Referee:

Content:

submitted on *Thu 25 May 2017 at 11:34*

Comments

The work reports on irradiation experiments and provides transmission data on a number of plastic scintellator materials after neutron irradiation at various fluences (and associated dose values). It does show some interesting first indications of the material response to light transmission after irradiation with neutrons, which may already be useful with respect to the lifetime expectations of scintellator behaviour in the actual detector configuration of ATLAS. In this sense it is of some practical value in a large international experimental facility.
A1: The work is scientifically appropriate for the proceedings, provided the recommended changes are made.
A2: The paper is not always clear, especially when it comes to the graphical depiction and discussion of the results. Recommended improvements are made under "Detailed comments per section"" below.
A3: The background discussion is adequate but could have been stronger by mentioning more explicitly why neutron irradiation is of particular importance, with reference to the ATLAS environment, and potential impact on the detector maintenace.
B1: The work is relevant because it provides first data that did not exist and is necessary for maintenace planning (at least) of the ATLAS experiment. Because the results are preliminary and need further illucidation to understand the potential impact. I cannot therefore agree strongly that it is relevant and novel.
B2. The motivation for the work is clear.
C1: The title implies damage assessment, which is in fact not done explicitly. This can only be achieved with follow-up work. What has been shown are one implicit outcome of the damage, namely the effects on light transmission of the materials after damage.
C2. The abstract does not reflect the information in the article correctly. Recommendation to correct this is under "Detailed comments" below.

C3: The graphs are necessary but not clear in places. Suggestions on how to improve follows below.

C4: The description in the text is adequate and some suggestions to condense are given below.

C5: Conclusions are correctly reflected in as much as the findings are preliminary.

Detailed comments per section

The following title reflects the work reported much more accurately:
" Neutron irradiation and light transmission assessment of plastic scintillators of the TileCal section of the ATLAS detector"

Abstract:
Mentioning of the linear accelerator and SAFARI irradiations should be omitted because the paper only deals with results of irradiations at IBR-

2. The former two will presumably follow and may be mentioned under "Upcoming work" instead, but can simply be omitted for purposes of this paper.

The SAFARI-1 reactor and linear accelerator were omitted from the abstracted and mentioned in the "Upcoming work" section.

The same holds for part in the abstract starting with "In addition.." None of these things are covered in the current paper and best resorts under "Upcoming work", but can be omitted to shorten the paper only to relevant aspects of the current investigation.

The part that starts with "In addition…" was also removed and discussed under the "Upcoming work" section.

The author may delete this part and replace it with one sentence such as. "The first results of the effect of neutron irradiation on the transmission properties of a number of plastic scintillator materials are presented."

"The first results of the effect of neutron irradiation on the transmission properties of a number of plastic scintillator materials are presented." Was added to replace the removed sentences mentioned above.

Introduction
First paragraph, line 7: ..and fluoresce to emit light.

Fluorescence was changed to fluoresce.

Second paragraph sentence 2: This region contains ….

" This region contains additional plastic scintillators that are radially distributed within the region." was changed to " This region contains additional plastic scintillators that are radially distributed."

Scintillation Mechanism
First paragraph, line 5: , whether it be a it liquid, a ….

"…., whether it be it a liquid, a ….' was changed to ", whether it be a it liquid, a …."

Second paragraph last two sentences: , thus there is an internal non-radiatively de-exitation… and, .. decay to the ground state due to angular momentum selection rules, …

"thus there is an internal non-radiatively de-excitation occurring within the scintillator taking place in the picoseconds time range. The excited triplet state cannot decay to the ground state as a result angular momentum selection rules, it therefore results in a delayed fluorescence and phosphorescence" was changed to "thus there is an internal non-radiatively de-excitation occurring within the scintillator taking place in the picoseconds time range and, the excited triplet state cannot decay to

the ground state as a result angular momentum selection rules, it therefore results in a delayed fluorescence and phosphorescence"

Experimental Details
Paragraph 4: Taking into account the reactor spectrum, the Monte Carlo N-particle…..

"The Monte Carlo N-Particle (MCNP) 5…" was changed to "Taking into account the reactor spectrum, the Monte Carlo N-particle…."

Light Transmission Results and Analysis
First paragraph: Consider combining the observation of an upturn at ~700 nm for figure 2 and 3 by omitting the last part of the sentence starting with c and replace the sentence However we do observe an increase …. With " We observe a relative (to un-irradiated case) increase in transmission above ~700 nm for samples EJ200 and EJ260. This saves space and draw better attention to a common feature of the two samples.

"The overall transmission of the grade decreases…" was changed to "We observe a relative (to un-irradiated case) increase in transmission above ~700 nm for samples EJ200 and EJ260."

The colours on the graphs are hard to distinguish and it must be considered to increase linewidth to enhance colour contrast or to use 1, 2, 3, 4, 5 in the legend and on the curves (in places that distinguish them clearly) or different line types. This is necessary for the expanded (right hand) versions only.

Graphs were changed

Conclusion
First sentence: .. neutron irradiation has indeed have an observable effect on….

"From the results obtained in this study, we observed that neutron irradiation has an effect….." was changed to "….neutron irradiation has indeed have an observable effect on…."

Third sentence: It does not make sense to mention a lack of effect where there is no effect expected anyhow. Consider replacing by: "The EJ200 showed the highest transmission loss (3.8%) whilst for the EJ260 it is observed that no transmission occurs in the wavelength range…."

"The EJ200 showed the highest transmission loss with a 3.8% loss whilst the EJ260 showed no loss at all at wavelength 450 nm since it is observed that no transmission occurs in the wavelength range of 400 – 460 nm." Was replaced with ""The EJ200 showed the highest transmission loss (3.8%) whilst for the EJ260 it is observed that no transmission occurs in the wavelength range…."

Second paragraph, second sentence. Confusing, if it says that both an increase and decrease is observed. You may perhaps simply omit this

sentence and start the next one with "For the EJ208 and the Kharkov type the highest dose exposure show an increase…."

"The overall transmission for the EJ200 and EJ260 decreases with exposure to radiation but there is no clear relationship between the dose exposure and the light transmittance from the three doses under study." Was replaced with "The overall transmission for the EJ200 and EJ260 decreases with exposure to radiation but there is no clear relationship between the dose exposure and the light transmittance from the three doses under study.

gories above. 100 words minimum.

Content:

submitted on *Sat 18 Nov 2017 at 22:38*

Comments

Please see attached file (NPRP190-Reviewer_Comments1.pdf) for reviewer's comments.