FPGA Musical Interval Trainer Design Overview:

- **Sense and set circuits for each MOD counter**
  - Used to reset MOD counters used in frequency division and musical scales
- **Clock choice circuit**
  - Sets internal or manual single-step clocking mode
- **Clock signals inputs**
- **MOD 5 counter**
  - Slow 50MHz signal to 10MHz
- **MOD 10 counter**
  - Displays number of iterations through a scale on separate 7-segment displays
- **MOD 7 counters**
  - Hold values of Major/Minor Scales
- **MOD 13 counter**
  - Represents the musical Chromatic Scale
- **Latches**
  - Holds value and act as memory device to store user's past inputs (answers)
- **One frequency divider**
  - Slows internal counter down to 1 HZ
- **One adder**
  - Adds the number or "correct answers" given by user
- **Ripple counter**
  - Used in frequency divider circuit to slow down internal counter to usable rate
- **4 Hex-to-7-segment displays**
  - Display number of iterations through each scale and the number of "wrong answers" given
- **12 LEDs**
  - Displays which note is currently being tested for in the "scale" (mod counter)
- **4 output decoder circuit**
  - Selects which MOD counter is to be clocked

- **Comparator circuit**
  - Compares the user input with the next value in the MOD 7 counter (representing musical notes of a scale)
- **Switches**
  - Allow user to select which scale and clock source is to be used
- **Push buttons**
  - Used to advance the manual clock to the next clock cycle.
- **Active low & active high sub circuits**
  - Active HIGH circuit chooses internal clocking mode
  - Active LOW circuit chooses manual clocking mode