

# Waveform

## Spline™

1D Diffusion



*Optimized One Dimensional Curved Gaussian Shapes  
From The Acoustical Industry's Leading Innovator*

As architecture evolves from rectilinear to curvilinear lines, acoustic surface treatment needs to evolve to meet the aesthetic challenge, while also offering optimal sound diffusion and absorption. To solve this problem and provide curvilinear options, RPG developed a powerful Shape Optimization software, which optimizes sound diffusion, while providing a given shape motif. The Waveform Spline-W is a veneered or painted, wall or ceiling applied, 1-dimensional sound diffuser, which provides an attractive wavy spline shaped appearance. It is available in 24" x 48" x 4" panels, allowing a variety of tiling options, depending on the orientation of adjacent panels. The panels are easily mounted with wall or ceiling cleats and are available in a wide variety of veneers and finishes. In the photo, Waveform Spline-W units are applied to the walls of a performance stage. The upper row of panels is rotated 180 degrees from the lower row offering an interesting topology.



*The Sound of Innovation™*

# Problem and Solution

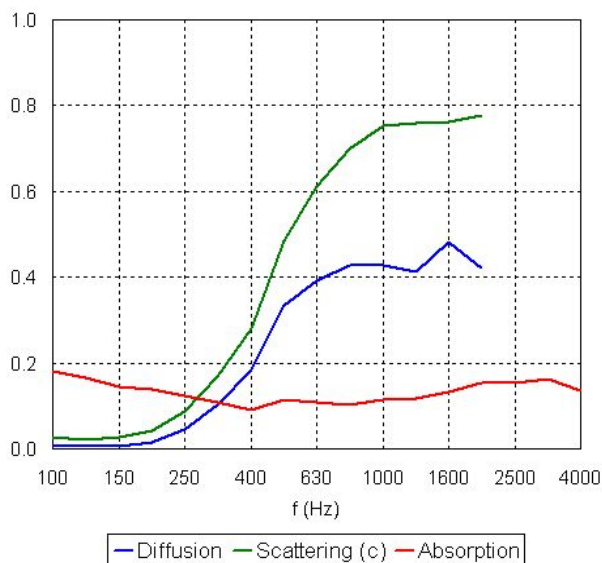
## Problem

Flat panel arrays provide uneven sound pressure across the audience area. Listeners experience sound level minima when the geometrical reflection point for a receiver is between panels and maxima when the geometric reflection point lies on the panels. Coverage can be improved by curving or shaping the panels, but there is no guarantee that optimum results will be obtained, and consequently, uneven response is often still experienced.

## Solution

To solve this problem, RPG developed the first Shape Optimization program, which automatically determines the best shape, tilt and arraying to insure uniform coverage. The Shape Optimizer combines the power of the boundary element and multi-dimensional optimization techniques, incorporating the diffusion coefficient as the metric of optimal performance. The Waveform Spline provides optimal ensemble for musicians on stage and uniform coverage in the audience. Each canopy element has the same optimal shape for aesthetic reasons. However, each panel's tilt is independent. This insures optimal coverage on stage and in the audience forestage seating area.

# Performance Specifications



The graph illustrates the random incidence diffusion, scattering and absorption coefficients, along with tabulated values and an image of the 6"/12"/6" test sample on the diffusion goniometer. The diffusion coefficient measured according to AES-4id-2001 is a measure of how uniform the Waveform Gaussian scatters sound. The correlation scattering coefficient, is less critical than the diffusion coefficient and measures the amount of sound scattered in non-specular directions to only be used in computer modeling programs. The random incidence coefficient, measure according to ISO 354 is a measure of how much sound is absorber.

# Installation

Installation is simple using integral metal hair pin connectors. Simply attach suitable supplied engineered cables for dead hung installation. The image to the far right illustrates how the Spline panels can be seamlessly joined end to end forming an arc.

## FEATURES

- Optimized shape
- Optimized arraying and positioning
- Integrated mounting hardware and engineered cable system
- Seamless Tiling in both directions
- Glass Reinforced Gypsum (GRG) meets Class A fire rating
- GRG or GRG/Honeycomb/GRG (GHG) composite
- Field finished

## BENEFITS

- Optimized shape insures uniform coverage
- RPG provides optimal arraying and tilting to insure uniform coverage and eliminate guess work in the field
- Spline panels can be used independently or tiled side to side and front to back, for wide area application
- GRG is non-combustible, and hence, can be used in all applications requiring a Class A rated material
- In addition to 1/8" and 1/4" thick GRG, RPG also offers a novel GHG composite 1 5/8" thick for improved damping and stiffness
- Field finishing allows joints to be taped forming a continuous surface, which can also be field painted
- Installation is quick and easy using integral metal hairpin hanging loops and supplied engineered cables.

## APPLICATIONS

Auditoriums, Rehearsal rooms, Performance, and Worship Spaces.

## SPECIFICATIONS

- GRG Panels:  
Size: 47 3/4" x 95 3/4" x 8"  
Surface weight between 3 and 5 lbs/sf  
Thickness: 1/8" and 1/4" GRG, 1 5/8" GHG  
Finish: Paint ready, field finished
- Wood Panels:  
Size: 47 3/4" x 95 3/4" x 8"  
Surface weight between 3 and 5 lbs/sf  
Thickness: 1/8" and 1/4" GRG, 1 5/8" GHG  
Finish: Paint ready, field finished