



**SDI Review Form 1.6**

Journal Name:	<a href="#">Physical Science International Journal</a>
Manuscript Number:	Ms_PSIJ_40246
Title of the Manuscript:	Calculation of Temporal Plasmas of XFEL Experiments with a Relativistic Collisional Radiative Average Atom Code
Type of the Article	Original Research Article

**General guideline for Peer Review process:**

This journal's peer review policy states that **NO** manuscript should be rejected only on the basis of '**lack of Novelty**', provided the manuscript is scientifically robust and technically sound. To know the complete guideline for Peer Review process, reviewers are requested to visit this link:

(<http://www.sciencedomain.org/page.php?id=sdi-general-editorial-policy#Peer-Review-Guideline>)



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**PART 1: Review Comments**

	Reviewer's comment	Author's comment (if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)
<b>Compulsory</b> REVISION comments		<p>This is my final revised paper version 1, please check all changes in yellow, especially that of lines:</p> <p>Lines 253-255: We can observe also in Figure 3.b, that n-shell populations temporal evolutions <math>P_n(t)</math> at <math>E_{rad}=800</math> eV and <math>P_n(t)</math> n-shells populations temporal evolutions at <math>E_{rad}=1050</math> eV versus 2000 eV, follow perfectly the changes in the electronic temperature temporal profiles.</p>
<b>Minor</b> REVISION comments	<p>Comments about the article "Calculation of temporal Plasmas . . . Atom Code" (<b>Ms_PSIJ_40246</b>).</p> <p>This work is a sequel of those presented in Refs. [1-7], now used to model plasmas with temporal resolution. In brief, I consider that this paper can be published, although has several untidiness, that must be corrected. In first place, it is not clear how the Average Atom Model is constructed, because the authors used the RSHM, useful ion by ion. As I understand, an Average Atom Model, as explained in the book by Nikiforov et al, do not use particular ions but is constructed <i>ab initio</i>, resulting in an average (!) of all ions presents in the plasma...</p> <p>Going to certain details, the introduction can be shortened: lines 47 to 64 are not important; the figure 1 is not illuminating. In the lines 94 to 98 the symbols P, D, S and L were not defined; just they are from line 148; this must be improved. In the line 215 is introduced the formula of Stewart-Pyatt to take into account the plasma effects. There are no arguments about the usefulness of that formula in comparison with other models, as those cited in the paper by Crowley: High Energy Density Physics <b>13</b>, 84 (2014). Other more refined criterium, as the thermodynamic consistency condition (TCC), introduced by Nikiforov et al, are not mentioned. Without this condition appear discontinuities in the thermodynamic properties of the plasma. In the Eq. (7) there are not correspondence between the subscript "e" in <math>D_e</math> and the subscript "i" in the square root. Some Reference must be cited about the origin of formulas 7 to 10. The graphs must be presented with better resolution: the lines are very thin and the characters are not readable. The Tables of pages 18 to 25 are not illuminating: is better replace them with well made graphs. The words "excellent and complete....", presented in lines 195 and 382 should be avoided by the authors... In the Ref. [3], what is UPM? Universidad Politécnica de Madrid? In the Ref. [7], what is the volumen of JQSRT? In the Ref. [8], details are mising.</p> <p>In summary, with these small changes, this work can be published in Physical Science International Journal.</p>	<p>Just let me explain that the real purpose of the paper is to demonstrate that the new code ATMED CR can also compute typical plasmas created in XFEL facilities. Please keep in mind that ATMED CR is a new code and the most advanced collisional radiative average atom model launched with a doctoral thesis on October of 2017. The operating schemes are inside the thesis book and the temporal plasmas are those of Workshop NLTE-10 of 2017, never calculated before with ATMED CR:</p> <ol style="list-style-type: none"> <li>For further information about the construction of the average atom model with the relativistic screened hydrogenic atomic model I include the reference 2 of thesis book. I've followed Nikiforov et al. and with the formulas from several authors adapted to the average atom. You all can trust the results because I have a very huge database of plasmas and for all chemical elements the properties are very accurate.</li> <li>Don't include the lines 94 to 98 if you don't want, the equations explain the algorithm in Fortran to the temporal module for iterations in populations. I explain the symbols in lines: 149 (D degeneracy)-150-153 (L Sum of depopulation rates)-154 (P Populations)-156 (S Sum of population rates).</li> <li>I include the formula of Stewart-Pyatt because in the instructions of the Workshop they ask for analyzing the behavior of this model for plasma effects in comparison with ionization pressure model more similar to Ecker-Kröll.</li> <li>The quantities <math>D_e</math> and <math>D_i</math> are used for computing <math>R_D</math>.</li> <li>Reference [3,5] for formulas 7 to 10.</li> <li>Don't include the tables if you don't want. I think it is illustrative being a new code to give the tables in case a reader wants to see the order of magnitude of properties, being very accurate statistical averages of quantum mechanical calculations. It is also very important to establish the big difference of calculating with the steady state scheme and the temporal scheme.</li> <li>I'll send the figures by email for better resolution and you can locate in bigger size inside the document (the dots per inch are 1000 horizontal and vertical, if you need even better resolution, indicate it to me and I put 2000 or 3000 dots).</li> <li>Words "excellent and complete", eliminated, you can trust the results.</li> <li>JQSRT is Journal of Quantitative Spectroscopy &amp; Radiative Transfer</li> <li>UPM is "Universidad Politécnica de Madrid"</li> <li>Reference completed: W.A. Lokke and W.H. Grasberger. XSNQ-U A Non-LTE Emission and Absorption Coefficient Subroutine. Prepared for U.S. Energy Research &amp; Development Administration</li> </ol>



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<b><u>Optional/General</u></b> comments		Corrected orbital number 34: <b>6g</b> <sub>9/2</sub>