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Changfeng Gui (changfeng.gui@utsa.edu) and **Amir Moradifam*** (amirm@ucr.edu). *The Sphere Covering Inequality and Its Applications.*

We show that the total area of two distinct Gaussian curvature 1 surfaces with the same conformal factor on the boundary, which are also conformal to the Euclidean unit disk, must be at least 4π . In other words, the areas of these surfaces must cover the whole unit sphere after a proper rearrangement. We refer to this lower bound of total areas as the Sphere Covering Inequality. This inequality and its generalizations are applied to a number of open problems related to Moser-Trudinger type inequalities, mean field equations and Onsager vortices, etc, and yield optimal results. In particular we confirm the best constant of a Moser-Trudinger type inequality conjectured by A. Chang and P. Yang in 1987. This is a joint work Changfeng Gui. (Received August 05, 2020)