

GB3EX

Trials, tribulations & triumphs at a power-less remote site

TEAMWORK. This is the story of team effort meeting the challenges of getting a repeater on the air, proving that repeaters don't just happen.

HISTORY. GB3EX is the Exeter 70cm repeater, for over 20 years located on Haldon Hill to the west of the city. It closed down in January 2011 when the rent became unaffordable. The hunt for a new site was on.

TRIALS. One day, in May 2011, Dave, MOUAC was operating /P from the nearest high point to his QTH when the landowner asked what was he doing – and showed interest when Dave explained.

Pete, G3ZVI visited the area a few days later and found nothing much there apart from a barn full of chicken manure, but you could see for miles in all directions. The landowner was very cooperative, saying we could use his barn; but there was no electricity.

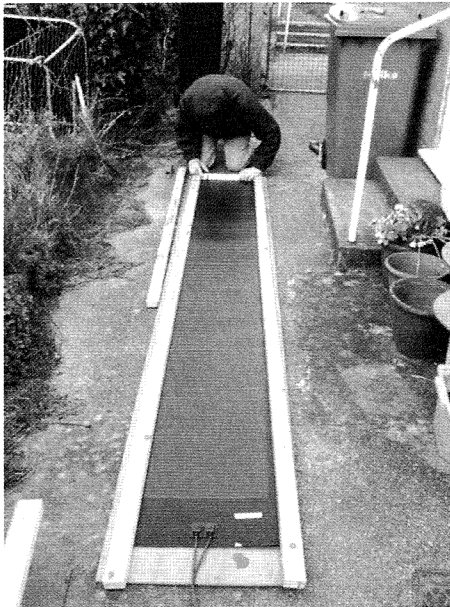
In August 2011 a test was carried out using the local RAYNET UHF frequencies and on VHF in collaboration the Air Training Corps, who were also looking for a repeater site. Results were very promising using just a 20ft mast.

The Olympics of 2012 meant that very little progress was possible that year due to our proximity to Weymouth.

In March 2013 a RAYNET exercise was held involving the entire SW region. We stationed a vehicle at the proposed site, working 2m and 70cm: the results were excellent.

We believed it was unlikely that we would get the NoV for GB3EX for some considerable time due to objections from the MOD, so we went ahead with a RAYNET repeater. It was 70cm inband and crossband to 2m. The aerial, rigged during July 2013, comprised a 4-stack dipole (for use with GB3EX in due course) and a dual band collinear above it for RAYNET. Although there was still no local electricity, we intended to operate RAYNET when required using a battery and generator until more funds became available.

TRIBULATIONS. Having rigged both aeri- als, they were tested with an expensive aerial analyser. To our surprise, it reported the 4-stack was completely dud. Connections were checked and no fault found. Later it was replaced by a second 4-stack, only to find *that* was apparently dud as well.



Pete, G3ZVI assembles the solar panel support frame.

Both aeri- als were perfectly OK when tested elsewhere. Then the penny dropped: there was a busy communications site in the next field and the copious emissions from that mast were swamping the analyser.

What happened next was the very wet winter when much of the West Country was under water. You'd think a hilltop site would be OK, but no. The chicken manure leached out onto the field; the entire site was seriously waterlogged and dangerous to the point that we said that no-one was to go on site alone. More than once someone had to be hauled out of the bog having gone in up to their knees – that's very scary.

At the beginning of 2014 it was decided to submit the application for GB3EX in the belief we would have a very long time to complete the installation work. To our astonishment, it came through in 20 days; it seems someone in the ETCC had been tasked with clearing the backlog, and clearly the MOD removed their objections. We now had 90 days to get it on the air. Access to the site was still nearly impossible; if a ladder was stood up it rapidly sunk into the bog, so we built a raft using a stack of pallets and were able to make some progress. The priority was to install a battery and a 60W solar panel that had been donated by Alec, G0BCO.

Back at base, the repeater was being built. After careful study of suitable RF hardware we settled on Tait 8000 series mobiles, which have a very low standby current

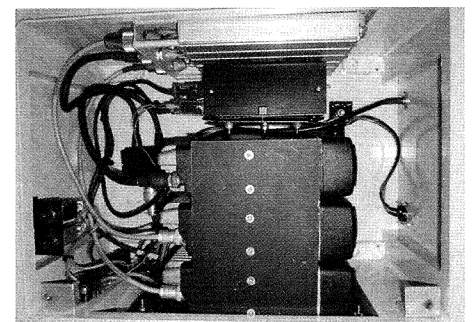
consumption of just 180mA. Assuming 23 hours standby at 180mA, 1 hour in use at 2.8A and 96 x 6 second idents, the total daily power requirement is 7.4Ah. Each Ah of battery use requires 1.3AH to recharge. The solar panel managed around 0.5A in overcast conditions, so the worst case scenario was 4AH during the winter, but given 8 hours of bright sunshine, not unknown during the winter, we are looking at a net gain of over 20Ah. We bought a new 110Ah marine grade battery claimed to be OK down to -18°C, not that Devon is noted for such low temperatures. The 60W solar power should see us through the summer, assuming a decent sunshine average.

The repeater housing was an IP65 cabinet enclosed in a steel frame with sufficient space to hold both repeaters, duplexers and logic units. The RAYNET 70cm repeater system uses the 7.6MHz split so we applied for a 7.6MHz split for GB3EX as it greatly simplified the duplexer requirements (and also avoided the use of 434MHz in a built-up area).

TRIUMPHS. A temporary version of GB3EX was put on the air just for the Exeter Rally weekend at the beginning of March 2014, followed by full operation on 31 March. GB3EX gives good mobile coverage for the City of Exeter and, importantly, the southern part of the M5.

As predicted, the solar panel provided ample power through the summer, but at the onset of winter we had to install a wind generator. Another 110AH battery was installed and fed from the generator. The batteries are connected to the repeater via isolating diodes.

ON THE AIR. GB3EX transmits on 430.950MHz, receives on 438.550MHz and requires a 77Hz CTCSS tone for access. continues >



Inside the sealed repeater case.

THE TEAM. Keith, G7NBU is the Keeper. Initially he didn't think he could contribute very much; wrong: he owns a ladder, a car with a roof rack and has no fear of heights.

Lin, 2EOTGT also felt he had little to offer the project since he comes from the automotive industry and is an ex soldier. However, he knows which end of a welding torch gets hot, which was an invaluable contribution since we needed several custom-made brackets and other hardware.

John, G8XQQ and Pete, G3ZVI are experienced RF engineers. John is an avionics engineer and builds equipment with a zero fail target; Pete has 52 years experience in the PMR industry and knows where to find good surplus equipment.

Allan, G1JXI is happy on a ladder and handy with spanners.

Thanks too to the members of the Exeter amateur radio fraternity who gave us signal reports and lots of encouragement while the rain was lashing down and the mud was squelching.

THE FUTURE. Due to the remoteness of the site it is highly desirable to monitor conditions, especially battery voltages. An Arduino-based telemetry project is under way, managed by IT expert Nick, MONRJ.

The second project involves linking GB3EX with the Exeter 2m repeater, GB3EW, which would provide first class coverage of the City and surroundings.



Keith, G7NBU & Allan, G1JXI rig the turbine.