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A. 研究概要

Bultinck-Mariëna-Williamson-Şahinoğlu-Haegemana-Verstraete の最近の結果の数学的構造と，部分因子環論における対称双ユニタリ平坦接続およびチューブ代数の数学的構造が同一であることを証明した．より詳しくは，有限指数，深さ有限の部分因子環から生じる対称双ユニタリ平坦接続が，彼らの扱っているテンソルのすべての条件を満たすこと及び，それから生じるチューブ代数と彼らのテンソルから生じるエニオン代数が同型であることを示した．これより Verlinde 公式が成り立っていることが分かる．

We have shown that the mathematical structures in a recent work of Bultinck-Mariëna-Williamson-Şahinoğlu-Haegemana-Verstraete are the same as those of flat symmetric bi-unitary connections and the tube algebra in subfactor theory. More specifically, a system of flat symmetric bi-unitary connections arising from a subfactor with finite index and finite depth satisfies all their requirements for tensors and the tube algebra for such a subfactor and the anyon algebra for such tensors are isomorphic up to the normalization constants. The Verlinde formula follows from this identification.

B. 発表論文

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2. M. Bischoff, Y. Kawahigashi, R. Longo, K.-H. Rehren, "Tensor categories and endomorphisms of von Neumann algebras (with applications to Quantum Field Theory)", SpringerBriefs in Mathematical Physics Vol. **3**, 2015.

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C. 口頭発表

1. Conformal field theory and operator algebras, Mini-course (three talks), Universidad Nacional Autónoma de México (Mexico), May 2019.

2. Anyons, matrix product operator algebras and subfactors, "Interactions between Noncommutative Analysis and Quantum Information Theory", Harbin (China), June 2019.

3. Anyons, matrix product operator algebras and subfactors, "The Mathematical Foun-

dations of Conformal Field Theory and Related Topics", Chern Institute of Mathematics (China), June 2019.

4. Anyons, matrix product operator algebras and subfactors, "Operator Algebras and Applications", Simons Center for Geometry and Physics (U.S.A.), June 2019.

5. Matrix product operator algebras, anyons and subfactors, "In and Around Topological Physics", Beijing (China), July 2019.

6. Matrix product operator algebras, anyons and subfactors, "C^*-algebras", Oberwolfach (Germany), August 2019.

7. Matrix product operator algebras, anyons and subfactors, Functional Analysis Seminar, UCLA (U.S.A.), October 2019.

8. Matrix product operator algebras, anyons and subfactors, Operator algebra seminar, Fields Institute (Canada), November 2019.

9. Mathematics of topological quantum computing and operator algebras, "Indo-Japan Joint Workshop on Quantum Computing and Quantum Information", Indian Statistical Institute, Kolkata (India), January 2020.

10. Topological phases of matter, tensor categories and operator algebras, "Noncommutative Geometry and its Applications", National Institute of Science, Education and Research (India), January 2020.

D. 講義

1. 数理科学の研究フロンティア：宇宙，物質，生命，情報：理研の若手研究者によるオムニバス講義のコーディネート．(教養学部 1,2 年生講義)

2. 解析学 VI・解析学特別演習 III：Fourier 解析と超関数．(理学部 3 年生講義)

E. 修士・博士論文

1. (修士) 粟津光 (AWAZU Hikaru): On the permanence properties of residually exact groups

2. (修士) 羽柴康仁 (HASHIBA Yasuhito): On central sequence algebras of tensor product

von Neumann algebras

3. (博士) 野島遼 (NOJIMA Ryo): On Induction for Twisted Representations of Conformal Nets

F. 対外研究サービス

1. *Communications in Mathematical Physics* の editor.

2. *International Journal of Mathematics* の editor.

3. *Japanese Journal of Mathematics* の managing editor.

4. *Journal of Mathematical Physics* の associate editor.

5. *Journal of Mathematical Sciences, the University of Tokyo* の editor-in-chief.

6. *Reviews in Mathematical Physics* の associate editor.

7. Mathematical Physics Studies (Springer) の editor.

8. 日本数学会「第 23 回高木レクチャー」(京都大学数理解析研究所，2019 年 6 月 8 日) のオーガナイザー．

9. サマースクール数理物理「グラフの数理と物理」(東京大学大学院数理科学研究科，2019 年 8 月 23–25 日) のオーガナイザー．

10. "Subfactors and Applications" (Oberwolfach, Germany, 2019 年 10 月 27 日〜11 月 2 日) のオーガナイザー．

11. 日本数学会「第 24 回高木レクチャー」(東京大学数物連携宇宙研究機構，2019 年 12 月 8 日) のオーガナイザー．

12. "East Asian Core Doctoral Forum on Mathematics" (東京大学数物連携宇宙研究機構，2020 年 1 月 14〜17 日) のオーガナイザー．

13. 「物質のトポロジカル相の理論的探究」(東京大学大学院数理科学研究科，2020 年 1 月 26 〜28 日) のオーガナイザー．