



Royston Station System Settings Testing 10/06/25 & 19/06/25

Revision History			
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01	Alessandro Anelli	16/06/2025	
02	Francesca Gonnella	23/06/2025	Included 19 th June Testing
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Reviewal			
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1 Summary

To further support Govia Thameslink Railway (GTR) at Royston Train station with station passenger announcement speakers, further testing and monitoring was commissioned by GTR to support their efforts to enhance the speaker set up at the station.

A total of two visits to Royston Station were conducted to capture and assess the speaker outputs at the location to identify the best set up to meet the network rail standard. These were conducted on the 10th and 19th June 2025.

The initial testing completed on the 10th of June revealed that multiple speakers were non-functional or partially operational, those being three key speakers on Platform 2 (speakers 3, 4, and 5) either inoperative or unable to broadcast certain announcements. These were subsequently replaced or repaired, and further follow-up testing was conducted on the 19th of June, with successful results in all except two instances.

The purpose of testing on the 19th of June was to assess the ideal speaker directionality configuration in order to ensure equal coverage of speaker outputs across Platform 2. This additional exercise was completed based on the findings obtained from the 10th of June testing, which revealed that speaker directionality likely had the largest impact on noise levels of announcements.

It was found when attending Royston station to complete the testing that the original speaker schematic provided for test planning was inaccurate, resulting in on-day adjustments to the testing approach. Additionally, it was found that system limitations prevent individual speaker volume adjustments, allowing only zone-wide changes, which restricts the ability to balance sound levels accurately across all platform areas in various states of function and directionality – GTR were not certain on exactly what was covered within each zone.

Key Findings and Recommendations:

Key Findings	Recommendations
- Station microphone outperformed roaming microphone. - Station microphone LAeq dB(A) levels did not exceed 80 dB(A) at +5 input setting. - Roaming microphone noise levels did not exceed LAeq 80 dB(A) at +10 input setting	- Set station office microphone input settings between 0 and +5 - Set roaming microphone input settings between +5 and +10
Automated announcements were still found to be considerably quieter than manual announcements, even when changing input settings.	Increase the automatic announcements through the PA system prior to the station amplifier, so levels are in keeping with the manual announcements input level changes.
Individual speaker levels cannot be adjusted. Only zone-wide adjustments can be made at Royston Station.	- Explore system upgrade options that allow individual speaker volume control to enable more precise balancing and a limiter to avoid exceeding the standard. - Add a limiter to the system architecture to ensure that the 90dB(A) limit within NR standard NR_L2_TEL_30134 is not exceeded.
Station schematic was found to be incorrect during testing on 10/06/25.	Update and verify the station's speaker schematic to reflect actual current hardware locations and functionality.

For clarity and consistency, the following report will refer to the measurement points between speaker pairs as "Locations", each identified by a corresponding number. These are detailed in Table 1 below for reference.

Table 1: Speaker Pair Location References

Location Name	Location
Location 1	Beyond speaker 1
Location 2	Between speakers 1 & 2
Location 3	Between speakers 2 & 3
Location 4	Between speakers 3 & 4
Location 5	Under the bridge
Location 6	Between speakers 5 & 6
Location 7	Between speakers 6 & 7
Location 8	Between speakers 7 & 8

2 Initial Testing 10th June (No Speaker Direction Change)

2.1 Testing Methodology for Initial 10th of June Visit

Following on from the first investigation into the noise levels on the expansion of Royston station Platform 2 on 28th of January and the results shown in report 'EESL-GTRN-REP-001_3-Royston Station Report', Encompass Engineering were asked to carry out further testing on the 10th of June, 2025 to understand the platform's compliance to Network Rail standard NR_L2_TEL_30134.

To carry out the testing on the 10th of June, three test scenarios were utilised to gauge noise levels of the public address system at various station microphone input levels.

It is important to note that "test Scenario 3" was agreed to be changed on the day, deviating from a speaker isolation exercise to a brief speaker directionality trial (for speakers 8 and 9 only). The three test scenarios utilised on the day are as follows (in completion order):

Table 2: Testing Scenario Synopses for 10/06/25

Test Scenario	Scenario Synopsis
Scenario 1	"As-Is" testing: No changes were made to the functional and operation state of the speakers. E.g.: speakers that were left isolated previously by GTR (8 and 9) were left isolated. Adjustments were only made to system input levels.
Scenario 2	"All-On" testing: Any isolated speakers were now switched on, ensuring no speaker was left switched off for this test scenario. Changes were then made to the system input levels.
Scenario 3	Initial Scenario Scope: "Isolation Exercise": - Platform 2 was to be divided into three sections. Within each section, 2 pairs of speakers were to be switched-on solely and noise level measurements were to be taken at intersecting and the furthest points. This would then be repeated for every speaker pair. Changed Scenario Scope: "Brief Speaker Directionality Test". - Speakers 8 and 9 were redirected away from the track (their original configuration), towards the bridge. Noise levels were measured between 8 and 9 before and after this change to gain some insight into the impact of directionality on noise levels.

For each of the three scenarios, the same system input levels for the station microphone were chosen:

Table 3: System Input Settings used for Testing Scenarios on 10/06/25

Input Level System Settings Used
<i>As-Is (input setting not set)</i>
-25
-15
-10
-5
0
+5

Due to inconsistencies and defective speaker equipment identified on the day, the testing could not be completed in full. GTR agreed to amend the defective speakers so that the testing could be re-attempted fully.

2.2 Speaker Functionality Issues

The current speaker schematic that GTR possess for Royston station is inaccurate, with several speakers no longer present. There were also several speakers with varying states of functionality.

The directionality of the speakers on Platform 2 before any adjustment was made on the 10th of June can be seen below in Figure 1;

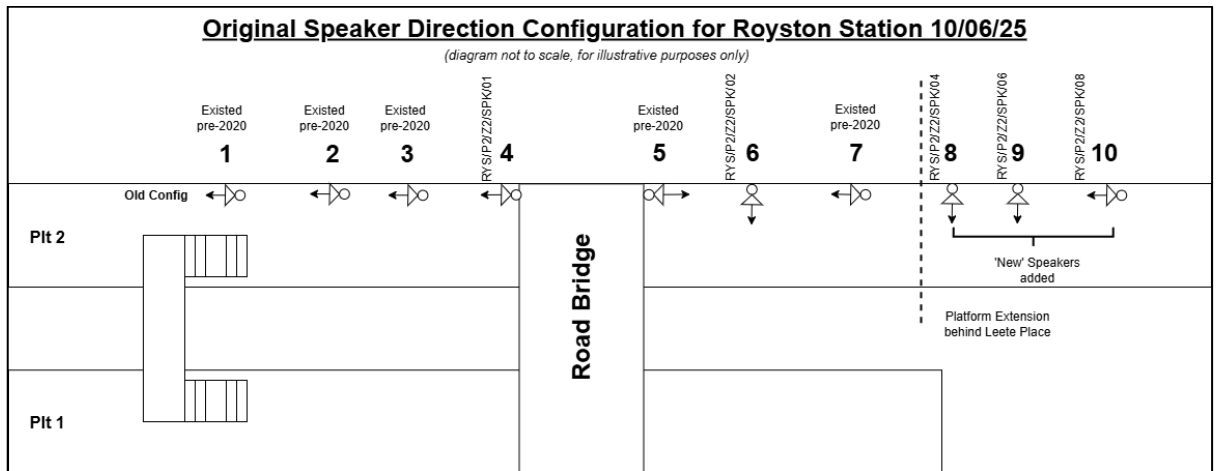


Figure 1: Original speaker directions before testing on 10/06/25

Figure 2 below shows the speaker directions after the adjustment of speakers 8 and 9 during test scenario 3;

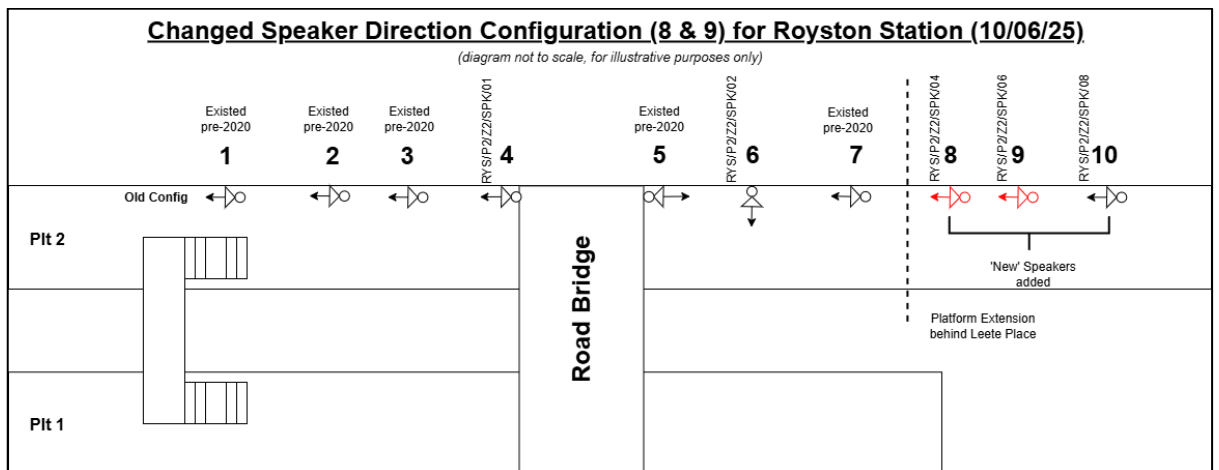


Figure 2: Changes to speaker directions during test scenario 3 on 10/06/25

On Platform 2, the non-functioning speakers were 3, 4, and 5. Whilst initially all three were found to be inoperative at the start of testing, by the end of testing speaker 5 began functioning for an unknown reason.

Additionally, speaker 2 broadcasted automated and roaming announcements, but failed to relay station office microphone announcements. These faults directly affected test accuracy and system compliance during the visit.

At the end of testing on the 10th of June, GTR made the decision to leave the speakers configured as per Figure 2.

2.3 Speaker Directionality and System Limitations

Initially, speakers 8 and 9 were found to be positioned facing the track. Ahead of testing Scenario 3 (speaker isolation exercise), consideration was given to redirecting both speakers to face along the old platform.

Additional consideration was also given to redirecting other speakers across the platform in attempts to 'cover' the middle section of Platform 2, where speakers 3, 4 and 5 were non-functional.

This was not pursued due to the risk of increasing noise imbalances along the platform and nearby Leete Place, and the extended testing time required.

2.4 Results and Data (10/06/25)

124 readings were collected during testing. Post-monitoring analysis of announcement-only segments identified only four instances where LAeq dB(A) exceeded 65 dB(A), with the highest being 69.8 dB(A) between speakers 1 and 2 at a "-10" input setting.

23 instances exist where the LAFmax dB(A) exceeded 65dB(A), with 0 instances exceeding 90 dB(A). The "As-Is" configuration performed worst, while "0" performed the best, followed closely by "+5" settings. At speaker 10 on the new platform, no setting achieved 65 dB(A), likely due to lack of speaker coverage in that area.

Below is a table of LAeq dB(A) readings per speaker pairs across the three testing scenarios:

Table 4: Average Noise levels between speaker pairs on Platform 2 on 10/06/25

	Average System Settings LAeq dB(A)						
Speaker Pair	As Is	-25	-15	-10	-5	0	5
Between 1-2	50.6	56.4	N/A	69.8	N/A	N/A	N/A
Between 2-3	51.3	54.9	N/A	57.3	N/A	N/A	N/A
Between 3-4	49.6	50.1	N/A	58.5	N/A	N/A	N/A
Between 4-5	55.2	53	N/A	59.8	N/A	N/A	N/A
Between 5-6	44.3	48.4	N/A	53.3	54.45	57.6	N/A
Between 6-7	51.5	51.7	51	58.1	60.2	64.2	62
Between 7-8	54.8	51.5	57.3	49.9	54.8	61.5	54.8
Between 8-9	52.1	51.1	50.2	55.4	59.8	62.9	54.3
Between 9-10	53.3	52.5	55.1	61.2	66	67.9	N/A
Behind 10	51.5	49.7	49.7	55.7	55.8	54.5	58

Measurement locations were not referred to as "Locations" during the 10th of June testing. Analysis of the data gathered on 10th June highlights speaker directionality as the primary factor influencing the audibility of announcement noise levels.

3 Follow-up Testing 19th June (Speaker Direction Change)

3.1 Testing Methodology for Speaker Direction Testing

Upon replacement and rectification of the identified defective speakers (3, 4 and 5), Encompass Engineering re-attended Royston Station on the 19th of June 2025 to complete the testing in-full.

The purpose of this follow-up test was to directly assess the impact of speaker directionality in conjunction with PA system level adjustments on announcement dB(A) levels and ensure equal coverage across Platform 2.

This follow-up test included the following two test scenarios.

Table 5: Test Scenario synopsis for testing on 19/06/25 (speaker directionality testing)

Test Scenario	Scenario Synopsis
Scenario 1	“No Direction Change” testing: An initial measurement at each mid-point between all speaker pairs on Platform 2, with no adjustments made to their directionality. Only system input settings were altered. Speakers 8 and 9 remained isolated.
Scenario 2	“Direction Change” testing: Speaker directionalities were adjusted as per Figure 4 below, and all speakers were active. This was agreed to be the optimum configuration for the speakers to allow for equal coverage across Platform 2. System input settings were then altered upon completion of directionality changes. Measurements were then taken at each mid-point between all speaker pairs.

All noise level measurements across both test scenarios undertaken on the 19th of June were completed with the following system levels for both station, office and automated announcement input settings.

Table 6: System Input settings used for testing on 19/06/25

Input Level System Settings Used
-5
0
+5
+10

These input settings were chosen based on data from the testing conducted on the 10th of June, which showed that noise levels began to approach the Network Rail NR_L2_TEL_30134 minimum requirement of 65 dB(A) at settings above ‘-10’.

As a result, the lowest input setting used was ‘-5’, as testing below this value would not meet the minimum 65 dB(A) requirement.

3.2 Speaker Direction Changes

The speaker adjustments were primarily changes to their horizontal and vertical pitch. This included raising the vertical pitch of speakers 1 through 5 to ensure the sound was projected effectively across the platform, targeting the midpoints between each speaker pair for a more distributed and even coverage.

An example of this pitch adjustment can be seen below in Figure 3.



Figure 3: Adjustment capacity of speakers on Platform 2 of Royston Station (speaker 9 in image)

The exception to this was speaker 6, which initially was facing the track (as seen in Figures 1 and 2). This was rotated clockwise by 90 degrees to point the speaker along the platform towards speaker 5, thereby covering a larger area and increasing audibility of announcements past the road bridge.

Figure 4 below illustrates the changes made to the directionality of the speakers on Platform 2.

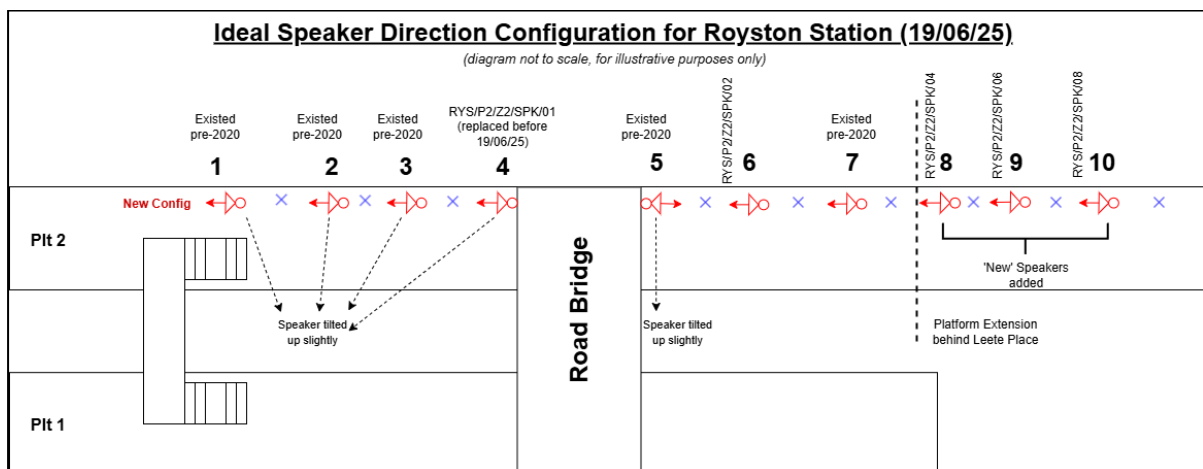


Figure 4: Ideal speaker directionality configuration for Platform 2 at Royston station

3.3 Results and Data (19/06/25)

Since no adjustments were made to speakers 8, 9 and 10, no additional measurements were taken on the 19th of June, as data captured on the first visit can be used.

The station office microphone outperformed roaming microphone when input levels were compared. The average (LAeq) and peak (LAFmax) dB(A) values per microphone type, pre- and post-direction adjustment across all input settings, can be seen below in Table 7.

Table 7: Average LAeq dBA(A) and LAFmax dB(A) per microphone type pre-and post-adjustment

Microphone Type	Average LAeq dB(A)	Highest Recorded LAFmax dB(A)	Location of Highest Recorded LAFmax dB(A)
Roaming (pre)	55.5	64.2	Location 6
Roaming (post)	64.3	84.9	Location 4
Roaming (overall)	62.9	84.9	Location 4
Station (pre)	56.9	75.1	Location 4
Station (post)	64.6	92.7	Location 4
Station (overall)	63.8	92.7	Location 4

Based on discussions with GTR during the visit, this is most likely due to the roaming microphone being a lower quality, non-system-specific microphone, compared with the station office microphone which is an integrated and hard-wired part of the PA system.

All data recorded between speaker pairs at every testing setting can be found below in Table 8.

Table 8: All LAeq and LAFmax dB(A) values per microphone type post-speaker direction adjustment

Speaker Pair	Station Microphone (Directions Changed)								Roaming Microphone (Directions Changed)							
	LAeq dB(A)				LAFmax dB(A)				LAeq dB(A)				LAFmax dB(A)			
	-5	0	5	10	-5	0	5	10	-5	0	5	10	-5	0	5	10
Location 1	70	74.7	78.5	80.8	76.7	83	87.3	89.3	63.8	68.1	67.2	74.3	70.1	75.2	75	81.5
Location 2	62.5	72.4	77.2	80	69.4	79.7	82.9	86.2	59.7	62	63.8	69.9	65.2	70.6	71.4	79.9
Location 3	62.4	65	68.6	75.1	69.5	73.3	76	82.4	59.3	62.7	65.1	67.4	65.1	68.5	70.3	72.6
Location 4	74.6	78.3	78.4	84.4	83.4	86.4	87.3	92.7	67.6	71.6	75.9	80	74.3	77.3	83	84.9
Location 5	60.5	61.4	67.9	72.4	64.5	66.6	72.1	79.1	62.8	61.9	63.7	65.9	68.6	67.9	68.5	70.4
Location 6	62.9	66.2	69.4	69.5	73.5	72.2	79.5	76	57.1	54.6	60.1	62.5	62	59.6	64.5	72.6
		60.8				67.5										
Location 7	59.6	65.8	73	74.1	67.8	75.2	81.8	82.9	52.8	57.4	63.3	65	57.5	63.2	70.7	71.4
Location 8	56.8	60.8	69.7	68.1	67.4	68.8	77.9	77.2	58.1	52	58.3	62	60.7	57.6	63.8	67.2
		58.7		68.9		63.5		77.3		50.5				55.9		

The highest SPL readings obtained throughout testing originated from between speakers 3 and 4 (Location 4). This is likely due to them being positioned closely to each other compared to any other speaker on Platform 2. As such, this outlier may skew the rest of the platform overall data due to the consistently higher obtained readings for location 4 (refer to Table 1).

The only instances where manual announcements failed to meet the minimum 65 dB(A) level occurred when input levels were set too low, specifically, below +5 for the station microphone, and occasionally below both +5 and +10 for the roaming microphone, depending on the location (referenced in Table 1).

Automated announcements were measured where possible, however they could not be pushed to the speakers at will, therefore not every location could be measured.

Those that were measured demonstrated a much lower SPL reading compared with the manual announcements, even though the input gain had been set consistently across them.

GTR made it known that the automatic announcements could have their input levels amended over and above the amplifier system used on the day of testing, however this was not adjusted on the day of testing.

3.4 Complainant Interaction (19/06/25)

During testing, a complainant from Leete Place arrived at Royston Station to enquire as to why there were so many announcements, and understand what work was being conducted. Encompass Engineering did not meet with this complainant directly, however, GTR relayed to Encompass personnel that the complainant had claimed to measure

readings of 95 dB during announcements via an unspecified mobile app, from within their home.

As such, GTR requested that a brief 'Loud announcement test' was performed between speakers 8 and 9 (directly behind Leete Place and the complainant's house) to better understand and validate the claimed dB level.

The results of this testing can be seen below in Table 9.

Table 9: Results from brief 'Loud Announcement' test in response to complainant claims

Microphone Type	System Input Level	LAeq dB(A)	LAFmax dB(A)
Roaming	+10	70.3	78
Station	+10	75.6	85.4

The input levels were set to the maximum '+10' to simulate a loud announcement, and both microphones were used, with the announcer speaking louder than they would usually. Although the office microphone did produce a relatively high peak reading, this was not exceeding the upper limit set out in Network Rail standard NR_L2_TEL_30134 of 90 dB(A).

It is uncertain as to the methodology used by the complainant, as well as the specifics of the values received. However, it is possible that the mobile device used by the complainant, as well as improper calibration of the device and different weightings, may have resulted in the elevated reading.

3.5 Recommended Settings & Levels

Roaming Microphone Recommended Settings

Based on the results obtained from the roaming microphone listed in Table 10 below, the optimum input level range for manual announcements made with the roaming microphone are between +5 and +10.

Seen in Table 10 and Figure 5 below, the optimal noise levels taken for the roaming microphone occurred between +5 and +10.

Only at +10 did the LAeq values for the roaming microphone announcements reach 80 dB(A), and LAFmax values for roaming microphone exceeded 80 dB(A) once at +5, and twice at +10. None of these values exceeded 90dB(A).

Table 10: LAeq and LAFmax dB(A) values recorded for roaming microphone post-speaker direction adjustments

Measurement	LAeq dB(A)				LAFmax dB(A)			
	-5	0	5	10	-5	0	5	10
Location 1	63.8	68.1	67.2	74.3	70.1	75.2	75	81.5
Location 2	59.7	62	63.8	69.9	65.2	70.6	71.4	79.9
Location 3	59.3	62.7	65.1	67.4	65.1	68.5	70.3	72.6
Location 4	67.6	71.6	75.9	80	74.3	77.3	83	84.9
Location 5	62.8	61.9	63.7	65.9	68.6	67.9	68.5	70.4
Location 6	57.1	54.6	60.1	62.5	62	59.6	64.5	72.6
Location 7	52.8	57.4	63.3	65	57.5	63.2	70.7	71.4
Location 8	58.1	52	58.3	62	60.7	57.6	63.8	67.2
		50.5				55.9		

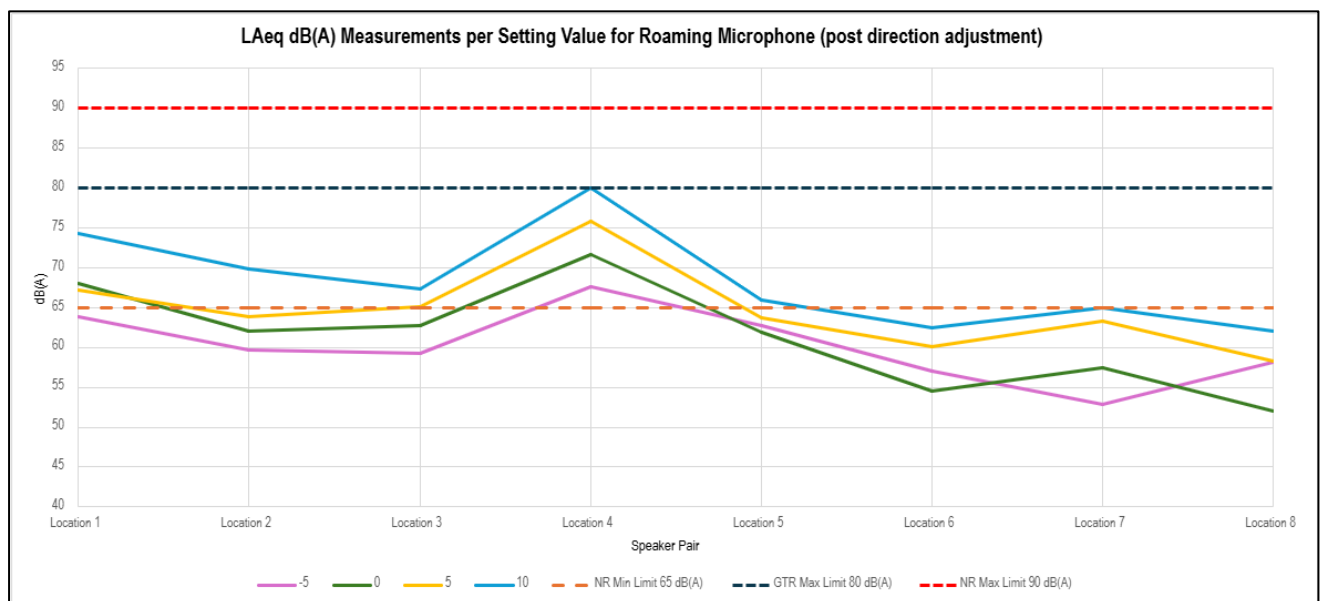


Figure 5: LAeq dB(A) per setting for Roaming Microphone (post direction adjustments) against NR standard and 80 dB(A) limit.

Station Microphone Recommended Settings

Based on the results obtained from the station microphone data listed in Table 11 below, the optimum input level range for manual announcements made with the station office microphone are between 0 and +5.

Table 11 and Figure 6 below show the LAeq values of the announcements never exceeded 80dB(A) at +5. LAFmax exceeded 80 dB(A) only four times, at +5 setting, and five times at +10 setting. There was one instance at "+10" whereby LAFmax exceeded the Network Rail standard NR_L2_TEL_30134 maximum of 90dB(A), however no instances below that exceeded the maximum.

Table 11: LAeq and LAFmax dB(A) values recorded for station office microphone post-speaker direction adjustments

Measurement	LAeq dB(A)				LAFmax dB(A)			
	-5	0	5	10	-5	0	5	10
Location 1	62.5	72.4	77.2	80	69.4	79.7	82.9	86.2
Location 2	70	74.7	78.5	80.8	76.7	83	87.3	89.3
Location 3	62.4	65	68.6	75.1	69.5	73.3	76	82.4
Location 4	74.6	78.3	78.4	84.4	83.4	86.4	87.3	92.7
Location 5	60.5	61.4	67.9	72.4	64.5	66.6	72.1	79.1
Location 6	62.9	60.8	69.4	69.5	73.5	67.5	79.5	76
		66.2				72.2		
Location 7	59.6	65.8	73	74.1	67.8	75.2	81.8	82.9
Location 8	56.8	60.8	69.7	68.1	67.4	68.8	77.9	77.2
		58.7		68.9		63.5		77.3

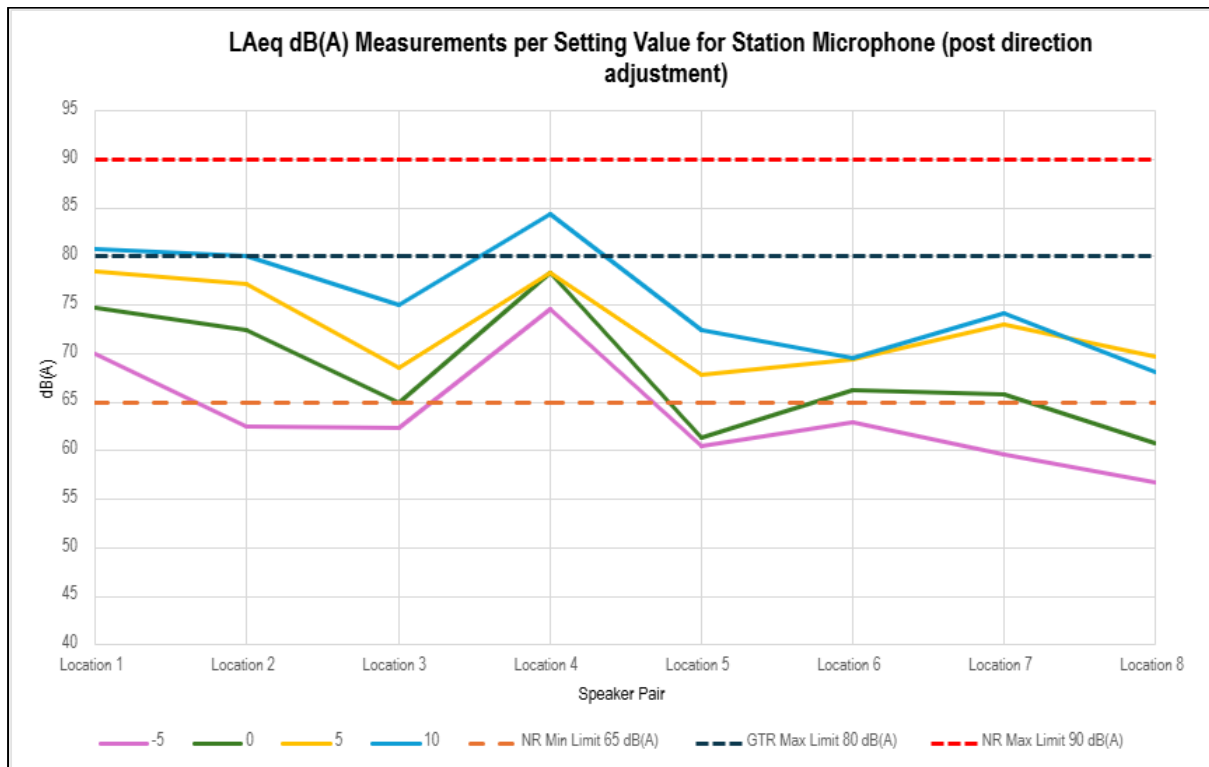


Figure 6: LAeq dB(A) per setting for Station Microphone (post direction adjustments) against NR standard and 80 dB(A) limit.

4 Recommendations

Following the key findings, the recommendations below are made:

4.1 Ideal Input Settings for Station and Roaming Microphones

The data from both roaming and station office microphone manual announcements suggest that the ideal input settings are as follows:

- **Station Office Microphone Ideal Input Range:** Between 0 and +5
- **Roaming Microphone Ideal Input Range:** Between +5 and +10

It is likely that by selecting an input value between these two given ranges, the manual announcements will fall between the minimum 65 dB(A) and maximum 90 dB(A) required by NR standard NR_L2_TEL_30134. Additionally, the average dB(A) readings for each microphone type between these ranges also were found to not exceed 80 dB(A).

4.2 Speaker 3 & 4 Adjustments

Due to the proximity of speakers 3 and 4, the levels measured in location 4 were substantially higher than the other locations (locations in Table 1). This was evident with the station office microphone peak reaching over 90 dB(A), in excess of the Network Rail standard NR_L2_TEL_30134 when at +10. It is recommended that either speaker 3 or 4 be isolated, with a possibility of utilising it elsewhere should the need arise.

It is also advisable to assess which of the two speakers would have a lesser impact on overall platform acoustics if isolated., ahead of removal.

4.3 Automatic Announcements Investigation

Due to the automatic announcements measuring substantially quieter than the manual announcements, even when set to the maximum input level of “+10”, it would be recommended to amend the gain settings prior to the amplifier input options that were tested, understanding what effect this has on the output SPL readings. This should be done by measuring the automatic announcements at the same amplifier input gain as the office microphone, and amending the gain input levels through the PA system until they reach the same output level.

4.4 Station Layout Diagram Revision

A fully updated and verified speaker schematic should be produced to reflect the actual installed system. This will assist in future testing, monitoring, and maintenance activities, while also reducing the risk of inaccurate planning based on outdated information.

4.5 Station PA System Upgrades

Consideration should be given to upgrading the PA system to enable individual speaker volume control rather than solely zone-wide adjustments. This would allow more precise balancing of audio levels across the platforms, improving consistency across the different sections of the platform where required, reducing the likelihood of disturbance to neighbours at the same time.

The system could also benefit from a limiter set at a cap chosen by GTR, within the 65dB(A) and 90dB(A) NR standard range, so that no matter what setting is chosen, announcements do not exceed this level.

5 Conclusion

The results from the follow-up testing on the 19th of June identified the recommended parameters at which to set both the station office and roaming microphone inputs, as well as the ideal directionality of each platform speaker. By setting the levels to these recommended ranges, it is likely that the manual announcements will fall above 65 dB(A) minimum, and below the 90 dB(A) maximum as required by Network Rail standard NR_L2_TEL_30134. Furthermore, these parameters also have the added benefit of likely not exceeding 80 dB(A) on average per manual announcement with each microphone type. Additional recommendations have been made to further limit the risk of exceeding this maximum 90 dB(A) limit requirement.

However, further investigation into the automated announcement output levels is further advisable, as no changes to the system settings during both days of monitoring resulted in substantial increases in noise levels of the automated announcements.