First Steps in the Ka Band

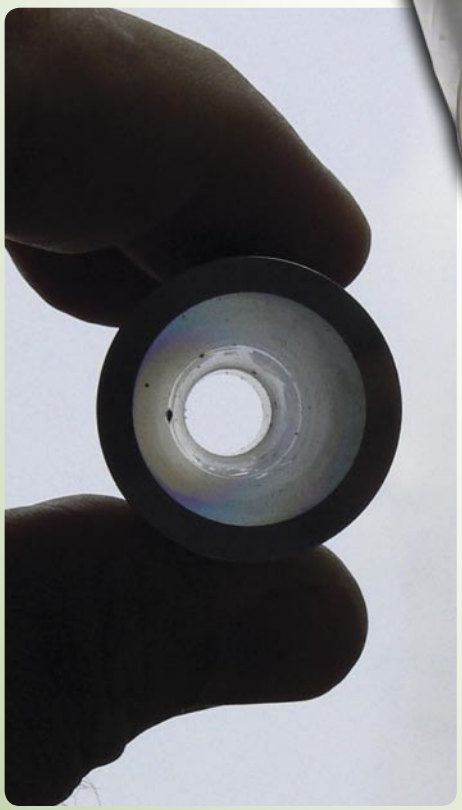
Reception Experiments In the 20 GHz Range

TELE-satellite has reported on the Ka band several times already, the latest time as recently as in issue 09/2007. The Ka band extends from 18.2 to 22.2 GHz and was split by LNB manufacturers into different segments. "A" denotes the first segment from 18.2 to 19.2 GHz, "B" stands for the second segment from 19.2 to 20.2 GHz and so on. Reducing each segment to a 1 GHz bandwidth makes sure conventional satellite receivers are capable of receiving signals that are transmitted on Ka band transponders when converted into intermediate frequencies between 0.95 and 1.95 GHz.

With these facts in mind it was about time someone tried out Ka band reception after all. Ron Eberson in Amsterdam did just that and we visited him to find out how he went about with his mission and what result he was able to achieve. This is how his story begins: "First of all I obtained a Ka band LNB directly from the manufacturer." The reason for this direct approach is that Ka band LNBs are not (yet) available from high street satellite shops. While Ka

Ron Eberson in the garden of his town house in northern Amsterdam. He shows a Ka band LNB with a purpose-built feed. Ron Eberson is an experienced antenna professional: for many years he had owned a company producing amateur radio antennas. In 2000 he sold his business and since then he has been able to invest most of his time in satellite reception.

Ron Eberson had a feed made out of an aluminium cast. "I could have done it myself with the help of a turning lathe," he says adding that "everybody can do that. You can buy a turning lathe for 300 euros these days." The feed output measures 28.8 mm and is fitted to the antenna, the feed's input fits the LNB output with 10.8 mm.



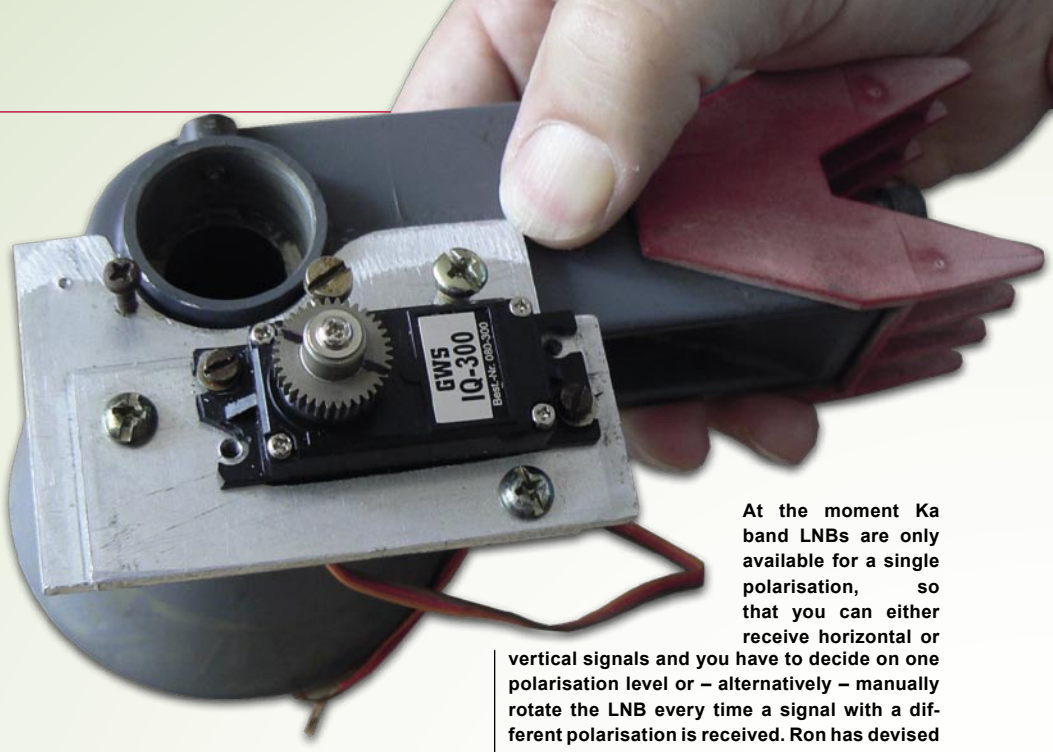
View into the feed horn: the conical shape of the feed is visible.

The feed fits perfectly into the existing reflector antenna and is inserted into the existing funnel feed.

band technology is already being used in professional applications, these systems always come in complete packages so that individual components are hard to come by. In particular, providers of Internet-via-satellite frequently rely on the Ka band as it offers extremely good bandwidths and the capacities are underused at the moment. North American Internet service provider Wildblue is one of the pioneers of Ka band use. Once Ron Eberson was able to call several Ka band LNBs (one for each frequency range or segment) his own, he encountered the next obstacle. "Due to the higher frequency range the waveguide is narrower than for other bands, which means that regular Ku band feeds simply won't fit." Not a problem for Ron Eberson, as he quickly made up his mind to build his own customised feed. "Of course I had to calculate the correct measurement first," Ron explains, but this turned out to be quite straightforward thanks to a software application called PCAAD 5.0 (http://www.antennadesignassociates.com/pcaad5.htm). "All you do is enter some basic parameters and the tool takes care of all the rest."

So then the actual feed had to be built. "Actually, I could have done it myself with the help of a turning lathe," Ron continues, but as he has a friend working at a professional metal processing company he had the feed made from an aluminium cast based on the result of the software tool. The next stop was to decide which receiver could be used for Ka band reception. According to Ron "any receiver will do, even though it only makes sense to use a box which allows entering any given IF manually." That's why Ron went for a Fortecstar receiver because "this box correctly displays the reception frequency on screen."

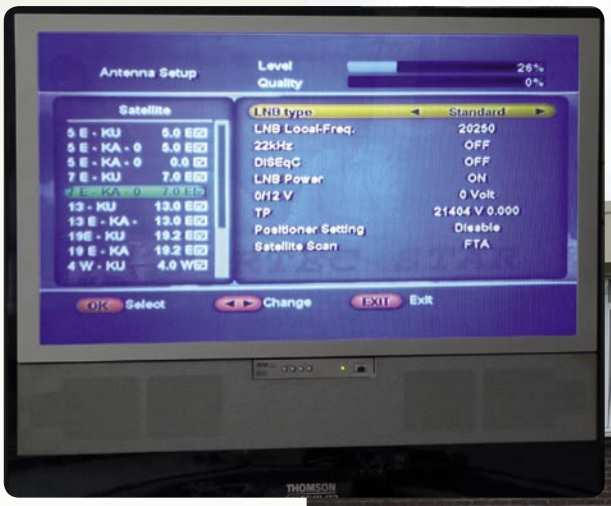
Ever since, Ron has been spending enormous amounts of time scanning the Ka band satellites. Albeit, his moments of success are still rare. "I'm really stuck without knowing the appropriate symbol rates," Ron tells us with disillusionment. A situation like this is the greatest challenge for any genuine DXer and even Ron admits that "this is part of the fun. Where's the challenge when all you need to do is press a button?". In the meantime he set up his own Internet forum (www.gregorian-users.com and http://96592.forums.motigo.com) to get in touch with other Ka band enthusiasts. "At the moment there are three members on the forum, but I do hope this number increases so that we can exchange our thoughts and ideas regarding the Ka band," hopes Ron Eberson, a true satellite pioneer.



At the moment Ka band LNBs are only available for a single polarisation, so that you can either receive horizontal or vertical signals and you have to decide on one polarisation level or – alternatively – manually rotate the LNB every time a signal with a different polarisation is received. Ron has devised something different altogether. "For about 10 euros I'm building a device that rotates the LNB as needed," Ron explains. "I take a motor with a cogwheel, like the ones that are used for model building, and a so-called servo tester, which are also quite common for model building when the remote control is not in use."

The LNB rotator is still in the making, but this is how it will work in the end: the motor with the cogwheel is mounted on the feed, and the LNB is mounted in the feed with a cogwheel ring and a flange so that it can rotate. With this mechanism Ron will be able to rotate the LNB from horizontal to vertical with his remote control.

The existing funnel feed for the Ku band. The Ka band feed is put into the opening that usually takes in the Ku band LNB. The funnel feed increases reception efficiency.

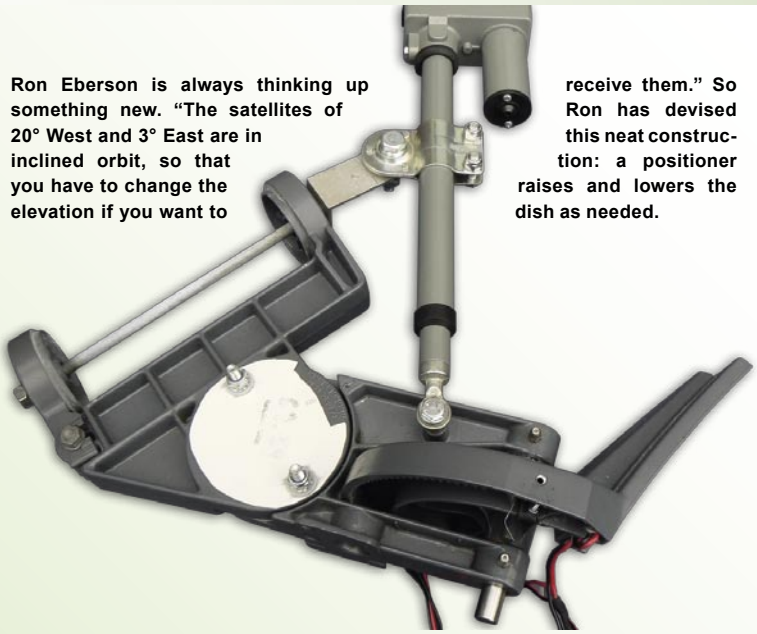


The moment of truth has arrived: Ron enters the local frequency of 20.250 GHz in his receiver and thus makes the receiver display the correct reception frequency without conversion. As the Ka band LNB is not divided into high and low bands and the polarisation cannot be changed, all these settings are turned OFF. However, due to lacking symbol rate information Ron has not been able to receive any Ka band signals yet.

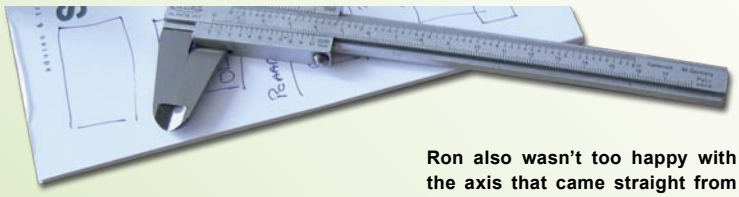
Ron has installed a 90 cm reflector antenna on the roof of his town house.

Ron Eberson's Handiwork

This is the small 55 cm reflector antenna Ron uses for his Ka band experiments. Nothing extraordinary at first sight, but if you have a closer look you'll notice that the motor is mounted at the wrong place: it does not sit below the rotating axis but above it. And come to think of it, we're not talking about a regular motor here either, but a DiSEqC motor. Ron sheds some light: "A conventional motor requires a 36 V positioner and can only move the dish 50° in each direction, which wasn't good enough for me." So Ron replaced the axis with a purpose-built axis and put a DiSEqC motor on top of it. "This has many advantages," Ron smiles, "because the dish can be turned almost 90° in each direction now, the motor axis is better protected from the elements and I can rotate the antenna using DiSEqC commands."



Ron Eberson is always thinking up something new. "The satellites of 20° West and 3° East are in inclined orbit, so that you have to change the elevation if you want to receive them." So Ron has devised this neat construction: a positioner raises and lowers the dish as needed.



Ron also wasn't too happy with the axis that came straight from the manufacturer (above): so he simply built a new one from machining steel (below) and added grooves for permanent lubrication. "Ever since, the antenna has worked flawlessly. Once a year I add some fat for lubrication and the thing runs as smoothly as on day one." In addition he added a thread in the centre. "This way I can stabilise the antenna if the motor is removed, otherwise the dish would judder like a sail in the wind."