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Acoustic Survey

Investigation into

Existing Noise Environment Survey

At

Willing House, Gray's Inn Road

Date of Report: 10th October 2006

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MIOA

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Copies to: Ole Smith, Heatherwick Studio,

Document Reference : dBA/SR/dB1837/EB/02

The Client.

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Heatherwick Studio
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London
WC1X 9NG

The Brief.

dB Attenuation were commissioned by Heatherwick Studio to carry out an acoustic survey of their proposed new premises in Grays Inn Road. The survey was requested as part of the planning application by Camden Planning Dept.

The existing and background noise levels to be established and presented in comparison with any contribution by the proposed air conditioning units.

The noise impact level to be calculated using the Sound Power Level of 83dB(A) - supplied by the manufacturer.

Summary.

The general noise level recorded in the roof area was relatively steady around 51–55dB, L_{Aeq}. The background noise level was from 48–51dB, L_{A90}. The increased noise level at location 2 when 1 condenser unit was operating from the Travelodge was +6dB(A).

The SWL of the proposed units combined is 83dB(A). There are no apparent tonal factors present with the units. The nearest bedroom window of the Travelodge is at a distance of some 7m from the intended location of the new unit. The predicted noise level at this window is some 57dB(A).

The predicted level at the penthouse flat on top of the adjacent Britannia Building is some 47dB(A).

Recommendations.

- Untreated, the proposed installation is predicted to have an impact on the noise levels in the vicinity of the roof area.

- The installation of a screen to shadow the directly affected areas has been suggested as a means to reduce the noise impact. Details are included in the report. This will reduce the impact of the noise of the plant to zero.

Theoretical and Methodology Information.

The survey was carried out between 17:30 and 20.00hrs on Monday 7th August 2006 by E. Brennan, MIOA. The weather was warm and still with no wind blowing in the quadrangle. The weather conditions were felt to be suitable for the purposes of the survey.

The equipment used was a CEL-593 Type 1 sound level analyser; calibration was checked with a CEL 284/2 acoustic calibrator. This instrument was supported on a tripod, with microphone level at 1.2m above ground and used at the various locations between the hours stated above.

There was some general background traffic activity in the area with intermittent local traffic, which remained relatively constant through out the survey.

The Sound level meter was set to 1/3 octave SPL_f reading and measurements were taken during an Environmental 5min assessment period. This allowed the operator to omit excessive background noise by comparing $L_{eq,5mins}$ with $L_{90,5mins}$. These are the mean equivalent noise levels and the minimum noise level recorded for 90% of the assessment period respectively.

Readings were taken at a distance of 1m away from and along the rear facing elevation of the Travelodge property as indicated in the layout sketch in the appendices. An additional reading was taken on the adjacent roof area that lays some 2m below the roof area in question.

An approximate sketch showing the location of the readings is included in the appendices at the end of this report.

BS4142 is the standard applicable noise generated from sources defined as industrial when present in a residential environment.

WHO Regulations are guidelines for generally all areas not covered by BS4142.

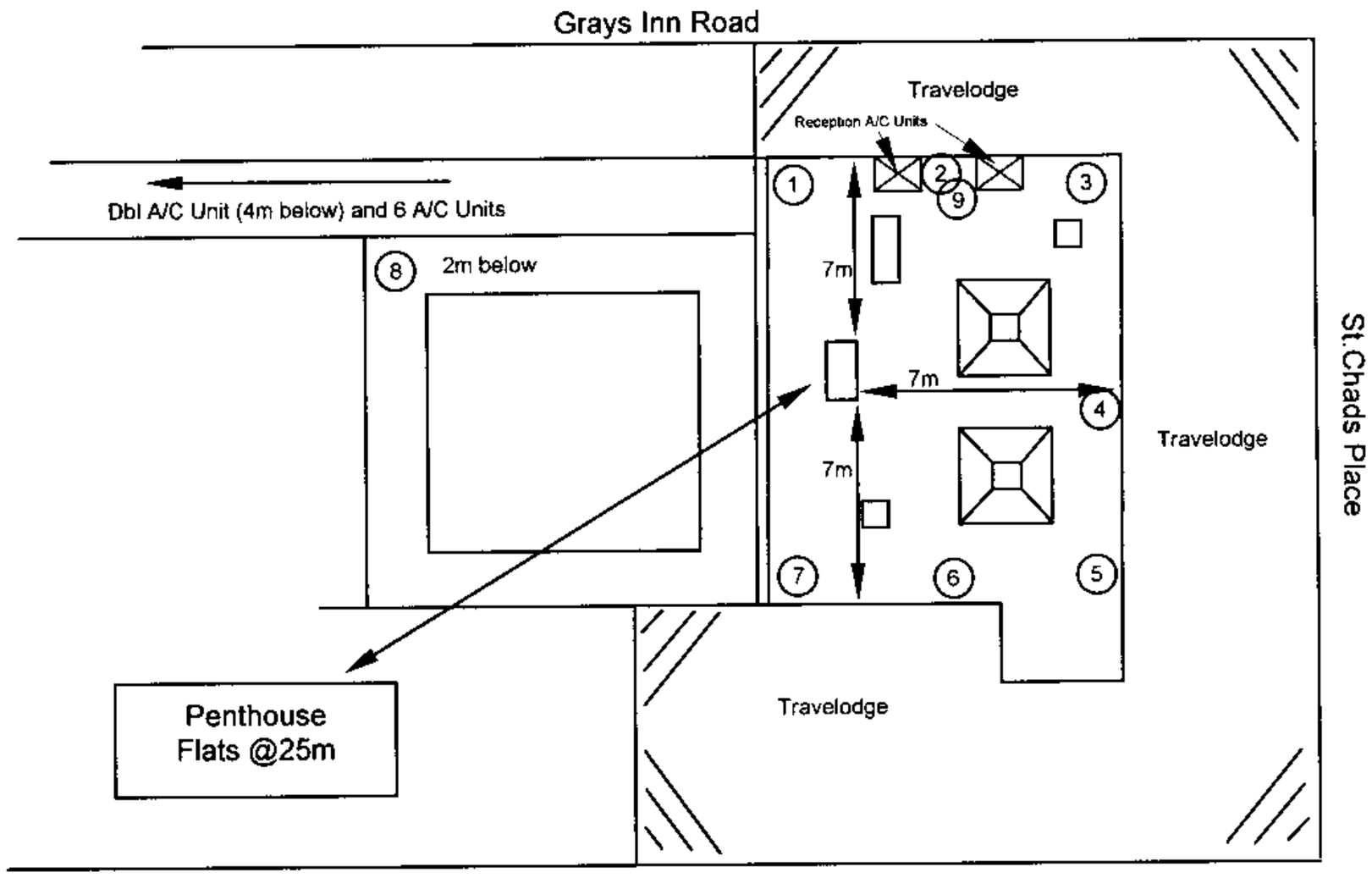
Tonal Noise is a peak in a frequency which can be defined as 5dB greater than the third octave above and below it.

Guidelines say that a weighting of +5dB should be added for tonal noise.

Discussion

The layout of the roof and the intended location of the proposed unit are shown in the sketch below. The roof area nominally measures 16 metres x 11 metres with 2 skylight windows into the studio and 3 access hatches to service areas. The roof of the studio has the Travelodge on three sides, is approximately 2 metres above the adjoining roof.

The approximate distance from this point to the nearest bedroom window of the Travelodge is some 7m in all directions. The bottom windows are at a level approximately equal to the proposed unit height.



There are 2 condenser units on the roof related to the reception area of the Travelodge, one unit operates spasmodically but according to the staff on duty they could not control it to operate during our survey, the second unit did not function at all and according to the staff has not worked for some time.

There are 6 single and a double air conditioning units outside the adjoining office block which were operating occasionally but, being located several metres below the studio roof could not be established how many were operating.

Aircraft noise is the major contributor to the general noise level peaks.

The noise from the building facing into Britannia St generates quite a lot of noise from voices, which was more prominent than normal due to the windows being open.

Results.

The results of the investigation are listed in full at the end of this report, but are shown in the summary table below.

Location	L_{Aeq}	L_{A90}
1	51	50
2	55	49
9(pos 2 with fan on)	61	48
3	50	48
4	50	49
5	54	48
6	50	48
7	50	49
8	55	51

The manufacturer's data shows individual SPL @1m of 57 and 63dB(A). At the worst incidence, the combined SPL will be 64dB(A).

For a unit that is 64dB(A) @1m, the SPL at 7m is given as;

- SPL at r2 = SPL at r1 – 20log(r2/r1) where r1=1m and r2=7m
    - SPL 7 = 64 – 20log(7/1)
    - SPL@7m = 47dB(A)

or

- Sound Power Level, SWL = 20logr + Sound Pressure Level, SPL + 7.9
- $SWL_{(RXYQ8P)}$ = 20log1 + 57 +7.9
- $SWL_{(RXYQ8P)}$ = 65dB(A)

- Sound Pressure Level, SPL @7m = SWL - 20log(7) - 7.9
- SPL@7m = 40dB(A)

and

- $SWL_{(RXYQ18P)}$ = 20log1 + 63 +7.9
- $SWL_{(RXYQ8P)}$ = 71dB(A)
- Sound Pressure Level, SPL @7m = SWL - 20log(7) - 7.9
- SPL@7m = 46dB(A)

giving a combined SPL@7m of 47dB(A).

However, further information provided by the manufacturer indicates a Sound Power Level of 83dB(A). This is extensively higher than that calculated from the given SPL@1m. To investigate the sound impact level worst case scenario, these two base figures should be used to compare the SPL at the nearest window.

- $SWL_{(RXYQ8P)}$ = 83dB(A)
- SWL, 83 = 20logr + SPL + 7.9
- SPL@8m = 83 - 20log8 - 7.9 (8m to centre of the plant)
- SPL@8m = 57dB(A)

Similarly, for the facing windows of Britannia House @26m ….

- SPL@26m = 83 - 20log26 - 7.9 (8m to centre of the plant)
- SPL@26m = 47dB(A)

There is clearly some difference in the two methods used to predict the noise impact of the plant, but in the situation where the worst case scenario is to be considered, the higher noise level must be assumed.

It should be considered that the manufacturer's data is from test conducted in an anechoic chamber. The actual installation location will give slightly higher readings due to floor and site reflections and could raise the readings by some 3dB.

Therefore to err on the side of safety, the noise level attributable to the proposed plant unit at the nearest Travelodge bedroom window is some 60dB(A). This compares marginally with the measured ambient noise level of 61dB(A) with a single Travelodge fan running, and would compare better still when both of them are in operation.

The other residential concern is the penthouse flats on the roof of the building adjacent to the roof area. This is some 25m away from the intended location of the proposed plant and under the previous calculation would have a direct noise level attributable to the new unit of some, 47dB(A), or a corrected 50dB(A).

Conclusions.

It can be seen from the sound power data and calculations above that the proposed plant would have an impact on the roof area with the present set up with existing ambient noise levels, fans and A/C units in the vicinity.

Predicted noise levels outside the windows are within the current 'operational' noise levels, but above the minimum background noise levels in the area. They have no apparent tonal identity.

Camden Council operates a 'non-creepage' policy which requires zero influence from new installations to control unwanted increase in background noise levels. Therefore the influence of the new plant should not impact on the 50dB(A) mean background noise level in the roof top area. The required SPL of the plant is therefore 10dB below current back ground – i.e. would be required to be as close to 40dB(A) as practicable.

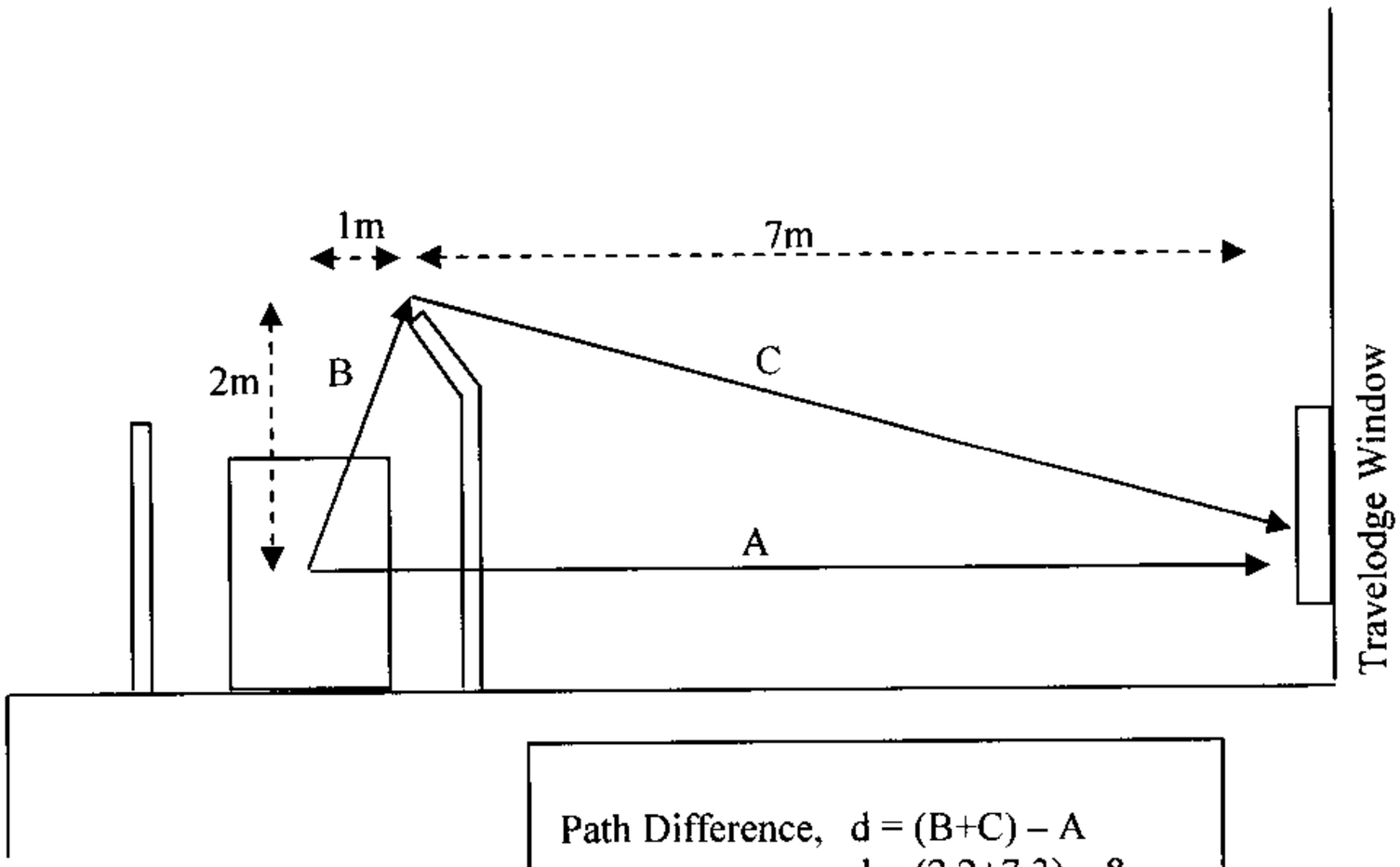
This is a reduction of a minimum of 10dB but a target level of 20dB from the predicted level of 60dB(A). In the direction of Britannia House, the reduction is only 0-10dB.

Recommendations.

To achieve this level of attenuation, this end a screen arrangement that is three sided and has a sloped roof section to protect the higher floors of the Travelodge could be considered to reduce further the noise levels of the equipment relative to the bedroom windows.

The size of the screen will be determined by the physical attributes of the plant plus ventilation and clearance requirements. Nominally, this give a structure some 3meters high, 3.7m across and 2.3m deep. To help in the protection of the higher placed windows, the top 600mm is angled inwards to increase the effective path difference caused by the screen, and allow for natural air convection movement within.

It is also proposed that the fourth side of the screen be only partial, providing access to the equipment, but limiting the effect of reflection towards the Travelodge windows. Although there will be some noise deflection toward the Britannia building, the requirement in this direction is less due to the distances involved and will be sufficient to provide the level of attenuation needed.



Path Difference, d = (B+C) – A
d = (2.2+7.3) – 8
d = 1.5m

The given path difference of 1.5m will provide 17 and 20dB attenuation in the 250 and 500Hz octave band widths. These are the dominant mid frequency bandwidths, the 1000Hz and higher having a better attenuation with the path difference.

With the increase in height of the windows above the unit, the path difference does reduce somewhat, but is still around 14 and 17dB at these octave frequencies. With the additional attenuation for distance to the higher windows this is sufficient to compensate.

The structure of the screen should be such that it will have a barrier effect of not less than that of the path difference. The given sound reduction index for the structure of the screen is;

63	125	250	500	K	2K	4K	8K	Hz
21	24	27	36	43	44	47	49	dB

With these measures taken it is predicted that the noise impact of the newly proposed plant will be kept to a minimum, and it is not likely that residents in the Travelodge or adjoining buildings will have nuisance caused by the installation.

Appendix 1

Sound level meter readings

and

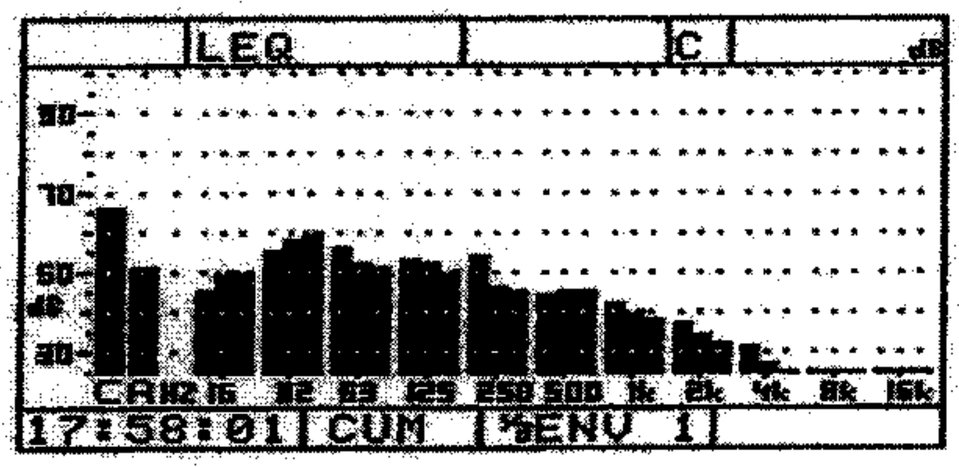
locations

CEL Instruments Ltd. CEL 593.CIT v 5.5

Start	07-AUG-06	17:58:01	Mode 1/3 ENV A001
End	07-AUG-06	18:03:04	
Length	0 days	00:05:03	
Mic	Free Field	200v ON	Period 5 minutes

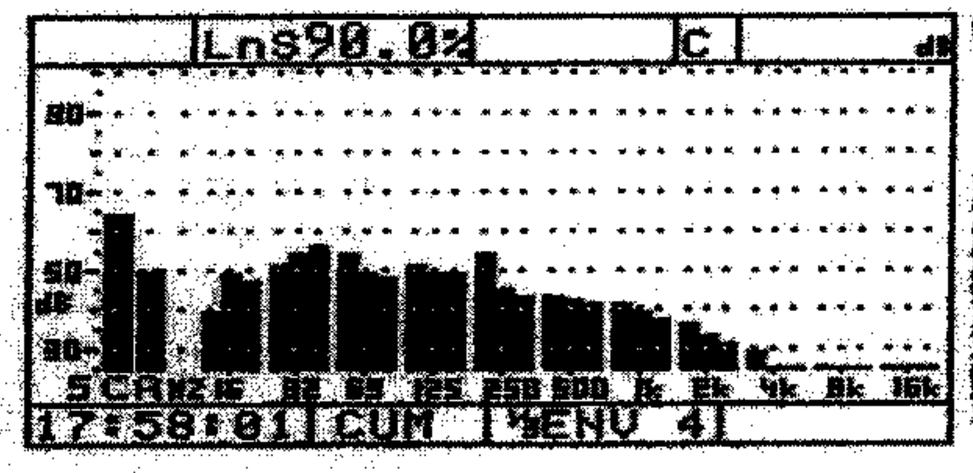
HEADER | LAST CAL 16-JUN-06
START 07-AUG-06 17:58:01
END 07-AUG-06 18:03:04
LENGTH 0 DAYS 00:05:03
TIMED RECS 1 PER 5min

MIC=FF 200V=ON TYPE=1
S C,A Q3 | %ENV |



OVERALL ->C 'C' 66.0dB 'A' 51.1dB

Hz	'C'	Hz	'C'	Hz	'C'
12	45.1dB	16	50.8dB	20	50.8dB
25	55.3dB	32	58.8dB	40	60.3dB
50	56.6dB	63	52.8dB	80	51.0dB
100	53.7dB	125	52.4dB	160	50.7dB
200	51.8dB	250	52.7dB	315	45.1dB
400	54.8dB	500	45.6dB	630	45.0dB
800	47.9dB	1k	46.5dB	1k25	38.2dB
1k6	47.1dB	2k	44.7dB	2k5	32.6dB
3k15	31.0dB	4k	27.1dB	5k	---.-dB
6k3	---.-dB	8k	---.-dB	10k	---.-dB
12k5	---.-dB	16k	---.-dB	20k	---.-dB



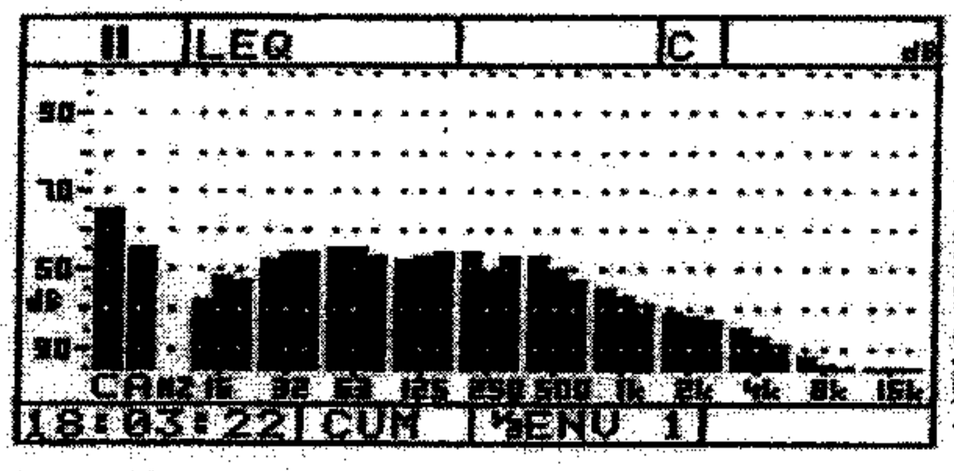
OVERALL ->C 'C' 64.0dB 'A' 50.0dB

Hz	'C'	Hz	'C'	Hz	'C'
12	36.0dB	16	49.0dB	20	47.0dB
25	51.0dB	32	54.0dB	40	56.0dB
50	54.0dB	63	49.0dB	80	48.0dB
100	51.0dB	125	49.0dB	160	49.0dB
200	51.0dB	250	45.0dB	315	43.0dB
400	53.0dB	500	42.0dB	630	41.0dB
800	41.0dB	1k	39.0dB	1k25	37.0dB
1k6	36.0dB	2k	33.0dB	2k5	31.0dB
3k15	29.0dB	4k	---.-dB	5k	---.-dB
6k3	---.-dB	8k	---.-dB	10k	---.-dB
12k5	---.-dB	16k	---.-dB	20k	---.-dB

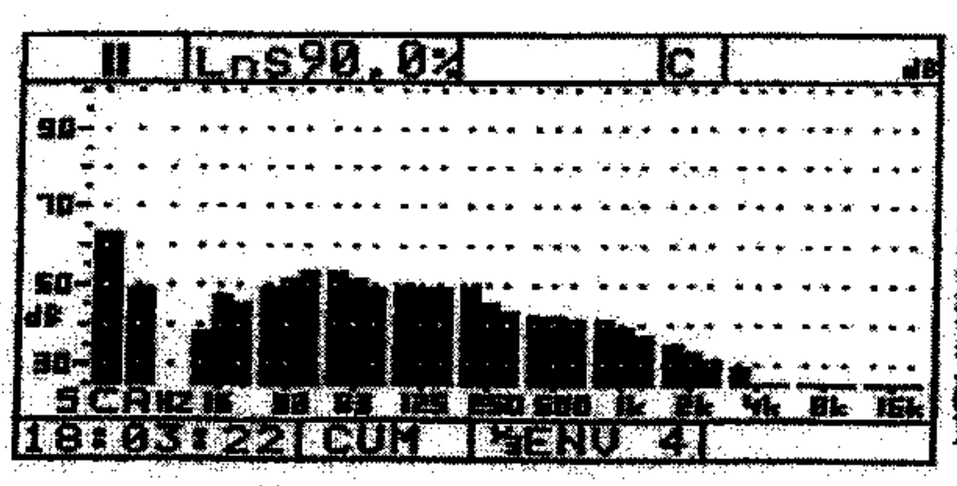
CEL Instruments Ltd. CEL 593.C1T v 5.5

Start	07-AUG-06	18:03:22	Mode 1/3 ENV A002
End	07-AUG-06	18:08:24	
Length	0 days	00:05:02	
Mic	Free Field	200v ON	Period 5 minutes

HEADER	LAST CAL 16-JUN-06
START	07-AUG-06 18:03:22
END	07-AUG-06 18:08:24
LENGTH	0 DAYS 00:05:02
TIMED RECS	1 PER 5min
MIC=FF 200V=ON	TYPE=1
S C,A Q3	%ENV



OVERALL ->	'C' 65.3dB	'A' 55.1dB
Hz 'C'	Hz 'C'	Hz 'C'
12 42.2dB	16 48.9dB	20 47.8dB
15 42.9dB	20 49.1dB	25 48.7dB
20 43.6dB	25 49.6dB	31.5 49.4dB
25 44.2dB	31.5 50.1dB	40 50.0dB
31.5 44.8dB	40 50.6dB	50 50.4dB
40 45.3dB	50 51.0dB	63 50.8dB
50 45.8dB	63 51.4dB	80 51.2dB
63 46.2dB	80 51.8dB	100 51.5dB
80 46.6dB	100 52.1dB	125 51.8dB
100 47.0dB	125 52.4dB	160 52.1dB
125 47.3dB	160 52.7dB	200 52.4dB
160 47.6dB	200 53.0dB	250 52.6dB
200 47.9dB	250 53.2dB	315 52.9dB
250 48.2dB	315 53.5dB	400 53.1dB
315 48.4dB	400 53.7dB	500 53.3dB
400 48.7dB	500 53.9dB	630 53.5dB
500 48.9dB	630 54.1dB	800 53.7dB
630 49.1dB	800 54.3dB	1k 53.9dB
800 49.3dB	1k 54.5dB	1k25 54.1dB
1k 49.5dB	1k25 54.7dB	1k6 54.3dB
1k25 49.7dB	1k6 54.9dB	2k 54.5dB
1k6 49.9dB	2k 55.1dB	2k5 54.7dB
2k 50.1dB	2k5 55.3dB	3k15 54.9dB
2k5 50.3dB	3k15 55.5dB	4k 55.1dB
3k15 50.5dB	4k 55.7dB	5k 55.3dB
4k 50.7dB	5k 55.9dB	6k3 55.5dB
5k 50.9dB	6k3 56.1dB	8k 55.7dB
6k3 51.1dB	8k 56.3dB	10k 55.9dB
8k 51.3dB	10k 56.5dB	12k5 56.1dB
10k 51.5dB	12k5 56.7dB	16k 56.3dB
12k5 51.7dB	16k 56.9dB	20k 56.5dB
16k 51.9dB	20k 57.1dB	
20k 52.1dB		



OVERALL ->	'C' 63.0dB	'A' 49.0dB
Hz 'C'	Hz 'C'	Hz 'C'
12 38.0dB	16 47.0dB	20 45.0dB
15 40.0dB	20 48.0dB	25 46.0dB
20 41.0dB	25 49.0dB	31.5 47.0dB
25 42.0dB	31.5 50.0dB	40 48.0dB
31.5 43.0dB	40 51.0dB	50 49.0dB
40 44.0dB	50 51.0dB	63 49.0dB
50 45.0dB	63 52.0dB	80 50.0dB
63 46.0dB	80 52.0dB	100 50.0dB
80 46.0dB	100 53.0dB	125 50.0dB
100 47.0dB	125 53.0dB	160 51.0dB
125 47.0dB	160 54.0dB	200 51.0dB
160 48.0dB	200 54.0dB	250 51.0dB
200 48.0dB	250 54.0dB	315 52.0dB
250 48.0dB	315 55.0dB	400 52.0dB
315 49.0dB	400 55.0dB	500 52.0dB
400 49.0dB	500 55.0dB	630 53.0dB
500 49.0dB	630 56.0dB	800 53.0dB
630 50.0dB	800 56.0dB	1k 53.0dB
800 50.0dB	1k 56.0dB	1k25 54.0dB
1k 50.0dB	1k25 57.0dB	1k6 54.0dB
1k25 50.0dB	1k6 57.0dB	2k 54.0dB
1k6 50.0dB	2k 57.0dB	2k5 55.0dB
2k 50.0dB	2k5 58.0dB	3k15 55.0dB
2k5 50.0dB	3k15 58.0dB	4k 55.0dB
3k15 50.0dB	4k 58.0dB	5k 56.0dB
4k 50.0dB	5k 59.0dB	6k3 56.0dB
5k 50.0dB	6k3 59.0dB	8k 56.0dB
6k3 50.0dB	8k 59.0dB	10k 57.0dB
8k 50.0dB	10k 60.0dB	12k5 57.0dB
10k 50.0dB	12k5 60.0dB	16k 57.0dB
12k5 50.0dB	16k 61.0dB	20k 57.0dB
16k 50.0dB	20k 61.0dB	
20k 50.0dB		

CEL Instruments Ltd. CEL 593.C1T v 5.5

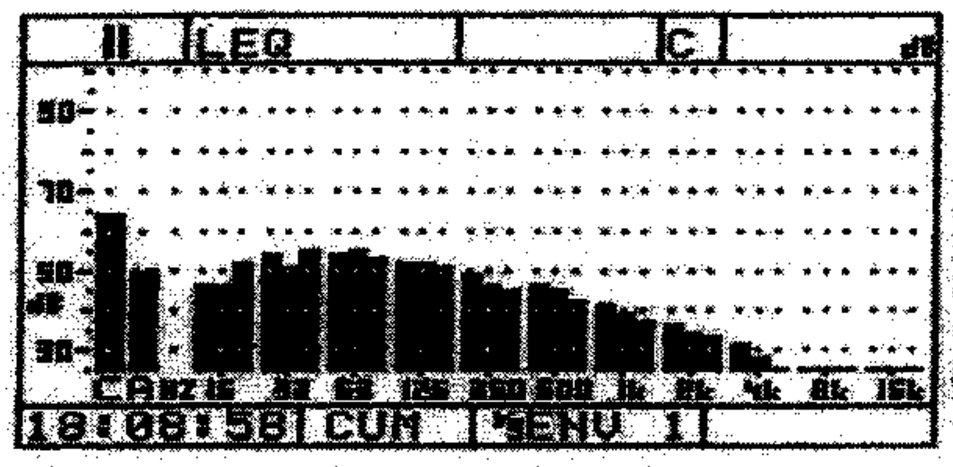
Start	07-AUG-06	18:08:58	Mode 1/3 ENV A003
End	07-AUG-06	18:14:30	
Length	0 days	00:05:32	
Mic	Free Field	200v ON	Period 5 minutes

HEADER | LAST CAL 16-JUN-06

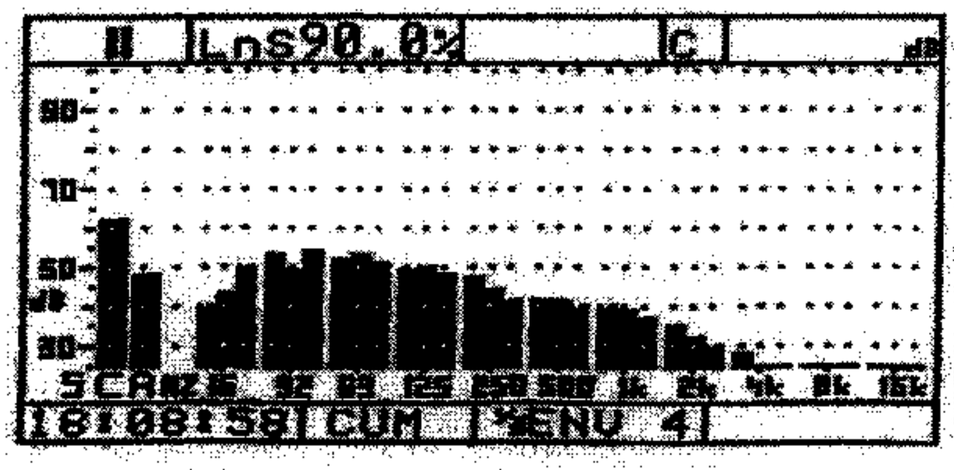
START 07-AUG-06 18:08:58
END 07-AUG-06 18:14:30
LENGTH 0 DAYS 00:05:32
TIMED RECS 1 PER 5min

MIC=FF 200V=ON TYPE=1

S C,A QJ | %ENV |



OVERALL ->'C'		'C' 64.0dB		'A' 50.6dB	
Hz	-'C'-	Hz	-'C'-	Hz	-'C'-
12	46.8dB	16	46.7dB	20	52.0dB
16	50.7dB	20	50.6dB	25	54.1dB
20	52.4dB	25	52.4dB	31.5	55.7dB
25	53.9dB	31.5	53.9dB	40	56.9dB
31.5	55.1dB	40	55.1dB	50	57.8dB
40	56.1dB	50	56.1dB	63	58.5dB
50	56.9dB	63	56.9dB	80	59.0dB
63	57.5dB	80	57.5dB	100	59.3dB
80	57.9dB	100	57.9dB	125	59.4dB
100	58.1dB	125	58.1dB	160	59.3dB
125	58.1dB	160	58.1dB	200	59.0dB
160	57.9dB	200	57.9dB	250	58.5dB
200	57.5dB	250	57.5dB	315	57.8dB
250	56.9dB	315	56.9dB	400	56.9dB
315	56.1dB	400	56.1dB	500	55.7dB
400	55.1dB	500	55.1dB	630	54.1dB
500	53.9dB	630	53.9dB	800	52.0dB
630	52.4dB	800	52.4dB	1k	49.8dB
800	50.7dB	1k	50.6dB	1k25	47.4dB
1k	48.8dB	1k25	48.7dB	1k6	44.8dB
1k25	46.7dB	1k6	46.6dB	2k	42.0dB
1k6	44.4dB	2k	44.3dB	2k5	39.0dB
2k	41.8dB	2k5	41.7dB	3k15	35.8dB
2k5	38.9dB	3k15	38.8dB	4k	32.4dB
3k15	35.7dB	4k	35.6dB	5k	28.8dB
4k	32.3dB	5k	32.2dB	6k3	25.0dB
5k	28.7dB	6k3	28.6dB	8k	21.0dB
6k3	24.9dB	8k	24.8dB	10k	16.8dB
8k	20.9dB	10k	20.8dB	12k5	12.4dB
10k	16.7dB	12k5	16.6dB	16k	7.8dB
12k5	12.3dB	16k	12.2dB	20k	3.0dB
16k	7.7dB	20k	7.6dB		
20k	2.9dB				

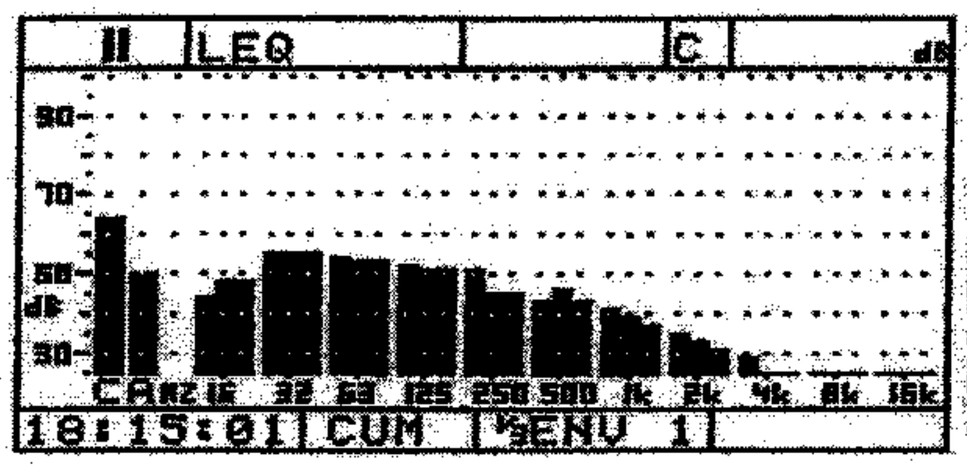


OVERALL ->'C'		'C' 62.0dB		'A' 46.9dB	
Hz	-'C'-	Hz	-'C'-	Hz	-'C'-
12	40.8dB	16	43.0dB	20	50.0dB
16	46.7dB	20	48.6dB	25	52.1dB
20	48.4dB	25	50.4dB	31.5	53.7dB
25	49.9dB	31.5	51.9dB	40	54.9dB
31.5	51.1dB	40	53.1dB	50	55.8dB
40	52.1dB	50	54.1dB	63	56.5dB
50	52.9dB	63	54.9dB	80	57.0dB
63	53.5dB	80	55.5dB	100	57.3dB
80	53.9dB	100	55.9dB	125	57.4dB
100	54.1dB	125	56.1dB	160	57.3dB
125	54.1dB	160	56.1dB	200	57.0dB
160	53.9dB	200	55.9dB	250	56.5dB
200	53.5dB	250	55.5dB	315	55.8dB
250	52.9dB	315	54.9dB	400	54.9dB
315	52.1dB	400	54.1dB	500	53.7dB
400	51.1dB	500	53.1dB	630	52.1dB
500	49.9dB	630	51.9dB	800	50.0dB
630	48.4dB	800	50.4dB	1k	47.8dB
800	46.7dB	1k	48.6dB	1k25	45.4dB
1k	44.8dB	1k25	46.7dB	1k6	42.8dB
1k25	42.7dB	1k6	44.6dB	2k	40.0dB
1k6	40.4dB	2k	42.3dB	2k5	37.0dB
2k	37.8dB	2k5	39.7dB	3k15	33.8dB
2k5	34.9dB	3k15	36.8dB	4k	30.4dB
3k15	31.7dB	4k	33.6dB	5k	26.8dB
4k	28.3dB	5k	30.2dB	6k3	23.0dB
5k	24.7dB	6k3	26.6dB	8k	19.0dB
6k3	20.9dB	8k	22.8dB	10k	14.8dB
8k	16.9dB	10k	18.8dB	12k5	10.4dB
10k	12.7dB	12k5	14.6dB	16k	5.8dB
12k5	8.3dB	16k	10.2dB	20k	1.0dB
16k	3.7dB	20k	5.6dB		
20k	1.0dB				

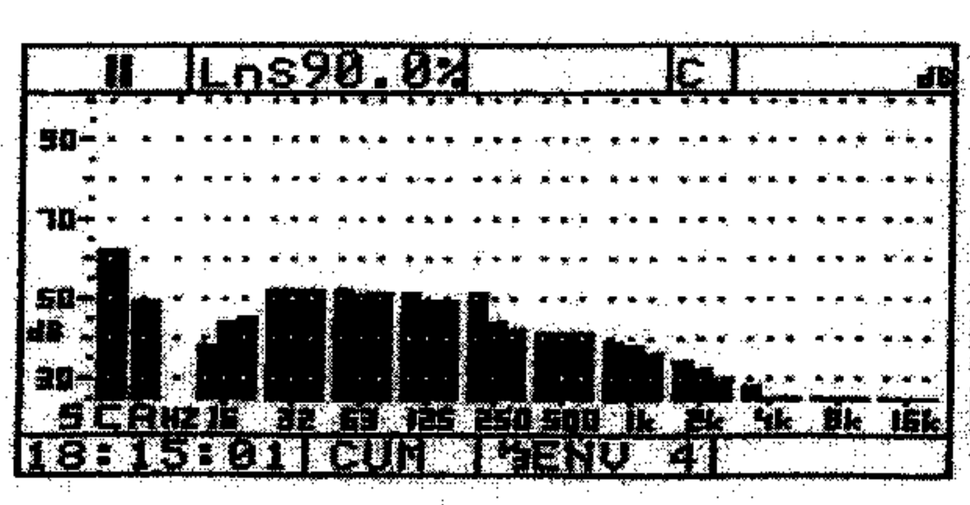
CEL Instruments Ltd. CEL 593.C1T v 5.5

Start	07-AUG-06	18:15:01	Mode 1/3 ENV A004
End	07-AUG-06	18:20:08	
Length	0 days	00:05:07	
Mic	Free Field	200v ON	Period 5 minutes

HEADER	LAST CAL 16-JUN-06
START	07-AUG-06 18:15:01
END	07-AUG-06 18:20:08
LENGTH	0 DAYS 00:05:07
TIMED RECS	1 PER 5min
MIC=FF	200V=ON TYPE=1
S C,A Q3	%ENV



OVERALL -> 'C' 64.0dB 'A' 50.4dB					
Hz	'C'	Hz	'C'	Hz	'C'
12	44.9dB	16	48.0dB	20	48.3dB
25	55.1dB	32	55.5dB	40	55.0dB
50	54.2dB	63	53.2dB	80	53.2dB
100	52.8dB	125	51.6dB	160	51.1dB
200	51.9dB	250	45.9dB	315	45.1dB
400	43.1dB	500	42.7dB	630	43.2dB
800	41.3dB	1k	39.8dB	1k25	37.4dB
1k6	35.4dB	2k	33.2dB	2k5	31.3dB
3k15	29.3dB	4k	25.7dB	5k	---.-dB
6k3	---.-dB	8k	---.-dB	10k	---.-dB
12k5	---.-dB	16k	---.-dB	20k	---.-dB



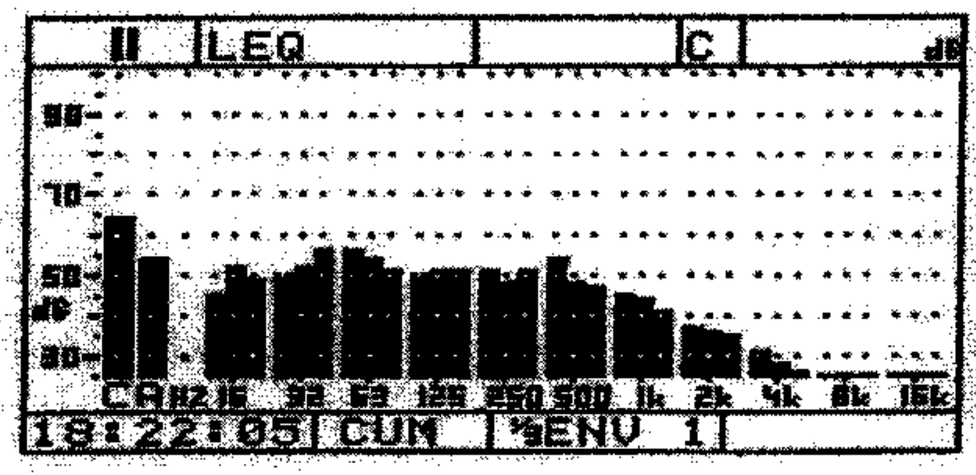
OVERALL -> 'C' 62.0dB 'A' 49.0dB					
Hz	'C'	Hz	'C'	Hz	'C'
12	38.0dB	16	44.0dB	20	45.0dB
25	52.0dB	32	52.0dB	40	52.0dB
50	52.0dB	63	51.0dB	80	51.0dB
100	51.0dB	125	49.0dB	160	49.0dB
200	51.0dB	250	44.0dB	315	42.0dB
400	41.0dB	500	41.0dB	630	41.0dB
800	38.0dB	1k	38.0dB	1k25	36.0dB
1k6	34.0dB	2k	32.0dB	2k5	30.0dB
3k15	28.0dB	4k	---.-dB	5k	---.-dB
6k3	---.-dB	8k	---.-dB	10k	---.-dB
12k5	---.-dB	16k	---.-dB	20k	---.-dB

CEL Instruments Ltd. CEL 593.C1T v 5.5

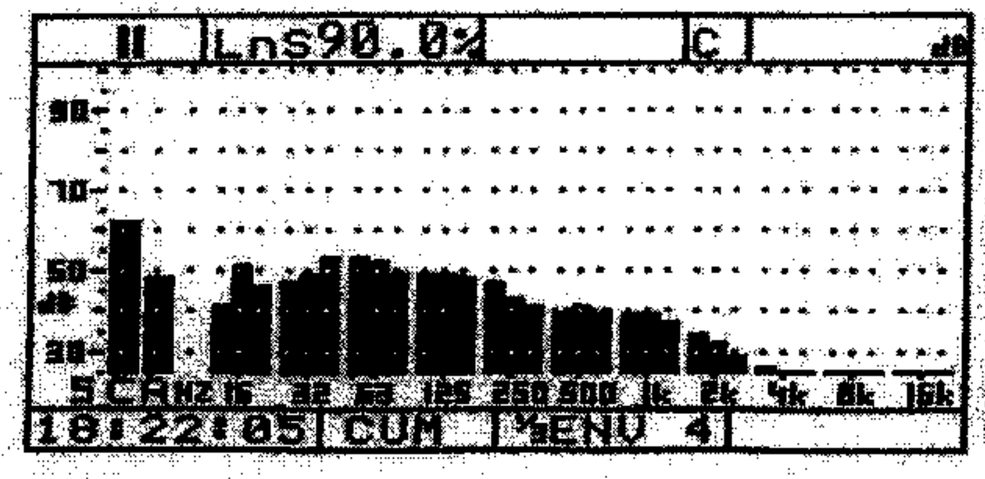
Start	07-AUG-06	18:22:05	Mode 1/3 ENV A005
End	07-AUG-06	18:27:07	
Length	0 days	00:05:02	
Mic	Free Field	200v ON	Period 5 minutes

HEADER | LAST CAL 16-JUN-06
START 07-AUG-06 18:22:05
END 07-AUG-06 18:27:07
LENGTH 0 DAYS 00:05:02
TIMED RECS 1 PER 5Min

MIC=FF 200V=ON TYPE=1
S C,A Q3 %ENV



OVERALL ->	'C' 64.5dB	'A' 54.5dB
Hz - 'C'	Hz - 'C'	Hz - 'C'
12 45.7dB	16 52.3dB	20 49.6dB
15 50.3dB	20 52.2dB	25 50.0dB
20 55.3dB	25 52.5dB	31.5 51.2dB
25 58.6dB	31.5 52.3dB	40 51.5dB
31.5 60.6dB	40 52.1dB	50 51.8dB
40 61.4dB	50 51.8dB	63 51.9dB
50 61.8dB	63 51.6dB	80 51.9dB
63 62.0dB	80 51.5dB	100 51.8dB
80 62.1dB	100 51.4dB	125 51.7dB
100 62.2dB	125 51.3dB	160 51.5dB
125 62.3dB	160 51.2dB	200 51.3dB
160 62.4dB	200 51.1dB	250 51.1dB
200 62.5dB	250 51.0dB	315 50.9dB
250 62.6dB	315 50.9dB	400 50.7dB
315 62.7dB	400 50.8dB	500 50.5dB
400 62.8dB	500 50.7dB	630 50.3dB
500 62.9dB	630 50.6dB	800 50.1dB
630 63.0dB	800 50.5dB	1k 49.9dB
800 63.1dB	1k 50.4dB	1k25 49.7dB
1k 63.2dB	1k25 50.3dB	1k6 49.5dB
1k25 63.3dB	1k6 50.2dB	2k 49.3dB
1k6 63.4dB	2k 50.1dB	2k5 49.1dB
2k 63.5dB	2k5 50.0dB	3k15 48.9dB
2k5 63.6dB	3k15 49.9dB	4k 48.7dB
3k15 63.7dB	4k 49.8dB	5k 48.5dB
4k 63.8dB	5k 49.7dB	6k3 48.3dB
5k 63.9dB	6k3 49.6dB	8k 48.1dB
6k3 64.0dB	8k 49.5dB	10k 47.9dB
8k 64.1dB	10k 49.4dB	12k5 47.7dB
10k 64.2dB	12k5 49.3dB	16k 47.5dB
12k5 64.3dB	16k 49.2dB	20k 47.3dB
16k 64.4dB	20k 49.1dB	
20k 64.5dB		



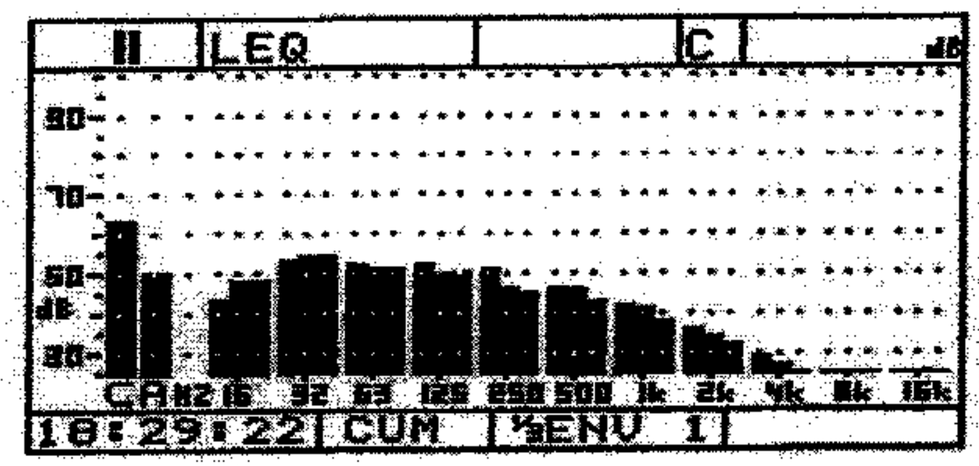
OVERALL ->	'C' 62.0dB	'A' 48.0dB
Hz - 'C'	Hz - 'C'	Hz - 'C'
12 41.0dB	16 51.0dB	20 45.0dB
15 44.0dB	20 49.0dB	25 47.0dB
20 47.0dB	25 49.0dB	31.5 49.0dB
25 50.0dB	31.5 49.0dB	40 49.0dB
31.5 53.0dB	40 49.0dB	50 48.0dB
40 56.0dB	50 48.0dB	63 47.0dB
50 58.0dB	63 47.0dB	80 47.0dB
63 59.0dB	80 47.0dB	100 47.0dB
80 60.0dB	100 47.0dB	125 47.0dB
100 61.0dB	125 47.0dB	160 47.0dB
125 61.0dB	160 47.0dB	200 47.0dB
160 61.0dB	200 47.0dB	250 47.0dB
200 61.0dB	250 47.0dB	315 47.0dB
250 61.0dB	315 47.0dB	400 47.0dB
315 61.0dB	400 47.0dB	500 47.0dB
400 61.0dB	500 47.0dB	630 47.0dB
500 61.0dB	630 47.0dB	800 47.0dB
630 61.0dB	800 47.0dB	1k 47.0dB
800 61.0dB	1k 47.0dB	1k25 47.0dB
1k 61.0dB	1k25 47.0dB	1k6 47.0dB
1k25 61.0dB	1k6 47.0dB	2k 47.0dB
1k6 61.0dB	2k 47.0dB	2k5 47.0dB
2k 61.0dB	2k5 47.0dB	3k15 47.0dB
2k5 61.0dB	3k15 47.0dB	4k 47.0dB
3k15 61.0dB	4k 47.0dB	5k 47.0dB
4k 61.0dB	5k 47.0dB	6k3 47.0dB
5k 61.0dB	6k3 47.0dB	8k 47.0dB
6k3 61.0dB	8k 47.0dB	10k 47.0dB
8k 61.0dB	10k 47.0dB	12k5 47.0dB
10k 61.0dB	12k5 47.0dB	16k 47.0dB
12k5 61.0dB	16k 47.0dB	20k 47.0dB
16k 61.0dB	20k 47.0dB	
20k 61.0dB		

CEL Instruments Ltd. CEL 593.CIT v 5.5

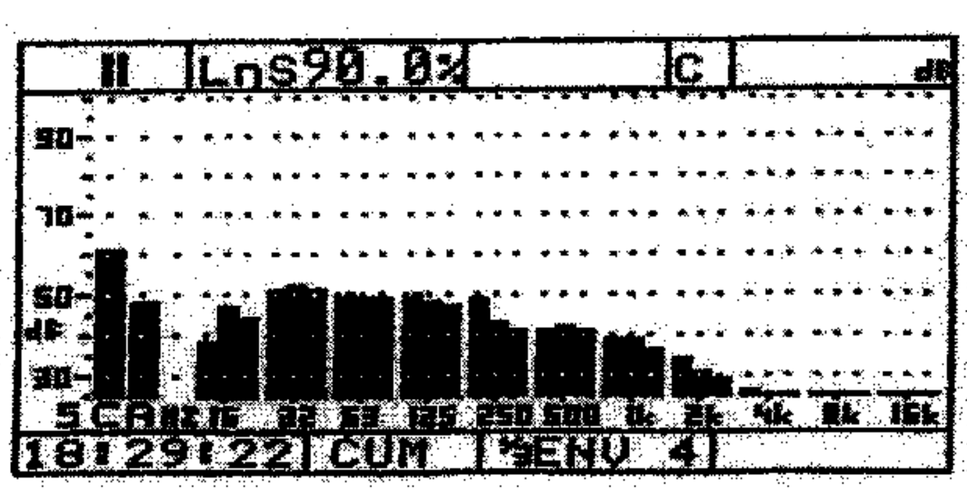
Start	07-AUG-06	18:29:22	Mode 1/3 ENV A006
End	07-AUG-06	18:34:38	
Length	0 days	00:05:16	
Mic	Free Field	200v ON	Period 5 minutes

HEADER	LAST CAL 16-JUN-06
START	07-AUG-06 18:29:22
END	07-AUG-06 18:34:38
LENGTH	0 DAYS 00:05:16
TIMED RECS	1 PER 5min
MIC=FF	200V=ON TYPE=1

S	C,A 03	%ENV	



OVERALL ->	'C' 63.2dB	'A' 50.9dB
Hz - 'C'	Hz - 'C'	Hz - 'C'
12 43.5dB	16 48.9dB	20 48.6dB
25 53.7dB	32 54.8dB	40 54.6dB
50 52.7dB	63 51.7dB	80 51.9dB
100 52.1dB	125 50.0dB	160 50.0dB
200 51.3dB	250 46.4dB	315 45.1dB
400 46.5dB	500 46.0dB	630 43.3dB
800 42.0dB	1k 41.1dB	1k25 38.5dB
1k6 36.7dB	2k 34.8dB	2k5 32.2dB
3k15 29.2dB	4k 27.5dB	5k ---.-dB
6k3 ---.-dB	8k ---.-dB	10k ---.-dB
12k5 ---.-dB	16k ---.-dB	20k ---.-dB



OVERALL ->	'C' 61.0dB	'A' 48.0dB
Hz - 'C'	Hz - 'C'	Hz - 'C'
12 38.0dB	16 47.0dB	20 44.0dB
25 51.0dB	32 52.0dB	40 51.0dB
50 50.0dB	63 49.0dB	80 49.0dB
100 50.0dB	125 46.0dB	160 47.0dB
200 49.0dB	250 43.0dB	315 41.0dB
400 41.0dB	500 42.0dB	630 41.0dB
800 39.0dB	1k 39.0dB	1k25 36.0dB
1k6 34.0dB	2k 31.0dB	2k5 29.0dB
3k15 26.0dB	4k ---.-dB	5k ---.-dB
6k3 ---.-dB	8k ---.-dB	10k ---.-dB
12k5 ---.-dB	16k ---.-dB	20k ---.-dB

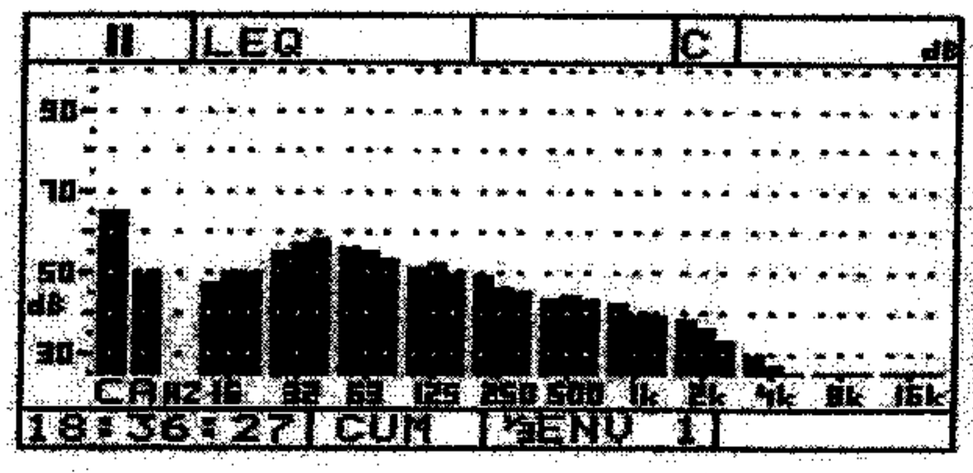
CEL Instruments Ltd. CEL 593.CIT v 5.5

Start	07-AUG-06	18:36:27	Mode 1/3 ENV A007
End	07-AUG-06	18:46:28	
Length	0 days	00:10:01	
Mic	Free Field	200v ON	Period 5 minutes

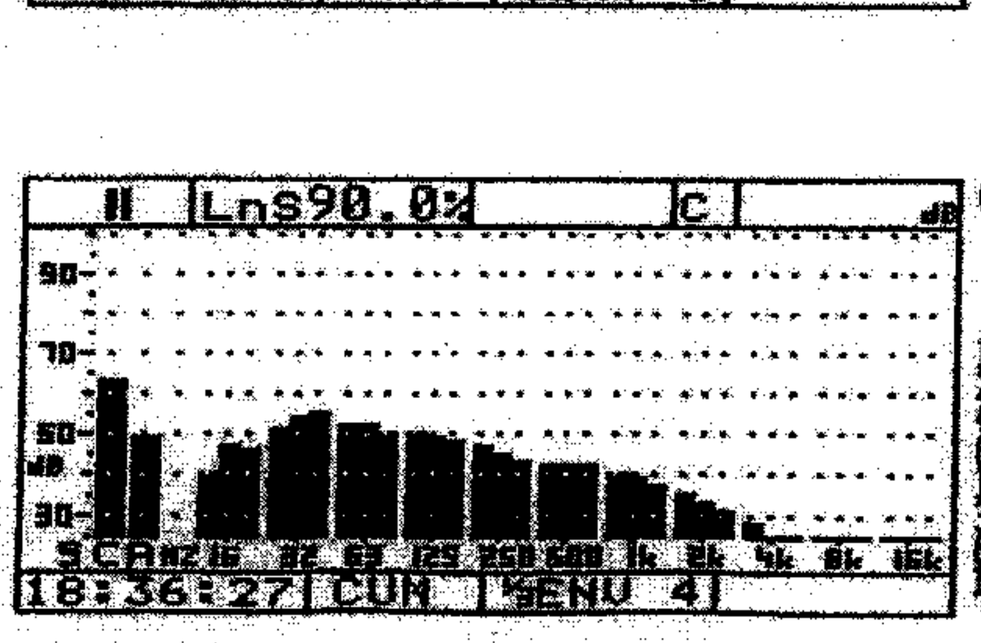
HEADER	LAST CAL 16-JUN-06		
START	07-AUG-06	18:36:27	
END	07-AUG-06	18:46:28	
LENGTH	0 DAYS	00:10:01	
TIMED RECS	2	PER	5min

MIC=FF 200V=ON TYPE=1

S C.A Q3 %ENV



OVERALL ->	'C' 65.4dB	'A' 50.8dB
Hz 'C'	Hz 'C'	Hz 'C'
12 47.1dB	16 50.4dB	20 50.6dB
25 55.3dB	32 52.8dB	40 58.4dB
50 58.3dB	63 55.9dB	80 53.0dB
100 51.7dB	125 52.5dB	160 50.4dB
200 49.2dB	250 46.7dB	315 45.1dB
400 43.9dB	500 44.5dB	630 43.2dB
800 42.5dB	1k 40.9dB	1k25 39.4dB
1k6 38.2dB	2k 36.7dB	2k5 33.5dB
3k15 30.7dB	4k 27.9dB	5k 25.3dB
6k3 ---.-dB	8k ---.-dB	10k ---.-dB
12k5 ---.-dB	16k ---.-dB	20k ---.-dB



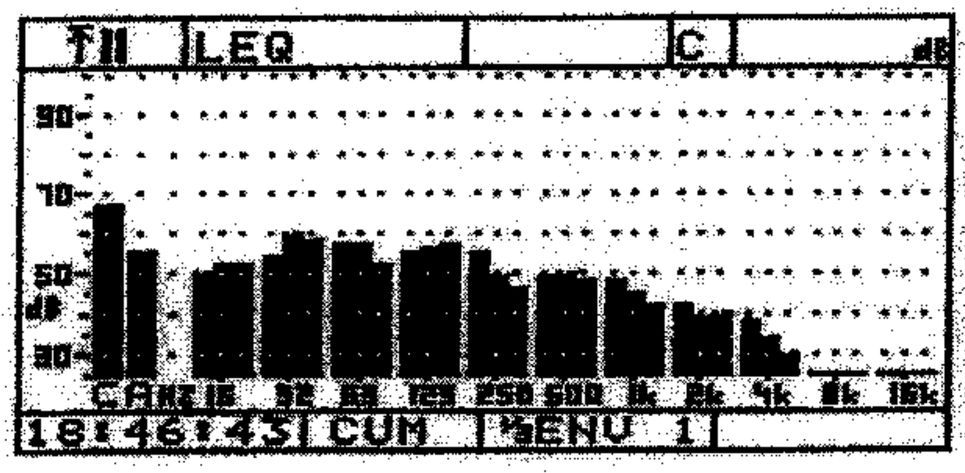
OVERALL ->	'C' 63.0dB	'A' 49.0dB
Hz 'C'	Hz 'C'	Hz 'C'
12 40.0dB	16 47.0dB	20 46.0dB
25 51.0dB	32 54.0dB	40 55.0dB
50 52.0dB	63 52.0dB	80 50.0dB
100 50.0dB	125 49.0dB	160 48.0dB
200 47.0dB	250 45.0dB	315 43.0dB
400 42.0dB	500 42.0dB	630 42.0dB
800 40.0dB	1k 39.0dB	1k25 37.0dB
1k6 35.0dB	2k 33.0dB	2k5 31.0dB
3k15 28.0dB	4k ---.-dB	5k ---.-dB
6k3 ---.-dB	8k ---.-dB	10k ---.-dB
12k5 ---.-dB	16k ---.-dB	20k ---.-dB

CEL Instruments Ltd. CEL 593.C1T v 5.5

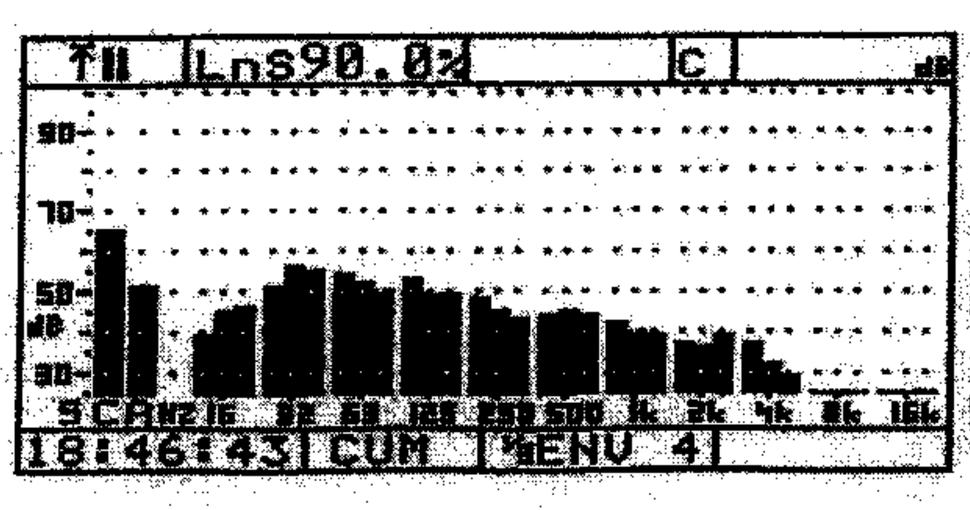
Start	07-AUG-06	18:46:43	Mode 1/3 ENV A008
End	07-AUG-06	19:26:44	
Length	0 days	00:40:01	
Mic	Free Field	200v ON	Period 5 minutes

HEADER | LAST CAL 16-JUN-06
START 07-AUG-06 18:46:43
END 07-AUG-06 19:26:44
LENGTH 0 DAYS 00:40:01
TIMED RECS 8 PER 5min

MIC=FF 200V=ON TYPE=1
S C,A Q3 %ENV



OVERALL ->	'C'	67.7dB	'A'	55.8dB
Hz	'C'	Hz	'C'	Hz	'C'
12	50.5dB	16	52.3dB	20	52.5dB
25	51.6dB	32	60.2dB	40	58.8dB
50	57.4dB	63	57.6dB	80	52.8dB
100	55.5dB	125	56.4dB	160	57.6dB
200	53.3dB	250	49.6dB	315	46.1dB
400	49.4dB	500	50.6dB	630	48.6dB
800	48.9dB	1k	45.9dB	1k25	42.3dB
1k6	42.1dB	2k	39.0dB	2k5	40.1dB
3k15	38.1dB	4k	34.8dB	5k	30.1dB
6k3	25.8dB	8k	---.-dB	10k	---.-dB
12k5	---.-dB	16k	---.-dB	20k	---.-dB



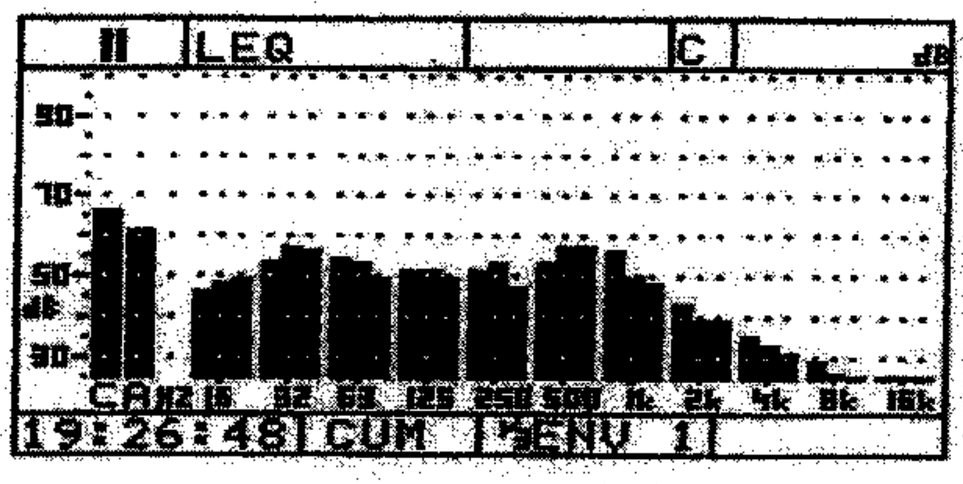
OVERALL ->	'C'	65.0dB	'A'	51.0dB
Hz	'C'	Hz	'C'	Hz	'C'
12	39.0dB	16	45.0dB	20	46.0dB
25	51.0dB	32	56.0dB	40	55.0dB
50	54.0dB	63	52.0dB	80	50.0dB
100	53.0dB	125	49.0dB	160	49.0dB
200	46.0dB	250	45.0dB	315	43.0dB
400	43.0dB	500	45.0dB	630	44.0dB
800	43.0dB	1k	40.0dB	1k25	39.0dB
1k6	37.0dB	2k	36.0dB	2k5	39.0dB
3k15	37.0dB	4k	32.0dB	5k	29.0dB
6k3	---.-dB	8k	---.-dB	10k	---.-dB
12k5	---.-dB	16k	---.-dB	20k	---.-dB

CEL Instruments Ltd. CEL 593.C1T v 5.5

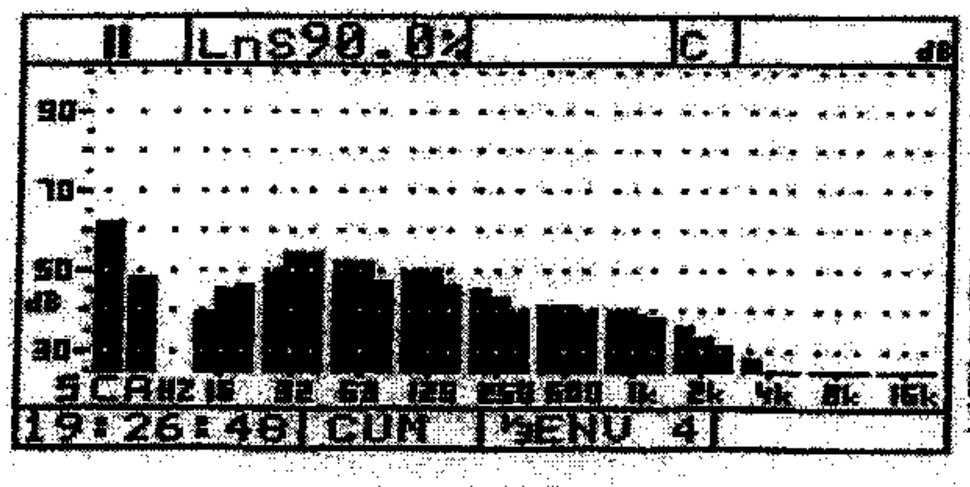
Start	07-AUG-06	19:26:48	Mode 1/3 ENV A009
End	07-AUG-06	19:31:50	
Length	0 days	00:05:02	
Mic	Free Field	200v ON	Period 5 minutes

HEADER | LAST CAL 16-JUN-06
START 07-AUG-06 19:26:48
END 07-AUG-06 19:31:50
LENGTH 0 DAYS 00:05:02
TIMED RECS 1 PER 5min

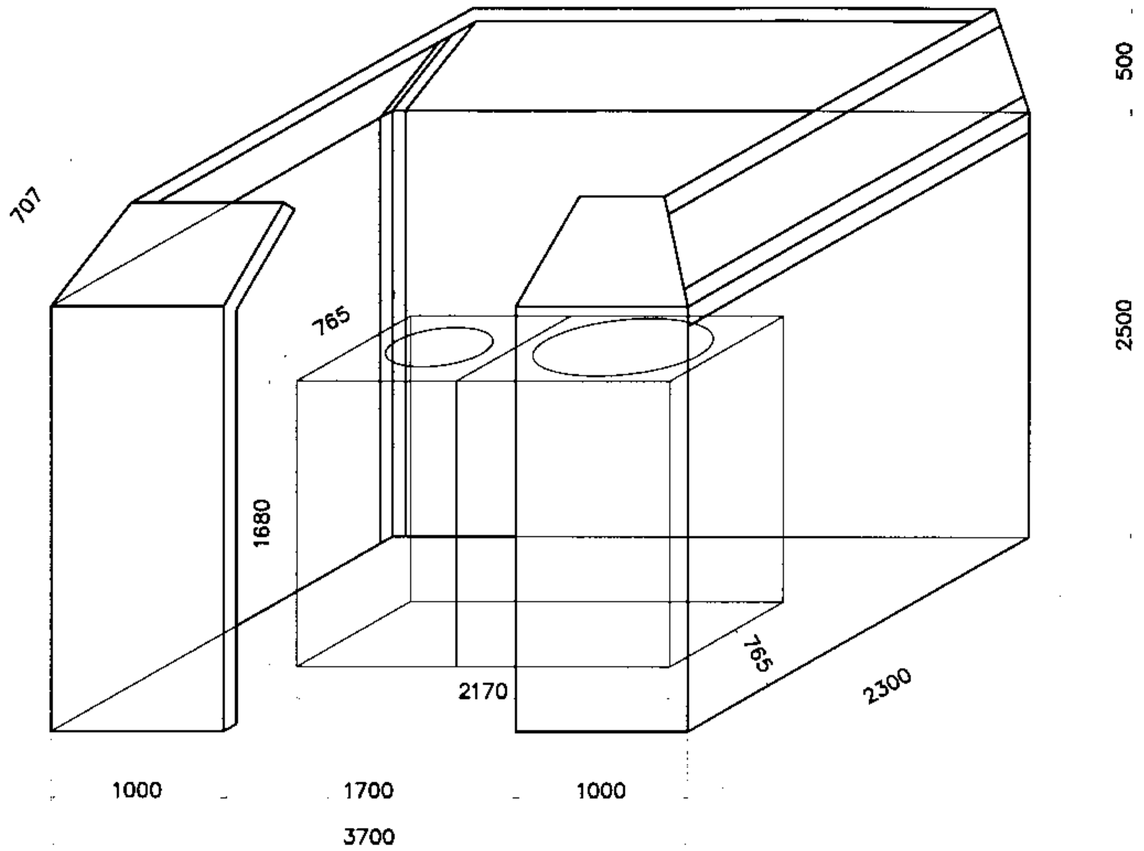
MIC=FF 200V=ON TYPE=1
S C,A 03 %ENV

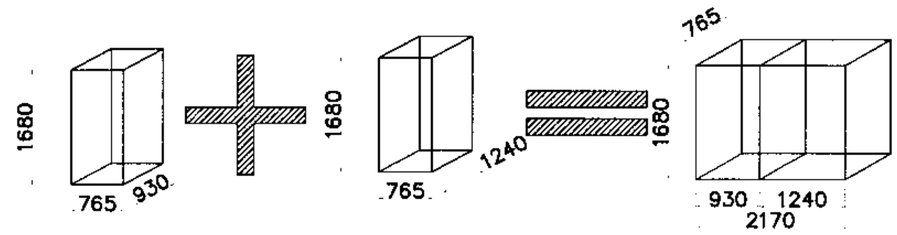


OVERALL -> 'C' 66.7dB 'A' 61.1dB					
Hz	'C'	Hz	'C'	Hz	'C'
12	46.6dB	16	48.7dB	20	49.2dB
25	53.6dB	32	57.5dB	40	56.9dB
50	57.9dB	63	53.4dB	80	49.0dB
100	51.1dB	125	51.0dB	160	49.9dB
200	51.6dB	250	53.0dB	315	47.6dB
400	53.8dB	500	57.6dB	630	47.4dB
800	56.6dB	1k	58.3dB	1k25	48.5dB
1k6	47.1dB	2k	53.3dB	2k5	49.1dB
3k15	35.7dB	4k	32.0dB	5k	31.2dB
6k3	29.2dB	8k	26.6dB	10k	---.-dB
12k5	---.-dB	16k	---.-dB	20k	---.-dB



OVERALL -> 'C' 62.0dB 'A' 48.0dB					
Hz	'C'	Hz	'C'	Hz	'C'
12	39.0dB	16	45.0dB	20	46.0dB
25	50.0dB	32	51.0dB	40	51.0dB
50	52.0dB	63	52.0dB	80	47.0dB
100	50.0dB	125	50.0dB	160	46.0dB
200	45.0dB	250	43.0dB	315	40.0dB
400	41.0dB	500	41.0dB	630	40.0dB
800	40.0dB	1k	39.0dB	1k25	38.0dB
1k6	36.0dB	2k	33.0dB	2k5	31.0dB
3k15	28.0dB	4k	---.-dB	5k	---.-dB
6k3	---.-dB	8k	---.-dB	10k	---.-dB
12k5	---.-dB	16k	---.-dB	20k	---.-dB





DO NOT SCALE

REV	DATE	DETAILS

CLIENT Heatherwick Studio	PROJECT Willing House, Grays Inn Road	DRAWN	JDB
		CHECKED	DJB
		SCALE	A2, 1:100
TITLE General Arrangement of Proposed Acoustic Screen for Roof Plant		DATE	14/11/06
		DIMENSIONS	MM

dB Attenuation ltd
Erskine House, Threshelfords
Inworth Road, Feering
Colchester,Essex
CO5 9SE
Tel : 01376 572787
Fax : 01376 572788
e-mail : design@dbattenuation.co.uk

Drawing No. dB1837/ga

Revision No.