

1.6.4 Old strings

For wound strings, the energy share converted into heat depends strongly on the age of the strings. Dirt and remains of skin are deposited in the grooves of the winding; this causes additional damping. Corrosion may also contribute. The mass introduced into the winding has the effect of a detuning; however, the strongest impact is perceivable in the damping of high frequency partials: an old string sounds dull. With electrically amplified guitars it does not help to turn up the treble control, because the decay constant cannot be extended that way.

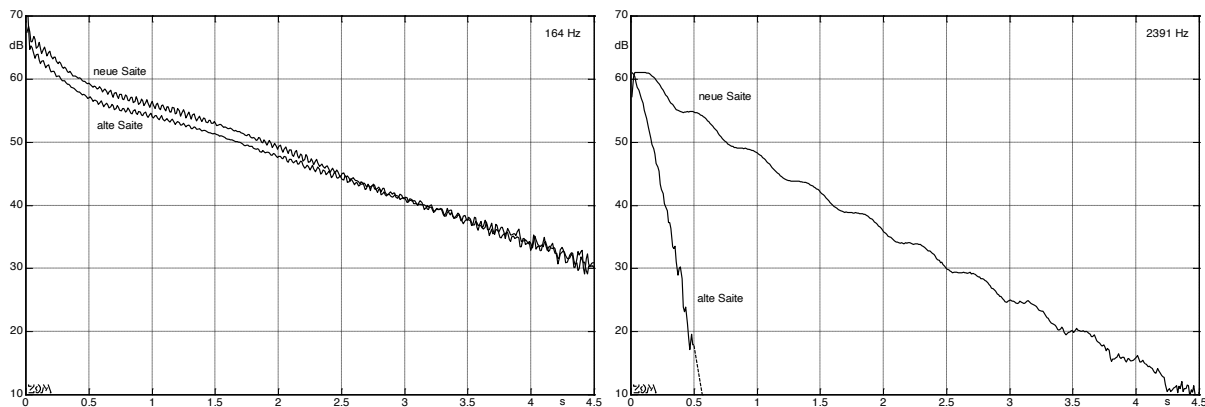


Fig. 1.51: The decay of an open E_2 -string: left for a low-frequency partial, right for a high-frequency partial. “Alte Saite” = old string; “neue Saite” = new string.

In **Fig. 1.51** we see the course of the partial-levels of a decaying E_2 -string. For the 2nd partial (164,8 Hz), the differences between old and new string are within the limit of reproducibility: the vibrations decay with practically the same speed. This is very different at high frequencies: the decay duration for the old string is reduced to 1/7th. The time constant for the decay of the old string is merely 0,1 s; under no circumstance must any measurement of the decay therefore be taken with the FAST setting.

For a E_4 -string, no ageing could be found: neither with the fundamental, nor for the higher harmonics. The string had been wiped with a cloth before the measurement, and apparently any residue lets itself readily enough be removed from the solid strings. In contrast, simple wiping does bring only very mild relief for the wound strings. Better results are said to be obtained by ultrasonic baths, or boiling the strings in suitable solvents; we did not carry out any analysis to that end.

Besides corrosion and residue, a further ageing process is to be considered: over time, the frets grind small **transverse grooves** into the strings – action and homogeneity consequently change. Mass and stiffness are not distributed uniformly along the string anymore but depend on the location. For the model of the string, an inhomogeneous transmission line with location-dependent wave-impedance results. Each groove makes for a small mismatch and thus triggers minor reflections. This effect was not analyzed in the scope of this present work.

In conclusion, Chapters 1.5.3 , 7.7.6, and 7.12.2 should be mentioned: for old strings, it is not only the decay process that is different but also the excitation. New strings sound more brilliant because every **bounce** off a fret generates a broadband impulse. In old strings, the deposits act as treble-attenuating buffer.