Feed & Front End PDR

Hot Off the Press

Q, Ka, K-Band Cost Savings

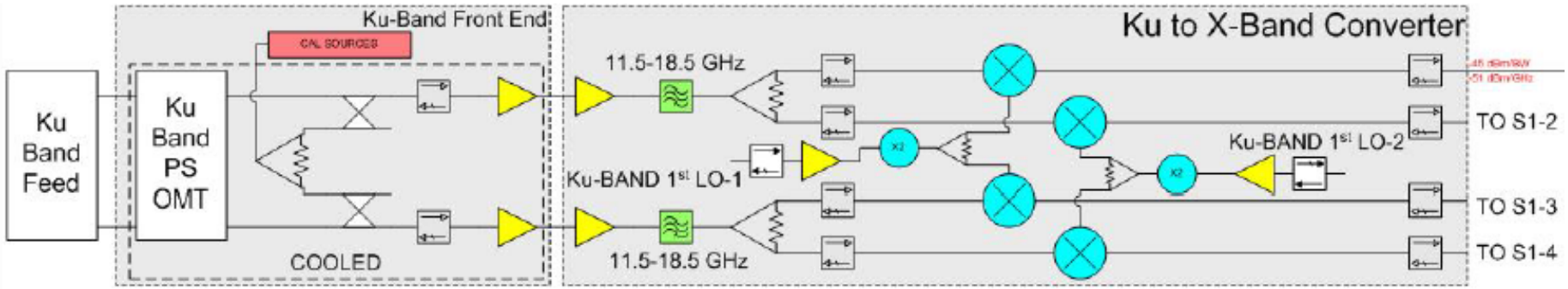
A Cheaper QAK Down-Conversion Scheme

- Potential way to save $1.2M on Q, Ka & K Rx's
  - Requirement for 2 totally independent IF pairs adds
    - ~$20K per Rx at Q-Band
    - ~$10K per Rx at Ka-Band
    - ~$10K per Rx at K-Band
- Spacek Mixers in Q's & Miteq Mixers in K's
    - both have wideband IF's good up to 18 GHz
    - Presumably a Spacek Ka-Band Mixer will also
- Allows us to "block" convert entire Q (10 GHz) and K (8 GHz) RF band down to 8-18 GHz

The "Block" Conversion Scheme

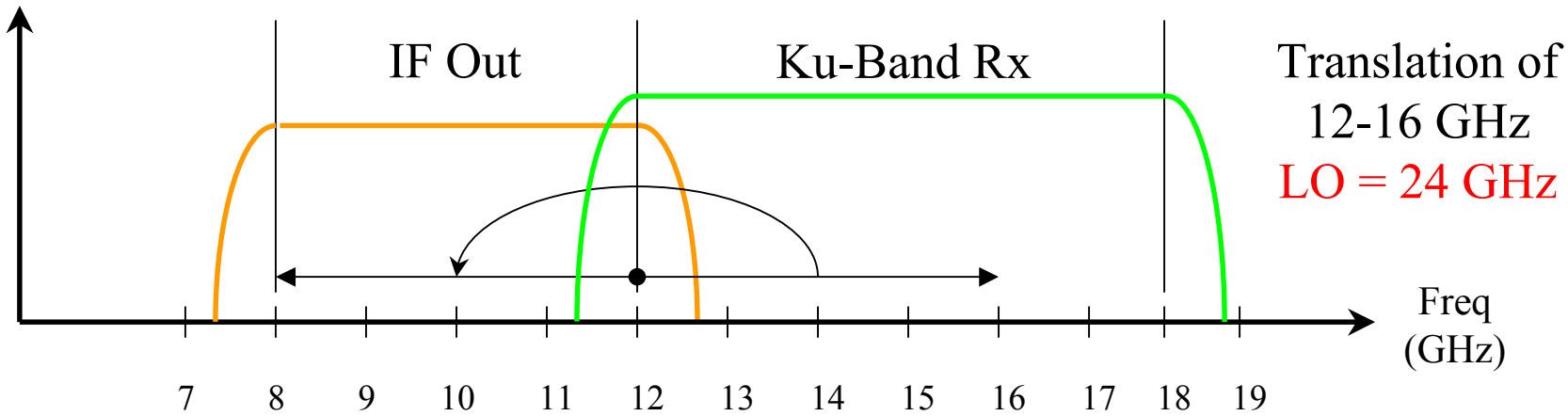
- Problem now becomes how to down-convert two 4 GHz chunks in the IF (per polarization)
- Turns out we have Ku-Band Down Converter
- So from the 8-18 GHz IF, we can
  - Feed 8-12 into Down-Converter Module
  - Feed 12-18 GHz into Ku-Band Converter
- And get 2 x 4 GHz per polarization
- Will work for Ka-Band too but less flexible

The Ku-Band Down-Converter



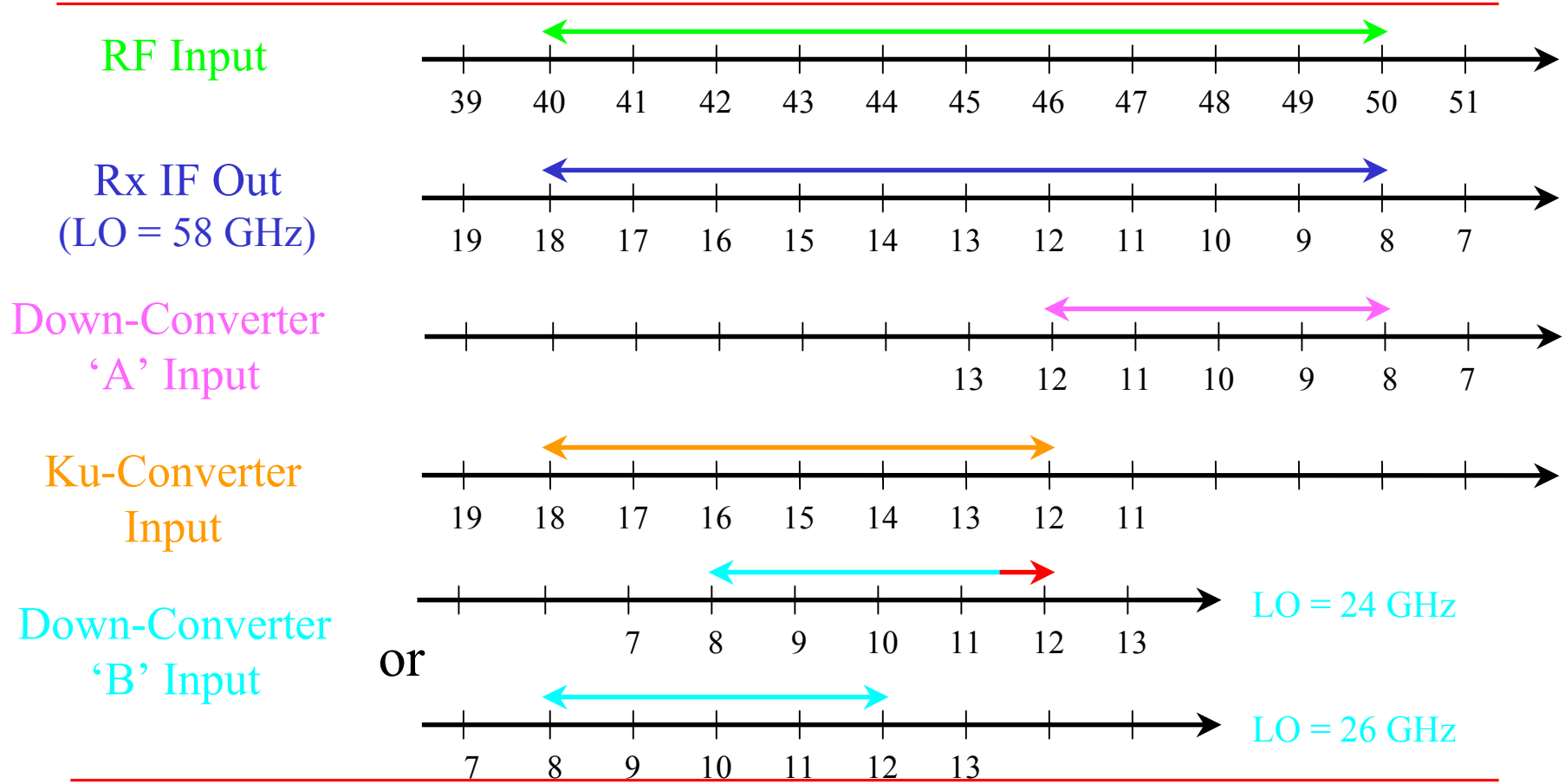
- 8-12 GHz goes directly to a Down-Converter Module
- Add switch to selecting Q/Ka/K/Ku 12-18 GHz IF's
- For Q, Ka & K, need 1st LO-1 for Rx's
  - So can only handle one 4 GHz chunk
  - Normal Ku-Band conversion uses both 1st LO's
- Main X-Band IF Switch Module now selects
  - Q/A/K/U or X or L/C/S or Spares

Ku Down-Conversion RF/IF Isolation

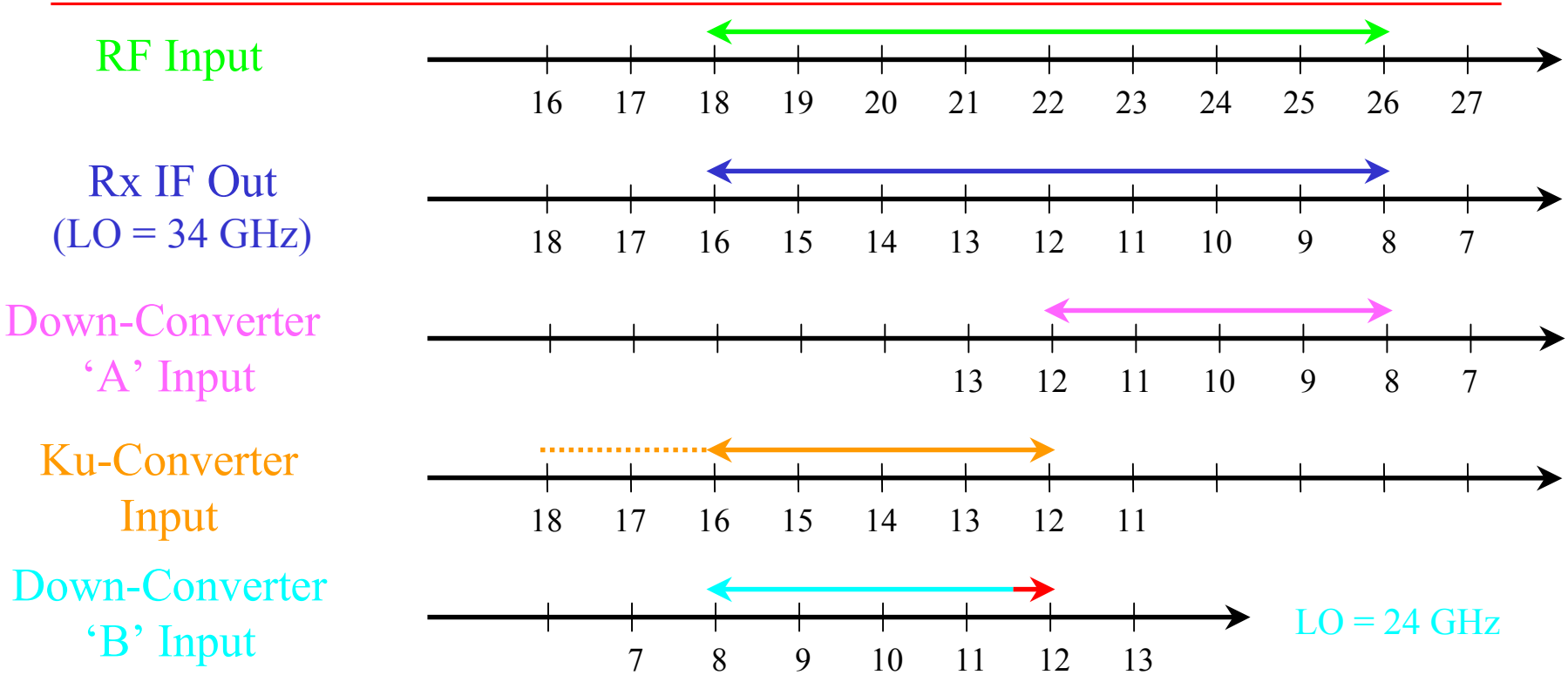


- Can't do the 2 x 3 GHz trick used for Ku Band Rx
- Get 20 dB isolation thru mixer
- Get ?? dB from different sideband fringe rates
- Or have correlator throw away about 500 MHz

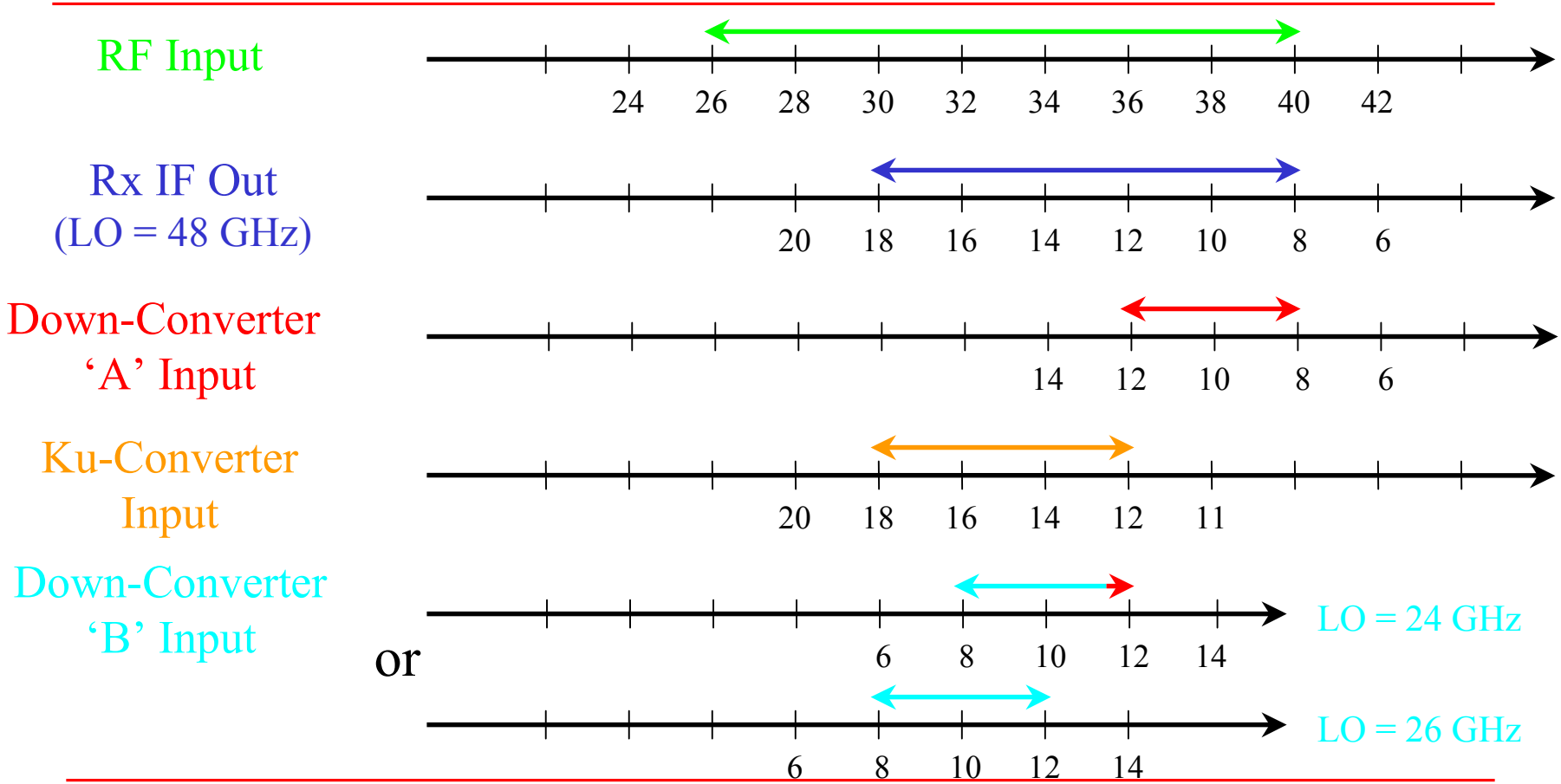
Q-Band with Single Wideband IF



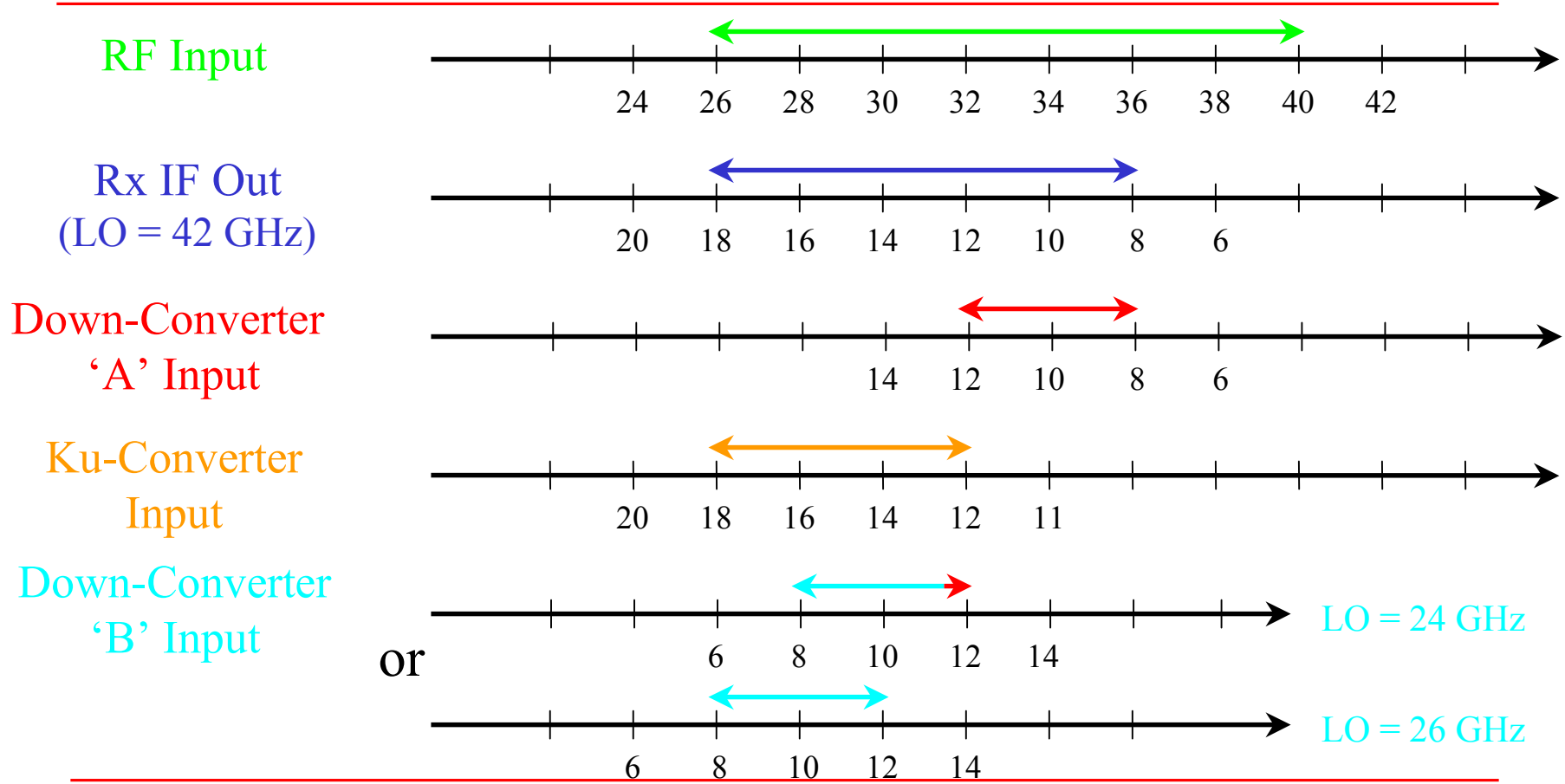
K-Band with Single Wideband IF



Ka-Band Wideband IF High-End Coverage



Ka-Band Wideband IF Low-End Coverage



Potential Problems

- RF/IF Isolation in Ku-Band Down-Converter
- Covers entire RF bands at Q & K but not as flexible at Ka Band as independent mixer pairs
- Mixer Conversion Loss likely worse at 18 GHz
- Now running 8-18 GHz IF's thru long cables
- Will likely encounter more LO signals leaking into 8-18 GHz IF band
- Single LO chain has no "hot" spare backup

But…

- Could save $900K for Q & K-Band
- Another $300K at Ka-Band if reduced flexibility doesn't adversely affect science
- What needs to be done
  - Check true performance of Q & K mixers
  - Analyze effect of fringe washing in overlap band
  - New Block Diagram to check for incompatibilities
  - Determine unobtainable astronomical lines at Ka-Band