BIOSENSOR

Acoustic Transmission

Unfocused Transducer Characteristics

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-Transducer Characteristics

The sound field of an ultrasonic transducer operating at a single frequency is divided into a near field and a far field zone. The transition between these zones occurs at a distance Yo^+ (or N) and is sometimes referred to as the "natural focus" of a flat (of unfocused) transducer. The near/far distance Yo^+ is significant because amplitude variations that characterize the near field (and can make flaw evaluation difficult) change to a smoothly declining amplitude as the distance from the transducer increases.

The tables presented here for unfocused and focused ultrasonic transducers represents a range of typical transducers. An important column in the unfocused tables, *Normal Range of Focusing*, shows the normal range of focusing for immersion transducers in water for both spherical and cylindrical lenses. The *Down Field Focal Zone* column shows the start and end of the Yo^+ maxima on the transducer axis as the distance from the transducer increases.

Spherical or cylindrical focusing changes the structure of the transducer field by "pulling" the Yo^+ point nearer the transducer, to the focal point of the transducer. Again, the *Down Field Focal Zone* column shows the beginning and end of the focal zone, where the amplitude falls 6 dB below the maxima at the focal point.

It is important to note that the driving excitation normally used in NDT applications are either spike or rectangular pulsars, not single frequency. They can significantly alter the results shown in both tables. Nonetheless, the supporting analysis is widely used because it represents a reasonable approximation and a good starting point.

Frequency (MHz)	**Diameter** (in.)	**Focal Length** (in)	**6 dB Spot Size** (in)	**START** (in)	**END** (in)	**Focal Gain SPHER.** (dB)	**CYL.** (in)
1.00	1.00	2.50	.146	1.9	4.10	11.80	9.3
2.25	.500	1.50	.078	1.10	2.50	10.00	7.5
2.25	.750	2.00	.069	1.50	2.80	24.00	21.5
2.25	1.000	3.00	.078	2.30	3.90	27.90	25.4
2.25	1.000	5.00	.130	3.80	7.90	15.00	12.5
5.00	.250	.75	.035	.60	1.20	12.90	10.4
5.00	.375	1.00	.031	.80	1.30	26.50	24.0
5.00	.375	2.00	.062	1.50	3.50	8.30	5.8

5.00	.500	1.50	.035	1.20	1.90	30.20	27.7
5.00	.500	3.00	.070	2.20	4.90	12.90	1.4
5.00	.750	2.00	.031	1.60	2.20	39.20	36.7
5.00	.750	4.00	.062	3.10	5.40	40	24.0
5.00	.750	6.00	.094	4.60	9.40	16.20	13.7
5.00	1.000	3.00	.035	2.50	3.30	41.40	38.9
5.00	1.000	4.00	.047	3.20	4.60	37.50	35.0
5.00	1.000	6.00	.070	4.70	7.60	3.20	27.7
10.00	.125	.38	.018	.30	.60	12.90	10.4
10.00	.250	.75	.018	.60	1.00	30.20	27.7
10.00	.250	1.50	.035	1.10	2.40	12.90	10.4
10.00	.375	1.00	.016	.80	1.10	39.20	36.7
10.00	.375	2.00	.031	1.50	2.70	26.50	24.0
10.00	.375	3.00	.047	2.30	4.70	16.20	13.7
10.00	.500	1.50	.018	1.20	1.60	41.40	38.9
10.00	.500	3.00	.035	2.30	3.80	30.20	27.7
10.00	.500	5.00	.059	3.80	7.60	17.90	15.4
10.00	.750	3.00	.023	2.50	3.20	42.80	40.3
10.00	.750	4.00	.031	3.20	4.50	39.20	36.7
10.00	.750	6.00	.047	4.70	7.40	32.50	30.0
15.00	.125	.50	.016	.40	.80	16.20	13.7
15.00	.250	.75	.012	.60	.90	37.50	35.0
15.00	.250	1.50	.023	1.20	2.10	23.70	21.2
15.00	.375	1.50	.016	1.20	1.70	39.20	36.7
15.00	.375	2.50	.026	2.00	3.20	30.40	27.9
15.00	.375	4.00	.042	3.10	6.00	19.30	16.8

20.00	.125	.50	.012	.40	.70	23.70	21.2
20.00	.125	.75	.018	.60	1.20	12.90	10.4
20.00	.250	.75	.009	.60	.80	41.40	38.9
20.00	.250	1.50	.018	1.20	1.90	3.20	27.7
20.00	.250	3.00	.035	2.20	4.90	12.90	10.4

Data compiled by Xactex Corporation. Sources of original data are unknown