NORTHERN CALIFORNIA CONTEST CLUB

Demystifying the K3 Filters

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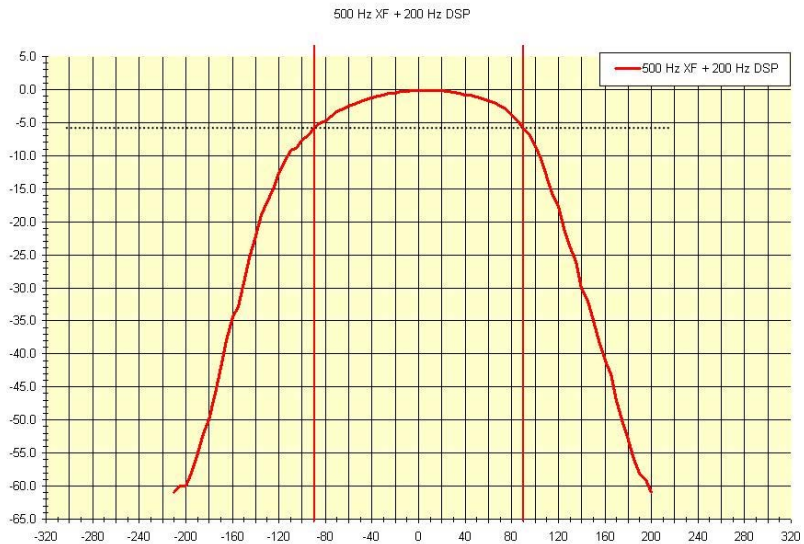
K3 Filters

- Front-end bandpass filters
  - Ham bands standard
  - general coverage optional
- IF filters
  - 8.215 MHz crystal filters
  - 15 KHz & Audio DSP filters
  - special DSP filters
    - Dual Passband CW filter
    - Dual-Tone RTTY filter

Crystal vs. DSP Filters



- Crystal filters have broader skirts and some asymmetry

- DSP filters have steeper, deeper skirts

K3 Filter Bandwidths

Crystal Filters

- 5-pole discreet crystal filters by Elecraft:
  - 200, 500, 2700
- 8-pole crystal filters by INRAD:
  - 250, 400, 500, 1500, 1800, 2100, 2800, 6000, 13000
- (future) variable 5-pole crystal filters by Elecraft

DSP Filters (steps)

- 50 Hz from 50-1000 Hz
- 100 Hz from 1000-3000 Hz
- 200 Hz from 3000 Hz up

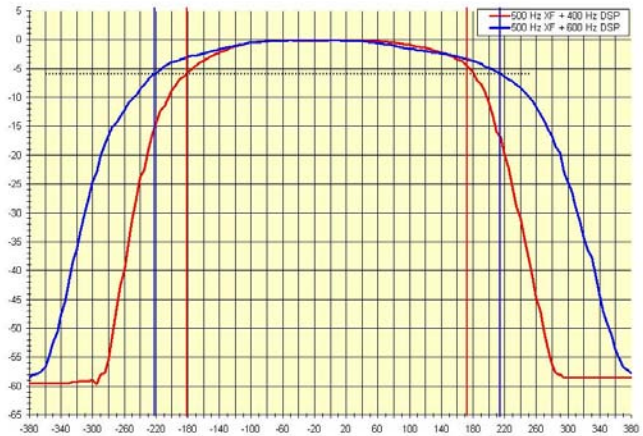
Which Filters Should I Get?

- None! The K3 comes with a 2.7 kHz crystal filter and the DSP IF and audio filters are continuously variable down to 50 Hz.
- For operating on a crowded band, e.g., a contest, having a crystal filter near your favorite bandwidth is a tremendous benefit.
- Determine your favorite bandwidths using the K3 DSP filtering, then purchase optional crystal filters to eliminate artifacts of nearby strong signals.

Basic IF Filtering

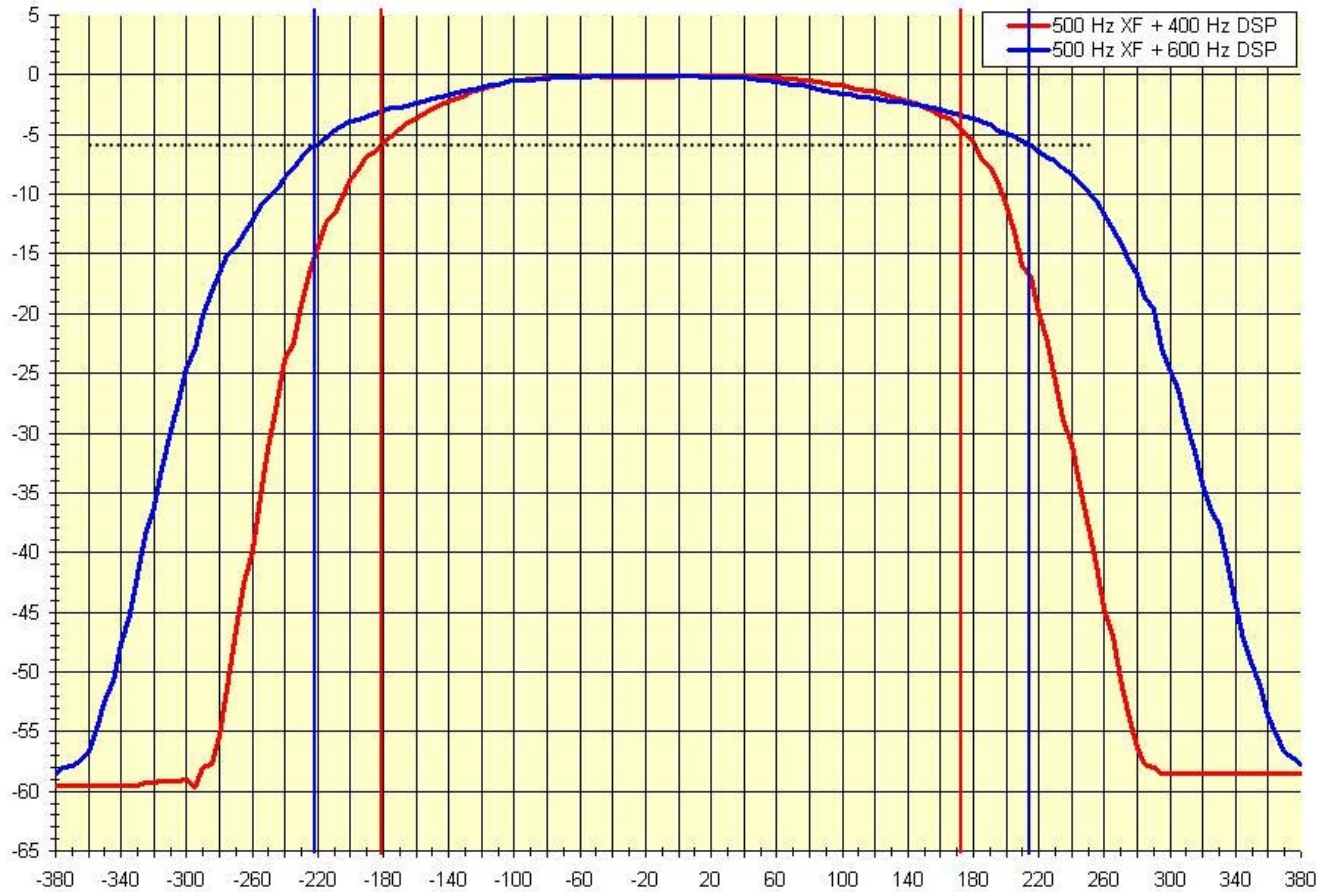
- Bandwidth set by DSP
  - WIDTH & SHIFT (bandwidth and center frequency), or
  - HI CUT & LO CUT (high and low band edges)
- Crystal “roofing” filter has a wider bandwidth to protect the DSP from nearby strong signals
  - Full range of bandwidths: 13 kHz down to 200 Hz
  - Five slots per receiver.
  - FT-1000D, TS950SDX, Icom 756 have 15 kHz roofing filters
    - INRAD after-market 4-5 kHz roofing filter mod
    - First 30 dB critical in typical roofing filter design

Basic vs. Reversed IF Filtering



- Basic (red): 500 Hz crystal filter and 400 Hz DSP filter
- Reversed (blue): 500 Hz crystal filter and 600 Hz DSP filter
  - \+ Different “sound”
  - \+ Bandpass less abrupt
  - – Non-uniform DSP bandwidth control

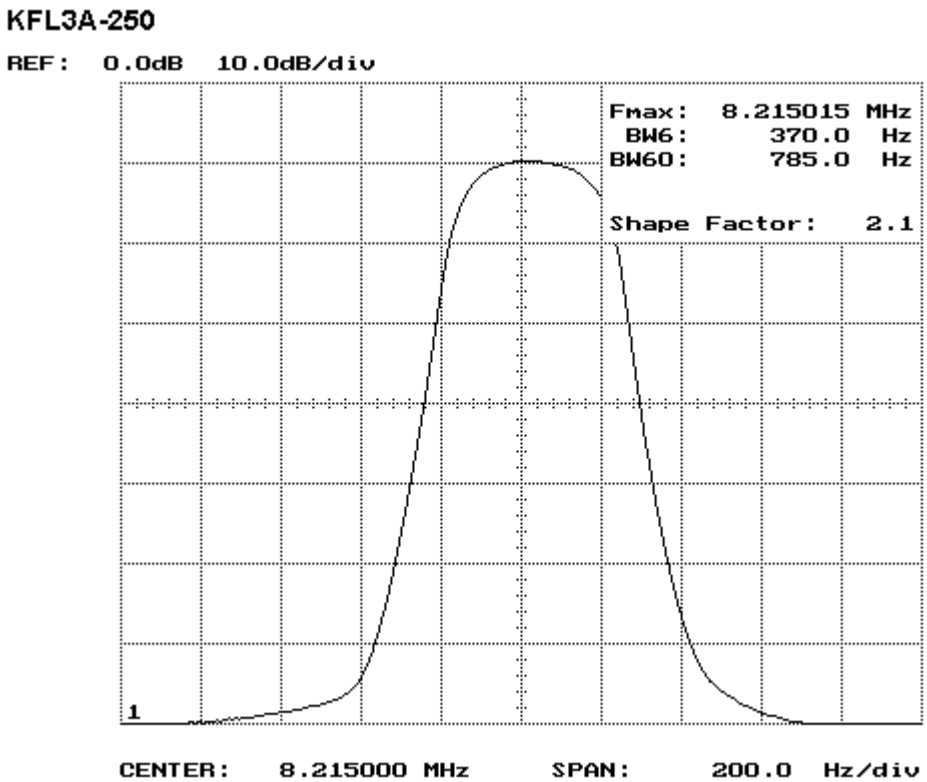
Basic vs. Reversed IF Filtering



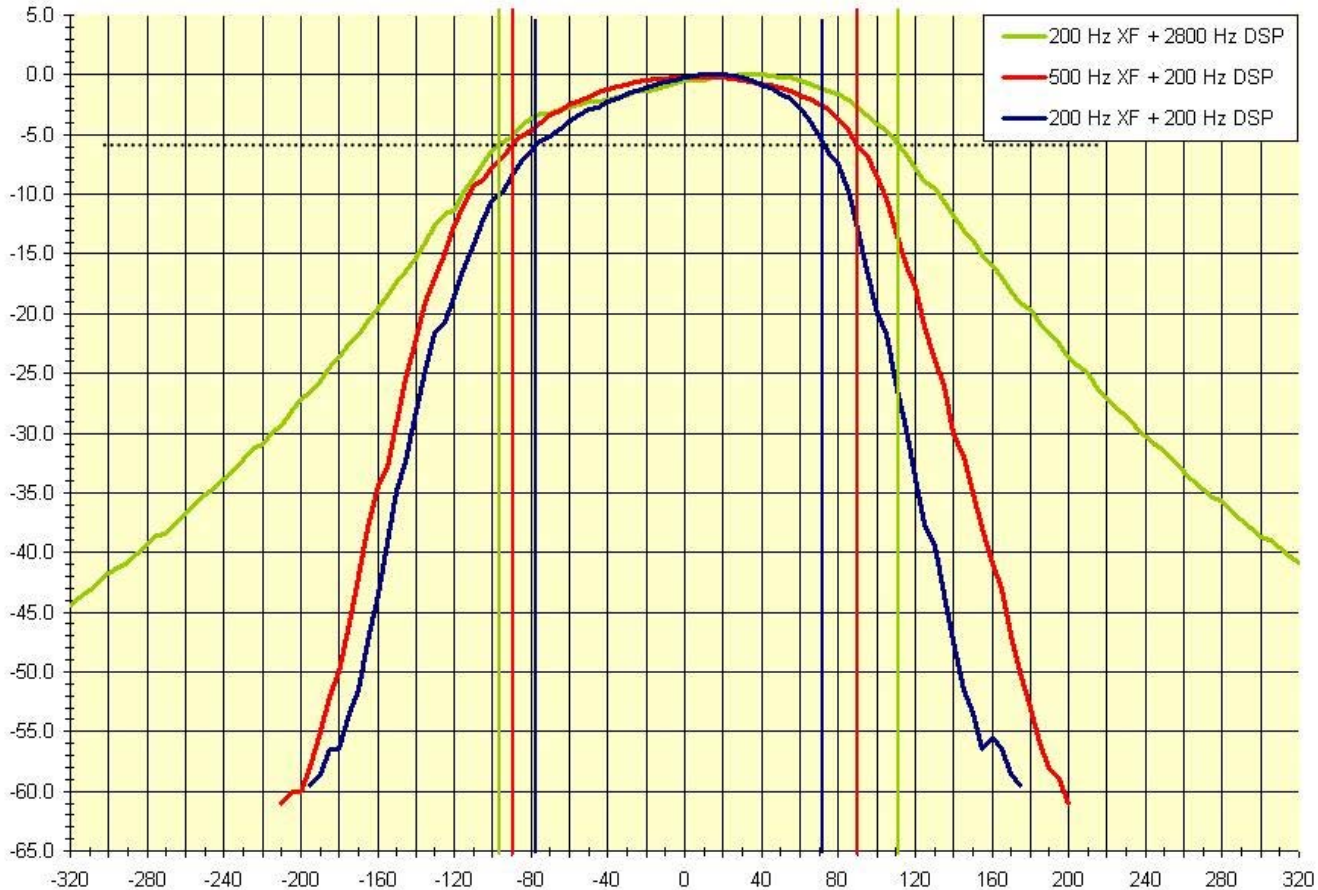
Caveats

- Filter marketing names vs. actual bandwidth:
  - 200 is 205
  - 250 is 370
  - 400 is 435
  - 500 is 525
  - 1000 is 1100
  - 1800 is 1900
  - etc.
- Cascade effect when crystal and DSP filters are near same bandwidth
- 2700 or 2800 crystal filter must be used for transmit in CW, RTTY and SSB modes

250 Hz 8-pole Crystal Filter

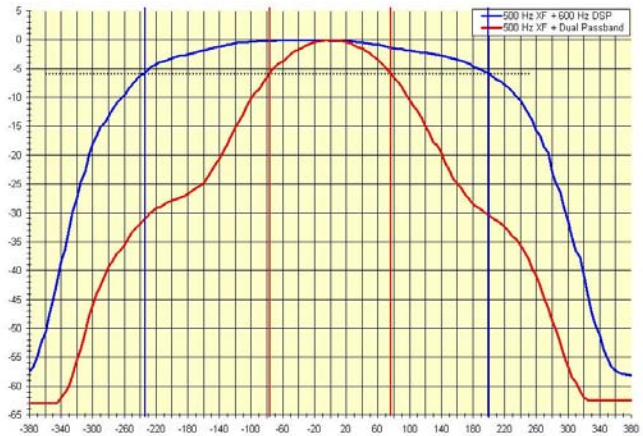


Cascade Effect



Special DSP Filters

- Dual Passband for CW
  - Narrow filter within a wider “context” filter



- Dual-Tone Filter for RTTY (DTF)
  - Cascaded with crystal and DSP filters
  - Two 50 Hz filters 170 Hz apart

CW Recommendation

- Contesting, DXpedition pileups, etc:
  - 400-500 Hz
    - 500 Hz 5-pole or 400 Hz 8-pole crystal filter
    - 350-600 Hz DSP (Standard or “reverse” relationship)
  - 100-200 Hz for extreme conditions, e.g., 160m contest
    - 200 Hz 5-pole crystal filter
    - 100-300 Hz DSP (Standard or “reverse” relationship)
- Casual operating
  - 700-1000 Hz
    - 1000 Hz or wider crystal filter
    - 700-1200 Hz DSP (Standard or “reverse” relationship)

RTTY Recommendation

- Contesting, DXpedition pileups, etc:
  - 300 Hz
    - 500 Hz 5-pole, 250/400 Hz 8-pole crystal filter (actually 370/435 Hz)
    - 300 Hz DSP
  - 200-250 Hz for extreme conditions
    - 250 Hz 8-pole crystal filter (actually 370 Hz)
    - 200-250 Hz DSP
      - Optionally DTF (220 Hz) with 300 Hz regular DSP
  - *[260 Hz 5-pole crystal filter (modified 200 Hz 5-pole) with 300-400 Hz DSP]*
- Casual operating (easier to tune?)
  - 500-1000 Hz
    - 500 Hz or wider crystal filter
    - 500-1200 Hz DSP (Standard or “reverse” relationship)

SSB Recommendation

- Contesting, DXpedition pileups, etc:
  - 1800 Hz
    - 1800 Hz 8-pole crystal filter (actually 1900 Hz)
    - 200 Hz LO CUT - 2000 Hz HI CUT
  - 1500 Hz for extreme conditions
    - 1500 or 1800 Hz 8-pole crystal filter (actually 1650 and 1900 Hz)
    - 300 Hz LO CUT - 1800 Hz HI CUT
- Casual operating
  - 2500-2800 Hz
    - 2700 or 2800 Hz crystal filter
    - 2500-3000 Hz DSP (Standard or “reverse” relationship)

Summary

- Cascaded crystal and DSP filters
  - Be aware of actual crystal filter bandwidth
  - Be aware of cascaded bandwidth
- “Tight” crystal filter for maximum strong signal protection
- Can’t remove dirty transmission (phase noise, clicks, etc) within passband