Reply to reviewers' comments on "Spectrum of singly charged uranium (U II)"

We thank the reviewers for their constructive comments.

Reviewer 1:

1) In the title of Table 1, it would be clearer to give the meaning of the symbols used (N_tot, N_ZE, N_IS and N_ident).
   Answer: Done according to the suggestion.

2) In Section 3.3, it is shown that the use of fitted energies is, as expected, better than the use of ab initio values for estimating the partition functions. However, as far as I understand, this conclusion is only drawn when replacing fitted data by experimental ones. It would also be interesting to compare the partition functions obtained using ALL the calculated (fitted) energy levels (i.e. including also those for which there is no available experimental data) and the values obtained when using only experimentally known levels.

   Answer: We believe that in fact we did so but we have not been clear in our explanations. The corresponding paragraph has been rephrased to clarify what we did. The notation \( Q_{\text{exp}}(T) \) has been replaced by \( Q_{\text{exp/LSF}}(T) \).

Reviewer 2:

First and foremost is the English used in this paper. It is, at best and in many, cases (too many to enumerate) awkward in its formulation. While the meaning of the authors was, in all cases, decipherable, this is barest minimum of praise. I would urge the authors to have someone with a greater understanding of written English proofread the paper. This is not something that can be left to the journal’s copy editors.

Answer: We tried our best to improve our English by shortening many sentences and by rephrasing in many places to clarify our presentation. We believe that now the English is acceptable.

As an example, starting at the end of line 22 is the sentence, “Not only specific radiative data for this transition are needed, partition functions depending on level energies relative to the ground level \( 5f^36d^7s\ 4I_{9/2} \) also plays a role.” This sentence, hueing as closely to the authors apparently intended formulation as I am able, should read, “Not only are specific radiative data for this transition needed but so are partition functions that depend on energy levels relative to the ground level \( 5f^36d^7s\ 4I_{9/2} \).”

Answer: This particular sentence has been replaced by the reviewer's formulation

With respect to the original experiment, if it happened in the 1980s then the language of the abstract must be altered to reflect that. The first sentence of the abstract makes it seem as though the initial experiment took place recently. Only in the body of the paper (in Section 2) is this made clear.

Answer: We have clarified this point and we emphasized on our initial purpose of theoretical interpretation by placing the mention of experimental data behind it in the abstract. We also rephrased the Introduction for more precision.
The original experiment needs a citation. On line 48, after mentioning that the observation took place “in the late eighties,” please insert a citation.

Is this the first time that this particular data set has been analyzed? If so, then it must be stated (and, also, congratulations). If not then the previous groups looking at this data set should be acknowledged.

Answer: We have changed the title of Section 2 "Experimental data" by "Available experimental data" and we have added more precisions on the context of the recording. Partial results on U III were reported in a communication at an EGAS conference with J-F Wyart as co-author. The corresponding reference has been added (Ref 13). The technical team (F Launay and M Benharrous) is acknowledged.

It would be nice, when discussing the analysis of the spectra, to include a couple of sample spectra (one typical case and one atypical but illustrative case) to help with the uncertainty discussion.

Answer: We inserted a figure showing a section of the spectrogram we used. It is rather typical.

Additional change:

A Figure 2 showing a diagram of levels of both parities has been inserted in Section 3.