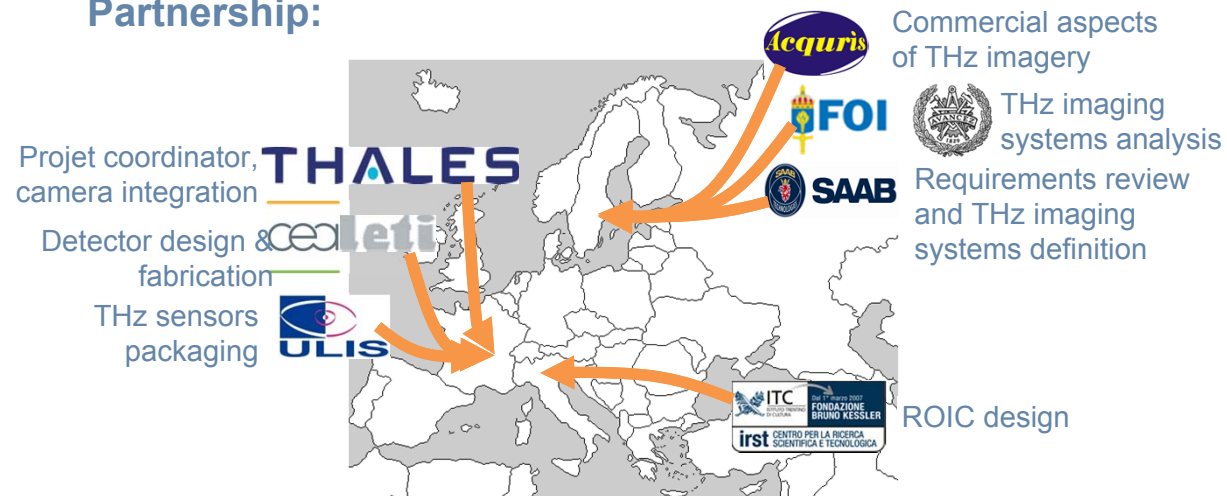




IMATERA project « IMAGing in the TERAhertz domain » Results and perspectives

Dr François Simoens, CEA-Leti Minatec, France

Partnership:

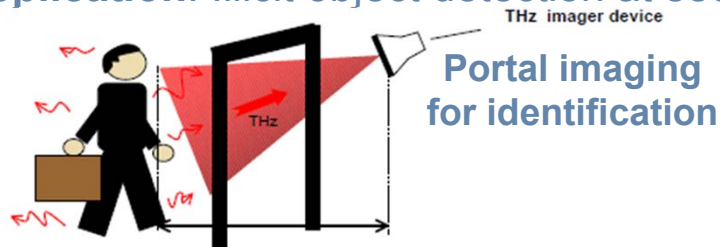
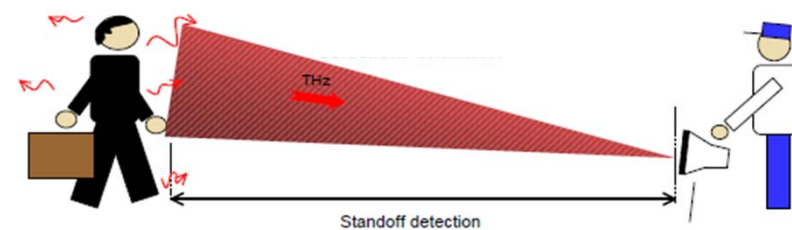




IMATERA project « IMAging in the TERAhertz domain »

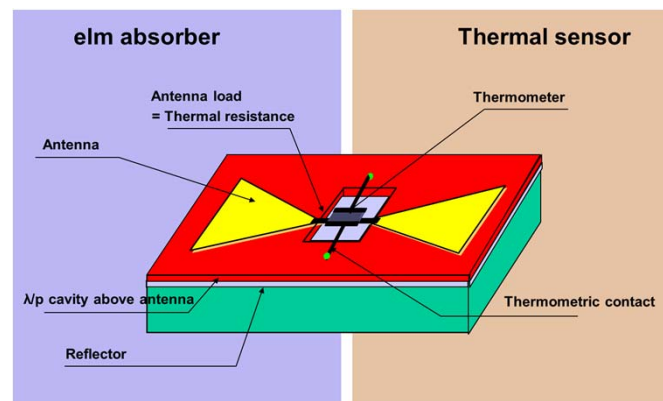
Objective: room temperature, real-time, 2D THz camera demonstrator for passive imaging based on uncooled silicon bolometer array.

Application: Illicit object detection at security check points (concealed weapons...)



Technical breakthrough:
CEA-Leti monolithic 2D THz sensor

- Uncooled antenna-coupled μ bolometer
- Silicon standard microelectronics processes
- Targeted NEP: 10's pW

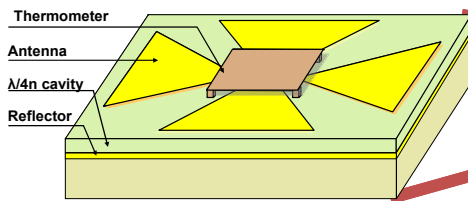




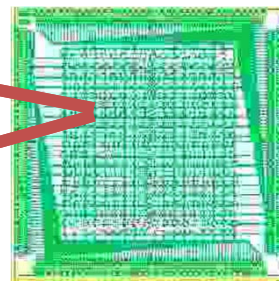
IMATERA : project results

Very innovative uncooled Terahertz 2D imaging technology

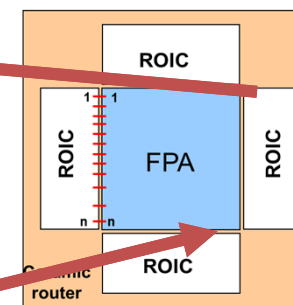
Strong experience acquired in **electromagnetism and optics modeling**, and in **system analysis for passive THz imaging**



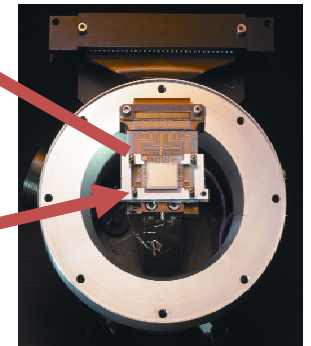
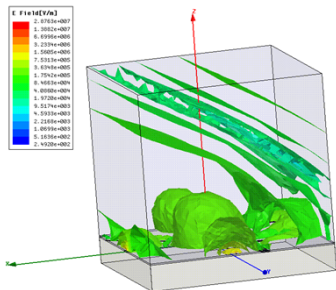
- Antenna-coupled microbolometer: pixel pitch: 220-230μm



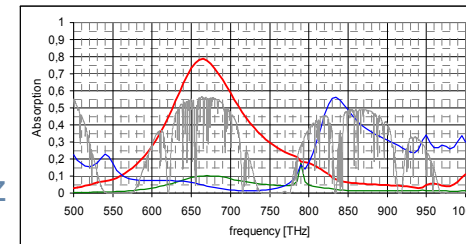
- 16 x 16 pixel array



- Complete FPA with ROICs



- Frequency Band: 660GHz = atmosphere transmission window
- Pixel absorption coefficient: >80%
- Frequency bandwidth(6dB): 100GHz



Unfortunately the first manufactured sensor prototypes didn't show sufficient technological maturity... Stop=06/2009



Contact: Dr François Simoens, Imaging Program Manager (francois.simoens@cea.fr)

IMATERA : perspectives

still no commercial uncooled THz 2D camera for passive real-time imaging optimized in the 0.6- 0.8 THz range with a pW level sensitivity though

- 0.6-0.8THz detection: spatial resolution improved vs sub mm solutions
- Uncooled operation & standard microelectronic processes : cost effective and easy to use sensor
- 2D monolithic sensor: Limited scanning, reduced acquisition time

Business and societal impact

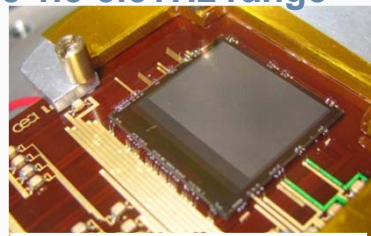
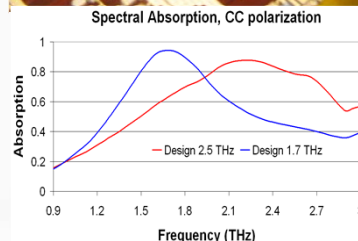
Future long term markets should prioritize passive THz as among “Green technologies”

Low price THz camera implies passive, uncooled, 2D, silicon compatible = IMATERA approach

Since 2009, demonstration by CEA-Leti of active imaging with antenna-coupled a-Si microbolometer arrays in the 1.5-3.5THz range

- 2D large array: 320x240 pixels
- Monolithic sensor: Retina + CMOS ROIC
- High fabrication yield: Operability > 99%

- Max optical absorption ~90% for 2 designs @1.7 THz & 2.4THz
- High sensitivity: 30pW @2.5THz



CEA-Leti Expression of Interest for a passive imaging camera project in the 0.6-0.8THz range

