Deadtime, Trigger Bandwidth and Efficiency

- What is an acceptable amount of deadtime?
  - 0 % at any L1Accept rate
  - Operationally this is defined as < 5%
  - Currently this limits us to 20 kHz L1A rate

- How to take more B triggers while minimizing deadtime?
  - Increase L1A rate into L2. Requires:
    - Speeding up SVX readout
    - Speeding up SVT processing
    - Speeding up L2 processing
  - Increase SVT efficiency
  - Increase L1A rate AND SVT efficiency!
  - Increase SVT efficiency at the expense of the L1A rate
  - “Load Leveling” ?
  - Most of the above
Current trigger rates and deadtimes

Run 161678 – Trigger and DAQ remarkably well behaved

3% deadtime @ 17 kHz

Deadtime vs. L1Accept rate
Comparison of data to simulation
Trigger rates v. deadtime – ModSim Predictions

Graphical Representation of results shown at last meeting

Percent deadtime vs. L1A rate

The result of doing nothing

The result of doing everything
What is “everything”? 

1. Move to 2 SRCs – this is happening now
2. L2 improvements
   1. Shorten DMA configuration by 2 µsec
   2. Shorten L2 mean processing time by 3 µsec
   3. Shorten L2 processing tail by 7 µsec
3. Change from 8 to 7 bit digitization for SVXII (9 µsec ⇒ 6.5 µsec)
4. Shorten SVT mean processing time by 3 µsec
5. Truncate the long SVT processing tail

Many of these improvements are speculative!
Trigger rates and deadtimes - ModSim

Graphical Representation of results shown at last meeting

The result of doing nothing

Improvement 1

Note: All improvements are cumulative
Summary

- System works well but runs slower than planned
- If we want to run faster (20 kHz ⇒ 30 kHz) then we need to make improvements everywhere. **There is no one fix.**
- Not all suggested improvements may be possible
- There may be some we have not yet thought of
- This work will require beam tests and downtime
- Suggest capping the L1Accept rate at 20 kHz until the improvements start rolling in
- Exception: End of store studies at higher rates for Silicon studies and comparisons to ModSim deadtime model