ABSTRACT

The AdS/CFT correspondence has been one of the major breakthroughs in modern theoretical physics in the last two decades. The duality claims the spectrum matching between string theory (Energies of the states) in certain spacetime dimensions and quantum field theory (Scaling dimensions of the local gauge invariant operators) at its boundary in one lower dimension. Solving the theory for full spectrum on both sides of the duality has been extremely challenging. However, the presence of *integrability* through its algebraic equations has made the problem more tractable. Studying semiclassical string solutions in the large charge limit using integrable models like the string sigma model and the Neumann-Rosochatius model in different AdS backgrounds has played a significant role in establishing the AdS/CFT duality. In this connection, we study the dynamics of rigidly rotating N-spike solutions for different strings and brane-like probes in $AdS_3 \times S^3 \times \mathcal{M}^4$ backgrounds supported by mixed NS-NS and R-R three form fluxes. In particular, we analyze the configuration of the N-spike string profile in different $AdS_3 \times S^3$ backgrounds and study the effect of fluxes on it. We then compute the scaling relation among the conserved charges both in the presence and absence of flux in the framework of string theory which corresponds to anomalous dimensions of certain dual gauge theory operators. We also study spiky string solutions in certain large N limits and find that they correspond to the periodic-spike string moving in $AdS_3 - pp$-wave background. Moreover, we investigate the integrability of systems with deformation using the Neumann-Rosochatius model by finding Uhlenbeck integrals of motions and the constraint it follows.

Keywords: AdS/CFT correspondence, Sigma model, Neumann- Rosochatius model, Semiclassical strings, Integrablity, Dispersion relations.