UWB Technology – Integration Strategies to meet Healthcare Applications

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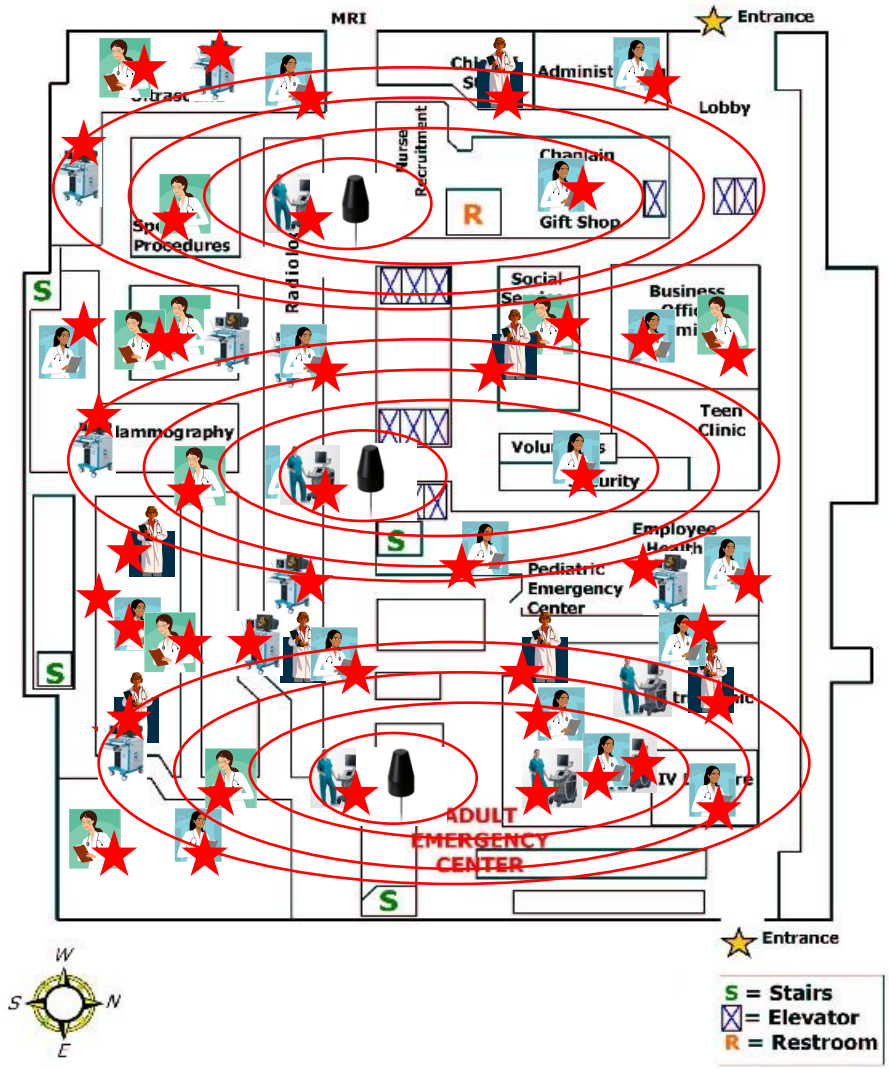
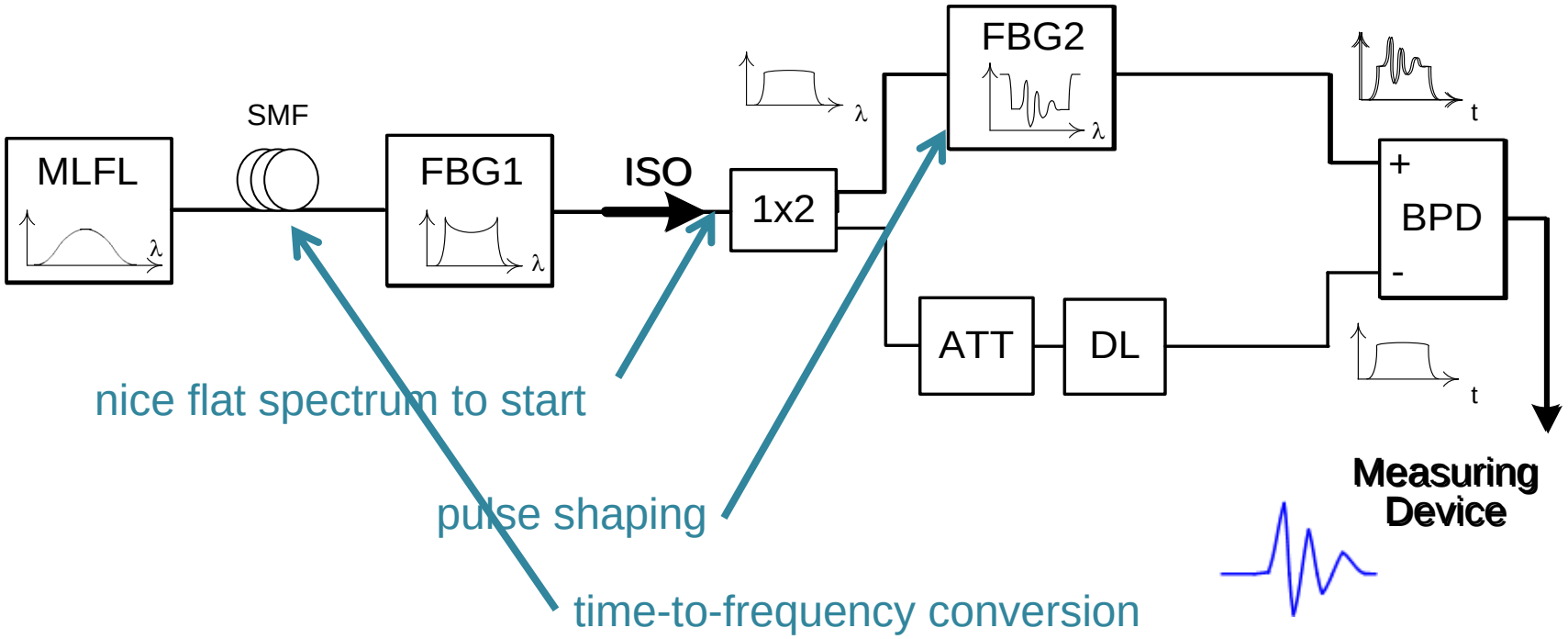
Ultra-Wide Band (UWB)

- Precise Location Identification
  - Ultra-wide band technologies for asset tracking
  - New pulse generators for custom pulse-shapes
- High bit rate communications
  - short range
  - low power
  - body area networks

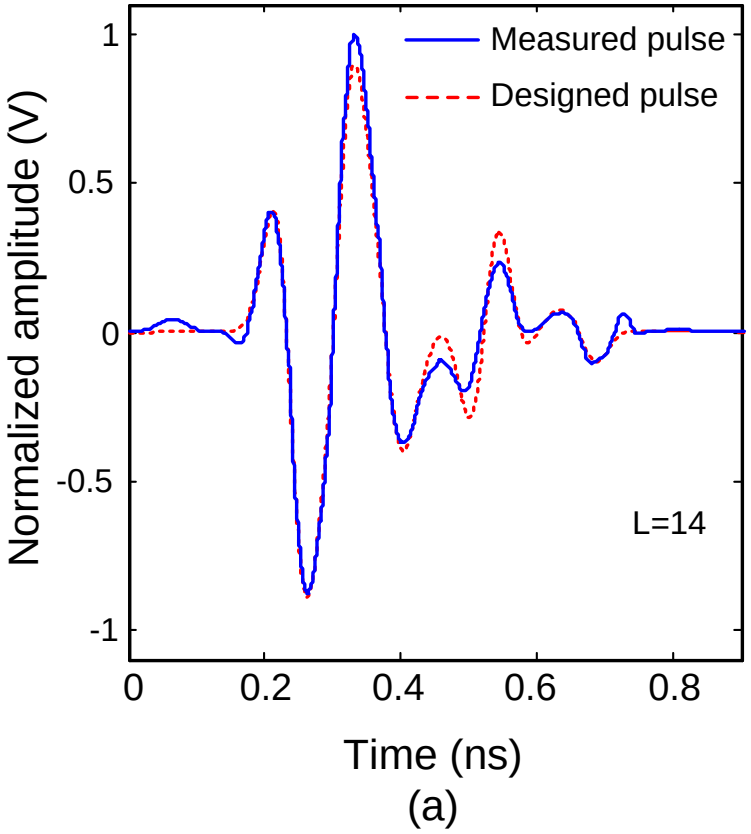


Optical Generation of UWB Pulses

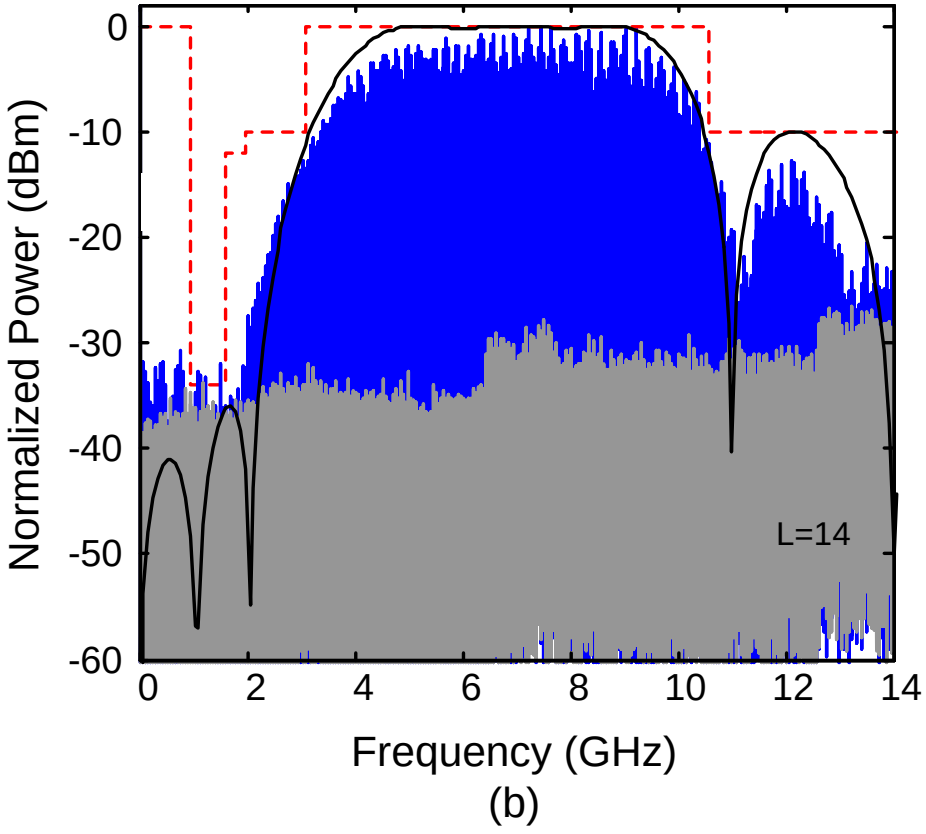


- Very fine resolution – extremely high power efficiencies
- Great when optical transport is needed (no EMI)
- Bulky now – what about integrated optics?

Experimental Results



(a)

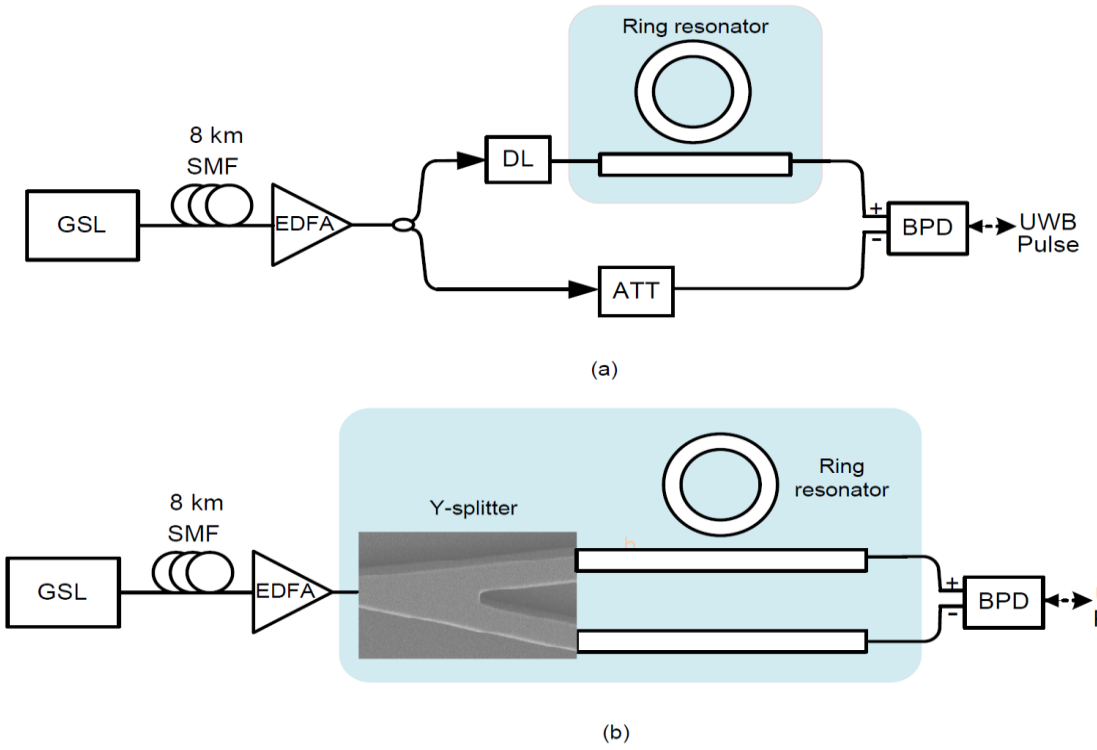


(b)

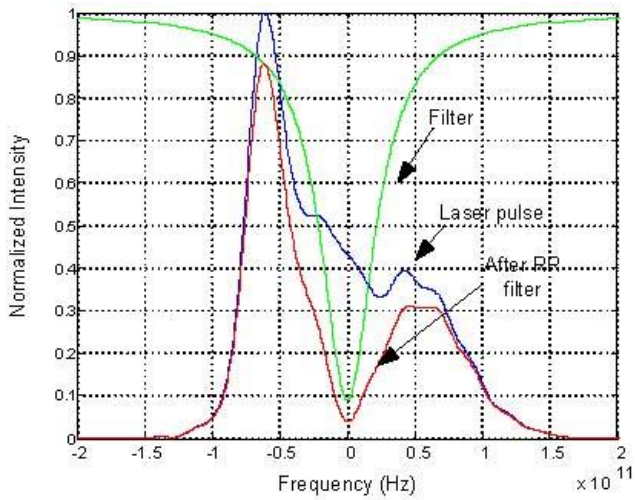
Integrated Photonics

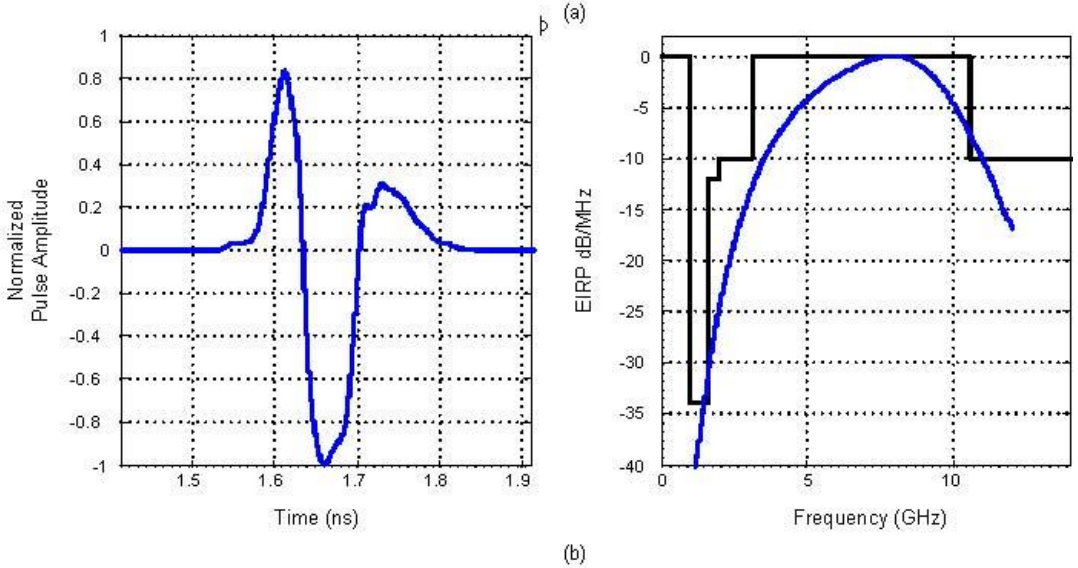
Leverage fine pulse shaping in optics

- CMC production facility
- Design completed Sept 2010
- Chips received May 2011
- Low cost, integrable solution
- Great for antenna remoting with very low (~zero) electromagnetic interference



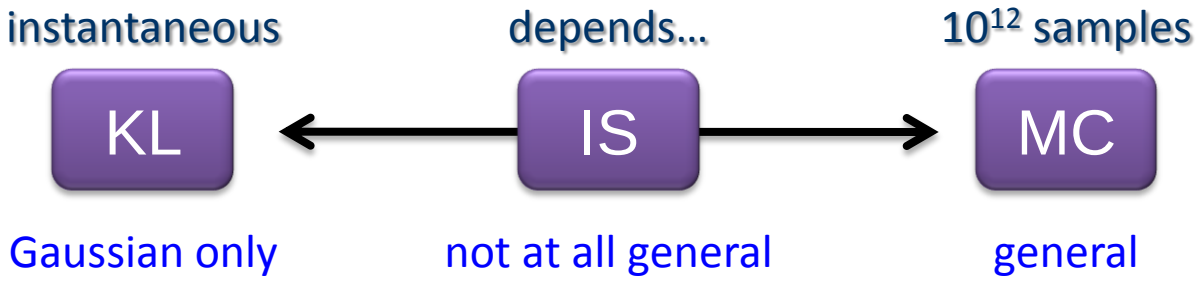
Simulation of Design



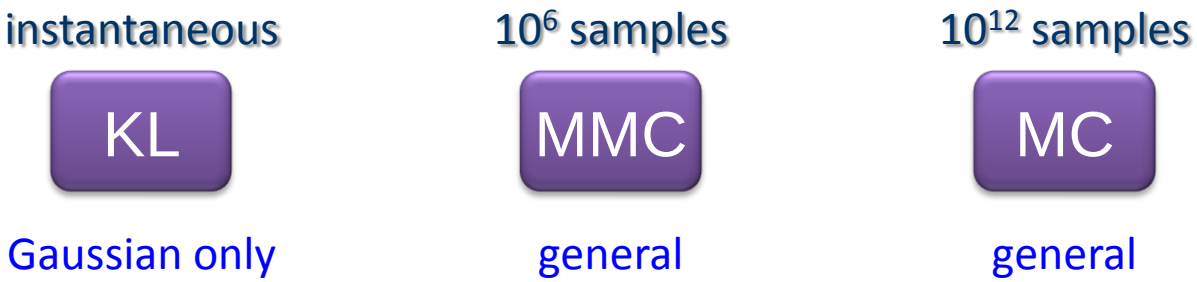


Computer Modeling & Monte Carlo

- Importance Sampling
  - Somewhere in between on complexity
  - Not at all general

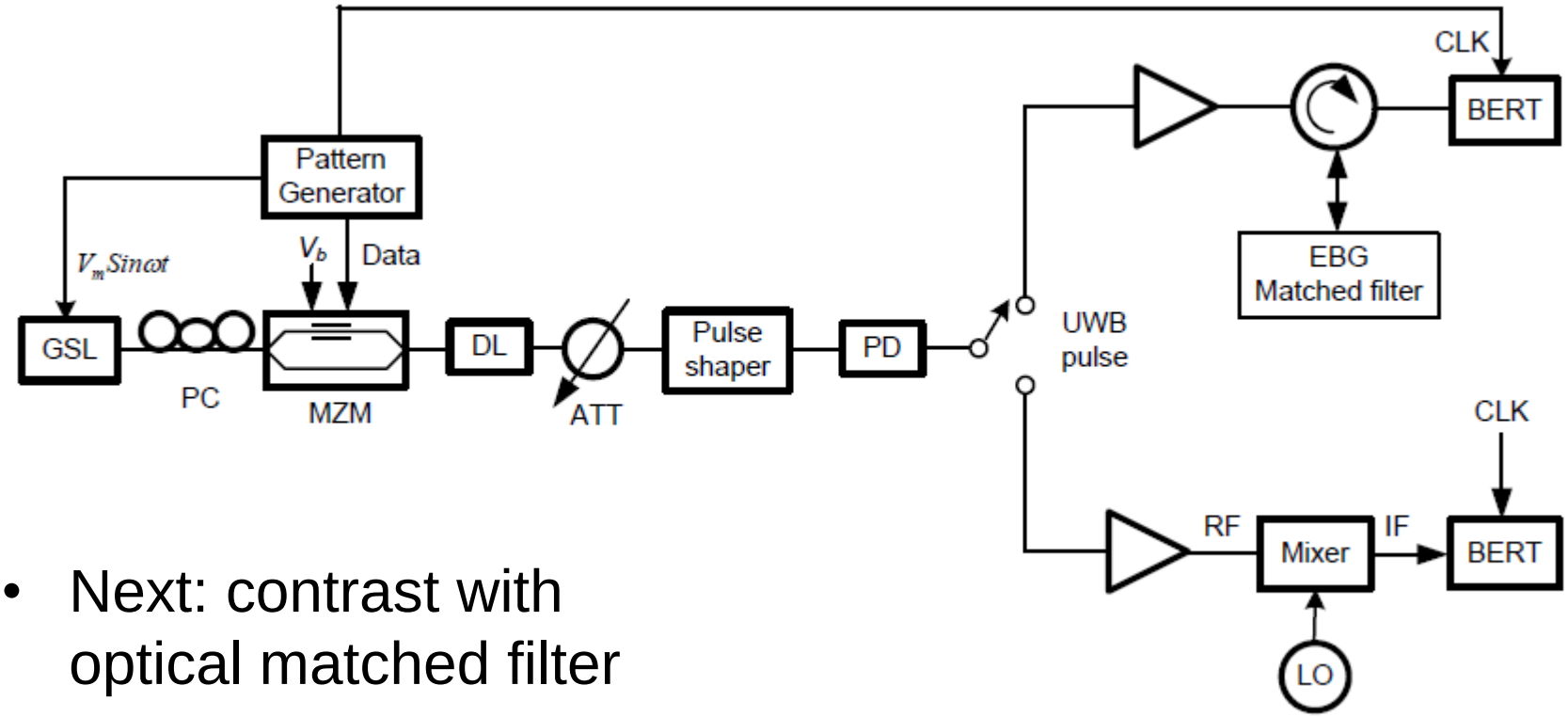


- Multicanonical Monte Carlo



UWB Receivers

- Optics provides high performance transmitters – what about receivers?
  - Compared EBG matched filter with simple down converter



- Next: contrast with optical matched filter

Body Area Networks

- Advantages of UWB
  - low power
    - reduced tissue damage
    - extended battery life
  - high data rate communications
    - compatible with high density sensors
- CMOS effort instead of optics
  - power efficiency
  - small size
  - collaboration with Prof. Benoit Gosselin
- Leveraging learnings from previous UWB work

Conclusions

- Ultra-Wide Band Concepts
  - Transmitters using optics for low EMI antenna remoting
  - Integrated solutions for optical transmitters
  - Examining advantages in optics for receivers
  - New effort to examine body area networks
  - Applying new computer modeling techniques to accelerate simulations