# AT A GLANCE ON THE FUTURE: ENTERING THE INTIMACY OF OUR MATERIALS

## Is your new phone capable of making calls?

With each new generation of phones, bandwidth and data throughput increase (see the 5G sign). This is the case with 5G, which will soon use a frequency of 28 GHz. This change is not without effect on the materials, which may behave differently depending on the frequency to which they are subjected. It is therefore necessary to verify that the materials that make up the telephone correctly propagate electromagnetic waves!

This questioning applies to all devices using radio frequencies: in radio astronomy, for radars, in the biomedical environment ...

## How it works?

The material to be tested is placed in the middle of the system. A transmitter sends waves which are reflected in a first mirror, then a second and then pass through the material where they are slowed, deflected and attenuated. Once the waves have left the material, they are reflected in two other mirrors before being picked up by the receiver for analysis. The mirrors act like magnifying glasses which concentrate the wave beam on a tiny surface in order to limit losses.

The analysis then consists in comparing the received wave with the emitted wave in order to deduce the properties of the material. These properties also vary according to the frequency with which the material is subjected (what is called the "frequency response of a material").

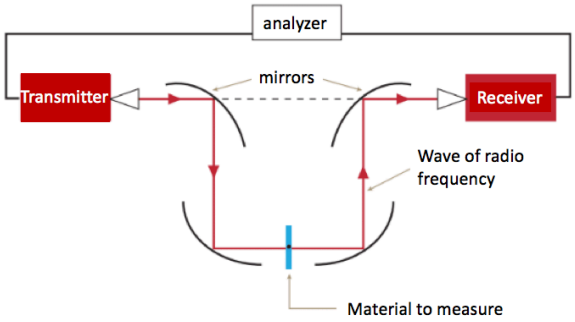


Diagram representing the path of the radiofrequency wave in the material characterization system

## Bonus!

Once the frequency response of the materials is known, it can be used to analyze certain properties. For example, you can follow the fermentation process of liquids like beer or wine by controlling the alcohol level. We can also assess the moisture content of certain foods or even building materials such as concrete.

## Technology for today or for tomorrow?

The device presented here works and is ready to be marketed and used in the industrial world. It allows solids or liquids to be tested at frequencies up to 220 GHz, well beyond applications for cellphones.