Research Report（April, 2020- March, 2021）

Enrollment from April 2020

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I. **List of Papers**

II. **List of Talks**

III. **Research Results in AY2020**

The projected structures on Riemann surface is be expressed locally at each point, but it can be expressed globally as an Oper by using a vector bundle. When we consider Oper, connection can be expressed locally as an off-diagonal matrix. Therefore, we tried to express holomorphic data in DPW method globally using Oper. The Maurer-Cartan form obtained from an extended frame of CMC-surface in $R^{\{1,2\}}$ can be regarded as a local expression of the connection when we choose an appropriate local trivialization of harmonic bundle.

On the other hand, Gaiotto predicts that a conformal limit of Higgs bundle is Oper. This conjecture has been shown to hold if Riemann surface is compact. The Higgs bundles correspond to a harmonic bundles by Non Abelian Hodge correspondence. I construct a harmonic bundle which corresponds to the Maurer-Cartan form obtained from Smyth type potential.

IV. **Research Plan for AY2021**

I will check what kind of Oper corresponds to hamonic bundle obtained from Smyth-type holomorphic potential. When we consider Smyth-type holomorphic potential, Riemann surface needs to be considered on C- {0}, which is not compact. In this case, what is important in Gaitot conjecture is the behavior of harmonic bundle at singularity $z = 0$. First, we formulate these conditions with Smyth-type potential, and our goal is to consider these conditions for more general holomorphic data.