Preliminary Seismic Survey of the Livingston LIGO Site

Warren Johnson,
Department of Physics and Astronomy, Louisiana State University, Baton Rouge, LA, 70803

Donald Stevenson, and Kyle Clevenger,
Louisiana Geological Survey, Louisiana State University, Baton Rouge, LA, 70803

Contents

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Introduction

A major consideration in the siting of a Laser Interferometer Gravitational Observatory (or LIGO) is the amount of ground motion that the isolation system must contend with. We were charged with with making a preliminary survey of the normal ground motion at several locations in or near Livingston Parish Louisiana. The major data collected were vertical and horizontal ground motion spectral densities in the region of 1 to 100 Hz.

Experimental Procedures

This section concentrates on details of the measurements, so that the site evaluators can attempt to determine the systematic differences, if any, between this survey and others.

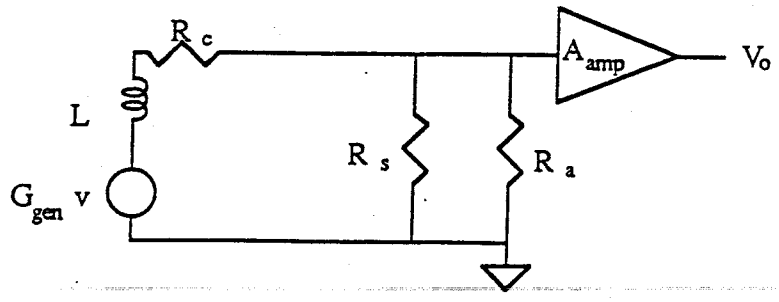
Seismometers and Amplifiers

All data presented in this report were taken with two identical high sensitivity seismometers made by Teledyne Geotech (model S-13). They have proof-masses $\mathbf{M} = 5.00$ kg and a nominal natural period of 1.0 sec. [A symbol will be shown in bold type the first time it is used.] The design allows for either vertical or horizontal orientation, depending on how internal mechanical connections are made; one was set up for each orientation.

The seismometers have velocity sensors, consisting of a sensor coil attached to the framework of the device and a permanent magnet attached to the proof-mass. The manufacturer's calibration sheets state that this combination has a generator constant $\mathbf{G_{gen}} = 629$ volt.sec/cm and an output resistance of $\mathbf{R_c} = 3700\ \Omega$. These instruments were bought about one year ago and had not yet seen any field use, so we were inclined to believe that the calibrations were still very good.

The coil output was attached, by shielded twisted pair about 10 feet long, to the input of a Geotech seismic sensor amplifier, model 42.50, which was battery powered and inside a sealed metal box. These amplifiers have low- and high-frequency cutoff filters, which were set to 0.2 and 100 Hz respectively during all measurements. The lowest gain setting was potentially too large to keep the output within a convenient range for the data acquisition instruments, so the gain of an intermediate stage within the each amplifier was reduced, following the manufacturer's advice, by 40 dB. The voltage gain $\mathbf{A_{amp}(f)}$ was then checked, using a sine wave generator and a signal analyzer (FFT); over the range f = 1 to 90 Hz, it was found to be about 0.9 +- 0.2 dB greater than the nominal gain (= GainSetting-40 dB). Above 60 Hz the rolloff of the high-cut filter became detectable. The nominal gain for most of the calibration measurements was 44 dB, and for all the field measurements it was 56 dB.

The equivalent circuit for the sensor-amplifier combination is



Most of the damping of the proof-mass is provided by the net input resistance of the amplifier. The bare input resistance $\mathbf{R_a}$ = 20 kΩ of the amplifier is reduced by a shunting damping resistor $\mathbf{R_s}$ placed on the amplifier circuit board. Thus the net input resistance is $\mathbf{R_{in}} = (R_a^{-1}+R_s^{-1})^{-1}$. The shunting resistor R_s was chosen to be 7400 Ω, the value calculated to make the net damping coefficient **h** = 0.70 of critical. The net input resistance was checked, with an impedance bridge, to have the value 5450 kΩ, in good agreement with expectation. This causes the input voltage to the amplifier to be smaller, by the factor $\mathbf{A_{div}} = R_{in}/(R_{in} + R_c)$, than the voltage $G_{gen}v$ generated by the velocity. The coil inductance L, estimated at 5 Henries, is too small to have an effect at these frequencies.

Vertical Calibration

The calibration procedure used the manufacturer's calibration coil, which is a second coil mounted on the framework and inside another magnet attached to the proof-mass. We put known sinusoidal currents through the vertical seismometer's calibration coil, using a voltage $\mathbf{V_{gen}}$ in series with a net resistance $\mathbf{R_{cal}}$. We can then calculate the resulting force from the manufacturer's value for the coil-magnet motor constant $\mathbf{G_{mot}}$ = 0.1975 Newton/Amp. If the proof-mass were a free mass, then the magnitude of its velocity v(f) would be $\mathbf{v_{fm}}(f)$

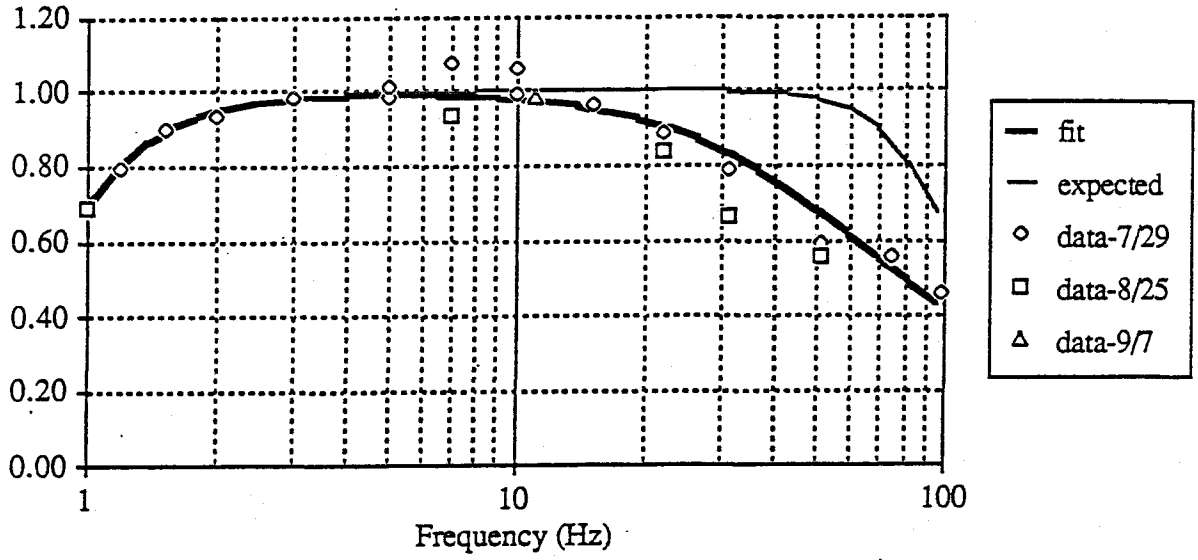
$$v_{fm}(f) \equiv \frac{G_{mot}\left(\frac{V_{gen}}{R_{cal}}\right)}{2\pi f M} \qquad (1)$$

and the amplifier output voltage $\mathbf{V_o}$ will be

$$V_o(f) = A_{amp}\, A_{div}\, G_{gen}\, v(f) \qquad (2)$$

We inferred the measured output velocity v(f) of the vertical seismometer using eq. (2), divided by the free mass value from eq. (1), and obtained the following results:

calibration data for the vertical S-13 seismometer:
ratio of (measured velocity)/(free mass velocity)



The ratio is not 1, for f < 2 Hz, because the velocity response of the proof-mass is influenced by the damped harmonic resonance. Solving the equation of a motion for a simple damped harmonic oscillator, we find that the true velocity v(f) is expected to become

$$v(f) = H_{do}(f)\, v_{fm}(f) \equiv \frac{v_{fm}(f)}{\sqrt{\left(1 - (f_r/f)^2\right)^2 + \left(2h(f_r/f)\right)^2}} \qquad (3)$$

where f_r and **h** are the the resonance frequency and damping coefficient of the harmonic oscillator and $H_{do}(f)$ is the response function of the damped oscillator, relative to a free mass. Replacing eq. (1) with this expression, and also using the measured frequency dependent gain $A_{amp}(f)$, changes the response to the "expected" line in the graph above. The resonance frequency and damping coefficient were allowed to vary, and a good fit to the low frequency data was obtained with $f_r = 0.97$ Hz and h = 0.72, in good agreement with the manufacturer's values.

The equations above describe the response to a force applied directly to the proof-mass. We

were surprised to discover that the response to the ground velocity is essentially identical, requiring only that the ground velocity $v_{gr}(f)$ be substituted for $v_{fm}(f)$ in combining eqs. (2) and (3).

$$v_{fm}(f) \dashrightarrow v_{gr}(f) \qquad (4)$$

This can be shown from the equations of motion, where v(f) becomes the velocity difference between the ground and the proof mass.

The expected and measured values are in excellent agreement below about 30 Hz, which means that the amplifier response and the sensor coil parameters are completely consistent with the calibration coil parameters. One calibration point was taken in the field (9/7) on each seismometer to verify that the lab calibration was still valid. We therefore are confident of the correctness of the instrument response below 30 Hz.

Above 30 Hz there is a deficiency in the vertical response that grows with frequency. The true cause for this deficiency is unknown. Talking to the service personnel at Geotech was not helpful. At one time we had thought that it was due to the sensor coil inductance causing an enhanced voltage divider effect, but this explanation fails quantitatively : the inductance is too small by an order of magnitude. We conjecture that there is some connection to the much greater deviation found when the seismometer is used in the horizontal configuration.

We have chosen to take the calibration procedure at face value, and so have altered the instrument response function by multiplying it by a single pole hi frequency rolloff function $H_{hi}(f)$:

$$H_{do}(f) \longrightarrow H_{do}(f)\, H_{hi}(f) \equiv \frac{H_{do}(f)}{\sqrt{1 + (f/f_{hi})^2}} \qquad (5)$$

where $f_{hi} = 46$ Hz provides a reasonable fit. (The correction for the amplifier rolloff was not included because it made the fit worse.) This is shown in the graph above as the line labeled "fit". Of course, to correct the measured voltages, we divided them by this combined response function to give the best estimate of the true ground velocity. This correction increases the reported values for motion above 30 Hz by at most a factor of 2 at 100 Hz.

Horizontal Calibration

The horizontal seismometer was calibrated by comparison with the vertical seismometer. Each instrument had its calibration coil excited by a pseudorandom voltage source with a uniform spectral density between 0.25 and 100 Hz. Thus the applied force spectral density is also uniform. The resulting voltage spectra are in the Appendix : Calibration Spectra.

Below 30 Hz, the two spectra are very close, as expected. Compare particularly the spectra labeled #7 and #4 of 29 July . Above 30 Hz, the spectra become quite different. The horizontal seismometer response has a zero at about 46 Hz and a narrow pole at about 71 Hz. This was quite unexpected.

There is a well known cause for a zero-pole pair in this sequence : a second mass "attached" by a spring to the proof mass. [see H.K.P. Neubert, Instrument Transducers, 2nd ed., sec. 4.1.2.6(b).] After finding the zero-pole in the response, we went looking for such a resonator. With the cover removed, we could see nothing visible that was a likely candidate for the attached resonator. We removed some small flexure hinges that had remained attached to the proof mass after conversion to horizontal operation, but this made no difference. Further attempts to find the resonator would have required serious disassembly, with a risk of damage to the motion constraint system, so we are not now able to assign a definite cause for the unexpected response above 30 Hz.

We have included the horizontal data up to 100 Hz, but we have treated them exactly the same as the vertical data and have made no additional correction above 30 Hz.

Added in proof: We have a hypothesis for the cause for the unexpected horizontal response: compliant mounting of either the sensor magnet and/or the calibration magnet. The large frequency separation between the zero and the pole must indicate that the "attached" mass is a significant fraction of the total proof-mass; the magnets are good candidates for this attached mass. The difference between the vertical and horizontal responses might be explained by supposing that in the vertical orientation the compliant mounting deflects enough so that the magnet rests against a stop, which significantly increases the rigidity of the connection to the proof-mass, thus shifting the zero and pole above 100 Hz. The unexpected rolloff in the vertical response may be the precursor of the shifted zero.

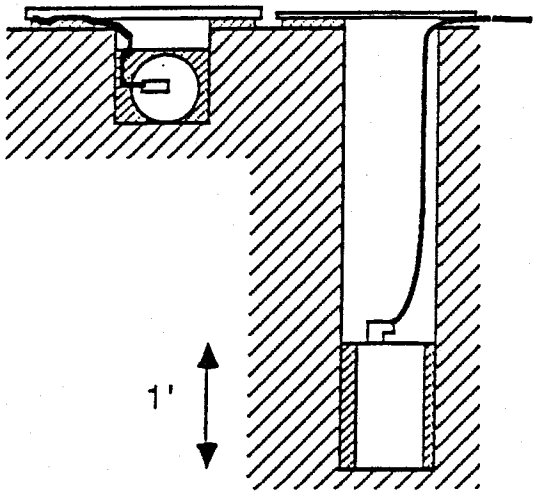
Further work will be required to verify this hypothesis and determine if the horizontal data can be reliably corrected above 30 Hz. Our guess is that the calibration magnet and sensor magnet are rigidly connected to each other and compliantly connected to the rest of the proof mass, and that the true horizontal response to ground motion is closer to the vertical response than is indicated by the spectra in the appendix.

Noise Floor of the Measurements

The noise floor of the instruments was apparently not reached during any of the ground noise measurements. We evaluated it by locking the proof-mass and measuring the output noise of the amplifier. This was not really satisfactory in the laboratory, where it was easy to see many peaks at the vibration frequencies of nearby machinery. In the field, the ground was much quieter, and a spectrum was taken with the mass locked (see Appendix : Calibration Data). It was found to be nearly the same as the spectrum when the sensor coil was detached from the amplifier, shown as AMPNOISE in figure 26B of Appendix : Ground Noise Spectra. This is a reasonable indication of the displacement noise floor for the vertical seismometer at all frequencies and the horizontal seismometer below 30 Hz.

Ground Placement

All placements of the seismometers in the ground were the same. A hydraulic-motor driven auger, 9" in diameter, was used to dig holes in the sandy clay soil. The seismometers, cylinders 6.5" dia by 12" long were arranged as shown:



The depth of both units was determined by the necessity to level them to within 4 degrees of the nominal orientation. Soil was packed around them till it was firm to the hand. The cable was buried in soil for 8"-12" after it emerged from the hole. A piece of plywood covered each hole, flush with the surrounding ground. Scratching the cable outside the hole produced no visible microphonics.

Data Acquisition : special problems

Data acquisition for this kind of seismic survey presented some special problems : electric power, and protection of the instruments.

The normal field methods for seismic data acquisition are not concerned with quantifying the natural ground noise, instead they are designed for event detection. In particular, we do not know much about dynamic range and noise properties of the radio data transmission links that we use for remote seismic stations. We decided that systematic uncertainties could be large, unless we used laboratory electronics whose characteristics are well understood.

One disadvantage of such instruments is that they require considerable electric power : up to 700 watts AC for our lab instruments . They also require more protection from the heat and rain. We therefore rented a small recreational vehicle to carry the electronics. It had a high capacity AC generator powered by a gasoline engine (30 A at 115 V) that we used to intermittently power an air conditioner and a recharger for six marine batteries. The battery power was converted to AC and regulated by a Sola uninterruptable power supply (UPS).

We took three precautions against generating ground noise. The vehicle was parked 100-130 yards from the seismometers and amplifiers, and connected to them by shielded cable of this length. During measurements, we remained inside seated and nearly unmoving. The (audibly noisy) generator was turned off during measurement sessions (which typically lasted 30-40 minutes), except for a few recordings to gauge the effect of the generator. During measurements it was quiet inside the vehicle, but not completely silent, due to instrument fans and the buzz of the inverter on the UPS.

Data Acquisition: instruments

The primary data acquisition instrument was a high quality digital signal analyzer (HP 3561A) which was directly connected by a 130 yard cable to the output of either amplifier. This analyzer is well calibrated throughout the frequency range, and has a large dynamic range (14 bits or 87 dB). The data were acquired as 5-40 record averages of the power spectrum; they spanned either 0-100 Hz or 0-40 Hz. Each spectrum was then transferred to computer disk for storage. The first letter of the disk filename indicates the day the data was taken, and the following numbers indicate the hour and minute of Central Daylight Time when that average was started. This analyzer records only one input signal at a time, so the vertical and horizontal seismometer data were acquired sequentially.

As a backup system, we used a Honeywell 1" tape recorder, connected in parallel with the analyzer, which continuously recorded both seismometers during the measurement sessions. Analog-

to-fm converters were used so that the dynamic range of the recording should be about 55 dB. We have not looked at any of this data because the analyzer acquired data has given a reasonably consistent picture. This tape is being kept as an archive, if any further analysis is desired.

Locations and Times

Measurements were recorded on disk at five locations on the forested tract of land in Livingston Parish owned by Cavenham Forest Industries. On the following page is a marked copy of the USGS quad map (Satsuma, LA) that locates these sites.

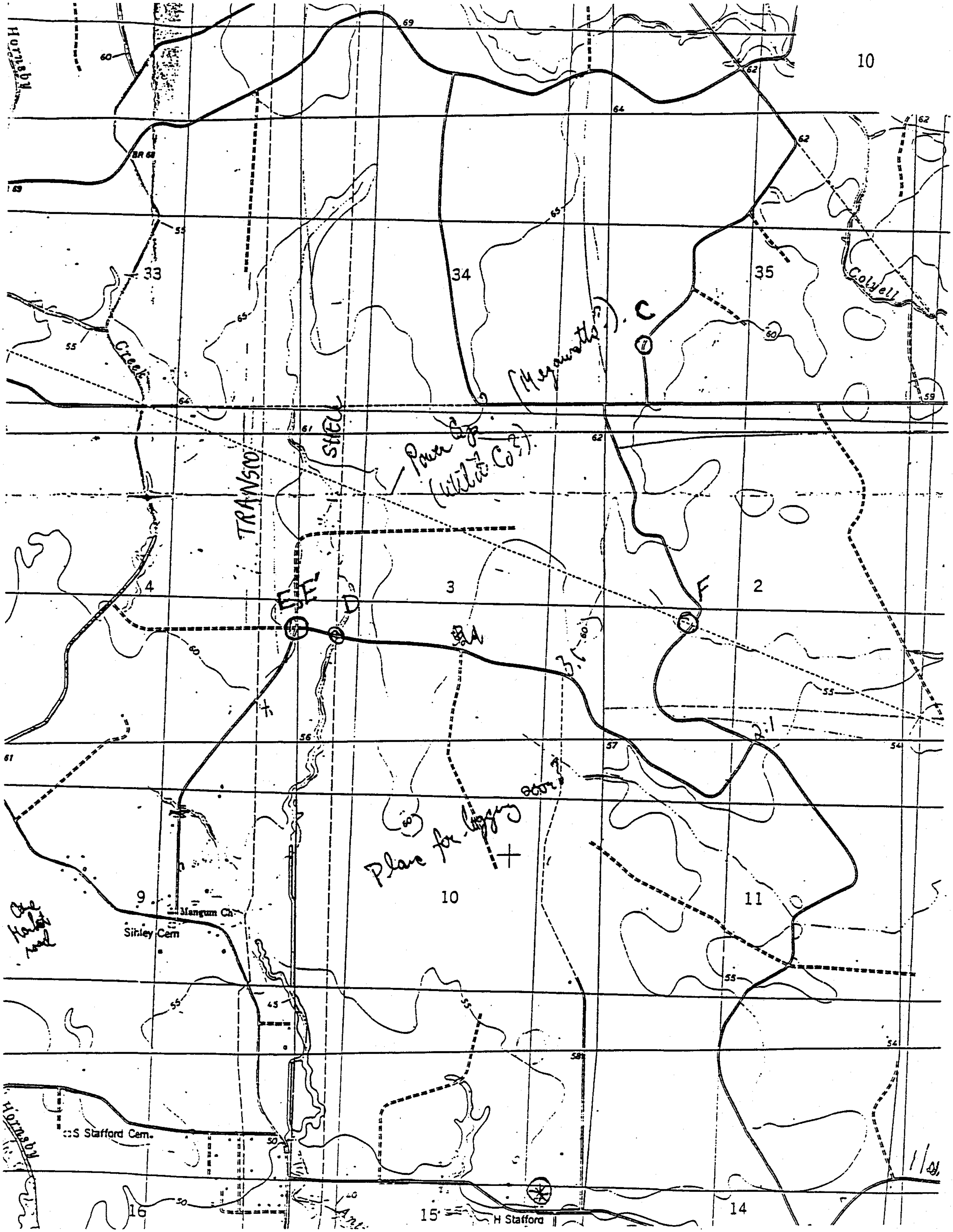
August 31

Sites A & B : two locations within 50 yards of the Livingston (Fire) Lookout Tower. This was a dry run, done without the computer, so data could not be converted to displacements or corrected for instrument response. The raw data plots are not included in this report.

September 7 (Data filenames start with T)

Site C : a site where the trees were set back perhaps 40' from the gravel road, so that the seismometers could be out in the open, away from tree roots. It is about 1600 meters east of the eastern pipeline right-of-way and about 1300 meters north of the power line. The subjective wind speed was "moderate", meaning some breeze could be felt near the ground, and there was modest movement at the tops of the trees, but not of the lower branches. The wind speed recorded at the Livingston Fire Tower was 4 mph at 13:30, and 3 mph at 15:15. Data was collected from 17:15 to 17:40 Central Daylight Time.

Site D : a site on the east pipeline right-of-way, which is owned by Shell. This right-of-way was supposed to have a CO_2 pipeline on the west side and a 48" dia Shell crude oil pipeline 30' or 40' east in the middle of the right-of-way. When we looked closely, we found signs indicating a third pipeline another 40' east of the crude oil line. The crude oil pipeline was operating at a normal flow rate. The seismometers were placed 15' west of the CO_2 pipeline or about 45' to 55' west of the crude oil line, and about 20' east of the tree line. The horizontal seismometer axis was E-W, or perpendicular to the N-S pipelines. The subjective wind speed was "calm", meaning no perceptible breeze at ground level and no visible movement of the tops of the trees. Data collected from 19:59 to 20:37.


Hornsby
69
64
62
BR 68
33
34
35
Colyell
Creek
C
TRANSCO
SHELL
4
3
2
D
F
9
10
11
Mangum Ch
Sibley Cem
S Stafford Cem.
H Stafford
16
15
14

September 8 (Data filenames start with U)

Site D again. The crude oil pipeline was off. A few cows walked by about 100' from the seismometers, during the first 15-20 minutes of data collection. Subjective wind speed was "strong", because the lower tree branches were occasionally moving several feet. Data collected from 10:26 to 11:13.

Site E : two hundred meters west of site D, where the two gravel roads cross, which put it half way to the other pipeline right-of-way. The seismometers were under the branches of a pine tree, about 10' from its trunk. Horizontal axis was E-W. Subjective wind still "strong". Fire tower recorded wind velocity as 5 mph at 13:30. Data was collected from 13:03 to 13:39. The crude oil pipeline was still off.

Site E' : across the road from site E, which got the seismometers out from under the trees, about 20' away from the nearest one. Subjective wind was down slightly. Data was collected on tape from 14:51 to 15:13, computer data till 15:34. The pipeline log shows that flow was stopped at 6:30 and reestablished at 15:05 (about three hours later than we had been told). An operator estimated it might typically take 5-10 minutes for flow to be reestablished.

Site F : directly under the power lines, which makes it about 40' to the tree line. This site is 1800 meters east of the Shell pipeline. The recreational vehicle was closer to the seismometers, perhaps 60 yards away. Subjective wind "calm". Data from 17:17 to 17:35.

Measurements were also made on the Idlewild Plantation (farm), an LSU agricultural research station and the site of the defunct LSU optical observatory. This is about 2 miles SE of Clinton LA. According to soil experts on the Louisiana Geological Survey, the soil there is looser and more sandy than near Livingston, with a deeper water table; perhaps the ground noise would be different. This area is also about three times farther from Interstate 10 than the Livingston area.

September 9 (Data filenames start with V)

Site G : in an open field at the Idlewild farm, about 1/2 mile north of the observatory, using the usual ground placement. The subjective wind was "very strong", strong enough to gently rock the recreational vehicle. It was sunny and clear, but a hurricane was some hundreds of miles south and heading towards us; it arrived the next day as an ordinary rain storm. (The Livingston fire tower, about 20 miles SE of here, recorded 6 mph at 13:20, not consistent with our subjective impression. The reason is unknown.) Data were collected from 10:24 to 10:58.

September 14 (Data filenames start with W)

Site H : at the defunct optical observatory at Idlewild. A small pickup truck carried the equipment, and the tape recorder was not brought. The truck was parked about 100 yards from the building. Subjective wind was "light and variable". The first set of data were taken on top of the 8' dia concrete pier that had supported the telescope. This location is about 12' above ground level. The data were taken from 15:45 to 16:31. Then the seismometers were moved to ground level, and placed on the concrete slab next to the pier. Data were collected from 16:14 to 16:31.

Results

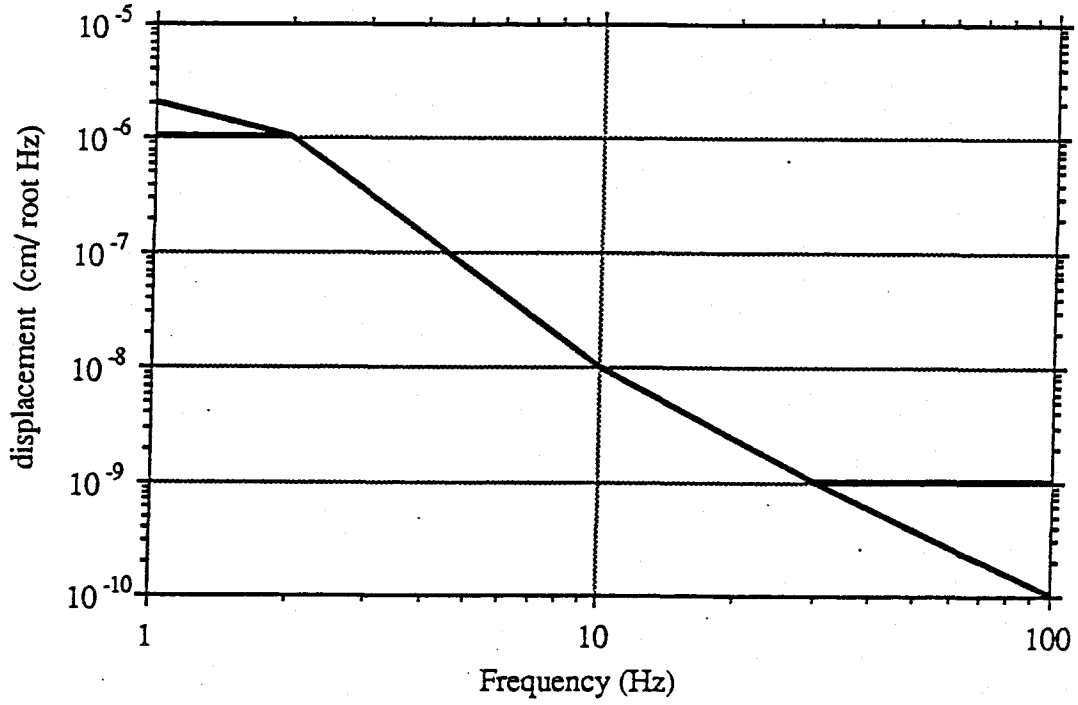
Typical Spectra

The raw spectrum of the amplifier output, as recorded, is proportional to a slightly distorted spectrum of the ground velocity. A typical one is shown on a following page.

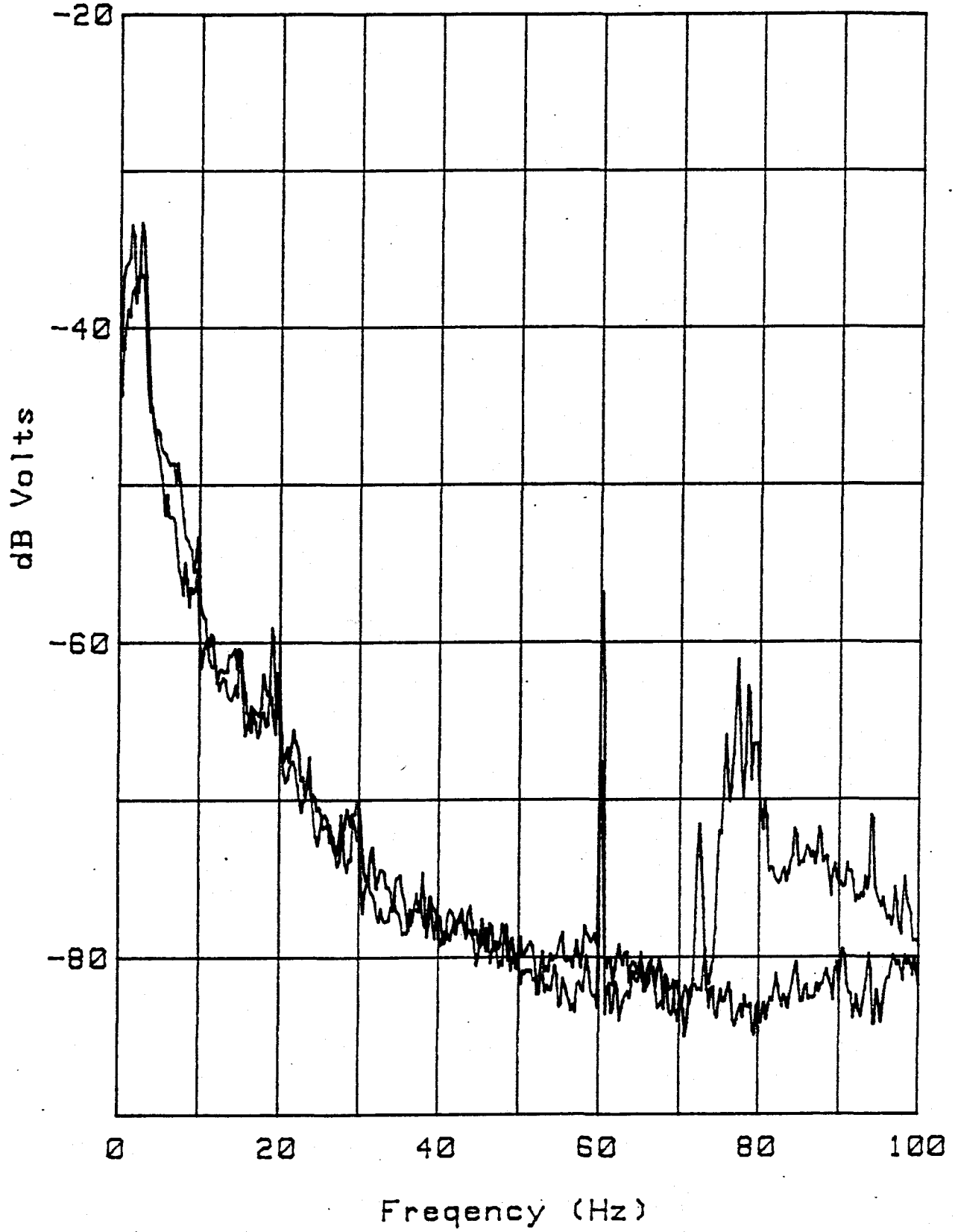
The distortions of the raw power spectrum were corrected by dividing each frequency bin by the frequency dependent instrument response and the noise bandwidth. We then converted this to a displacement spectrum and plotted its square root. The page following the raw spectrum shows this corrected and converted spectrum for the same data set.

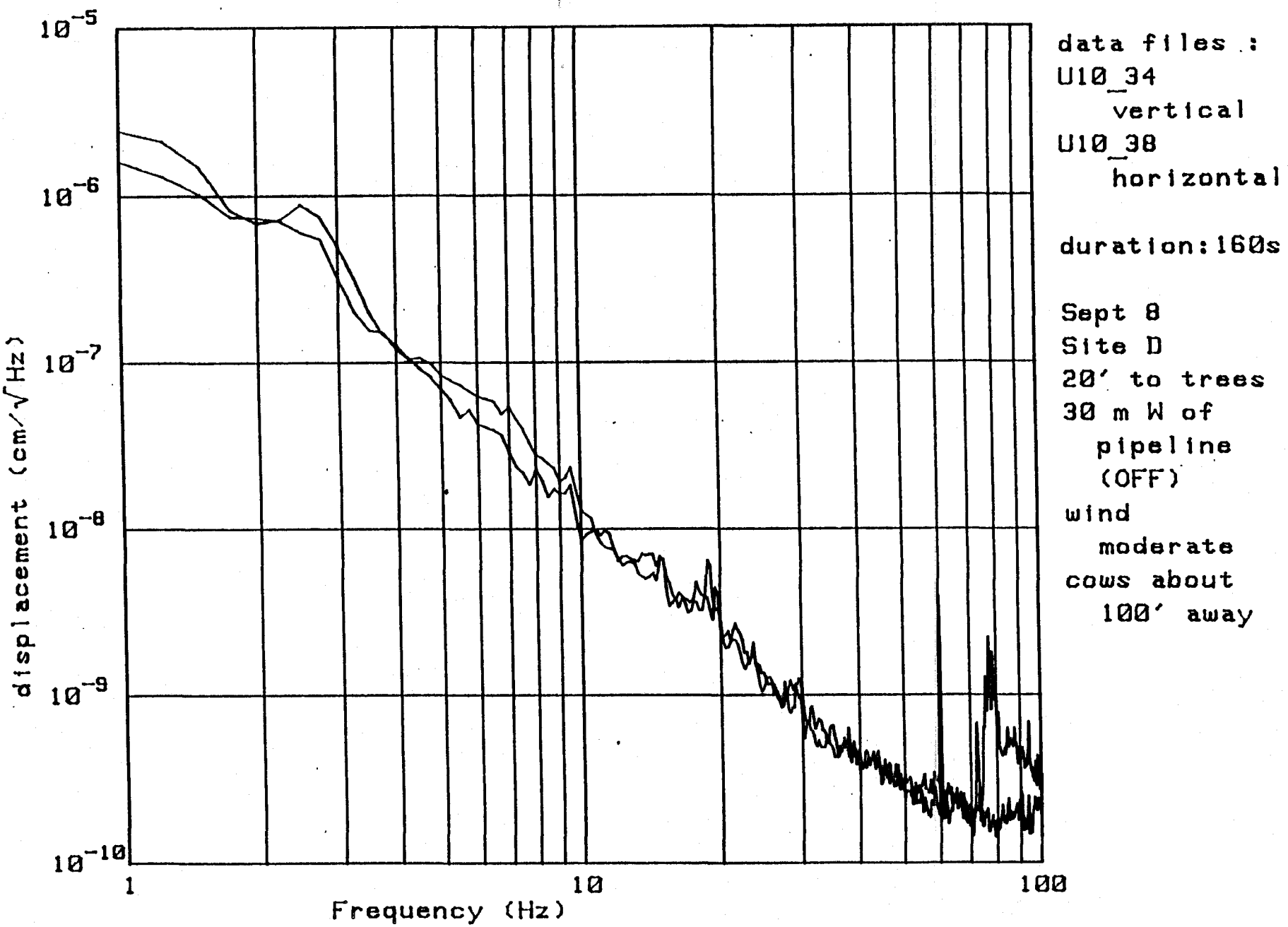
All of the data stored on disk appears among the 26 plots in the Appendix : Ground Noise Spectra.

Most of these ground noise spectra are fairly similar. We would summarize them with the following graph of the "typical spectrum" :



data files : U10_34 U10_38 duration: 160 s
vertical horizontal




10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
10^{-10}
displacement (cm/√Hz)
1
10
100
Frequency (Hz)
data files :
U10_34
vertical
U10_38
horizontal
duration:160s
Sept 8
Site D
20' to trees
30 m W of
pipeline
(OFF)
wind
moderate
cows about
100' away

There is a plateau between 1 and 2 Hz, at 1-2x10^{-6} cm/√Hz, then the displacement falls steeply, nearly two orders of magnitude per decade (a so-called $1/f^2$ displacement spectrum); in some plots that fall continues to nearly 1x10^{-10} cm/√Hz at 100 Hz, in others there are features that rise above 1x10^{-9} cm/√Hz above 30 Hz.

Variation

The ground noise below 30 Hz showed no obvious variation during a measurement session, except for the occasional passing truck (apparently farmers and hunters who have leases from Cavenham).

Above 30 Hz there were occasional strong variations in the noise. By observing the screen as the average accumulated, we believe the noise followed the $1/f^2$ behavior out to 100 Hz for the majority of the time, and that the spectra with higher noise were taken during short "episodes" of extra noise. We had the impression that these episodes should be attributed to very local sources, perhaps animals or farmers passing nearby but out of sight.

We are fairly certain that several of the larger noisy episodes are due to passing small airplanes. (See file T20_17 on graph 8B and file U15_30 on graph 17B). Watching the screen, these episodes were characterized by a single sharp peak in the spectrum that shifted frequency from one record to the next. On the raw average, this shows up as a 'rectangle' of overlapping peaks of noise centered near 80 Hz. This is consistent with time variable doppler shifts of the fundamental frequency of a small airplane (2500 rpm x 1min/60s x 2prop-blades/rev = 83 Hz). In one case we could hear the passing plane.

We have recently noticed an interesting fact about the noisy episodes visible in the ground noise spectra from Livingston : almost none of them appear in the horizontal spectra. It may be coincidence, but another hypothesis is : that most of the episodes are due to airborne sound, and that sound waves in air can not excite much horizontal ground motion, because the pressure forces they exert against level ground must be vertical. Since horizontal isolation is much more important for a LIGO than vertical isolation, this could indicate that the episodic noise is of less effect than the graphs seem to indicate.

Pipeline Noise

There are five or six large pipelines that cross the Cavenham tract. The data we collected indicates that one of them is a significant source of noise : the Shell crude oil line. The crude oil line

was (fortuitously) off for part of the data taking, so that we have data to isolate its effects. Some data were taken next to it when it was both on (graphs 6B-10B) and off (graphs 11B-12B). When the crude oil was flowing, the ground noise next to the pipeline increased by factors up to 30 for a band of frequencies centered near 7 Hz, but had no effect above 10 Hz. At a distance of 200 meters, the crude oil flow increased the noise by a factor of 10 in a narrower band at 7 Hz (see graphs 16B-17B). At a distance of 1800 meters its effects were undetectable. This is clearly a source of noise that one would like to avoid. More measurements will be needed to be certain how close one can be and not see this source.

When the crude oil line is off, the spectra near the other pipelines resembled spectra far away from them. We conclude that the other pipelines, which are gas pipelines, were not a significant source of noise.

Wind Noise

Comparison of the many spectra at the Livingston site seems to show rather little effect due to the local wind : on Sept 8 the wind was subjectively "strong" during the middle of the day and calm later, but the spectra do not show systematic differences with wind speed (factoring out the effect of the crude oil pipeline). The one case that seems to show a wind effect is a comparison of graphs 14B and 17B; by moving the seismometers out from under a tree, the noise above 30 Hz was reduced significantly, which implies that this type of wind generated noise is easy to avoid.

The one caution in evaluating the effect of wind is that our subjective evaluation of wind speed may be too low, and so we may not have data representative of really windy days. The wind measurement at the Fire Tower that afternoon was 5 mph, which does not sound like "strong". The Fire Tower measurement is objective and certainly much more reliable. Our conclusion then is that wind noise is not significant for a typical day at the Livingston site. The data we collected represents the conditions for 80% of the year, because the Fire Tower wind speed exceeded 5 mph on only 74 days in 1987 (see the Appendix : Wind Speed Records).

In contrast, the data taken on Sept 9 at Idlewild (site G) do seem to show a systematic effect due to the wind. The spectra are 3 or 4 times higher (for $f > 4$ Hz) than the previous day and the subjective wind was much stronger. We might conclude that : 1) the wind had passed the threshold where it makes a significant contribution. The ambiguity comes from the Fire Tower measurement of 6 mph for that day. Several alternate conclusions might then be drawn : 2) the wind was different at the Fire Tower, which is 15 miles away, and the local wind was still the cause for the increased motion, or 3) the Fire Tower wind measure should be trusted (our subjective measure of wind speed is very unreliable), hence we should look for alternate explanations of the greater motion at this different site on this different day. The data is insufficent to chose among these alternatives.

Remarks

The absolute instrumental uncertainties in our measurements are quite small for vertical ground motion from 1-100 Hz and for horizontal motion from 0-30 Hz.

The major systematic uncertainty in our measurements is the amount of ground motion generated by the large vehicle used to transport the electronic equipment. We do not believe it generated much, because there was no systematic decline in noise as the vehicle's engine cooled down during the collection times, and because the measurements at site F show no large increase in noise when the vehicle was significantly closer, but it would take more measurements to be certain. (It would be helpful to know more about the nature of the vehicle effects that were seen at the Edwards site measurements.)

It was remarkable that the ground motion seen at the Livingston site was up to 100 times smaller than what we measured on the Gravity lab floor, which is a thick concrete slab resting directly on the ground (see graph 26B). Our measurement procedures show our lab to be much noiser than the Cal Tech and MIT labs.

One peculiar result from the measurements made at the old observatory at Clinton is the factor of 10 reduction in the horizontal motion, above 20 Hz, that was seen by simply moving the seismometer from the top of the old telescope pier to the slab beside it. (Compare graphs 22B and 25B.) Understanding the cause for this might be of some usefulness in design of end station piers for the LIGO.

The ground motion we observed at 1-3 Hz was much larger than what has been seen at the other potential sites. The consistency in the results seems to indicate that this is a persistent feature of the local ground motion. The other striking difference between the Livingston site and others is how much more rapid is the decrease of motion with increase in frequency. The true causes for this is unknown to us, but it is tempting to speculate that it is due to the deep layer (~ 40,000 feet) of alluvial deposits that underlie this entire region.

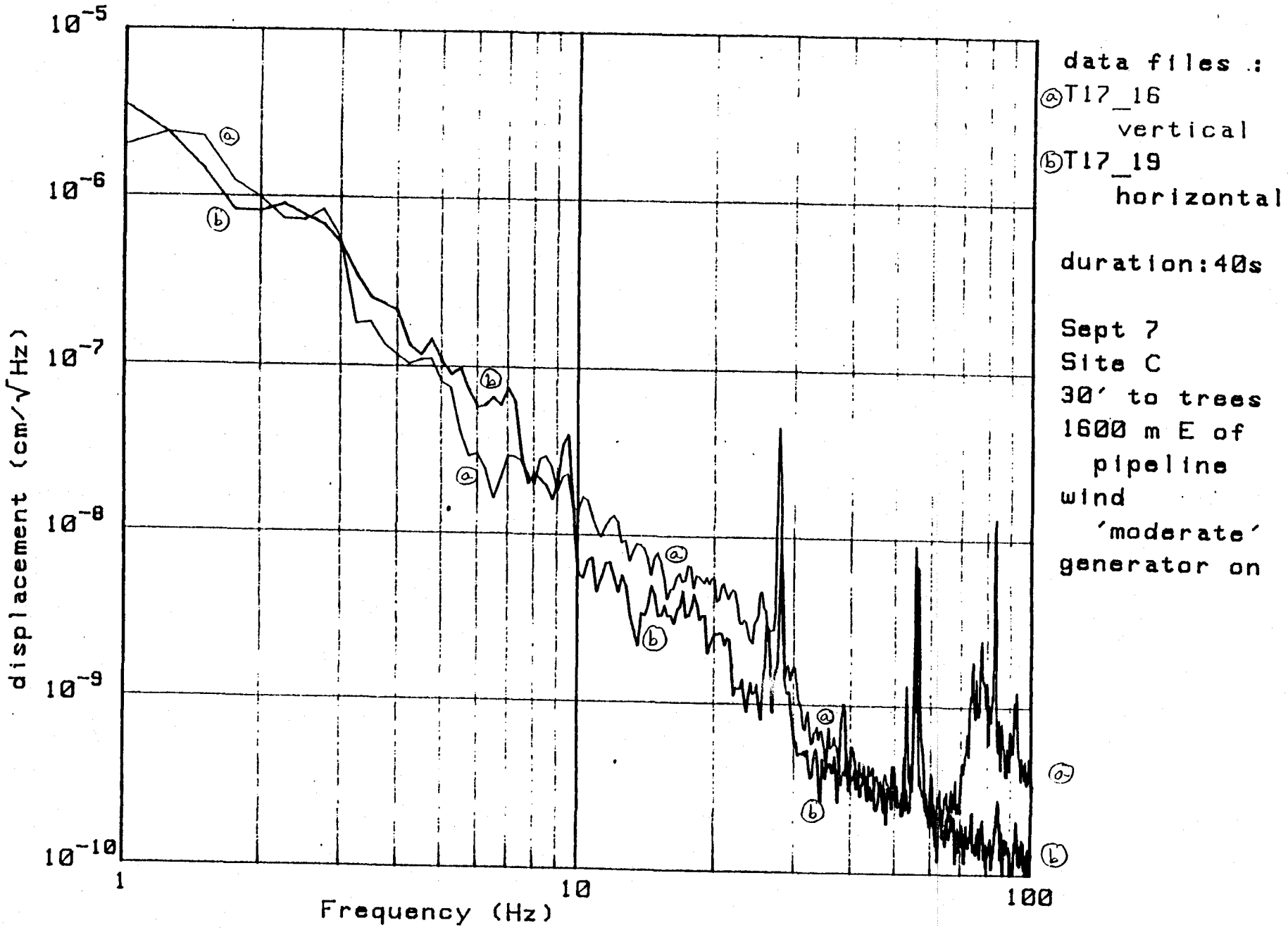
The LIGO design team must make the comparison between possible sites, but as we see it, the preliminary data indicate that there is a tradeoff to be made in site selection : the other sites are quieter by a factor of 10 at 1-3 Hz, and the Livingston site is quieter by nearly a factor of 10 at 30 Hz. Then an important issue in site selection will be the relative weights to place upon quietness at lower and at higher frequencies. It is our understanding that the quietness at higher frequencies is more desirable, and so the preliminary indications favor the Livingston site.

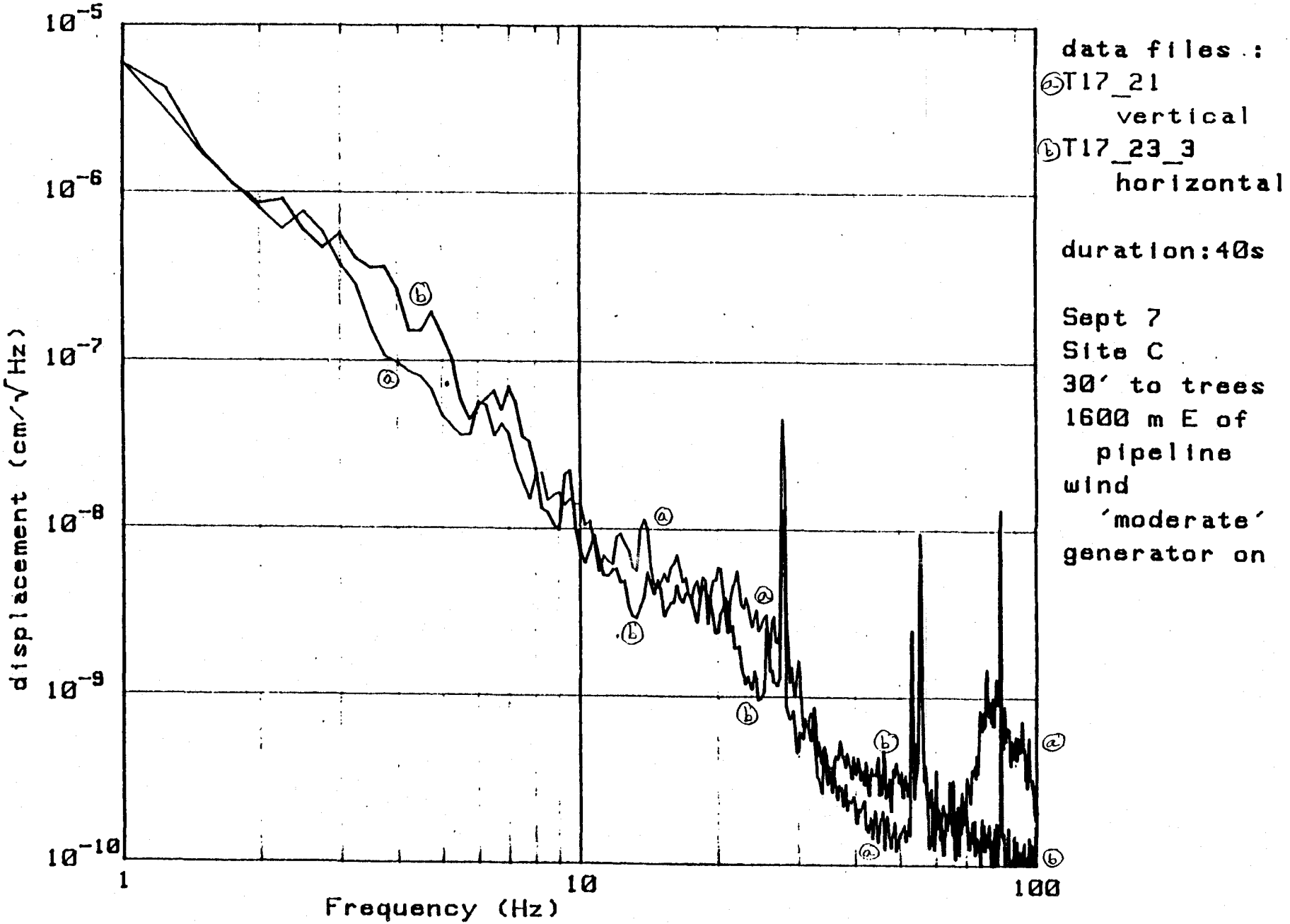
Appendix : Ground Noise Spectra

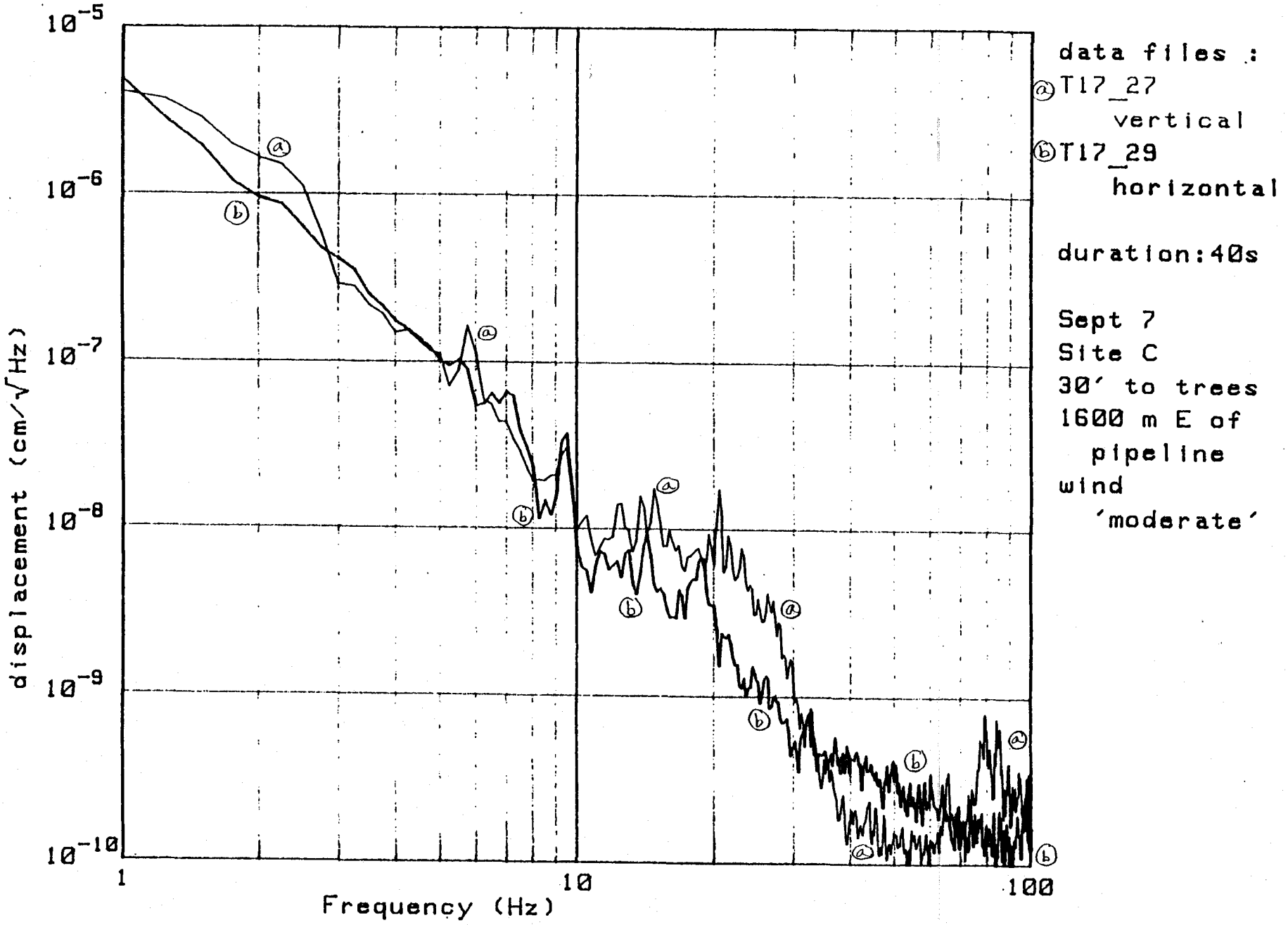
This appendix contains 26 graphs of converted and corrected spectra of the ground noise motion, numbered from 1B to 26B. (Graphs 1A through 26A are the raw data and are not included in this report.) This is all of the data acquired with the digital signal analyzer.

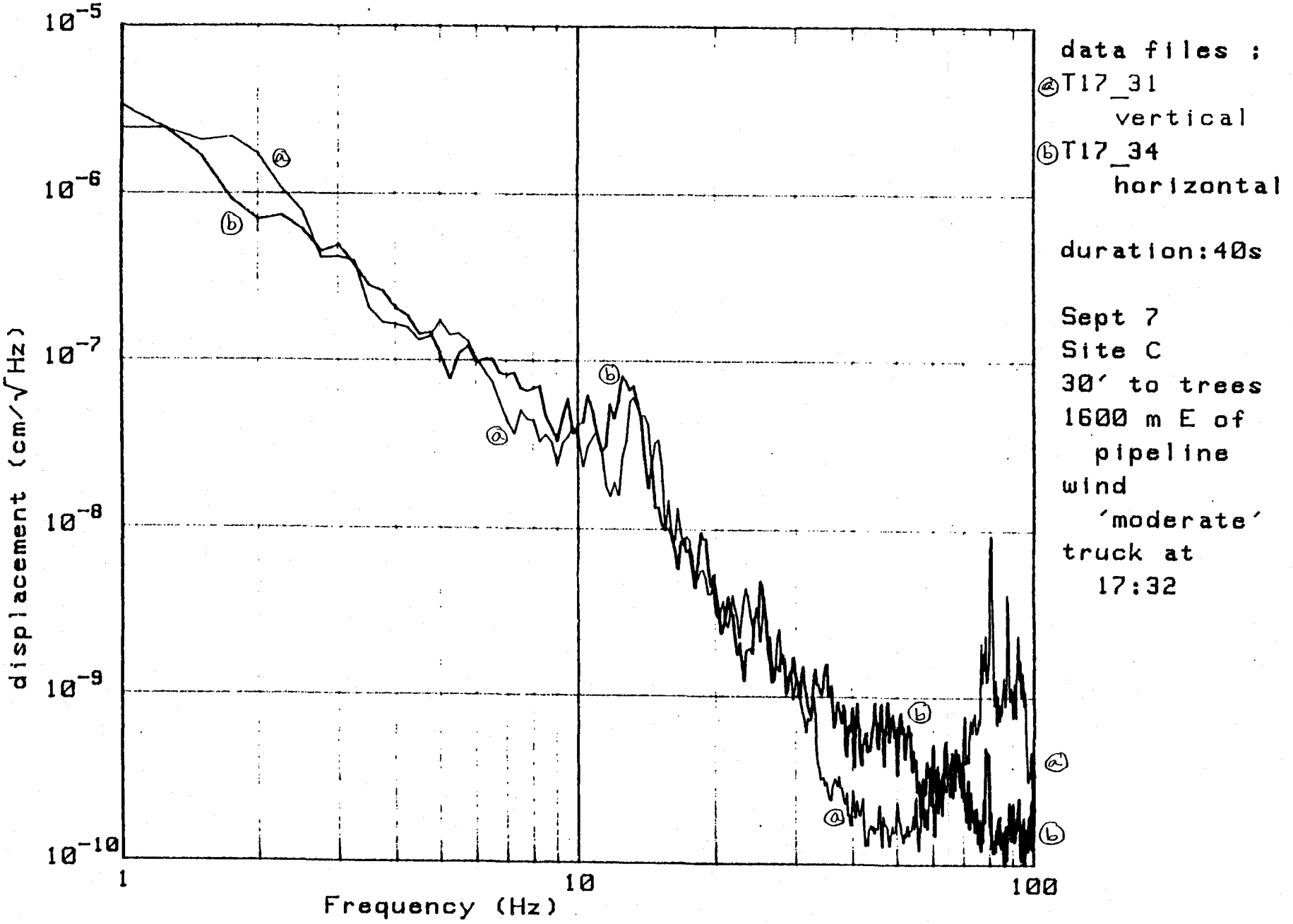
The letter in the data filename specifies the day that the data were taken (see Locations and Times), and the numbers in the filename give the hour and minute (CDT) that the particular average was started.

It may be difficult to distinguish between the vertical and the horizontal seismometer traces if the following are a black and white copies of the original graphs.

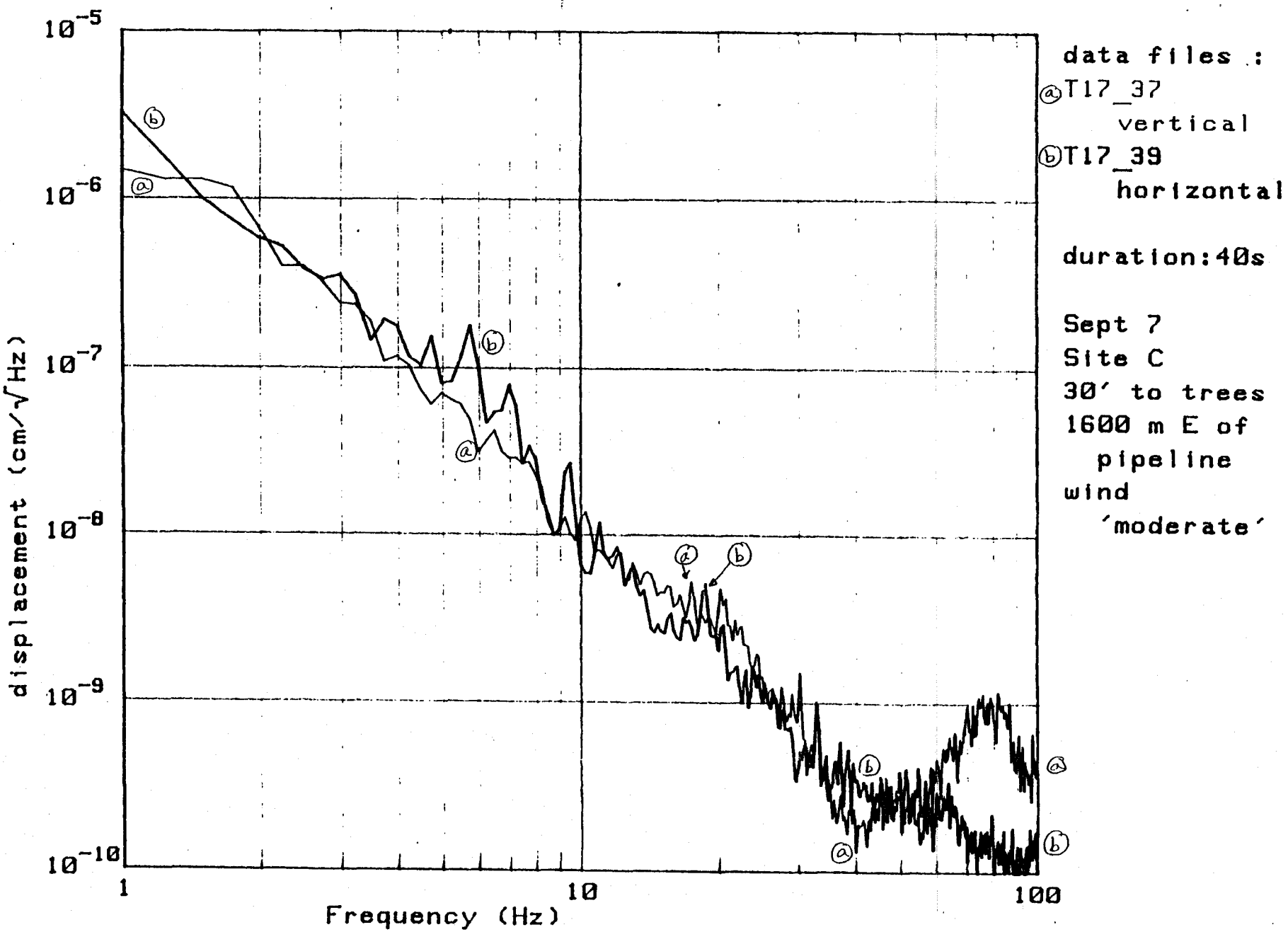

displacement (cm/√Hz)
10⁻⁵
10⁻⁶
10⁻⁷
10⁻⁸
10⁻⁹
10⁻¹⁰
1
10
100
Frequency (Hz)
data files :
ⓐT17_16
vertical
ⓑT17_19
horizontal
duration:40s
Sept 7
Site C
30' to trees
1600 m E of
pipeline
wind
'moderate'
generator on
ⓐ
ⓑ


10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
10^{-10}
displacement (cm/√Hz)
1
10
100
Frequency (Hz)
data files :
ⓐT17_21
vertical
ⓑT17_23_3
horizontal
duration:40s
Sept 7
Site C
30' to trees
1600 m E of
pipeline
wind
'moderate'
generator on

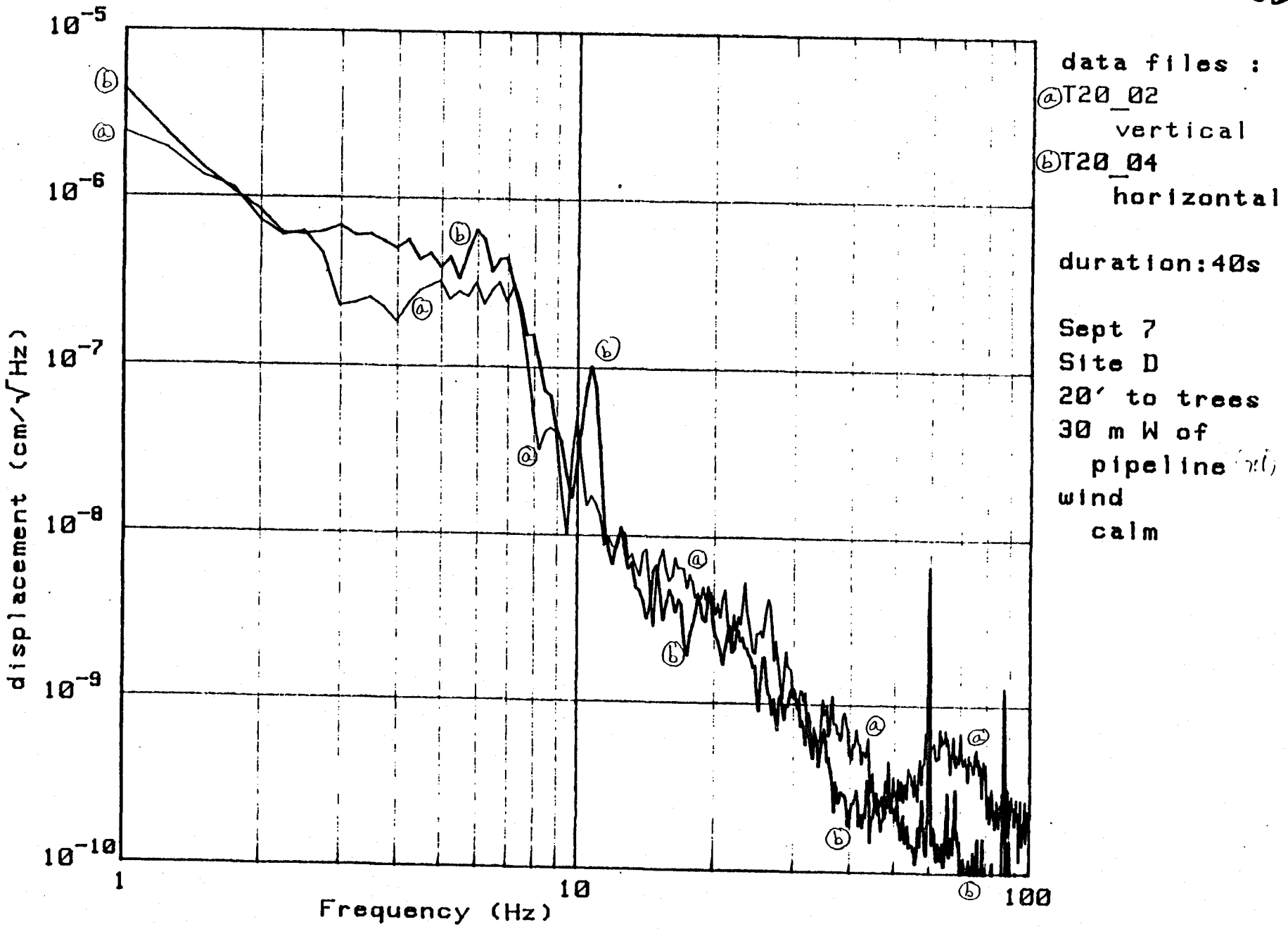

displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐT17_27
vertical
ⓑT17_29
horizontal
duration:40s
Sept 7
Site C
30' to trees
1600 m E of
pipeline
wind
'moderate'

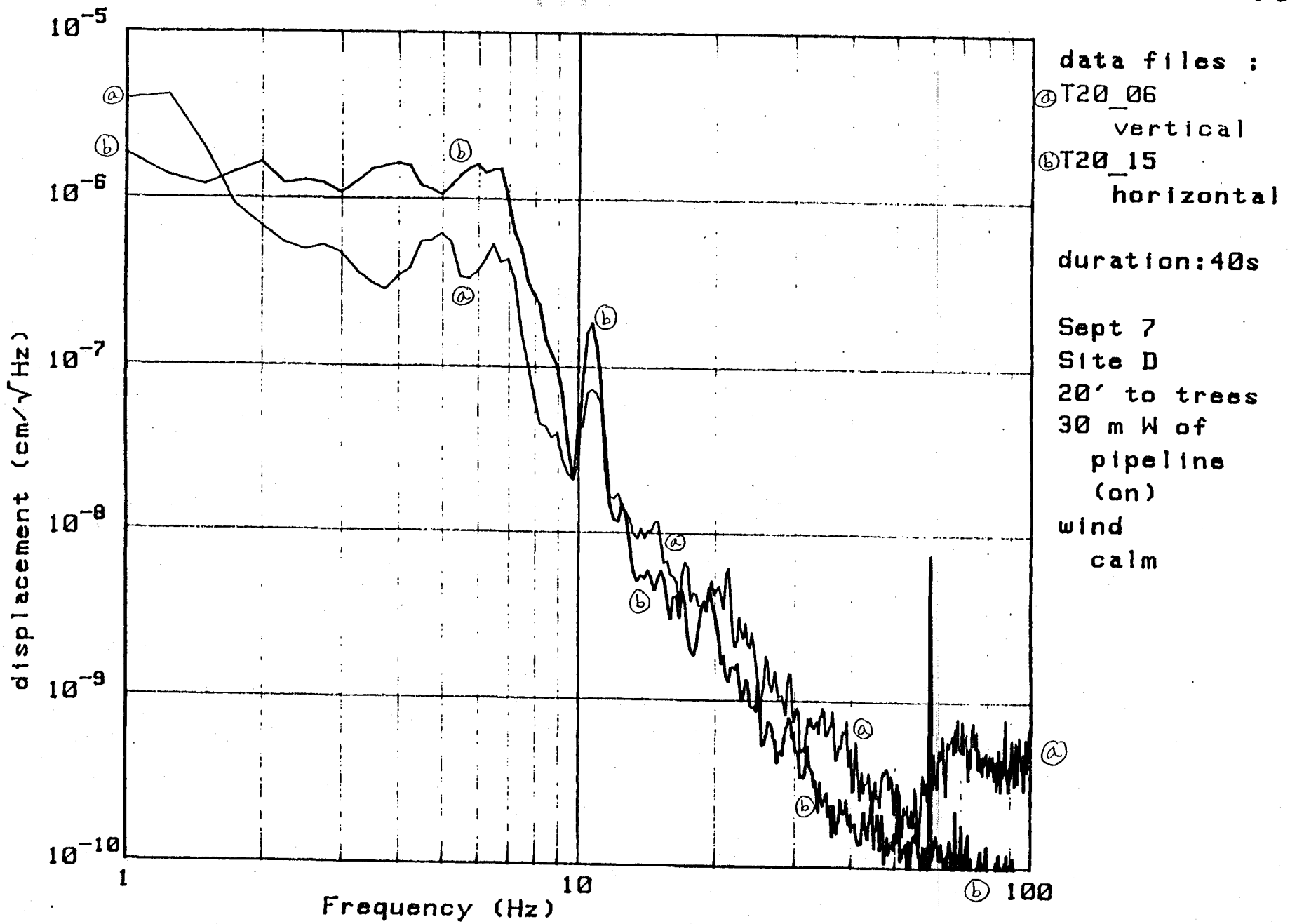

displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐT17_31
vertical
ⓑT17_34
horizontal
duration:40s
Sept 7
Site C
30' to trees
1600 m E of
pipeline
wind
'moderate'
truck at
17:32
ⓐ
ⓑ

5B

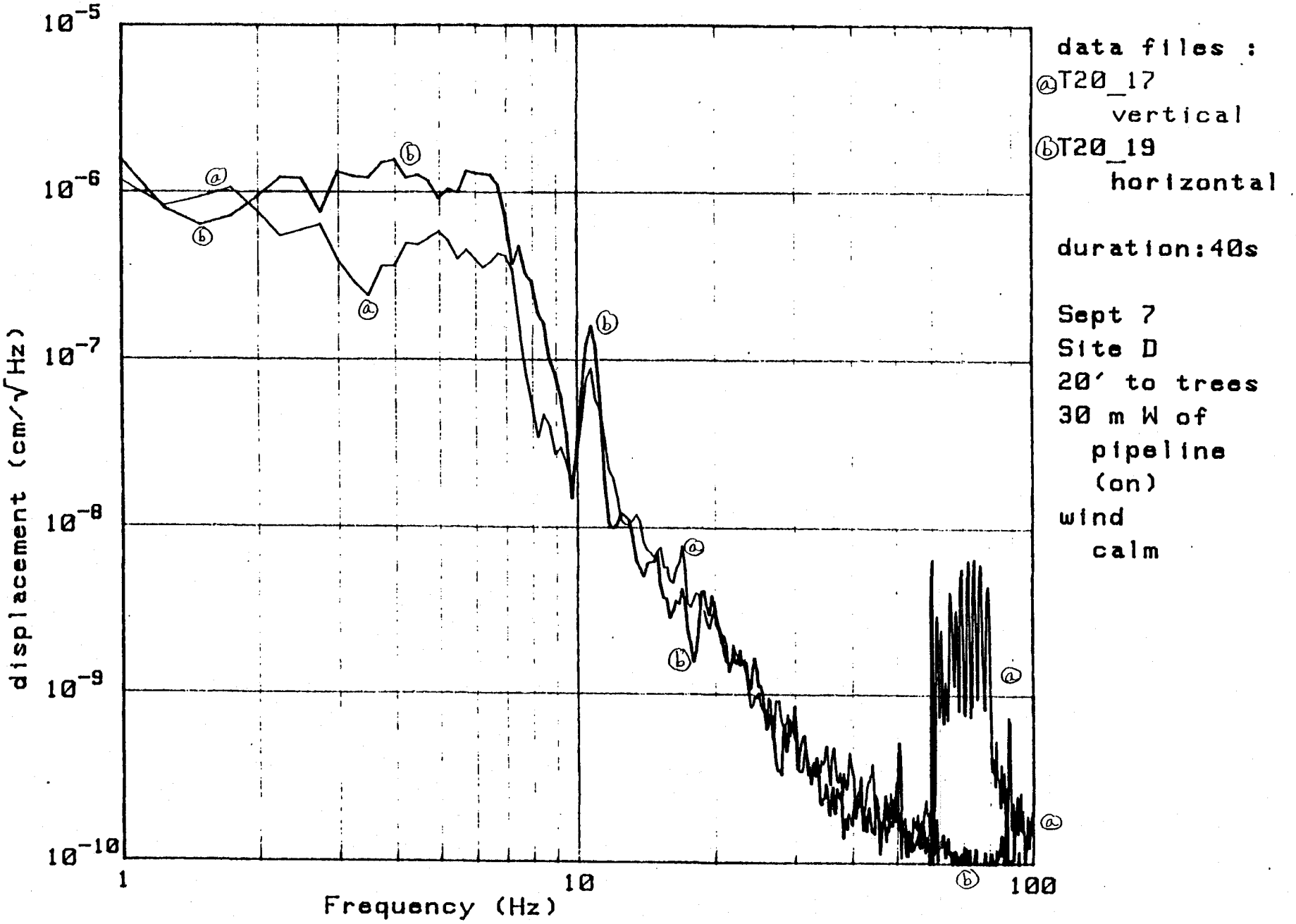

displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐT17_37
vertical
ⓑT17_39
horizontal
duration:40s
Sept 7
Site C
30' to trees
1600 m E of
pipeline
wind
'moderate'

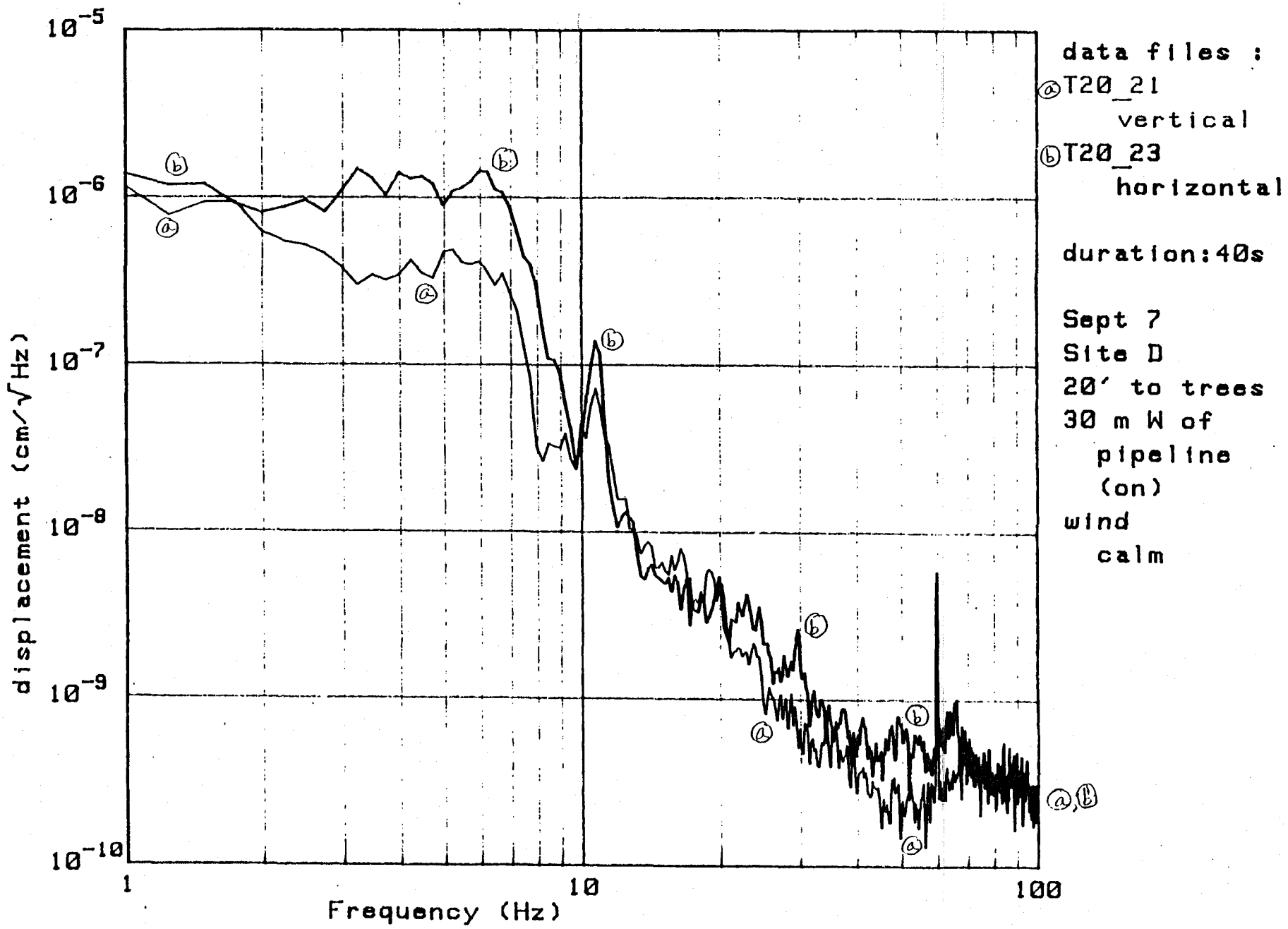
6B


displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐT20_02
vertical
ⓑT20_04
horizontal
duration:40s
Sept 7
Site D
20' to trees
30 m W of
pipeline
wind
calm

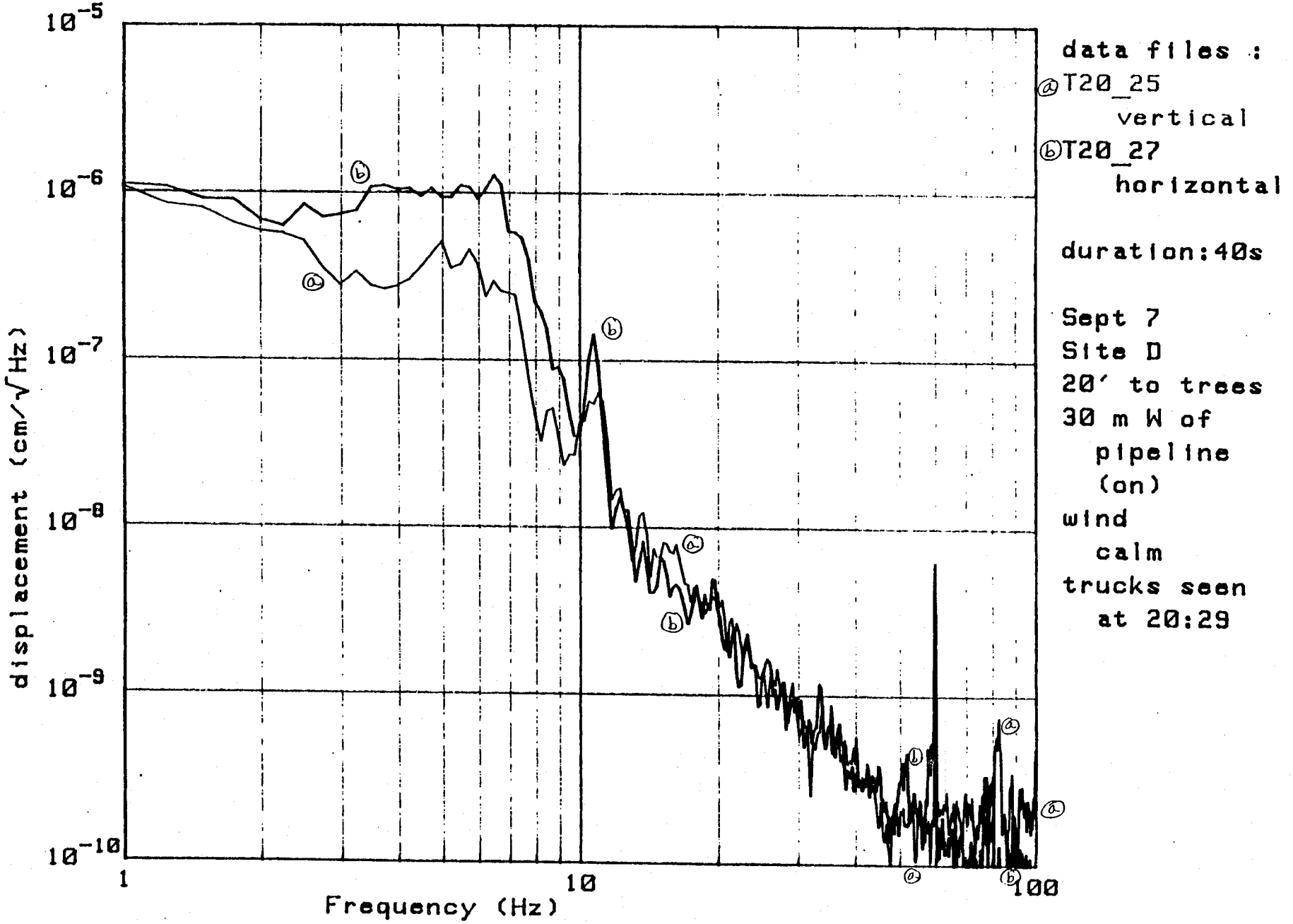

displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐT20_06
vertical
ⓑT20_15
horizontal
duration:40s
Sept 7
Site D
20' to trees
30 m W of
pipeline
(on)
wind
calm

8B

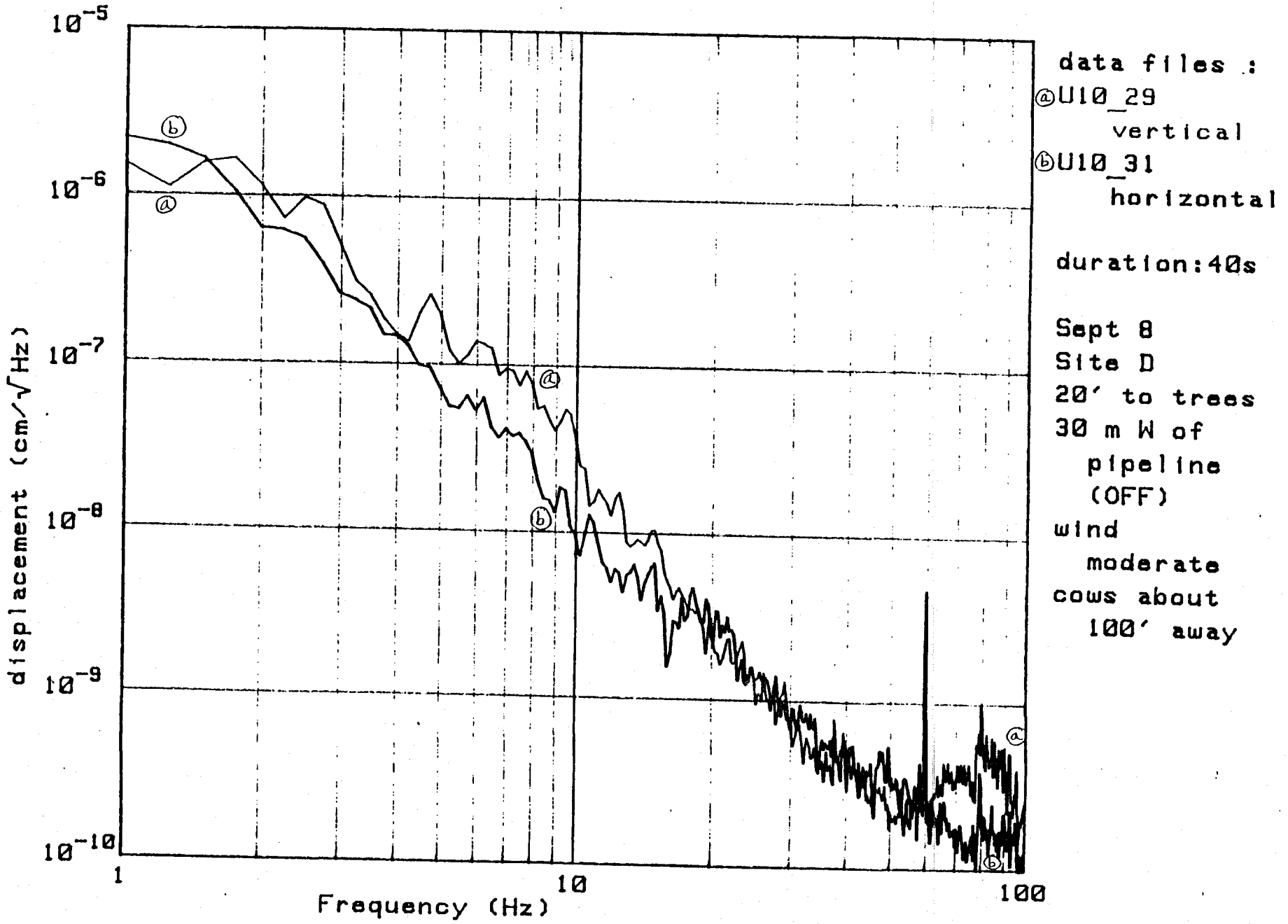

displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐT20_17
vertical
ⓑT20_19
horizontal
duration:40s
Sept 7
Site D
20' to trees
30 m W of
pipeline
(on)
wind
calm


displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐT20_21
vertical
ⓑT20_23
horizontal
duration:40s
Sept 7
Site D
20' to trees
30 m W of
pipeline
(on)
wind
calm
ⓐ,ⓑ

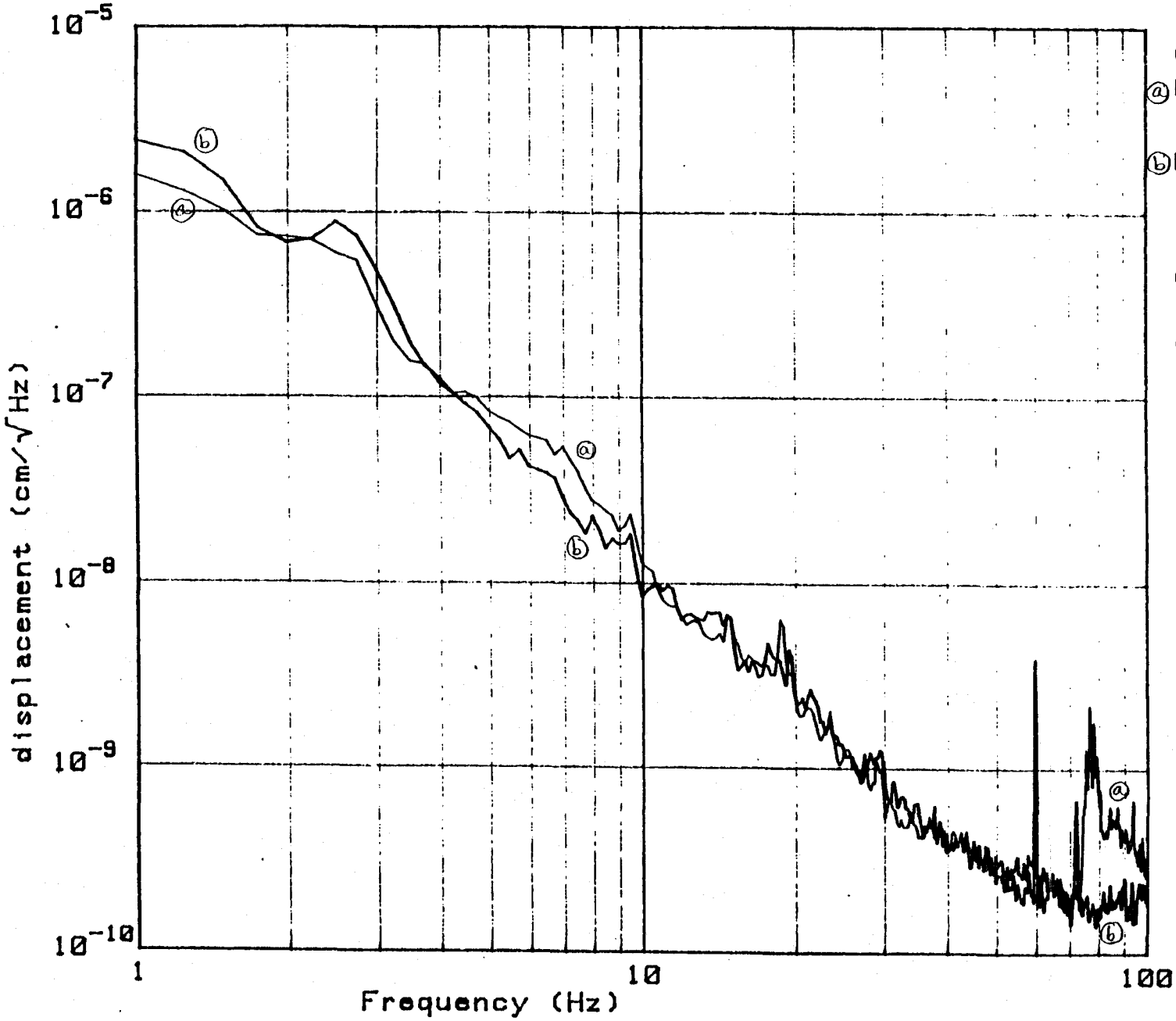
10B


10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
10^{-10}
displacement (cm/√Hz)
1
10
100
Frequency (Hz)
ⓐ
ⓑ
data files :
ⓐT20_25
vertical
ⓑT20_27
horizontal
duration:40s
Sept 7
Site D
20' to trees
30 m W of
pipeline
(on)
wind
calm
trucks seen
at 20:29

11B


displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
ⓐ
ⓑ
data files :
ⓐU10_29
vertical
ⓑU10_31
horizontal
duration:40s
Sept 8
Site D
20' to trees
30 m W of
pipeline
(OFF)
wind
moderate
cows about
100' away

12B

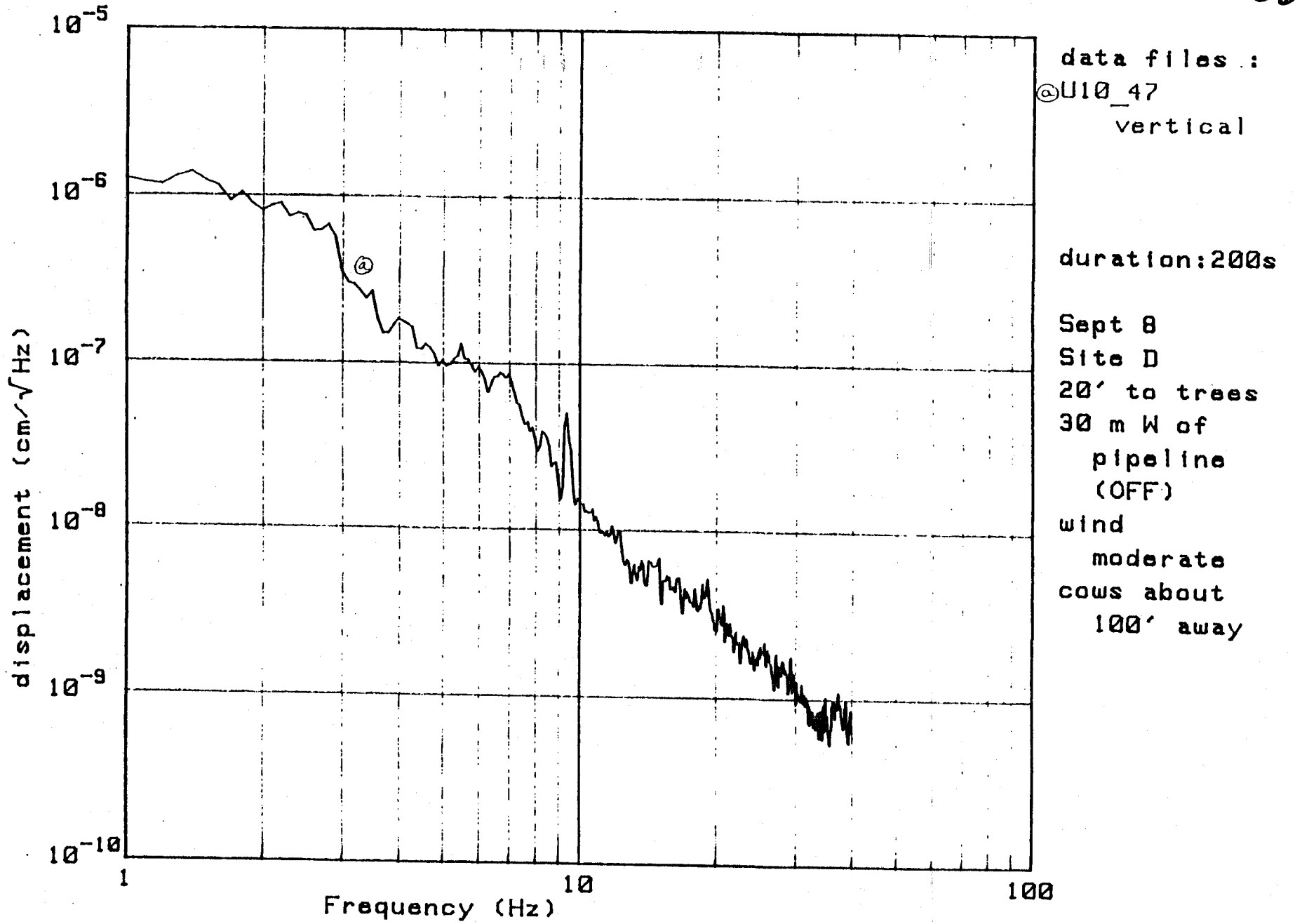


data files :
ⓐU10_34
vertical
ⓑU10_38
horizontal

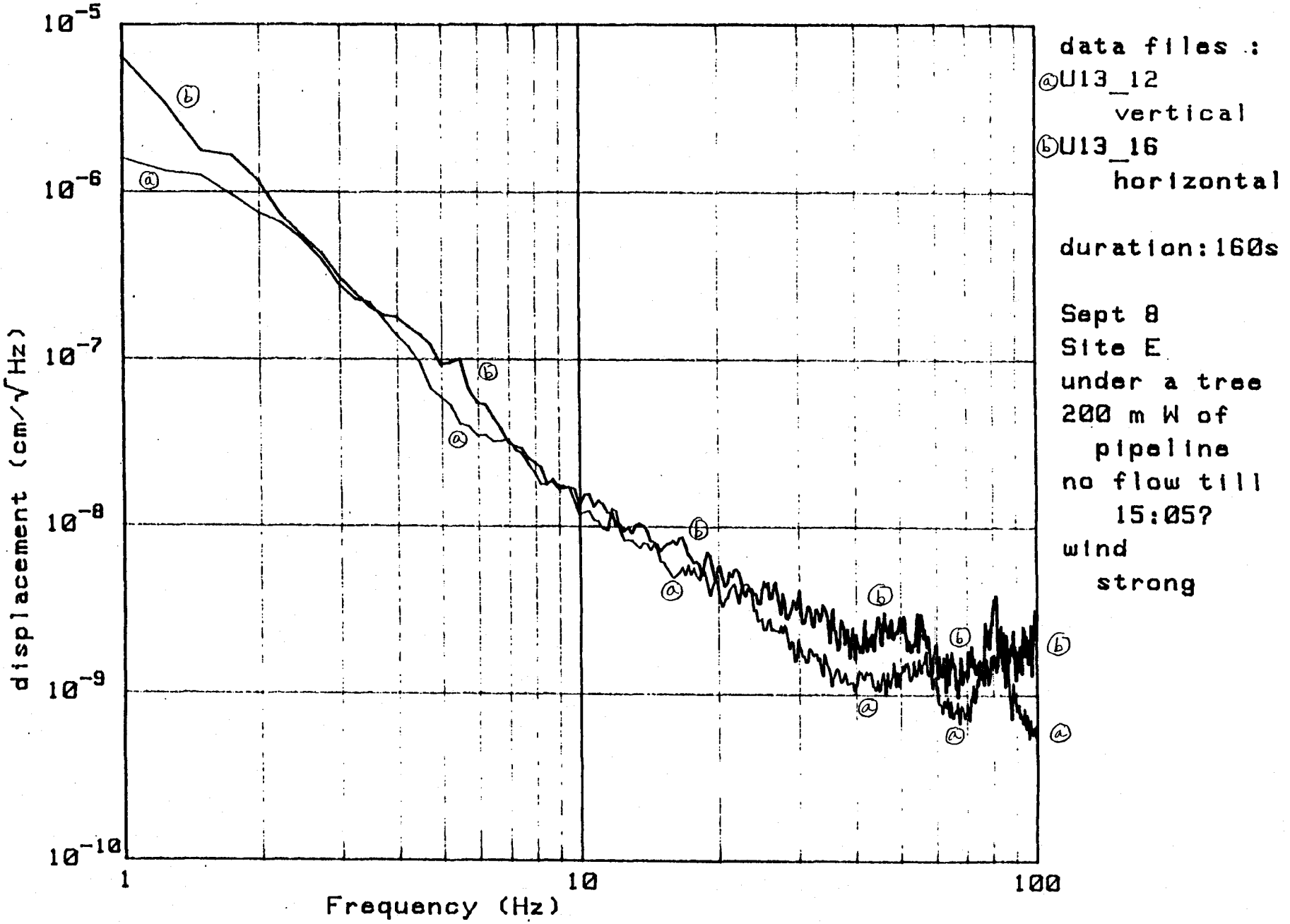
duration: 160s

Sept 8
Site D
20′ to trees
30 m W of
pipeline
(OFF)
wind
moderate
cows about
100′ away

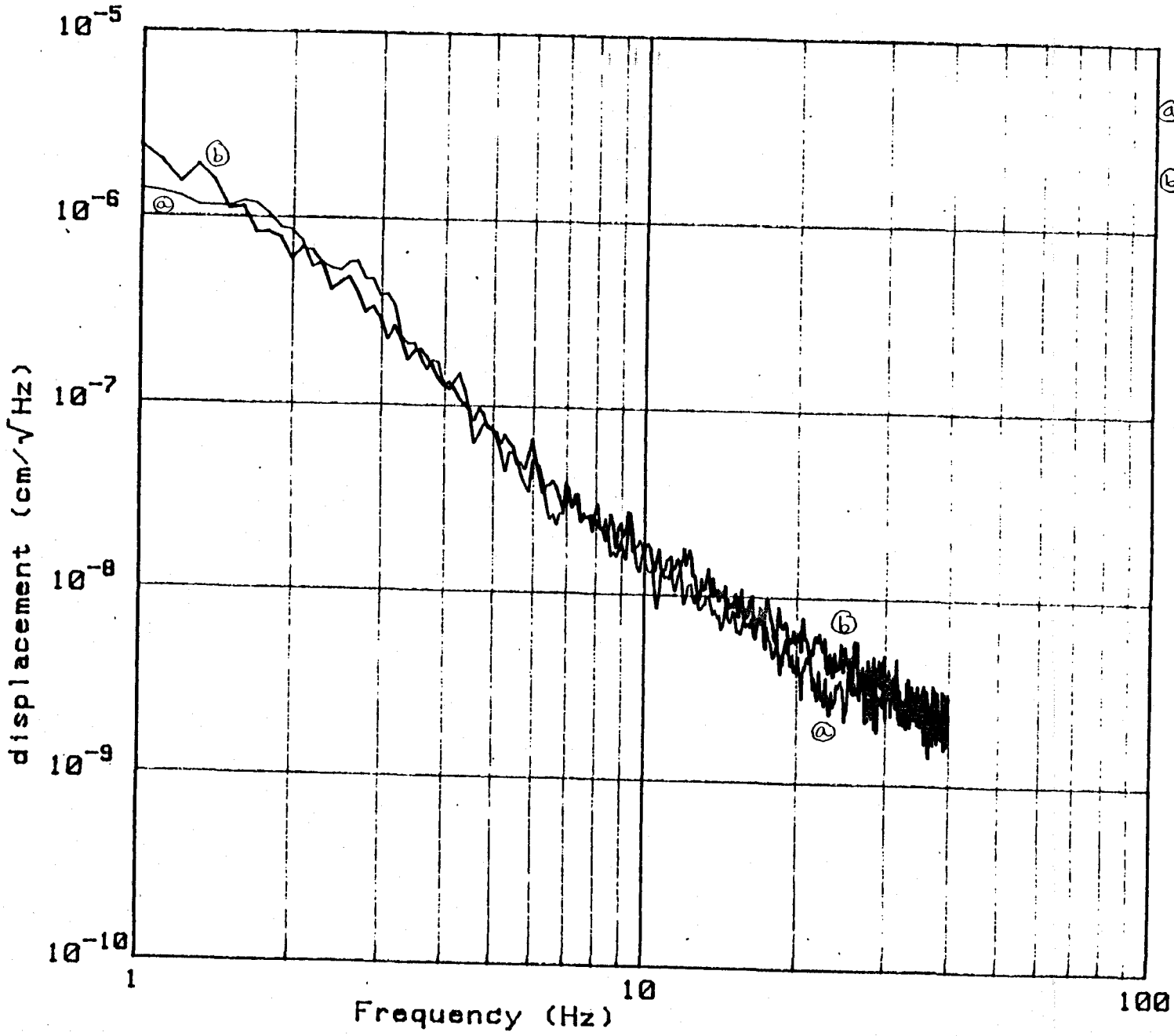
13B


displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
@
data files :
@U10_47
vertical
duration:200s
Sept 8
Site D
20' to trees
30 m W of
pipeline
(OFF)
wind
moderate
cows about
100' away

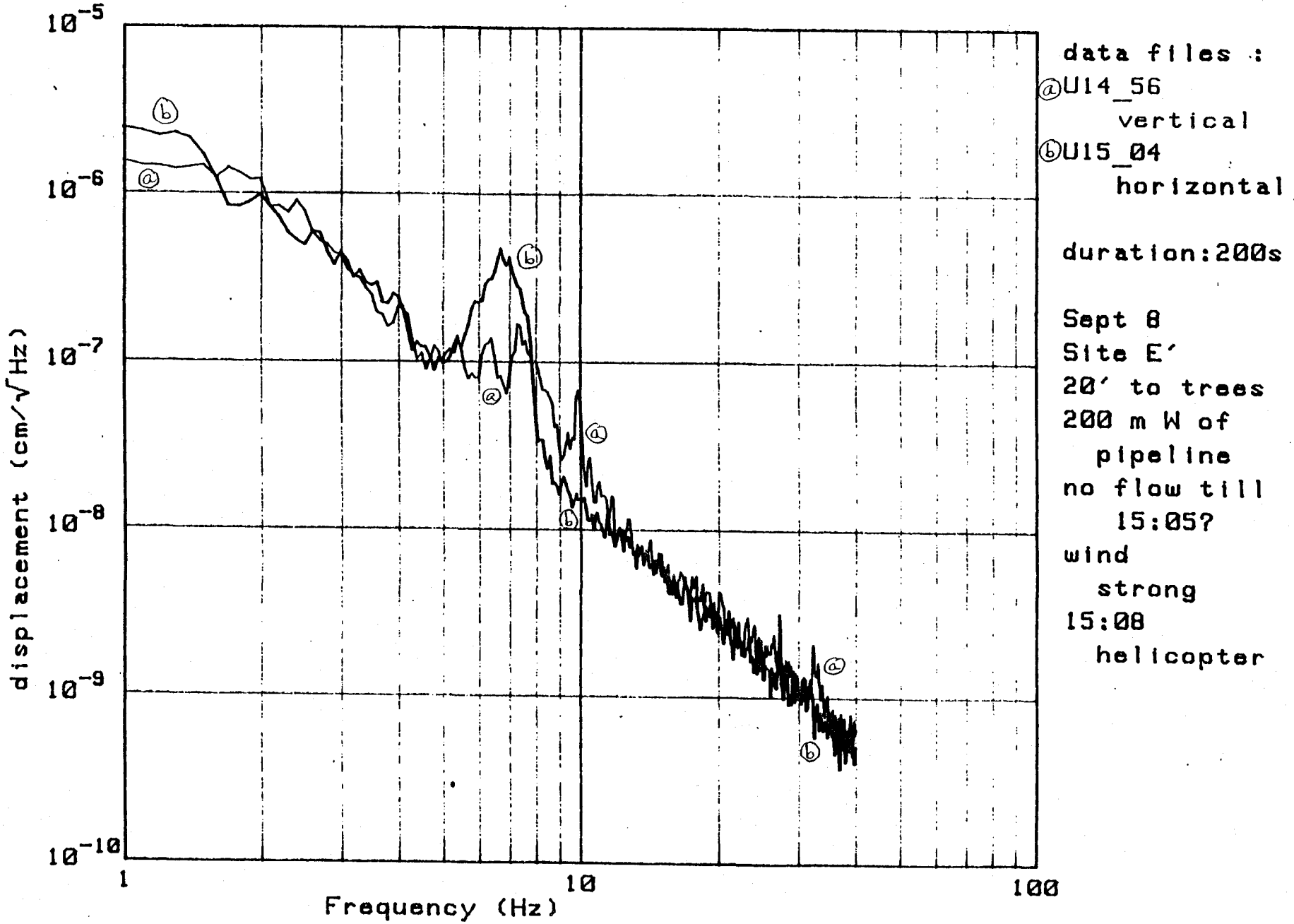
14B


displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
@U13_12
vertical
ⓑU13_16
horizontal
duration:160s
Sept 8
Site E
under a tree
200 m W of
pipeline
no flow till
15:05?
wind
strong

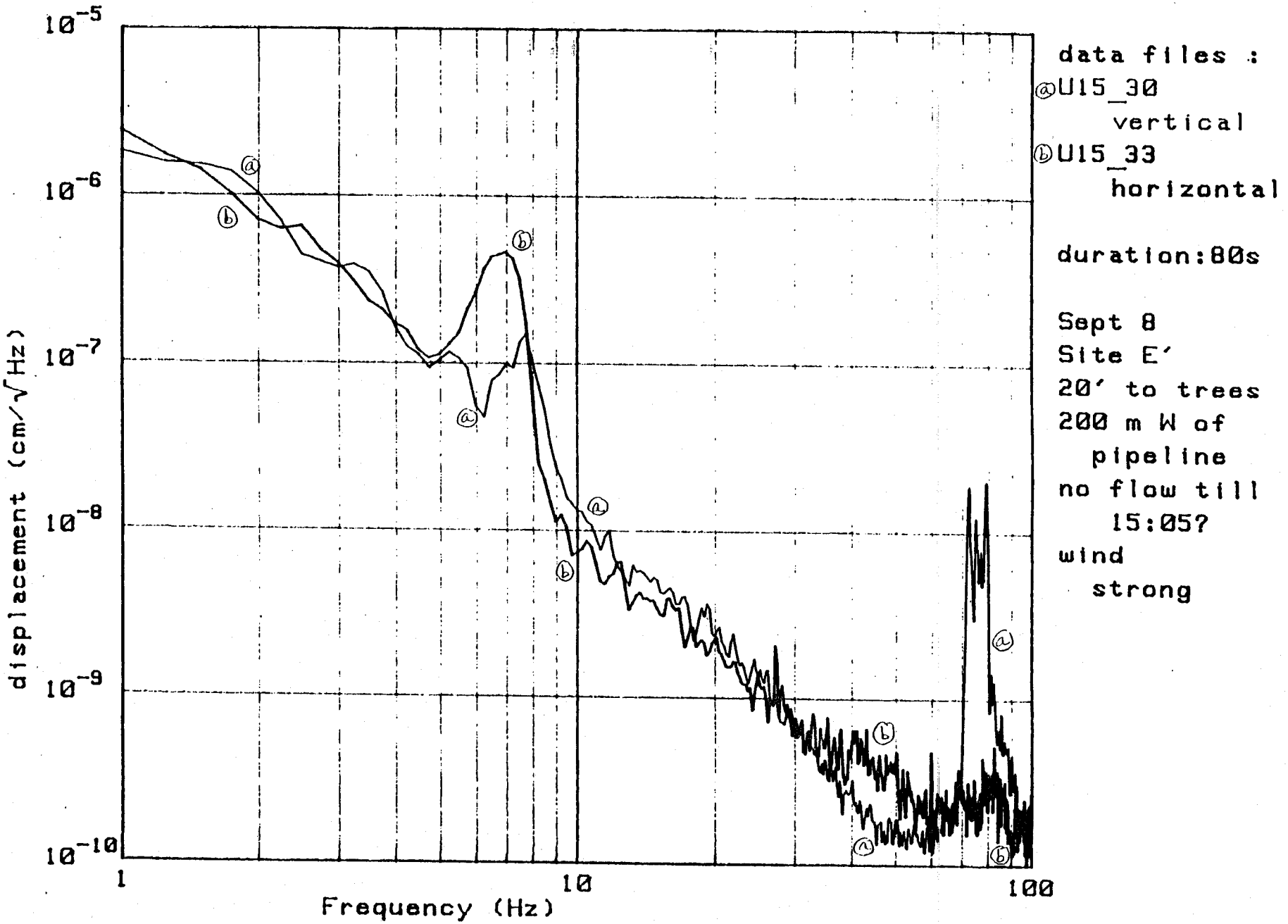
15B


displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
ⓐ
ⓑ
data files :
ⓐU13_24
vertical
ⓑU13_29
horizontal
duration:200s
Sept 8
Site E
under a tree
200 m W of
pipeline
no flow till
15:05?
wind
strong

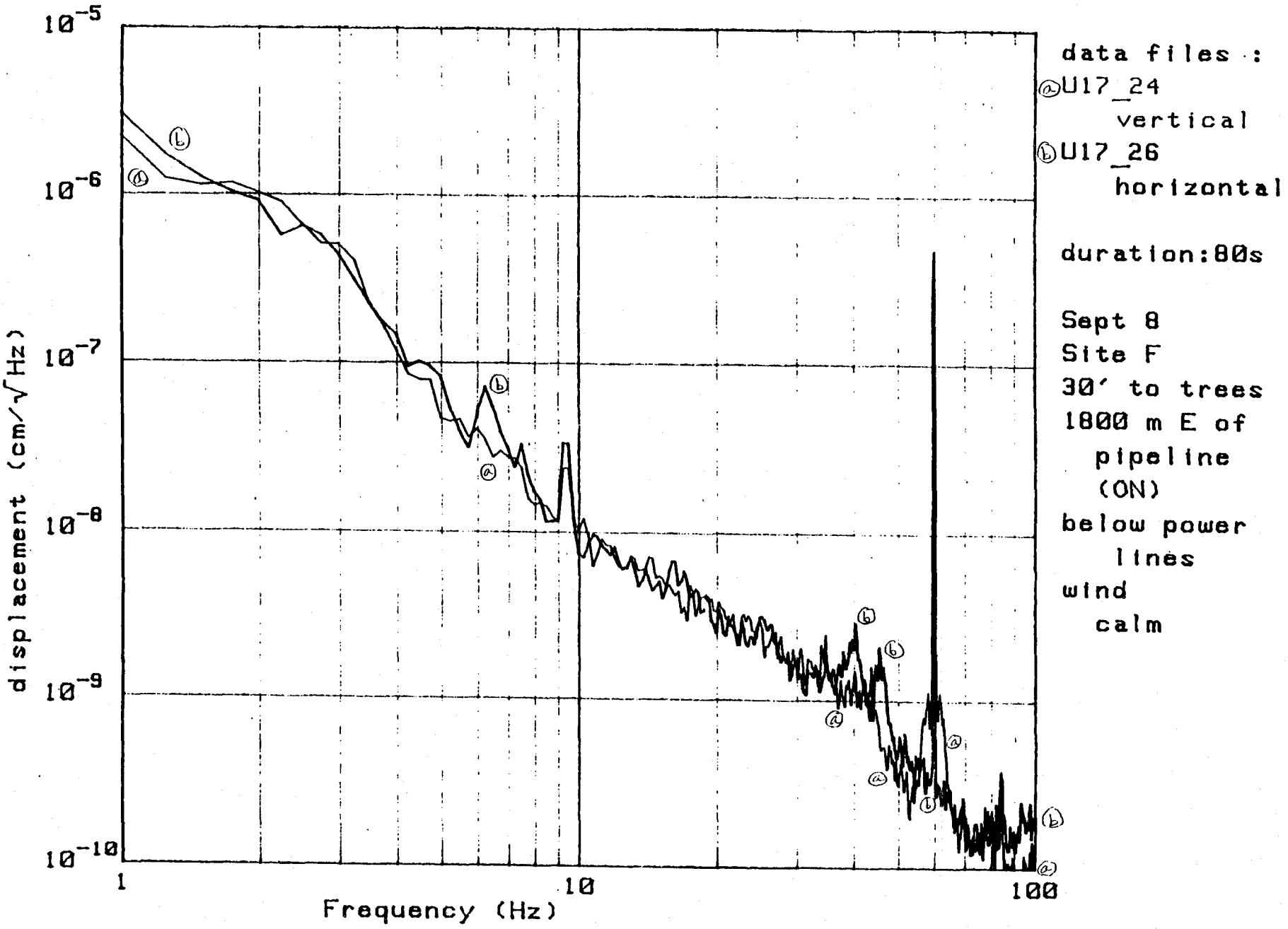
16B


displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐU14_56
vertical
ⓑU15_04
horizontal
duration:200s
Sept 8
Site E'
20' to trees
200 m W of
pipeline
no flow till
15:05?
wind
strong
15:08
helicopter

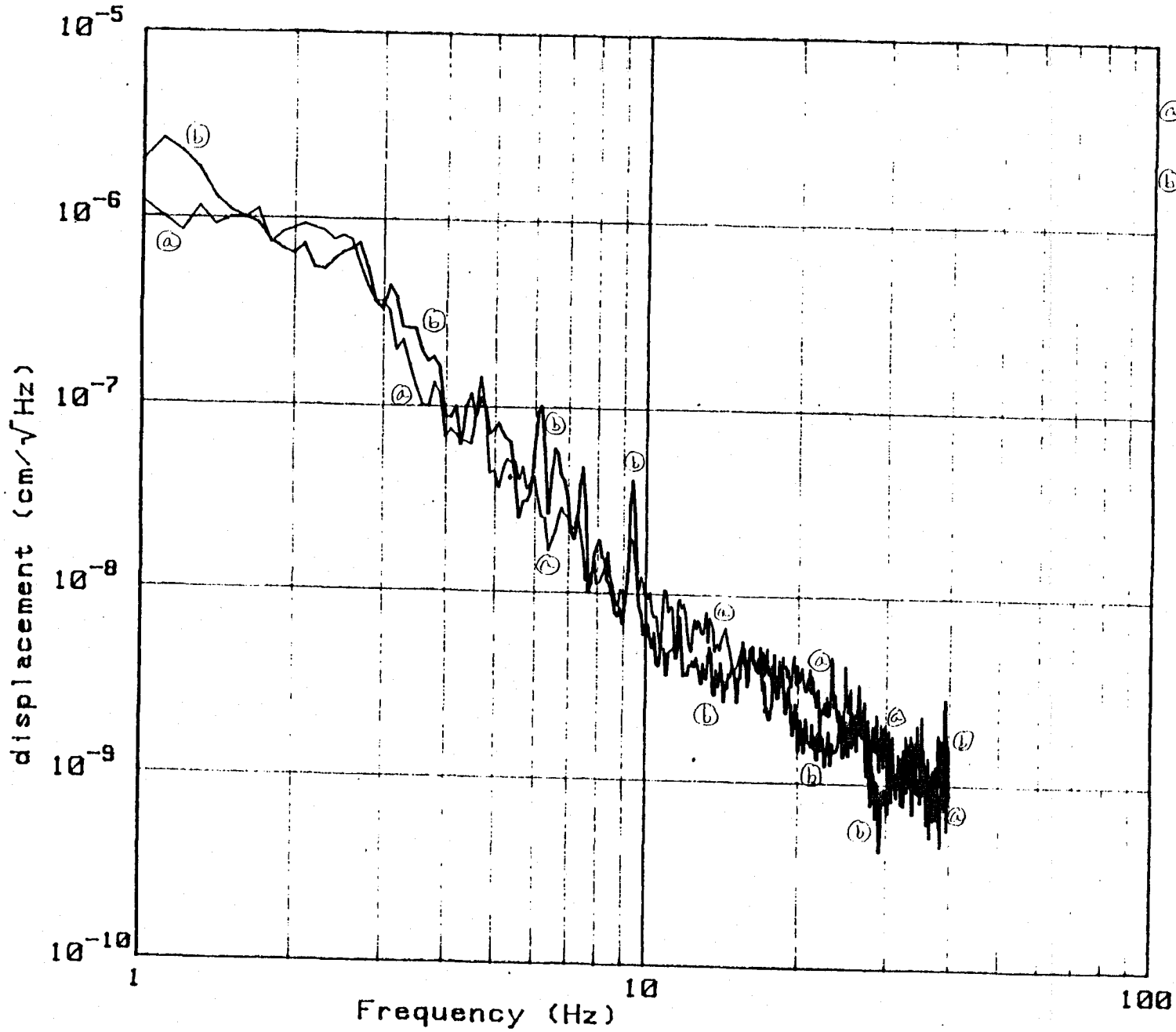
17B

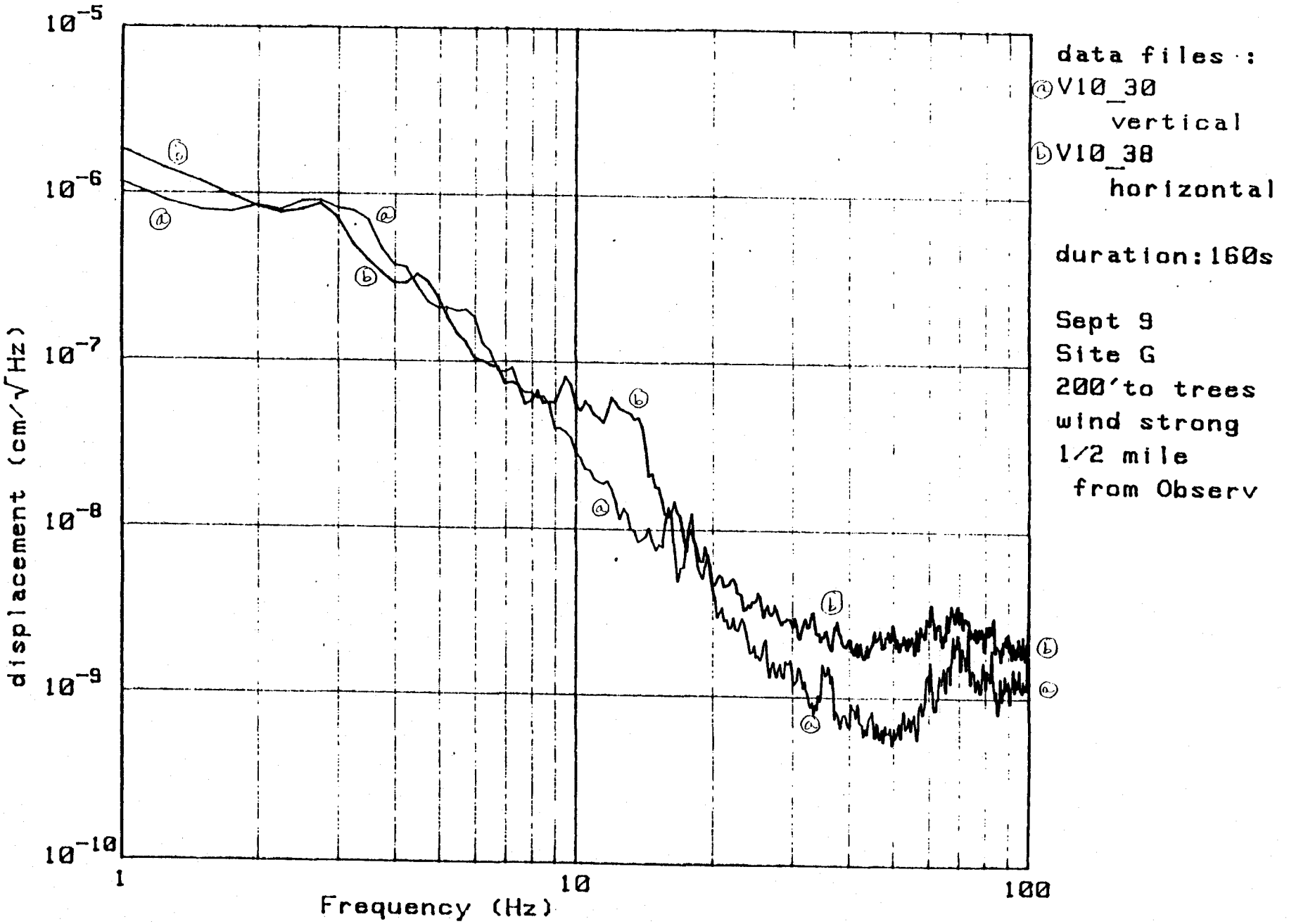

displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
@U15_30
vertical
ⓑU15_33
horizontal
duration:80s
Sept 8
Site E'
20' to trees
200 m W of
pipeline
no flow till
15:05?
wind
strong

18B

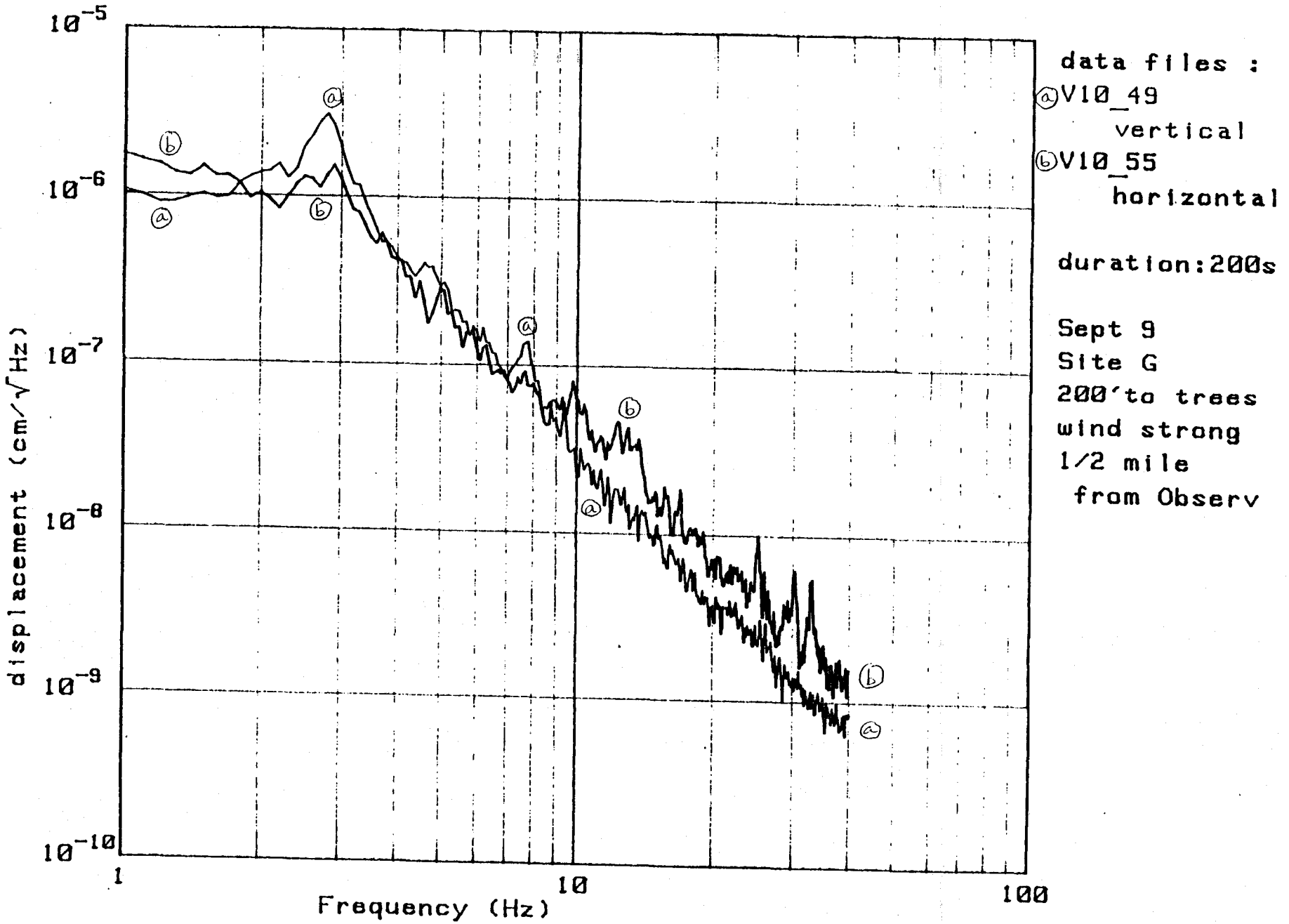

10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
10^{-10}
displacement (cm/√Hz)
1
10
100
Frequency (Hz)
data files :
ⓐU17_24
vertical
ⓑU17_26
horizontal
duration:80s
Sept 8
Site F
30' to trees
1800 m E of
pipeline
(ON)
below power
lines
wind
calm

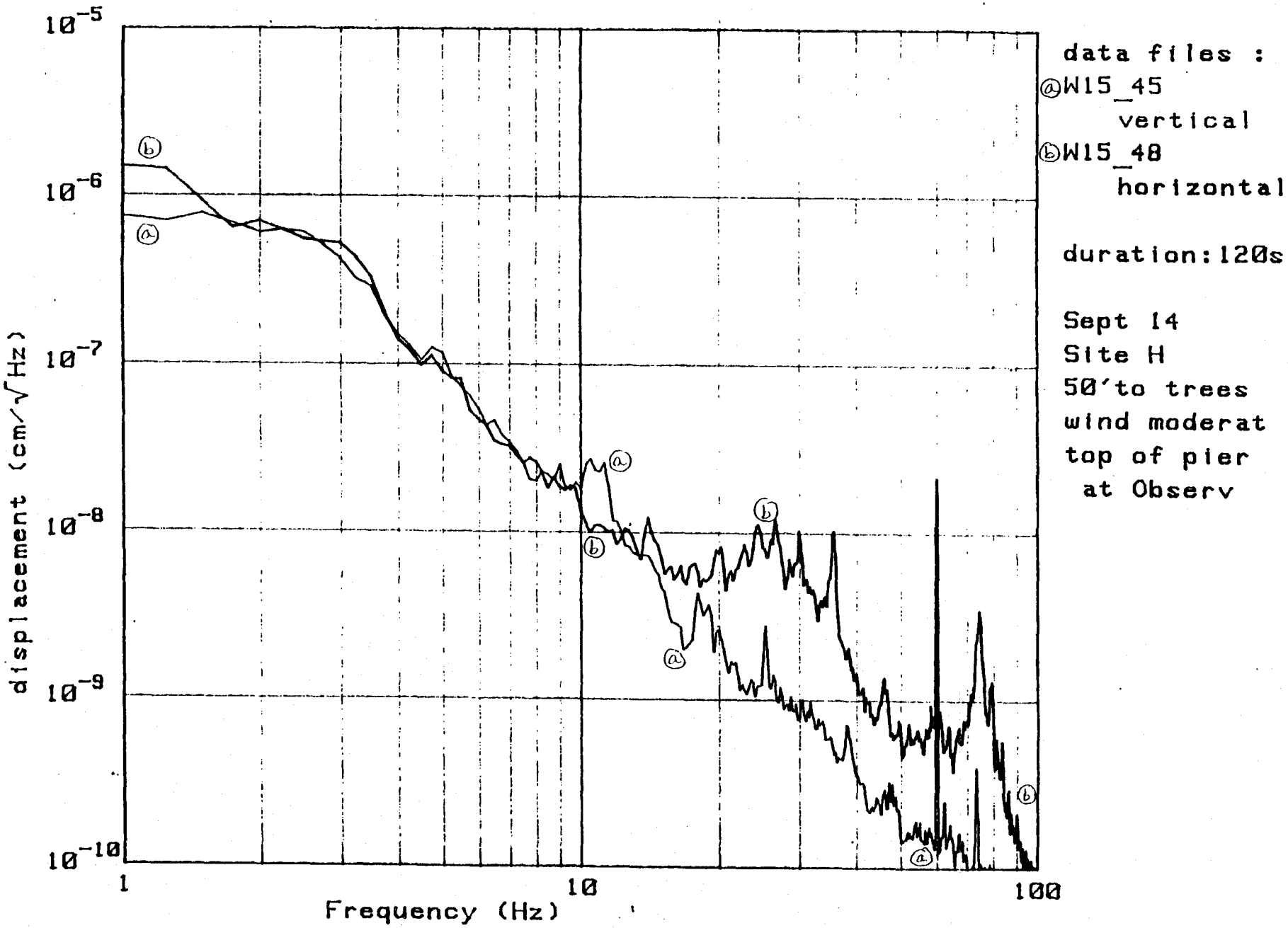
19B

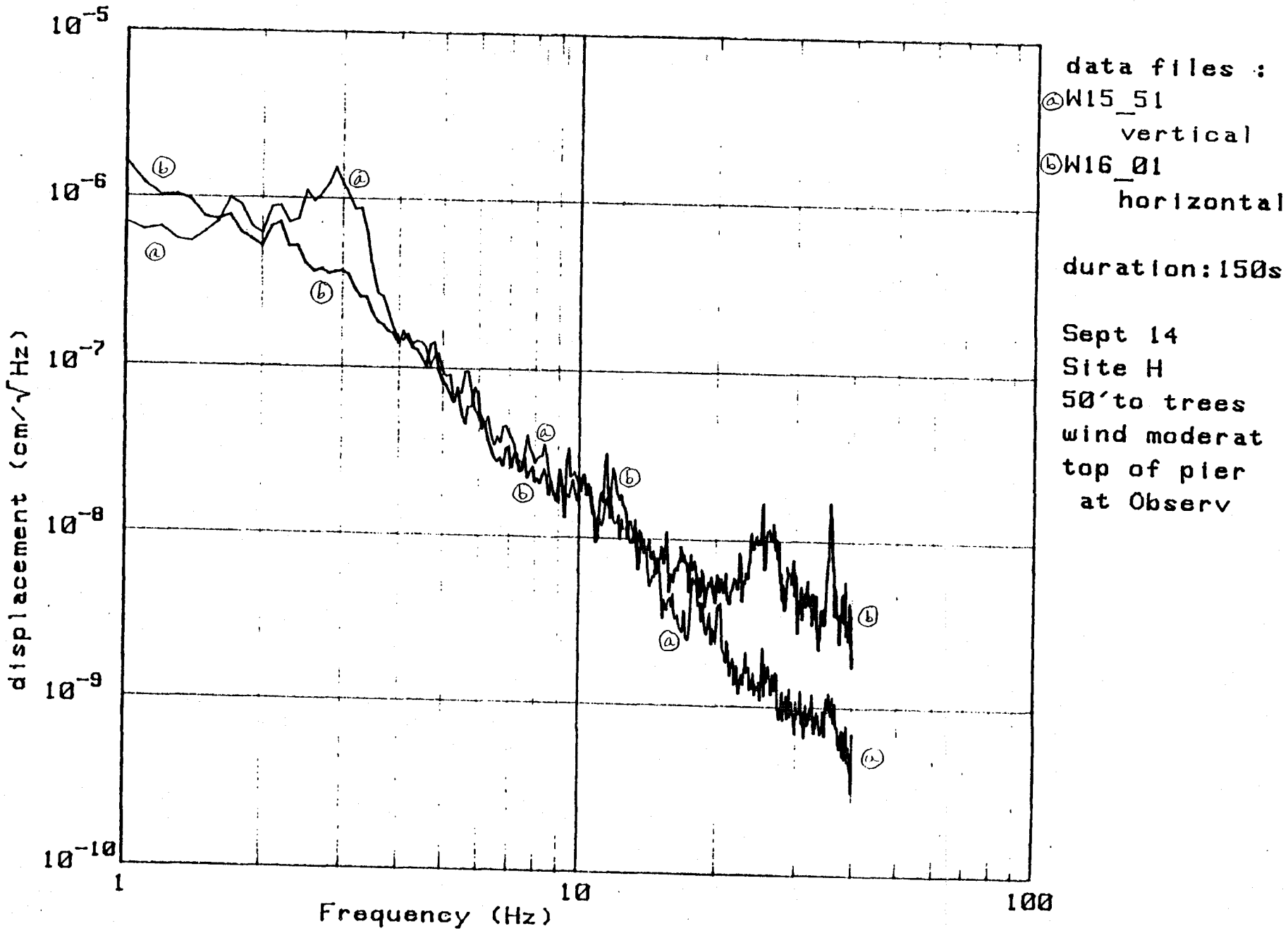

displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐU17_29
vertical
ⓑU17_32
horizontal
duration:100s
Sept 8
Site F
30' to trees
1800 m E of
pipeline
(ON)
below power
lines
wind
calm


displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐV10_30
vertical
ⓑV10_38
horizontal
duration:160s
Sept 9
Site G
200'to trees
wind strong
1/2 mile
from Observ

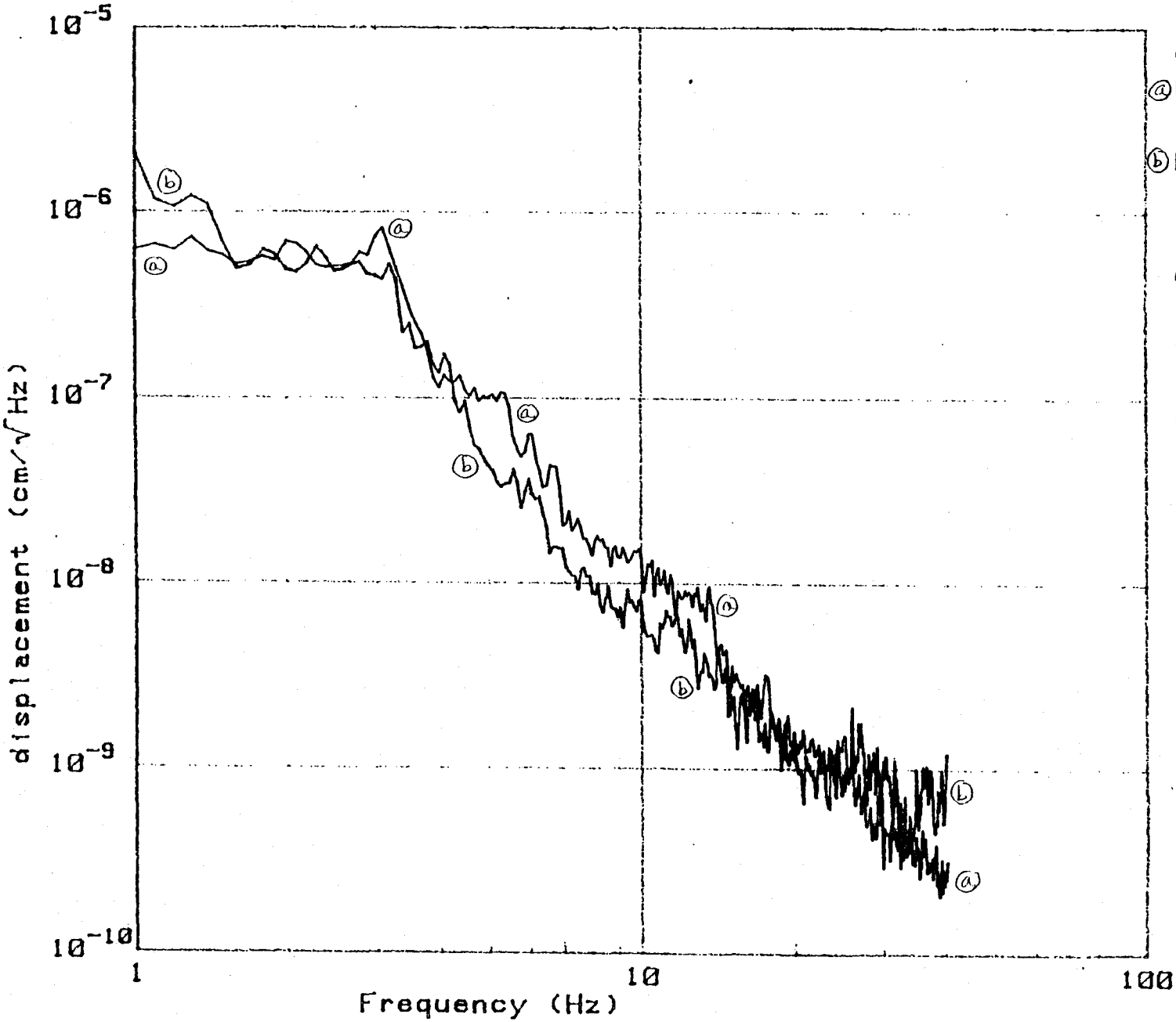
21B


displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐV10_49
vertical
ⓑV10_55
horizontal
duration:200s
Sept 9
Site G
200'to trees
wind strong
1/2 mile
from Observ

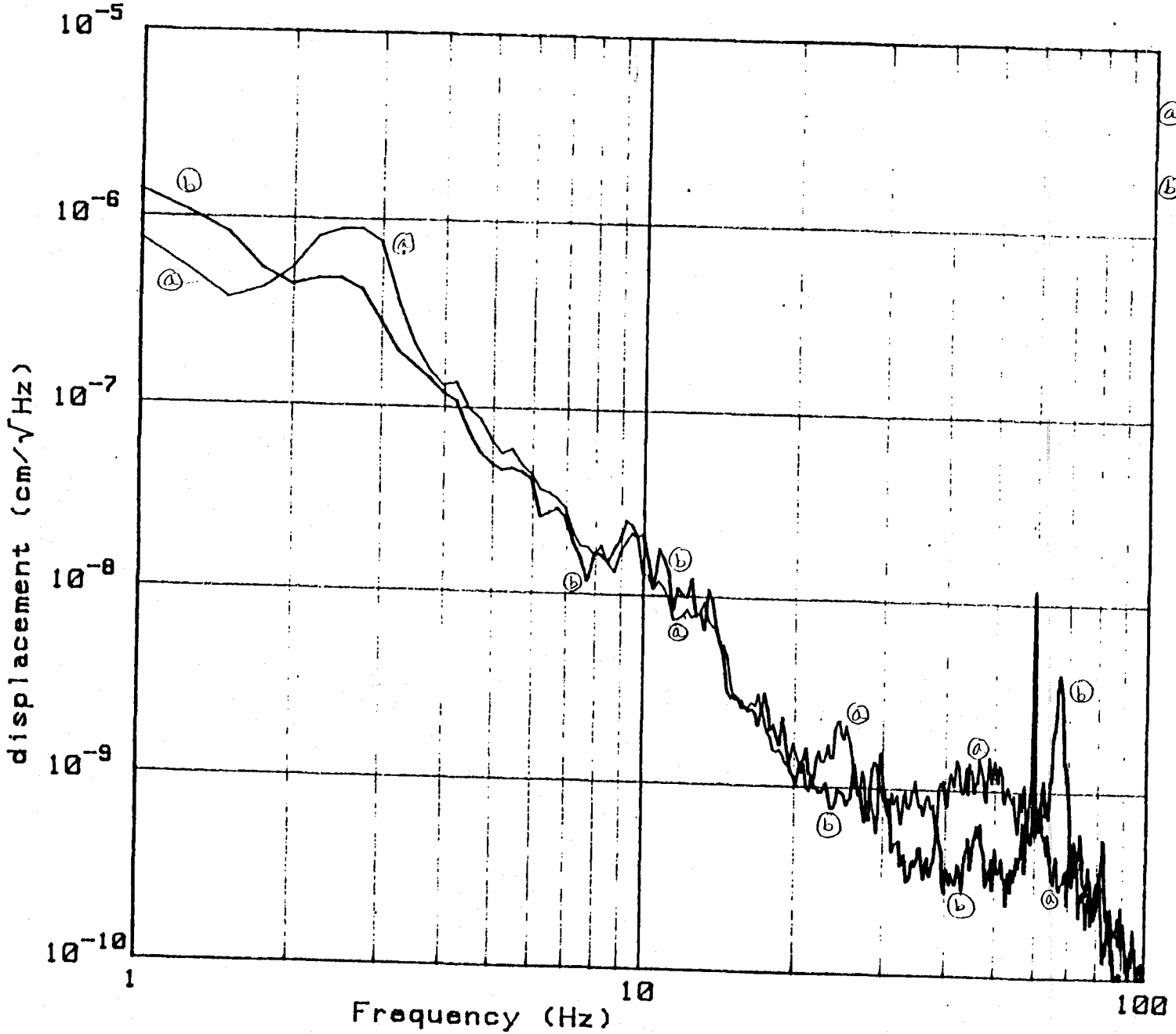

displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐW15_45
vertical
ⓑW15_48
horizontal
duration:120s
Sept 14
Site H
50'to trees
wind moderat
top of pier
at Observ

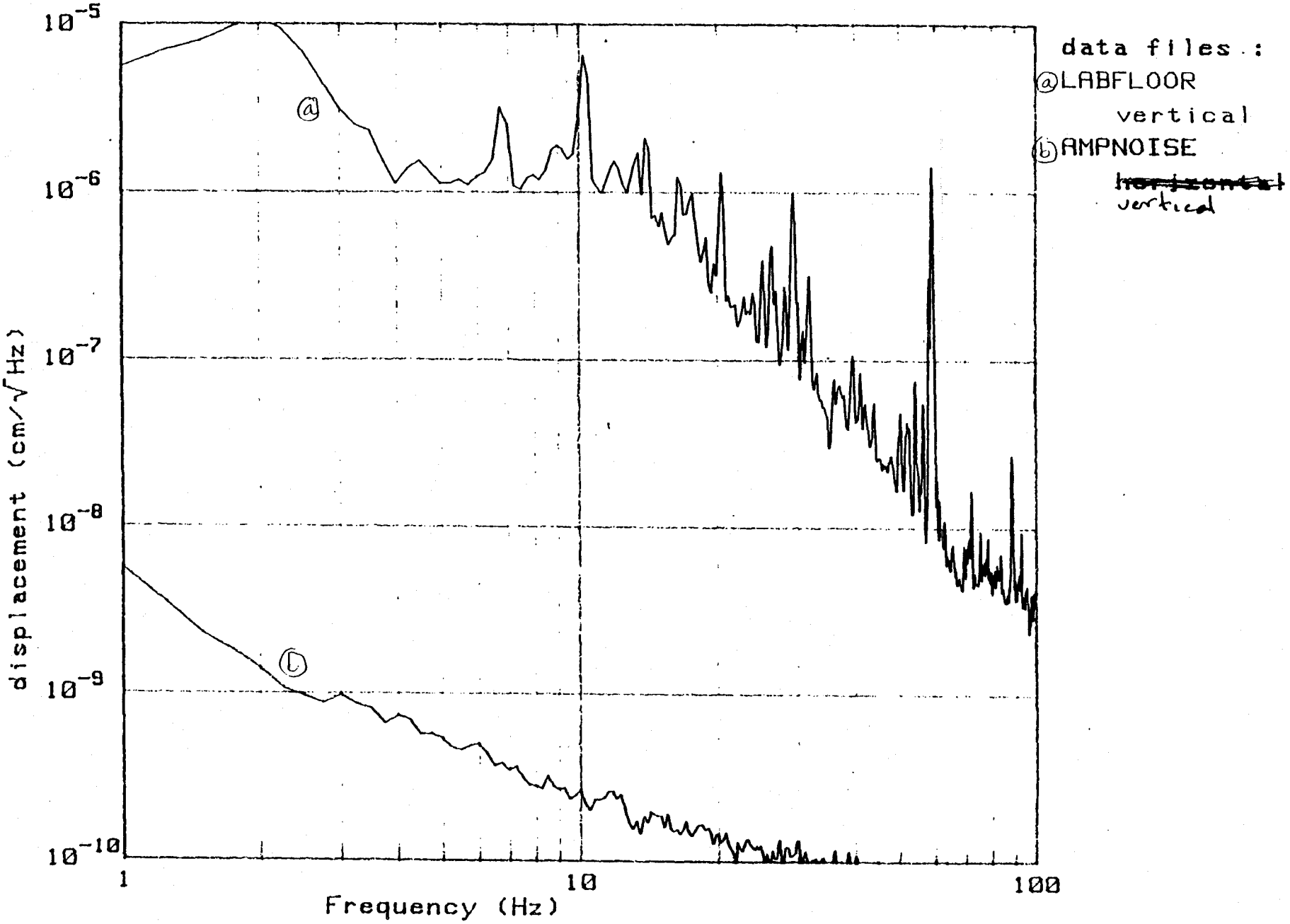

displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐW15_51
vertical
ⓑW16_01
horizontal
duration:150s
Sept 14
Site H
50'to trees
wind moderat
top of pier
at Observ

24B


displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
@W16_14
vertical
ⓑW16_23
horizontal
duration:150s
Sept 14
Site H
50'to trees
wind moderat
on slab
at Observ

25 B

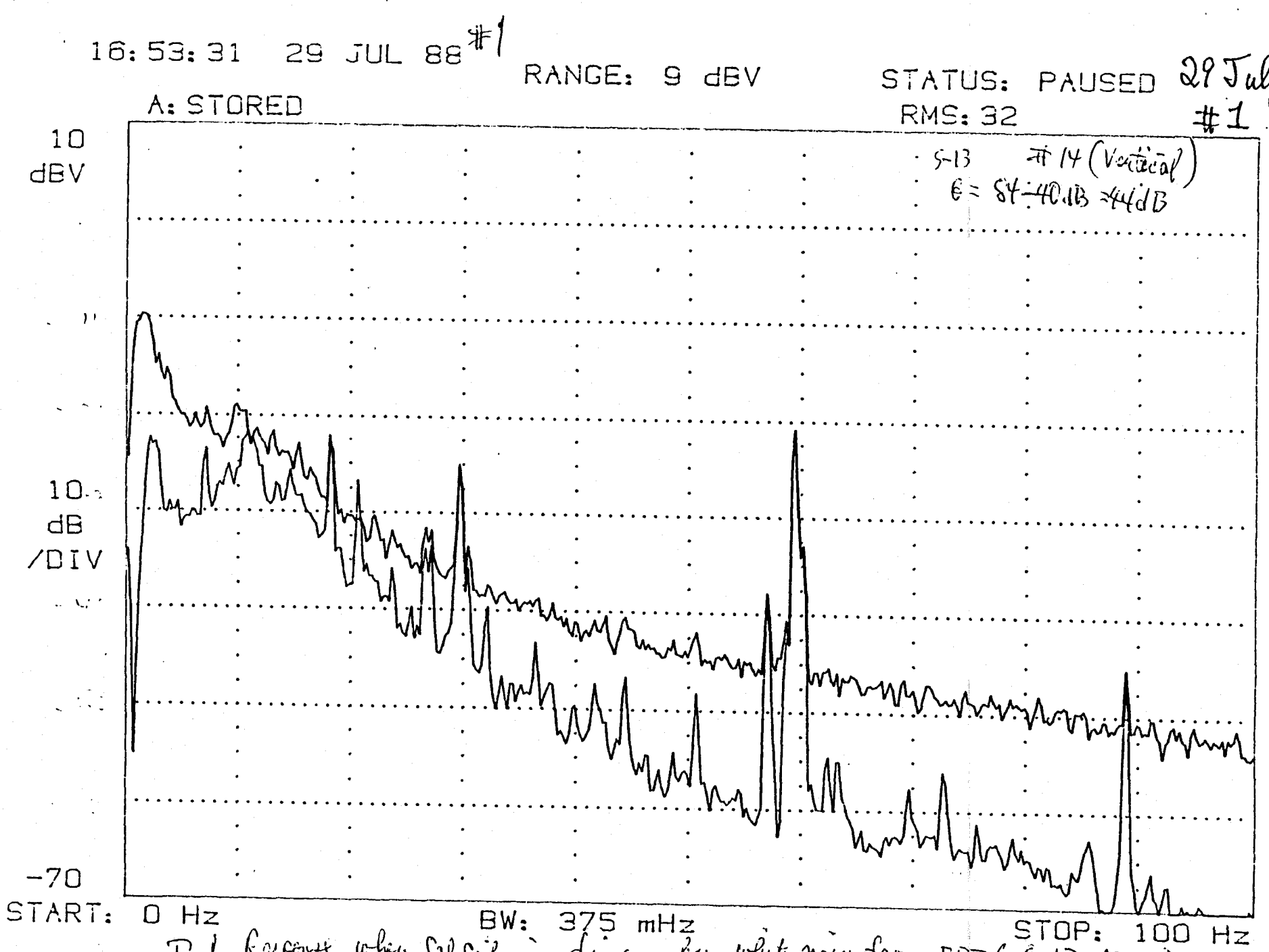

displacement (cm/√Hz)
10^-5
10^-6
10^-7
10^-8
10^-9
10^-10
1
10
100
Frequency (Hz)
data files :
ⓐW16_27
vertical
ⓑW16_31
horizontal
duration:60s
Sept 14
Observatory
on slab by
telescope
wind
moderate


10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
10^{-10}
displacement (cm/√Hz)
1
10
100
Frequency (Hz)
@
ⓑ
data files :
@LABFLOOR
vertical
ⓑAMPNOISE
~~horizontal~~
vertical

Appendix : Calibration Spectra

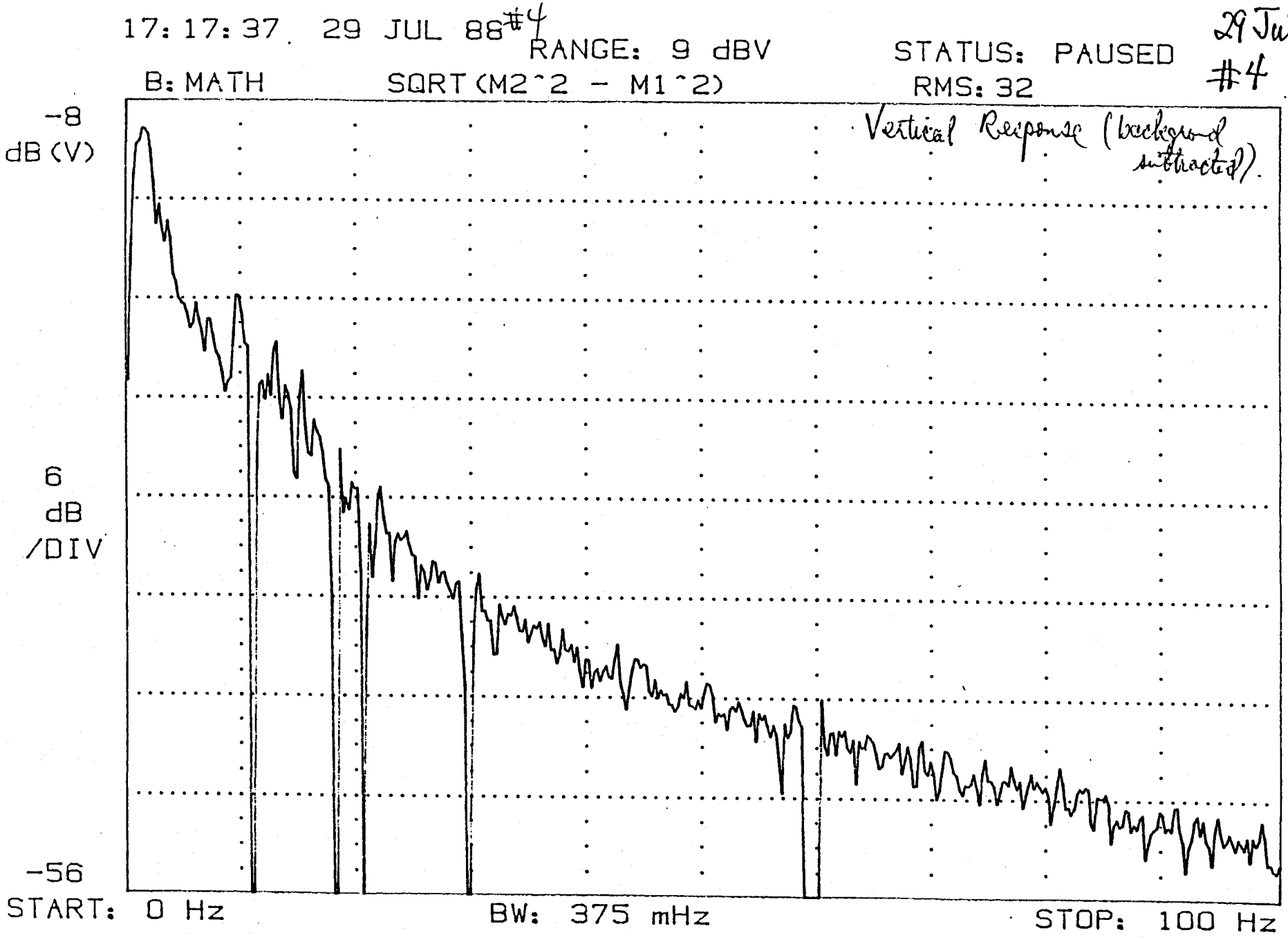
Four raw data graphs of calibration spectra. They were used to compare the response of the horizontal seismometer to the response of the vertical seismometer, when the proof mass was excited by a random force with a flat spectrum.

The fifth graph is the raw noise spectra, in the field, when the proof masses were locked.



29 July #1

Red - Response when Cal Coil is driven by white noise from FFT (0 dB Atten.)
Blue - " with no driving (background).



29 July
#4

Vertical Response (background subtracted).

#2 updated = #4 Transverse Response of #1 with background subtracted.

18:05:22 29 JUL 88 #5

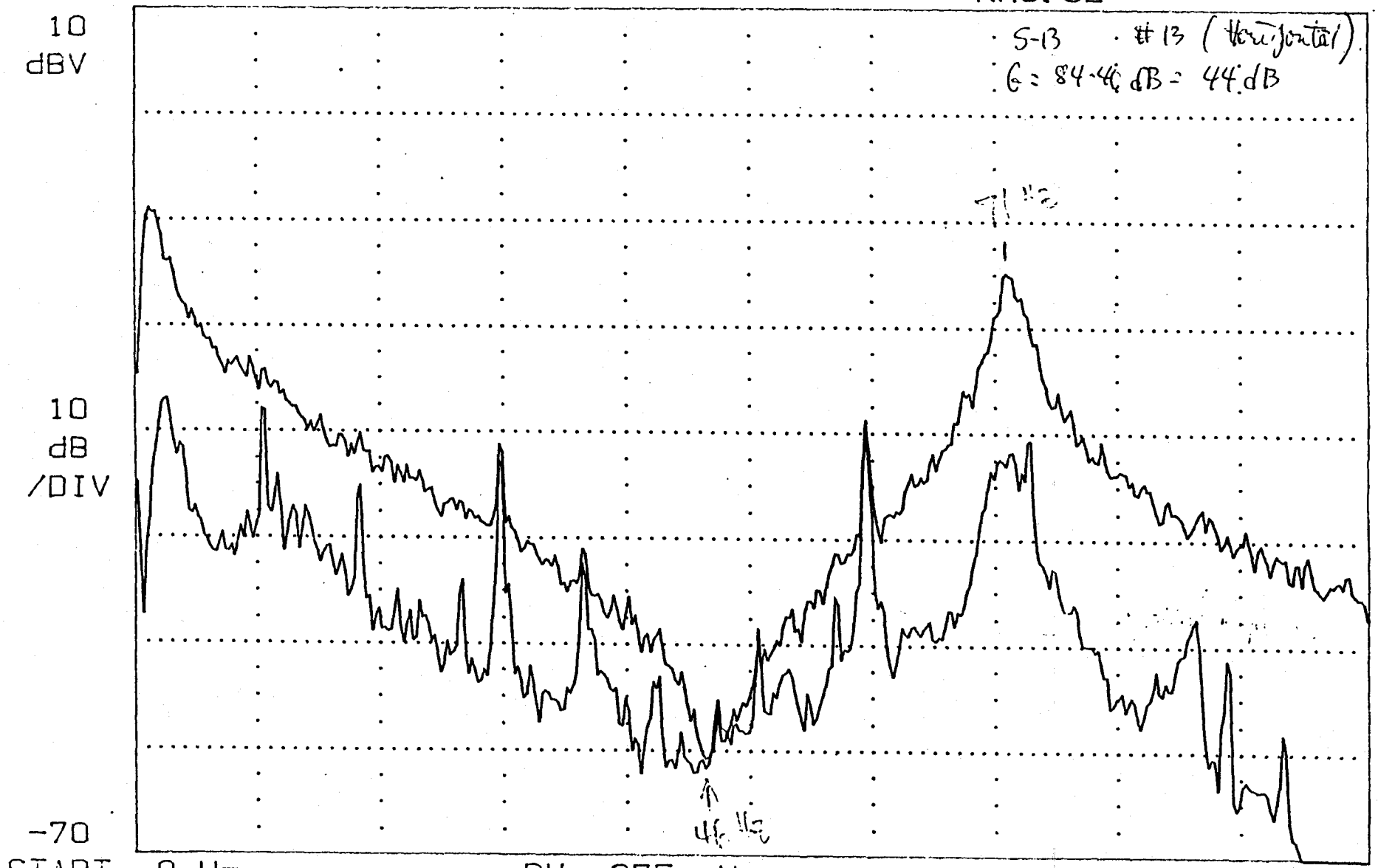
RANGE: 9 dBV

STATUS: PAUSED

29 July #5

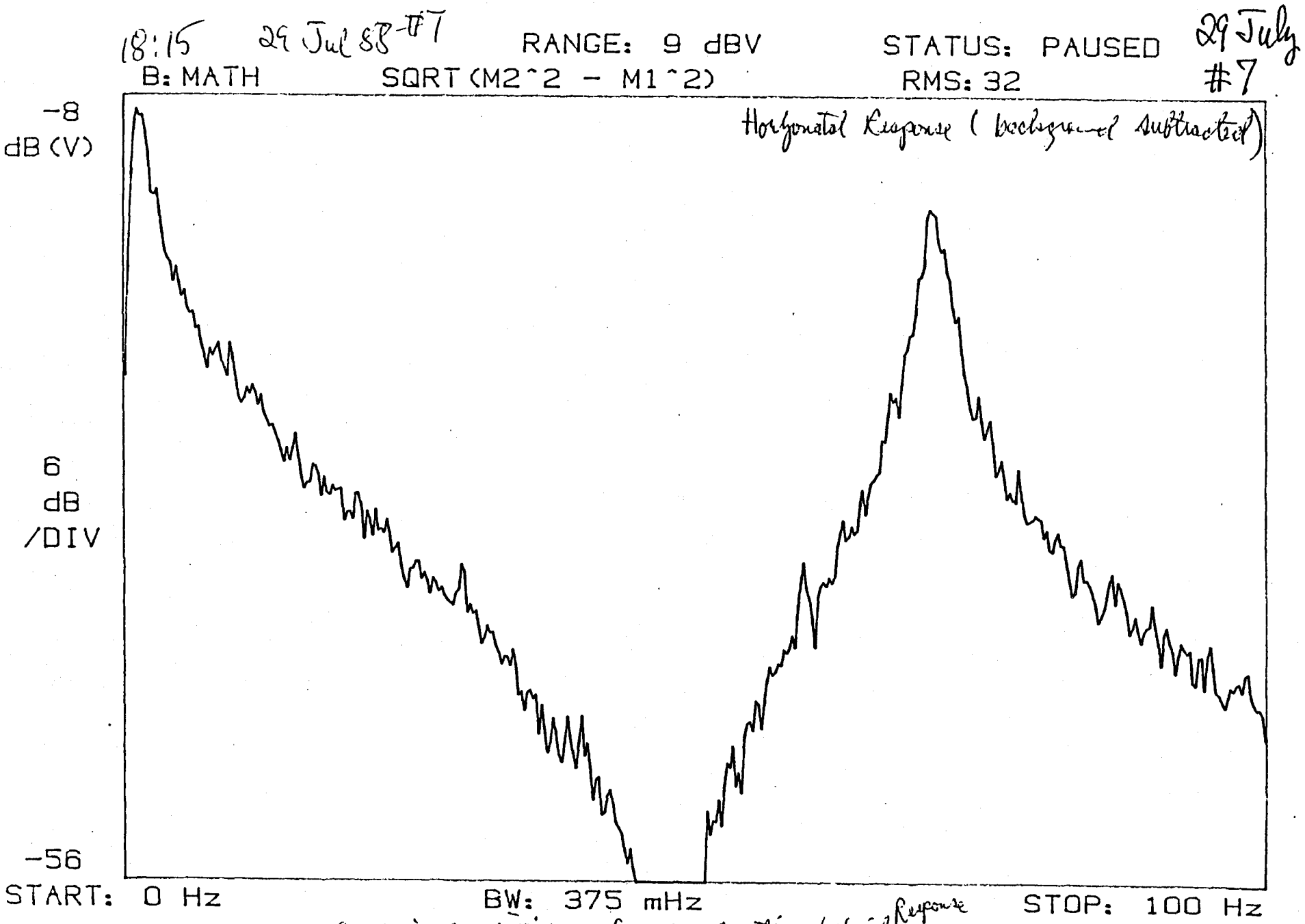
B: STORED

RMS: 32



Red - White force spectrum from coil coil.

Blue - no force (background)

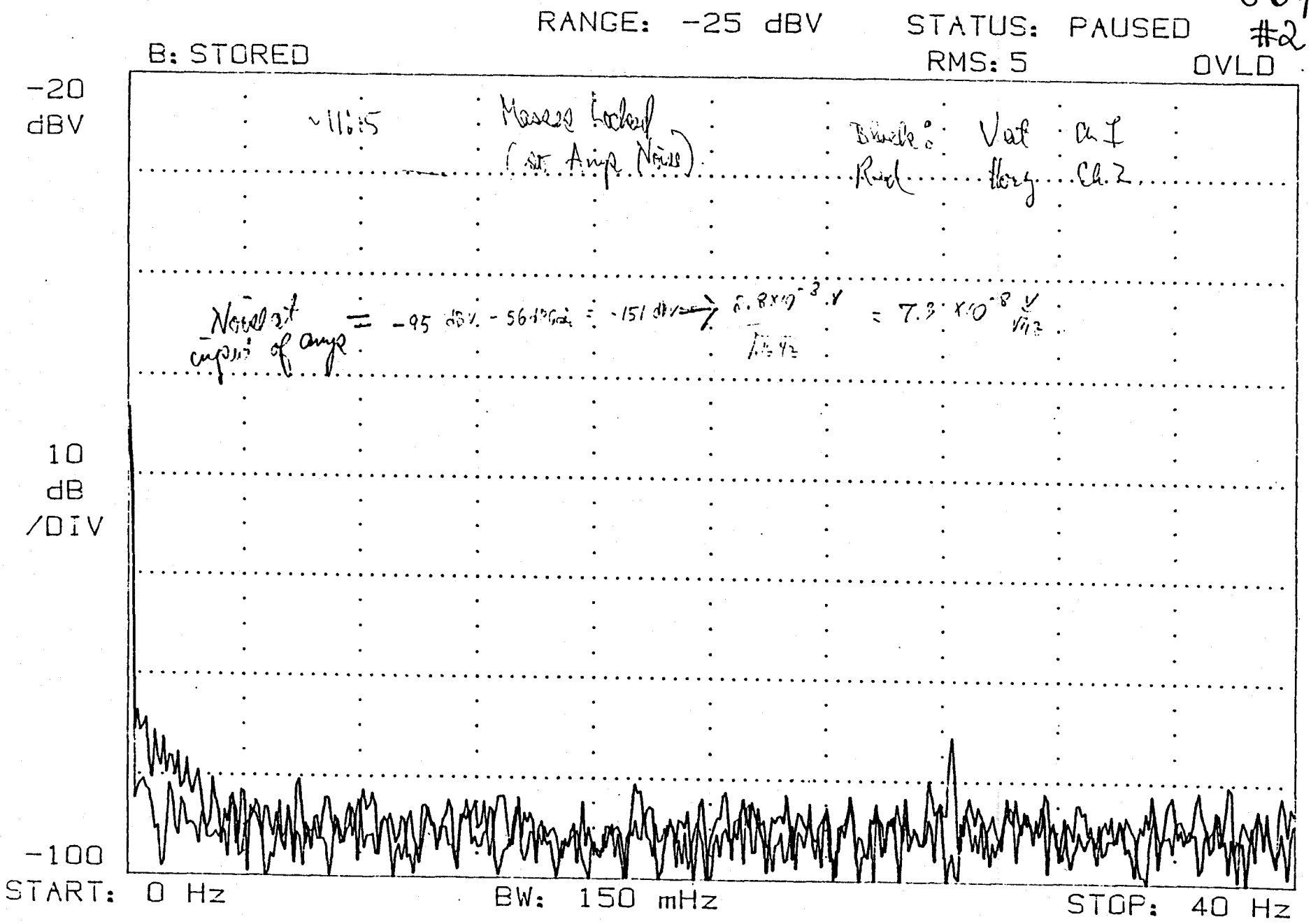


replot #6 of #4

Conclusion: within a few dB of the Vertical Response from 0 - 30 Hz above 30 Hz there is a big "bumpy" response. (Why not vertical?)

Sept 8 #2

8 Sept #2



15

Appendix : Local Wind Data

One years worth of data from the Livingston Fire Lookout Tower, courtesy of Cyril LeJuene of the Lousiana Department of Agriculture and Forestry. These anemometers are a type used on forest lookout towers around the entire country; Mr. LeJuene believes that the US Forest Service originated the instrument,the recording protocol, and the calibration chart.

Louisiana Department of Agriculture & Forestry
Office of Forestry
Post Office Box 8
Clinton, Louisiana
70722-0008
(504) 683-5862

BOB ODOM
COMMISSIONER

MICHAEL P. METY
STATE FORESTER

September 1, 1988

Dr. Warren Johnson
Department of Physics
Louisiana State University
Baton Rouge, Louisiana 70803

Dear Dr. Johnson:

We have enclosed the weather information that you requested for Livingston parish. The monthly reports are for calendar year 1987 and the data includes the wind speed for each day of that year.

Although the heading of each page lists Springville as the station, these measurements were actually taken at Livingston Fire Tower. And although the time of the entries is listed as 1300, the data is measured at 1:00 P.M. Central Standard Time and at 2:00 P.M. Central Daylight Time.

As we discussed, these wind speeds are used for determining fire danger and are corrected to represent wind speed at twenty feet above the ground instead of the one hundred foot level at which the anemometer is actually located.

If the Louisiana Department of Agriculture and Forestry, Office of Forestry can be of further assistance, please contact us.

Cyril E. LeJeune

CYRIL E. LeJEUNE - DISTRICT FORESTER

WIND CONVERSION & CORRECTION TABLE
FOR USE WITH "TOWER MOUNTED"
STEWART ANEMOMETERS

(Wind speeds at instruments have been reduced to equivalent speeds at standard 20-ft level)

STEADY WINDS				GUSTY WINDS			
Number of contacts in 2 min.	Wind Speed MPH 20'Std.	Number of contacts in 2 min.	Wind Speed MPH 20'Std.	Number of contacts in 4 min.	Wind Speed MPH 20'Std.	Number of contacts in 4 min.	Wind Speed MPH 20'Std.
1	1	31	12	1	1	62-63	12
2	1	32	12	2-3	1	64-65	12
3	1	33	12	4-5	1	66-67	12
4	2	34	12	6-7	1	68-69	12
5	2	35	13	8-9	2	70-71	13
6	3	36	13	10-11	2	72-73	13
7	3	37	14	12-13	3	74-75	14
8	4	38	14	14-15	3	76-77	14
9	4	39	15	16-17	4	78-79	15
10	4	40	15	18-19	4	80-81	15
11	4	41	15	20-21	4	82-83	15
12	5	42	15	22-23	4	84-85	15
13	5	43	16	24-25	5	86-87	16
14	6	44	16	26-27	5	88-89	16
15	6	45	17	28-29	6	90-91	17
16	7	46	17	30-31	6	92-93	17
17	7	47	18	32-33	7	94-95	18
18	7	48	18	34-35	7	96-97	18
19	7	49	18	36-37	7	98-99	18
20	7	50	18	38-41	7	100-101	18
21	8	51	19	42-43	8	102-103	19
22	8	52	19	44-45	8	104-105	19
23	9	53	20	46-47	9	106-107	20
24	9	54	20	48-49	9	108-109	20
25	9	55	20	50-51	9	110-111	20
26	9	56	20	52-53	9	112-113	20
27	10	57	21	54-55	10	114-115	21
28	10	58	21	56-57	10	116-117	21
29	11	59	22	58-59	11	118-119	22
30	11	60	22	60-61	11	120-121	22

If no contact made in 2 min. wind speed is 0.

If more than 60 contacts in 2 min., determine wind speed by formula:

No. of Contacts in 2 min. x 100

If no contact made in 4 min. wind speed is 0.

If more than 121 contacts in 4 min., determine wind speed by formula:

No. of Contacts in 4 min. x 100

FIRE DANGER RECORD -- NATION

DIST 10 PARISH -LIVINGSTON STATION -SPRINGVILLE MONTH/YEAR 01/87 TIME

DAY #	DRY TEMP	WET TEMP	REL HUM	HERB STG	FINE FUEL	RAIN IN	BU DRY YEST	DRY FACT	BU TODAY	ADJ FUEL	WIND SPD	SPRED IN	CLASS DY	FIRES #	ACRES #	SIG 7 #	MILES #
1	50	45	68	1	13	0	7	1	8	20	3	6	2	0	0	0	0
2	50	45	68	1	13	0	8	1	9	20	2	5	2	0	0	0	0
3	58	53	72	1	14	0	9	1	10	20	10	13	3	0	0	0	0
4	47	45	86	1	21	1.67	2	0	2	30	4	1	1	0	0	0	0
5	54	45	48	1	9	0	2	2	4	17	2	8	2	0	0	0	0
6	64	51	39	1	6.5	0	4	3	7	14	0	9	2	0	0	0	0
7	66	60	71	1	12	0	7	1	8	20	1	4	1	0	0	0	0
8	60	55	73	1	12	0	8	1	9	20	1	4	1	0	0	0	0
9	68	62	71	1	12	0	9	1	10	20	5	8	2	0	0	0	0
10	49	44	67	1	14	0.20	10	1	11	20	10	13	3	0	0	0	0
11	45	38	51	1	10	0	11	1	12	18	4	10	3	0	0	0	0
12	50	42	49	1	9	0	12	2	14	15	2	10	3	0	0	0	0
13	53	48	69	1	13	0	14	1	15	19	1	4	1	0	0	0	0
14	50	49	93	1	22	0.52	6	0	6	30+	0	1	1	0	0	0	0
15	58	55	83	1	17	0	6	0	6	23	1	1	1	0	0	0	0
16	57	56	94	1	22	0.88	3	0	3	30	2	1	1	0	0	0	0
17	53	53	100	1	30+	0.95	1	0	1	30+	3	1	1	0	0	0	0
18	70	70	100	1	30+	1.41	0	0	0	30+	5	1	1	0	0	0	0
19	45	39	57	1	12	0	0	1	1	21	5	6	2	0	0	0	0
20	44	39	63	1	13	0	1	1	2	21	2	3	1	0	0	0	0
21	36	36	100	1	30+	1.04	0	0	0	30+	4	1	1	0	0	0	0
22	47	41	59	1	12	1.05	0	1	1	21	8	8	2	0	0	0	0
23	49	39	37	1	8.5	0	1	2	3	17	4	10	3	0	0	0	0
24	60	55	73	1	12	0	3	1	4	21	3	4	1	0	0	0	0
25	47	45	86	1	21	0.47	3	0	3	30	6	1	1	0	0	0	0
26	46	40	58	1	12	0	3	1	4	21	10	10	3	0	0	0	0
27	55	45	43	1	8.5	0	4	2	6	16	7	17	3	0	0	0	0
28	65	60	75	1	14	0	6	1	7	20	4	7	2	0	0	0	0
29	73	62	53	1	7.5	0	7	2	9	16	9	19	3	2	8	1	7
30	67	55	45	1	8	0	9	2	11	16	6	15	3	0	0	2	28
31	63	50	38	1	6.5	0	11	3	14	13	2	12	3	1	6	1	20
TOTALS	TOTAL RAIN= 8.19													3	14	4	55

TOTAL RAINFALL = 8.19 SIGNAL 7'S = 4 SIGNAL 7 MILES = 55

AVER TEMP = 55 AVER HUMIDITY = 67 HIGH TEMP = 73 LOW TEMP = 36

NUMBER OF CLASS DAYS

13 CLASS 1 DAYS
8 CLASS 2 DAYS
10 CLASS 3 DAYS
0 CLASS 4 DAYS
0 CLASS 5 DAYS

FIRE DANGER RECORD -- NATIONAL SYSTEM

DIST 10 PARISH -LIVINGSTON STATION -SPRINGVILLE MONTH/YEAR 02/87 TIME 1

DAY #	DRY TEMP	WET TEMP	REL HUM	HERB STG	FINE FUEL	RAIN IN	BUY EST	DRY FAC T	BUR DAY	ADJ FUEL	WIND SPD	SPRD IN	CLASS DY	FIRES #	ACRES #	SIG 7 #	MILES #
1	71	63	64	1	9	0	14	2	16	15	9	19	3	3	3.50	0	0
2	68	57	58	1	9	0.52	9	2	11	18	4	10	3	0	0	0	0
3	69	59	55	1	9	0	11	2	13	15	1	8	2	2	6	1	25
4	62	58	79	1	14	0	13	1	14	19	7	10	3	0	0	0	0
5	55	55	100	1	30+	0.17	10	0	10	30+	3	1	1	0	0	0	0
6	51	50	93	1	22	0.65	6	0	6	30	2	1	1	0	0	0	0
7	60	50	48	1	8	0.12	6	1	7	16	3	11	3	0	0	0	0
8	69	55	39	1	6.5	0	7	3	10	14	9	22	4	0	0	0	0
9	50	39	32	1	7	0	10	2	12	13	9	25	4	0	0	0	0
10	63	50	38	1	6.5	0	12	3	15	13	6	20	4	0	0	0	0
11	68	58	54	1	8.5	0	15	2	17	15	9	19	3	2	5.25	0	0
12	70	62	64	1	9	0	17	2	19	15	7	17	3	1	10	0	0
13	72	61	53	1	7.5	0	19	2	21	14	1	9	2	0	0	0	0
14	71	61	56	1	8	0	21	2	23	14	7	20	4	4	36.25	0	0
15	60	60	100	1	30+	1.87	2	0	2	30+	3	1	1	0	0	0	0
16	55	52	82	1	17	0.04	2	0	2	24	4	3	1	0	0	0	0
17	49	46	80	1	18	0	2	0	2	27	5	1	1	0	0	0	0
18	42	38	69	1	14	0	2	1	3	21	6	7	2	0	0	0	0
19	50	45	68	1	13	0	3	1	4	21	5	6	2	1	11	0	0
20	54	52	88	1	19	0.05	4	0	4	30	6	1	1	0	0	0	0
21	50	50	100	1	30+	0.75	2	0	2	30+	3	1	1	0	0	0	0
22	51	49	87	1	19	0.75	0	0	0	27	6	1	1	0	0	0	0
23	55	49	65	1	13	0	0	1	1	21	4	1	1	0	0	0	0
24	48	48	100	1	30+	0.48	1	0	1	30+	3	1	1	0	0	0	0
25	55	55	100	1	30+	1.02	0	0	0	30+	2	1	1	0	0	0	0
26	65	65	100	1	30+	0.58	0	0	0	30+	4	1	1	0	0	0	0
27	67	67	100	1	30+	2.96	0	0	0	30+	3	1	1	0	0	0	0
28	65	56	56	1	9	0.81	0	2	2	17	7	13	3	0	0	0	0
TOTALS	TOTAL RAIN= 10.77													13	72	1	25

TOTAL RAINFALL = 10.77 SIGNAL 7'S = 1 SIGNAL 7 MILES = 25

AVER TEMP = 59 AVER HUMIDITY = 72 HIGH TEMP = 72 LOW TEMP = 42

NUMBER OF CLASS DAYS

13 CLASS 1 DAYS
4 CLASS 2 DAYS
7 CLASS 3 DAYS
4 CLASS 4 DAYS
0 CLASS 5 DAYS

FIRE DANGER RECORD -- NATIONAL SYSTEM

DIST 10 PARISH -LIVINGSTON STATION -SPRINGVILLE MONTH/YEAR 03/87 TIME

DAY #	DRY TEMP	WET TEMP	REL HUM	HERB STG	FINE FUEL	RAIN IN	BU EST	DRY FACT	BU TODAY	ADJ FUEL	WIND SPD	SPRED IN	CLASS DY	FIRES #	ACRES #	SIG 7 #	MILES #
1	61	52	54	1	8.5	0	2	2	4	17	9	15	3	0	0	0	0
2	61	52	54	1	8.5	0	4	2	6	17	3	9	2	0	0	0	0
3	67	54	41	1	7.5	0	6	2	8	16	4	12	3	0	0	0	0
4	66	50	29	1	5.5	0	8	3	11	14	4	14	3	4	20.50	0	0
5	67	50	26	1	5.5	0	11	3	14	13	2	12	3	4	28	0	0
6	68	54	38	1	6.5	0	14	3	17	13	9	25	4	0	0	0	0
7	54	52	88	1	19	0.40	12	0	12	26	1	1	1	0	0	0	0
8	56	54	88	1	19	0.60	6	0	6	26	2	1	1	0	0	0	0
9	70	58	48	1	7	0	6	2	8	14	1	9	2	0	0	0	0
10	64	55	56	1	9	0	8	2	10	16	4	12	3	0	0	0	0
11	45	43	85	1	21	0.05	10	0	10	29	4	1	1	0	0	0	0
12	56	46	44	1	9.5	0	10	2	12	18	7	13	3	0	0	0	0
13	62	49	37	1	6.5	0	12	3	15	15	3	11	3	0	0	0	0
14	67	54	41	1	7.5	0	15	2	17	15	11	22	4	1	7	0	0
15	70	62	64	1	9.5	0	17	2	19	17	2	8	2	1	4	0	0
16	75	64	55	1	9.5	0	19	2	21	16	15	26	4	2	19	0	0
17	65	65	100	1	30+	0.10	21	0	21	30	11	1	1	0	0	0	0
18	71	61	56	1	8	2.32	1	2	3	17	2	8	2	0	0	0	0
19	73	60	46	1	7	0	3	2	5	15	4	12	3	0	0	0	0
20	75	60	40	1	6	0	5	3	8	14	5	16	3	1	10	0	0
21	79	63	40	1	6	0	8	3	11	14	2	11	3	0	0	0	0
22	75	62	47	1	7	0	11	2	13	13	1	10	3	0	0	0	0
23	75	65	58	1	8	0	13	2	15	15	21	34	4	0	0	0	0
24	67	52	34	1	6	1.60	2	3	5	15	1	8	2	0	0	0	0
25	72	55	31	1	5	0	5	3	8	11	4	19	3	0	0	0	0
26	73	59	42	1	6	0	8	3	11	14	7	20	4	0	0	0	0
27	73	62	53	1	7.5	0.13	10	2	12	16	2	10	3	0	0	0	0
28	77	63	45	1	7	0	12	2	14	13	4	16	3	0	0	0	0
29	65	65	100	1	30+	0.07	14	0	14	30+	3	1	1	0	0	0	0
30	41	39	84	1	18	0.70	6	0	6	26	9	3	1	0	0	0	0
31	51	40	34	1	7	0	6	2	8	14	6	18	3	0	0	1	30
TOTALS	TOTAL RAIN= 5.97													13	88.5	1	30

TOTAL RAINFALL = 5.97 SIGNAL 7'S = 1 SIGNAL 7 MILES = 30

AVER TEMP = 66 AVER HUMIDITY = 53 HIGH TEMP = 79 LOW TEMP = 41

NUMBER OF CLASS DAYS

6 CLASS 1 DAYS
5 CLASS 2 DAYS
15 CLASS 3 DAYS
5 CLASS 4 DAYS
0 CLASS 5 DAYS

FIRE DANGER RECORD -- NATIONAL SYSTEM

DIST 10 PARISH -LIVINGSTON STATION -SPRINGVILLE MONTH/YEAR 04/87 TIME

DAY #	DRY TEMP	WET TEMP	REL HUM	HERB STG	FINE FUEL	RAIN IN	BU YEST	DRY FACT	BU TODAY	ADJ FUEL	WIND SPD	SPRED IN	CLASS DY	FIRES #	ACRES #	SIG 7 #	MILES #
1	66	52	36	2	12	0	8	2	10	20	3	6	2	0	0	0	0
2	70	59	51	2	13	0	10	2	12	20	7	10	3	2	7	0	0
3	50	42	49	2	14	0.40	8	2	10	20	7	10	3	0	0	0	0
4	54	42	32	2	12	0	10	2	12	20	7	10	3	0	0	0	0
5	61	47	31	2	11	0	12	3	15	17	3	10	3	2	7	0	0
6	67	53	37	2	12	0	15	2	17	19	6	9	2	0	0	0	0
7	68	53	34	2	11	0	17	3	20	16	1	8	2	2	3.25	0	0
8	70	55	36	2	11	0	20	3	23	16	9	19	3	3	14	0	0
9	72	52	21	2	9	0	23	4	27	14	3	12	3	1	3	0	0
10	73	61	50	2	13	0	27	2	29	18	6	12	3	6	76.50	0	0
11	76	67	63	2	14	0	29	2	31	17	6	12	3	0	0	0	0
12	82	72	62	2	14	0	31	2	33	17	6	13	3	4	61	1	30
13	66	65	95	2	30	0.12	31	0	31	29	4	1	1	0	0	0	0
14	69	58	51	2	14	1.08	9	2	11	20	8	11	3	0	0	0	0
15	72	59	45	2	12	0	11	2	13	19	13	17	3	0	0	0	0
16	74	62	50	3	18	0	13	2	15	25	12	6	2	0	0	0	0
17	79	64	43	3	16	0	15	3	18	22	9	9	2	2	4	0	0
18	86	69	42	3	15	0	18	3	21	21	6	7	2	2	10.25	1	25
19	85	65	30	3	15	0	21	3	24	21	4	5	2	2	35	0	0
20	86	66	34	3	15	0	24	3	27	21	7	8	2	2	26	2	50
21	88	67	32	3	15	0	27	3	30	20	5	8	2	1	8	1	30
22	79	70	64	3	19	0	30	2	32	23	4	3	1	1	5	0	0
23	77	60	35	3	16	0	32	3	35	20	5	8	2	1	5	0	0
24	75	60	40	3	16	0	35	3	38	20	9	19	3	1	40	1	12
25	75	62	47	3	17	0	38	2	40	19	5	8	2	0	0	1	15
26	80	61	32	3	15	0	40	3	43	19	4	8	2	2	73	0	0
27	85	66	36	3	15	0	43	3	46	19	3	6	2	1	30	1	20
28	85	70	47	2	11	0	46	3	49	14	5	16	3	0	0	1	20
29	82	63	33	2	9.5	0	49	4	53	13	3	14	3	2	56	0	0
30	86	68	39	2	10	0	53	3	56	13	2	12	3	0	0	0	0
TOTALS		TOTAL RAIN=	1.6											37	464	9	202

TOTAL RAINFALL = 1.6 SIGNAL 7'S = 9 SIGNAL 7 MILES = 202

AVER TEMP = 75 AVER HUMIDITY = 43 HIGH TEMP = 88 LOW TEMP = 50

NUMBER OF CLASS DAYS

2 CLASS 1 DAYS
13 CLASS 2 DAYS
15 CLASS 3 DAYS
0 CLASS 4 DAYS
0 CLASS 5 DAYS

FIRE DANGER RECORD -- NATIONAL SYSTEM

DIST 10 PARISH -LIVINGSTON STATION -SPRINGVILLE MONTH/YEAR 05/87 TIME

DAY #	DRY TEMP P	WET TEMP P	REL HUM M	HERB STG	FINE FUEL	RAIN IN	BU DRY YEST T	DRY FACT T	BU TODAY	ADJ FUEL L	WIND SPD	SPRED INDX	CLASS DY	FIRES #	ACRES #	SIG 7 #	MILES #
1	85	69	44	2	10	0	56	3	59	13	3	14	3	4	50	0	0
2	84	72	56	2	12	0	59	2	61	15	5	14	3	1	25	0	0
3	88	73	49	2	11	0	61	3	64	13	1	10	3	0	0	0	0
4	82	75	72	2	15	0	64	1	65	18	1	6	2	0	0	0	0
5	82	74	69	2	14	2.19	4	2	6	20	1	4	1	0	0	0	0
6	81	73	68	2	14	0	6	2	8	20	2	5	2	0	0	0	0
7	73	70	78	2	17	0.20	6	1	7	23	1	3	1	0	0	0	0
8	80	71	64	2	13	0	7	2	9	20	1	4	1	0	0	0	0
9	85	70	47	2	11	0.03	9	3	12	18	7	13	3	0	0	0	0
10	76	72	82	2	19	0	12	1	13	25	1	1	1	0	0	0	0
11	80	70	61	2	13	0.40	8	2	10	20	1	4	1	0	0	0	0
12	82	75	72	2	15	0	10	1	11	23	1	1	1	0	0	0	0
13	79	71	68	2	15	2.09	1	1	2	24	1	1	1	0	0	0	0
14	83	72	59	2	12	0	2	2	4	21	2	3	1	0	0	0	0
15	84	73	59	2	12	0	4	2	6	20	4	7	2	0	0	0	0
16	80	72	68	2	14	0	6	2	8	20	2	5	2	0	0	0	0
17	84	74	62	2	12	0	8	2	10	20	4	7	2	0	0	0	0
18	86	75	68	2	13	0	10	2	12	20	1	4	1	0	0	0	0
19	82	75	57	3	17	0	12	2	14	22	1	1	1	0	0	0	0
20	87	75	57	3	17	0	14	2	16	22	1	1	1	0	0	0	0
21	88	75	55	3	17	0	16	2	18	22	1	1	1	0	0	0	0
22	87	77	64	3	18	0.08	18	2	20	24	3	3	1	0	0	0	0
23	76	73	87	3	26	1.67	3	0	3	30+	6	1	1	0	0	0	0
24	75	74	95	3	29	0.25	3	0	3	30+	2	1	1	0	0	0	0
25	86	77	67	3	19	0	3	2	5	27	3	1	1	0	0	0	0
26	81	75	76	3	21	1.12	1	1	2	30	4	1	1	0	0	0	0
27	84	74	62	3	18	0	2	2	4	27	5	1	1	0	0	0	0
28	86	74	57	3	17	0	4	2	6	23	5	4	1	0	0	0	0
29	84	75	66	3	19	0	6	2	8	26	3	6	2	0	0	0	0
30	85	73	56	3	17	0	8	2	10	23	5	4	1	0	0	0	0
31	86	75	60	3	18	0	10	2	12	26	7	2	1	0	0	0	0
TOTALS	TOTAL RAIN= 8.03													5	75	0	0

TOTAL RAINFALL = 8.03 SIGNAL 7'S = 0 SIGNAL 7 MILES = 0

AVER TEMP = 83 AVER HUMIDITY = 64 HIGH TEMP = 88 LOW TEMP = 73

NUMBER OF CLASS DAYS

21 CLASS 1 DAYS
6 CLASS 2 DAYS
4 CLASS 3 DAYS
0 CLASS 4 DAYS
0 CLASS 5 DAYS

FIRE DANGER RECORD -- NATIONAL SYSTEM

DIST 10 PARISH -LIVINGSTON STATION -SPRINGVILLE MONTH/YEAR 06/87 TIME

DAY #	DRY TEMP	WET TEMP	REL HUM	HERB STG	FINE FUEL	RAIN IN	BUI YEST	DRY FACT	BUI TODAY	ADJ FUEL	WIND SPD	SPRED IN	CLASS DY	FIRES #	ACRES #	SIG 7 #	MILES #
1	86	77	67	3	19	0	12	2	14	25	5	2	1	0	0	0	0
2	86	77	67	3	19	0	14	2	16	25	1	1	1	0	0	0	0
3	84	78	76	3	21	.08	16	1	17	28	5	1	1	0	0	0	0
4	85	75	63	3	18	0	17	2	19	25	2	1	1	0	0	0	0
5	85	74	60	3	18	0	19	2	21	24	2	8	2	0	0	0	0
6	88	75	55	3	17	0	21	2	23	21	3	9	2	0	0	0	0
7	83	76	73	3	20	0	23	1	24	24	5	4	1	0	0	0	0
8	80	76	83	3	22	1.55	3	1	4	30	4	1	1	0	0	0	0
9	85	75	63	3	18	0	4	2	6	26	6	2	1	0	0	0	0
10	84	76	69	3	19	0	6	2	8	26	5	2	1	0	0	0	0
11	83	78	80	3	22	0	8	1	9	29	4	1	1	0	0	0	0
12	77	77	100	3	30+	.5	5	0	5	30+	1	1	1	0	0	0	0
13	79	77	91	3	29	.52	2	0	2	30+	1	1	1	0	0	0	0
14	80	77	87	3	25	1.30	0	1	1	30	2	1	1	0	0	0	0
15	85	77	70	3	20	.57	1	1	2	27	4	1	1	0	0	0	0
16	84	77	73	3	20	1.22	0	1	1	27	4	1	1	0	0	0	0
17	82	77	80	3	22	.35	1	1	2	30	4	1	1	0	0	0	0
18	75	74	95	3	30+	.05	2	0	2	30+	2	1	1	0	0	0	0
19	79	75	83	3	24	.15	1	1	2	30+	5	1	1	0	0	0	0
20	85	80	80	3	22	.45	1	1	2	30	1	1	1	0	0	0	0
21	74	74	100	3	30+	.30	1	0	1	30+	2	1	1	0	0	0	0
22	83	79	84	3	22	0	1	1	2	30	1	1	1	0	0	0	0
23	94	80	54	3	15	0	2	3	5	24	2	2	1	0	0	0	0
24	82	78	84	3	22	.05	5	1	6	29	0	1	1	0	0	0	0
25	86	79	73	3	20	.45	5	1	6	29	2	1	1	0	0	0	0
26	85	80	80	3	22	0	6	1	7	29	5	1	1	0	0	0	0
27	86	71	48	3	16	.20	6	3	9	23	5	4	1	0	0	0	0
28	85	69	44	3	15	0	9	3	12	23	7	5	2	0	0	0	0
29	85	78	73	3	20	0	12	1	13	25	7	2	1	0	0	0	0
30	75	75	100	3	30+	.96	4	0	4	30+	2	1	1	0	0	0	0
TOTALS	TOTAL RAIN= 8.7													0	0	0	0

TOTAL RAINFALL = 8.7 SIGNAL 7'S = 0 SIGNAL 7 MILES = 0

AVER TEMP = 83 AVER HUMIDITY = 75 HIGH TEMP = 94 LOW TEMP = 74

NUMBER OF CLASS DAYS

27 CLASS 1 DAYS
3 CLASS 2 DAYS
0 CLASS 3 DAYS
0 CLASS 4 DAYS
0 CLASS 5 DAYS

FIRE DANGER RECORD -- NATIONAL SYSTEM

DIST 10 PARISH -LIVINGSTON STATION -SPRINGVILLE MONTH/YEAR 07/87 TIME

DAY #	DRY TEMP	WET TEMP	REL HUM	HERB STG	FINE FUEL	RAIN IN	BU YEST	DRY FACT	BU TODAY	ADJ FUEL	WIND SPD	SPRED IN	CLASS DY	FIRES #	ACRES #	SIG 7 #	MILES #
1	74	74	100	3	30+	0.11	3	0	3	30+	9	1	1	0	0	0	0
2	85	79	77	3	21	0.60	2	1	3	30	2	1	1	0	0	0	0
3	89	79	64	3	18	0	3	2	5	27	1	1	1	0	0	0	0
4	87	80	74	3	20	0.12	3	1	4	27	3	1	1	0	0	0	0
5	88	81	74	3	20	0.40	3	1	4	21	2	1	1	0	0	0	0
6	73	72	95	3	30+	0.18	3	0	3	30+	5	1	1	0	0	0	0
7	74	73	95	3	30+	0.24	3	0	3	30+	2	1	1	0	0	0	0
8	80	77	87	3	25	0.25	3	1	4	30	1	1	1	0	0	0	0
9	86	78	70	3	20	0.12	3	1	4	27	2	1	1	0	0	0	0
10	89	79	64	3	19	0	4	2	6	26	0	1	1	0	0	0	0
11	90	77	55	3	16	0	6	3	9	23	1	1	1	0	0	0	0
12	90	80	65	3	18	0	9	2	11	26	2	1	1	0	0	0	0
13	89	78	61	3	18	0	11	2	13	25	1	1	1	0	0	0	0
14	87	78	67	3	19	0	13	2	15	25	3	1	1	0	0	0	0
15	86	73	54	3	17	0	15	2	17	22	2	3	1	0	0	0	0
16	90	75	50	3	15	0	17	3	20	21	3	4	1	0	0	0	0
17	88	76	58	3	17	0	20	2	22	21	2	3	1	0	0	0	0
18	87	75	57	3	17	0	22	2	24	21	1	2	1	0	0	0	0
19	92	79	56	3	16	0	24	3	27	21	2	3	1	0	0	0	0
20	91	77	53	3	15	0	27	3	30	20	1	4	1	0	0	0	0
21	78	78	100	3	30+	0.80	10	0	10	30+	1	1	1	0	0	0	0
22	83	80	83	3	22	0.70	6	1	7	29	1	1	1	0	0	0	0
23	84	79	80	3	22	0	7	1	8	29	2	1	1	0	0	0	0
24	89	79	64	3	18	0	8	2	10	26	1	1	1	0	0	0	0
25	89	79	64	3	18	0	10	2	12	26	2	1	1	0	0	0	0
26	91	80	62	3	17	0	12	2	14	22	1	2	1	0	0	0	0
27	87	79	70	3	20	0.47	8	1	9	26	1	1	1	0	0	0	0
28	92	78	53	3	15	0	9	3	12	22	1	2	1	0	0	0	0
29	90	81	68	3	18	0.39	8	2	10	26	2	1	1	0	0	0	0
30	91	82	68	3	18	0	10	2	12	26	1	1	1	0	0	0	0
31	89	80	68	3	19	0.42	8	2	10	26	1	1	1	0	0	0	0
TOTALS						TOTAL RAIN= 4.8								0	0	0	0

TOTAL RAINFALL = 4.8 SIGNAL 7'S = 0 SIGNAL 7 MILES = 0

AVER TEMP = 86 AVER HUMIDITY = 70 HIGH TEMP = 92 LOW TEMP = 73

NUMBER OF CLASS DAYS

31 CLASS 1 DAYS
0 CLASS 2 DAYS
0 CLASS 3 DAYS
0 CLASS 4 DAYS
0 CLASS 5 DAYS

FIRE DANGER RECORD -- NATIONAL SYSTEM

DIST 10 PARISH -LIVINGSTON STATION -SPRINGVILLE MONTH/YEAR 08/87 TIME

DAY #	DRY TEMP	WET TEMP	REL HUM	HERB STG	FINE FUEL	RAIN IN	BUR YEST	DRY FACT	BUR TODAY	ADJ FUEL	WIND SPD	SPRED IN	CLASS DY	FIRES #	ACRES #	SIG 7 #	MILES #
1	89	79	64	3	18	0	10	2	12	26	2	1	1	0	0	0	0
2	92	80	59	3	16	0	12	3	15	22	3	4	1	0	0	0	0
3	91	82	68	3	18	0	15	2	17	25	2	1	1	0	0	0	0
4	80	79	96	3	30+	1.05	5	0	5	30+	1	1	1	0	0	0	0
5	88	83	85	3	25	0.32	3	1	4	30	2	1	1	0	0	0	0
6	84	79	80	3	22	0.10	4	1	5	30	1	1	1	0	0	0	0
7	89	80	68	3	19	0	5	2	7	26	2	1	1	0	0	0	0
8	87	80	74	3	20	0	7	1	8	26	1	1	1	0	0	0	0
9	80	78	91	3	28	0	8	0	8	30+	0	1	1	0	0	0	0
10	81	78	87	3	25	0	8	1	9	29	2	1	1	0	0	0	0
11	80	79	96	3	30+	0.62	4	0	4	30+	1	1	1	0	0	0	0
12	79	79	100	3	30+	3.68	0	0	0	30+	3	1	1	0	0	0	0
13	83	79	84	3	22	0.64	0	1	1	30	2	1	1	0	0	0	0
14	89	82	74	3	20	0	1	1	2	27	3	1	1	0	0	0	0
15	88	79	64	3	19	0	2	2	4	27	1	1	1	0	0	0	0
16	89	79	64	3	18	0	4	2	6	26	3	1	1	0	0	0	0
17	90	79	62	3	17	0	6	2	8	23	4	3	1	0	0	0	0
18	88	78	64	3	18	0	8	2	10	26	4	1	1	0	0	0	0
19	90	80	65	3	18	0	10	2	12	26	2	1	1	0	0	0	0
20	89	77	58	3	17	0	12	2	14	22	1	2	1	0	0	0	0
21	90	78	58	3	16	0	14	3	17	22	1	2	1	0	0	0	0
22	90	82	71	3	19	0	17	2	19	25	1	1	1	0	0	0	0
23	89	79	64	3	18	0	19	2	21	24	2	2	1	0	0	0	0
24	90	79	62	3	17	0	21	2	23	21	1	2	1	0	0	0	0
25	87	79	70	3	20	0	23	1	24	24	2	2	1	0	0	0	0
26	90	81	68	3	18	0	24	2	26	24	1	1	1	0	0	0	0
27	79	79	100	3	30+	0.52	14	0	14	30+	1	1	1	0	0	0	0
28	89	79	64	3	18	0	14	2	16	25	3	1	1	0	0	0	0
29	87	78	67	3	20	0.09	16	1	17	25	2	1	1	0	0	0	0
30	82	76	73	3	20	0.50	12	1	13	26	1	1	1	0	0	0	0
31	76	74	91	3	29	1.60	2	0	2	30+	1	1	1	0	0	0	0
TOTALS			TOTAL RAIN= 9.12											0	0	0	0

TOTAL RAINFALL = 9.12 SIGNAL 7'S = 0 SIGNAL 7 MILES = 0

AVER TEMP = 86 AVER HUMIDITY = 74 HIGH TEMP = 92 LOW TEMP = 76

NUMBER OF CLASS DAYS

31 CLASS 1 DAYS
0 CLASS 2 DAYS
0 CLASS 3 DAYS
0 CLASS 4 DAYS
0 CLASS 5 DAYS

FIRE DANGER RECORD -- NATIONAL SYSTEM

DIST 10 PARISH -LIVINGSTON STATION -SPRINGVILLE MONTH/YEAR 09/87 TIME

DAY #	DRY TEMP	WET TEMP	REL HUM	HERB STG	FINE FUEL	RAIN IN	BU YEST	DRY FACT	BU TODAY	ADJ FUEL	WIND SPD	SPRED IN	CLASS DY	FIRES #	ACRES #	SIG 7 #	MILES #
1	80	72	68	3	19	0	2	2	4	27	4	1	1	0	0	0	0
2	85	72	73	3	18	0	4	2	6	27	3	1	1	0	0	0	0
3	86	68	39	3	15	0	6	3	9	23	1	2	1	0	0	0	0
4	87	73	51	3	17	0	9	2	11	23	3	3	1	0	0	0	0
5	85	73	56	3	17	0	11	2	13	23	1	1	1	0	0	0	0
6	83	74	65	3	19	0	13	2	15	25	0	1	1	0	0	0	0
7	87	74	54	3	17	0	15	2	17	22	2	3	1	0	0	0	0
8	88	75	55	3	17	0	17	2	19	22	5	6	2	0	0	0	0
9	89	77	58	3	17	0	19	2	21	21	3	4	1	0	0	0	0
10	88	78	64	3	18	0	21	2	23	24	2	2	1	0	0	0	0
11	76	74	91	3	29	0	23	0	23	30	3	1	1	0	0	0	0
12	86	77	67	3	19	2.05	2	2	4	27	2	1	1	0	0	0	0
13	86	75	60	3	18	0	4	2	6	26	3	1	1	0	0	0	0
14	88	75	55	3	17	0	6	2	8	23	2	2	1	0	0	0	0
15	86	76	63	3	18	0	8	2	10	26	1	1	1	0	0	0	0
16	82	79	88	3	25	0	10	1	11	29	3	1	1	0	0	0	0
17	86	80	77	3	21	0	11	1	12	29	2	1	1	0	0	0	0
18	75	75	100	3	30+	0.86	5	0	5	30+	0	1	1	0	0	0	0
19	80	78	91	3	28	0.96	1	0	1	30+	2	1	1	0	0	0	0
20	80	68	54	3	17	0	1	2	3	24	3	3	1	0	0	0	0
21	80	69	57	3	17	0	3	2	5	24	2	2	1	0	0	0	0
22	83	71	55	3	17	0	5	2	7	23	3	3	1	0	0	0	0
23	78	64	46	3	17	0	7	2	9	26	4	1	1	0	0	0	0
24	78	65	49	3	17	0	9	2	11	23	4	1	1	0	0	0	0
25	78	65	49	3	17	0	11	2	13	22	0	2	1	0	0	0	0
26	79	67	53	3	18	0	13	2	15	25	2	1	1	0	0	0	0
27	81	73	68	3	19	0	15	2	17	25	3	1	1	0	0	0	0
28	80	74	75	3	21	0	17	1	18	28	2	1	1	0	0	0	0
29	80	74	75	3	21	0	18	1	19	28	1	1	1	0	0	0	0
30	76	63	48	3	11	0	19	2	21	21	6	7	2	0	0	0	0
TOTALS		TOTAL RAIN=	3.87											0	0	0	0

TOTAL RAINFALL = 3.87 SIGNAL 7'S = 0 SIGNAL 7 MILES = 0

AVER TEMP = 83 AVER HUMIDITY = 63 HIGH TEMP = 89 LOW TEMP = 75

NUMBER OF CLASS DAYS

28 CLASS 1 DAYS
2 CLASS 2 DAYS
0 CLASS 3 DAYS
0 CLASS 4 DAYS
0 CLASS 5 DAYS

FIRE DANGER RECORD -- NATIONAL SYSTEM

DIST 10 PARISH -LIVINGSTON STATION -SPRINGVILLE MONTH/YEAR 10/87 TIME

DAY #	DRY TEMP	WET TEMP	REL HUM	HERB STG	FINE FUEL	RAIN IN	BU YEST	DRY FACT	BU TODAY	ADJ FUEL	WIND SPD	SPRED IN	CLASS DY	FIRES #	ACRES #	SIG 7 #	MILES #
1	76	60	38	3	16	0	21	3	24	21	3	4	1	0	0	0	0
2	79	62	37	3	16	0	24	3	27	21	2	3	1	0	0	0	0
3	65	52	39	3	17	0	27	2	29	21	7	8	2	2	12	0	0
4	65	53	44	3	17	0	29	2	31	20	2	5	2	0	0	0	0
5	71	58	45	3	17	0	31	2	33	20	1	4	1	0	0	1	25
6	76	62	45	3	17	0	33	2	35	20	9	12	3	0	0	0	0
7	74	56	30	3	15	0	35	3	38	20	4	7	2	2	6	0	0
8	70	55	36	3	16	0	38	3	41	19	3	6	2	0	0	1	20
9	75	61	44	2	11	0	41	3	44	14	2	11	3	0	0	0	0
10	75	63	51	2	13	0	44	3	47	16	1	8	2	0	0	0	0
11	78	62	39	2	11	0	47	3	50	13	4	16	3	1	5	0	0
12	67	55	45	2	13	0	50	2	52	15	6	15	3	3	13	1	30
13	66	54	44	2	13	0	52	2	54	15	5	14	3	3	5.25	0	0
14	72	61	53	2	13	0	54	2	56	15	2	10	3	5	32	0	0
15	74	60	43	2	11	0	56	3	59	13	3	17	3	1	1	0	0
16	73	59	42	2	11	0	59	3	62	13	2	12	3	0	0	0	0
17	78	62	39	2	11	0	62	3	65	13	5	18	3	1	10	0	0
18	81	67	48	2	11	0	65	3	68	13	1	12	3	2	4	0	0
19	83	64	34	2	9.5	0	68	4	72	12	3	15	3	5	39.25	0	0
20	79	69	60	2	14	0	72	2	74	14	3	12	3	0	0	0	0
21	64	48	26	2	11	0	74	3	77	12	8	25	4	3	6.25	0	0
22	66	51	32	2	11	0	77	3	80	12	4	19	3	7	35	0	0
23	74	63	54	2	13	0	80	2	82	14	3	14	3	2	20	2	50
24	76	67	63	2	14	0	82	2	84	14	3	12	3	1	10	0	0
25	77	69	67	2	15	0	84	1	85	17	0	6	2	1	5	0	0
26	62	62	100	2	30+	.76	23	0	23	30	2	2	1	1	5	1	30
27	69	55	39	2	12	.05	23	2	25	18	7	13	3	0	0	0	0
28	68	53	34	2	11	0	25	3	28	16	4	12	3	2	6	2	35
29	72	57	38	2	11	0	28	3	31	15	5	14	3	2	18	0	0
30	76	63	48	2	12.	0	31	2	33	17	3	15	3	1	3	1	2
31	75	62	47	2	12	0	33	2	35	17	3	9	2	1	15	0	0
TOTALS	TOTAL RAIN= .81													46	250.75	9	192

TOTAL RAINFALL = .81 SIGNAL 7'S = 9 SIGNAL 7 MILES = 192

AVER TEMP = 73 AVER HUMIDITY = 45 HIGH TEMP = 83 LOW TEMP = 62

NUMBER OF CLASS DAYS

4 CLASS 1 DAYS
7 CLASS 2 DAYS
19 CLASS 3 DAYS
1 CLASS 4 DAYS
0 CLASS 5 DAYS

FIRE DANGER RECORD -- NATIONAL SYSTEM

DIST 10 PARISH -LIVINGSTON STATION -SPRINGVILLE MONTH/YEAR 11/87 TIME

DAY #	DRY TEMP	WET TEMP	REL HUM	HERB STG	FINE FUEL	RAIN IN	BU YEST	DRY FACT	BU TODAY	ADJ FUEL	WIND SPD	SPRED IN	CLASS DY	FIRES #	ACRES #	SIG 7 #	MILES #
1	78	60	33	2	10	0	35	3	38	15	9	19	3	3	20	0	0
2	80	67	50	2	12	0	38	2	40	18	3	9	2	14	181	0	0
3	80	68	54	2	12	0	40	2	42	16	4	12	3	4	12	0	0
4	74	68	77	2	17	0	42	1	43	19	2	5	2	1	2	0	0
5	80	65	44	2	10	0	43	3	46	16	6	15	3	10	28.75	2	50
6	67	50	26	2	11	0	46	3	49	14	3	12	3	17	63.25	0	0
7	73	65	65	2	15	0	49	1	50	19	5	8	2	6	58	0	0
8	74	69	78	2	17	0	50	1	51	18	3	10	3	2	5	0	0
9	70	70	100	2	30+	.40	32	0	32	29	2	1	1	0	0	0	0
10	49	46	80	2	23	.12	31	0	31	26	5	2	1	0	0	0	0
11	55	45	43	2	14	0	31	2	33	17	6	12	3	0	0	0	0
12	59	47	33	2	12	0	33	2	35	17	3	9	2	1	20	0	0
13	60	50	48	2	13	0	35	2	37	17	3	9	2	0	0	0	0
14	69	63	72	2	17	0	37	1	38	20	7	10	3	0	0	1	50
15	75	70	78	2	17	0	38	1	39	20	11	15	3	4	160	0	0
16	77	72	79	2	17	.04	39	1	40	19	17	19	3	0	0	0	0
17	67	55	45	2	13	2.00	3	2	5	21	3	4	1	0	0	0	0
18	65	53	44	2	13	0	5	2	7	20	2	5	2	0	0	0	0
19	65	53	44	2	13	0	7	2	9	20	4	7	2	0	0	0	0
20	62	50	41	2	13	0	9	2	11	20	3	6	2	0	0	0	0
21	59	44	24	2	11	0	11	3	14	17	2	8	2	6	102	0	0
22	70	59	51	2	13	0	14	2	16	19	3	6	2	4	38	1	45
23	73	64	61	2	14	0	16	2	18	19	2	5	2	3	7	1	20
24	74	67	70	2	16	0	18	1	19	22	9	9	2	4	87	1	20
25	74	68	74	2	16	0	19	1	20	21	7	8	2	3	55	0	0
26	70	70	100	2	30+	.08	20	0	20	30	2	1	1	0	0	0	0
27	70	68	90	2	24	0	20	0	20	27	1	1	1	0	0	0	0
28	57	52	71	2	19	.56	9	1	10	26	3	1	1	0	0	0	0
29	56	49	60	2	16	0	10	1	11	26	1	1	1	0	0	0	0
30	61	52	54	2	14	0	11	2	13	19	8	11	3	0	0	0	0
TOTALS		TOTAL RAIN= 3.2												82	839	6	185

TOTAL RAINFALL = 3.2 SIGNAL 7'S = 6 SIGNAL 7 MILES = 185

AVER TEMP = 68 AVER HUMIDITY = 60 HIGH TEMP = 80 LOW TEMP = 49

NUMBER OF CLASS DAYS

7 CLASS 1 DAYS
13 CLASS 2 DAYS
10 CLASS 3 DAYS
0 CLASS 4 DAYS
0 CLASS 5 DAYS

FIRE DANGER RECORD -- NATIONAL SYSTEM

DIST 10 PARISH -LIVINGSTON STATION -SPRINGVILLE MONTH/YEAR 12/87 TIME

DAY #	DRY TEMP	WET TEMP	REL HUM	HERB STG	FINE FUEL	RAIN IN	BU YEST	DRY FACT	BU TODAY	ADJ FUEL	WIND SPD	SPRED IN	CLASS DY	FIRES #	ACRES #	SIG 7 #	MILES #
1	59	49	47	2	14	0	13	2	15	16	9	19	3	0	0	0	0
2	60	49	44	2	13	0	15	2	17	19	5	8	2	5	38	0	0
3	70	62	64	2	14	0	17	2	19	19	7	10	3	1	1	0	0
4	68	52	31	2	11	0	19	3	22	16	7	25	4	1	35	0	0
5	59	48	43	2	14	0	22	2	24	18	3	9	2	4	50	0	0
6	68	62	71	2	17	0	24	1	25	21	12	11	3	2	7	0	0
7	65	63	90	2	25	.15	21	0	21	27	2	1	1	0	0	0	0
8	67	65	90	1	20	.07	21	0	21	24	1	1	1	0	0	0	0
9	63	61	89	1	18	0	21	0	21	24	2	2	1	0	0	0	0
10	62	54	59	1	8.5	0	21	2	23	14	3	12	3	0	0	0	0
11	71	66	77	1	12	0	23	1	24	18	5	11	3	1	17	0	0
12	68	63	76	1	14	0	24	1	25	18	1	6	2	0	0	0	0
13	69	62	67	1	11	0	25	1	26	16	3	11	3	2	31	1	15
14	80	74	75	1	11	0	26	1	27	16	10	20	4	1	3	0	0
15	48	41	54	1	10	.25	22	1	23	16	4	12	3	0	0	0	0
16	46	38	45	1	9.5	0	23	2	25	16	8	18	3	1	.25	0	0
17	46	39	52	1	10	0	25	1	26	16	4	12	3	2	4.25	0	0
18	56	45	39	1	7.5	0	26	2	28	14	4	14	3	0	0	1	4
19	67	62	76	1	14	0	28	1	29	18	8	14	3	0	0	0	0
20	63	63	100	1	30+	.29	22	0	22	30+	1	1	1	0	0	0	0
21	55	55	100	1	30+	1.05	6	0	6	30+	0	1	1	0	0	0	0
22	62	58	79	1	14	.34	5	1	6	20	2	5	2	0	0	0	0
23	63	61	89	1	18	0	6	0	6	26	1	1	1	0	0	0	0
24	73	72	95	1	25	.05	6	0	6	29	5	1	1	0	0	0	0
25	75	72	87	1	16	.04	6	0	6	23	2	2	1	0	0	0	0
26	76	74	91	1	19	0	6	0	6	21	1	1	1	0	0	0	0
27	69	68	95	1	25	.13	6	0	6	29	2	1	1	0	0	0	0
28	52	44	51	1	9.5	0	6	2	8	18	7	13	3	0	0	0	0
29	48	41	54	1	10	0	8	1	9	18	8	14	3	0	0	0	0
30	49	45	73	1	15	0	9	1	10	23	4	3	1	0	0	0	0
31	59	59	100	1	30+	.20	10	0	10	30+	3	1	1	0	0	0	0
TOTALS	TOTAL RAIN= 2.57													20	186.5	2	19

TOTAL RAINFALL = 2.57 SIGNAL 7'S = 2 SIGNAL 7 MILES = 19

AVER TEMP = 62 AVER HUMIDITY = 71 HIGH TEMP = 80 LOW TEMP = 46

NUMBER OF CLASS DAYS

12 CLASS 1 DAYS
4 CLASS 2 DAYS
13 CLASS 3 DAYS
2 CLASS 4 DAYS
0 CLASS 5 DAYS