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Test Procedure for Compatibility of Hearing Aids and Ultrasonic Lighting Control Devices

National Electrical Manufacturers Association

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Hearing Aids and Ultrasonic Lighting Control Devices

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Foreword

This publication has been developed to address the potential for interference between hearing aids and ultrasonic lighting control devices (occupancy sensors). Some occupancy sensors may occasionally interfere with normal acoustic signal processing in some digital hearing instruments causing significant noise and distortion of the signal. This publication provides a basis to evaluate the possible interactions between ultrasonic lighting control devices and hearing aids utilizing a set of test procedures. This evaluation can be used as the basis for specifying performance criteria for both hearing aids and occupancy sensors to eliminate interference complaints.

The Lighting Controls Section of NEMA reviews this test procedure periodically for any revisions necessary to keep up to date with the latest technological advances. Proposed revisions or comments should be submitted to:

Senior Technical Director, Operations
National Electrical Manufacturers Association
1300 North 17th Street, Suite 900
Rosslyn, VA 22209

Members of the NEMA Lighting Controls Section developed this Standards Publication. Section approval of this Standard does not necessarily imply that all section members voted for its approval or participated in its development. At the time it was approved, the Lighting Controls Section was composed of the following members:

Acuity Brands Lighting
Eaton's Cooper Lighting
GE Lighting
Hubbell Building Automation
Leviton Lighting & Energy Solutions
Lutron Electronics Company, Inc.
OSRAM SYLVANIA
Philips Lighting Electronics North America
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Schneider Electric
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Section 1
General

1.1 Scope

This Standards publication sets forth test procedures for use with a small acoustic chamber to evaluate potential interactions between hearing aids and ultrasonic lighting control devices, hereinafter referred to as occupancy sensors. The test procedures are designed to simulate and test occupancy sensors at three typical, specific frequencies (25 kHz, 32.7 kHz, and 40 kHz) and one type of hearing aid. However, if there are multiple hearing aids, the test procedures are repeated as many times as necessary.

1.2 References

This document is based on the report of David F. Henry and Barak Dar, *Effects of Ultrasonic Occupancy Sensors on Hearing Aids*, dated February 22, 2006.

1.3 Test Equipment

Test equipment to be used includes:

a. 2CC acoustic coupler
b. Acoustic test chamber
c. Milli-voltmeter, or oscilloscope
d. Ultrasonic occupancy sensor transducers
e. Voltmeter
f. Wave function generator

1.4 Reference Ultrasonic Transducers

Three sets of ultrasonic transducers (transmitter and receiver) are used to perform the compatibility testing. Each transducer set is tuned to one of the common ultrasonic occupancy sensors operating frequencies, i.e., 25, 32.768, or 40 kHz. The transmitter is calibrated to produce a known sound pressure level at the 12 in. (30 cm) specification distance and the receiver is calibrated to produce known electric output signal levels with specified input levels. An example of transducer data is shown in Table 1-1.

Table 1-1
Example Reference Data for Ultrasonic Transducers

ID	Frequency	Transmitter Specification Voltage (V_{SPEC})	Specification Distance – D_{SPEC} (in. [cm])	Sound Level Meter - SPL_{SPEC} (dB)	Receiver – R_{SPEC} (V_{P-P} square wave)
25	25 kHz	20 VP-P [square wave]	12 in. (30 cm)	111	976
32	32.768 kHz			115	1200
40	40 kHz			117	1170

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