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X band resonator for non destructive EPR measurements

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The EPR measurements of radicals induced by ionizing radiation in the glass of touchscreen displays of mobile phones allow to reconstruct the dose absorbed by the mobile phone and thus to estimate the dose received by the individual carrying out the device. Using conventional microwave cavities, after its extraction, the display must be fragmented, so that the mobile phone is no more usable. The aim of the present proposal is to design and assemble an X band (9.8 GHz) resonant cavity prototype for EPR measurements on intact samples having with thickness in the range of the glass thickness. The idea is to assemble an X-band resonant metallic cavity having a rectangular (TE₁₀₂ mode) or a circular (TE₁₁₁ or TM₀₁₀) section; a slit will be realized on one side of the cavity, for the emission of the excitation magnetic field. The sample to be measured will be lodged outside the cavity, without being disassembled or altered in any way.

Simulations were performed using the software Microwave Studio (CST)

Simulations of a commercial rectangular cavity, located at the ISS were made, in order to check the suitability of the software Microwave Studio (CST) to be used to design and assemble the prototype of the cavity with aperture. Fig. 1 a shows the simulated geometry and Fig. 1b the magnetic field distribution on the external slit surface.

Then, CAD simulations of the metallic cavity with multiples apertures were performed, considering several geometries and positions, with samples of different permeability, permittivity and shapes. A study of the force lines of the magnetic field were realized both outside and inside the cavities. Results obtained from simulations will be presented in the poster.

Several cavity designs were simulated. The properties will be presented and used as criteria to choose the cavity which will be built.

Figure 1

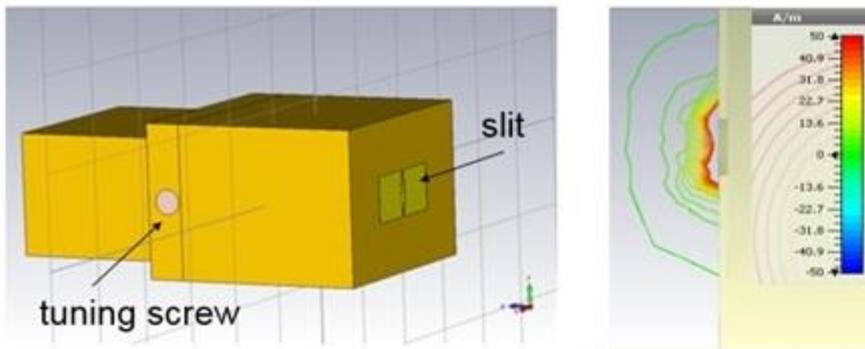


Fig. 1 CST model of an EPR resonator structure with a slit (a) and magnetic field distribution on the external slit surface.