



**ACOUSTIC IMPACT REPORT ON THE USE  
OF MASKS FOR WIND INSTRUMENTS AND  
THE SINGING VOICE**

**STUDY CONDUCTED AT THE REQUEST OF**

**ATQ QUIMYSER S.L.U.**  
Trav. Riu Serpis, 1  
46723 - ALMOINES (Valencia)

**STUDIBOR-MARMITA**

*Recording studio*

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**ACOUSTIC IMPACT REPORT ON THE USE OF MASKS FOR WIND INSTRUMENTS**

MODELS EMPLOYED IN THE TEST FOR WIND INSTRUMENTS

**To be used by the musician on their face:**

1- HYGIENIC MASK FOR ADULT 3 LAYERS ADAPTED. (With opening for embouchure).

2 - BLACK HIGH-BREATHABILITY MASK ADAPTED FOR INSTRUMENTS. (With opening for embouchure).

**To be placed on the instrument bell:**

3.1 SPECIFIC MASK FOR WIND INSTRUMENTS 1 LAYER

3.2 SPECIFIC MASK FOR WIND INSTRUMENTS 3 LAYERS

Masks 1 and 2 have no effect whatever on the sound, as the connection between the lips and all types of instrument mouthpieces is direct. Use should be decided on the basis of how comfortable the player feels. Therefore, no comparison has been drawn between them.

The analysis was carried out with the direct sound, and this was compared with each of the masks 3.1 and 3.2.

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**FIRSTLY, WE OBSERVED THE BEHAVIOUR WITH A TRUMPET**

4 SAMPLES WERE RECORDED

Long held note Bb2

Long held note Bb3

Long held note F4

Rising and falling scale in Bb

3 TAKES WERE RECORDED OF EACH

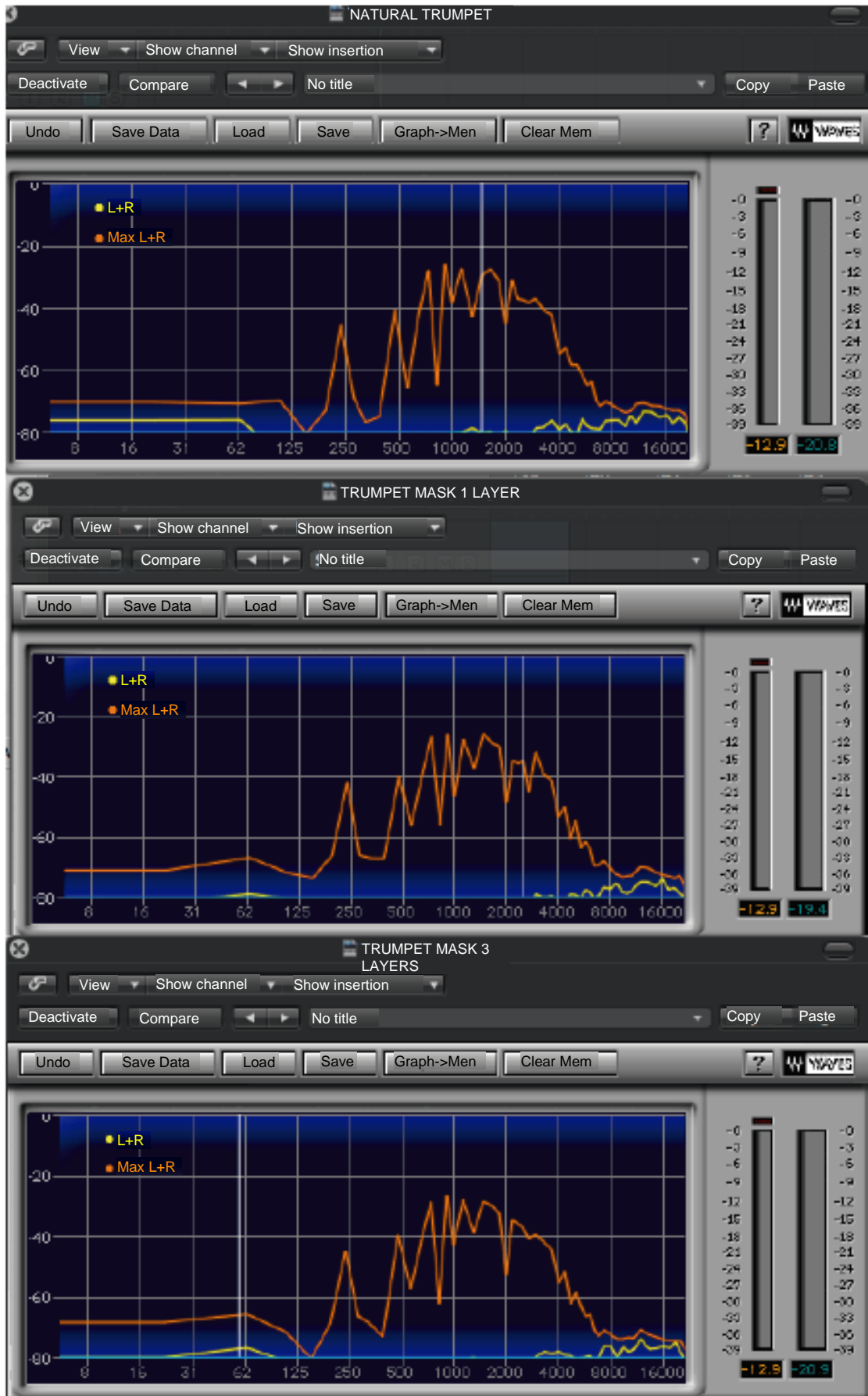
Natural (without mask)

With the mask 2 and the wind instrument mask 3.1 of 1 layer

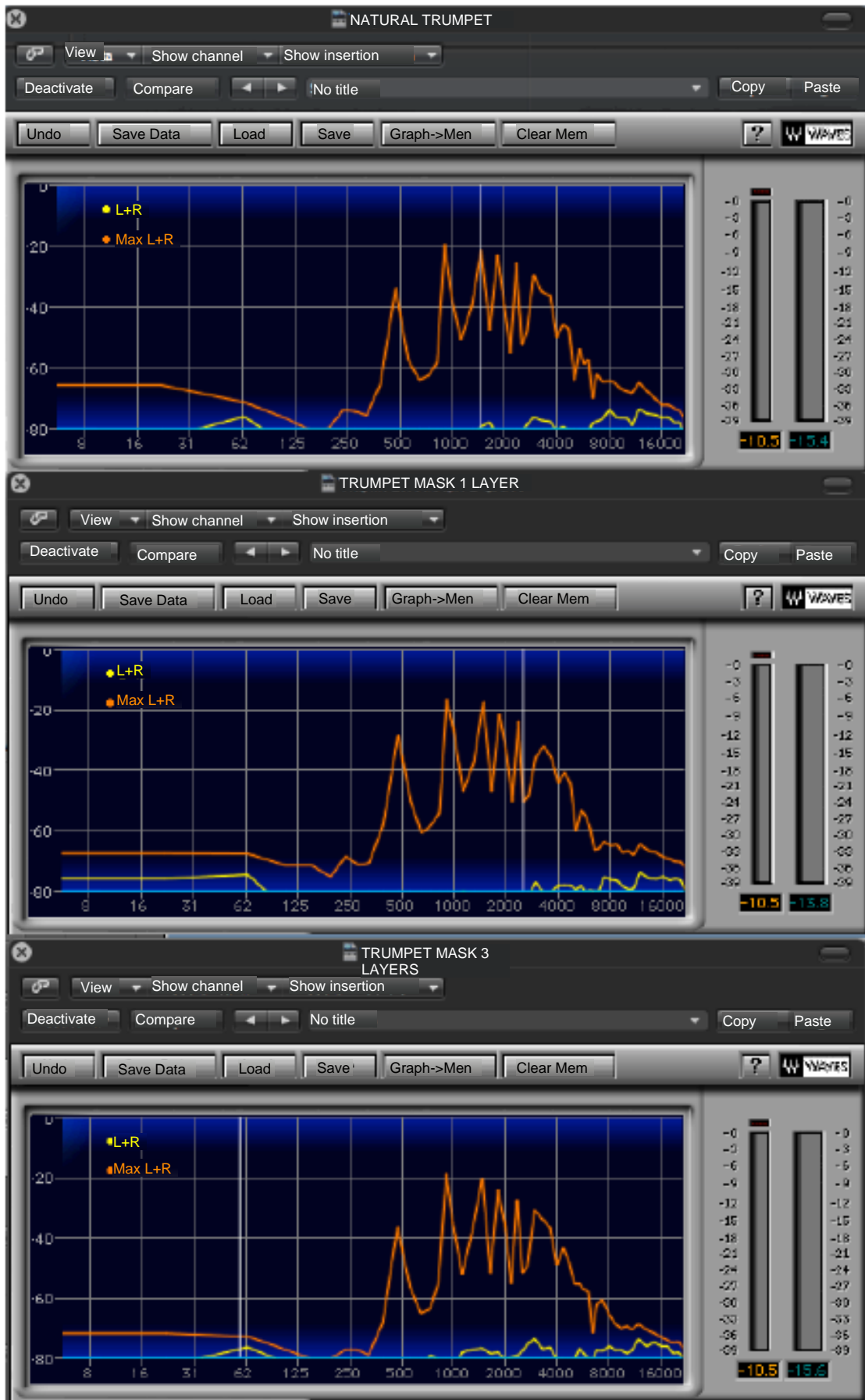
With the mask 2 and the wind instrument mask 3.2 of 3 layers

WE INCLUDE THE COMPARISONS FOR THE WHOLE PROCESS

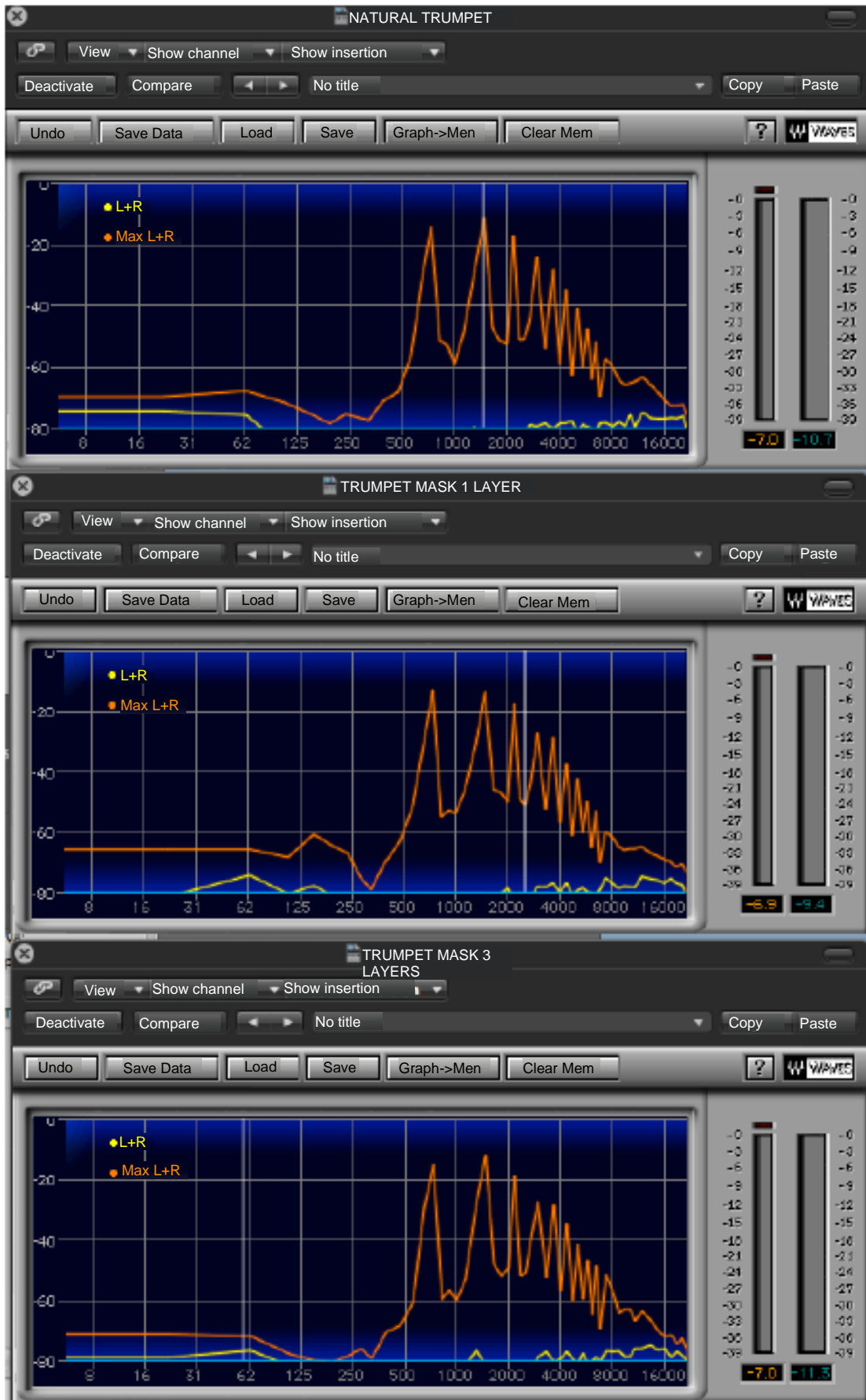
COMPARISON TRUMPET - HELD NOTE Bb2



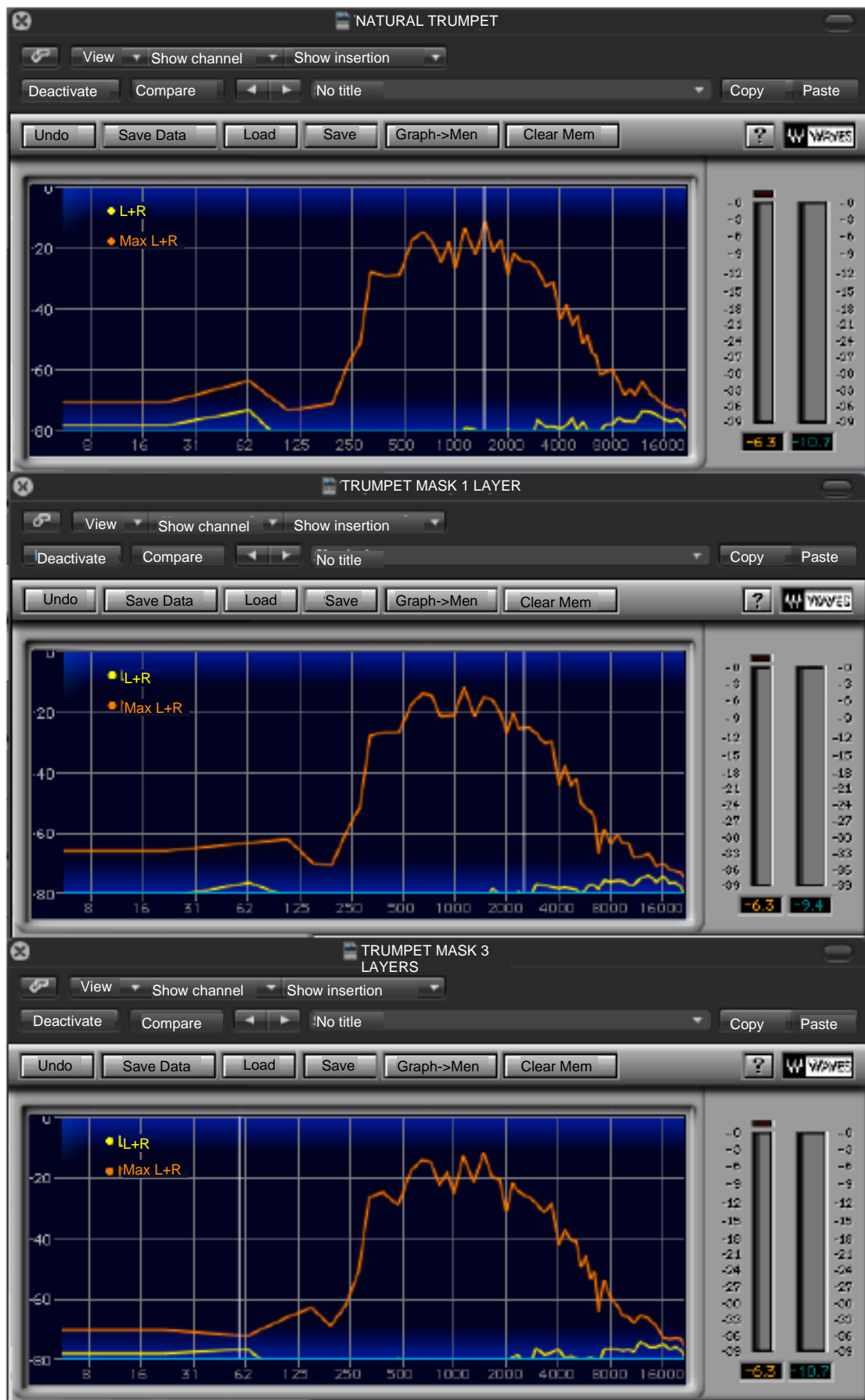
COMPARISON TRUMPET - HELD NOTE Bb3



COMPARISON TRUMPET - HELD NOTE F4



COMPARISON TRUMPET - RISING/FALLING SCALE Bb



IMPACT ANALYSIS WITH A TRUMPET

The tests were conducted using the PAZ analyser from the software company Waves.

If we look at the curves for the different takes, no substantial falls are seen in the general frequency range unless we carry out exhaustive analysis.

In all cases, the takes were recorded with identical intensity, so that the analyser could detect changes in the frequencies but not in the dynamics.

Even so, we must point out that there are occasional falls, depending on the different scores used, as the filters (masks) mainly affect the brightest zones of the instrument.

On the four takes, these falls are seen between 1500 and 3000 Hz, with the most noticeable point at 2000 Hz.

We also see from the graphs that the falls are barely visible for the 1-layer masks, and there is a slight rise with 3 layers:

Bb2	Freq: 1995	Natural -45.2	Mask 1 -49.8	Mask 3 -53.5	db
Bb3	Freq: 2158	Natural -53.0	Mask 1 -50.6	Mask 3 -54.5	db
F4	Freq: 2904	Natural -25.0	Mask 1 -28.5	Mask 3 -28.5	db
Scale	Freq: 2000	Natural -29.0	Mask 1 -28.0	Mask 3 -29.4	db

In playing the scales, we see that the differences barely exist, because the different notes define a sound curve that balances out the frequencies.

We have highlighted those frequencies which could be more significant, as the general curves are not affected very much, as has been said.

A "blind" audition was also performed, and the versions unanimously identified were those with the 3-layer masks, as the sound could be heard slightly muffled.

From our point of view, we think that the 1-layer masks are the most reliable acoustically, as the resulting sound is practically the same as the natural one.

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## SECONDLY, WE OBSERVED THE BEHAVIOUR WITH A

### CLARINET

Just as with the trumpet, the masks on the player's face do not affect the sound as the lips and mouthpiece are connected directly.

The clarinet has one noticeable difference from the trumpet, as it is an open instrument in sound terms, and the note that could most be affected is the bass Mi, because all the keys are closed to produce it.

This must be borne in mind as the same could occur with similar instruments like the oboe and bassoon.

As we did with the trumpet, two types of masks for the instrument bell were used:

**3.1** SPECIFIC MASK FOR WIND INSTRUMENTS 1 LAYER

**3.2** SPECIFIC MASK FOR WIND INSTRUMENTS 3 LAYERS

5 SAMPLES WERE RECORDED

Long held note E2

Long held note E3

Long held note E4

Long held note E5

2 rising and falling scales in E

3 TAKES WERE RECORDED OF EACH

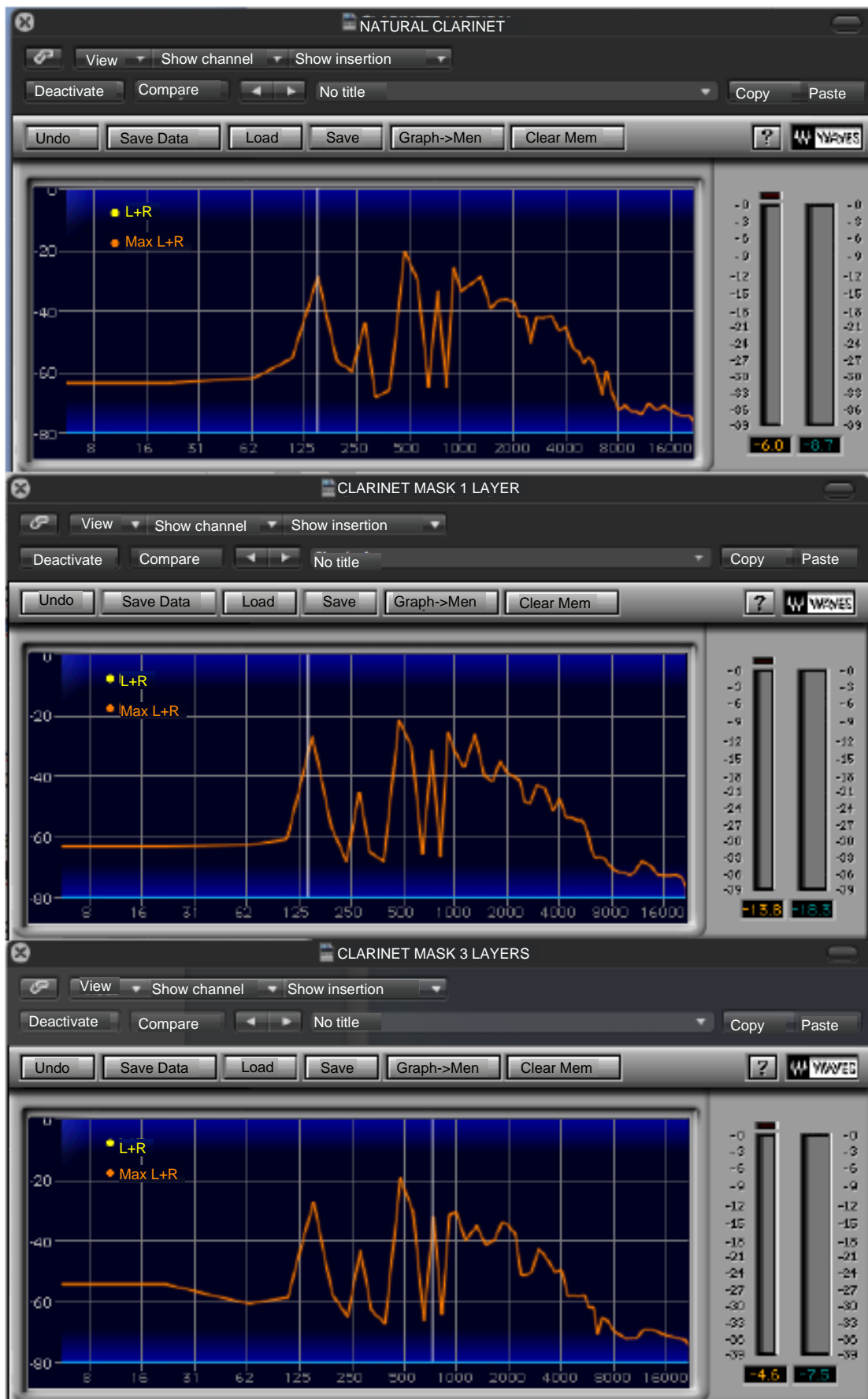
Natural (without mask)

With the mask **2** and the wind instrument mask **3.1** of 1 layer

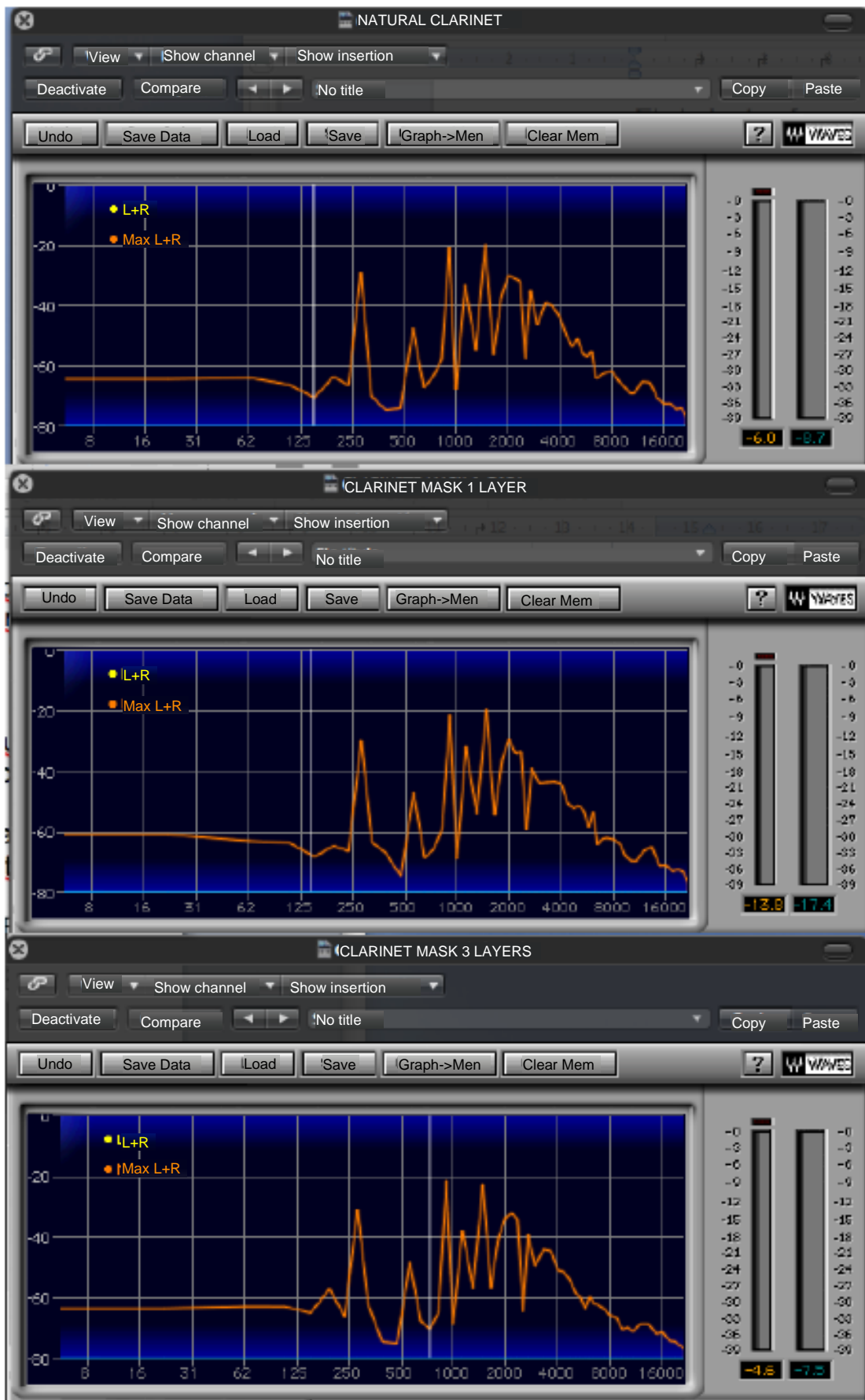
With the mask **2** and the wind instrument mask **3.2** of 3 layers

WE INCLUDE THE COMPARISONS FOR THE WHOLE PROCESS

# COMPARISON CLARINET – HELD NOTE E2



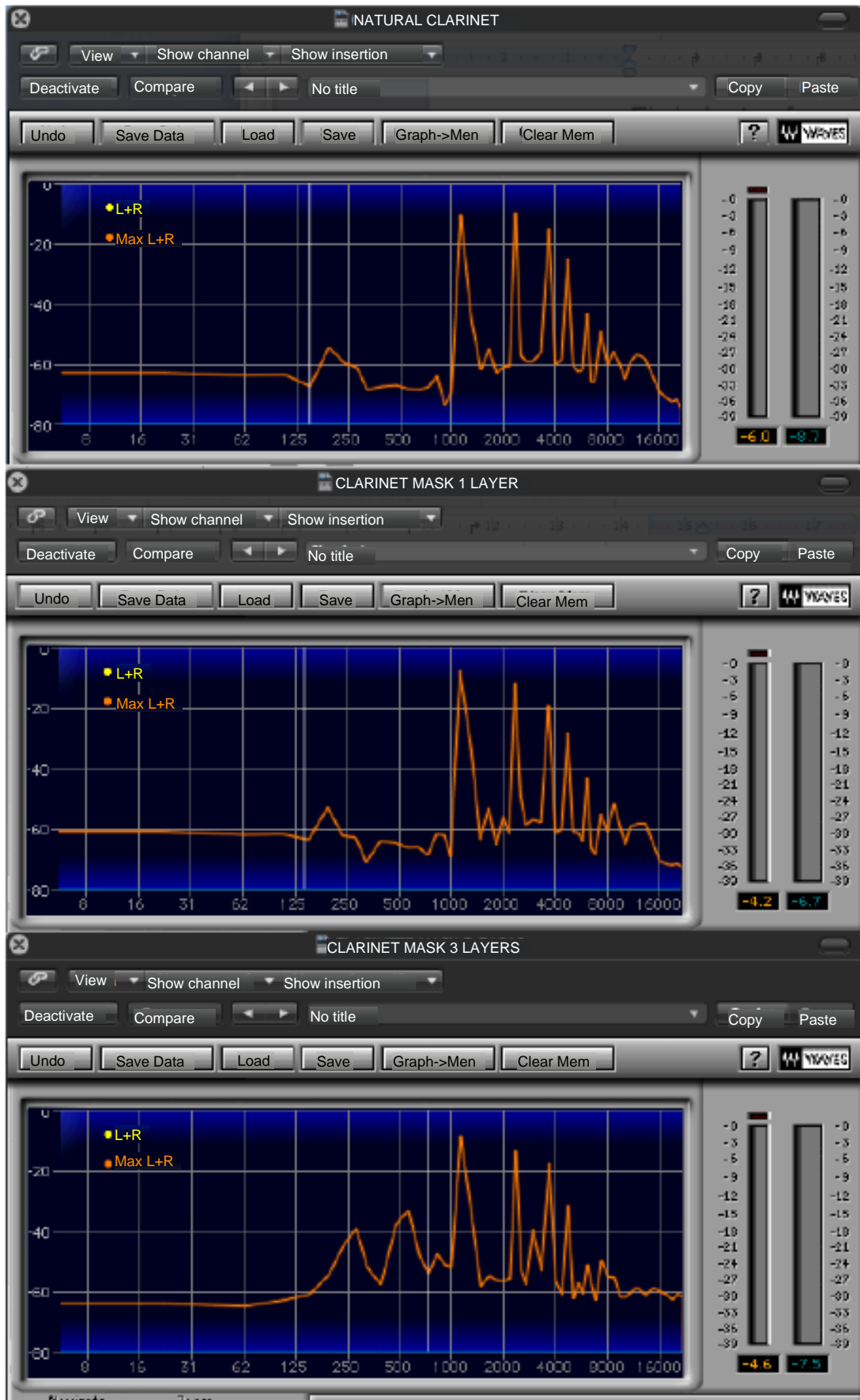
# COMPARISON CLARINET – HELD NOTE E3



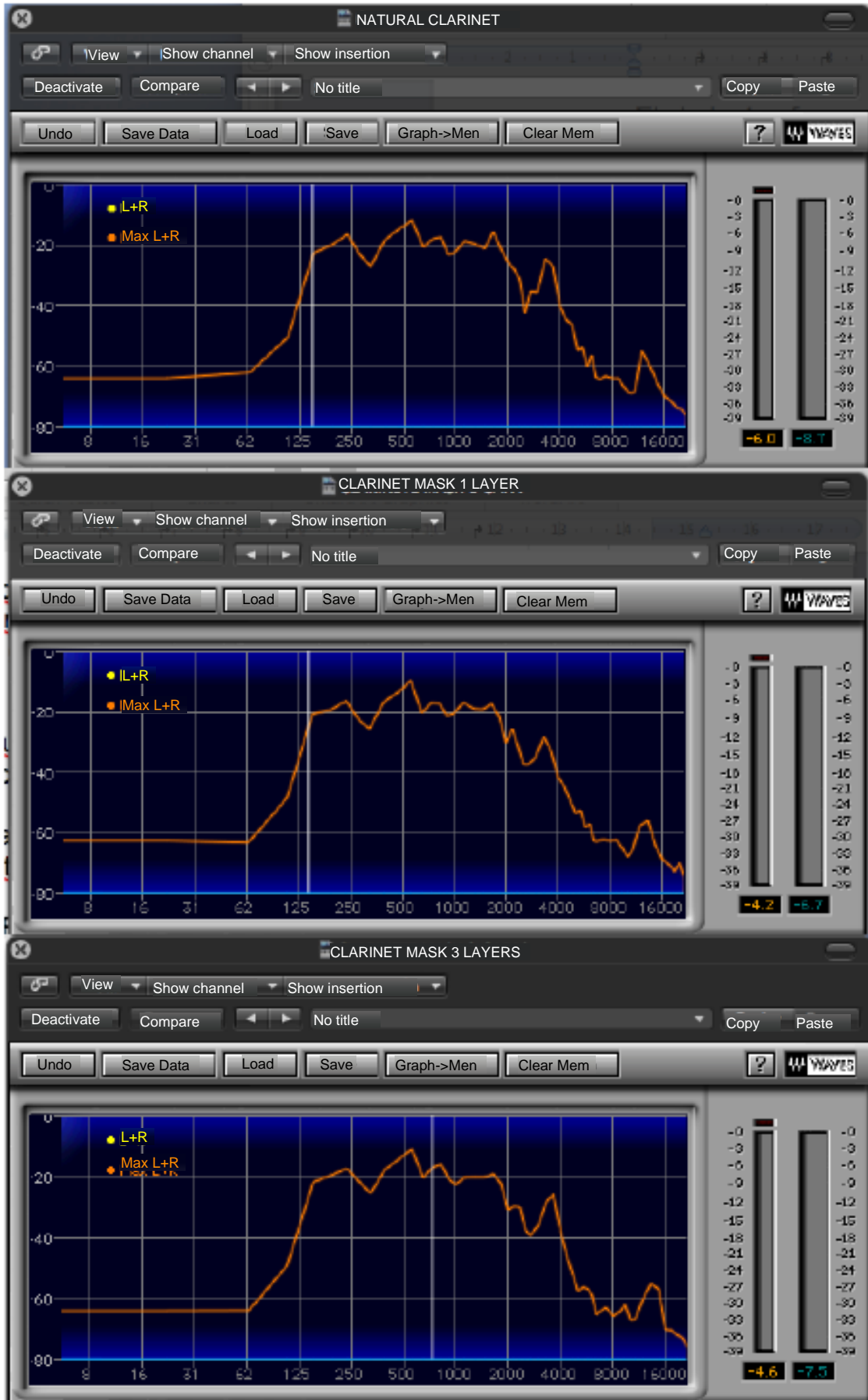
# COMPARISON CLARINET – HELD NOTE E4



# COMPARISON CLARINET – HELD NOTE E5



# COMPARISON CLARINET – 2 RISING/FALLING SCALES



## IMPACT ANALYSIS WITH A CLARINET

The tests were conducted using the PAZ analyser from the software company Waves.

Although substantial falls in the general frequency range are not seen on the curves for the different takes, some more important falls are seen with the clarinet.

In all the cases, just as with the trumpet, the takes were recorded with identical intensity, so that the analyser could detect changes in the frequencies but not in the dynamics.

Even so, we must point out that there are occasional falls, depending on the different scores used, as the filters (masks) mainly affect the brightest zones of the instrument.

On the four takes, these falls are seen between 1500 and 3000 Hz, with the most noticeable point at 2000 Hz.

We also see from the graphs that the falls are barely visible for the 1-layer masks, and there is a slight rise with 3 layers:

E2	Freq: 1995	Natural -45.2	Mask 1 -49.8	Mask 3 -53.5	db
E3	Freq: 2158	Natural -53.0	Mask 1 -50.6	Mask 3 -54.5	db
E4	Freq: 2904	Natural -25.0	Mask 1 -28.5	Mask 3 -28.5	db
E5	Freq: 2904	Natural -25.0	Mask 1 -28.5	Mask 3 -28.5	db
Scales	Freq: 2000	Natural -29.0	Mask 1 -28.0	Mask 3 -29.4	db

In playing the scales, it is seen that the differences barely exist, because the different notes define a sound curve that balances out the frequencies.

Just as with the trumpet, we have highlighted those frequencies which could be more significant, as the general curves are not affected very much, as has been said.

After this second analysis, we insist that, from our point of view, the 1-layer masks are the most reliable acoustically, as the resulting sound is practically the same as the natural one.

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## **ACOUSTIC IMPACT REPORT ON THE USE OF MASKS FOR THE SINGING VOICE BY FREQUENCIES**

### **MODELS EMPLOYED IN THE TESTS WITH A SOPRANO**

**1.- BASIC HYGIENIC MASK DIE-CUT ADULT 2+1 LAYER**

**2.- SPECIFIC HYGIENIC MASK FOR SINGERS 3 LAYERS**

**3.- SPECIFIC HYGIENIC MASK FOR SINGERS 1 LAYER**

The analysis was carried out with the direct sound, and it was compared with the use of masks for the voice 1, 2 and 3.

### **WE OBSERVED THE BEHAVIOUR**

**3 SAMPLES WERE RECORDED**

Long held note B3

Long held note F4

A melodic fragment of wide range

**4 TAKES WERE RECORDED OF EACH**

Natural (without mask)

With mask 1 (Die-cut adult 2+1 layer)

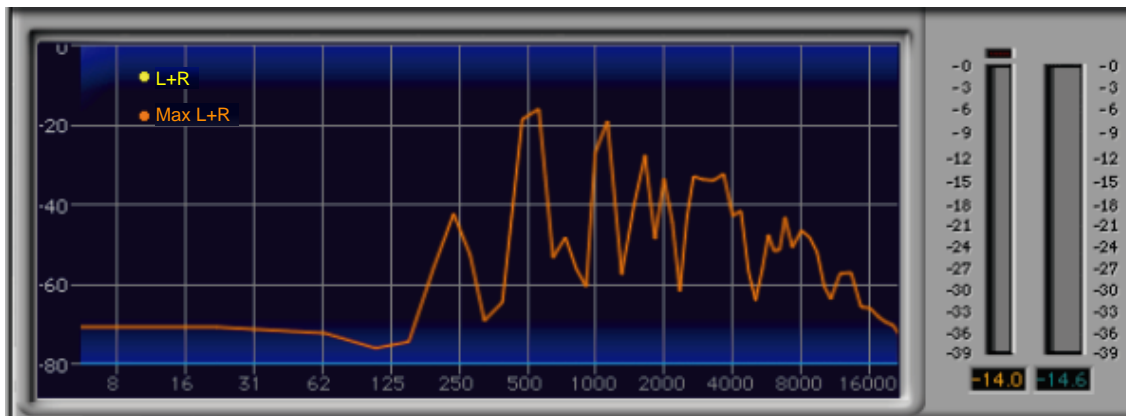
With mask 2 (Specific for singers 3 layers)

With mask 3 (Specific for singers 1 layer)

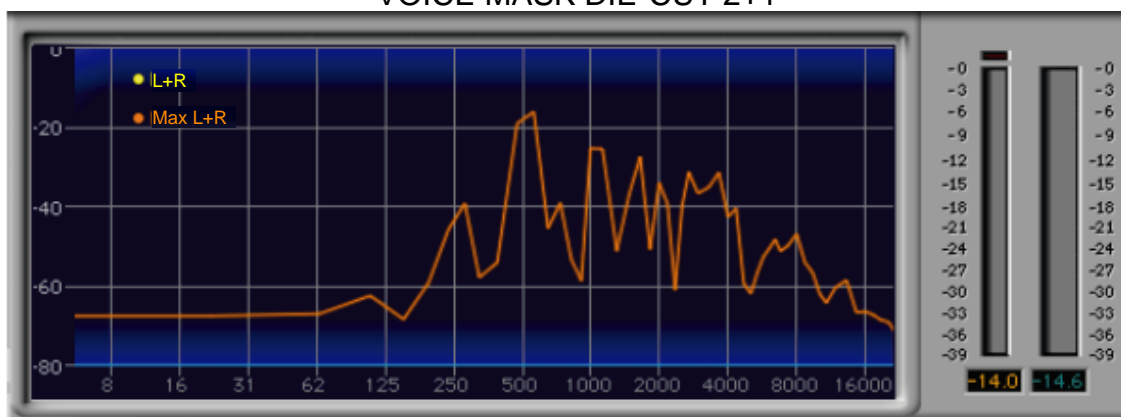
**WE INCLUDE THE COMPARISONS FOR THE WHOLE PROCESS**

# COMPARISON SOPRANO VOICE HELD NOTE B3

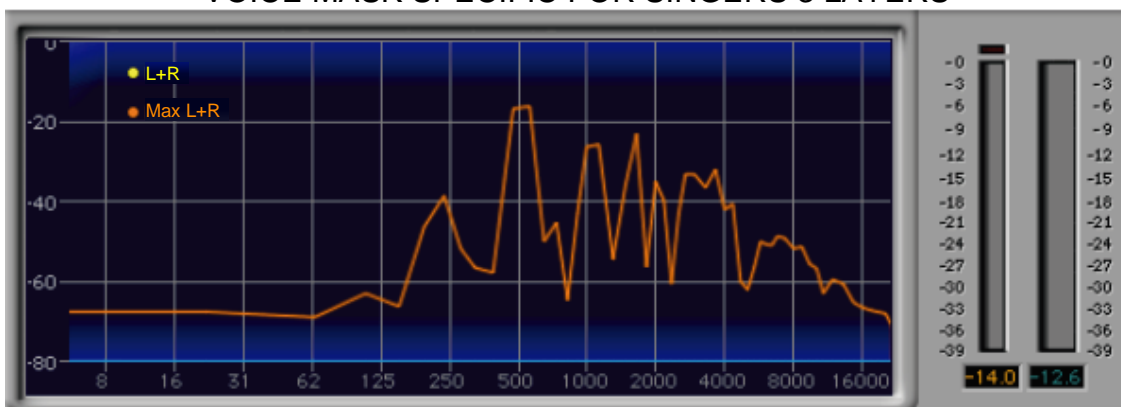
## NATURAL VOICE



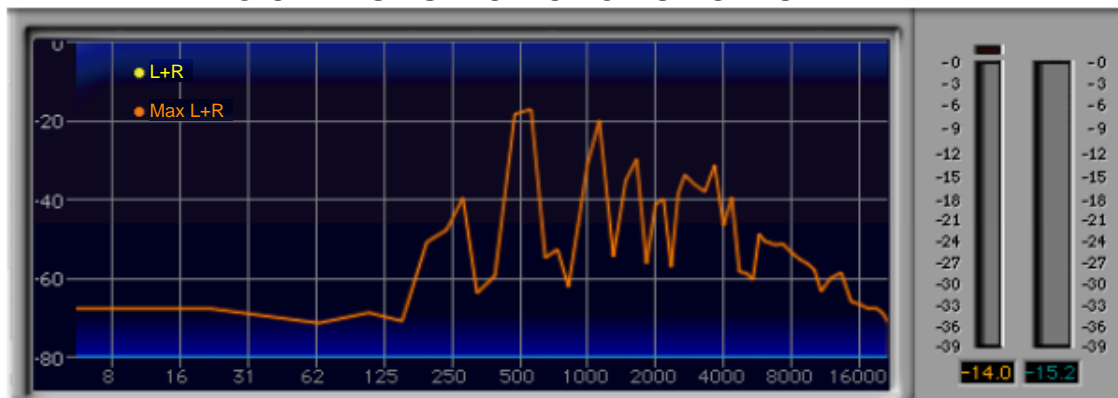
## VOICE MASK DIE-CUT 2+1



## VOICE MASK SPECIFIC FOR SINGERS 3 LAYERS

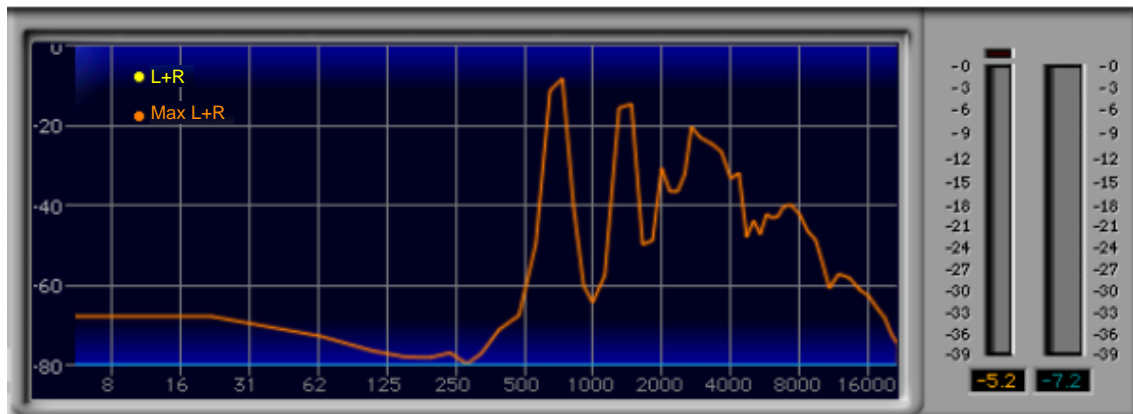


## VOICE MASK SPECIFIC FOR SINGERS 1 LAYER

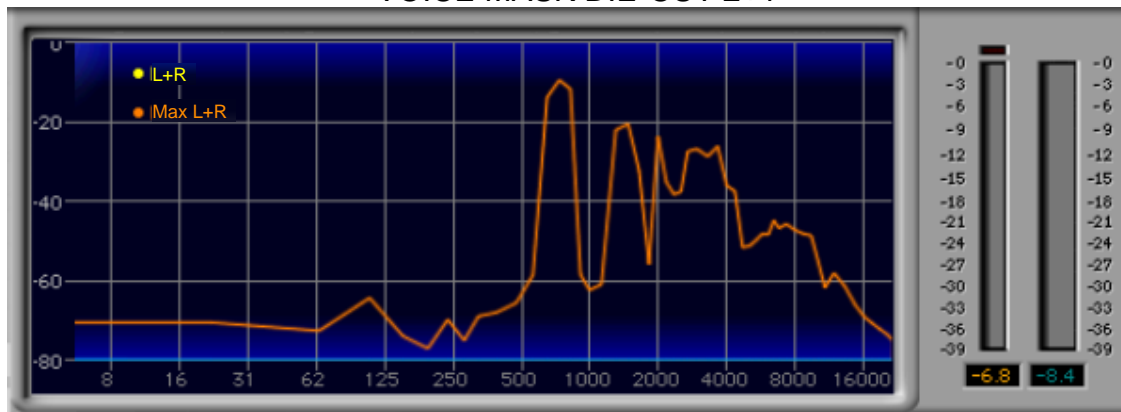


# COMPARISON SOPRANO VOICE HELD NOTE F4

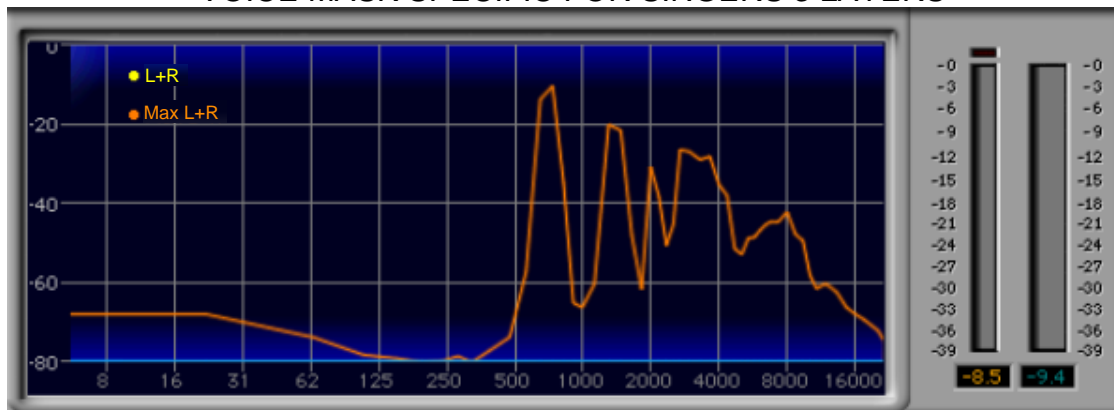
## NATURAL VOICE



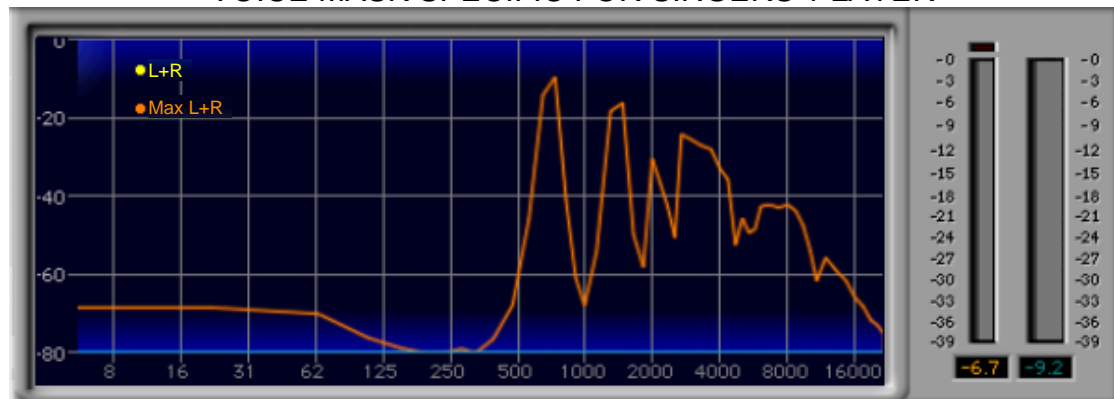
## VOICE MASK DIE-CUT 2+1



## VOICE MASK SPECIFIC FOR SINGERS 3 LAYERS

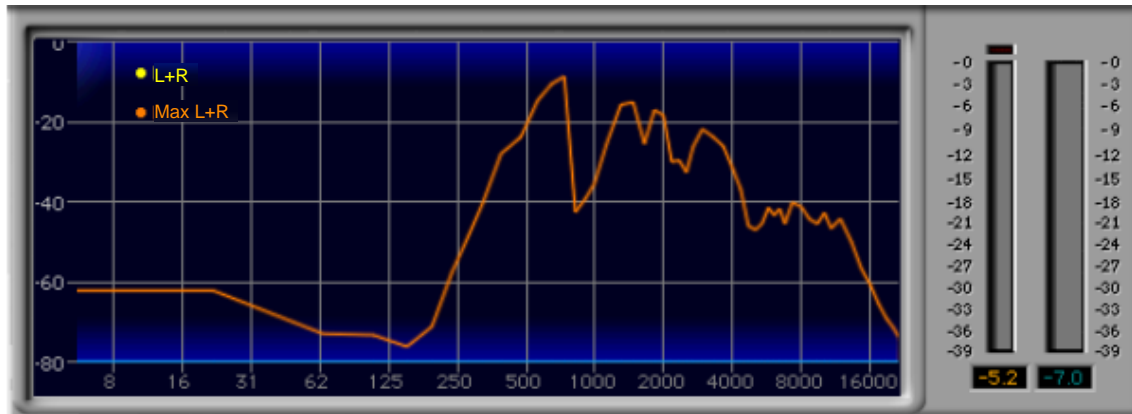


## VOICE MASK SPECIFIC FOR SINGERS 1 LAYER

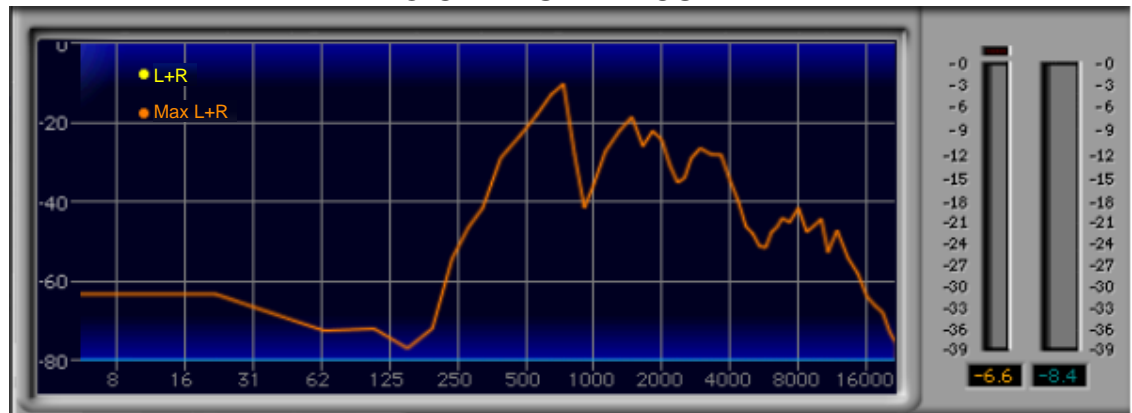


# COMPARISON SOPRANO VOICE MELODIC FRAGMENT

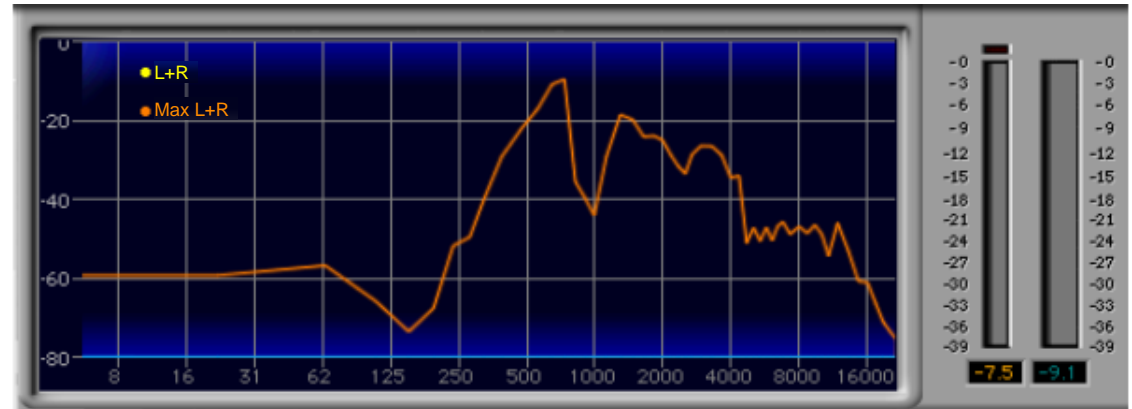
## NATURAL VOICE



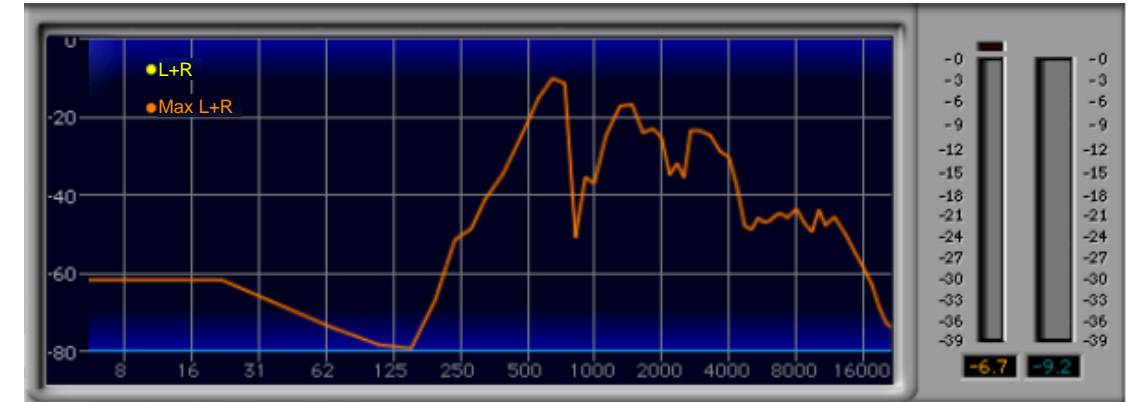
## VOICE MASK DIE-CUT 2+1



## VOICE MASK SPECIFIC FOR SINGERS 3 LAYERS



## VOICE MASK SPECIFIC FOR SINGERS 1 LAYER



## IMPACT ANALYSIS WITH THE SINGING VOICE OF A SOPRANO

No substantial differences are noticed in the curves generated by the various recordings, either in the held note tests or the melodic fragment.

We think it is not necessary to look into the other vocal ranges, as we appreciate that the most important factor for singers is the performer's own comfort and protection.

If we focus on the comparison yielded by the four takes, we see that the curves generated by using masks **2** and **3** (specific for singers) are practically the same as those produced by the natural voice.



### FINAL CONCLUSIONS

Following the analysis, our recommendations are the following:

#### WIND INSTRUMENTS

##### TESTS

- BLACK HIGH-BREATHABILITY MASK ADAPTED FOR INSTRUMENTS. (With opening for embouchure).
- SPECIFIC MASK FOR WIND INSTRUMENTS 3 LAYERS (for maximum protection)

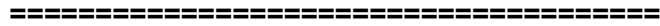
##### CONCERTS AND RECORDINGS

- BLACK HIGH-BREATHABILITY MASK ADAPTED FOR INSTRUMENTS. (With opening for embouchure).
- SPECIFIC MASK FOR WIND INSTRUMENTS 1 LAYER (for greater acoustic fidelity)

#### SINGERS

##### IN ALL CASES

- SPECIFIC HYGIENIC MASK FOR SINGERS 3 LAYERS (for fidelity, comfort and protection)



Recordings made at the Studibor-Marmita studio on 02-06-20  
Report compiled by Pep Llopis  
Valencia, 09-06-20