Tammes' problem and irreducible contact graphs
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The Tammes problem is to find the arrangement of N equal circles on a unit sphere which maximizes the radius of these circles. This problem is presently solved for several values of N, namely for N=3,4,6,12 by L. Fejes Toth (1943); for N=5,7,8,9 by Schutte and van der Waerden (1951); for N=10,11 by Danzer (1963) and for N=24 by Robinson (1961). The optimal configurations of 13 and 14 circles were conjectured more than 65 years ago. In this talk will be shown how using Fejes Toth's bound for spherical codes and enumerations of irreducible contact graphs this problem can be proved for for N<15.
I will also consider periodic planar packings of congruent circles, i.e. packings of tori with the maximal circle radius. We have found optimal arrangements for N=6, 7 and 8 circles. Surprisingly, for the case N=7 there are three different optimal arrangements.