Spherical designs, complex spherical designs, and unitary designs

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We first give a survey on these concepts, following the three basic papers: Spherical codes and designs (Delsarte-Goethals-Seidel, 1977); Complex spherical designs and codes (Roy-Suda, 2014); Unitary designs and codes (Roy-Scott, 2009). Then in particular we comment on the paper of Roy-Suda (2014) and discuss the existence and the classification problems of ""good"" tight complex spherical T-designs (for certain T) coming from tight real spherical t-designs. Here, ""good"" means either the number of distances $s=|A(X)|$ is small, or an association scheme is naturally attached to it.

This part is based on the ongoing joint work with Takayuki Okuda (Hiroshima University), Da Zhao (Shanghai Jiao Tong University) and Yan Zhu (Shanghai University). Finally, we will discuss the existence (non-existence) problem of tight unitary t-designs in the sense of Roy-Scott (2009). In particular, we show the non-existence of tight unitary 4-designs.