musicians' hearing services

WRAP-AROUND ACOUSTIC SCREEN FIELD TRIAL
QUEENSLAND SYMPHONY ORCHESTRA
8-9 APRIL 2011

INTRODUCTION
Symphony Services Australia are trialling a personal wrap-around acoustic screen for use in orchestra and band situations. The design is based on the acoustic screens currently used with success throughout Australia and internationally, a product also developed by Symphony Services Australia.

AIM
The aim of this trial was to determine the level of sound reduction achieved by the new design acoustic screen in an actual orchestral environment and whether this compares favourably with the sound reduction achieved using the current wrap-around acoustic screen.

MATERIALS
- 1x prototype wrap-around acoustic screen (new design)
- 1x standard wrap-around personal acoustic screen
- 4x CEL 460 personal dosimeters
- 1x CEL 282 Calibration coupler
- 2x adapted boom microphone stands
- dB12 data logging software

METHOD
Field trials took place at Studio 420, the rehearsal hall of the Queensland Symphony Orchestra and at the Queensland Performing Arts Centre's Concert Hall. Data gathering occurred at Studio 420 on Friday, 8th April during the both the morning and afternoon rehearsal calls (10am-12.30am and 1.30-4pm respectively), and Saturday 9th April during a General (or dress) rehearsal.

Testing concentrated on the back desk of the woodwinds, where wrap-around screens are in constant use. The brass section directly to the rear of this row of musicians also gave a good opportunity to test the effectiveness of the new screen. The positions tested in Studio 420 were principal bassoon, bass clarinet in the morning call, and second bassoon for the duration of the afternoon call.

Data was obtained using two dosimeters mounted on a single boom microphone stand. This was arranged so one dosimeter microphone was around thirty centimetres from the rear (exposed) side of the screen and the other around fifteen centimetres from the front (non-exposed) side of the screen. Figure 1 is indicative of microphone positions for each test, with arrows showing microphones.

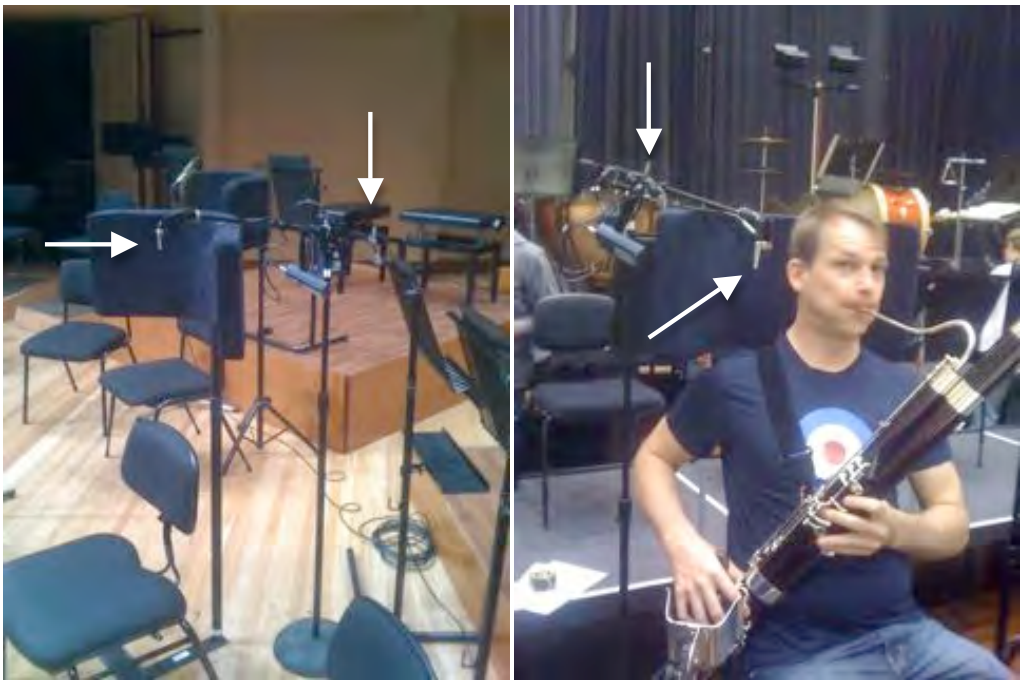

Figure 1. Typical microphone positions

The data obtained was dBALEQ levels, dBA average, dBC peak levels, noise dose (100%=85dBALEQ8hr with 3dB exchange), and duration, including plots of dBA and dBC level over time.

The dosimeters were set with a threshold of 75dBA and programmed for slow response. Plots were described using ten-second samples. Calibration of the dosimeters was carried out prior to and at the conclusion of each test using a CEL 282 2cc coupler. Data was manually transcribed and subsequently downloaded to computer using CEL's proprietary software for analysis and reporting.

Two readings were taken of the older style screens to serve as comparison.

RESULTS

Results are tabulated in Table 1 below. Data taken from the old screens is highlighted in blue. Corresponding graphs comparing exposure levels for exposed and screened positions are displayed in Figures 2-11. One artefact was noted in the Bass Clarinet screened reading, and the next highest peak has been inserted.

Location of screen	Venue	Repertoire/call type	Duration (min)	dBALEQ$_T$ outside screen	dBALEQ$_T$ inside screen	Reduction (dBA)	dBC Peak outside screen	dBC Peak inside screen	Reduction (dBC)	Note
Bassoon 1 right ear	Studio 420	Mahler 5 Mvt 3 Rehearsal	72	87.7	87.8	-0.1	124.8	120.7	4.1	No musicians directly to the rear
Clarinet 1 (old screen)	*Studio 420*	*Mahler 5 Mvt 3 Rehearsal*	*72*	*86.8*	*87.2*	*-0.4*	*122.1*	*121.4*	*0.7*	*No musicians directly to the rear*
Bass clarinet right ear	Studio 420	Mahler 5 Mvt 5 Rehearsal	54	89.8	89.1	0.7	123.6	**122.6** (123.8 artefact)	1	Horn section to rear
Bassoon 2 right ear (new screen)	Studio 420	Mahler 5 Mvt 1 & Dvorak Vln Concerto	155	90.8	88.7	2.9	127.4	124.3	3.1	Trumpet section to the rear
Bassoon 2 right (old screen)	*Studio 420*	*Mahler 5 Mvt 5 Rehearsal*	*62*	*92.5*	*89.2*	*3.3*	*126.8*	*122.8*	*4*	*Trumpet section to the rear*
Violin 2 left ear	QPAC Concert Hall	Dvorak Vln Conc general rehearsal	80	80.5	80.5	0	116.8	113.7	3.1	In front of flutes
Contra-bassoon RE	QPAC Concert Hall	Mahler 5 general rehearsal	92	93	90.4	2.6	127.1	124	3.1	Tpt and tbn directly to the rear

Table 1. Results from testing

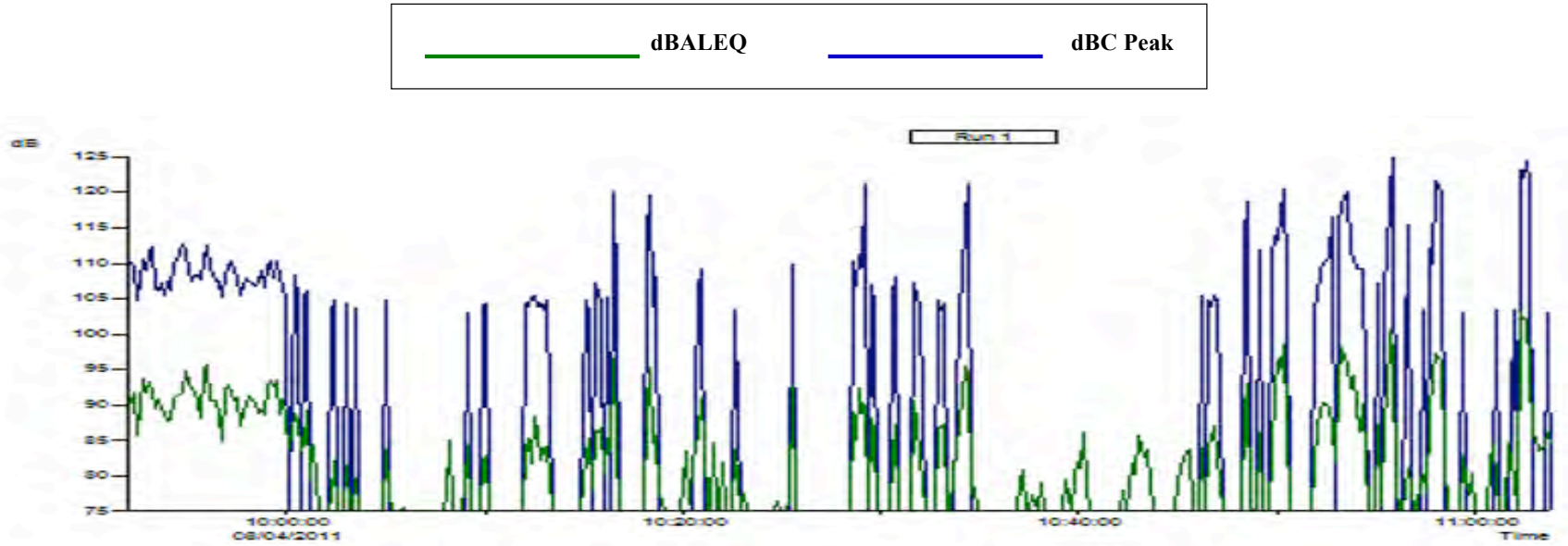

Figure 2. Bassoon 1 Exposed

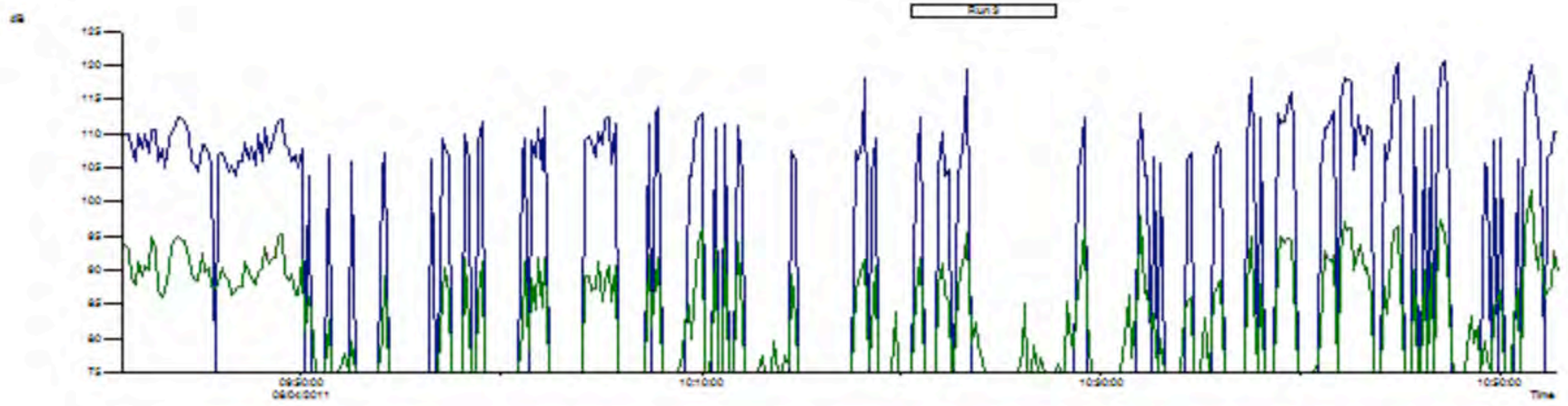

Figure 3. Bassoon 1 screened

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6/105 Seville Road
PO Box 7117
Holland Park East Qld 4121

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enquiries@musicianshearingservices.com.au
www.musicianshearingservices.com.au

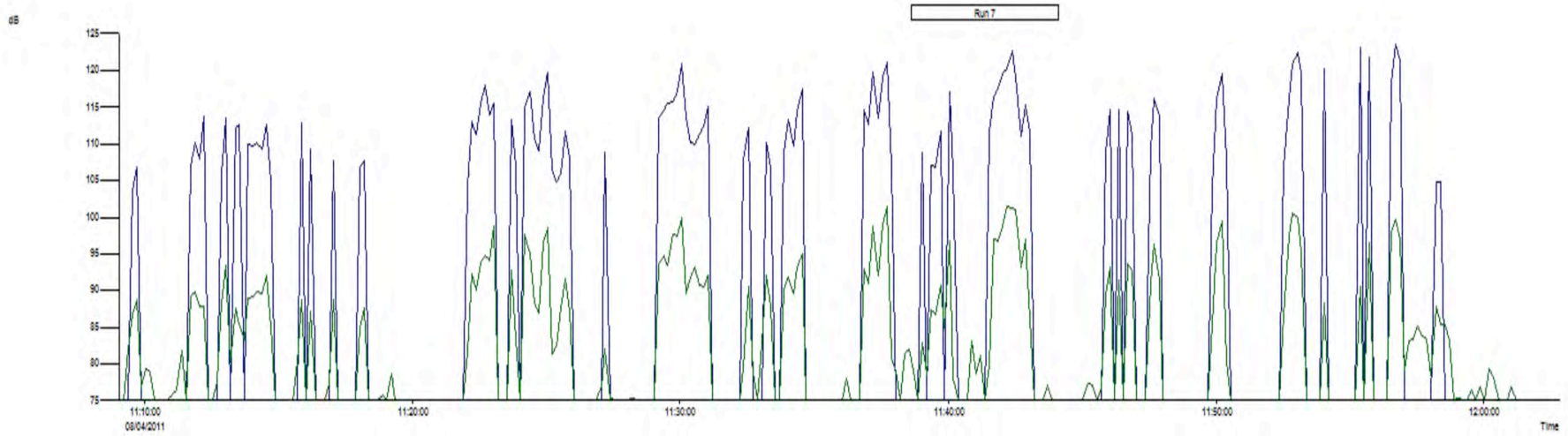

Figure 4. Bass Clarinet exposed

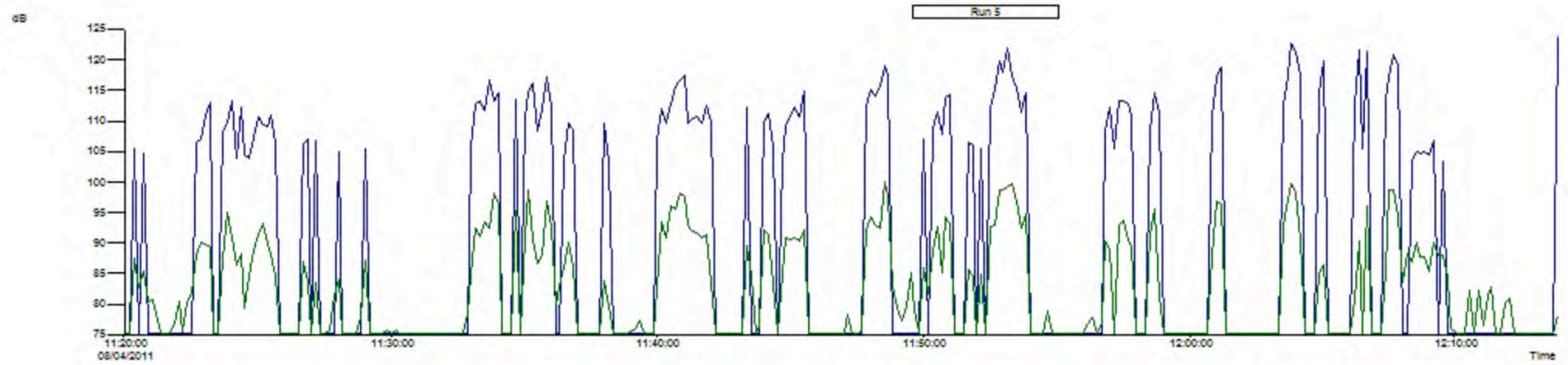

Figure 5. Bass Clarinet screened (note artefact at switch off)

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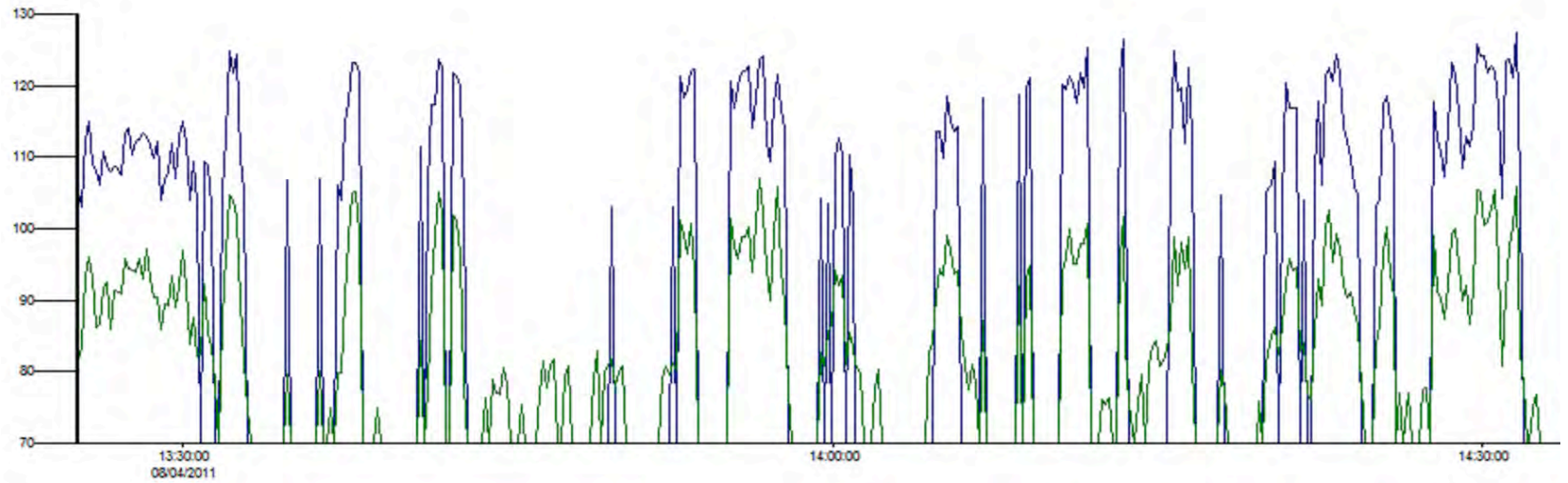

Figure 6. Bassoon 2 new screen - exposed (first half of data only)

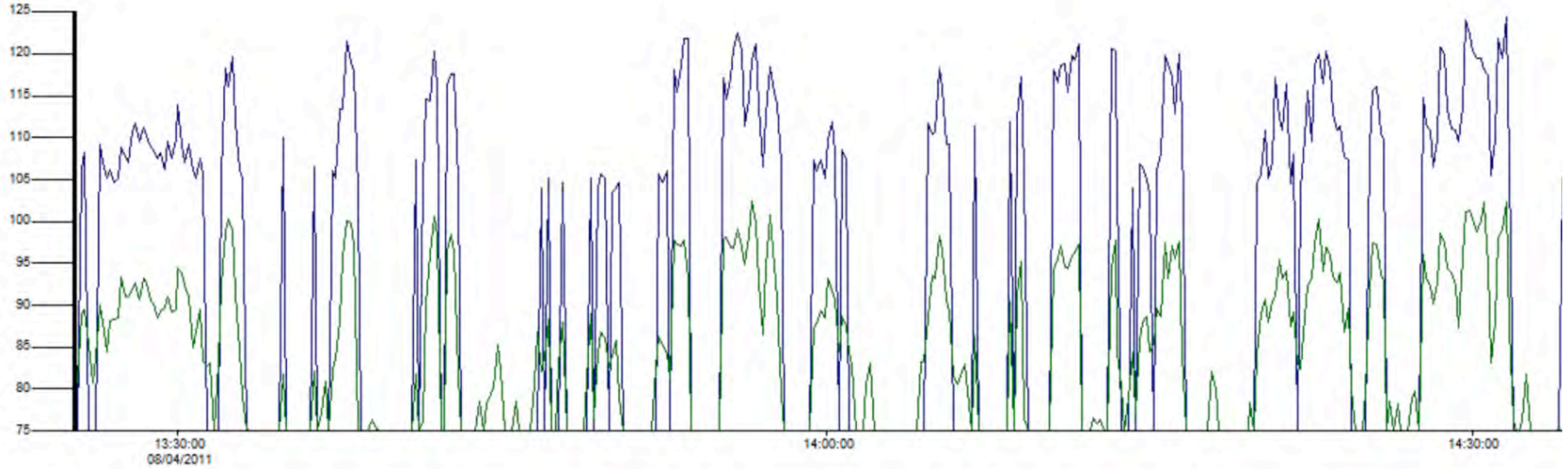

Figure 7. Bassoon 2 new screen - screened (first half of data only)

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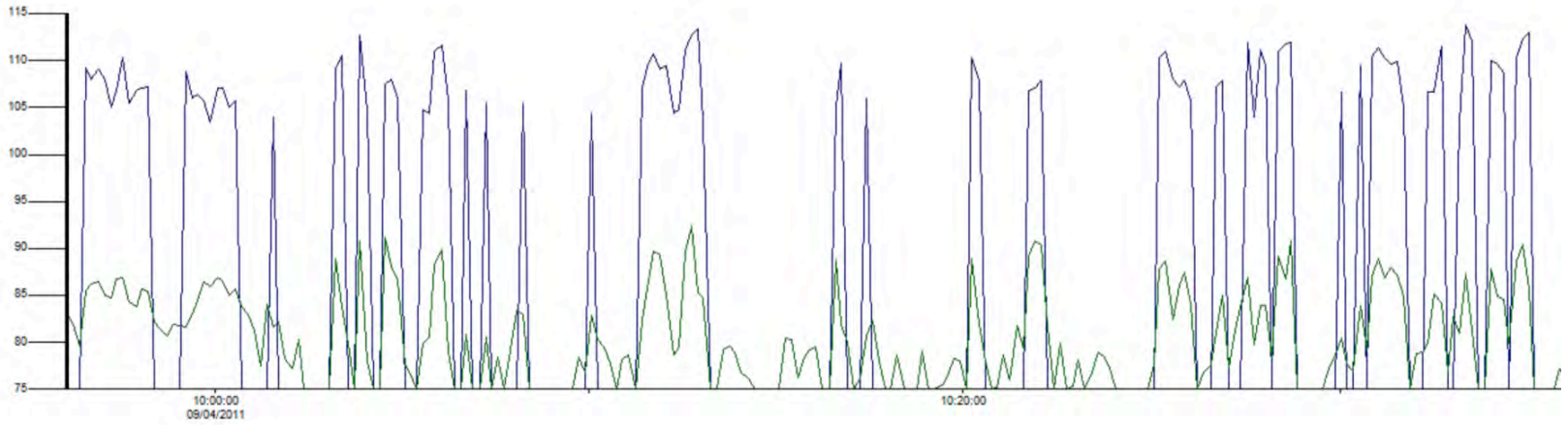

Figure 8. Violin 2 back desk exposed (first half of data only)

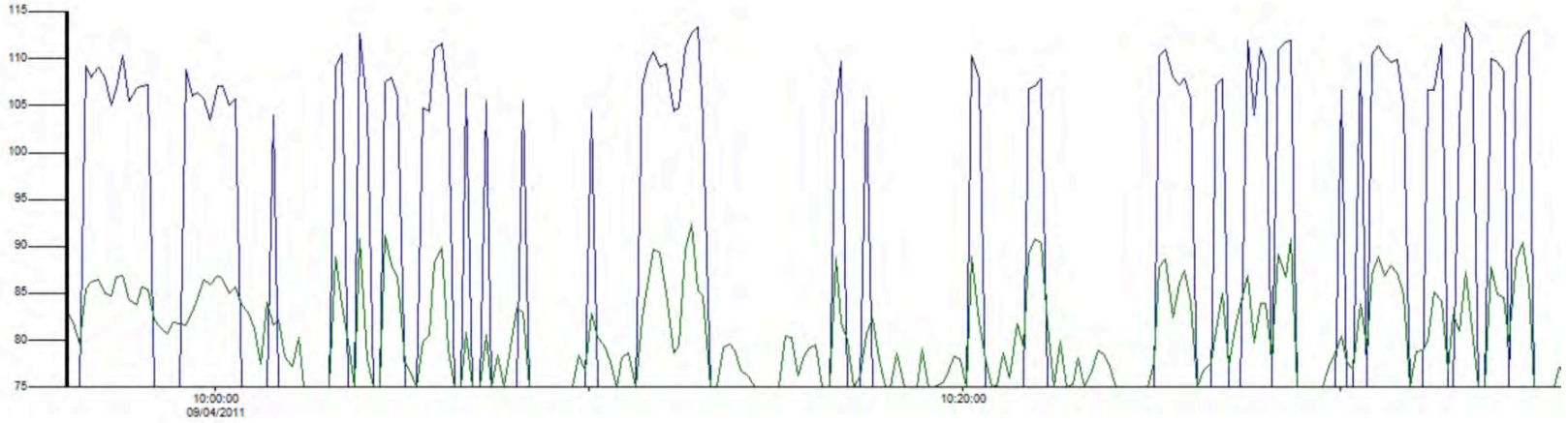

Figure 9. Violin 2 back desk screened (first half of data only)

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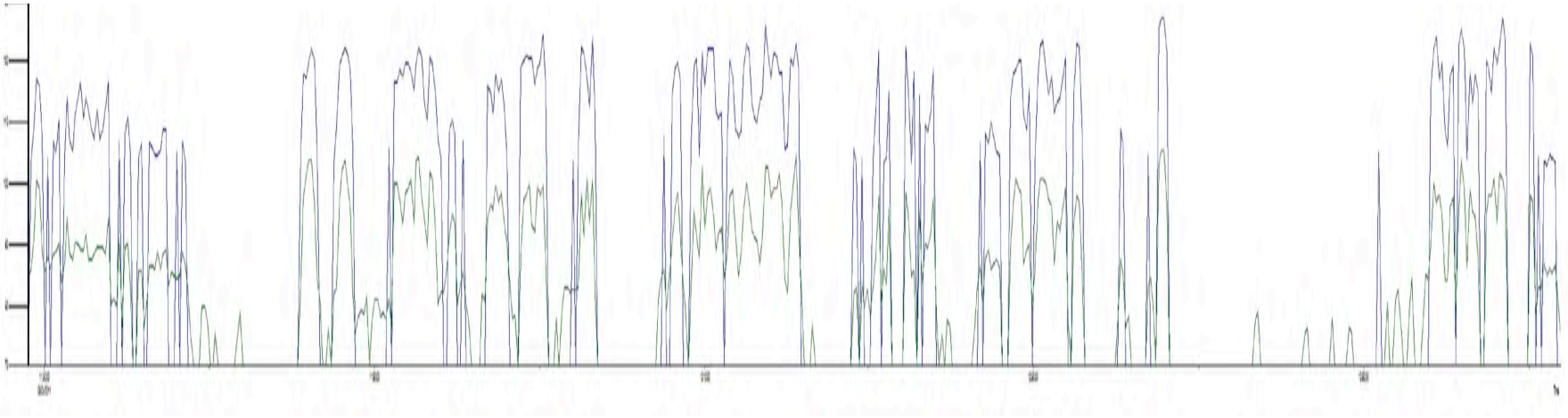

Figure 10. Contra-bassoon exposed

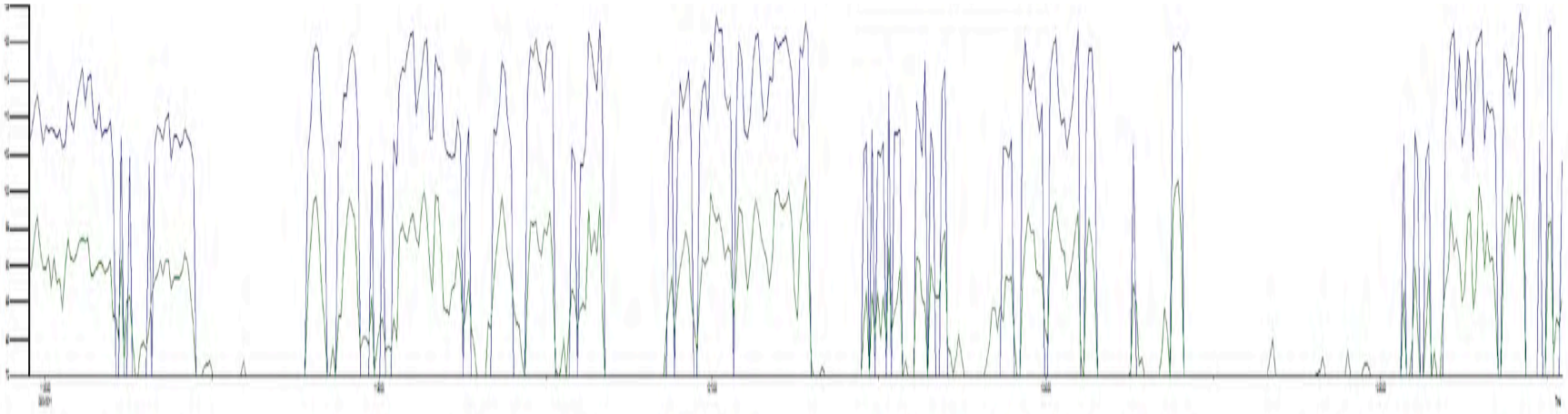

Figure 11. Contra-bassoon screened

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DISCUSSION

It is clear from the results that the new screen is effective in significantly reducing peak levels. Although peak sound levels in orchestras very rarely exceed the maximum allowable 140dBC, reduction of lower level peaks has a positive effect on the comfort of the musicians, thereby improving their subjective response to the sound they are hearing.

Results also indicate that in areas of high average sound levels the screen consistently reduces sound levels by close to half, but seems to have little effect on averages when there are low to moderate sound levels. This may be explained by the contribution of the instrument in front of the screen to the sound level readings.

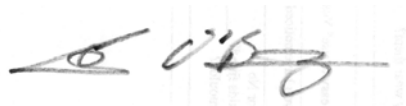
Comparative data between the old screen and the new screen, while not conclusive, indicates likelihood of slightly better performance from the old screens. The number of variables in this type of field testing, however, makes conclusive comparisons difficult without more longitudinal data.

Anecdotally musicians responded well to the new screen, claiming very little noticeable difference between it and the existing models.

CONCLUSION

This brief field trial has shown the new screen to be effective in reducing both peak and average sound levels. Laboratory testing is required to objectively demonstrate the exact specifications of the screen's reductive properties.

Please contact Musicians' Hearing Services should you need any further information regarding this report.



Ian O'Brien **MAudSt MPhil BMus MAudSA**
Audiologist
Musicians' Hearing Services
10 April 2011