

An instrument to be proud of

Right about now HIFI, the Heterodyne Instrument for the Far-Infrared, is orbiting the Earth exploring the almost unknown fringe between infrared and radio frequency radiations. HIFI is a product of close collaboration between science and technology. Its development involved 23 institutes from eleven countries and was led by the Netherlands Institute for Space Research, SRON.

HIFI was launched aboard the Herschel, an ESA (European Space Agency) space telescope. Klaas Wildeman of the Dutch space research institute SRON supervised the development, construction and testing of the most complex component of HIFI, the Focal Plane Unit that captures the radiation directly behind the telescope and conducts it to the detectors via an opto-mechanical system. The detectors then convert the radiation into electrical signals that are transmitted to Earth. The detectors were developed in close collaboration with the Kavli Institute of Nanoscience of the Delft University of Technology. Wildeman: 'We immediately realised that the required engineering was particularly complex.'

COOLING

So the solution was anything but standard. 'In order to electronically amplify and process the radiation captured by HIFI, it had to be mixed with other frequencies. To ensure a good result this has to be done at two degrees above absolute zero and even at a distance of one and a half million kilometres from Earth it is not that cold. Liquid helium is therefore needed for cooling, something that required special solutions. Add to that the fact that the sensitive instrument has to withstand the launch vibrations as well as be extremely light and compact, and you get an idea of the enormity of the challenge.'

SRON called on TNO. 'We already knew that TNO was capable of fantastic designs. This time the collaboration was also successful, especially between the optical and mechanical experts. However, the instrument still needed to be built.'

PRIDE

'Building it ourselves was not an option. You need people that can really do it, who are really proud of their workmanship. Which brought us to the Doetinchem-based fine metals company Mecon in the east of the country. A subsidy from the NIVR, the Netherlands Agency for Aerospace Programmes, gave us the nudge we needed.'

This was the final piece of the puzzle. Wildeman: 'Twenty-three organisations from eleven countries were involved but the core was formed by SRON, TNO, TU Delft and Mecon. We each had our own input but it was a single effort. We enjoyed working together and were open towards each other. And HIFI is clearly better for it. The number of design and construction errors remained remarkably low, certainly for such an ambitious plan. The input of the three participants also helped make HIFI more lightweight.'

Cooperation works is Wildeman's conclusion. 'It may seem obvious but it should be done more often. HIFI can serve as an example for subsequent projects.'

Info: ben.braam@tno.nl, jan.nijenhuis@tno.nl

The Herschel Space Observatory in the ESTEC test area. Herschel is the largest space telescope ever built with, on board, HIFI, the largest space instrument ever built under Dutch supervision.

Photo: ESA / Annelke le Floc'h



SEARCHING FOR WATER IN SPACE

HIFI is studying the composition of interstellar clouds that float through space, measuring the possible presence of water in them. That is only feasible from space – even atop the highest desert mountain, the terrestrial atmosphere is too humid. HIFI will also be taking measurements of the atmosphere of the planets and comets in our solar system.