First Latin-American Congress
on Solid State Dosimetry and Radiation Measurements
13-17 September, 2021

# DEVELOPMENT OF AN ALIGNMENT TEST DEVICE FOR RADIODIAGNOSTIC EQUIPMENT UTILIZING 3D PRINT

MIRANDA, E,H.[1] , and SILVA, J,O.[2]

[1]Instituto de Física, Universidade Federal de Góias, 74690-900 Goiânia, GO, Brazil.

**Introduction:** According to 2008 UNSCEAR [1] report, radiology is the biggest source of human exposure to ionizing radiation. For that reason, keep imaging equipment according to national and international standards is essential, in order to avoid unnecessary exposure.

The alignment test, one of the quality tests, verifies that the X-ray central axis and the image receiving plane are properly aligned. According to Portaria 453/98 [2], the difference should be no bigger than 3 degrees. Usually, the devices used in this test are made of acrylic and fiberglass. Unfortunately, these commercial devices can represent a big cost for small clinics, this can result in a non-compliance of the standard [3]. In order to make this quality control test more accessible, we developed a low-price device utilizing a 3D printer.

An alignment test device consists in a structure with two separate spheres aligned along the vertical axis. Our device has 15 cm between the spheres, same distance used in commercial ones. We used 2 mm spheres for the test

**Material and method:** The device model was developed with the free app TinkerCad. We used a Anet A8 DIY 3D Printer and Lactic Polyacid based resin to print it.

We tested the device in a Digital Radiography equipment located in Hospital das Clínicas da UFG / EBSERH. The technique used was 70 kV/20mAs during one second.

**Results**: A device picture and an alignment test image made with it can be seen in the right.

In order to analyse the alignment, we needed a guide table (the green table in Figure 1). Both spheres in the minor circle means proper alignment.

As expected, the device provides an alignment test useful image, where both spheres are cleared showed. The device supports presence in the image although unwanted, does not compromise the image test quality.

**Conclusions:** We showed that a low-price device for alignment test that can be operated in a routine radiodiagnostic technique can be created using a 3D printer.

Unfortunately, this device cannot be used without a guide table. For that reason, our next object for this project is to create a low-price guide table using circuit boards.

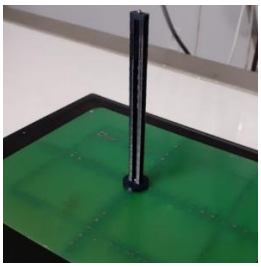

Figure 1: device holding both spheres.

Figure 2: Alignment test image.

**References:**

1. UNSCEAR. Sources and effects of ionizing radiation: UNSCEAR 2008 report to the General Assembly with scientific annexes. New York: UNSCEAR, 2010.
2. Brasil. Ministério da Saúde. Portaria MS 453/98, de 02 de junho de 1998. In: Diário Oficial da União. Diretrizes de proteção radiológica em radiodiagnóstico médico e odontológico do Ministério da Saúde. Brasília, DF: Ministério da Saúde; 1998
3. SILVA, Marcos Otaviano Da; CARVALHO, Antônio Carlos Pires; AZEVEDO, Ana Cecília Pedrosa De. Levantamento das condições de funcionamento dos serviços de radiologia de hospitais públicos e universitários do Rio de Janeiro*. v. 37, n. 4, p. 271–278, 2004.