1 Introduction

Munro Acoustics was commissioned to investigate the acoustics and audio monitoring system at Casino Zogernitz. Tests were carried out on 05 May 2009.

The objective was to define the existing acoustics in terms of suitability for performance and recording.

1.1 Initial Observations

Describe general features of test site

2 Method and Equipment

2.1 Analysis

Tests were conducted using Time Delay Spectrometry and Maximum Length Sequences to capture the periodic impulse response of the complete sound source-room system. This method allows detailed analysis of each time, frequency and energy transform. Results can be compared using a wide range of industry standards as well as several unique to advanced FFT techniques.

2.2 Method

Each impulsive test is used as a power source and three measurement locations are fixed for each, giving a minimum of nine spectral responses for averages and summed energy for statistical analysis. Other locations may be used for sound field calculation and modal analysis.

2.3 Data

To assess the acoustics of the theatre and the scope of remedial works the following data may be required;

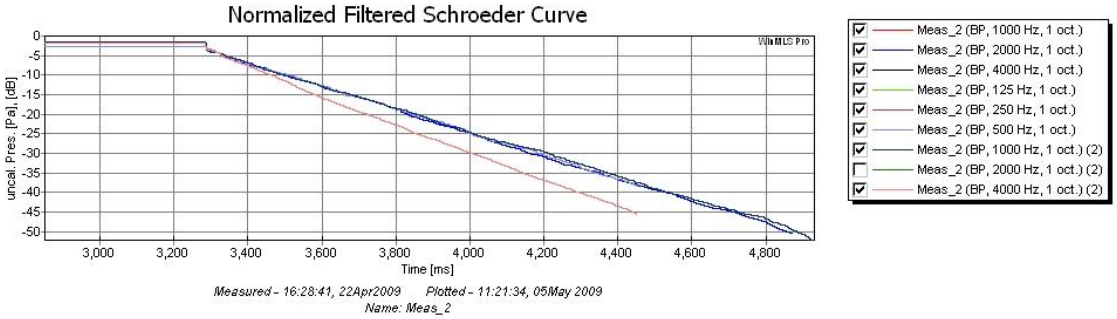
- Background noise levels and sound insulation (when appropriate)
- Reverberation times and general time domain data
- Energy spectral distribution including frequency and phase responses
- Complete transfer functions for each main speaker channel (if appropriate)

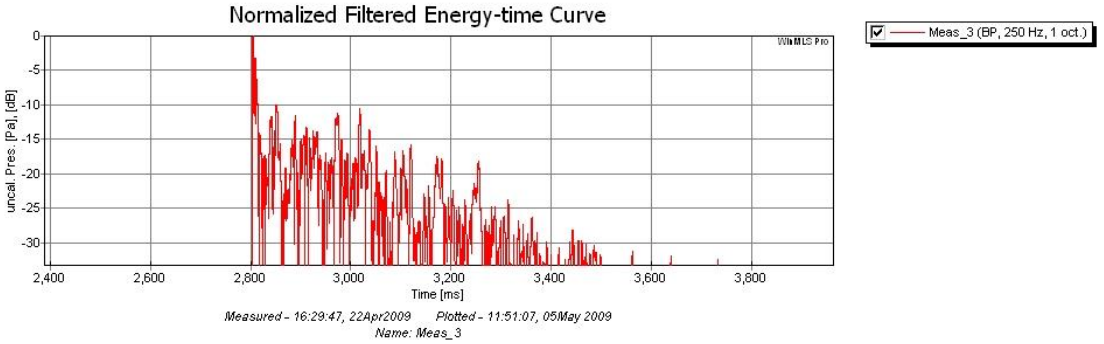
3 Results

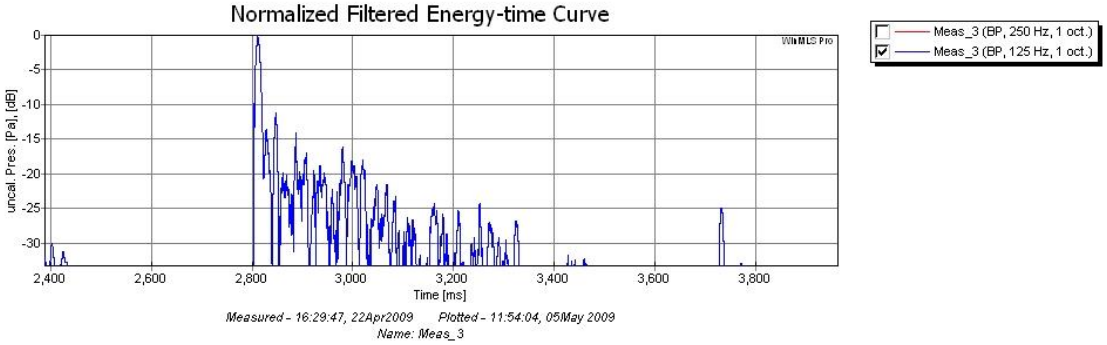
Most data is best analysed using statistical averaging as all theatres are subject to variations (acoustically) unless they generate a truly diffused sound field in themselves. The initial charts show averaged energy for different microphone positions and a combination of the three initial impulses used as a test source.

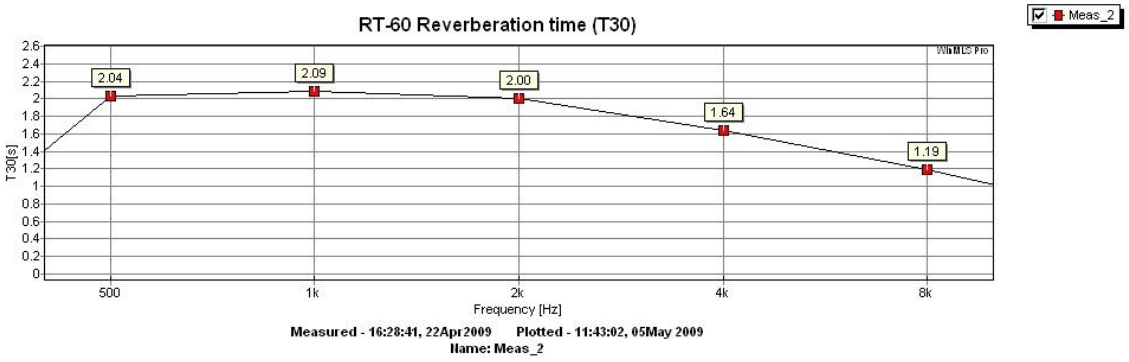
Individual measurements are then used to identify particular variations and steps are taken to identify causes of such variations and their possible remedies (if appropriate).

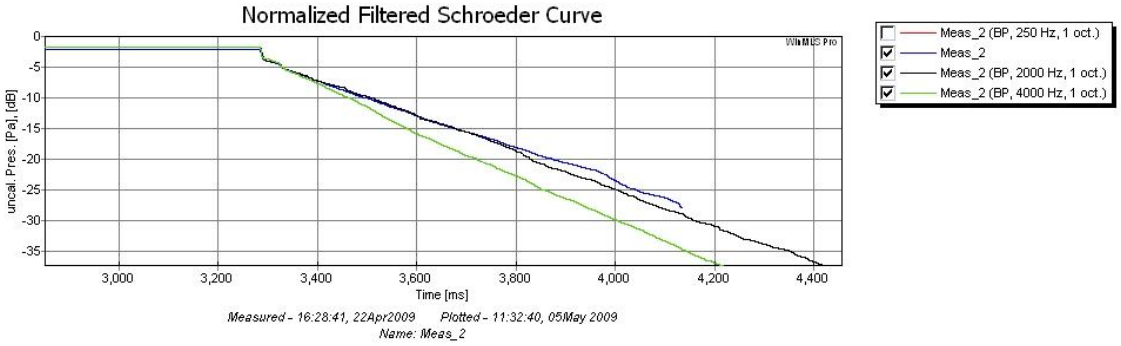
3.1 Averaged Reverberation Plots

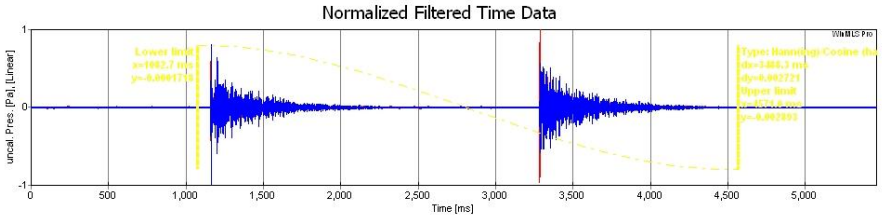












3.2 Reverberation Times

The above plots show very even and consistent reverberation decay across the audio spectrum. The decay time is defined as a value equivalent to the time taken for 60dB reduction from the initial energy condition. This is usually measured for the initial 20dB decay and then multiplied to obtain the 60dB value.

3.3 Actual Decay Rates as Calculated to obtain T60

Frequency Band	125	250	1000	2000	4000
Reverberation Time (seconds)	1.8	2.0	2.0	2.0	1.6

The main decay curves show good correlation for different positions but the slopes at 250 and 500 Hz would be more linear if the reverberation and diffusion were increased in line with recommended values.

Generally, more reverberation means smoother and more consistent values over a wider area but with the sacrifice of higher direct energy, i.e. less 'nearfield'. It's a question of balance that makes a theatre most acceptable.

3.4 Smoothed Centre Channel Response (without eq.)

Not Applicable as no sound system installed

3.5 Left Right Channel Balance (no eq.)

Not Applicable

3.6 Step Function Response

Not Applicable

4 Conclusions

The auditorium is remarkably well balanced from an acoustic standpoint and I would have no hesitation and approving the room for recording and recital purposes. The size makes it ideal for recording orchestras in the absence of audience seating, or ensemble performances for up to 200 people.

5 Recommendations

5.1 Acoustic Improvements

The auditorium does not need any specific remedial treatment but any repairs or modifications should be approved by the acoustic consultant.

Additional areas have been proposed for recording rooms and control rooms and I see no impediment to this proposal as long as each area is acoustically isolated from other areas of the building. Any residential development should be carefully assessed for acoustic isolation from the main auditorium.