



Acoustic Cavitation

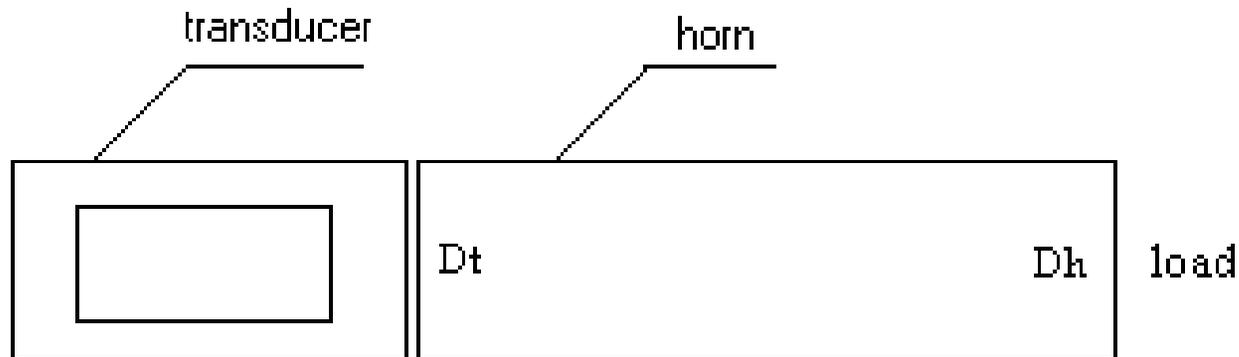
Experimental Results

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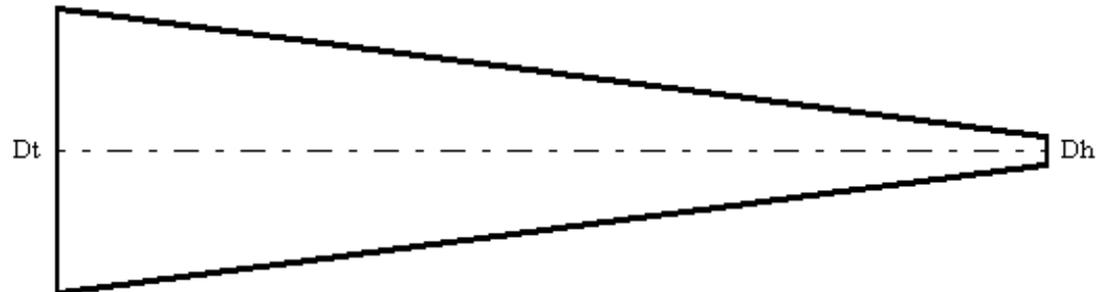
sergei@peshkovsky.com

Part 1. Ultrasound Sources for Producing Cavitation

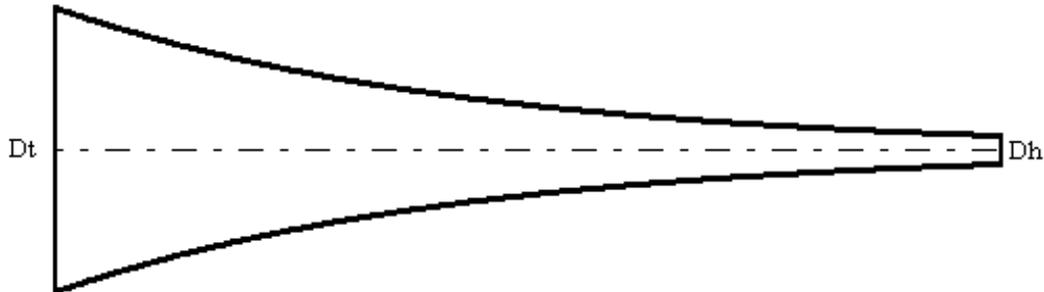


- $\tau'_t / V'_t = r * K^2 * N^2$; $K = V'_h / V'_t$; $N = D_h / D_t$
- $P'_a \cong 1.5 * P_0$; $P'_a = r * V'_h$
- $(\tau'_t / P_0) \cong 1.5 * K * N^2$
- $K * N^2 \cong 15 - 45$

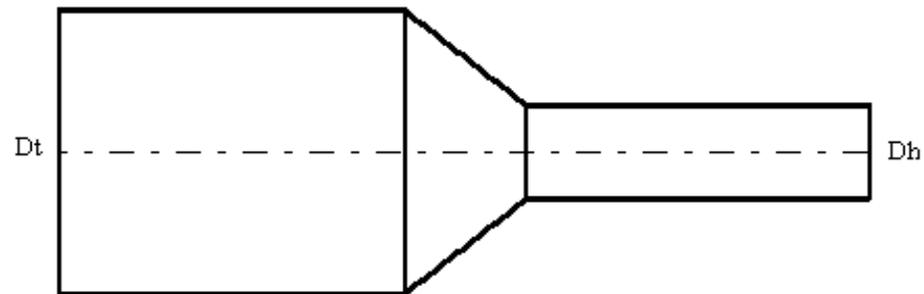
Regular Tapering Horns



- $K > 1$

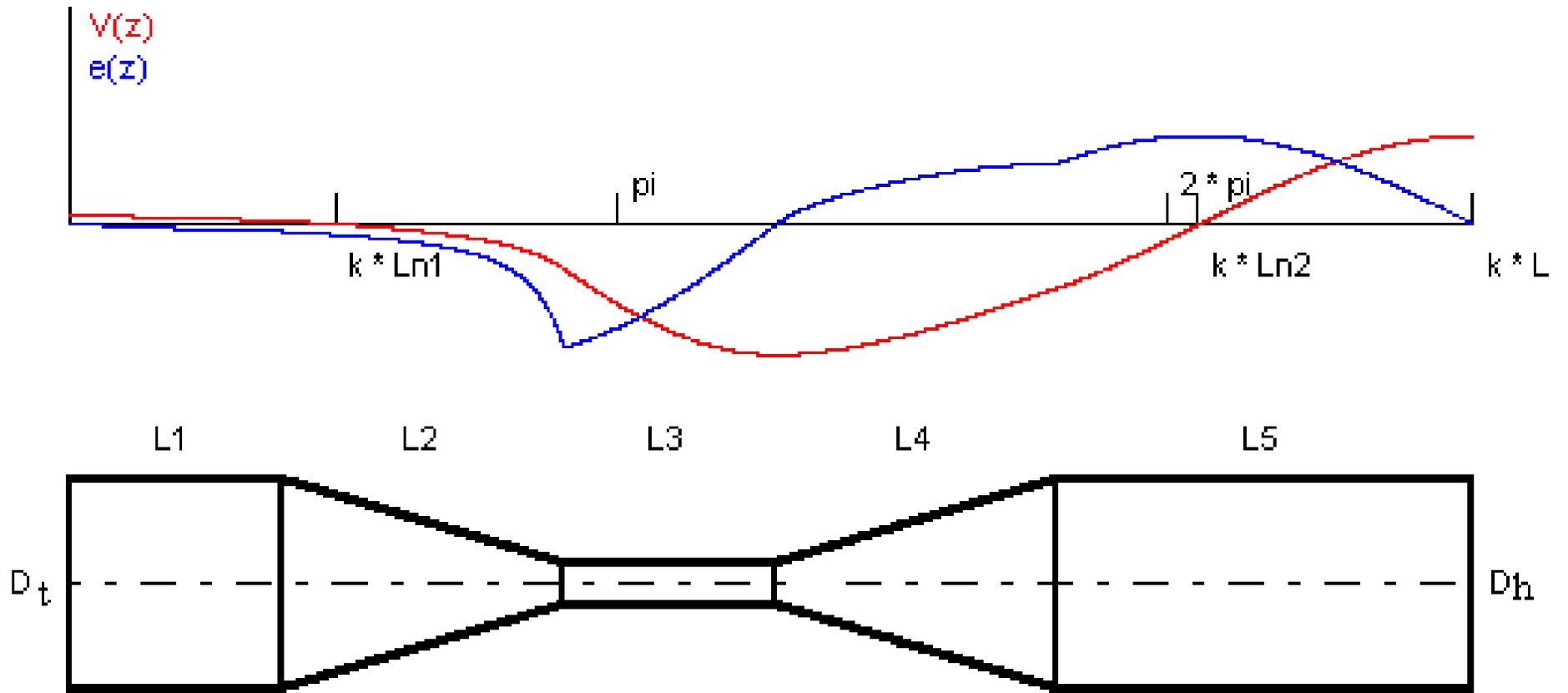


- $N^2 < 1$

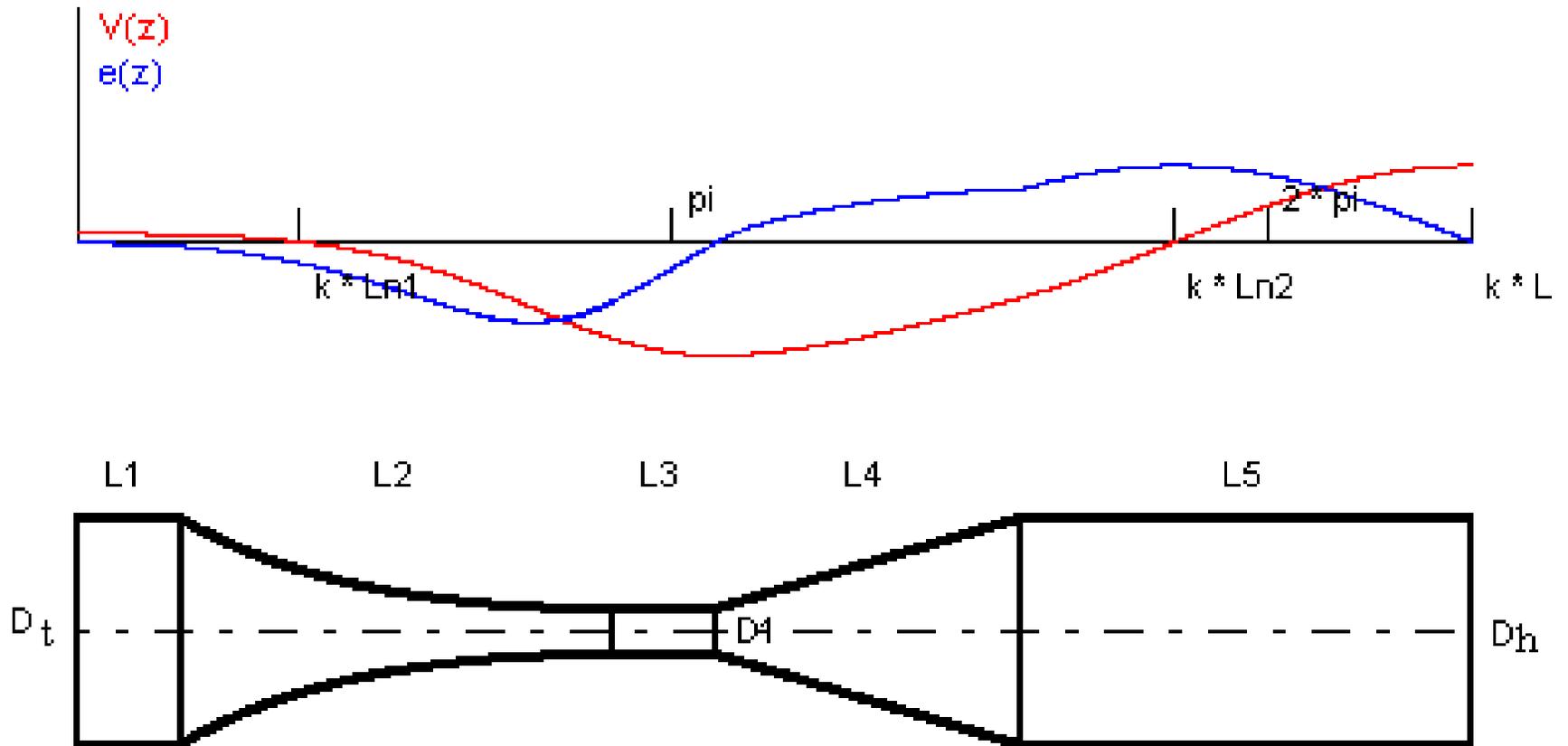


- $K * N^2 \leq 1$

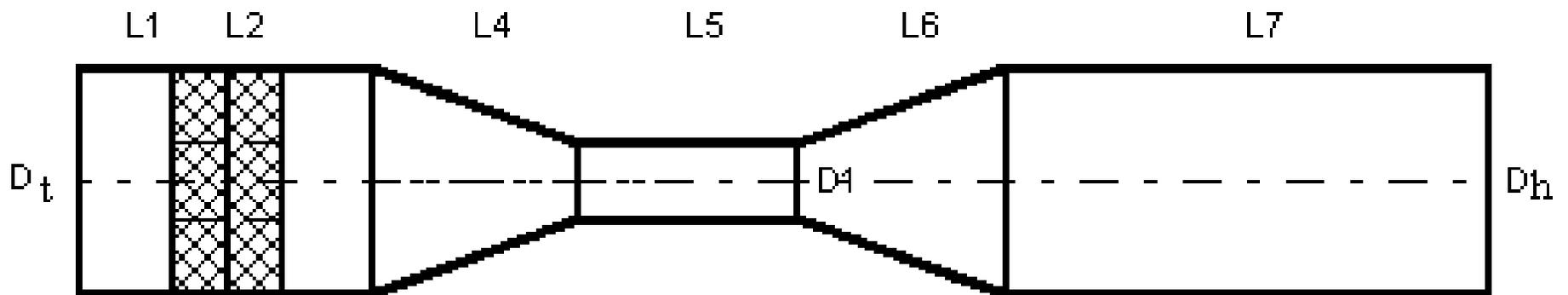
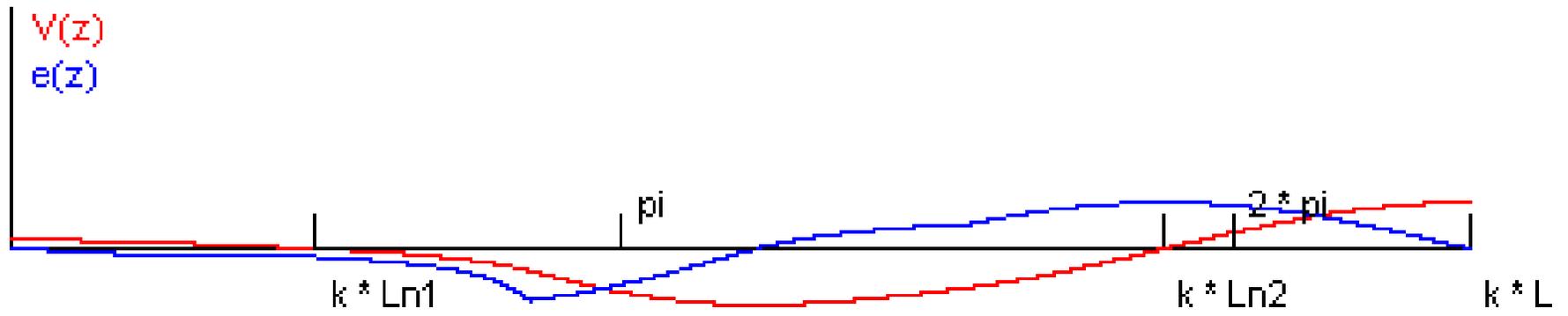
Barbell Horn



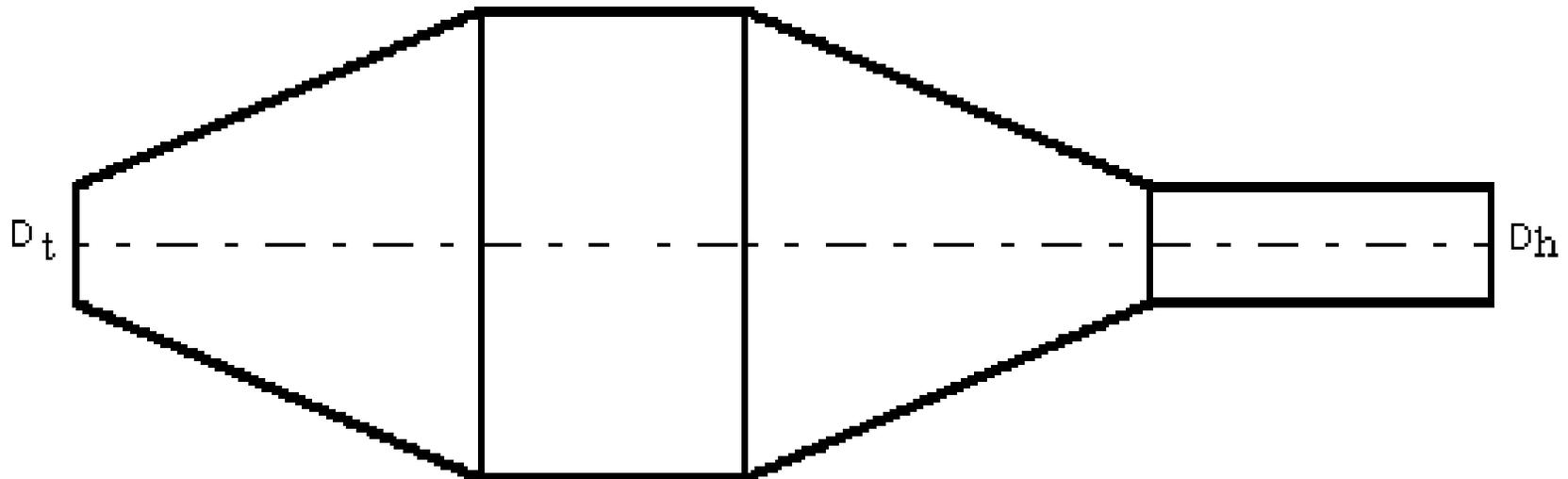
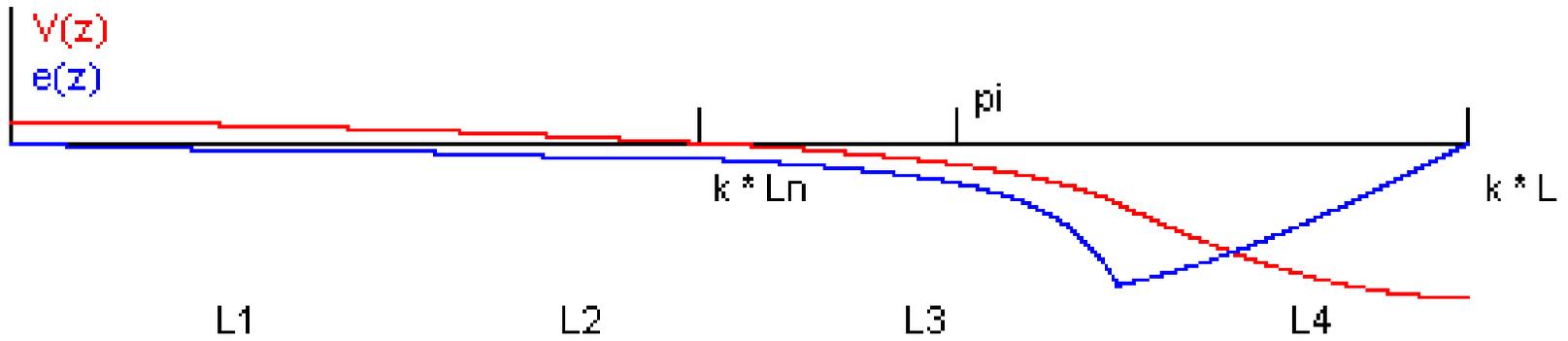
Barbell Horn



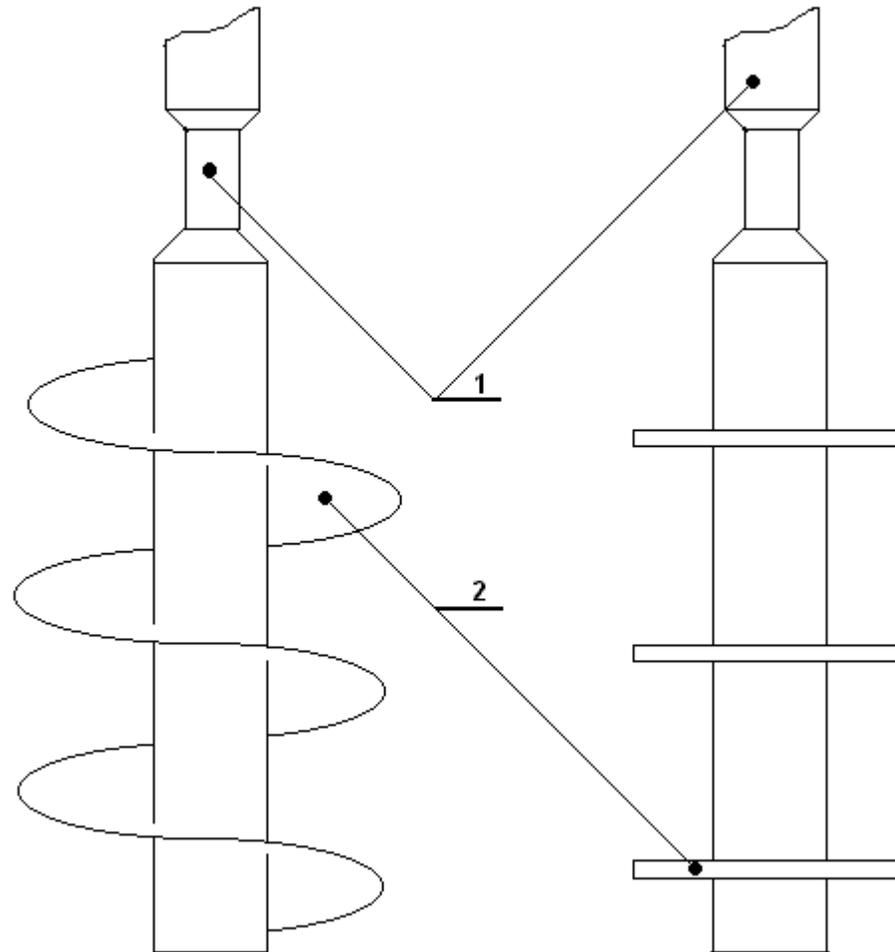
Ceramic Transducer - Barbell Horn



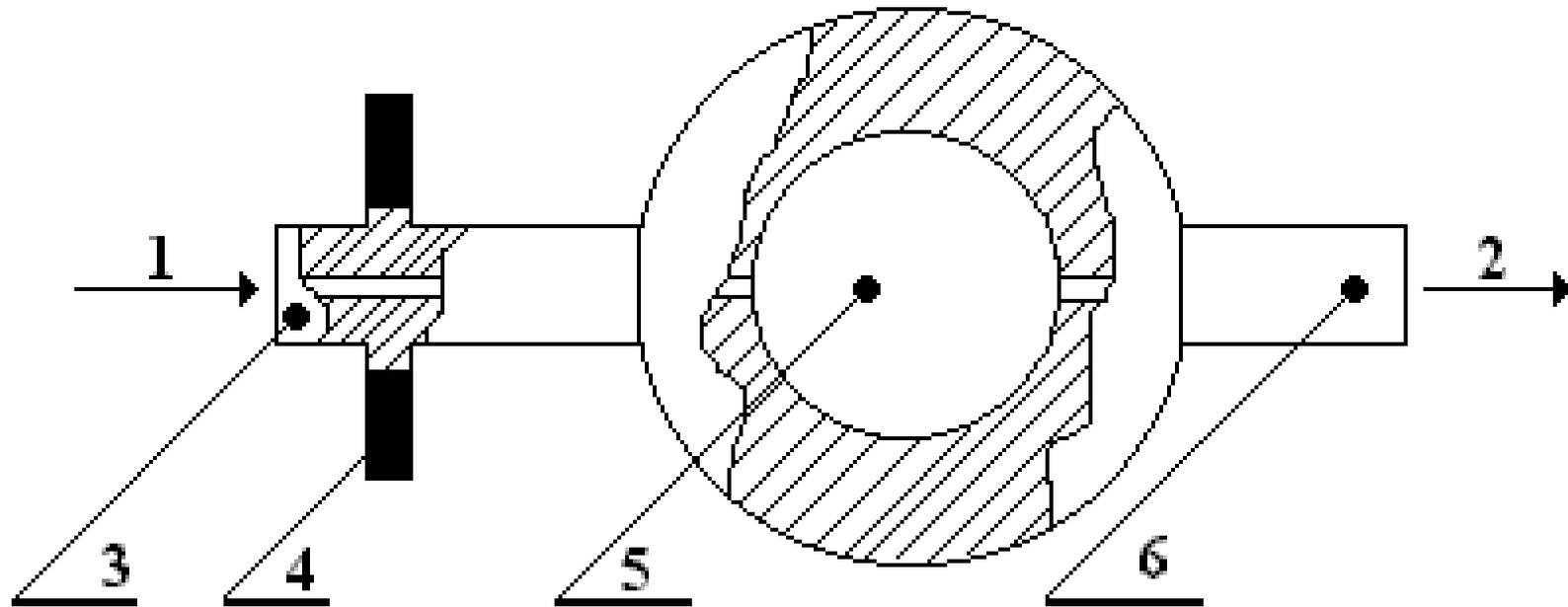
Barrel Horn



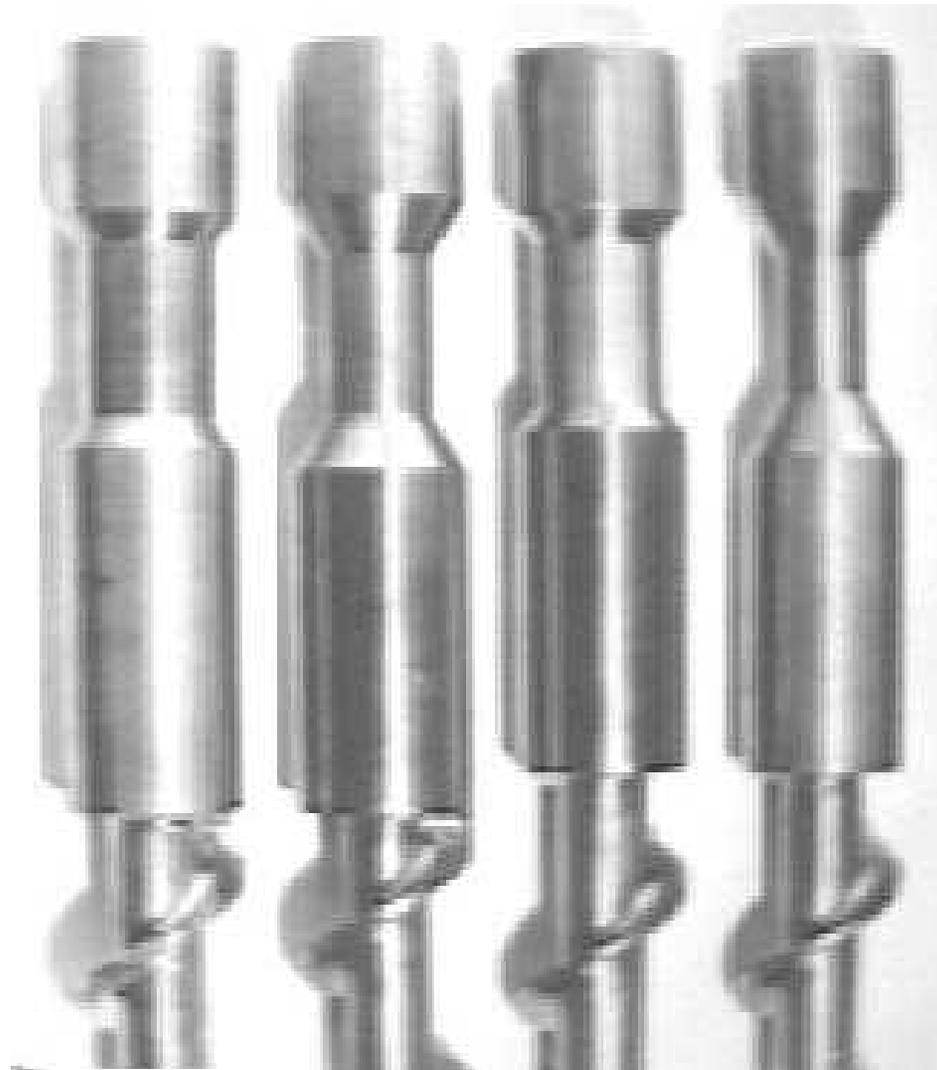
Acoustic Systems



Acoustic System



Photograph of Acoustic System



Computer-Aided Design

Barbell Horn with Conical Transitional Echelon

File Tools Attachment Help

Set parameters

D0, mm	N1	A0, μ	F, kHz	C, m/sec	em * 10000
60.0	5.00	10.0	18.0	5120.0	45.6
k * L2	K1	N2	Evaluation		

Additional parameters

Barbell Horn
L1 = L3; L2 = L4

Matched Barbell Horn
L1 = L3; L2 = L4
k * L2 = 0.5

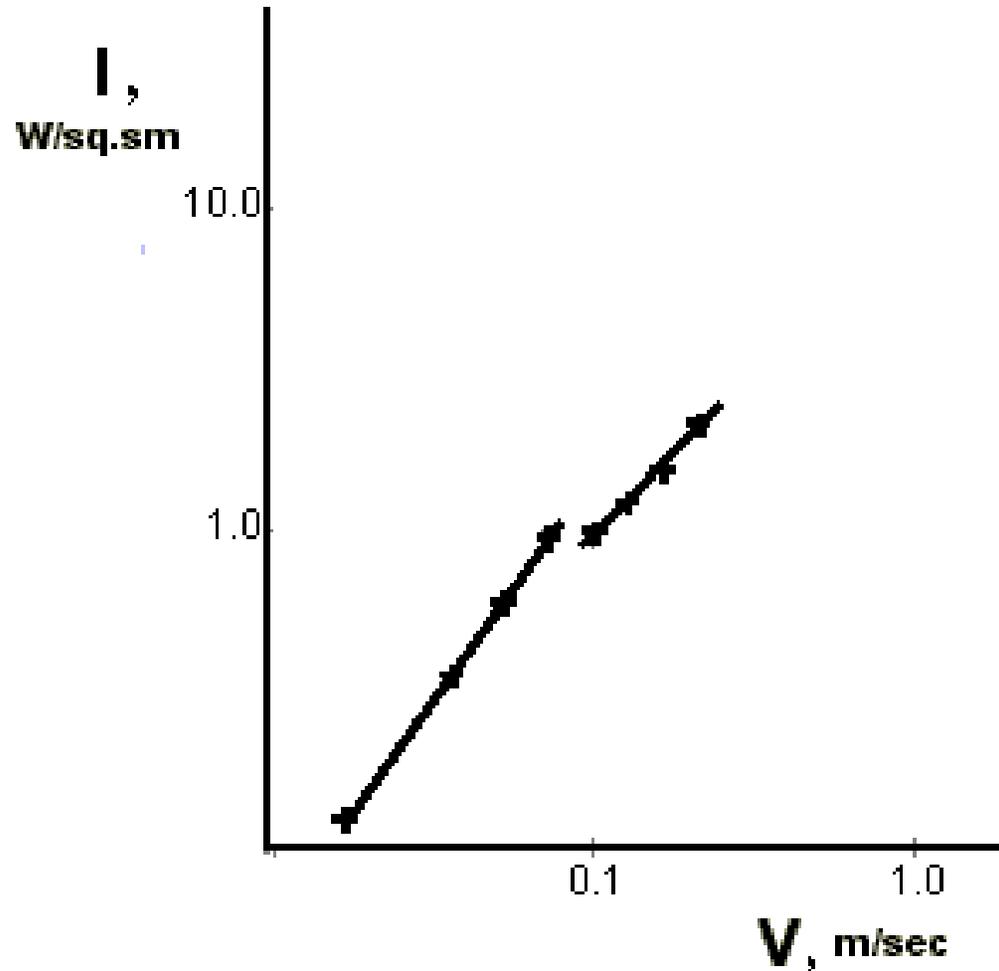
D0 = D2
 L2 = F(N1)
 D0 >= D2

Material - Titanium

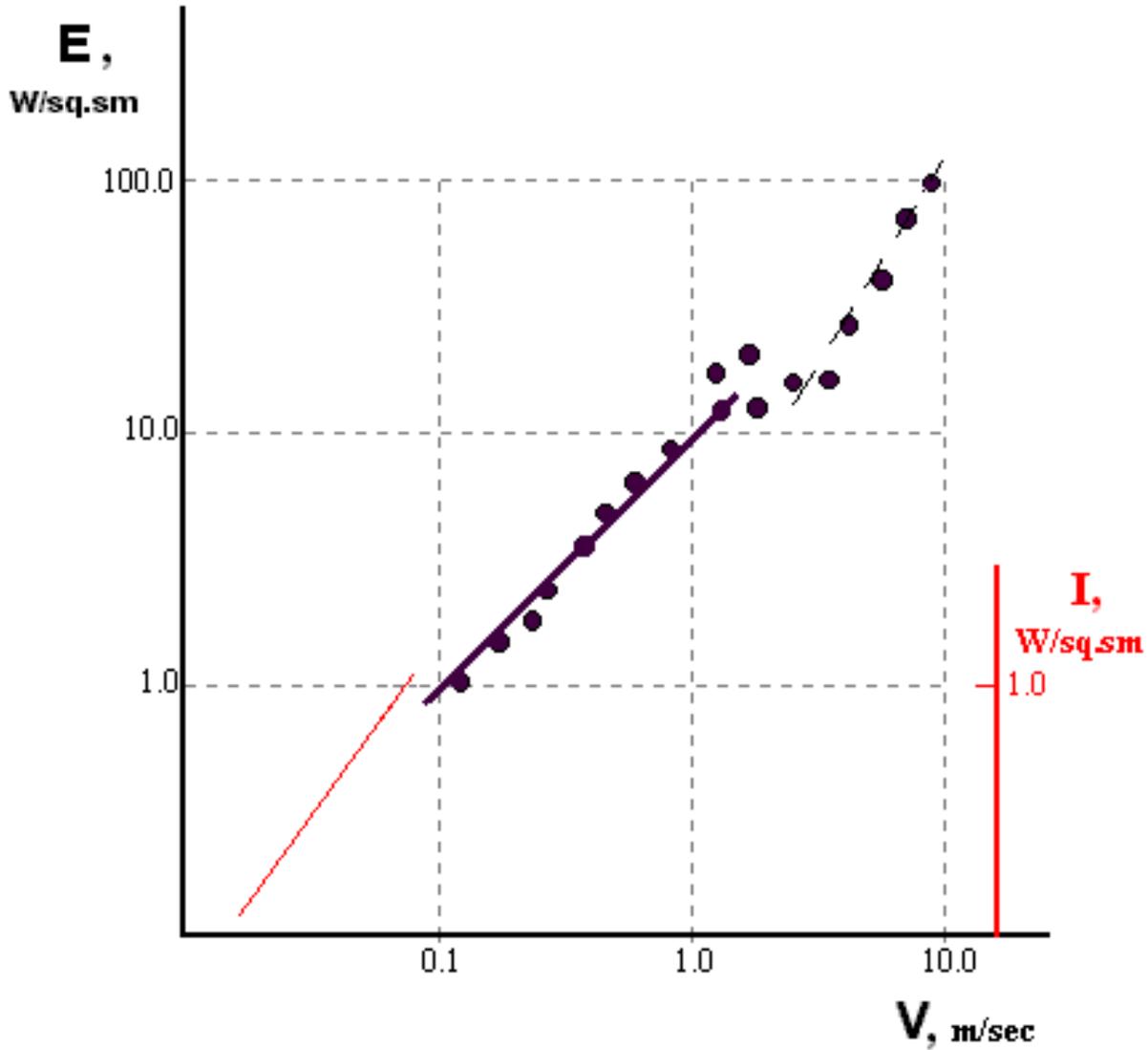
Results

K	11.05
L1, mm	55.36
L2, mm	72.9
L5, mm	108
L, mm	364.51
Ln1, mm	68.86
Ln2, mm	293.02
D1, mm	12
D2, mm	60
Dm, mm	71.15
A2, μ	110.5
Am, μ	266.6
$\alpha, 1/m$	L2:10.97; L4:-54.87

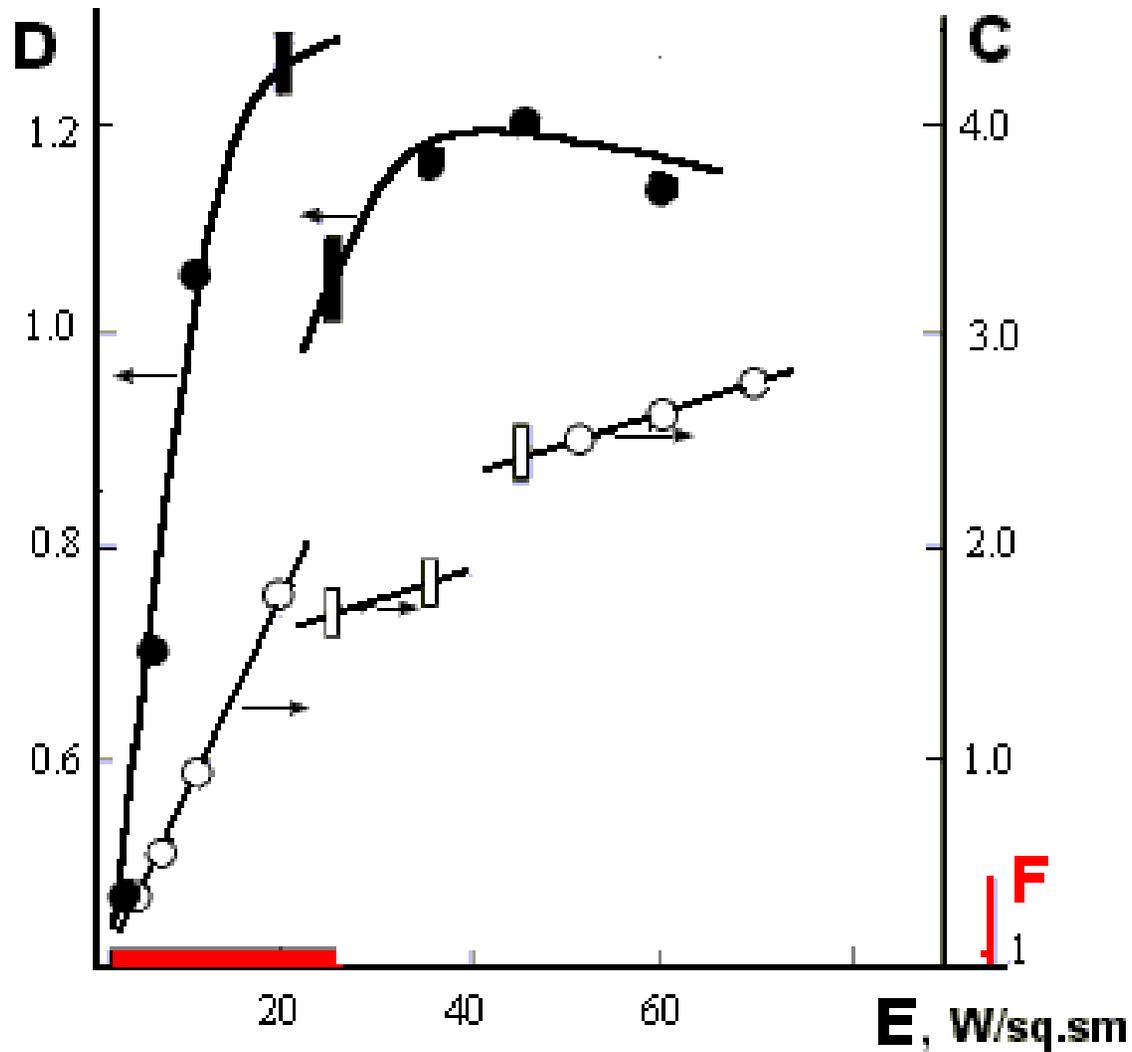
Part 2. Experimental Examination of Water at Cavitation (Dr. Y. Kikuchi)



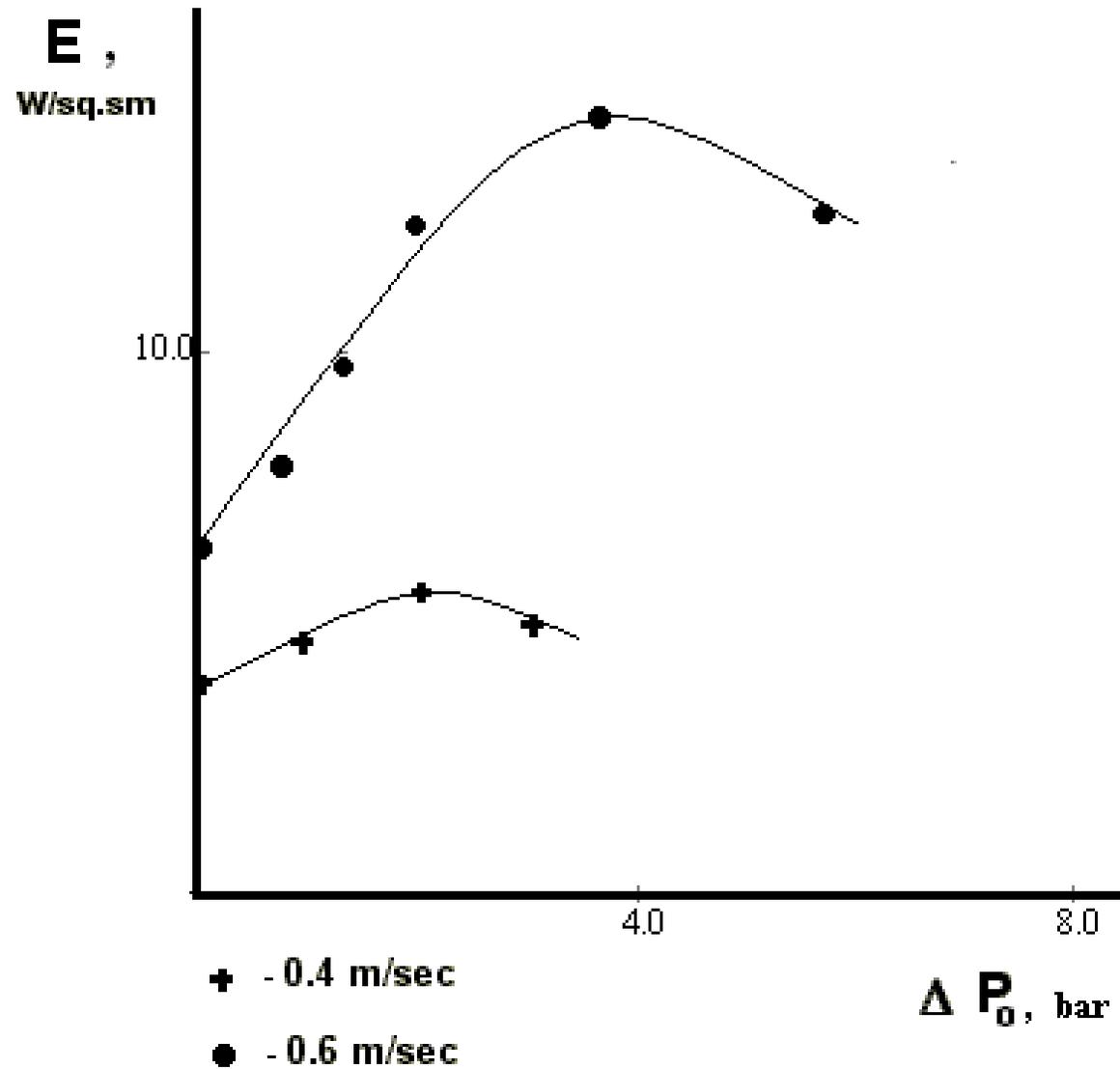
Experimental Examination of Water (Water Calorimeter)



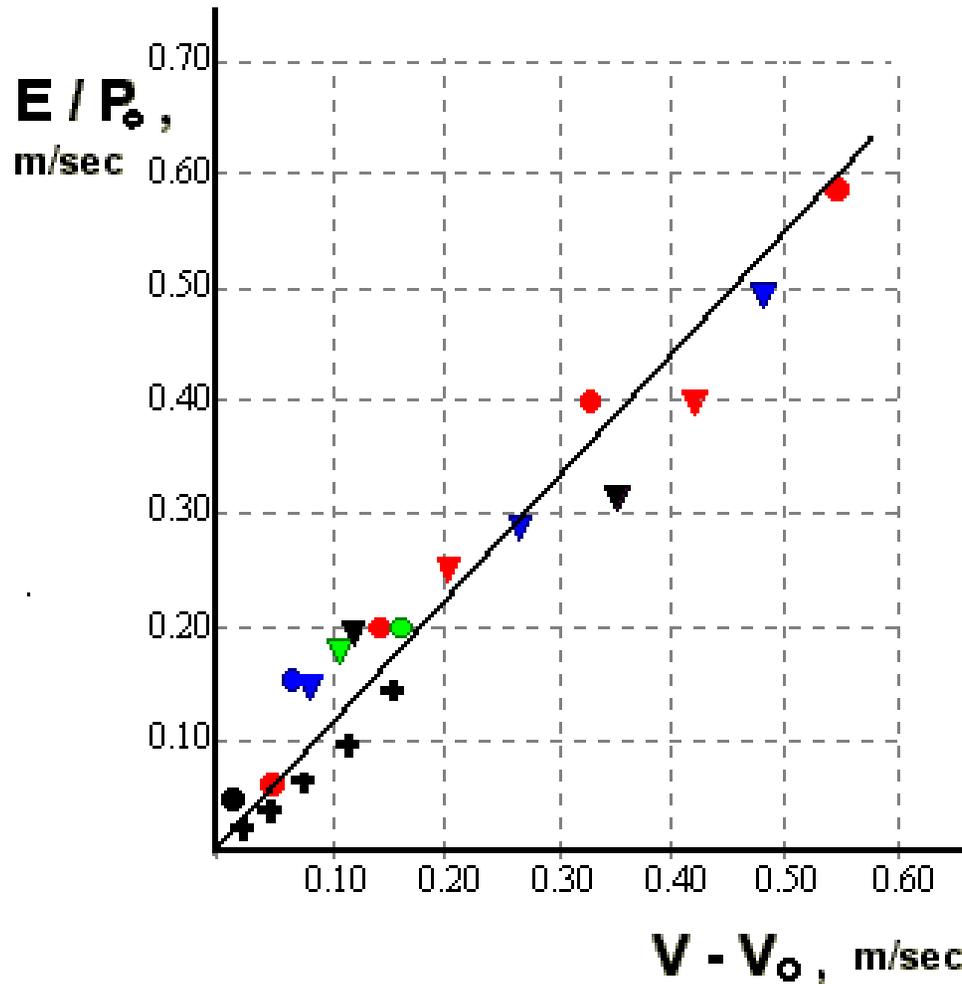
Activity of Acoustic Cavitation



Dependence from Static Pressure



Consolidated Experimental Data

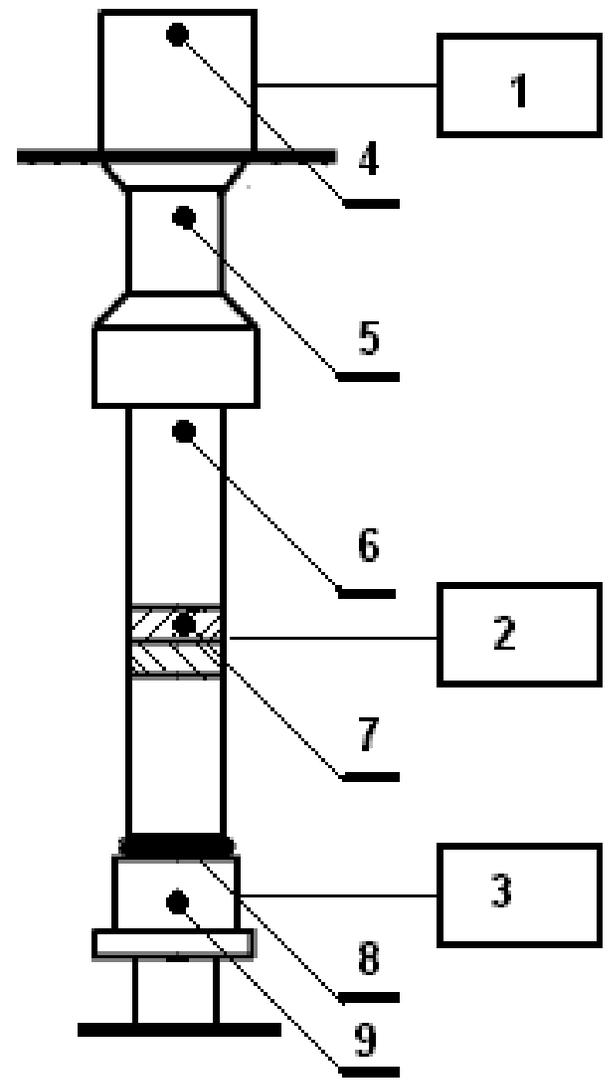


- + - Y.Kikuchi; ● - 1.0 bar; ● - 1.35 bar; ▼ - 1.5 bar;
- ▼ - 2.0 bar; ▼ - 3.0 bar; ▼ - 4.0 bar; ● - 5.0 bar;
- - 7.0 bar.

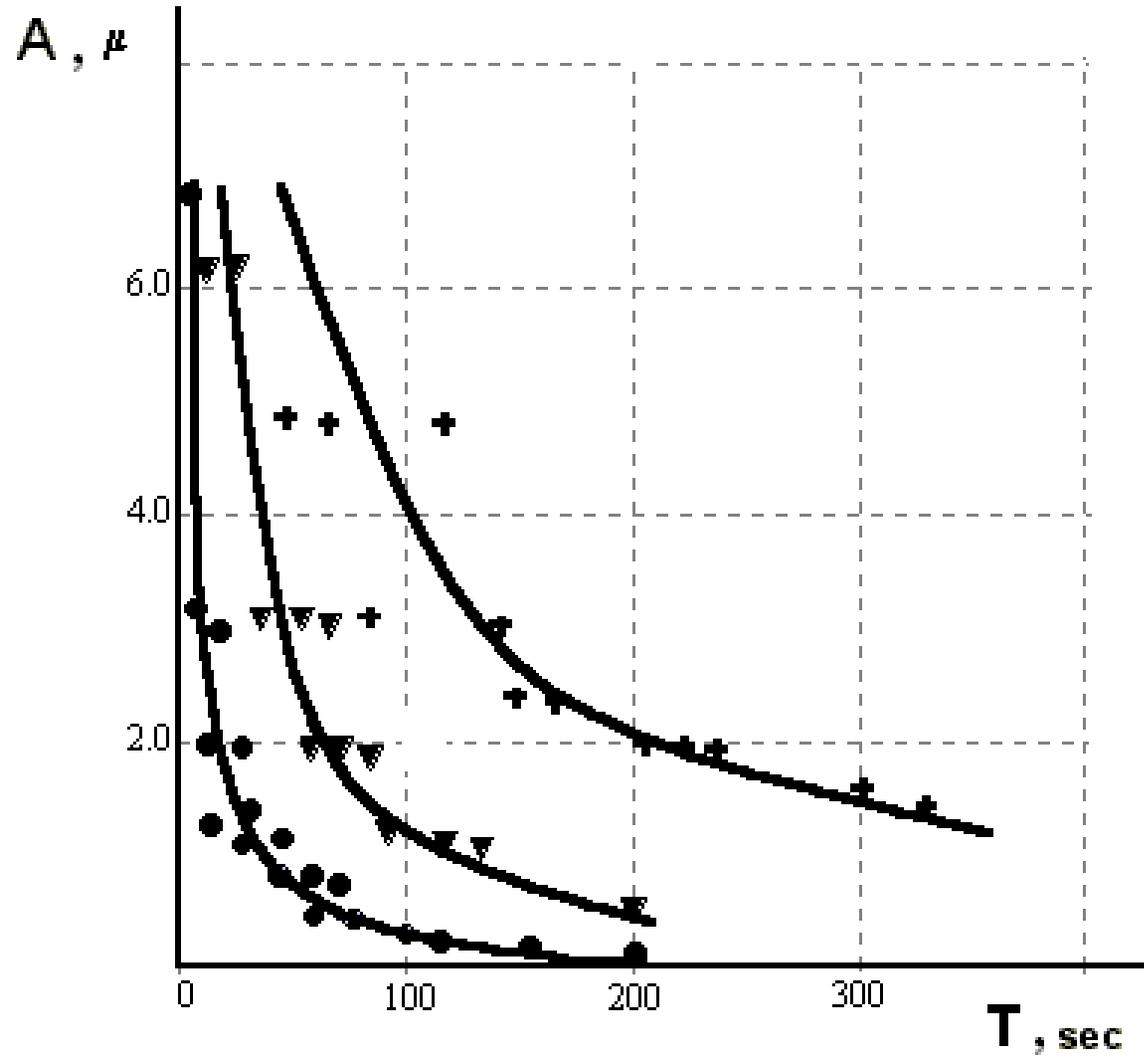
$$E / P_0 = 1.1 * (V - V_0)$$

$$P_a \cong 1.5 * P_0$$

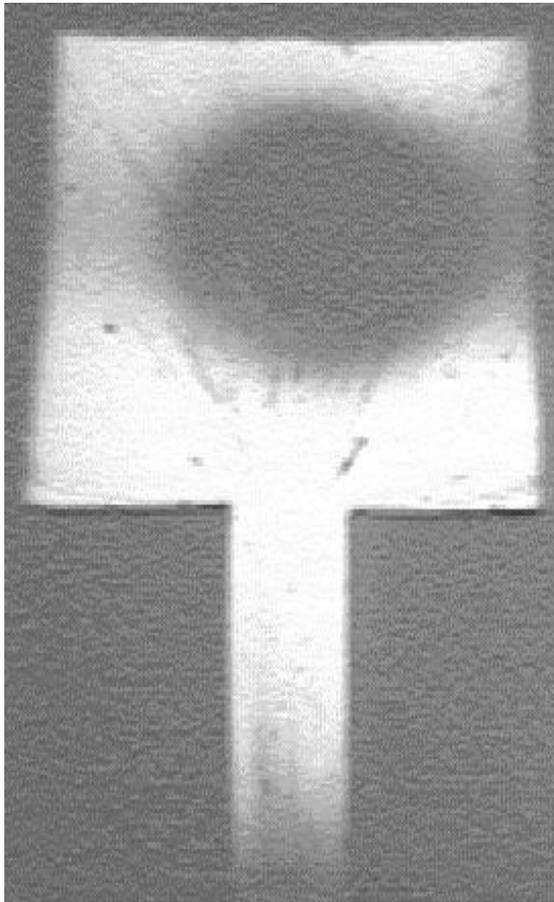
Part 3. Experimental Examination of Molten Polymers



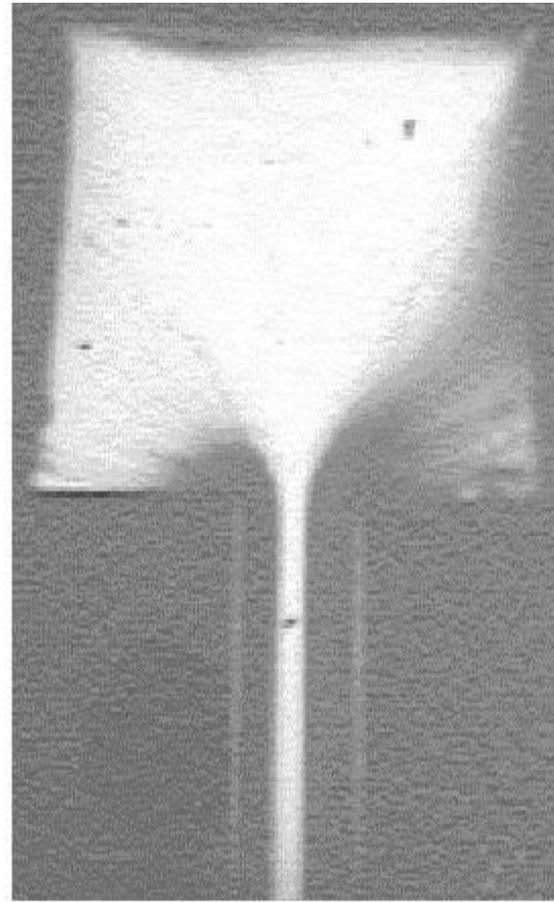
Threshold Amplitude of Acoustic Oscillations



Cavitation Area in Polymer



1



2