



中华人民共和国国家标准

GB/T 23146—2008

十二平均律的频率与音分的计算

Calculation of frequency of twelve-tone equal temperament and cent

2008-12-30 发布

2009-09-01 实施

中华人民共和国国家质量监督检验检疫总局 发布
中国国家标准化管理委员会

前 言

本标准的附录 A 为规范性附录。

本标准由中国轻工业联合会提出。

本标准由全国乐器标准化技术委员会归口。

本标准由宁波森隆乐器股份有限公司、北京乐器研究所、全国乐器标准化中心、上海超拔钢琴有限公司起草。

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十二平均律的频率与音分的计算

1 范围

本标准规定了十二平均律的频率与音分计算及换算的方法。
本标准可用于乐器设计、制造及乐器调律。

2 规范性引用文件

下列文件中的条款通过本标准的引用而成为本标准的条款。凡是注日期的引用文件，其随后所有的修改单(不包括勘误的内容)或修订版均不适用于本标准，然而，鼓励根据本标准达成协议的各方研究是否可使用这些文件的最新版本。凡是不注日期的引用文件，其最新版本适用于本标准。

GB/T 3451 标准调音频率

3 要求

- 3.1 十二平均律是将一个八度音程即 2 倍频率之间等分为 12 个音级，每两个相邻音级的频率比为： $\sqrt[12]{2}$ ，(约等于 1.059 463)；每两个相邻音级相差 100 音分。
- 3.2 以小字一组 a 为标准音，应符合 GB/T 3451 规定的要求。
- 3.3 十二平均律音列顺序见表 1。

表 1 十二平均律音列顺序表

大字 2 组		大字 1 组		大字组		小字组		小字 1 组		小字 2 组		小字 3 组		小字 4 组		小字 5 组	
顺序号	音名	顺序号	音名	顺序号	音名	顺序号	音名	顺序号	音名	顺序号	音名	顺序号	音名	顺序号	音名	顺序号	音名
—	—	4	C ₁	16	C	28	c	40	c ¹	52	c ²	64	c ³	76	c ⁴	88	c ⁵
—	—	5	♯C ₁	17	♯C	29	♯c	41	♯c ¹	53	♯c ²	65	♯c ³	77	♯c ⁴	—	—
—	—	6	D ₁	18	D	30	d	42	d ¹	54	d ²	66	d ³	78	d ⁴	—	—
—	—	7	♯D ₁	19	♯D	31	♯d	43	♯d ¹	55	♯d ²	67	♯d ³	79	♯d ⁴	—	—
—	—	8	E ₁	20	E	32	e	44	e ¹	56	e ²	68	e ³	80	e ⁴	—	—
—	—	9	F ₁	21	F	33	f	45	f ¹	57	f ²	69	f ³	81	f ⁴	—	—
—	—	10	♯F ₁	22	♯F	34	♯f	46	♯f ¹	58	♯f ²	70	♯f ³	82	♯f ⁴	—	—
—	—	11	G ₁	23	G	35	g	47	g ¹	59	g ²	71	g ³	83	g ⁴	—	—
—	—	12	♯G ₁	24	♯G	36	♯g	48	♯g ¹	60	♯g ²	72	♯g ³	84	♯g ⁴	—	—
1	A ₂	13	A ₁	25	A	37	a	49	a ¹	61	a ²	73	a ³	85	a ⁴	—	—
2	♯A ₂	14	♯A ₁	26	♯A	38	♯a	50	♯a ¹	62	♯a ²	74	♯a ³	86	♯a ⁴	—	—
3	B ₂	15	B ₁	27	B	39	b	51	b ¹	63	b ²	75	b ³	87	b ⁴	—	—

- 3.4 音列中各音名与对应频率的换算
- 3.4.1 由音名演算对应的频率，见式(1)

$$f_n = 27.5 \times 2^{\frac{n}{12}} \dots\dots\dots(1)$$

式中：
n——音在音列中的位置。整数位为各音名对应顺序号，小数位为音分值。其小数位第一位为音

分值的十位,小数第二位为音分值的个位,小数第三位四舍五入;

f_n ——音列中 n 的频率值。

注:若当音列中的音名在 A_2 音的下方时,其顺序号 n 从 0 开始顺序取负数,如 $^{\#}G_2$ 的顺序号 $n=0$ 、 G_2 的顺序号 $n=-1$ 、 $^{\#}F_2$ 的顺序号 $n=-2$ 、 F_2 的顺序号 $n=-3$ ……。

示例:计算 $^{\#}g^2$ 音的频率值。

将 $^{\#}g^2$ 的顺序号 $n=60$ 代入式(1)中 $f_n=27.5 \times 2^{\frac{60-1}{12}} \approx 830.609\ 4$

得: $^{\#}g^2$ 音的频率值约为 830.61 Hz。

3.4.2 由频率演算对应的音名,见式(2)

$$n = 12 \times \log \frac{f_n}{27.5} / \log 2 + 1 \quad \dots\dots\dots (2)$$

注:由于式中计算结果用于音名的顺序号,所以这里计算得到的数值应将小数位四舍五入取整数。

示例:查找频率为 123.47 Hz 的音名。

将频率值代入式中: $n = 12 \times \log \frac{123.47}{27.5} / \log 2 + 1 = 25.999\ 884 + 1 \approx 27$

根据计算结果可在表 1 中按顺序号查找对应的音名为大字组 B。

3.5 频率与音分的换算

3.5.1 由音分换算频率

3.5.1.1 与音名相差音分数的频率

计算方法:先将音名顺序号与所相差的音分值加减组合得出 n 值后,使用式(1)计算。

示例 1:计算比 $^{\#}c^1$ 低 32 音分的频率值。

查表 1 得 $^{\#}c^1$ 的顺序号为 41,将其与相差音分数 -0.32 加减组合后: $n=41-0.32=40.68$

将 $n=40.68$ 代入式(1)中:

$$f_n = 27.5 \times 2^{\frac{40.68-1}{12}} = 27.5 \times 2^{\frac{39.68}{12}} \approx 272.106\ 3$$

得出:比 $^{\#}c^1$ 低 32 音分的频率值约为 272.11 Hz。

示例 2:计算比 $^{\#}c^1$ 高 32 音分的频率值。

查表 1 得 $^{\#}c^1$ 的顺序号为 41,将其与相差音分数 0.32 加减组合后: $n=41+0.32=41.32$

将 $n=41.32$ 代入式(1)中:

$$f_n = 27.5 \times 2^{\frac{41.32-1}{12}} = 27.5 \times 2^{\frac{40.32}{12}} \approx 282.353\ 7$$

得出:比 $^{\#}c^1$ 高 32 音分的频率值约为 282.35 Hz。

3.5.1.2 与频率相差音分数的频率

计算方法:先使用式(2)计算出该频率在音列中的位置,即 n 值,再与相差的音分数相加减,然后使用式(1)计算。

示例 1:计算比频率 $f_n=443$ Hz 高 12 音分的频率值。

将 $f_n=443$ 代入式(2)中:

$$n = 12 \times \log \frac{443}{27.5} / \log 2 + 1 = 49.117\ 6, \text{用 } 49.117\ 6 \text{ 加上比 } 443 \text{ Hz 高 } 12 \text{ 音分的值,则:}$$

$$n = 49.117\ 6 + 0.12 = 49.237\ 6$$

$$\text{再将 } n = 49.237\ 6 \text{ 代入式(1)计算: } f_n = 27.5 \times 2^{\frac{49.237\ 6-1}{12}} = 446.080\ 3$$

得出:比 $f_n=443$ Hz 高 12 音分的频率值为 446.08 Hz。

示例 2:计算比频率 $f_n=443$ Hz 低 12 音分的频率值。

将 $f_n=443$ 代入式(2)中:

$$n = 12 \times \log \frac{443}{27.5} / \log 2 + 1 = 49.117\ 6, \text{用 } 49.117\ 6 \text{ 加上比 } 443 \text{ Hz 低 } 12 \text{ 音分的值,则:}$$

$$n = 49.117\ 6 - 0.12 = 48.997\ 6$$

$$\text{再将 } n = 48.997\ 6 \text{ 代入式(1)计算: } f_n = 27.5 \times 2^{\frac{48.997\ 6-1}{12}} = 439.939\ 01$$

得出:比 $f_n=443$ Hz 高 12 音分的频率值为 439.94 Hz。

3.5.2 由频率换算音分

两频率之间相差的音分数

计算方法：先使用式(2)分别计算出两个频率在音列中的位置 n 值，再将两个 n 值相加减后乘以 100 并保留到整数位。

示例：计算频率 447 Hz 与 442 Hz 之间相差的音分数。

先将 447 和 442 分别代入式(2)中：

$$n_1 = 12 \times \log \frac{447}{27.5} / \log 2 + 1 = 49.273\ 255$$

$$n_2 = 12 \times \log \frac{442}{27.5} / \log 2 + 1 = 49.078\ 513$$

然后 $(n_1 - n_2) \times 100 = (49.273\ 255 - 49.078\ 513) \times 100 = 19.474\ 2$

得出：频率 447 Hz 与 442 Hz 之间相差 19 音分。

注：在音列中任意两频率之间相差的音分值都可用上述方法计算。

附 录 A
(规范性附录)

十二平均律的频率与音分对照表

A.1 十二平均律的频率与音分对照表(大字一组),见表 A.1。

表 A.1 十二平均律的频率与音分对照表(大字一组)

音分	C ₁	#C ₁	D ₁	#D ₁	E ₁	F ₁	#F ₁	G ₁	#G ₁	A ₁	#A ₁	B ₁	—
0	32.703	34.648	36.708	38.891	41.203	43.654	46.249	48.999	51.913	55.000	58.270	61.735	-100
1	32.722	34.668	36.729	38.913	41.227	43.679	46.276	49.028	51.943	55.032	58.304	61.771	-99
2	32.741	34.688	36.751	38.936	41.251	43.704	46.303	49.056	51.973	55.064	58.338	61.807	-98
3	32.760	34.708	36.772	38.958	41.275	43.729	46.330	49.084	52.003	55.095	58.372	61.842	-97
4	32.779	34.728	36.793	38.981	41.299	43.755	46.356	49.113	52.033	55.127	58.405	61.878	-96
5	32.798	34.748	36.814	39.003	41.323	43.780	46.383	49.141	52.063	55.159	58.439	61.914	-95
6	32.817	34.768	36.836	39.026	41.346	43.805	46.410	49.170	52.093	55.191	58.473	61.950	-94
7	32.836	34.788	36.857	39.048	41.370	43.830	46.437	49.198	52.123	55.223	58.507	61.986	-93
8	32.855	34.808	36.878	39.071	41.394	43.856	46.464	49.226	52.154	55.255	58.540	62.021	-92
9	32.874	34.828	36.899	39.094	41.418	43.881	46.490	49.255	52.184	55.287	58.574	62.057	-91
10	32.893	34.849	36.921	39.116	41.442	43.906	46.517	49.283	52.214	55.319	58.608	62.093	-90
11	32.912	34.869	36.942	39.139	41.466	43.932	46.544	49.312	52.244	55.351	58.642	62.129	-89
12	32.931	34.889	36.963	39.161	41.490	43.957	46.571	49.340	52.274	55.383	58.676	62.165	-88
13	32.950	34.909	36.985	39.184	41.514	43.983	46.598	49.369	52.304	55.415	58.710	62.201	-87
14	32.969	34.929	37.006	39.207	41.538	44.008	46.625	49.397	52.335	55.447	58.744	62.237	-86
15	32.988	34.949	37.028	39.229	41.562	44.033	46.652	49.426	52.365	55.479	58.778	62.273	-85
16	33.007	34.970	37.049	39.252	41.586	44.059	46.679	49.454	52.395	55.511	58.811	62.309	-84
17	33.026	34.990	37.070	39.275	41.610	44.084	46.706	49.483	52.425	55.543	58.845	62.345	-83
18	33.045	35.010	37.092	39.297	41.634	44.110	46.733	49.512	52.456	55.575	58.879	62.381	-82
19	33.064	35.030	37.113	39.320	41.658	44.135	46.760	49.540	52.486	55.607	58.914	62.417	-81
20	33.083	35.050	37.135	39.343	41.682	44.161	46.787	49.569	52.516	55.639	58.948	62.453	-80
21	33.102	35.070	37.156	39.365	41.706	44.186	46.814	49.597	52.547	55.671	58.982	62.489	-79
22	33.121	35.091	37.178	39.388	41.730	44.212	46.841	49.626	52.577	55.703	59.016	62.525	-78
23	33.141	35.111	37.199	39.411	41.754	44.237	46.868	49.655	52.607	55.736	59.050	62.561	-77
24	33.160	35.131	37.221	39.434	41.779	44.263	46.895	49.683	52.638	55.768	59.084	62.597	-76
25	33.179	35.152	37.242	39.457	41.803	44.288	46.922	49.712	52.668	55.800	59.118	62.633	-75
26	33.198	35.172	37.264	39.479	41.827	44.314	46.949	49.741	52.699	55.832	59.152	62.670	-74
27	33.217	35.192	37.285	39.502	41.851	44.340	46.976	49.770	52.729	55.864	59.186	62.706	-73
28	33.236	35.213	37.307	39.525	41.875	44.365	47.003	49.798	52.760	55.897	59.221	62.742	-72
29	33.256	35.233	37.328	39.548	41.899	44.391	47.031	49.827	52.790	55.929	59.255	62.778	-71
30	33.275	35.253	37.350	39.571	41.924	44.417	47.058	49.856	52.821	55.961	59.289	62.815	-70
31	33.294	35.274	37.371	39.594	41.948	44.442	47.085	49.885	52.851	55.994	59.323	62.851	-69
32	33.313	35.294	37.393	39.616	41.972	44.468	47.112	49.914	52.882	56.026	59.358	62.887	-68
33	33.333	35.315	37.415	39.639	41.996	44.494	47.139	49.942	52.912	56.058	59.392	62.923	-67
34	33.352	35.335	37.436	39.662	42.021	44.519	47.167	49.971	52.943	56.091	59.426	62.960	-66
35	33.371	35.355	37.458	39.685	42.045	44.545	47.194	50.000	52.973	56.123	59.461	62.996	-65
36	33.390	35.376	37.479	39.708	42.069	44.571	47.221	50.029	53.004	56.156	59.495	63.033	-64
37	33.410	35.396	37.501	39.731	42.094	44.597	47.248	50.058	53.035	56.188	59.529	63.069	-63
38	33.429	35.417	37.523	39.754	42.118	44.622	47.276	50.087	53.065	56.221	59.564	63.105	-62
39	33.448	35.437	37.544	39.777	42.142	44.648	47.303	50.116	53.096	56.253	59.598	63.142	-61
40	33.468	35.458	37.566	39.800	42.167	44.674	47.330	50.145	53.126	56.286	59.632	63.178	-60
41	33.487	35.478	37.588	39.823	42.191	44.700	47.358	50.174	53.157	56.318	59.667	63.215	-59
42	33.506	35.499	37.610	39.846	42.215	44.726	47.385	50.203	53.188	56.351	59.701	63.251	-58
43	33.526	35.519	37.631	39.869	42.240	44.751	47.412	50.232	53.219	56.383	59.736	63.288	-57
44	33.545	35.540	37.653	39.892	42.264	44.777	47.440	50.261	53.249	56.416	59.770	63.325	-56
45	33.564	35.560	37.675	39.915	42.288	44.803	47.467	50.290	53.280	56.448	59.805	63.361	-55
46	33.584	35.581	37.697	39.938	42.313	44.829	47.495	50.319	53.311	56.481	59.840	63.398	-54
47	33.603	35.601	37.718	39.961	42.337	44.855	47.522	50.348	53.342	56.514	59.874	63.434	-53
48	33.623	35.622	37.740	39.984	42.362	44.881	47.550	50.377	53.373	56.546	59.909	63.471	-52
49	33.642	35.642	37.762	40.007	42.386	44.907	47.577	50.406	53.403	56.579	59.943	63.508	-51
50	33.661	35.663	37.784	40.030	42.411	44.933	47.605	50.435	53.434	56.612	59.978	63.544	-50
—	#C ₁	D ₁	#D ₁	E ₁	F ₁	#F ₁	G ₁	#G ₁	A ₁	#A ₁	B ₁	C	音分

表 A.1 (续)

音分	C ₁	#C ₁	D ₁	#D ₁	E ₁	F ₁	#F ₁	G ₁	#G ₁	A ₁	#A ₁	B ₁	—
51	33.681	35.684	37.805	40.054	42.435	44.959	47.632	50.464	53.465	56.644	60.013	63.581	—49
52	33.700	35.704	37.827	40.077	42.460	44.985	47.660	50.494	53.496	56.677	60.047	63.618	—48
53	33.720	35.725	37.849	40.100	42.484	45.011	47.687	50.523	53.527	56.710	60.082	63.655	—47
54	33.739	35.746	37.871	40.123	42.509	45.037	47.715	50.552	53.558	56.743	60.117	63.691	—46
55	33.759	35.766	37.893	40.146	42.533	45.063	47.742	50.581	53.589	56.775	60.151	63.728	—45
56	33.778	35.787	37.915	40.169	42.558	45.089	47.770	50.610	53.620	56.808	60.186	63.765	—44
57	33.798	35.808	37.937	40.193	42.583	45.115	47.797	50.640	53.651	56.841	60.221	63.802	—43
58	33.817	35.828	37.959	40.216	42.607	45.141	47.825	50.669	53.682	56.874	60.256	63.839	—42
59	33.837	35.849	37.981	40.239	42.632	45.167	47.853	50.698	53.713	56.907	60.291	63.876	—41
60	33.856	35.870	38.003	40.262	42.656	45.193	47.880	50.727	53.744	56.940	60.325	63.913	—40
61	33.876	35.890	38.025	40.286	42.681	45.219	47.908	50.757	53.775	56.972	60.360	63.949	—39
62	33.896	35.911	38.047	40.309	42.706	45.245	47.936	50.786	53.806	57.005	60.395	63.986	—38
63	33.915	35.932	38.069	40.332	42.730	45.271	47.963	50.815	53.837	57.038	60.430	64.023	—37
64	33.935	35.953	38.091	40.355	42.755	45.298	47.991	50.845	53.868	57.071	60.465	64.060	—36
65	33.954	35.973	38.113	40.379	42.780	45.324	48.019	50.874	53.899	57.104	60.500	64.097	—35
66	33.974	35.994	38.135	40.402	42.805	45.350	48.047	50.904	53.930	57.137	60.535	64.134	—34
67	33.994	36.015	38.157	40.425	42.829	45.376	48.074	50.933	53.962	57.170	60.570	64.171	—33
68	34.013	36.036	38.179	40.449	42.854	45.402	48.102	50.962	53.993	57.203	60.605	64.209	—32
69	34.033	36.057	38.201	40.472	42.879	45.429	48.130	50.992	54.024	57.236	60.640	64.246	—31
70	34.053	36.077	38.223	40.496	42.904	45.455	48.158	51.021	54.055	57.269	60.675	64.283	—30
71	34.072	36.098	38.245	40.519	42.928	45.481	48.185	51.051	54.086	57.303	60.710	64.320	—29
72	34.092	36.119	38.267	40.542	42.953	45.507	48.213	51.080	54.118	57.336	60.745	64.357	—28
73	34.112	36.140	38.289	40.566	42.978	45.534	48.241	51.110	54.149	57.369	60.780	64.394	—27
74	34.131	36.161	38.311	40.589	43.003	45.560	48.269	51.139	54.180	57.402	60.815	64.431	—26
75	34.151	36.182	38.333	40.613	43.028	45.586	48.297	51.169	54.211	57.435	60.850	64.469	—25
76	34.171	36.203	38.355	40.636	43.053	45.613	48.325	51.198	54.243	57.468	60.885	64.506	—24
77	34.191	36.224	38.378	40.660	43.077	45.639	48.353	51.228	54.274	57.501	60.921	64.543	—23
78	34.210	36.245	38.400	40.683	43.102	45.665	48.381	51.258	54.305	57.535	60.956	64.580	—22
79	34.230	36.266	38.422	40.707	43.127	45.692	48.409	51.287	54.337	57.568	60.991	64.618	—21
80	34.250	36.286	38.444	40.730	43.152	45.718	48.437	51.317	54.368	57.601	61.026	64.655	—20
81	34.270	36.307	38.466	40.754	43.177	45.744	48.465	51.346	54.400	57.634	61.062	64.692	—19
82	34.289	36.328	38.489	40.777	43.202	45.771	48.493	51.376	54.431	57.668	61.097	64.730	—18
83	34.309	36.349	38.511	40.801	43.227	45.797	48.521	51.406	54.463	57.701	61.132	64.767	—17
84	34.329	36.370	38.533	40.824	43.252	45.824	48.549	51.436	54.494	57.734	61.167	64.805	—16
85	34.349	36.391	38.555	40.848	43.277	45.850	48.577	51.465	54.526	57.768	61.203	64.842	—15
86	34.369	36.412	38.578	40.872	43.302	45.877	48.605	51.495	54.557	57.801	61.238	64.880	—14
87	34.389	36.433	38.600	40.895	43.327	45.903	48.633	51.525	54.589	57.835	61.274	64.917	—13
88	34.408	36.455	38.622	40.919	43.352	45.930	48.661	51.554	54.620	57.868	61.309	64.955	—12
89	34.428	36.476	38.645	40.942	43.377	45.956	48.689	51.584	54.652	57.901	61.344	64.992	—11
90	34.448	36.497	38.667	40.966	43.402	45.983	48.717	51.614	54.683	57.935	61.380	65.030	—10
91	34.468	36.518	38.689	40.990	43.427	46.009	48.745	51.644	54.715	57.968	61.415	65.067	—9
92	34.488	36.539	38.712	41.013	43.452	46.036	48.774	51.674	54.746	58.002	61.451	65.105	—8
93	34.508	36.560	38.734	41.037	43.477	46.063	48.802	51.704	54.778	58.035	61.486	65.142	—7
94	34.528	36.581	38.756	41.061	43.502	46.089	48.830	51.733	54.810	58.069	61.522	65.180	—6
95	34.548	36.602	38.779	41.085	43.528	46.116	48.858	51.763	54.841	58.102	61.557	65.218	—5
96	34.568	36.623	38.801	41.108	43.553	46.143	48.886	51.793	54.873	58.136	61.593	65.255	—4
97	34.588	36.645	38.824	41.132	43.578	46.169	48.915	51.823	54.905	58.170	61.629	65.293	—3
98	34.608	36.666	38.846	41.156	43.603	46.196	48.943	51.853	54.936	58.203	61.664	65.331	—2
99	34.628	36.687	38.868	41.180	43.628	46.223	48.971	51.883	54.968	58.237	61.700	65.369	—1
100	34.648	36.708	38.891	41.203	43.654	46.249	48.999	51.913	55.000	58.270	61.735	65.406	0
—	#C ₁	D ₁	#D ₁	E ₁	F ₁	#F ₁	G ₁	#G ₁	A ₁	#A ₁	B ₁	C	音分

A.2 十二平均律的频率与音分对照表(大字组),见表 A.2。

表 A.2 十二平均律的频率与音分对照表(大字组)

音分	C	[#] C	D	[#] D	E	F	[#] F	G	[#] G	A	[#] A	B	—
0	65.406	69.296	73.416	77.782	82.407	87.307	92.499	97.999	103.83	110.00	116.54	123.47	—100
1	65.444	69.336	73.459	77.827	82.455	87.358	92.552	98.055	103.89	110.06	116.61	123.54	—99
2	65.482	69.376	73.501	77.872	82.502	87.408	92.606	98.112	103.95	110.13	116.68	123.61	—98
3	65.520	69.416	73.544	77.917	82.550	87.458	92.659	98.169	104.01	110.19	116.74	123.69	—97
4	65.558	69.456	73.586	77.962	82.598	87.509	92.713	98.226	104.07	110.25	116.81	123.76	—96
5	65.596	69.496	73.629	78.007	82.645	87.560	92.766	98.282	104.13	110.32	116.88	123.83	—95
6	65.633	69.536	73.671	78.052	82.693	87.610	92.820	98.339	104.19	110.38	116.95	123.90	—94
7	65.671	69.576	73.714	78.097	82.741	87.661	92.873	98.396	104.25	110.45	117.01	123.97	—93
8	65.709	69.617	73.756	78.142	82.789	87.711	92.927	98.453	104.31	110.51	117.08	124.04	—92
9	65.747	69.657	73.799	78.187	82.836	87.762	92.981	98.510	104.37	110.57	117.15	124.11	—91
10	65.785	69.697	73.841	78.232	82.884	87.813	93.034	98.567	104.43	110.64	117.22	124.19	—90
11	65.823	69.737	73.884	78.278	82.932	87.864	93.088	98.624	104.49	110.70	117.28	124.26	—89
12	65.861	69.778	73.927	78.323	82.980	87.914	93.142	98.680	104.55	110.77	117.35	124.33	—88
13	65.899	69.818	73.970	78.368	83.028	87.965	93.196	98.738	104.61	110.83	117.42	124.40	—87
14	65.937	69.858	74.012	78.413	83.076	88.016	93.250	98.795	104.67	110.89	117.49	124.47	—86
15	65.976	69.899	74.055	78.459	83.124	88.067	93.304	98.852	104.73	110.96	117.56	124.55	—85
16	66.014	69.939	74.098	78.504	83.172	88.118	93.357	98.909	104.79	111.02	117.62	124.62	—84
17	66.052	69.979	74.141	78.549	83.220	88.169	93.411	98.966	104.85	111.09	117.69	124.69	—83
18	66.090	70.020	74.183	78.595	83.268	88.220	93.465	99.023	104.91	111.15	117.76	124.76	—82
19	66.128	70.060	74.226	78.640	83.316	88.271	93.519	99.080	104.97	111.21	117.83	124.83	—81
20	66.166	70.101	74.269	78.686	83.364	88.322	93.573	99.138	105.03	111.28	117.90	124.91	—80
21	66.205	70.141	74.312	78.731	83.413	88.373	93.627	99.195	105.09	111.34	117.96	124.98	—79
22	66.243	70.182	74.355	78.776	83.461	88.424	93.682	99.252	105.15	111.41	118.03	125.05	—78
23	66.281	70.222	74.398	78.822	83.509	88.475	93.736	99.309	105.22	111.47	118.10	125.12	—77
24	66.319	70.263	74.441	78.868	83.557	88.526	93.790	99.367	105.28	111.54	118.17	125.19	—76
25	66.358	70.304	74.484	78.913	83.606	88.577	93.844	99.424	105.34	111.60	118.24	125.27	—75
26	66.396	70.344	74.527	78.959	83.654	88.628	93.898	99.482	105.40	111.66	118.30	125.34	—74
27	66.434	70.385	74.570	79.004	83.702	88.679	93.953	99.539	105.46	111.73	118.37	125.41	—73
28	66.473	70.426	74.613	79.050	83.751	88.731	94.007	99.597	105.52	111.79	118.44	125.48	—72
29	66.511	70.466	74.656	79.096	83.799	88.782	94.061	99.654	105.58	111.86	118.51	125.56	—71
30	66.550	70.507	74.699	79.141	83.847	88.833	94.115	99.712	105.64	111.92	118.58	125.63	—70
31	66.588	70.548	74.743	79.187	83.896	88.884	94.170	99.769	105.70	111.99	118.65	125.70	—69
32	66.627	70.588	74.786	79.233	83.944	88.936	94.224	99.827	105.76	112.05	118.72	125.77	—68
33	66.665	70.629	74.829	79.279	83.993	88.987	94.279	99.885	105.82	112.12	118.78	125.85	—67
34	66.704	70.670	74.872	79.324	84.041	89.039	94.333	99.942	105.89	112.18	118.85	125.92	—66
35	66.742	70.711	74.916	79.370	84.090	89.090	94.388	100.00	105.95	112.25	118.92	125.99	—65
36	66.781	70.752	74.959	79.416	84.138	89.142	94.442	100.06	106.01	112.31	118.99	126.07	—64
37	66.819	70.793	75.002	79.462	84.187	89.193	94.497	100.12	106.07	112.38	119.06	126.14	—63
38	66.858	70.833	75.045	79.508	84.236	89.245	94.551	100.17	106.13	112.44	119.13	126.21	—62
39	66.897	70.874	75.089	79.554	84.284	89.296	94.606	100.23	106.19	112.51	119.20	126.28	—61
40	66.935	70.915	75.132	79.600	84.333	89.348	94.661	100.29	106.25	112.57	119.27	126.36	—60
41	66.974	70.956	75.176	79.646	84.382	89.399	94.715	100.35	106.31	112.64	119.33	126.43	—59
42	67.013	70.997	75.219	79.692	84.431	89.451	94.770	100.41	106.38	112.70	119.40	126.50	—58
43	67.051	71.038	75.263	79.738	84.479	89.503	94.825	100.46	106.44	112.77	119.47	126.58	—57
44	67.090	71.079	75.306	79.784	84.528	89.554	94.880	100.52	106.50	112.83	119.54	126.65	—56
45	67.129	71.120	75.350	79.830	84.577	89.606	94.934	100.58	106.56	112.90	119.61	126.72	—55
46	67.168	71.162	75.393	79.876	84.626	89.658	94.989	100.64	106.62	112.96	119.68	126.80	—54
47	67.206	71.203	75.437	79.922	84.675	89.710	95.044	100.70	106.68	113.03	119.75	126.87	—53
48	67.245	71.244	75.480	79.968	84.724	89.762	95.099	100.75	106.75	113.09	119.82	126.94	—52
49	67.284	71.285	75.524	80.015	84.773	89.813	95.154	100.81	106.81	113.16	119.89	127.02	—51
50	67.323	71.326	75.567	80.061	84.822	89.865	95.209	100.87	106.87	113.22	119.96	127.09	—50
—	[#] C	D	[#] D	E	F	[#] F	G	[#] G	A	[#] A	B	c	音分

表 A.2 (续)

音分	C	[#] C	D	[#] D	E	F	[#] F	G	[#] G	A	[#] A	B	—
51	67.362	71.367	75.611	80.107	84.871	89.917	95.264	100.93	106.93	113.29	120.03	127.16	—49
52	67.401	71.409	75.655	80.153	84.920	89.969	95.319	100.99	106.99	113.35	120.09	127.24	—48
53	67.440	71.450	75.699	80.200	84.969	90.021	95.374	101.05	107.05	113.42	120.16	127.31	—47
54	67.479	71.491	75.742	80.246	85.018	90.073	95.429	101.10	107.12	113.49	120.23	127.38	—46
55	67.518	71.532	75.786	80.292	85.067	90.125	95.484	101.16	107.18	113.55	120.30	127.46	—45
56	67.557	71.574	75.830	80.339	85.116	90.177	95.540	101.22	107.24	113.62	120.37	127.53	—44
57	67.596	71.615	75.874	80.385	85.165	90.229	95.595	101.28	107.30	113.68	120.44	127.60	—43
58	67.635	71.657	75.917	80.432	85.214	90.282	95.650	101.34	107.36	113.75	120.51	127.68	—42
59	67.674	71.698	75.961	80.478	85.264	90.334	95.705	101.40	107.43	113.81	120.58	127.75	—41
60	67.713	71.739	76.005	80.525	85.313	90.386	95.761	101.45	107.49	113.88	120.65	127.83	—40
61	67.752	71.781	76.049	80.571	85.362	90.438	95.816	101.51	107.55	113.94	120.72	127.90	—39
62	67.791	71.822	76.093	80.618	85.412	90.490	95.871	101.57	107.61	114.01	120.79	127.97	—38
63	67.830	71.864	76.137	80.664	85.461	90.543	95.927	101.63	107.67	114.08	120.86	128.05	—37
64	67.870	71.905	76.181	80.711	85.510	90.595	95.982	101.69	107.74	114.14	120.93	128.12	—36
65	67.909	71.947	76.225	80.758	85.560	90.647	96.038	101.75	107.80	114.21	121.00	128.19	—35
66	67.948	71.988	76.269	80.804	85.609	90.700	96.093	101.81	107.86	114.27	121.07	128.27	—34
67	67.987	72.030	76.313	80.851	85.659	90.752	96.149	101.87	107.92	114.34	121.14	128.34	—33
68	68.027	72.072	76.357	80.898	85.708	90.805	96.204	101.92	107.99	114.41	121.21	128.42	—32
69	68.066	72.113	76.401	80.944	85.758	90.857	96.260	101.98	108.05	114.47	121.28	128.49	—31
70	68.105	72.155	76.446	80.991	85.807	90.910	96.315	102.04	108.11	114.54	121.35	128.57	—30
71	68.145	72.197	76.490	81.038	85.857	90.962	96.371	102.10	108.17	114.61	121.42	128.64	—29
72	68.184	72.238	76.534	81.085	85.906	91.015	96.427	102.16	108.24	114.67	121.49	128.71	—28
73	68.223	72.280	76.578	81.132	85.956	91.067	96.482	102.22	108.30	114.74	121.56	128.79	—27
74	68.263	72.322	76.622	81.179	86.006	91.120	96.538	102.28	108.36	114.80	121.63	128.86	—26
75	68.302	72.364	76.667	81.225	86.055	91.172	96.594	102.34	108.42	114.87	121.70	128.94	—25
76	68.342	72.405	76.711	81.272	86.105	91.225	96.650	102.40	108.49	114.94	121.77	129.01	—24
77	68.381	72.447	76.755	81.319	86.155	91.278	96.706	102.46	108.55	115.00	121.84	129.09	—23
78	68.421	72.489	76.800	81.366	86.205	91.331	96.761	102.52	108.61	115.07	121.91	129.16	—22
79	68.460	72.531	76.844	81.413	86.254	91.383	96.817	102.57	108.67	115.14	121.98	129.24	—21
80	68.500	72.573	76.888	81.460	86.304	91.436	96.873	102.63	108.74	115.20	122.05	129.31	—20
81	68.539	72.615	76.933	81.507	86.354	91.489	96.929	102.69	108.80	115.27	122.12	129.38	—19
82	68.579	72.657	76.977	81.555	86.404	91.542	96.985	102.75	108.86	115.34	122.19	129.46	—18
83	68.619	72.699	77.022	81.602	86.454	91.595	97.041	102.81	108.93	115.40	122.26	129.53	—17
84	68.658	72.741	77.066	81.649	86.504	91.648	97.097	102.87	108.99	115.47	122.33	129.61	—16
85	68.698	72.783	77.111	81.696	86.554	91.701	97.153	102.93	109.05	115.54	122.41	129.68	—15
86	68.738	72.825	77.155	81.743	86.604	91.754	97.210	102.99	109.11	115.60	122.48	129.76	—14
87	68.777	72.867	77.200	81.790	86.654	91.807	97.266	103.05	109.18	115.67	122.55	129.83	—13
88	68.817	72.909	77.244	81.838	86.704	91.860	97.322	103.11	109.24	115.74	122.62	129.91	—12
89	68.857	72.951	77.289	81.885	86.754	91.913	97.378	103.17	109.30	115.80	122.69	129.98	—11
90	68.897	72.993	77.334	81.932	86.804	91.966	97.434	103.23	109.37	115.87	122.76	130.06	—10
91	68.936	73.036	77.378	81.980	86.854	92.019	97.491	103.29	109.43	115.94	122.83	130.13	—9
92	68.976	73.078	77.423	82.027	86.905	92.072	97.547	103.35	109.49	116.00	122.90	130.21	—8
93	69.016	73.120	77.468	82.074	86.955	92.125	97.603	103.41	109.56	116.07	122.97	130.28	—7
94	69.056	73.162	77.513	82.122	87.005	92.179	97.660	103.47	109.62	116.14	123.04	130.36	—6
95	69.096	73.204	77.557	82.169	87.055	92.232	97.716	103.53	109.68	116.20	123.11	130.44	—5
96	69.136	73.247	77.602	82.217	87.106	92.285	97.773	103.59	109.75	116.27	123.19	130.51	—4
97	69.176	73.289	77.647	82.264	87.156	92.338	97.829	103.65	109.81	116.34	123.26	130.59	—3
98	69.216	73.331	77.692	82.312	87.206	92.392	97.886	103.71	109.87	116.41	123.33	130.66	—2
99	69.256	73.374	77.737	82.359	87.257	92.445	97.942	103.77	109.94	116.47	123.40	130.74	—1
100	69.296	73.416	77.782	82.407	87.307	92.499	97.999	103.83	110.00	116.54	123.47	130.81	0
—	[#] C	D	[#] D	E	F	[#] F	G	[#] G	A	[#] A	B	c	音分

A.3 十二平均律的频率与音分对照表(小字组),见表 A.3。

表 A.3 十二平均律的频率与音分对照表(小字组)

音分	c	[#] c	d	[#] d	e	f	[#] f	g	[#] g	a	[#] a	b	—
0	130.81	138.59	146.83	155.56	164.81	174.61	185.00	196.00	207.65	220.00	233.08	246.94	—100
1	130.89	138.67	146.92	155.65	164.91	174.72	185.10	196.11	207.77	220.13	233.22	247.08	—99
2	130.96	138.75	147.00	155.74	165.00	174.82	185.21	196.22	207.89	220.25	233.35	247.23	—98
3	131.04	138.83	147.09	155.83	165.10	174.92	185.32	196.34	208.01	220.38	233.49	247.37	—97
4	131.12	138.91	147.17	155.92	165.20	175.02	185.43	196.45	208.13	220.51	233.62	247.51	—96
5	131.19	138.99	147.26	156.01	165.29	175.12	185.53	196.56	208.25	220.64	233.76	247.66	—95
6	131.27	139.07	147.34	156.10	165.39	175.22	185.64	196.68	208.37	220.76	233.89	247.80	—94
7	131.34	139.15	147.43	156.19	165.48	175.32	185.75	196.79	208.49	220.89	234.03	247.94	—93
8	131.42	139.23	147.51	156.28	165.58	175.42	185.85	196.91	208.61	221.02	234.16	248.09	—92
9	131.49	139.31	147.60	156.37	165.67	175.52	185.96	197.02	208.73	221.15	234.30	248.23	—91
10	131.57	139.39	147.68	156.46	165.77	175.63	186.07	197.13	208.86	221.27	234.43	248.37	—90
11	131.65	139.47	147.77	156.56	165.86	175.73	186.18	197.25	208.98	221.40	234.57	248.52	—89
12	131.72	139.56	147.85	156.65	165.96	175.83	186.28	197.36	209.10	221.53	234.70	248.66	—88
13	131.80	139.64	147.94	156.74	166.06	175.93	186.39	197.48	209.22	221.66	234.84	248.80	—87
14	131.87	139.72	148.02	156.83	166.15	176.03	186.50	197.59	209.34	221.79	234.97	248.95	—86
15	131.95	139.80	148.11	156.92	166.25	176.13	186.61	197.70	209.46	221.91	235.11	249.09	—85
16	132.03	139.88	148.20	157.01	166.34	176.24	186.71	197.82	209.58	222.04	235.25	249.23	—84
17	132.10	139.96	148.28	157.10	166.44	176.34	186.82	197.93	209.70	222.17	235.38	249.38	—83
18	132.18	140.04	148.37	157.19	166.54	176.44	186.93	198.05	209.82	222.30	235.52	249.52	—82
19	132.26	140.12	148.45	157.28	166.63	176.54	187.04	198.16	209.94	222.43	235.65	249.67	—81
20	132.33	140.20	148.54	157.37	166.73	176.64	187.15	198.28	210.07	222.56	235.79	249.81	—80
21	132.41	140.28	148.62	157.46	166.83	176.75	187.25	198.39	210.19	222.68	235.93	249.96	—79
22	132.49	140.36	148.71	157.55	166.92	176.85	187.36	198.50	210.31	222.81	236.06	250.10	—78
23	132.56	140.44	148.80	157.64	167.02	176.95	187.47	198.62	210.43	222.94	236.20	250.24	—77
24	132.64	140.53	148.88	157.74	167.11	177.05	187.58	198.73	210.55	223.07	236.34	250.39	—76
25	132.72	140.61	148.97	157.83	167.21	177.15	187.69	198.85	210.67	223.20	236.47	250.53	—75
26	132.79	140.69	149.05	157.92	167.31	177.26	187.80	198.96	210.79	223.33	236.61	250.68	—74
27	132.87	140.77	149.14	158.01	167.40	177.36	187.91	199.08	210.92	223.46	236.75	250.82	—73
28	132.95	140.85	149.23	158.10	167.50	177.46	188.01	199.19	211.04	223.59	236.88	250.97	—72
29	133.02	140.93	149.31	158.19	167.60	177.56	188.12	199.31	211.16	223.72	237.02	251.11	—71
30	133.10	141.01	149.40	158.28	167.69	177.67	188.23	199.42	211.28	223.85	237.16	251.26	—70
31	133.18	141.10	149.49	158.37	167.79	177.77	188.34	199.54	211.40	223.97	237.29	251.40	—69
32	133.25	141.18	149.57	158.47	167.89	177.87	188.45	199.65	211.53	224.10	237.43	251.55	—68
33	133.33	141.26	149.66	158.56	167.99	177.97	188.56	199.77	211.65	224.23	237.57	251.69	—67
34	133.41	141.34	149.74	158.65	168.08	178.08	188.67	199.88	211.77	224.36	237.70	251.84	—66
35	133.48	141.42	149.83	158.74	168.18	178.18	188.78	200.00	211.89	224.49	237.84	251.98	—65
36	133.56	141.50	149.92	158.83	168.28	178.28	188.88	200.12	212.02	224.62	237.98	252.13	—64
37	133.64	141.59	150.00	158.92	168.37	178.39	188.99	200.23	212.14	224.75	238.12	252.28	—63
38	133.72	141.67	150.09	159.02	168.47	178.49	189.10	200.35	212.26	224.88	238.25	252.42	—62
39	133.79	141.75	150.18	159.11	168.57	178.59	189.21	200.46	212.38	225.01	238.39	252.57	—61
40	133.87	141.83	150.26	159.20	168.67	178.70	189.32	200.58	212.51	225.14	238.53	252.71	—60
41	133.95	141.91	150.35	159.29	168.76	178.80	189.43	200.69	212.63	225.27	238.67	252.86	—59
42	134.03	141.99	150.44	159.38	168.86	178.90	189.54	200.81	212.75	225.40	238.81	253.01	—58
43	134.10	142.08	150.53	159.48	168.96	179.01	189.65	200.93	212.87	225.53	238.94	253.15	—57
44	134.18	142.16	150.61	159.57	169.06	179.11	189.76	201.04	213.00	225.66	239.08	253.30	—56
45	134.26	142.24	150.70	159.66	169.15	179.21	189.87	201.16	213.12	225.79	239.22	253.44	—55
46	134.34	142.32	150.79	159.75	169.25	179.32	189.98	201.28	213.24	225.92	239.36	253.59	—54
47	134.41	142.41	150.87	159.84	169.35	179.42	190.09	201.39	213.37	226.05	239.50	253.74	—53
48	134.49	142.49	150.96	159.94	169.45	179.52	190.20	201.51	213.49	226.19	239.63	253.88	—52
49	134.57	142.57	151.05	160.03	169.55	179.63	190.31	201.62	213.61	226.32	239.77	254.03	—51
50	134.65	142.65	151.13	160.12	169.64	179.73	190.42	201.74	213.74	226.45	239.91	254.18	—50
—	[#] c	d	[#] d	e	f	[#] f	g	[#] g	a	[#] a	b	c ¹	音分

表 A.3 (续)

音分	c	[#] c	d	[#] d	e	f	[#] f	g	[#] g	a	[#] a	b	—
51	134.72	142.73	151.22	160.21	169.74	179.83	190.53	201.86	213.86	226.58	240.05	254.32	—49
52	134.80	142.82	151.31	160.31	169.84	179.94	190.64	201.97	213.98	226.71	240.19	254.47	—48
53	134.88	142.90	151.40	160.40	169.94	180.04	190.75	202.09	214.11	226.84	240.33	254.62	—47
54	134.96	142.98	151.48	160.49	170.04	180.15	190.86	202.21	214.23	226.97	240.47	254.77	—46
55	135.04	143.06	151.57	160.58	170.13	180.25	190.97	202.32	214.36	227.10	240.61	254.91	—45
56	135.11	143.15	151.66	160.68	170.23	180.35	191.08	202.44	214.48	227.23	240.74	255.06	—44
57	135.19	143.23	151.75	160.77	170.33	180.46	191.19	202.56	214.60	227.36	240.88	255.21	—43
58	135.27	143.31	151.83	160.86	170.43	180.56	191.30	202.68	214.73	227.50	241.02	255.35	—42
59	135.35	143.40	151.92	160.96	170.53	180.67	191.41	202.79	214.85	227.63	241.16	255.50	—41
60	135.43	143.48	152.01	161.05	170.63	180.77	191.52	202.91	214.98	227.76	241.30	255.65	—40
61	135.50	143.56	152.10	161.14	170.72	180.88	191.63	203.03	215.10	227.89	241.44	255.80	—39
62	135.58	143.64	152.19	161.24	170.82	180.98	191.74	203.14	215.22	228.02	241.58	255.95	—38
63	135.66	143.73	152.27	161.33	170.92	181.09	191.85	203.26	215.35	228.15	241.72	256.09	—37
64	135.74	143.81	152.36	161.42	171.02	181.19	191.96	203.38	215.47	228.29	241.86	256.24	—36
65	135.82	143.89	152.45	161.52	171.12	181.29	192.08	203.50	215.60	228.42	242.00	256.39	—35
66	135.90	143.98	152.54	161.61	171.22	181.40	192.19	203.61	215.72	228.55	242.14	256.54	—34
67	135.97	144.06	152.63	161.70	171.32	181.50	192.30	203.73	215.85	228.68	242.28	256.69	—33
68	136.05	144.14	152.71	161.80	171.42	181.61	192.41	203.85	215.97	228.81	242.42	256.83	—32
69	136.13	144.23	152.80	161.89	171.52	181.71	192.52	203.97	216.10	228.95	242.56	256.98	—31
70	136.21	144.31	152.89	161.98	171.61	181.82	192.63	204.09	216.22	229.08	242.70	257.13	—30
71	136.29	144.39	152.98	162.08	171.71	181.92	192.74	204.20	216.35	229.21	242.84	257.28	—29
72	136.37	144.48	153.07	162.17	171.81	182.03	192.85	204.32	216.47	229.34	242.98	257.43	—28
73	136.45	144.56	153.16	162.26	171.91	182.13	192.96	204.44	216.60	229.47	243.12	257.58	—27
74	136.53	144.64	153.24	162.36	172.01	182.24	193.08	204.56	216.72	229.61	243.26	257.73	—26
75	136.60	144.73	153.33	162.45	172.11	182.34	193.19	204.68	216.85	229.74	243.40	257.87	—25
76	136.68	144.81	153.42	162.54	172.21	182.45	193.30	204.79	216.97	229.87	243.54	258.02	—24
77	136.76	144.89	153.51	162.64	172.31	182.56	193.41	204.91	217.10	230.01	243.68	258.17	—23
78	136.84	144.98	153.60	162.73	172.41	182.66	193.52	205.03	217.22	230.14	243.82	258.32	—22
79	136.92	145.06	153.69	162.83	172.51	182.77	193.63	205.15	217.35	230.27	243.96	258.47	—21
80	137.00	145.15	153.78	162.92	172.61	182.87	193.75	205.27	217.47	230.40	244.11	258.62	—20
81	137.08	145.23	153.87	163.01	172.71	182.98	193.86	205.39	217.60	230.54	244.25	258.77	—19
82	137.16	145.31	153.95	163.11	172.81	183.08	193.97	205.50	217.72	230.67	244.39	258.92	—18
83	137.24	145.40	154.04	163.20	172.91	183.19	194.08	205.62	217.85	230.80	244.53	259.07	—17
84	137.32	145.48	154.13	163.30	173.01	183.30	194.19	205.74	217.98	230.94	244.67	259.22	—16
85	137.40	145.57	154.22	163.39	173.11	183.40	194.31	205.86	218.10	231.07	244.81	259.37	—15
86	137.48	145.65	154.31	163.49	173.21	183.51	194.42	205.98	218.23	231.20	244.95	259.52	—14
87	137.55	145.73	154.40	163.58	173.31	183.61	194.53	206.10	218.35	231.34	245.09	259.67	—13
88	137.63	145.82	154.49	163.68	173.41	183.72	194.64	206.22	218.48	231.47	245.24	259.82	—12
89	137.71	145.90	154.58	163.77	173.51	183.83	194.76	206.34	218.61	231.61	245.38	259.97	—11
90	137.79	145.99	154.67	163.86	173.61	183.93	194.87	206.46	218.73	231.74	245.52	260.12	—10
91	137.87	146.07	154.76	163.96	173.71	184.04	194.98	206.58	218.86	231.87	245.66	260.27	—9
92	137.95	146.16	154.85	164.05	173.81	184.14	195.09	206.70	218.99	232.01	245.80	260.42	—8
93	138.03	146.24	154.94	164.15	173.91	184.25	195.21	206.81	219.11	232.14	245.95	260.57	—7
94	138.11	146.32	155.03	164.24	174.01	184.36	195.32	206.93	219.24	232.28	246.09	260.72	—6
95	138.19	146.41	155.11	164.34	174.11	184.46	195.43	207.05	219.37	232.41	246.23	260.87	—5
96	138.27	146.49	155.20	164.43	174.21	184.57	195.55	207.17	219.49	232.54	246.37	261.02	—4
97	138.35	146.58	155.29	164.53	174.31	184.68	195.66	207.29	219.62	232.68	246.51	261.17	—3
98	138.43	146.66	155.38	164.62	174.41	184.78	195.77	207.41	219.75	232.81	246.66	261.32	—2
99	138.51	146.75	155.47	164.72	174.51	184.89	195.88	207.53	219.87	232.95	246.80	261.47	—1
100	138.59	146.83	155.56	164.81	174.61	185.00	196.00	207.65	220.00	233.08	246.94	261.63	0
—	[#] c	d	[#] d	e	f	[#] f	g	[#] g	a	[#] a	b	c ¹	音分

A.4 十二平均律的频率与音分对照表(小字一组),见表 A.4。

表 A.4 十二平均律的频率与音分对照表(小字一组)

音分	c ¹	#c ¹	d ¹	#d ¹	e ¹	f ¹	#f ¹	g ¹	#g ¹	a ¹	#a ¹	b ¹	—
0	261.63	277.18	293.66	311.13	329.63	349.23	369.99	392.00	415.30	440.00	466.16	493.88	—100
1	261.78	277.34	293.83	311.31	329.82	349.43	370.21	392.22	415.54	440.25	466.43	494.17	—99
2	261.93	277.50	294.00	311.49	330.01	349.63	370.42	392.45	415.78	440.51	466.70	494.45	—98
3	262.08	277.66	294.17	311.67	330.20	349.83	370.64	392.68	416.02	440.76	466.97	494.74	—97
4	262.23	277.82	294.34	311.85	330.39	350.04	370.85	392.90	416.27	441.02	467.24	495.03	—96
5	262.38	277.98	294.51	312.03	330.58	350.24	371.06	393.13	416.51	441.27	467.51	495.31	—95
6	262.53	278.14	294.68	312.21	330.77	350.44	371.28	393.36	416.75	441.53	467.78	495.60	—94
7	262.69	278.31	294.85	312.39	330.96	350.64	371.49	393.58	416.99	441.78	468.05	495.88	—93
8	262.84	278.47	295.02	312.57	331.15	350.85	371.71	393.81	417.23	442.04	468.32	496.17	—92
9	262.99	278.63	295.20	312.75	331.35	351.05	371.92	394.04	417.47	442.29	468.59	496.46	—91
10	263.14	278.79	295.37	312.93	331.54	351.25	372.14	394.27	417.71	442.55	468.86	496.74	—90
11	263.29	278.95	295.54	313.11	331.73	351.45	372.35	394.49	417.95	442.80	469.14	497.03	—89
12	263.45	279.11	295.71	313.29	331.92	351.66	372.57	394.72	418.19	443.06	469.41	497.32	—88
13	263.60	279.27	295.88	313.47	332.11	351.86	372.78	394.95	418.43	443.32	469.68	497.61	—87
14	263.75	279.43	296.05	313.65	332.30	352.06	373.00	395.18	418.68	443.57	469.95	497.89	—86
15	263.90	279.59	296.22	313.83	332.50	352.27	373.21	395.41	418.92	443.83	470.22	498.18	—85
16	264.05	279.76	296.39	314.02	332.69	352.47	373.43	395.64	419.16	444.09	470.49	498.47	—84
17	264.21	279.92	296.56	314.20	332.88	352.67	373.65	395.86	419.40	444.34	470.76	498.76	—83
18	264.36	280.08	296.73	314.38	333.07	352.88	373.86	396.09	419.65	444.60	471.04	499.05	—82
19	264.51	280.24	296.91	314.56	333.27	353.08	374.08	396.32	419.89	444.86	471.31	499.33	—81
20	264.67	280.40	297.08	314.74	333.46	353.29	374.29	396.55	420.13	445.11	471.58	499.62	—80
21	264.82	280.57	297.25	314.92	333.65	353.49	374.51	396.78	420.37	445.37	471.85	499.91	—79
22	264.97	280.73	297.42	315.11	333.84	353.69	374.73	397.01	420.62	445.63	472.13	500.20	—78
23	265.12	280.89	297.59	315.29	334.04	353.90	374.94	397.24	420.86	445.88	472.40	500.49	—77
24	265.28	281.05	297.76	315.47	334.23	354.10	375.16	397.47	421.10	446.14	472.67	500.78	—76
25	265.43	281.21	297.94	315.65	334.42	354.31	375.38	397.70	421.35	446.40	472.94	501.07	—75
26	265.58	281.38	298.11	315.83	334.62	354.51	375.59	397.93	421.59	446.66	473.22	501.36	—74
27	265.74	281.54	298.28	316.02	334.81	354.72	375.81	398.16	421.83	446.92	473.49	501.65	—73
28	265.89	281.70	298.45	316.20	335.00	354.92	376.03	398.39	422.08	447.17	473.76	501.94	—72
29	266.04	281.86	298.63	316.38	335.20	355.13	376.24	398.62	422.32	447.43	474.04	502.23	—71
30	266.20	282.03	298.80	316.57	335.39	355.33	376.46	398.85	422.56	447.69	474.31	502.52	—70
31	266.35	282.19	298.97	316.75	335.58	355.54	376.68	399.08	422.81	447.95	474.59	502.81	—69
32	266.51	282.35	299.14	316.93	335.78	355.74	376.90	399.31	423.05	448.21	474.86	503.10	—68
33	266.66	282.52	299.32	317.11	335.97	355.95	377.11	399.54	423.30	448.47	475.13	503.39	—67
34	266.81	282.68	299.49	317.30	336.17	356.15	377.33	399.77	423.54	448.73	475.41	503.68	—66
35	266.97	282.84	299.66	317.48	336.36	356.36	377.55	400.00	423.79	448.99	475.68	503.97	—65
36	267.12	283.01	299.84	317.66	336.55	356.57	377.77	400.23	424.03	449.25	475.96	504.26	—64
37	267.28	283.17	300.01	317.85	336.75	356.77	377.99	400.46	424.28	449.50	476.23	504.55	—63
38	267.43	283.33	300.18	318.03	336.94	356.98	378.21	400.69	424.52	449.76	476.51	504.84	—62
39	267.59	283.50	300.36	318.22	337.14	357.18	378.42	400.93	424.77	450.02	476.78	505.14	—61
40	267.74	283.66	300.53	318.40	337.33	357.39	378.64	401.16	425.01	450.28	477.06	505.43	—60
41	267.90	283.83	300.70	318.58	337.53	357.60	378.86	401.39	425.26	450.54	477.34	505.72	—59
42	268.05	283.99	300.88	318.77	337.72	357.80	379.08	401.62	425.50	450.81	477.61	506.01	—58
43	268.21	284.15	301.05	318.95	337.92	358.01	379.30	401.85	425.75	451.07	477.89	506.30	—57
44	268.36	284.32	301.22	319.14	338.11	358.22	379.52	402.09	426.00	451.33	478.16	506.60	—56
45	268.52	284.48	301.40	319.32	338.31	358.42	379.74	402.32	426.24	451.59	478.44	506.89	—55
46	268.67	284.65	301.57	319.50	338.50	358.63	379.96	402.55	426.49	451.85	478.72	507.18	—54
47	268.83	284.81	301.75	319.69	338.70	358.84	380.18	402.78	426.73	452.11	478.99	507.48	—53
48	268.98	284.98	301.92	319.87	338.89	359.05	380.40	403.02	426.98	452.37	479.27	507.77	—52
49	269.14	285.14	302.10	320.06	339.09	359.25	380.62	403.25	427.23	452.63	479.55	508.06	—51
50	269.29	285.30	302.27	320.24	339.29	359.46	380.84	403.48	427.47	452.89	479.82	508.36	—50
—	#c ¹	d ¹	#d ¹	e ¹	f ¹	#f ¹	g ¹	#g ¹	a ¹	#a ¹	b ¹	c ²	音分

表 A.4 (续)

音分	c ¹	#c ¹	d ¹	#d ²	e ¹	f ¹	#f ¹	g ¹	#g ¹	a ¹	#a ¹	b ¹	—
51	269.45	285.47	302.44	320.43	339.48	359.67	381.06	403.71	427.72	453.15	480.10	508.65	—49
52	269.60	285.63	302.62	320.61	339.68	359.88	381.28	403.95	427.97	453.42	480.38	508.94	—48
53	269.76	285.80	302.79	320.80	339.87	360.08	381.50	404.18	428.22	453.68	480.66	509.24	—47
54	269.91	285.96	302.97	320.98	340.07	360.29	381.72	404.42	428.46	453.94	480.93	509.53	—46
55	270.07	286.13	303.14	321.17	340.27	360.50	381.94	404.65	428.71	454.20	481.21	509.83	—45
56	270.23	286.30	303.32	321.36	340.46	360.71	382.16	404.88	428.96	454.47	481.49	510.12	—44
57	270.38	286.46	303.49	321.54	340.66	360.92	382.38	405.12	429.21	454.73	481.77	510.41	—43
58	270.54	286.63	303.67	321.73	340.86	361.13	382.60	405.35	429.45	454.99	482.05	510.71	—42
59	270.70	286.79	303.85	321.91	341.05	361.33	382.82	405.58	429.70	455.25	482.32	511.00	—41
60	270.85	286.96	304.02	322.10	341.25	361.54	383.04	405.82	429.95	455.52	482.60	511.30	—40
61	271.01	287.12	304.20	322.28	341.45	361.75	383.26	406.05	430.20	455.78	482.88	511.60	—39
62	271.16	287.29	304.37	322.47	341.65	361.96	383.49	406.29	430.45	456.04	483.16	511.89	—38
63	271.32	287.46	304.55	322.66	341.84	362.17	383.71	406.52	430.70	456.31	483.44	512.19	—37
64	271.48	287.62	304.72	322.84	342.04	362.38	383.93	406.76	430.94	456.57	483.72	512.48	—36
65	271.64	287.79	304.90	323.03	342.24	362.59	384.15	406.99	431.19	456.83	484.00	512.78	—35
66	271.79	287.95	305.08	323.22	342.44	362.80	384.37	407.23	431.44	457.10	484.28	513.08	—34
67	271.95	288.12	305.25	323.40	342.63	363.01	384.59	407.46	431.69	457.36	484.56	513.37	—33
68	272.11	288.29	305.43	323.59	342.83	363.22	384.82	407.70	431.94	457.63	484.84	513.67	—32
69	272.26	288.45	305.61	323.78	343.03	363.43	385.04	407.93	432.19	457.89	485.12	513.97	—31
70	272.42	288.62	305.78	323.96	343.23	363.64	385.26	408.17	432.44	458.16	485.40	514.26	—30
71	272.58	288.79	305.96	324.15	343.43	363.85	385.48	408.41	432.69	458.42	485.68	514.56	—29
72	272.74	288.95	306.14	324.34	343.63	364.06	385.71	408.64	432.94	458.68	485.96	514.86	—28
73	272.89	289.12	306.31	324.53	343.82	364.27	385.93	408.88	433.19	458.95	486.24	515.15	—27
74	273.05	289.29	306.49	324.71	344.02	364.48	386.15	409.11	433.44	459.22	486.52	515.45	—26
75	273.21	289.45	306.67	324.90	344.22	364.69	386.38	409.35	433.69	459.48	486.80	515.75	—25
76	273.37	289.62	306.84	325.09	344.42	364.90	386.60	409.59	433.94	459.75	487.08	516.05	—24
77	273.52	289.79	307.02	325.28	344.62	365.11	386.82	409.82	434.19	460.01	487.37	516.35	—23
78	273.68	289.96	307.20	325.47	344.82	365.32	387.05	410.06	434.44	460.28	487.65	516.64	—22
79	273.84	290.12	307.38	325.65	345.02	365.53	387.27	410.30	434.70	460.54	487.93	516.94	—21
80	274.00	290.29	307.55	325.84	345.22	365.74	387.49	410.53	434.95	460.81	488.21	517.24	—20
81	274.16	290.46	307.73	326.03	345.42	365.96	387.72	410.77	435.20	461.08	488.49	517.54	—19
82	274.32	290.63	307.91	326.22	345.62	366.17	387.94	411.01	435.45	461.34	488.77	517.84	—18
83	274.47	290.80	308.09	326.41	345.82	366.38	388.17	411.25	435.70	461.61	489.06	518.14	—17
84	274.63	290.96	308.26	326.60	346.02	366.59	388.39	411.48	435.95	461.88	489.34	518.44	—16
85	274.79	291.13	308.44	326.78	346.22	366.80	388.61	411.72	436.20	462.14	489.62	518.74	—15
86	274.95	291.30	308.62	326.97	346.42	367.01	388.84	411.96	436.46	462.41	489.91	519.04	—14
87	275.11	291.47	308.80	327.16	346.62	367.23	389.06	412.20	436.71	462.68	490.19	519.34	—13
88	275.27	291.64	308.98	327.35	346.82	367.44	389.29	412.44	436.96	462.94	490.47	519.64	—12
89	275.43	291.80	309.16	327.54	347.02	367.65	389.51	412.67	437.21	463.21	490.76	519.94	—11
90	275.59	291.97	309.34	327.73	347.22	367.86	389.74	412.91	437.47	463.48	491.04	520.24	—10
91	275.75	292.14	309.51	327.92	347.42	368.08	389.96	413.15	437.72	463.75	491.32	520.54	—9
92	275.90	292.31	309.69	328.11	347.62	368.29	390.19	413.39	437.97	464.01	491.61	520.84	—8
93	276.06	292.48	309.87	328.30	347.82	368.50	390.41	413.63	438.22	464.28	491.89	521.14	—7
94	276.22	292.65	310.05	328.49	348.02	368.71	390.64	413.87	438.48	464.55	492.17	521.44	—6
95	276.38	292.82	310.23	328.68	348.22	368.93	390.86	414.11	438.73	464.82	492.46	521.74	—5
96	276.54	292.99	310.41	328.87	348.42	369.14	391.09	414.35	438.98	465.09	492.74	522.04	—4
97	276.70	293.16	310.59	329.06	348.62	369.35	391.32	414.59	439.24	465.36	493.03	522.35	—3
98	276.86	293.33	310.77	329.25	348.83	369.57	391.54	414.83	439.49	465.63	493.31	522.65	—2
99	277.02	293.50	310.95	329.44	349.03	369.78	391.77	415.06	439.75	465.89	493.60	522.95	—1
100	277.18	293.66	311.13	329.63	349.23	369.99	392.00	415.30	440.00	466.16	493.88	523.25	0
—	#c ¹	d ¹	#d ¹	e ¹	f ¹	#f ¹	g ¹	#g ¹	a ¹	#a ¹	b ¹	c ²	音分

A.5 十二平均律的频率与音分对照表(小字二组),见表 A.5。

表 A.5 十二平均律的频率与音分对照表(小字二组)

音分	c ²	#c ²	d ²	#d ²	e ²	f ²	#f ²	g ²	#g ²	a ²	#a ²	b ²	—
0	523.25	554.37	587.33	622.25	659.26	698.46	739.99	783.99	830.61	880.00	932.33	987.77	—100
1	523.55	554.69	587.67	622.61	659.64	698.86	740.42	784.44	831.09	880.51	932.87	988.34	—99
2	523.86	555.01	588.01	622.97	660.02	699.26	740.84	784.90	831.57	881.02	933.41	988.91	—98
3	524.16	555.33	588.35	623.33	660.40	699.67	741.27	785.35	832.05	881.53	933.94	989.48	—97
4	524.46	555.65	588.69	623.69	660.78	700.07	741.70	785.80	832.53	882.04	934.48	990.05	—96
5	524.76	555.97	589.03	624.05	661.16	700.48	742.13	786.26	833.01	882.55	935.02	990.62	—95
6	525.07	556.29	589.37	624.41	661.54	700.88	742.56	786.71	833.49	883.06	935.56	991.20	—94
7	525.37	556.61	589.71	624.78	661.93	701.29	742.99	787.17	833.97	883.57	936.10	991.77	—93
8	525.67	556.93	590.05	625.14	662.31	701.69	743.42	787.62	834.46	884.08	936.65	992.34	—92
9	525.98	557.25	590.39	625.50	662.69	702.10	743.85	788.08	834.94	884.59	937.19	992.91	—91
10	526.28	557.58	590.73	625.86	663.07	702.50	744.28	788.53	835.42	885.10	937.73	993.49	—90
11	526.59	557.90	591.07	626.22	663.46	702.91	744.71	788.99	835.90	885.61	938.27	994.06	—89
12	526.89	558.22	591.41	626.58	663.84	703.31	745.14	789.44	836.39	886.12	938.81	994.64	—88
13	527.20	558.54	591.76	626.94	664.22	703.72	745.57	789.90	836.87	886.63	939.35	995.21	—87
14	527.50	558.87	592.10	627.31	664.61	704.13	746.00	790.36	837.35	887.15	939.90	995.79	—86
15	527.80	559.19	592.44	627.67	664.99	704.53	746.43	790.81	837.84	887.66	940.44	996.36	—85
16	528.11	559.51	592.78	628.03	665.38	704.94	746.86	791.27	838.32	888.17	940.98	996.94	—84
17	528.41	559.84	593.13	628.39	665.76	705.35	747.29	791.73	838.81	888.68	941.53	997.51	—83
18	528.72	560.16	593.47	628.76	666.15	705.76	747.72	792.18	839.29	889.20	942.07	998.09	—82
19	529.03	560.48	593.81	629.12	666.53	706.16	748.15	792.64	839.78	889.71	942.62	998.67	—81
20	529.33	560.81	594.15	629.48	666.92	706.57	748.59	793.10	840.26	890.23	943.16	999.24	—80
21	529.64	561.13	594.50	629.85	667.30	706.98	749.02	793.56	840.75	890.74	943.71	999.82	—79
22	529.94	561.45	594.84	630.21	667.69	707.39	749.45	794.02	841.23	891.25	944.25	1 000.4	—78
23	530.25	561.78	595.18	630.58	668.07	707.80	749.89	794.48	841.72	891.77	944.80	1 001.0	—77
24	530.56	562.10	595.53	630.94	668.46	708.21	750.32	794.93	842.20	892.28	945.34	1 001.6	—76
25	530.86	562.43	595.87	631.30	668.84	708.62	750.75	795.39	842.69	892.80	945.89	1 002.1	—75
26	531.17	562.75	596.22	631.67	669.23	709.03	751.19	795.85	843.18	893.32	946.44	1 002.7	—74
27	531.48	563.08	596.56	632.03	669.62	709.43	751.62	796.31	843.66	893.83	946.98	1 003.3	—73
28	531.78	563.40	596.91	632.40	670.00	709.84	752.05	796.77	844.15	894.35	947.53	1 003.9	—72
29	532.09	563.73	597.25	632.77	670.39	710.25	752.49	797.23	844.64	894.87	948.08	1 004.5	—71
30	532.40	564.06	597.60	633.13	670.78	710.67	752.92	797.69	845.13	895.38	948.62	1 005.0	—70
31	532.71	564.38	597.94	633.50	671.17	711.08	753.36	798.16	845.62	895.90	949.17	1 005.6	—69
32	533.01	564.71	598.29	633.86	671.55	711.49	753.79	798.62	846.11	896.42	949.72	1 006.2	—68
33	533.32	565.03	598.63	634.23	671.94	711.90	754.23	799.08	846.59	896.94	950.27	1 006.8	—67
34	533.63	565.36	598.98	634.60	672.33	712.31	754.67	799.54	847.08	897.45	950.82	1 007.4	—66
35	533.94	565.69	599.32	634.96	672.72	712.72	755.10	800.00	847.57	897.97	951.37	1 007.9	—65
36	534.25	566.01	599.67	635.33	673.11	713.13	755.54	800.46	848.06	898.49	951.92	1 008.5	—64
37	534.55	566.34	600.02	635.70	673.50	713.54	755.97	800.93	848.55	899.01	952.47	1 009.1	—63
38	534.86	566.67	600.36	636.06	673.89	713.96	756.41	801.39	849.04	899.53	953.02	1 009.7	—62
39	535.17	567.00	600.71	636.43	674.27	714.37	756.85	801.85	849.53	900.05	953.57	1 010.3	—61
40	535.48	567.32	601.06	636.80	674.66	714.78	757.29	802.32	850.02	900.57	954.12	1 010.9	—60
41	535.79	567.65	601.40	637.17	675.05	715.20	757.72	802.78	850.52	901.09	954.67	1 011.4	—59
42	536.10	567.98	601.75	637.53	675.44	715.61	758.16	803.24	851.01	901.61	955.22	1 012.0	—58
43	536.41	568.31	602.10	637.90	675.83	716.02	758.60	803.71	851.50	902.13	955.77	1 012.6	—57
44	536.72	568.64	602.45	638.27	676.23	716.44	759.04	804.17	851.99	902.65	956.33	1 013.2	—56
45	537.03	568.96	602.80	638.64	676.62	716.85	759.48	804.64	852.48	903.17	956.88	1 013.8	—55
46	537.34	569.29	603.14	639.01	677.01	717.26	759.91	805.10	852.98	903.70	957.43	1 014.4	—54
47	537.65	569.62	603.49	639.38	677.40	717.68	760.35	805.57	853.47	904.22	957.99	1 015.0	—53
48	537.96	569.95	603.84	639.75	677.79	718.09	760.79	806.03	853.96	904.74	958.54	1 015.5	—52
49	538.27	570.28	604.19	640.12	678.18	718.51	761.23	806.50	854.45	905.26	959.09	1 016.1	—51
50	538.58	570.61	604.54	640.49	678.57	718.92	761.67	806.96	854.95	905.79	959.65	1 016.7	—50
—	#c ²	d ²	#d ²	e ²	f ²	#f ²	g ²	#g ²	a ²	#a ²	b ²	c ³	音分

表 A.5 (续)

音分	c ²	#c ²	d ²	#d ²	e ²	f ²	#f ²	g ²	#g ²	a ²	#a ²	b ²	—
51	538.89	570.94	604.89	640.86	678.96	719.34	762.11	807.43	855.44	906.31	960.20	1 017.3	-49
52	539.21	571.27	605.24	641.23	679.36	719.75	762.55	807.90	855.94	906.83	960.76	1 017.9	-48
53	539.52	571.60	605.59	641.60	679.75	720.17	762.99	808.36	856.43	907.36	961.31	1 018.5	-47
54	539.83	571.93	605.94	641.97	680.14	720.59	763.43	808.83	856.93	907.88	961.87	1 019.1	-46
55	540.14	572.26	606.29	642.34	680.54	721.00	763.88	809.30	857.42	908.41	962.42	1 019.7	-45
56	540.45	572.59	606.64	642.71	680.93	721.42	764.32	809.77	857.92	908.93	962.98	1 020.2	-44
57	540.77	572.92	606.99	643.08	681.32	721.84	764.76	810.23	858.41	909.46	963.53	1 020.8	-43
58	541.08	573.25	607.34	643.45	681.72	722.25	765.20	810.70	858.91	909.98	964.09	1 021.4	-42
59	541.39	573.58	607.69	643.83	682.11	722.67	765.64	811.17	859.40	910.51	964.65	1 022.0	-41
60	541.70	573.91	608.04	644.20	682.50	723.09	766.08	811.64	859.90	911.03	965.21	1 022.6	-40
61	542.02	574.25	608.39	644.57	682.90	723.51	766.53	812.11	860.40	911.56	965.76	1 023.2	-39
62	542.33	574.58	608.74	644.94	683.29	723.92	766.97	812.58	860.89	912.09	966.32	1 023.8	-38
63	542.64	574.91	609.10	645.31	683.69	724.34	767.41	813.05	861.39	912.61	966.88	1 024.4	-37
64	542.96	575.24	609.45	645.69	684.08	724.76	767.86	813.52	861.89	913.14	967.44	1 025.0	-36
65	543.27	575.57	609.80	646.06	684.48	725.18	768.30	813.99	862.39	913.67	968.00	1 025.6	-35
66	543.58	575.91	610.15	646.43	684.87	725.60	768.74	814.46	862.89	914.20	968.56	1 026.2	-34
67	543.90	576.24	610.51	646.81	685.27	726.02	769.19	814.93	863.38	914.72	969.12	1 026.7	-33
68	544.21	576.57	610.86	647.18	685.66	726.44	769.63	815.40	863.88	915.25	969.68	1 027.3	-32
69	544.53	576.91	611.21	647.56	686.06	726.86	770.08	815.87	864.38	915.78	970.24	1 027.9	-31
70	544.84	577.24	611.56	647.93	686.46	727.28	770.52	816.34	864.88	916.31	970.80	1 028.5	-30
71	545.16	577.57	611.92	648.30	686.85	727.70	770.97	816.81	865.38	916.84	971.36	1 029.1	-29
72	545.47	577.91	612.27	648.68	687.25	728.12	771.41	817.28	865.88	917.37	971.92	1 029.7	-28
73	545.79	578.24	612.62	649.05	687.65	728.54	771.86	817.76	866.38	917.90	972.48	1 030.3	-27
74	546.10	578.57	612.98	649.43	688.05	728.96	772.30	818.23	866.88	918.43	973.04	1 030.9	-26
75	546.42	578.91	613.33	649.80	688.44	729.38	772.75	818.70	867.38	918.96	973.61	1 031.5	-25
76	546.73	579.24	613.69	650.18	688.84	729.80	773.20	819.17	867.88	919.49	974.17	1 032.1	-24
77	547.05	579.58	614.04	650.55	689.24	730.22	773.64	819.65	868.39	920.02	974.73	1 032.7	-23
78	547.37	579.91	614.40	650.93	689.64	730.64	774.09	820.12	868.89	920.55	975.29	1 033.3	-22
79	547.68	580.25	614.75	651.31	690.04	731.07	774.54	820.59	869.39	921.09	975.86	1 033.9	-21
80	548.00	580.58	615.11	651.68	690.43	731.49	774.99	821.07	869.89	921.62	976.42	1 034.5	-20
81	548.31	580.93	615.46	652.06	690.83	731.91	775.43	821.54	870.39	922.15	976.99	1 035.1	-19
82	548.63	581.26	615.82	652.44	691.23	732.33	775.88	822.02	870.90	922.68	977.55	1 035.7	-18
83	548.95	581.59	616.17	652.81	691.63	732.76	776.33	822.49	871.40	923.22	978.11	1 036.3	-17
84	549.27	581.93	616.53	653.19	692.03	733.18	776.78	822.97	871.90	923.75	978.68	1 036.9	-16
85	549.58	582.26	616.89	653.57	692.43	733.61	777.23	823.44	872.41	924.28	979.25	1 037.5	-15
86	549.90	582.60	617.24	653.95	692.83	734.03	777.68	823.92	872.91	924.82	979.81	1 038.1	-14
87	550.22	582.94	617.60	654.32	693.23	734.45	778.13	824.40	873.42	925.35	980.38	1 038.7	-13
88	550.54	583.27	617.96	654.70	693.63	734.88	778.58	824.87	873.92	925.89	980.94	1 039.3	-12
89	550.85	583.61	618.31	655.08	694.03	735.30	779.03	825.35	874.43	926.42	981.51	1 039.9	-11
90	551.17	583.95	618.67	655.46	694.43	735.73	779.48	825.83	874.93	926.96	982.08	1 040.5	-10
91	551.49	584.28	619.03	655.84	694.83	736.15	779.93	826.30	875.44	927.49	982.64	1 041.1	-9
92	551.81	584.62	619.39	656.22	695.24	736.58	780.38	826.78	875.94	928.03	983.21	1 041.7	-8
93	552.13	584.96	619.74	656.59	695.64	737.00	780.83	827.26	876.45	928.57	983.78	1 042.3	-7
94	552.45	585.30	620.10	656.97	696.04	737.43	781.28	827.74	876.96	929.10	984.35	1 042.9	-6
95	552.77	585.64	620.46	657.35	696.44	737.85	781.73	828.21	877.46	929.64	984.92	1 043.5	-5
96	553.09	585.97	620.82	657.73	696.84	738.28	782.18	828.69	877.97	930.18	985.49	1 044.1	-4
97	553.41	586.31	621.18	658.11	697.25	738.71	782.63	829.17	878.48	930.71	986.06	1 044.7	-3
98	553.73	586.65	621.54	658.49	697.65	739.13	783.09	829.65	878.98	931.25	986.63	1 045.3	-2
99	554.05	586.99	621.89	658.87	698.05	739.56	783.54	830.13	879.49	931.79	987.20	1 045.9	-1
100	554.37	587.33	622.25	659.26	698.46	739.99	783.99	830.61	880.00	932.33	987.77	1 046.5	0
—	#c ²	d ²	#d ²	e ²	f ²	#f ²	g ²	#g ²	a ²	#a ²	b ²	c ²	音分

A.6 十二平均律的频率与音分对照表(小字三组),见表 A.6。

表 A.6 十二平均律的频率与音分对照表(小字三组)

音分	c ³	#c ³	d ³	#d ³	e ³	f ³	#f ³	g ³	#g ³	a ³	#a ³	b ³	—
0	1 046.5	1 108.7	1 174.7	1 244.5	1 318.5	1 396.9	1 480.0	1 568.0	1 661.2	1 760.0	1 864.7	1 975.5	-100
1	1 047.1	1 109.4	1 175.3	1 245.2	1 319.3	1 397.7	1 480.8	1 568.9	1 662.2	1 761.0	1 865.7	1 976.7	-99
2	1 047.7	1 110.0	1 176.0	1 245.9	1 320.0	1 398.5	1 481.7	1 569.8	1 663.1	1 762.0	1 866.8	1 977.8	-98
3	1 048.3	1 110.7	1 176.7	1 246.7	1 320.8	1 399.3	1 482.5	1 570.7	1 664.1	1 763.1	1 867.9	1 979.0	-97
4	1 048.9	1 111.3	1 177.4	1 247.4	1 321.6	1 400.1	1 483.4	1 571.6	1 665.1	1 764.1	1 869.0	1 980.1	-96
5	1 049.5	1 111.9	1 178.1	1 248.1	1 322.3	1 401.0	1 484.3	1 572.5	1 666.0	1 765.1	1 870.0	1 981.2	-95
6	1 050.1	1 112.6	1 178.7	1 248.8	1 323.1	1 401.8	1 485.1	1 573.4	1 667.0	1 766.1	1 871.1	1 982.4	-94
7	1 050.7	1 113.2	1 179.4	1 249.6	1 323.9	1 402.6	1 486.0	1 574.3	1 667.9	1 767.1	1 872.2	1 983.5	-93
8	1 051.3	1 113.9	1 180.1	1 250.3	1 324.6	1 403.4	1 486.8	1 575.2	1 668.9	1 768.2	1 873.3	1 984.7	-92
9	1 052.0	1 114.5	1 180.8	1 251.0	1 325.4	1 404.2	1 487.7	1 576.2	1 669.9	1 769.2	1 874.4	1 985.8	-91
10	1 052.6	1 115.2	1 181.5	1 251.7	1 326.1	1 405.0	1 488.6	1 577.1	1 670.8	1 770.2	1 875.5	1 987.0	-90
11	1 053.2	1 115.8	1 182.1	1 252.4	1 326.9	1 405.8	1 489.4	1 578.0	1 671.8	1 771.2	1 876.5	1 988.1	-89
12	1 053.8	1 116.4	1 182.8	1 253.2	1 327.7	1 406.6	1 490.3	1 578.9	1 672.8	1 772.2	1 877.6	1 989.3	-88
13	1 054.4	1 117.1	1 183.5	1 253.9	1 328.4	1 407.4	1 491.1	1 579.8	1 673.7	1 773.3	1 878.7	1 990.4	-87
14	1 055.0	1 117.7	1 184.2	1 254.6	1 329.2	1 408.3	1 492.0	1 580.7	1 674.7	1 774.3	1 879.8	1 991.6	-86
15	1 055.6	1 118.4	1 184.9	1 255.3	1 330.0	1 409.1	1 492.9	1 581.6	1 675.7	1 775.3	1 880.9	1 992.7	-85
16	1 056.2	1 119.0	1 185.6	1 256.1	1 330.8	1 409.9	1 493.7	1 582.5	1 676.6	1 776.3	1 882.0	1 993.9	-84
17	1 056.8	1 119.7	1 186.3	1 256.8	1 331.5	1 410.7	1 494.6	1 583.5	1 677.6	1 777.4	1 883.1	1 995.0	-83
18	1 057.4	1 120.3	1 186.9	1 257.5	1 332.3	1 411.5	1 495.4	1 584.4	1 678.6	1 778.4	1 884.1	1 996.2	-82
19	1 058.1	1 121.0	1 187.6	1 258.2	1 333.1	1 412.3	1 496.3	1 585.3	1 679.6	1 779.4	1 885.2	1 997.3	-81
20	1 058.7	1 121.6	1 188.3	1 259.0	1 333.8	1 413.1	1 497.2	1 586.2	1 680.5	1 780.5	1 886.3	1 998.5	-80
21	1 059.3	1 122.3	1 189.0	1 259.7	1 334.6	1 414.0	1 498.0	1 587.1	1 681.5	1 781.5	1 887.4	1 999.6	-79
22	1 059.9	1 122.9	1 189.7	1 260.4	1 335.4	1 414.8	1 498.9	1 588.0	1 682.5	1 782.5	1 888.5	2 000.8	-78
23	1 060.5	1 123.6	1 190.4	1 261.2	1 336.1	1 415.6	1 499.8	1 589.0	1 683.4	1 783.5	1 889.6	2 002.0	-77
24	1 061.1	1 124.2	1 191.1	1 261.9	1 336.9	1 416.4	1 500.6	1 589.9	1 684.4	1 784.6	1 890.7	2 003.1	-76
25	1 061.7	1 124.9	1 191.7	1 262.6	1 337.7	1 417.2	1 501.5	1 590.8	1 685.4	1 785.6	1 891.8	2 004.3	-75
26	1 062.3	1 125.5	1 192.4	1 263.3	1 338.5	1 418.1	1 502.4	1 591.7	1 686.4	1 786.6	1 892.9	2 005.4	-74
27	1 063.0	1 126.2	1 193.1	1 264.1	1 339.2	1 418.9	1 503.2	1 592.6	1 687.3	1 787.7	1 894.0	2 006.6	-73
28	1 063.6	1 126.8	1 193.8	1 264.8	1 340.0	1 419.7	1 504.1	1 593.5	1 688.3	1 788.7	1 895.1	2 007.7	-72
29	1 064.2	1 127.5	1 194.5	1 265.5	1 340.8	1 420.5	1 505.0	1 594.5	1 689.3	1 789.7	1 896.2	2 008.9	-71
30	1 064.8	1 128.1	1 195.2	1 266.3	1 341.6	1 421.3	1 505.8	1 595.4	1 690.3	1 790.8	1 897.2	2 010.1	-70
31	1 065.4	1 128.8	1 195.9	1 267.0	1 342.3	1 422.2	1 506.7	1 596.3	1 691.2	1 791.8	1 898.3	2 011.2	-69
32	1 066.0	1 129.4	1 196.6	1 267.7	1 343.1	1 423.0	1 507.6	1 597.2	1 692.2	1 792.8	1 899.4	2 012.4	-68
33	1 066.6	1 130.1	1 197.3	1 268.5	1 343.9	1 423.8	1 508.5	1 598.2	1 693.2	1 793.9	1 900.5	2 013.6	-67
34	1 067.3	1 130.7	1 198.0	1 269.2	1 344.7	1 424.6	1 509.3	1 599.1	1 694.2	1 794.9	1 901.6	2 014.7	-66
35	1 067.9	1 131.4	1 198.6	1 269.9	1 345.4	1 425.4	1 510.2	1 600.0	1 695.1	1 795.9	1 902.7	2 015.9	-65
36	1 068.5	1 132.0	1 199.3	1 270.7	1 346.2	1 426.3	1 511.1	1 600.9	1 696.1	1 797.0	1 903.8	2 017.0	-64
37	1 069.1	1 132.7	1 200.0	1 271.4	1 347.0	1 427.1	1 511.9	1 601.9	1 697.1	1 798.0	1 904.9	2 018.2	-63
38	1 069.7	1 133.3	1 200.7	1 272.1	1 347.8	1 427.9	1 512.8	1 602.8	1 698.1	1 799.1	1 906.0	2 019.4	-62
39	1 070.3	1 134.0	1 201.4	1 272.9	1 348.5	1 428.7	1 513.7	1 603.7	1 699.1	1 800.1	1 907.1	2 020.5	-61
40	1 071.0	1 134.6	1 202.1	1 273.6	1 349.3	1 429.6	1 514.6	1 604.6	1 700.0	1 801.1	1 908.2	2 021.7	-60
41	1 071.6	1 135.3	1 202.8	1 274.3	1 350.1	1 430.4	1 515.4	1 605.6	1 701.0	1 802.2	1 909.3	2 022.9	-59
42	1 072.2	1 136.0	1 203.5	1 275.1	1 350.9	1 431.2	1 516.3	1 606.5	1 702.0	1 803.2	1 910.4	2 024.0	-58
43	1 072.8	1 136.6	1 204.2	1 275.8	1 351.7	1 432.0	1 517.2	1 607.4	1 703.0	1 804.3	1 911.5	2 025.2	-57
44	1 073.4	1 137.3	1 204.9	1 276.5	1 352.5	1 432.9	1 518.1	1 608.3	1 704.0	1 805.3	1 912.7	2 026.4	-56
45	1 074.1	1 137.9	1 205.6	1 277.3	1 353.2	1 433.7	1 519.0	1 609.3	1 705.0	1 806.3	1 913.8	2 027.6	-55
46	1 074.7	1 138.6	1 206.3	1 278.0	1 354.0	1 434.5	1 519.8	1 610.2	1 706.0	1 807.4	1 914.9	2 028.7	-54
47	1 075.3	1 139.2	1 207.0	1 278.8	1 354.8	1 435.4	1 520.7	1 611.1	1 706.9	1 808.4	1 916.0	2 029.9	-53
48	1 075.9	1 139.9	1 207.7	1 279.5	1 355.6	1 436.2	1 521.6	1 612.1	1 707.9	1 809.5	1 917.1	2 031.1	-52
49	1 076.5	1 140.6	1 208.4	1 280.2	1 356.4	1 437.0	1 522.5	1 613.0	1 708.9	1 810.5	1 918.2	2 032.2	-51
50	1 077.2	1 141.2	1 209.1	1 281.0	1 357.1	1 437.8	1 523.3	1 613.9	1 709.9	1 811.6	1 919.3	2 033.4	-50
—	#c ³	d ³	#d ³	e ³	f ³	#f ³	g ³	#g ³	a ³	#a ³	b ³	c ⁴	音分

表 A.6 (续)

音分	c ³	#c ³	d ³	#d ³	e ³	f ³	#f ³	g ³	#g ³	a ³	#a ³	b ³	—
51	1 077.8	1 141.9	1 209.8	1 281.7	1 357.9	1 438.7	1 524.2	1 614.9	1 710.9	1 812.6	1 920.4	2 034.6	-49
52	1 078.4	1 142.5	1 210.5	1 282.5	1 358.7	1 439.5	1 525.1	1 615.8	1 711.9	1 813.7	1 921.5	2 035.8	-48
53	1 079.0	1 143.2	1 211.2	1 283.2	1 359.5	1 440.3	1 526.0	1 616.7	1 712.9	1 814.7	1 922.6	2 036.9	-47
54	1 079.7	1 143.9	1 211.9	1 283.9	1 360.3	1 441.2	1 526.9	1 617.7	1 713.9	1 815.8	1 923.7	2 038.1	-46
55	1 080.3	1 144.5	1 212.6	1 284.7	1 361.1	1 442.0	1 527.8	1 618.6	1 714.8	1 816.8	1 924.8	2 039.3	-45
56	1 080.9	1 145.2	1 213.3	1 285.4	1 361.9	1 442.8	1 528.6	1 619.5	1 715.8	1 817.9	1 926.0	2 040.5	-44
57	1 081.5	1 145.8	1 214.0	1 286.2	1 362.6	1 443.7	1 529.5	1 620.5	1 716.8	1 818.9	1 927.1	2 041.7	-43
58	1 082.2	1 146.5	1 214.7	1 286.9	1 363.4	1 444.5	1 530.4	1 621.4	1 717.8	1 820.0	1 928.2	2 042.8	-42
59	1 082.8	1 147.2	1 215.4	1 287.7	1 364.2	1 445.3	1 531.3	1 622.3	1 718.8	1 821.0	1 929.3	2 044.0	-41
60	1 083.4	1 147.8	1 216.1	1 288.4	1 365.0	1 446.2	1 532.2	1 623.3	1 719.8	1 822.1	1 930.4	2 045.2	-40
61	1 084.0	1 148.5	1 216.8	1 289.1	1 365.8	1 447.0	1 533.1	1 624.2	1 720.8	1 823.1	1 931.5	2 046.4	-39
62	1 084.7	1 149.2	1 217.5	1 289.9	1 366.6	1 447.8	1 533.9	1 625.2	1 721.8	1 824.2	1 932.6	2 047.6	-38
63	1 085.3	1 149.8	1 218.2	1 290.6	1 367.4	1 448.7	1 534.8	1 626.1	1 722.8	1 825.2	1 933.8	2 048.7	-37
64	1 085.9	1 150.5	1 218.9	1 291.4	1 368.2	1 449.5	1 535.7	1 627.0	1 723.8	1 826.3	1 934.9	2 049.9	-36
65	1 086.5	1 151.1	1 219.6	1 292.1	1 369.0	1 450.4	1 536.6	1 628.0	1 724.8	1 827.3	1 936.0	2 051.1	-35
66	1 087.2	1 151.8	1 220.3	1 292.9	1 369.7	1 451.2	1 537.5	1 628.9	1 725.8	1 828.4	1 937.1	2 052.3	-34
67	1 087.8	1 152.5	1 221.0	1 293.6	1 370.5	1 452.0	1 538.4	1 629.9	1 726.8	1 829.4	1 938.2	2 053.5	-33
68	1 088.4	1 153.2	1 221.7	1 294.4	1 371.3	1 452.9	1 539.3	1 630.8	1 727.8	1 830.5	1 939.4	2 054.7	-32
69	1 089.1	1 153.8	1 222.4	1 295.1	1 372.1	1 453.7	1 540.2	1 631.7	1 728.8	1 831.6	1 940.5	2 055.9	-31
70	1 089.7	1 154.5	1 223.1	1 295.9	1 372.9	1 454.6	1 541.0	1 632.7	1 729.8	1 832.6	1 941.6	2 057.0	-30
71	1 090.3	1 155.1	1 223.8	1 296.6	1 373.7	1 455.4	1 541.9	1 633.6	1 730.8	1 833.7	1 942.7	2 058.2	-29
72	1 090.9	1 155.8	1 224.5	1 297.4	1 374.5	1 456.2	1 542.8	1 634.6	1 731.8	1 834.7	1 943.8	2 059.4	-28
73	1 091.6	1 156.5	1 225.2	1 298.1	1 375.3	1 457.1	1 543.7	1 635.5	1 732.8	1 835.8	1 945.0	2 060.6	-27
74	1 092.2	1 157.1	1 226.0	1 298.9	1 376.1	1 457.9	1 544.6	1 636.5	1 733.8	1 836.9	1 946.1	2 061.8	-26
75	1 092.8	1 157.8	1 226.7	1 299.6	1 376.9	1 458.8	1 545.5	1 637.4	1 734.8	1 837.9	1 947.2	2 063.0	-25
76	1 093.5	1 158.5	1 227.4	1 300.4	1 377.7	1 459.6	1 546.4	1 638.3	1 735.8	1 839.0	1 948.3	2 064.2	-24
77	1 094.1	1 159.2	1 228.1	1 301.1	1 378.5	1 460.4	1 547.3	1 639.3	1 736.8	1 840.0	1 949.5	2 065.4	-23
78	1 094.7	1 159.9	1 228.8	1 301.9	1 379.3	1 461.3	1 548.2	1 640.2	1 737.8	1 841.1	1 950.6	2 066.6	-22
79	1 095.4	1 160.5	1 229.5	1 302.6	1 380.1	1 462.1	1 549.1	1 641.2	1 738.8	1 842.2	1 951.7	2 067.8	-21
80	1 096.0	1 161.2	1 230.2	1 303.4	1 380.9	1 463.0	1 550.0	1 642.1	1 739.8	1 843.2	1 952.8	2 069.0	-20
81	1 096.6	1 161.8	1 230.9	1 304.1	1 381.7	1 463.8	1 550.9	1 643.1	1 740.8	1 844.3	1 954.0	2 070.2	-19
82	1 097.3	1 162.5	1 231.6	1 304.9	1 382.5	1 464.7	1 551.8	1 644.0	1 741.8	1 845.4	1 955.1	2 071.4	-18
83	1 097.9	1 163.2	1 232.3	1 305.6	1 383.3	1 465.5	1 552.7	1 645.0	1 742.8	1 846.4	1 956.2	2 072.6	-17
84	1 098.5	1 163.9	1 233.0	1 306.4	1 384.1	1 466.4	1 553.6	1 645.9	1 743.8	1 847.5	1 957.4	2 073.8	-16
85	1 099.2	1 164.5	1 233.6	1 307.1	1 384.9	1 467.2	1 554.5	1 646.9	1 744.8	1 848.6	1 958.5	2 074.9	-15
86	1 099.8	1 165.2	1 234.3	1 307.9	1 385.7	1 468.1	1 555.4	1 647.8	1 745.8	1 849.6	1 959.6	2 076.1	-14
87	1 100.4	1 165.9	1 235.2	1 308.6	1 386.5	1 468.9	1 556.3	1 648.8	1 746.8	1 850.7	1 960.8	2 077.3	-13
88	1 101.1	1 166.5	1 235.9	1 309.4	1 387.3	1 469.8	1 557.2	1 649.7	1 747.8	1 851.8	1 961.9	2 078.5	-12
89	1 101.7	1 167.2	1 236.6	1 310.2	1 388.1	1 470.6	1 558.1	1 650.7	1 748.9	1 852.8	1 963.0	2 079.7	-11
90	1 102.3	1 167.9	1 237.3	1 310.9	1 388.9	1 471.5	1 559.0	1 651.7	1 749.9	1 853.9	1 964.2	2 080.9	-10
91	1 103.0	1 168.6	1 238.1	1 311.7	1 389.7	1 472.3	1 559.9	1 652.6	1 750.9	1 855.0	1 965.3	2 082.2	-9
92	1 103.6	1 169.2	1 238.8	1 312.4	1 390.5	1 473.2	1 560.8	1 653.6	1 751.9	1 856.1	1 966.4	2 083.4	-8
93	1 104.3	1 169.9	1 239.5	1 313.2	1 391.3	1 474.0	1 561.7	1 654.5	1 752.9	1 857.1	1 967.6	2 084.6	-7
94	1 104.9	1 170.6	1 240.2	1 313.9	1 392.1	1 474.9	1 562.6	1 655.5	1 753.9	1 858.2	1 968.7	2 085.8	-6
95	1 105.5	1 171.3	1 240.9	1 314.7	1 392.9	1 475.7	1 563.5	1 656.4	1 754.9	1 859.3	1 969.8	2 087.0	-5
96	1 106.2	1 171.9	1 241.6	1 315.5	1 393.7	1 476.6	1 564.4	1 657.4	1 755.9	1 860.4	1 971.0	2 088.2	-4
97	1 106.8	1 172.6	1 242.4	1 316.2	1 394.5	1 477.4	1 565.3	1 658.3	1 757.0	1 861.4	1 972.1	2 089.4	-3
98	1 107.5	1 173.3	1 243.1	1 317.0	1 395.3	1 478.3	1 566.2	1 659.3	1 758.0	1 862.5	1 973.3	2 090.6	-2
99	1 108.1	1 174.0	1 243.8	1 317.7	1 396.1	1 479.1	1 567.1	1 660.3	1 759.0	1 863.6	1 974.4	2 091.8	-1
100	1 108.7	1 174.7	1 244.5	1 318.5	1 396.9	1 480.0	1 568.0	1 661.2	1 760.0	1 864.7	1 975.5	2 093.0	0
—	#c ³	d ³	#d ³	e ³	f ³	#f ³	g ³	#g ³	a ³	#a ³	b ³	c ⁴	音分

A.7 十二平均律的频率与音分对照表(小字四组),见表 A.7。

表 A.7 十二平均律的频率与音分对照表(小字四组)

音分	c ⁴	#c ⁴	d ⁴	#d ⁴	e ⁴	f ⁴	#f ⁴	g ⁴	#g ⁴	a ⁴	#a ⁴	b ⁴	—
0	2 093.0	2 217.5	2 349.3	2 489.0	2 637.0	2 793.8	2 960.0	3 136.0	3 322.4	3 520.0	3 729.3	3 951.1	—100
1	2 094.2	2 218.7	2 350.7	2 490.5	2 638.5	2 795.4	2 961.7	3 137.8	3 324.4	3 522.0	3 731.5	3 953.3	—99
2	2 095.4	2 220.0	2 352.0	2 491.9	2 640.1	2 797.1	2 963.4	3 139.6	3 326.3	3 524.1	3 733.6	3 955.6	—98
3	2 096.6	2 221.3	2 353.4	2 493.3	2 641.6	2 798.7	2 965.1	3 141.4	3 328.2	3 526.1	3 735.8	3 957.9	—97
4	2 097.8	2 222.6	2 354.8	2 494.8	2 643.1	2 800.3	2 966.8	3 143.2	3 330.1	3 528.1	3 737.9	3 960.2	—96
5	2 099.1	2 223.9	2 356.1	2 496.2	2 644.6	2 801.9	2 968.5	3 145.0	3 332.0	3 530.2	3 740.1	3 962.5	—95
6	2 100.3	2 225.2	2 357.5	2 497.7	2 646.2	2 803.5	2 970.2	3 146.9	3 334.0	3 532.2	3 742.3	3 964.8	—94
7	2 101.5	2 226.4	2 358.8	2 499.1	2 647.7	2 805.1	2 971.9	3 148.7	3 335.9	3 534.3	3 744.4	3 967.1	—93
8	2 102.7	2 227.7	2 360.2	2 500.5	2 649.2	2 806.8	2 973.7	3 150.5	3 337.8	3 536.3	3 746.6	3 969.4	—92
9	2 103.9	2 229.0	2 361.6	2 502.0	2 650.8	2 808.4	2 975.4	3 152.3	3 339.8	3 538.3	3 748.7	3 971.7	—91
10	2 105.1	2 230.3	2 362.9	2 503.4	2 652.3	2 810.0	2 977.1	3 154.1	3 341.7	3 540.4	3 750.9	3 974.0	—90
11	2 106.3	2 231.6	2 364.3	2 504.9	2 653.8	2 811.6	2 978.8	3 156.0	3 343.6	3 542.4	3 753.1	3 976.3	—89
12	2 107.6	2 232.9	2 365.7	2 506.3	2 655.4	2 813.3	2 980.5	3 157.8	3 345.5	3 544.5	3 755.2	3 978.5	—88
13	2 108.8	2 234.2	2 367.0	2 507.8	2 656.9	2 814.9	2 982.3	3 159.6	3 347.5	3 546.5	3 757.4	3 980.8	—87
14	2 110.0	2 235.5	2 368.4	2 509.2	2 658.4	2 816.5	2 984.0	3 161.4	3 349.4	3 548.6	3 759.6	3 983.1	—86
15	2 111.2	2 236.8	2 369.8	2 510.7	2 660.0	2 818.1	2 985.7	3 163.3	3 351.3	3 550.6	3 761.8	3 985.4	—85
16	2 112.4	2 238.0	2 371.1	2 512.1	2 661.5	2 819.8	2 987.4	3 165.1	3 353.3	3 552.7	3 763.9	3 987.8	—84
17	2 113.7	2 239.3	2 372.5	2 513.6	2 663.0	2 821.4	2 989.2	3 166.9	3 355.2	3 554.7	3 766.1	3 990.1	—83
18	2 114.9	2 240.6	2 373.9	2 515.0	2 664.6	2 823.0	2 990.9	3 168.7	3 357.2	3 556.8	3 768.3	3 992.4	—82
19	2 116.1	2 241.9	2 375.2	2 516.5	2 666.1	2 824.7	2 992.6	3 170.6	3 359.1	3 558.8	3 770.5	3 994.7	—81
20	2 117.3	2 243.2	2 376.6	2 517.9	2 667.7	2 826.3	2 994.3	3 172.4	3 361.0	3 560.9	3 772.6	3 997.0	—80
21	2 118.5	2 244.5	2 378.0	2 519.4	2 669.2	2 827.9	2 996.1	3 174.2	3 363.0	3 563.0	3 774.8	3 999.3	—79
22	2 119.8	2 245.8	2 379.4	2 520.8	2 670.7	2 829.6	2 997.8	3 176.1	3 364.9	3 565.0	3 777.0	4 001.6	—78
23	2 121.0	2 247.1	2 380.7	2 522.3	2 672.3	2 831.2	2 999.5	3 177.9	3 366.9	3 567.1	3 779.2	4 003.9	—77
24	2 122.2	2 248.4	2 382.1	2 523.8	2 673.8	2 832.8	3 001.3	3 179.7	3 368.8	3 569.1	3 781.4	4 006.2	—76
25	2 123.4	2 249.7	2 383.5	2 525.2	2 675.4	2 834.5	3 003.0	3 181.6	3 370.8	3 571.2	3 783.6	4 008.5	—75
26	2 124.7	2 251.0	2 384.9	2 526.7	2 676.9	2 836.1	3 004.7	3 183.4	3 372.7	3 573.3	3 785.7	4 010.9	—74
27	2 125.9	2 252.3	2 386.2	2 528.1	2 678.5	2 837.7	3 006.5	3 185.3	3 374.7	3 575.3	3 787.9	4 013.2	—73
28	2 127.1	2 253.6	2 387.6	2 529.6	2 680.0	2 839.4	3 008.2	3 187.1	3 376.6	3 577.4	3 790.1	4 015.5	—72
29	2 128.4	2 254.9	2 389.0	2 531.1	2 681.6	2 841.0	3 010.0	3 188.9	3 378.6	3 579.5	3 792.3	4 017.8	—71
30	2 129.6	2 256.2	2 390.4	2 532.5	2 683.1	2 842.7	3 011.7	3 190.8	3 380.5	3 581.5	3 794.5	4 020.1	—70
31	2 130.8	2 257.5	2 391.8	2 534.0	2 684.7	2 844.3	3 013.4	3 192.6	3 382.5	3 583.6	3 796.7	4 022.5	—69
32	2 132.1	2 258.8	2 393.1	2 535.5	2 686.2	2 845.9	3 015.2	3 194.5	3 384.4	3 585.7	3 798.9	4 024.8	—68
33	2 133.3	2 260.1	2 394.5	2 536.9	2 687.8	2 847.6	3 016.9	3 196.3	3 386.4	3 587.7	3 801.1	4 027.1	—67
34	2 134.5	2 261.4	2 395.9	2 538.4	2 689.3	2 849.2	3 018.7	3 198.2	3 388.3	3 589.8	3 803.3	4 029.4	—66
35	2 135.7	2 262.7	2 397.3	2 539.8	2 690.9	2 850.9	3 020.4	3 200.0	3 390.3	3 591.9	3 805.5	4 031.8	—65
36	2 137.0	2 264.1	2 398.7	2 541.3	2 692.4	2 852.5	3 022.2	3 201.9	3 392.2	3 594.0	3 807.7	4 034.1	—64
37	2 138.2	2 265.4	2 400.1	2 542.8	2 694.0	2 854.2	3 023.9	3 203.7	3 394.2	3 596.0	3 809.9	4 036.4	—63
38	2 139.5	2 266.7	2 401.5	2 544.3	2 695.5	2 855.8	3 025.6	3 205.6	3 396.2	3 598.1	3 812.1	4 038.7	—62
39	2 140.7	2 268.0	2 402.8	2 545.7	2 697.1	2 857.5	3 027.4	3 207.4	3 398.1	3 600.2	3 814.3	4 041.1	—61
40	2 141.9	2 269.3	2 404.2	2 547.2	2 698.7	2 859.1	3 029.1	3 209.3	3 400.1	3 602.3	3 816.5	4 043.4	—60
41	2 143.2	2 270.6	2 405.6	2 548.7	2 700.2	2 860.8	3 030.9	3 211.1	3 402.1	3 604.4	3 818.7	4 045.8	—59
42	2 144.4	2 271.9	2 407.0	2 550.1	2 701.8	2 862.4	3 032.6	3 213.0	3 404.0	3 606.4	3 820.9	4 048.1	—58
43	2 145.6	2 273.2	2 408.4	2 551.6	2 703.3	2 864.1	3 034.4	3 214.8	3 406.0	3 608.5	3 823.1	4 050.4	—57
44	2 146.9	2 274.5	2 409.8	2 553.1	2 704.9	2 865.7	3 036.1	3 216.7	3 408.0	3 610.6	3 825.3	4 052.8	—56
45	2 148.1	2 275.9	2 411.2	2 554.6	2 706.5	2 867.4	3 037.9	3 218.5	3 409.9	3 612.7	3 827.5	4 055.1	—55
46	2 149.4	2 277.2	2 412.6	2 556.0	2 708.0	2 869.1	3 039.7	3 220.4	3 411.9	3 614.8	3 829.7	4 057.5	—54
47	2 150.6	2 278.5	2 414.0	2 557.5	2 709.6	2 870.7	3 041.4	3 222.3	3 413.9	3 616.9	3 831.9	4 059.8	—53
48	2 151.8	2 279.8	2 415.4	2 559.0	2 711.2	2 872.4	3 043.2	3 224.1	3 415.8	3 619.0	3 834.2	4 062.1	—52
49	2 153.1	2 281.1	2 416.8	2 560.5	2 712.7	2 874.0	3 044.9	3 226.0	3 417.8	3 621.1	3 836.4	4 064.5	—51
50	2 154.3	2 282.4	2 418.2	2 561.9	2 714.3	2 875.7	3 046.7	3 227.9	3 419.8	3 623.1	3 838.6	4 066.8	—50
—	#c ⁴	d ⁴	#d ⁴	e ⁴	f ⁴	#f ⁴	g ⁴	#g ⁴	a ⁴	#a ⁴	b ⁴	c ⁵	音分

表 A.7 (续)

音分	c ⁴	#c ⁴	d ⁴	#d ⁴	e ⁴	f ⁴	#f ⁴	g ⁴	#g ⁴	a ⁴	#a ⁴	b ⁴	—
51	2 155.6	2 283.8	2 419.6	2 563.4	2 715.9	2 877.4	3 048.4	3 229.7	3 421.8	3 625.2	3 840.8	4 069.2	—49
52	2 156.8	2 285.1	2 421.0	2 564.9	2 717.4	2 879.0	3 050.2	3 231.6	3 423.7	3 627.3	3 843.0	4 071.5	—48
53	2 158.1	2 286.4	2 422.4	2 566.4	2 719.0	2 880.7	3 052.0	3 233.5	3 425.7	3 629.4	3 845.2	4 073.9	—47
54	2 159.3	2 287.7	2 423.8	2 567.9	2 720.6	2 882.3	3 053.7	3 235.3	3 427.7	3 631.5	3 847.5	4 076.2	—46
55	2 160.6	2 289.0	2 425.2	2 569.4	2 722.1	2 884.0	3 055.5	3 237.2	3 429.7	3 633.6	3 849.7	4 078.6	—45
56	2 161.8	2 290.4	2 426.6	2 570.8	2 723.7	2 885.7	3 057.3	3 239.1	3 431.7	3 635.7	3 851.9	4 081.0	—44
57	2 163.1	2 291.7	2 428.0	2 572.3	2 725.3	2 887.3	3 059.0	3 240.9	3 433.6	3 637.8	3 854.1	4 083.3	—43
58	2 164.3	2 293.0	2 429.4	2 573.8	2 726.9	2 889.0	3 060.8	3 242.8	3 435.6	3 639.9	3 856.4	4 085.7	—42
59	2 165.6	2 294.3	2 430.8	2 575.3	2 728.4	2 890.7	3 062.6	3 244.7	3 437.6	3 642.0	3 858.6	4 088.0	—41
60	2 166.8	2 295.7	2 432.2	2 576.8	2 730.0	2 892.3	3 064.3	3 246.6	3 439.6	3 644.1	3 860.8	4 090.4	—40
61	2 168.1	2 297.0	2 433.6	2 578.3	2 731.6	2 894.0	3 066.1	3 248.4	3 441.6	3 646.2	3 863.1	4 092.8	—39
62	2 169.3	2 298.3	2 435.0	2 579.8	2 733.2	2 895.7	3 067.9	3 250.3	3 443.6	3 648.3	3 865.3	4 095.1	—38
63	2 170.6	2 299.6	2 436.4	2 581.3	2 734.7	2 897.4	3 069.7	3 252.2	3 445.6	3 650.5	3 867.5	4 097.5	—37
64	2 171.8	2 301.0	2 437.8	2 582.8	2 736.3	2 899.0	3 071.4	3 254.1	3 447.6	3 652.6	3 869.8	4 099.9	—36
65	2 173.1	2 302.3	2 439.2	2 584.2	2 737.9	2 900.7	3 073.2	3 255.9	3 449.6	3 654.7	3 872.0	4 102.2	—35
66	2 174.3	2 303.6	2 440.6	2 585.7	2 739.5	2 902.4	3 075.0	3 257.8	3 451.5	3 656.8	3 874.2	4 104.6	—34
67	2 175.6	2 305.0	2 442.0	2 587.2	2 741.1	2 904.1	3 076.8	3 259.7	3 453.5	3 658.9	3 876.5	4 107.0	—33
68	2 176.9	2 306.3	2 443.4	2 588.7	2 742.7	2 905.7	3 078.5	3 261.6	3 455.5	3 661.0	3 878.7	4 109.3	—32
69	2 178.1	2 307.6	2 444.8	2 590.2	2 744.2	2 907.4	3 080.3	3 263.5	3 457.5	3 663.1	3 880.9	4 111.7	—31
70	2 179.4	2 309.0	2 446.3	2 591.7	2 745.8	2 909.1	3 082.1	3 265.4	3 459.5	3 665.2	3 883.2	4 114.1	—30
71	2 180.6	2 310.3	2 447.7	2 593.2	2 747.4	2 910.8	3 083.9	3 267.2	3 461.5	3 667.4	3 885.4	4 116.5	—29
72	2 181.9	2 311.6	2 449.1	2 594.7	2 749.0	2 912.5	3 085.7	3 269.1	3 463.5	3 669.5	3 887.7	4 118.9	—28
73	2 183.1	2 313.0	2 450.5	2 596.2	2 750.6	2 914.2	3 087.4	3 271.0	3 465.5	3 671.6	3 889.9	4 121.2	—27
74	2 184.4	2 314.3	2 451.9	2 597.7	2 752.2	2 915.8	3 089.2	3 272.9	3 467.5	3 673.7	3 892.2	4 123.6	—26
75	2 185.7	2 315.6	2 453.3	2 599.2	2 753.8	2 917.5	3 091.0	3 274.8	3 469.5	3 675.8	3 894.4	4 126.0	—25
76	2 186.9	2 317.0	2 454.7	2 600.7	2 755.4	2 919.2	3 092.8	3 276.7	3 471.5	3 678.0	3 896.7	4 128.4	—24
77	2 188.2	2 318.3	2 456.2	2 602.2	2 757.0	2 920.9	3 094.6	3 278.6	3 473.5	3 680.1	3 898.9	4 130.8	—23
78	2 189.5	2 319.7	2 457.6	2 603.7	2 758.5	2 922.6	3 096.4	3 280.5	3 475.6	3 682.2	3 901.2	4 133.2	—22
79	2 190.7	2 321.0	2 459.0	2 605.2	2 760.1	2 924.3	3 098.2	3 282.4	3 477.6	3 684.3	3 903.4	4 135.5	—21
80	2 192.0	2 322.3	2 460.4	2 606.7	2 761.7	2 926.0	3 099.9	3 284.3	3 479.6	3 686.5	3 905.7	4 137.9	—20
81	2 193.3	2 323.7	2 461.8	2 608.2	2 763.3	2 927.6	3 101.7	3 286.2	3 481.6	3 688.6	3 907.9	4 140.3	—19
82	2 194.5	2 325.0	2 463.3	2 609.7	2 764.9	2 929.3	3 103.5	3 288.1	3 483.6	3 690.7	3 910.2	4 142.7	—18
83	2 195.8	2 326.4	2 464.7	2 611.3	2 766.5	2 931.0	3 105.3	3 290.0	3 485.6	3 692.9	3 912.5	4 145.1	—17
84	2 197.1	2 327.7	2 466.1	2 612.8	2 768.1	2 932.7	3 107.1	3 291.9	3 487.6	3 695.0	3 914.7	4 147.5	—16
85	2 198.3	2 329.1	2 467.5	2 614.3	2 769.7	2 934.4	3 108.9	3 293.8	3 489.6	3 697.1	3 917.0	4 149.9	—15
86	2 199.6	2 330.4	2 469.0	2 615.8	2 771.3	2 936.1	3 110.7	3 295.7	3 491.6	3 699.3	3 919.2	4 152.3	—14
87	2 200.9	2 331.7	2 470.4	2 617.3	2 772.9	2 937.8	3 112.5	3 297.6	3 493.7	3 701.4	3 921.5	4 154.7	—13
88	2 202.1	2 333.1	2 471.8	2 618.8	2 774.5	2 939.5	3 114.3	3 299.5	3 495.7	3 703.5	3 923.8	4 157.1	—12
89	2 203.4	2 334.4	2 473.3	2 620.3	2 776.1	2 941.2	3 116.1	3 301.4	3 497.7	3 705.7	3 926.0	4 159.5	—11
90	2 204.7	2 335.8	2 474.7	2 621.8	2 777.7	2 942.9	3 117.9	3 303.3	3 499.7	3 707.8	3 928.3	4 161.9	—10
91	2 206.0	2 337.1	2 476.1	2 623.3	2 779.3	2 944.6	3 119.7	3 305.2	3 501.7	3 710.0	3 930.6	4 164.3	—9
92	2 207.2	2 338.5	2 477.5	2 624.9	2 780.9	2 946.3	3 121.5	3 307.1	3 503.8	3 712.1	3 932.9	4 166.7	—8
93	2 208.5	2 339.8	2 479.0	2 626.4	2 782.6	2 948.0	3 123.3	3 309.0	3 505.8	3 714.3	3 935.1	4 169.1	—7
94	2 209.8	2 341.2	2 480.4	2 627.9	2 784.2	2 949.7	3 125.1	3 310.9	3 507.8	3 716.4	3 937.4	4 171.5	—6
95	2 211.1	2 342.5	2 481.8	2 629.4	2 785.8	2 951.4	3 126.9	3 312.9	3 509.8	3 718.6	3 939.7	4 173.9	—5
96	2 212.3	2 343.9	2 483.3	2 630.9	2 787.4	2 953.1	3 128.7	3 314.8	3 511.9	3 720.7	3 941.9	4 176.3	—4
97	2 213.6	2 345.3	2 484.7	2 632.5	2 789.0	2 954.8	3 130.5	3 316.7	3 513.9	3 722.9	3 944.2	4 178.8	—3
98	2 214.9	2 346.6	2 486.1	2 634.0	2 790.6	2 956.5	3 132.3	3 318.6	3 515.9	3 725.0	3 946.5	4 181.2	—2
99	2 216.2	2 348.0	2 487.6	2 635.5	2 792.2	2 958.2	3 134.2	3 320.5	3 518.0	3 727.2	3 948.8	4 183.6	—1
100	2 217.5	2 349.3	2 489.0	2 637.0	2 793.8	2 960.0	3 136.0	3 322.4	3 520.0	3 729.3	3 951.1	4 186.0	0
—	#c ⁴	d ⁴	#d ⁴	e ⁴	f ⁴	#f ⁴	g ⁴	#g ⁴	a ⁴	#a ⁴	b ⁴	c ⁵	音分

中 华 人 民 共 和 国
国 家 标 准
十二平均律的频率与音分的计算
GB/T 23146—2008

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中国标准出版社出版发行
北京复兴门外三里河北街16号
邮政编码:100045

网址 www.spc.net.cn

电话:68523946 68517548

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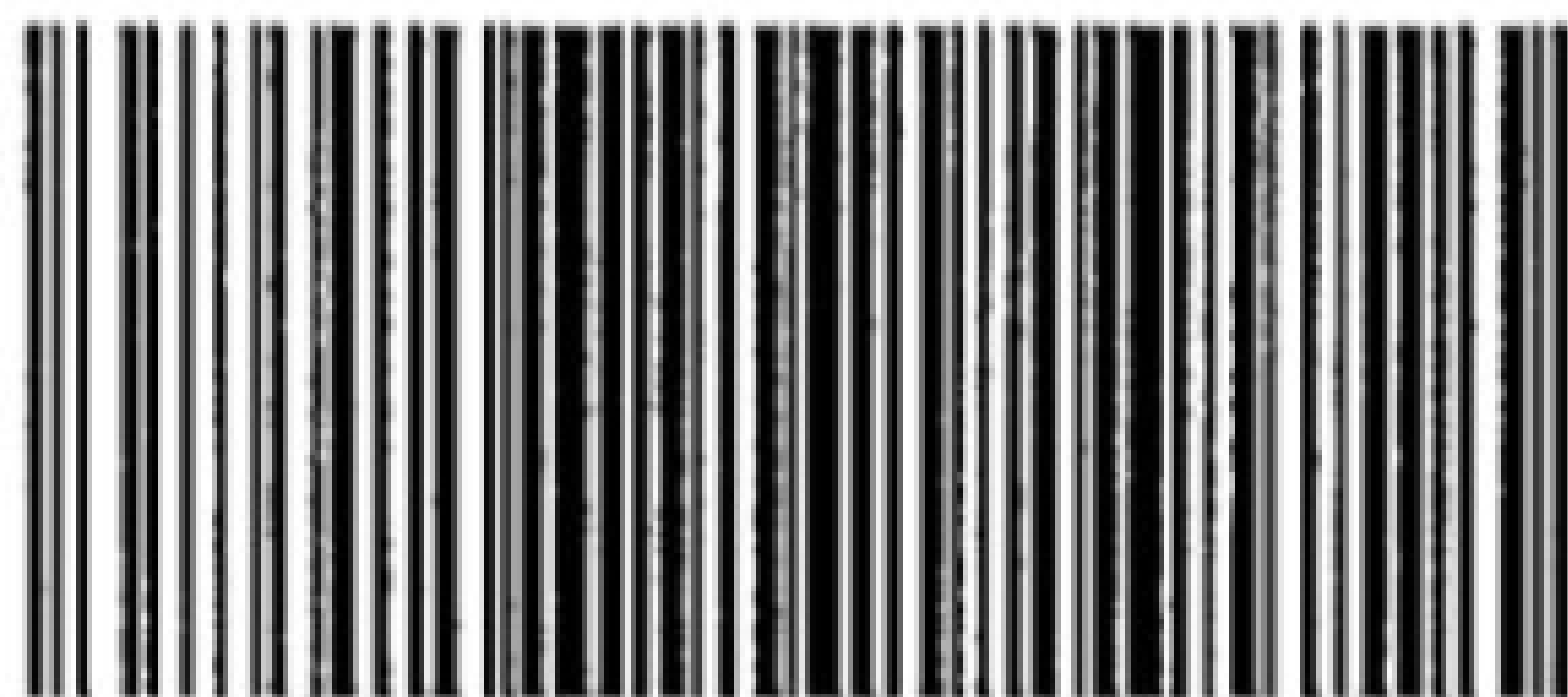
开本 880×1230 1/16 印张 1.5 字数 35 千字
2009年5月第一版 2009年5月第一次印刷

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书号: 155066·1-36557 定价 20.00 元

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