canTiLena

A 3-Way, Transmission Line-based Speaker System

by
Paul Kittinger
(aka: Paul K.)
Email: pkitt@columbus.rr.com

The *canTiLena* is a 3-way speaker system featuring a Scan Speak 22W/8857T00 woofer in a single-fold, mass-loaded transmission line (ML-TL). Martin King's Mathcad-based ML-TQWT program was used to model/design the line and cabinet. The TL's actual line length is just shy of 77 inches, which has a ¼-wavelength resonant frequency of 44 Hz. That, in combination with the mass-loading port's size, creates an overall system resonance of ~27 Hz. The cabinet is divided equally front to back with the line starting at the front of the bottom, making a U-turn at the top, and then ending at the bottom of the rear. Polyester batting is placed throughout the front half of the cabinet at a uniform density of 0.8 lb./cu.ft. A system F3 of 30 Hz resulted per the modeling. Cabinet volume is right at 2 cu.ft. [Cantilena basically means smooth, flowing music.]

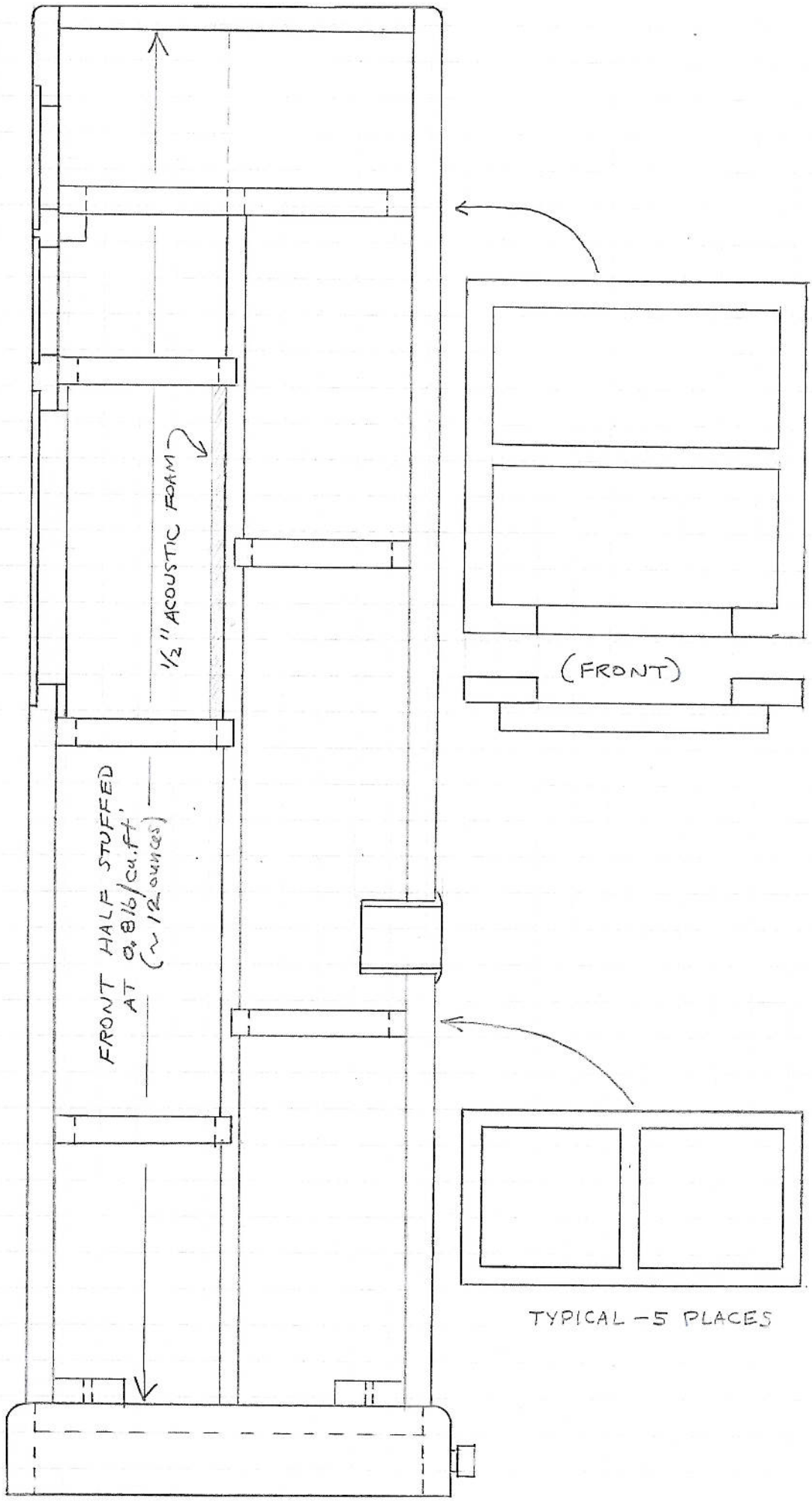
Joining the SS woofer are a Morel MDM55 dome midrange and a Fountek NeoCD1.0 ribbon tweeter. Rick Craig of Selah Audio designed the crossover and because he feels he has developed unique crossover design capabilities for the MDM55 he wants to protect as proprietary information, the values of crossover components are not shown. Allowable for publication, however, are the acoustic corner frequencies of ~800 Hz and ~5 kHz.

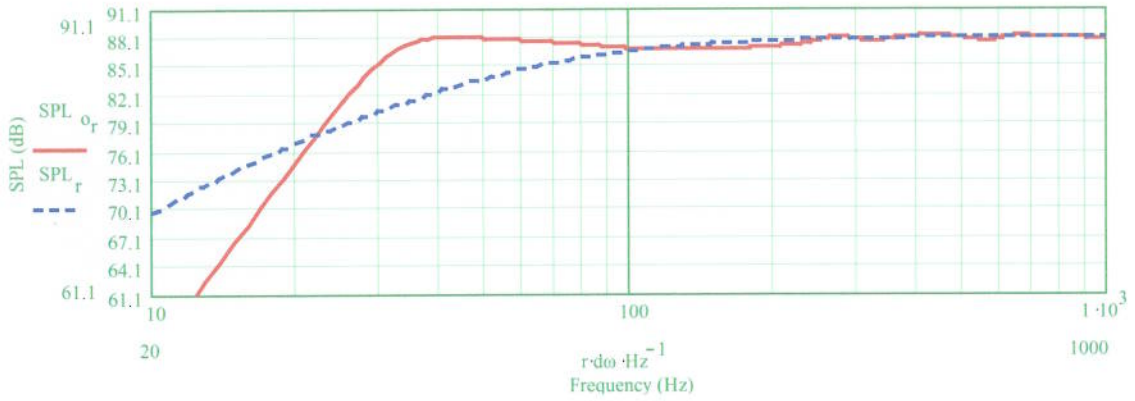
The cabinet's finish is a combination of textured beige paint and solid red oak. Texturing was created by applying 100% acrylic latex paint with a stippling roller; 4 coats of this were applied over 2 coats of white primer. Solid red oak, in ¾-inch thickness, is used to clad the sides and wrap the base; the oak was finished with Golden Oak stain followed by 4 coats of semi-gloss polyurethane. The grille assemblies, covered in brown cloth, are held on by hidden magnets in the backs of the grille frames and fronts of the baffles.

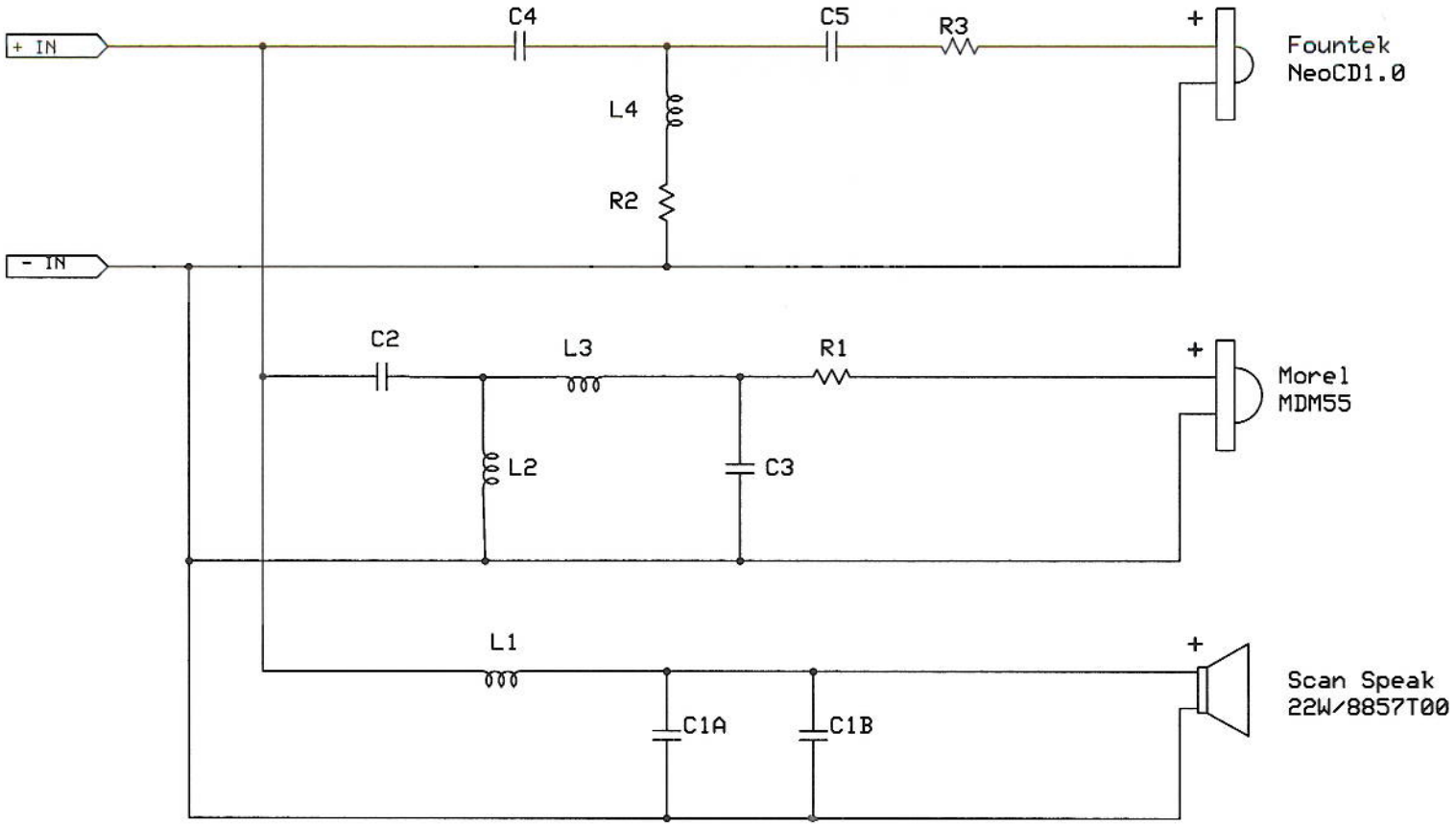
The total height of the system is just over 41 inches, placing the tweeter's center at 37 inches from the floor. Cabinet dimensions, including the side cladding, are 11-1/2 inches wide by 11-1/4 inches deep, and the base is 1 inch wider and deeper. The center divider, the two sides and all 6 "window frame" braces were assembled with dadoes and wood glue. Polyurethane glue was used to attach the half-round top, rear panel and baffle to the top, rear and front edges of the sides and the braces. MDF of ½-inch thickness was used for the center divider and sides, and ¾-inch MDF was used for the 6 braces, rear panel and baffle. In the woofer area, the baffle was made 1 inch thick by gluing on a piece of ¼-inch MDF to its rear.

The crossover uses high-order slopes for the three drivers and all are wired in-phase. The system's nominal impedance is 6.3 ohms, with a minimum of 5.8 ohms. Three of the four crossover inductors are Madisound "standard" air-cores; the inductor in the woofer crossover is a 14-gage Solen air core chosen for its short height and low resistance. Capacitors are Solen polypropylene and resistors are Mills. Since the crossover is mounted upside down in the base where height is limited to 1.25", in addition to choosing the Solen inductor for its height, the required capacitance in the woofer crossover was divided into two equal-value capacitors. 3 dB of BSC are incorporated into the crossover, resulting in a sensitivity of 87 dB. Counting the pair of capacitors in the woofer crossover as a single capacitor, there are 12 components total.

The following 7 pages contain: a side-drawing of the cabinet; a graph from the modeling software showing the system response; the crossover schematic (sans component values); three graphs showing crossover/driver responses at the two corners and on- and off-axis system responses; and, a photo of an installed crossover assembly.

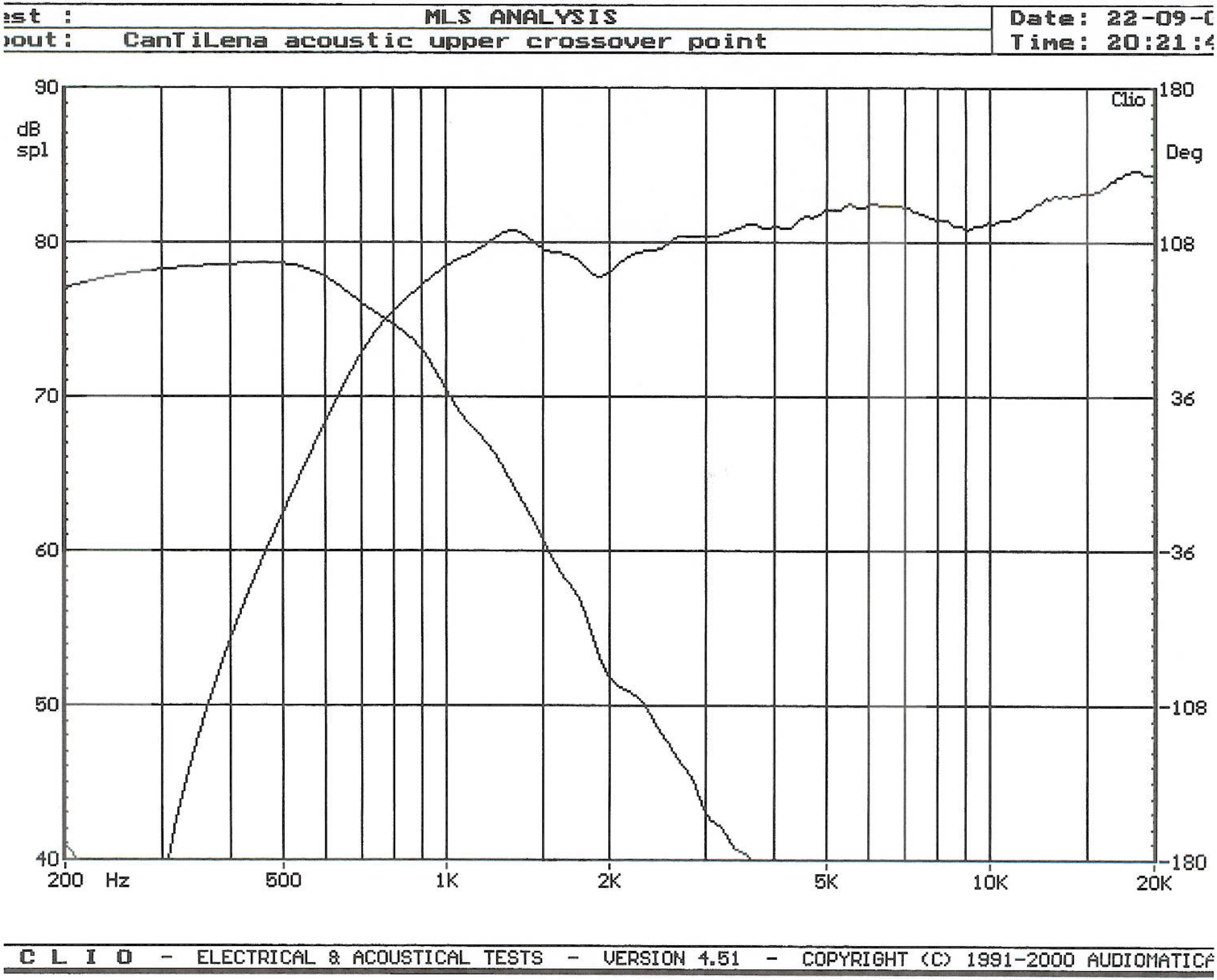

1/2" ACOUSTIC FOAM
FRONT HALF STUFFED AT 0.8 lb/cu.ft. (~12 ounces)
(FRONT)
TYPICAL – 5 PLACES


91.1
91.1
88.1
85.1
82.1
79.1
76.1
73.1
70.1
67.1
64.1
61.1
61.1
SPL (dB)
SPL o r
SPL r
10
20
100
1·10^3
1000
r·dω·Hz^-1
Frequency (Hz)



Component values not shown to honor the proprietary rights of the crossover designer, Rick Craig of Selah Audio

canTiLena		
Crossover Schematic		
	Rev 1.0 18 SEP 2007	Page 1 of 1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pout: CanTiLena acoustic upper crossover point
Time: 20:21:4
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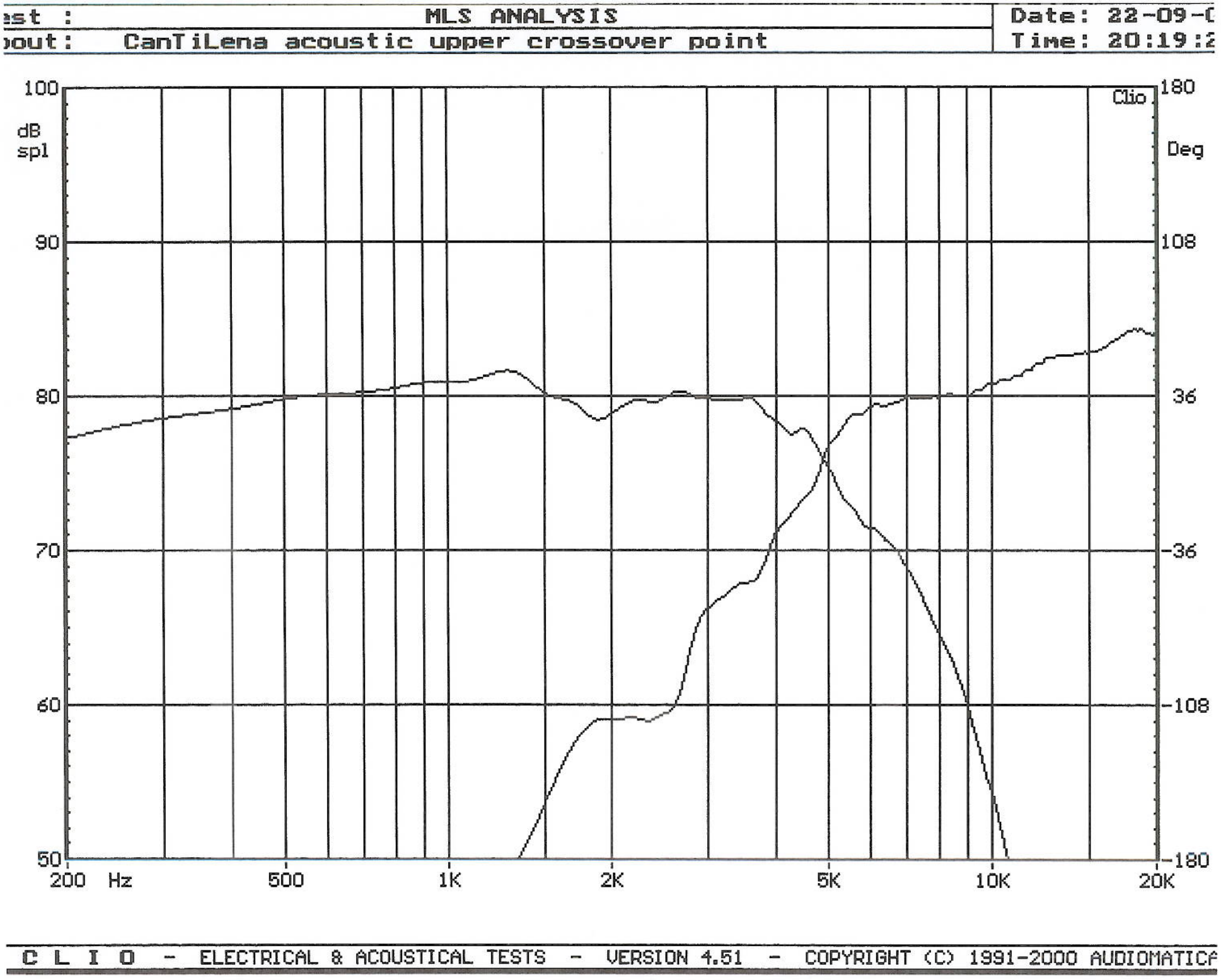
C L I O - ELECTRICAL & ACOUSTICAL TESTS - VERSION 4.51 - COPYRIGHT (C) 1991-2000 AUDIOMATICA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Date: 22-09-(
pout: CanTiLena acoustic upper crossover point
Time: 20:19:2
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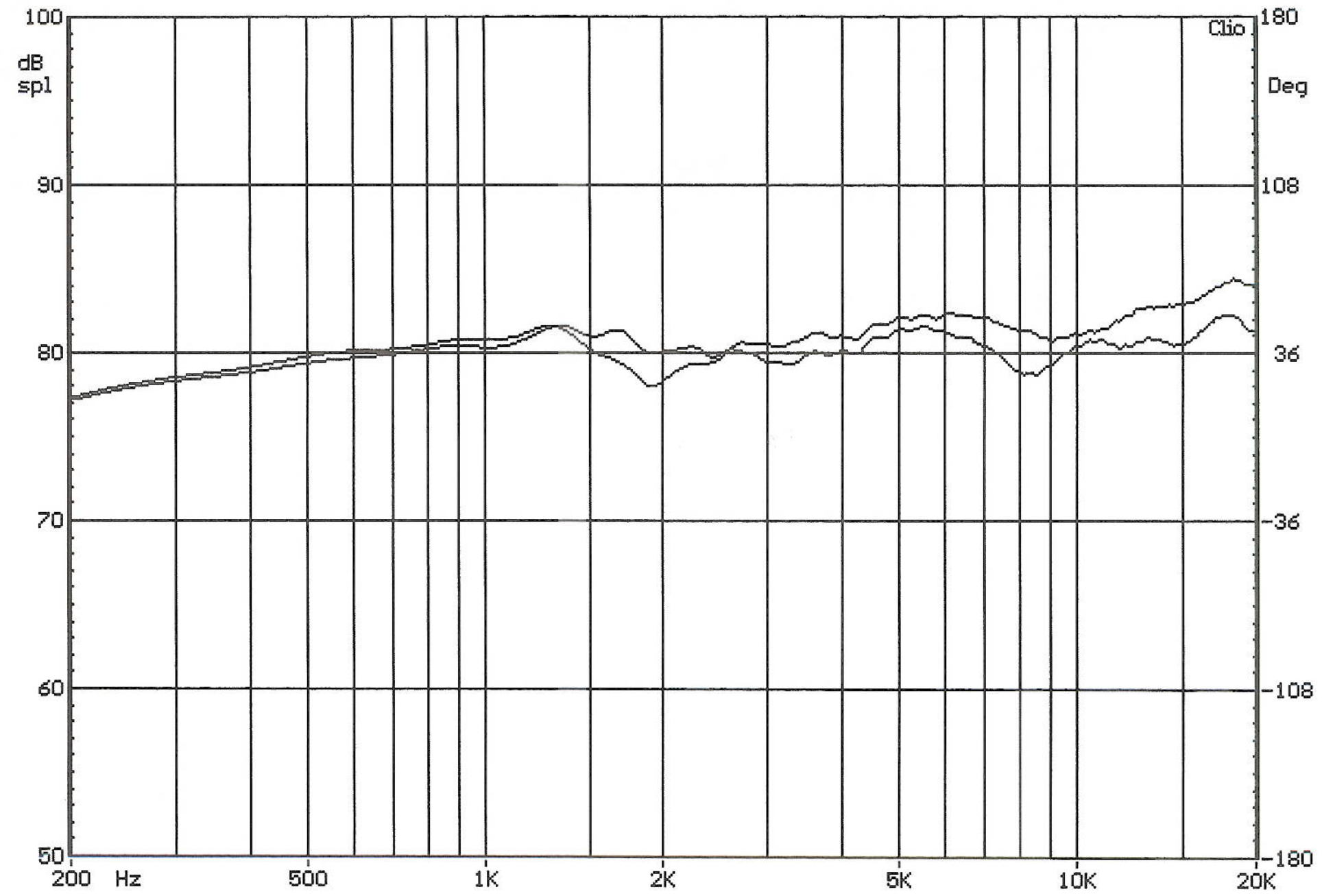

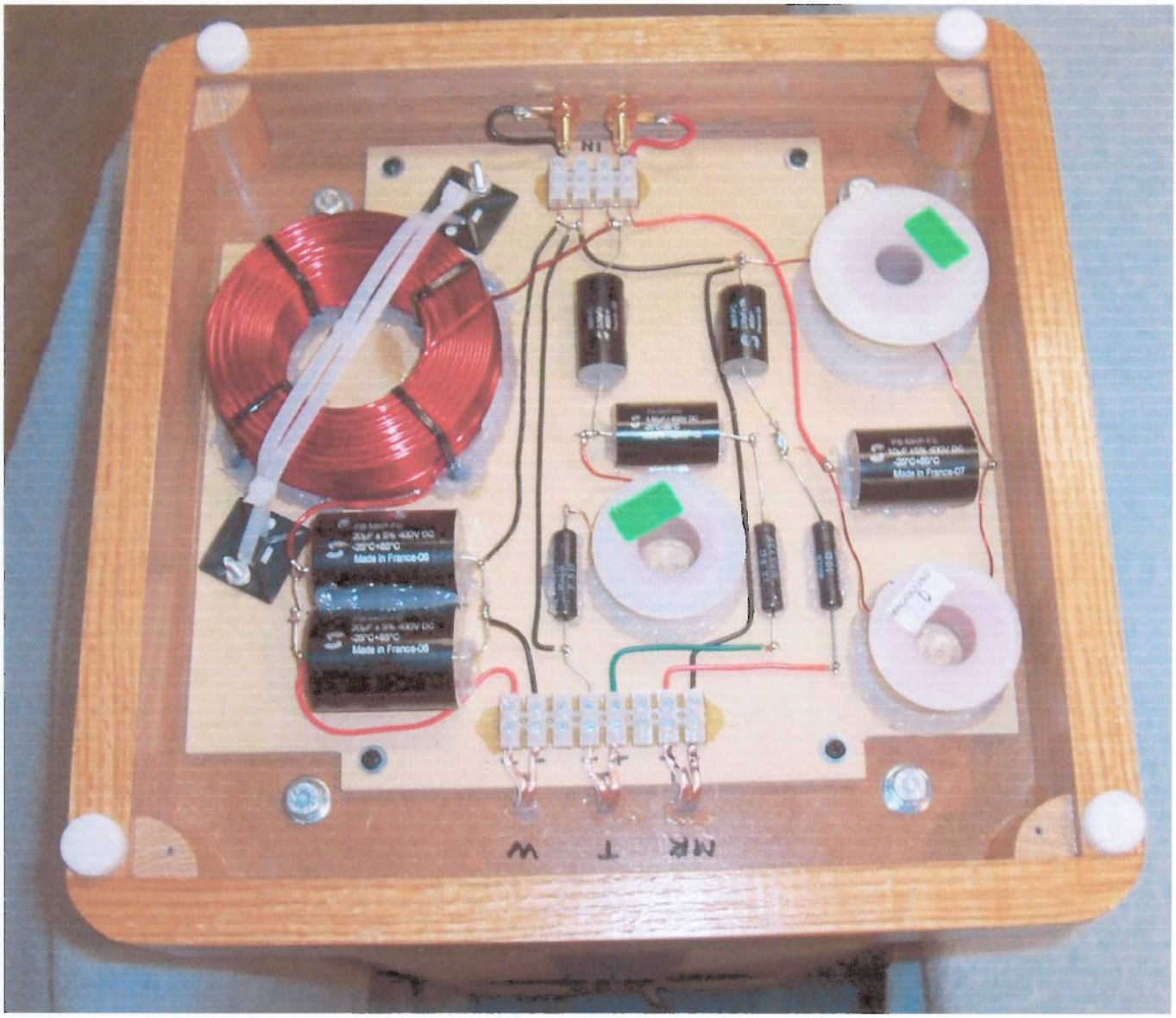
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