for jim, ben and lou
Three pieces for harp, guitar and percussion

I. Preamble
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for Jim Tenney

For guitar, diatonic harp, "tuner/2nd harp" (three performers), with optional three bass notes on second (concert) harp (played by tuner)

Tempo is relatively fast for the eighth note, (about 360). Except where indicated, the general dynamic level is mezzo forte, or a little louder depending on performance circumstances.

Any harp and any guitar might be used. The harp is diatonic, but a concert harp could be used without pedals. The guitar may be amplified, acoustic, or amplified acoustic, steel or nylon strings. What is important is a general matching of dynamics and timbre between the harp and guitar, though they do not need to be indistinguishable (just compatible).

The third performer's (tuner/2nd harp) main responsibility is to retune the guitar throughout the piece. This performer also plays harp, but only three low notes (C, E, and G) tuned to 1:1, 5:4, and 3:2. These are as low as possible: if a folk harp is used for the main harp part, the tuner might use the lowest notes on a concert harp for these three notes. These notes are always optional where written, and occur at the beginnings of measures as a kind of pedal/accel. If the performer is too busy retuning the guitar at any time, these notes can be omitted.

Harp Tuning
The (diatonic) harp is tuned differently in each of it's four and a half octaves. The tuning is specified as harmonics of a given harmonic series, and the three series are related as 1:5:3 (a just major triad).

For example, C₃ is the 3rd harmonic of C, a G-natural 2♯ sharp of equal-tempered G. E₁₁ is the 11th harmonic on E, which is 11/8 x 5/4 = 55/32, notated as a B♭ 62♯ flat of its tempered namesake (and actually, closer to an "A").

All pitches are referred to by their octave reduced ratios. The three harmonic series, their "note names" (used here) and their cents deviations from 12-ET are given below (only odd harmonics are given):

C (1/1)
-\[
\begin{array}{cccccccc}
1 & 3 & 5 & 7 & 9 & 11 & 13 & 15 & 17 \\
C & G & E & B♭ & D & F♯ & Ab & B & C♯/Db \\
0 & +2 & -14 & -31 & +4 & -49 & +41 & -12 & +5 \\
\end{array}
-\]

E (5/4 to C)
-\[
\begin{array}{cccccccc}
1 & 3 & 5 & 7 & 9 & 11 & 13 & 15 & 17 \\
E & B & G♯ & D & F♯ & B♭ & C & D♯ & F \\
-14 & -12 & -28 & -45 & -10 & -63 & +27 & -26 & -9 \\
\end{array}
-\]
### G (3/2 to C)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>9</th>
<th>11</th>
<th>13</th>
<th>15</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>D</td>
<td>B</td>
<td>F</td>
<td>A</td>
<td>C#</td>
<td>Eb</td>
<td>F#</td>
<td>Ab</td>
<td>G#</td>
</tr>
<tr>
<td>+2</td>
<td>+4</td>
<td>-12</td>
<td>-29</td>
<td>+6</td>
<td>-47</td>
<td>+43</td>
<td>-10</td>
<td>+7</td>
<td></td>
</tr>
</tbody>
</table>

**Guitar Tuning and General Tuning Notes**

The guitar is tuned (and retuned four times throughout the piece) to these pitches as well. The guitar (and harp) tunings are shown below.

The piece is a continual modulation through the three harmonic series, achieved by “replacing” notes from one series with those of the other. The order of the three series is: C-E-G-C. The “replacement pattern” proceeds from the highest odd harmonic of the new series (17) down to the lowest, and is specifically described below. In most cases, one pitch replaces another within a semitone of itself. Where the replaced notes have the same “name,” I have also given the cents difference between them.

#### C→E

<table>
<thead>
<tr>
<th>C:</th>
<th>13</th>
<th>17</th>
<th>1</th>
<th>7</th>
<th>11</th>
<th>9</th>
<th>3</th>
<th>15</th>
<th>5</th>
<th>(old)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E:</td>
<td>17</td>
<td>15</td>
<td>13</td>
<td>11</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>(new)</td>
</tr>
</tbody>
</table>

(27) (32) (39) (49) (+) (+)

#### E→G

<table>
<thead>
<tr>
<th>E:</th>
<th>5</th>
<th>9</th>
<th>15</th>
<th>13*</th>
<th>11**</th>
<th>17</th>
<th>3</th>
<th>7</th>
<th>1</th>
<th>(old)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G:</td>
<td>17</td>
<td>15</td>
<td>13</td>
<td>11*</td>
<td>9**</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>(new)</td>
</tr>
</tbody>
</table>

(+35) (+) (+69) (+26) (+37) (+20) (+) (+59)

* E₁₃ is notated as a C-natural (+27), G₁₁ as a C# (-47). The G₁₁ is 26¢ higher than the E₁₃.

** E₁₁ is notated as a Bb (-63), G₉ as an A-natural (+6). The G₉ is 57¢ lower than the E₁₁.

#### G→C

<table>
<thead>
<tr>
<th>G:</th>
<th>11</th>
<th>5</th>
<th>17</th>
<th>15</th>
<th>3</th>
<th>9***</th>
<th>13****</th>
<th>1</th>
<th>7</th>
<th>(old)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:</td>
<td>17</td>
<td>15</td>
<td>13</td>
<td>11</td>
<td>9</td>
<td>7***</td>
<td>5****</td>
<td>3</td>
<td>1</td>
<td>(new)</td>
</tr>
</tbody>
</table>

(+52) (+) (+34) (+39) (+) (+63) (+43) (+)

*** G₉ is notated as an A (+6), C₇ as a Bb (-31). The C₇ is 63¢ higher than the G₉.

**** G₁₃ is notated as an Eb (+43), C₅ as an E (-14). The C₅ is 43¢ higher than the G₁₃.

Most measures in the score are marked by the specific replacement occurring. For example, (G₁₇, E₅) indicates that the 17th harmonic of G (Ab) replaces the 5th of E (G#), a tuning difference of 35¢ (G₁₇ higher than E₅).

The retuning of the guitar by the third performer is gradual and continual, starting in Section II and even continuing into Section V (to gradually get the guitar completely in tune). The tuning instructions in each measure indicate where the retuning of a specific string should start, but it will certainly take several measures to completely retune the string.

_for Jim, Ben and Lou_
and the tuner will be tuning (slightly) several strings at once. It may not really be possible to completely tune the guitar until the complete harmonic series has been achieved. The several measure passages before sections III and V may be repeated until the guitar is tuned to the new harmonic series.

It is important that this performer know by ear the four different tunings of the guitar used, and the differences between them (of which the above is a theoretical, not a sonic, explanation). The current tuning is notated frequently throughout the piece, with numbers referring to the harmonic number of the new or entering series. No tuning is done in Section I.
I

Preamble

Tuning

Harp

Section I
C 5 7 17 3 1 5
E 11 7 15 3 1 5
G 13 17 3 1 5 7 1

Section II
C 5 7 17 3 1 5
G 13 17 3 1 5 7 1
I

Preamble

12th fret harmonics

(The C harmonic series tuning stays until II)

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*Gt: 1st X only, then tune to G#*

(tune I (E) → F (E₈))

(tune III (G) → G# (E₉))

1st X only

(tune II → C₃ (E₉))

(tune V → B♭ (E₁₁))

*In section II-IV, low notes on 2nd harp are optional; tuning is more important.*
null
(tune I → F (G₃))

(keep adjusting IV, I)

(keep adjusting IV)

(tune III → G (G₃))
Note: These three measures, until V, may be repeated to taste.

*In Section V, “leaving” pitches are accented slightly.