
  - **Future warfighter scenarios predict a large electronic component on the battlefield**
- **Weight is constrained while performance demand is increasing**

Challenges

- **Research thrusts across 4 areas: Materials & Devices, Circuits and Systems, Heterogeneous Integration, and Waveforms**
- **Stringent requirements for communication in a contested spectrum have typically resulted in large power demands – how can efficiency improve yet still meet these requirements?**



ARL Facilities and Capabilities Available to Support Collaborative Research

- **Full custom ASIC design flow – Cadence and Mentor Graphics**
- **Extensive test capabilities: Sources, scopes and network analyzers up to 110 GHz, fully automatic temperature controlled probe stations**
- **Digital waveform synthesis**
- **“Challenges and Opportunities for Energy Efficient Digital Electronics,” GOMACTech 2015**
- **“Systematic Analysis of Interleaved Digital-to-Analog Converters,” IEEE Trans. Circuits and Systems II, Vol 58, pp 882-886, Dec 2011**

Complementary Expertise / Facilities / Capabilities Sought in Collaboration

- **Unique communication circuits – enhanced linearity, lower noise, improved efficiency**
- **Custom integration of diverse materials – III-V and CMOS mating, COTS to custom integration**
- **Novel materials enabling new communication paradigms**
- **Suggestions for innovative new research approaches to address energy efficiency**