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# Photon strength function modelling, status and perspectives.

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The present contribution will give an overview of the photon strength function models developed to compensate for the lack of data for experimentally non-accessible nuclei. During this overview, phenomenological and microscopic approaches will be presented in light of their respective strengths. We will discuss more particularly the added value of microscopic approaches and the progressive reduction of phenomenological ingredients introduced in their post-treatment.

Among microscopic methods, the quasi-random phase approximation (QRPA) has been extensively used for the past decade due to its ability to be applicable to all nuclei.
Focussing on this approach, we will present the Gogny-based QRPA approach [1] which can be applied to spherical as well as to axially deformed nuclei, from light (i.e. oxygen) to superheavy elements [2]. Despite the intensive computational effort it represents, large-scale calculations of dipole strength functions can be performed with limited phenomenological ingredients [3,4,5]. The resulting photon strength functions have been shown to reproduce the bulk of experimental data with a high level of accuracy [6].

We will also present other observables obtained within the standard QRPA framework [7] and its extension, with a special emphasis on the $4^-$ isomeric states in the $N = 100$ isotonic chain [8].
This study requires the calculation of the transition probabilities between excited QRPA states, which have also been consistently applied to the microscopic description of the low-energy component of the dipole strength function, known as the upbend and as observed in Oslo data [6].
We will therefore return to the definition of the photon strength function and its application to reaction calculation. Particular attention will be paid to the differences and similarities between photon absorption and de-excitation strength functions.

As perspectives, new theoretical results including these transition probabilities between excited states will be presented and commented.

[1] S. Péru and H. Goutte, Phys.Rev. C 77, 044313 (2008);
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[7] S. Péru and Martini, Eur. Phys. J. A 50: 88 (2014);
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**Primary author:** PERU, Sophie (CEA, DAM, DIF)

**Co-authors:** HILAIRE, Stéphane (CEA, DAM, DIF); GORIELY, Stephane (ULB)

**Presenter:** PERU, Sophie (CEA, DAM, DIF)

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