Port Macquarie Base Hospital

Acoustic Assessment of Expansion

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1 INTRODUCTION

ALC have been engaged by Aurecon to undertake an assessment of operational noise likely to be associated with the proposed expansion of Port Macquarie Base Hospital at Wrights Road, Port Macquarie.

In this report we will:

- Identify relevant Council and Office of Environment and Heritage (OEH) noise emission criteria applicable to the development.
- Identify nearby noise sensitive receivers and operational noise sources with the potential to adversely impact nearby development.
- Predict operational noise emissions and assess them against acoustic criteria.
- If necessary, determine building and/or management controls necessary to ensure ongoing compliance with noise emission goals.
- Identify relevant OEH and Australian Standard criteria applicable to potential noise and vibration impacts on nearby developments arising during construction of the subject development.
- If necessary, determine building and/or management controls necessary to ensure compliance with noise and vibration goals for the construction phase.

2 SITE DESCRIPTION AND PROPOSED WORKS

The proposed development is located on Wrights Road, Port Macquarie to the east of the intersection with the Oxley Highway.

The proposed expansion consists:

- A Hospital Building to the west and north west of the existing Hospital Building, which necessitates the removal of 60 parking spaces to the west of the existing Hospital Building
- Expansion of the existing carpark to the south west of the existing Hospital Building providing an additional 24 car parking spaces

The Hospital will operate 24 hours a day.

Development in the vicinity of the new Hospital Building and associated additional 24 car parking spaces on the western end of the site consists of:

- To the north is Hospital land, with single storey residences on the opposite site of the Oxley Highway on Locksley Place and Nottingham Drive and the Southern end of Deakin Close.
- To the east lies the existing Hospital.
- To the south is Wrights Road. On the far side of Wrights Road are Medical Specialists' rooms. Also to the south, are single storey residences on Highfields Circuit.
- To the west is the Oxley Highway, with the Retreat Manufactured Homes Village at distance.

See Aerial photo, following page.

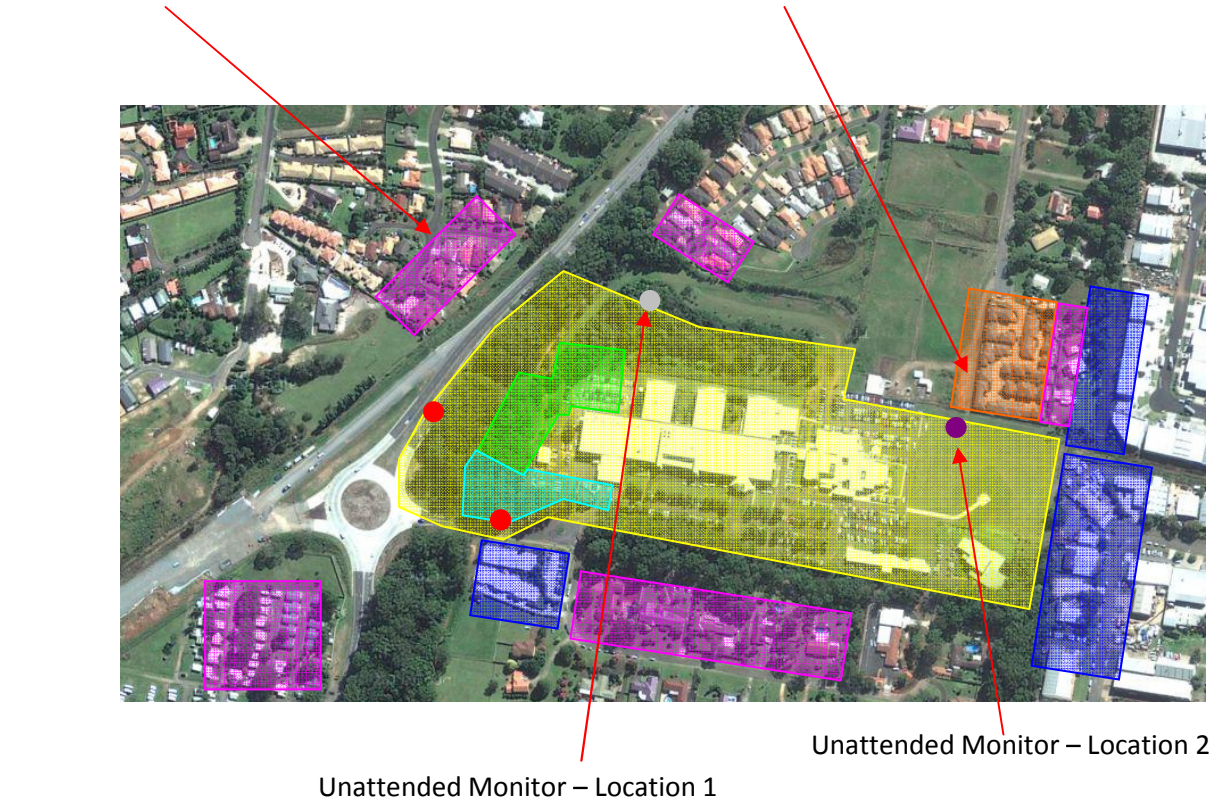


Figure 1 – Aerial Photo showing location of proposed works, potential noise receivers and noise monitoring locations

Legend

Location	Marking
Hospital Boundary	
Proposed Re-Configured Carpark	
Proposed new Hospital Building	
Single Storey Residential Receivers	
Two Storey Residential Receivers	
Commercial Receivers	
Unattended Noise Monitor Location 1	
Unattended Noise Monitor Location 2	
Attended Traffic Noise Monitoring Locations	

3 NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three-principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15 minute period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

L_1 levels represent is the loudest 1% noise event during a measurement period.

4 SURVEY OF AMBIENT NOISE

A survey of existing ambient noise at the site has been conducted using both long term monitoring and short term, hand held, measurements.

Long term monitoring has been conducted between 28 October and 8 November 2011 using two noise monitors installed on site, one on the western portion of the site and one on the east (refer to Figure 1).

Monitoring was conducted using Acoustic Research Laboratories noise monitors set to A-weighted fast response. The monitors were be calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. Noise logger data will be provided in Appendix 1.

In addition, short term noise measurements were conducted to supplement the long term logging data using a Norsonic Type 1 sound analyser to supplement the long term monitoring.

Background noise levels are as follows:

Table 1 – Background Noise Levels – Location 1

Location	Time of Day	Background Noise Level dB(A)L_{90}
Nearest Residential Receivers	Daytime (7am-6pm)	44
	Evening (6pm-10pm)	41
	Night time (10pm-7am)	39

Table 2– Background Noise Levels – Location 2

Location	Time of Day	Background Noise Level dB(A)L_{90}
Nearest Residential Receivers	Daytime (7am-6pm)	39
	Evening (6pm-10pm)	34
	Night time (10pm-7am)	31

Table 3 – Traffic Noise Levels

Location	**Time of Day**	**Background Noise Level dB(A)$L_{eq\ (1hr)}$**
Wrights Road	Day	61
Oxley Highway	Day	66

5 NOISE EMISSION CRITERIA

There are no specific noise controls outlined in the Port Macquarie Council DCP. In the absence of this, the following noise controls will be adopted:

- OEH Industrial Noise Policy (INP).
- OEH Road Noise Policy.
- OEH guidelines for Sleep Arousal.
- The OEH Interim Construction Noise Guidelines and Australian Standard 2436 for the control of construction noise and vibration.

5.1 OEH INDUSTRIAL NOISE POLICY

Noise generated within the proposed development (on site) will be assessed with reference to the OEH Industrial Noise Policy, Intrusiveness and Amenity Criteria, as required by the DCP.

Noise sources covered by this code will include vehicle noise (generated on the site) and mechanical services noise.

5.1.1 INP - Intrusiveness Assessment

Intrusiveness criteria are calculated with reference to the existing background noise levels, and are presented below.

Table 3 – INP Intrusiveness Criteria

Location	Time of Day	Background noise Level - dB(A)L_{90}	Intrusiveness Noise Objective dB(A)$L_{eq(15min)}$ (Background + 5dB)
All Potentially Affected Residential Properties Near Location 1	Day Time (7am – 6pm)	44	49
	Evening (6pm – 10pm)	41	46
	Night (10pm-7am)	39	44
All Potentially Affected Residential Properties Near Location 2	Day Time (7am – 6pm)	39	44
	Evening (6pm – 10pm)	34	39
	Night (10pm-7am)	31	36

5.1.2 INP - Amenity Assessment

The OEH Amenity Criteria provide noise emission goals for both residential and commercial areas, and are as follows:

Table 4 – INP Amenity Criteria

Receiver Location	Land Type	Time of Day	Amenity Noise Objective dB(A)$L_{eq(Period)}$
All Potentially Affected Residential Properties	Suburban	Day Time (7am – 6pm)	55
		Evening (6pm – 10pm)	45
		Night (10pm-7am)	40

5.2 SLEEP AROUSAL ASSESSMENT

Sleep arousal is a function of both the noise level and the duration of the noise.

To assess potential sleep arousal impacts, a two stage test is carried out:

- Step 1 - An "emergence" test is first carried out. That is, the L1 noise level of any specific noise source should not exceed the background noise level (L90) by more than 15dB(A) outside a resident's bedroom window between the hours of 10pm and 7am. If the noise events are within this, then sleep arousal impacts are unlikely and no further analysis is needed. This is consistent with the Noise Guide for Local Government. The guideline level is set out below.

Table 5 - Sleep Arousal Emergence Criteria

Location	Background Noise Level dB(A)L_{90}	Emergence Level dB(A) $L_{1(1min)}$
Location 1	39	54
Location 2	31	46

- Step 2 - If there are noise events that could exceed the emergence level, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the OEH Industrial Noise Policy, this more detailed sleep arousal test is conducted using the guidelines in appendix B of the OEH Environmental Criteria for Road Traffic Noise. These guidelines also indicate that *internal* noise levels of 50-55 dB(A) are unlikely to cause an awakening.

5.3 NOISE FROM INCREASED TRAFFIC GENERATION ON PUBLIC STREETS

Council's DCP has no specific noise criteria with respect to traffic generation associated with developments. In the absence of this, OEH guidelines can be used for assistance.

For land use developments with the potential to create additional traffic the development should comply with the requirements for new developments detailed in the OEH Road Noise Policy. Increased noise levels on Oxley Highway will be assessed against the "arterial" road acoustic criteria, while increased traffic on Wright Road will be assessed against the "local" road acoustic criteria.

Noise levels generated by traffic should not exceed the noise levels set out in the table below when measured at a nearby property.

Table 6 - Criteria for Traffic Noise Generated by New Developments

Road Type	Time of day	Criteria for Acceptable Traffic Noise Level Arterial Roads
Arterial	Day (7am to 10pm)	60 dB(A)$L_{eq(15hr)}$
	Night (10pm to 7am)	55 dB(A)$L_{eq(9hr)}$
Local	Day (7am to 10pm)	55 dB(A)$L_{eq(Worst\ 1hr)}$
	Night (10pm to 7am)	50dB(A)$L_{eq(Worst\ 1hr)}$

However, if existing noise levels exceed those in the table below, all reasonable steps should be undertaken to minimise noise impacts. Section 3.4 of the Policy states that an increase in the existing noise level of 2dB(A) would be considered a barely perceptible increase to the average person.

5.4 CONSTRUCTION NOISE AND VIBRATION IMPACTS

5.4.1 Construction Noise

5.4.1.1 OEH Interim Construction Noise Guidelines

The OEH Interim Construction Noise Guideline nominates acceptable levels of noise emissions above the background noise level. For projects within the recommended standard hours the guideline recommends a noise level of 10dB(A) above the background – this level is referred to as the "noise effected level". The noise emission goals for nearby development are as follows:

Table 7 - Noise Emission Goal – Residential Properties

RECEIVER	TIME OF DAY	MEASURED BACKGROUND LEVELS – dB(A)L_{90}	NOISE EFFECTED LEVEL BACKGROUND + 10dB(A)$L_{eq(15min)}$
Location 1	Day (7am-6pm)	44	54
Location 2	Day (7am-6pm)	39	49

*Assumed noise level to be confirmed with on site testing (which is currently under way).

Table 8 - Noise Emission Goal – Hospital

TIME OF DAY	Noise Emission Goal dB(A)$L_{eq(15min)}$
Day (7am-6pm)	45 (internal noise level)*

*Assuming standard façade construction, and external noise level of 65-70dB(A) will result in an internal noise level of 45dB(A).

Where noise from the construction works is above the "noise affected level", the proponent should apply any feasible and reasonable work practices to minimise noise, as is recommended in AS2436.

If noise emissions are likely to exceed 75dB(A)$L_{eq(15min)}$, the receiver is deemed to be "highly noise affected". Introduction of management controls such as scheduling of noisy periods, or respite periods is recommended.

5.4.1.2 Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site".

Where compliance with OEH cannot be achieved, noise emissions are to be managed in accordance with principles in AS2436:

- That reasonable suitable noise criterion is established (i.e. – adopt OEH/Council guidelines).
- That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes on parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours.
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

5.4.2 Construction Vibration

Vibration caused by construction should be limited to:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*
- For human exposure to vibration (amenity), the evaluation criteria presented in the British Standard BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment

The criteria and the application of this standard are discussed in separate sections below.

5.4.2.1 Structure Borne Vibrations (Building Damage)

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 8.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 9 - DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			**Plane of Floor of Uppermost Storey**
		< 10Hz	**10Hz to 50Hz**	**50Hz to 100Hz**	**All Frequencies**
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

5.4.2.2 Assessing Amenity (Human Comfort)

The Office of Environment and Heritage NSW "Assessing Vibration: A Technical Guideline" (Feb 2006) is based on the guidelines contained in BS 6472:1992. This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings.

The recommendations of this guideline should be adopted to assess and regulate vibration within the construction site.

Table 10 - OEH Recommended Vibration Criteria

		RMS acceleration (m/s^2)		**RMS velocity (mm/s)**		**Peak velocity (mm/s)**	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0

6 NOISE EMISSION ASSESSMENT

The operational noise emissions will be assessed below. Assessment of the following noise sources will be undertaken:

- Noise from the use of loading docks (truck manoeuvring and material handling) will be assessed with reference to the Industrial Noise Policy.
- Noise from mechanical services (roof top ventilation) will be assessed with reference to the Industrial Noise Policy.
- Noise from vehicles using the additional western car parking spaces will be assessed with reference to the Industrial Noise Policy.
- Noise from traffic generated on public roads will be assessed with reference to the OEH Road Noise Policy.
- Sleep disturbance noise events will be assessed with reference to the OEH application notes to the Industrial Noise Policy (late night use of the western car park and loading dock).
- Noise emissions from the construction of the proposed new building and car parking areas will be assessed with reference to the OEH Interim Construction Noise Guidelines and Australian Standard 2436.
- Construction vibration will be limited to:
    - For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*
    - For human exposure to vibration (amenity), the evaluation criteria presented in the British Standard BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment

In all cases, all predicted noise levels in the following sections are based on the proviso that the acoustic treatments/management controls recommended in section 7 are implemented.

6.1 LOADING DOCKS

Noise associated with the use of the loading docks will consist of:

- Trucks moving into or out of the loading dock.
- Materials Handling.

Noise generated on the proposed site will be assessed with reference to the DECC Industrial Noise Policy.

Predictions will be made based on the following data/assumptions:

- Noise levels used in calculations:

Table 11 - Noise Source Data

Noise Source	Noise Level (sound power level)
Truck engine (semi-trailer driving at approx 5km/h)	105dB(A)L_{eq}
Materials Handling	90dB(A)L_{eq}

- Relative position of noise source and noise receiver, taking into account distance attenuation and noise screening (where appropriate) i.e. due to the level difference between the site and the receivers, there is line of sight screening.

- There is no more than 1 vehicle movement in any 15 minute period.

Operational noise levels are predicted and assessed against relevant criteria from section 4.

6.1.1 Western Loading Dock

Operational noise levels are predicted at the boundary of the nearby residential developments at the southern end of Nottingham Drive - these are the potentially most affected noise receiver locations.

Table 12 - Western Loading Dock – Noise Impact Assessment

Receiver Location	Noise Source	Predicted Noise Level – dB(A)$L_{eq(15min}$	Compliance
Nottingham Drive	Truck manoeuvring to/from site	38dB(A)$L_{eq(15min)}$	Complies –Daytime and Evening and Night Time Criteria in section 5.1
	Materials Handling	34dB(A)$L_{eq(15min)}$	

6.2 USE OF THE WESTERN CAR PARK

Noise generated by vehicle movements in the western carpark on the proposed site will be assessed with reference to the OEH Industrial Noise Policy. This does not include Emergency Vehicles as these are excluded from assessment in the regulations.

The western car park is proposed to operate 24 hours, although the bulk of the use will be during the day and evening.

Noise emissions from late evening and night time use of the carpark has been included in this assessment for completeness.

Predictions will be made based on the following data/assumptions:

- Up to 50 vehicle movements per hour (equal to the carpark completely empties and fills once per hour and each car takes half a minute to park or leave) during the daytime.

- During the evening period (6pm-10pm) there would be up to 25 movements per hour.

- During the night time period (10pm-7am), occasional movements are expected at not more than 12 per hour (i.e. 3 per 15minutes).

- Noise levels used in calculations:

Table 13 - Noise Source Data

Noise Source	Noise Level (sound power level)
Car Driving at approx 10km/h	84dB(A)Leq

- Relative position of noise source and noise receiver, taking into account distance attenuation and noise screening (where appropriate).

Operational noise levels are predicted and assessed against relevant criteria from section 4.

Table 14 – Eastern Car Park – Noise Impact Assessment

Receiver Location	Time of Day	Predicted Noise Level – dB(A)$L_{eq(15min}$	Compliance
Rear of 1 Highfield Circuit	Day 7am – 6pm	39dB(A)$L_{eq(15min)}$	Complies –Daytime and Evening and Night Time Criteria in section 5.1
	Evening 6pm-10pm	36dB(A)$L_{eq(15min)}$	
	Night 10pm-7am	32dB(A)$L_{eq(15min)}$	

6.3 PEAK NOISE EVENTS (SLEEP AROUSAL)

6.3.1 Loading Dock

A sleep arousal assessment of peak noise events from the loading dock will be conducted.

The peak noise assessment will be assessed is based on the following assumptions:

- The loudest typical peak noise event from the brake release valve with an approximate sound power level of 110dB(A)$L_{1(1min)}$.
- The noise event examined is that from the truck releasing airbrakes when it leaves the loading dock on the western side of the new Hospital Building, (the space nearest the residential development on Nottingham Drive, approximately 110m away).

The prediction takes into account the relative position of noise source and receiver, and noise attenuation over distance.

Predicted level is as follows:

Table 15 - Sleep Arousal Assessment

Receiver Location	Noise Source	Predicted Facade Noise Level	Emergence Test Level	Complies
Residential Properties on Nottingham Drive	Truck Airbrake	56dB(A)$L_{1(1min)}$	54dB(A)$L_{1(1min)}$	Exceeds preliminary emergence test, further investigation required

Initial assessment requires that noise emissions from air release valve will exceed 50dB(A)L_1 (15dB(A) above the background noise level). Therefore more detailed assessment is recommended by the INP Application Notes.

In the event that the "background+15" test is not satisfied, the INP explanatory notes recommends an assessment, taking into account exact noise levels and the number of noise events.

The EPA Road Noise Policy states that noise levels of less than 55dB(A) when measured *inside* a bedroom are considered unlikely to affect sleep (page 35 of the guidelines, which state that peak noise events of approximately 50-55dB(A)L_1 are "unlikely to cause awakening reactions").

The external noise level of 56dB(A) referred to in table 15 above would correlate to an *internal* noise level of approximately 46dB(A), which is below the 50-55dB(A) target and therefore acceptable. Further, in reviewing the *noise level v probability of sleep disturbance in the* appendix B of the EPA *Environmental Criteria for Road Traffic Noise*, there is less than a 2% chance of sleep arousal from such events. (Note – although the road traffic noise acoustic criteria of the ECRTN are now superseded by the Road Noise Policy, the ECRTN presents the more detailed analysis of sleep disturbance, and remains an appropriate analysis tool when reviewing potential sleep disturbance, and is specifically referred to in the INP Application Notes).

Assuming that the window of a bedroom facing the loading dock is left open, there is typically a 10dB(A) noise reduction as noise travels from outside to inside the room. On applying this reduction, the noise level from the valve will be approximately 46dB(A)L_1 when measured inside the bedroom. This is less than the 50-55dB(A) level specified in the guidelines, and therefore unlikely to cause sleep arousal.

6.3.2 Western Car Park Noise

The Western car park can be used 24hours a day. A sleep arousal assessment of peak noise events from the Western car park will be conducted.

The peak noise assessment will be assessed is based on the following assumptions:

- The loudest typical peak noise event from the use of the car park will be from a car door closing or a car starting, both with an approximate sound power level of approximately 95dB(A)$L_{1(1min)}$.
- The noise event examined is that from the closing of a car door at the southernmost parking space on the site, (the space nearest the residential premises and at least 70m away from the car).

The prediction takes into account the relative position of noise source and receiver, and noise attenuation over distance.

Predicted level is as follows:

Table 16 – Sleep Arousal Assessment

Receiver Location	Noise Source	Predicted Noise Level	Emergence Test Level	Complies?
Residential Properties on Highland Circuit	Door Close	50dB(A)$L_{1(1min)}$	54dB(A)$L_{1(1min)}$	Complies emergence test, no further investigation required

6.4 MECHANICAL SERVICES NOISE

Detailed acoustic assessment of mechanical plant is not typically undertaken at DA stage as plant selections and locations are not finalised.

We recommend that a detailed review of plant items be undertaken at Construction Certificate stage, once mechanical plant selections have been undertaken. In particular, external roof top plant (cooling towers, condensers etc) should be assessed to ensure that satisfactory noise levels will be achieved. Indicatively, we assume that all cooling towers will require variable speed drives (to allow for reduced fan speeds during evening and night time periods) and that noise screens capable of providing line of sight screening between the roof top plant and the nearest residences will be required.

In our opinion, all plant items can be treated to an extent so as to be capable of complying with EPA INP acoustic guidelines.

6.5 INCREASED TRAFFIC ON PUBLIC STREETS

Work in the Western Portion of the site will result in a net reduction in parking spaces from 60 to 24. On that basis, there will be no net increase in traffic on public streets from the proposed new building and associated re-configured carpark.

6.6 CONSTRUCTION NOISE IMPACTS

Obviously, noise impacts on nearby development will be dependant on the activity and where on the site the activity is undertaken. Excavation and piling works tend to be the loudest typical activity.
Work in the western portion of the site will have greatest impact on the residents on Locksley Place, residents within the existing Hospital and the western end of Highfield Circuit.

6.6.1 Western Work - New Hospital Building and Associated Works

Initial analysis indicates:

- Excavation/soil retention phase - Primary noise emissions occur during excavation and earth retention (piling), with equipment items typically having sound power levels of approximately 115dB(A)$L_{eq(15min)}$. Excavators (dozers with bucket, saws or hammers) and piling works are typically the loudest activity during construction. For eastern work, noise levels of between 40-60dB(A) within the hospital and up to 64dB(A) at the nearest residents to the east will potentially be generated. This is predicted to occur for short periods, when working close to the eastern boundary (approx 85m away from the nearest residents), however typical noise levels are likely to be closer to 59dB(A). OEH acoustic criteria (refer to tables 1 and 2) may be exceeded from time to time, with higher noise levels generated when working near the northern and western boundaries of the site.

- During erection of structure, it is the use of hand tools (angle grinders etc) and concrete pumps which are the loudest typical activity (sound power levels of approximately 105dB(A)$L_{eq(15min)}$). Noise levels of between 30-50dB(A) within the hospital, indicating that a potential minor exceedance of OEH acoustic criteria in the existing Hospital (refer to tables 1 and 2) is possible from time to time, but compliance is expected at the eastern residential receivers.

- Obviously, once construction of the building shell is complete, noise from hand tools will be relatively low, as the new building façade will provide considerable noise attenuation. Once the building shell is largely complete, use of hand tools in internal areas is unlikely to exceed OEH recommended levels.

6.6.2 Recommended Construction Noise and Vibration Controls

Noise impacts can be minimised using the following:

- Selection of equipment and process.
- Location of static plant (particularly concrete pumps).
- Use of screens or enclosures (typically only feasible for static plant).
- Scheduling of noisy activities and provision of respite periods.

Detailed construction noise planning is typically undertaken after engagement of a builder and a construction program is prepared (ie – after DA stage) and therefore, detailed planning is not possible at this stage.

In light of the above, we recommend:

- During preparation of the construction program (CC stage), consult with the Port Macquarie Base Hospital to determine what areas of the hospital are particularly noise sensitive, and at what time (ward rooms, operating theatres etc).
- On completion of the construction program, acoustic review of proposed construction activities and plant/methods should be undertaken to identify work items likely to exceed OEH guidelines.
- For those activities likely to generate high noise levels, the analysis should identify where on the site are the areas likely to result in high noise levels. This will then assist in determining the likely time period for which high noise levels will occur.
- Identify feasible acoustic controls or management techniques (use of screens, scheduling of noisy works, notification of adjoining land users, respite periods) when excessive levels may occur.
- For activities where acoustic controls and management techniques still cannot guarantee compliant noise levels, implement a notification process whereby nearby development is made aware of the time and duration of noise intensive construction processes.

Through adoption of the above, noise impacts on nearby development and the existing hospital can be suitably managed to prevent excessive impact.

6.7 VIBRATION IMPACTS

Excavation and earth retention works (piling) are the primary vibration generating activities.

Vibration impacts on the residential properties to the west are unlikely to exceed the criteria outlined in section 3.2

Due to its proximity, there is potential for higher levels of vibration to be generated at the Port Macquarie Base Hospital. In particular, if excavating in rock or installing driven piles in close proximity to the façade of the hospital. We recommend:

- Consultation with Hospital prior to construction to determine if there is any particularly vibration sensitive equipment items on site, particularly near the northern or western facades (MRI, microscopes etc) in order to determine appropriate vibration criteria.

- Where practicable, excavation in rock should be done using rock saws as opposed to pneumatic hammers.

- If piling is required, use of augured or vibro piling should be used rather than impact piling.

- For at least the initial stages of excavation and piling, vibration monitoring at the Hospital should be conducted to ensure excessive levels of vibration are not achieved. Any monitoring system should allow for rapid feedback to the contractor (for example, SMS notification) in the event that excessive levels are reached.

7 RECOMMENDATIONS

We recommend the following acoustic treatments/management controls:

- Western loading dock:
    - No more than 1 truck movement per 15 minute period during night time periods (10pm-7am).

- Detailed acoustic assessment of mechanical services should be conducted at CC stage, once primary external plant selections are completed. This assessment can then recommend suitable ameliorative treatments to ensure compliance with relevant noise goals.

- See sections 6.6 above for construction noise controls. Provided these steps are taken, construction noise will be managed in accordance with the OEH Interim Construction Noise Guideline.

- See sections and 6.7 above for construction vibration controls. Provided these steps are taken, construction vibration will be managed in accordance with the project goals.

8 CONCLUSION

Noise emissions associated with the proposed extension to Port Macquarie Base Hospital including the new building and associated parking have been assessed with reference to relevant OEH and Council acoustic guidelines.

With the recommendations presented in section 7 of this report adopted, both operational noise and construction noise impacts associated with the site will comply with relevant acoustic criteria, preventing unacceptable noise impacts on the nearest surrounding residential residents.

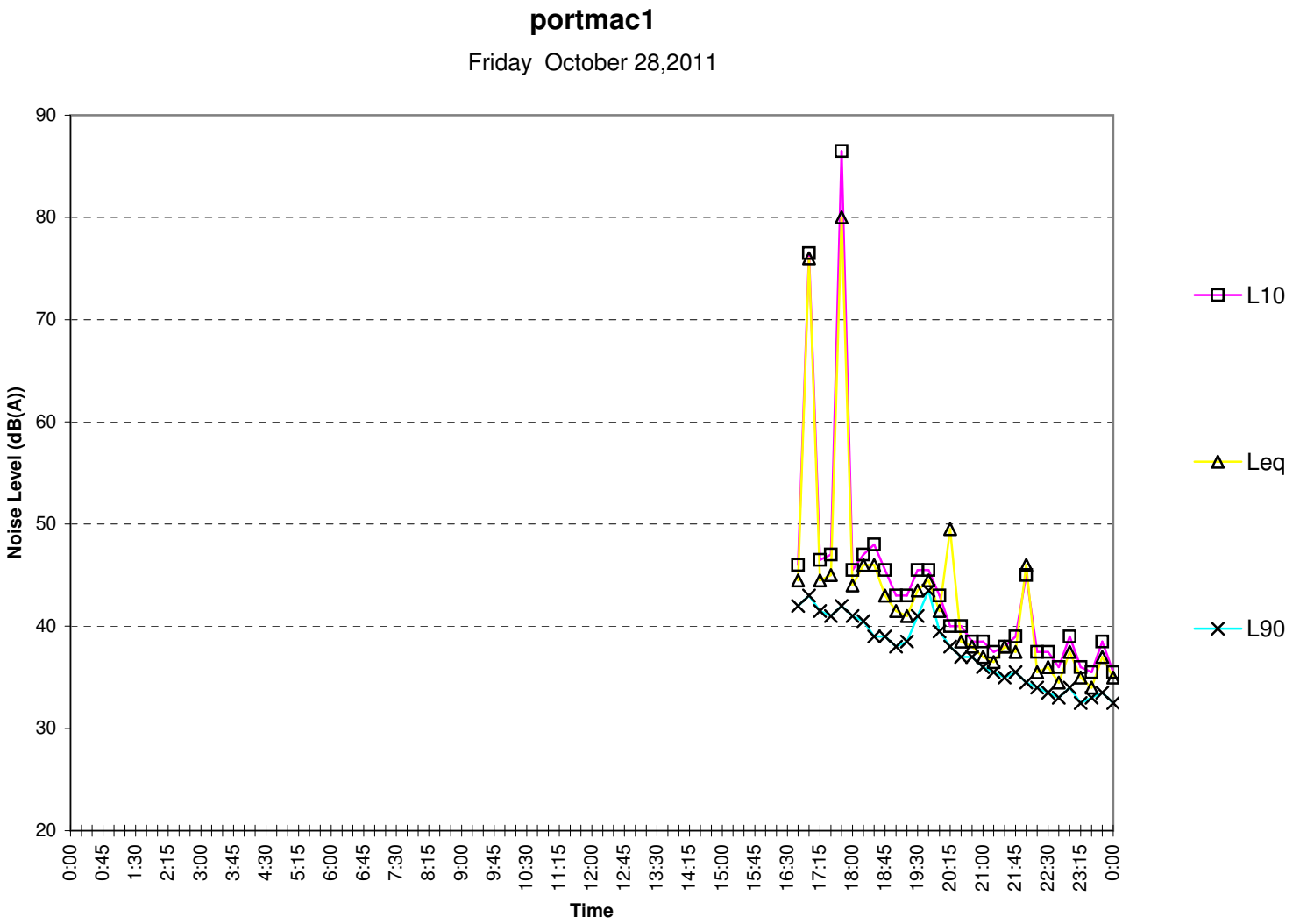
We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Hilary Pearce

APPENDIX 1

NOISE LOGGING RESULTS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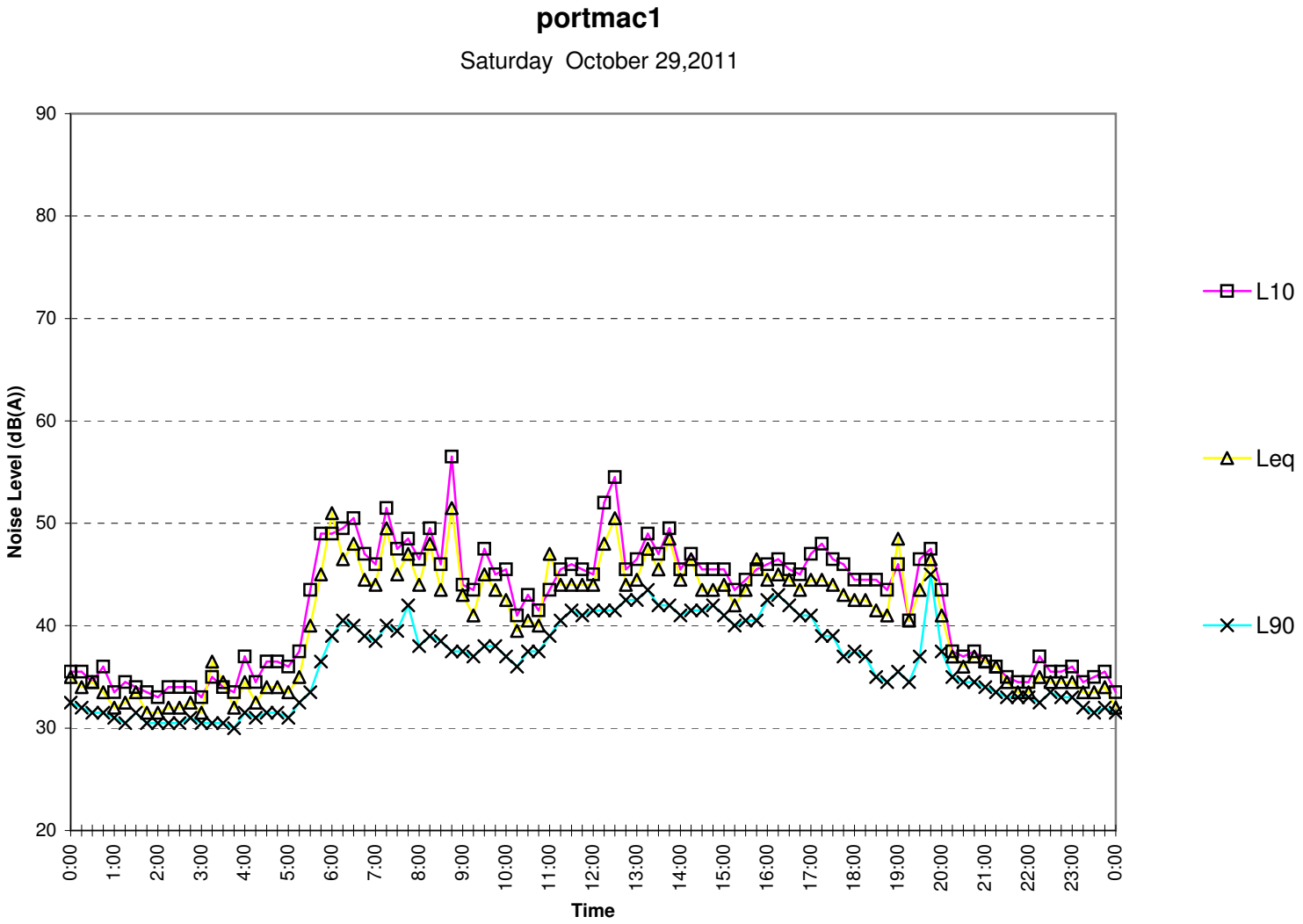
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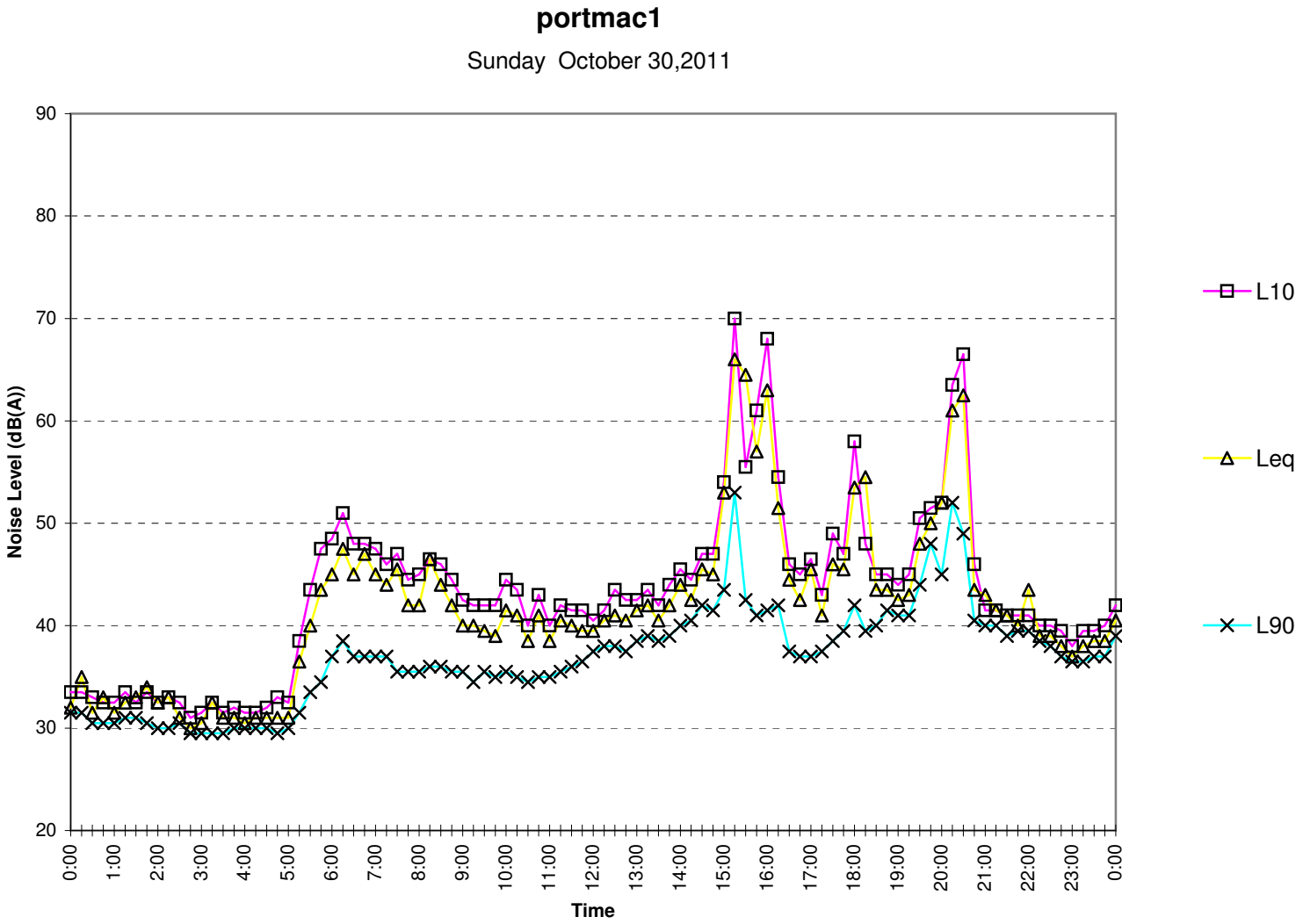
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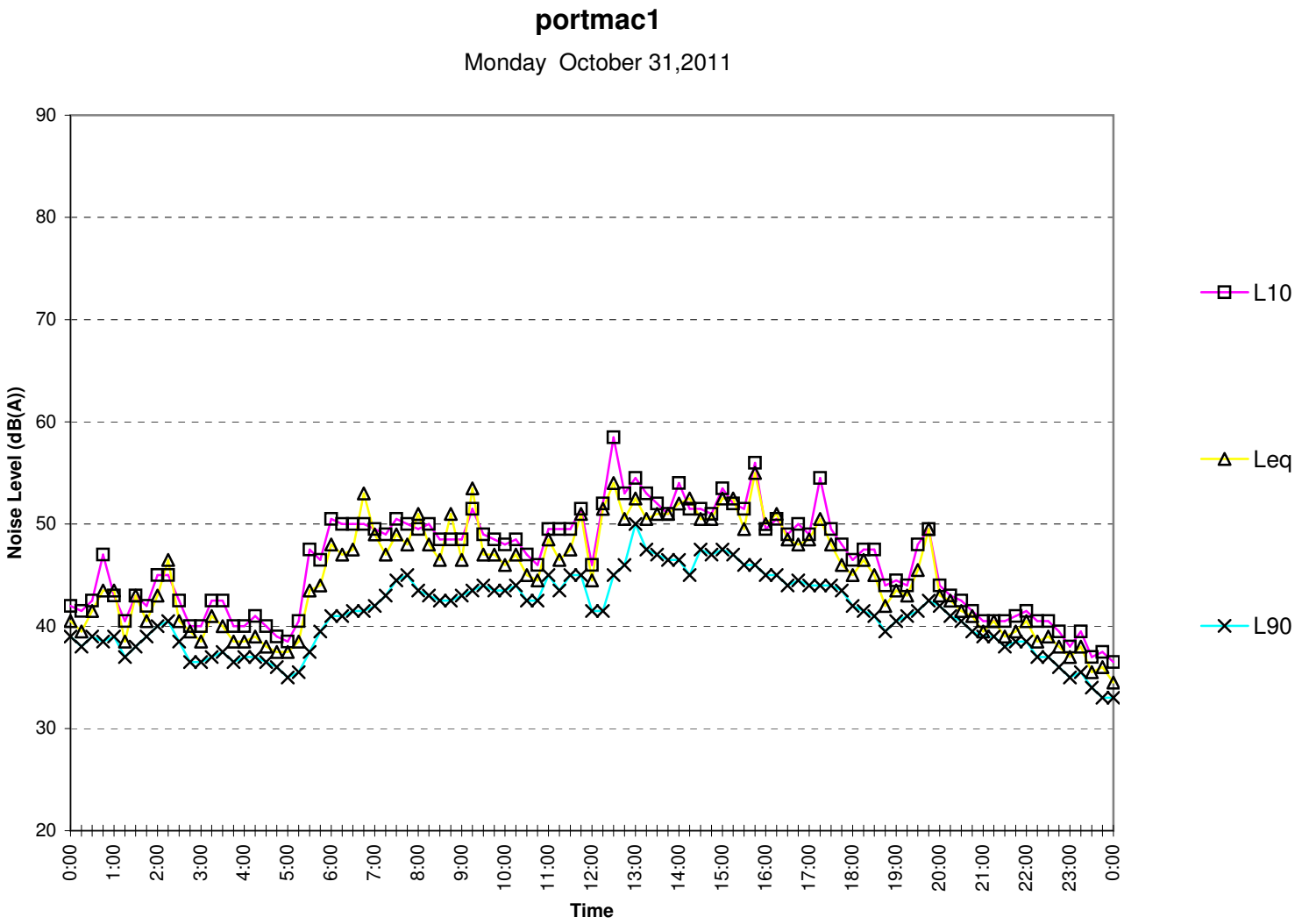
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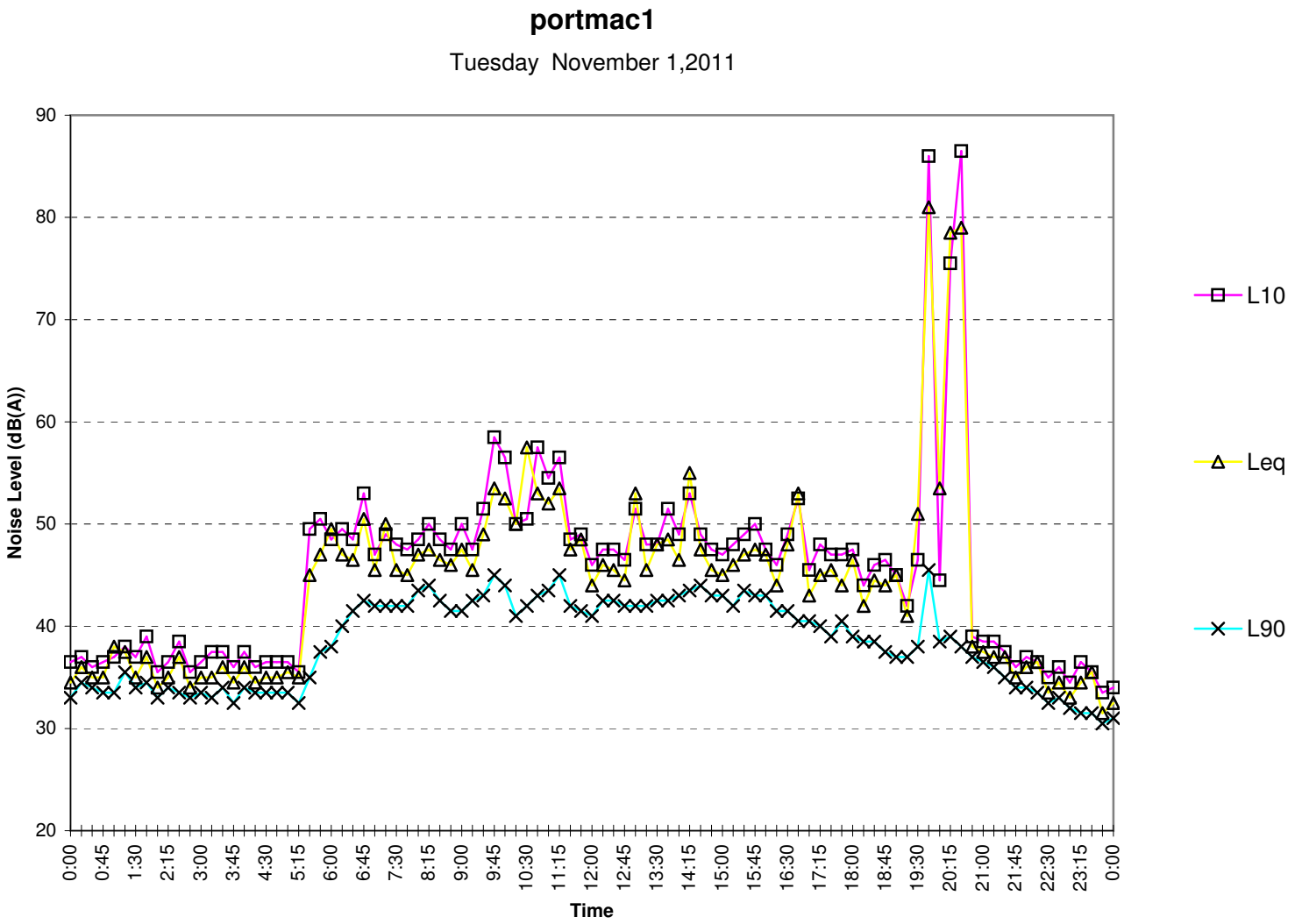
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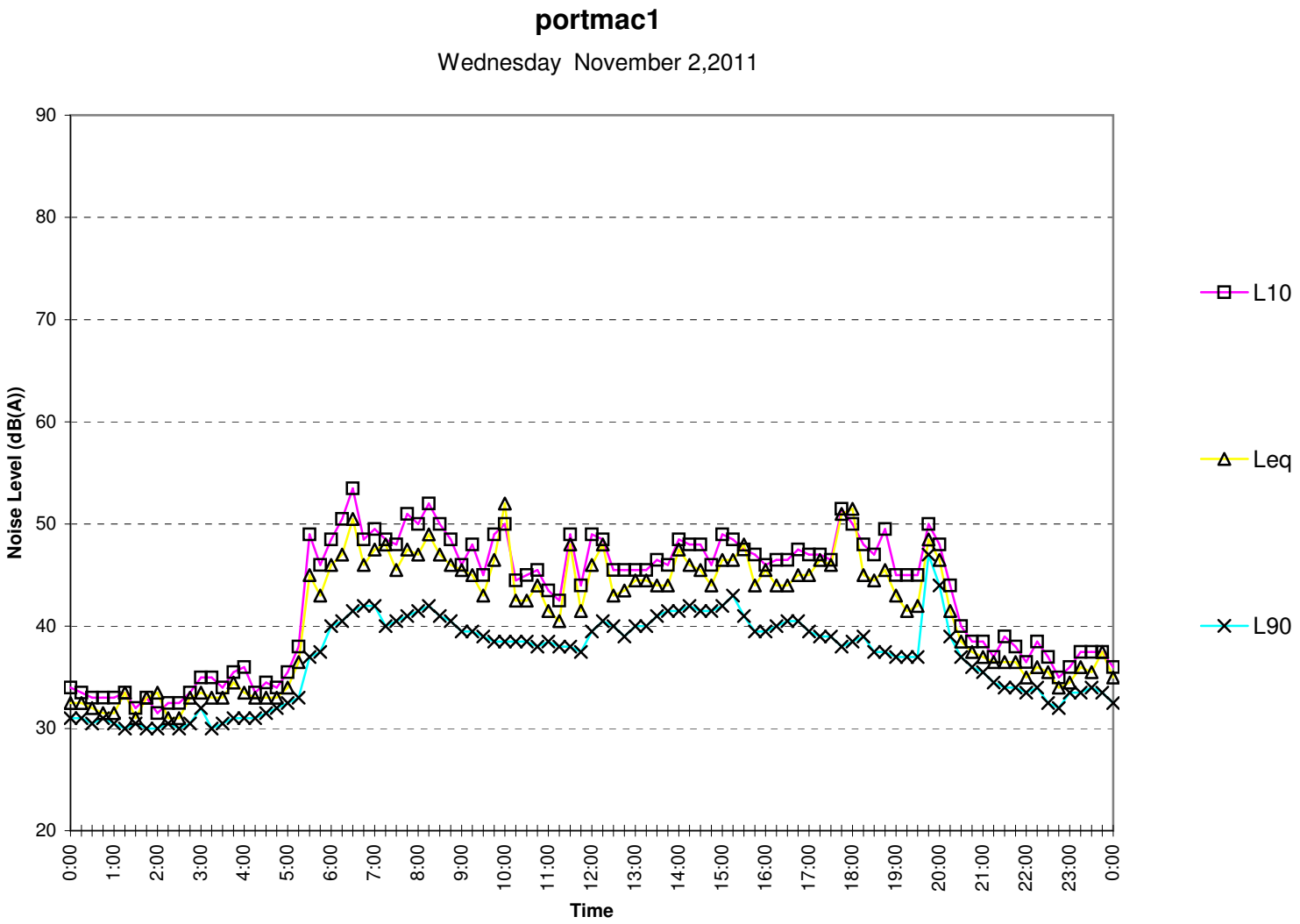
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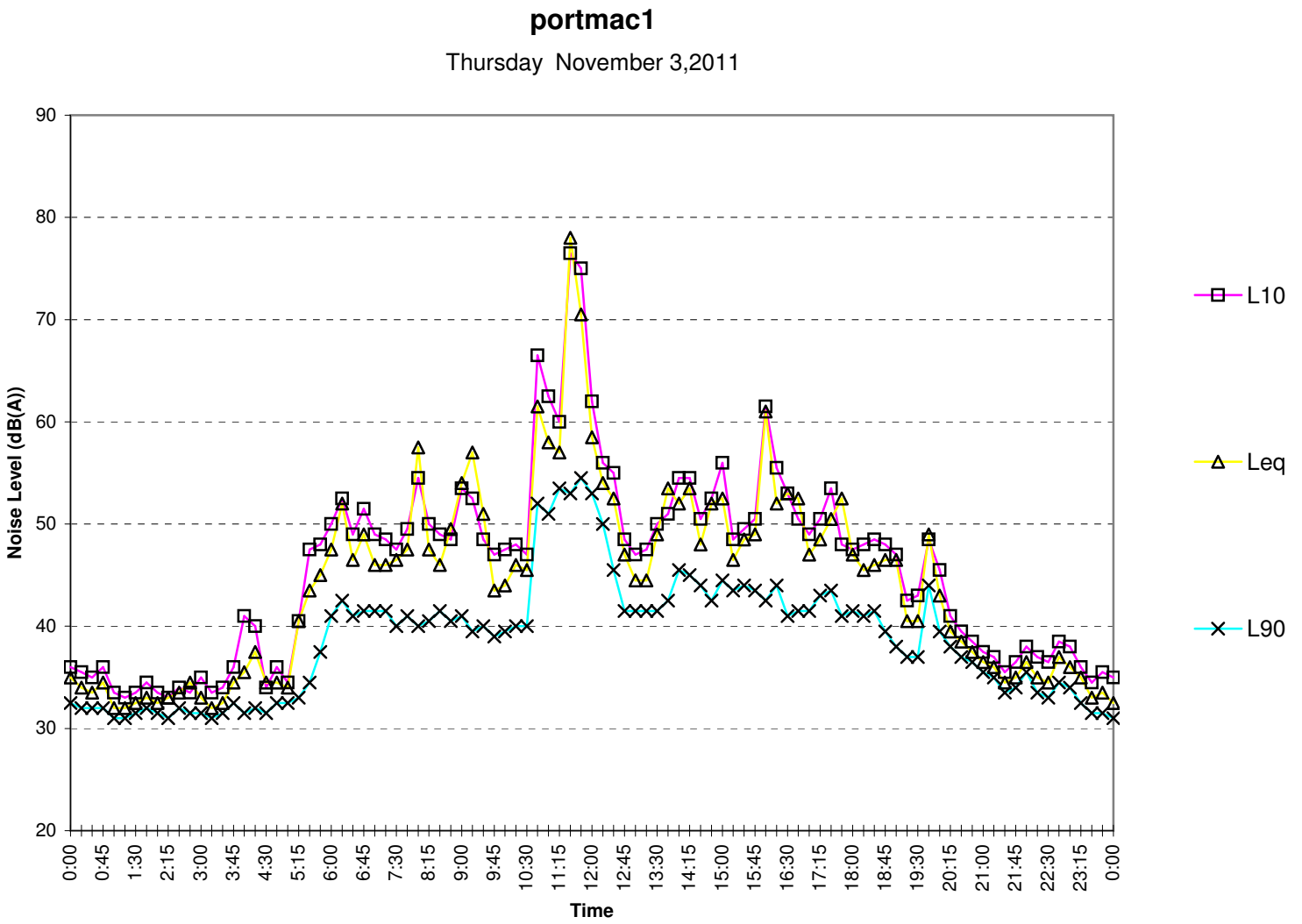
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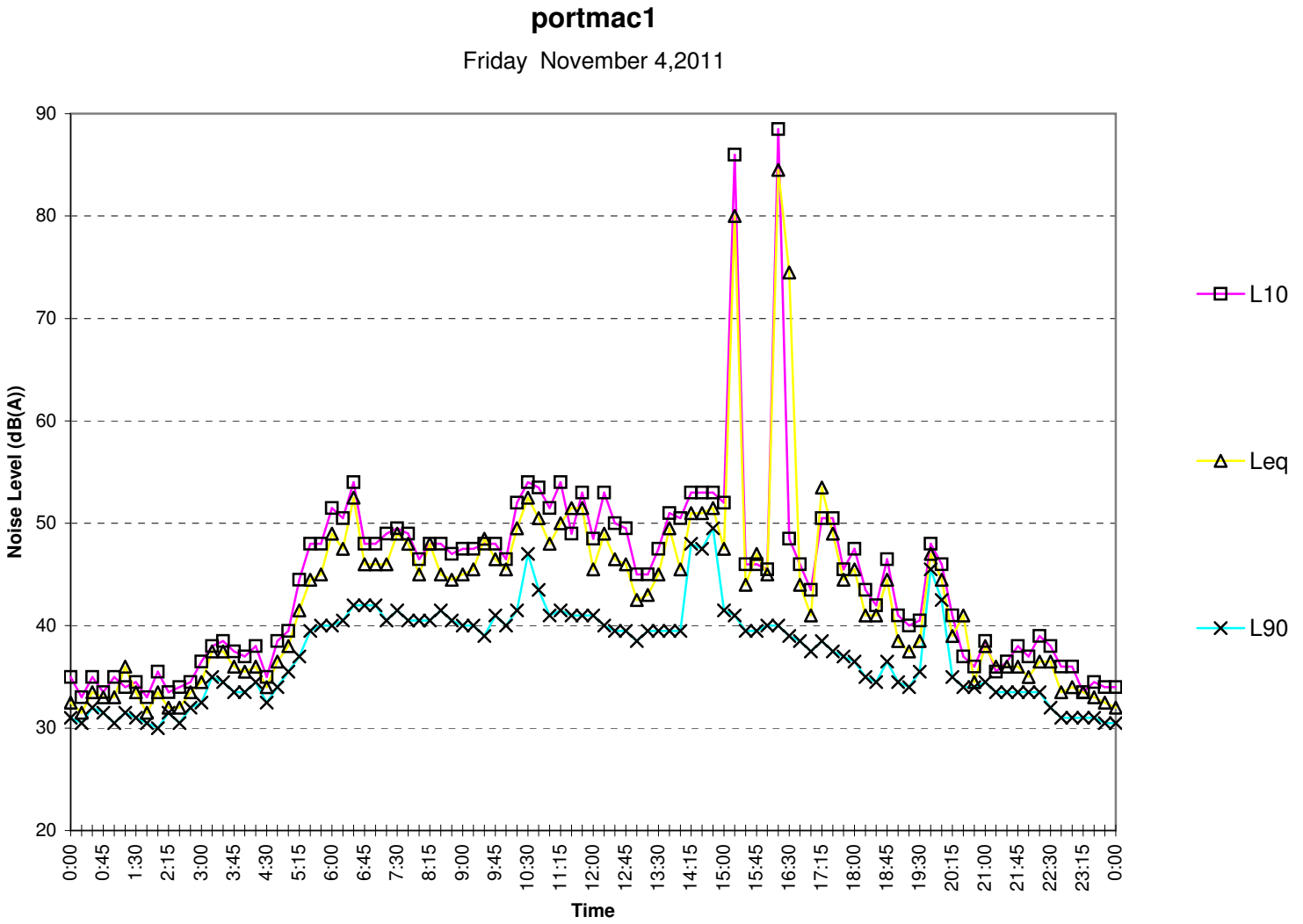
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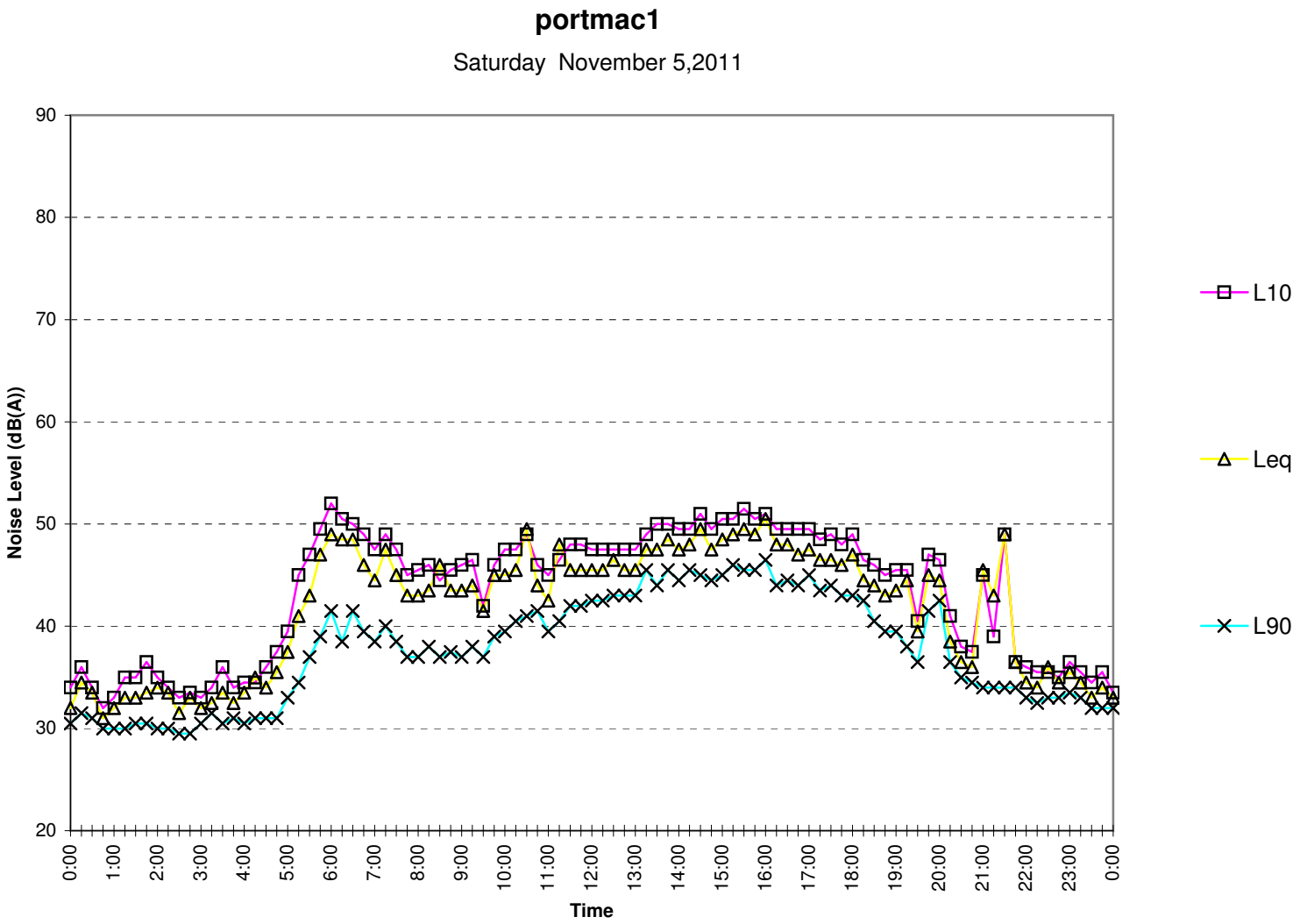
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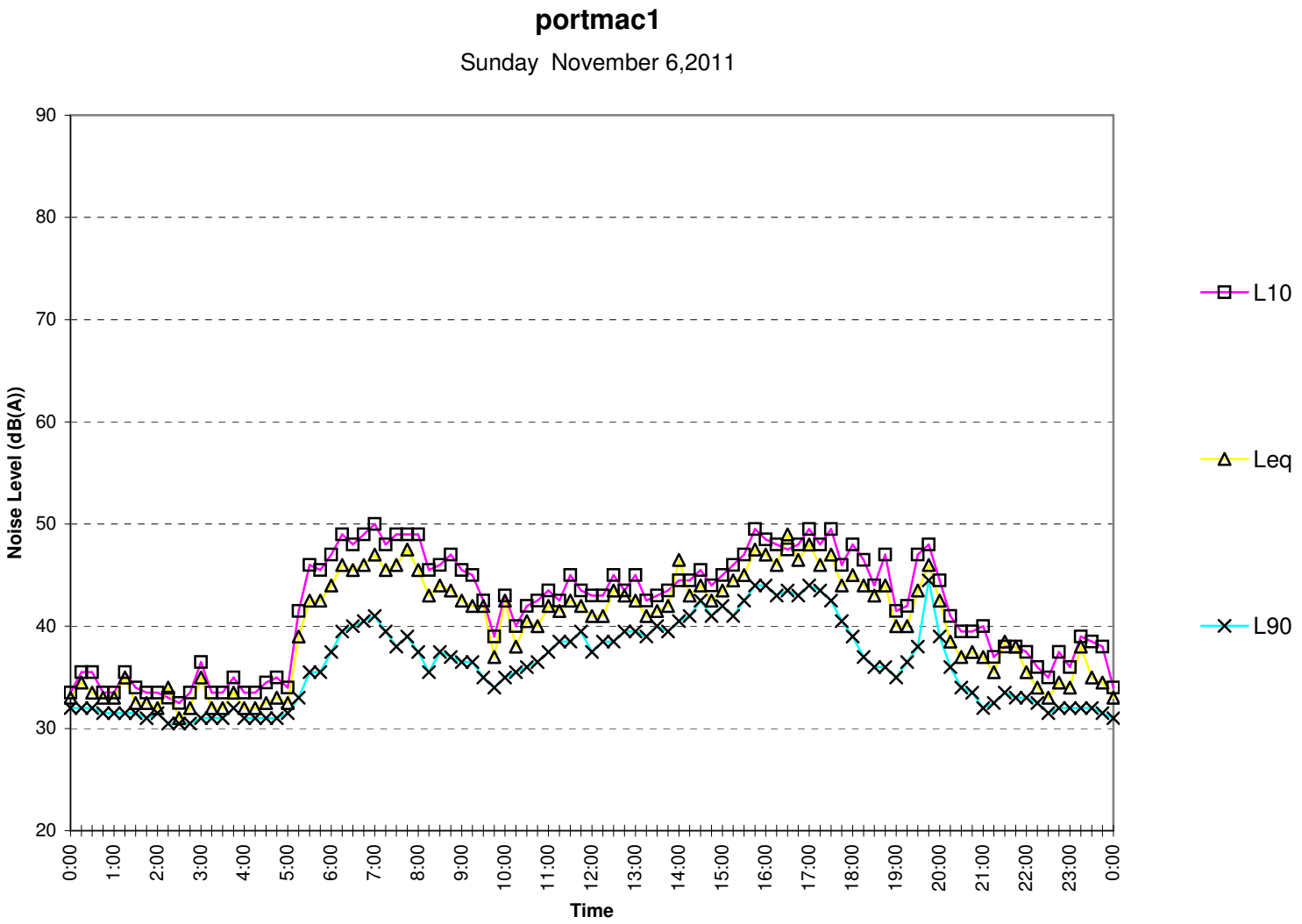
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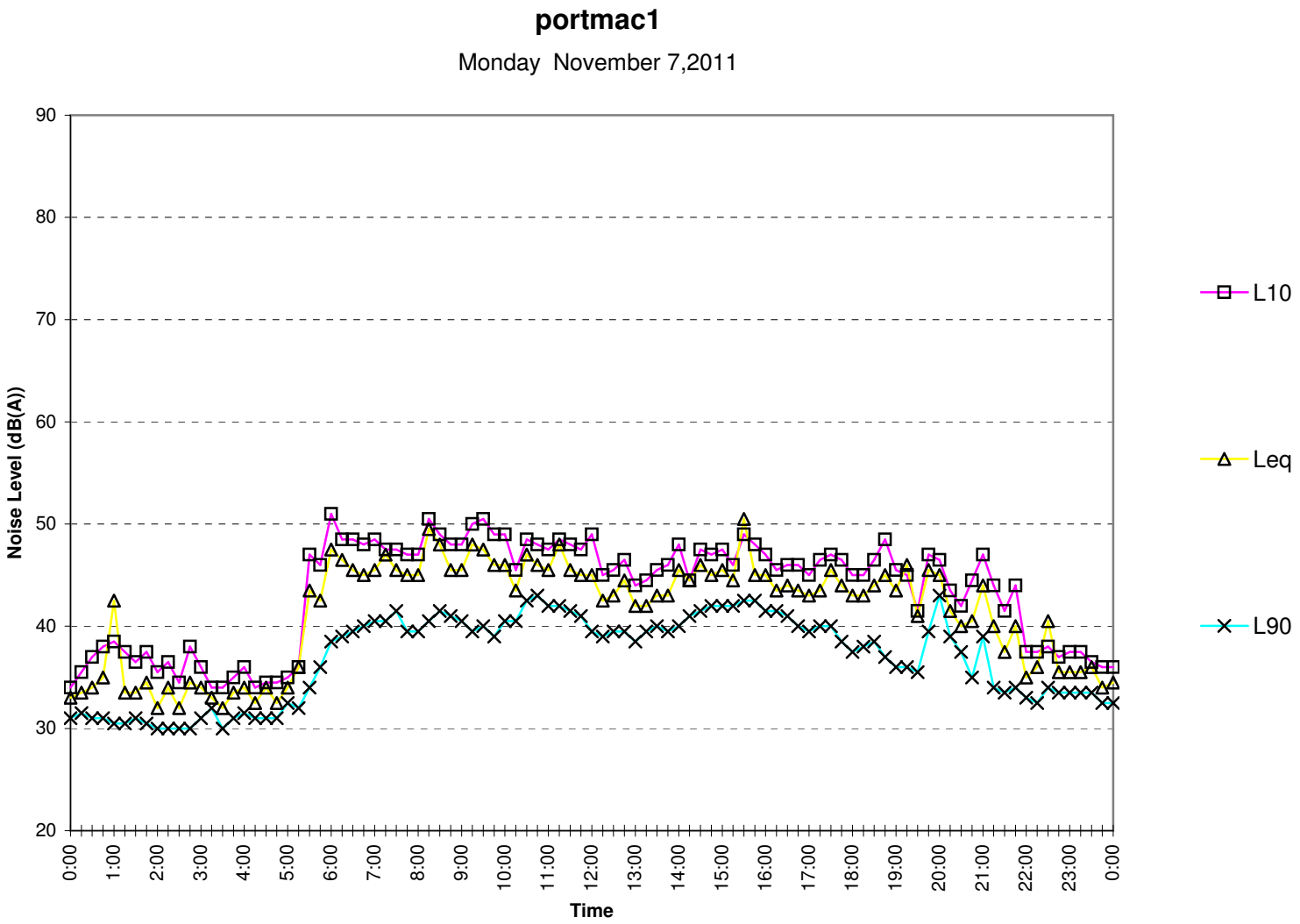
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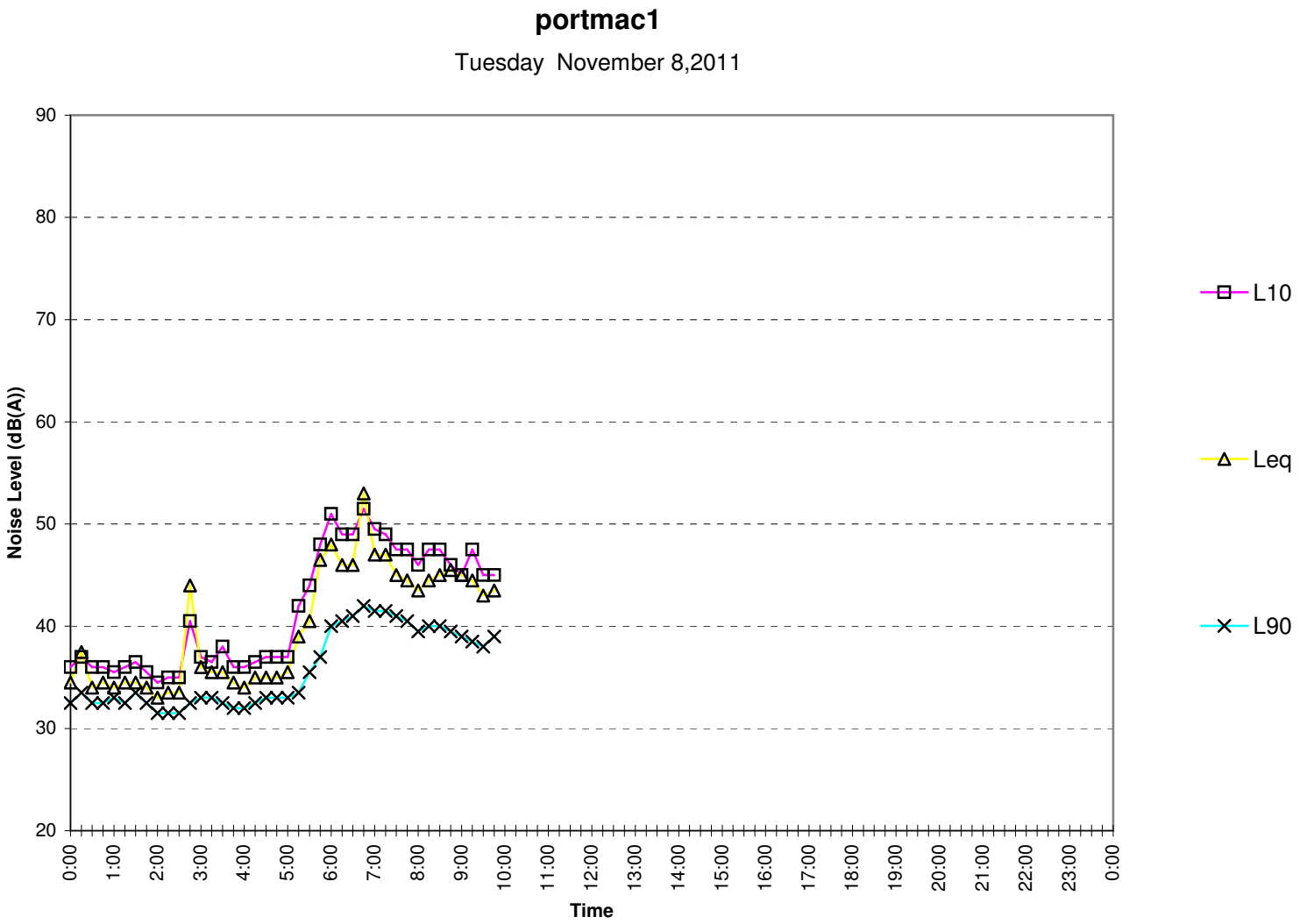
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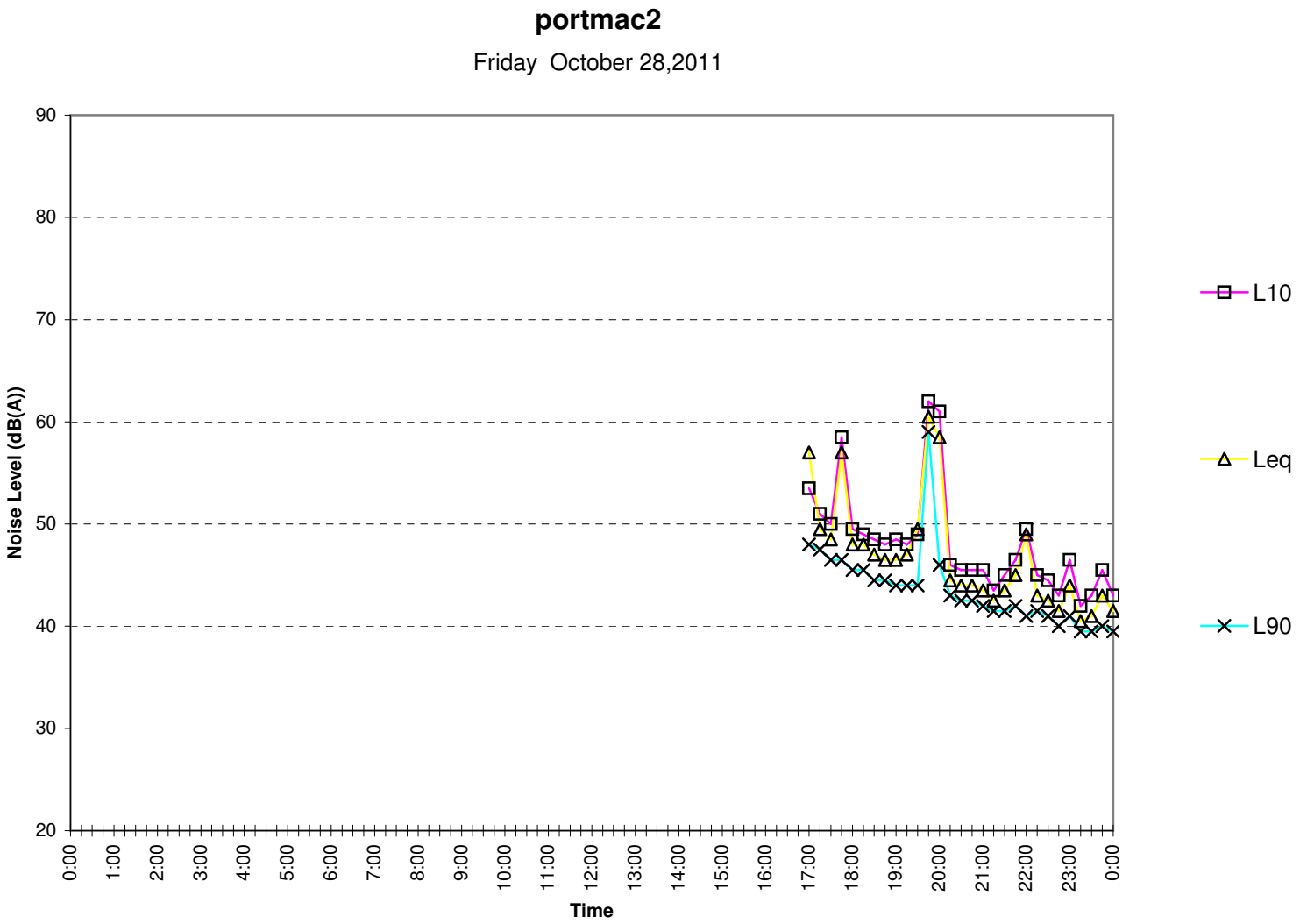
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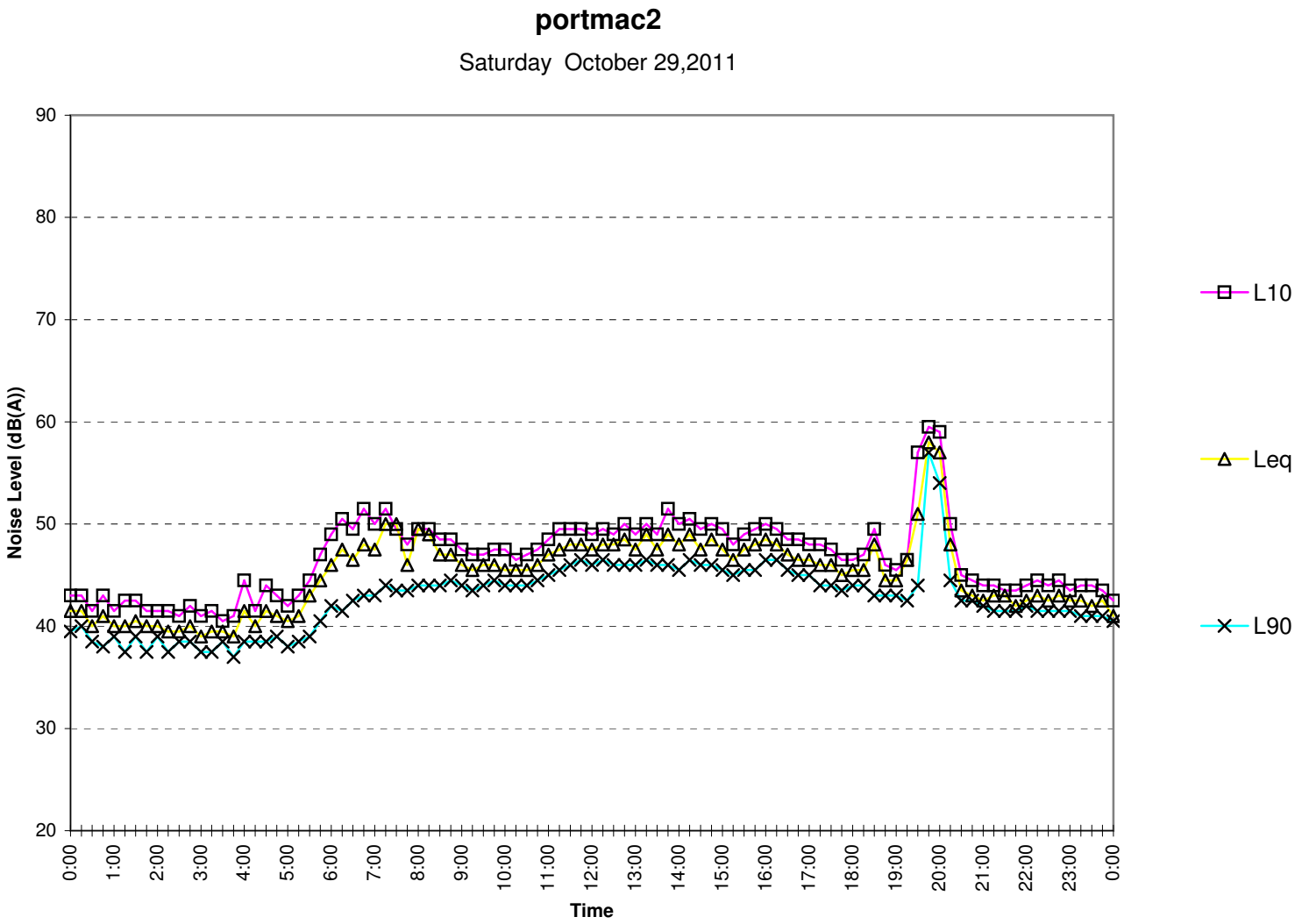
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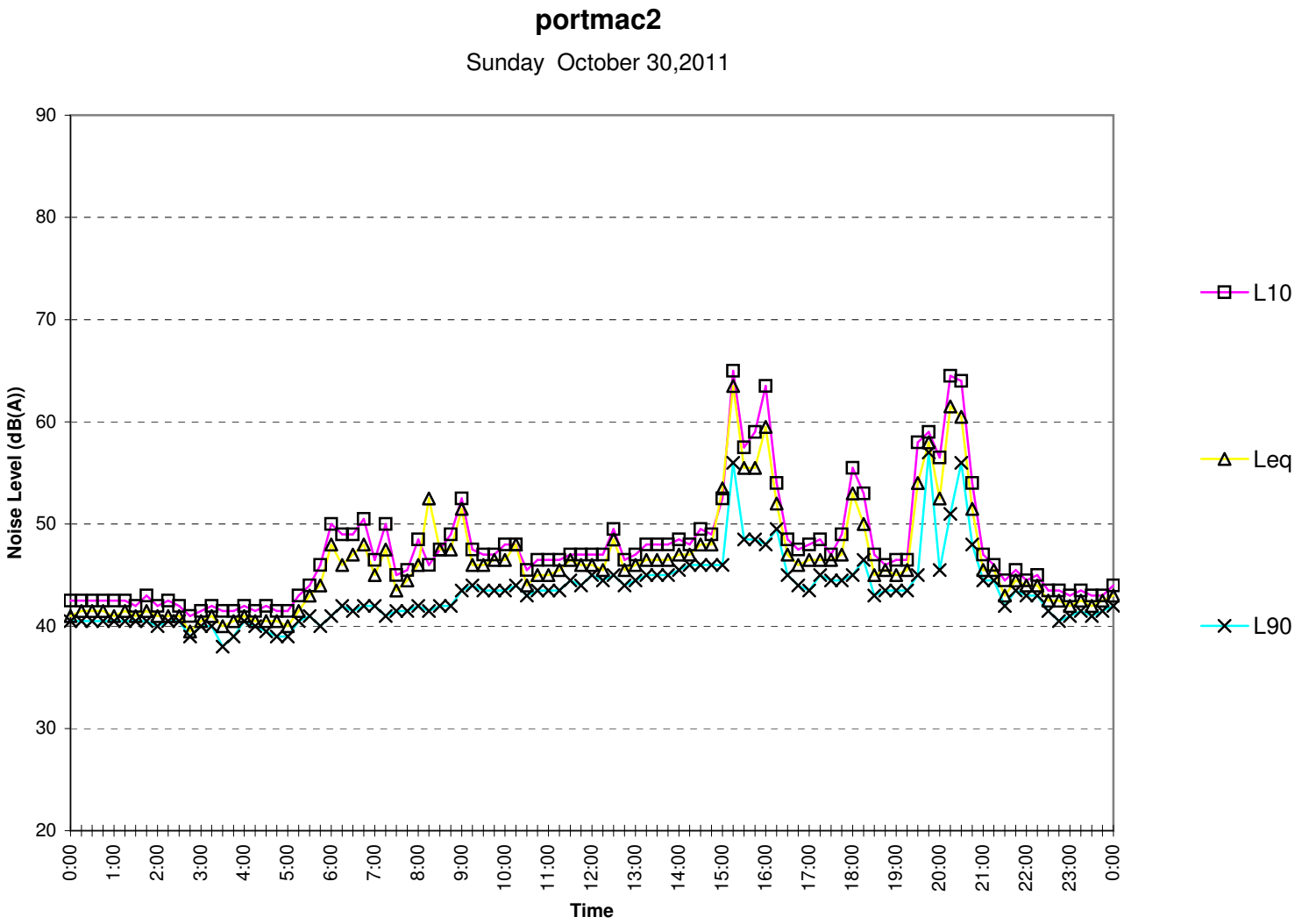
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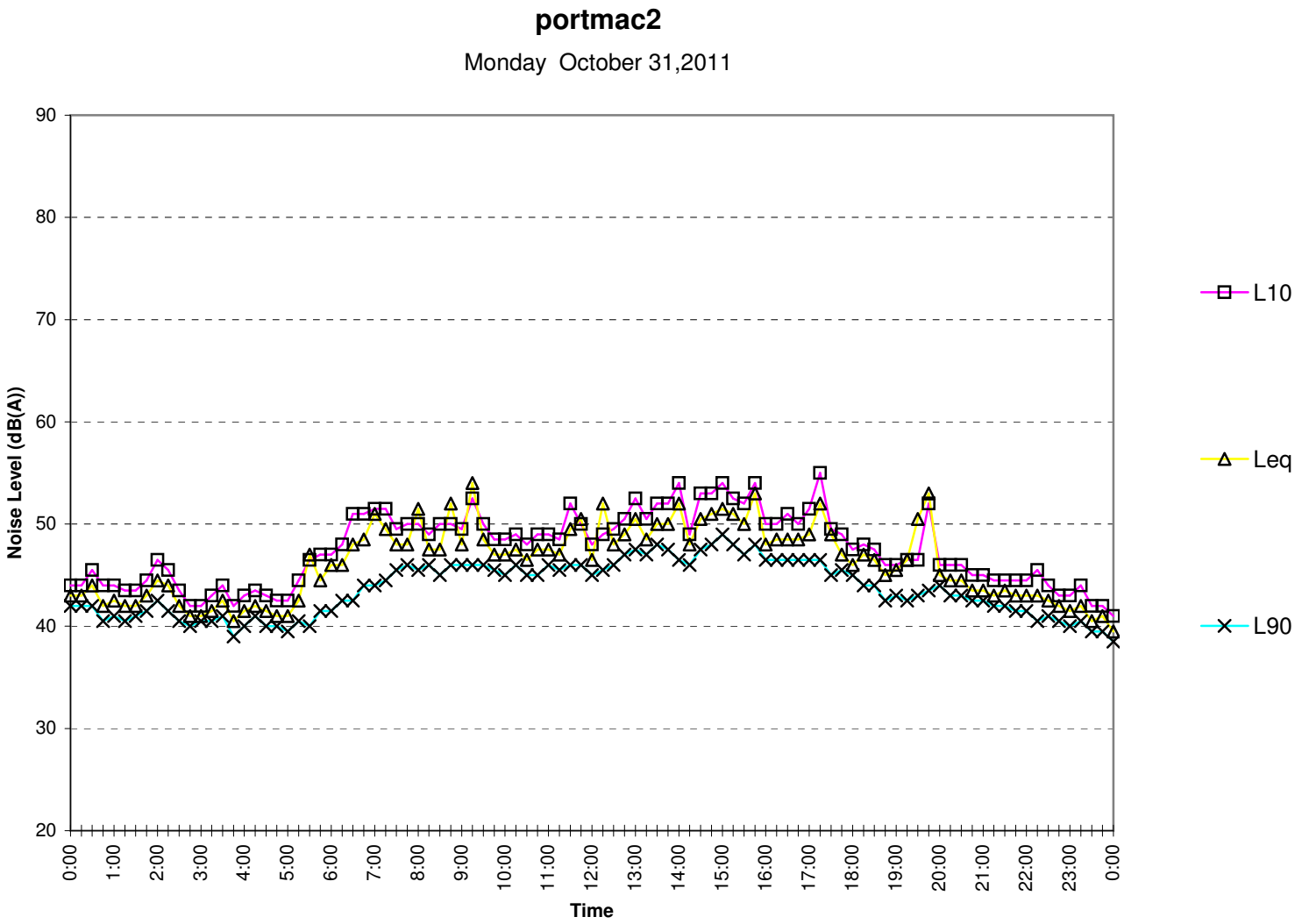
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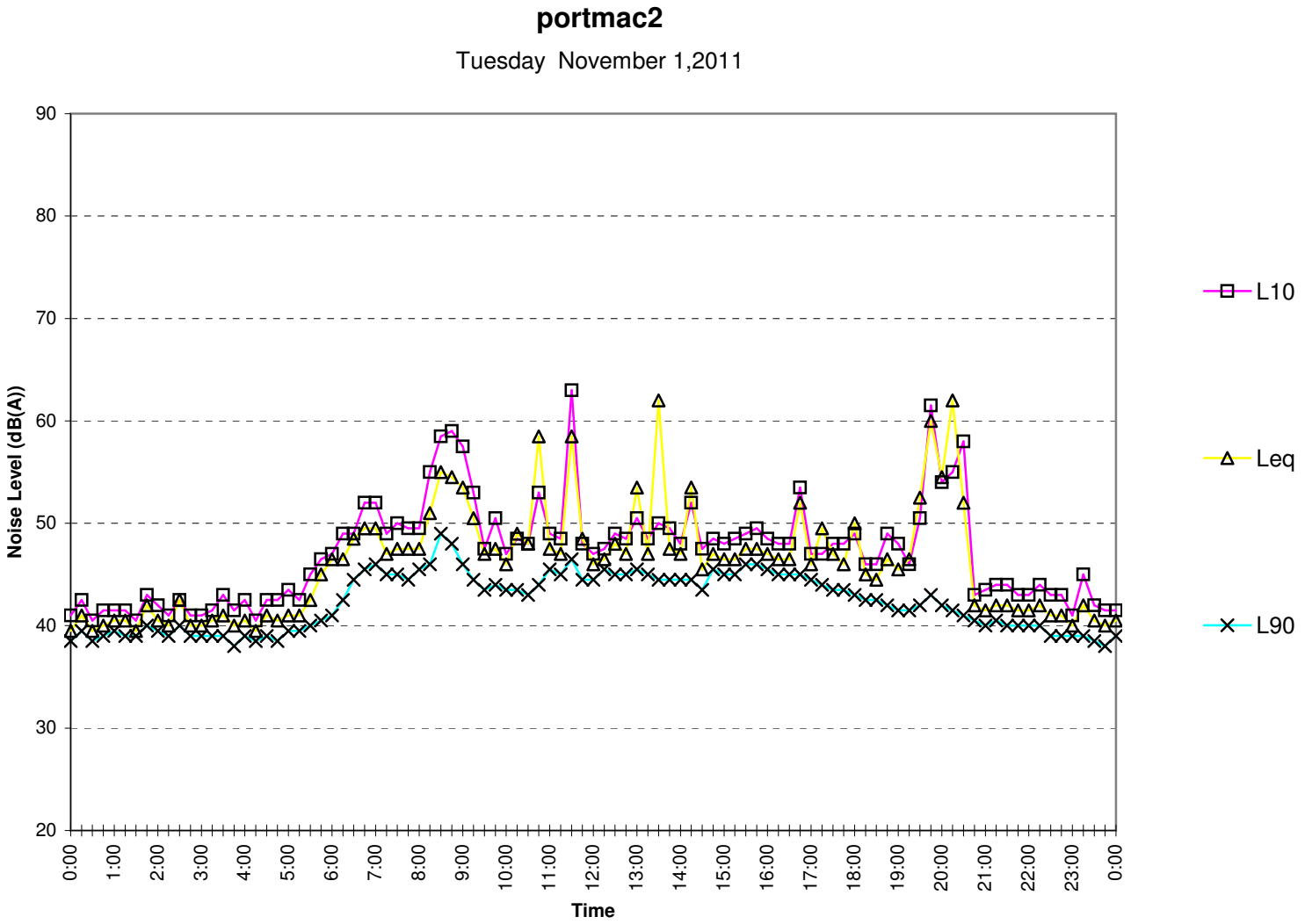
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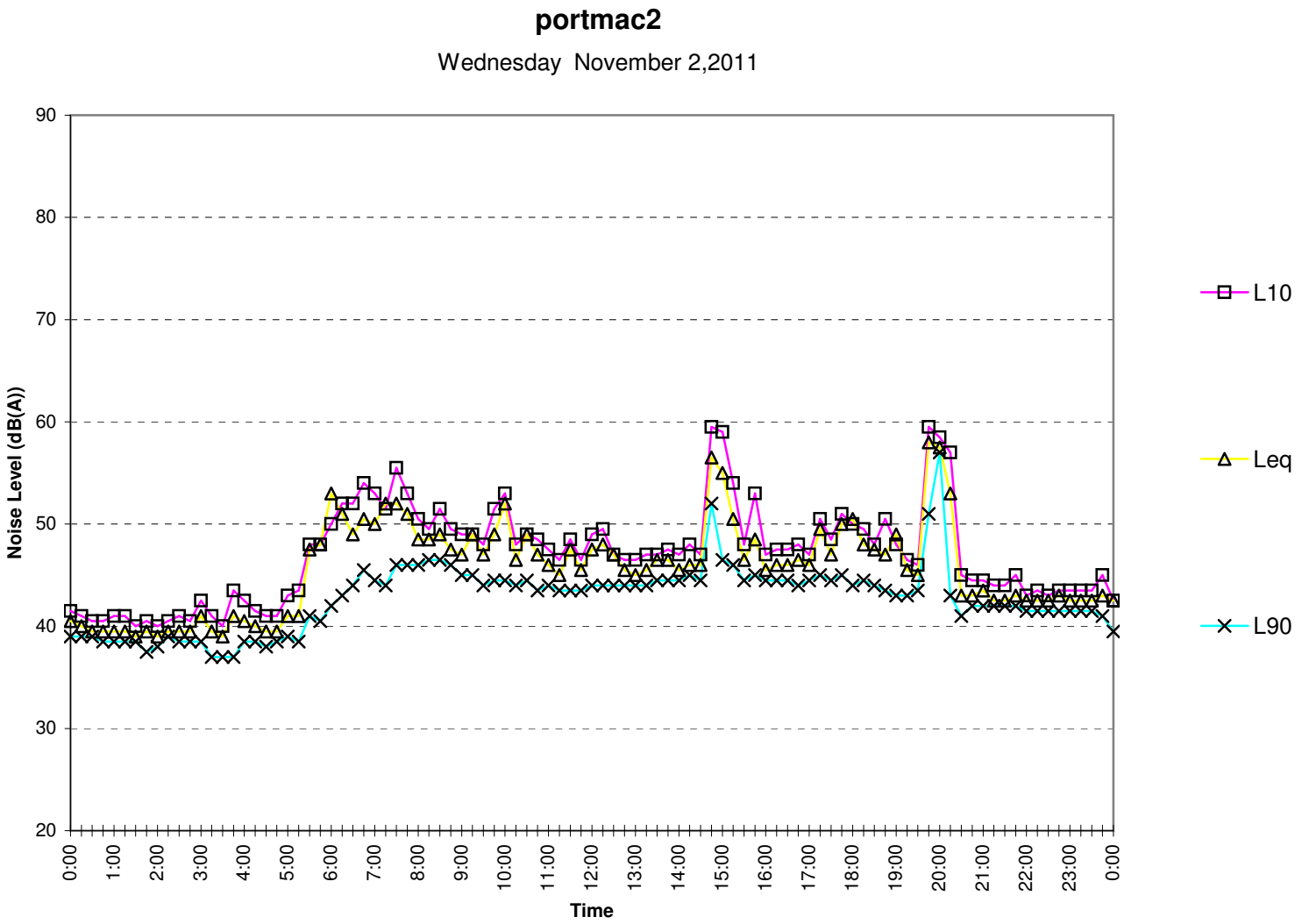
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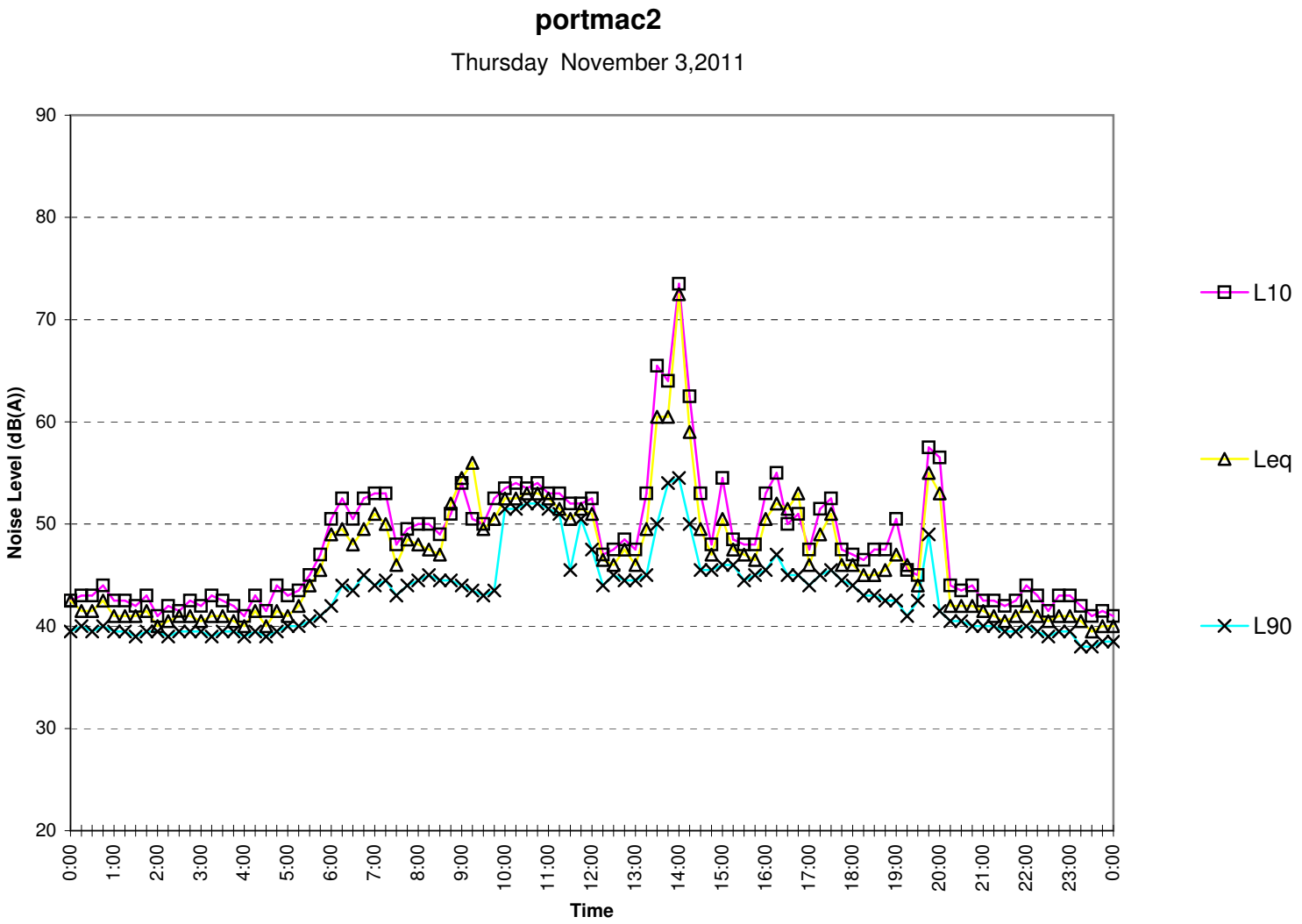
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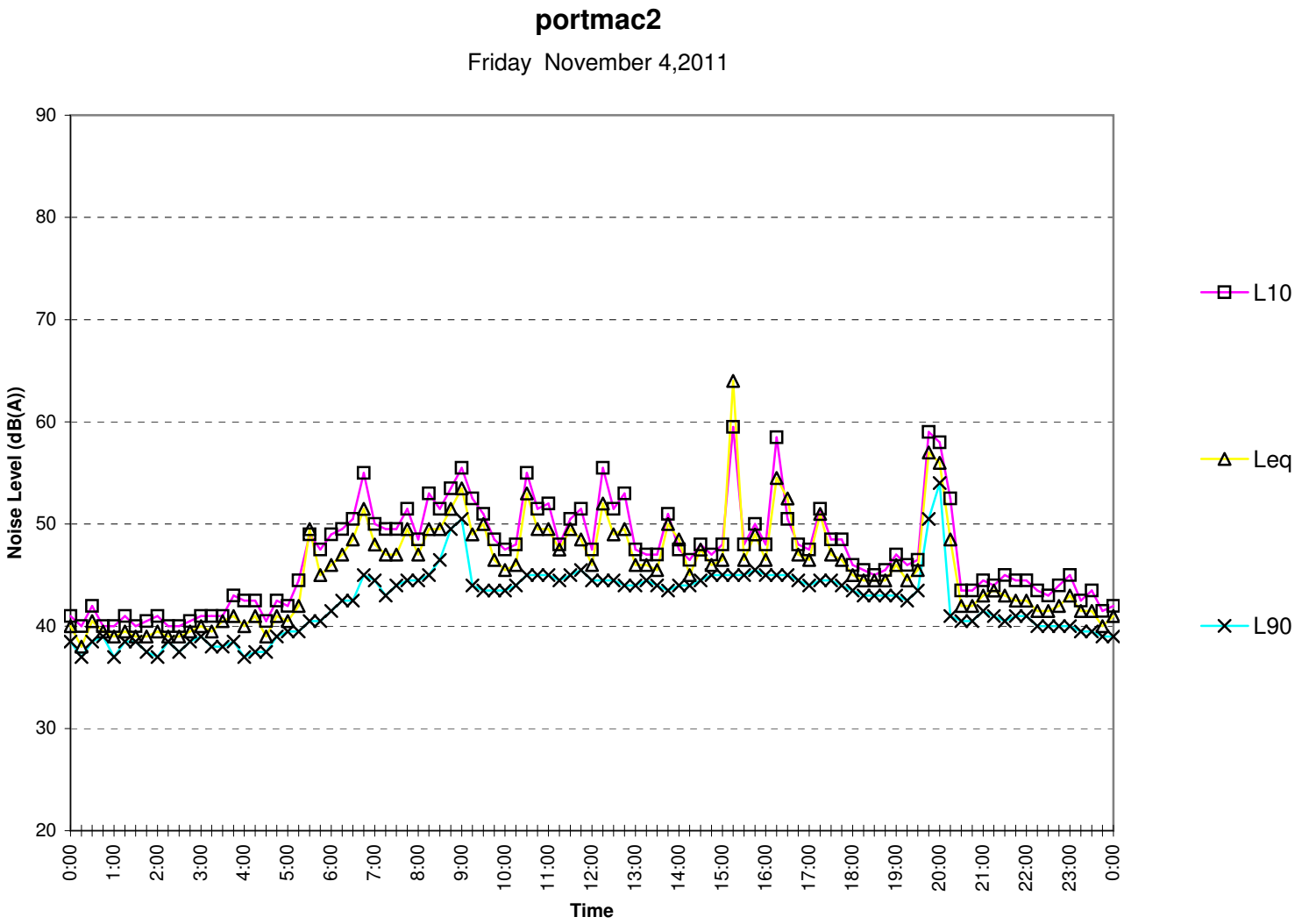
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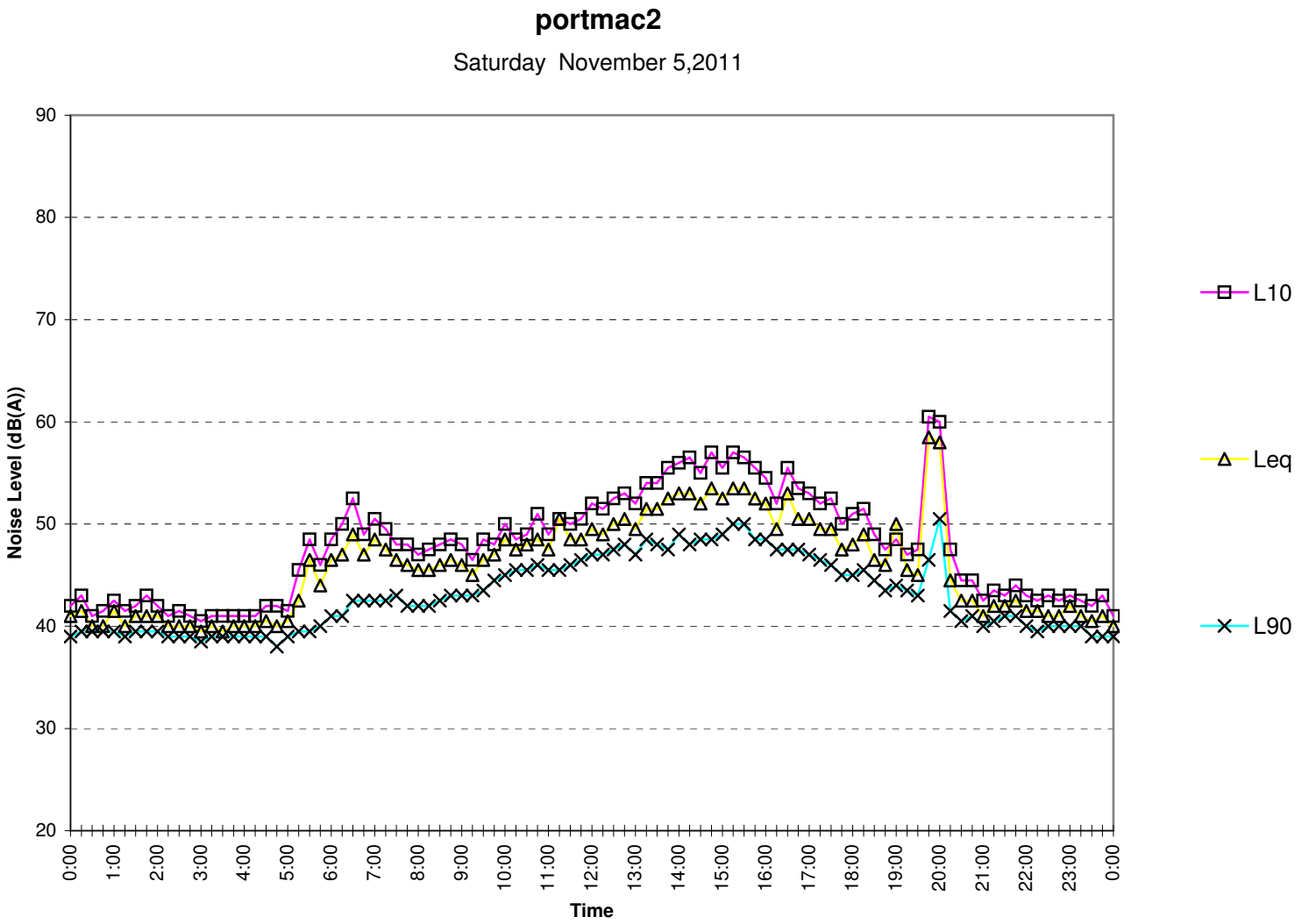
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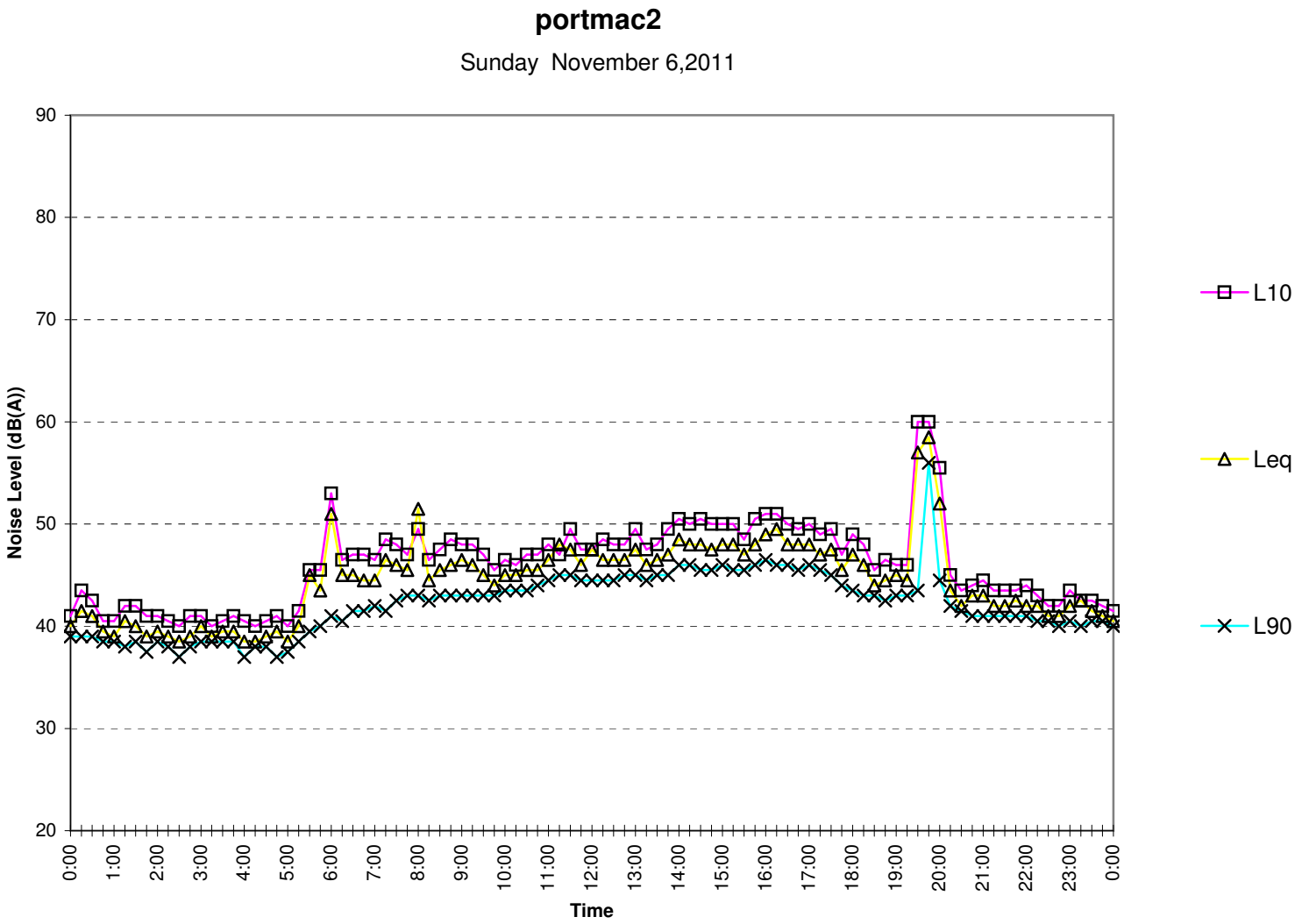
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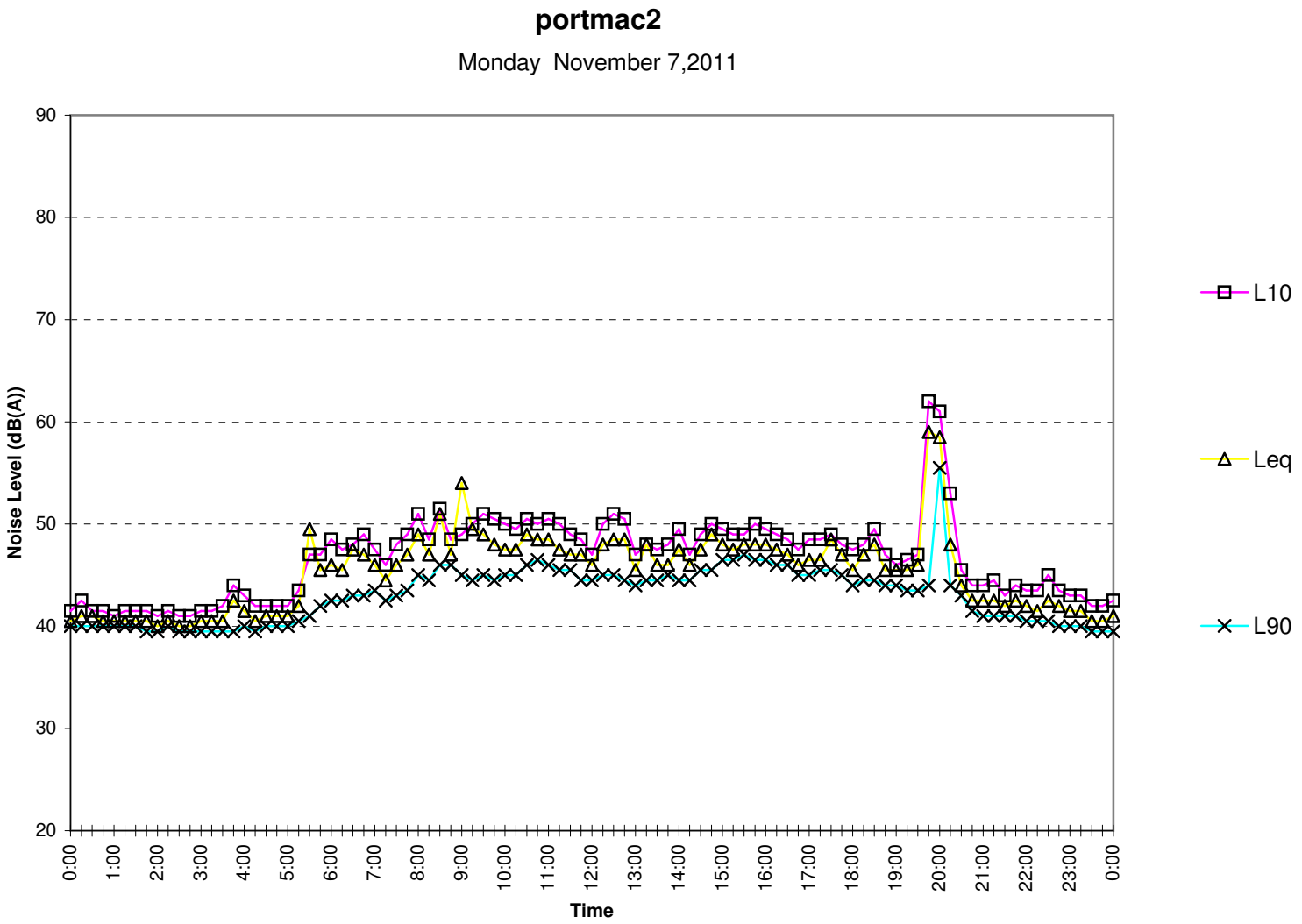
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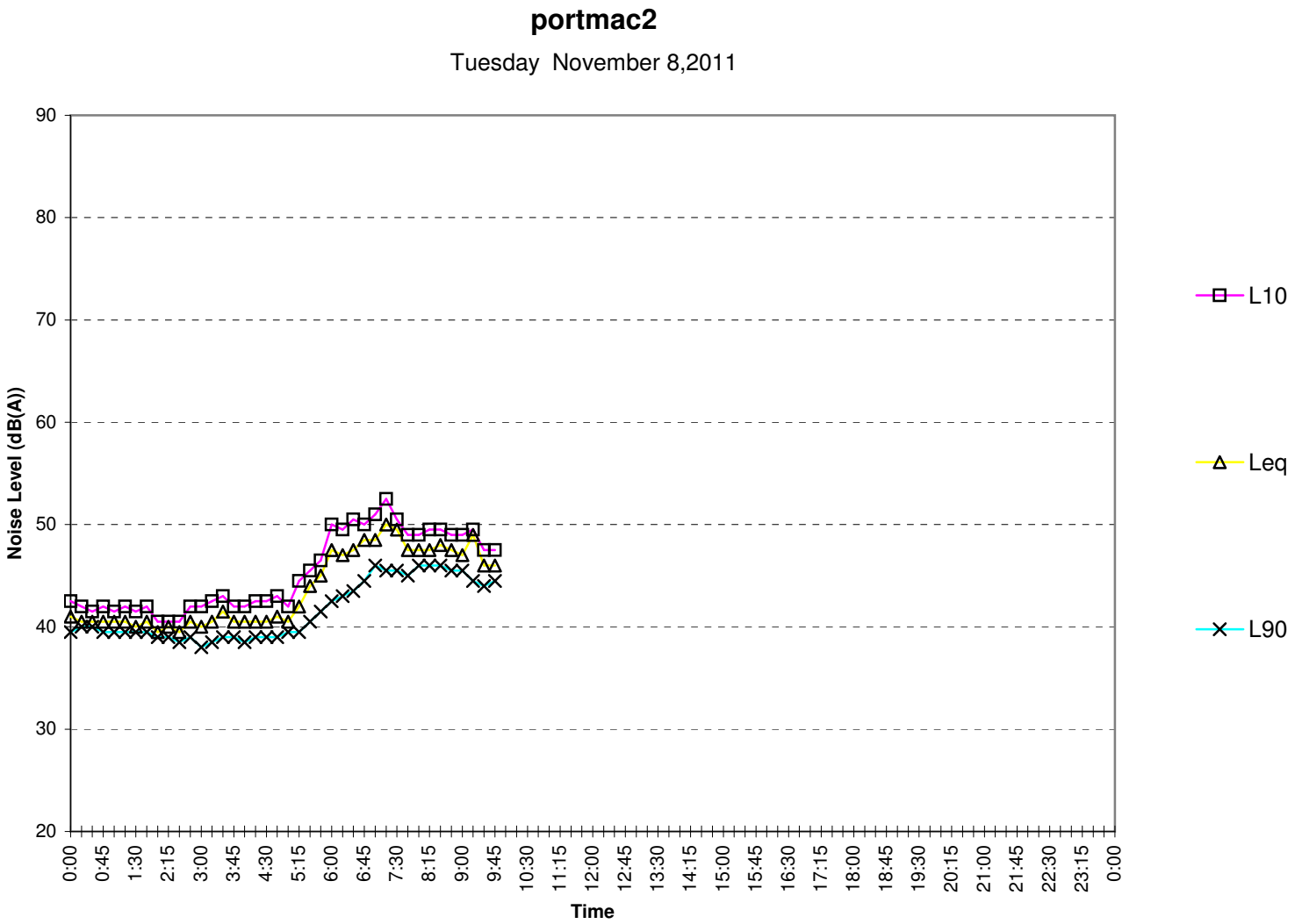
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21:00
21:45
22:30
23:15
0:00
Time
L10
Leq
L90