

物理实验教学中心

Physics Experiment Center



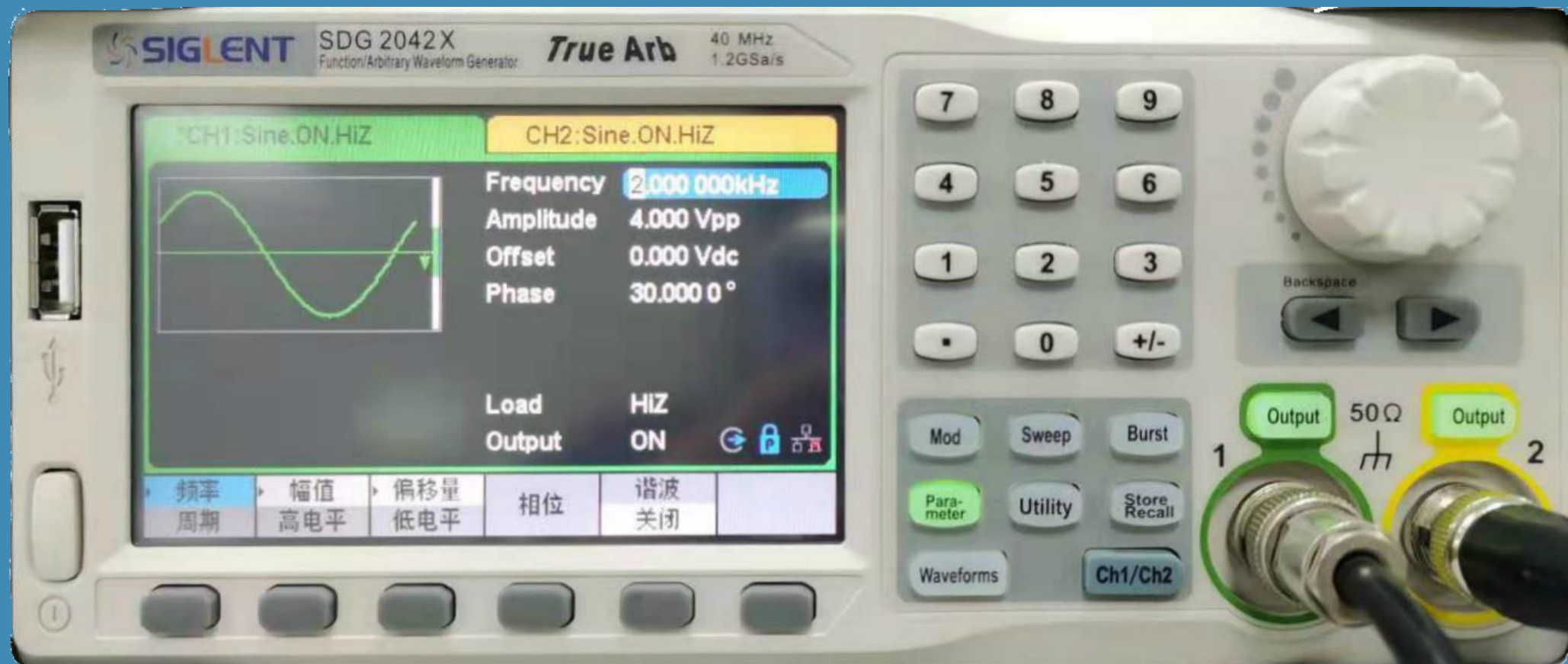
Oscilloscope

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Experimental Goals

1. Adjustment and use of oscilloscope.
2. Learn to use oscilloscope to observe voltage waveform.
3. Observation of Lissajous figures.

SDG 2042X Signal generator



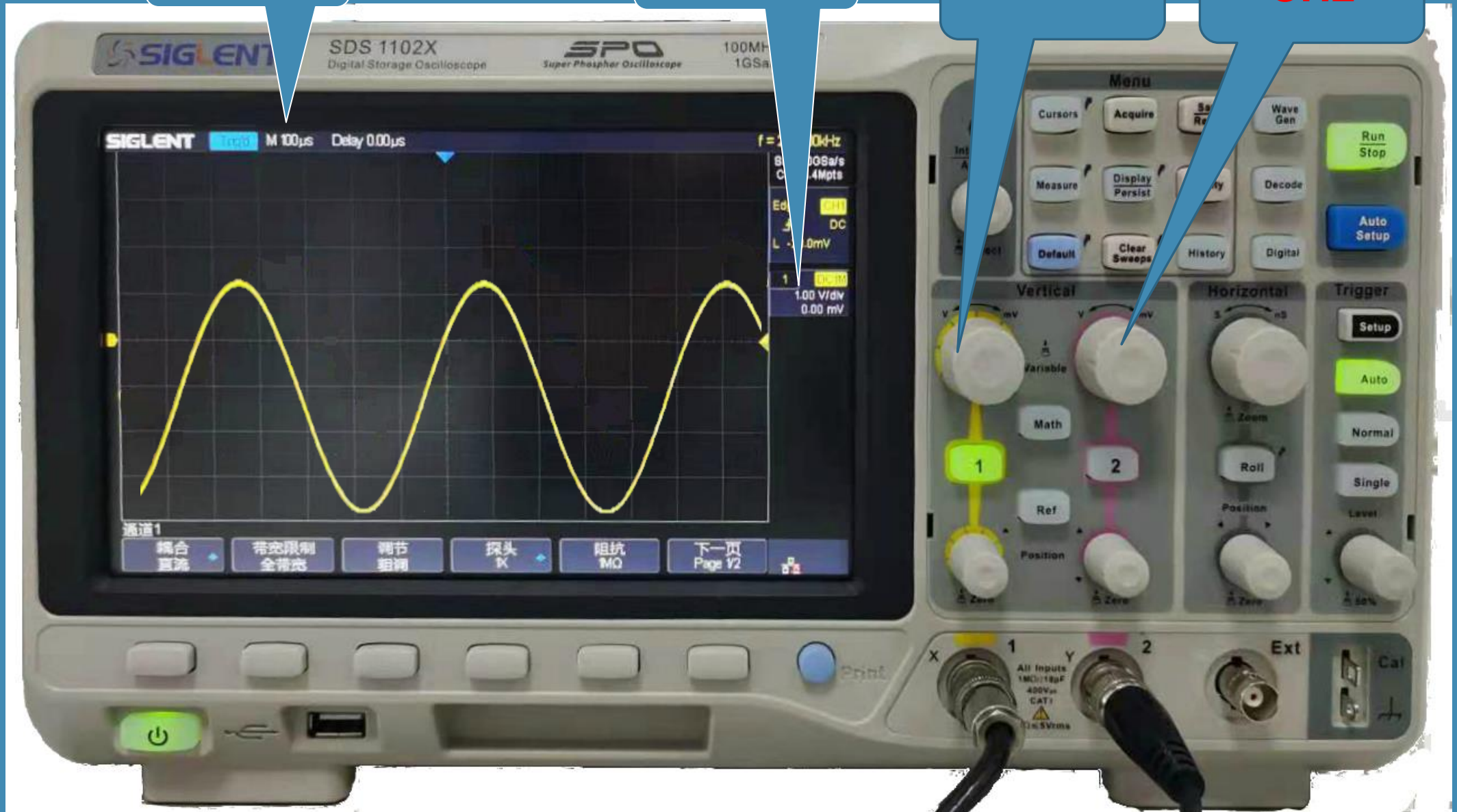
SDS 1102X Oscilloscope

M 100 μ s

1.00V/div

CH1

CH2



Steps:

1. Settings of Signal generator:

Set CH1:

Frequency: 1.000000KHz;

Vpp/ Amplitude: 5.000V;

Phase:0.000。

output 1;

2. Observe voltage waveform on Oscilloscope

Power on → Channel 1 → Default (blue) → Auto setup (blue)



Table 1. The voltage of sinusoidal signals

NO. \	Voltage (V)	Sensitivity of Y axis: S_y (V/div)	D_y (div)	$U_{p-p}(v)$	$U_p(v)$	$U (v)$
1	2.5	1				
2	3.0	1				
3	4.5	1				
4	5.0	1				

$$S_y * D_y = \text{Voltage} = U_{p-p} \quad U_p = \frac{1}{2} U_{p-p} = \sqrt{2} U$$

Table 2. The period of sinusoidal signals

NO. \	f (Hz)	Sensitivity of X axis: S _x (us/div)	D _x (div)	T (us)
1	400	100	25	2500
2	2000	100	5	
3	8000	25		
4	15000	10		

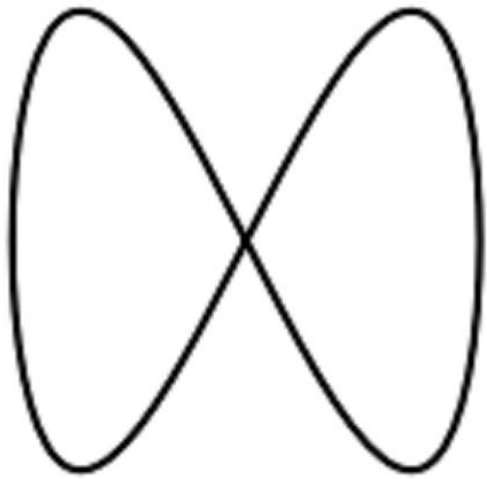
$$S_x * D_x = 1/f = T$$

$$1 \text{ ms} = 10^{-3} \text{ s}$$

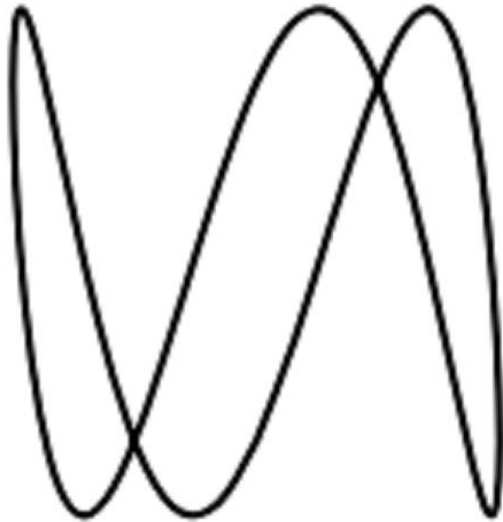
$$1 \text{ us} = 10^{-6} \text{ s}$$

$$1 \text{ Hz} = 1 \text{ s}^{-1}$$

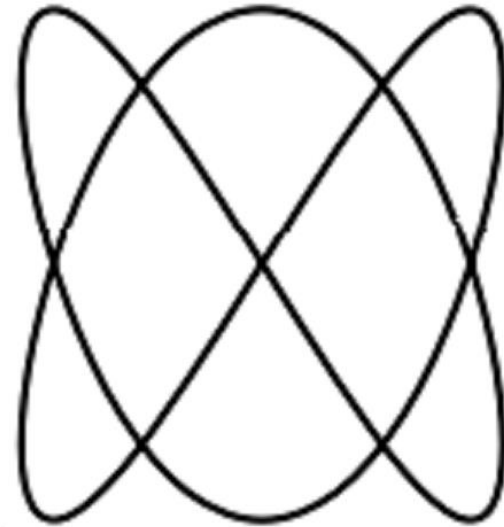
3. Lissajous figures



$N_y:N_x=1:2$



$N_y:N_x=1:3$



$N_y:N_x=2:3$

$$f_x:f_y = N_y:N_x$$

1 Signal generator:

Set: Ch1 and Ch2:
Ch1: 3KHz, 4V, 0;
Ch2: 2KHz, 4V, 0.
output 1 and 2

2 Oscilloscope

Open Ch1 and Ch2 → Acquire → XY





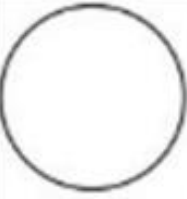









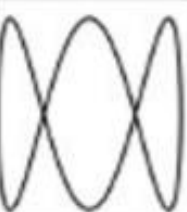


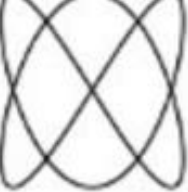




Phase diff. fx:fy	0	$\frac{1}{4}\pi$	$\frac{1}{2}\pi$	$\frac{3}{4}\pi$	π
1:1					
1:2					
1:3					
2:3					

Table 3. Plot Lissajous figures

$f_x = 3 \text{ kHz}$, $f_y = 6 \text{ kHz}$

Phase diff.	0°	90°	180°	270°	360°
Lissajous figures					



END