ARCHIMEDES is a psychoacoustics research project, funded under the European EUREKA scheme. Three partners share the work involved: The Acoustics Laboratory of The Technical University of Denmark; Bang and Olufsen of Denmark; and KEF Electronics of England. Its primary object is to quantify the influence of listening room acoustics on the timbre of reproduced sound. For simulation of the acoustics of a standard listening room, an electroacoustic setup has been built in an anechoic chamber. The setup is based on a computer model of the listening room, and it consists of a number of loudspeakers positioned on an imaginary sphere surrounding the position of the test subject. The setup has been designed for the highest degree of flexibility. This includes the possibility of simulation of directivity characteristics of normal domestic loudspeakers and absorption coefficients of the surfaces of the listening room. This paper is a presentation of the system, with special emphasis on the psychoacoustical background of the design. This will include a discussion of choice of experimental procedure, test stimuli, and test subjects as well as purpose built loudspeakers and the DSP system.