



# VOCAL DOSE MEASURES: SAFETY LIMITS FOR VOCALIZATION



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**Organizers:**



# VOICE MISUSE AND ABUSE

**Raffaele Pisani**



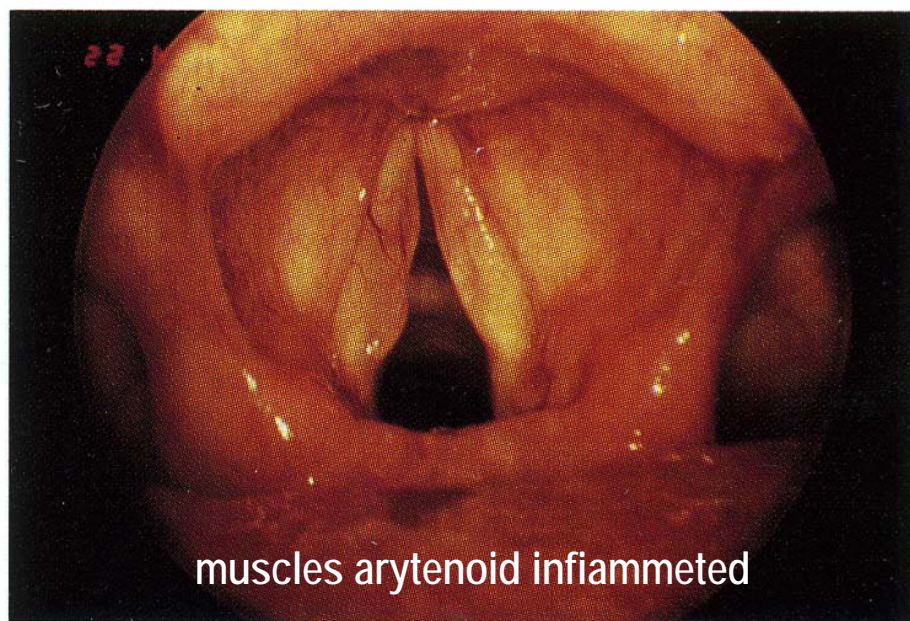
**Misuse and abuse of the phonatory mechanism may take some forms of specific tissue changes in the vocal folds.**

**These changes include vocal nodules, polyps, cysts, edema, laryngitis, contact ulcer, granulomas, etc.**

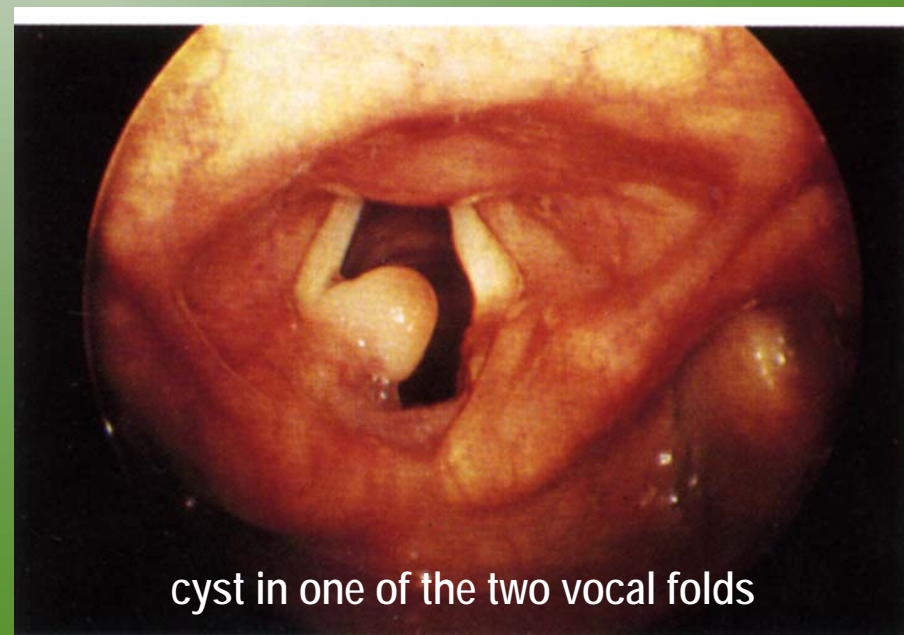
## TISSUE CHANGES IN THE VOCAL FOLDS

The mechanic actions can cause reversible and irreversible damages. The last ones can be removed only by surgery operations.

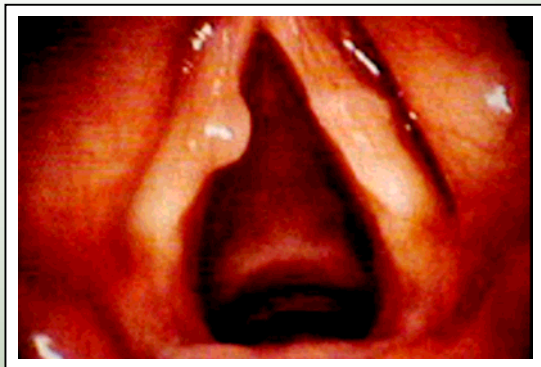
### REVERSIBLE DAMAGE



### IRREVERSIBLE DAMAGE



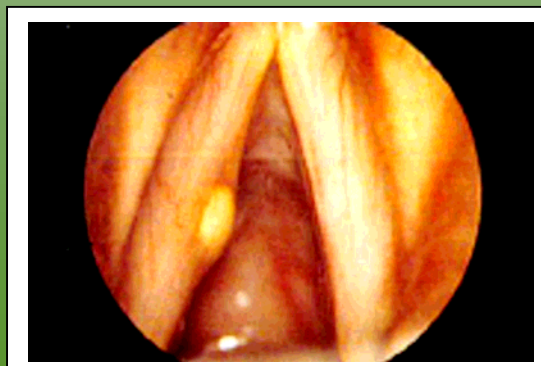
## TISSUE CHANGES IN THE VOCAL FOLDS



**A single vocal fold polyp**



**Large sessile polyp involving the entire length of the vocal fold**



**Intracordal cyst**

Who uses voice for professionals  
are more subjected of some  
traumas to vocal folds and  
laryngeal mucosa than others:

ministers

sports coaches

singers

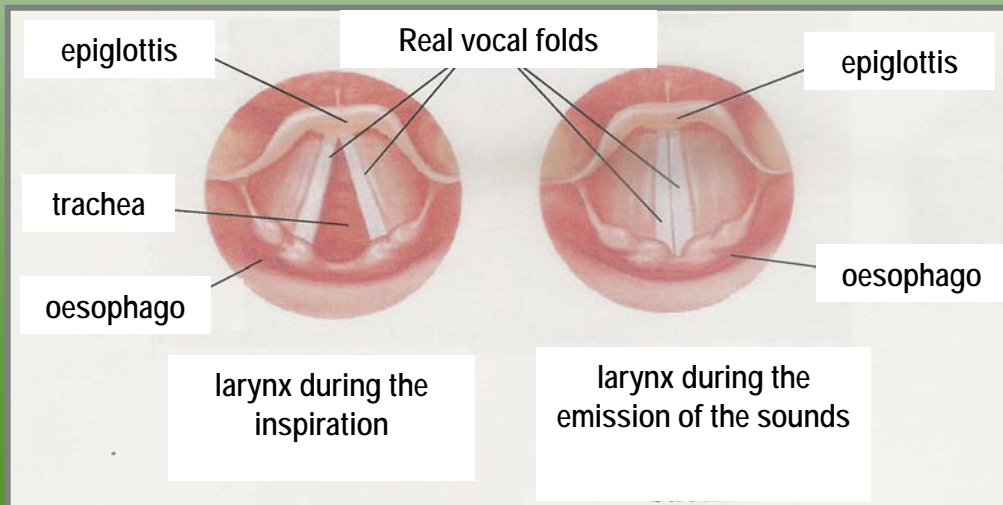
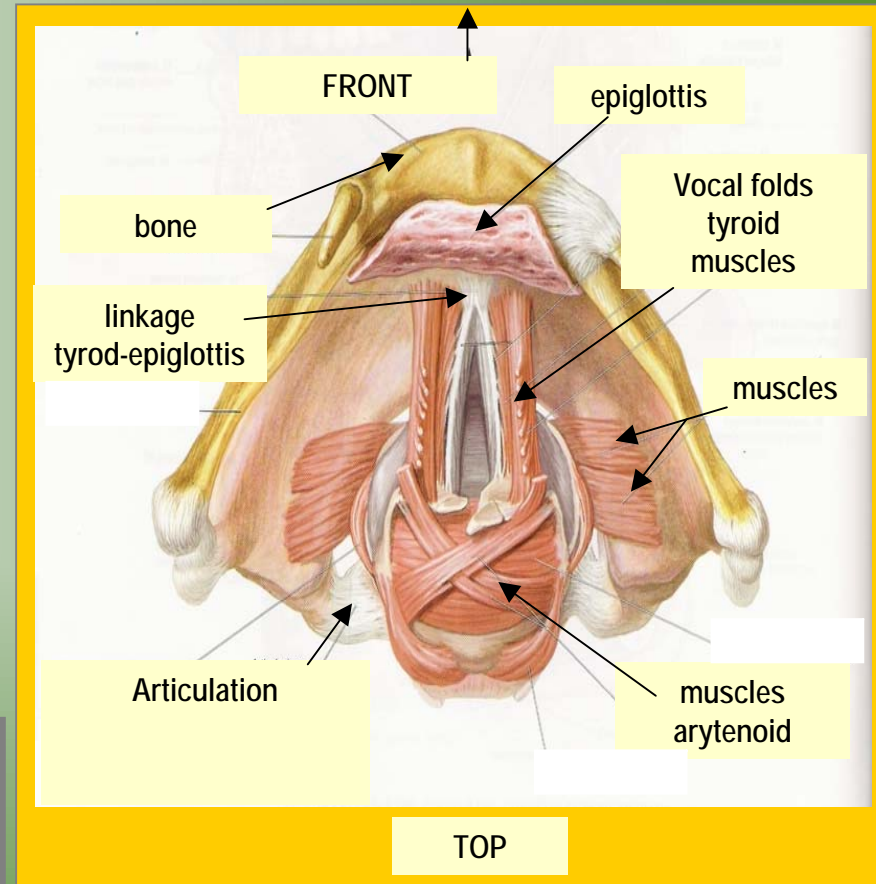
speakers

actors

teachers...



## THE MECHANISM OF PHONATION

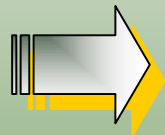


**The mechanism for loudness requires the creation of increased resistance of the laryngeal valve until an appropriate level of air pressure is produced and released**

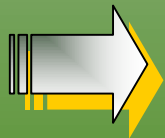
**The vocal folds must be adducted strongly to create the increased medial compression required for this valving capability.**

**The laryngeal mucosa, especially along the glottal edge, may become irritated, inflamed and swollen**

**The abuse of the voice may result in altered mass and affect the stiffness of the cover of the vocal folds. Vibratory behaviour is changed and reflected in the sound of the voice**



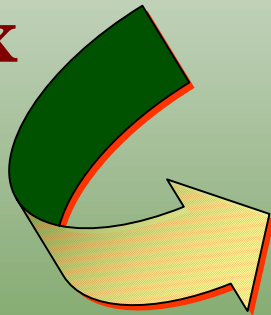
**The capacity to fully adduct the vocal folds may be altered by mass lesions and this will change the sound of the voice**



**Leakage of air through an incompletely closed glottis is heard as noise and adds a breathy component to the voice**



The number of collisions between the vocal folds during the speech is deduced from the fundamental frequency detected by an accelerometer located at the lower frontal part of the neck, between the thyroid gland and larynx

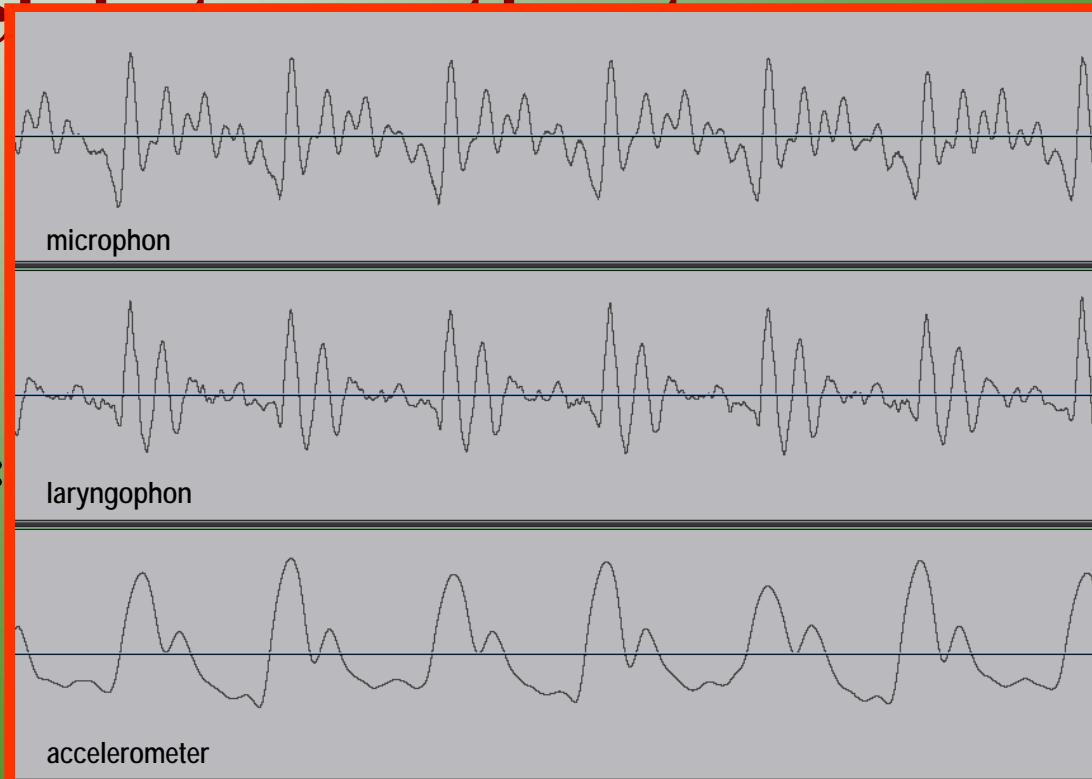


Comparison between:

*microphon signal*

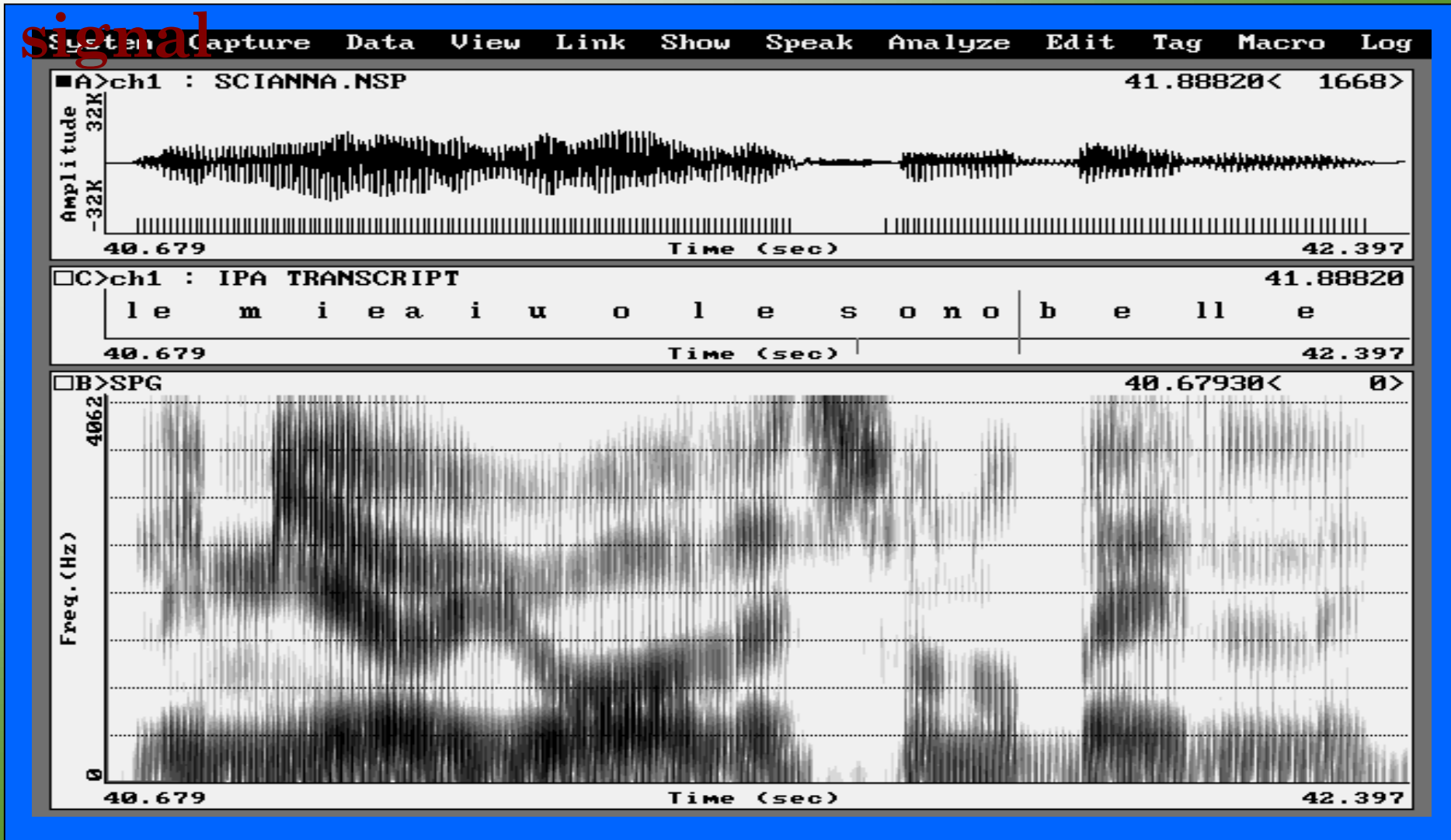
*laringophon signal*

*accelerometer signal*

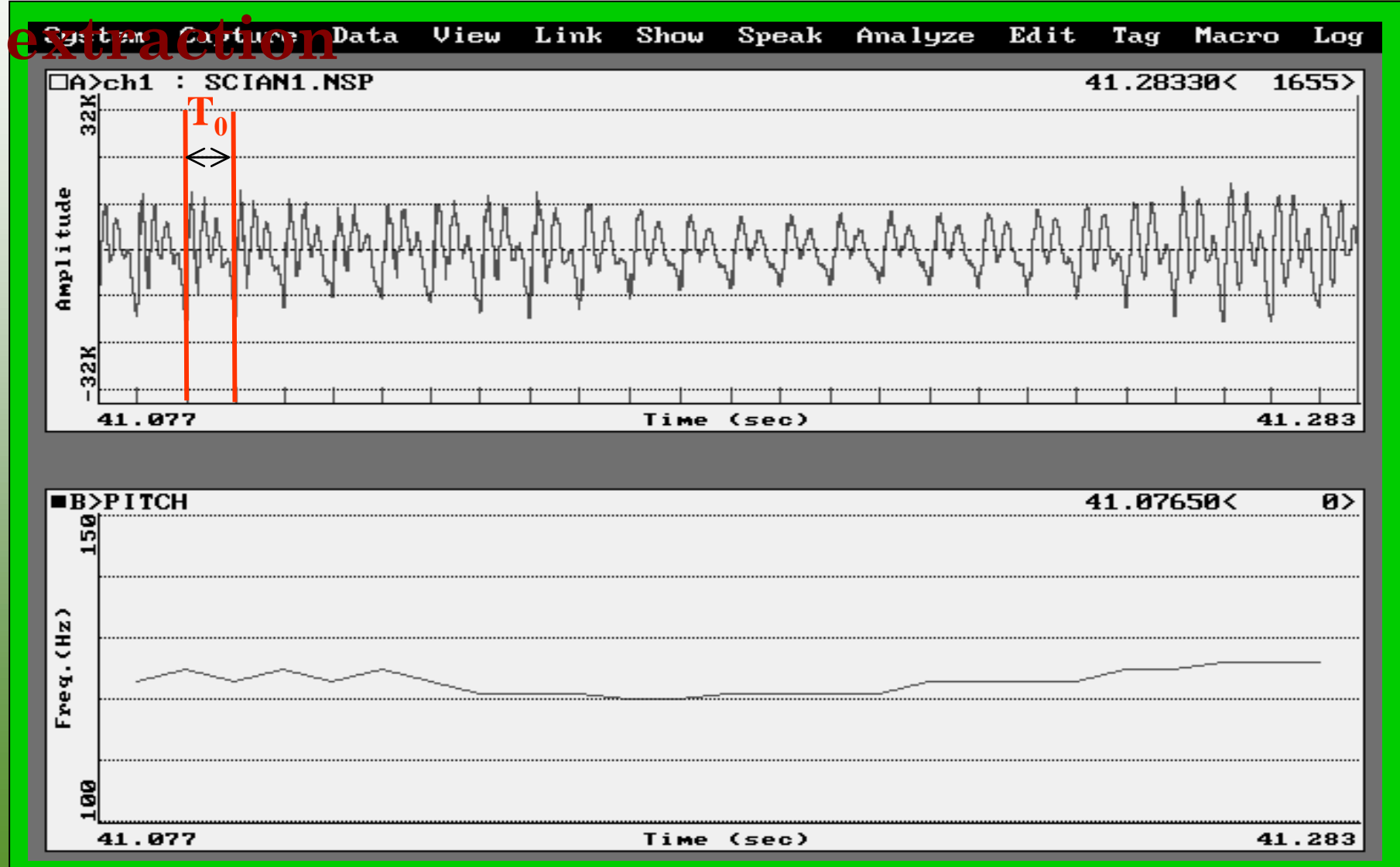


## A male speaker: sonagram of the speech

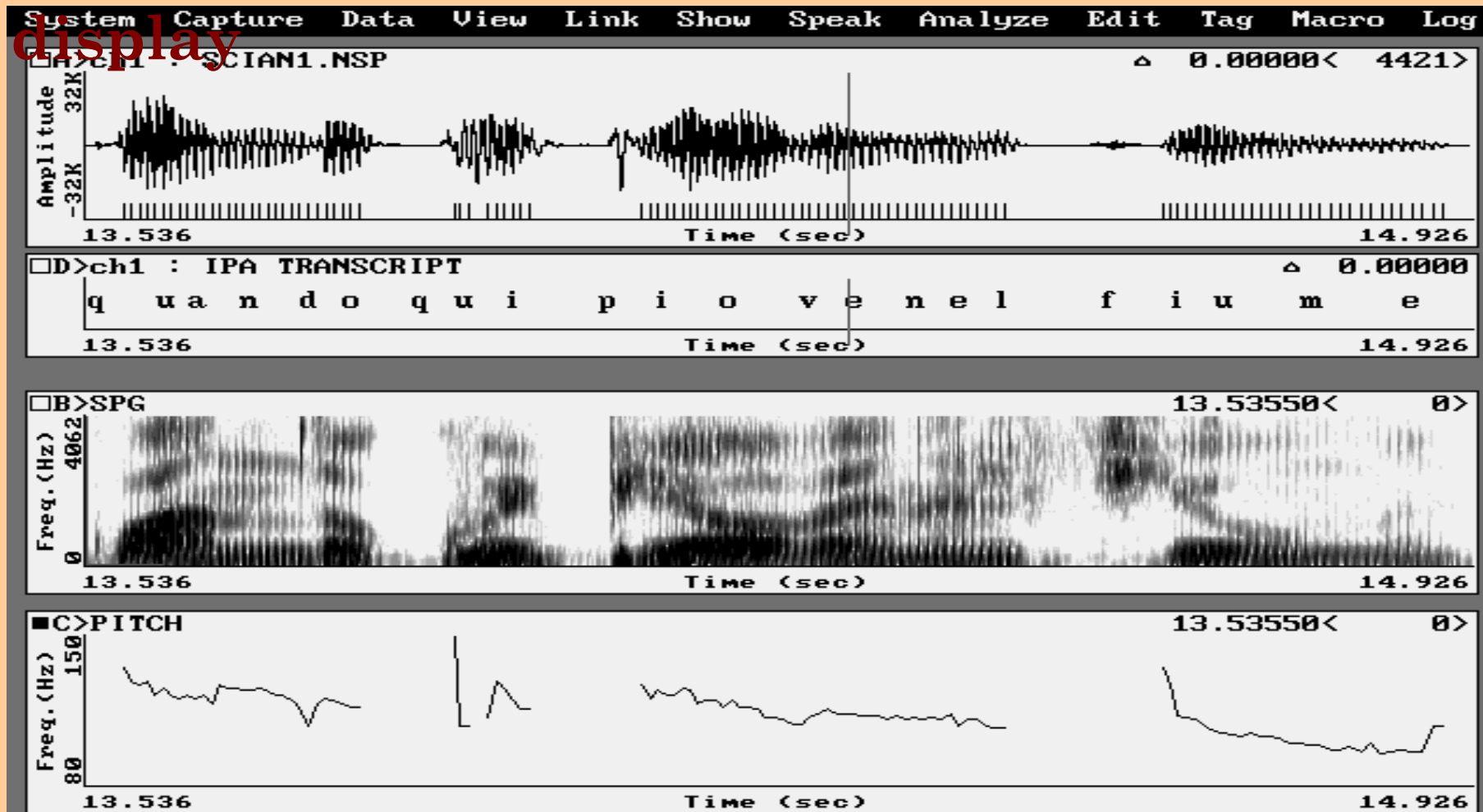
signal



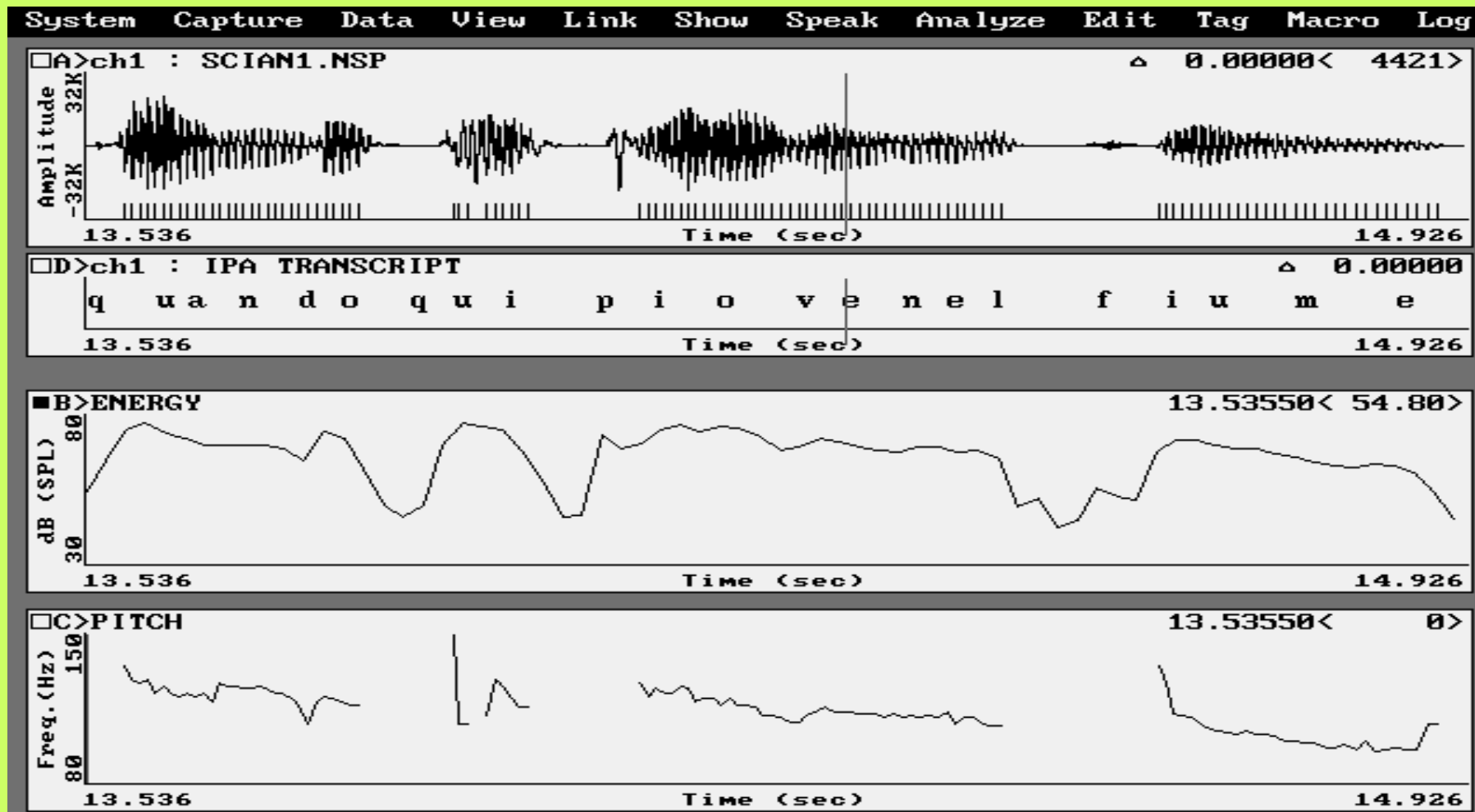
## Fundamental frequency



## Each glottal pulse is marked of the waveform display



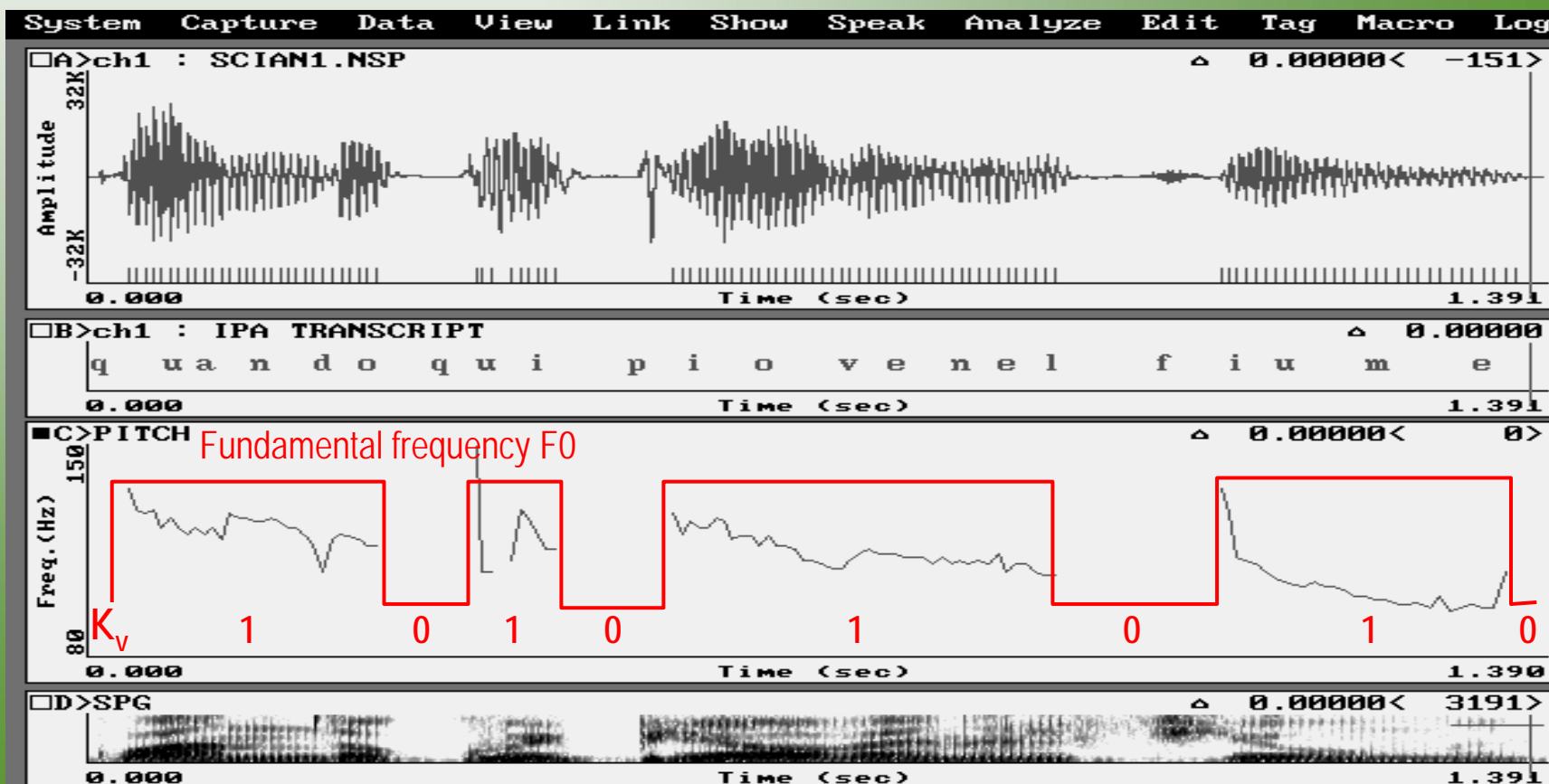
## Fundamental frequency and energy calculation (intensity of the vocal emission)





## Time Dose ( $D_t$ )

Quantizes the set time of the vocal folds vibrations during the whole period of the vocal emission



## JONAS BRUNSKOG (Denmark)

**discuss the results of investigations on teacher's vocal effort in simulated classrooms. The simulation in laboratory of a general acoustic classroom, where twenty two subjects read a text with a loud voice in different noise conditions, is analysed: this shows a defined correlation between environmental noise and vocal doses.**

## ERIC HUNTER (United States)

presents safety limits for vocalization with the developments of the vocal thresholds, feedback and a vibration dose exposure. More, a recovery model of dermal wound healing is presented. Safety limits for vocalization and guidelines are discussed. The translation of the model in the field of whole body and hand vibration exposure is very important particularly in relation to standards and thresholds

## RENATA SISTO (Italy)

resume the problem of the vocal effort by the vocal dose measurement in occupationally exposed workers.

## ARIANNA ASTOLFI (Italy)

presents case studies and help to understand vocal dosimetry in the field of primary schools teachers during the working days. The aim of the research is to investigate the influence of the acoustic parameters measured in the classrooms and the teachers vocal doses accumulated



# TO CONCLUDE

To sum up workers that use voice for job could be involved in occupational voice diseases like whom work in high noise levels. For this subject is important to define a risk ranking of larynx damages and increase the research in this new field.