Some estimates for numerical integration errors and discrete energy on spheres of arbitrary dimension

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We study the worst-case error of numerical integration on the unit sphere $\mathbb{S}^{d}\subset\mathbb{R}^{d+1}$, $d\geq2$, for certain spaces of continuous functions on $\mathbb{S}^{d}$. For the classical Sobolev spaces $\mathbb{H}^s(\mathbb{S}^d)$ ($s>\frac d2$) upper and lower bounds for the worst case integration error have been obtained by Brauchart, Hesse and Sloan.

We analyze energy integrals with regard to area-regular partitions of the sphere and compare obtained estimates with discrete energy sums. In particular the asymptotic equalities for the discrete Riesz s-energy of N-point sequence of well separated t-designs on the unit sphere $\mathbb{S}^{d}\subset\mathbb{R}^{d+1}$, $d\geq2$ are found.