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TECHNICAL REPORT

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PC Pro - Noise Testing of Laptops

1.0 Summary

Intertek RPT were asked to carry out noise and temperature measurements for PC Pro on 12 samples of laptop.

Overall, the following observations have been made:

- The noisiest laptop measured overall was the Watford Aries Precision Media 2 Go, which measured 45dBA when measured from the side.
- The quietest laptop overall was the Sony Vaio VGN-A397XP, which measured 29.5dBA from the front. As this value was close to the background noise, it was corrected to 26.2dBA. This would only be audible if you were close to it.
- The hottest laptop measured was the AlienWare Area-51m 7700, which measured 36.5°C. Its power supply was also the hottest, at 41°C.
- The coolest laptop was the IBM T42 ThinkPad UC2F7UK, which measured 28.4°C. The power supply for this laptop was also the coolest, at 32.4°C.
- Significant differences in mains power consumption were measured. The least efficient was the Watford Aries, which consumed 2.4 watts in standby (off) mode while the three most efficient samples consumed less than 1 watt. For the in-use but idle power consumption the most efficient was the Dell at 38.5 watts while the four least efficient models consumed slightly over 100 watts.

2.0 Introduction

Sound pressure levels for 12 samples of laptop were measured to see how they compared. The laptops were measured both from the front and from the side. Operating (surface) temperatures and mains power consumptions were also measured.

3.0 Measurement Method

The measurements were carried out in the laboratory's listening room, designed according to IEC standard (268-13). This room had a low background noise and represented a domestic listening environment.

The sound levels were measured using the 01dB Symphonie sound measurement system. This was used with a ½ " Bruel and Kjaer microphone and pre-amp, where the microphone was positioned at 0.5m from the edge of the device under test. The microphone was placed at this distance, as it represented how far away the user would typically be from the machine. The system was calibrated before use.

The laptops were run for an hour before testing to make sure they built up enough heat to cause the fans to run at their maximum speed. This gave maximum noise and temperature readings from the laptops.

The sample under test was placed on a table, with a reflecting surface behind. The reflecting surface caused noises that were emitted from the rear of the device to be reflected back again in a random manner. This simulated the laptop being positioned close to a wall and meant that the laptop only needed to be measured from the front and the side, rather than all four sides of the device.

The recorded measurements were averaged over 10 seconds between the frequencies of 20Hz to 20kHz.

The temperature of the laptops was also recorded. A calibrated probe was used to measure the surface temperature at various points. The recorded temperature is the surface temperature at the hottest point.

Power consumption was measured using a calibrated power analyser.

4.0 Results

The results are given in dBA, which means that the A-weighting correction has been applied to the measurement. The A-weighting is designed to simulate the response of the human ear, so gives a more meaningful result in terms of perceived loudness.

The noise results are given in Table 4.1

The Background Noise was measured three times during the measurement period. The results are given in the table below.

BGN (dBA)	26.7
	26.9
	26.8
Average	**26.8**

The average background noise level has been used to calculate the correction factors for all the measured results. A correction factor needs to be applied when the measured noise is within 10dB of the background noise level. This correction factor attempts to remove the effects that the background noise has on the result. The results are shown in the following table.

Graphs 4.1 –4.3 show the frequency content of the measured background noise and the loudest and quietest laptops. The graph of the background noise is very useful when comparing with the graphs of sample measurements as it indicates which frequencies are due to the sample noise and which were already present due to the background noise.

Temperature results are given in Table 4.2 for both the maximum surface temperature and the maximum temperature of the power supply.

Mains power consumption results are given in Table 4.3 for On/idle and standby. The standby power of the power supplies alone are also given.

Table 4.1 Measured Noise of Laptops

		Overall Measured Level (dBA)	Corrected Level due to Background Noise (dBA)
AJP	Front	41.3	**41.3**
D900T	Side	44.4	**44.4**
AlienWare	Front	38.0	**38.0**
Area-51m 7700	Side	39.1	**39.1**
Dell	Front	31.9	**30.3**
Inspiron 9300	Side	34.3	**33.5**
HP	Front	39.8	**39.8**
Pavilion zd8053EA	Side	42.9	**42.9**
IBM	Front	31.7	**29.9**
T42 ThinkPad UC2F7UK	Side	33.2	**32.0**
Mesh	Front	40.8	**40.8**
Ultima Pro PCI-Xtreme	Side	41.6	**41.6**
MV	Front	33.9	**32.9**
Sirius AMD 17	Side	36.4	**35.9**
Samsung	Front	31.1	**29.1**
M40 Plus NM40PRTV03/SUK	Side	31.2	**29.2**
SavRow	Front	37.1	**37.1**
Katana K-90 WSX	Side	37.3	**37.3**
Sony	Front	29.5	**26.2**
Vaio VGN-A397XP	Side	31.0	**28.9**
Toshiba	Front	33.7	**32.7**
Qosmio G10	Side	34.8	**34.0**
Watford Aries	Front	42.1	**42.1**
Precision Media 2 Go	Side	45.0	**45.0**

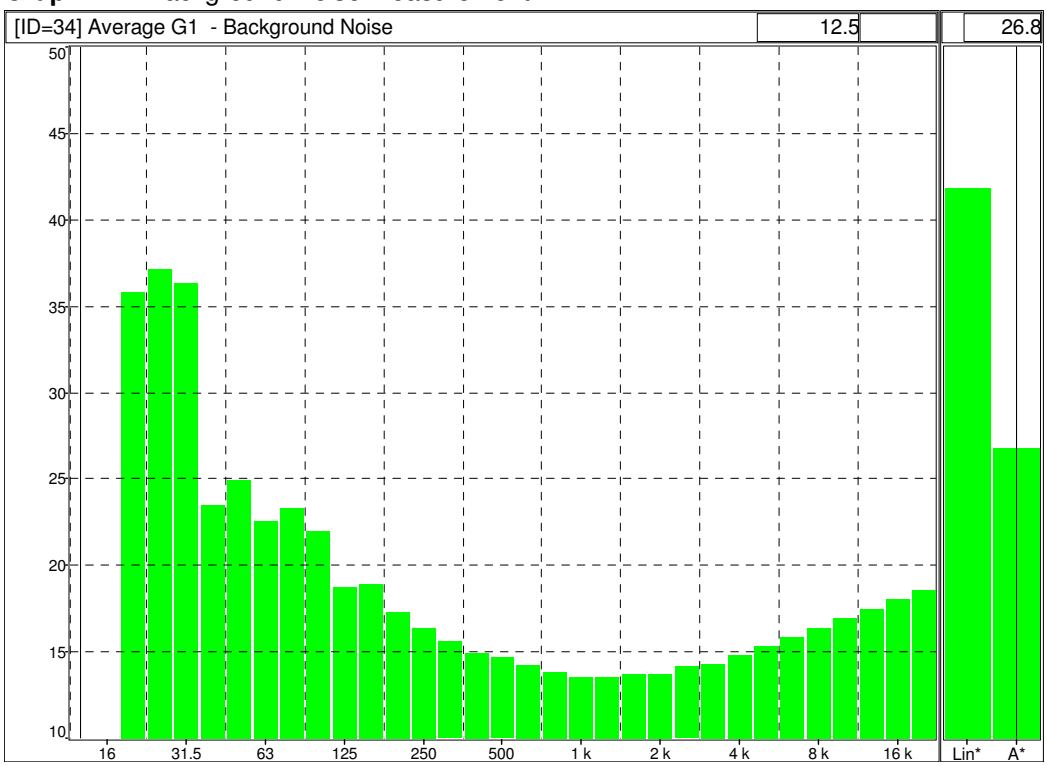
Table 4.2 Measured Temperature of Laptops

		Temperature °C
AJP	Hottest Point	33
D900T	PSU	35.5
AlienWare	Hottest Point	36.5
Area-51m 7700	PSU	41
Dell	Hottest Point	28.9
Inspiron 9300	PSU	32.9
HP	Hottest Point	31.5
Pavilion zd8053EA	PSU	38
IBM	Hottest Point	28.4
T42 ThinkPad UC2F7UK	PSU	32.4
Mesh	Hottest Point	33.7
Ultima Pro PCI-Xtreme	PSU	39
MV	Hottest Point	30.7
Sirius AMD 17	PSU	32.6
Samsung	Hottest Point	36.3
M40 Plus NM40PRTV03/SUK	PSU	39.8
SavRow	Hottest Point	31.9
Katana K-90 WSX	PSU	36.2
Sony	Hottest Point	29.6
Vaio VGN-A397XP	PSU	35
Toshiba	Hottest Point	31.6
Qosmio G10	PSU	34.7
Watford Aries	Hottest Point	35.2
Precision Media 2 Go	PSU	40.9

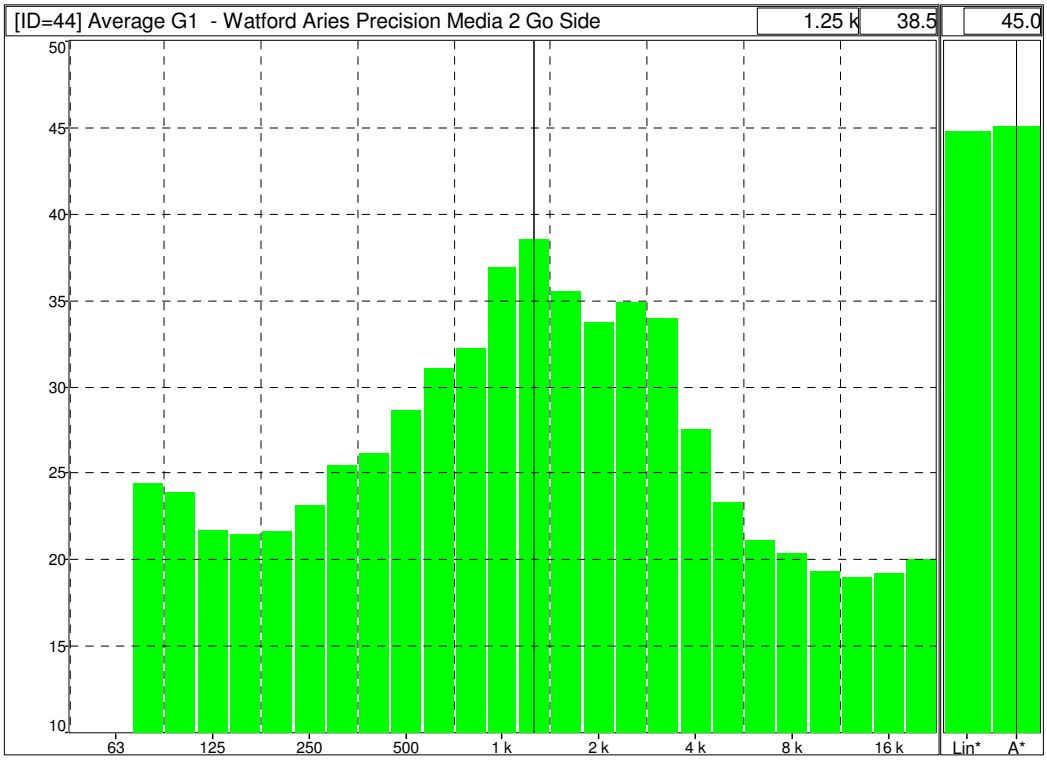
Table 4.3 Power Measurements

Model Details	On/Idle (W)	Standby (W)	Power Supply	
			Rating (V & A)	Standby (W) (Disconnected)
AJP D900T	104.0	1.2	20.0 - 9.0	0.7
AlienWare Area-51m 7700	106.0	1.2	20.0 – 9.0	0.7
Dell Inspiron 9300	38.5	0.8	19.5 – 4.6	0.5
HP Pavilion zd8053EA	68.4	1.1	14.8 - 6.6	0.8
IBM T42 ThinkPad UC2F7UK	23.0	1.0	16.0 – 4.5	0.4
Mesh Ultima Pro PCI-Xtreme	107.0	1.3	20.0 – 9.0	0.7
MV Sirius AMD 17	61.0	1.8	20.0 – 6.0	0.3
Samsung M40 Plus NM40PRTV03/SUK	28.0	1.2	19.0 – 3.2	0.7
SavRow Katana K-90 WSX	106.0	1.0	20.0 – 9.0	0.7
Sony Vaio VGN-A397XP	47.0	0.8	19.5 - 4.7	0.4
Toshiba Qosmio G10	48.0	0.7	15.0 – 8.0	0.4
Watford Aries Precision Media 2 Go	80.0	2.4	20.0 – 7.5	0.7

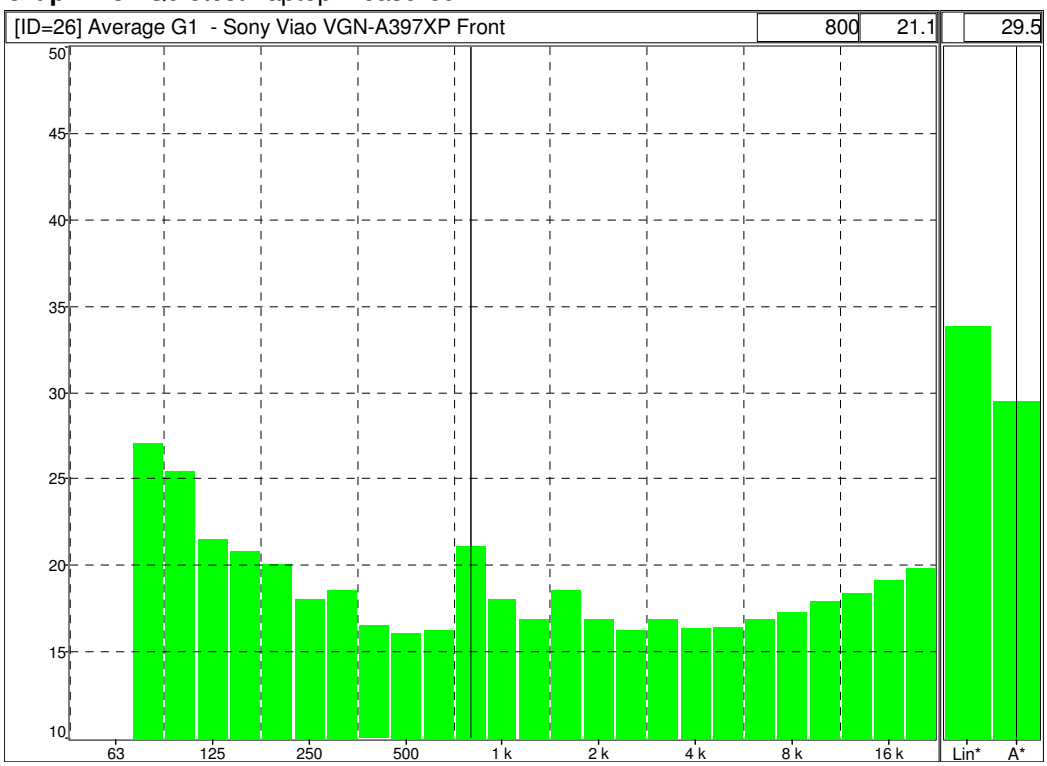
Graph 4.1 Background Noise Measurement



Graph 4.2 Loudest Laptop Measured



Graph 4.3 Quietest Laptop Measured



5.0 Conclusions

The Watford Aries Precision Media 2 Go was the loudest laptop on test, measured at 45dBA from the side. If the fans were the cause of this noise, it would follow then that this laptop should have been one of the coolest, but this was not the case, as the IBM was the coolest.

The AJP D900T was the second loudest PC and was noted as having a particularly annoying whining noise.

The quietest laptop overall was the Sony Vaio VGN-A397XP, calculated as 26.2dBA once background noise had been accounted for. It is clear when comparing graphs 4.1 and 4.3 that this PC has not had much impact on the overall noise of the room.

For better accuracy whilst measuring the quieter PCs (below 29.8dBA) a quieter listening environment would need to be used. The results quoted below this level are within 3dB of the background noise and so are of a reduced level of accuracy. However, measurements in the listening room represent a realistic domestic environment and arguably it may not be necessary to achieve this greater degree of accuracy.

The overall noise level of the device may not actually indicate how annoying that noise is. For example the noise from a large fan is constant and typically of a low frequency so may be less annoying than the noise from small fans. The ‘annoyance’ factor can only really be found from subjective assessment, though the frequency graphs of the measured noise may help to pinpoint the annoying part of the noise.