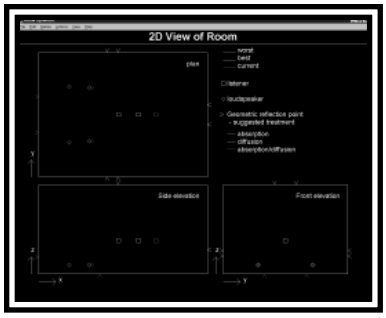
DiffuseReflections

The Newsletter for Progressive Acoustics Research **Volume 5, Issue 2, 1999**



Room Optimizer™

The First Automated Listener and Loudspeaker Placement Software From The Acoustical Industry's Leading Innovator is now available for $99.99.

IN THIS ISSUE

"Imagine: no more fumbling through binders of questionable accuracy and timeliness. The RPG® web site is always up to date and you can access information on our acoustical products 24 hours a day."

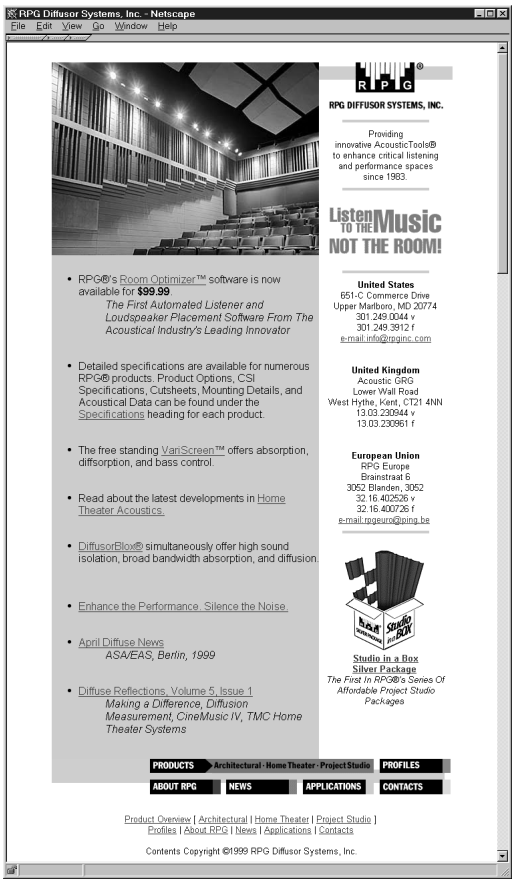
For up to the minute information, we invite you to visit RPG's web site: http://www.rpgdiffusors.com.

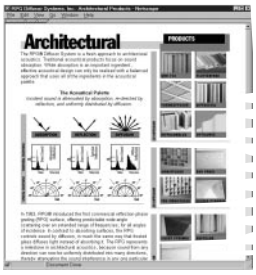
DIFFUSE NEWS

www.rpgdiffusors.com

Dr. Peter D'Antonio
President and CEO

RPG®'s Web site continues to grow. We are committed to innovation in information transfer with the same vigor that we extend to acoustics research. Imagine: no more fumbling through binders of questionable accuracy and timeliness. The RPG® Web site is always up to date and you can access information on our acoustical products 24 hours a day. Print directly from the screen, download product information in Adobe's PDF format, and even download the entire Web site and take it with you for presentations.



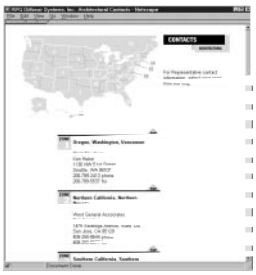


Architectural, Home Theater, and Project Studio Overview Pages discuss the unique needs of different listening environments. Products designed to enhance the acoustics of specific spaces are highlighted.

Individual Product pages provide comprehensive information including cutsheets, acoustical data, CSI specifications, and mounting details. Adobe Acrobat PDF files for each product are also available for download.

Project Profiles offer testimonials from actual clients, consultants, and architects highlighting the benefits of installing RPG® technology in a variety of situations. Links to products integral to the success of the projects are provided.

Diffusenews is a monthly page devoted to RPG®'s contributions to education, product development, acoustics research, and the music and film industries. Links to DiffuseReflections PDF files and RPG® Interviews are found here.



The Contacts pages list national and international dealers and representatives for quick access to RPG® technology in your area. Links to acoustic-related web sites give access to even more information.

Research & Development

3D SCATTERING PATTERNS

In Volume 5 Issue 1, we described a 5th-scale three dimensional measurement apparatus developed to characterize the scattering from architectural surfaces. We now begin a discussion of how this new goniometer can be used to assist acousticians in evaluating scattering surfaces.

Specular Scattering

In figure 1 we illustrate a periodic array of (16) 3.5" (90 mm) x 3.5" (90 mm) x 23.625" (600 mm) battens oriented parallel to the x-axis of the 3D scattering pattern for normal incidence in the 2 kHz 1/3-octave band shown in Figure 2.

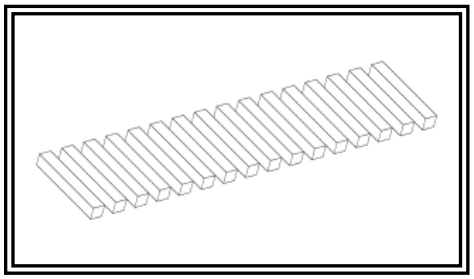


Figure 1. Periodic array of rectangular battens

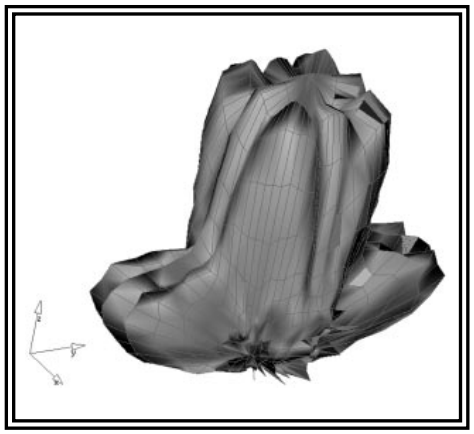


Figure 2. 3D scattering pattern from a parallel array of rectangular battens aligned parallel to x at normal incidence in the 2 kHz 1/3-octave band.

The scattering along x is essentially specular, wheras the battens offer modest diffusion parallel to the y axis.

Redirection

Figure 4 shows an example of the type of scattering obtained using the 3D goniometer for a square-based pyramid, shown in Figure 3, 4.92' (1.5 m) x 4.92' (1.5 m) x 1.15' (0.35 m) at normal incidence in the 2 kHz 1/3-octave band. Note that the four-fold symmetry of the square-based pyramid is revealed in the four symmetrical scattering lobes. The absence of appreciable specular scattering for normal incidence is also indicated by the dip in the center of the scattering pattern. By contrast, the parallel battens scatter a significant amount of energy into the specular direction. While pyramids are often classified as diffusors, they essentially provide redirection. This redirection contributes to the diffusivity of the sound field, but large 2' x 2' and 4' x 4' pyramids do not produce diffuse reflections.

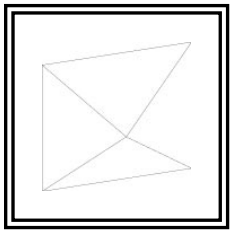


Figure 3. Square-based pyramid

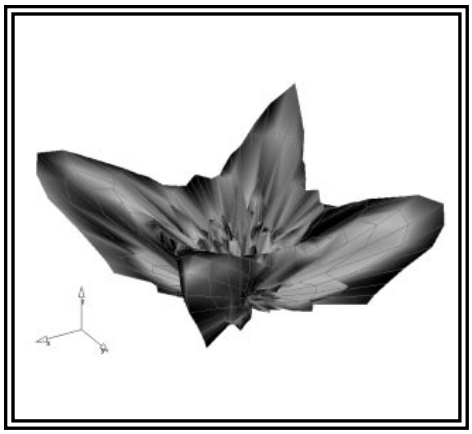


Figure 4. Backscattered pressure from a square based pyramid at normal incidence in the 2 kHz 1/3-octave band

Diffusion

The number theoretic diffusor offers an elegant and efficient means of obtaining diffuse reflections and uniform diffusivity. RPG®'s 2' (568 mm) x 2' (568 mm) x 6 3/8" (162 mm) 2D Skyline® diffusor is pictured in Figure 5. The 3D scattering pattern obtained with the 3D goniometer from an array of (4) Skyline® units is shown in Figure 6. The Skyline® is an optimized primitive root diffusor. The 2D phase grating consists of 156 distinct phase blocks. Notice the uniform scattering into the diffraction directions, indicated by the outward pointing lobes, at normal incidence in the 2 kHz 1/3-octave band. The Skyline® can be used for wall or ceiling diffusion.

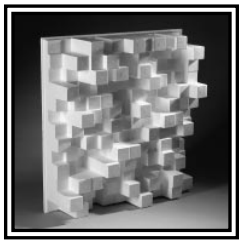


Figure 5. RPG® Skyline® optimized 2D primitive root diffusor

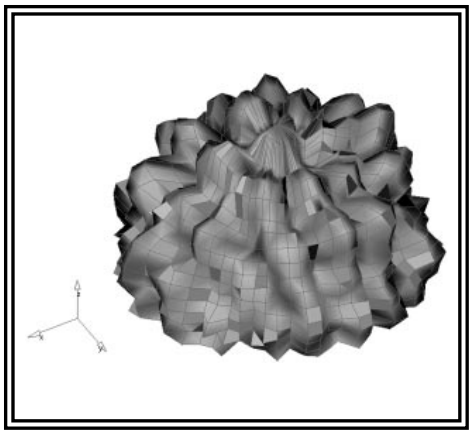


Figure 6. Backscattered pressure from a 2D optimized primitive root RPG® Skyline® diffusor at normal incidence in the 2 kHz 1/3-octave band

Diffuse Applications

CINEMUSIC V

We conclude our treatment of RPG®'s Home Theater CineMusic Systems by describing CineMusic V. The fabric wrapped absorptive panel has achieved the status of the most commonly specified acoustical product. In fact, many people associate the word acoustical with absorption. For the past fifteen years, RPG® has published widely on the importance of having a balanced design utilizing the three tools in the acoustical palette: absorption, reflection, and diffusion. The traditional fabric wrapped panel simply cannot offer the degree of diffusion required for today's 5.1 surround sound formats. However, many rooms simply do not allow surface treatment deeper than 1 or 2 inches and the aesthetic requirements dictate a flat upholstered panel. To address this problem, RPG® developed the first flat diffusor based on a reflection amplitude grating, as opposed to the traditional reflection phase gratings. As the names imply, the phase grating manipulates the phase of an incident sound wave, whereas the amplitude grating affects its amplitude. RPG® mapped absorption to a zero and reflection to a one and used an optimal binary sequence to determine the spatial arrangement for optimum diffusion. The resulting flat binary amplitude diffsorber, BAD™, essentially represents the evolution of the "absorptive only" fabric panel. The BAD™ Panel provides absorption below about 1kHz, and diffusion above. This allows reflection control to control specular reflections, without excessively "deadening " the space. When you consider that the desired goal in home theater is immersion or envelopment, it is not surprising that a diffsorptive surface is more appropriate than a purely absorptive one. The BAD™ Panel is available in standard sizes in multiples of 2' and also in custom sizes. The illustration in Figure 1 is an example of a panelized room design. The panels can be reflective, absorptive or diffsorptive to fine tune the acoustics of the space to suit the 5.1 dipole surround or the matching ITU surround sound format. Figure 2 is a rendering of one corner of such a room. If you would like to explore the various home theater CineMusic options RPG® offers, please consult previous issues of Diffuse Reflections and our Web site.

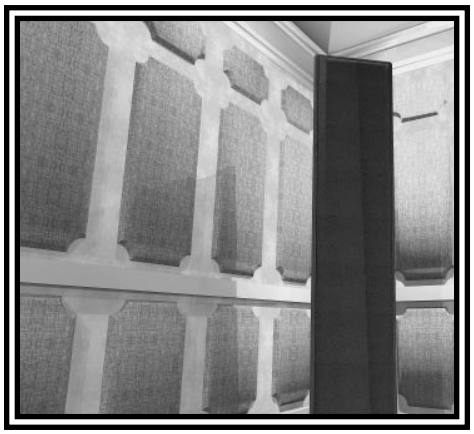


Figure 2. Rendering of CineMusic V Home Theater System.

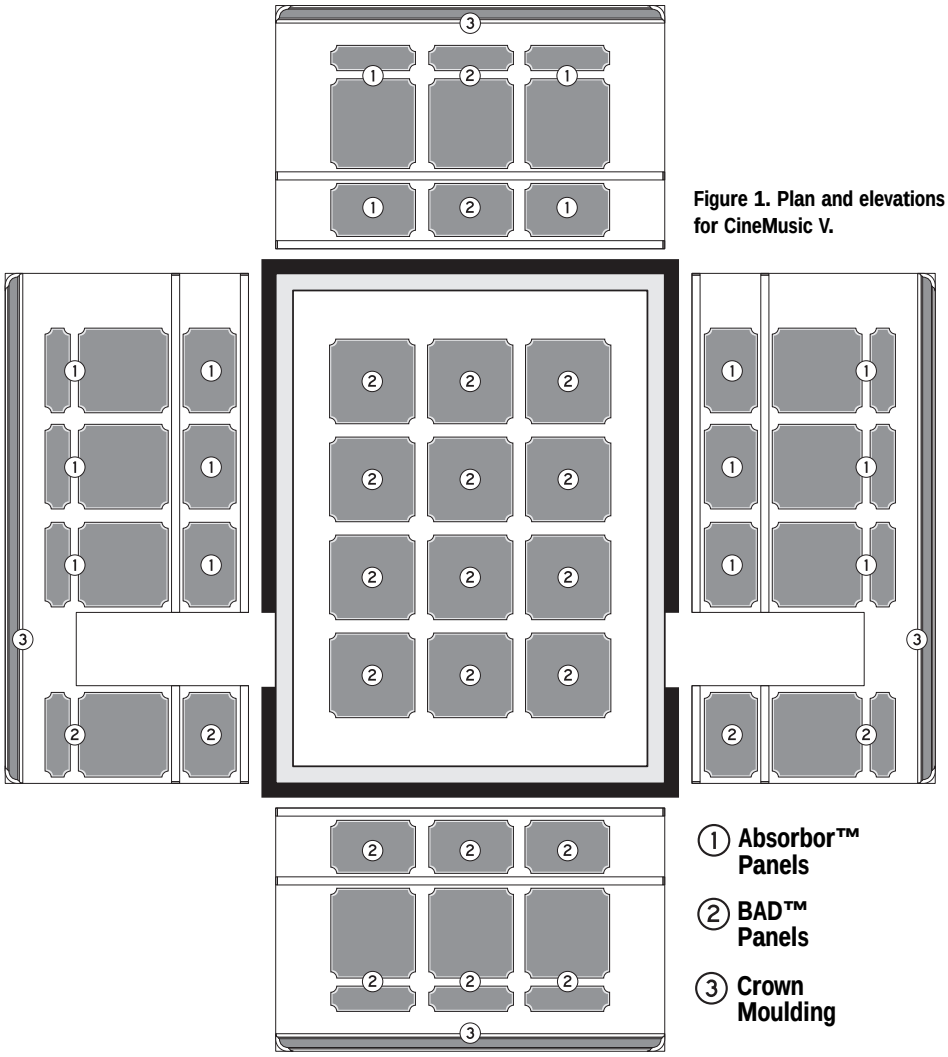


Figure 1. Plan and elevations for CineMusic V.

Project Profile: Cedarburg Performing Arts Center

CONSULTANT

"The Cedarburg Performing Arts Center seats approximately 600 on one level, with a fully rigged stage house and an orchestra shell. It serves as a multipurpose high school auditorium, a home for community theater groups, and avenue for touring productions. Unlike many facilities of this size, Cedarburg PAC has an experienced professional management and technical staff. It was essential to provide an acoustical environment which would meet their expectations, and DiffusorBlox® are a very important element of the solution. The hall has no discreet echoes. Speech intelligibility — both reinforced and unreinforced — is very good. The excellent sound diffusion in the room helps create a delightful musical listening environment. Once again, DiffusorBlox® have proven to be a cost-effective means for enhancing auditorium acoustics."

Mr. James Yerges
Yerges Acoustics

ARCHITECT

"The goal of this project was to design a technically advanced facility that would serve the school district's needs for performing arts education as well as the broader community needs for a professional performing arts facility. The theater has superb acoustics and excellent sightlines. Early studies using computer generated models were performed to assure completely unobstructed views from every seat. Similar studies were done with acoustic models to maximize the acoustic quality: the shape of the house was modified during design, as this information became available. The side walls of the main house are lined with DiffusorBlox®: concrete masonry units specifically designed to diffuse sound energy, a critical component of the excellent acoustics."

Mr. Paul Rushing
Kubala Washatko Architects, Inc.

CLIENT

"The Cedarburg Performing Arts Center offers a superb acoustical environment due in large part to the DiffusorBlox® that have been employed. As a result, our audiences will marvel for many years to come about the quality of the listening environment. Thank you!"

Mr. Joe McKenna
Managing Director
Cedarburg Performing Arts Center

PRODUCTS

DiffusorBlox®

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