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On the acoustics of a specifically designed library discussion room with corrugated ceiling

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There is a discussion room at the library of Viipuri in Finland where the ceiling has been especially designed to enhance the acoustics and make every position within the room acoustically equivalent. In other words no matter where a speaker is standing, he is supposed to be heard equally well all over the room. For that purpose a corrugated ceiling has been constructed that must distribute sound optimally, at least from the point of view of a ray theoretical analysis. The numerical study presented here shows that the corrugation is such that the ray approach is not exactly valid and a plane wave expansion technique shows that the acoustics is much worse than it is supposed to be. A detailed description of the sound distribution as a function of the position of the sound source and the receiver is presented. The acquired knowledge is important for future construction of similar rooms.