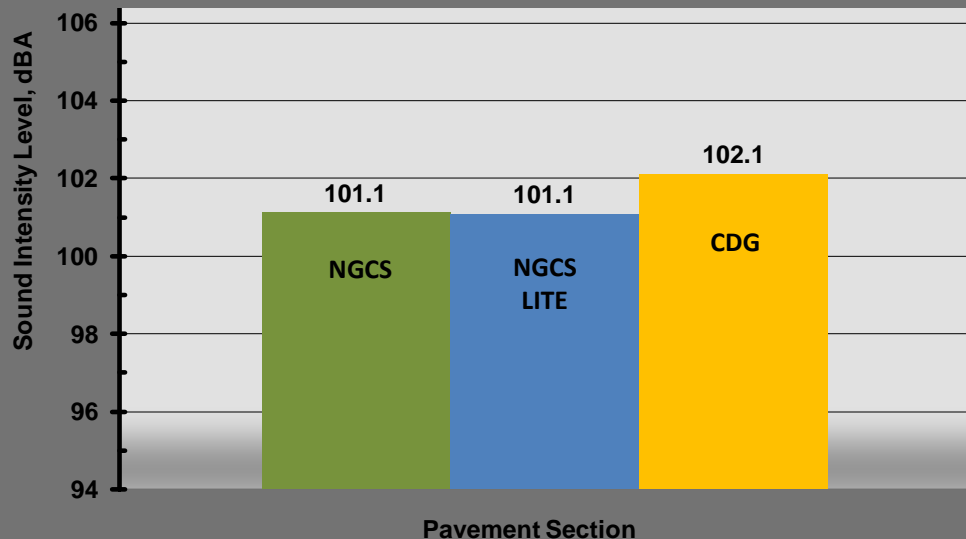


2009

MnROADS I-94 NGCS, NGCS LITE and CDG OBSI Test Results

NGCS Textures Still Performing

This report contains the results of the OBSI testing conducted on I-94 WB roadway on July 7 2009. The NGCS and NGCS LITE both tested at 101 dBA and were one dBA quieter than the CDG section.



Executive Summary

On July 7, 2009 the NGCS, NGCS LITE and CDG textures were tested using the ACPA OBSI dual probe system. Figures 1 and 2 indicate the results of this testing. Figure 1 indicates the NGCS and NGCS LITE tested at the same 101 dBA and the CDG was approximately 1 dBA louder than the NGCS surfaces. The NGCS and CDG surfaces are approximately 21 months in service and the NGCS LITE approximately 8 months in service. The in-service time is periodically interrupted by roadway closures to conduct MnROADS testing operations so the actual service time is somewhat less.

Subsequent sections of this report describe the increased distress evident in the pavement condition of the test sections, particularly the CDG section, and provide a summary of the OBSI results from just after construction to the present time.

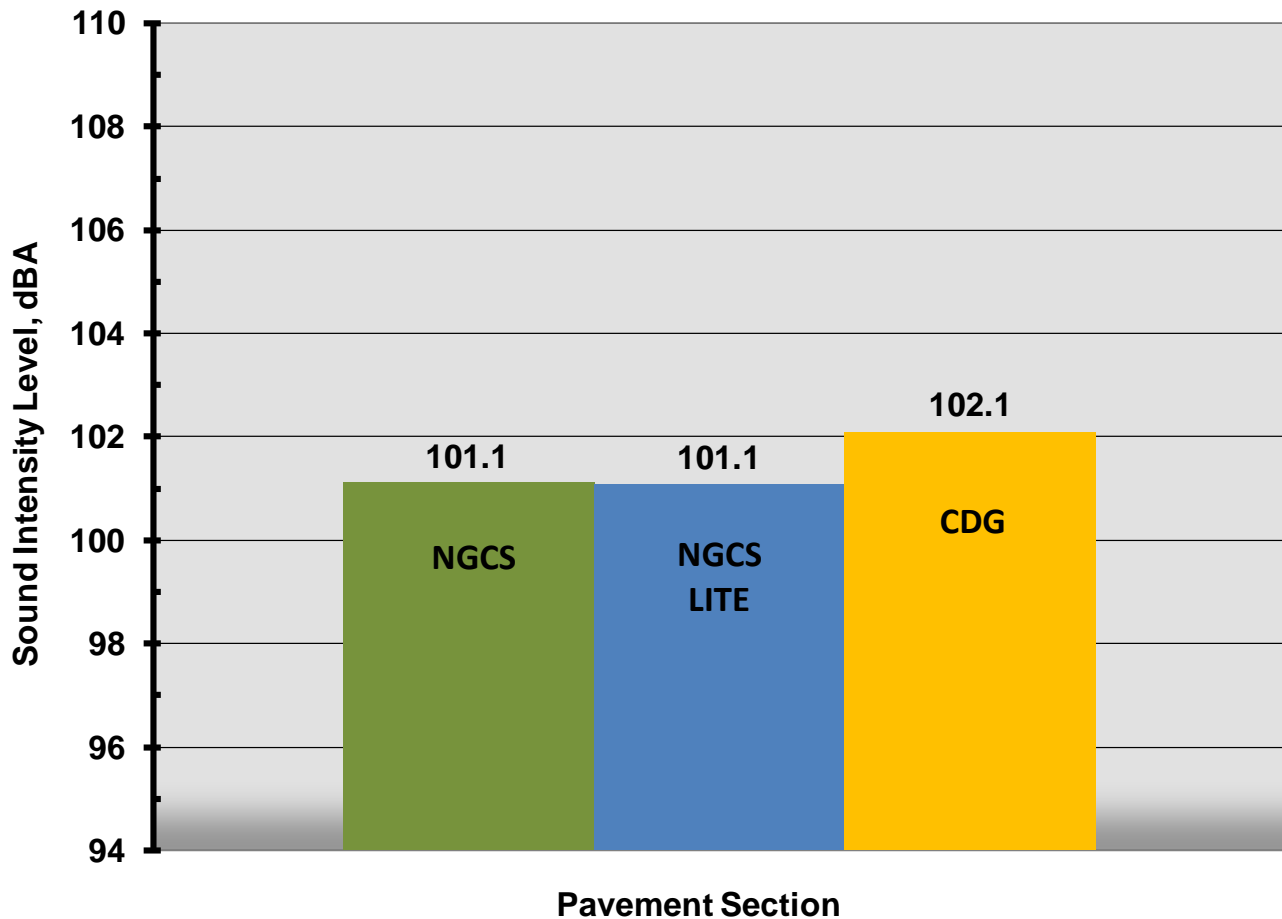


Figure 1 Overall One-Third Octave Band OBSI Level By Texture Type

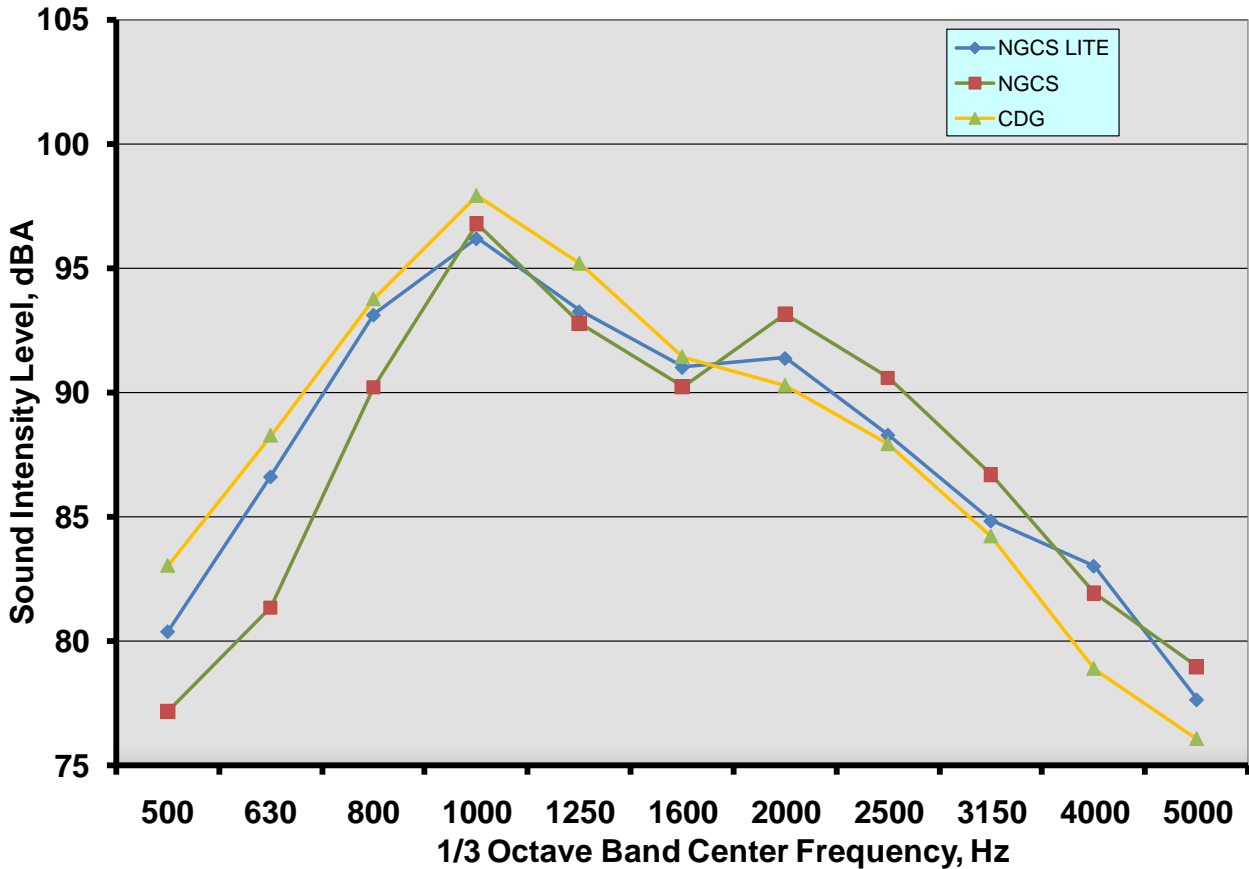


Figure 2 One-Third Octave Band OBSI Spectra by Texture Type

Introduction

On July 7, 2009 the NGCS, NGCS LITE, and CDG textures located on MnROADS I-94 WB roadway were tested. The testing was conducted between 11:45AM and 3:30PM. Temperatures ranged between 80 to 82 degrees Fahrenheit. A 2008 Pontiac G6 fitted with the ACPA dual probe OBSI system was used to conduct the testing. Testing was conducted at 60 MPH using an ASTM SRTT tire. The roadway was open to traffic during testing.

The I-94 EB had construction in the EB roadway at some point downstream of MnROADS and this backed up the EB traffic for many miles. This prevented the normal loop back for testing and instead local roads to the north were used to return to the eastern start point. This added a little more time to the return loop. Figure 3 indicates this backup.

On the CDG section (e.g. Cell 8) a pothole has developed that extends into the right wheelpath as indicated in Figure 4. To avoid this and the other distress shown in Figures 5&6, it was decided to shift the test vehicle to the left side of the travel lane. This put the driver side of the car near the center-lane stripe, encroaching towards the high-speed traffic. This resulted in testing a different wheelpath than has been tested previously. The pothole represented a potential danger to the OBSI equipment due to its extent.



Figure 3 Photo of I-94 EB Traffic Backup Resulting from Construction Project to the East



Figure 4 Pothole in Cell 8 CDG Causing All Testing to Be Shifted to Left Side of Lane



Figure 5 Distress Evident on I-94 Cell 8 CDG



Figure 6 Open Instrumentation Hand Holes on MnROADS Sections

In the future, continued deterioration of the pavement condition may jeopardize the evaluation of the texture noise levels.

July 7, 2009 OBSI Results

Figures 1 and 2 indicate the OBSI results for all three textures. As indicated in Figure 1, the NGCS surfaces produced identical overall levels and were approximately 1 dBA lower than the CDG.

Figure 2 indicates the spectra results between 500 Hz and 5000 Hz for all the surfaces. As indicated, the NGCS surface has lower levels below 1000 Hz and higher levels above 2000 Hz than either the CDG or NGCS LITE textures. The NGCS LITE texture is a transition texture between the CDG and NGCS although it does exhibit the dip at 1600 Hz characteristic to the NGCS surface. Although the overall levels are identical, the NGCS surface still appears to produce somewhat more of a broadband spectrum. Whether this is meaningful from a consumer noise standpoint is unknown at this time.

Discussion of Results to Date

Figure 7 indicates the OBSI results since construction. It should be noted that the results obtained at the three dates represent results obtained in different wheelpaths. For the 10-25-07 results, the right wheel path of the travel lane was tested. For the 5-12-08 results the right wheel path of the high speed lane was tested. For the 7-7-09 results the testing was skewed to the left to avoid a pothole that developed in the CDG section. So all three OBSI test tracks were different.

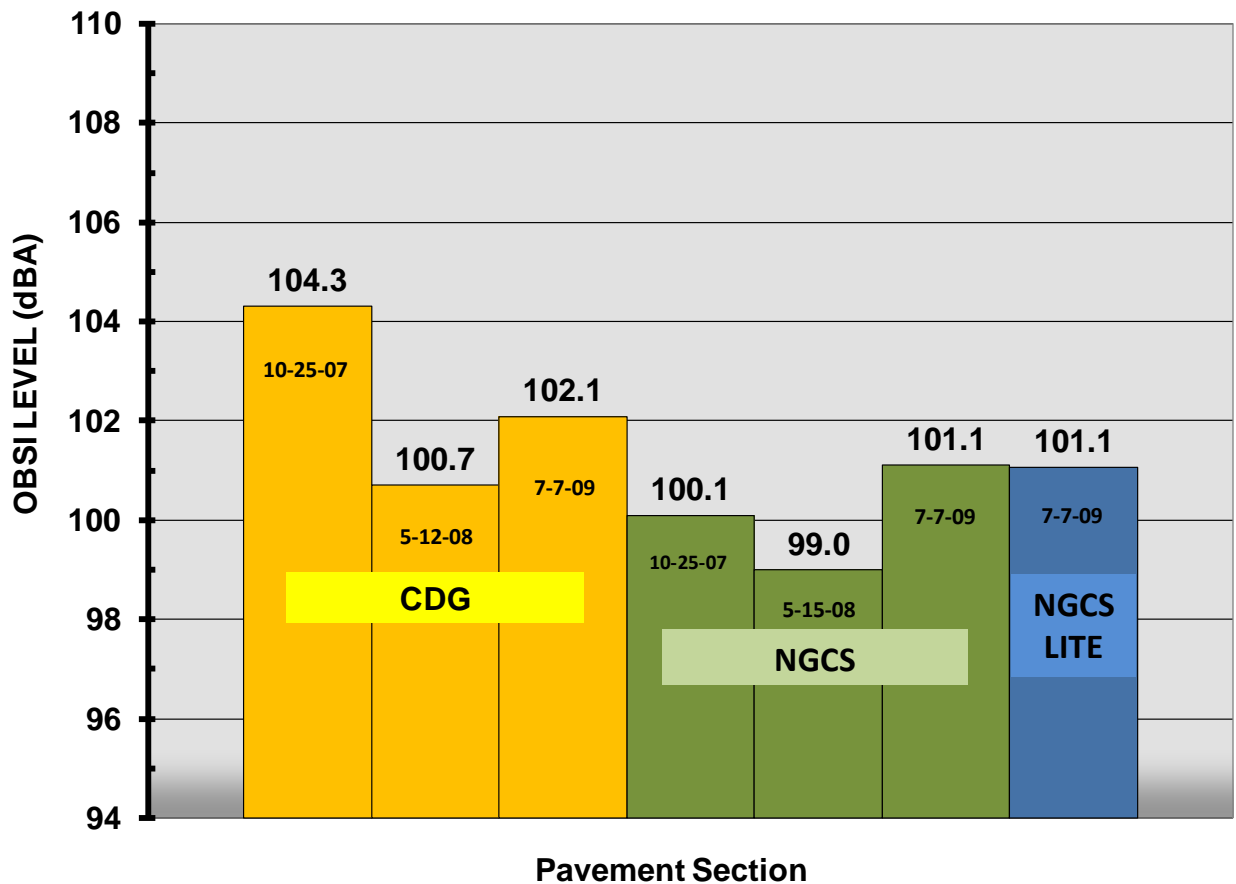


Figure 7 OBSI Results from Construction through July 7-7-09

The 5-12-08 testing was conducted in the high-speed lane because MnROADS had trenches cut into the travel lane to install instrumentation which were still open and this prevented conducting testing in the travel lane.

As indicated in Figures 4-6 the roadway condition of the test sections is deteriorating, particularly the CDG section. This section of roadway is approximately 16 years old and is starting to incur additional spalling. It was also noted that the transverse joint sealing was in worse condition with some areas missing the sealant. The effects of these changes over time have not been accounted for.

In addition, the ACPA SRTT tire is in its 4th year of use and will be replaced this year. These sections will be re-tested later this summer with the new ACPA SRTT tire. It is quite possible that a half dBA of OBSI level is due to tire condition but this has not currently been verified.

July 7th Variation in Run to Run Results

Figures 8-10 indicate the run to run variability for all three textures. As indicated, the results were very consistent except for the CDG surface for values below 1000 Hz. It is not known whether the pavement distress was contributing to this difference or just texture variation.

NGCS

Figure 8 indicates the run to run variation for the July 7th NGCS OBSI results.

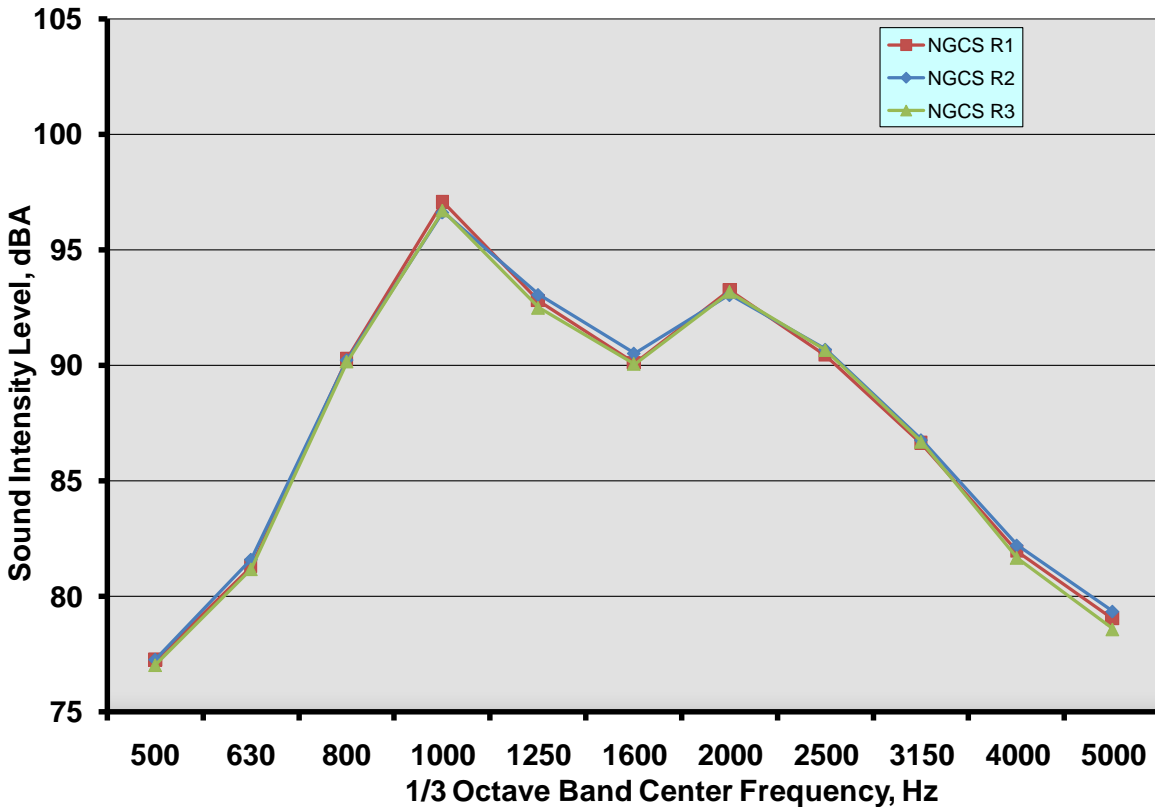


Figure 8 Run to Run Variation of NGCS OBSI Results on July 7th 2009

NGCS LITE

Figure 9 indicates the run to run variation of the July 7th NGCS LITE OBSI results.

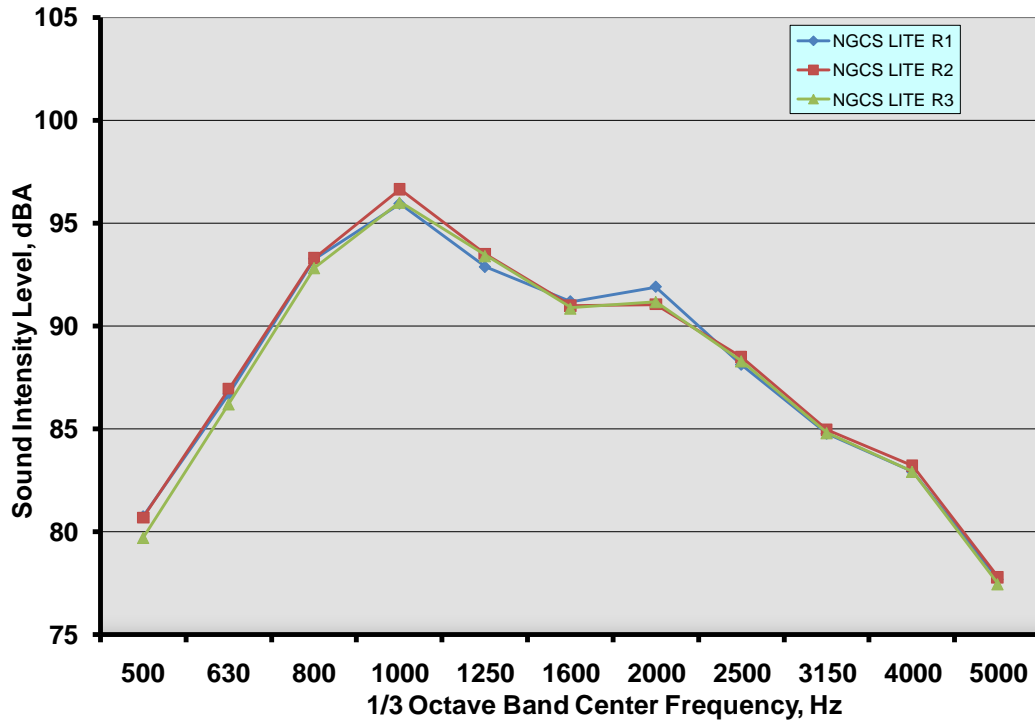


Figure 9 Run to Run Variation of NGCS LITE OBSI Results on July 7th 2009

CDG

Figure 10 indicates the run to run variation of the July 7th CDG OBSI results.

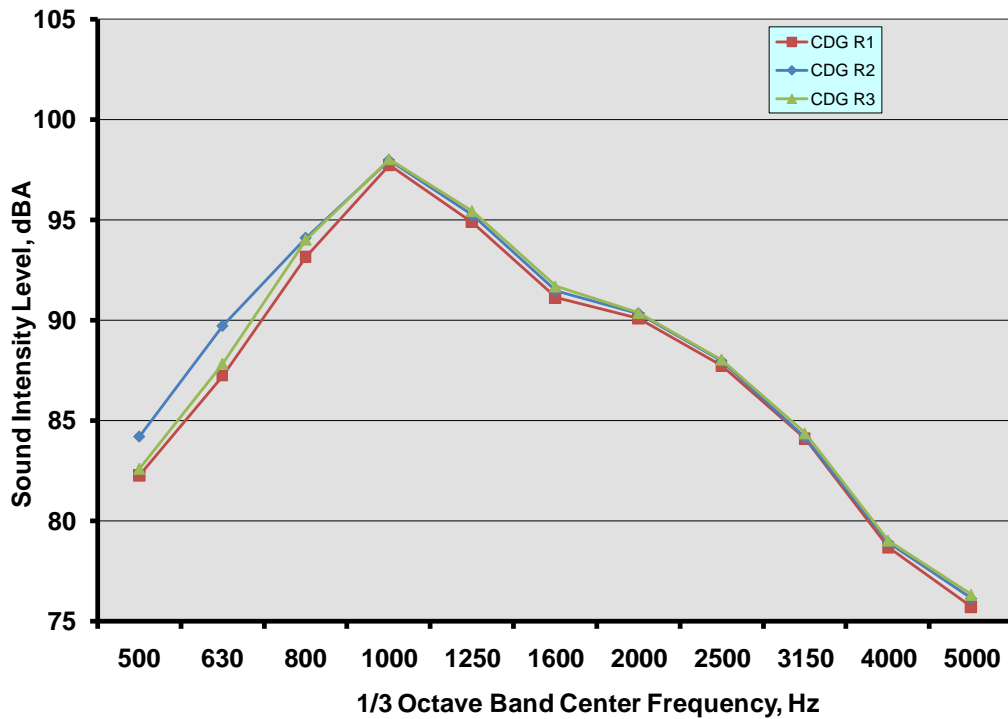


Figure 10 Run to Run Variation of CDG OBSI Results on July 7th 2009