



ACOUSTIC IMPACT REPORT ON THE USE OF MASKS FOR THE SINGING VOICE

Specific hygienic mask for singers of different layers

STUDY CONDUCTED AT THE REQUEST OF

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

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

MODELS EMPLOYED IN THE TEST WITH A SOPRANO VOICE

- 1.- SPECIFIC HYGIENIC MASK FOR SINGERS 3 LAYERS
- 2.- SPECIFIC HYGIENIC MASK FOR SINGERS 4 LAYERS
- 3.- SPECIFIC HYGIENIC MASK FOR SINGERS 5 LAYERS

The analysis was carried out by recording the voice directly with no mask, to establish a comparison with the use of the masks 1, 2 and 3.

WE OBSERVED THE BEHAVIOUR

1 SAMPLE WAS RECORDED WITH TWO PARTS

- A** - A more intense, louder melodic fragment (FORTE)
- B** - A less intense, softer melodic fragment (MEZZOPIANO)

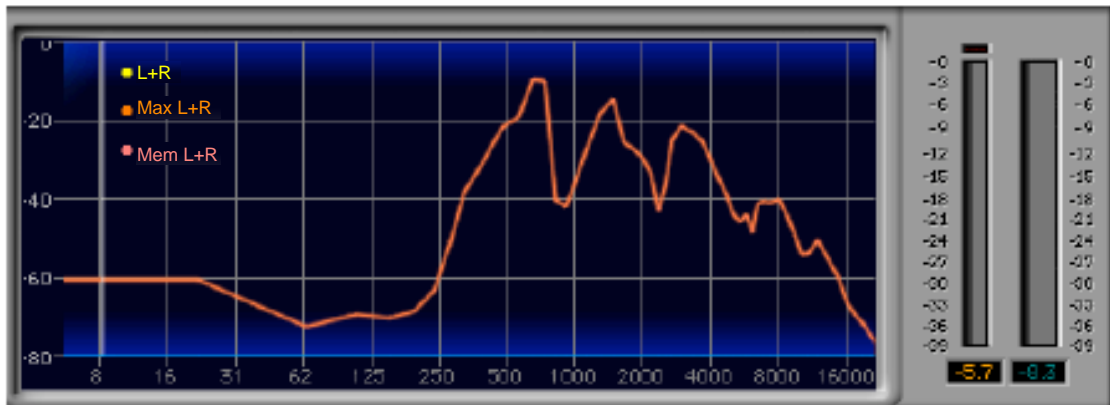
4 TAKES WERE RECORDED FOR EACH PIECE

- Natural (without mask)
- With mask 1 (specific for singers, 3 layers)
- With mask 2 (specific for singers, 4 layers)
- With mask 3 (specific for singers, 5 layers)

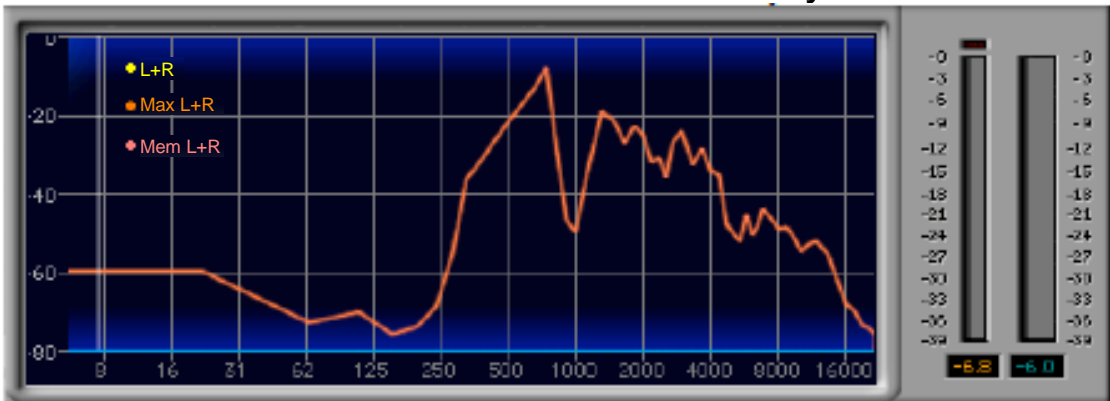
THE PROCESS GRAPHS FOLLOW

COMPARISON FRAGMENT A FORTE passage

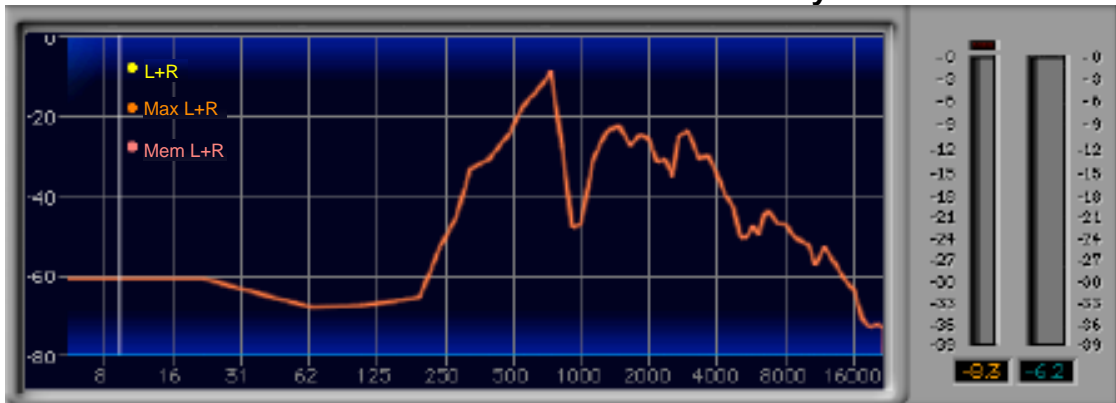
VOICE TAKE A Forte NATURAL



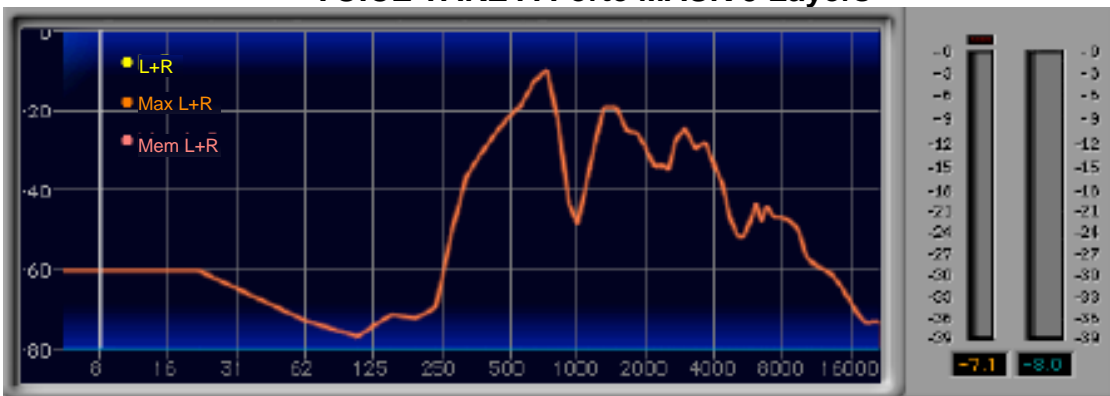
VOICE TAKE A Forte MASK 3 Layers



VOICE TAKE A Forte MASK 4 Layers



VOICE TAKE A Forte MASK 5 Layers



IMPACT ANALYSIS of fragment A, FORTE passage

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

The takes were recorded with a near-identical intensity, so that the analyser could detect changes in the frequencies but not in the dynamics.

Although our comparison will centre on establishing the differences between masks with different numbers of layers, we also recorded the same passage with natural voice (no mask) to have a basic reference.

While we can see that the natural voice curves are stronger, we also observe a very similar relationship between the three types of masks.

When listening, in our understanding, the differences noticed are not significant.

We detail the differences noticed at certain frequencies, which are those of the peaks produced by the melody performed.

Takes:	Natural	3 layers	4 layers	5 layers
Freq: 712	-9.3 db	-9.3 db	-9.3 db	-9.3 db
Freq: 922	-44.2 db	-46.1 db	-47.6 db	-48.6 db
Freq: 1424	-15.7 db	-19.8 db	-22.6 db	-22.6 db
Freq: 3021	-22.1 db	-25.0 db	-25.0 db	-26.0 db
Freq: 7967	-40.7 db	-48.0 db	-49.0 db	-47.0 db

In the low midrange frequencies (712), there is no difference either between the masks or with the natural voice test.

At 922 Hz, there is a slight fall of 0.5 db for 3 and 4 layers, while for 5 layers there is a steeper fall of 1.5 db.

At 1424 Hz, bigger differences are seen, although the 4- and 5-layer masks show the same behaviour.

There is greater stability at 3021 Hz, where the values for 3 and 4 layers are the same and there is a fall of only 1 db for 5 layers.

Finally, the highest frequencies (7967) are where the greatest falls are recorded, between 7 and 9 db.

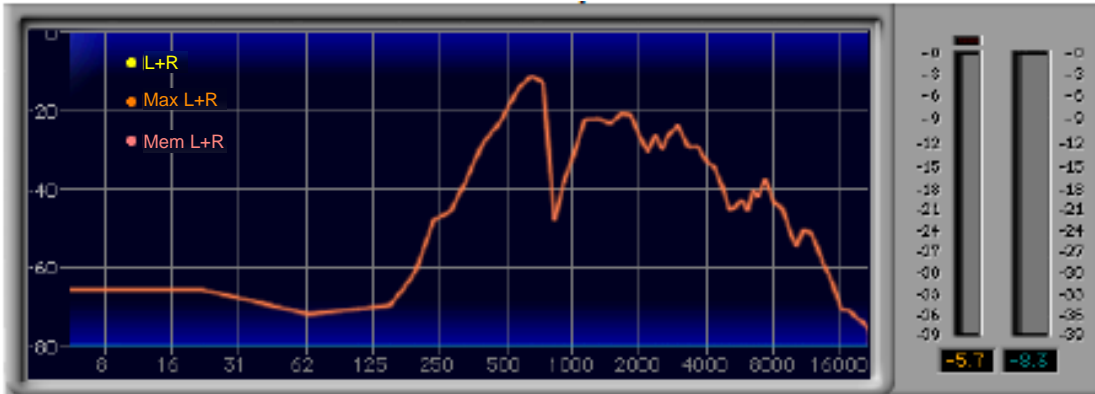
This reduction in the highest frequencies is natural as these are where the voice is sharpest or brightest.

This is not a serious impediment to listening and it should be emphasised that the differences between the three types of masks are not substantial. and the curves generated show hardly any differences between the 4-layer and 5-layer masks.

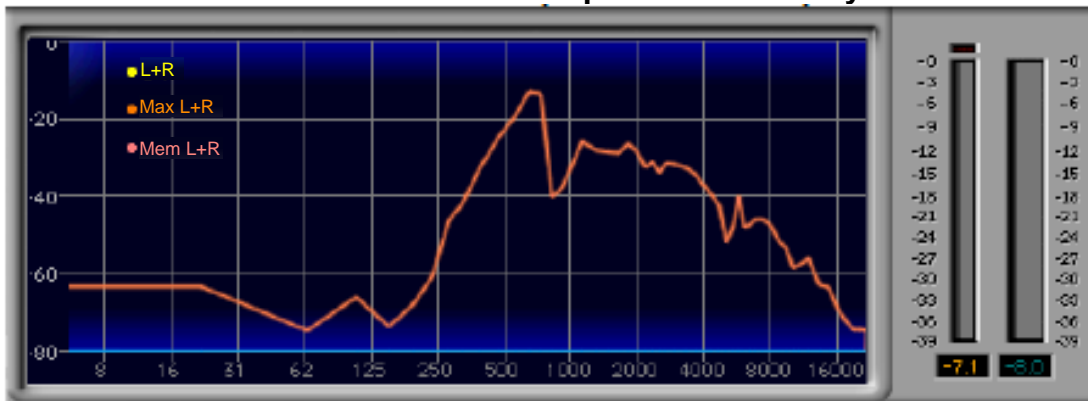
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COMPARISON FRAGMENT B MEZZOPIANO PASSAGE

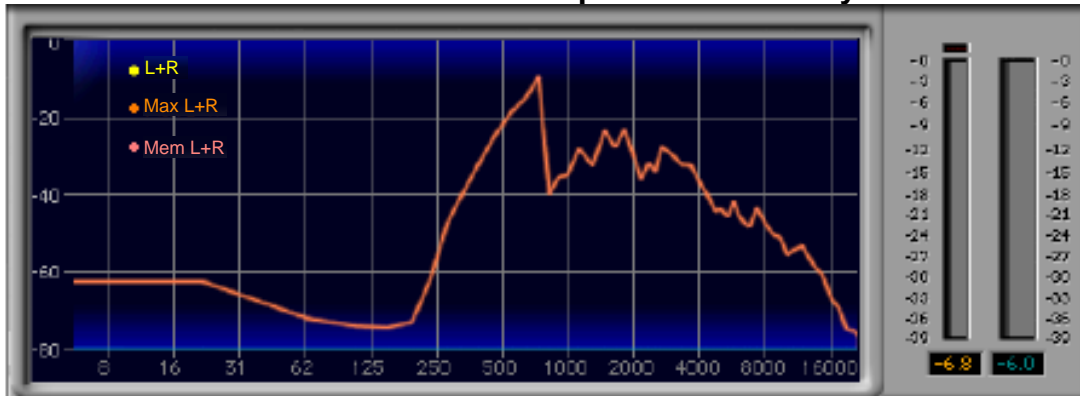
VOICE TAKE B Mezzopiano NATURAL



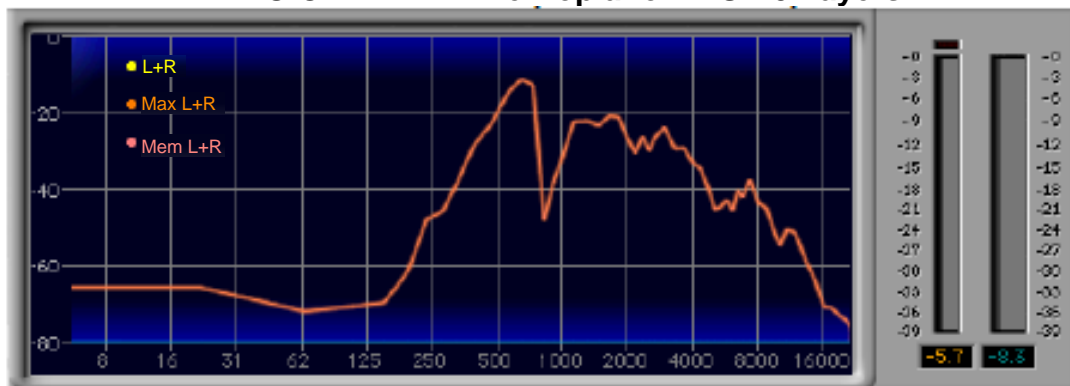
VOICE TAKE B Mezzopiano MASK 3 Layers



VOICE TAKE B Mezzopiano MASK 4 Layers



VOICE TAKE B Mezzopiano MASK 5 Layers



IMPACT ANALYSIS of fragment B, MEZZOPIANO passage

Although the two passages are of the same melody, we have decided to analyse the two fragments separately in case the different intensities give rise to some important alteration.

Basically, no major differences are observed between this analysis and the other one. We can see at a glance that the graphs for the three masks are similar.

However, we must point out that the emphasis in the different takes of this fragment has not been as analogous as in the recordings of fragment A, with some rather atypical variations being seen.

We detail the differences noticed at certain frequencies, which are those of the peaks produced by the melody performed.

Takes:	Natural	3 layers	4 layers	5 layers
Freq: 643	-11.5 db	-13.4 db	-13.3 db	-13.3 db
Freq: 835	-44.2 db	-40.7 db	-39.3 db	-50.6 db
Freq: 1633	-21.0 db	-29.0 db	-27.8 db	-28.8 db
Freq: 2925	-24.0 db	-32.1 db	-31.4 db	-24.0 db
Freq: 7234	-37.7 db	-45.9 db	-43.7 db	-46.4 db

Frequency 643: a fall of 2 db with respect to the natural voice take, but identical behaviour for the 3 masks.

Frequency 835: curiously, the 3- and 4-layer masks improve, with a greater fall being seen for the 5-layer case.

1633 Hz: falls of 6 and 8 db with respect to the natural voice, but balance among the 3 masks, with only minor differences.

Frequency 2925: substantial fall for the masks of 3 and 4 layers, with none at all for the 5-layer one.

Frequency 7234: considerable fall for all 3 masks,, which is sharpest for the 3- and 5-layer cases

Just as in the earlier analysis, the most noticeable reduction takes place at the high midrange and high frequencies (from 1600 Hz), where the voice is sharpest or brightest.

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FINAL CONCLUSIONS

ALTHOUGH THE THREE MASK TYPES ARE EQUALLY FIDELITOUS FOR THE DEEPER RANGES OF THE FEMALE VOICE; FROM THE MIDRANGE-HIGH FREQUENCIES, A LITTLE MUFFLING STARTS TO BE NOTICEABLE, DEPENDING ON THE THICKNESS OF THE PROTECTIONS.

AVERAGE RATIOS	NATURAL	3 LAYERS	4 LAYERS	5 LAYERS
	-26.4	-29.64	-30.7	-30.7

IRRESPECTIVE OF THE DIFFERENCES FOUND A THE SUCCESSIVE FREQUENCIES OF EACH FRAGMENT AND THE DIFFERENT MASKS, AS WE HAVE SET OUT IN THIS REPORT. **THE MOST RELIABLE MASK IN TERMS OF ACOUSTIC FIDELITY IS THE 3-LAYER ONE.**

THE 4-LAYER AND 5-LAYER MASKS ARE VERY CLOSE TO THIS, BUT WITH A SLIGHTLY MORE PRONOUNCED FALL WITH RESPECT TO THE NATURAL VOICE.

THERE IS PRACTICALLY NO DIFFERENCE BETWEEN THESE TWO LATTER MASKS, AND AT THE SAME TIME WE CONSIDER THEM COMPLETELY VALID FOR THEIR INTENDED USE, AS DETERMINED BY THE QUALITY REQUIRED.

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Recordings made at the Studibor-Marmita studio on 16-06-20
Report compiled by Pep Llopis
Valencia, 18-06-20