

Non-ionizing radiation and imaging

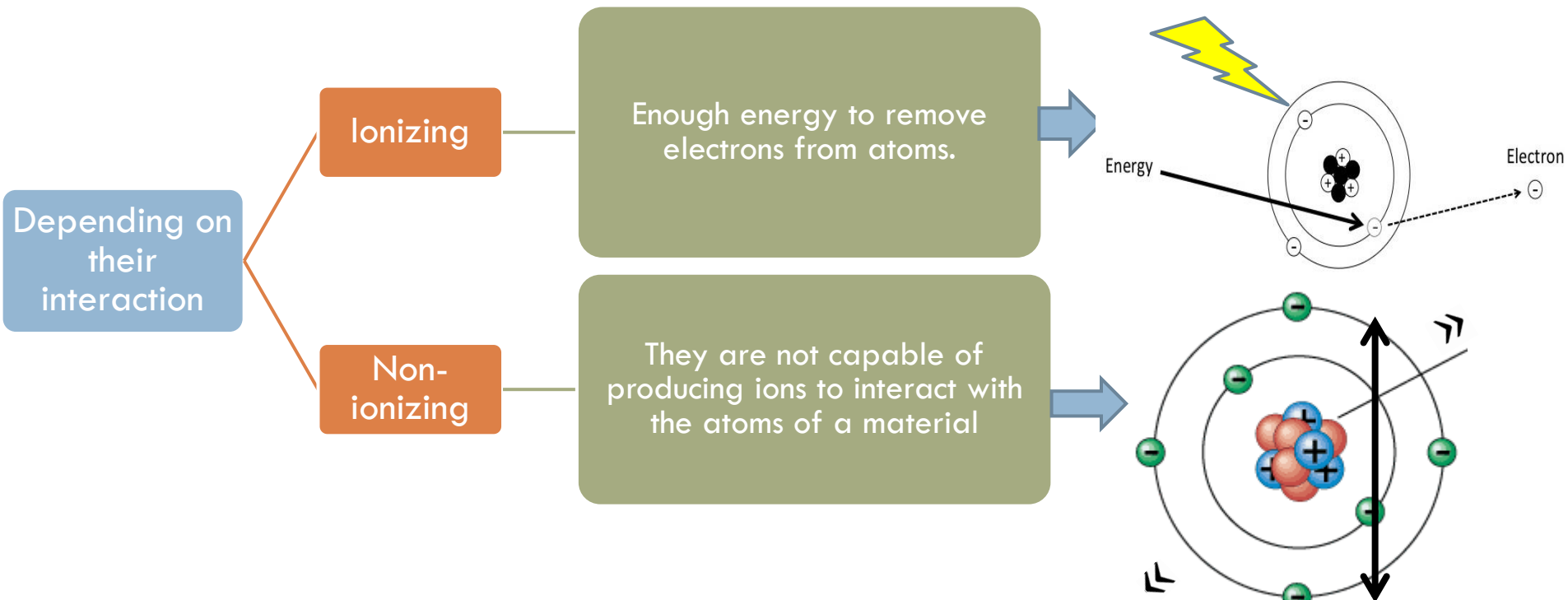


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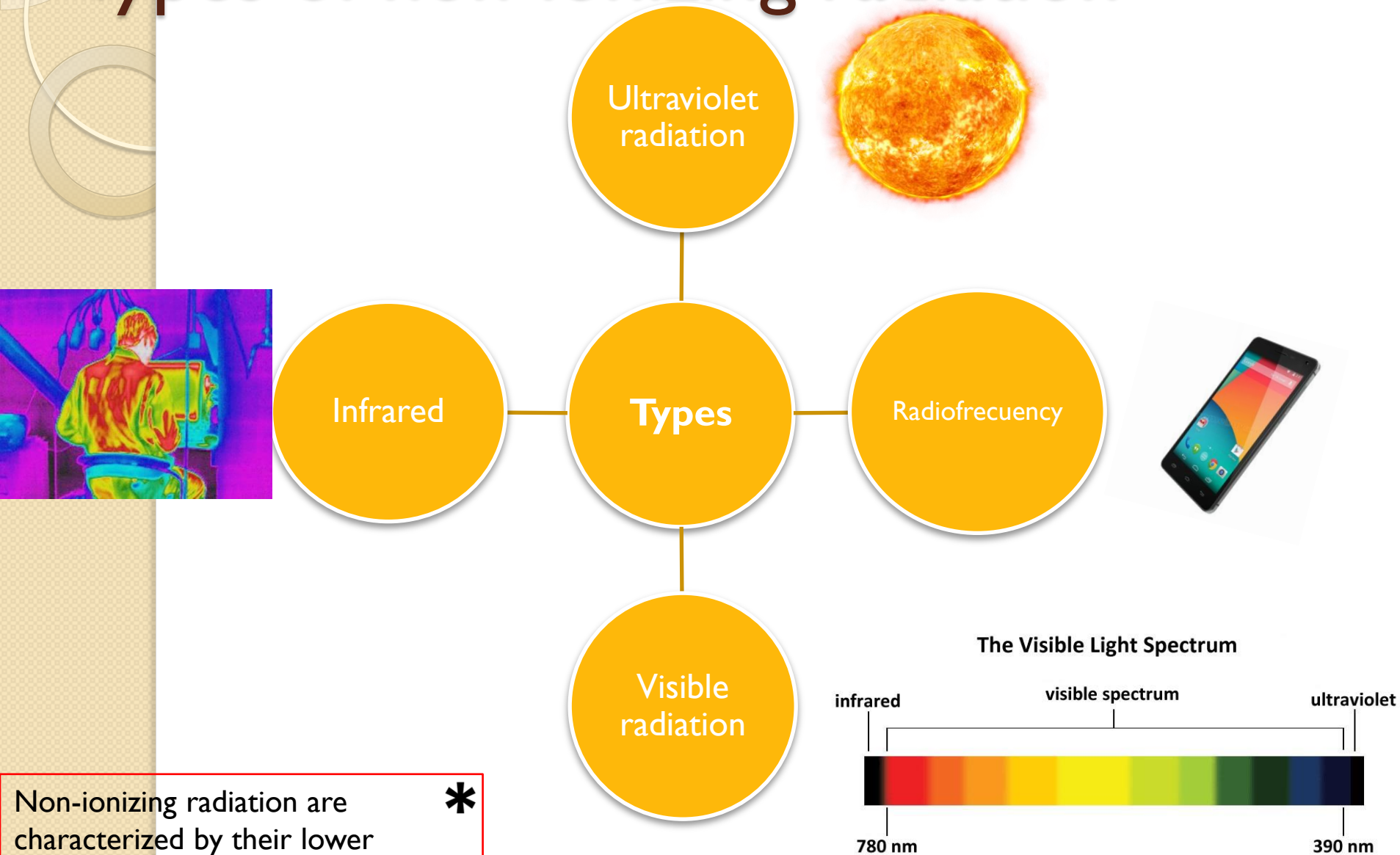
Medical imaging

What is radiation?

- Energy propagation through the means, whether in the form of electromagnetic waves, or shaped corpuscles subatomic endowed with great speed.



Types of non-ionizing radiation



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Non-ionizing radiation are characterized by their lower frequencies (electrons can't be taken out)

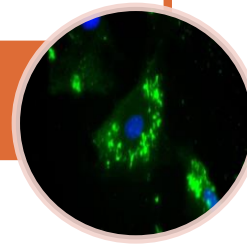
MEDICAL APPLICATIONS LASER

Formed by optical radiation, can be used for:

- Surgery, vessel sealing



- Fluorescence (diagnosis of tumor cells)



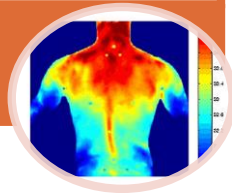
- Destruction of bleeding ulcers



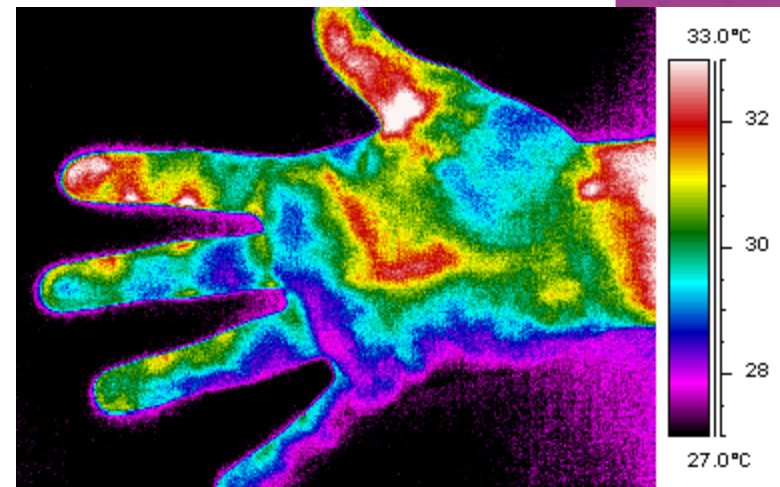
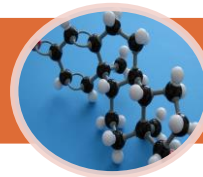
MEDICAL APPLICATIONS INFRARED

wavelength is between $0.8\ \mu$ (10^{-6} m) and $1000\ \mu$ (1 nm), they can be used for:

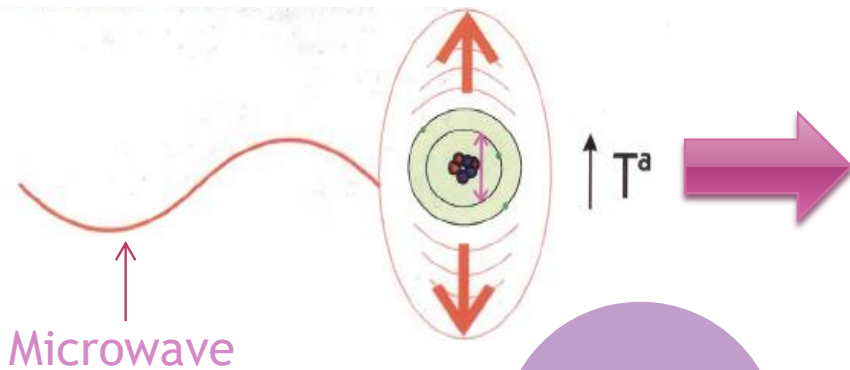
- Thermography (graphic recording of heat from the body)



- Study of molecular structures



MICROWAVES MEDICAL USES



HEAT THERAPIES

Diathermy

- Rehabilitation
- Surgery



Contact diathermy

- Physiotherapy
- Aesthetics
- Phlebology



OBTAINING IMAGES BY MAGNETIC RESONANCE

1 Preparation of the patient.

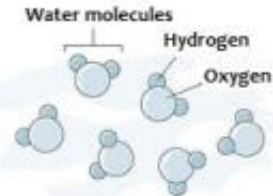
The patient lies down on the stretcher with the necessary bobbins depending on the type of test. Then, he is introduced into the device.

2 Creation of the electromagnetic field.

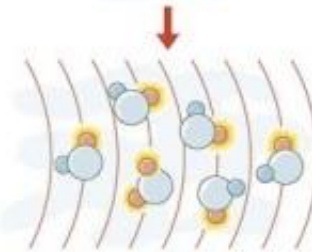
The main bobbins produce an electromagnetic field within the tube.

3 High-energy nucleus formation.

Water molecules of the patient's body contain hydrogen.

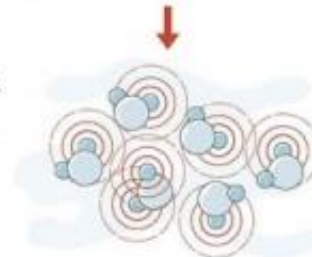


In electromagnetic field presence, hydrogen atoms acquire energy.



4 Signal reception.

After that, hydrogen atoms emit energetic waves, which are captured by the receivers.

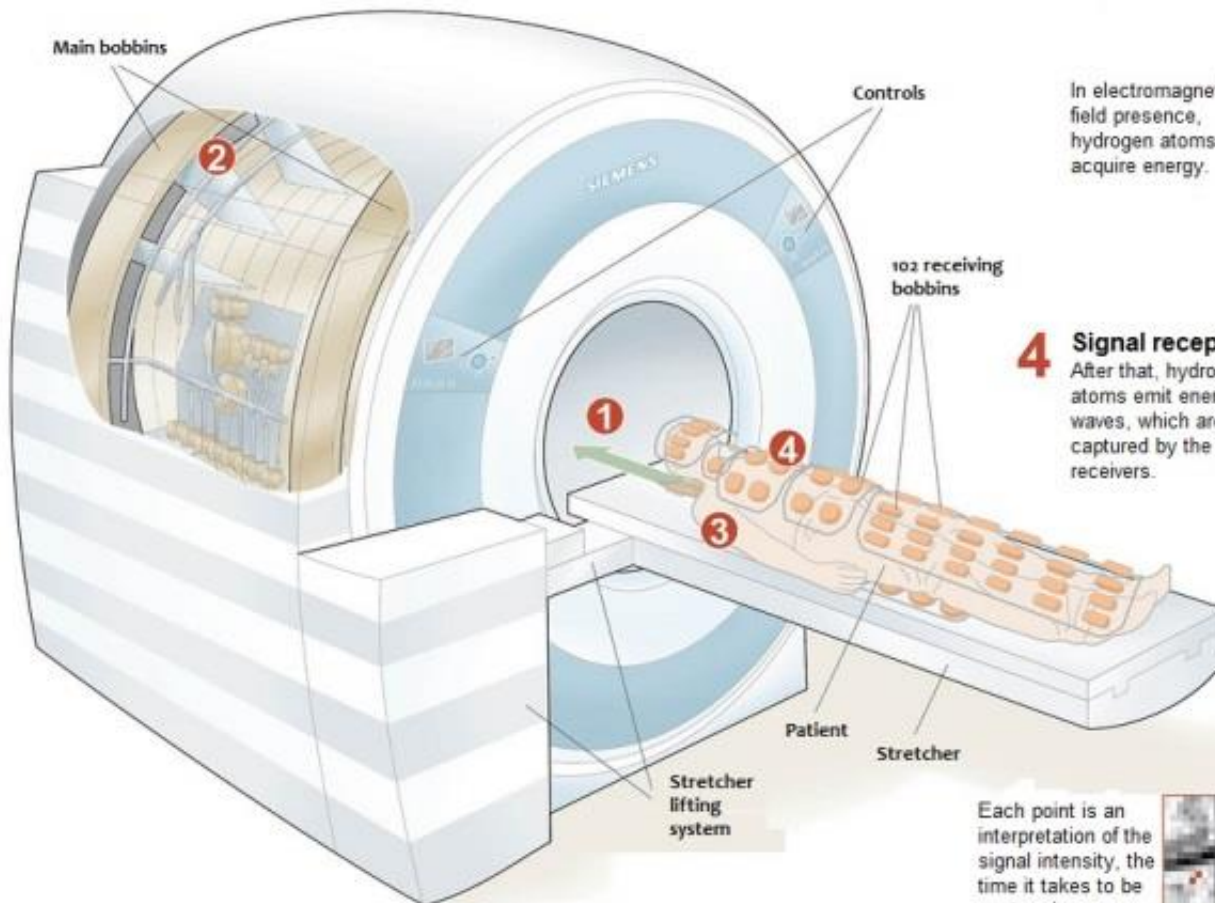


5 Image formation.

Received signals are interpreted in order to create an image of the tissues.

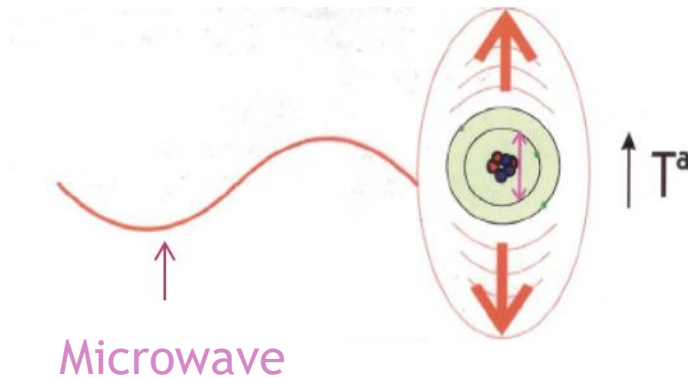


Each point is an interpretation of the signal intensity, the time it takes to be captured...



HEALTH RISKS

⦿ Thermal effects:



Prone organs:

- Crystalline lens
- Vitreous humour
- Glands
- Other organs sensitive to temperature increase.

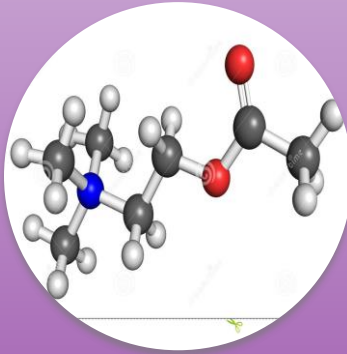
- ## ⦿ Non-thermal effects:
- electroencephalogram alterations, cholinergic activity changes. **There is scientific controversy!**

HEALTH RISKS

Neuropsychiatric effects



Thermoregulation changes



Cholinergic activity changes



Encephalographic alterations



Suicide tendency



HEALTH RISKS

- ◉ **Immune system:** allergies, **immunodepression**, hematologic and leukocyte alterations...
- ◉ **Genetic alterations:** It is thought that electromagnetic waves don't have mutagenic effects when exposure is low-medium.
- ◉ **Cardiovascular:** myocardial electrical conduction problems, repolarization alterations, myocardial infarction...

CONCLUSION

Non-ionizing radiation...

- ◉ Belongs to **low-frequency** radiation.
- ◉ It has several **applications in the medical field**.
- ◉ Many possible risks have been described in relation to this type of radiation, but the WHO admits that all the **epidemiological studies** made until now (in this field) are **insufficient** to test the health risks associated to this radiation.

BIBLIOGRAPHY

- ◉ Revista Cubana de Medicina Militar
- ◉ Scielo