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A Note on the Trace Inequality for Products of Hermitian Matrix Power

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Abstract: Da-wei Zhang [J.M.A.A., 237 (1999):721-725] obtained the inequality between $tr(AB)^{2^k}$ and $trA^{2^k}B^{2^k}$ for *Hermitian* matrices A and B, where k is natural number. Here it is proved that these results hold when the power index of the product of *Hermitian* matrices A and B is nonnegative even number. In the meantime, it is pointed out that the relation between $tr(AB)^m$ and trA^mB^m is complicated when the power index m is a nonnegative odd number, therefore the above inequality can't be generalized to all nonnegative integers. As an application, we not only improve the results of Xiaojing Yang [J.M.A.A., 250 (2000), 372-374], Xinmin Yang [J.M.A.A., 263 (2001):327-333] and Fozi M. Dannan [J.Ineq. Pure and Appl. Math., 2(3) Art.34 (2001)], moreover give the complete resolution for the question of the trace inequality about the powers of Hermitian and skew Hermitian matrices that is proposed by Zhengming Jiao.