

A select group of Dekanies and Constant Structures in which they are found
[Kraig Grady with Terumi Narushima 23-7-2010]

Dekanies are simply the combination of 2 out of 5 (or 3 out of 5) harmonics that one multiplies together that forms a 10 tone structure that has interesting properties.

Being harmonically based in structure there is much advantage into finding a suitable set of notes to add if wanting to have some sort of melodic integrity.

Constant Structures are scales where any time a ratio or interval occurs it is always subtended by the same number of notes in the scale. It is a strategy that can be seen in the scales of Partch and Novaro to name two. One can also generate them using Viggo Brun's Algorithm

The Dekanies chosen here were from their occurrences in Wilson's D'alessandro CPS (Combination Product Set). It also has a practical source.

If one was interested in either working (electronically for instance) or building instruments using CPS structures one might wonder if there is a smaller but meaningful subset to work with first. One might have only a 12 tone instrument such as a keyboard, for example.

It is an old question.

Back in the mid 80s I had a 12 tone marimba and since I could not get a full Eikosany, I ended up tuning it to two 5-7-9-11 Hexanies a $3/2$ apart. It was a good choice in many ways. I realize I might have opted for others if I had known about them.

The Dekanies recently came to mind and I wondered if any of them could be found in a Constant Structure of 12 or less notes. If so, one would have half of an Eikosany. If one liked the territory they could find a like instrument to complete the whole larger structure.

To find Constant Structures can require a rather extended process.

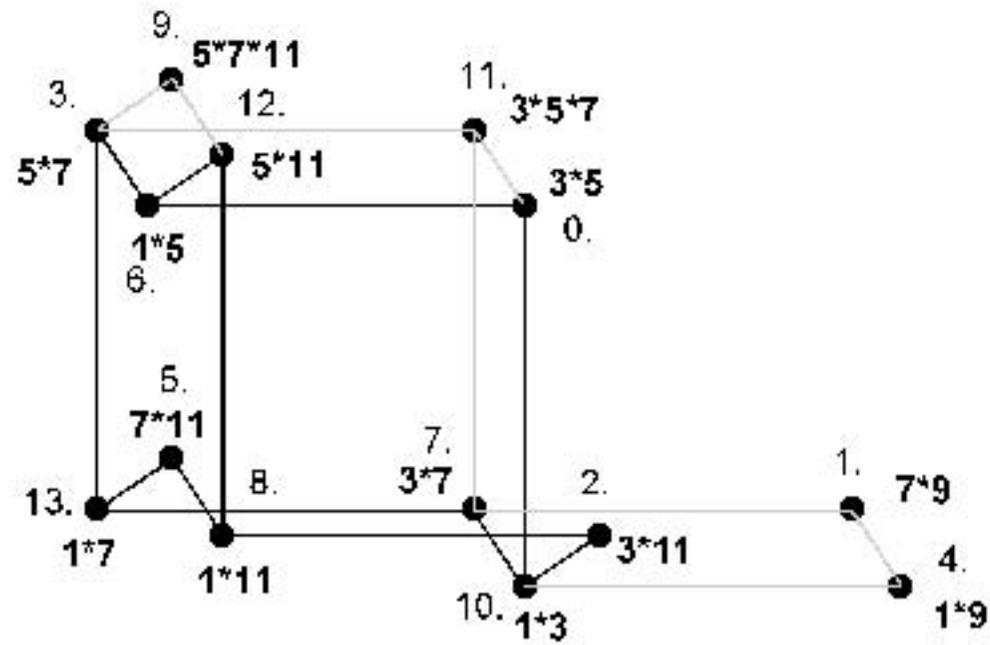
I used the situation to involve Terumi Narushima to give her some hands on work in this direction, it being of some interest to her.

We did indeed find a few possibilities of Dekanies with constant structures of 12 notes or less.

We also found some other interesting sets that were unexpected and yet seemed possibly useful for others in different situations.

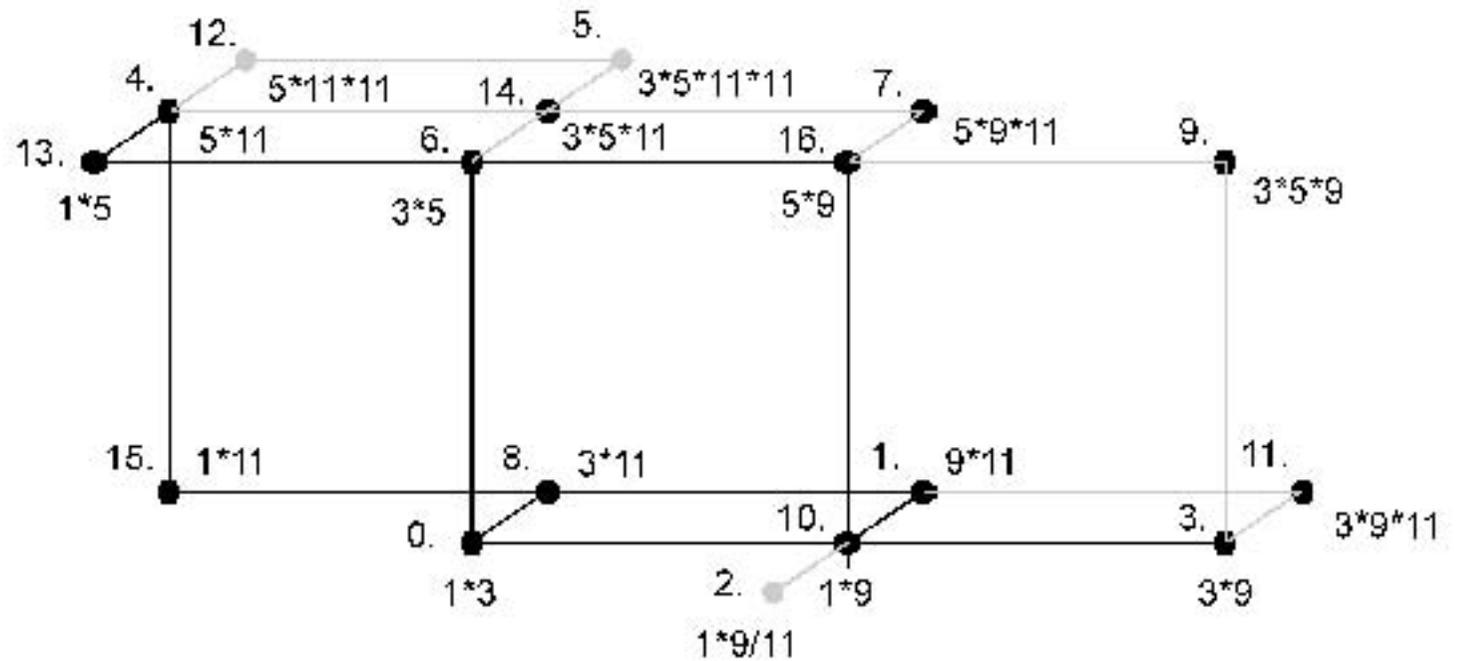
While we investigated the 2 out of 5 sets, the 3 out of 5 sets (being the inversions of these) are also possible.

The 1-3-5-7-11 Dekany within a 14 tone Constant Structure



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The 1-3-5-9-11 (Double!) Dekany within a 17 tone Constant Structure

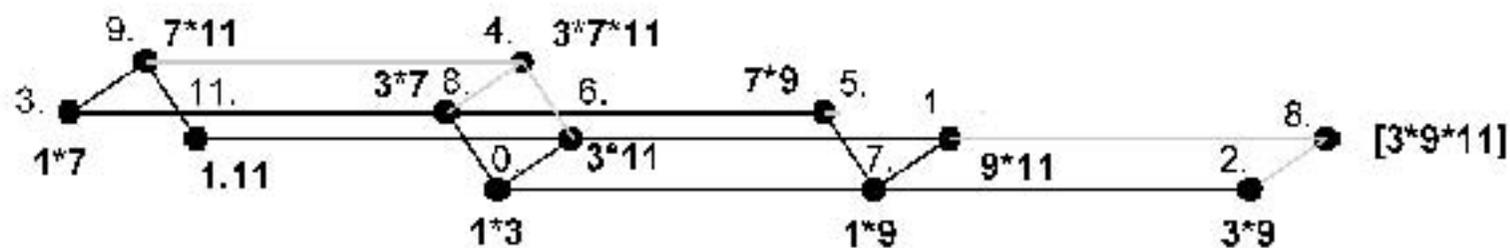


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|-----|------|--------|------|-----------|------|--------|--------|-------|------|---------|-----|--------|-----|-----|-----|-----|-------|
| 1*3 | 9*11 | 3*9 | 5*11 | 3*5 | 3*11 | 1*9 | 3*9*11 | 1*5 | 1*11 | 5*9 | 1*3 | | | | | | |
| 0. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17/0. |
| | | 1*9/11 | | 3*5*11*11 | | 5*9*11 | | 3*5*9 | | 5*11*11 | | 3*5*11 | | | | | |

THE 1-3-7-9-11 2(5) DEKANY WITHIN A 12 TONE CONSTANT STRUCTURE

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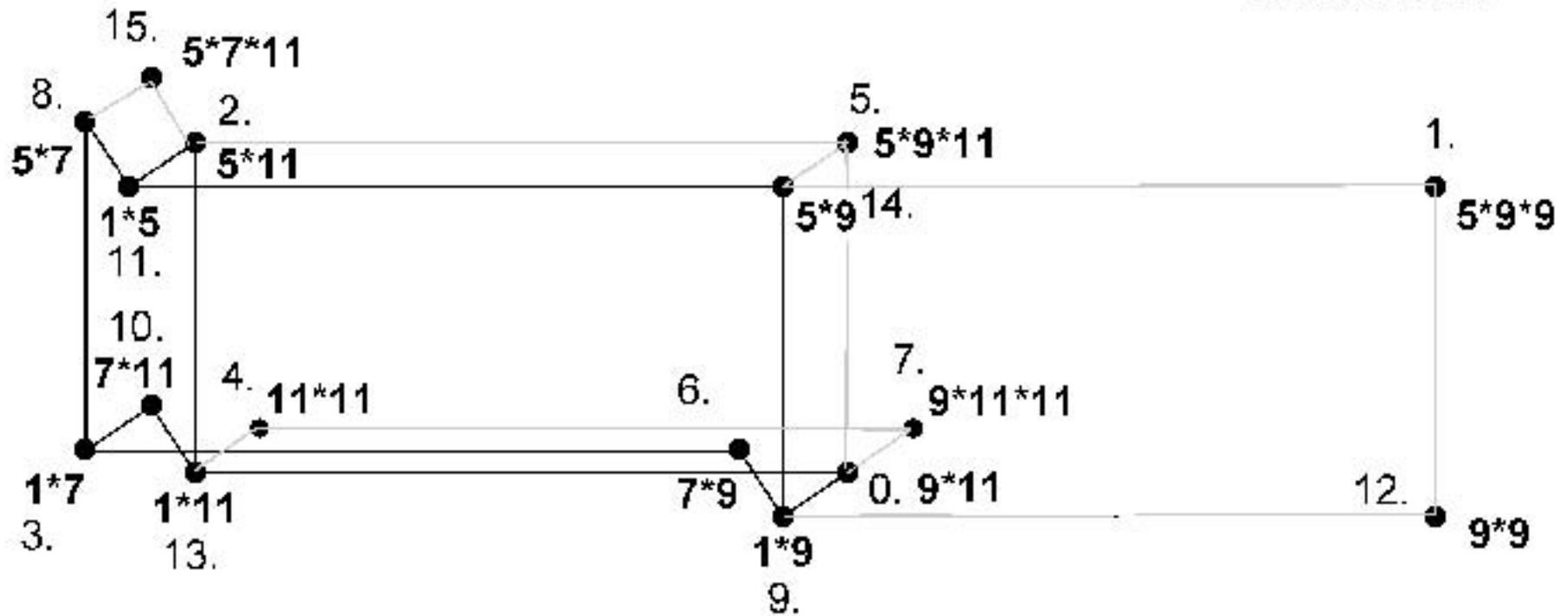
1*3	9*11	3*9	1*7		7*9	3*11	1*9		7*11	3*7	1*11	1*3
0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12./0.
				3*7*11					3*9*11			

THE 1-3-7-9-11 2)5 DEKANY AND ITS MIRROR
 PLOTTED ON TWO 12 TONE KEYBOARDS

1*3*5	480	B -49.36 (A# 50.64)	7*9*11	346.5	F -13.58
5*9*11	495	B +3.91	3*7*9	378	F# 37.06
3*5*9	270	C# -45.45 (C 54.55)	1*9*11	396	G 17.6
1*5*7	280	C# +17.51	1*3*9	432	A -31.77 (G# 60.33)
3*5*7*11	288.75	D -29.22	1*7	448	A 31.19
5*7*9	315	D# 21.42	3*7*11	462	A# -15.53
3*5*11	330	E 1.95	1*7*9	504	B 35.1
1*5*9	360	F# - 47.41 (F 52.59)	1*3*11	264	C 15.64
3*5*9*11	371.25	F# 5.86	1*9	288	D -33.71 (C# 66.29)
5*7*11	385	G -31.18	3*9*11	297	D 19.55
3*5*7	420	G# 19.46	1*7*11	308	D# -17.49
1*5*11	440	A 0	1*3*7	336	E 33.15
1*3*5	480	B -49.36 (A# 50.64)	7*9*11	346.5	F -13.58

The 1-5-7-9-11 Dekany within a 16 tone Constant Structure

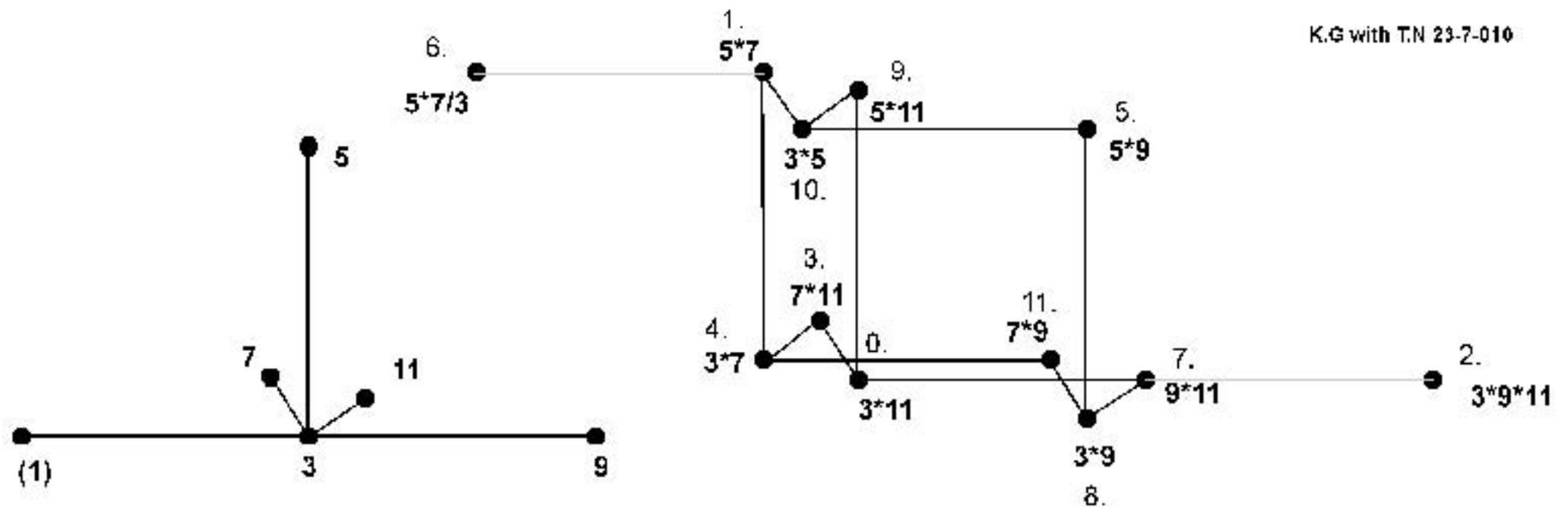
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$9 \cdot 11$	$5 \cdot 11$	$1 \cdot 7$		$7 \cdot 9$	$5 \cdot 7$	$1 \cdot 9$	$7 \cdot 11$	$1 \cdot 5$		$1 \cdot 11$	$5 \cdot 9$		$9 \cdot 11$			
0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16/0.
$5 \cdot 9 \cdot 9$				$11 \cdot 11$	$5 \cdot 9 \cdot 11$	$9 \cdot 11 \cdot 11$						$9 \cdot 9$			$5 \cdot 7 \cdot 11$	

The 3-5-7-9-11 Dekany within a 12 tone Constant Structure

K.G with T.N 23-7-010

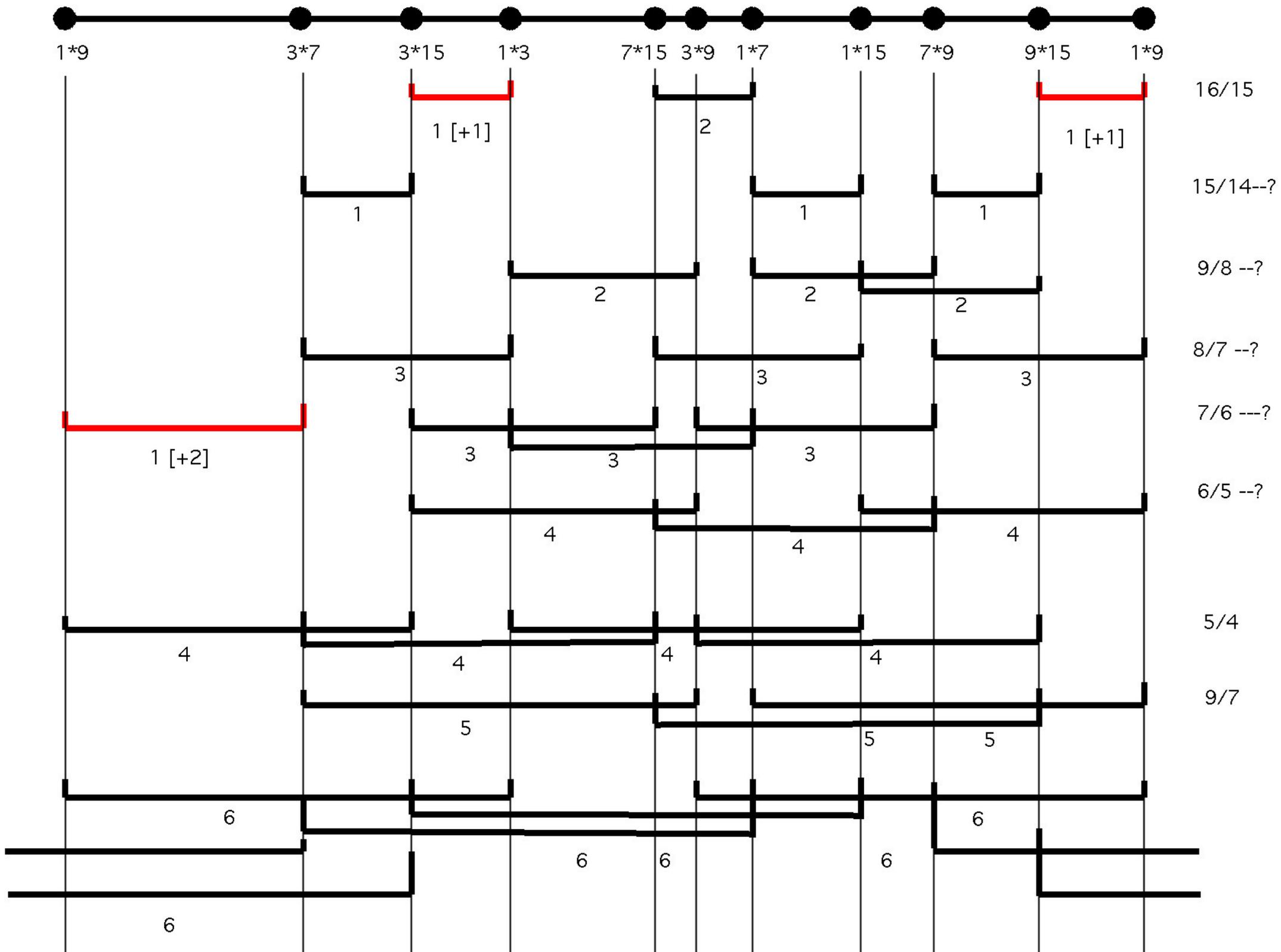


3*11	5*7	7*11	3*7	5*9	9*11	3*9	5*11	3*5	7*9	3*11		
0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12/0.
3*11		3*9*11				5*7/3						

THE 3-5-7-9-11 2)5 DEKANY AND ITS MIRROR

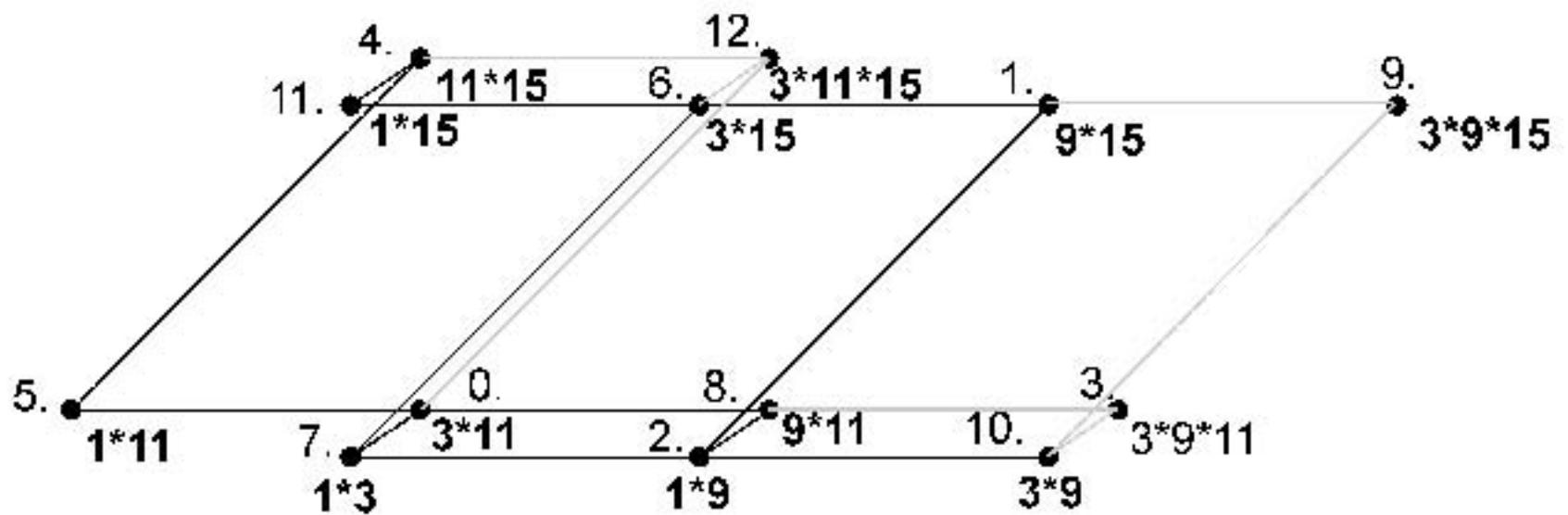
PLACED ON 2 12 TONE KEYBOARDS

1*3*11	264	C 15.64	3*5*11	330	E 1.95
1*5*7	280	C# +17.51	7*9*11	346.5	F -13.58
3*9*11	297	D 19.55	3*7*9	378	F# 37.06
1*7*11	308	D# -17.49	5*7*11	385	G -31.18
1*3*7	336	E 33.15	3*5*7	420	G# 19.46
1*5*9	360	F# -47.41 (F 52.59)	1*7	448	A 31.19
3*5*9*11	371.25	F# 5.86	3*7*11	462	A# -15.53
1*9*11	396	G 17.6	5*9*11	495	B +3.91
1*3*9	432	A -31.77 (G# 68.23)	3*5*9	270	C# -45.45 (C 54.55)
1*5*11	440	A 0	1*5*7	280	C# +17.51
1*3*5	480	B -49.36 (A# 50.64)	3*9*11	297	D 19.55
1*7*9	504	B 35.1	5*7*9	315	D# 21.42



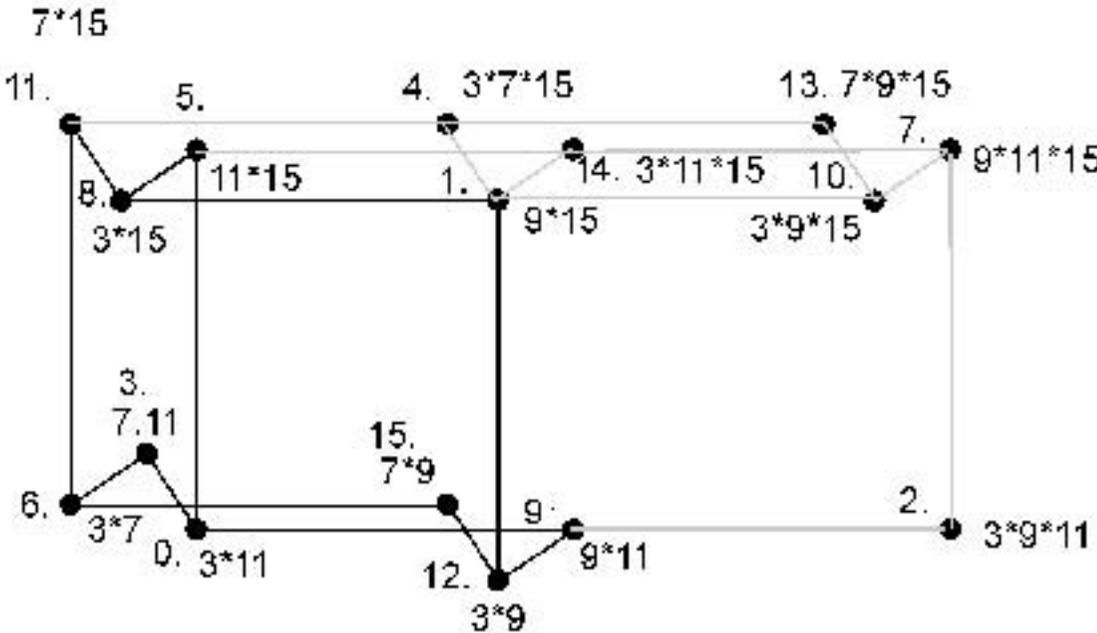
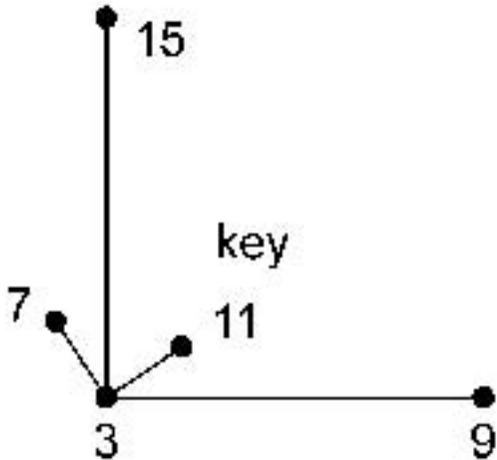
THE 1-3-9-11-15 2)5 Dekany within a 13 tone Constant Structure

K.G with T.N 23-7-010



$3 \cdot 11$ 0. $9 \cdot 15$ 1. $1 \cdot 9$ 2. 3. $3 \cdot 9 \cdot 11$ $11 \cdot 15$ 4. $1 \cdot 11$ 5. $3 \cdot 15$ 6. $1 \cdot 3$ 7. $9 \cdot 11$ 8. 9. $3 \cdot 9 \cdot 15$ $3 \cdot 9$ 10. $1 \cdot 15$ 11. 12. $3 \cdot 11 \cdot 15$ $3 \cdot 11$ 13/0.

The 3-7-9-11-15 Dekany within a 16 tone Constant Structure



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|------|------|--------|------|--------|-------|-----|---------|------|--------|-----|------|--------|---------|-----|-------|
| 3*11 | 9*15 | | 7.11 | | 11*15 | 3*7 | | 3*15 | 9*11 | | 7*15 | 3*9 | | 7*9 | 3*11 |
| 0. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. |
| | | 3*9*11 | | 3*7*15 | | | 9*11*15 | | 3*9*15 | | | 7*9*15 | 3*11*15 | | 16/0. |