# The INSPIRE Journal

Volume 6 Number 1
November 1997

# INSPIRE Survey Included With This Issue

A survey of all past and present INSPIRE participants has been included with this issue of *The INSPIRE Journal*. The purpose of the survey is to evaluate all aspects of The INSPIRE Project including all past and present activities. We would also like to get ideas for future activities and projects.

As an incentive, a one-year (2 issues) subscription to *The INSPIRE Journal* will be given to each person who returns a completed survey. In addition to responding to the survey questions, please feel free to include any comments, complaints and suggestions that you feel would be helpful to INSPIRE organizers. Thank you in advance for your time and assistance.

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The INSPIRE Journal
Volume 6 Number 1
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# INTMINS-November/97 Operations Schedule

By Bill Taylor, Washington, DC
Stas Klimov, Moscow, Russia
Bill Pine, Ontario, CA

The November 1997 INTMINS Operations schedule has been determined. Operations will occur on the last two weekends: November 22-23 and November 29-30. Data gathered will be analyzed and reported on in the April 1998 issue of *The INSPIRE Journal.*

## Gathering Data:

IMPORTANT NOTE: Data gathering procedures will remain the same as those used since April 1996.

Perhaps the most important ingredient in a successful data gathering session is what happens **before** you go out in the field. The following is the recommended procedure for data gathering including preparation prior to the date of the operation.

Step 0: Completely check out all equipment. A good method is to set up everything in your living room. All you will hear is household 60 Hz, but you will know the equipment is working. This is also a good time to fill out the log cover sheet (see the page 57 of the *Journal*).

Step 1: Define "T-time" as the starting time for operation of ISTOCHNIK.
Convert the UT time to local time.
Arrive at your site with time to spare.

Step 2: Start data recording at T minus 12 minutes.
Prior to this time place a brief voice introduction on the tape identifying the observers and the operation number.

Step 3: Place time marks on the tape at: T-12, T-10, T-5, T, T+3, T+8, T+13, and near the end of the tape. Use UTC times only. Note that this schedule brackets the scheduled time of operation of ISTOCHNIK with time marks. Use 60 minute tapes and place one operation per side.

Step 4: Keep a written log (see page 58 of the *Journal*) of time marks and descriptions of everything you hear.

Step 5: Review your tapes and revise your logs if necessary.

Step 6: Mail your tapes and logs to Bill Pine at the address shown on Page 2.
Your tapes will be returned to you.
Send in copies of your logs since they will not be returned.
You will receive a copy of the spectrographs made from your data.
Your data will be incorporated in the data analysis report article in the *Journal.*

## Mode of Operation:

The two instruments on MIR are Ariel and ISTOCHNIK. Ariel is a plasma generator and operates for 5 minutes, alternating between axes. ISTOCHNIK is a modulated electron gun that accelerates a beam of electrons and emits them into space. The electron beam is turned on and off at frequencies of either 10 hertz or 1000 hertz (1 kHz), which should cause the radiation of electromagnetic waves in the VLF range at those two frequencies. ISTOCHNIK operates for a total of 2 minutes on the following schedule:

ISTOCHNIK mode:
10 seconds modulate at 10 Hz
10 seconds modulate at 1000 Hz
10 seconds modulate at 10 Hz
10 seconds modulate at 1000 Hz
repeat for 2 minutes of operation

On each pass, Ariel will either operate first or last, whichever gives the most coverage over INTMINS observers. Since the signal from ISTOCHNIK is more powerful, it is the one most likely to be detected. For that reason, the schedule emphasizes the operation of ISTOCHNIK.

## Notes on Time Marks and Logging;

The purpose of putting time marks on the data tapes is twofold:

1. The obvious need to know what time is represented in each part of the tape,

2. also to provide a means of synchronizing the tape with actual time. Battery operated recorders tend to run slower as the batteries wear out. Some recorders run fast or slow because of the particular motor being used. By timing (with a stopwatch) the actual times between time marks, the speed of the analysis recorder can be adjusted to synchronize the data tape with actual time. This has the effect of adjusting the frequencies on the spectrogram to the proper values since incorrect tape speed on the data recorder will cause the frequencies to be out of position.

When time marks are put on the tape, they should include an announcement of the UT time and a mark (either by voice ("mark") or by WWV tone or some other means). Try to minimize the interruption to the data flow when putting on the time marks. This takes practice! Also, put the time marks on at least as often as is called for by the instructions. It is better to have more time marks than are called for than to have too few.

The purpose of the data log is to record the contents of the tape. The time of each time mark should be recorded. Anything else of interest should be noted on the log with the time indicated.

Tapes with incomplete or missing time marks and poor logs are nearly impossible to analyze. Your help in following good time mark and logging procedures is much appreciated.

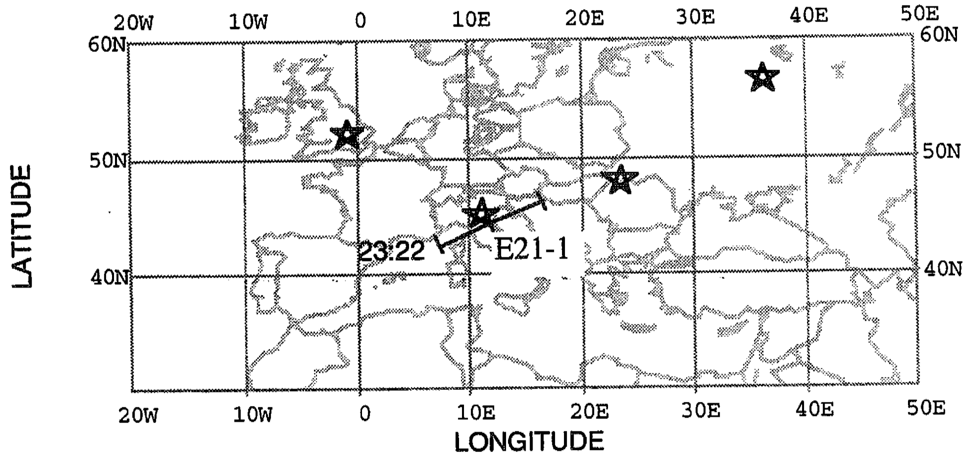
# INTMINS-April/97 Operations Schedule

The following maps show the ground track of MIR while ISTOCHNIK is operating. The time indicated on the map is the "T-time" (all times are UT).

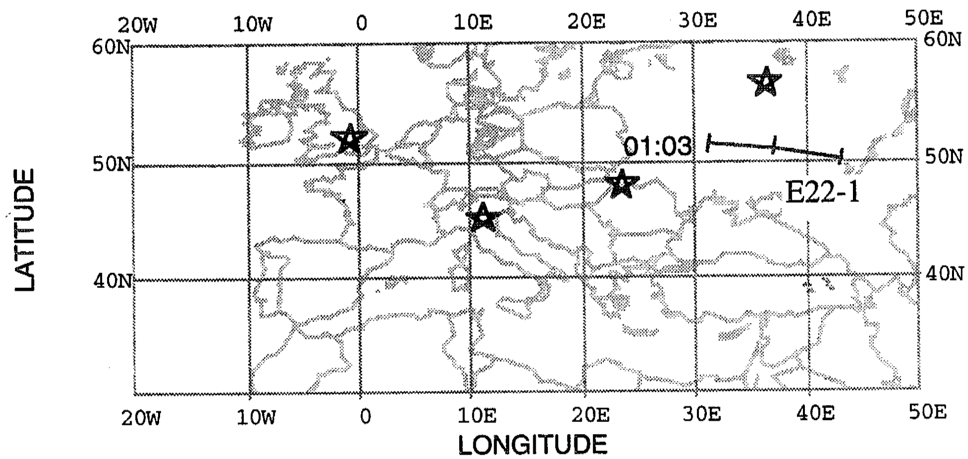
On all passes, MIR moves from west to east (left to right). The ground track shown is 2 minutes long which corresponds to the actual firing time of ISTOCHNIK. The passes are numbered with the UT date followed by the operation number on that day. Some passes late in the day are on the PREVIOUS date LOCAL TIME. Operations are numbered sequentially although they may not occur on consecutive orbits. European passes are identified with an "E".

| Pass Number | UT Date | Tape Start UT | ISTOCHNIK Start (T-time) UT | Tape Stop UT |
|---|---|---|---|---|
| E21-1 | 11/21 | 2310 | 2322 | 2335 |
| E22-1 | 11/22 | 0051 | 0103 | 0116 |
| 22-2 | 11/22 | 0518 | 0530 | 0543 |
| 22-3 | 11/22 | 0648 | 0700 | 0713 |
| 22-4 | 11/22 | 0825 | 0837 | 0850 |
| 22-5 | 11/22 | 1011 | 1023 | 1036 |
| 22-6 | 11/22 | 1145 | 1157 | 0010 |
| 22-7 | 11/22 | 1320 | 1332 | 1345 |
| 23-1 | 11/23 | 0422 | 0434 | 0447 |
| 23-2 | 11/23 | 0550 | 0602 | 0615 |
| 23-3 | 11/23 | 0727 | 0739 | 0752 |
| 23-4 | 11/23 | 0911 | 0923 | 0936 |
| 23-5 | 11/23 | 1045 | 1057 | 1110 |
| 29-1 | 11/29 | 0146 | 0158 | 0211 |
| 29-2 | 11/29 | 0320 | 0332 | 0345 |
| 29-3 | 11/29 | 0947 | 0959 | 1012 |
| E29-4 | 11/29 | 2016 | 2028 | 2041 |
| E29-5 | 11/29 | 2156 | 2208 | 2221 |
| E29-6 | 11/29 | 2326 | 2338 | 2351 |
| 30-1 | 11/30 | 0048 | 0100 | 0113 |
| 30-2 | 11/30 | 0218 | 0230 | 0243 |
| 30-3 | 11/30 | 0353 | 0405 | 0418 |
| 30-4 | 11/30 | 0537 | 0549 | 0602 |
| 30-5 | 11/30 | 0847 | 0859 | 0912 |

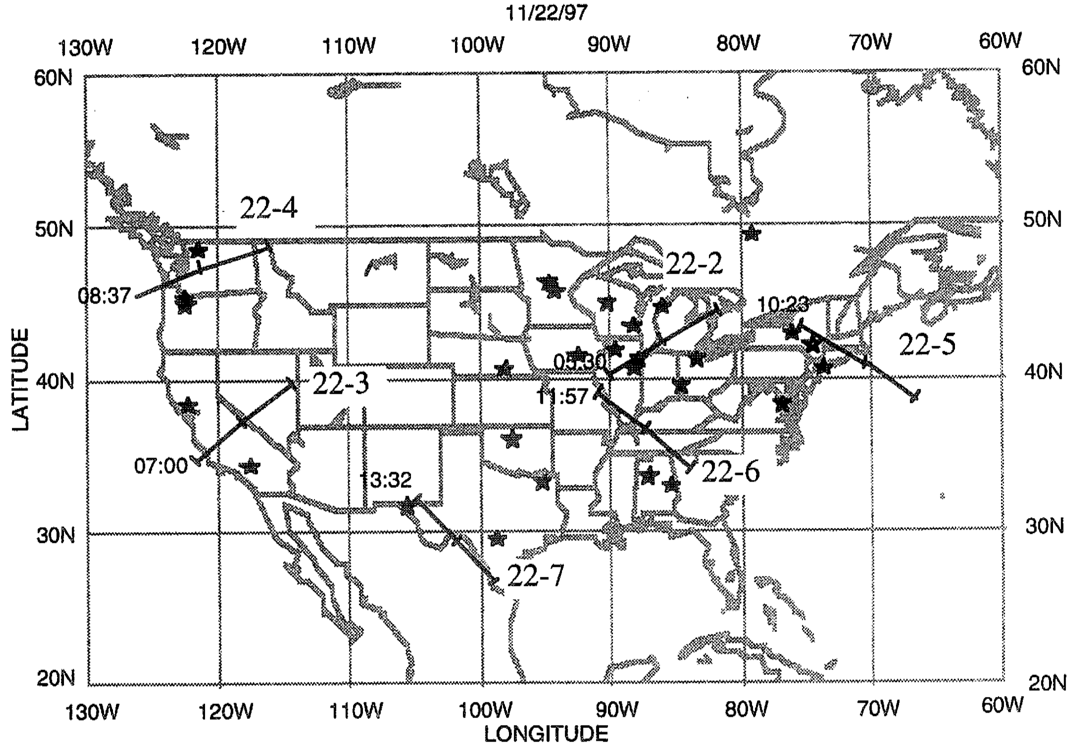
11/21/97

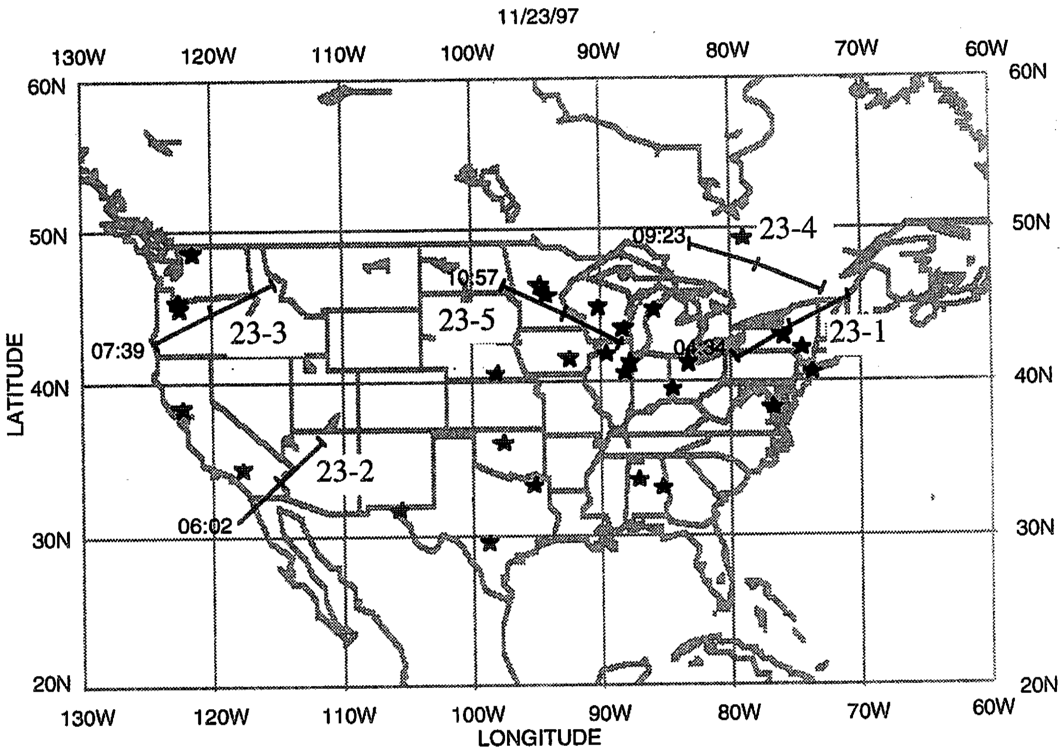


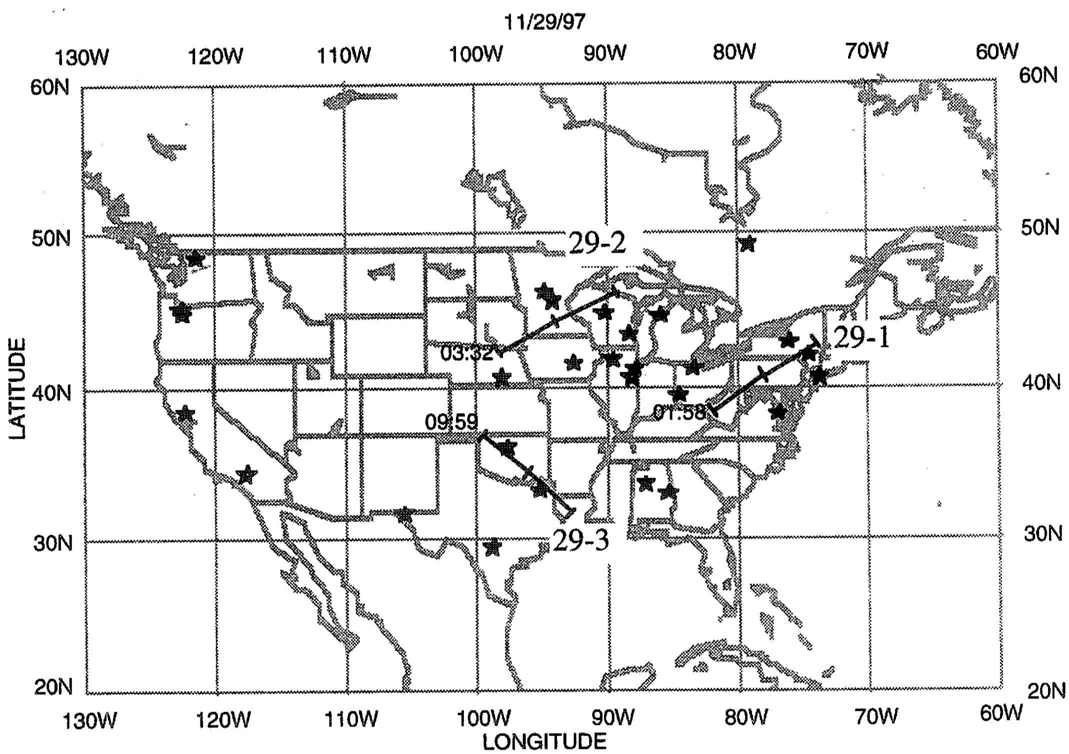

11/22/97

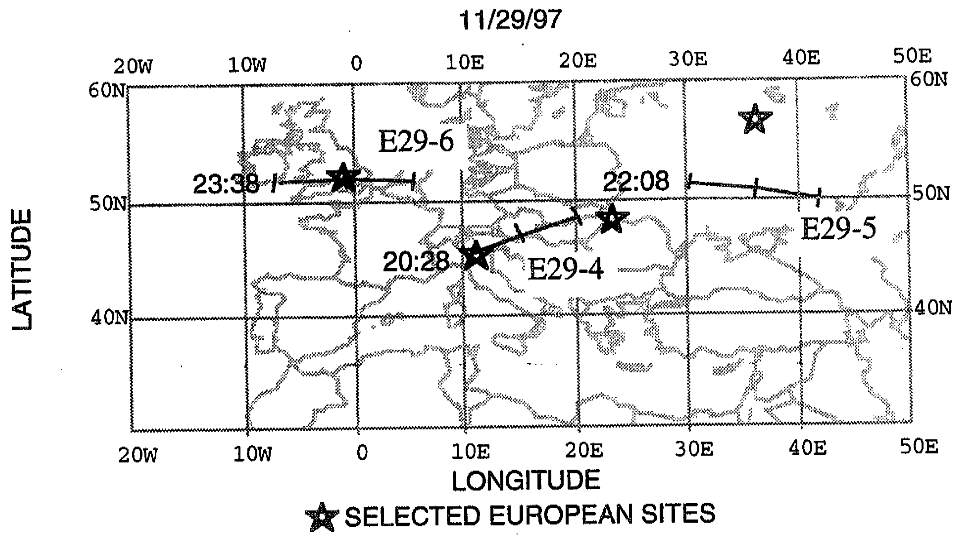



11/22/97

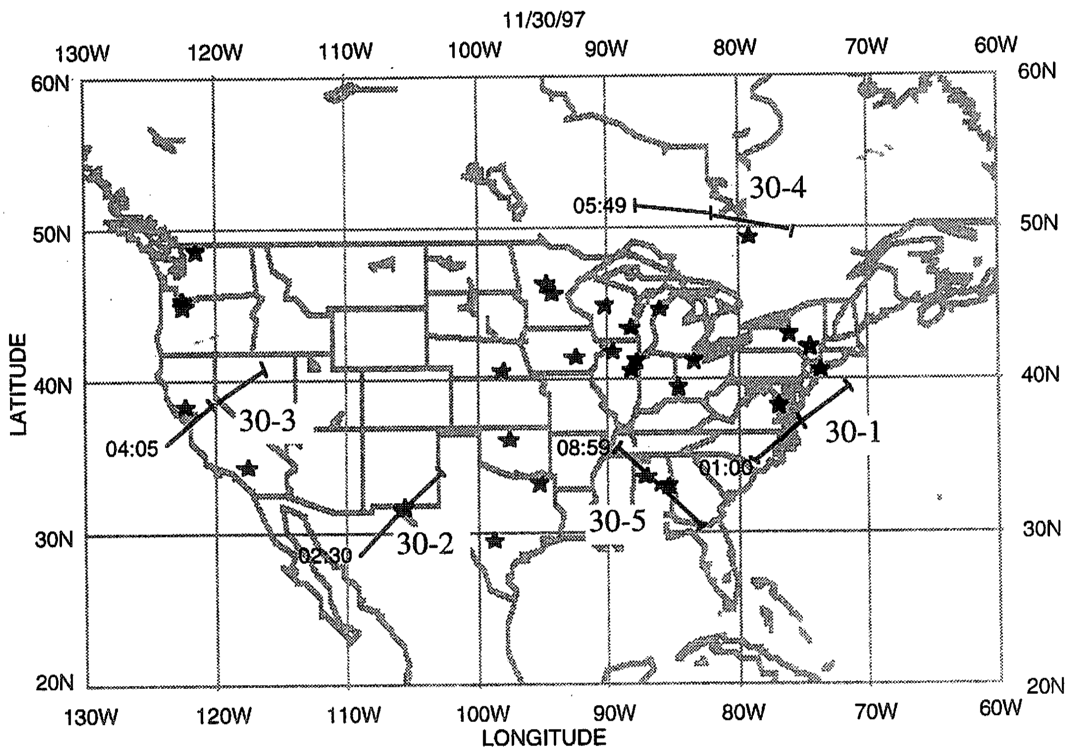



11/23/97
130W
120W
110W
100W
90W
80W
70W
60W
60N
50N
40N
30N
20N
LATITUDE
LONGITUDE
23-1
23-2
23-3
23-4
23-5
07:39
06:02
10:57
09:23


11/29/97
130W
120W
110W
100W
90W
80W
70W
60W
60N
50N
40N
30N
20N
LATITUDE
LONGITUDE
29-1
29-2
29-3
03:32
09:59
01:58



11/29/97
20W
10W
0
10E
20E
30E
40E
50E
60N
50N
40N
LATITUDE
LONGITUDE
E29-6
23:38
22:08
E29-5
20:28
E29-4
SELECTED EUROPEAN SITES

11/30/97
130W
120W
110W
100W
90W
80W
70W
60W
60N
50N
40N
30N
20N
LATITUDE
LONGITUDE
30-4
05:49
30-3
04:05
30-1
08:59
01:00
30-5
30-2
02:30

## UT to Local Time Conversion Table for T-times
## (North American Passes)

| Operation | UT Date | T-time | EST UT-5 | CST UT-6 | MST UT-7 | PST UT-8 |
|---|---|---|---|---|---|---|
| 22-2 | 11/22 | 0530 | 0030 | 2330 * | 2230 * | 2130 * |
| 22-3 | 11/22 | 0700 | 0200 | 0100 | 0000 | 2300 * |
| 22-4 | 11/22 | 0837 | 0337 | 0237 | 0137 | 0037 |
| 22-5 | 11/22 | 1023 | 0523 | 0423 | 0323 | 0223 |
| 22-6 | 11/22 | 1157 | 0657 | 0557 | 0457 | 0357 |
| 22-7 | 11/22 | 1332 | 0832 | 0732 | 0632 | 0532 |
| 23-1 | 11/23 | 0434 | 2334 * | 2234 * | 2134 * | 2034 * |
| 23-2 | 11/23 | 0602 | 0102 | 0002 | 2302 * | 2202 * |
| 23-3 | 11/23 | 0739 | 0239 | 0139 | 0039 | 2339 * |
| 23-4 | 11/23 | 0923 | 0423 | 0323 | 0223 | 0123 |
| 23-5 | 11/23 | 1057 | 0557 | 0457 | 0357 | 0257 |
| 29-1 | 11/29 | 0158 | 2058 * | 1958 * | 1858 * | 1758 * |
| 29-2 | 11/29 | 0332 | 2232 * | 2132 * | 2032 * | 1932 * |
| 29-3 | 11/29 | 0959 | 0459 | 0359 | 0259 | 0159 |
| 30-1 | 11/30 | 0100 | 2000 * | 1900 * | 1800 * | 1700 * |
| 30-2 | 11/30 | 0230 | 2130 * | 2030 * | 1930 * | 1830 * |
| 30-3 | 11/30 | 0405 | 2305 * | 2205 * | 2105 * | 2005 * |
| 30-4 | 11/30 | 0549 | 0049 | 2349 * | 2249 * | 2149 * |
| 30-5 | 11/30 | 0859 | 0359 | 0259 | 0159 | 0059 |

NOTE: An asterisk (*) indicates a local date on the date PRECEDING the UT date. Late evening passes are on the date preceding the UT date.

Example: Operation 23-1 has a T-time of 0434 UT on 4/19. In New York, where this operation is best situated, participants would record using a T-time of 2334 EST on 11/22/97.

# Good-bye OMEGA

By Bill Taylor
President, The INSPIRE Project, Inc.
Washington, DC

Well, they did it. As they have been telling us they would for some time now, the US Government turned off the OMEGA radionavigation stations. As of 0300 UT on September 30, 1997, OMEGA no longer exists. It's good for the US Government's budget and, as a taxpayer, I'm happy because GPS does a much better job of locating your position. As an INSPIRE participant, though, I'm sad because OMEGA was such a great time and frequency calibration tool and because it was such a good indicator of correctly operating INSPIRE receivers. Not that we don't have other tools, of course. WWV is a great time standard, it's just a little harder to use. And the Navy's VLF stations are very good frequency standards, but they are still harder to use. Finally, sferics are the best way to tell that an INSPIRE receiver is working.

## OMEGA Background

To quote from the US Coast Guard's description of OMEGA at

http://www.navcen.uscg.mil/omega/omegaff.htm

(the Coast Guard was responsible for OMEGA):

> OMEGA is a very low frequency (VLF), continuous, passive, en route, radionavigation system usable by mariners, aviators and others worldwide. Precise time can also be determined from OMEGA.
>
> OMEGA was developed by the United States and is operated in partnership with six other nations. OMEGA signals from eight stations provide an all-weather navigational capability nearly worldwide. The stations are operated by Norway, Liberia, United States (two), France, Argentina, Japan and Australia. The US Coast Guard is responsible for the operation and maintenance of the OMEGA system.
>
> OMEGA signals are phase-synchronized and are transmitted on a time-shared basis, according to the OMEGA Radionavigation System Signal Transmission Format. The stations transmit four common frequencies (10.2, 11.05, 11-1/3 and 13.6 kHz) and one frequency unique to each station. All frequencies are usable for navigation.
>
> The accuracy of Omega is 2-4 miles, with 95% confidence. The accuracy obtainable depends upon geographic location and direction of travel, stations used, signal propagation anomalies, season, time of day and receiving equipment. The primary limitation on OMEGA accuracy is variations in signal propagation. Errors that result from these variations can be reduced by applying corrections for predicted conditions to the receiver's readings either manually or automatically. The system's coverage has been validated on a regional basis. As each geographic area was validated, a report on operational limitations was promulgated.

And from the main WWW site for OMEGA,

http://www.navcen.uscg.mil/omega/

All eight OMEGA stations (NORWAY (A), LIBERIA (B), HAWAII (C), NORTH DAKOTA (D),
LA REUNION (E) ARGENTINA (F), AUSTRALIA (G) AND JAPAN (H)) around the world have permanently ceased to operate.

Users must no longer depend on OMEGA broadcasts for navigation of any kind.

Omega operated in an outstanding manner for over twenty-six years. It was the first world wide Radionavigaton system and has served as an exemplary model of International cooperation.

## Data Without OMEGA

I have recorded data today to see what it sounds and looks like without OMEGA. Figure 1 is ten seconds of data with OMEGA, followed by calibration frequencies of 11.905, 12.649 and 14.881 kHz (the ALPHA station frequencies, more about ALPHA later) and finally, 10 seconds of data without OMEGA, recorded on September 30, 1997, about 1845 UT at Goddard Space Flight Center. Note by the way that the signals are remarkably free of 60 Hz and harmonics, even though I was only about 100 meters from a large building. You don't have to be a kilometer away from power lines to get good signals, sometimes even in your backyard or street is good enough to hear strong tweeks. Try it!

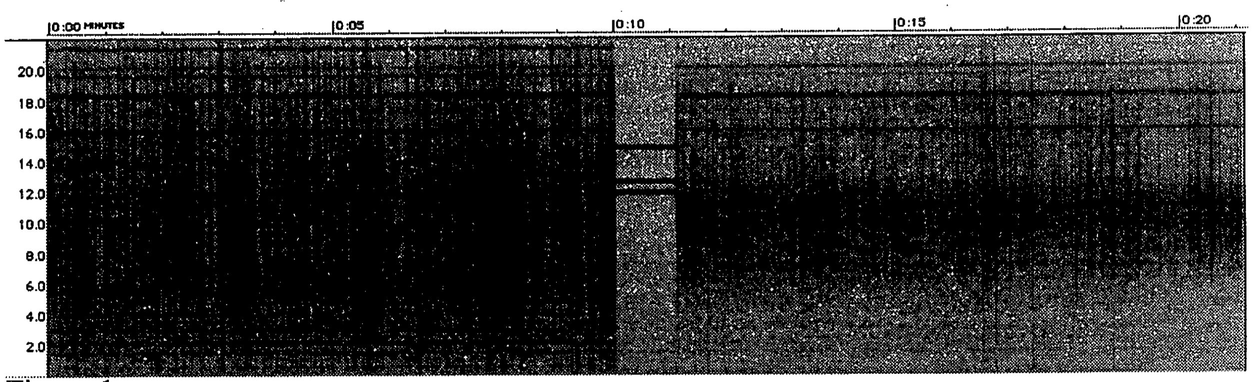



Figure 1.

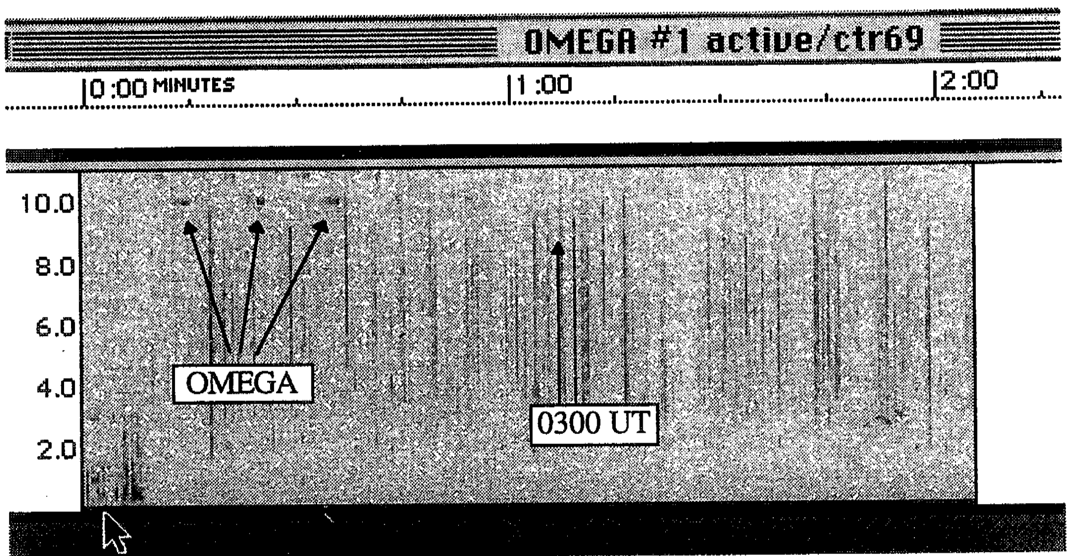
## ALPHA

So what is ALPHA? It's a three station complex of VLF transmitters in Krasnodar, Novosibirsk, and Komsomolskamur, Russia that broadcast on 11.905, 12.649 and 14.881 kHz. It also was developed for radionavigation, but it is difficult to determine much information about it. Like OMEGA, it has operated for many years, and continues to do so. Our Russian INTMINS Leader, Stas Klimov of the Space Research Institute tells me that ALPHA is being used for basic radio physics research. Our European Coordinator, Flavio Gori, receives ALPHA regularly and tells me that the basic cycle of the transmissions is three segments of 3.6 seconds each. During the segments 1, 2, or three of the stations are transmitting. The pulse lengths are 0.4 seconds long, with 0.2 seconds or more between pulses. I had hoped that I would be able to see the ALPHA signals in Figure 1, but have not been able to, at least with confidence, so far.

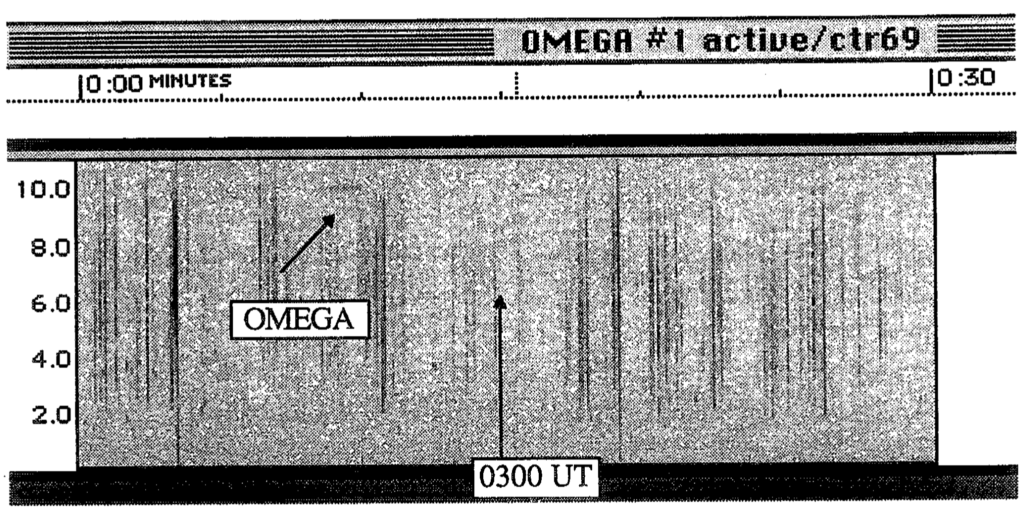
# Chaffey High School Observes the OMEGA Shutdown

by Bill Pine
Chaffey High School
Ontario, California

On Monday evening, September 29, at 8:00 PM local time (0300 UT 30Sept97) Chaffey High School INSPIRE Team members were at our observing site in the mountains to record the shutdown of the OMEGA system. Below are some spectrograms of the time of the shutdown. OMEGA dashes are visible in each before 0300 UT, but the dashes disappear exactly on time. Student observers also reported that the cessation was audibly apparent as they listened.

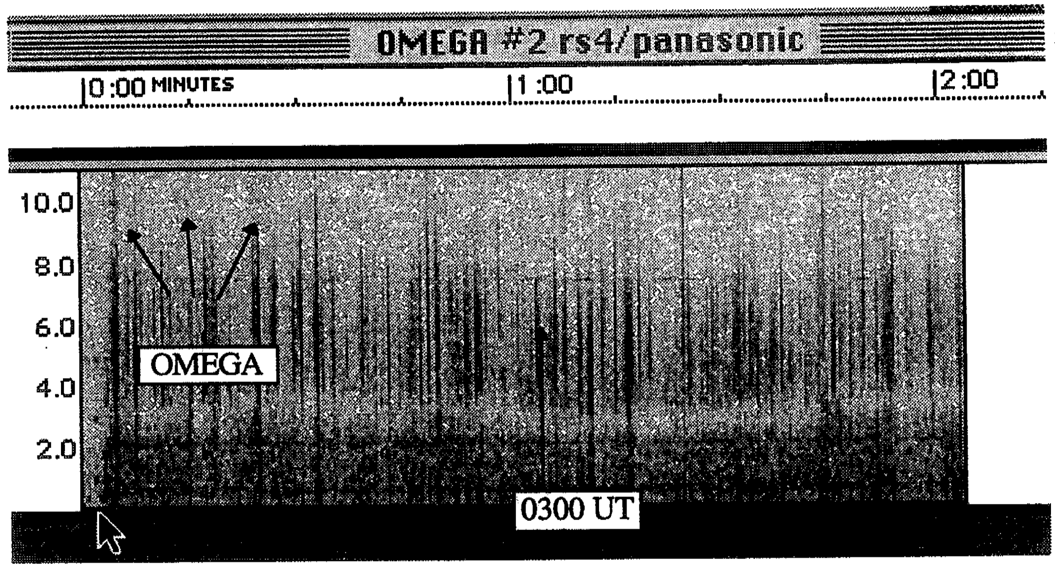



Lower arrow points to 0259 UT WWV tone.

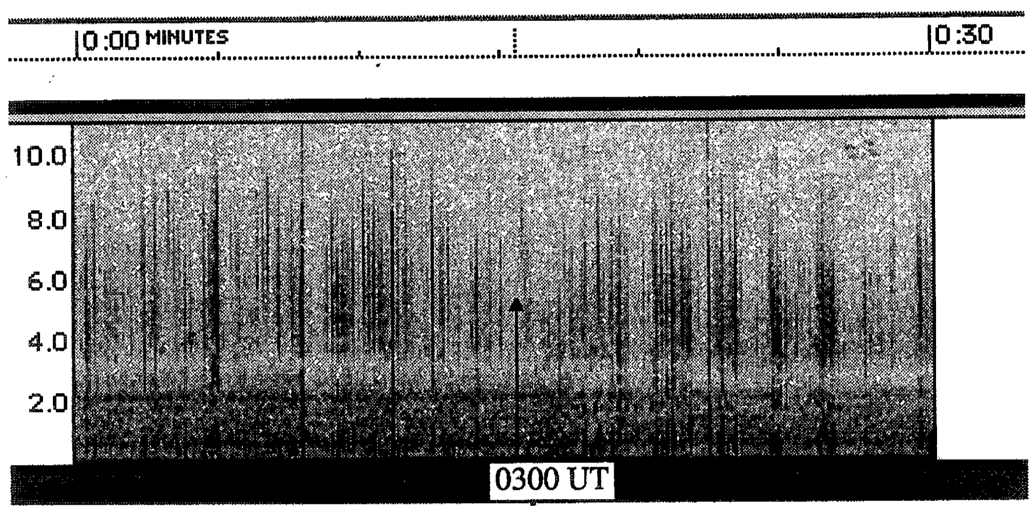



**Eric Reed** - ACTIVE receiver, RS CTR69 recorder

This is a B-field receiver that has been the most sensitive to OMEGA signals in the past. While VLF propagation conditions change constantly, there is some evidence that the shutdown was not abrupt, but rather involved a reduction in power over about 30 seconds.

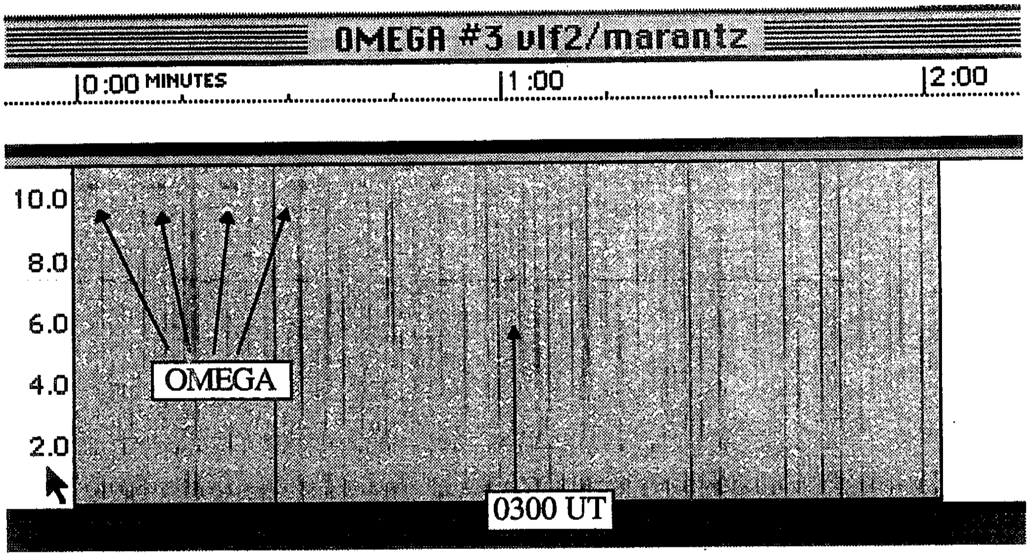



Lower arrow points to 0259 UT WWV tone.

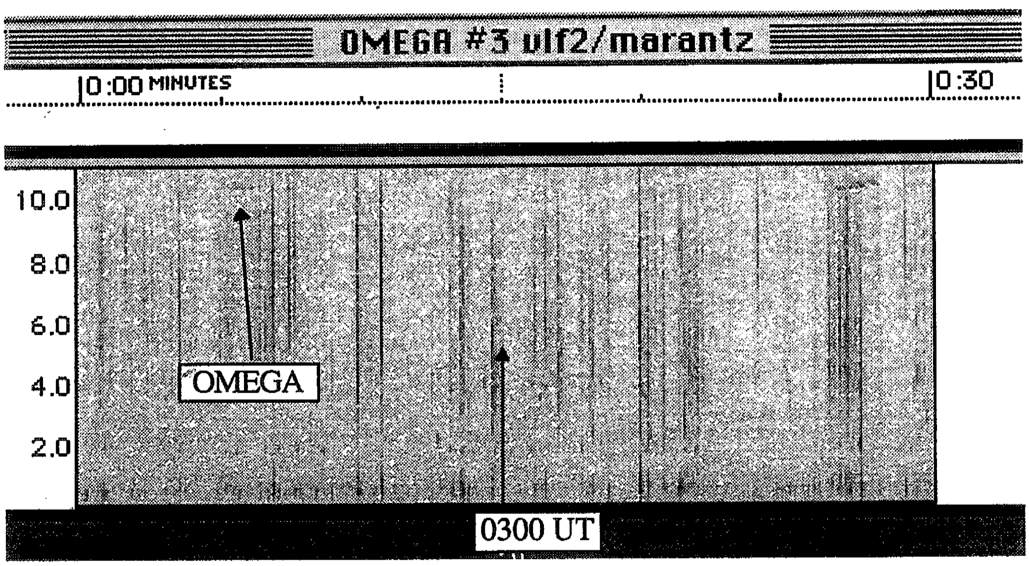



**Maria George** - RS4 receiver, Panasonic recorder

The RS4 receiver used for this observation was built by Chaffey students in 1993. The antenna is a telescoping 6 foot whip. The recorder is a 7-year old portable. This receiver is not usually sensitive to the OMEGA frequencies, but it did record some of the signals as shown. In the 30-second closeup, the OMEGA dashes are not apparent before 0300 UT.




The WWV tone was not picked up on this recorder, but the spectrogram starts at 0259 UT.




**Megan Souter** - VLF2 receiver, Marantz PMD430 recorder

The VLF2 receiver used here was built by Chaffey students in 1996. The Marantz recorder is the best recorder we use. The antenna is a 6-foot telescoping whip.

The students who went on this trip had been physics students for about 3 weeks, but they were eager to get involved in INSPIRE. Maria George, Megan Souter and Eric Reed did a good job making field observations for the first time - and in the dark! Fortunately the weather was good and it was a very pleasant evening.

As a data analyst, I will miss OMEGA. Since my high frequency hearing is not what it used to be, I was unable to hear OMEGA in the field. (This fact amused my students.) OMEGA was a friendly presence on spectrograms, providing reliable time information and a good indication that the receiver was working properly.

# LOW FREQUENCY PEOPLE

By Flavio Gori
INSPIRE European Coordinator
Florence, Italy

I was involved in VLF/ULF radio frequency field since 1991, not really so long. Through this I have had the pleasure to meet, both in person that by letter, so many interesting people, that I never thought before they could even live. There are on this land people who really like to study and work just for the pleasure to discover something, following their wonderful spirit, to arrive where their heart wants to go. And this place is free from money. Yes, they do not search for money. They just look for research. They just want to know how this, our world, lives and works.

I believe these people are a big, very big, part of this Low Frequency world. I'm sure they could be a very important example for the young researchers in the INSPIRE Project, too.

Most of you know about the people who created INSPIRE and the other who usually write in this Journal and other newsletters dedicated to this radio range. They are very well known in the world-wide community.

This time I will take the opportunity to talk about a wonderful man who has done a very important job in this range. A man who has worked in the VLF/ULF range for most of his life: from 1959 as a contractor for the NASA Space Program until the first MARS VIKING Mission in 1975. Even a brief summary of his earlier space work would include the Gemini, Mercury, Apollo, Apollo-Soyuz and Viking projects! What a lot of experience! He has served in such very quiet sites as Ascension Island, a place where you can do VLF research with almost no background noise. Being very capable with electronics, he was (and is still) able to build for himself the devices he needs. As you can understand he's able to accomplish the good kind of design and handling with the very high knowledge of the theoretic side of the range.

Probably, at this point, you are wondering who ever he will be. His name is Mr Jim Stoughton, living in Seattle, WA. Does anybody know him? Dan Levit has written about him some times in his column dedicated to the Natural Radio Phenomena in "The Lowdown" newsletter (produced by the Long Wave Club of America). Very unfortunately the hard noise in Seattle does not permit any kind of VLF activity to Jim, though he is still very active producing interesting devices, useful for "our" research.

Back in '59 he was in Grand Bahamas, serving all nights from 0000 to 0800 in the morning at the big high power transmitter site. First at the Grand Bahamas GBI-03 transmitter site, then he became site RF system chief, and was responsible for all logistics, personnel training and Missions Operations of three different sites: radio transmitters/receivers, Apollo EME and Command Control/Destruct range safety site. Grand Bahamas Islands being one of the great thunderstorm sites in the world, he also did much research on lightning as well as VLF work. His job was as an RCA International worker, a second contractor for NASA.

He reports about the wonderful Ascension Island time: a paradise for VLF and also for sun and sea lovers. (They had to stay very alert for the big fish going around, also near the beach.) So the time there is not just for research, though not so easy, so far away from anything. In Ascension, Jim could track also some interesting phenomena such as missile re-entries coming into the atmosphere from space at great velocities. After some Columbia University VLF scientists came there to investigate about distant missile lift-off signatures left in the atmosphere, Jim built his own gear and indeed verified disturbances in the VLF range. Maybe you remember a similar research made by some USA scientists headed by Dr Jack Dea in San Diego, in the 80's. This is a very interesting research which probably started in the '60s from an idea of an Italian researcher, Dr. Mario Grossi, who lives in the USA and actually works at Harvard University:

The space vehicle reentry signs can be detected in the radio spectrum below 15 Hz, so this requires an important antenna system, very accurate. Possibly you have to invest many hours to get the best from the system. This is what one friend of mine and me have done last winter, though we could not go down below 14/15 kHz. We need more turns. Many more turns. Of course we have faced some problems connected with hum-noise, also the computer noise. In a professional lab, here in Firenze, we are trying to get closer to those frequencies, thanks to important collaborations. I'll keep you posted.

As you can understand also in these few words, Jim's life has been really fascinating. In the present days he is still well involved in the VLF radio range and from Seattle he is in tune with some people involved in this side of radio science. His NATURAL RADIO LAB, which is located just at his home, is able to build fascinating analog devices such as

- Rhiometer (very able to detect space VLF radio waves);
- T-Storm/Solar activity monitor;
- Simple spheric/T-Storm monitor;
- Combo photon/IR level meter;
- Volt auto electrical system Analyzer,

just to list a few. I have purchased these items and they just arrived at my home. As soon as possible I'll begin to work them and let you know how they work. I am sure these devices will be perfect. One more of Jim's devices is a GRAVITY WAVE DETECTOR: it will be the next for me.

All of these are items will let us understand a little bit more of the secrets of our Earth and the atmosphere surrounding all of us. Jim's instruments give us a way to investigate our physical world in more depth. They give us a way to understand, by our field sessions, how the Earth lives and works and which kind of research could be more useful for our minds.

These kinds of instruments are a real dream come true for a curious spirit like mine (and I'm sure like yours). People involved in a field research such as VLF/ULF radio waves have to be interested in all the kind of scientific research, especially if connected to very low frequency radio waves. God only knows how many there are.

I think Jim has a wonderful way to spend the "autumn years of life", as Jim called his time now. Ham people have to continue to try not to become just push-button men, like some I know, in these lazy years. Here in Europe, and probably in the USA too, many hams (and not only hams) are becoming lazier and lazier, like people only TV watching. They prefer to look at television (sometimes not understanding and not seeing, too), avoiding letting the brain work on some problems incidental to radio waves propagation, or building devices, or any other kind of design and work.

This is probably not a good way to go in to the future and the young people should be warned about this risk, for their future life. The same risk is very present for the older people, who probably should stay well in tune with the new and old things, if they continue to use their mind. In this way we'll enter in the future in a better shape, not only for our body!

The very wonderful world we can experienced in these years is not enough. We have to catch the many opportunities we see in front of us. We have to keep our eyes very open so we don't spoil all these opportunities. In a time rich with important and brand new items we are risking not profiting from these opportunities while driving our brains in a closed road.

Jim Stoughton gives us a hand. We should be awake enough to take it.

# INTMINS OBSERVERS

## Roster Update

The following is a roster of INTMINS observers including first-time observers. Team number assignments are permanent and will be used to refer to teams in the future.

North American observers:

| Team # | Observer | Location |
|---|---|---|
| 1 | John Lamb, Jr.<br>East Texas State University (Retired) | Belton, TX |
| 2 | Stephen G. Davis | Fort Edwards, NY |
| 3 | Don Shockey | Oklahoma City, OK |
| 4 | Mike Aiello | Croton, NY |
| 5 | Jean-Claude Touzin | St. Vital, QC, CANADA |
| 6 | Bill Pine<br>Chaffey High School | Ontario, CA |
| 7 | Dean Knight<br>Sonoma Valley High School | Sonoma, CA |
| 8 | Mike Dormann | Seattle, WA |
| 9 | Robert Moloch<br>Eastern Elementary School | Greentown, IN |
| 10 | Bill Taylor<br>INSPIRE | Washington, DC |
| 11 | Mark Mueller<br>Brown Deer High School | Brown Deer, WI |
| 12 | Jon Wallace | Litchfield, CT |
| 13 | Bill Combs | Crawfordsville, IN |
| 14 | John Barry<br>Seeger High School | West Lebanon, IN |
| 15 | Robert Bennett | Las Cruces, NM |
| 16 | Leonard Marraccini | Finleyville, PA |
| 17 | Kent Gardner | Fullerton, CA |
| 18. | David Jones | Columbus, GA |
| 19. | Larry Kramer / Clifton Lasky | Fresno, CA |
| 20. | Barry S. Riehle<br>Turpin High School | Cincinnati, OH |
| 21. | Phil Hartzell | Aurora, NE |

## European observers:

| Team # | Observer | Location |
|---|---|---|
| E1 | Flavio Gori | Florence, IT |
| E2 | Silvio Bernocco | Vaccera, IT |
| E3 | Fabio Courmoz | Aosta, IT |
| E4 | Joe Banks | London, UK |
| E5 | Renato Romero | Cumiana, IT |
| E6 | Marco Ibridi | Finale E., IT |
| E7 | Alessandro Arrighi | Firenze, IT |
| E8 | Zeljko Andreic<br>Rudjer Boskovic Institute | Zagreb, Croatia |
| E9. | Dr. Valery Korepanov<br>Lviv Center of Institute of Space Research of NASU | Lviv, UKRAINE |

## Additions to the roster of INTMINS Observers:

New INTMINS teams, with their permanent team numbers and descriptions are shown below. INTMINS observers are described in the following format:

X. (team number) Name of observer — Location

Team Name

| | |
|---|---|
| Longitude: | of observation site |
| Latitude: | of observation site |

Description of observation site

| | |
|---|---|
| Receiver: | description of receiver used |
| Recorder: | description of recorder used |
| Antenna: | antenna type and description |
| WWV: | WWV radio used (if any) |
| File code: | used for naming data files for storage |

## North American Teams:

22. Rick Campbell — Brighton, MI

| | |
|---|---|
| Longitude: | 83° 50' 2.7" W |
| Latitude: | 42° 16' 43.7" N |

Open field near golf course

| | |
|---|---|
| Receiver: | Homebrew RS4 |
| Recorder: | Radio Shack 14-1158 |
| Antenna: | 6' whip |
| WWV: | Radio Shack DX-440 |
| File code: | CAMPBELL MI |

23. Jim Ericson — Glacier, WA

| | |
|---|---|
| Longitude: | 121° 57.91' W |
| Latitude: | 48° 53.57' N |
| Receiver: | WR-3 |
| Recorder: | Sony DAT Portable (TCD-D7) |
| Antenna: | 50' horizontal wire extended up 30' |
| WWV: | Radio Shack Time-Weather Cube |
| File code: | ERICSON WA |

24. Paul DeVoe — Redlands, CA

Redlands High School

| | |
|---|---|
| Longitude: | 116° 52' W |
| Latitude: | 34° 10' N |
| Jenks Lake | |
| Receiver: | INSPIRE RS4 |
| Recorder: | |
| Antenna: | whip |
| WWV: | |
| File code: | DEVOE CA |

## European teams:

E10. Sarah Dunkin — London, England

University College London

| | |
|---|---|
| Longitude: | 0° 02' E |
| Latitude: | 51° 40' N |
| Cleared area on edge of forest. | |
| Receiver: | INSPIRE RS4 |
| Recorder: | Mono recorder |
| Antenna: | 4 meter wire |
| WWV: | |
| File code: | DUNKIN UK |

# INTMINS - April/97 Data Analysis Report

by Bill Pine
Chaffey High School
Ontario, CA

The April/97 INTMINS observations marked the fifth session in an ongoing series of operations conducted with the cooperation and assistance of the Russian Space Agency (IKI) and ENERGIA, the Russian space engineering organization. INTMINS is an attempt to detect manmade VLF radio waves emitted by instruments on the MIR Space Station.

## INTMINS Status Report

After analyzing data tapes for the latest INTMINS operations, the 1 kHz signal from ISTOCHNIK still has not been detected. The current plan is to continue the twice-annual observing sessions as we have done in the past.

Occasionally we get telemetry reports from MIR which indicate when the instruments operate to allow us to see if they operated and if the operation was on schedule. Telemetry from the April operations indicates that ARIEL operated as scheduled. ISTOCHNIK, however, did not operates for passes 26-1, 26-2, 26-3, 26-4, 26-5 and 27-2.

There has been a very positive result from our efforts and it is obvious to the data analyst: without exception every observer is getting better and better at all aspects of the procedure. This cannot help but increase the odds of detection at some later date.

## Data Analysis Procedure

The data analysis procedure used this time consisted of the following:

1. A sound file was created of the 2-minute period of ISTOCHNIK operation.

2. A spectrogram image was made of this file using a frequency range of 0-11.025 kilohertz. The 1 kilohertz region of the spectrogram was examined for the 10 seconds on, 10 seconds off signal from ISTOCHNIK.

3. A one-minute portion of the file was cropped, enlarged and an image made. Again the 1 kilohertz region of the spectrograph was examined.

4. Finally, a 30-second portion was cropped, enlarged and an image made. A final examination of the 1 kilohertz region was made.

5. Additional sound files and spectrogram images were made of items of interest noted in the logs.

**INTMINS-April/97 Opertions Summary**

(NOTE: All times are UT on the date indicated.)

European Passes

| Pass | ISTOCHNIK Start Time | Path during ISTOCHNIK Firing | Number of Observers Recording Data |
|---|---|---|---|
| E20-4 | 1340 | Northern Italy | 2 |
| E20-5 | 1520 | Russia, South of Moscow | 1 |
| E20-6 | 1650 | Southern England | 2 |
| E28-1 | 1040 | Northern Italy | 4 |
| E28-2 | 1221 | Russia, South of Moscow | 2 |
| E28-3 | 1350 | Southern England | 2 |

North American Passes

| Pass | ISTOCHNIK Start Time | Path during ISTOCHNIK Firing | Number of Observers Recording Data |
|---|---|---|---|
| 19-1 | 0059 | Quebec | 3 |
| 19-2 | 0234 | MN, WI, MI | 3 |
| 19-3 | 0405 | WA, OR | 2 |
| 19-4 | 1912 | VA, DC, MD, DE | 0 |
| 19-5 | 2353 | WA | 1 |
| 20-1 | 0135 | MN, WI, MI | 2 |
| 20-2 | 0312 | NE, KS, OK, AR | 4 |
| 20-3 | 0443 | No. CA, So. NV | 4 |
| 20-7 | 1812 | East of NC, VA and DC | 0 |
| 20-8 | 1943 | Sw. TX, OK | 4 |
| 20-9 | 2117 | So. CA, NV | 5 |
| 26-1 | 0035 | MS, AL, GA | 2 |
| 26-2 | 0208 | Se. AZ, NM, So. central TX | 1 |
| 26-3 | 1705 | So. TX, LA, AR | 3 |
| 26-4 | 1838 | So. CA, NV, So. UT | 3 |
| 26-5 | 2023 | Quebec | 3 |
| 26-6 | 2335 | IA, IL, IN | 1 |
| 27-1 | 1612 | VA, DC, MD, DE | 1 |
| 27-2 | 1746 | So. MN, WI, No. MI | 0 |

Summary of European Passes Recorded

| Team/Pass | E20-4 | E20-5 | E20-6 | E28-1 | E28-2 | E28-3 |
|---|---|---|---|---|---|---|
| E2 | x | | | x | | |
| E3 | | | | | x | |
| E5 | x | x | x | x | | x |
| E6 | | | | x | | |
| E10 | | | x | x | x | x |

## Summary of North American Passes Recorded

| Pass | 4/19 | | | | | 4/20 | | | | | | 4/26 | | | | | | 4/27 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Team | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 |
| 1 | | | | | | | | | | x | | | | x | | | | | |
| 3 | | | | | | | x | | | x | | | | | | | | | |
| 5 | x | | | | | | | | | | | | | | | x | | | |
| 6 | | | | | | | | x | | | x | | | | x | | | | |
| 7 | | | | | | | | x | | | x | | | | | | | | |
| 8 | | | x | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | x | | |
| 13 | | | | | | | x | | | | | | | x | | | | | |
| 15 | x | x | x | | | x | x | x | | x | | x | x | x | | x | | | |
| 16 | | | | | | | | | | | | | | | | x | | x | |
| 18 | | | | | | | | | | | | x | | | | | | | |
| 19 | | | | | | | | x | | | x | | | | | | | | |
| 21 | | x | | | | | x | | | x | | | | | | | | | |
| 22 | x | x | | | | x | | | | | | | | | | | | | |
| 23 | | | | | x | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | x | | | | x | | | | |