

Subgroup Resonance Calculation Methodology Improvements

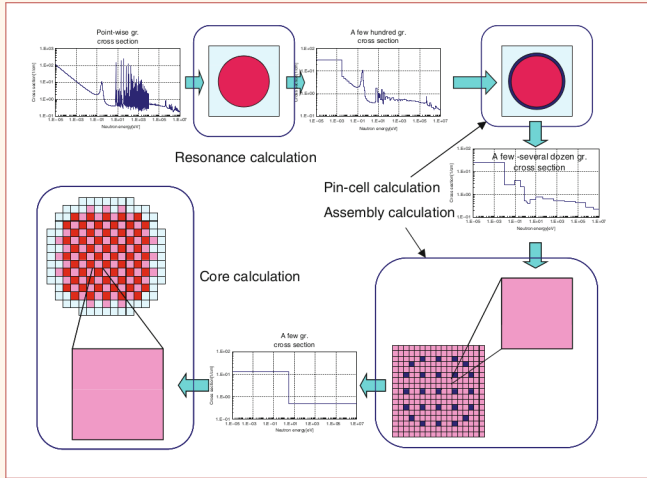
a holistic approach

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Nuclear Engineering Research Seminar, May 19th, 2020

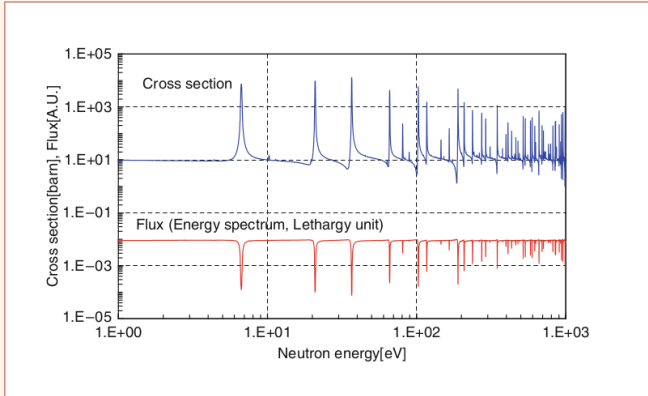
Resonance Calculations¹

in context



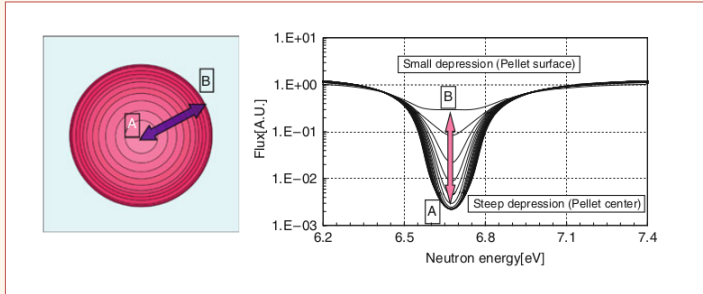
¹D. Knott y A. Yamamoto, "Lattice physics computations," en Handbook of Nuclear Engineering (D. Cacuci, ed.), vol. II Reactor Design, pp. 913–1239, Springer Science+Business Media, 2010.

Energetic Resonance¹



¹D. Knott y A. Yamamoto, "Lattice physics computations," en Handbook of Nuclear Engineering (D. Cacuci, ed.), vol. II Reactor Design, pp. 913–1239, Springer Science+Business Media, 2010.

Spatial Resonance¹



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General Overview

resonance methods

- ▶ Equivalence

General Overview

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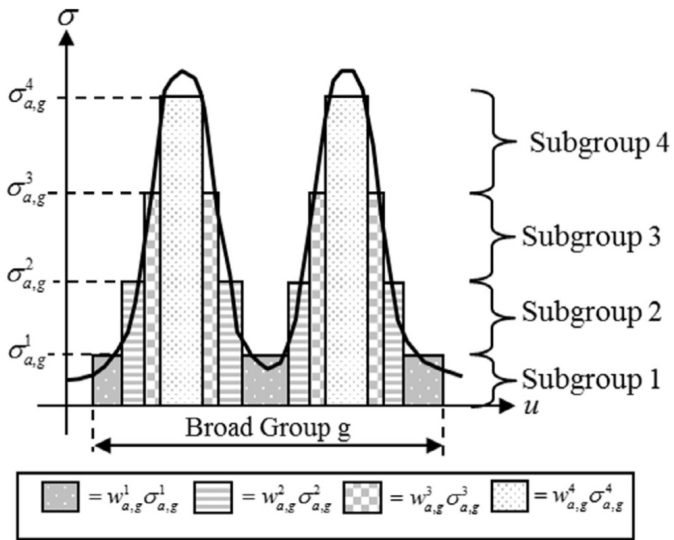
- ▶ Equivalence
- ▶ Ultrafine

General Overview

resonance methods

- ▶ Equivalence
- ▶ Ultrafine
- ▶ Subgroup

Subgroup Method



General Overview

general concerns [Liu and Martin, 2017]

- ▶ spatial self-shielding effects

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- ▶ resonance interference

General Overview

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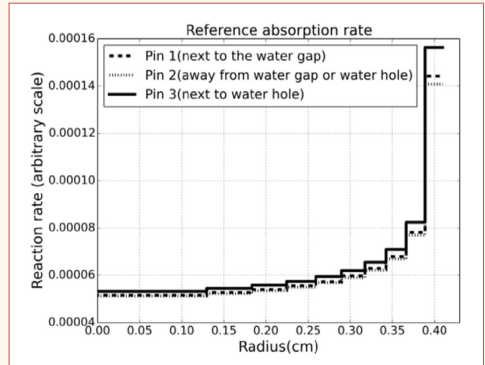
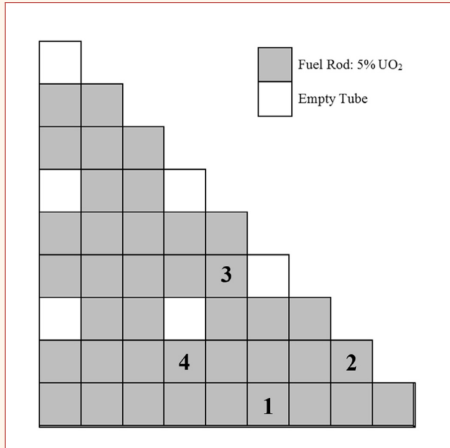
- ▶ spatial self-shielding effects
- ▶ resonance interference
- ▶ non-uniform temperature effects

General Overview

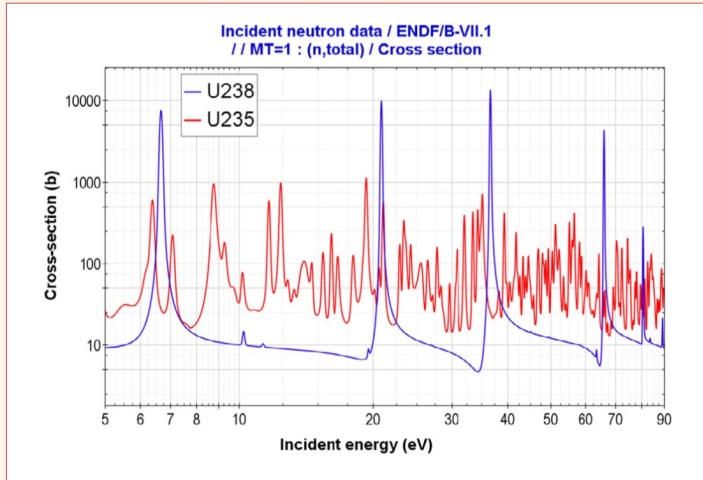
general concerns [Liu and Martin, 2017]

- ▶ spatial self-shielding effects
- ▶ resonance interference
- ▶ non-uniform temperature effects
- ▶ self-shielding of clad isotopes

Spatial Self-Shielding Effects [Liu and Martin, 2017]



Interference Effects [Soppera et al. 2014]



Resonance Interference Factors (RIF)

- ▶ Tabular values [Choi et al. 2015]

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- ▶ Subgroup weights [Joo et al. 2009]

Primary Objective

Develop a self-shielding methodology for a 2D heterogenous system, capable of performing high fidelity whole core direct transport calculations. Such that within pin effects are considered, these include multi-region depletion and non uniform temperature distribution.

Proposed Roadmap

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- ▶ WIMS structure library adoption and resonance models.
- ▶ New library generation with NJOY.
- ▶ Adoption of a *better* equivalence method [Choi et al. 2017].
- ▶ Application of a *better* subgroup method [Lu et al. 2018] and ESSM-X [Liu et al. 2015]

Thanks!
Questions?