

*Equal Beating
Meantone
Temperaments*

Juhan Puhm

Equal Beating Meantone Temperaments

In this day and age our task is made incredibly easy with all the resources available to us. We can tune with electronic tuners, change tunings and pitches on the fly with our electronic instruments and practically any piece of information we desire is somewhere at our fingertips. It is difficult to imagine how composers and theorists of the past would even begin tuning somewhat fanciful scales and temperaments, let alone the laborious calculations required to figure out the pitches and so on or even working without a universal pitch reference like cents. We just plug everything into our computer or our now outdated hand held calculator!

It is conjectured that in the past, before the utility of counting beats became to be understood and standard, the practice of tuning similar intervals the same size, say major thirds or perfect fifths, was done by listening to when the similar intervals all sounded the same. In other words, when they beat at the same rate they were thought to be the same size. This of course is incorrect. The higher the same interval is pitched the faster it beats.

Nevertheless this idea of similar or equal beating intervals across the range of an octave can lead us on an interesting theoretical journey. Much time and effort has gone into this chapter and the related “Equal Beating Temperaments” chapter, many sections of which have not yielded anything much of use as we shall see below. Yet the theory is sound and the results which are workable are stunning.

When a single interval of a chord beats at the same rate, no matter the scale degree the chord is built upon in the octave, the connection and smoothness of a progression of one chord or interval to the next is quite amazing. It is as if the ear, due to the equal beating doesn't have to readjust with every new chord and the chords just flow into one another. Of course the proof is in the listening and not in these written words.

It is no easy task to generate the required pitches so that a particular interval beats at the same rate on every degree in the octave. With any open ended meantone temperament we can actually set any interval to vibrate at any rate we arbitrarily choose. That though is precisely the problem. What beat rate shall we choose? Somewhere down the road this freedom of beat rate can be utilized to become an interesting acoustic property utilized in a composition, especially if the beat rate is chosen to be extreme!

Two Meantone Temperaments, namely subsets of 31Et and 43Et (which are almost identical to 1/4 and 1/5 Syntonic Comma Meantone) eliminate the need to arbitrarily set a beat rate. Since they are both Equal Temperaments they both loop back around to where they began. There will be only one possible beat rate for each temperament that will complete the loop back to the beginning or starting note. Both these possible Meantones are however no longer “Equal”. The perfect fifths are no longer equal in each of these meantones but vary throughout on every single degree. They can be classified as “Unequal Meantone Temperaments”. It is possible as well in each of these two Unequal Meantone Temperaments to choose which interval is equal beating. While any interval may be chosen, we will generate Equal Beating intervals only on the perfect fifth, major and minor thirds. These new temperaments (classed under Unequal Meantone Temperaments) will be named either “31 or 43 Equal Beating Meantone Temperaments” with a further suffix of (P5), (+3) or (-3) to show which interval is equal beating. For example; “43EBMT(P5) Equal Beating Meantone Temperament” for short or for long.

Preliminary Observations

- **31EBMT(P5)**

Right from the beginning we can see how a huge amount of work gives very little beneficial results. “1/4 Syntonic Comma Equal Meantone Temperament” (EMT) and 31Et EMT due to their pure or almost pure major thirds are wonderfully pure meantone temperaments best for mainly triadic major and minor harmony. By setting all the perfect fifths to beat equally the smallest perfect fifth is now -7.102 flat from just which is even more than the already very flat 31Et fifth of -5.1808 cents. As well a number of major thirds are tuned flat from just which produces what is called “harmonic wastage”. Major thirds should always be tempered sharp from just. The smallest major third is -2.009 cents flat and the largest major third is 2.697 cents sharp from just. We can see how equal beating intervals now produce a varying range of interval sizes. In 31Et EMT the major third is 0.7831 cents sharp from just and of course pure in 1/4 Syntonic Comma EMT. None of this is bad except 1/4 Syntonic Comma / 31Et EMT are already unbalanced enough as it is without having further flattened perfect fifths and major thirds.

- **31EBMT(+3)**

As the thirds in 31Et EMT are almost pure to start with (0.7831 cents sharp) and therefore have a very slow beat rate, when all the thirds are set to vibrate at one beat rate the difference between 31EBMT(+3) and 31Et EMT is almost negligible. These two temperaments are indistinguishable from one another. The smallest major third is 0.561 cents sharp and the largest major third is 1.073 cents sharp from just. Not much has changed here from the 0.7831 cents sharp major third of 31Et EMT.

- **31EBMT(-3)**

Things get much worse here with the smallest perfect fifth being a huge -10.349 cents flat from just and the smallest major third -3.805 cents flat from just. Everything is wildly uneven. If this temperament is to be usable at all, usable triads have to be carefully selected. Even so, the minor thirds flow beautifully from one to another. If we limit ourselves to mainly minor thirds we have an interesting experimental temperament. The smallest minor third is -4.372 cents flat from just and the largest minor third is -8.166 cents flat from just. This range is perfectly normal and workable. Everything else though varies wildly!

- **43EBMT(P5)**

Things completely change here and this temperament is stunning. The chords flow ultra-smoothly from one to the other. 43Et and its 43Et EMT subset are already the best temperaments to work in and this temperament is even better. I would nominate 43EBT(P5) Equal Beating Temperament” and its equal beating meantone subset 43EBMT(P5) as two of the best temperaments possible out of all possible temperaments.

We will give here a quick overview of 31Et, 12Et and 43Et. In 31Et the major third is almost pure though the perfect fifths are quite flat. Along with 1/4 Syntonic Comma EMT this temperament is excellent for major and minor triadic harmony because of the purity of its harmony. However, anything more complex like diminished triads, dominant sevenths, augmented triads etc have a sourness or out of tuneness to them. This is unpleasantly noticeable when pieces written in later temperaments like Well or Equal Temperament (12Et) are adapted to be

played in 31Et or its meantone subset. This temperament just is not able to support complex harmony say from the late Romantic period, atonality or jazz. Atonal music played in 31Et doesn't sound atonal, it just sounds out of tune. This is substantiated by the simple observation that music written in the Renaissance is rarely more complex harmony or sonority wise than simple major and minor triads. The question why more complex harmonies weren't utilized in the Renaissance is simply answered. It is because they sounded sour and out of tune and were rejected. We find this same sour or out of tuneness in contemporary writing for 31Et that attempts to experiment with extended harmonic complexes. Finally, pitches in a meantone temperament are their exact note name. For example G# is a completely different pitch than Ab, hence the reason for split keys on harpsichords and early organs. Later, with Well and Equal Temperaments all enharmonic notes are tempered to a single pitch (as well negating the need to split keys any more).

At the other end of the spectrum, the perfect fifths of 12Et are excellent but the major and minor thirds are incredibly sharp and flat. All the dissonance that was hidden away in the wolf intervals of meantone temperaments is now evenly spread around the whole scale. Everything in 12Et is somewhat out of tune which allows us to play complex harmonies. The complex harmonies are now no more out of tune than the major and minor triads. We seem to think that in 12Et we can play everything that came before it but that isn't so. There is no satisfaction playing Renaissance music or music with very open thirds in 12Et. The sound is incredibly grating and non-harmonious replete with harmonic distortion.

Between the almost pure major thirds of 31Et and the excellent perfect fifths of 12Et lies 43Et. In 43Et the fifth is tempered flat by almost the same amount as the major third is tempered sharp (-4.28 / +4.38 cents). I can't overstate how excellent 43Et and its meantone subsets are. It is very harmonious like 31Et but at the same time can support complex harmony like 12Et. It is one of the best temperaments and the amazing smoothness of 43EBMT(P5) as mentioned above is even better!

In 43EBMT(P5) the fifths have a range of -3.089 to -5.887 cents flat. The major thirds have a range of 2.019 to 5.953 cents sharp. The minor thirds have the greatest range from -10.149 to -6.421. These are excellent values overall! One might think there is some semblance of key colouring here due to the different size of major thirds. Possibly so, but the key colouring of Well Temperament is more uniform and produced in a different way.

- 43EBMT(+3)

43EBMT(+3) is also a somewhat workable temperament but the values have a much greater variance: P5 = -9.342 to +0.937 cents, +3 = 3.163 to 6.019 cents, -3 = -13.173 to -3.863 cents. This is a usable temperament for equal beating major thirds though the exaggerated interval ranges can introduce some unevenness, especially with some of the very flat perfect fifths.

- 43EBMT(-3)

As with 31EBMT(-3) the extreme fluctuation of range and unevenness of this temperament make it better suited for experimental purposes revolving around the minor third interval which has a very usable range of -6.358 to -11.883 cents.

Compendium Musica

So while a huge amount of time and energy have gone into the charts of this and the “Equal Beating Temperaments” chapter, only one temperament stands out as amazing. The mixed results of the other temperaments range from barely any difference from Equal Meantone Temperaments, to very wide interval ranges making the temperament suitable only for experimental purposes, for example with equal beating minor thirds. Even so, creating new temperaments based upon practical and acoustic foundations is a very interesting pursuit. There is a lot we can do mathematically but in order to be constructive and useful the basis of new temperaments should always be acoustic and listenable!

31EBMT(P5) Equal Beating Meantone Temperament

-Equal Beating Perfect Fifths and Fourths (C 0 to Cb 29)

P4 below P5 beats at the same rate as the P5
P4 above P5 beats at twice the rate of the P5

A 23 to E 10 =	1.49632245	697.705	Cents	Beat Rate	A - 415	A - 440
				0.007355	3.052366	3.236244
				D 5 to A 23 Beat Rate: 0.007355		

3/2 =	701.955	Cents
--------------	----------------	--------------

Note	Ratios	Cents	+/- 3/2	+/- 12ET
B# 30	1.170043	271.874	701.955	-28.126
	1.495300	696.522	-5.433	
E# 12	0.782481	775.352		-24.648
	1.496483	697.891	-4.064	
A# 25	1.045759	77.461		-22.539
	1.494744	695.878	-6.077	
D# 7	0.699624	581.583		-18.417
	1.496068	697.411	-4.544	
G# 20	0.935284	1084.172		-15.828
	1.494125	695.161	-6.794	
C# 2	1.251949	389.011		-10.989
	1.495607	696.877	-5.078	
F# 15	0.837084	892.134		-7.866
	1.496712	698.156	-3.799	
B 28	1.118564	193.978		-6.022
	1.495085	696.272	-5.683	
E 10	1.496322	697.705		-2.295
	1.496322	697.705	-4.250	
A 23	1	0		0
	1.494504	695.600	-6.355	
D 5	0.669118	504.400		4.400
	1.495889	697.204	-4.751	
G 18	0.894609	1007.196		7.196
	1.493859	694.853	-7.102	
C 0	1.197716	312.343		12.343
	1.495408	696.647	-5.308	
F 13	0.800929	815.695		15.695
	1.496564	697.985	-3.970	
Bb 26	1.070357	117.710		17.710
	1.494864	696.017	-5.938	
Eb 8	1.432046	621.693		21.693
	1.496158	697.515	-4.440	
Ab 21	0.957149	1124.179		24.179
	1.494259	695.316	-6.639	
Db 3	0.640551	428.863		28.863
	1.495706	696.992	-4.963	
Gb 16	1.713040	931.870		31.870
	1.496787	698.242	-3.713	
Cb 29	1.144478	233.628		33.628
	1.495195	696.401	-5.554	
Fb 11	0.765437	737.227		37.227

Beat Rate	Perf. Fifth
0.007355	B# 30
0.007355	E# 12
0.007355	A# 25
0.007355	D# 7
0.007355	G# 20
0.007355	C# 2
0.007355	F# 15
0.007355	B 28
0.007355	E 10
0.007355	A 23
0.007355	D 5
0.007355	G 18
0.007355	C 0
0.007355	F 13
0.007355	Bb 26
0.007355	Eb 8
0.007355	Ab 21
0.007355	Db 3
0.007355	Gb 16
0.007355	Cb 29
0.007355	Fb 11

	Root	P5	Ratio	Cents	+/- 3/2	+3rd	Pitch
					701.955		
4/25 Syn. C.							
	Cb 29	Gb 16	1.496787	698.242	-3.713	Eb 8	1.432046
1/6 Hold. C.	B 28	F# 15	1.496712	698.156	-3.799	D# 7	1.399249
	Bb 26	F 13	1.496564	697.985	-3.970	D 5	1.338236
	A# 25	E# 12	1.496483	697.891	-4.064	----	----
43Et	A 23	E 10	1.496322	697.705	-4.250	C# 2	1.251949
1/5 Syn. C.							
	Ab 21	Eb 8	1.496158	697.515	-4.440	C 0	1.197716
	G# 20	D# 7	1.496068	697.411	-4.544	B# 30	1.170043
1/5 Dit. C.	G 18	D 5	1.495889	697.204	-4.751	B 28	1.118564
2/9 Syn. C.							
	Gb 16	Db 3	1.495706	696.992	-4.963	Bb 26	1.070357
	F# 15	C# 2	1.495607	696.877	-5.078	A# 25	1.045759
31Et	F 13	C 0	1.495408	696.647	-5.308	A 23	1
1/4 Syn. C.	E# 12	B# 30	1.495300	696.522	-5.433	----	----
	Fb 11	Cb 29	1.495195	696.401	-5.554	Ab 21	0.957149
	E 10	B 28	1.495085	696.272	-5.683	G# 20	0.935284
Eq. Hrm. 2	Eb 8	Bb 26	1.494864	696.017	-5.938	G 18	0.894609
Eq. Hrm. 1	D# 7	A# 25	1.494744	695.878	-6.077	----	----
5/17 Syn. C.	D 5	A 23	1.494504	695.600	-6.355	F# 15	0.837084
	Db 3	Ab 21	1.494259	695.316	-6.639	F 13	0.800929
	C# 2	G# 20	1.494125	695.161	-6.794	E# 12	0.782481
	C 0	G 18	1.493859	694.853	-7.102	E 10	0.748161
1/3 Syn. C.							
	Average:		+ 1.495482	696.733	-5.2223		
			* 1.495482	696.732	-5.2226		
	31ET EMT		1.495518	696.774	-5.1808		

+3rd Ratio	Cents	+/- 5/4	Beat Rate	A - 415	A - 440
Root to +3rd		386.314	Root to +3rd		
1.251266	388.066	1.752	0.005794	2.404	2.549
1.250933	387.605	1.292	0.004174	1.732	1.837
1.250271	386.689	0.376	0.001161	0.482	0.511
----	----	----	----	----	----
1.251949	389.011	2.697	0.007796	3.236	3.430
1.251337	388.164	1.851	0.005118	2.124	2.252
1.251003	387.702	1.388	0.003752	1.557	1.651
1.250338	386.782	0.468	0.001210	0.502	0.533
1.249658	385.840	-0.473	-0.001171	-0.486	-0.515
1.249287	385.327	-0.987	-0.002386	-0.990	-1.050
1.248550	384.305	-2.009	-0.004645	-1.928	-2.044
----	----	----	----	----	----
1.250461	386.952	0.638	0.001411	0.585	0.621
1.250111	386.467	0.153	0.000331	0.137	0.146
1.249414	385.502	-0.811	-0.001678	-0.696	-0.738
----	----	----	----	----	----
1.251026	387.734	1.421	0.002747	1.140	1.209
1.250375	386.833	0.519	0.000960	0.399	0.423
1.250020	386.341	0.027	0.000049	0.021	0.022
1.249313	385.362	-0.951	-0.001645	-0.683	-0.724
1.250312	386.746	0.4327	0.001352	0.561	0.595
1.250312	386.746	0.4323			
1.250566	387.097	0.7831			

-3rd Ratio	Cents	+/- 6/5	Beat Rate	A - 415	A - 440
+3rd to P5		315.641	+3rd to P5		
1.196218	310.177	-5.465	0.027078	11.237	11.914
1.196477	310.551	-5.090	0.024649	10.229	10.845
1.196992	311.296	-4.346	0.020129	8.354	8.857
----	----	----	----	----	----
1.195194	308.694	-6.947	0.030082	12.484	13.236
1.195648	309.351	-6.291	0.026065	10.817	11.469
1.195895	309.709	-5.932	0.024015	9.966	10.567
1.196388	310.422	-5.219	0.020203	8.384	8.889
1.196892	311.152	-4.489	0.016631	6.902	7.318
1.197168	311.550	-4.091	0.014809	6.146	6.516
1.197716	312.343	-3.298	0.011421	4.740	5.025
----	----	----	----	----	----
1.195716	309.449	-6.192	0.020504	8.509	9.022
1.195962	309.806	-5.836	0.018884	7.837	8.309
1.196452	310.515	-5.127	0.015871	6.587	6.983
----	----	----	----	----	----
1.194623	307.866	-7.775	0.022507	9.340	9.903
1.195049	308.483	-7.158	0.019828	8.229	8.725
1.195281	308.820	-6.821	0.018462	7.662	8.123
1.195744	309.490	-6.151	0.015921	6.607	7.005
1.196083	309.981	-5.6601	0.020415	8.472	8.983
1.196083	309.981	-5.6605			
1.195873	309.677	-5.9639			

Harm. 7th	Pitch
(x6th)	
A 23	2
----	----
G# 20	1.870569
----	----
F# 15	1.674169
----	----
E# 12	1.564961
E 10	1.496322
----	----
D# 7	1.399249
----	----
D 5	1.338236
----	----
C# 2	1.251949
----	----
B# 30	1.170043
B 28	1.118564
----	----
A# 25	1.045759

H.7th Ratio	Cents	+/- 7/4
Root to x6th		968.826
1.747521	966.372	-2.454
----	----	----
1.747612	966.462	-2.364
----	----	----
1.749120	967.955	-0.870
----	----	----
1.749323	968.156	-0.669
1.746979	965.835	-2.991
----	----	----
1.747032	965.888	-2.938
----	----	----
1.748330	967.173	-1.653
----	----	----
1.748476	967.318	-1.508
----	----	----
1.748635	967.475	-1.351
1.746253	965.115	-3.711
----	----	----
1.746256	965.118	-3.708
1.747776	966.625	-2.2013
1.747776	966.624	-2.2016
1.748905	967.742	-1.0840

Compendium Musica

Bbb 24	1.496405 1.023034	697.801	-4.154	39.426	0.007355	Bbb 24
Ebb 6	1.494627 1.368949	695.743	-6.212	543.683	0.007355	Ebb 6
Abb 19	1.495981 0.915085	697.310	-4.645	1046.372	0.007355	Abb 19
Dbb 1	1.493996 0.612508	695.011	-6.944	351.361	0.007355	Dbb 1
Gbb 14	1.225016 1.638258	696.766	-5.189	854.595	0.007355	Gbb 14
Cbb 27	1.495510 1.094624	698.073	-3.882	156.522	0.007355	Cbb 27
Fbb Dx 9	1.496640 0.732201	696.148	-5.807	660.374	0.007355	Fbb Dx 9
Bbbb Gx 22	1.494977 1.464402	697.613	-4.342	1162.761	0.007355	Bbbb Gx 22
Cx 4	1.496242 1.309863	695.462	-6.493	467.299	0.007355	Cx 4
Fx 17	1.494385 0.875694	697.101	-4.854	970.198	0.007355	Fx 17
B# 30	1.751387 1.496857	698.324	-3.631	271.874	0.007355	B# 30
	1.170043			-28.126		

(foldout)

+/- 3/2	701.955		+/- 5/4	+/- 6/5
			386.314	315.641
		E 10		
			-0.951	
	-4.250	C 0		
				-3.298
	-5.308	A 23		
			-2.009	
	-6.355	F 13		
				-4.346
	-3.970	D 5		
			0.376	
	-4.751	Bb 26		
				-5.127
	-5.938	G 18		
			-0.811	
	-7.102	Eb 8		
				-6.291
	-4.440	C 0		
			1.851	
	-5.308	Ab 21		
				-7.158
	-6.639	F 13		
			0.519	
	-3.970	Db 3		
				-4.489
	-4.963	Bb 26		
			-0.473	
	-5.938	Gb 16		
				-5.465
	-3.713	Eb 8		
			1.752	
	-4.440	Cb 29		
				-6.192
	-5.554	Ab 21		
			0.638	
	-6.639	Fb 11		
				-7.277
		Db 3		

(foldout)

+/- 3/2	701.955		+/- 5/4	+/- 6/5
			386.314	315.641
		D# 7		
				-5.932
	-4.544	B# 30		
			1.388	
	-5.433	G# 20		
				-6.821
	-6.794	E# 12		
			0.027	
	-4.064	C# 2		
				-4.091
	-5.078	A# 25		
			-0.987	
	-6.077	F# 15		
				-5.090
	-3.799	D# 7		
			1.292	
	-4.544	B 28		
				-5.836
	-5.683	G# 20		
			0.153	
	-6.794	E 10		
				-6.947
	-4.250	C# 2		
			2.697	
	-5.078	A 23		
				-7.775
	-6.355	F# 15		
			1.421	
	-3.799	D 5		
				-5.219
	-4.751	B 28		
			0.468	
	-5.683	G 18		
				-6.151
	-7.102	E 10		
			-0.951	
		C 0		

31EBMT(+3) Equal Beating Meantone Temperament

-Equal Beating +3rds and -6ths (C 0 to Cb 29)

-6th below +3rd beats at the same rate as the +3rd.

-6th above +3rd beats at twice the rate of the +3rd.

Beat Rate	A - 415	A - 440
A 23 to C# 2 = 1.25046359	386.956 Cents	0.001854
F 18 to A 32	Beat Rate: 0.001854	0.769559 0.815918

5/4 =	386.31371	Cents
-------	-----------	-------

Note	Ratios	Ratios	Ratios	Ratios	Cents	+/- 3/2	+/- 12ET	Beat Rate	A - 415	A - 440	Root	P5
B# 30		1.169764			271.461	701.955	-28.539	Perf. Fifth			B# 30	
E# 12	0.782003	1.250496			697.165	-4.790		0.006482	2.690	2.852	Cb 29	Gb 16
A# 25	1.250741	387.000			774.296		-25.704	0.008978	3.726	3.950	B 28	F# 15
D# 7	387.340	0.001854			696.993	-4.962		0.006277	2.605	2.762	Bb 26	F 13
G# 20	0.001854	0.935440	0.699201	1.398403	77.303		-22.697	0.009515	3.949	4.187	A# 25	E# 12
C# 2	1.250464	0.625232			696.767	-5.188		0.006277	2.605	2.762	D# 7	A 23
F# 15	1.250464				580.536		-19.464	0.004815	1.998	2.118	G# 20	Ab 21
B 28	386.956				696.075	-5.880		0.007553	3.135	3.323	C# 2	Eb 8
E 10	0.001854	0.747981			1084.461		-15.539	0.010414	4.322	4.582	F# 15	D# 7
A 23	1				386.956	-4.450		0.007553	3.135	3.323	G 18	D 5
D 5		1.250775			890.221		-9.779	0.010414	4.322	4.582	B 28	Gb 16
G 18	1.250580	387.387			696.734	-5.221		0.007241	3.005	3.186	F# 15	C# 2
C 0	387.116	0.001854			193.648		-6.352	0.008074	3.351	3.553	E 10	F 13
F 13	0.799629	0.598014			696.359	-5.596		0.005672	2.354	2.495	A 23	E# 12
Bb 26		1.196028			697.289		-2.711	0.005672	2.354	2.495	D 5	Fb 11
Eb 8	1.250725	0.001854			0		0	0.008702	3.611	3.829	E 10	Cb 29
Ab 21	0.001854	0.956452			697.053	-4.902		0.008702	3.611	3.829	D 5	B 28
Db 3	0.639333	1.278665			502.947		2.947	0.005422	2.250	2.386	G 18	Eb 8
Gb 16		1.250606			696.331	-5.624		0.006831	2.835	3.006	C 0	Bb 26
Cb 29	1.250453	387.153			1006.617		6.617	0.009445	3.920	4.156	D# 7	A# 25
Fb 11	0.001854	0.764791			309.902		9.902	0.006591	2.735	2.900	F 13	D 5
					812.884		12.884	0.006591	2.735	2.900	C# 2	G# 20
					696.850	-5.105		0.009046	3.754	3.980	Db 3	Ab 21
					116.033		16.033	0.006591	2.735	2.900	C# 2	G# 20
					619.405		19.405	0.009046	3.754	3.980	Eb 8	
					1122.917		22.917	0.009046	3.754	3.980	Ab 21	
					425.566		25.566	0.005094	2.114	2.241	Db 3	
					928.969		28.969	0.007927	3.290	3.488	Gb 16	
					232.530		32.530	0.010916	4.530	4.803	Cb 29	
					735.764		35.764	0.006866	2.849	3.021	Fb 11	

Average:	+
	*
31ET EMT	
Average P5	
Beat Rate	

Ratio	Cents	+/- 3/2	+3rd	Pitch	+3rd Ratio	Cents	+/- 5/4	Beat Rate	-3rd Ratio	Cents	+/- 6/5	Beat Rate	A - 415	A - 440	Harm. 7th	Pitch	H.7th Ratio	Cents	+/- 7/4
		701.955			Root to +3rd		386.314	Root to +3rd	+3rd to P5		315.641	+3rd to P5			(x6th)		Root to x6th		968.826
1.495228	696.438	-5.517	Eb 8	1.430155	1.250405	386.875	0.561	0.001854	1.195795	309.564	-6.078	0.030072	12.480	13.232	A 23	2	1.748629	967.470	-1.356
1.495344	696.573	-5.382	D# 7	1.398403	1.250415	386.888	0.574	0.001854	1.195879	309.685	-5.956	0.028817	11.959	12.679	----	----	----	----	----
1.495584	696.850	-5.105	D 5	1.337114	1.250434	386.914	0.600	0.001854	1.196052	309.936	-5.705	0.026394	10.953	11.613	G# 20	1.870881	1.749597	968.428	-0.398
1.495707	696.993	-4.962	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
1.495963	697.289	-4.666	C# 2	1.250464	1.250464	386.956	0.642	0.001854	1.196327	310.333	-5.308	0.022968	9.532	10.106	----	----	----	----	----
1.495271	696.488	-5.467	C 0	1.196028	1.250485	386.985	0.671	0.001854	1.195753	309.503	-6.138	0.025397	10.540	11.175	F# 15	1.672320	1.748462	967.304	-1.522
1.494914	696.075	-5.880	B# 30	1.169764	1.250496	387.000	0.686	0.001854	1.195457	309.075	-6.566	0.026569	11.026	11.691	----	----	----	----	----
1.495135	696.331	-5.624	B 28	1.118351	1.250518	387.032	0.718	0.001854	1.195612	309.299	-6.342	0.024537	10.183	10.796	E# 12	1.564007	1.748841	967.679	-1.147
1.495365	696.597	-5.358	Bb 26	1.069321	1.250542	387.064	0.751	0.001854	1.195773	309.533	-6.109	0.022598	9.378	9.943	E 10	1.495963	1.749489	968.320	-0.506
1.495483	696.734	-5.221	A# 25	1.045664	1.250554	387.081	0.768	0.001854	1.195856	309.653	-5.988	0.021664	8.991	9.532	----	----	----	----	----
1.495729	697.018	-4.937	A 23	1	1.250580	387.116	0.802	0.001854	1.196028	309.902	-5.739	0.019858	8.241	8.737	D# 7	1.398403	1.748814	967.652	-1.174
1.495855	697.165	-4.790	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
1.495511	696.766	-5.189	Ab 21	0.956452	1.250606	387.153	0.839	0.001854	1.195829	309.613	-6.028	0.019947	8.278	8.777	D 5	1.337114	1.748340	967.183	-1.643
1.495159	696.359	-5.596	G# 20	0.935440	1.250620	387.172	0.858	0.001854	1.195535	309.187	-6.454	0.020885	8.667	9.189	----	----	----	----	----
1.495392	696.628	-5.327	G 18	0.894310	1.250648	387.211	0.898	0.001854	1.195693	309.417	-6.225	0.019259	7.992	8.474	C# 2	1.250464	1.748711	967.550	-1.276
1.495511	696.767	-5.188	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
1.495758	697.053	-4.902	F# 15	0.836160	1.250693	387.274	0.960	0.001854	1.195943	309.779	-5.863	0.016960	7.039	7.463	B# 30	1.169764	1.749684	968.514	-0.312
1.496016	697.351	-4.604	F 13	0.799629	1.250725	387.318	1.004	0.001854	1.196119	310.033	-5.608	0.015516	6.439	6.827	B 28	1.118351	1.749248	968.082	-0.744
1.496150	697.505	-4.450	E# 12	0.782003	1.250741	387.340	1.027	0.001854	1.196210	310.165	-5.476	0.014818	6.150	6.520	----	----	----	----	----
1.495467	696.715	-5.240	E 10	0.747981	1.250775	387.387	1.073	0.001854	1.195632	309.328	-6.314	0.016337	6.780	7.188	A# 25	1.045664	1.748560	967.401	-1.425
1.495527	696.785	-5.1701			1.250571	387.104	0.7902	0.001854	1.195853	309.647	-5.9938	0.021917	9.096	9.644			1.748943	967.780	-1.0456
1.495527	696.785	-5.1702			1.250571	387.104	0.7902		1.195853	309.647	-5.9939						1.748943	967.780	-1.0457
1.495518	696.774	-5.1808			1.250566	387.097	0.7831		1.195873	309.677	-5.9639						1.748905	967.742	-1.0840
	A - 415	A - 440																	
0.007593	3.151	3.341																	

1/4 Syn. C.

31Et

Bbb 24	1.022561			1.250507 387.016 0.001854		0.001854	697.140 38.625 -4.815			0.008521	3.536	3.749	Bbb 24
Ebb 6		1.250758 387.363 0.001854				0.683698	696.908 -5.047		38.625	0.005971	2.478	2.627	
Abb 19				0.914631	1.367395		541.716 696.201 -5.754		41.716	0.009104	3.778	4.006	Ebb 6
Dbb 1		0.611462	1.222923				1045.515 697.114 -4.841		45.515	0.005122	2.126	2.254	Abb 19
Gbb 14	0.817678			1.250634 387.191 0.001854			348.401 696.875 -5.080		48.401	0.007188	2.983	3.163	Dbb 1
Cbb 27					1.093545		851.526 696.710 -5.245		-48.474	0.009924	4.118	4.366	Gbb 14
Fbb Dx 9		1.250709 387.296 0.001854		0.731334	1.462669		154.816 696.492 -5.463		-45.184	0.006912	2.869	3.041	Cbb 27
Bbbb Gx 22							658.323 696.893 -5.062		-41.677	0.008566	3.555	3.769	Fbb Dx 9
Cx 4	1.307543	0.653772					1161.431 697.200 -4.755		-38.569	0.005379	2.232	2.367	Bbbb Gx 22
Fx 17				1.250396 386.863 0.001854			464.230 696.462 -5.493		-35.770	0.008310	3.449	3.656	Cx 4
B# 30	1.250443 386.928 0.001854		1.250593 387.135 0.001854		1.169764		967.768 696.307 -5.648		-32.232	0.011430	4.744	5.029	Fx 17
E# 12			0.782003				271.461 -28.539		-28.539				B# 30
A# 25	1.045664												E# 12
D# 7						0.699201							A# 25
													D# 7

(foldout)

$\pm 3/2$	701.955	$\pm 5/4$	$\pm 6/5$
		386.314	315.641
		E 10	
		1.073	
-4.666		C 0	
			-5.739
-4.937		A 23	
		0.802	
-4.902		F 13	
			-5.705
-5.105		D 5	
		0.600	
-5.624		Bb 26	
			-6.225
-5.327		G 18	
		0.898	
-5.240		Eb 8	
			-6.138
-5.467		C 0	
		0.671	
-4.937		Ab 21	
			-5.608
-4.604		F 13	
		1.004	
-5.105		Db 3	
			-6.109
-5.358		Bb 26	
		0.751	
-5.327		Gb 16	
			-6.078
-5.517		Eb 8	
		0.561	
-5.467		Cb 29	
			-6.028
-5.189		Ab 21	
		0.839	
-4.604		Fb 11	
			-5.443
		Db 3	

(foldout)

$\pm 3/2$	701.955	$\pm 5/4$	$\pm 6/5$
		386.314	315.641
		D# 7	
			-6.566
-5.880		B# 30	
		0.686	
-4.790		G# 20	
			-5.476
-4.450		E# 12	
		1.027	
-4.962		C# 2	
			-5.988
-5.221		A# 25	
		0.768	
-5.188		F# 15	
			-5.956
-5.382		D# 7	
		0.574	
-5.880		B 28	
			-6.454
-5.596		G# 20	
		0.858	
-4.450		E 10	
			-5.308
-4.666		C# 2	
		0.642	
-5.221		A 23	
			-5.863
-4.902		F# 15	
		0.960	
-5.382		D 5	
			-6.342
-5.624		B 28	
		0.718	
-5.596		G 18	
			-6.314
-5.240		E 10	
		1.073	
		C 0	

31EBMT(-3) Equal Beating Meantone Temperament

-Equal Beating -3rds and +6ths (C 0 to Cb 29)

+6th above -3rd beats at the same rate as the -3rd
+6th below -3rd beats at half the rate of the -3rd

A 23 to C 0 =	1.19662154	310.760	Cents	0.016892	A - 415	7.010296	A - 440	7.432603
	F# 15 to A 23 Beat Rate:		0.016892					

6/5 =	315.64129	Cents
--------------	------------------	--------------

Note	Ratios	Ratios	Ratios
Fb 11		0.762951	
Cb 29		1.194710 307.992 0.016892	1.142016
Gb 16	0.854135		1.196460 310.527 0.016892
Db 3	1.195272 308.807 0.016892	0.638608	1.277216
Ab 21			1.196834 311.068 0.016892
Eb 8	0.714594		1.195768 309.524 0.016892
Bb 26	1.194353 307.476 0.016892	1.067162	
F 13			1.196213 310.169 0.016892
C 0	1.196622	0.598311	1.194942 308.329 0.016892
G 18	1.196622 310.760 0.016892	0.892117	1.195473 309.097 0.016892
D 5			0.668005
A 23	1		1.196973 311.269 0.016892
E 10	1.195960 309.802 0.016892	0.746246	1.116158
B 28			1.196379 310.409 0.016892
F# 15	0.836149		1.196379 310.409 0.016892
C# 2	1.195171 308.660 0.016892	1.249375	0.624687
G# 20			1.196764 310.966 0.016892
D# 7	0.699606	1.399212	1.195670 309.383 0.016892
A# 25			1.195670 309.383 0.016892
E# 12	1.197110 311.466 0.016892	1.043961	0.780271
B# 30			1.196129 310.048 0.016892

Cents	+/- 4/3	+/- 12ET
731.596	498.045	31.596
501.697	3.652	
229.899		29.899
502.856	4.811	
927.043		27.043
503.440	5.395	
423.604		23.604
504.232	6.187	
1119.372		19.372
501.136	3.091	
618.236		18.236
505.700	7.655	
112.536		12.536
502.688	4.643	
809.847		9.847
499.087	1.042	
310.760		10.760
508.394	10.349	
1002.366		2.366
500.849	2.804	
501.518		1.518
501.518	3.473	
0		0
506.731	8.686	
693.269		-6.731
503.020	4.975	
190.249		-9.751
500.051	2.006	
890.198		-9.802
504.750	6.705	
385.448		-14.552
505.608	7.563	
1079.840		-20.160
498.303	0.258	
581.537		-18.463
507.056	9.011	
74.482		-25.518
504.025	5.980	
770.457		-29.543
500.385	2.340	
270.071		-29.929

Beat Rate	A - 415	A - 440
Perf. Fifth		
0.004823	2.001	2.122
0.009507	3.945	4.183
0.007972	3.308	3.508
0.006834	2.836	3.007
0.005107	2.120	2.247
0.009459	3.925	4.162
0.008575	3.559	3.773
0.001441	0.598	0.634
0.010698	4.440	4.707
0.004331	1.797	1.906
0.004016	1.667	1.767
0.015014	6.231	6.606
0.006424	2.666	2.827
0.003878	1.609	1.706
0.009696	4.024	4.266
0.008169	3.390	3.594
0.000416	0.173	0.183
0.010895	4.522	4.794
0.010800	4.482	4.752
0.003162	1.312	1.391

Root	P5	Ratio	Cents
Cb 29	Gb 16	1.495838	697.144
B 28	F# 15	1.498263	699.949
Bb 26	F 13	1.495982	697.312
A# 25	E# 12	1.494828	695.975
A 23	E 10	1.492493	693.269
Ab 21	Eb 8	1.497325	698.864
G# 20	D# 7	1.499777	701.697
G 18	D 5	1.497573	699.151
Gb 16	Db 3	1.495333	696.560
F# 15	C# 2	1.494202	695.250
F 13	C 0	1.499098	700.913
E# 12	B# 30	1.497974	699.615
Fb 11	Cb 29	1.496839	698.303
E 10	B 28	1.495696	696.980
Eb 8	Bb 26	1.493382	694.300
D# 7	A# 25	1.492213	692.944
D 5	A 23	1.496994	698.482
Db 3	Ab 21	1.494649	695.768
C# 2	G# 20	1.493462	694.392
C 0	G 18	1.491060	691.606
Average:	+	1.495649	696.926
	*	1.495647	696.924
31ET EMT		1.495518	696.774
Average P5			A - 415
Beat Rate		0.007061	2.930

+/- 3/2	-3rd	Pitch
701.955		
-4.811	----	----
-2.006	D 5	1.336011
-4.643	Db 3	1.277216
-5.980	C# 2	1.249375
-8.686	C 0	1.196622
-3.091	Cb 29	1.142016
-0.258	B 28	1.116158
-2.804	Bb 26	1.067162
-5.395	----	----
-6.705	A 23	1
-1.042	Ab 21	0.954495
-2.340	G# 20	0.932947
-3.652	----	----
-4.975	G 18	0.892117
-7.655	Gb 16	0.854135
-9.011	F# 15	0.836149
-3.473	F 13	0.798228
-6.187	Fb 11	0.762951
-7.563	E 10	0.746246
-10.349	Eb 8	0.714594
-5.0291		
-5.0312		
-5.1808		

A - 440
3.107

	-3rd Ratio	Cents	+/- 6/5	Beat Rate
	Root to -3rd		315.641	Root to -3rd
Eq. Hrm. 2	----	----	----	----
	1.196973	311.269	-4.372	0.016892
	1.196834	311.068	-4.573	0.016892
	1.196764	310.966	-4.675	0.016892
	1.196622	310.760	-4.881	0.016892
	1.196460	310.527	-5.114	0.016892
	1.196379	310.409	-5.232	0.016892
1/4 Syn. C.	1.196213	310.169	-5.472	0.016892
	----	----	----	----
	1.195960	309.802	-5.839	0.016892
31Et	1.195768	309.524	-6.117	0.016892
	1.195670	309.383	-6.258	0.016892
	----	----	----	----
	1.195473	309.097	-6.544	0.016892
	1.195272	308.807	-6.834	0.016892
	1.195171	308.660	-6.981	0.016892
2/9 Syn. C.	1.194942	308.329	-7.312	0.016892
1/5 Dit. C.	1.194710	307.992	-7.649	0.016892
	1.194592	307.821	-7.820	0.016892
	1.194353	307.476	-8.166	0.016892
1/5 Syn. C.	1.195774	309.533	-6.1078	0.016892
	1.195774	309.533	-6.1082	
	1.195873	309.677	-5.9639	

+3rd Ratio	Cents	+/- 5/4	Beat Rate	A - 415	A - 440
-3rd to P5		386.314	-3rd to P5		
----	----	----	----	----	----
1.251710	388.680	2.366	0.009136	3.791	4.020
1.249949	386.244	-0.070	-0.000258	-0.107	-0.114
1.249058	385.009	-1.305	-0.004707	-1.953	-2.071
1.247256	382.509	-3.805	-0.013136	-5.451	-5.780
1.251462	388.337	2.023	0.006678	2.771	2.938
1.253597	391.288	4.975	0.016059	6.665	7.066
1.251928	388.982	2.668	0.008231	3.416	3.622
----	----	----	----	----	----
1.249375	385.448	-0.866	-0.002500	-1.038	-1.100
1.253670	391.389	5.075	0.014011	5.815	6.165
1.252832	390.231	3.917	0.010567	4.385	4.650
----	----	----	----	----	----
1.251133	387.882	1.569	0.004044	1.678	1.779
1.249407	385.493	-0.821	-0.002025	-0.840	-0.891
1.248535	384.284	-2.030	-0.004899	-2.033	-2.155
1.252775	390.153	3.839	0.008860	3.677	3.899
1.251056	387.776	1.462	0.003223	1.338	1.418
1.250186	386.571	0.257	0.000554	0.230	0.244
1.248425	384.130	-2.183	-0.004503	-1.869	-1.981
1.250727	387.320	1.0061	0.002902	1.204	1.277
1.250725	387.318	1.0043			
1.250566	387.097	0.7831			

Harm. 7th	Pitch
(x6th)	
A 23	2
----	----
G# 20	1.865893
----	----
F# 15	1.672297
----	----
E# 12	1.560542
E 10	1.492493
----	----
D# 7	1.399212
----	----
D 5	1.336011
----	----
C# 2	1.249375
----	----
B# 30	1.168825
B 28	1.116158
----	----
A# 25	1.043961

H.7th Ratio	Cents	+/- 7/4
Root to x6th		968.826
1.751290	970.101	1.275
----	----	----
1.748463	967.304	-1.522
----	----	----
1.752023	970.826	2.000
----	----	----
1.749256	968.090	-0.736
1.747374	966.226	-2.600
----	----	----
1.752898	971.690	2.864
----	----	----
1.751109	969.922	1.096
----	----	----
1.748369	967.212	-1.614
----	----	----
1.749724	968.553	-0.273
1.747797	966.645	-2.181
----	----	----
1.744848	963.721	-5.105
1.749377	968.210	-0.6162
1.749376	968.208	-0.6176
1.748905	967.742	-1.0840

Fx 17	1.196541 310.644 0.016892	0.872783			308.161 0.016892	505.637 964.434	7.592			0.015344 6.368 6.751			Fx 17
Cx 4	0.016892	1.195373 308.953 0.016892		1.306082	0.653041	502.139 462.295	4.094		-35.566 -37.705	0.006184 2.566 2.721			Cx 4
Bbbb Gx 22	0.976836	0.016892		1.196904 311.169 0.016892		502.868 1159.427	4.823		-40.573	0.005451 2.262 2.398			Bbbb Gx 22
Fbb Dx 9	1.195864 309.664 0.016892	0.730135		0.016892		503.946 655.481	5.901		-44.519	0.009971 4.138 4.387			Fbb Dx 9
Cbb 27		1.194473 307.649 0.016892		1.091217		504.355 151.126	6.310		-48.874	0.007969 3.307 3.506			Cbb 27
Gbb 14	0.816846	0.016892		1.196296 310.290 0.016892		501.364 849.763	3.319		49.763	0.006269 2.602 2.758			Gbb 14
Dbb 1	1.195057 308.496 0.016892	0.611261	1.222522	0.016892		501.931 347.832	3.886		47.832	0.005494 2.280 2.417			Dbb 1
Abb 19			1.196693 310.864 0.016892	0.912163		506.995 1040.837	8.950		40.837	0.009456 3.924 4.161			Abb 19
Ebb 6	1.367040	0.683520	0.016892	1.195572 309.241 0.016892		499.570 541.267	1.525		41.267	0.002409 1.000 1.060			Ebb 6
Bbb 24	1.197042 311.368 0.016892		1.021583	0.016892		504.298 36.968	6.253		36.968	0.007394 3.068 3.253			Bbb 24
Fb 11	0.016892		1.196045 309.925 0.016892	0.762951		505.373 731.596	7.328		31.596	0.012945 5.372 5.696			Fb 11
Cb 29	1.142016		0.016892										Cb 29
Gb 16			0.854135										Gb 16

(foldout)

+/- 3/2	701.955		+/- 5/4	+/- 6/5
			386.314	315.641
		E 10		
	-8.686	C 0	-3.805	
				-4.881
-1.042		A 23		
	-3.473	F 13	3.839	
				-7.312
-4.643		D 5		
	-2.804	Bb 26	2.668	
				-5.472
-7.655		G 18		
	-10.349	Eb 8	-2.183	
				-8.166
-3.091		C 0		
	-1.042		5.075	
		Ab 21		-6.117
-6.187		F 13		
	-4.643		-0.070	
		Db 3		-4.573
-5.395		Bb 26		
	-7.655		-0.821	
		Gb 16		-6.834
-4.811		Eb 8		
	-3.091		2.023	
		Cb 29		-5.114
-3.652		Ab 21		
	-6.187		1.462	
		Fb 11		-7.649
		Db 3		

(foldout)

+/- 3/2	701.955		+/- 5/4	+/- 6/5
			386.314	315.641
		D# 7		
	-0.258			-4.175
		B# 30		3.917
	-2.340	G# 20		
				-6.258
-7.563		E# 12		
	-5.980		-1.305	
		C# 2		-4.675
-6.705		A# 25		-2.030
	-9.011	F# 15		
				-6.981
-2.006		D# 7		4.975
	-0.258	B 28		-5.232
-4.975		G# 20		0.257
	-7.563	E 10		-7.820
		C# 2		-0.866
-8.686		A 23		-5.839
	-6.705			
		F# 15		2.366
-3.473		D 5		-4.372
	-2.006	B 28		1.569
-2.804		G 18		-6.544
	-4.975	E 10		-3.805
-10.349		C 0		

43EBMT(P5) Equal Beating Meantone Temperament

-Equal Beating Perfect Fifths and Fourths (C 0 to Cb 40)

A 32 to E 14	=	1.49695604	698.438	Cents	0.006088	A - 415	A - 440
				Beat Rate	0.006088	2.526487	2.678685
				D 7 to A 32 Beat Rate:	0.006088		

P4 below P5 beats at the same rate as the P5
P4 above P5 beats at twice the rate of the P5

3/2 =	701.955	Cents
--------------	----------------	--------------

Note	Ratios		Cents			Beat Rate	
			+/- 3/2	+/- 12ET			
B# 42		1.175438	279.838	701.955	-20.162		B# 42
		1.496126	697.478	-4.477		0.006088	E# 17
E# 17	1.571309	0.785655	782.360		-17.640		A# 35
	1.497100		698.604	-3.351		0.006088	D# 10
A# 35	1.049569		83.756		-16.244		G# 28
	1.495662		696.941	-5.014		0.006088	C# 3
D# 10	0.701742	1.403484	586.815		-13.185		F# 21
		1.496754	698.204	-3.751		0.006088	B 39
G# 28		0.937685	1088.610		-11.390		E 14
		1.495146	696.344	-5.611		0.006088	A 32
C# 3	1.254305	0.627153	392.266		-7.734		D 7
	1.496369		697.759	-4.196		0.006088	G 25
F# 21	0.838233	1.676466	894.508		-5.492		C 0
		1.497281	698.814	-3.141		0.006088	F 18
B 39		1.119673	195.693		-4.307		Bb 36
		1.495933	697.255	-4.700		0.006088	Eb 11
E 14	1.496956	0.748478	698.438		-1.562		A# 35
	1.496956		698.438	-3.517		0.006088	A 32
A 32	1		0		0		D 7
	1.495448		696.693	-5.262		0.006088	G 25
D 7	0.668696	1.337392	503.307		3.307		C 0
		1.496594	698.019	-3.936		0.006088	F 18
G 25		0.893624	1005.288		5.288		Bb 36
		1.494908	696.068	-5.887		0.006088	Eb 11
C 0	1.195557	0.597779	309.220		9.220		A# 35
	1.496191		697.553	-4.402		0.006088	D 7
F 18	0.799068	1.598135	811.667		11.667		A 32
		1.497148	698.661	-3.294		0.006088	Bb 36
Bb 36		1.067453	113.007		13.007		Eb 11
		1.495735	697.025	-4.930		0.006088	Ab 29
Eb 11	1.427329	0.713665	615.982		15.982		D 7
	1.496808		698.267	-3.688		0.006088	A 32
Ab 29	0.953582		1117.715		17.715		Bb 36
	1.495227		696.437	-5.518		0.006088	Eb 11
Db 4	0.637751	1.275501	421.277		21.277		Ab 29
		1.496429	697.828	-4.127		0.006088	Db 4
Gb 22	1.704727	0.852363	923.449		23.449		Gb 22
	1.497326		698.866	-3.089		0.006088	Cb 40
Cb 40	1.138514		224.582		24.582		Fb 15
	1.496000		697.333	-4.622		0.006088	
Fb 15	0.761039	1.522077	727.250		27.250		

Note	Beat Rate
Perf. Fifth	
B# 42	0.006088
E# 17	0.006088
A# 35	0.006088
D# 10	0.006088
G# 28	0.006088
C# 3	0.006088
F# 21	0.006088
B 39	0.006088
E 14	0.006088
A 32	0.006088
D 7	0.006088
G 25	0.006088
C 0	0.006088
F 18	0.006088
Bb 36	0.006088
Eb 11	0.006088
Ab 29	0.006088
Db 4	0.006088
Gb 22	0.006088
Cb 40	0.006088
Fb 15	0.006088

	Root	P5	Ratio	Cents	+/- 3/2	+3rd	Pitch
					701.955		
12Et							
	Cb 40	Gb 22	1.497326	698.866	-3.089	Eb 11	1.427329
	B 39	F# 21	1.497281	698.814	-3.141	D# 10	1.403484
	Bb 36	F 18	1.497148	698.661	-3.294	D 7	1.337392
	A# 35	E# 17	1.497100	698.604	-3.351	----	----
4/25 Syn. C.	A 32	E 14	1.496956	698.438	-3.517	C# 3	1.254305
	Ab 29	Eb 11	1.496808	698.267	-3.688	C 0	1.195557
	G# 28	D# 10	1.496754	698.204	-3.751	B# 42	1.175438
	G 25	D 7	1.496594	698.019	-3.936	B 39	1.119673
	Gb 22	Db 4	1.496429	697.828	-4.127	Bb 36	1.067453
	F# 21	C# 3	1.496369	697.759	-4.196	A# 35	1.049569
43Et							
1/5 Syn. C.	F 18	C 0	1.496191	697.553	-4.402	A 32	1
	E# 17	B# 42	1.496126	697.478	-4.477	----	----
	Fb 15	Cb 40	1.496000	697.333	-4.622	Ab 29	0.953582
	E 14	B 39	1.495933	697.255	-4.700	G# 28	0.937685
1/5 Dit. C.							
2/9 Syn. C.	Eb 11	Bb 36	1.495735	697.025	-4.930	G 25	0.893624
	D# 10	A# 35	1.495662	696.941	-5.014	----	----
31Et							
1/4 Syn. C.	D 7	A 32	1.495448	696.693	-5.262	F# 21	0.838233
	Db 4	Ab 29	1.495227	696.437	-5.518	F 18	0.799068
	C# 3	G# 28	1.495146	696.344	-5.611	E# 17	0.785655
	C 0	G 25	1.494908	696.068	-5.887	E 14	0.748478
Eq. Hrm. 2	Average:	+	1.496257	697.630	-4.3254		
		*	1.496257	697.629	-4.3256		
	43ET EMT		1.496296	697.674	-4.2806		

+3rd Ratio	Cents	+/- 5/4	Beat Rate	A - 415	A - 440
Root to +3rd		386.314	Root to +3rd		
1.253677	391.399	5.085	0.016746	6.950	7.368
1.253476	391.122	4.808	0.015569	6.461	6.850
1.252882	390.300	3.987	0.012305	5.107	5.414
----	----	----	----	----	----
1.254305	392.266	5.953	0.017221	7.147	7.577
1.253754	391.506	5.192	0.014320	5.943	6.301
1.253553	391.228	4.914	0.013326	5.530	5.864
1.252957	390.405	4.091	0.010571	4.387	4.651
1.252345	389.558	3.244	0.007994	3.317	3.517
1.252121	389.248	2.935	0.007111	2.951	3.129
1.251459	388.333	2.019	0.004662	1.935	2.051
----	----	----	----	----	----
1.253001	390.465	4.151	0.009135	3.791	4.019
1.252789	390.172	3.858	0.008350	3.465	3.674
1.252163	389.307	2.993	0.006174	2.562	2.717
----	----	----	----	----	----
1.253533	391.200	4.887	0.009451	3.922	4.158
1.252947	390.390	4.077	0.007517	3.120	3.308
1.252733	390.094	3.780	0.006855	2.845	3.016
1.252099	389.218	2.904	0.005018	2.083	2.208
1.252929	390.366	4.0519	0.010137	4.207	4.460
1.252929	390.365	4.0516			
1.253169	390.698	4.3840			

-3rd Ratio	Cents	+/- 6/5	Beat Rate	A - 415	A - 440
+3rd to P5		315.641	+3rd to P5		
1.194348	307.467	-8.174	0.040339	16.741	17.749
1.194503	307.693	-7.948	0.038573	16.008	16.972
1.194964	308.360	-7.281	0.033677	13.976	14.818
----	----	----	----	----	----
1.193454	306.172	-9.469	0.041051	17.036	18.063
1.193861	306.761	-8.880	0.036700	15.230	16.148
1.194009	306.977	-8.665	0.035209	14.612	15.492
1.194449	307.614	-8.027	0.031077	12.897	13.674
1.194902	308.270	-7.371	0.027211	11.292	11.973
1.195067	308.510	-7.131	0.025886	10.743	11.390
1.195557	309.220	-6.421	0.022213	9.218	9.774
----	----	----	----	----	----
1.193934	306.868	-8.774	0.028922	12.003	12.726
1.194082	307.083	-8.559	0.027745	11.514	12.208
1.194521	307.719	-7.923	0.024481	10.160	10.772
----	----	----	----	----	----
1.192986	305.492	-10.149	0.029397	12.200	12.935
1.193368	306.047	-9.594	0.026496	10.996	11.658
1.193508	306.250	-9.391	0.025502	10.583	11.221
1.193922	306.850	-8.791	0.022747	9.440	10.009
1.194202	307.256	-8.3849	0.030425	12.626	13.387
1.194202	307.256	-8.3852			
1.194009	306.977	-8.6645			

Harm. 7th	Pitch
(x6th)	
A 32	2
----	----
G# 28	1.875370
----	----
F# 21	1.676466
----	----
E# 17	1.571309
E 14	1.496956
----	----
D# 10	1.403484
----	----
D 7	1.337392
----	----
C# 3	1.254305
----	----
B# 42	1.175438
B 39	1.119673
----	----
A# 35	1.049569

H.7th Ratio	Cents	+/- 7/4
Root to x6th		968.826
1.756676	975.418	6.592
----	----	----
1.756865	975.604	6.778
----	----	----
1.758072	976.793	7.967
----	----	----
1.758356	977.072	8.246
1.756241	974.989	6.163
----	----	----
1.756401	975.147	6.321
----	----	----
1.757325	976.057	7.231
----	----	----
1.757556	976.285	7.459
----	----	----
1.757806	976.531	7.705
1.755660	974.416	5.590
----	----	----
1.755781	974.536	5.710
1.756976	975.714	6.877
1.756976	975.713	6.8874
1.758022	976.744	7.9183

		1.497006	698.496	-3.459		0.006088	
Bbb 33		1.016747	28.754		28.754		Bbb 33
		1.495523	696.780	-5.175		0.006088	
Ebb 8	1.359722	0.679861	531.974		31.974		Ebb 8
	1.496650		698.084	-3.871		0.006088	
Abb 26	0.908511		1033.890		33.890		Abb 26
	1.494991		696.164	-5.791		0.006088	
Dbb 1	0.607703	1.215406	337.726		37.726		Dbb 1
		1.496253	697.625	-4.330		0.006088	
Gbb 19	1.624600	0.812300	840.101		40.101		Gbb 19
	1.497195		698.714	-3.241		0.006088	
Cbb 37	1.085096		141.387		41.387		Cbb 37
	1.495804		697.105	-4.850		0.006088	
Fbb 12	0.725427	1.450853	644.282		44.282		Fbb 12
		1.496860	698.327	-3.628		0.006088	
Bbbb 30		0.969265	1145.955		45.955		Bbbb 30
		1.495304	696.527	-5.428		0.006088	
Db↑ 5	1.296412	0.648206	449.429		49.429		Db↑ 5
	1.496486		697.895	-4.060		0.006088	
Gb↑ 23	0.866304	1.732608	951.534		-48.466		Gb↑ 23
		1.497369	698.916	-3.039		0.006088	
Cb↑ 41		1.157101	252.618		-47.382		Cb↑ 41
		1.496064	697.407	-4.548		0.006088	
Fb↑ 16	1.546860	0.773430	755.211		-44.789		Fb↑ 16
	1.497054		698.552	-3.403		0.006088	
Bbb↑ 34	1.033269		56.660		-43.340		Bbb↑ 34
	1.495594		696.862	-5.093		0.006088	
D#↓ 9	0.690875	1.381751	559.797		-40.203		D#↓ 9
		1.496703	698.145	-3.810		0.006088	
G#↓ 27		0.923197	1061.652		-38.348		G#↓ 27
		1.495070	696.256	-5.699		0.006088	
C#↓ 2	1.234987	0.617494	365.396		-34.604		C#↓ 2
	1.496312		697.693	-4.262		0.006088	
F#↓ 20	0.825354	1.650709	867.702		-32.298		F#↓ 20
		1.497239	698.765	-3.190		0.006088	
B↓ 38		1.102502	168.937		-31.063		B↓ 38
		1.495870	697.182	-4.773		0.006088	
Dx 13	1.474061	0.737030	671.755		-28.245		Dx 13
	1.496909		698.384	-3.571		0.006088	
Gx 31	0.984737		1173.372		-26.628		Gx 31
	1.495378		696.612	-5.343		0.006088	
Cx 6	0.658520	1.317041	476.760		-23.240		Cx 6
		1.496541	697.958	-3.997		0.006088	
Fx 24	1.760113	0.880056	978.801		-21.199		Fx 24
	1.497410		698.964	-2.991		0.006088	
B# 42	1.175438		279.838		-20.162		B# 42

(foldout)

+/- 3/2	701.955		+/- 5/4	+/- 6/5
			386.314	315.641
		E 10		
			2.904	
	-3.517	C 0		
				-6.421
	-4.402	A 23		
			2.019	
	-5.262	F 13		
				-7.281
	-3.294	D 5		
			3.987	
	-3.936	Bb 26		
				-7.923
	-4.930	G 18		
			2.993	
	-5.887	Eb 8		
				-8.880
	-3.688	C 0		
			5.192	
	-4.402	Ab 21		
				-9.594
	-5.518	F 13		
			4.077	
	-3.294	Db 3		
				-7.371
	-4.127	Bb 26		
			3.244	
	-4.930	Gb 16		
				-8.174
	-3.089	Eb 8		
			5.085	
	-3.688	Cb 29		
				-8.774
	-4.622	Ab 21		
			4.151	
	-5.518	Fb 11		
				-9.669
		Db 3		

(foldout)

+/- 3/2	701.955		+/- 5/4	+/- 6/5
			386.314	315.641
		D# 7		
				-8.665
	-3.751	B# 30		
			4.914	
	-4.477	G# 20		
				-9.391
	-5.611	E# 12		
			3.780	
	-3.351	C# 2		
				-7.131
	-4.196	A# 25		
			2.935	
	-5.014	F# 15		
				-7.948
	-3.141	D# 7		
			4.808	
	-3.751	B 28		
				-8.559
	-4.700	G# 20		
			3.858	
	-5.611	E 10		
				-9.469
	-3.517	C# 2		
			5.953	
	-4.196	A 23		
				-10.149
	-5.262	F# 15		
			4.887	
	-3.141	D 5		
				-8.027
	-3.936	B 28		
			4.091	
	-4.700	G 18		
				-8.791
	-5.887	E 10		
			2.904	
		C 0		

43EBMT(+3) Equal Beating Meantone Temperament

-Equal Beating +3rds and -6ths (C 0 to Cb 40)

-6th below +3rd beats at the same rate as the +3rd

-6th above +3rd beats at twice the rate of the +3rd

Beat Rate	A - 415	A - 440
A 32 to C# 3 = 1.25260275	389.915	Cents 0.010411
	4.320557	4.580831
F 18 to A 32	Beat Rate: 0.010411	

5/4 =	386.31371	Cents
-------	-----------	-------

Note	Ratios	Ratios	Ratios	Ratios	Cents	+/- 3/2	+/- 12ET	Beat Rate	A - 415	A - 440	Perf. Fifth	Root	P5
B# 42		1.177554			282.951	701.955	-17.049					B# 42	
E# 17	0.785479	1.252769			700.977	-0.978		0.001331	0.552	0.586		Cb 40	Gb 22
A# 35	1.254156	390.144			781.975		-18.025	0.004839	2.008	2.129		B 39	F# 21
D# 10	392.060	0.010411			699.291	-2.664		0.005693	2.362	2.505		Bb 36	F 18
G# 28	0.010411		0.939961		82.684		-17.316	0.015175	6.298	6.677		A# 35	E# 17
C# 3	1.252603	0.626301			697.263	-4.692		0.005953	2.471	2.619		D# 10	
F# 21	1.252603				585.420		-14.580	-0.01017	-0.422	-0.448		A 32	E 14
B 39	389.915				692.613	-9.342		0.011191	4.644	4.924		G# 28	
E 14	0.010411		0.749886		1092.807	0.937	-7.193	0.005953	2.471	2.619		C# 3	
A 32	1				389.915		-10.085	0.011191	4.644	4.924		F# 21	
D 7					697.846	-4.109		0.010058	4.174	4.425		G 25	D 7
G 25	1.253262				892.069		-7.931	0.005953	2.471	2.619		B 39	
C 0	390.825				696.178	-5.777		0.011191	4.644	4.924		Gb 22	Db 4
F 18	0.797918				195.890		-4.110	0.010058	4.174	4.425		F# 21	C# 3
Bb 36					701.693	-0.262	1.693	0.000454	0.189	0.200		E 14	
Eb 11	1.254091				0		0	0.002680	1.112	1.179		A 32	
Ab 29	391.970				699.637	-2.318		0.011035	4.579	4.855		D 7	
Db 4	0.636252	1.272504			500.363		0.363	0.005964	2.475	2.624		G 25	
Gb 22					694.815	-7.140		0.005964	2.475	2.624		C 0	
Cb 40	1.252562				1005.548		5.548	0.002446	1.015	1.076		F 18	
Fb 15	389.858				696.188	-5.767		0.006370	2.644	2.803		Bb 36	
	0.010411				309.360		9.360	0.006746	2.799	2.968		C# 3	G# 28
					700.185	-1.770		0.011625	4.824	5.115		Db 4	Ab 29
					809.175		9.175	0.006746	2.799	2.968		Eb 11	
					698.503	-3.452		-0.000126	-0.052	-0.055		C 0	G 25
					110.672		10.672	0.007178	2.979	3.159		Db 4	
					696.486	-5.469		0.012875	5.343	5.665		Gb 22	
					614.185		14.185	0.007218	2.995	3.176		Cb 40	
					694.912	-7.043						Fb 15	
					1119.273		19.273						
					702.069	0.114							
					417.204		17.204						
					697.079	-4.876							
					920.126		20.126						
					695.417	-6.538							
					224.709		24.709						
					696.476	-5.479							
					728.232		28.232						

Ratio	Cents	+/- 3/2	+3rd	Pitch	1/5 Dit. C.	+3rd Ratio	Cents	+/- 5/4	Beat Rate	-3rd Ratio	Cents	+/- 6/5	Beat Rate	A - 415	A - 440	Harm. 7th (x6th)	Pitch	H.7th Ratio Root to x6th	Cents	+/- 7/4	
		701.955				Root to +3rd		386.314	Root to +3rd	+3rd to P5		315.641	+3rd to P5								968.826
1.494346	695.417	-6.538	Eb 11	1.425849		1.252286	389.477	3.163	0.010411	1.193295	305.940	-9.701	0.047804	19.839	21.034	A 32	2	1.756548	975.291	6.466	
1.495003	696.178	-5.777	D# 10	1.402354		1.252324	389.530	3.216	0.010411	1.193783	306.649	-8.993	0.043593	18.091	19.181	----	----	----	----	----	----
1.497012	698.503	-3.452	D 7	1.335120		1.252442	389.692	3.378	0.010411	1.195275	308.811	-6.830	0.031542	13.090	13.879	G# 28	1.879921	1.763506	982.135	13.309	
1.497694	699.291	-2.664	----	----		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
1.499773	701.693	-0.262	C# 3	1.252603		1.252603	389.915	3.601	0.010411	1.197325	311.778	-3.863	0.016752	6.952	7.371	----	----	----	----	----	----
1.493910	694.912	-7.043	C 0	1.195654		1.252727	390.086	3.773	0.010411	1.192527	304.826	-10.816	0.044679	18.542	19.659	F# 21	1.674106	1.754017	972.795	3.970	
1.491928	692.613	-9.342	B# 42	1.177554		1.252769	390.144	3.831	0.010411	1.190904	302.469	-13.173	0.053554	22.225	23.564	----	----	----	----	----	----
1.493827	694.815	-7.140	B 39	1.119801		1.252912	390.342	4.029	0.010411	1.192284	304.473	-11.168	0.043203	17.929	19.009	E# 17	1.570959	1.757700	976.427	7.601	
1.495781	697.079	-4.876	Bb 36	1.066014		1.253059	390.546	4.232	0.010411	1.193703	306.533	-9.108	0.033563	13.929	14.768	E 14	1.499773	1.762927	981.567	12.741	
1.496444	697.846	-4.109	A# 35	1.048919	1/5 Syn. C. 43Et	1.253109	390.615	4.301	0.010411	1.194185	307.231	-8.410	0.030499	12.657	13.420	----	----	----	----	----	----
1.498467	700.185	-1.770	A 32	1		1.253262	390.825	4.512	0.010411	1.195654	309.360	-6.282	0.021731	9.018	9.562	D# 10	1.402354	1.757516	976.246	7.420	
1.499153	700.977	-0.978	----	----		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
1.495261	696.476	-5.479	Ab 29	0.954441		1.253418	391.041	4.727	0.010411	1.192947	305.435	-10.206	0.033661	13.969	14.811	D 7	1.335120	1.753345	972.131	3.305	
1.493294	694.198	-7.757	G# 28	0.939961		1.253471	391.114	4.800	0.010411	1.191327	303.083	-12.558	0.040761	16.916	17.935	----	----	----	----	----	----
1.495269	696.486	-5.469	G 25	0.893758		1.253651	391.363	5.049	0.010411	1.192732	305.124	-10.518	0.032480	13.479	14.291	C# 3	1.252603	1.756992	975.729	6.903	
1.495941	697.263	-4.692	----	----		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
1.497993	699.637	-2.318	F# 21	0.837053		1.253899	391.705	5.392	0.010411	1.194668	307.931	-7.710	0.022317	9.262	9.819	B# 42	1.177554	1.763967	982.588	13.762	
1.500099	702.069	0.114	F 18	0.797918		1.254091	391.970	5.656	0.010411	1.196164	310.099	-5.543	0.015303	6.351	6.733	B 39	1.119801	1.759995	978.686	9.860	
1.500812	702.892	0.937	E# 17	0.785479		1.254156	392.060	5.746	0.010411	1.196671	310.832	-4.809	0.013073	5.425	5.752	----	----	----	----	----	----
1.495012	696.188	-5.767	E 14	0.749886	1/6 Hold. C.	1.254354	392.333	6.019	0.010411	1.191858	303.855	-11.786	0.030527	12.669	13.432	A# 35	1.048919	1.754553	973.324	4.498	
1.496351	697.738	-4.2168				1.253208	390.751	4.4370	0.010411	1.193841	306.733	-8.9081	0.032650	13.550	14.366			1.758279	976.996	8.1705	
1.496349	697.736	-4.2190				1.253208	390.751	4.4368		1.193840	306.731	-8.9102						1.758275	976.993	8.1668	
1.496296	697.674	-4.2806				1.253169	390.698	4.3840		1.194009	306.977	-8.6645						1.758022	976.744	7.9183	
	A - 415	A - 440																			
0.006384	2.650	2.809																			

Bbb 33	1.015921			1.252864 390.276 0.010411		0.010411	700.886 -1.069 27.346			0.001881	0.781	0.828	Bbb 33
Ebb 8		1.254287 392.241 0.010411			0.678501	1.357002	27.346		27.346	0.003661	1.519	1.611	Ebb 8
Abb 26	1.253211 390.755 0.010411			0.908795			528.507 698.839 -3.116 28.507			0.012382	5.139	5.448	Abb 26
Dbb 1		1.214188 0.607094		1.253590 391.279 0.010411			694.074 -7.881 1034.433 698.442 -3.513 34.433			0.003692	1.532	1.624	Dbb 1
Gbb 19	0.810655			1.253590 391.279 0.010411			335.991 699.399 -2.556 35.991			0.003587	1.489	1.578	Gbb 19
Cbb 37				0.724954	1.449908		836.591 697.721 -4.234 36.591			0.007939	3.295	3.493	Cbb 37
Fbb 12	1.254026 391.881 0.010411						138.870 695.716 -6.239 38.870			0.007824	3.247	3.442	Fbb 12
Bbbb 30		0.969269					643.154 697.192 -4.763 43.154			0.007989	3.316	3.515	Bbbb 30
Db 5	1.292883 0.646442			1.252248 389.424 0.010411			1145.962 701.252 -0.703 45.962			0.000788	0.327	0.347	Db 5
Gb 23		1.253366 390.969 0.010411					444.710 696.318 -5.637 44.710			0.008434	3.500	3.711	Gb 23
Cb 41	1.252521 389.802 0.010411			1.157844			948.393 694.663 -7.292 48.393			0.014600	6.059	6.424	Cb 41
Fb 16		0.773333		1.252816 390.210 0.010411			253.730 698.736 -3.219 -46.270			0.004309	1.788	1.896	Fb 16
Bbb 34	1.032224			1.254221 392.150 0.010411			754.993 700.085 -1.870 -45.007			0.003342	1.387	1.471	Bbb 34
D# 9		0.616584	1.233168				54.908 698.048 -3.907 -45.092			0.004665	1.936	2.052	D# 9
G# 27	1.253160 390.685 0.010411			0.924193		1.379409	556.860 693.340 -8.615 -43.140			0.013762	5.711	6.055	G# 27
C# 2			1.252363 389.583 0.010411			0.689704	1063.520 700.677 -1.278 -37.157			0.001365	0.567	0.601	C# 2
F# 20	0.823697			1.253530 391.196 0.010411			362.843 698.620 -3.335 -37.157			0.004756	1.974	2.093	F# 20
B 38			1.252644 389.972 0.010411		1.101445		864.223 696.947 -5.008 -35.777			0.009546	3.961	4.200	B 38
Dx 13	1.253962 391.793 0.010411			1.474545	0.737272		167.277 694.953 -7.002 -32.723			0.008928	3.705	3.928	Dx 13
Gx 31			0.984452				672.324 699.452 -2.503 -27.676			0.004267	1.771	1.877	Gx 31
Cx 6	0.656876	1.313751		1.252210 389.372 0.010411			1172.871 700.441 -1.514 -27.129			0.001723	0.715	0.758	Cx 6
Fx 24			1.253314 390.897 0.010411		0.879074		472.431 695.563 -6.392 -27.569			0.009719	4.033	4.276	Fx 24
B# 42	1.252481 389.747 0.010411			1.177554			976.867 693.916 -8.039 -23.133			0.016366	6.792	7.201	B# 42
E# 17		0.785479					282.951						E# 17
A# 35	1.048919												A# 35
D# 10					0.701177								D# 10

(foldout)

+/- 3/2	701.955		+/- 5/4	+/- 6/5
			386.314	315.641
		E 10		
			6.019	
	-0.262	C 0		-6.282
	-1.770	A 23	4.512	
	-2.318	F 13		-6.830
	-3.452	D 5		
			3.378	
	-7.140	Bb 26		-10.518
	-5.469	G 18	5.049	
				-10.816
	-5.767	Eb 8		
	-7.043	C 0		
			3.773	
	-1.770	Ab 21		-5.543
	0.114	F 13		
			5.656	
	-3.452	Db 3		-9.108
	-4.876	Bb 26		
			4.232	
	-5.469	Gb 16		-9.701
	-6.538	Eb 8		
			3.163	
	-7.043	Cb 29		-10.206
	-5.479	Ab 21		
			4.727	
	0.114	Fb 11		-4.614
		Db 3		

(foldout)

+/- 3/2	701.955		+/- 5/4	+/- 6/5
			386.314	315.641
		D# 7		
				-13.173
	-9.342	B# 30	3.831	
				-4.809
	-0.978	G# 20		
	0.937	E# 12		
			5.746	
	-2.664	C# 2		-8.410
	-4.109	A# 25		
			4.301	
	-4.692	F# 15		-8.993
	-5.777	D# 7		
			3.216	
	-9.342	B 28		-12.558
	-7.757	G# 20		
			4.800	
	0.937	E 10		-3.863
	-0.262	C# 2		
			3.601	
	-4.109	A 23		-7.710
	-2.318	F# 15		
			5.392	
	-5.777	D 5		-11.168
	-7.140	B 28		
			4.029	
	-7.757	G 18		-11.786
	-5.767	E 10		
			6.019	
		C 0		

43EBMT(-3) Equal Beating Meantone Temperament

-Equal Beating -3rds and +6ths (C 0 to Cb 40)

+6th above -3rd beats at the same rate as the -3rd
+6th below -3rd beats at half the rate of the -3rd

A 32 to C 0 = 1.19509497	308.550	Cents	Beat Rate 0.024525	A - 415 10.177937	A - 440 10.791066	6/5 = 315.64129	Cents
			F# 21 to A 32 Beat Rate: 0.024525				

Note	Ratios	Ratios	Ratios
Fb 15		0.756906	
Cb 40		1.192274 304.458 0.024525	1.133985
Gb 22	0.849677		1.194832 308.169 0.024525
Db 4	1.193112 305.676 0.024525	1.269686	0.634843
Ab 29		1.195382 308.966 0.024525	0.949075
Eb 11	0.712152		1.193830 306.717 0.024525
Bb 36	1.191791 303.758 0.024525	1.062159	
F 18		1.194484 307.665 0.024525	0.794983
C 0	1.195095	0.597547	1.192641 304.992 0.024525
G 25	1.195095 308.550 0.024525	0.889220	1.192641 304.992 0.024525
D 7		1.193417 306.118 0.024525	0.666574
A 32	1		1.195601 309.283 0.024525
E 14	1.194143 307.170 0.024525	0.745104	1.195601 309.283 0.024525
B 39		1.192152 304.282 0.024525	1.115044
F# 21	0.837421		1.194744 308.042 0.024525
C# 3	1.193012 305.531 0.024525	0.625008	1.250015
G# 28		1.195310 308.861 0.024525	0.933291
D# 10	0.701938	1.403876	1.193726 306.566 0.024525
A# 35		1.195822 309.603 0.024525	1.045767
E# 17		1.194398 307.540 0.024525	0.781830
B# 42	1.173985		1.192518

Cents	+/- 4/3	+/- 12ET
717.824	498.045	17.824
500.142	2.097	
217.682		17.682
499.698	1.653	
917.984		17.984
504.619	6.574	
413.366		13.366
503.853	5.808	
1109.513		9.513
497.205	-0.840	
612.308		12.308
507.909	9.864	
104.399		4.399
501.603	3.558	
802.796		2.796
494.246	-3.799	
308.550		8.550
511.816	13.771	
996.735		-3.265
498.931	0.886	
497.804		-2.196
497.804	-0.241	
0		0
509.383	11.338	
690.617		-9.383
502.096	4.051	
188.520		-11.480
495.691	-2.354	
892.830		-7.170
506.495	8.450	
386.335		-13.665
505.857	7.812	
1080.478		-19.522
493.179	-4.866	
587.299		-12.701
509.826	11.781	
77.474		-22.526
503.562	5.517	
773.912		-26.088
496.215	-1.830	
277.696		-22.304

Beat Rate	A - 415	A - 440
Perf. Fifth		
0.002749	1.141	1.209
0.003246	1.347	1.428
0.009661	4.009	4.251
0.006378	2.647	2.806
-0.001383	-0.574	-0.608
0.012138	5.037	5.341
0.006543	2.715	2.879
-0.005240	-2.174	-2.305
0.014203	5.894	6.249
0.001365	0.566	0.601
-0.000279	-0.116	-0.123
0.019584	8.127	8.617
0.005225	2.168	2.299
-0.004552	-1.889	-2.003
0.012232	5.076	5.382
0.008442	3.503	3.714
-0.007881	-3.271	-3.468
0.014281	5.927	6.284
0.009982	4.142	4.392
-0.002480	-1.029	-1.091

Root	P5	Ratio	Cents
Cb 40	Gb 22	1.498569	700.302
B 39	F# 21	1.502041	704.309
Bb 36	F 18	1.496920	698.397
A# 35	E# 17	1.495228	696.438
A 32	E 14	1.490208	690.617
Ab 29	Eb 11	1.500728	702.795
G# 28	D# 10	1.504222	706.821
G 25	D 7	1.499233	701.069
Gb 22	Db 4	1.494315	695.381
F# 21	C# 3	1.492697	693.505
F 18	C 0	1.503295	705.754
E# 17	B# 42	1.501586	703.785
Fb 15	Cb 40	1.498184	699.858
E 14	B 39	1.496494	697.904
Eb 11	Bb 36	1.491478	692.091
D# 10	A# 35	1.489828	690.174
D 7	A 32	1.500209	702.196
Db 4	Ab 29	1.494977	696.147
C# 3	G# 28	1.493247	694.143
C 0	G 25	1.488116	688.184
Average:	+	1.496579	698.002
	*	1.496572	697.994
43ET EMT		1.496296	697.674
Average P5			A - 415
Beat Rate		0.005211	2.162

+/- 3/2	-3rd	Pitch	-3rd Ratio	Cents	+/- 6/5	Beat Rate	+3rd Ratio	Cents	+/- 5/4	Beat Rate	A - 415	A - 440	Harm. 7th	Pitch	H.7th Ratio	Cents	+/- 7/4	
701.955			Root to -3rd		315.641	Root to -3rd	-3rd to P5		386.314	-3rd to P5			(x6th)		Root to x6th		968.826	
-1.653	----	----	----	----	----	----	----	----	----	----	----	----	A 32	2	1.763692	982.318	13.492	
2.354	D 7	1.333147	1.195601	309.283	-6.358	0.024525	1.256306	395.026	8.712	0.033629	13.956	14.797	----	----	----	----	----	
-3.558	Db 4	1.269686	1.195382	308.966	-6.675	0.024525	1.252252	389.430	3.117	0.011439	4.747	5.033	G# 28	1.866581	1.757347	976.078	7.253	
-5.517	C# 3	1.250015	1.195310	308.861	-6.780	0.024525	1.250912	387.577	1.263	0.004561	1.893	2.007	----	----	----	----	----	
-11.338	C 0	1.195095	1.195095	308.550	-7.091	0.024525	1.246937	382.066	-4.247	-0.014642	-6.076	-6.442	----	----	----	----	----	
0.840	Cb 40	1.133985	1.194832	308.169	-7.472	0.024525	1.256016	394.626	8.313	0.027290	11.325	12.008	F# 21	1.674842	1.764709	983.317	14.491	
4.866	B 39	1.115044	1.194744	308.042	-7.599	0.024525	1.259033	398.779	12.465	0.040287	16.719	17.726	----	----	----	----	----	
-0.886	Bb 36	1.062159	1.194484	307.665	-7.976	0.024525	1.255130	393.404	7.090	0.021795	9.045	9.590	E# 17	1.563659	1.758462	977.177	8.351	
-6.574	----	----	----	----	----	----	----	----	----	----	----	----	E 14	1.490208	1.753852	972.632	3.806	
-8.450	A 32	1	1.194143	307.170	-8.471	0.024525	1.250015	386.335	0.021	0.000061	0.025	0.027	----	----	----	----	----	
3.799	Ab 29	0.949075	1.193830	306.717	-8.924	0.024525	1.259221	399.037	12.724	0.035004	14.527	15.402	D# 10	1.403876	1.765919	984.503	15.677	
1.830	G# 28	0.933291	1.193726	306.566	-9.075	0.024525	1.257898	397.218	10.904	0.029485	12.236	12.973	----	----	----	----	----	
-2.097	----	----	----	----	----	----	----	----	----	----	----	----	D 7	1.333147	1.761311	979.980	11.154	
-4.051	G 25	0.889220	1.193417	306.118	-9.523	0.024525	1.253957	391.786	5.472	0.014075	5.841	6.193	----	----	----	----	----	
-9.864	Gb 22	0.849677	1.193112	305.676	-9.965	0.024525	1.250073	386.415	0.101	0.000249	0.103	0.109	C# 3	1.250015	1.755265	974.026	5.200	
-11.781	F# 21	0.837421	1.193012	305.531	-10.111	0.024525	1.248795	384.644	-1.670	-0.004037	-1.675	-1.776	----	----	----	----	----	
0.241	F 18	0.794983	1.192641	304.992	-10.649	0.024525	1.257888	397.204	10.890	0.025083	10.409	11.036	B# 42	1.173985	1.761222	979.893	11.067	
-5.808	Fb 15	0.756906	1.192274	304.458	-11.183	0.024525	1.253887	391.689	5.375	0.011769	4.884	5.178	B 39	1.115044	1.756409	975.155	6.329	
-7.812	E 14	0.745104	1.192152	304.282	-11.359	0.024525	1.252564	389.861	3.548	0.007642	3.171	3.362	----	----	----	----	----	
-13.771	Eb 11	0.712152	1.191791	303.758	-11.883	0.024525	1.248638	384.426	-1.888	-0.003880	-1.610	-1.707	A# 35	1.045767	1.750098	968.923	0.097	
-3.9532			1.193856	306.754	-8.8871	0.024525	1.253501	391.156	4.8426	0.014107	5.854	6.207			1.758935	977.643	8.8168	
-3.9614			1.193855	306.753	-8.8880		1.253496	391.149	4.8348						1.758929	977.637	8.8107	
-4.2806			1.194009	306.977	-8.6645		1.253169	390.698	4.3840						1.758022	976.744	7.9183	
A - 440																		
2.293																		

Fx 24	1.195007 308.423 0.024525		0.875560		304.814 0.024525	507.763 9.718			0.019714 8.181 8.674			Fx 24
Cx 6			1.193315 305.970 0.024525	1.311225	0.655612	969.933 500.836 2.791		-30.067	0.004231 1.756 1.861			Cx 6
Gx 31	0.982408			1.195528 309.177 0.024525		469.098 499.825 1.780		-30.727	0.002021 0.839 0.889			Gx 31
Dx 13	1.194038 307.019 0.024525		0.733721	1.096775		1169.273 505.309 7.264		-36.036	0.012341 5.121 5.430			Dx 13
B _↓ 38			1.192031 304.106 0.024525			663.964 504.043 5.998		-40.079	0.007613 3.159 3.350			B _↓ 38
F# _↓ 20	0.822761			1.194657 307.916 0.024525		159.921 497.667 -0.378		-37.746	-0.000719 -0.299 -0.317			F# _↓ 20
C# _↓ 2	1.192888 305.351 0.024525	1.231043	0.615522			862.254 502.397 4.352		-40.143	0.006196 2.572 2.726			C# _↓ 2
G# _↓ 27		1.195238 308.757 0.024525		0.918066		359.857 507.853 9.808		-47.995	0.010432 4.329 4.590			G# _↓ 27
D# _↓ 9	1.379443 0.689722			1.193623 306.416 0.024525		1052.005 495.101 -2.944		-43.097	-0.004687 -1.945 -2.062			D# _↓ 9
Bbb _↑ 34	1.195748 309.496 0.024525	1.029957		0.769143		556.903 505.803 7.758		-48.900	0.009251 3.839 4.071			Bbb _↑ 34
Fb _↑ 16		1.194312 307.416 0.024525		1.192396 304.636 0.024525		51.100 505.512 7.467		45.588	0.013299 5.519 5.851			Fb _↑ 16
Cb _↑ 41	1.153623			0.645040	1.290080	745.588 498.181 0.136		47.407	0.000182 0.075 0.080			Cb _↑ 41
Gb _↑ 23	1.194919 308.296 0.024525	0.862385				247.407 503.722 5.677		43.684	0.011331 4.702 4.986			Gb _↑ 23
Db _↑ 5		1.193213 305.822 0.024525				943.684 502.732 4.687		40.952	0.006995 2.903 3.078			Db _↑ 5
Bbbb 30	0.965440			1.195455 309.071 0.024525		440.952 501.841 3.796		39.111	0.004239 1.759 1.865			Bbbb 30
Fbb 12	1.193934 306.868 0.024525	0.722742		1.079154		1139.111 501.249 3.204		37.862	0.005355 2.222 2.356			Fbb 12
Cbb 37		1.191911 303.932 0.024525				637.862 505.981 7.936		31.881	0.009916 4.115 4.363			Cbb 37
Gbb 19	0.808621			1.194570 307.790 0.024525		131.881 499.638 1.593		32.243	0.002977 1.236 1.310			Gbb 19
Dbb 1	1.192765 305.171 0.024525	0.606372	1.212744			832.243 498.313 0.268		33.930	0.000375 0.156 0.165			Dbb 1
Abb 26				0.903383		333.930 509.840 11.795		24.091	0.012351 5.126 5.435			Abb 26
Ebb 8	0.677939	1.355877		1.193520 306.267 0.024525		1024.091 497.019 -1.026		27.072	-0.001606 -0.667 -0.707			Ebb 8
Bbb 33		1.195675 309.390 0.024525	1.014708			527.072 501.795 3.750		25.277	0.004400 1.826 1.936			Bbb 33
Fb 15				0.756906		25.277 507.453 9.408		17.824	0.016498 6.847 7.259			Fb 15
Cb 40	1.133985											Cb 40
Gb 22			0.849677									Gb 22

(foldout)

+/- 3/2	701.955		+/- 5/4	+/- 6/5
			386.314	315.641
		E 10		
	-11.338	C 0	-4.247	
	3.799	A 23		-7.091
	0.241	F 13	10.890	
	-3.558	D 5		-10.649
	-0.886	Bb 26	7.090	
	-9.864	G 18		-7.976
	-13.771	Eb 8	-1.888	
	0.840	C 0		-11.883
	3.799	Ab 21	12.724	
	-5.808	F 13		-8.924
	-3.558	Db 3	3.117	
	-6.574	Bb 26		-6.675
	-9.864	Gb 16	0.101	
	-1.653	Eb 8		-9.965
	0.840	Cb 29	8.313	
	-2.097	Ab 21		-7.472
	-5.808	Fb 11	5.375	
		Db 3		-11.183

(foldout)

+/- 3/2	701.955		+/- 5/4	+/- 6/5
			386.314	315.641
		D# 7		
	4.866	B# 30		-6.038
	1.830	G# 20	10.904	
	-7.812	E# 12		-9.075
	-5.517	C# 2	1.263	
	-8.450	A# 25		-6.780
	-11.781	F# 15	-1.670	
	2.354	D# 7		-10.111
	4.866	B 28	12.465	
	-4.051	G# 20		-7.599
	-7.812	E 10	3.548	
	-11.338	C# 2		-11.359
	-8.450	A 23	0.021	
	0.241	F# 15		-8.471
	2.354	D 5	8.712	
	-0.886	B 28		-6.358
	-4.051	G 18	5.472	
	-13.771	E 10		-9.523
		C 0	-4.247	

1/4 Syntonic Comma Equal Meantone Temperament

Jorgensen Chapters 11,12

Fifth = $(3/2) / (81/80)^{1/4} = 1.495348781 = 696.5784$ Cents

Note	Ratio	Cents	+/- from 12ET
B#	1.168241	269.21	-30.79
E#	1.562500	772.63	-27.37
A#	1.044907	76.05	-23.95
D#	1.397542	579.47	-20.53
G#	1.869186	1082.89	-17.11
C#	1.250000	386.31	-13.69
F#	1.671851	889.74	-10.26
B	1.118034	193.16	-6.84
E	1.495349	696.58	-3.42
A	1.000000	0.00	0.00
D	1.337481	503.42	3.42
G	1.788854	1006.84	6.84
C	1.196279	310.26	10.26
F	1.600000	813.69	13.69
Bb	1.069984	117.11	17.11
Eb	1.431084	620.53	20.53
Ab	1.914046	1123.95	23.95
Db	1.280000	427.37	27.37
Gb	1.711975	930.79	30.79
Cb	1.144867	234.22	34.22
Fb	1.531237	737.64	37.64

		Wolf +/- from Just
wolf o8	1123.95	35.68
+7	1082.89	
-7	1006.84	
wolf x6	965.78	-30.31
wolf o7	930.79	46.44
+6	889.74	
-6	813.69	
wolf x5	772.63	-41.06
wolf o6	737.64	35.68
P5	696.58	
o5	620.53	
x4	579.47	
P4	503.42	
wolf x3	462.36	-35.68
wolf o4	427.37	41.06
+3	386.31	
-3	310.26	
wolf x2	269.21	-46.44
wolf o3	234.22	30.31
+2	193.16	
-2	117.11	
wolf x1	76.05	-35.68

-Pure Major Thirds and Minor Sixths

-Equal Beating 1st Inversion Minor Triads (P4, +6)

-Minor Sevenths beat almost twice as fast as Minor Seconds

Beat Rates from A

	A 415	A 440
8(Ab)-15(A)	0.312372	129.634181
15(A)-8(G#)	0.046512	19.302558
9(G)-16(A)	0.099689	41.371117
16(A)-9(Fx)	0.277647	115.223519
3(Gb)-5(A)	0.135926	56.409100
3(F#)-5(A)	0.015552	6.454199
8(A)-5(F)	0	0
8(A)-5(E#)	0.187500	77.812500
2(Fb)-3(A)	0.062474	25.926836
3(A)-2(E)	0.009302	3.860512
5(Eb)-7(A)	0.155418	64.498274
10(A)-7(D#)	0.217203	90.139078
3(D)-4(A)	0.012442	5.163359
4(A)-3(Cx)	0.081600	33.863907
4(Db)-5(A)	0.120000	49.800000
4(C#)-5(A)	0	0
6(A)-5(C)	0.018605	7.721023
6(A)-5(B#)	0.158794	65.899437
8(Cb)-9(A)	0.158934	65.957791
9(A)-8(B)	0.055728	23.127157
15(Bb)-16(A)	0.049767	20.653438
16(A)-15(A#)	0.326399	135.455627

A-440 Avg.
Beat Rate for
+/-3/6, P4/5
4.10

Avg. Deviation
from Mean
2.74

	Beat Rates
	Major Triads
	2nd Inversion
2X	0.000000
Z	0.023256
2Y	0.018605
	1st Inversion
2Y	0.018605
2X	0.000000
Z	0.023256
	Root Position
Z	0.023256
Y	0.009302
X	0.000000
	Minor Triads
	2nd Inversion
2X	0.037210
2Z	0.000000
2Y	0.018605
	1st Inversion
2Y	0.018605
X	0.018605
Z	0.000000
	Root Position
Z	0.000000
Y	0.009302
X	0.018605

31ET Equal Meantone Temperament

Jorgensen Chapters 28,29

Fifth = $2^{1/18}(3/1)$ = 1.495517882 = 696.7742 Cents

Note	Ratio	Cents	+/- from 12ET
B#	1.169431	270.97	-29.03
E#	1.563914	774.19	-25.81
A#	1.045734	77.42	-22.58
D#	1.398491	580.65	-19.35
G#	1.870243	1083.87	-16.13
C#	1.250566	387.10	-12.90
F#	1.672418	890.32	-9.68
B	1.118287	193.55	-6.45
E	1.495518	696.77	-3.23
A	1.000000	0.00	0.00
D	1.337329	503.23	3.23
G	1.788450	1006.45	6.45
C	1.195873	309.68	9.68
F	1.599276	812.90	12.90
Bb	1.069380	116.13	16.13
Eb	1.430113	619.35	19.35
Ab	1.912532	1122.58	22.58
Db	1.278843	425.81	25.81
Gb	1.710234	929.03	29.03
Cb	1.143573	232.26	32.26
Fb	1.529334	735.48	35.48

		Wolf +/- from Just
wolf o8	1122.58	34.31
+7	1083.87	
-7	1006.45	
wolf x6	967.74	-28.35
wolf o7	929.03	44.67
+6	890.32	
-6	812.90	
wolf x5	774.19	-39.49
wolf o6	735.48	33.53
P5	696.77	
o5	619.35	
x4	580.65	
P4	503.23	
wolf x3	464.52	-33.53
wolf o4	425.81	39.49
+3	387.10	
-3	309.68	
wolf x2	270.97	-44.67
wolf o3	232.26	28.35
+2	193.55	
-2	116.13	
wolf x1	77.42	-34.31

-Almost Identical to 1/4 Syntonic Comma Equal Meantone Temperament

Beat Rates from A

	A 415	A 440
8(Ab)-15(A)	0.300256	124.606170
15(A)-8(G#)	0.038055	15.792916
9(G)-16(A)	0.096049	39.860251
16(A)-9(Fx)	0.259858	107.841236
3(Gb)-5(A)	0.130701	54.241057
3(F#)-5(A)	0.017254	7.160421
8(A)-5(F)	0.003618	1.501341
8(A)-5(E#)	0.180429	74.878203
2(Fb)-3(A)	0.058667	24.346962
3(A)-2(E)	0.008964	3.720158
5(Eb)-7(A)	0.150564	62.484242
10(A)-7(D#)	0.210563	87.383650
3(D)-4(A)	0.011988	4.975076
4(A)-3(Cx)	0.076723	31.839960
4(Db)-5(A)	0.115370	47.878718
4(C#)-5(A)	0.002262	0.938763
6(A)-5(C)	0.020634	8.562956
6(A)-5(B#)	0.152846	63.431161
8(Cb)-9(A)	0.148584	61.662160
9(A)-8(B)	0.053705	22.287598
15(Bb)-16(A)	0.040695	16.888624
16(A)-15(A#)	0.313988	130.304927

A-440 Avg.
Beat Rate for
+/-3/6, P4/5
4.75

Avg. Deviation
from Mean
2.57

	Beat Rates
	Major Triads
	2nd Inversion
2X	0.004524
Z	0.025804
2Y	0.017928
	1st Inversion
2Y	0.017928
2X	0.004524
Z	0.025804
	Root Position
Z	0.025804
Y	0.008964
X	0.002262
	Minor Triads
	2nd Inversion
2X	0.041267
2Z	0.005410
2Y	0.017928
	1st Inversion
2Y	0.017928
X	0.020634
Z	0.002705
	Root Position
Z	0.002705
Y	0.008964
X	0.020634

-Exact meantone between 10/9 and 9/8 intervals

-Very Good 7 Limit Ratios

5 Limit					+/- from Just	
					Avg.->	6.91
15/8	1088.27				-5.38	
16/9	996.09	9/5	1017.60		10.75	-10.75
5/3	884.36				5.38	
8/5	813.69				0.00	
3/2	701.96				-5.38	
(o5) 64/45	609.78				10.75	
(x4) 45/32	590.22				-10.75	
4/3	498.04				5.38	
5/4	386.31				0.00	
6/5	315.64				-5.38	
9/8	203.91	10/9	182.40		-10.75	10.75
16/15	111.73				5.38	

7 Limit					+/- from Just	
					Avg.->	4.03
7/4	968.83				-3.04	
12/7	933.13				-2.33	
14/9	764.92				7.71	
(o5) 7/5	582.51	(x4)10/7	617.49		38.02	3.04
(x4)10/7	617.49	(o5) 7/5	582.51		-38.02	-3.04
9/7	435.08				-7.71	
7/6	266.87				2.33	
8/7	231.17				3.04	

11 Limit				+/- from Just	
				Avg.->	24.98
21/11	1119.46			4.49	
11/6	1049.36			33.53	
20/11	1035.00			-28.15	
18/11	852.59			37.14	
11/7	782.49			-9.86	
22/15	663.05			33.53	
16/11	648.68			-28.15	
11/8	551.32			28.15	
15/11	536.95			-33.53	
14/11	417.51			9.86	
11/9	347.41			-37.14	
11/10	165.00			28.15	
12/11	150.64			-33.53	
22/21	80.54			-4.49	

13 Limit					+/- from Just	
					Avg.->	15.78
25/13	1132.10				-8.15	
13/7	1071.70	24/13	1061.43		11.19	21.46
26/15	952.26				13.53	
22/13	910.79				20.00	
13/8	840.53	21/13	830.25		-26.84	-16.57
20/13	745.79				-8.15	
13/9	636.62				-16.09	
18/13	563.38				16.09	
13/10	454.21				8.15	
16/13	359.47	26/21	369.75		26.84	16.57
13/11	289.21				-20.00	
15/13	247.74				-13.53	
14/13	128.30	13/12	138.57		-11.19	-21.46
26/25	67.90				8.15	

-Very Good 7 Limit Ratios

5 Limit					+/- from Just	
					Avg.->	6.77
15/8	1088.27				-4.40	
16/9	996.09	9/5	1017.60		10.36	-11.14
5/3	884.36				5.96	
8/5	813.69				-0.78	
3/2	701.96				-5.18	
(o5) 64/45	609.78				9.58	
(x4) 45/32	590.22				-9.58	
4/3	498.04				5.18	
5/4	386.31				0.78	
6/5	315.64				-5.96	
9/8	203.91	10/9	182.40		-10.36	11.14
16/15	111.73				4.40	

7 Limit					+/- from Just	
					Avg.->	4.08
7/4	968.83				-1.08	
12/7	933.13				-4.10	
14/9	764.92				9.28	
(o5) 7/5	582.51	(x4)10/7	617.49		36.84	1.87
(x4)10/7	617.49	(o5) 7/5	582.51		-36.84	-1.87
9/7	435.08				-9.28	
7/6	266.87				4.10	
8/7	231.17				1.08	

11 Limit				+/- from Just	
				Avg.->	25.04
21/11	1119.46			3.12	
11/6	1049.36			34.51	
20/11	1035.00			-28.54	
18/11	852.59			37.73	
11/7	782.49			-8.30	
22/15	663.05			33.72	
16/11	648.68			-29.33	
11/8	551.32			29.33	
15/11	536.95			-33.72	
14/11	417.51			8.30	
11/9	347.41			-37.73	
11/10	165.00			28.54	
12/11	150.64			-34.51	
22/21	80.54			-3.12	

13 Limit					+/- from Just	
					Avg.->	16.71
25/13	1132.10				-9.52	
13/7	1071.70	24/13	1061.43		12.17	22.44
26/15	952.26				15.48	
22/13	910.79				18.24	
13/8	840.53	21/13	830.25		-27.62	-17.35
20/13	745.79				-10.30	
13/9	636.62				-17.26	
18/13	563.38				17.26	
13/10	454.21				10.30	
16/13	359.47	26/21	369.75		27.62	17.35
13/11	289.21				-18.24	
15/13	247.74				-15.48	
14/13	128.30	13/12	138.57		-12.17	-22.44
26/25	67.90				9.52	

Almost 1/5 Syntonic Comma Equal Meantone Temperament

Jorgensen Chapters 35,36

Fifth = $4 \times X^4 - 3 \times X^3 = 10$ X= 1.496279720 = 697.6559 Cents

Note	Ratio	Cents	+/- from 12ET
B#	1.174803	278.90	-21.10
E#	1.570299	781.25	-18.75
A#	1.049469	83.59	-16.41
D#	1.402771	585.94	-14.06
G#	1.875012	1088.28	-11.72
C#	1.253116	390.62	-9.38
F#	1.674975	892.97	-7.03
B	1.119427	195.31	-4.69
E	1.496280	697.66	-2.34
A	1.000000	0.00	0.00
D	1.336648	502.34	2.34
G	1.786629	1004.69	4.69
C	1.194048	307.03	7.03
F	1.596022	809.38	9.38
Bb	1.066660	111.72	11.72
Eb	1.425750	614.06	14.06
Ab	1.905726	1116.41	16.41
Db	1.273643	418.75	18.75
Gb	1.702413	921.10	21.10
Cb	1.137764	223.44	23.44
Fb	1.520790	725.79	25.79

		Wolf +/-
		from Just
wolf o8	1116.41	28.14
+7	1088.28	
-7	1004.69	
wolf x6	976.56	-19.53
wolf o7	921.10	36.74
+6	892.97	
-6	809.38	
wolf x5	781.25	-32.44
wolf o6	725.79	23.83
P5	697.66	
o5	614.06	
x4	585.94	
P4	502.34	
wolf x3	474.21	-23.83
wolf o4	418.75	32.44
+3	390.62	
-3	307.03	
wolf x2	278.90	-36.74
wolf o3	223.44	19.53
+2	195.31	
-2	111.72	
wolf x1	83.59	-28.14

-Equal Beating 1st Inversion Minor Triads (+3, P4)

-Major Sixths beat twice as fast as Major Thirds

-(1/5 Syntonic Comma Fifth = 1.496277870 = 697.6537 cents)

Beat Rates from A		A 415	A 440
8(Ab)-15(A)	0.245808	102.010191	108.155384
8(G#)-15(A)	0.000093	0.038489	0.040807
9(G)-16(A)	0.079662	33.059820	35.051375
16(A)-9(Fx)	0.179492	74.489126	78.976422
3(Gb)-5(A)	0.107238	44.503890	47.184847
3(F#)-5(A)	0.024926	10.344087	10.967225
8(A)-5(F)	0.019891	8.254696	8.751967
8(A)-5(E#)	0.148505	61.629718	65.342352
2(Fb)-3(A)	0.041580	17.255801	18.295307
3(A)-2(E)	0.007441	3.087832	3.273846
5(Eb)-7(A)	0.128748	53.430324	56.649018
10(A)-7(D#)	0.180604	74.950505	79.465595
3(D)-4(A)	0.009945	4.127346	4.375982
4(A)-3(Cx)	0.054682	22.693205	24.060265
4(Db)-5(A)	0.094571	39.247125	41.611409
4(C#)-5(A)	0.012463	5.172044	5.483613
6(A)-5(C)	0.029762	12.351332	13.095388
6(A)-5(B#)	0.125984	52.283313	55.432911
8(Cb)-9(A)	0.102110	42.375512	44.928254
9(A)-8(B)	0.044588	18.504019	19.618719
16(A)-15(Bb)	0.000099	0.041054	0.043527
16(A)-15(A#)	0.257968	107.056516	113.505704

A-440 Avg.
Beat Rate for +/-3/6, P4/5
7.66
Avg. Deviation from Mean
3.28

Beat Rates
Major Triads
2nd Inversion
2X 0.024926
Z 0.037296
2Y 0.014881
1st Inversion
2Y 0.014881
2X 0.024926
Z 0.037296
Root Position
Z 0.037296
Y 0.007441
X 0.012463
Minor Triads
2nd Inversion
2X 0.059524
2Z 0.029762
2Y 0.014881
1st Inversion
2Y 0.014881
X 0.029762
Z 0.014881
Root Position
Z 0.014881
Y 0.007441
X 0.029762

43ET Equal Meantone Temperament

Fifth = $2^{25/43}$ = 1.496295739 = 697.6744 Cents

Note	Ratio	Cents	+/- from 12ET
B#	1.174916	279.07	-20.93
E#	1.570433	781.40	-18.60
A#	1.049547	83.72	-16.28
D#	1.402861	586.05	-13.95
G#	1.875112	1088.37	-11.63
C#	1.253169	390.70	-9.30
F#	1.675029	893.02	-6.98
B	1.119450	195.35	-4.65
E	1.496296	697.67	-2.33
A	1.000000	0.00	0.00
D	1.336634	502.33	2.33
G	1.786591	1004.65	4.65
C	1.194009	306.98	6.98
F	1.595953	809.30	9.30
Bb	1.066603	111.63	11.63
Eb	1.425658	613.95	13.95
Ab	1.905583	1116.28	16.28
Db	1.273534	418.60	18.60
Gb	1.702249	920.93	20.93
Cb	1.137642	223.26	23.26
Fb	1.520611	725.58	25.58

		Wolf +/-
		from Just
wolf o8	1116.28	28.01
+7	1088.37	
-7	1004.65	
wolf x6	976.74	-19.35
wolf o7	920.93	36.57
+6	893.02	
-6	809.30	
wolf x5	781.40	-32.29
wolf o6	725.58	23.63
P5	697.67	
o5	613.95	
x4	586.05	
P4	502.33	
wolf x3	474.42	-23.63
wolf o4	418.60	32.29
+3	390.70	
-3	306.98	
wolf x2	279.07	-36.57
wolf o3	223.26	19.35
+2	195.35	
-2	111.63	
wolf x1	83.72	-28.01

-Almost Identical to 1/5 Syntonic Comma Equal Meantone Temperament

Beat Rates from A		A 415	A 440
8(Ab)-15(A)	0.244665	101.536044	107.652673
8(G#)-15(A)	0.000896	0.371729	0.394122
9(G)-16(A)	0.079318	32.916936	34.899884
16(A)-9(Fx)	0.177798	73.786174	78.231124
3(Gb)-5(A)	0.106746	44.299674	46.968329
3(F#)-5(A)	0.025087	10.411066	11.038239
8(A)-5(F)	0.020233	8.396517	8.902331
8(A)-5(E#)	0.147833	61.350629	65.046450
2(Fb)-3(A)	0.041222	17.107156	18.137708
3(A)-2(E)	0.007409	3.074536	3.259749
5(Eb)-7(A)	0.128290	53.240290	56.447536
10(A)-7(D#)	0.179973	74.688728	79.188049
3(D)-4(A)	0.009902	4.109530	4.357092
4(A)-3(Cx)	0.054218	22.500371	23.855815
4(Db)-5(A)	0.094135	39.066049	41.419425
4(C#)-5(A)	0.012677	5.261129	5.578064
6(A)-5(C)	0.029954	12.430909	13.179759
6(A)-5(B#)	0.125418	52.048415	55.183862
8(Cb)-9(A)	0.101135	41.971122	44.499503
9(A)-8(B)	0.044396	18.424440	19.534346
16(A)-15(Bb)	0.000955	0.396487	0.420372
16(A)-15(A#)	0.256788	106.566899	112.986592

A-440 Avg.
Beat Rate for +/-3/6, P4/5
7.72
Avg. Deviation from Mean
3.32

Beat Rates
Major Triads
2nd Inversion
2X 0.025355
Z 0.037537
2Y 0.014817
1st Inversion
2Y 0.014817
2X 0.025355
Z 0.037537
Root Position
Z 0.037537
Y 0.007409
X 0.012677
Minor Triads
2nd Inversion
2X 0.059908
2Z 0.030274
2Y 0.014817
1st Inversion
2Y 0.014817
X 0.029954
Z 0.015137
Root Position
Z 0.015137
Y 0.007409
X 0.029954

-Minor Thirds beat four times as fast as Perfect Fifths

-Almost pure and almost equal beating Minor Seconds and Major Sevenths

-Major Thirds/Minor Sixths and Perfect Fourths/Fifths both tempered by almost 1/5 Syntonic Comma

-Good tritone intervals

5 Limit				+/- from Just	
				Avg.->	6.15
15/8	1088.27			0.01	
16/9	996.09	9/5	1017.60	8.60	-12.91
5/3	884.36			8.61	
8/5	813.69			-4.31	
3/2	701.96			-4.30	
(o5) 64/45	609.78			4.29	
(x4) 45/32	590.22			-4.29	
4/3	498.04			4.30	
5/4	386.31			4.31	
6/5	315.64			-8.61	
9/8	203.91	10/9	182.40	-8.60	12.91
16/15	111.73			-0.01	

7 Limit				+/- from Just	
				Avg.->	9.88
7/4	968.83			7.73	
12/7	933.13			-12.03	
14/9	764.92			16.33	
(o5) 7/5	582.51	(x4)10/7	617.49	31.55	-3.42
(x4)10/7	617.49	(o5) 7/5	582.51	-31.55	3.42
9/7	435.08			-16.33	
7/6	266.87			12.03	
8/7	231.17			-7.73	

11 Limit				+/- from Just	
				Avg.->	26.16
21/11	1119.46			-3.05	
11/6	1049.36			38.92	
20/11	1035.00			-30.31	
18/11	852.59			40.38	
11/7	782.49			-1.24	
22/15	663.05			34.61	
16/11	648.68			-34.62	
11/8	551.32			34.62	
15/11	536.95			-34.61	
14/11	417.51			1.24	
11/9	347.41			-40.38	
11/10	165.00			30.31	
12/11	150.64			-38.92	
22/21	80.54			3.05	

13 Limit				+/- from Just	
				Avg.->	20.92
25/13	1132.10			-15.69	
13/7	1071.70	24/13	1061.43	16.58	26.85
26/15	952.26			24.30	
22/13	910.79			10.31	
13/8	840.53	21/13	830.25	-31.15	-20.88
20/13	745.79			-20.00	
13/9	636.62			-22.55	
18/13	563.38			22.55	
13/10	454.21			20.00	
16/13	359.47	26/21	369.75	31.15	20.88
13/11	289.21			-10.31	
15/13	247.74			-24.30	
14/13	128.30	13/12	138.57	-16.58	-26.85
26/25	67.90			15.69	

-Good tritone intervals

5 Limit				+/- from Just	
				Avg.->	6.16
15/8	1088.27			0.10	
16/9	996.09	9/5	1017.60	8.56	-12.95
5/3	884.36			8.66	
8/5	813.69			-4.38	
3/2	701.96			-4.28	
(o5) 64/45	609.78			4.18	
(x4) 45/32	590.22			-4.18	
4/3	498.04			4.28	
5/4	386.31			4.38	
6/5	315.64			-8.66	
9/8	203.91	10/9	182.40	-8.56	12.95
16/15	111.73			-0.10	

7 Limit				+/- from Just	
				Avg.->	10.03
7/4	968.83			7.92	
12/7	933.13			-12.20	
14/9	764.92			16.48	
(o5) 7/5	582.51	(x4)10/7	617.49	31.44	-3.53
(x4)10/7	617.49	(o5) 7/5	582.51	-31.44	3.53
9/7	435.08			-16.48	
7/6	266.87			12.20	
8/7	231.17			-7.92	

11 Limit				+/- from Just	
				Avg.->	26.20
21/11	1119.46			-3.18	
11/6	1049.36			39.01	
20/11	1035.00			-30.34	
18/11	852.59			40.43	
11/7	782.49			-1.10	
22/15	663.05			34.63	
16/11	648.68			-34.73	
11/8	551.32			34.73	
15/11	536.95			-34.63	
14/11	417.51			1.10	
11/9	347.41			-40.43	
11/10	165.00			30.34	
12/11	150.64			-39.01	
22/21	80.54			3.18	

13 Limit				+/- from Just	
				Avg.->	21.01
25/13	1132.10			-15.82	
13/7	1071.70	24/13	1061.43	16.67	26.94
26/15	952.26			24.49	
22/13	910.79			10.14	
13/8	840.53	21/13	830.25	-31.23	-20.95
20/13	745.79			-20.20	
13/9	636.62			-22.66	
18/13	563.38			22.66	
13/10	454.21			20.20	
16/13	359.47	26/21	369.75	31.23	20.95
13/11	289.21			-10.14	
15/13	247.74			-24.49	
14/13	128.30	13/12	138.57	-16.67	-26.94
26/25	67.90			15.82	

Equal Meantone Temperament Average Deviations

Equal Meantone Temperaments
Enharmonic Pythagorean Just Fifth
Pythagorean Just Fifth
12ET
4/25 Syntonic Comma
1/6 Holdrian Comma
43ET
Almost 1/5 Syntonic Comma
Almost 1/5 Ditonic Comma
Almost 2/9 Syntonic Comma
31ET
1/4 Syntonic Comma
Equal Harmony 2 (Almost 50ET)
Equal Harmony 1 (Almost 2/7 Syntonic Comma)
Almost 5/17 Syntonic Comma
1/3 Syntonic Comma
19ET

Fifths		(cents)	Deviation from Just
1.5	=	701.9550	0
1.5	=	701.9550	0
1.498307	=	700	-1.9550
1.497021556	=	698.5140	-3.4410
1.496733999	=	698.1814	-3.7736
1.496295739	=	697.6744	-4.2806
1.496279720	=	697.6559	-4.2991
1.495953506	=	697.2784	-4.6766
1.495865822	=	697.1769	-4.7781
1.495517882	=	696.7742	-5.1808
1.495348781	=	696.5784	-5.3766
1.494830501	=	695.9783	-5.9767
1.494684827	=	695.8096	-6.1454
1.494530181	=	695.6304	-6.3246
1.493801582	=	694.7862	-7.1688
1.493758962	=	694.7368	-7.2182

Average Deviations from Just (cents)			
5 Limit	7 Limit	11 Limit	13 Limit
1.40	21.89	19.96	24.31
15.36	27.75	19.96	24.31
10.61	29.22	36.34	34.52
7.00	16.96	29.73	25.02
6.52	14.22	28.21	23.43
6.16	10.03	26.20	21.01
6.15	9.88	26.16	20.92
6.41	6.77	25.30	19.12
6.49	5.93	25.15	18.63
6.77	4.08	25.04	16.71
6.91	4.03	24.98	15.78
8.03	5.42	24.81	12.62
8.34	6.13	24.76	12.17
8.67	6.89	24.71	11.75
10.24	13.79	24.46	10.66
10.38	14.20	24.41	10.70

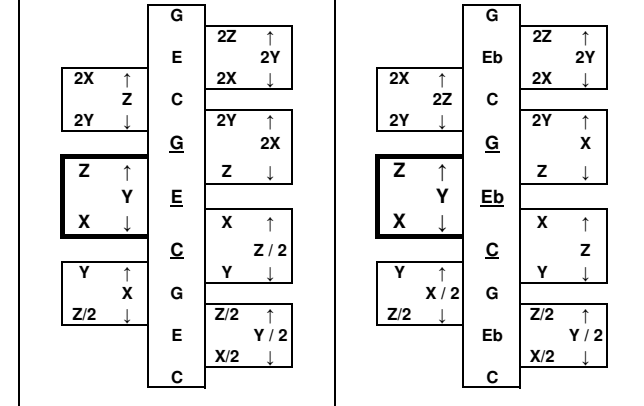
Average Beat Rate	(hertz)	Avg. Dev. from Mean
1.99		1.32
21.84		14.56
15.39		9.10
10.49		5.16
9.39		4.43
7.72		3.32
7.66		3.28
6.41		2.69
6.08		2.63
4.75		2.57
4.10		2.74
4.76		0.68
4.95		0.87
5.14		1.29
6.08		4.26
6.27		4.30

Interval Beat Rates

Comparative Beat Rates of Tempered Inverted Intervals

P5	G	X	P4	C	2X	+3	E	X	-6	C	2X	+6	C	X	-3	E _b	2X
	C	X	P5	G	X	-6	C	X	+3	E	X	-3	E _b	X	+6	C	X
P4	G	X	P5	C	X		E	X		C	X		C	X		E _b	X

Comparative Beat Rates of Tempered Major and Minor Triad Inversions



Interval Beat Rate Formulas

X, Y, Z = Beat Rates in hertz
C, Eb, E, G = Pitches in hertz

$\begin{matrix} Z & G & \uparrow \\ X & E & Y \\ & C & \downarrow \end{matrix}$	$\begin{matrix} Z & C & \uparrow \\ X & G & Y \\ & E & \downarrow \end{matrix}$	$\begin{matrix} Z & E & \uparrow \\ X & C & Y \\ & G & \downarrow \end{matrix}$	$\begin{matrix} Z & G & \uparrow \\ X & E\flat & Y \\ & C & \downarrow \end{matrix}$	$\begin{matrix} Z & C & \uparrow \\ X & G & Y \\ & E\flat & \downarrow \end{matrix}$	$\begin{matrix} Z & E\flat & \uparrow \\ X & C & Y \\ & G & \downarrow \end{matrix}$
$\begin{matrix} C E \uparrow \\ C E \downarrow \end{matrix} \left\{ \begin{array}{l} X = 4E - 5C \\ E = (5C + X) / 4 \\ X = 5C - 4E \\ E = (5C - X) / 4 \end{array} \right.$	$\begin{matrix} E G \downarrow \\ E G \uparrow \end{matrix} \left\{ \begin{array}{l} X = 6E - 5G \\ G = (6E - X) / 5 \\ X = 5G - 6E \\ G = (6E + X) / 5 \end{array} \right.$	$\begin{matrix} G C \uparrow \\ G C \downarrow \end{matrix} \left\{ \begin{array}{l} X = 3C - 4G \\ C = (4G + X) / 3 \\ X = 4G - 3C \\ C = (4G - X) / 3 \end{array} \right.$	$\begin{matrix} C E\flat \downarrow \\ C E\flat \uparrow \end{matrix} \left\{ \begin{array}{l} X = 6C - 5E\flat \\ E\flat = (6C - X) / 5 \\ X = 5E\flat - 6C \\ E\flat = (6C + X) / 5 \end{array} \right.$	$\begin{matrix} E\flat G \uparrow \\ E\flat G \downarrow \end{matrix} \left\{ \begin{array}{l} X = 4G - 5E\flat \\ G = (5E\flat + X) / 4 \\ X = 5E\flat - 4G \\ G = (5E\flat - X) / 4 \end{array} \right.$	$\begin{matrix} G C \uparrow \\ G C \downarrow \end{matrix} \left\{ \begin{array}{l} X = 3C - 4G \\ C = (4G + X) / 3 \\ X = 4G - 3C \\ C = (4G - X) / 3 \end{array} \right.$
$\begin{matrix} C G \downarrow \\ C G \uparrow \end{matrix} \left\{ \begin{array}{l} Y = 3C - 2G \\ G = (3C - Y) / 2 \\ Y = 2G - 3C \\ G = (3C + Y) / 2 \end{array} \right.$	$\begin{matrix} E C \downarrow \\ E C \uparrow \end{matrix} \left\{ \begin{array}{l} Y = 8E - 5C \\ C = (8E - Y) / 5 \\ Y = 5C - 8E \\ C = (8E + Y) / 5 \end{array} \right.$	$\begin{matrix} G E \uparrow \\ G E \downarrow \end{matrix} \left\{ \begin{array}{l} Y = 3E - 5G \\ E = (5G + Y) / 3 \\ Y = 5G - 3E \\ E = (5G - Y) / 3 \end{array} \right.$	$\begin{matrix} C G \downarrow \\ C G \uparrow \end{matrix} \left\{ \begin{array}{l} Y = 3C - 2G \\ G = (3C - Y) / 2 \\ Y = 2G - 3C \\ G = (3C + Y) / 2 \end{array} \right.$	$\begin{matrix} E\flat C \uparrow \\ E\flat C \downarrow \end{matrix} \left\{ \begin{array}{l} Y = 3C - 5E\flat \\ C = (5E\flat + Y) / 3 \\ Y = 5E\flat - 3C \\ C = (5E\flat - Y) / 3 \end{array} \right.$	$\begin{matrix} G E\flat \downarrow \\ G E\flat \uparrow \end{matrix} \left\{ \begin{array}{l} Y = 8G - 5E\flat \\ E\flat = (8G - Y) / 5 \\ Y = 5E\flat - 8G \\ E\flat = (8G + Y) / 5 \end{array} \right.$
$\begin{matrix} E G \downarrow \\ E G \uparrow \end{matrix} \left\{ \begin{array}{l} Z = 6E - 5G \\ Z = 5G - 6E \end{array} \right.$	$\begin{matrix} G C \uparrow \\ G C \downarrow \end{matrix} \left\{ \begin{array}{l} Z = 3C - 4G \\ Z = 4G - 3C \end{array} \right.$	$\begin{matrix} C E \uparrow \\ C E \downarrow \end{matrix} \left\{ \begin{array}{l} Z = 4E - 5C \\ Z = 5C - 4E \end{array} \right.$	$\begin{matrix} E\flat G \uparrow \\ E\flat G \downarrow \end{matrix} \left\{ \begin{array}{l} Z = 4G - 5E\flat \\ Z = 5E\flat - 4G \end{array} \right.$	$\begin{matrix} G C \uparrow \\ G C \downarrow \end{matrix} \left\{ \begin{array}{l} Z = 3C - 4G \\ Z = 4G - 3C \end{array} \right.$	$\begin{matrix} C E\flat \downarrow \\ C E\flat \uparrow \end{matrix} \left\{ \begin{array}{l} Z = 6C - 5E\flat \\ Z = 5E\flat - 6C \end{array} \right.$