Auditory masking is often observed in everyday life: While walking on a street a passing truck can disrupt our conversation. Likewise, one would not want a cell phone to ring in quiet parts of a classical concert but it might not even be heard in a loud rock-concert. Components of one sound interact with components of another sound similar in frequency and time and render them inaudible. This is referred to as masking. Partial masking can also occur: Components are not inaudible, but their loudness is reduced (c.f. Chapter 18). This chapter first introduces the frequent case of masking by one tone on another for simultaneous and successive presentation.

Many spectral masking effects can be described by comparing signal power, integrated over a certain frequency region, with and without the probe present. Detection of changes in energy in the bandpass-filtered signal forms the basis of the critical band concept. The critical band (CB) is defined as the rectangular bandwidth of the filter. Section 3 presents a collection of experiments which reveal the influence of critical band filters.
It turns out that CBs observed in psychophysical masking experiments grow in the same way as the physiologically measured distance on the basilar membrane or the psychophysical scales of just-audible pitch steps or of ratio pitch. Scales of psychophysically derived CBs are presented in Section 4 whereas Section 5 discusses the limits of the CB-concept. The last section gives a brief introduction to models of masking.

2 • Description of Masking Effects

2.1 Simultaneous Masking

In a simultaneous masking experiment the level of a probe signal is varied in the presence of a masking sound to find the threshold at which the probe is just audible. Three variations for presenting the results are common: (1) tuning curves describe the level of a masker necessary to mask a probe of fixed frequency and low level, (2) masking growth functions show the dependence of probe level on masker level for fixed probe and masker frequencies, and (3) masking patterns depict the level of probes of different frequencies that are just audible in the presence of a masker of fixed level and frequency.

Figure 1 presents masking patterns of a tonal masker for simultaneously presented probe tones. It is immediately evident that the level of the test tone ($L_T$) has to be raised to assure audibility as its frequency ($f_T$) approaches that of the masker ($f_M$), i.e., a tonal masker produces more masking in its spectral vicinity. Masking even occurs for very low masker levels ($L_M$) but the effect is spread widely across frequencies for higher levels.

The slopes of the masking pattern depend heavily on masker level. To illustrate this non-linearity Figure 1 also shows masking patterns mirrored at the masker frequency. For tonal maskers of a level $L_M \approx 40$ dB SPL the pattern is almost symmetrical. If the masker level is lower than 40 dB SPL the pattern tilts so that the low-frequency slope is shallower than the high-frequency slope. For masker levels above 40 dB SPL the opposite occurs: The low-frequency slope becomes somewhat steeper whereas the slope on the high-frequency side becomes far more shallow. Masking spreads out to frequencies far above the masker frequency, which is called the upward spread of masking. The excess in masking between the mirrored high- and the low-frequency side is labeled “A” in Figure 1. Additionally, the frequency of maximum masking can shift upward from the masker frequency.

The way masking ($L_T$) grows with increasing masker level ($L_M$) can also be captured from Figure 1. At $f_T = f_M = 1,000$ Hz the different masking patterns are about 10 dB apart – equal to the increase in masker level. More precisely, masking increases from