

# BREAKOUT

The Newsletter of the Hastings and  
Napier Amateur Radio Clubs

Hastings Branch 13 NZART – Napier Branch 25 NZART

Volume 8, Issue 2, February 2010



Hastings Br  
13  
Club Call  
**ZL2AS**

Napier Br 25  
Club Call  
**ZL2GT**

**IRLP**  
Node  
6793  
147.250

Branch  
Nets  
9.00 AM  
Sunday  
Morning  
3615 Hz  
147.250  
MHz

Editor  
John Newson  
**ZL2VAF**



*Matea Maritime Tx site – one of the sites to be discussed by ZL2DW at this months Hastings Branch Meeting.*

<http://groups.yahoo.com/group/zl2as/>



**Join the KIWI DX Group**  
**Talk to ZL2AL for Details**

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## HASTINGS BRANCH 13

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**Club Call:** ZL2AS and ZL2QS

**Club Nights:** Fourth Wednesday each month at 7.30 pm Surf Club Rooms, Windsor Park, Hastings

## Hastings Branch 13 - President's Report

Hi all.

I have been frantically rebuilding and commissioning 870 repeater for Te Mata but it still has one or two bugs in it. I hope to get these ironed out soon but the repeater can be heard from time to time operating from my workshop. Feel free to try it if you can access it. 800# will give you a signal report.

The Kaweka Challenge is this weekend, as is the Jock White Field Day. If you are involved in either have a good weekend and enjoy amateur radio.

David and myself visited 2 repeater sites last weekend and carried out some maintenance. 670 was the first, and we installed a circulator into the tx line, to try and prevent intermod. We also swapped the tx and rx antenna to try and minimise the interference, and it may have worked. The RX antenna is now on the top. This is not ideal and we will be looking for a more permanent solution. Clifton was our second visit where we refitted 9175 after an audio realignment. We also performed some maintenance on the coax to the HF antenna and the power cable feeding the site. This weekend the far end of the HF antenna has been elevated so the HF signals should be somewhat better.

The car rally date this year has been moved and the new date is still being confirmed. This is due to some of the route being unavailable and due to the fact that council require notice to close roads, we had run out of time to offer such notice for an April event. When the new date is set you will be advised.

I am looking at holding another weekend tutorial session soon - dates to be confirmed. Pass the word.

David is hosting the after meeting this month on an interesting topic with commercial grade HF facilities. I tender my apologies as I will be in Napier however I'm sure Rob or David will look after the meeting.

Subs are now due. You can deposit directly into bank 03-0642-0733310-00 or take that number and \$20 into any Westpac Branch, or to Apex Communications. Please support the club and its activities.

See you on the air.

Regards, Warren Harris ZL2AJ



### After Meeting Presentation

"Large HF Commercial Aerials I have known" (by ZL2DW) (accompanied with lots of photos and diagrams). Come along and be impressed.

## **NAPIER BRANCH 25**

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**Committee Meetings:** *Third Monday of the month 7pm at Club Rooms*

**Club Call:** **ZL2GT**

**Club Nights:** *First Wednesday each month (except January) 7.30pm at the Club Rooms: 123 Latham Street Napier*

## **NAPIER NEWS...**

The next Napier meeting will be at the clubrooms on Wednesday 3 March at 7.30 pm. Laurie ZL2TC will give a presentation on balun and trap construction.

At our last meeting Dave ZL2DW discussed the various transmitting facilities around NZ and showed photos and reports of the stations. Dave has followed the fates of the big power facilities over the years. Thanks Dave.

There is to be a working bee at the clubrooms to re-erect the HF mast and antenna plus tidy up of the shack and rooms on Saturday 13 March from 9 am. Please come along and give a hand. Lee ZL2AL will do the metal work on the brackets for the mast and he is geared up with the tools for that task. It is also intended to replace the blackboard with a whiteboard at the same time.

Subs for 2009/10 are now due and can be paid to Stan or if you wish the \$25 can be deposited to the club account 'Napier Amateur Radio Club Inc' at an ANZ bank. Our bank account is 116400 0014548 11 and the branch is Napier. A reference of your callsign is required on the deposit.

It's amazing what a few sunspots will do for propagation. It's very noticeable after the long lull that we have been through. 12 metres has been opening nicely to the east in the mornings and west in the late evening. Europe and Asia are workable around 10 – 11 -12 at night on CW. Some signals on 10 metres at times while at the other end 80 and 40 have been producing some DX. Some of the DXpeditions around the Pacific – Tahiti, Kiribati, Northern Cooks, Hawaii, have been on 160 metres as well as the other bands.

Stan ZL2ST

## New amateur radio digital mode - ROS

ROS is a brand-new Amateur Radio digital spread spectrum mode with the first HF contact taking place on Thursday February 18.

The first contact with ROS took place on February 18, 2010, at 20:56 UTC from Vitoria in Spain to the University of Twente in the Netherlands covering a distance of 1265 Km on 7.065 MHz.

The HF frequencies currently used for ROS are USB 3.600, 7.053, 14.101, 28.300 MHz To use ROS you just need your HF radio, a PC and a basic PC sound card interface, see link below.

The software for ROS is free and you can download it along with the User Guide and Introduction to ROS Spread Spectrum at <http://rosmodem.wordpress.com/>

The University of Twente has a Software Defined Radio you can use via the Internet, see <http://websdr.ewi.utwente.nl:8901/>

Soundcard Interfacing  
[http://www.southgatearc.org/news/september2007/psk31\\_soundcard\\_interface.htm](http://www.southgatearc.org/news/september2007/psk31_soundcard_interface.htm)



## Non-Operating TX Blamed for Neighbours Health Problems

from:  
<http://mybroadband.co.za/news/Wireless/11099.html>

### **iBurst plays trump card in the Craigavon tower battle where residents complain about health issues**

Over the past few months a battle between certain concerned Craigavon residents and iBurst reached fever pitch, with residents demanding that iBurst move a tower that was erected in Fourways Memorial Park on 12 August 2009.

A 'Craigavon Task Force' was established shortly after the erection of the tower, partly because some residents in the area complained about ailments which they attributed to the tower. They staged a protest a few weeks after the tower went live, handing out flyers with the message: "iBurst subjects a residential community filled with children to uninvited microwaves from their tower".

In an email one Craigavon Task Force member, Tracey-Lee Dorny, describes the affected community's symptoms: "several rash cases were presented in person and by photos from people who could not attend [a meeting with iBurst]. Headaches, nausea, tinnitus, dry burning itchy skins, gastric imbalances and totally disrupted sleep patterns, especially with some of the children, were some of the issues presented by the residents."

Dorny told The Star that she and her son are spending alternate nights at her mother's house to get some relief. "When I'm off the property, the symptoms subside," she said.

Another resident, Dave McGregor, is also quoted in The Star as saying that his wife and nine-year-old son suffer bouts of nausea and retching, and have developed skin rashes since the erection of the tower. "We've told our son that the tower is only switched on one day a week, so it's not psychosomatic," McGregor told The Star.



## iBurst disputes the health complaints

iBurst CEO Jannie van Zyl said that no medical proof regarding the ailments was presented by any resident to date, but notwithstanding this absence of medical proof iBurst agreed to meet with the Craigavon residents to address their concerns.

"At this meeting the residents were informed that the radiation levels emitted by the tower were ten thousand times LESS than the international safety standards set for mobile towers and that the radiation at this site was in fact the same level as that already present from cellular phone towers in the area," said Van Zyl. "In other words the iBurst tower did not increase the radiation in the area significantly above the level already present for a long time."

Craigavon Task Force members remained unimpressed, and according to Van Zyl the residents reiterated their viewpoint that their ongoing health problems were caused by the tower. "At the meeting on the 16th of November 2009 a number of residents and their staff confirmed that they were still experiencing symptoms such as rashes, headaches and the like and that these symptoms disappear when they leave the vicinity of the tower."

According to Van Zyl residents quoted periods of hours, or at most, two days to see an improvement in the symptoms experienced. "One lady who showed us a rash claimed that when she goes home for the weekend, the rash disappears. Another said headaches disappear when she goes home at night," said Van Zyl.

## iBurst makes massive revelation

At the meeting Van Zyl agreed to turn off the tower with immediate effect to assess whether the health problems described by some of the residents subsided. What Craigavon residents were unaware of is that the tower had already been switched off in early October – six weeks before the November meeting where residents confirmed the continued ailments they experienced.

MyBroadband was furnished with technical reports which confirmed that the Fourways Memorial Park iBurst tower was turned off in early October and that it did not provide any services over the next few weeks.

Van Zyl argues that this clearly proves that the iBurst tower could not be the cause of the health symptoms described by some of the residents. Van Zyl reiterated that residents said that the symptoms typically subsided in hours or days after leaving the Craigavon area, and since it still prevailed in mid-November it means that it could not have been related to the iBurst tower radiation.

"At the meeting in mid-November residents claimed that full recovery of skin conditions could take as long as 6 weeks. Yet, the tower was switched off for more than 6 weeks by this time," said Van Zyl. "At this point it became apparent that the tower can, in no way, be the cause of the symptoms, as it was already switched off for many weeks, yet the residents still saw symptoms that come and go according to their proximity to the area."

Van Zyl added that "whatever caused their symptoms, it was now a fact that it could not be attributed to the iBurst tower and the tower was switched back on in the 2nd week of December." The iBurst CEO added that residents failed to show up for subsequent meetings scheduled for the 30th of November and the 2nd of December.

## Case continues

While this revelation may seriously dent the argument, from this particular group of Craigavon residents, that the iBurst tower is to blame for the ailments, the case is unlikely to go away soon.

Bismarck Olivier from the legal firm Bezuidenhout, Van Zyl and Associates, who represents the Craigavon residents, previously said that there is no talk of abandoning the action against iBurst and that the recent activity surrounding the issue is 'only the beginning'.

Olivier added that anyone who thinks that their legal case is based only on health issues is sorely mistaken, adding that their case is not built on health concerns alone, but rather various other aspects related to the mast, including the public participation and environmental approval processes which they are confident are flawed.

Van Zyl however said that iBurst appointed an independent and accredited EIA consultant and that the correct procedures were followed - including notifying the adjacent property owners and publishing notices in the press and on the site itself. He added that he is confident that all processes and procedures were followed to the letter.

According to Olivier residents are now looking at a solution through the Department of Environmental Affairs, and if that fails they will fight the matter in court. iBurst responded saying that it will definitely fight any legal action related to the Craigavon tower.

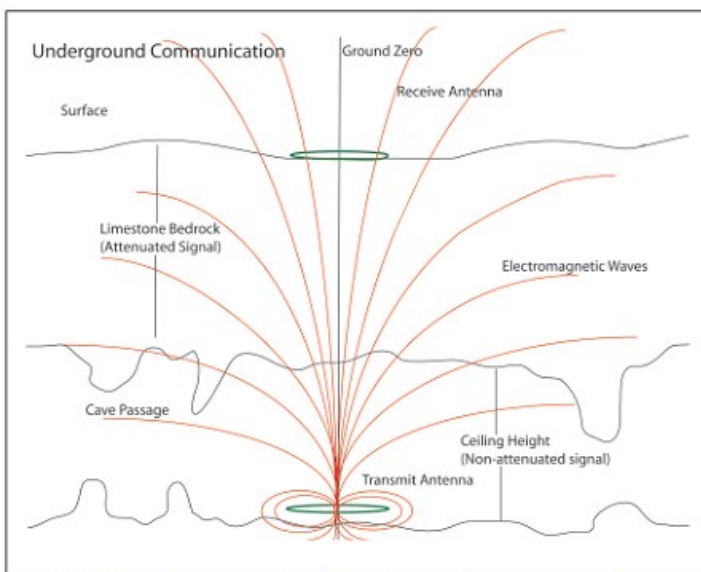
## 2009 ISEF: The underground radio II ALEXANDER KENDRICK, Los Alamos High School, New Mexico

This article describes the winning project for SEG's Distinguished Achievement Award at the 2009 International Science and Engineering Fair. The author is a student at Los Alamos High School, New Mexico, United States. Additional details about ISEF and other projects that received SEG awards can be found in "Gathering genius in Reno— The 2009 ISEF" by Richard Nolen-Hoeksema in the August 2009 issue of TLE.

An underground radio can provide a quick and efficient way to communicate during a mine or cave rescue. Many of the world's most dangerous caves are over 200 km in length and over 250 m deep. Rescues in these caves can take days and require tremendous effort to get the injured safely out of a cave that often contains numerous rappels, climbs, and dangerous terrain. Typical rescues use telephone wire or fiber-optic cables to communicate through cave passages. However, running these lines throughout the cave takes a significant amount of time and can damage the cave. These communication systems can not be left in the cave for lengthy periods because telephone lines can corrode very easily in this environment.

Conversely, a radio installed at two or more central locations throughout the cave provides an efficient, low-impact, and fast method of communication to the surface.

Commercial high-frequency communication systems are not able to penetrate rock to great depths due to a high attenuation rate; thus underground radio systems must use very low frequencies. In order to penetrate limestone, granite, and other rock types, an induction radio must be used (Figure 1). This instrument induces a current in a buried loop antenna, which generates an electromagnetic field that travels upward through the bedrock to the surface antenna which generates a signal that can be decoded. Many systems use an Earth antenna to transmit and receive signals. This type of system sends signals over a long wire anchored by two metal stakes on the surface and another antenna in the cave (a wire submerged in mud or water). This system is able to use the "Earth" as an antenna and is able to transmit and receive large signals through the Earth. The depth record for this type of system is around 1200 m. This system requires the rock to be conductive and the cave to have a stream system or wet environment; in dry conditions, this system is ineffective.



**Figure 1.** Graphical representation of inductive coupling and how one antenna induces a current in the other, producing a signal that is then decoded. The antennas are positioned directly on top of each other in order to retain the maximum signal.

### The system

The loop antenna used for the underground radio is 2 m in diameter and has 25 turns of copper wire around the antenna for sensitivity. The larger the configuration used, the stronger the signal. However, the system must be easily transportable to get inside and outside of mines and caves effectively. The underground radio uses a PVC pipe frame antenna that is completely collapsible and which can compact into a small bundle for easy transportation.

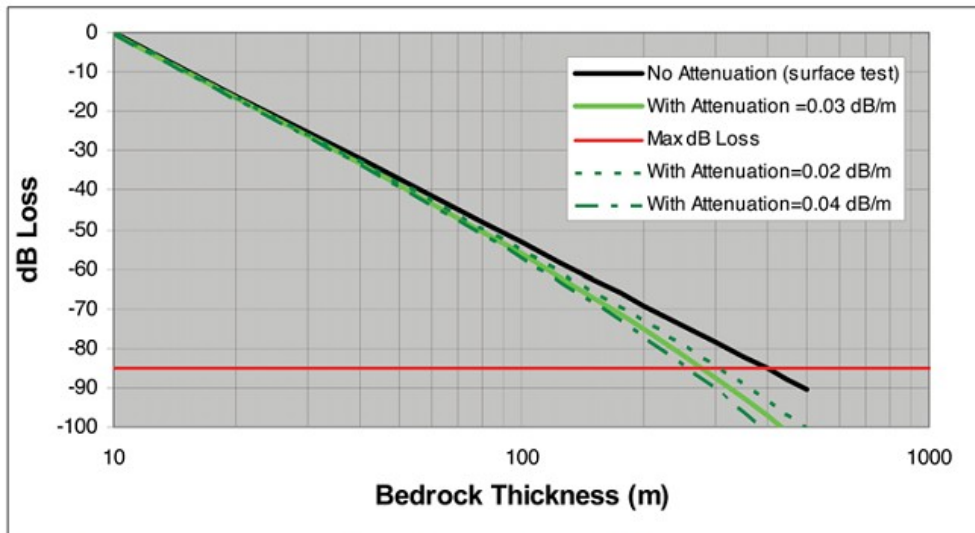
The radio uses a digital communication program because it is less prone to error in a noisy rescue environment. I wrote this program in the C and Assembly programming languages. It uses pulse width modulation (PWM) to encode 0s and 1s. This program is run by an 8051 microcontroller and allows the user to type in ASCII characters and then send the corresponding 0s and 1s. The receive program times the pulses sent and

converts the 0s and 1s back into characters, printing the message on the screen. Digital communication eliminates the need for large bandwidth, greatly reduces noise in the system, and allows a deeper range. This program can also be extended to store critical patient information, and keep a log of sent-and-received messages to track rescue and medical information.

Since low frequencies are required for deep radio communications, this design used 23.4 kHz. A model based on James Wait's equations for electromagnetic field propagation through a medium was used to determine the best frequency for an operational goal of 300 m through Guadalupe Limestone with a bandwidth of 400 Hz. This simulation showed that 20-30 kHz is the optimal frequency range for this type of communication. The transmitter uses a Class-E amplifier, designed using a computer modeling program and then finetuned by hand. This amplifier is very efficient and does not overheat. A receive circuit, similarly modeled and constructed, magnifies and filters the radio signal and transforms it into a series of clean pulses for the 8051 decoding program.

## Testing and results

The radio was tested on the surface to determine the system's effectiveness and to obtain the maximum range on the surface. Signal strength measurements were also taken on the surface to determine the rate the signal decreased through air. The surface test made sure the system was completely operational before underground testing. The maximum digital surface range was 400 m. The underground radio was tested in three different caves: Cottonwood, Black, and Carlsbad Caverns. Each cave was in Guadalupe Limestone in Eddy County, New Mexico (United States). In order to place both antennas on top of each other to maximize the signal, the surface and cave were surveyed using standard techniques. This survey data also determined the depth of limestone rock through which the induction radio was transmitting. At each location where the radio was tested, signal strength measurements were taken to determine the attenuation rate through Guadalupe Limestone (Figure 2). The attenuation rate of 0.03 dB/m, determined by matching the surface curve



**Figure 2.** Maximum predicted underground range for the 23.4 kHz radio using two 2-m diameter antennas. The green curve uses the measured attenuation coefficient from the cave tests in Cottonwood, Black and Carlsbad Caverns. The black line shows how fast the signal decreases on the surface. Based on the range at which the signal was lost on the surface, the maximum dB loss was determined (the red line). This predicts a maximum digital underground range of 275 m with an error of about  $\pm 25$  m. The two dashed dark green curves use a larger and smaller attenuation coefficient of 0.04 and 0.02 dB/m and represent the possible error of the data and variances in the type of limestone bedrock.

represent the error in the collected data due to anomalies in the rock such as higher water content in the limestone or air pockets, positional errors in the radios, and measurement errors of the bedrock's thickness. All will affect the attenuation measurements. The best fit 0.03 dB/m attenuation curve crosses the radio's noise threshold at 275 m through limestone rock. The two error curves predict a two-way digital noise threshold of 250–300 m through the Guadalupe Limestone. A research proposal was submitted to Carlsbad Caverns National Park to obtain permission to test the underground radio in the Left Hand Tunnel (LHT) for testing at a depth of 205 m. After the proposal was approved, two teams of cavers set up one system on the surface and another in the LHT. Digital text messages were transmitted and received successfully without error during the test. This was the first digital communication in the history of the Carlsbad Caverns National Park (Figure 3). This technology can pinpoint the location of trapped miners or cavers using radiolocation. A radiolocation survey was attempted at the LHT test, but the electromagnetic field was too spread out on the surface for accurate results.

This system can also be used for imaging different layers of rock as well as finding coal, oil, or the water table. This is a great area of interest and, in future work, the current system will be modified for imaging applications. Corresponding author: [alex\\_k@cybermesa.com](mailto:alex_k@cybermesa.com)



**Figure 3.** Photo of the underground radio set up in Black Cave, Eddy County, New Mexico. This was the configuration used for communication as well as obtaining signal strength measurements.



# NOTICES

**Jock White Field Day**  
27<sup>th</sup> & 28<sup>th</sup> February 2010



**Kaweka Challenge**  
27<sup>th</sup> & 28<sup>th</sup> February 2010



**Hawkes Bay Car Rally**  
Date to be confirmed



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