Int J of Theoretical Physics, Group Theory and Nonlinear Optics ISSN: 1525-4674
Volume 15, Number 1/2 

# THE IMPACT OF GEOMETRY FACTORS ON NMR DIFFUSION MEASUREMENTS BY THE STEJSKAL AND TANNER PULSED GRADIENTS METHOD

***O. M. Dada[1], O. P. Faromika[2], O. B. Awojoyogbe[1*], O. E. Dada[3] and M. A. Aweda[4]***

[1]Department of Physics, Federal University of Technology, Minna, Niger State, Nigeria

[2]Department of Physics, Federal University of Technology, Akure, Ondo State, Nigeria

[3]Department of Radiation Biology and Radiotherapy, College of Medicine of the University of Lagos, Idi-Araba, Lagos State, Nigeria

[4]Department of Medicine, Faculty of Basic Medical Sciences, College of Health Sciences, University of Ilorin, Ilorin, Kwara State, Nigeria.

## Abstract

Diffusion imaging and particularly diffusion tensor imaging have become popular due to their numerous clinical and research applications which span from brain stroke evaluation to fiber tracking. With few exceptions, these methods are rooted in the classical Stejskal-Tanner formula for the diffusion-attenuated signal, usually obtained by solving the Bloch-Torrey partial differential equations. Here we derive the Stejskal-Tanner formula in the simplest possible manner, avoiding cumbersome integrals and differential equations. This approach makes it easy to understand the origin of the diffusion signal attenuation, the effects of various diffusion sequence parameters, and also the numerous important pitfalls are discussed. This contribution is based on a mathematical formulation for the analysis of geometry factors in Stejskal-Tanner imaging sequence. Calculations are based on the direct analytical solution of the Bloch NMR flow equations by the method of separation of variable in Cartesian, cylindrical and spherical polar coordinates representing the NMR transverse magnetization. Appropriate mathematical transformations are involved in the resolution algorithm at different stages. The mathematical transformations are introduced based on Bessel and Legendre polynomials.

**Keywords:** NMR diffusion equations, Stejskal-Tanner imaging sequence, Geometrical factors, Bessel and Legendre polynomials.

* Corresponding author: Email: awojoyogbe@yahoo.com