

625 RIVERBANK DRIVE
GENEVA, IL 60134
630-232-0104

Test Report

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FOUNDED 1918 BY
WALLACE CLEMENT SABINE

SPONSOR: **Kirei**
San Diego, CA

CONDUCTED: 2024-02-05

ON: Hyperfly Cloud (large) 2 units spaced 12" apart

Sound Absorption
RAL™-A24-066

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TEST METHODOLOGY

Riverbank Acoustical Laboratories™ is accredited by the U.S. Department of Commerce, National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP) as an ISO 17025:2017 Laboratory (NVLAP Lab Code: 100227-0) and for this test procedure. The test reported in this document conformed explicitly with ASTM C423-23: "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method." The specimen mounting was performed according to ASTM E795-23: "Standard Practices for Mounting Test Specimens During Sound Absorption Tests." A description of the measurement procedure and room specifications are available upon request. The results presented in this report apply to the sample as received from the test sponsor.

INFORMATION PROVIDED BY SPONSOR

The test specimen was designated by the sponsor as Hyperfly Cloud (large) 2 units spaced 12" apart. The following nominal product information was provided by the sponsor prior to testing. The accuracy of such sponsor-provided information can affect the validity of the test results.

Product Under Test

Product Name: Hyperfly Cloud (large)
Manufacturer: Kirei

SPECIMEN MEASUREMENTS & TEST CONDITIONS

Through a full external visual inspection performed on the test specimen, Riverbank personnel verified the following information:

Test Specimen

Product Type: Baffles constructed with fins and hubs of PET felt
One hub per baffle, fins attached radially to hub, thirty fins per baffle
Baffle Diameter: 1207 mm (47.5 in.)
Baffle Depth: 168 mm (6.625 in.)
Felt Thickness: 11.95 mm (0.4705 in.)
Overall Weight: 9.19 kg (20.25 lbs)

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Physical Measurements (per object)

Dimensions: 1.21 m (47.5 in) wide by 1.21 m (47.5 in) long
Thickness: 0.17 m (6.625 in)
Weight: 4.59 kg (10.12 lbs)

Test Environment

Room Volume: 291.98 m³
Temperature: 21.7 °C ± 0.1 °C (Requirement: ≥ 10 °C and ≤ 5 °C change)
Relative Humidity: 57.65 % ± 1.5 % (Requirement: ≥ 40 % and ≤ 5 % change)
Barometric Pressure: 99.2 kPa (Requirement not defined)

MOUNTING METHOD

Type JH-MOD Mounting: The specimen is an array of 2 spaced sound absorbing objects suspended from cables such that the closest face is located approximately 1445 mm (56.875 in.) from the horizontal test surface. This approximates the mounting method of a typical ceiling baffle installation. The objects were evenly distributed in a single row, spaced 305 mm (12 in.) apart. The width of the installed object array was 1207 mm (47.5 in.) and the length of the installed object array was 2718 mm (107 in.). The area of extended continuous surface attributed to the object array was 4.55 m² (49.0 ft²).

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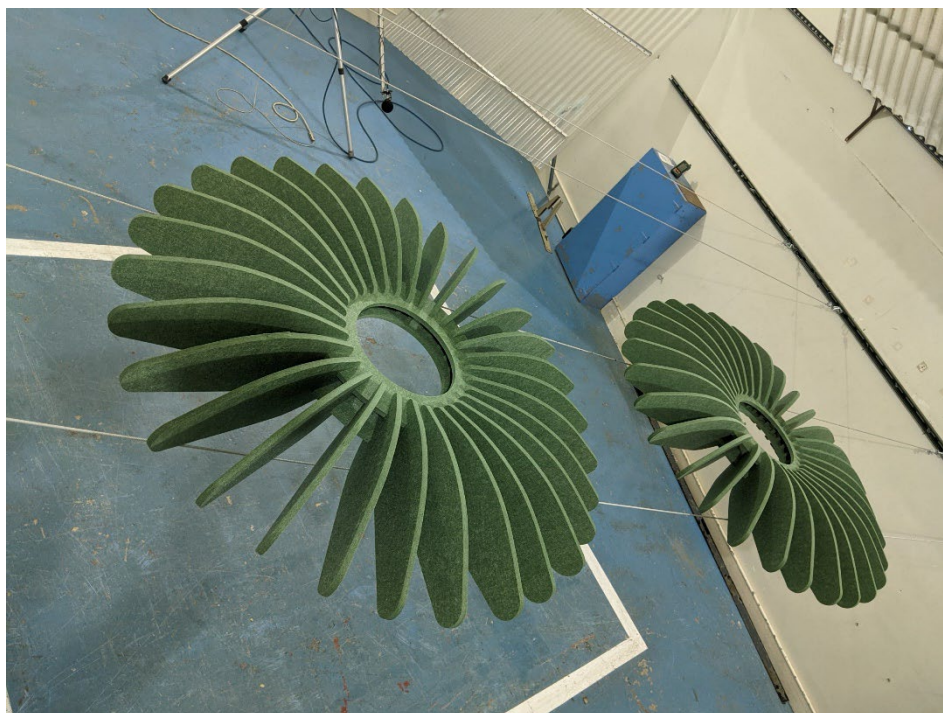


Figure 1 – Specimen mounted in test chamber



Figure 2 – Specimen mounted in test chamber

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Figure 3 – Detail of specimen material

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Page 5 of 9**TEST RESULTS**

The preferred presentation of sound absorption test results for arrays of spaced objects is sound absorption (m^2) per object and total sound absorption (m^2) at each one-third-octave band

ASTM C423-23 Appendix X2 allows calculation of sound absorption per m^2 (SA/m^2) based on the projected horizontal surface area attributable to an array of objects. The extended continuous surface area used in this calculation is to be determined using the following procedure:

$S_{\text{array}} = (w + w_1) \times (l + 0.3)$ If the set of objects consists of a single row of equal sized objects with equal space between each. (ASTM E423-23 X.2.3.2)

Where:

S_{array} = area of extended continuous surface attributed to the object array, m^2

w = the measured width of the installed object array, in meters

w_1 = the distance between objects in the array along the width, in meters

l = the measured length of the object array, in meters

Note: A standard distance of 0.3 meters is added to the array length to account for the assumed area between this set of objects and an adjacent array of objects.

The sound absorption per m^2 (SA/m^2) is calculated based on the following formula:

$$\alpha_{\text{array}} = (A_2 - A_1)/S_{\text{array}}$$

Where:

α_{array} = sound absorption per m^2 (SA/m^2) of extended continuous surface, no units,

A_1 = absorption of the empty reverberation room, m^2 and

A_2 = absorption of the room after the specimen has been installed, m^2 .

S_{array} = area of extended continuous surface attributed to the test specimen, m^2

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TEST RESULTS (continued)

1/3 Octave Center Frequency (Hz)	Total Absorption		Absorption per Object		α_{array} (Sabins/ft ²) (SA/m ²)
	(m ²)	(Sabins)	(m ² / Object)	(Sabins / Object)	
100	0.09	0.93	0.04	0.46	0.02
** 125	-0.20	-2.12	-0.10	-1.06	-0.04
160	0.15	1.57	0.07	0.79	0.03
200	0.21	2.31	0.11	1.16	0.05
** 250	0.19	2.08	0.10	1.04	0.04
315	0.65	7.04	0.33	3.52	0.14
400	0.82	8.82	0.41	4.41	0.18
** 500	1.59	17.09	0.79	8.54	0.35
630	2.01	21.69	1.01	10.84	0.44
800	2.32	24.95	1.16	12.48	0.51
** 1000	2.51	27.06	1.26	13.53	0.55
1250	2.85	30.69	1.43	15.34	0.63
1600	3.06	32.95	1.53	16.48	0.67
** 2000	3.27	35.21	1.64	17.61	0.72
2500	3.42	36.84	1.71	18.42	0.75
3150	3.57	38.46	1.79	19.23	0.78
** 4000	3.67	39.49	1.83	19.75	0.81
5000	3.44	37.06	1.72	18.53	0.76

Array-NRC 0.40 over 4.55 m² of extended continuous surface area

Array-SAA 0.42 over 4.55 m² of extended continuous surface area

Tested by

Marc Sciaky
Marc Sciaky
Senior Experimentalist

Report by

Keith Kimberling
Keith Kimberling
Test Engineer

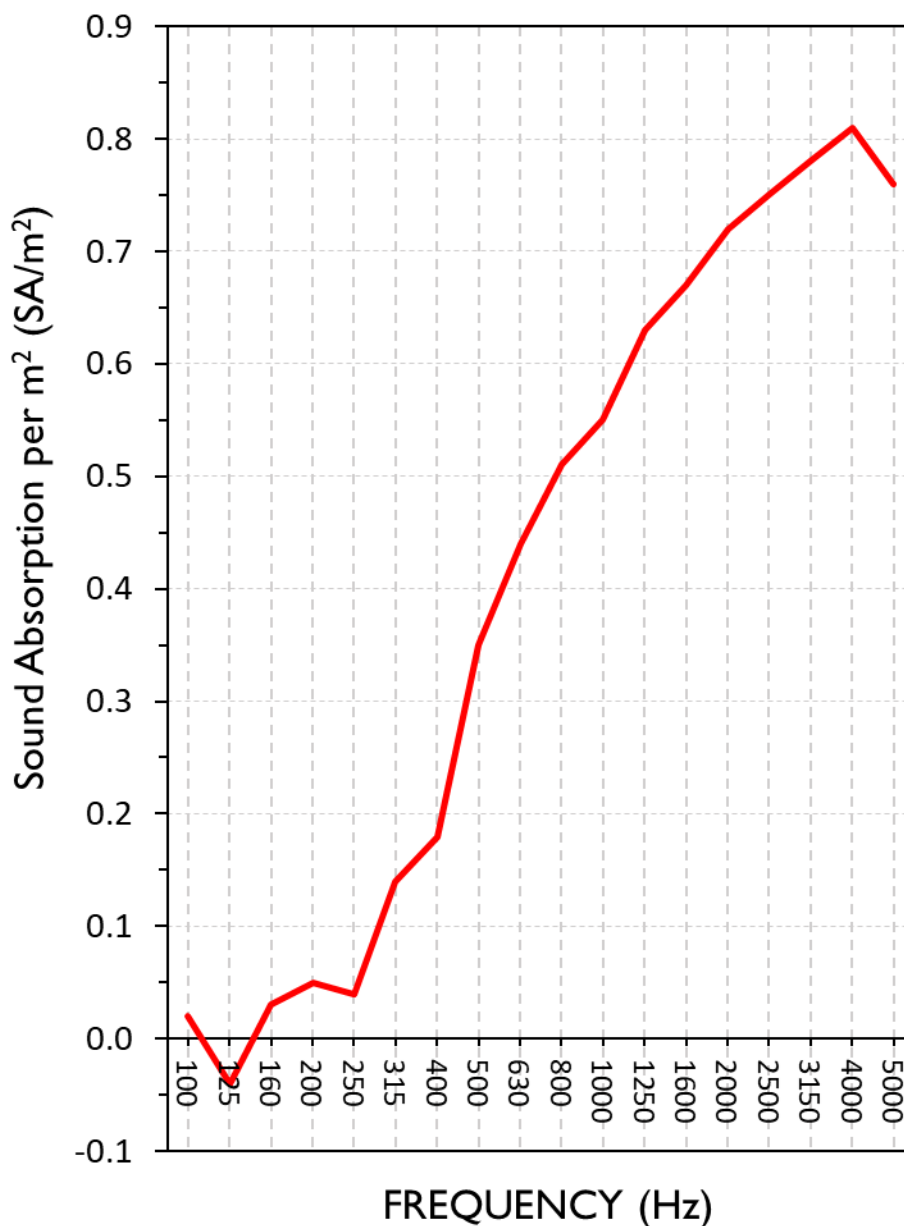
Approved by

Eric P. Wolfram
Eric P. Wolfram
Laboratory Manager

Note: Sound absorption per m² (SA/m²), and therefore the reported Single Number Ratings, are highly dependent on the exact sample shape, size, spacing, and extended continuous surface area present in the test and subsequent calculations. Changes to any of these parameters will change the resulting values. These presented results are valid only for the specific configuration present in this test.

SOUND ABSORPTION REPORT

Hyperfly Cloud (large) 2 units spaced 12" apart



Array-NRC 0.40 over 4.55 m² of extended continuous surface area

Array-SAA 0.42 over 4.55 m² of extended continuous surface area

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APPENDIX A: Extended Frequency Range Data

Specimen: Hyperfly Cloud (large) 2 units spaced 12" apart (See Full Report)

The following non-accredited data were obtained in accordance with ASTM C423-23, but extend beyond the defined frequency range of 100Hz to 5,000Hz. These unofficial results are representative of the RAL test environment only and intended for research & comparison purposes.

1/3 Octave Band Center Frequency	Total Absorption		Absorption per Object		α_{array} (Sabins/ft ²)
(Hz)	(m ²)	(Sabins)	(m ² / Object)	(Sabins / Object)	(SA/m ²)
31.5	0.31	3.36	0.16	1.68	0.07
40	0.27	2.88	0.13	1.44	0.06
50	-0.67	-7.20	-0.33	-3.60	-0.15
63	-0.30	-3.27	-0.15	-1.64	-0.07
80	-0.38	-4.09	-0.19	-2.05	-0.08
100	0.09	0.93	0.04	0.46	0.02
125	-0.20	-2.12	-0.10	-1.06	-0.04
160	0.15	1.57	0.07	0.79	0.03
200	0.21	2.31	0.11	1.16	0.05
250	0.19	2.08	0.10	1.04	0.04
315	0.65	7.04	0.33	3.52	0.14
400	0.82	8.82	0.41	4.41	0.18
500	1.59	17.09	0.79	8.54	0.35
630	2.01	21.69	1.01	10.84	0.44
800	2.32	24.95	1.16	12.48	0.51
1000	2.51	27.06	1.26	13.53	0.55
1250	2.85	30.69	1.43	15.34	0.63
1600	3.06	32.95	1.53	16.48	0.67
2000	3.27	35.21	1.64	17.61	0.72
2500	3.42	36.84	1.71	18.42	0.75
3150	3.57	38.46	1.79	19.23	0.78
4000	3.67	39.49	1.83	19.75	0.81
5000	3.44	37.06	1.72	18.53	0.76
6300	2.90	31.24	1.45	15.62	0.64
8000	2.16	23.23	1.08	11.62	0.47
10000	1.26	13.59	0.63	6.80	0.28
12500	-0.68	-7.34	-0.34	-3.67	-0.15

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APPENDIX B: Instruments of Traceability

Specimen: Hyperfly Cloud (large) 2 units spaced 12" apart (See Full Report)

<u>Description</u>	<u>Model</u>	<u>Serial Number</u>	<u>Date of Certification</u>	<u>Calibration Due</u>
System 1	Type 3160-A-042	3160-106968	2023-07-17	2024-07-17
Bruel & Kjaer Mic And Preamp G	Type 4943-B-001	2525858	2023-05-03	2024-05-03
Bruel & Kjaer Pistonphone	Type 4228	2781248	2023-07-12	2024-07-12
EXTECH Hygro 6015	SD700	A.116015	2023-05-31	2024-05-31

APPENDIX C: Revisions to Original Test Report

Specimen: Hyperfly Cloud (large) 2 units spaced 12" apart (See Full Report)

<u>Date</u>	<u>Revision</u>
2024-02-06	Original report issued

END