frontiers | Frontiers in Energy Research

CORRECTION
published: 19 May 2022
doi: 10.3389/fenrg.2022.898887

Corrigendum: Validation of Doppler Temperature Coefficients and Assembly Power Distribution for the Lattice Code KYLIN V2.0

Lei Jichong[1], *Xie Jinsen*[1], *Chen Zhenping*[1]*, *Yu Tao*[1]*, *Yang Chao*[1], *Zhang Bin*[2], *Zhao Chen*[2], *Li Xiangyang*[2], *Wu Jiebo*[1] *and Deng Nianbiao*[3]

[1]School of Nuclear Science and Technology, University of South China, Hengyang, China, [2]Science and Technology on Reactor System Design Technology Laboratory, Nuclear Power Institute of China, Chengdu, China, [3]School of Resource Environment and Safety Engineering, University of South China, Hengyang, China

Keywords: KYLIN V2.0, doppler temperature coefficient, power distribution, method of characteristic (MOC), AFA 3G

A Corrigendum on

Validation of Doppler Temperature Coefficients and Component Power Distribution for the Advanced Neutronics Lattice Code KYLIN V2.0

by Jichong, L., Jinsen, X., Zhenping, C., Tao, Y., Chao, Y., Bin, Z., Chen, Z., Xiangyang, L., Jiebo, W., Huajian, Z., and Nianbiao, D. (2021). Frontiers in Energy Research, 2021: 809. doi: 10.3389/fenrg.2021.801481

OPEN ACCESS

Edited and reviewed by:
Shripad T. Revankar, Purdue University, United States

***Correspondence:**
Yu Tao
yutao29@sina.com
Chen Zhenping
chzping@yeah.net

Specialty section:
This article was submitted to Nuclear Energy, a section of the journal Frontiers in Energy Research

Received: *18 March 2022*
Accepted: *31 March 2022*
Published: *19 May 2022*

Citation:
Jichong L, Jinsen X, Zhenping C, Tao Y, Chao Y, Bin Z, Chen Z, Xiangyang L, Jiebo W and Nianbiao D (2022) Corrigendum: Validation of Doppler Temperature Coefficients and Assembly Power Distribution for the Lattice Code KYLIN V2.0. Front. Energy Res. 10:898887. doi: 10.3389/fenrg.2022.898887

In the original article there was an error in the **Title**. The correction has been made as follows.

"Validation of Doppler temperature coefficients and assembly power distribution for the lattice code KYLIN V2.0."

In the original article there was some missing words from the **Abstract**. The section should be corrected as follows:

This work is interested in verifying and analyzing the advanced neutronics lattice code KYLIN V2.0. Assembly calculations are an integral part of the two-step calculation for core design, and their accuracy directly affects the results of the core physics calculations**.** In this paper, we use the Doppler coefficient numerical benchmark problem and CPR1000 AFA-3G fuel assemblies to verify and analyze the advanced neutronics lattice code KYLIN V2.0 developed by the Nuclear Power Institute of China. The analysis results show that the Doppler coefficients calculated by KYLIN V2.0 are in good agreement with the results of other well-known nuclear engineering design software in the world; the power distributions of AFA-3G fuel assemblies are in good agreement with the results of the RMC calculations, it's error distribution is in accordance with the normal distribution. It shows that KYLIN V2.0 has high calculation accuracy and meets the engineering design requirements.

In the original article there was some errors in the **Introduction** in paragraph 1, 2 and 3 as some words were missing. The **Introduction** should be corrected as follows:

The main task of reactor physics analysis is to simulate various nuclear reaction processes in the core and to analyze various key parameters related to the "nuclear" in the nuclear reactor, including core criticality (reactivity), core three-dimensional power distribution, various reactivity coefficients, control rod values, shutdown margins, and isotope changes of various assemblies in the nuclear fuel, etc. The key to the physical analysis of the reactor is to solve the neutron transport equation and the fuel consumption equation. There are two methods to solve the neutron transport equation, one is the approximate method to solve the seven-dimensional equation, and the other is the probabilistic method to solve the neutron transport equation - Monte Carlo transport calculation method

(Hammersley, 2013). However, the Monte Carlo method cannot be widely used in the engineering design of nuclear reactor core physics due to the large calculation rate and the difficulty of multi-physics coupling calculation (Lang et al., 1993).

Nuclear Power Institute of China (NPIC) has developed a software platform with independent property rights for nuclear power design and system safety analysis, NEPRI, in which the lattcie code KYLIN-V2.0 (Chai et al., 2017) is mainly used to calculate the few group constants for transport of single rods and assemblies of pressurized water reactors and the nucleon density of important nuclides for the core diffusion code for full core calculations. KYLIN-V2.0 uses the subgroup resonance calculation method to obtain effective resonance self-shielding cross sections, eliminating the limitations of lattice geometry and ensuring accuracy and efficiency, with multi-group energy structure in the cross section database. When multiple resonance nuclides are present, the Bondarenko iterative method is used to deal with resonance interference effects. The neutron transport calculation adopts the method of characteristics (MOC) (Douglas and Russell, 1982), the Chebyshev rational approximation method (CRAM) (Maria, 2016) with good computational accuracy and efficiency is used in the fuel burnup calculation in KYLIN V2.0 program.The KYLIN V2.0 program solves the multigroup diffusion equation by the fractional group diffusion theory and obtains the few-group parameters needed for the core procedure by parallel group homogenization.

In order to further confirm the engineering applicability of KYLIN V2.0 code and the credibility of the calculation results, an application study and additional validation experiments of the key nuclear power design software were conducted. In this paper, the Doppler temperature coefficient and neutron transport functions of the KYLIN V2.0 code are verified based on the Doppler temperature coefficient numerical benchmark problem and the AFA-3G fuel assembly problem.

In the original article there were some errors in Section "*KYLIN V2.0 Software*", sentence 1 and 2, page 2. The sentences should be corrected as follows:

"The neutronics lattice calculation code KYLIN-V2.0 is an important program in the core design program system, which provides the homogenization parameters of two-dimensional components for the core design software CORCA 3D through the cross-section production software PACFAC. The calculation flow chart of KYLIN-V2.0 is shown in Figure 1, and the program uses the 45-group or 190-group multi-group cross-section library generated by the NJOY code to calculate."

In the original article there were some errors in section "*AFA-3G fuel assembly benchmark questions*", page 5. The sentences should be corrected as follows:

"According to the relevant references, the eigenvalues and relative errors of the assemblies at different depletion steps obtained by KYLIN V2.0 code and RMC code [9] based on the ENDF/B-VIII.0 database after refinement modeling are shown in **Table 3**."

"**Figure 5** shows Geometric arrangement of AFA-3G37000 type assembly and **Figure 6** Geometric arrangement of AFA-3G44512 type assembly"

"**Table 3**. Table of characteristic values of different depletion steps of AFA-3G assemblies calculated by KYLIN V2.0."

"It shows that KYLIN V2.0 can meet the engineering design requirements in terms of calculating the eigenvalues and the assembly power distribution."

In the original article, there was an error in the **Conclusion** due to a missing word. The sentence should be corrected as follows:

"d) The KYLIN-V2.0 program is able to meet engineering design requirements in terms of calculating Doppler temperature coefficients, eigenvalues, and assembly power distributions.**"**

The authors apologize for those errors and state that those do not change the scientific conclusions of the article in any way. The original article has been updated.