Response to the referee report on "Compatibility of covariant quantum channels with emphasis on Weyl symmetry"

I thank the esteemed referee for his/her comments and suggestions. I have largely implemented the changes requested and tried to make the paper more reader friendly especially by explaining the main idea of each section and the function of the various lemmata. I have also made some reordering to streamline the style of the paper and deleted the repetition spotted by the referee. Below is a more comprehensive list of major changes implemented.

- An orienting paragraph has been added in the beginning of each section and subsection except for the introduction (Section 1), Section 6, and the conclusions section. Background knowledge is introduced in these paragraphs and a short account of what is following in each individual section and subsection is given.
- All the typos and small mistakes and misspellings spotted by the referee have been amended. Notably one (and only this one) suggestion made by the referee has not been implemented: In Theorem 4.12 and in its corollaries, the kernel β has not been replaced by $\tilde{\beta}$, $\tilde{\beta}(g,h) = \beta(g,h)\sqrt{\rho_\mu(g)\rho_\mu(h)}$. The reason for this is that, in the current form Equation (4.6), which characterizes the compatibility of Φ_1 and Φ_2, explicitly depends from the density function of the measure μ associated with Φ_1. In the suggested form, this dependency would no longer be explicit which, in my opinion, could hamper reader's understanding.
- In the paragraph just after Definition 2.1, the reason for the ordering of the Hilbert spaces in the notation for the set $\mathbf{Ch}(\mathcal{H},\mathcal{K})$ of channels $\Phi : \mathcal{L}(\mathcal{K}) \to \mathcal{L}(\mathcal{H})$ is explained together with the introduction of the predual (Schrödinger) picture.
- The second paragraph after Definition 2.1 has been rewritten, as the earlier version was slightly inaccurate.
- The beginning of Section 4 has been largely rewritten. This is done in order to allow for better motivation for the following content and to introduce the main examples (continuous and finite phase spaces) concomitantly with the abstract phase space.
- The symbol for the symplectic form has been changed from S to ω, in order to differentiate this form from trace-class operators which are often denoted by S; the possible (and probably likely) confusion caused by the double meaning of S was specifically mentioned by the referee. The symbol ω is not used for anything else and is, moreover, probably more easily recognized than S.
- Positive kernels are now defined early in Subsection 4.1 (Definition 4.3) and all the following positivity conditions appearing later in the article are replaced by saying that the corresponding two-argument function is a positive kernel. The special case of functions of positive type are already introduced in Definition 4.3 due to their importance.

- The homomorphism T of Lemma 4.4 was changed into δ to avoid confusion with trace-class operators; this source of confusion was also specifically mentioned by the referee.
- The definition of the representation $W^{\otimes 2}$ has been moved to the position just before Definition 4.5 and Theorem 4.6. The discussion leading to the new corollary 4.7 was moved from between Lemma 4.4 and Theorem 4.6 since the content of Corollary 4.7 is easier to handle after the proof of Theorem 4.6. Moreover, the discussion (in a now deleted remark) originally just after Definition 4.5 has been moved just after the proof of Theorem 4.6 and has been joined with the content of an earlier remark 4.8 with all the resulting merged content removed from the remark environment in order to avoid repetition and motivate the discussion.
- Corollary 4.9 has been moved to the end of Subsection 4.1 in order to make subsections 4.1 and 4.2 more coherent
- Remark 4.10 has been added just before Lemma 4.11 in order to motivate Lemma 4.11 as a step towards Theorem 4.12. To this end, the covariant Stinespring dilation of a covariant (W, W)-covariant channel Φ_1 associated with a Borel probability measure which is absolutely continuous w.r.t. dg is introduced in Remark 4.10 and it is explained that in the following lemma the $(\overline{W}, W)$-covariant channels are characterize so that the (W, W)-covariant channels compatible with Φ_1 can be characterized with the help of Proposition 3.6.
- The isometry J appearing in the proof of Lemma 4.11 has been renamed as K in order to avoid confusion with the isometry J appearing in the covariant Stinespring dilation of Φ_1 introduced earlier in Remark 4.10.
- Some rewriting has been done in the beginning of Section 5.1 to connect the basic definitions of the continuous phase space to what has been presented in the tables in the beginning of Section 4.
- Earlier the definitions of Gaussian channels with the (Schrödinger) output phase space $\mathbb{R}^{4N}$ (joint channel case) and those with the output phase space $\mathbb{R}^{2N}$ were given separately, causing repetition as remarked by the referee. Now, these definitions have been united.
- The rather simple proof before Proposition 5.1 (earlier named as a theorem) has been suppressed as requested by the referee.
- Only the first two sentences of the (former) remark following Proposition 5.1 have been saved and the rest is omitted. As the referee pointed out, it is not clear how the fact that the set $C_S^0(\mathbb{R}^{4N})$ contains no modulus-1 functions adds to the rest of this section. The functions in this set seem to have to decay (quite fast) as we move away from the origin, but the text originally in the former remark here does not well elucidate this and a proper treatment of this property would take considerably more space.
- The beginning of Subsection 5.2 has been rewritten. Reference to the basic definitions of the finite phase space given in the beginning of Section 4 is made.

- The structure of (W, W)-covariant channels in the finite phase space case is given in equations (5.7) and (5.8).
- The depolarizing channel is introduced in Equation (5.10) and there alone deleting the repetition spotted by the referee.

I hope that with these alterations the paper is more suited for publication in *Annales Henri Poincaré*. I look forward to hearing from your decision.