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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 13 samples of laptops.

Overall, the following observations have been made:

- The noisiest laptop measured overall was the AJP, which measured 40.6dBA when measured from the side.

- The quietest laptop overall was the Toshiba, which measured 28dBA from the side. As this value was close to the background noise, it was corrected to 21.9dBA. This would only be audible if you were close to it.

- The hottest laptop measured was the Samsung, which measured 42.1°C.

- The coolest laptop was the Rock, which measured 28.8°C.

2.0 Introduction

Sound pressure levels for 13 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 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.

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.

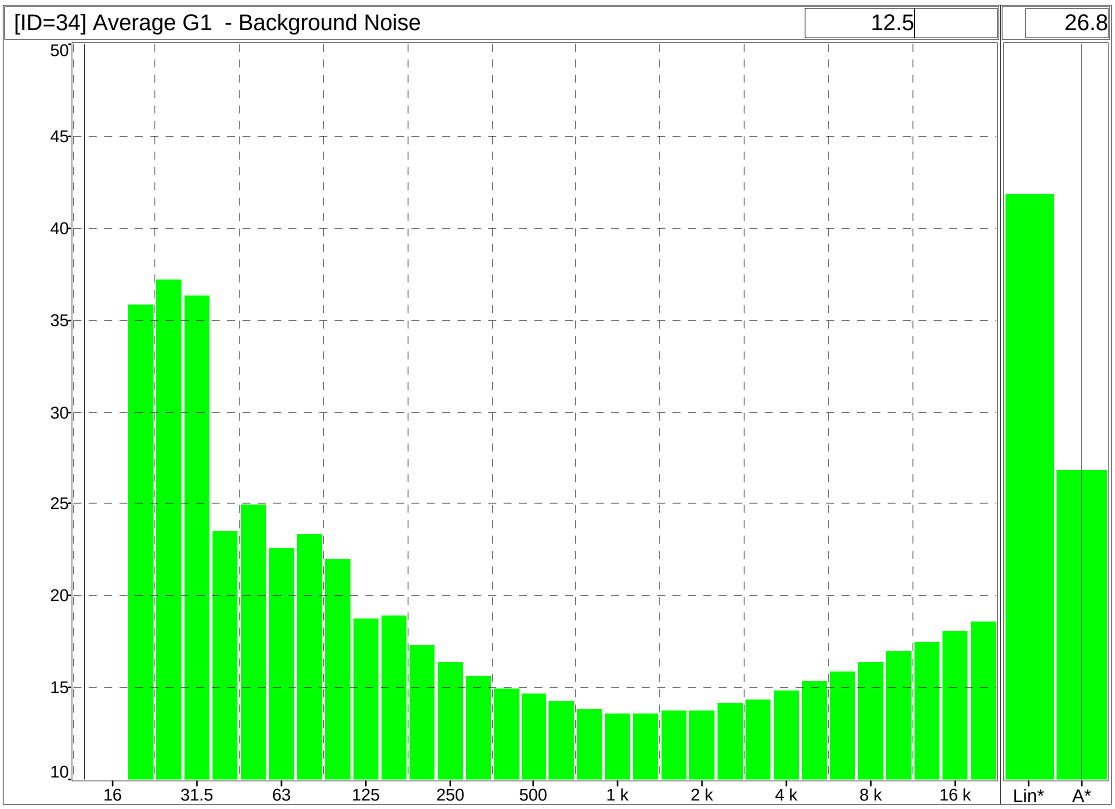
Table 4.1 Measured Noise of Laptops

		Overall Measured Level (dBA)	Corrected Level due to Background Noise (dBA)
Acer	Front	34.3	33.4
	Side	32.7	31.5
AJP	Front	28.5	23.5
	Side	40.6	40.6
Dell	Front	31.2	29.3
	Side	29.6	26.5
Elonex	Front	34.8	34.0
	Side	38.4	38.4
Fujitsu Siemens	Front	35.4	34.8
	Side	36.7	36.3
Hi-Grade	Front	32.8	31.6
	Side	33.9	33.0
HP	Front	33.6	32.6
	Side	35.8	35.3
IBM	Front	30.0	27.2
	Side	31.2	29.3
NEC	Front	36.4	35.9
	Side	38.2	38.2
Rock	Front	30.5	28.1
	Side	30.0	27.2
Samsung	Front	28.9	24.7
	Side	28.7	24.1
Sony	Front	29.3	25.8
	Side	28.3	22.9
Toshiba	Front	28.4	23.3
	Side	28.0	21.9

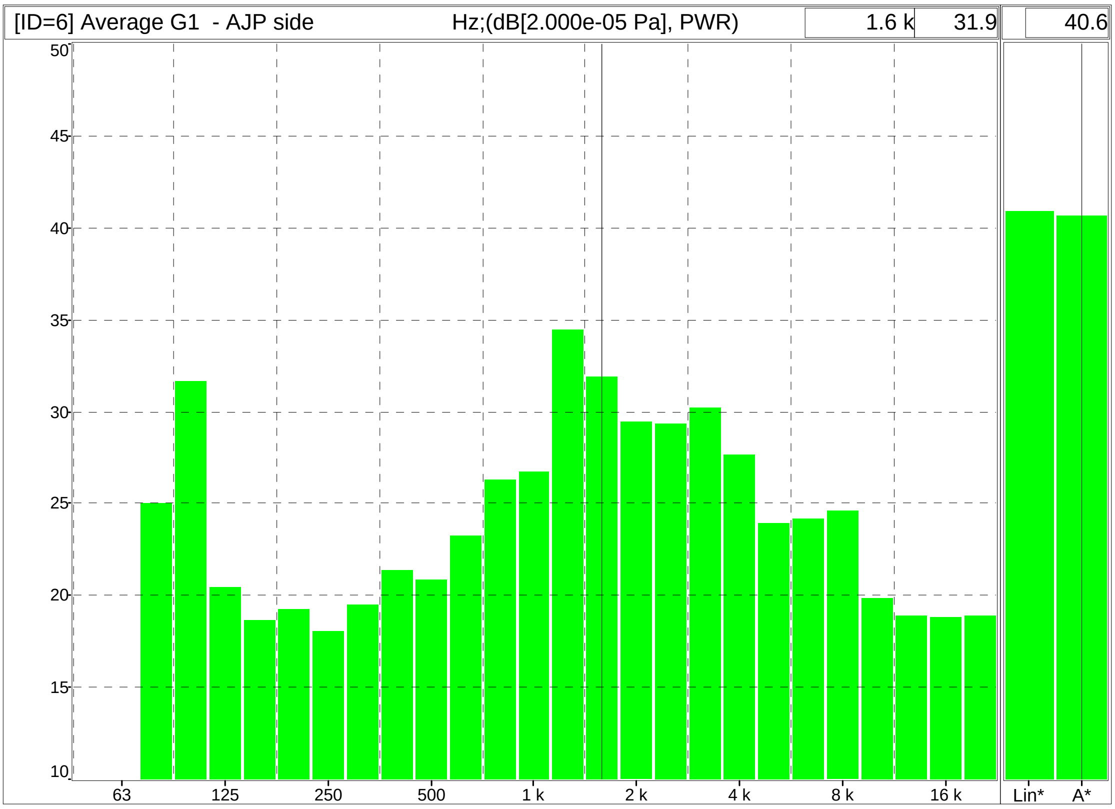
Table 4.2 Measured Temperature of Laptops

	Temperature (°C)
Acer	41.9
AJP	36.5
Dell	39.9
Elonex	33.4
Fujitsu Siemens	36.5
Hi-Grade	37.3
HP	39.3
IBM	36.1
NEC	36.6
Rock	28.8
Samsung	42.1
Sony	36.2
Toshiba	39

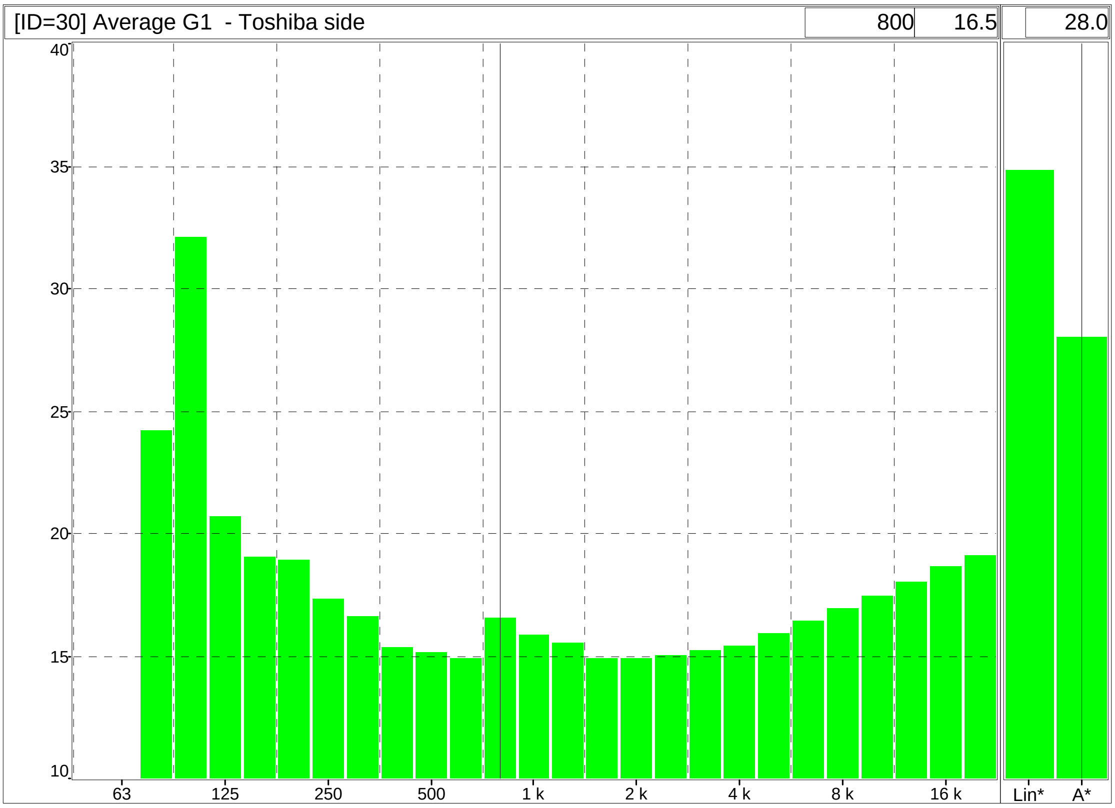
Graph 4.1 Background Noise Measurement



Graph 4.2 Loudest Laptop Measured



Graph 4.3 Quietest Laptop Measured



5.0 Conclusions

The AJP was the loudest laptop on test, measured at 40.6dBA 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 Rock was the coolest.

The quietest laptop overall was the Toshiba, calculated as 21.9dBA 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.