

Press release

Vacuum technology promotes fundamental research

Oerlikon Leybold vacuum technology and measuring equipment enables the proof of gravitational waves predicted by Einstein

Cologne 04/04/2016 –After about 100 years, it is a fact: Albert Einstein was right again. A century after the physicist predicted the existence of gravitational waves in the scope of his theory of general relativity, their existence has now been proved scientifically. The vacuum and measuring equipment of Oerlikon Leybold Vacuum has provided an important contribution to this discovery of American and German space scientists being worthy of a Nobel Prize. This is what they discovered: Gravity is created because mass causes a curvature of spacetime.

Astronomers around the globe have already been working for a century on the scientific image of the "sound of the universe". The curvature of spacetime by the masses propagating gravitational waves which move through the universe – this has been only a hypothetical assumption so far. Now, however, the terrestrial measuring of the length changes in the waves has been successful. To achieve this, extremely sensitive measuring technology and proven vacuum technology of the Cologne based company Leybold Vacuum has been used.

The tiny waves which are moving with the speed of light could not have been discovered without a gravitational wave detector like the GEO 600 at the Max Planck institute for gravitational physics in Hanover, Germany. The GEO 600 detector has played a strategically important role during the research. In Hanover, large parts of the instruments were developed and tested which then enabled the two big American LIGO measuring stations in Livingston, Louisiana and Hanford, Washington to find the proof for Einstein's gravitational waves.

LIGO measures the spacetime with two tubes with a length of four kms, which come together on the ground as a pipeline. The length of the arms can be monitored precisely via a laser system on the inside of the tubes. If a gravitational wave moves through the unit, it compresses and stretches the arms to a different degree.

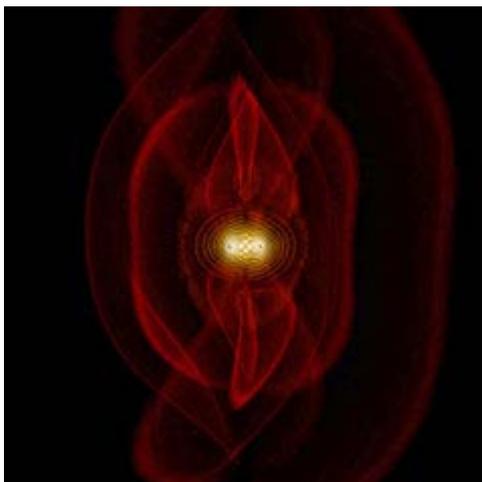
Only due to the extremely high sensitivity of the measuring instruments, it has indeed been possible to detect sizes of about a ten thousandth of the diameter of a nucleus. The GEO 600 also contains measuring equipment as well as dry compressing screw vacuum pumps of the SCREWLINE series manufactured by Leybold Vacuum. Apart from being easy to operate and as precise as possible, the measuring technology must feature a very fast operational readiness as well as short response times.

In order to proof the existence of gravitational waves, further accompanying research projects were carried out simultaneously in Italy (VIRGO) and Japan (KAGRA). In addition, these two research locations were equipped with machines manufactured by Leybold Vacuum - the VIRGO wave detector in the Pisa province has been using Leybold measuring technology and mass spectrometers for about 15 years. And the KAGRA project in the Japanese city of Ida features the currently largest vacuum system volume in Japan. Oerlikon Leybold Vacuum is represented there with several SP250/RUVAC pumping systems.

SCREWLINE vacuum pumps are dry compressing fore vacuum pumps working based on the screw principle. The robust SCREWLINE pump family was designed for the special requirements of R&D as well as industrial applications. The innovative design enables the usage in all applications requiring reliable, compact and maintenance-friendly vacuum solutions. One of its biggest advantages, which played a major role in this application, is a high degree of flexibility for potential uses. Connections using universal flanges or clamping flanges enable a simple integration into the system. Using the available accessories, the pump can be adapted to each individual requirement which is typical for research applications. These pumps are optimized by connecting them to the Roots vacuum pumps of the RUVAC series.

Oerlikon Leybold Vacuum CEO Dr. Martin Füllenbach says: "This scientific sensation illustrates once again the importance of our technological solutions for research applications of fundamental significance. We are very proud to further accompany and support the leading research institutes also in the years to come".

Maybe not only pride but also joy will be one of the emotions, since it is not impossible that these discoveries will be awarded with the Nobel Prize for Physics in the future.



Source: NASA – Gravitational waves of two black holes



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About Oerlikon

Oerlikon (SIX: OERL) is a leading global technology Group, with a clear strategy of becoming a global powerhouse in surface solutions, advanced materials and materials processing. The Group is committed to investing in value-bringing technologies that provide customers with lighter, more durable materials that are able to increase performance, improve efficiency and reduce the use of scarce resources. A Swiss company with over 100 years of tradition, Oerlikon has a global footprint of over 13 500 employees at more than 170 locations in 37 countries and sales of CHF 2.7 billion in 2015. The company invested CHF 103 million in R&D in 2015 and has over 1 350 specialists developing innovative and customer-oriented products and services.

Oerlikon Leybold Vacuum produces vacuum pumps for a wide range of modern production and analysis procedures as well as research projects. The core capabilities of Oerlikon Leybold Vacuum are application-based solutions for creating vacuums and extracting processing gases. Our fields of application are the semi-conductor and data storage industries, analytics as well as numerous classical industrial branches.