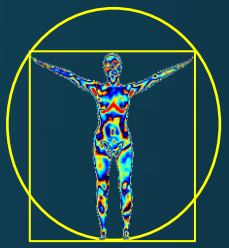
IRMMW-THz 2020
Nov. 8-13th, 2020 in Buffalo, NY, USA



MEDICAL APPLICATIONS OF THERMOGRAPHIC TECHNOLOGIES

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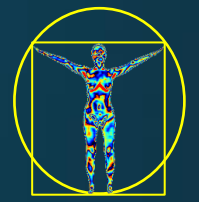
INTRODUCTION

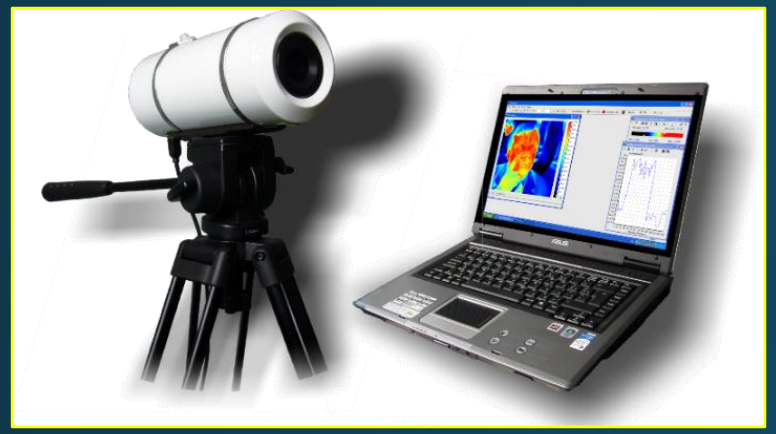


Medical thermography or thermal imaging (“thermovision”) is a promising safe technique for noninvasive diagnostics and early recognition of human deceases. It implies visualization of body’s emission in the IR or longer-wave spectral ranges and enables *linking temperature gradients* on human skin *with physiological processes* in the body.

The thermal field shows blood circulation for subcutaneous vasculature in reflexogenic zones, which are controlled by the autonomic nervous system and reflects a work of specific viscera. Unlike methods of active radiation diagnostics, such as ultrasound- or X-ray-based, thermal imaging allows seeing not structural features of viscera but functional changes in their work, thereby enabling to distinguish normal and pathological processes in the body at early stages.

In this contribution, we overview the results of long-term clinical applications for the technology of medical thermography in Russian Federation utilizing commercially available IR imaging systems and microwave radiometric devices. The application areas cover gynecology, urology, oncology, traumatology, neurosurgery, ophthalmology, pediatrics, stomatology, and cosmetology.

INSTRUMENTATION



- **Cooled IR imager "SVIT"**

  Manufacturer: ISP SB RAS, Russia

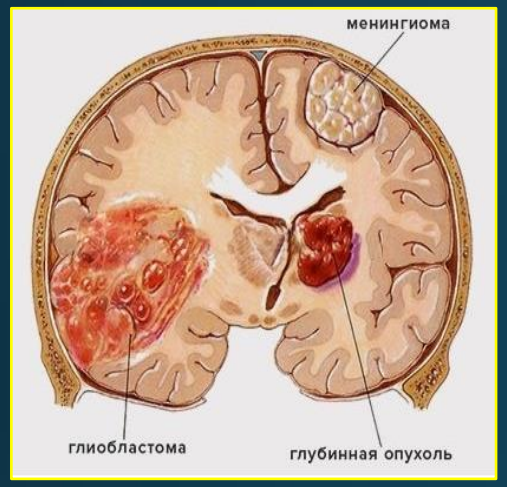
  FPA format: 128x128
  Technology: InAs-MOSFET
  Spectral sensitivity: 2.6 – 3.05 um
  Frame rate: 100 rps
  NETD: 0.025 K
  Coolant: liquid N_2, 0.2 l

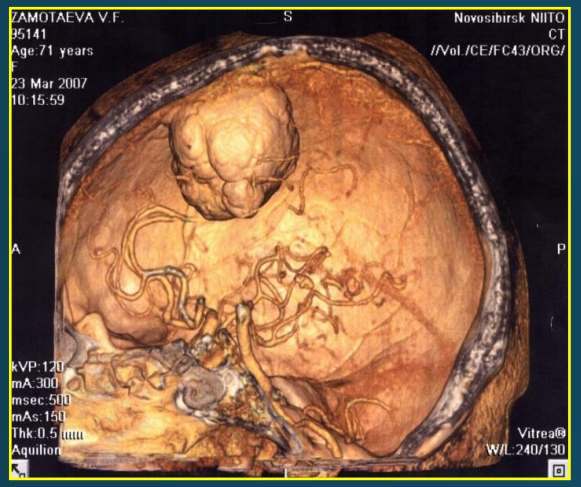
- **IR imager "IRVision"**

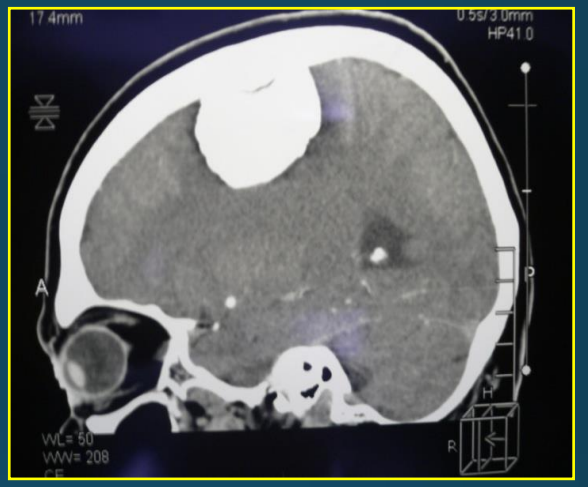
  Manufacturer: LUGGAR LLC, Russia

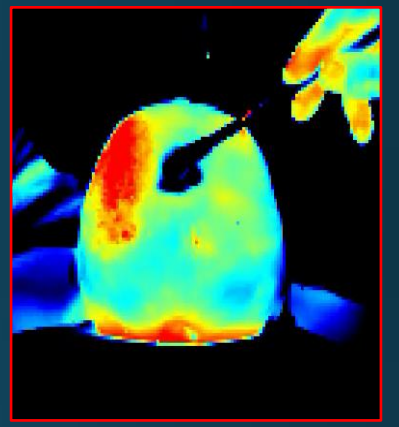
  FPA format: 640x480
  Technology: Si-microbolometers
  Spectral sensitivity: 8 – 14 um
  Frame rate: 25 rps
  NETD: 0.06 K
  Coolant: no

APPLICATION in NEUROSURGERY



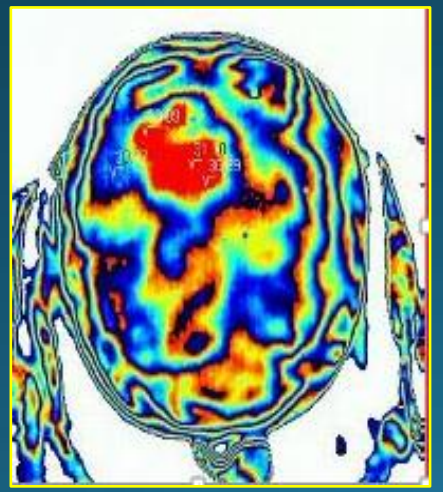




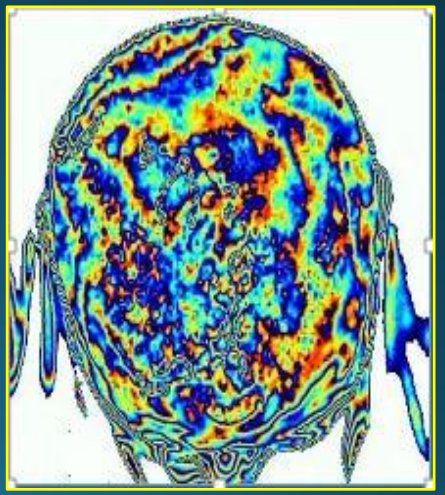


Thermonavigation of parasagittal meningiomas:

BEFORE operation

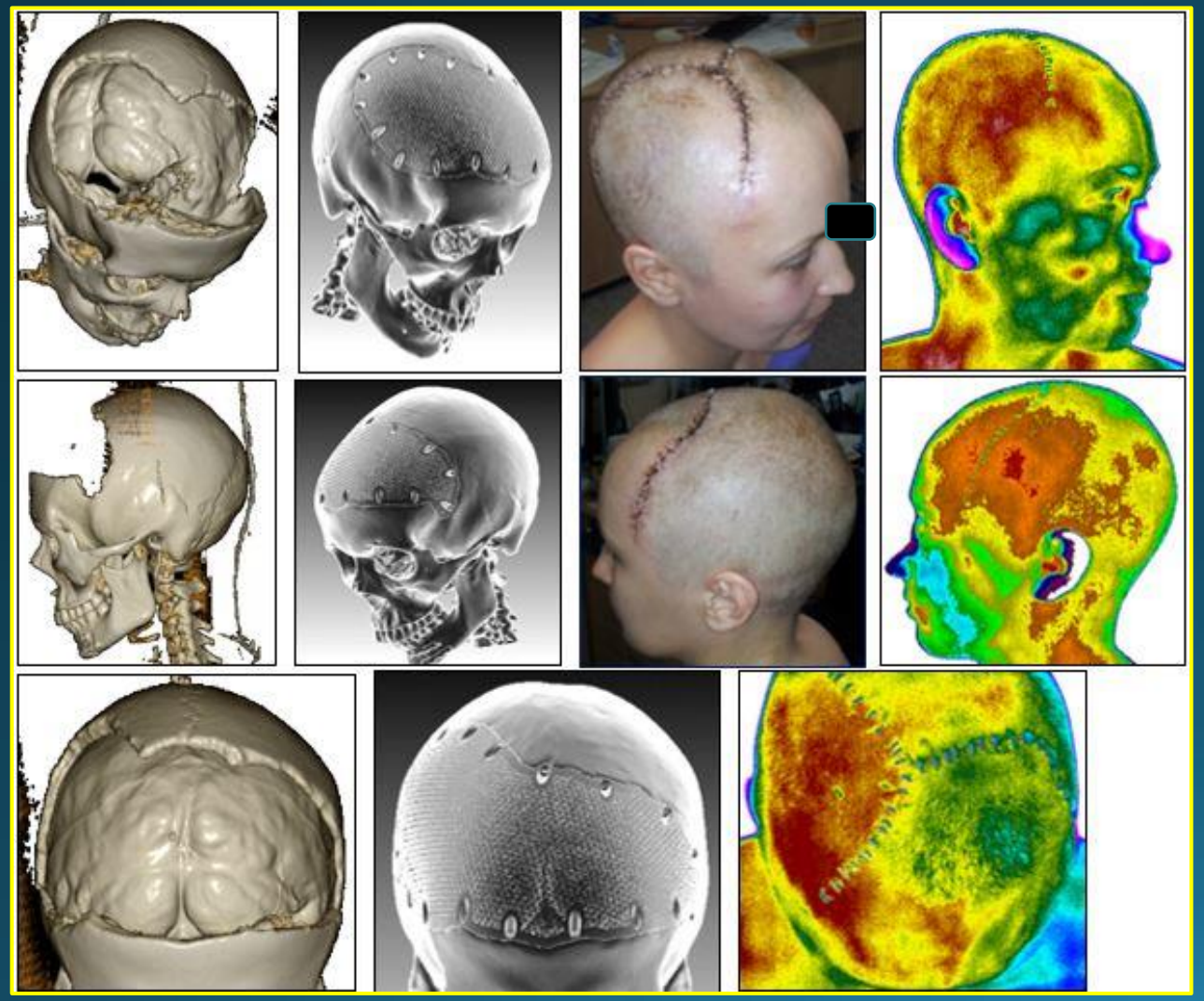


AFTER operation



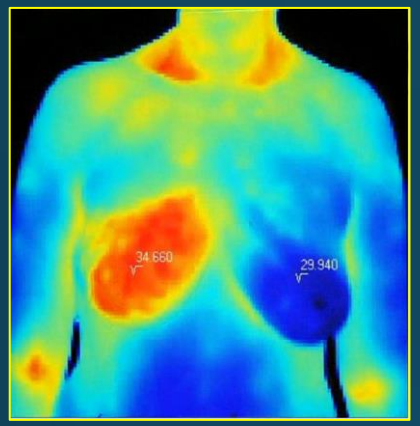
APPLICATION in NEUROSURGERY

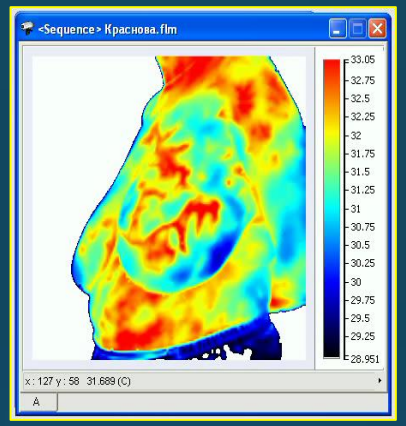
Cranioplasty of a large skull defect with an individual implant



APPLICATION in MAMMOGRAPHY

BREAST CANCER



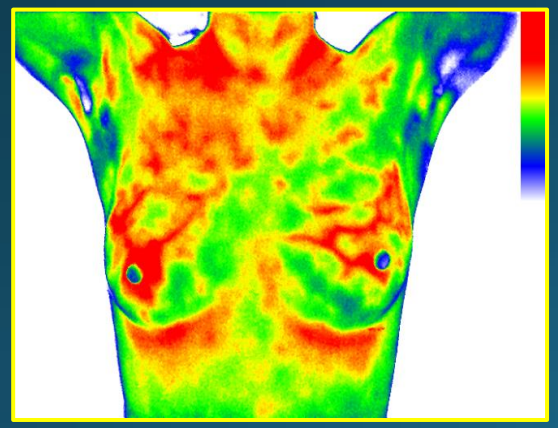


"SVIT" (2.6 – 3.0 µm)

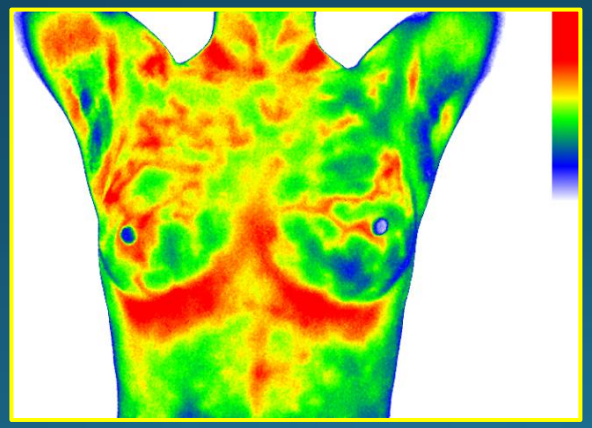
XR MAMMOGRAPHY

Ultrasound LOCATION

Menstrual cycle start



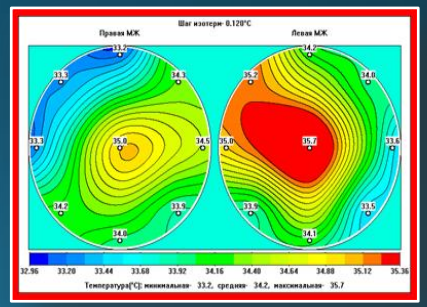
Menstrual mid-cycle



12.09.2017

"IRVision" (8.0 – 14.0 µm)

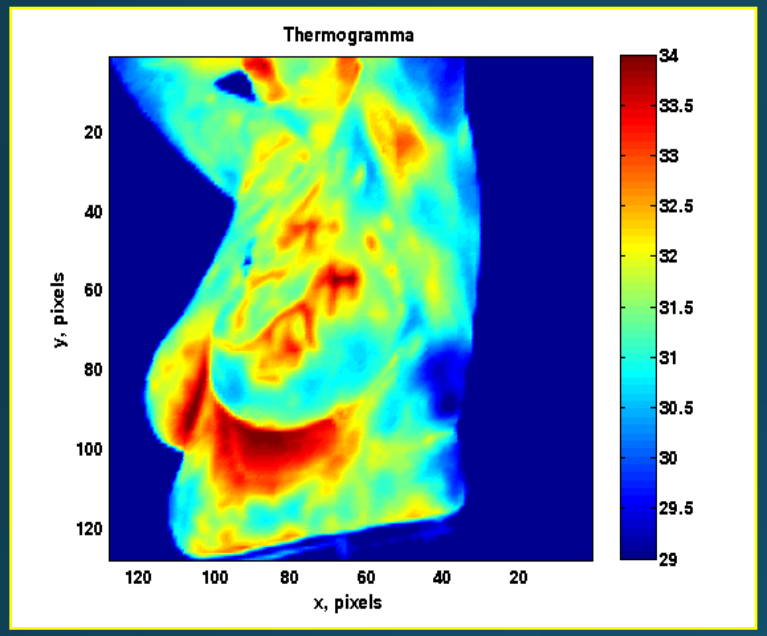
15.01.2018

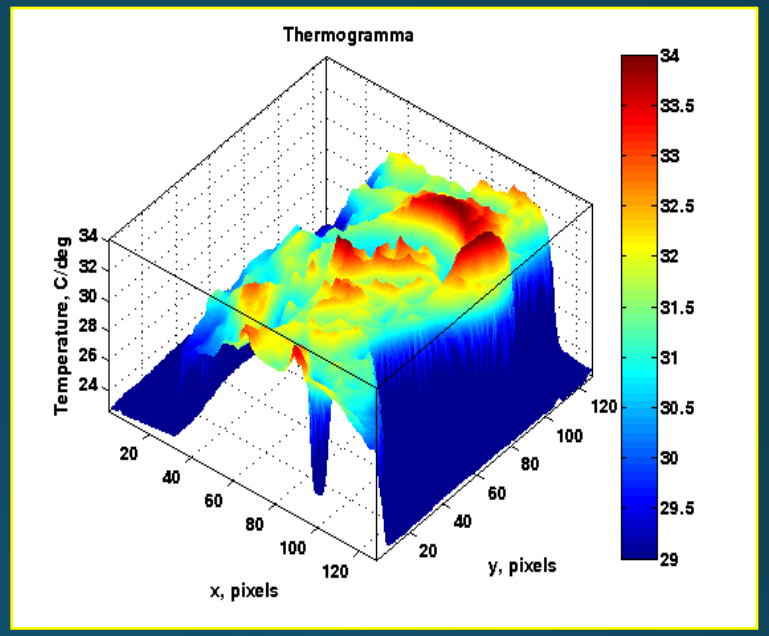


RadioThermometry

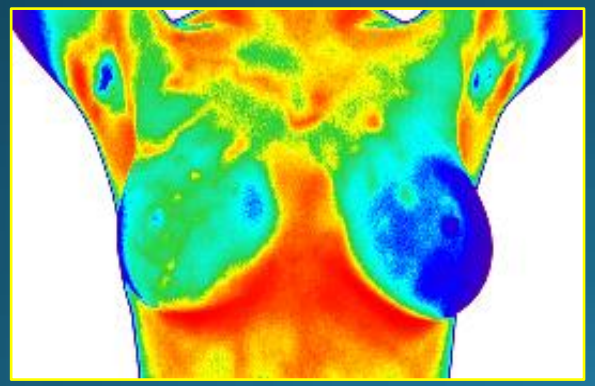
APPLICATION in MAMMOGRAPHY

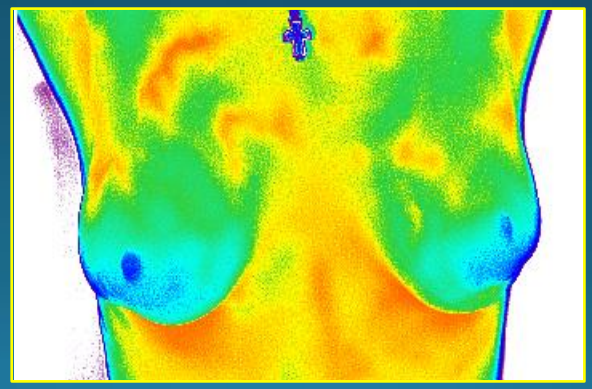
Breast cancer and its metastasis





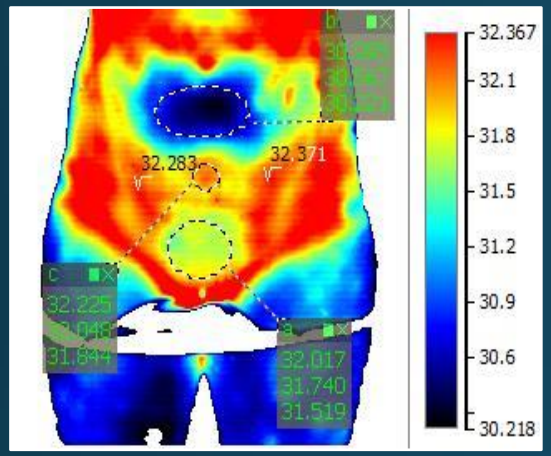
Defects of mammoplasty using silicone implants



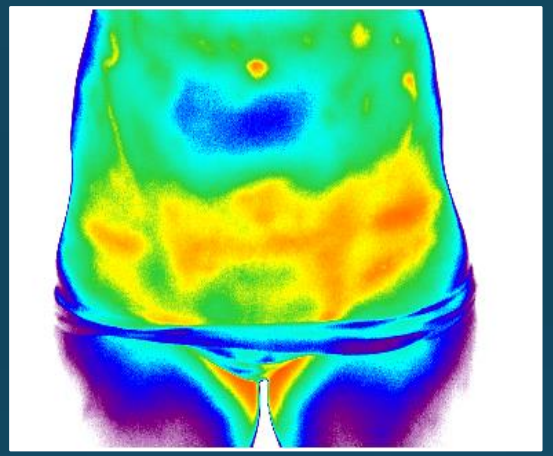


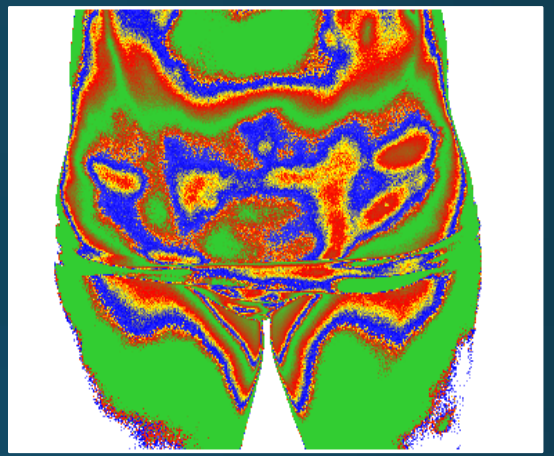
APPLICATION in GYNAECOLOGY

"SVIT" (2.6 – 3.0 μm)



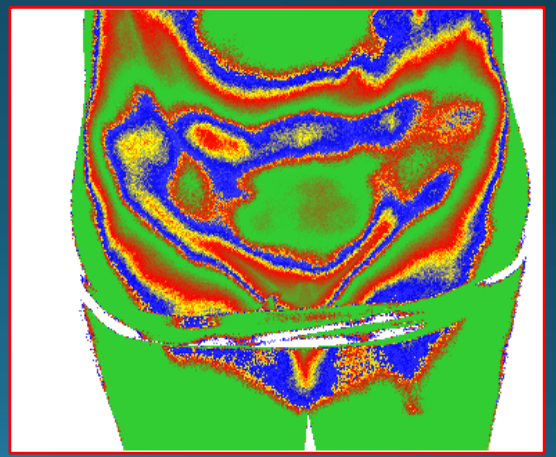
"IRVision" (8.0 – 14.0 μm)





sagittal section on the right ovary

sagittal section on the left ovary

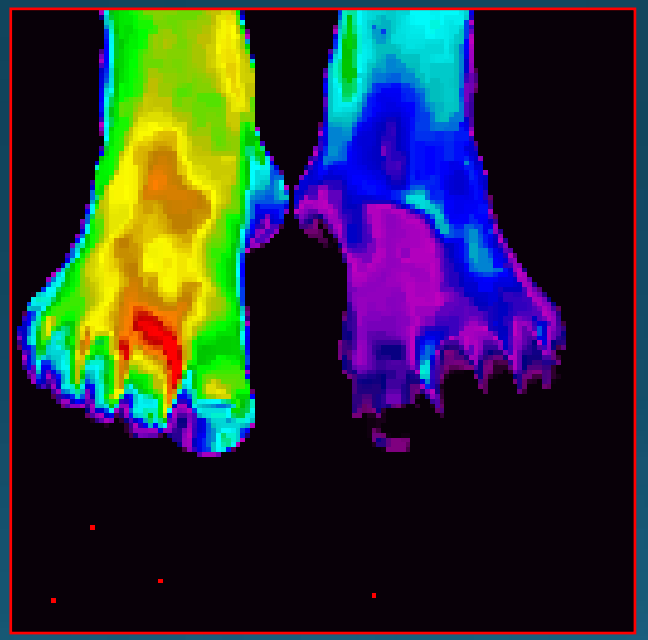


NMR diagnosis (3 Tesla) 23.04.15г.

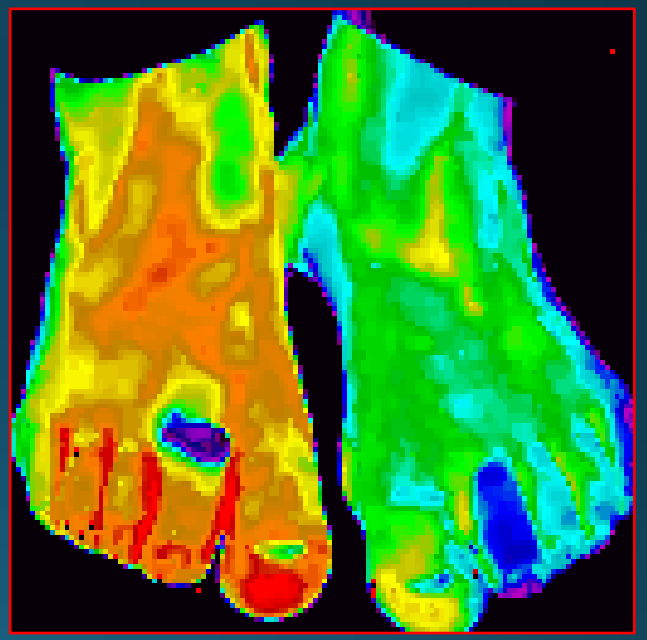
APPLICATION in TRAUMATOLOGY

Thermal imaging of the inflammatory process in the right foot

10.06.2002



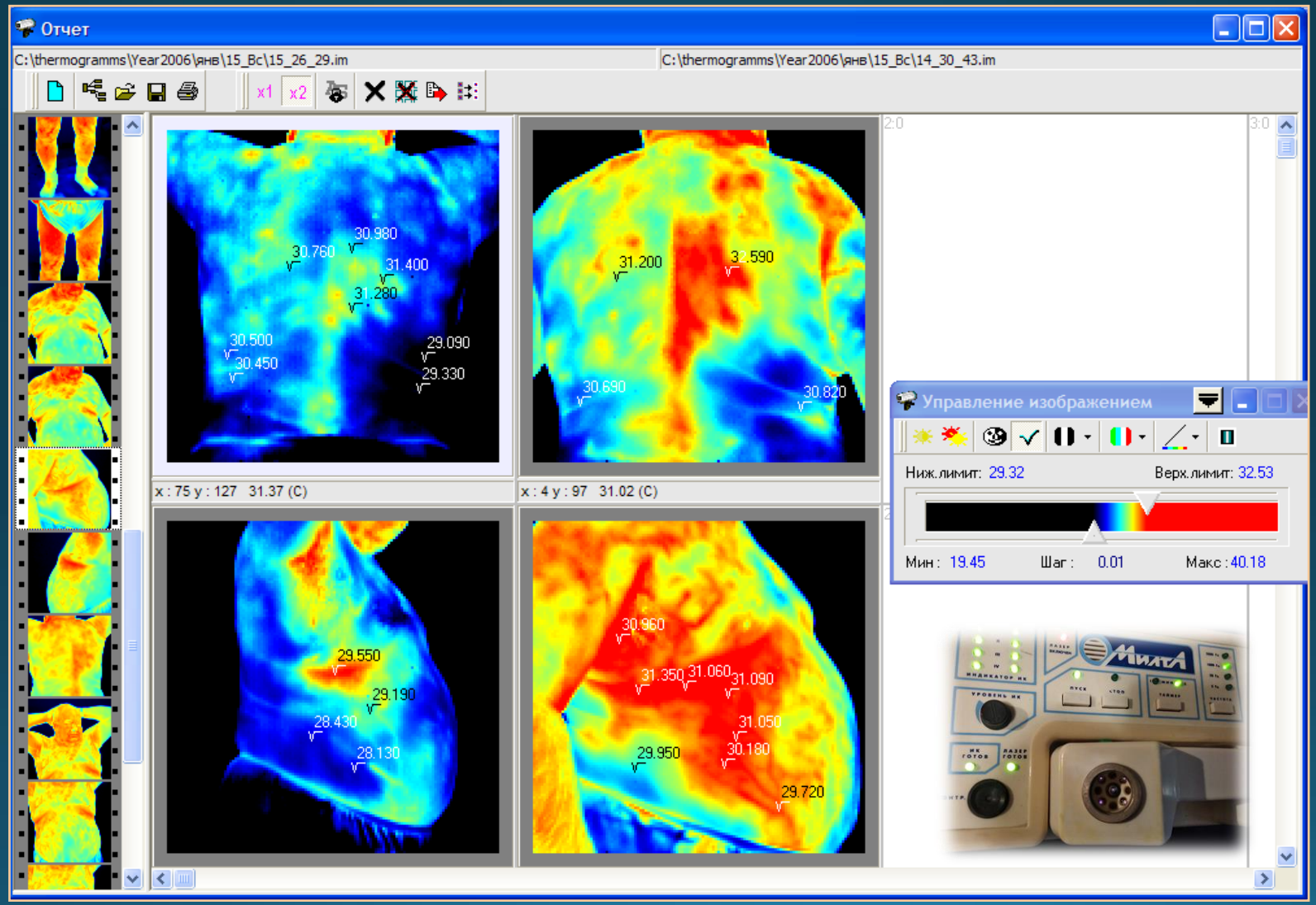
11.06.2002



21.06.2002

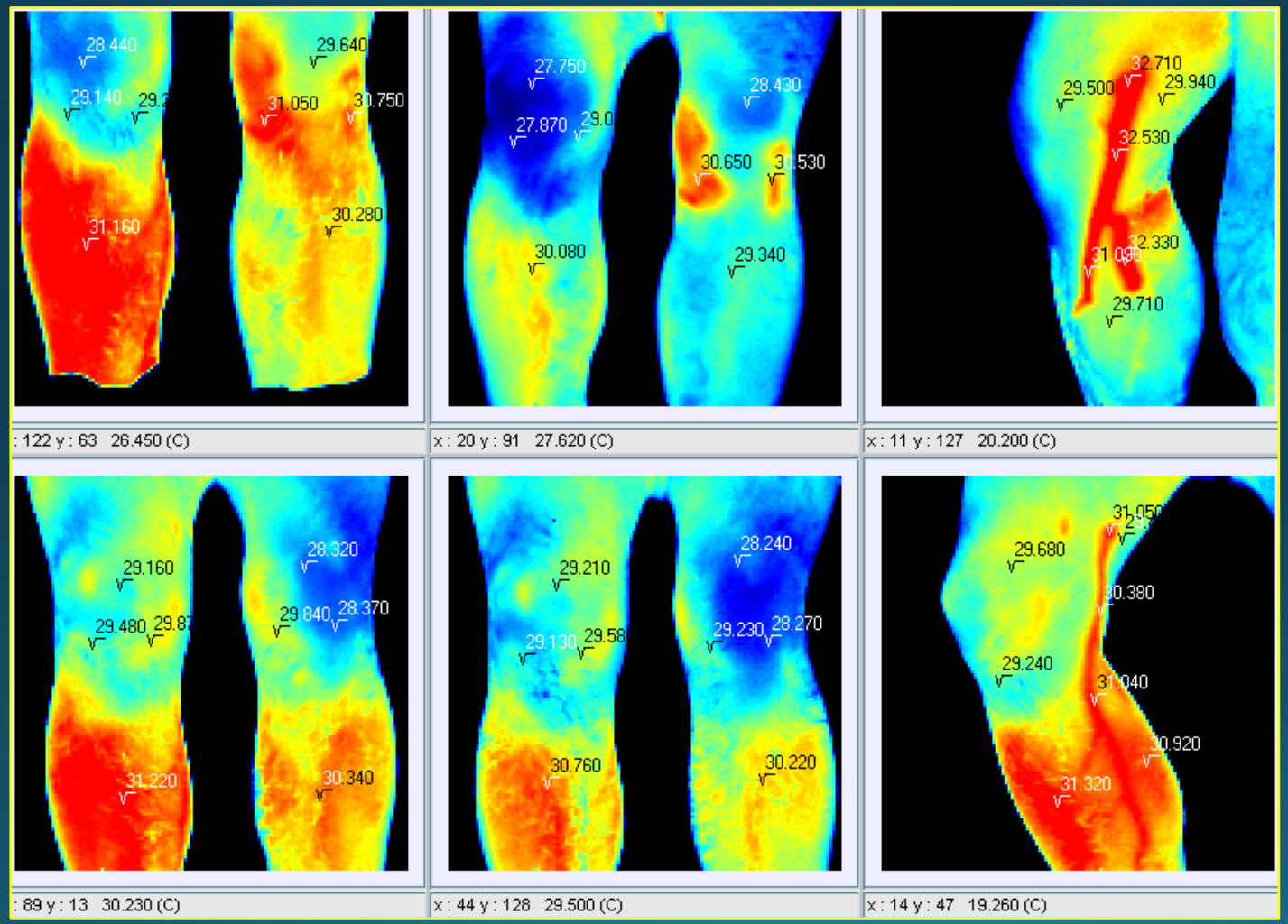
APPLICATION in TRAUMATOLOGY

Spinal trauma before (left) and after (right) exposure to the quantum device "MILTA"



APPLICATION in TRAUMATOLOGY

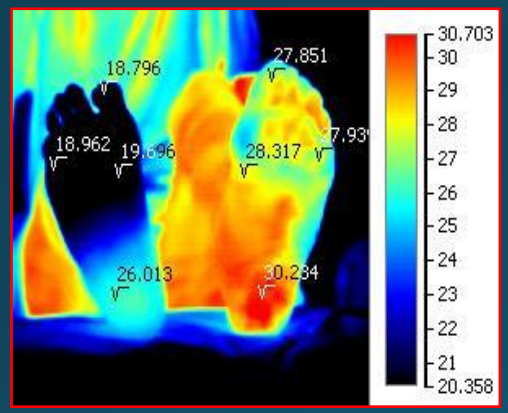
Knee injury (left) and
thermal imaging demonstration of treatment dynamics

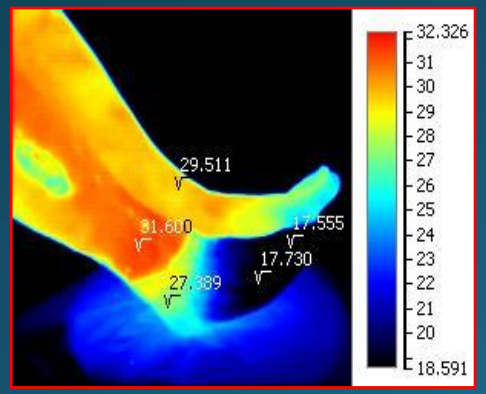


APPLICATION in DIABETES TREATMENT

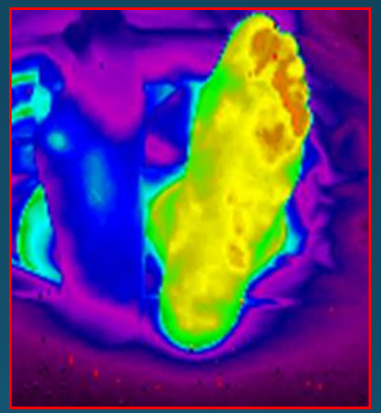
Diagnosis of peripheral vascular lesions in different types of diabetes
and IR monitoring of the treatment process

thermonavigation



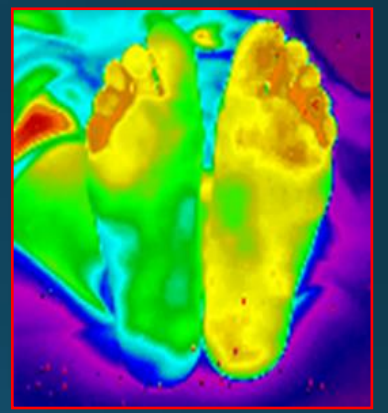


thermal monitoring of treatment



BEFORE

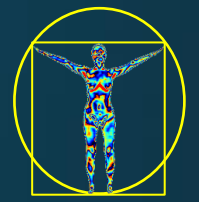
60
minutes



AFTER

RESONANT QUANTUM THERAPEUTIC DEVICE

CONCLUSION



Capabilities of thermographic technologies:

- rapid diagnostics;
- setting topical and differential diagnoses of different pathologies ;
- screening (preclinical diagnosis) of various diseases during medical examinations of humans;
- correcting programs of treatment and rehabilitation;
- controlling efficiency of treatment;
- prognosticating potential complications of human diseases;
- realizing effective and safe “thermal navigation” during surgical operations.

Our team has accumulated extensive and unique experience in medical thermography and the interpretation of thermographic images.