Neutral thirds tuning for quartertones on conventionally fretted guitar

This tuning allows you to play the quartertone scale on a conventionally fretted guitar or bass guitar. The modification is cheap and reversible, only requiring a custom set of single strings. This is 'stealth microtonality', no-one would know by looking at your guitar it is microtonal.

Introduction to 24EDO

The quartertone scale is also known as: 24 Equal Divisions of the Octave (24EDO), 24 Equal Temperament (24ET), 24 Tone Equal Temperament (24TET) or just 24 equal. Use of the word 'temperament' is sloppy, the quartertone scale is not necessarily a temperament, so I use 24EDO. 24EDO is a division of the octave into 24 equal steps of pitch, each step being a quartertone = half a semitone = 50 cents. Our standard system of 12 equal temperament (12ET) is contained within 24EDO. 24EDO is the standard tones plus 12 quartertones, each one added halfway between the standard tones.

When naming the new intervals, super = quartertone sharp, sub = quartertone flat, neutral = halfway between major and minor.

A popular ASCII notation is to use up and down arrows: ^ = quartertone sharp, v = quartertone flat.

Semitones - Interval name - Abbreviation - Notation example

12	Octave	8	C
11.5	Supermajor seventh	^7	B^
11	Major seventh	7	B
10.5	Neutral seventh	n7	Bv
10	Minor seventh	b7	Bb
9.5	Supermajor sixth / Subminor seventh	^6 / vb7	A^ / Bbv
9	Major sixth	6	A
8.5	Neutral sixth	n6	Av
8	Minor sixth	b6	Ab
7.5	Superfifth / Subminor sixth	^5 / vb6	G^ / Abv
7	Fifth	5	G
6.5	Subfifth	v5	Gv
6	Augmented fourth / Diminished fifth	#4 / b5	F# / Gb
5.5	Superfourth	^4	F^
5	Fourth	4	F
4.5	Supermajor third / Subfourth	^3 / v4	E^ / Fv
4	Major third	3	E
3.5	Neutral third	n3	Ev
3	Minor third	b3	Eb
2.5	Supermajor second / Subminor third	^2 / vb3	D^ / Ebv
2	Major second	2	D
1.5	Neutral second	n2	Dv
1	Minor second	b2	Db
0.5	Subminor second	vb2	Dbv
0	Unison	1	C

Neutral thirds tuning

The intervals between the open strings are all neutral thirds of 3.5 semitones = half a fifth. Therefore chords and scales can be transposed to any position on the fretboard without changing shape, modulation to any key is possible. Although the pitch range of a guitar is reduced, there are now 24 usable tones per octave, so the total number of notes actually increases.

Open string tuning
Semitones - Interval name

12 + 5.5	Supereleveth
12 + 2	Ninth
10.5	Neutral seventh
7	Fifth
3.5	Neutral third
0	Unison

The tuning follows the conventional chord structure of root - third - fifth - seventh - ninth - eleventh. The strings alternate between standard tones and quartertones. Playing the open strings or chords straight across one fret creates neutral versions of the conventional chords: 3 adjacent strings create a neutral triad, where the major or minor third is replaced by a neutral third halfway between at 3.5 semitones. 4 adjacent strings create a neutral seventh, where additionally the major or minor seventh has been replaced by a neutral seventh halfway between at 10.5 semitones. 5 adjacent strings add a ninth to the these chords and 6 adjacent strings add a supereleventh to this neutral ninth chord.

String gauges and restringing

I have used the D'Addario tension charts to create a sequence of gauges suitable for this tuning and with a slight, steady fall in tension from lowest to highest string. This tuning reduces the pitch range of the instrument so choose a sequence of gauges that covers the required range. Acoustic guitars have a fixed intonation bridge so you need to use similar gauges to an acoustic set, the closest match is 48 38 30 24w 17p 13p. Using strings thinner than the nut slots is not problematic as long as there is downforce at the nut and the slot floors retain their curvature.

Guitar
74 59 48 38 30 24w 17p 13p 10p 8p

Bass
125 95 75 60 45 35 25w 17p 13p 10p 8p

For example 6 string electric guitar equivalent to a 10-46 set:

10p	D^
13p	B (standard B)
17p	G^
24w	E
30	C^
38	A (standard A)

4 string bass equivalent to 40-100 set (FACE tuning)

45 Ev
60 C
75 Av
95 F

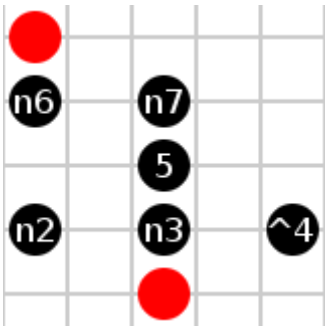
Since with these gauge sequences the lowest string is the tightest, restring the lowest string first and tune it up to the highest tension you are comfortable with, this will set the pitch of your tuning. Because the gauges have changed you will need to move the saddles to reset the intonation.

Tuning the quartertone strings

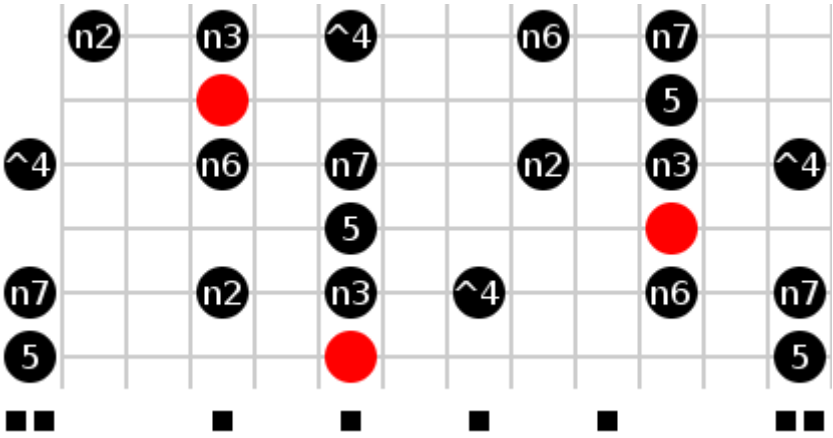
Most guitar tuners display pitch from -50 cents to +50 cents. -50 cents = quartertone flat , +50 cents = quartertone sharp. When correctly tuned to the quartertone midway between 2 semitones the display may jump back and forth from the lower semitone +50 cents to the higher semitone -50 cents, as these are the same pitch.

Scale example 1 n2 n3 ^4 5 n6 n7 8

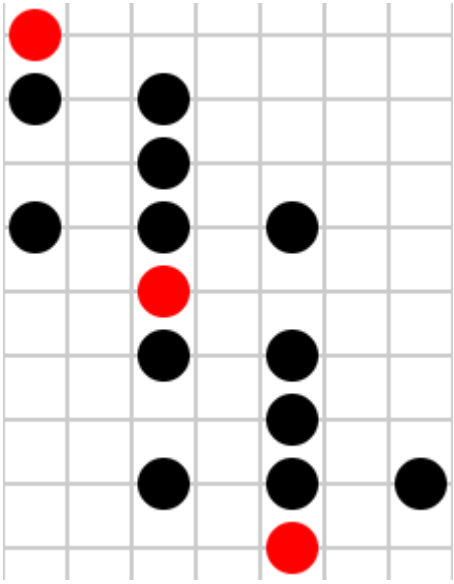
This scale introduces all 4 neutral intervals and the superfourth / 11th harmonic.
Scales can be defined as the pattern of a 1 octave run played across the strings. Red circles are the tonics.



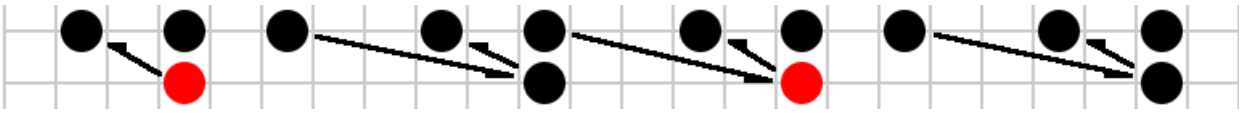
To cover the entire fretboard with the scale, first draw the tonics and use them to position copies of the pattern above.



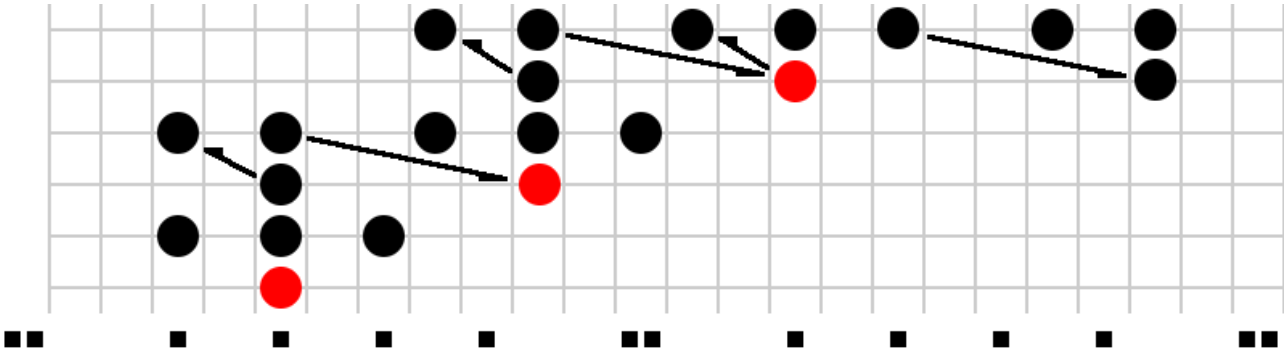
A 2 octave run through the scale on a 9 string guitar, showing how to play across the strings.



2 octave run through the scale playing up the strings. This involves skipping between 2 strings.



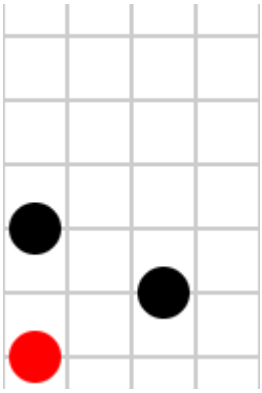
A diagonal 3 octave run through the scale on a 6 string guitar.



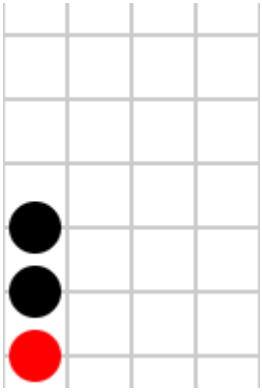
Basic chords

Red circles are the root tones.

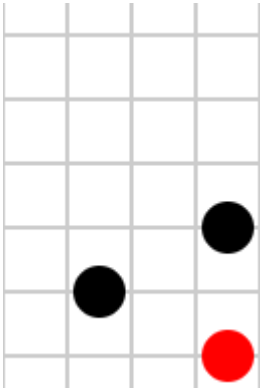
Suspended superfourth chord, sus^4. A fundamental chord combining the superfourth / 11th harmonic and the fifth / 3rd harmonic.



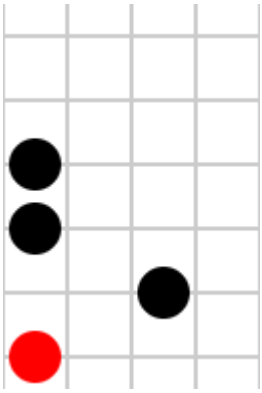
Neutral triad, n. Precisely midway between a major and a minor triad.



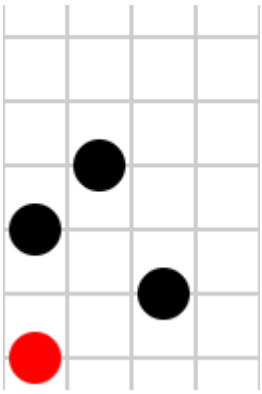
Suspended neutral second chord, susn2



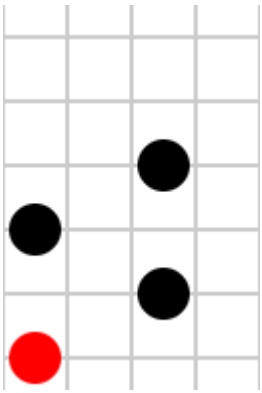
Suspended superfourth neutral seventh chord, sus^4 n7



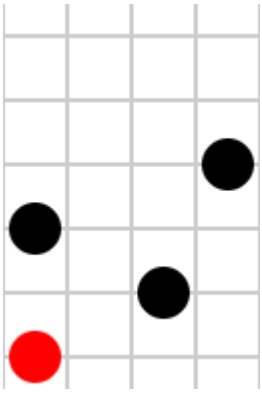
Suspended superfourth supermajor seventh chord, sus^4 ^7



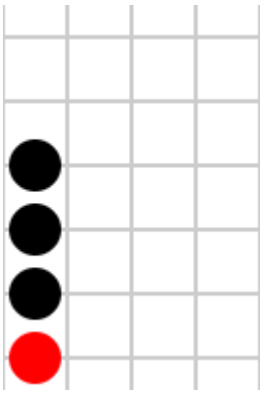
Suspended superfourth subminor ninth chord, sus^4 vb9



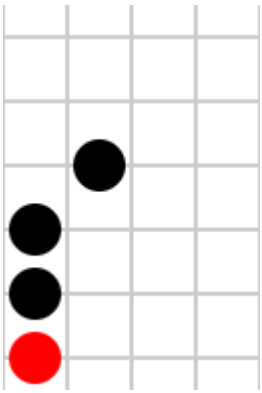
Suspended superfourth neutral ninth chord, sus^4 n9



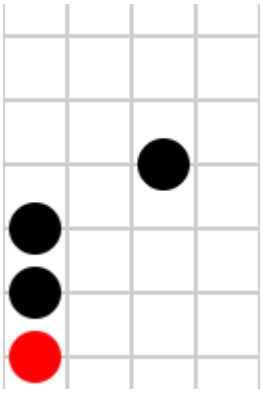
Neutral seventh chord, n7 . A neutral triad plus a neutral seventh.



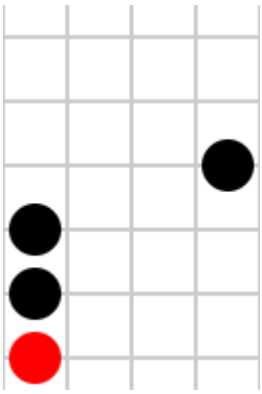
Neutral triad supermajor seventh chord, n ^7



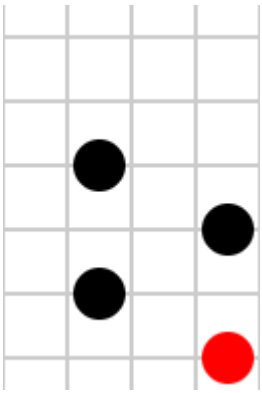
Neutral triad subminor ninth chord, n vb9



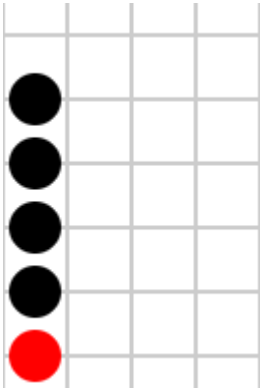
Neutral triad neutral ninth chord, n n9



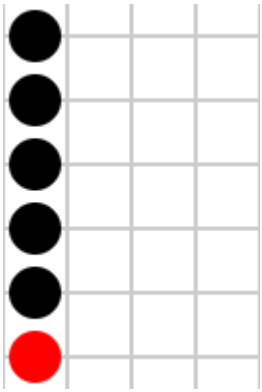
Suspended neutral second neutral sixth chord, susn2 n6



Neutral ninth chord, n9. A neutral seventh chord plus a ninth. A ninth can be added to all previous chords.

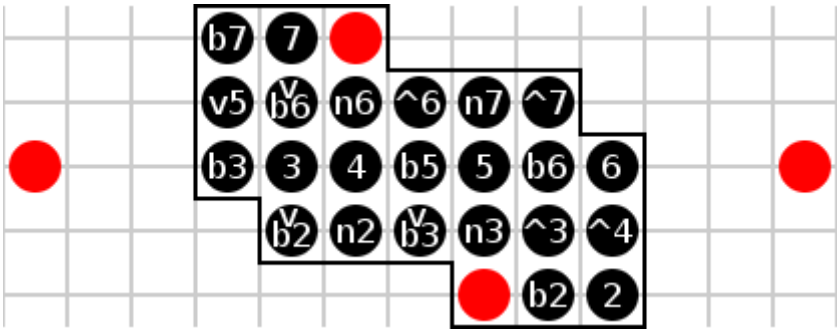


Neutral ninth supereleventh chord, n9 ^11. A neutral ninth plus a supereleventh.
A supereleventh can be added to all previous chords.

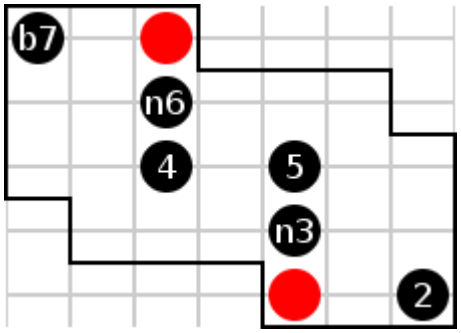


Creating and visualising scales

Here is the scale pattern master diagram with all 24 tones.

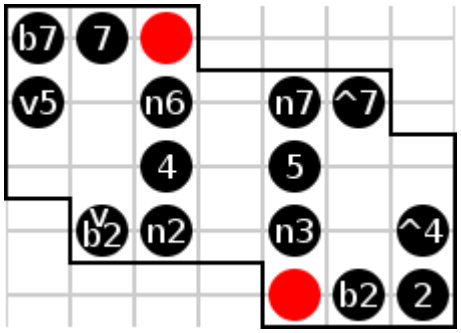


A scale can be defined by the pattern it creates within the black outline, the pattern is a 1 octave run played across the strings. For example …



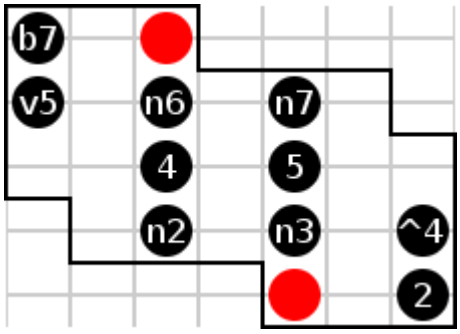
To cover the entire fretboard you 'tile' the fretboard with the shape outlined in black. I have added 2 tonics to the master diagram to help position copies of the pattern.

15 tones of 24EDO closely approximate a Just Intonation tonal system constructed from the 3rd and 11th harmonics (no need to understand what that means). The 15 tones contain 7 standard tones plus 8 quartertones.



If you choose your scale from the 15 tones shown the resulting scale will have a tonal consistency.

To narrow the choice further, here are the 11 most consonant tones of the Just Intonation system.



This is a good way to start designing scales and to acclimatise your ears to 24EDO. Choose your scale from the 11 tones shown.

By ixlramp, June 2011

This work is licensed under a
Creative Commons Attribution-ShareAlike 3.0 Unported License.