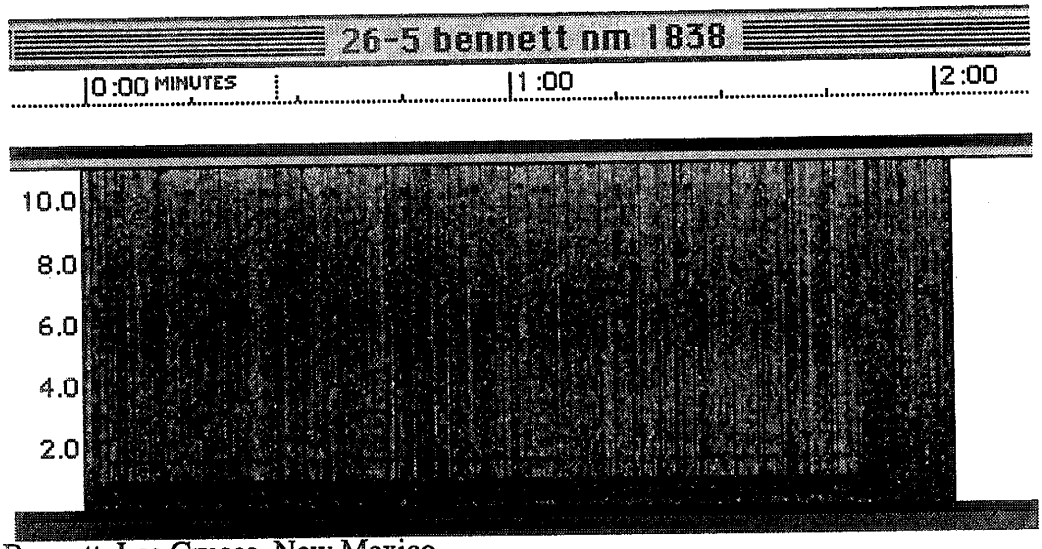
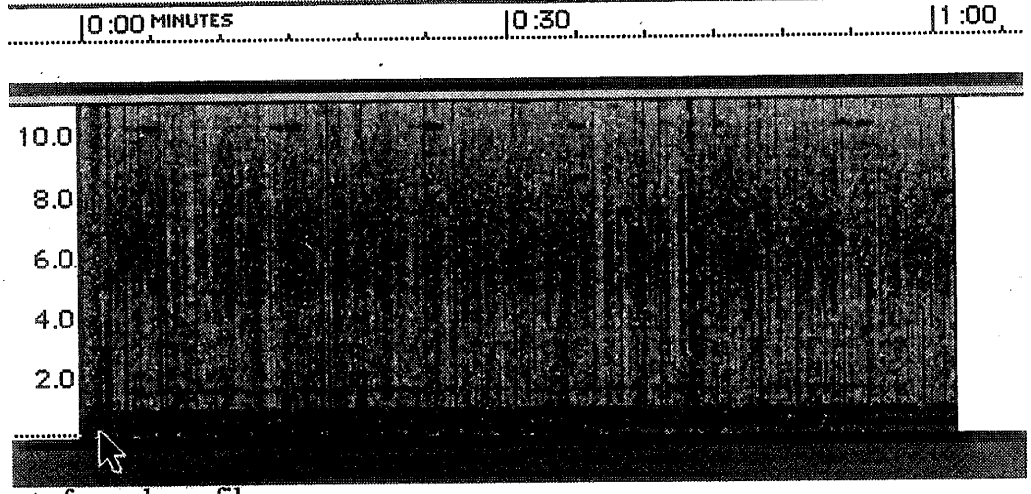
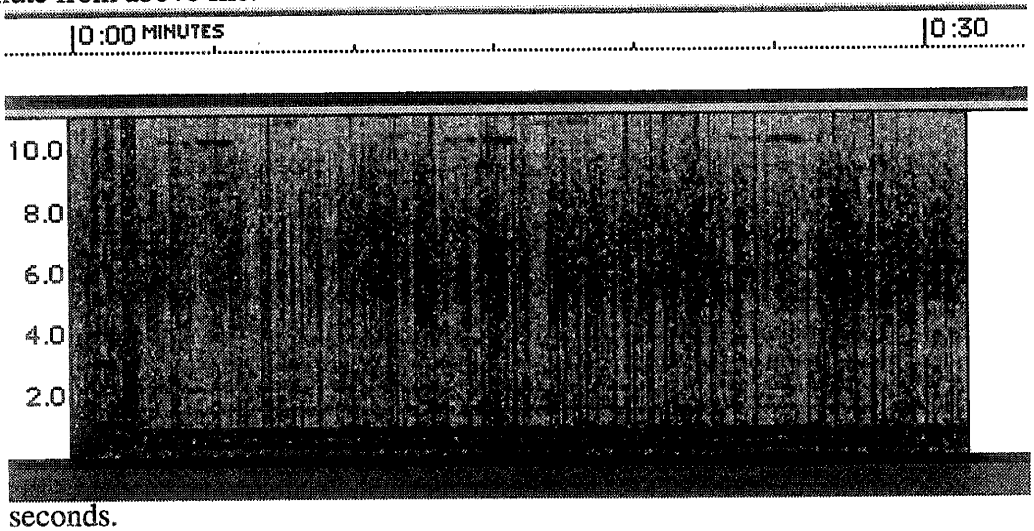
26-5



Robert Bennett, Las Cruces, New Mexico
Dense sferics due to local thunderstorm activity; prominent hum.

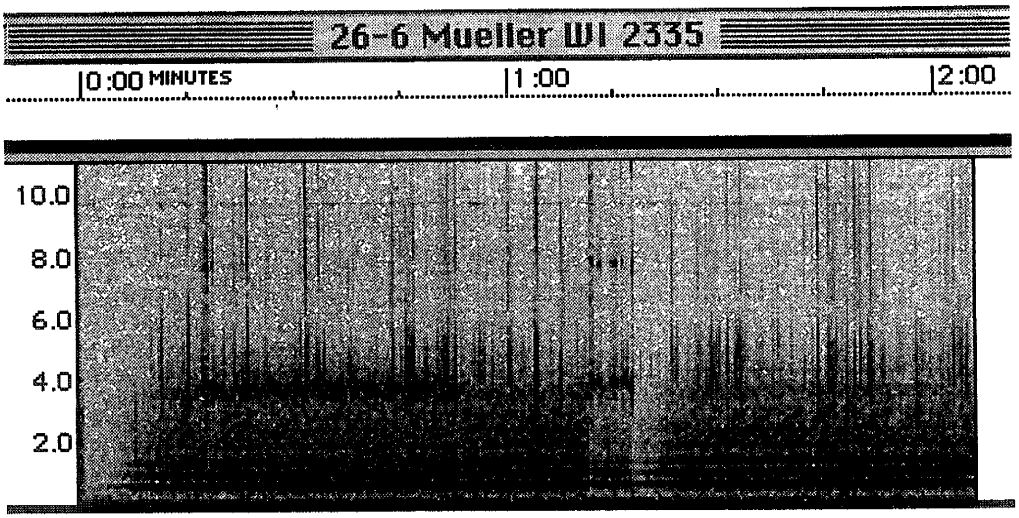


First minute from above file.

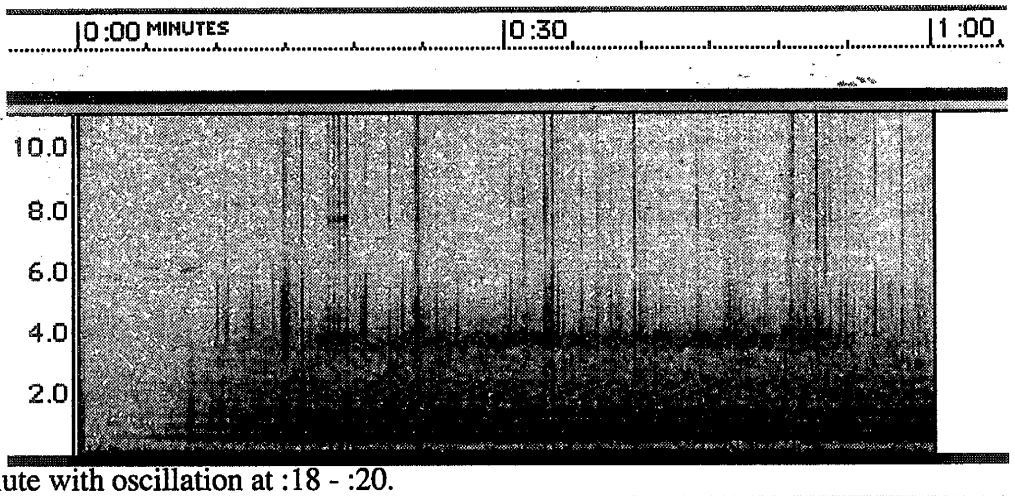


First 30 seconds.

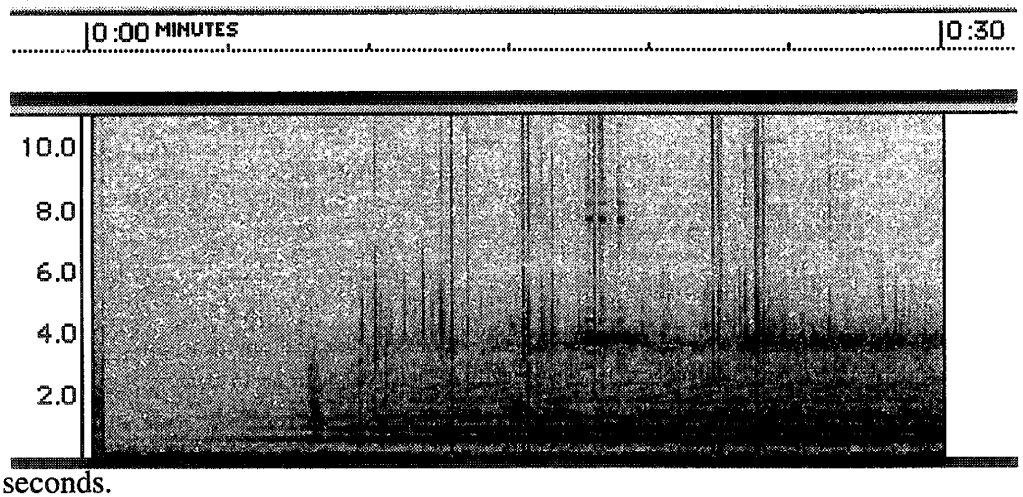
26-6



Mark Mueller, Brown Deer High School, Brown Deer, Wisconsin
Medium density, strong sferics. Prominent hum bands below 2 kHz. Intermittent oscillation shows up at about 15 seconds and again at 1:10.

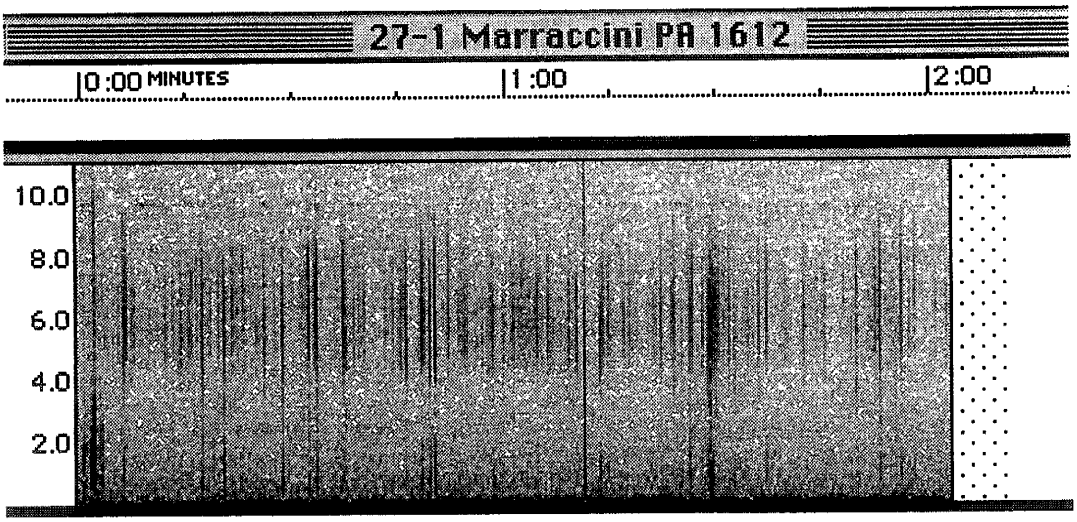


First minute with oscillation at :18 - :20.

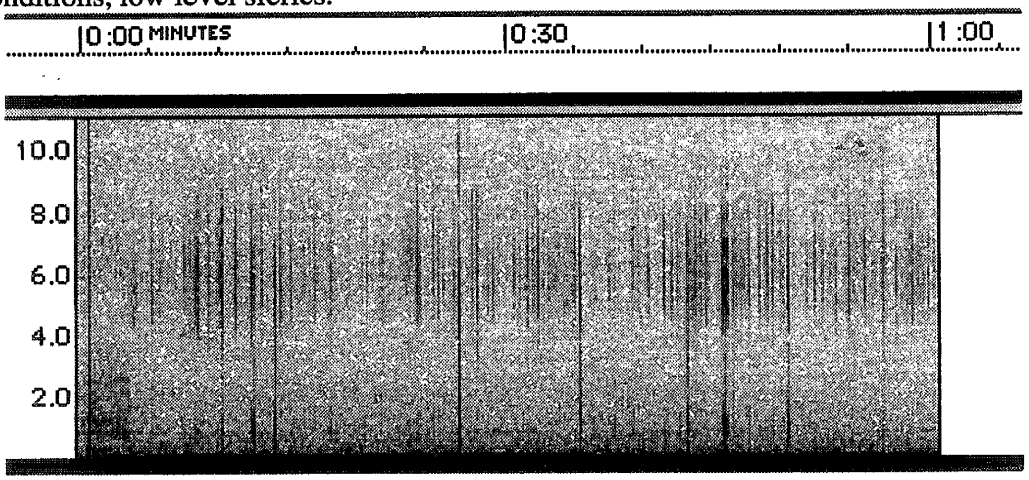


First 30 seconds.

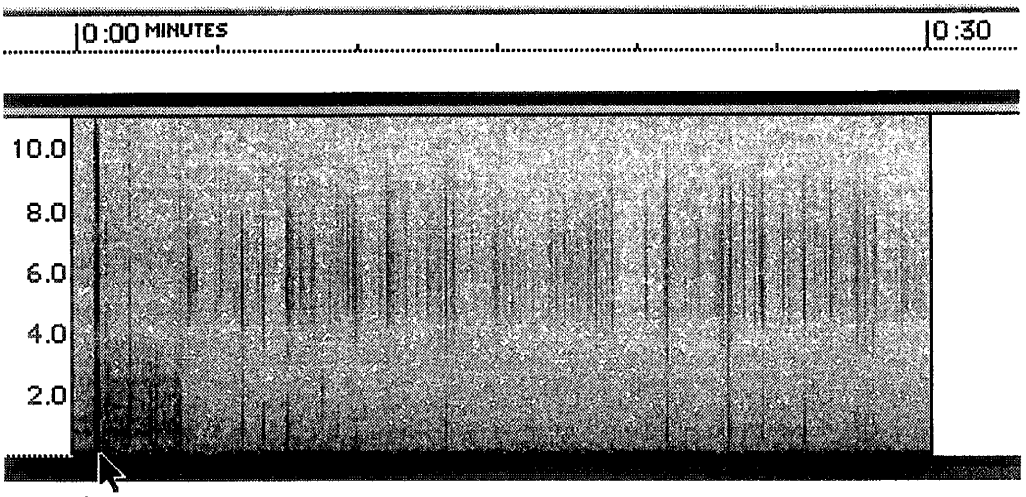
27-1



Leonard Marraccini, Finleyville, Pennsylvania
Quiet conditions, low level sferics.

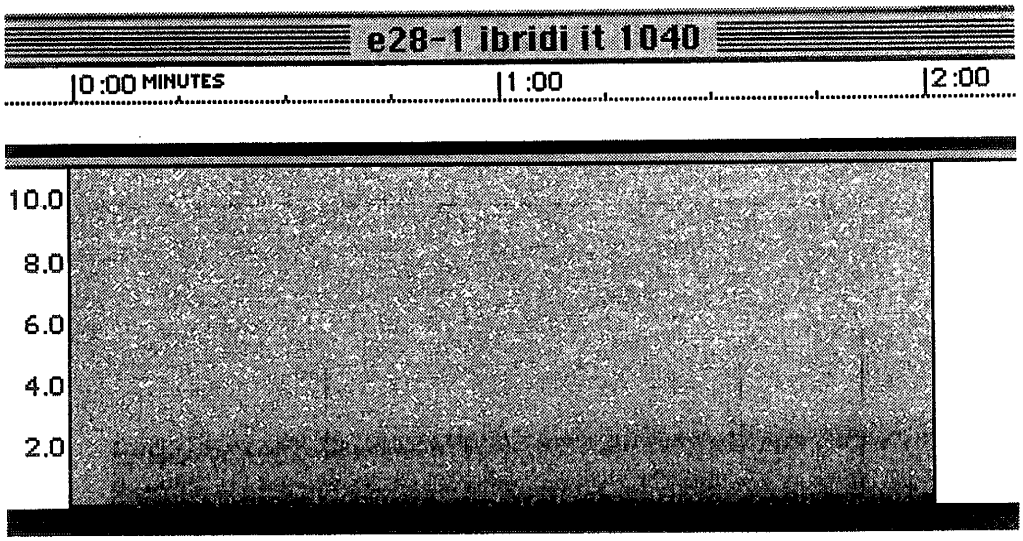


first minute.

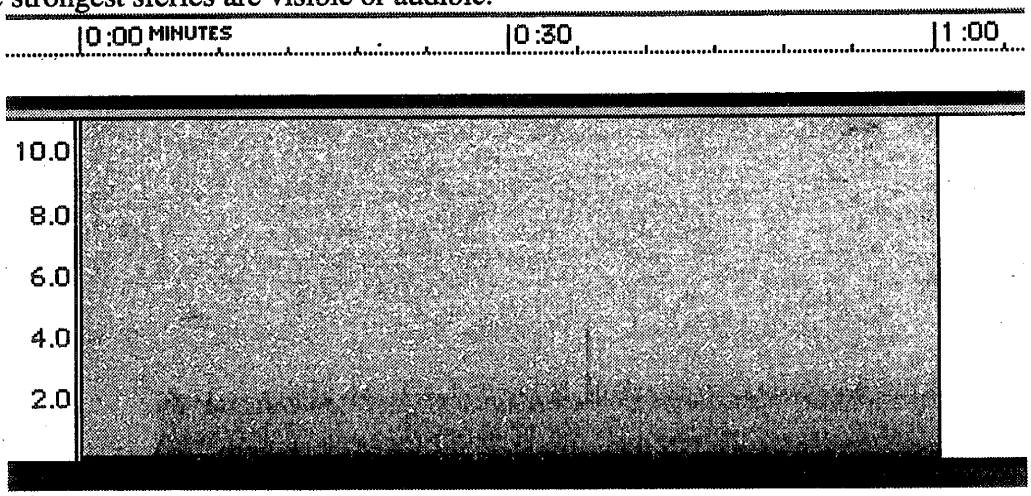


First 30 seconds.

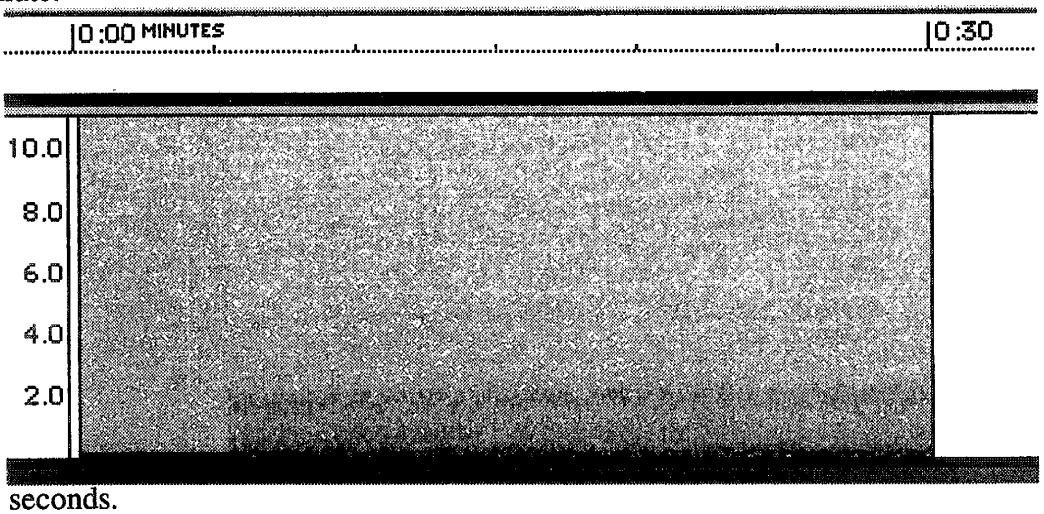
E28-1



Marco Ibridi, Aosta, Italy
Only the strongest sferics are visible or audible.

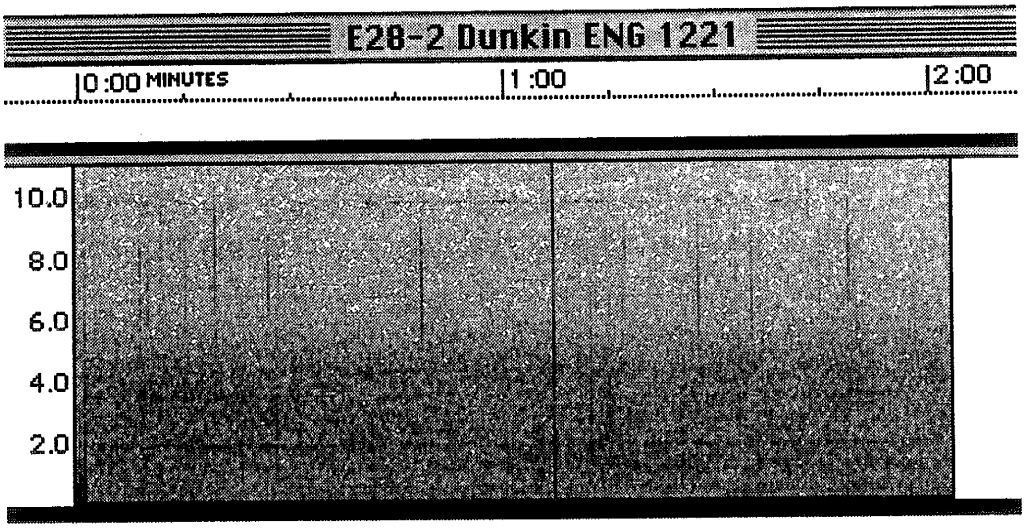


First minute.

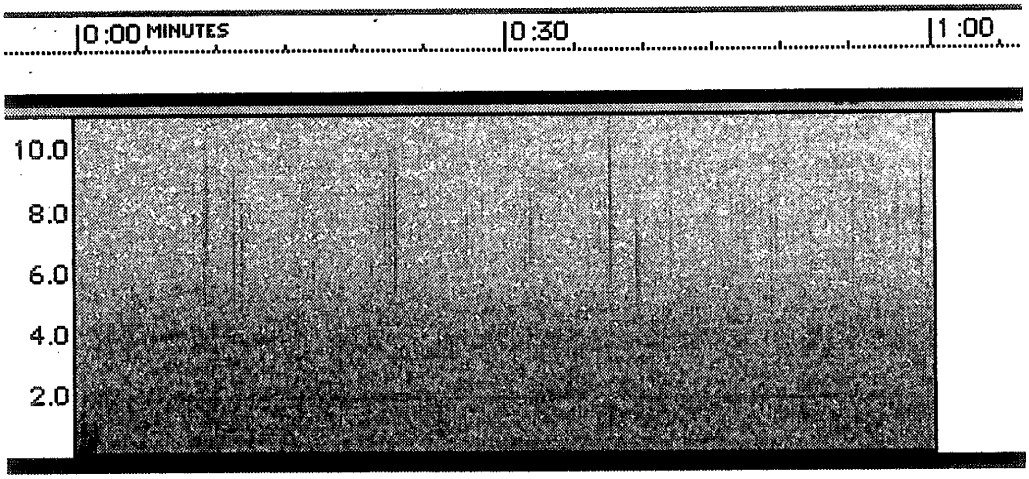


First 30 seconds.

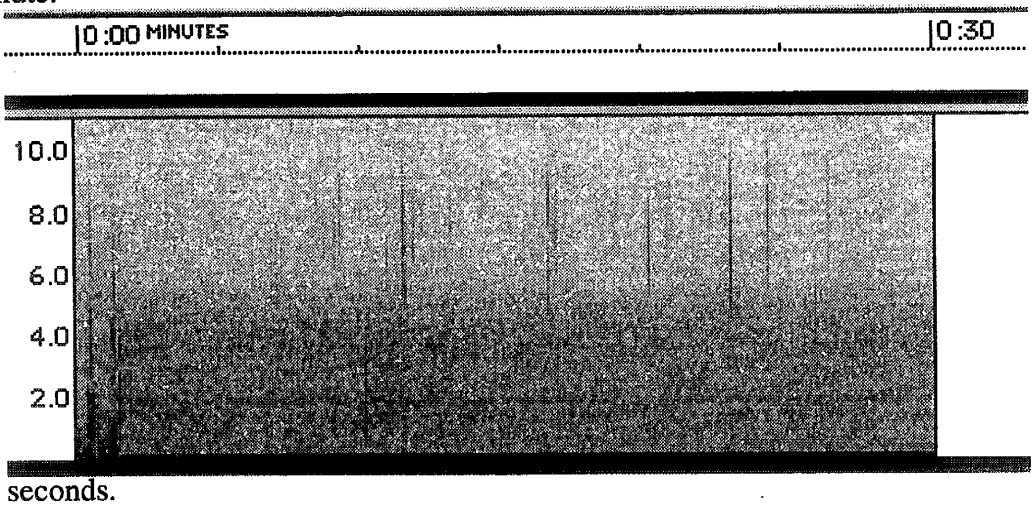
E28-2



Sarah Dunkin, University College London, London, England
Quiet conditions with only a few sferics present.

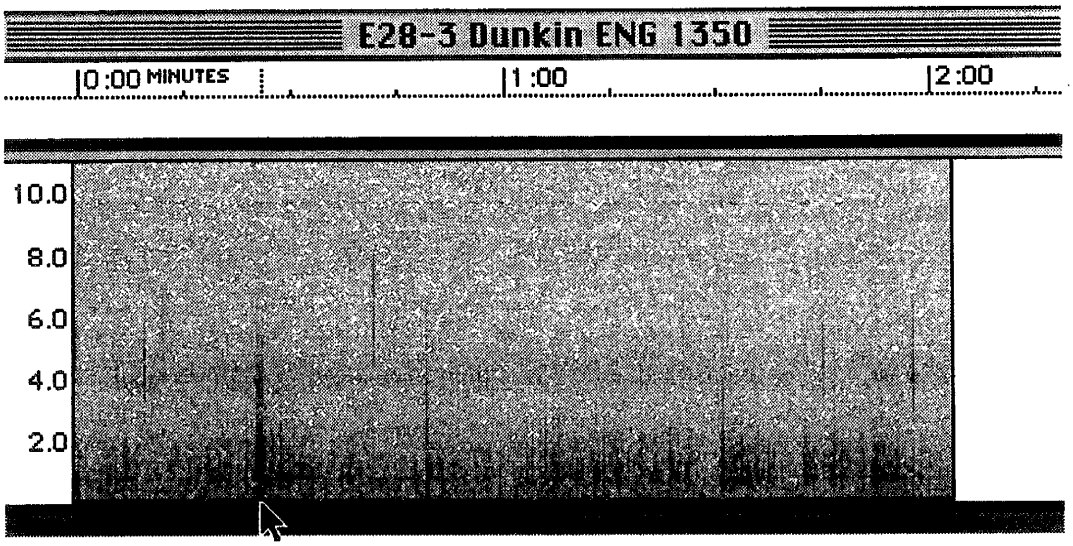


First minute.

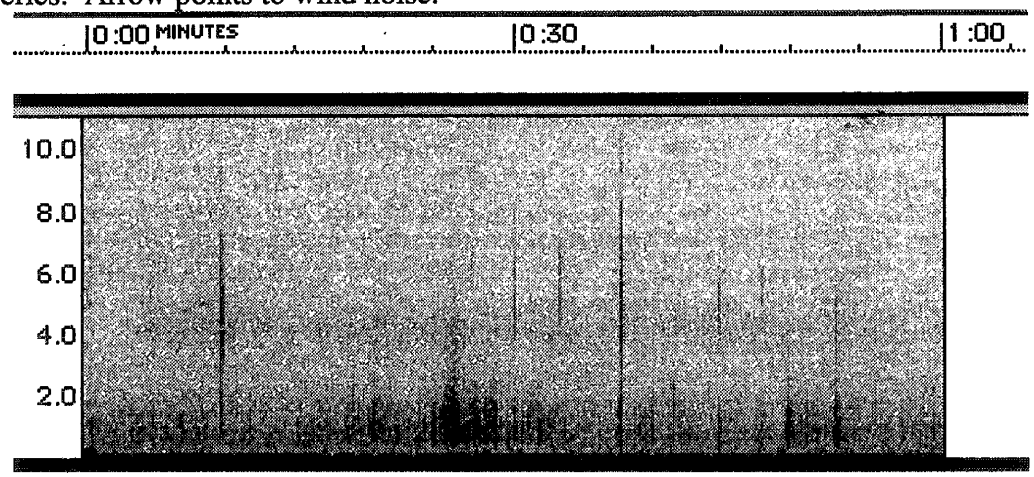


First 30 seconds.

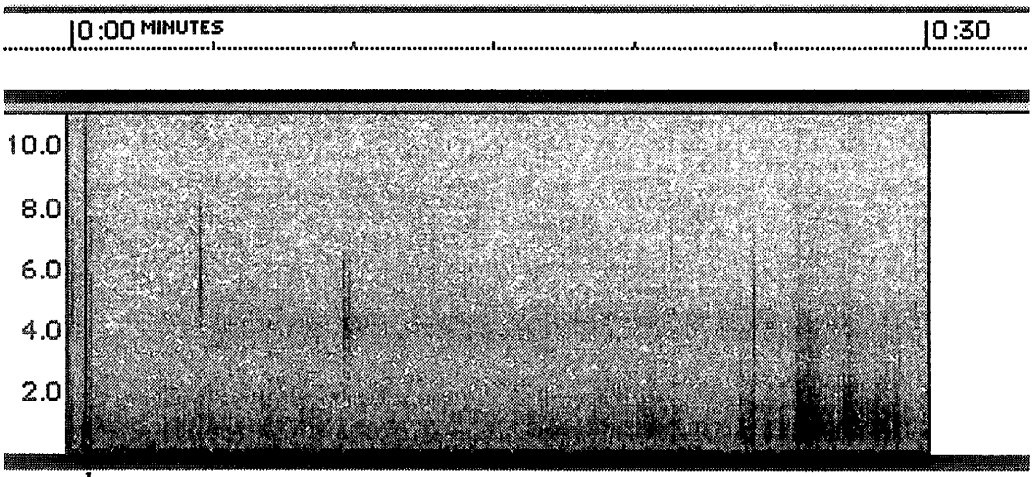
E28-3



Sarah Dunkin, University College London, London, England
Quiet sferics. Arrow points to wind noise.



First minute.



First 30 seconds.

Notes From the Field

Communications from INTMINS Participants

Edited by Bill Pine
Chaffey High School
Ontario, CA

Data submissions are often accompanied by notes and messages from INTMINS participants describing various aspects of their experiences as observers. As an ongoing feature, some of these communications will be summarized in *The INSPIRE Journal.* The following summaries are in the approximate order in which the data was received by INSPIRE.

Team 18 David M. Jones Columbus, Georgia

After a weekend spent inside searching operation 26-1, I am sending you the tape. The MIR flew nearby at about two thirds the minutes between sunset and the end of civil twilight. Although Scott stood outside the car looking for it, too much light remained. Scott volunteered to help out for one practice session and the Friday twilight overflight. The director of the nearby Space Science Center suggested him. Scott has been a disk jockey and now works at a TV station. He knows about split second timing and good sound. He also mans the consoles for Saturday simulated moon landings at the Space Science Center. Thanks to him, I didn't waste precious recording seconds switching between the MIR and time hacks.

Friday evening, when the time came for us to get together, I spotted him looking for a parking space in my neighborhood. An outdoor riverfest had pre-empted our planned get-together at the Space Science Center a block away. We drove to the Alabama side of Fort Benning. The Chattahoochee River almost surrounds a former paratrooper landing field where we set up. You can see the easterly penetration of this bend into Georgia on any state outline map. I put the antenna through the sunroof while Scott assembled the RS-4 and the Radio Shack cassette recorder. I didn't earth ground the receiver since I didn't want too much gain. Thunderstorms in East Texas might overload the receiver. The car provided a counterpoise. I sat inside and put in plain view a big clockface-drawing of events.

We rolled the tape and took a hack at 0023Z. T-time was 0035. The East Texas thunderstorms filled up all of the clear space with strong sferics and occasional tweaks. I could barely hear Omega which surprisingly didn't record at all. I suspect the tape quality. It was the first time I used it. Loran-C was absent. No whistlers occurred. We missed the 0048Z time hack but recorded the double tick at 0048:30 after the missing tick . We hacked at 0049. I didn't hear the one-kilohertz tone from MIR. Receiver gain was max and Scott rode the gain on the cassette when he wasn't outside looking at the sky. Filter was off and the antenna selector, whip. We made no connection to the WWV receiver and instead Scott held the microphone close to the radio speaker.

Back at my apartment, we played the tape back through Mike Cook's weak-signal program FFTDSP42u. We also made a quick .wav and displayed it on R.S. Horne's Spectrogram 2.3. I refined the recordings over the weekend. You might look close at 0034:57.7 and 0037:36.6. I suspect those are the seventeenth harmonic of powerline freq which seems to be everywhere I drive. Why aren't lesser harmonics as evident?

There is a lot that I don't understand about VLF wave propagation, and the behavior of harmonics tops the list! Anybody have any thoughts on this? - *ed.*

Team 3 Don Shockey Oklahoma City, Oklahoma

I like the new VLF2! It seems far more sensitive than the older model but my first venture was only partially successful. The second seemed to go better: Operation 20-2: a faulty switch marred everything up to "T" time, when things worked for about 3 to 4 minutes then went south again. Operation 20-8: Disconnecting the switch let the operation go much smoother. Very few operational problems and hopefully the data looks as good. All in all, the new receiver will be a plus and I look forward to the next round.

Don is one of the most faithful INSPIRE observers.

Team 1 Jack Lamb Belton, Texas

A funny thing happened on my way to my listening spot on the 20th. I found the road to it closed and locked because It was under water. As you may have heard, we have had lots of rain this year in central Texas. We have not had the flooding like they have in North Dakota but some things are inaccessible near lakes. I hurried to find higher ground that was quiet. I wandered through farm roads looking for the absence of electric poles. Finally I thought I had a good place. I was running out of time to search too. The first recording seems pretty good except for a low pulsing sound in the background I have not heard before. Perhaps you can identify it. The second recording was made on the 26th when a rain storm was all over Belton and Kileen. Matt and I looked on the TV weather map and saw that the storm had passed Lampassas, so we drove there and found a farmer's driveway that was surprisingly quiet. We recorded the biggest bunch of noise I have ever heard. Unfortunately, I did not hear any whistlers on either tape. I also did not hear anything I thought was from MIR. However, I hope whatever I did record will be of some help in forming the total picture.

Thanks for the answer to my question in the Journal. Now I can explain a bit better what we are trying to do. I hope to interest some students at The University of Mary Hardin Baylor here in Belton where I am now teaching part-time. Maybe they will become excited about delving into an area where little is known.

I wonder if you could speculate in the next newsletter about what we might discover about the magnetosphere with our listening equipment (did I miss reading about that in a previous Journal?). I also hope you can report in that newsletter that someone actually recorded a signal from MIR. Finally, could you compare the new VLF2 with the old one, especially how much better the data was this time. I am debating whether or not to buy one.

I hope Lake Belton goes down to normal over the summer so I can use my old recording spot in November.

Investigation of the magnetosphere is a daunting proposition because it is so vast in size. Since we can't go everywhere in the magnetosphere, we need some way to investigate it from here. This is called remote sensing. Rather than measure the magnetic field strength directly by going to each location, we instead examine what has been to various places in the magnetosphere - namely natural radio signals. The propagation of these signals is influenced by such things as the magnetic field strength, the shape of the magnetic field and the charge distribution and densities in the magnetosphere. It is attempting to increase the scientific knowledge base about these things that magnetospheric research is all about.

To this point in time, no confirmed recordings of the signal from MIR have been made. The new receiver seems to be more sensitive and should, therefore, increase the chances of successfully detecting the signal from MIR.

Team 13 William Combs Crawfordsville, Indiana

20-2 There were small tweeks and sferics throughout the tape but no signal was received from MIR. The site this time is in the south end of the Camp Atterbury Military Training Area. No power lines were within a mile of the Artillery Firing Point that I occupied. Comet Hale-Bopp was nice and the coyotes provided background music. I ran the tapes through the AD12 (spectrum analysis software for the PC) and it appears to be nice and clean.

26-6 There was much static or sferics. The wind was blowing and I think there was some noise from the sun. A neighbor was planting about 1/4 mile away. Line hum seemed satisfactory. I could not detect a signal from ISTOCHNIK. A tremendous difference from 20-2 as far as background.

Team 22 Rick Campbell Ann Arbor, Michigan

My recording adventure began with months of preparation. I started by building a receiver matching the specifications of the RS-4. I have built ELF receivers in the past but always using loop antennas, never using high impedance vertical whips. This being completed, I searched for a quiet spot and started to gather the recording gear and various patch cords needed for my data gathering setup. Finding a quiet site proved to be the most difficult. I am an amateur astronomer and I always complained about light pollution, but now I can add AC power grid pollution to that complaint! The most easily accessible site proved to be near a golf course here in Ann Arbor, Michigan. I called the local director and he graciously granted me permission to use a large field owned by the University of Michigan near the course. I took some experimental recordings at other various spots around the area at various times of day to become familiar with the sounds of natural radio emissions.

When the orbit schedule arrived I chose 3 passes that were within my area: 19-1, 19-2 and 20-1. 19-1 was a little off, but only about an hour and a half before 19-2, and it seemed that I could use it as sort of a shakedown run, so I chose to record it. Well, as usual, it was not ideal. Minutes before the recording was to start, the 5 MHz WWV signal that had been booming in suddenly faded to almost nothing. I switched to 10 MHz and was relieved that it was at least audible but still weak. I admit I must have looked odd. Here I was sitting in a lawn chair by a small table in the middle of an open field! The temperatures dropped in the low 30's (F) but I was comfortable. An almost full moon, Mars in the southeast and Hale-Bopp in the east made the passing time serene.

On the way home I reviewed the recordings and discovered that a low level WWV signal propagated to the recording. My setup included a switch I could throw that would pass the time signals at the proper intervals through a mixer, but how did this signal pass through? My first thought was the external speaker (about 3 feet away from the ELF receiver) so I planned to connect a pair of headphones the next night. I did some tests and ruled out any patch cords or the mixer. On Pass 20-1 I would try the headphones.

On the 20th, WWV was stronger and 10 MHz was of sufficient strength. The almost-full moon provided enough light for me to see well without a flashlight! Skies were again clear and the stars and Hale-Bopp were bright. Driving home I again noticed the dreaded WWV signal bleeding through the recordings. They were low level but noticeable. What with the background AC hum and the WWV signals I was doubting that the I kHz signal would be discernible at all. All this work and my recordings were flawed by this pesky signal. I vowed to resolve the problem and redouble my efforts with the next round of recordings perhaps later in the year.

Team 5 Jean-Claude Touzin St. Vital, Quebec, Canada

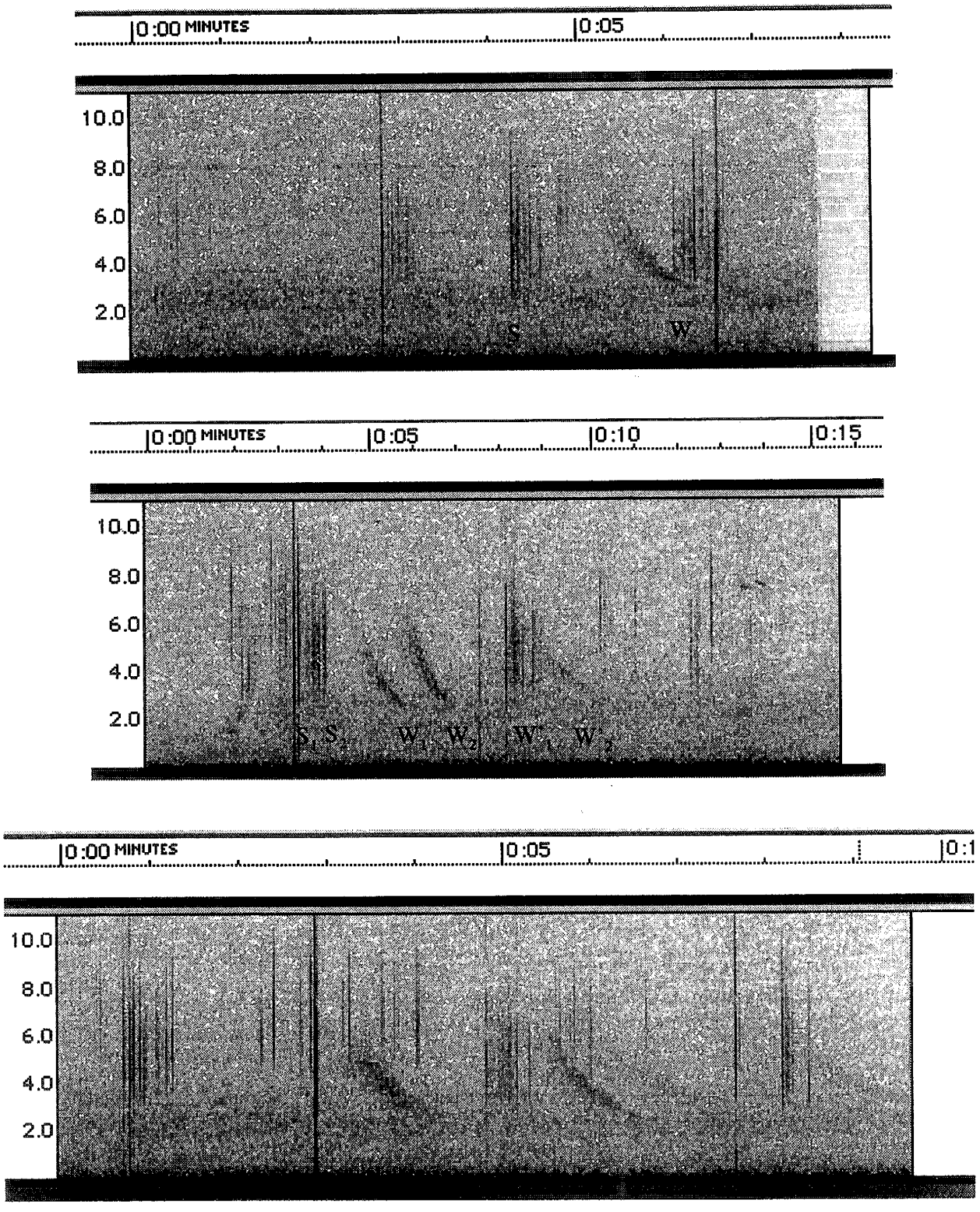
I had trouble going to my site for 26-5. Now my bridge is above water during springtime flood, but both sides of the river were not. I had to cut two trees to make walkways on both sides of the river. Call it "The Never Ending Journey".

Team 16 Leonard Marraccini Finleyville, Pennsylvania

I have enclosed a 5-minute tape segment from a tape which I made on May 2, 1997. I used the same instrument setup (RS4, Sears Cassette Recorder, 2.54 meter whip) and was located at the same test site as for the previous two tapes. I was very fortunate to record a VERY ACTIVE whistler/sferic period. The tape session began at 8:33 AM local time (1233 UT). I did not include any data sheet with this cassette. I though you might enjoy this copy of the 5-minute segment!

Leonard's tape contained many whistlers. They seem to be of the two-hop variety. That means they originated with lightning relatively near to the observation site and the signal bounced off the ionosphere in the southern magnetic hemisphere and returned to this hemisphere. You can tell this from the spectrograms because each whistler is preceded by a strong local sferic. Some whistlers also show a 4-hop echo of the whistler.

Code: S - sferic; W - whistler (2-hop); W' - 4-hop whistler



Multiple strong sferics and whistlers. The darkest whistlers are 2-hop, the fainter are 4-hop echoes of the 2-hop whistlers.

Team 7 Dean Knight Sonoma, California
Sonoma Valley High School

You will note the 20-9 tapes have a much stronger WWV signal at all recorders (compared to 20-3 where I had to yell out "mark" since the short-wave radio kept drifting in and out). I fastened telephone pick-up coils to the outside of the short-wave receiver near the speaker, amplified these signals using 2 small Radio Shack amplifiers and sent that signal to small loudspeakers at each of the other two stations. The students at the other stations could then set their microphones on the speaker to get WWV. Seems to help.

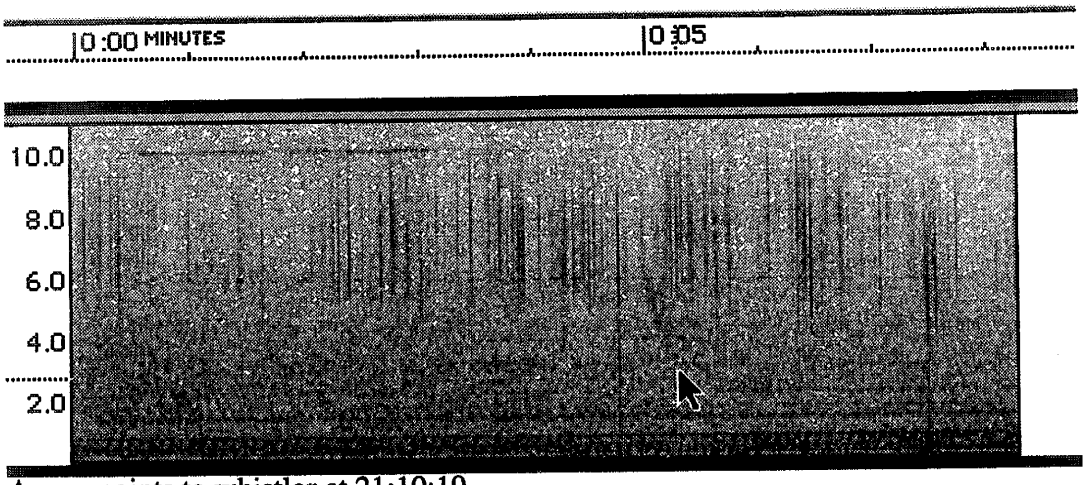
By the way, I understand that we are attempting to pick up a radio signal produced by the ion beam acting as a "virtual antenna". Since charges are being accelerated one would expect noise at that frequency just from the antenna. But is there anything else in terms of magnetosphere interaction or whatever that you (or others) are also looking for (once the signal is detected). I would also be interested in finding out more about this particular investigation. Actually, I am finding the normal atmospheric chatter (and other sounds) produced to be fascinating in themselves, but I also want to understand the full scope of the project.

The "virtual antenna" refers to the fact that the electron beam is projected out into space rather than being carried by a physical antenna. The accelerated charges should radiate electromagnetic waves at the modulation frequency (and perhaps harmonics of that frequency). The first step is to detect the signal on the ground. This has never been done before (and we have not done it - yet). Once the signal is detected, the next step is to analyze where the signal goes. The normal, inverse square radiation pattern should be modified by the presence of the magnetic field of the earth. This is where the increased understanding of the magnetosphere can be realized. We are still a ways short of that goal, but we are making progress!

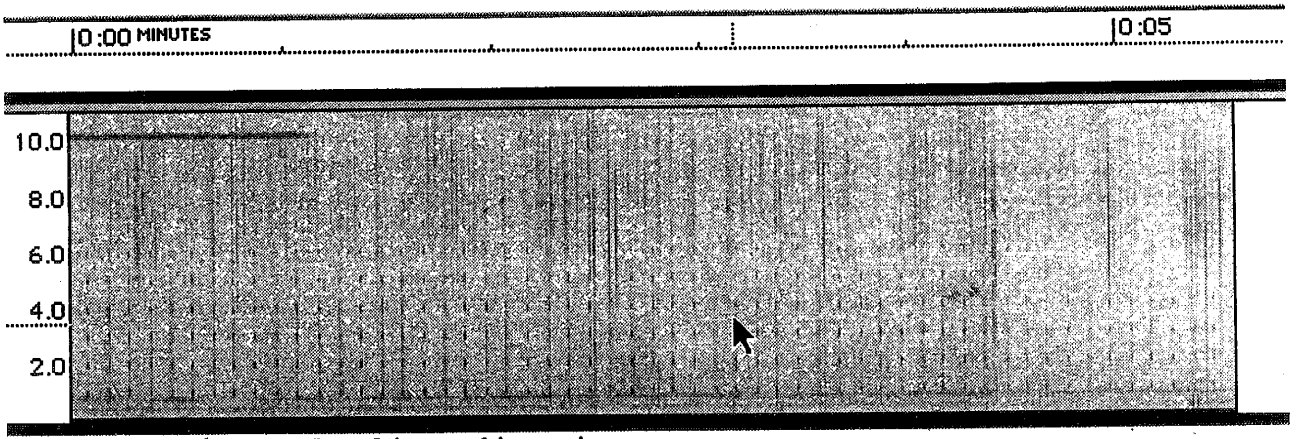
Sonoma Valley Physics Student Observers:

20-3 and 20-9	20-3 only	20-9 only
Whitney Baker	Emilie Connors	Jim Barrat
Betsy Bradbury	Kate Denson	Juan Cruz
Bryan Carlson	Brad Duncan	Abe Gardner
Sabrena Carrington	Lauren Flaherty	Beth Gullikson
Tierra McCulligh	Soren Hansen	Regina Gonzalez
Tom McKeever	Signi Hirsimaki	Brian Johnson
Katy McNulty	Jenne Leigh Hotthouse	Katherine Merritt
Scott Morse		
Nathan Prziborowski		
Jenny Scafidi		
Camille Varin		
Jenny Watters		

Some whistlers were recorded during these sessions. Some of the same whistlers were recorded by the Chaffey High School team which was observing about 500 miles to the south.



Arrow points to whistler at 21:10:19

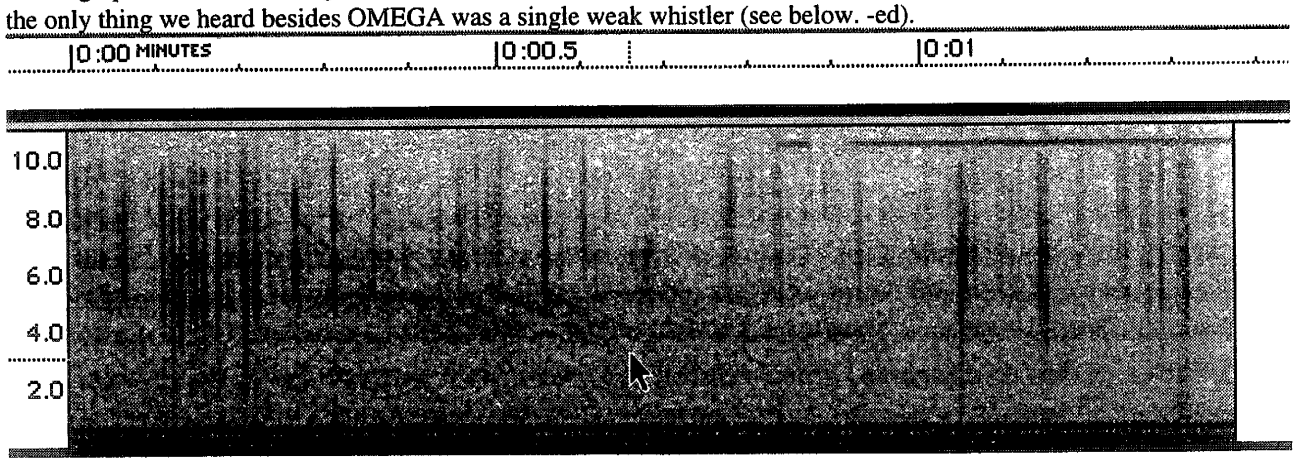


Whistler at 21:10:19. Very faint on this receiver.

Team 23 Jim Ericson Glacier, Washington

In spite of a nasty winter, the local librarian (Paula Dunn) and I managed to get a little ways up a logging road and catch the April 19th Pass 19-5.

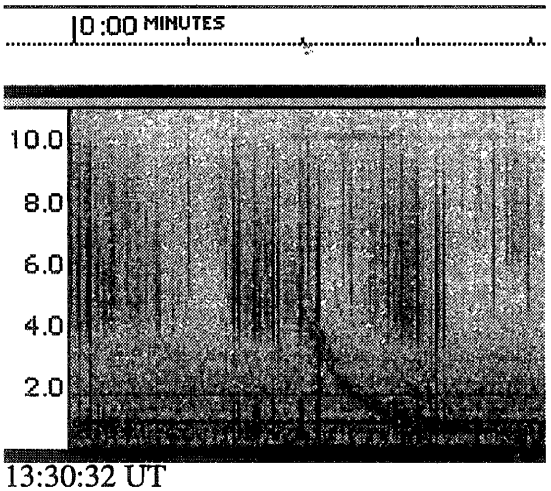
Due to icy conditions farther up, we could only get about 1.5 miles from the local high-voltage feeder line which runs along Mt. Baker Highway. It was raining like crazy, so we abbreviated our antenna party somewhat, winding up with a 50 foot long wire from the receiver to a branch on a nearby dead tree. Hum was pretty heavy and the only thing we heard besides OMEGA was a single weak whistler (see below. -ed).



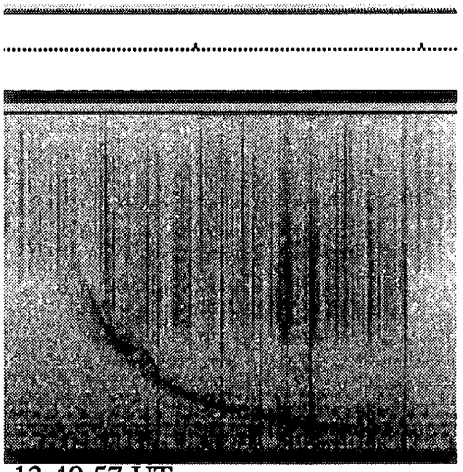
Paula is the local librarian here in our tiny village of 120 people. she has her own WR-3 receiver and spends quite a bit of time in the nearby mountains doing whistler hunting. She is quite enthusiastic about INSPIRE, whistlers and Amateur Radio (her call sign is KC7VKL), and is doing her best to get local high schoolers involved in these projects as well.

Team E2 Silvio Bernocco Vaccera, Italy

Silvio captured some great whistlers during his 20-4 session. Below are some pictures.

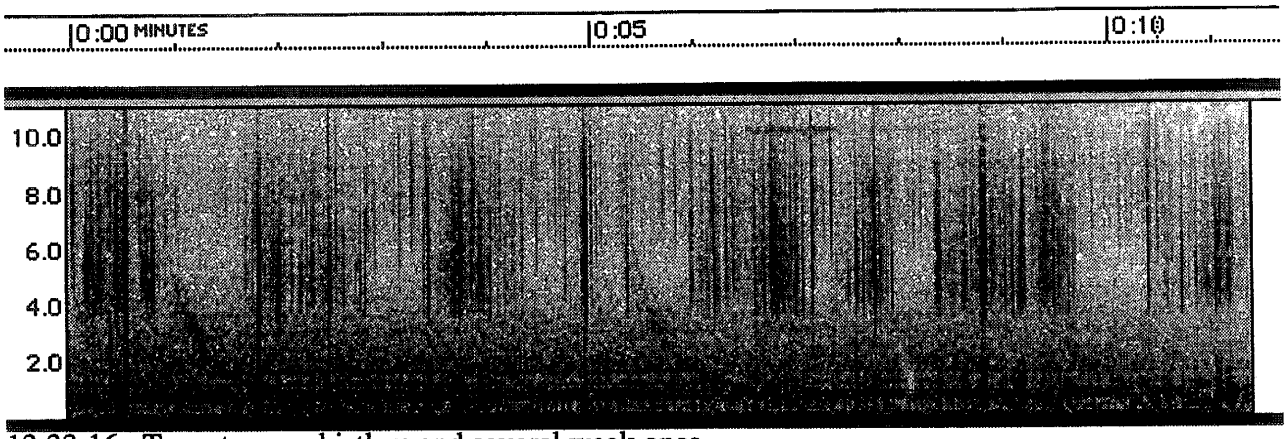


13:30:32 UT



13:40:57 UT

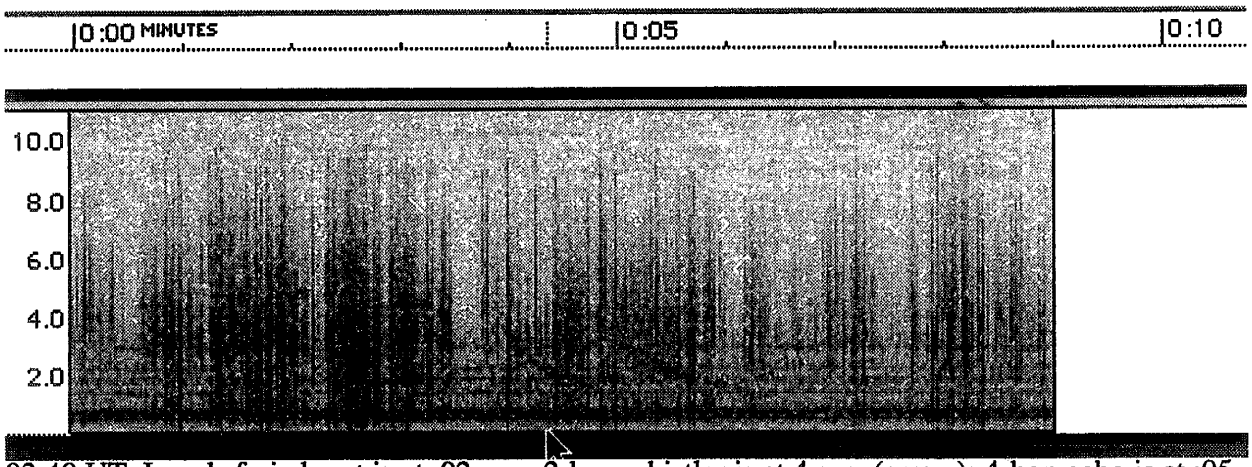
Notice the long "ramp" extending well below 2 kHz, which is a common cutoff point for whistlers. Time marks at the top of the spectrograms are 1 second intervals. The audible dispersion is about 2.5 seconds and the tone is pretty pure. There is some hum present at low frequencies, but this does not detract from the quality of the signal or data.



13:33:16 Two strong whistlers and several weak ones.

Team 21 Phil Hartzell Aurora, Nebraska

Phil logged and recorded several whistlers during his observations of 19-2. Conditions were generally quite noisy with lightning seen in the distance in northeast Kansas. Phil reported that the whistlers seemed to follow especially strong local sferics by a predictable time interval. This, of course, is the definition of 2-hop whistlers. Here are a couple.



02:40 UT Local sferic burst is at :02 sec.; 2-hop whistler is at 4 sec. (arrow); 4-hop echo is at :05 sec.

Team E5 Renato Romero Cumiana, Italy

Now the news:

On April 22 OPERA (Observatory PErmanent of RAdionature) was formed. It consists of the following activities:

- Two sessions of about 5 minutes every day in the morning and evening counting the number of whistlers per minute. This is using E-field and B-field receivers.
- Daily collection of solar and geophysical activity (via SEC : Space Environment Centre)
- Daily collection of weather condition data from the magnetic conjugate point (for Italy, this is South Africa). (Via Intellicast)

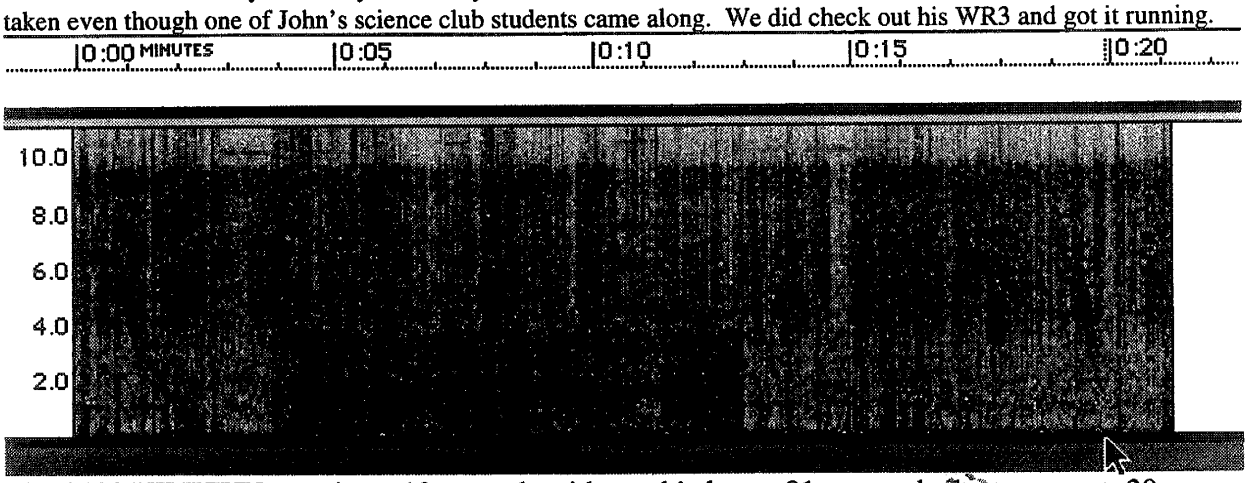
The activity will be 6 months in length and all of the data will be stored in a database, probably Excel, making it possible to show graphically the connections of whistlers with the other values. The results will be available in the fall of '97. See you at the next experience!

Team 8 Mike Dormann Seattle, Washington

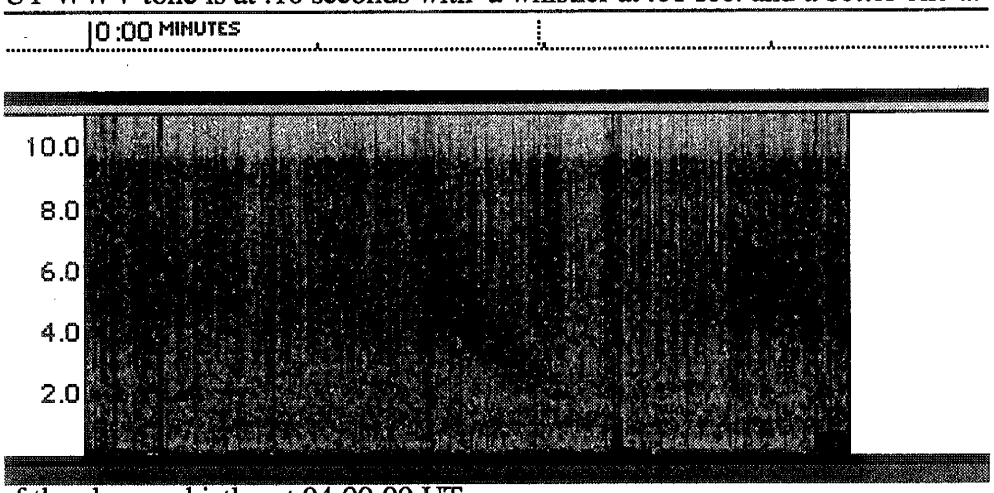
19-3 I made it to Cranberry Marsh in southwest Washington in plenty of time to set up a first class observation station. There was no wind noise or power line interference. I could hear chorus and tweeks so weak as to be whispers. Although the recording does not give justice to the signal to noise ratio of the setup, I have never had such listening conditions. If there were to be a time that I could actually hear INTMINS it would have been this time. To make a long story short, no luck.

John Currie joined me and we set up a WR3 receiving station using a 25 foot mast antenna. This was John's first shot at VLF listening and he was quite impressed. A beautiful night with not too many bugs!

The second day was rainy and windy - a real Pacific Northwest storm. Nothing worked and no data was taken even though one of John's science club students came along. We did check out his WR3 and got it running.



The 0400 UT WWV tone is at :10 seconds with a whistler at :01 sec. and a better one at :20 sec.



Close-up of the above whistler at 04:00:09 UT.

Team 24 Paul Devoe Redlands, California
Redlands High School

The newest INSPIRE team is from Redlands High School. Student members of the Redlands INSPIRE Team include:

Heather Armitage
Sonia Choi
Kim Corneille
Josh Davila
Robert Rodger
Michael Vines
Geoff Tucker

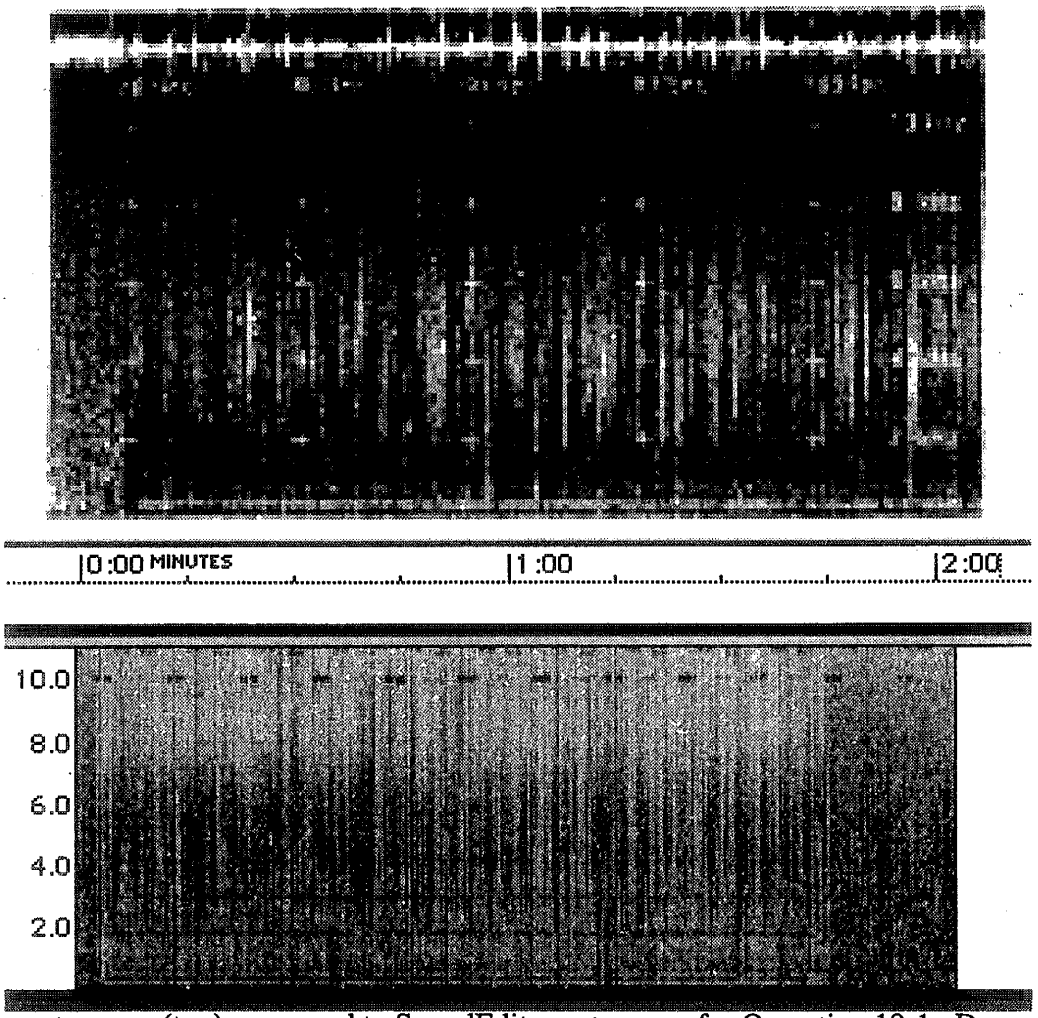
Team 15 Robert Bennett Las Cruces, New Mexico

I have enclosed a copy of my attempt at reducing and analyzing the recordings. The color printer I used to print the plots is not the best in the world and some detail has been lost. If you would, please check my work when you listen to the tapes and see if I missed anything of interest. Also, any pointers on my technique would be welcome.

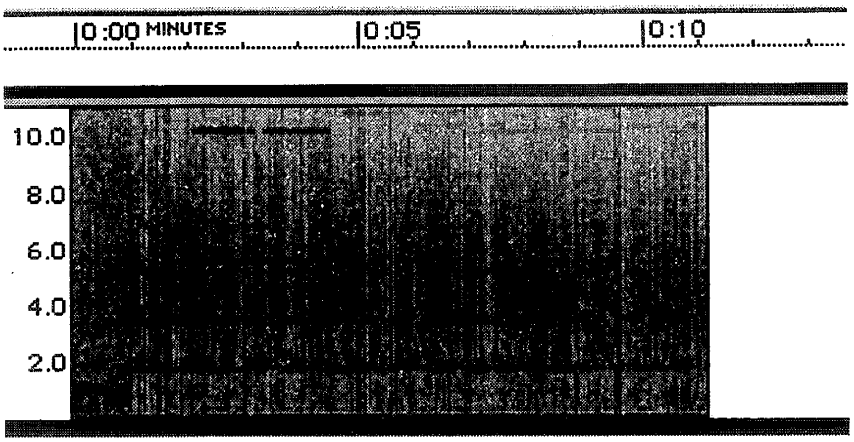
I also collected a lot of useful and interesting information on the performance of different combinations of antennas. I am still in the process of reducing the data and analyzing it. I have enough to possibly write an article for the INSPIRE Journal. Are you interested in such an article? If so, please provide details on the format you desire and suspense dates for the article.

Robert used the GRAM analysis program for the PC and produced some great results. the following is an example of his spectrograms and one done using SoundEdit Pro for comparison. The GRAM spectrograms had to be scanned into the Mac for inclusion in the *Journal*, so some loss of clarity resulted. (In other words, Robert's spectrograms are beautiful, but you can't tell from the image below!)

An article on antenna performance would be very appropriate for the Journal and much appreciated. The best format for text is Word RTF file attachments to email messages. Bitmap (.BMP) images of the spectrograms could also be sent as attachments to messages. Deadlines for articles are October 1 and March 1.



GRAM spectrogram (top) compared to SoundEdit spectrogram for Operation 19-1. Dense sferics and OMEGA present.

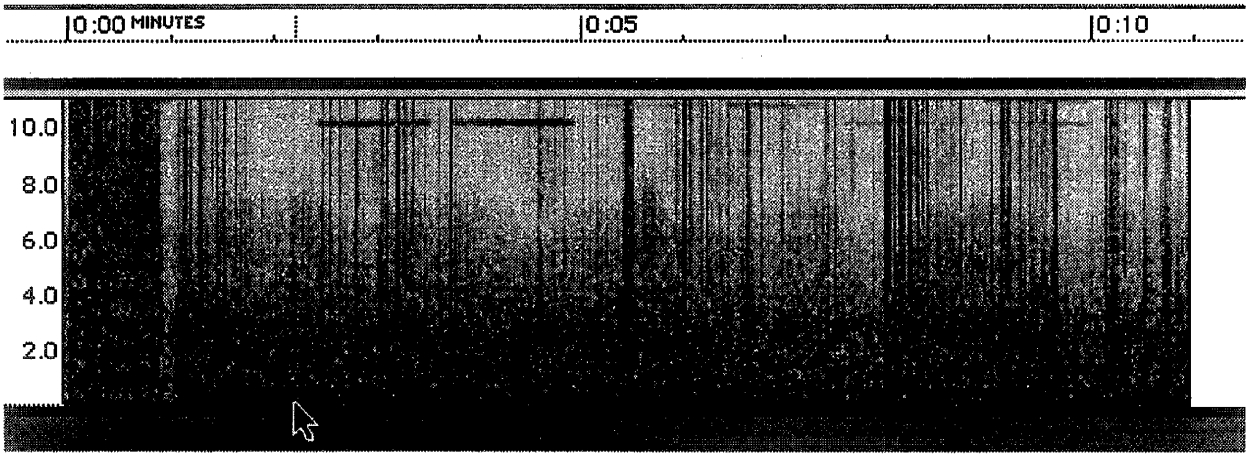


This spectrogram starts with the 0405 UT WWV tone at 1 kHz. There are four OMEGA stations present. At 10.2 kHz, the first dash (:02 - :03) is from Hawaii; the second dash (:03 - :04) is from North Dakota; the third dash (:07 - :08) is from Australia; the fourth dash (centered on :09) is from Japan.

Team 19 Larry Kramer / Clifton Lasky Fresno, California

Our E-field antenna has been improved since the last data taken in early May. With the help of Mike Staal at M2, or M-squared, Enterprises in Fresno, California, we were able to come up with a very nice vertical VLF antenna. It stands 14.6 meters (48 feet) tall. I designed a support base using an old milk crate with some slabs of aluminum bolted to it. Mike suggested using 1.5 inch aluminum tubing for the first few meters of the vertical element, getting smaller as the height is increased. A very strong fiberglass pipe insulates the antenna from ground. within a few minutes we had a superb VLF antenna at a very good price. The performance was excellent: even in the daytime we could hear a good activity level.

The weather was mostly overcast on the 20-3 data take. As the clouds began to dissipate, Comet Hale-Bopp was surprisingly visible through the haze. Just about 10 minutes before the 20-9 data take, the wind blew down my new vertical. No damage was done and it was back up in no time.



This spectrogram starts with the 0456 WWV tone (note the harmonics present up to 9 or 10 kHz); arrow points to the bottom of a nice whistler that follows the tone. Four OMEGA stations present.

Team 4 Mike Aiello Croton, New York

I have constructed my new VLF2 receiver. It went together easily and worked on the first try. This is a very nice receiver; I especially like the audio output feature. I have made two modifications to my kit to facilitate portable use for site checking:

1. I substituted a 3-conductor stereo jack for the (mono) audio output jack with the two audio channels wired in parallel to the output signal. This allows the use of readily available "Walkman" headphones for the audio output.
2. I put a 6' whip antenna in the radio enclosure behind the jacks on the left hand side, extending out the top, and a "ground plate" made from double sided pc-board affixed to the back. The whip and ground plate are connected to the + and - inputs of the board through a DPDT switch that selects either the face plate screw connections or the whip and plate. There is room for the switch on the face plate between the data output jack and the data level switch.
   This configuration allows you to use the receiver by extending the whip and holding the receiver so that your hand contacts the ground plate. Throwing the switch to the other position allows use of the face plate connections as originally intended.

I tried the receiver in the field today on a hike through a wooded area in our neighborhood. I didn't find any new recording sites (there are houses near the wood and a high level of AC hum), but the VLF2 with on-board antenna worked beautifully!

The trickiest part was figuring out the correct placement of drill holes for the antenna and switch. If you think others might be interested in these modifications, I could write them up with some diagrams and illustrations for the next Journal.

The Journal is always looking for contributions from INSPIRE participants. This would make a great article, Mike!

Team 17 Kent Gardner Fullerton, California

Because of my new work schedule, I couldn't make it to my mountain receiving location so I tried to do 23-1 here in Fullerton at a once reasonably quiet site. A new housing project ruined that so I ended up with no usable data. I will try again next time.

Is it possible to enhance any chance of receiving the INTMINS signals by redesigning the antennas? Would long wires at submultiples of any particular wavelength be more sensitive to the signals? I have thought about switching three different antennas at reasonable intervals during a pass to see if different polarizations might help. I am thinking that two long wires at right angles to each other and a vertical whip could be switched at about 6 second intervals. The exact timing would have to be thought through to account for the number of LF modulations occurring during an experimental test. Maybe a loop would be another possibility. A quiet switching circuit would have to be put together also that would not add noise in the received signal. Just a thought.

First the questions: I think that antenna design and orientation is a rich area for further investigation. Several other participants are proceeding in this area and I anticipate using the Journal as a means for sharing the results.

The basic frequency that we are looking for with INTMINS is 1 kilohertz. The wavelength of this wave is 300 kilometers! So submultiple wavelength antennas, such as half-wave and quarter-wave antennas, are sort of out of the question. The basic premise I have been using is that the longer the antenna the better since that intercepts more of the radio energy, but submultiples of the wavelength are not practical. Does anyone else have any thoughts on this?

I have tried some experiments with various orientations of whip antennas, but could find no difference in the reception. A difference might show up using long wires, though, and it would be interesting to find out.

Team E8 Zeljko Andreic Zagreb, Croatia
Rudjer Boskovic Institute

This from Goran Zgrablic:

I'm sending you this letter as one of the INSPIRE observers from Croatia. We are a group of students studying physics at Zagreb University. Our mentor, Dr. Zeljko Andreic, sent you our VLF observations from April 1996.

Unfortunately we did not have good luck with the INTMINS operations in November and December 1996. It was very cold and the roads to remote areas were completely blocked and frozen. Actually, a few passes were recorded, but in very bad conditions: it was snowing, we were close to power lines and shielded by nearby vegetation and snow. I noticed that the signal had not as much static as usual. It is probably because of the absorption of the snow.

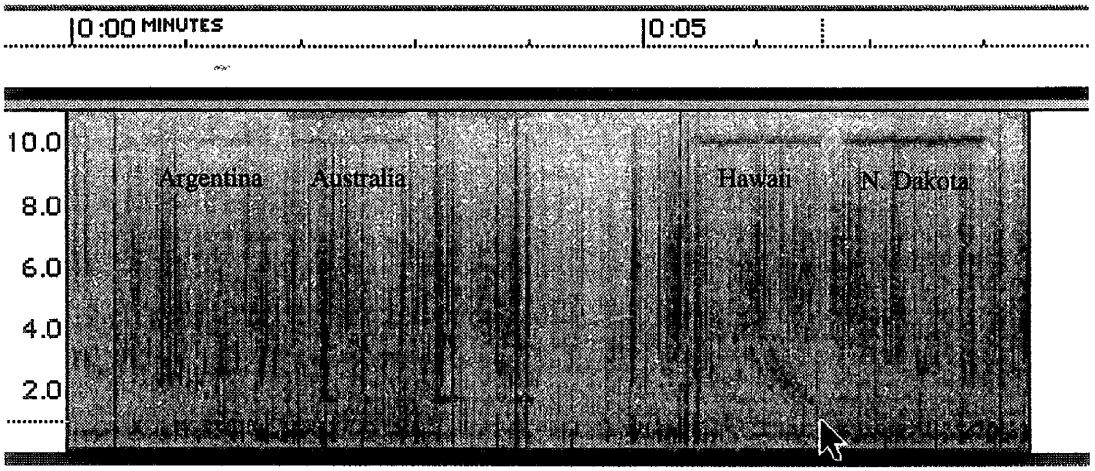
Our group has been working on VLF observations of meteors. The observation consists of parallel visual observations and VLF recording. We choose some major meteor showers, such as the Perseids, because we need very bright fireballs. If you are interested, I could write an article for the INSPIRE Journal.

I am interested! An article would be welcome.

Team 6 Bill Pine Ontario, California
Chaffey High School

Chaffey High School INSPIRE Team consisted of:

Jillian Anthony	Blake Hunter	Brad Olsan
Mike Corral	Marco Moreno	Monika Witecka
	Matt Munson	



Whistler at 0459:14 on 4/20/97. Note also the tweeks between :03 and :04 sec. Four OMEGA stations present. This was taken using the new VLF2 receiver.

Data Log Cover Sheet (copy as needed)

INSPIRE Observer Team _____ Receiver _____

Operation _____

Date _____ Tape Start Time (UT) _____

****

Operation details: Tape start time: _____ UT _____ local

Operation start time: _____ UT _____ local

Operation type: _____

Operation stop time: _____ UT _____ local

Tape stop time: _____ UT _____ local

Equipment: Receiver _____ WW V reception:

Recorder _____ _____

Antenna _____ _____

WWV radio _____ _____

Site description: _____

Longitude: _____° _____ ' W Latitude: _____° _____ ' N

Local weather: _____

Personnel: _____ _____ _____

_____ _____ _____

Team Leader address: Name _____

Street _____

_____

City, State, Zip, Country _____

INSPIRE Data (copy as needed)

INSPIRE Observer Team _____ Receiver _____

Operation _____

Date _____ Tape Start Time (UT) _____

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Code: S - sferics 0 1 2 3 4 5 M - Mark T - tweek W - whistler O - OMEGA C - chorus
L M H

Time	Entry	Observer
_____	_____ S: 0 1 2 3 4 5	_____
_____	_____ S: 0 1 2 3 4 5	_____
_____	_____ S: 0 1 2 3 4 5	_____
_____	_____ S: 0 1 2 3 4 5	_____
_____	_____ S: 0 1 2 3 4 5	_____
_____	_____ S: 0 1 2 3 4 5	_____
_____	_____ S: 0 1 2 3 4 5	_____
_____	_____ S: 0 1 2 3 4 5	_____
_____	_____ S: 0 1 2 3 4 5	_____
_____	_____ S: 0 1 2 3 4 5	_____
_____	_____ S: 0 1 2 3 4 5	_____
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