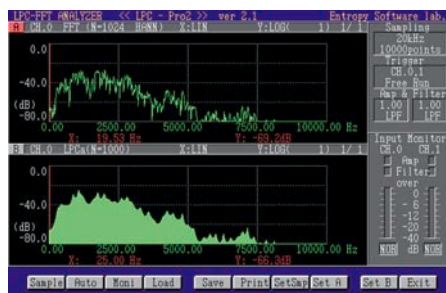


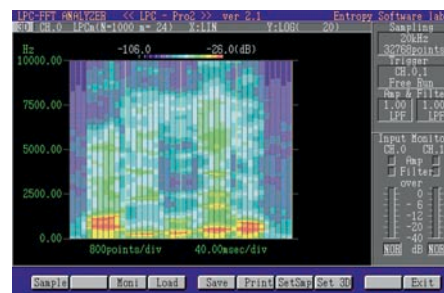
# Detects minute frequency changes in sounds. LPC SPECTRUM ANALYSIS

- The LPC-FFT analysis block performs analysis on the LPC spectrum, FFT spectrum, rotary spectrum, large scale FFT, the LPC transfer function, FFT transfer function, FIR digital filters, correlation functions and filter simulations.
- By specifying the time zone sampled from the 32768 point-waveform data, the FFT and LPC spectrum are displayed on one screen for frequency analysis by comparison.
- The rotary spectrum analysis resolves complex rotary motions into frequency components of clockwise circular motion and counterclockwise circular motion and displays both components.
- The amplifier and filter signal levels are displayed to control waveform deformation caused by excess input level.
- Analysis processing is possible for both the AD conversion block input waveform and the disk file waveform.
- The waveform and spectrum data can be output to a disk file in text file format. This enables the output data to be used with general commercial application software.

(See the LPC-Pro2 SOFTWARE FUNCTIONS)



FFT spectrum (upper graph) and  
LPC spectrum (lower graph)  
analyzing machine noise



LPC spectrum 3D display  
analyzing acoustic waves of "aueo"  
(voice prints)

## What is LPC (Linear Predictive Coefficient) spectrum analysis?

In 1967, Burg reported on a new spectrum analysis method called MEM (Maximum Entropy Method) for analysis of seismic waves. Because the MEM is able to obtain a high resolution spectrum from transient signals including seismic waves, MEM application has spread to the study of geomagnetic variations, solar cycles and voice recognition since the 1970s. It also goes by other names including AR (auto-regression) and LPC (Linear Predictive Coefficient) in these studies. The MEM, however, has not spread to other general fields due to the heavy calculation load that prevents real-time processing. However, the recent development of high-speed microprocessors has achieved LPC spectrum real-time processing, enabling the LPC spectrum analysis to be applied to many fields.

## Features of respective spectrum analyses

In the digital signal processing field, the following two spectrum analysis methods are famous; the FFT method reported in 1965 and the LPC method reported in 1967.

### 【Features of FFT】

Fast Fourier Transform

Calculations are small. The frequency resolution is  $\Delta f = (1/T)$  Hz for waveform data length T seconds. The FFT is suitable for steady-state wave signals with long waveform data length T.

### 【Features of LPC】

Linear Predictive Coefficient

Frequency resolution  $\Delta f$  can be specified regardless of the waveform data length T. Calculations are large. The LPC is suitable for transient signals with short waveform data length T.



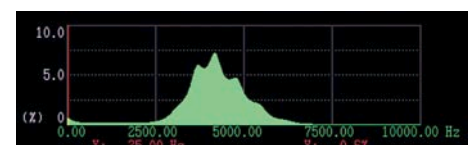
FFT spectrum



Waveform of transient waves in time domain



LPC spectrum



LPC spectrum