

3-D Simulations for Pharmaceutical Materials Exposure in Reverberation Chamber

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The Radio Frequency Identification technology is used in lots of different applications and the interest of the auto-identification is now growing in the pharmaceutical domain for both the tracking and the security for counterfeit. The RFID technology can be used at different frequencies but this study focus on Ultra High Frequency (860 MHz). The use of RFID systems in the pharmaceutical supply chain raises questions in terms of radiation impacts, especially for temperature sensitive pharmaceutical drugs. To irradiate samples, different solutions can be considered as waveguides or anechoic chamber that is most often used as exposure system. In this study, we follow another way and we argue that it can be interesting to place the drug in a reverberation chamber. We have evaluated the possibility and the efficiency of placing more than one sample at once during an irradiation.

Our precedent study (S. Derenne and P. De Doncker, "Exposure homogeneity of pharmaceutical materials in reverberation chamber" URSI GASS, 2014) has shown results for 2-D simulations. The next step that we study here is 3-dimensions simulations with FDTD method as the example in Fig. 1 - (a). The same assumption considering cylinders fulfilled with saline solution as samples is made. The methodology consist in computing the Specific Absorption Rate in each sample and using two different ways to compare with a unique sample (the reference). As shown in Fig 1 - (b) each cylinder will be divided in one hand into eight cones to evaluate the directional homogeneity and in the other hand in eight concentric rings to evaluate the penetration homogeneity always in comparaison with the reference. We have developed a tool, the spread, to be able to compare different scenarios in terms of radius and distance between the cylinders. At the end, we will be able to compare 2-D and 3-D simulations and chose the best way to expose more than one sample during one test.

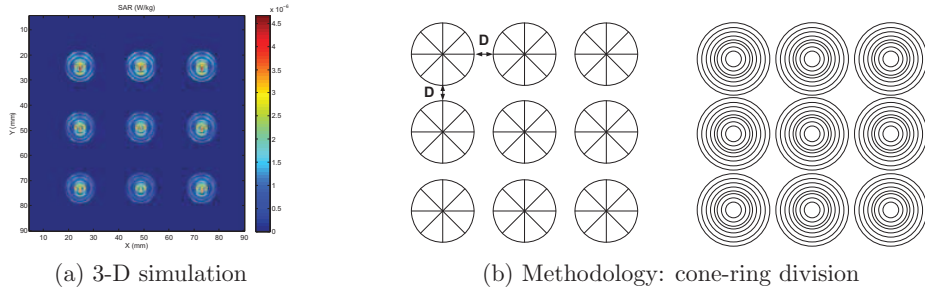


Figure 1: Example for one scenario and the methodology to evaluate the homogeneity