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Terahertz Imaging Systems

Application

- **Application drivers:** T-ray imaging for i) *Medical*: cancer diagnostics, biometrics, ii) *Security*: detection of explosives and narcotics, etc.
- **Size of market:** i) Accessible, lower-cost medical imaging comparable to e.g. X-ray; ii) Growing demand for security screening
- **Examples of unmet bio/medical need:**
 - Early detection of skin cancer
 - Real-time on-the-fly detection of explosives and narcotics

Research Needs

Scientific/technological problems and barriers:

- Compact and efficient THz components
- THz materials, e.g. for optics
- Sufficient radiated power
- THz detector arrays
- Data reconstruction and storage.

Advantages

Impact if successful:

- New powerful imaging and screening technology, increase availability to healthcare sites and to wider population of patients

Advantages:

- Non-invasive, real-time, high-resolution
- Remote “materials fingerprinting”
- Synergistic with current semiconductor trends
 - Solid-state electronic devices have entered the sub-THz regime
- “Low hanging fruit”

Metric(s) of Progress

3 year goal:

- Compact and efficient THz sources and optics

5 year goal:

- Demonstrated integrated system

10 year goal:

- Competitive tools for medical imaging and security screening

Resource requirements: **Annual cost :** ~\$2M/year; **People:** ~6 Faculty ; **Time:** Near term goals ~ 3 yrs., Long term goals ~ 10 yrs.; **Facilities:** Primarily physics and engineering teams with access to relevant operational environments.