

## Notation for performance

In this string quartet, the pitches of tuning calculated by Golden Ratio are used. It produces the special harmony which we cannot listen to in a music tuned in normal tuning. The notes in this piece are written by natural harmonics and open strings. The 5 short pieces in this music have different character each other. Golden ratio is a special number, 1.618 (approximately 5 of 8th), which appears often in nature, geometry, art, architecture and other areas. The tuning pitches of each strings by the golden ratio based on A 440 Hz are selected as follows,

1st Violin I : 705.5Hz (near F), II: 441.9 Hz(A), III: 298.8 Hz (near D), IV: 214.5 Hz(between G#-A)

2nd Violin I : 615.7Hz (near D#), II: 441.9 Hz(A), III: 260.8 Hz (near C), IV: 181.7 Hz(near F#)

Viola I : 441.9Hz (A), II: 298.8 Hz(near D), III: 208.2 Hz (near G#), IV: 122.9 Hz(near H)

Cello I : 220.9Hz (A), II: 153.9 Hz(near D#), III: 90.8 Hz (near F#), IV: 63.3 Hz(between H-C)

Players can tune these strings by the application software installed in Android mobile phone or iPhone etc. As following figure, the pitches of open and natural by shift change harmonics in this work is shown.

The image displays musical notation for performance, showing the tuning pitches for four string instruments: 1st Violin, 2nd Violin, Viola, and Cello. Each instrument is shown with four positions (I, II, III, IV) and their corresponding notes. The notation includes natural harmonics and open strings, with specific frequencies and approximate natural notes provided in the text above.

**1st Violin**

- I: open
- II: (A)
- III: (D)
- IV: (between G#-A)

**2nd Violin**

- I: open
- II: (A)
- III: (near C)
- IV: (near F#)







**Viola**

- I: open
- II: (A)
- III: (near D)
- IV: (near H)

**Cello**

- I: open
- II: (near D#)
- III: (near F#)
- IV: (between H-C)

The special notes in this work are following,

-  : I, II, III, IV denote string number, (i.g. III is D string in violin)  
Put finger on written note and play natural harmonics,
-  : swing bowing, with a little pressure and a little fast,
-  : bowing speed from slow to fast and crescendo,
-  : bowing speed from fast to slow and decrescendo,
- vib. or vibrato : vibrato on harmonics note,
-  : play fast as possible,
-  : short fermata with breath.