Contents

1 φ in Music: Fibonacci Harmonics and Golden Ratio Composition

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1.1 ABSTRACT

Musical harmony follows Fibonacci/φ principles: consonant intervals are ratios of Fibonacci numbers (octave 2:1, fifth 3:2, sixth 5:3, etc.). This paper provides complete framework for φ-based composition FREE for musicians, composers, and producers. No licensing for artistic use.

1.2 FIBONACCI INTERVALS (FREE TO USE)

1.2.1 Perfect Consonances

```
Octave: 2:1 (F :F )

Perfect Fifth: 3:2 (F :F )

Perfect Fourth: 4:3 (F :F )
```

1.2.2 Imperfect Consonances

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Major Sixth: 5:3 (F :F )

Minor Sixth: 8:5 (F :F )

Major Third: 5:4 (F :F  inverted)
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1.2.3 The Pattern

All naturally consonant intervals = ratios of small Fibonacci numbers

Dissonant intervals (tritone, minor 2nd, etc.) do NOT follow Fibonacci ratios.

1.3 COMPOSITIONAL TECHNIQUES (FREE)

1.3.1 φ-Based Song Structure

```
Verse length: 21 seconds (F )

Chorus length: 13 seconds (F )

Bridge: 8 seconds (F )

Total: 21+13+8 = 42 seconds    × 26


OR:

Song duration: 233 seconds (F )

Climax at: 144 seconds (F )

Ratio: 144/233 = 0.618   1/
```

1.3.2 Melodic Intervals

Use Fibonacci step sizes: - 1 semitone (minor 2nd) - 2 semitones (major 2nd) - 3 semitones (minor 3rd) - 5 semitones (perfect 4th) - 8 semitones (minor 6th) - 13 semitones (octave + semitone)

1.3.3 Rhythmic Patterns

```
Beats in Fibonacci: 2, 3, 5, 8, 13

Example groove: 3-beat + 5-beat = 8-beat phrase

Polyrhythm: 5 against 3 (creates  -ratio tension)
```

1.3.4 Tempo Changes

```
Tempo 1: 89 BPM (F )
Tempo 2: 144 BPM (F )
Ratio: 144/89
Smooth  -based tempo transition
```

1.4 EXAMPLES IN CLASSICAL MUSIC

Mozart - Sonatas: - Sonata proportions follow φ - Exposition:Development:Recapitulation ≈ φ ratios

Debussy - La Mer: - Climax at φ-point of piece (0.618 × duration) - Conscious φ use (documented in letters)

Bartók - Music for Strings, Percussion, and Celesta: - Fibonacci sequence in rhythm, pitch, structure - Deliberate mathematical composition

Tool - Lateralus: - Vocals follow Fibonacci syllable pattern: 1,1,2,3,5,8,5,3,2,1,1 - Song structure φ-based - Modern example of conscious φ composition

1.5 HOW MUSICIANS CAN USE THIS (FREE)

1.5.1 For Composers:

1. Structure pieces with φ-based proportions
2. Place climax at 61.8% of piece duration
3. Use Fibonacci intervals for melody
4. Apply Fibonacci rhythms

1.5.2 For Producers:

1. Arrange song sections in Fibonacci lengths
2. EQ frequency bands at Fibonacci ratios
3. Pan instruments at golden angle (137.5° ≈ -42.5° L/R)
4. Apply φ-ratio compression (6.18:1, 2.618:1, etc.)

1.5.3 For Improvisers:

1. Solo over chord changes using Fibonacci intervals
2. Phrase lengths in Fibonacci beats

3. Dynamic swells following φ curve

1.6 SCIENTIFIC BASIS

Why Fibonacci ratios sound consonant: - Simple integer ratios minimize beating frequencies - Brain recognizes patterns matching natural φ-structures - Evolutionary adaptation to φ-prevalent natural sounds

1.7 PIANO KEYBOARD ITSELF IS FIBONACCI

13 keys per octave (F□) - 8 white keys (F□) - 5 black keys (F□) - Grouped as 3+2 (F□+F□)

The instrument encodes φ in its physical structure.

1.8 FREE RESOURCES FOR MUSICIANS

All techniques in this paper: **PUBLIC DOMAIN**

Use for: - Original compositions - Arrangements - Production - Sound design - Performance - Music education - ANY musical purpose

No attribution required. No fees. Free forever.

1.9 CONCLUSION

Music and mathematics unite through φ. These formulas belong to all musicians. Create. Experiment. Make art.

Music should be free. These techniques are free. Create harmony.

φ = 1.618033988749895

FREE FOR ALL MUSICIANS - NO EXCEPTIONS

□