PREDICTION MODEL "IMPACT" TO DETERMINE THE ACOUSTIC EFFECT OF NOISE BARRIERS ALONG HIGH SPEED ROADS

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This study is performed to evaluate the model "IMPACT" of prediction of outdoor and traffic noise for barrier attenuation, used by *'Centre de recherche en aménagement et développement (C.R.A.D.), Université Laval'*. This prediction model was compared to the detailed measurements and the calculation model *"Road and Rail Noise: Effects on Housing"* (Canada Mortgage and Housing Corporation).

An experimental campaign was organized in Duberger, Québec City, nearby the freeway *Boulevard de la Capitale*: free flow, grooved asphalt, one side noise barrier, 60912 vehicles/day for Capitale-Est, 63528 vehicles/day for Capitale-Quest, 110km/h vehicle speed. Sound levels were measured at twenty positions at a height of 1.5 meters and at various distances in front of and behind the barrier. In all measuring sites, noise levels were measured in terms of L_{eq} dB(A). Measurement periods lasted a minimum 10 min/run. During the L_{eq} measurements, traffic volume was counted lane-by-lane and classified as automobiles and heavy trucks. Traffic speeds were obtained by a car traveling with traffic.

In order to calculate traffic sound levels, "IMPACT" required: the roadway-barrier-receiver geometry, traffic flow conditions, traffic sound attenuation rates, and adjustments to account for additional attenuation. The highway traffic sound levels reported by "IMPACT" were A-weighted and they were presented in terms of the description L_{eq}. The geometry used in "IMPACT" was 3-dimensional. For the digital process of the basic mapping and for the treatment of the modeling outputs, "IMPACT" was equipped with a module for data exchange with the software *Microstation*. In order to provide the program with the coordinates of the receivers, roadways and barriers, a plan of the side under investigation was obtained. The plan showed all existing structures, (houses, roads, freeway, etc.) as well as the elevations and features of the surrounding terrain. This model produces an output file for use by the noise level design program.

Using the model *Road and Rail Noise: Effects on Housing* (CMHC) to calculate L_{eq} for the roadway traffic noise prediction for the verification of the "IMPACT" results was also studied. The reference level was calculated at a distance of 30 m from the center of the road. Step-by-step procedure: traffic count, base noise level, correction for road gradient, determination of equivalent source height, correction for distance, and correction for barriers. All the corrections were then included to take into account the usual propagation variables.

CONCLUSION

The differences between experimental measurements and the results of the "IMPACT" model are appreciably low for the noise level. The agreement is satisfactory between the CMHC model and "IMPACT" mode. The results are shown in Figure.1.

There are some differences between "IMPACT" and measured noise levels at certain positions behind the barrier, such as No.2, No.7, No.12, and No.17. It seems the effects of sound transmission varies through the barrier. It is recommended that the research be supported and actively followed for an upcoming project that will develop an "IMPACT" model in sound transmission of the barrier.

Even in these cases the differences between "IMPACT" and measured noise levels are within the range of measured ones. This lets one say that the determination of the sound field with provisional models is satisfactory enough to avoid expensive and useless experimental campaigns of measurements.

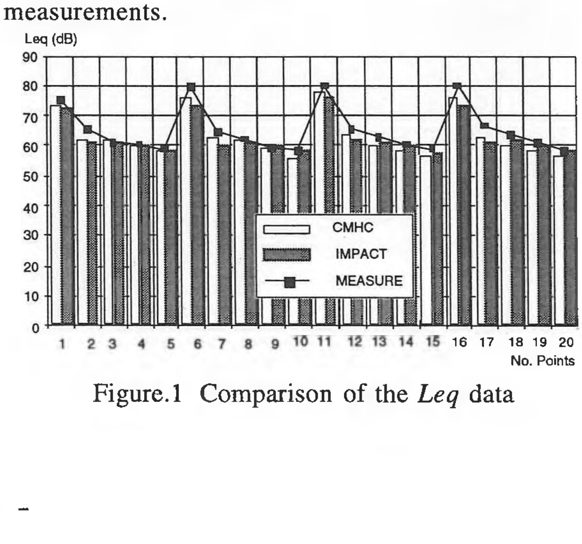
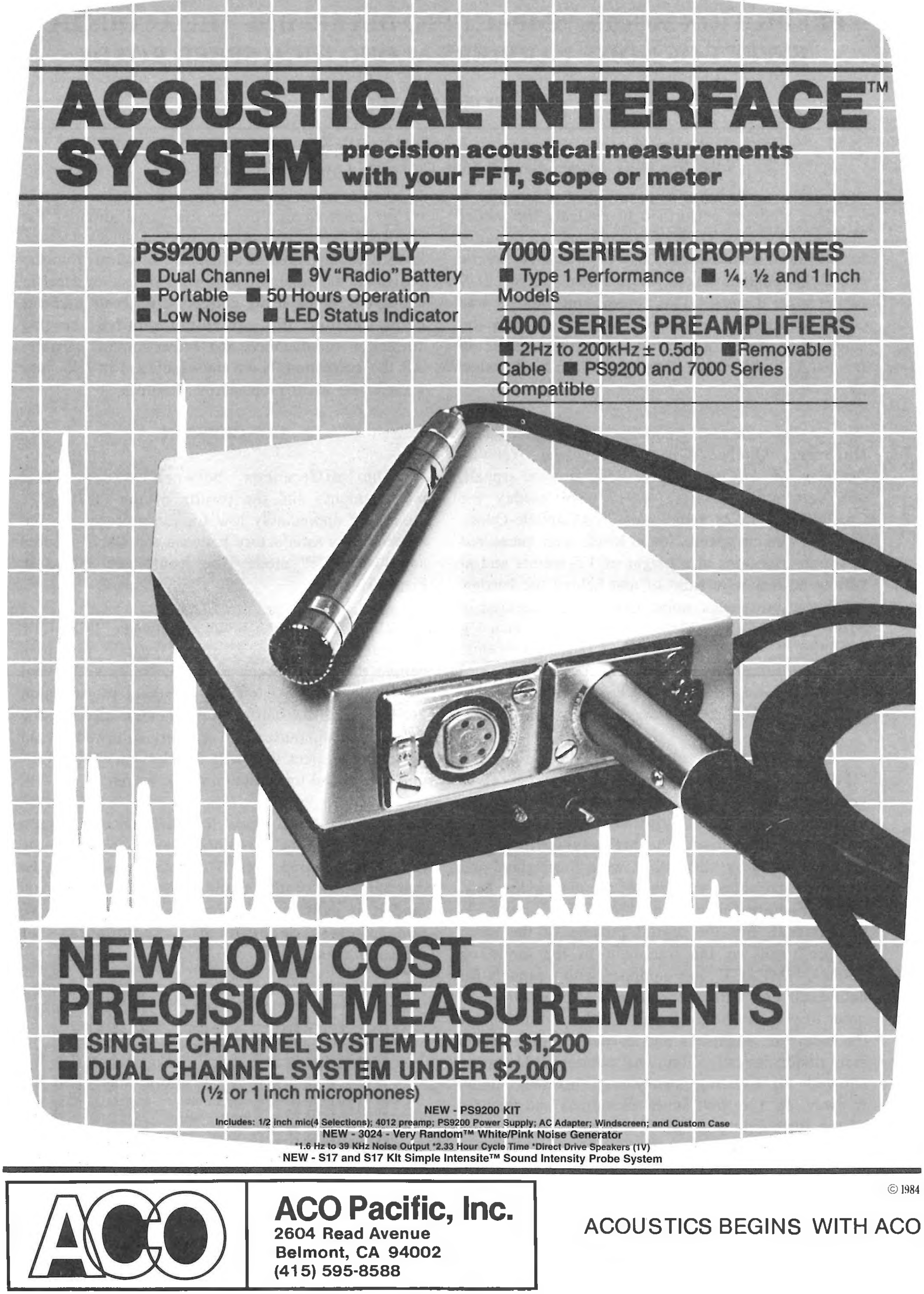


Figure.1 Comparison of the *Leq* data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