

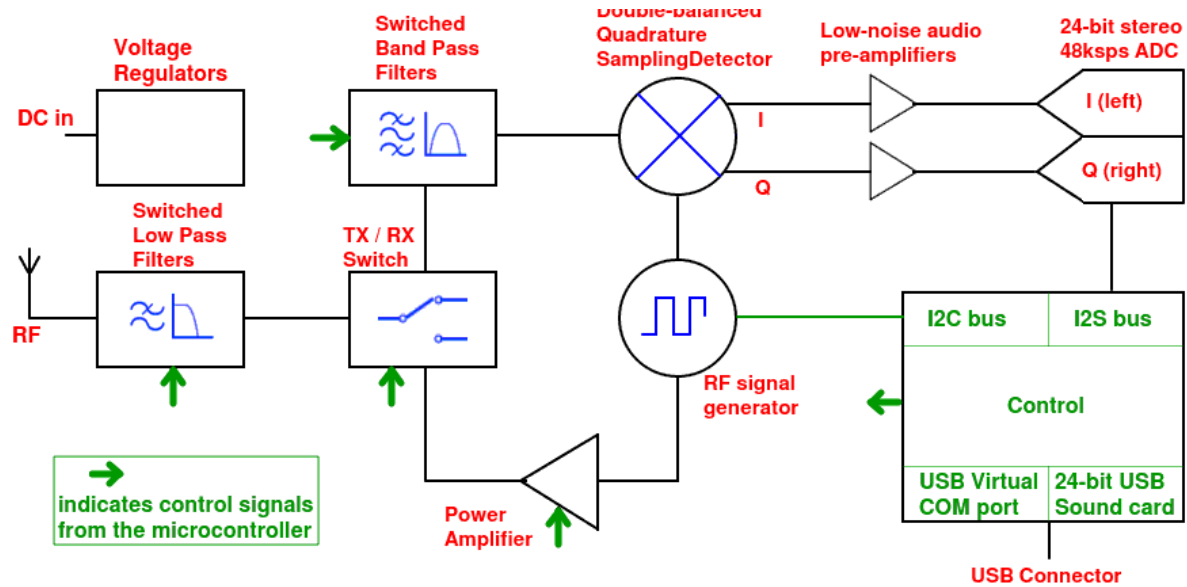
# • OUTLINE

- What is the QDX? Why is it interesting?
- What is different about QDX?
- Generation of FT8 signal
- “Normal” generation of SSB signal
- Key insight of digital radio signals
- QDX transmitter section
- QDX receive section
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# What is QDX?

- What is the QDX?
  - 5 W digital transceiver
    - 4 bands – 80,40,30,20 or
    - Handles many, but not all digital modes
  - Small size
  - Innovative architecture
    - Both receive and transmit
  - No IQ processing in PC, all done on QDX

# QDX block diagram



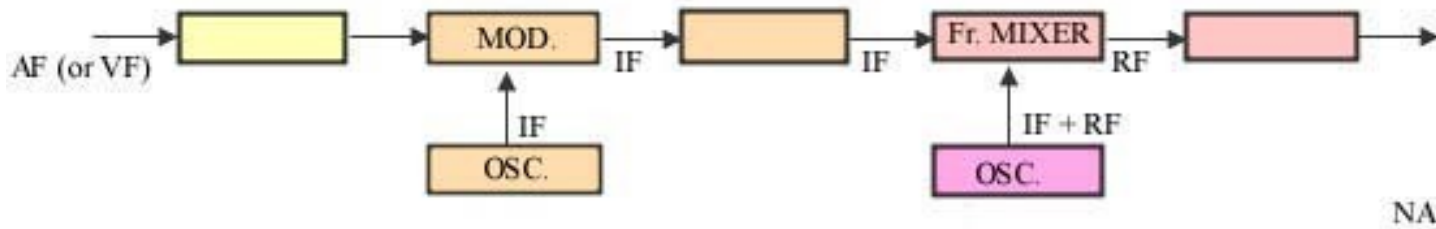
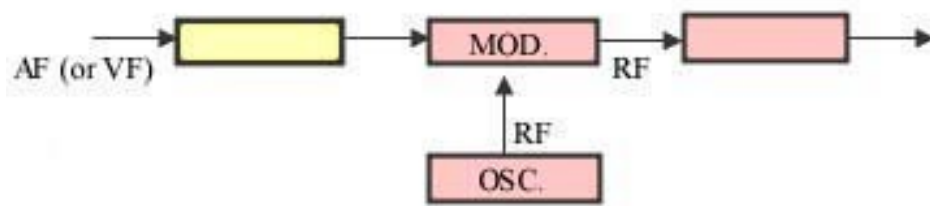
# FT8 signal

- [Call1] [Call2] [Grid square/signal report]
- Call sign 28 bits
- Grid/Signal report 15 bits
- Add FEC code bits (LDPC (174,91) code) + sync bits
  - Alltogether 174 bits to be send/decoded
- Send each 3 bit portion as one of 8 audio tones
  - Approximately 12.6 seconds transmit, 2.4 seconds decode

## Key insight

- At any given time, only one frequency is being transmitted

# “Normal Superhet” transmitter

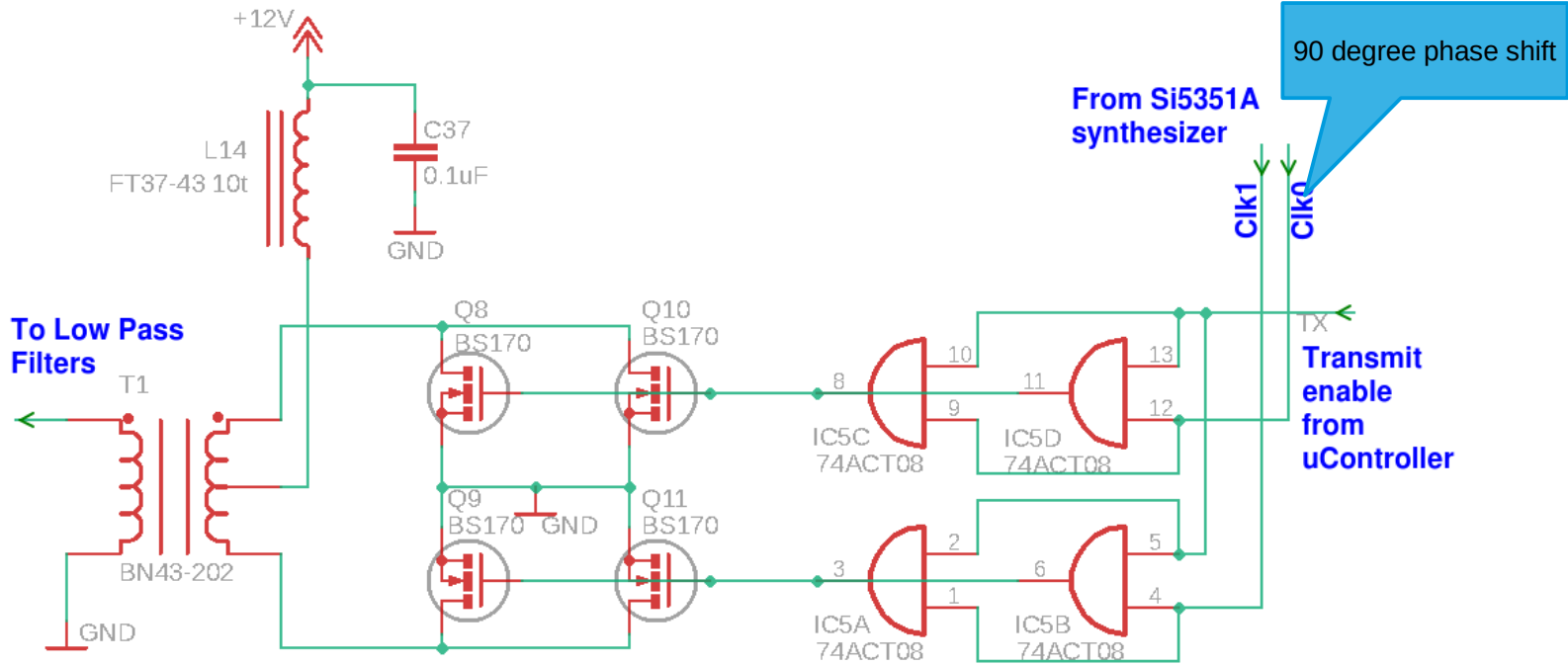


# QDX innovation

- Since only one frequency needs to be transmitted at any time, don't need complex "normal" ssb transmitter.
- 'Simple oscillator, amplifier is enough
  - Provided the oscillator can be shifted by a few Hz as each new frequency is needed.
- No suppressed carrier, No suppressed sideband
  - Only the one frequency to be transmitted
- Si5351 can be programmed to sub-Hz resolution at ham HF frequencies.
  - Frequency = Dial setting + "FT8 base" + 1 or 8 tone freq

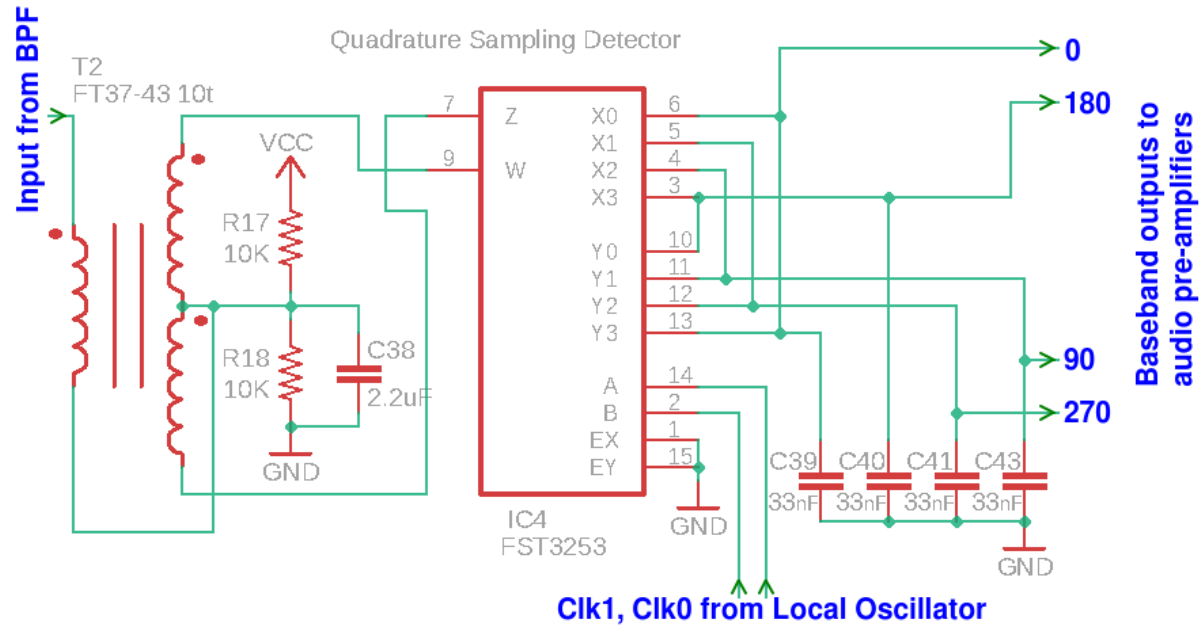
# QDX transmit chain

- Class D final

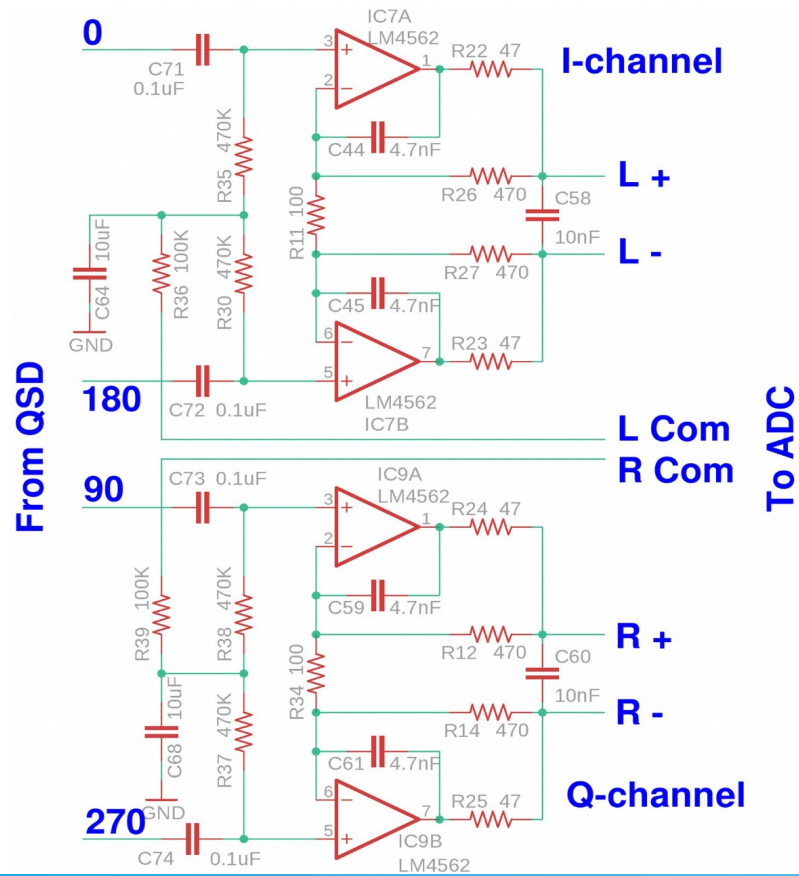




# QDX Receive chain - 1



# QDX receive chain 2



# QDX controller

- STM32F401 microcontroller
  - Built in USB, audio
  - Handles communication with computer
  - Converts received audio from ADC to USB-sound format and sends to computer
  - Computes frequency of Si5351 for transmit from audio signal input
    - Zero crossing determines audio frequency
      - Frequency from computer = FT8Base + current encoded frequency
  - Selects bandpass filter

# Conclusion

- QDX represents new way to generate digital signals
- Simpler architecture than conventional SSB generation
- Ideal rig for portable operation – small, low power needs
- Thanks for listening