CONSTRUCTION OF WEDGE-LOCAL QFT THROUGH LONGO-WITTEN ENDOMORPHISMS

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This work concerns construction of two-dimensional quantum field theory models. Apart from many efforts and results in constructive QFT, there is a emerging trend in this topic from operator-algebraic approach (algebraic QFT). In algebraic QFT, instead of quantum fields, one considers nets of von Neumann algebras. It has been found by Borchers that one can reconstruct the whole net on two-dimensional spacetime from a single von Neumann algebra and the spacetime symmetry. Accordingly, a single von Neumann algebra with a representation of the spacetime translation which acts on the algebra in an appropriate way is considered as a QFT model with a weaker localization property (wedge-localization).

First we recall the scattering theory and introduce the notion of asymptotic completeness for massless excitations. If a net is asymptotically complete, the full net can be characterized by a pair of one-dimensional (chiral) conformal nets and the S-matrix. A quite simple formula for the wedge-algebra is given [3].

Conversely, if one wishes to construct a net, he can start by choosing (two copies of) a conformal net and an appropriate S-matrix. We present a family of S-matrices which lead to wedge-local nets of von Neumann algebras [3]. The construction is based on the endomorphisms of the conformal net generated by the $U(1)$-current, studied recently by Longo and Witten [2].

We further construct a new family of such endomorphisms and accordingly a new family of wedge-local nets. The S-matrices do not preserve the Fock space structure, thus have a property which looks like particle production process [1]. This is a new feature among operator-algebraic constructions.

Keywords: net of von Neumann algebras, wedge-locality, asymptotic completeness, Longo-Witten endomorphism, S-matrix

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