Entwicklung und Bau eines akustischen Hochleistungs-Televiewers

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Abstract

The performance of the traditional Televiewer depends very much on the position of the tool in the hole (ecentricity) and on the shape of the hole (eliptical shape, breakouts). Theoretical calculations of the generated and at the borehole wall reflected wave field indicated, that the performance of the Televiewer can be improved, if instead of a simple transducer an array of many transducers is used to generate and to record the wave field. In laboratory experiments the practical aspects of such an approach were studied with a circular acoustic array of 128 elements.
Based on the results of these experiments the design of a high performance Televiewer system was started which from its early beginning has taken into account the stepwise realisation of a high temperature version.
According to temperature and pressure requirements the Televiewer tool can be split up in three different parts.

1. The acoustic transducers have to be exposed to the high temperature and high pressure environment to gain sufficient acoustic coupling to the borehole fluid. A transducer for 170°C has been tested successfully in the laboratory. The performance of this transducer is slightly less than the performance of the low temperature version.

2. To get enough dynamic range and to get low noise performance some analog front-end electronic has to be place as near as possible to the transducer. In the development of this part a big step forward was made by the realisation of an Integrated Circuit of the size of 2,5 x 2,5 mm, on which the front-end electronics for 4 transducers can be placed. The Integrated Circuit was tested successfully with temperature cycling up to 200°C. The small size and the low power consumption of the Integrated Circuit gives the possibility to shield it in a very small dewar, if the realisation of a version for 300°C turns out to be too expensive. The small dewar can be placed directly behind the transducers.

3. The digital hardware is realised with standard electronic components for 125°C. Emphasis is placed on low power consumption. New developments in the dewar and heat sink technology allow to effectively shield such electronic and to again an operation time of 2 days and more with an ambient temperature of 300°C. The electronic boards are justmanufactured. The hardware was designed to allow a great variety of experiments to be run in the hole. Only the acoustic part and the software have to be changed.