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Broadband Ocean Bottom Seismometer developed by Chinese Academy of Sciences

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Ocean bottom seismometer (OBS) plays an important role in the oceanic survey and the area of science. Inspired by the success of the world scale of OBS experiment, we developed our own autonomous OBS prototype. Supported by various national foundations, the OBS is designed to use in all the sea area in China to record both earthquake and the signal of the air-guns array.
Our OBS is lighter than other countries' broadband OBS. Within a single 17 inch glass sphere we integrate the broadband seismometers, data logger and lithium batteries. The overall weight of the OBS with a heavy anchor is 70 kilogram, and the recoverable part is 43 kilogram with 5 kilogram buoyancy.
The instrument is equipped with two types of batteries, rechargeable and disposable lithium batteries. When OBSs are used in the short term survey(less than four months), the rechargeable batteries supply the power. Otherwise, using the disposable batteries, the OBS can work about 12 months. When the voltage is below the threshold value, data logger stops working. The backup batteries will only be used in recovery procedure.
Equipped with molecular electronic seismometer, the OBS has a frequency band of 0.0018-50 Hz. Its maximum installation tilt is 30 degrees with the leveling platform.
We apply four ways to lower the power consumption,
(1)Instead of using normal A/D converter CS5372/76, we apply the fourth order of Δ-Σ modulators ADS1251 which is much less cost and power consumption. In order to acquire higher resolution A/D measurement results, multistage down sampling filter is used, providing dynamic range of 120dB @ 1000Hz SPS. Each channel's power consumption is less than 8 mW including the additional software filter. Of all the four channels, the A/D converter's power consumption is less than 32 mW.
(2)There is 4 pieces of SDHC card mounted in the OBS. Each card has a capacity of 32 GB, so there is 128 GB in total. They consume the power only when the data in buffer is sent to the card, so the average power consumption of SDHC cards is no more than 50 mW.
(3)A stable timing unit is very important to the OBS. Instead of high power consumption oven-controlled crystal oscillator, we use a low power temperature compensated crystal oscillators of which the power consumption is less than 20mW. It takes advantage of constant temperature of the ocean and offers a stability of $\pm$40ppb.
(4)The controller of the OBS is ARM microcontroller. It also has low power consumption. The core voltage is 1.8V and control level is 3.3V.
The overall power consumption of the instrument is 0.18W. The capacity of the mounted batteries is about 1600Watt Hours, so the work time of the OBS is no less than 1 year.
Otherwise, there are several more features, (1)Wireless controlled by Bluetooth. (2)Data download by USB cable. (3)Rechargeable batteries.
By the time of 2010 we have tested the OBS in several places such as Indian Ocean, South China Sea, Bohai Bay. And it shows good result.