

# PLAI™ Methodology: The First Easy for All Audiological Test



neuraniX

TRANSFORMING AUDIOLOGY DIAGNOSTICS

# Easy for the doctor

## What traditional diagnostic technique problems are solved for the doctor?

- **Simplified examinations** procedures eliminate the problems posed by conventional pediatric impedance testing reported by **63% of experienced practitioners** responding to an independent questionnaire.\*
- **Faster and easier use** lets **pediatricians** perform all the fundamental tests in treating Otitis.

- **42%** of audiometry technicians affirm that it is **difficult** to perform an exam that requires the exertion of **pressure** on patients with current ear pathology.\*
- Use by **Family Pediatricians** filters out non-critical issues to reduce **unnecessary examinations by specialists** at Otolaryngology-Pediatrics services.

- **Objective monitoring of the course of pathology** enables more precise dosage of care in line with WHO (World Health Organization) recommendations.
- The **absence of pain** caused to the patient allows smoother outpatient clinic activity and meets the expectations of the population.

\*White Paper: "Pros and Cons of traditional tympanometry: the customer's voice" - Dr. Flavia Sorrentino - Dr. Marco Greggio, September 22

# Easy for the patient

## What traditional diagnostic technique problems are solved for the patient?

- **No change in pressure** means that **none of the pain** that **93%** of Otitis media patients undergoing conventional examinations report is created.\*
- Tympanic membrane status can be **verified and monitored** even only a few days after **surgery**— otherwise impossible with conventional instruments.

- **Objective verification of the healing process:** patients can learn whether they are improving or not even during acute disease phases without any stress.
- More-detailed health records for children are provided with quick and **painless objective assessment**.

- Much faster examination than conventional systems **shortens waiting time**.
- Use as **monitoring** during infection contributes to the **reduction of prescribed medications**.
- Patients monitored by family physicians are referred to **specialists with greater confidence and accuracy**.
- **Reduces unnecessary check-ups and patient travel** for decreased social costs.

*"Finally, after 50 years, a great technological innovation takes place in the field of audiology."*

**DR. DOMENICO LEONARDO GRASSO**  
Specialist in Otolaryngology at Burlo  
Garofolo IRCCS Maternal and Children  
Health Center- Trieste



PLAI™

**PRESSURE LESS ACOUSTIC IMMITTANCE**

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# Pressure Less Acoustic Immittance

**Patented technology**  
PLAI™ (Pressure Less Acoustic Immittance) is a methodology patented by Neuranix developed through collaboration with CNR (National Research Center).

**94%<sub>AUC</sub>**

**AUC (Area Under Curve)**  
This statistical evaluation parameter was developed through the clinical trials performed and provides a useful value in diagnosing otitis.

**86%<sub>SPECIFICITY</sub>**

**Specificity** in recognizing healthy conditions.

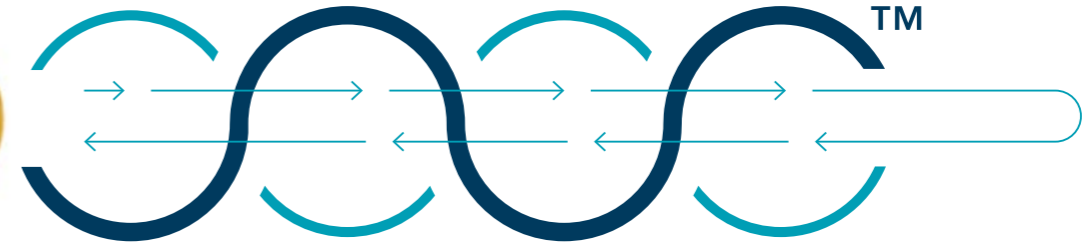
**Easy to use**  
PLAI™ methodology provides a significant reduction in the complexity of devices: no pump system that changes the pressure of the external ear canal is required. This also reduces the risks of downtime and improves safety for patients.

**Specialist Diagnosis**  
is facilitated by statistical algorithms that can give useful indications when testing in pediatric primary outpatient settings.

**Test result morphology storage** permits comparisons of patient examinations and ensures data evaluation over time: at the onset of pathology, between different screenings, or at the beginning of a pathology.

**med·wave®**

**Simplifies** examination of apprehensive and emotionally fragile patients.



**87%<sub>SENSITIVITY</sub>**

**Sensitivity** in estimating the ability of a test in detecting pathologies.

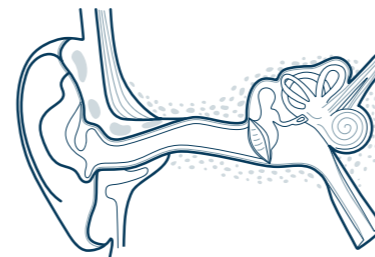
**Non-invasiveness** means peace of mind for the patient, operator and family members. Peace of mind matters to us.

**Safety.** Everything has been developed around the concept of safety: from the ease of sanitizing the touchscreen to the shape of the probe with replaceable and disinfectable tip holder.

**PLAI™ impulse:** the only instrument using truly multifrequency stimulation with chirps ranging from 100Hz to 1500Hz.

**The test is performed in seconds** without requiring time to check the pressure tightness and positioning that poses a problem reported by experienced practitioners in 21% of cases.\*

Extremely **simplified operator approach** allows even personnel with limited experience to perform fast and accurate testing.



\*White Paper: "Pros and Cons of traditional tympanometry: the customer voice"- Dr. Flavia Sorrentino - Dr. Marco Greggio, September 22

## The highest expression of PLAI™ technology

Current tympanometer technology has the disadvantage of requiring pressure on the tympanic membrane and in the middle ear while measurement lasts for several seconds.

Med-Wave® is the first non-invasive, painless test that applies no pressure to the ear, representing a substantial evolution in the audiological field.

Med-Wave® provides clinical data that can be integrated into the patient's management plan and provide guidance towards further diagnostic procedures.

Med-Wave® technology enables the assessment of the tympanic membrane over a wide range of frequencies.

The information is captured through the evaluation of the sound energy emitted by the PLAI™ probe.

Proprietary software is then used to analyze the data and show the acoustic admittance component curves for a functional interpretation of tympanum elastic behavior.



### APPLICATION AREAS



#### PAEDIATRICS

examines and monitors middle ear pathologies and assesses the healing process of otitis



#### AUDIOLOGY

Fast and precise objective evaluation of the middle ear status

#### ENT

evaluates the middle ear functionality before and after middle ear surgery without causing trauma



FIND OUT MORE ON  
[NEURANIX.COM/MED-WAVE/](https://neuraniX.com/med-wave/)

# The best way to comprehend all the advantages of new PLAI™ technology is by “listening” to the men and women who played a part in its invention

SCAN THE QR CODE  
AND READ THE INTERVIEWS!



PROF. DOMENICO STANZIAL

Scientific Director of the Research Section of the CNR-IDASC Department of Physics at the University of Ferrara  
Researcher at the IMM-CNR of Bologna  
Professor of Acoustical Energy at the Ph.D. course in Physics at the Univ. of Ferrara  
Full Member of the Acoustical Society of America

Expert in Applied and Theoretical Acoustics with particular attention to the development of Acoustical Energy models.

I've always been very interested in acoustics, and when I started studying the technology behind conventional tympanometry, I learned that these outdated measurements procedures were taken without using Pressure-Velocity technology, **a rather invasive procedure for patients** due to the change in static pressure inside the ear canal.

**I studied a methodology that lets the acoustic Velocity signal be obtained and processed using the two- microphone technique.**

We began this research with curiosity to evaluate the results of the experiment measuring the flow of acoustic energy inside the ear.

The simplest way to explain the methodology is **the Helmholtz bottle experiment**: if you take a resonant cavity in your hand and blow into it, a sound that is the product of the breath emitted into the bottle and the sound that comes out of it is emitted. In this case, excitation and resonance occur at the same time with sound absorption.

Applying this to audiometry, the outer ear's absorption is handled by the eardrum. If the eardrum becomes too soft or stiff, the response changes in frequency.

**Neuranix has expressed interest in developing the new technology in the medical sector.**

Neuranix experience in the veterinary sector has led it to develop the technology also for application in humans, which I think vaunts enormous potential for future development also in the field of otoemissions.



ENG. EMANUELE ACCARDO

Electronic Engineer and R&D Manager at Neuranix

**The device guarantees a complete overview of acoustic impedance, a complex entity composed of both a real and an imaginary part. This patent provides responses to both aspects that allow more information to be obtained in shorter time than those provided by a conventional tympanometer.**

An innovation necessarily requires the choice of new materials and shapes never produced before. Constructing the probe alone required the study of numerous variants and cutting-edge components that required numerous tests and modifications before a handy, practical, and easy to use product could be delivered.

Collaboration with the CNR (National Research Center) at the start was fundamental in studying the measurement acquisition and probe calibration required for the first prototypes. Cooperation with doctors and veterinarians was also fundamental in deepening the correlation between the physical parameters and the clinical conditions of the patients.



DR. ANTONELLA VERCELLI

Veterinary and sanitary director at the "Clinica Veterinaria Città di Torino

I started using Vet-Wave® three years ago. Right from the start, it was clear to me that it was a practical and interesting tool to be introduced in the field of otological examination.

**Unlike traditional human tympanometers that operate with the use of pressure, Vet-Wave® creates no discomfort.**

Most animals can be examined **without requiring sedation**. The device also has important applications **in observing the variation of the tympanic function over years**, and in monitoring tympanic membrane status during and after otitis and also during a video-otoscopy.

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AND READ THE INTERVIEWS!



ENG. PETER ZOTH

Founder and President of Fischer-Zoth Founder of Path Medical and Forerunner of universal hearing screening

**PLAI™ (Pressure Less Acoustic Immittance)** is an objective test of the integrity and compliance of the eardrum. Otitis Media, Tympano-Perforation, and the integrity and mobility of the ossicular chain can be easily diagnosed with **high specificity and sensitivity**.

The measurement requires only a few seconds. For these reasons, PLAI™ technique provides an ideal surplus in the **pediatric field and easy access to patients and children who are too sensitive for measurement techniques that exert pressure**.



DR. FLAVIA SORRENTINO

Surgeon Doctor in Audiology and Phoniatrics, researcher at the University of Padua-Department of Neuroscience

I believe that PLAI™ technology will be appreciated because it goes beyond the limits of conventional technology. It has been designed for a more complete assessment of the state of the middle ear. Compared to previous technology, it has a wider field of application and is **better tolerated by the patient**, which makes the execution of the examination easier and more accessible to health professionals.

PLAI™ provides a broad-spectrum measurement of the acoustic admittance of the ear. It is a highly innovative development for diagnosing children.

**PLAI™ offers an important new piece to the pediatric diagnostics puzzle, facilitating the pediatrician's task significantly.**

The probe is easier to handle, and because no pressure is required, the examination poses fewer problems. Furthermore, the fact that the test is also **painless makes the patient more collaborative and examination better.**



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Neuranix is an innovative company which develops and produces medical devices for both human and veterinary practitioners.

Neuranix owns an exclusive patented technology, based on which two families of products have been designed and developed: Vet-Wave® and Med-Wave®. The disruptive and patented technology of Neuranix is based on a methodology called PLAI™ Pressure Less Acoustic Immittance.

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