Chladni Violin Plate
SE-7319

Introduction

A string vibrating at a resonant frequency develops a standing wave pattern consisting of regularly spaced nodes (points on the string that do not vibrate) and antinodes (points where the amplitude of vibration is a maximum). More interesting standing wave patterns are created with vibrations in media that support wave propagations in two dimensions, such as a metal plate or a drum head.

In the early nineteenth century, Ernst Chladni developed a technique to investigate two-dimensional wave patterns. Sand is sprinkled onto a plate, and a violin bow is used to vibrate the plate. The sand comes to rest on the nodal lines, where no vibration occurs. Sand that is not resting on a nodal line gets bounced around until it finally lands on a nodal line and comes to rest.

When used with the PASCO Wave Driver (WA-9855), the Chladni Violin Plate improves on Chladni's original method, allowing you to produce steady plate vibrations at any desired frequency. The image below shows an example of the nodal patterns that can be created.

> ✎ **NOTE:** The Chladni Violin Plate can also be used with the Mechanical Wave Driver (SF-9324). A banana plug is included with the Chladni Violin Plate as legacy support for connecting the plate to the Mechanical Wave Driver. However, the Wave Driver (WA-9855) is strongly recommended for experiments with the Chladni Violin Plate.

Equipment
Included equipment:

- Violin-shaped plate
- Banana plug
- Nut
- Washer
- Lock washer
- Long screw (6-32 × 1-3/8)
- Short screw (6-32 × ¼)

> ✎ **NOTE:** You may also receive a solder tab alongside the other components. This tab can be discarded, as it is not used in the operation of the Chladni Violin Plate.

Other required equipment:

- Wave Driver (WA-9855)
- 2× Banana Plug Patch Cords (SE-9751)
- Any of the following function generators:
  - 850 Universal Interface (UI-5000)
  - 550 Universal Interface (UI-5001)
  - Sine Wave Generator (WA-9867)
  - Function Generator (PI-8127)
- Extra fine sand

Use the Chladni Violin Plate
Connect the plate to a driver
Connect to the Wave Driver (WA-9855; recommended):

1. Insert the long screw into the hole in the center of the plate.
2. Turn the screw over and place the lock washer onto the screw.
3. Place the nut onto the screw and tighten it until the nut reaches the lock washer.
4. Turn the plate upright again and, using a Phillips head screwdriver, tighten the screw until the nut is locked in place.
5. Insert the screw into the Wave Driver's drive post.
6. Rotate the plate clockwise to screw it in until it cannot easily rotate any further. Tighten the screw using the Phillips head screwdriver to secure the plate in place.

Connect to the Mechanical Wave Driver (SF-9324):

1. Insert the short screw into the hole in the center of the plate.
2. Turn the plate over and place the washer onto the screw.
3. Place the banana plug onto the screw and rotate clockwise until the plug reaches the washer.
4. Turn the plate upright again and, using a Phillips head screwdriver, tighten the screw until the banana plug is locked in place.
5. Insert the banana plug into the drive post of the Mechanical Wave Driver.

Drive the Chladni Violin Plate

1. Connect the wave driver to your chosen function generator. For more precise instructions, see the manuals for the wave driver and function generator.

2. Sprinkle extra fine sand onto the plate.

3. Begin driving the plate over a range of frequencies from approximately 100 Hz up to 7 kHz.

As you slowly vary the frequency, you will discover a variety of standing wave patterns. (Change the frequency gradually, as the resonances are very sharp and you might miss some if you change frequencies too fast.) Adjust the amplitude and amount of sand as needed to get clear patterns.

> ✏ **NOTE:** Try holding an edge of the plate to determine the effect this has on the resonant frequencies and patterns.

For further investigations, consider creating your own Chladni plates. We recommend cutting them from aluminum sheets approximately 0.035 inches thick, but you might find it interesting to experiment with other materials or thicknesses.

Technical support

Need more help? Our knowledgeable and friendly Technical Support staff is ready to answer your questions or walk you through any issues.

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Limited warranty
For a description of the product warranty, see the Warranty and Returns page at www.pasco.com/legal.

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