

Simple and fast visualization solution of the RF electromagnetic fields

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The ElectroMagnetic InfraRed thermography developed and used at the French Aerospace Lab ONERA can provide a map of the amplitude of the electric field radiated by a EM microwave source: a thin film of very low conductivity is placed in front of the source, and the radiated electric field induces currents that, by Joule effect, heats the film. This heating is recorded by an infrared camera for a few seconds. A low frequency modulation of the EM source, associated with a synchronous demodulation of the thermal frames (lock' in technic) eliminates the continuous thermal phenomena (conduction, convection). Patented by ONERA under the name EMIR (EM InfraRed) in 1998, it is used for studies in EM Compatibility (EM leakage detection), for the analysis of radiating objects, metamaterials, and of course for the characterization of antenna sources.

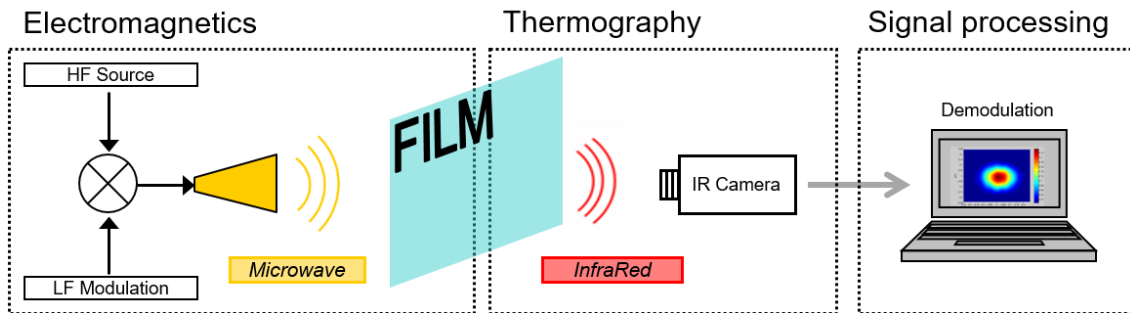


Figure 1. The EMIR method: the thin film absorbs a portion of the radiated energy and heats up, which is detected by the thermal camera; the video is then digitally demodulated

We present improvements of this method and in particular, we propose here for the first time a vector measurement of the electric field, by using anisotropic films with conductivity patterns. In the case of a linear polarization, this technique can measure the field direction, and in the case of circular polarization, it can give the axial ratio. Furthermore, we show, with the help of a patterned array, that we can obtain the spatial structure of the near field, both in amplitude and direction.

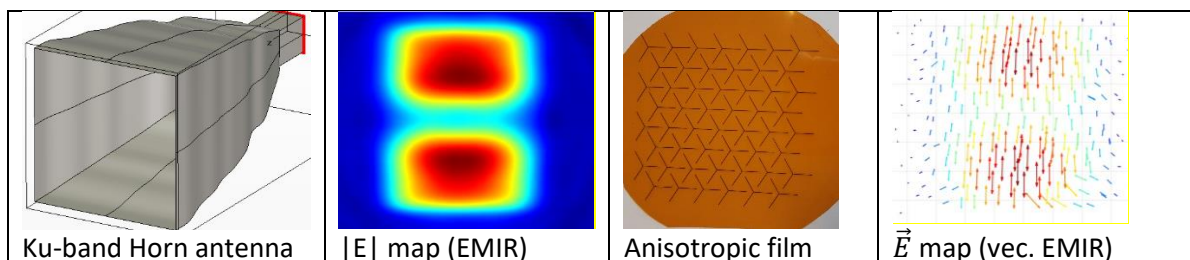


Figure 2. Horn antenna near field map: amplitude (isotropic film), \vec{E} (anisotropic patterns)

This method is now being industrialized, and an integrated measurement device requiring no specific installation (and in particular no anechoic chamber) will soon be marketed by the company ANYFIELDS (that uses the EMIR patents under license from ONERA).

The SONDRRA workshop will be an opportunity to present the device and to discuss about its possible evolutions according to the community requirements.