**Review 1**

**Files**

* [JPCSLaTeXGuidelines1.pdf](http://events.saip.org.za/getFile.py/access?resId=0&reviewId=1&materialId=reviewing&contribId=52&sessionId=16&confId=86)(*Uploaded on 20 Nov 2017 14:50*)
* [JPCSLaTeXGuidelines1Edited.pdf](http://events.saip.org.za/getFile.py/access?resId=1&reviewId=1&materialId=reviewing&contribId=52&sessionId=16&confId=86)(*Uploaded on 20 Nov 2017 14:50*)
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**Assessments**

**Response by authors:**

The paper has been revised taking into account the comments given by the reviewer. The title has been changed to more accurately reflect the changes and the contribution of the paper.

Individual responses to the reviewers comments are given in **red** below each of the comments.

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| **Referee:** | | **To be corrected**  submitted on *Mon 20 Nov 2017 at 14:50*  **Comments**  This paper will be accepted for the 2016 SAIP Proceedings after the corrections recommended by reviewers are made.  Please submit a corrected pdf of the paper as well as a description of all changes made in response to the reviewer comments, also in pdf format. Corrections must be submitted by noon on Monday, 27 November 2017.  Comments from the reviewers can be found by logging into the SAIP2016 website (http://events.saip.org.za/event/saip2016), clicking on My Contributions, then View for the specific paper, and finally look under History.  You can upload a second document to the Indico system by clicking on the More link in the Upload Paper window.  **Answers**  Does the article that you are being asked to review match your expertise? (On scale, + for yes or agree): Neutral  Are there any potential conflicts of interest if you review this article? (+3 for yes / -3 for no): Neutral  A1 Scientific merit: Is the work scientifically rigorous and accurate? Is it appropriate for the proceedings?: Neutral A2 Clarity: Are the ideas in the paper communicated clearly and legibly? : Neutral  A3 Context: Is there sufficient discussion of the background for this work and suitable referencing?: Neutral  B1 Originality: Is the work relevant and novel?: Neutral  B2 Motivation: Does the problem considered have a sound motivation? All papers should clearly demonstrate the scientific interest of the results: Neutral  C1 Title: Is it adequate and appropriate for the content of the article?: Neutral  C2 Abstract: Does it contain the essential information of the article? Is it complete?: Neutral  C3 Diagrams, figures, tables and captions: Are they essential and clear?: Neutral  C4 Text and mathematics: Are they brief but still clear? If you recommend shortening, please suggest (below at comments) what should be omitted: Neutral  C5 Conclusion: Does the paper contain a carefully written conclusion, summarising what has been learned and why it is interesting and useful?: Neutral  C6 References: Are the references in the correct format? Are all references mentioned in the text and cited chronologically?: Neutral | |
| Layout: | **ACCEPTED**  submitted on *Wed 10 Aug 2016 at 16:04*  **Answers**  Does the paper match the layout of the template?: Strongly Agree  Is the paper no more than 6 pages in total?: Strongly Agree  Is the paper formatted in accordance to the style format specifications of the template?: Strongly Agree | |

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| Content: | **To be corrected**  submitted on *Fri 17 Nov 2017 at 11:12*  **Comments**  The paper reports on the simulation of interaction between laser beams and two-level atoms. The simulation of saturated absorption spectroscopy is successful and of publication quality, although it can probably be found in literature as it is such a well-known example in physics. The title and abstract promise simulation of nonlinear processes and multi-level atoms, however there is no real content on these topics, and not even a detailed description of how these topics will be simulated. The paper seems to be incomplete to a reader who expect at least some results on nonlinear processes and multi-level atoms to follow. Either description of the simulation approach and some results (at least preliminary results) on the nonlinear processes and multi-level atoms should be added, or the reference to nonlinear processes should be removed from the paper. It will definitely contribute to the originality of the paper if results on nonlinear processes and multi-level atoms are included and I would encourage the autors to do so.  The title, abstract, introduction and relevant sections have been updated to include nonlinear processes in multilevel atoms.  Other comments: Please describe what the relevance is of creating entangled photons in Rb vapour.  Introduction updated to include this.  Description of figure 1D: replace (- - -) with (black). The dashed line looks like a solid line in the figure.  Corrected.  Equation 9: Did you develop this equation from scratch, or should there be reference/references to literature from where you took the different factors?  This section has been removed seeing that it is well documented in most graduate level texts.  Equation 9: Please define the meanings of the symbols. This paper will be published in the SA Journal of Science that is not a specialised physics journal, therefore symbols should be defined to accomodate the reader.  This section has been removed seeing that it is well documented in most graduate level texts.  In the paragraph below Equation 9 please replace the word “term” throughout by the word “factor”. Terms are added, but the square bracket here indicate factors that are multiplied with one another.  This section has been removed seeing that it is well documented in most graduate level texts.  **Criteria Evaluation**  Does the article that you are being asked to review match your expertise? (On scale, + for yes or agree): Agree  Are there any potential conflicts of interest if you review this article? (+3 for yes / -3 for no): Disagree  A1 Scientific merit: Is the work scientifically rigorous and accurate? Is it appropriate for the proceedings?: Neutral  A2 Clarity: Are the ideas in the paper communicated clearly and legibly? : Neutral  A3 Context: Is there sufficient discussion of the background for this work and suitable referencing?: Agree  B1 Originality: Is the work relevant and novel?: Weakly Agree  B2 Motivation: Does the problem considered have a sound motivation? All papers should clearly demonstrate the scientific interest of the results: Disagree  Paper has been revised to improve motivation. C1 Title: Is it adequate and appropriate for the content of the article?: Strongly Disagree  Title has been changed and more material has been added on nonlinear processes. C2 Abstract: Does it contain the essential information of the article? Is it complete?: Strongly Disagree  Abstract updated to more accurately describe the article. C3 Diagrams, figures, tables and captions: Are they essential and clear?: Strongly Agree  C4 Text and mathematics: Are they brief but still clear? If you recommend shortening, please suggest (below at comments) what should be omitted: Agree  C5 Conclusion: Does the paper contain a carefully written conclusion, summarising what has been learned and why it is interesting and useful?: Neutral  C6 References: Are the references in the correct format? Are all references mentioned in the text and cited chronologically?: Neutral |
| Content: | **To be corrected**  submitted on *Thu 20 Apr 2017 at 16:41*  **Comments**  This paper presents a student level study of laser-atom interactions and saturated absorption spectroscopy, with a brief introduction to multi-wave mixing and the generation of entangled photon pairs. The paper reads nicely and opens up a window into the future research that will be conducted at the CPUT. I suggest the paper be accepted, with the following corrections to be made:  - The introduction states that computational simulations of four-wave mixing and entangled photon generation are given in this paper, but this is not done.  This has been corrected with more material on four-wave mixing given in section 3.  - Multi-level effects are not studied in this paper despite being part of the title and mentioned in several places.  This has been corrected with more material on four-wave mixing given in section 3.   - P\_i is defined between Eq.2 and Eq.3 but never used.  This has been corrected.  - The green curve in Fig 1(D) is not described.  The green curve was a misprint. It has been removed.  - The plots in Fig. 1 require a legend.  Legend added.  - Eq.7 has a 2pi in the argument for sin, this could be a mistake.  This has been corrected.  - The units for various variables and equations are not clear. Specifically, the units in Eq. 7 regarding \omega\_0-\omega, D, and \omega\_\Delta are not given. Relevant units are also not used, as the rabi frequency is given in Hz and not in the usual rad/s.  This has been corrected. All frequencies are in Hz.  - All frequency units for all plots are given as arbitrary or not given at all, such as in Fig 2, 4 and 5. It is not clear what is meant by arbitrary units.  This has been corrected to show frequency in Hz.  - A Rabi frequency of 12 rad/s (or Hz) is much-much slower than the typical decay time of a dipole allowed transition which is on the order of 10s of nanoseconds. If that is what the author is considering in section 2, then it would be impossible to observe Rabi oscillations unless a picosecond laser is used for excitation. This should be made clear, or it should be made clear that this is a different dynamical regime from what is discussed in section 3.  The Rabi oscillation and the decay of the dipole allowed transitions are two different phenomena. Also note section 3 on Saturated absorption spectroscopy has been removed and changed to include material on four-wave mixing.  - Figure 3 gives the erroneous impression that the pump and prob beam need not overlap.  This section has been removed seeing that it is well documented in most graduate level texts.  - The plot for Pump beam=0 (blue curve) of Fig 5(B) appears to be a lorentzian, and not Doppler broadened as the other plots are. It also appears that using the pump beam makes spectroscopic measurements worse (more uncertain), which is in error.  This section has been removed seeing that it is well documented in most graduate level texts.  - What are the units of the pump beam intensity in Fig 5B in the legend?  This section has been removed seeing that it is well documented in most graduate level texts.  - The purpose of saturated absorption spectroscopy is not made clear.  This section has been removed seeing that it is well documented in most graduate level texts.  Opinion clarification:  A1: The scientific rigor is lost by not having the appropriate units printed out. Once this is fixed this opinion can change to a +1.  This has been corrected.  A2: It's clear that a two level laser-atom interaction study occured, however it was not clear on why this will be useful or how this extends to a multilevel case.  There is no direct link between the two level atom study and multilevel atoms. The two level atom is included to introduce ideas such as Rabi frequency, detuning and density matrix elements. The introduction has been updated to reflect this.  A3: Work is referenced where it needs to be and various references are made to the common use names of equations and their origins. B1: This work can be found in any textbook on spectroscopy. The only novel work presented here will be the use of four-wave mixing in order to produce entangled photons, but this is not studied here, merely introduced.  This section has been removed seeing that it is well documented in most graduate level texts. Material on four-wave mixing has been included.  B2: It's clear that some kind of spectroscopic study will be done on rubidium, and it is clear that future work will come. it is not clear why saturation absorption spectroscopy will be useful, or why certain features like laser modulation were chosen as a focus of study.  This section has been removed.  C1: The title is accurate, but no multi-level study occurs here.  Title has been corrected.  C2: The abstract accurately describes the various features that will be studied in the paper. C3: Units are often missing or arbitrary in figures and occasionally miss a legend, but are labelled and referenced well.  Units and legend added where appropriate.  C4: The equations are presented clearly and explained adequately. C5: The conclusion summarizes what is studied in the paper, but not why it is interesting or useful.  Conclusion updated to reflect this. C6: References are properly cited, but the Harvard style is not used.  Referencing has been done according to the template which is not Harvard style.  **Criteria Evaluation**  Does the article that you are being asked to review match your expertise? (On scale, + for yes or agree): Agree  Are there any potential conflicts of interest if you review this article? (+3 for yes / -3 for no): Strongly Disagree  A1 Scientific merit: Is the work scientifically rigorous and accurate? Is it appropriate for the proceedings?: Weakly Disagree  Paper has been improved. A2 Clarity: Are the ideas in the paper communicated clearly and legibly? : Weakly Disagree  Paper has been revised to improve scientific contribution. A3 Context: Is there sufficient discussion of the background for this work and suitable referencing?: Agree  B1 Originality: Is the work relevant and novel?: Weakly Disagree  We think it is novel. B2 Motivation: Does the problem considered have a sound motivation? All papers should clearly demonstrate the scientific interest of the results: Neutral  C1 Title: Is it adequate and appropriate for the content of the article?: Neutral  C2 Abstract: Does it contain the essential information of the article? Is it complete?: Agree  C3 Diagrams, figures, tables and captions: Are they essential and clear?: Weakly Disagree  Figures have been improved. C4 Text and mathematics: Are they brief but still clear? If you recommend shortening, please suggest (below at comments) what should be omitted: Agree  C5 Conclusion: Does the paper contain a carefully written conclusion, summarising what has been learned and why it is interesting and useful?: Weakly Agree  C6 References: Are the references in the correct format? Are all references mentioned in the text and cited chronologically?: Weakly Agree | |