

8.1.5 Typical detuning in guitars

Every guitarist will have experienced days when his/her guitar would just not tune properly. It typically gets really bad when we try to re-tune individual notes within *chords*. Even with a perfectly fretted neck and premium strings, this problem may occur – the most likely reason for which is the difference between just intonation and equal-temperament intonation. While the **fifth** tuned according to the latter is, with a deviation of 2 cents, really close to the perfect fifth tuned with just intonation, we find a much larger deviation for the **third**: that would be +13,7 cents for the major third, and as much as -15,6 cents for the minor third! Such detuning is already well audible, and the guitarist simply has to live with it. Trying to chord-specifically retune individual strings (towards just intonation) may easily generate deviations of as much as 29 cents for notes in other chords – and with that it now gets really shoddy. As an example:

An A-major chord (played without barré) consists of the notes [e-a-e-a-c#-e]. Given that all notes are tuned to equal temperament, it is in particular the C# played on the B-string that creates problems: it is sharp by 14 cents compared to a justly intonated C#. If we now retune the B-string by -14 cents (7,9 ‰), this A-chord will sound perfect. However: if, with the same retuning, e.g. an E-chord [e-h-e-g#-b-e] is played, the resulting sound is atrociously off. What happens is that the down-tuned B-string sounds a flat fifth – while the major third in that E-chord (the G# played on the neighboring G-string) is sharp. The interval between these two strings (3 half-steps G#-B) is too small by 29 cents! Changing from that re-adjusted A-major chord to a D-major chord creates a similar disaster: the down-tuned B-string now sounds too flat a D. The major third (F#) played on the neighboring E-string is already anyway too sharp by 13,7 cents and now sounds doubly out-of-tune relative to the tonic (that is lowered by 13,7 cents).

There may always be special cases when – given a limited selection of chords – a special detuning creates advantages. For example, it does not sound bad at all to slightly lower the tuning of the G-string for E and A7. E-major has [e-b-e-g#-b-e], and A7 has [e-a-e-g-c#-e]. In the E-major chord, the third profits, and in the A7 chord the diminished seventh – both are sharp in equal temperament relative to just tuning so that this detuning makes sense. For the same reason, the same detuning works well with the B7-chord [f#-b-d#-a-b-f#]. But don't you dare now changing to C or G ... Thus, for universal deployment it is the equal-temperament tuning (executed as perfectly as possible) that remains a workable solution.

8.1.6 Stretched tuning

Piano tuners are known to tune not exactly according to equal temperament but in a slightly stretched-out fashion. In particular, in the very high and very low ranges, deviations of up to 30 cent can result. A spreading-out of partials, and in addition a narrowing of the pitch perception, are given as justification. In the guitar-relevant pitch range, however, the effect (merely 2 cents per octave) is rather weak, and the (compared to guitar strings) much heavier piano strings are no adequate equivalent. “Buzz” Feiten has obtained a US-patent for the stretched tuning – see Chapter 7.2.3). Fender, on the other hand, recommends adjusting the octave at the 12th fret with no more than 1 cent error – no spreading. To each his/her own ...