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Combined detector model for the purpose of nuclear density measurement

Nuclear measurement systems have a special place in different industries of the world. One of the most used devices is a gamma density measurement that has two main individual techniques: transmission nuclear density measurement and backscatter nuclear density measurement. In this research these two main techniques have been combined and a new device for the purpose of measuring the density was designed. Then this new device was simulated, implemented and tested. The results of the combined method in comparison to the conventional transmission method show that the new method has better linear characteristics and has been successful to improve the precision of the measurement. These results those were confirmed by the simulations show that the combined method also can reduce MAE (%), MRE (%) and RMSE in comparison to the transmission method.

Summary

Key words: Nuclear measurement system, transmission technique, backscatter technique, buildup factor, MCNP, Compton scattering, measurement errors, RSQ function

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