

**Effelsberg-Bonn Fibre Inauguration**  
**19 November 2009, Effelsberg, Germany**  
**Dr. Huib Jan van Langevelde, Director, JIVE**

Dear ladies and gentlemen. As the JIVE director and EXPReS coordinator, I can assure you it is a great pleasure to be on the receiving end of the digital data stream that this great telescope generates. As Prof Zensus has pointed out, this telescope by itself constitutes almost half of the collecting area of the e-VLBI array. To have this fantastic sensitivity available is something we have anticipated for a long time. And with this telescope joining we commemorate the completion of the European e-VLBI array, not only in connecting a number of great and remote dishes, but also in the other important dimension, namely bandwidth capacity.

This week we have demonstrated that no less than four of the telescopes can stream data at the maximum VLBI capacity of 1 Gbps. When the EXPReS project started we had done a proof of concept program with three or four telescopes at 64 or maybe 128 Mbps. Today we do eight or ten telescopes at 512 Mbps. At the moment 512 is our operational data-rate, and the reason we are using that today is because you are not witnessing a test, but a live science run. Zsolt will keep you away from doing any harm to the project.

Today's science target is a perfect example of how e-VLBI is breaking new ground in radio-astronomy. The target source SS433 is showing variability on the timescale of days to weeks. From very first principles this must mean the source is very small by astronomical measures, light days at most. But with VLBI we have the resolution to make out what is happening on a very small scale, even if the source is thousands of light years away. But we must catch the star in the act, and we can do just that with e-VLBI. This is what happened two weeks ago when the international community reported a flare. Today we can show you already last week's result. Where it used to take months, this weekend the PI can be looking at the results. I must point out that these results are not public; it is the right of the PI and his team to access these results first.

I must say that I personally think it is a fantastic new feature of e-VLBI that brings the traditional excitement of astronomical observing to VLBI. Sitting behind a telescope and being involved in a discovery, combined with the fact that all these telescopes are moving about in remote places around the world to feed into one place and ready to produce a new image of the sky, is just fantastic. We hope to transfer some of that excitement to the general public, and especially to young people next year during the events associated with the International Year of Astronomy.

I like to think that it is some of this excitement that comes with astronomy has also transferred to the network providers. The nature of the EC-funded EXPReS project is that it a collaboration between astronomers and agencies working on the connectivity between educational facilities. DANTE and its GÉANT network are part of that collaboration, and in the Netherlands SurfNET is the partner that connects all the incoming signals. But the multi-disciplinary collaboration goes beyond the formal partners as we can see today. I also acknowledge the important role of E-LOFAR in getting connectivity. It brings a fresh new drive to our field that is much welcomed. With the network providers we have come a long way in understanding the optimal procedures and protocols to stream the bits with minimal delay in order for them to meet with similar bits

from other telescopes, reconstructing the interference pattern of a thousand kilometer telescope.

But we are not in this business for the pure excitement of connecting telescopes (no we are not :-). We are after astronomical knowledge. And 400 years after the invention of the telescope we are still doing this by disclosing more and more of parameter space. In EXPRoS we have done this successfully by revolutionizing the response time of the observations. This was not only a technological but also an organizational change, and it has already led to a number of new results, even though the network was not fully complete. But in the process we have learned that e-VLBI has much more potential than just changing the aspect of return time.

We are convinced that with e-VLBI we can also boost the sensitivity of VLBI. With new digital technology we can produce data-streams of 4 Gbps next year, and 10Gbps, maybe up to 64 Gbps, in the coming years. This corresponds to increasing bandwidths of the telescope receivers being digitized, boosting the sensitivity accordingly. We have also learned that e-VLBI is improving the reliability of our network.

To progress in that way we must carry out development programs beyond EXPRoS together with our NREN partners. We are aiming to making all the VLBI experiments e-VLBI or at least have an e-VLBI component. This requires connectivity for a few telescopes that are not on-line yet at the edges of Europe or beyond. I foresee that we need some transparent buffering mechanism if we do not want to loose the flexibility of recorded VLBI that we are used to today. And important for us is the ability to set-up point-to-point connections in a dynamic manner. The static light-paths that we use now are obviously not efficient for VLBI networks that change topology with the scientific goals of the astronomer. Moreover, we want to continue exploring the concept of distributed correlation, as it inherently suits the nature of our distributed organization. Distributed correlation requires very fast dynamic allocation of connections and computing resources.

It is obvious that such a program would allow us to continue to be a world leader in the area of e-VLBI. But our ambitions go beyond that, and in fact it is not very comfortable to be the world leader. In our trade it is very important to be globally compatible. And I am very uncomfortable with the fact that our traditional partners in global VLBI in the US are not making the same progress with e-VLBI; it is something we are addressing with urgency, and I think the link we have to space science will be important in that process. In the view of the ambitions of all radio-astronomers around the world to build the Square Kilometer Array, it is of vital importance that we turn the different VLBI networks that exist now into a single flexible and accessible instrument. Only in that way can we be a significant and complementary telescope for the astronomers that use the SKA or its pathfinders. I think in Europe we will be able to see some of that synergy when e-LOFAR becomes operational. There will be discoveries that require VLBI follow-up, and it will mean that astronomers will expect similar accessibility, interfaces and response time of the two instruments.

I think we are heading for an exciting time in which radio-astronomy and its scientific importance will be accelerating. For me it is obvious that e-VLBI is an important facet in the overall

instrument suite of astronomers. Our collaboration is important to keep icons of European science, like the Effelsberg telescope, at the forefront of astronomy.