



The Institute of Sound and
Communications Engineers

Engineering Note 35

Coverage angle and coverage area of a ceiling loudspeaker

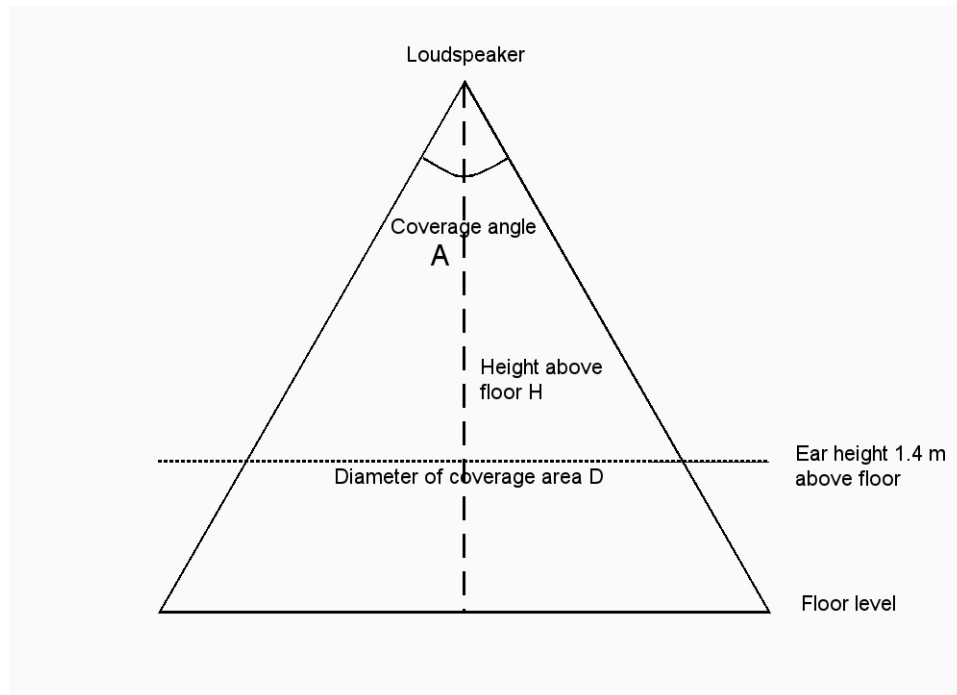
J M Woodgate *HonFInstSCE*

DISCLAIMER

Care is taken to determine that 'Engineering Notes' do not refer to any copyrighted or patented circuit or technique, but ISCE can accept no responsibility in this connection. Users of the information in an 'Engineering Note' must satisfy themselves that they do not infringe any Intellectual Property Rights.

Coverage angle and coverage area of a ceiling loudspeaker

It is important that the coverage area provided by a given ceiling loudspeaker is calculated, because it determines how far apart the loudspeakers can be in order to get uniform coverage of an area, without 'weak spots'. The diagram below shows the geometry of the situation.



The diameter of the coverage area (a circle if the loudspeaker does not have a non-coaxial tweeter) can be calculated either by Pythagoras or trigonometry (two sides of the same coin). Using trig, we get:

$$D = 2(H - 1.4) \tan(A / 2)$$

This Excel spreadsheet calculates some typical values:

Coverage angle and coverage area														
Ceiling height m	3	4	5	6	7	8	9	10	12	14	16	18	20	25
Coverage angle °	Diameter of the coverage area at 1.4 m above floor level m													
20	0.6	0.9	1.3	1.6	2.0	2.3	2.7	3.0	3.7	4.4	5.1	5.9	6.6	8.3
25	0.7	1.2	1.6	2.0	2.5	2.9	3.4	3.8	4.7	5.6	6.5	7.4	8.2	10.5
30	0.9	1.4	1.9	2.5	3.0	3.5	4.1	4.6	5.7	6.8	7.8	8.9	10.0	12.6
35	1.0	1.6	2.3	2.9	3.5	4.2	4.8	5.4	6.7	7.9	9.2	10.5	11.7	14.9
40	1.2	1.9	2.6	3.3	4.1	4.8	5.5	6.3	7.7	9.2	10.6	12.1	13.5	17.2
45	1.3	2.2	3.0	3.8	4.6	5.5	6.3	7.1	8.8	10.4	12.1	13.8	15.4	19.6
50	1.5	2.4	3.4	4.3	5.2	6.2	7.1	8.0	9.9	11.8	13.6	15.5	17.3	22.0
55	1.7	2.7	3.7	4.8	5.8	6.9	7.9	9.0	11.0	13.1	15.2	17.3	19.4	24.6
60	1.8	3.0	4.2	5.3	6.5	7.6	8.8	9.9	12.2	14.5	16.9	19.2	21.5	27.3
65	2.0	3.3	4.6	5.9	7.1	8.4	9.7	11.0	13.5	16.1	18.6	21.2	23.7	30.1
70	2.2	3.6	5.0	6.4	7.8	9.2	10.6	12.0	14.8	17.6	20.4	23.2	26.0	33.0
75	2.5	4.0	5.5	7.1	8.6	10.1	11.7	13.2	16.3	19.3	22.4	25.5	28.5	36.2
80	2.7	4.4	6.0	7.7	9.4	11.1	12.8	14.4	17.8	21.1	24.5	27.9	31.2	39.6
85	2.9	4.8	6.6	8.4	10.3	12.1	13.9	15.8	19.4	23.1	26.8	30.4	34.1	43.3
90	3.2	5.2	7.2	9.2	11.2	13.2	15.2	17.2	21.2	25.2	29.2	33.2	37.2	47.2

If the loudspeaker has one or more non-coaxial tweeters, the coverage angle is different in different directions, and the specification should give details.