The sphere packing problem in dimensions 8 and 24

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In this talk we will show that the sphere packing problem in dimensions 8 and 24 can be solved by a linear programming method. In 2003 H. Cohn and N. Elkies proved that the existence of a real function satisfying certain constrains leads to an upper bound for the sphere packing constant. Using this method they obtained almost sharp estimates in dimensions 8 and 24. We will show that functions providing exact bounds can be constructed explicitly as certain integral transforms of modular forms. Therefore, we solve the sphere packing problem in dimensions 8 and 24.