

TASK 2: EARTHQUAKES

Hi EXPLORER companies: Due to unfortunate circumstances, completed OBS WiFi underwater broadcasting systems will not be available at the competition. MATE is making some alterations to Task 2: Earthquakes to compensate for this. We have tried to mimic the prior set up as much as possible to be equitable to companies that built a WiFi receiver. See below for the updated product demonstration tasks.

This task involves the following steps:

- **Prior to the competition, developing a inductive coupling connector capable of providing power at 5 volts, 1 amp, 5 watts to an ocean bottom seismometer (OBS).**
- **During the competition – up to 25 points**
 - **Inserting the power connector into the port on the OBS – 5 points**
 - **Lighting the power indicator LED – 20 points**
- **Prior to the competition, developing a device capable of receiving WiFi data. Prior to the competition, demonstrating that the WiFi system is capable of receiving WiFi data in air.**
- **During the competition – up to 55 points**
 - **Leveling the OBS using a bubble level:**
 - **Physically leveling the OBS; demonstrated prior capability to connect to WiFi – 25 points**
 - **Physically leveling the OBS; did not demonstrate prior capability to connect to WiFi – 5 points**
 - **Receiving and accurately displaying a seismograph– up to 30 points**
 - **Receiving seismograph data points – 10 points**
 - **Displaying the seismograph – 10 points**
 - **Seismograph display is accurate – 10 points**

Total points = 80

Product Demonstration Notes:

Companies must attempt to power the OBS before attempting to level it. Companies must level the OBS via the bubble level in order to receive seismograph data. The OBS must be powered to level the OBS with prior demonstration of WiFi. The OBS must be powered to complete the seismograph tasks.

Prior to the competition, the ROV must demonstrate the ability to connect to the WiFi (in air, not in water). The WiFi system will be identical to the system specified in the manual and prop building document, but it will not be underwater. The connection set up will be available at the safety inspection. Power for EXPLORER class companies will be available at the safety inspection to demonstrate their ability to connect to WiFi. Companies may also demonstrate their connection to WiFi at the repair and power up station at the WKCAC on Thursday. Companies unable to demonstrate a

connection to WiFi during safety checks should consult the safety inspectors on scheduling another attempt.

Companies must design an inductive coupling connector capable of providing power at 5 volts, 1 amp, 5 watts to a simulated ocean bottom seismometer.

The OBS will contain a port with the power receiver module of a [wireless charger](#). The port will be oriented vertically and the receiver will be located inside at the center. Less than 2 mm of waterproofing coating will cover the receiver. The port will be 3D printed, round, approximately 3 cm deep, and have an inside diameter of 6 cm. Information about the port, including the 3D printing files, can be found on the [here](#). Companies are responsible for developing and building their own power connector using the transmitter module of a wireless charger. Companies will receive 5 points for successfully inserting their power connector into the port on the OBS. Successful insertion of the power connector is defined as the company-built connector remaining inside the port once it has been released from the ROV.

The inductive coupler will be used to power an LED attached to the receiver module. When companies connect their transmitter to the receiver in the port, the LED will turn from off to green, indicating that the OBS is receiving power via inductive coupling. Companies will receive 20 points for turning the LED to green. The station judge must be able to see the green LED light on a video screen.

The company-built transmitter module will not constitute debris if left in the pool at the end of product demonstration time.

Companies may choose to power their transmitter module from the surface or from batteries on-board the transmitter. The transmitter will be considered a Non-ROV device, and must follow the [Non-ROV device power specifications](#). If surface power is used, companies may choose to power the transmitter device from ROV power, or may run the wires independent of their ROV.

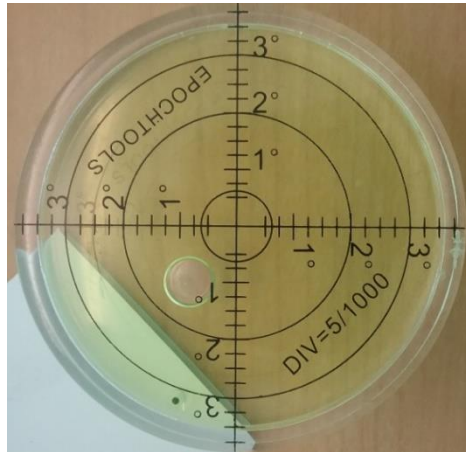
Note: MATE will provide a station at the pool so companies can test their inductive coupling connection. The testing station will be identical to the actual product demonstration stations, but will be located in shallow water.

Companies must physically level the OBS. The OBS will be located in an area on the pool bottom and will not be level. The frame of the OBS will be constructed from ½-inch PVC pipe. Each of the four corners of the frame will have a ½-inch PVC tee. Rotating the tee will raise or lower that corner of the OBS. Raising or lowering various corners will level the OBS.

Companies will use the bubble level to determine when the OBS is successfully leveled. Successfully leveling the OBS is defined as the bubble completely within the 2° ring of the bubble level. Companies will receive points when they show the station judge, on a video display, the bubble is within the proper ring. Companies that successfully demonstrated the ability to connect to WiFi will receive 25 points

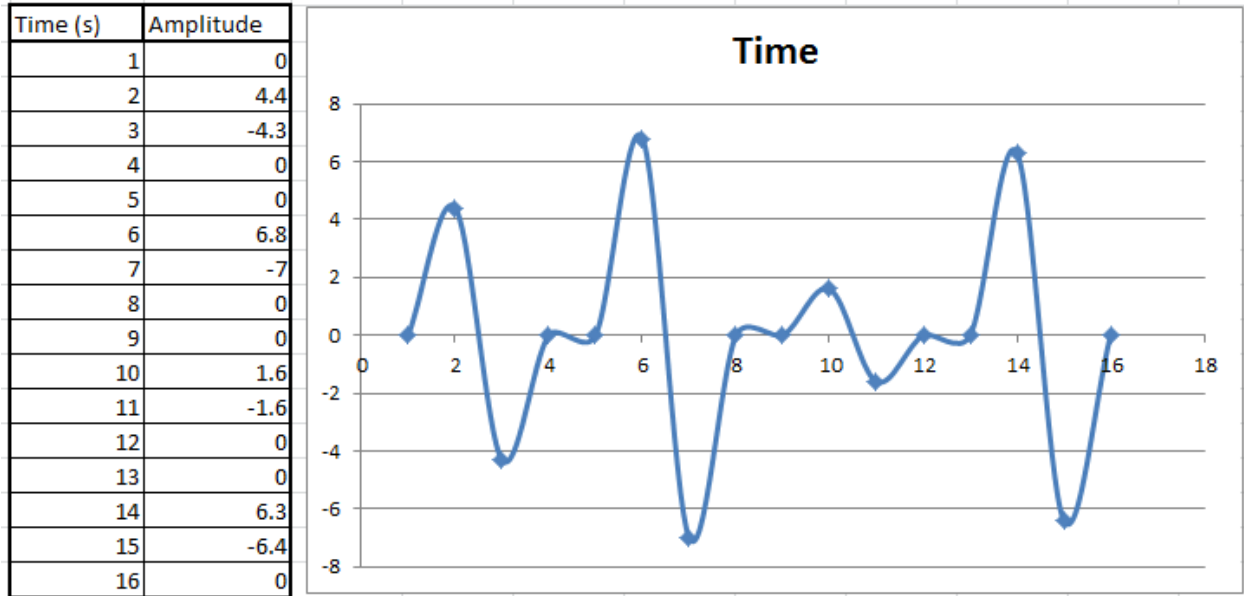
when the bubble level is within the proper ring. Companies that did not successfully demonstrate the ability to connect to WiFi will receive 5 points when the bubble level is within the proper ring. The OBS must be successfully powered (green light on) throughout the leveling process to receive 25 points. If the power puck is dislodged during leveling, companies may replace the puck to continue to power the OBS.

The station judge must be able to see the bubble level through a video display; when displaying the bubble level within the 2 degree circle, the ROV should not be touching or holding any part of the OBS.



[The bubble level.](#) To receive points, the bubble must be completely inside the 2° circle. In this photo, the bubble is successfully inside the 2° circle.

When the bubble is successfully within the 2° circle, companies that demonstrated the ability to connect to WiFi will be given a laminated, paper copy of 16 data points. Each data point represents an amplitude plot. These 16 data points must be plotted on a graph. Companies must plot the amplitude (Y axis of graph) over time (X axis of graph). The 16 points should be plotted against time 1 through 16, i.e. data point 1 at 1 second, data point 2 at 2 seconds, data point 3 at 3 seconds, etc. Companies will receive 10 points when they show the station judge their seismograph. Station judges will evaluate the seismograph for accuracy. Companies with an accurate seismograph will receive 10 points. The OBS must be successfully powered (green light on) to receive and plot the data. If the power puck is dislodged during seismograph analysis, companies may replace the puck to continue to power the OBS.



Companies will receive the 16 data points (columns on left of graph). Companies will use these points to create a seismograph.

Companies may plot the seismograph by hand on paper or may use a computer with EXCEL, Open Office, or other program to create the seismograph.