

## 测量介质的声速 (一)

· 测量相速度

· 测量频率: 利用脉冲信号.  $v_g = \frac{\Delta l}{\Delta t}$ · 谐振频率  $f_0 = 40.330 \text{ kHz}$  ✓

· 马氏波法数据记录表

$i$	1	2	3	4	5	6	<del>7</del>	<del>8</del>	<del>9</del>
$x/\text{mm}$	11.397	<del>12.752</del>	20.210	24.497	28.972	33.269			
	<del>11.489</del>	<del>12.647</del>			<del>28.759</del>	<del>33.314</del>			
		15.884			52.0	43.2			
$U/\text{V}$	99.2	<del>80.0</del>	70.4	60.8	<del>50.4</del>	<del>40.8</del>			
		73.6							
$x'/\text{mm}$	11.140	15.827	20.055	24.436	28.818	32.978			
$U'/\text{V}$	98.4	73.6	68.0	60.8	51.2	42.4			

$$\overline{\Delta X} = 4.3689$$

$$r = 0.99998$$

$$\overline{\Delta X'} = 4.3584$$

$$r = 0.9998$$

$$v = 351.972 \text{ m/s}$$

· 相位法数据记录表

$i$	1	2	3	4	5	6	
$x/\text{mm}$	10.679	19.692	28.666	37.420	46.117	54.672	$\overline{\Delta X} = 8.7998$
$x'/\text{mm}$	<del>10.506</del>	19.531	28.443	37.142	45.800	54.476	$\overline{\Delta X'} = 8.7816$

$$v = 350.53 \text{ m/s}$$

· 气样参数.  $\theta = T_p = 20.5^\circ\text{C}$  ✓  $T_{\text{湿}} = 16.6^\circ\text{C}$  ✓

$$\text{相对湿度 } H = 53\% \checkmark$$

$$\Rightarrow p_w = 2412.2 \text{ Pa}$$

$$v = 331.45 \sqrt{\left(1 + \frac{\theta}{T_0}\right) \left(1 + \frac{0.3192 p_w}{p}\right)} = 344.36 \text{ m/s}$$

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3.27



测空气中声速 (2)

测水中声速

	1	2	3	4	5	6	7	f/MHz
$x_2/\text{cm}$	0.00	2.61	5.23	7.91	10.55	13.20	15.85	<del>10.100</del> 9.7400
$x_1/\text{cm}$	1.00	3.79	6.58	9.30	12.01	14.80	17.50	<del>9.7400</del> 10.100

$$L = 63.9 \text{ cm}$$

$$\lambda_0 = 632.8 \text{ nm}$$

$$k_1 = 2.6446 \text{ cm} \quad r_1 = 0.999995$$

$$k_2 = 2.7482 \text{ cm} \quad r_2 = 0.99987$$

$$\Rightarrow \bar{k} = 2.6964 \text{ cm}$$

$$\Rightarrow d = \frac{\lambda_0}{\bar{k}} = 1.4996 \times 10^{-4} \text{ m}$$

$$\Rightarrow \Delta d = d_{1,2} \frac{L \lambda_0}{k_{1,2}} = 1.528 \times 10^{-4} \text{ m} / 1.471 \times 10^{-4} \text{ m}$$

$$\Rightarrow c_{1,2} = d_{1,2} f_{1,2} = 1489 \text{ m/s} / 1486 \text{ m/s}$$

$$T = 21.8^\circ \text{C}$$

3.29