This article is a follow-up of the previous paper by the same authors [1] in which a five-dimensional analog of the inequality $m \geq \sqrt{|J|}$ between mass m and angular momentum J of four-dimensional stationary black holes is studied. The five-dimensional spacetime is assumed to be bi-axially symmetric and has two independent angular momenta J_1 and J_2. The higher-dimensional inequality is then given by [1]

$$m^3 \geq \frac{27\pi}{32}(|J_1| + |J_2|)^2 \,. \tag{1}$$

In this article the authors extend the above result to *charged* black holes. In 4 dimensions the set of data is known to satisfy the inequality

$$m^2 \geq \frac{q^2 + \sqrt{q^4 + 4J^2}}{2} \tag{2}$$

where q denotes the electric charge. One of the main results of this paper is to present a five-dimensional version of this relation.

A higher-dimensional analog of the Kerr solution (or a 4-dim rotating black hole) are known to be the Myers-Perry black hole [2]. It is this solution that is used in the study of [1], however, a charged version of it can not be straightforwardly obtained. (As mentioned in the introduction, there are no solution-generating techniques known for charged stationary black holes in 5 dimensions.) Thus in this paper the authors make use of features in five-dimensional $\mathcal{N} = 1$ supergravity and construct 5-dim charged Myers-Perry black holes. The resultant inequality is then expressed as

$$m \geq \frac{27\pi}{8} \frac{(J_1 + J_2)^2}{(2m + \sqrt{3}|Q|)^2} + \sqrt{3}|Q| \tag{3}$$

where Q denote the total electric charge. Rigorous mathematical arguments, including natural assumptions, on the construction of the charged Myers-Perry solutions and the derivation of (3) are presented in the article.

References

[1] A. Alaee, M. Khuri and H. Kunduri, Adv. Theor. Math. Phys. **20**, 1397 (2016) doi:10.4310/ATMP.2016.v20.n6.a4 [arXiv:1510.06974 [gr-qc]].

[2] R. C. Myers, arXiv:1111.1903 [gr-qc].