

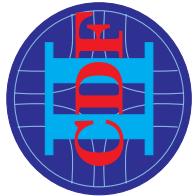


ModSim Studies for CDF II

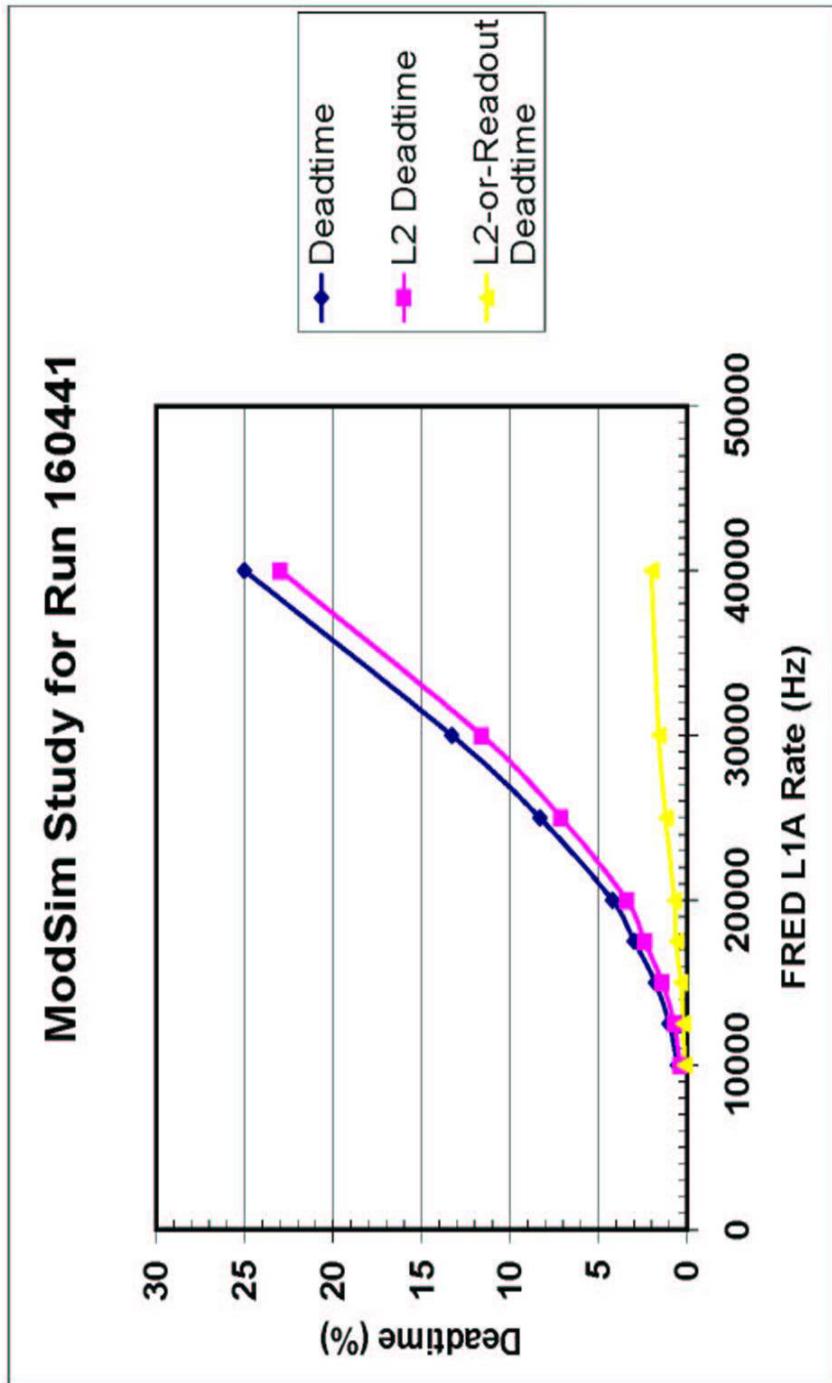
(Studies by H. Kasha and M. Schmidt, Yale)

□ Outline

- Validation of Simulation
 - Use natural sweep of L1A input rate as luminosity falls
 - Run 160441 used for comparison
- Projections for improvements with L2 Processors
 - Based on input from Stephen Miller & co.
- Projections for improvements when using 2 SRC's
 - With and without a switch from 8 to 7 bit digitization for SVXII
 - Based on input from Gino Bolla & Steve Nahn
- What if projections for improvements with SVT
 - Wild guesses (?)



Validation of ModSim for CDF II



25 April 2003

ModSim Studies for CDFII



Simulation Validation

- 'Validation' of simulation (ModSim part)
 - Use Run 160441 for comparison
 - Have ModSim draw from 'online' distributions for 160441
 - SVT time (L1A to EOE at L2 Decision crate) (per W. Ashmanskas)
 - L2 DMA configuration time (per S. Miller)
 - L2 processing time (ditto)
 - L2-TS handshake and building TL2D (ditto)
 - Silicon readout (L00 plus ISL tails) (per D. Stuart)
 - Also take as 'input', mean values for run 160441
 - L2A rate (\sim 140 Hz)
 - Non-silicon readout latency (\sim 660 microsec)
 - Other nominal inputs (silicon digitization, etc.)
 - Simulation assumes some level of correlation in tails



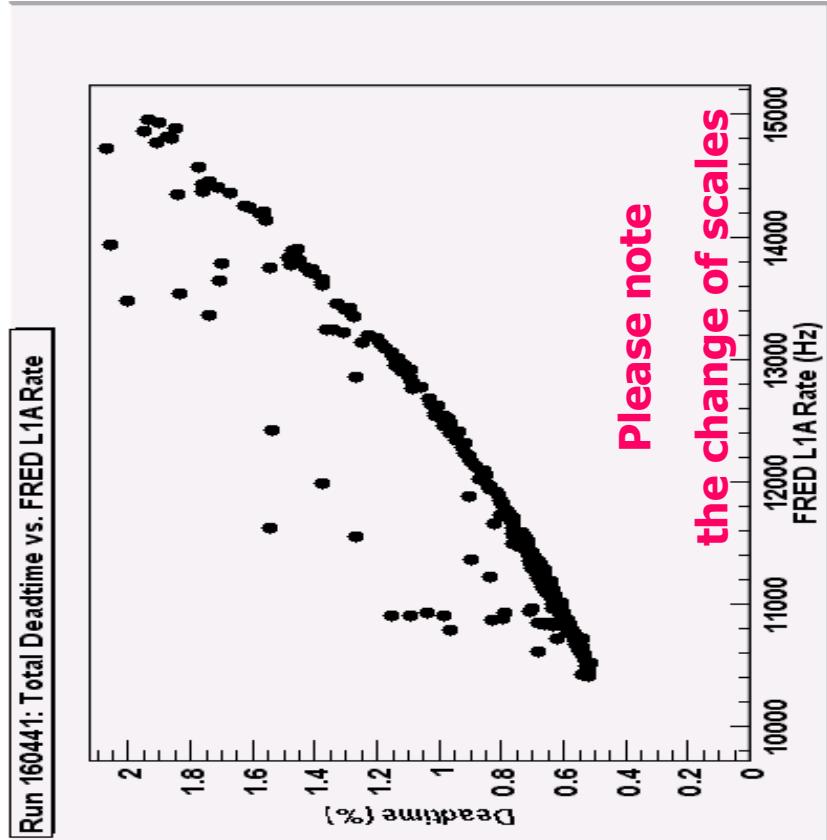
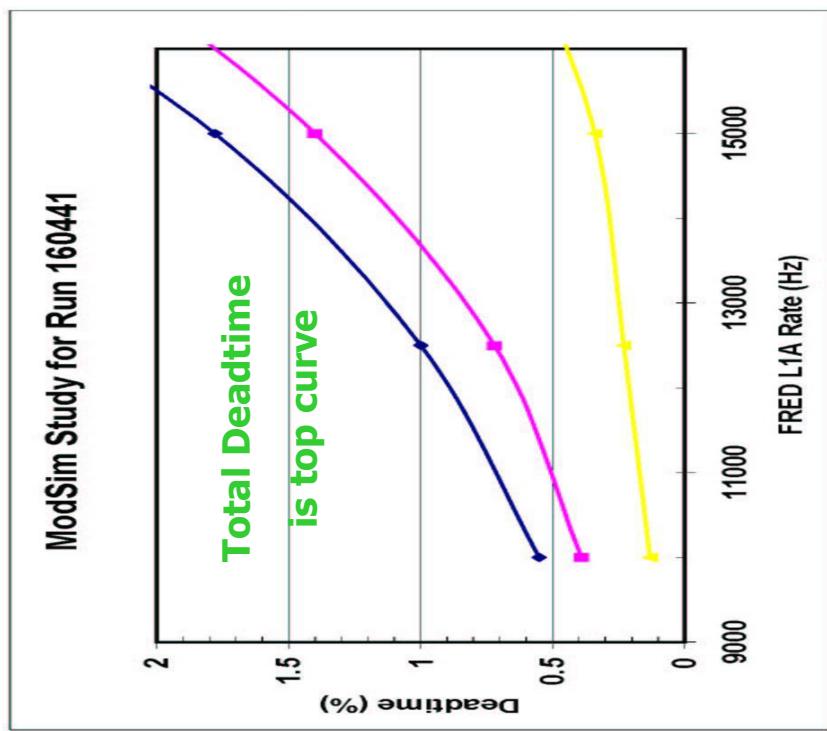
Simulation Validation

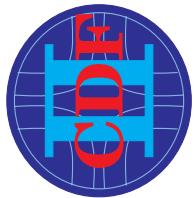
'Validation' of simulation (Data Part)

- Compare to data using TS scalers (*SL1D* bank)
- Compute 'instantaneous' values for relevant quantities
 - Use scaler differences between sorted stream A events
 - I did it offline, which is painfully slow, but quite detailed
 - Carla's DataAccess job + Zhenyu Han's root script
 - P. Wittich found it is easier to query the Run Summary data
 - B. Badgett's choice of 120 second interval is quite adequate
- One can look at MANY quantities and correlations
 - For today, most interesting ones are:
 - Total deadtime (no free L2 buffers, so no place for new L1A.
N.B. Inhibits and VRB holdups are removed from the accounting)
 - L2 deadtime (when ALL 4 L2 buffers are waiting for L2)
 - L2-or-Readout deadtime (when we can't decide whom to blame)
 - Everything else is just too small to bother showing today

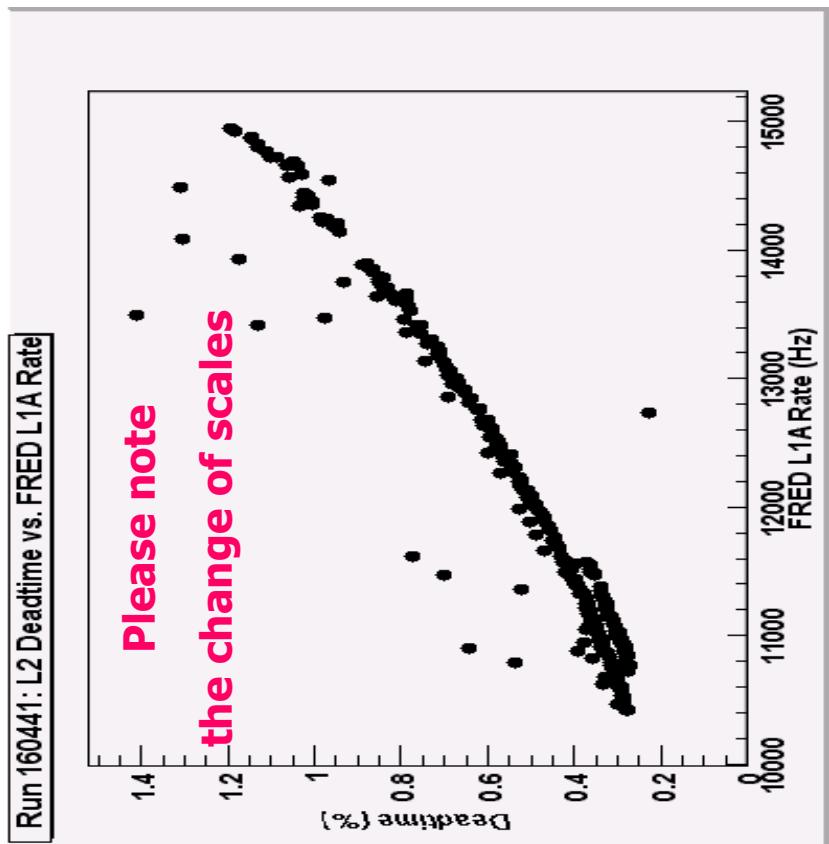
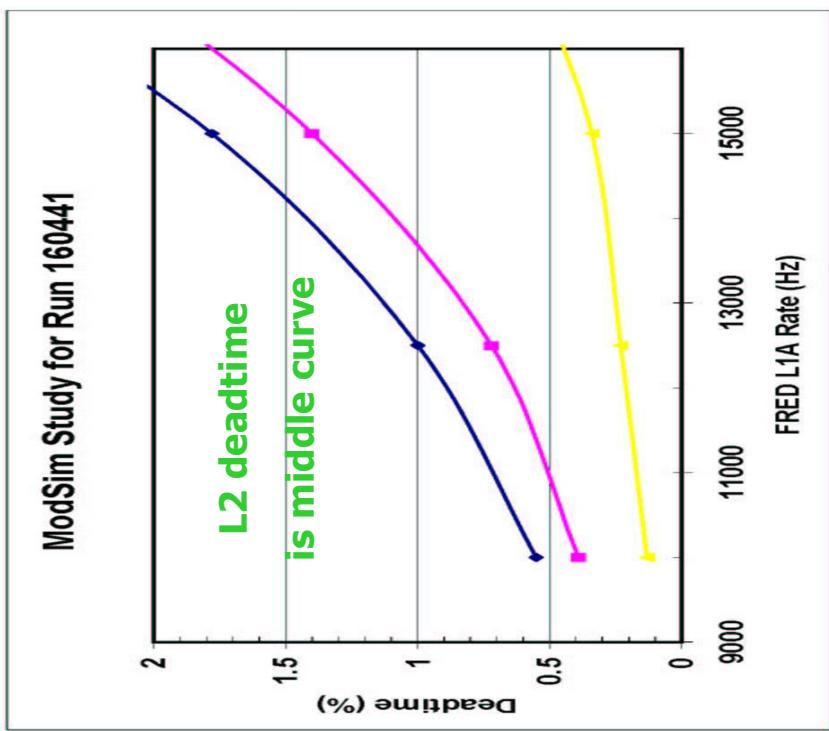


Total Deadtime (Sim vs. Data)



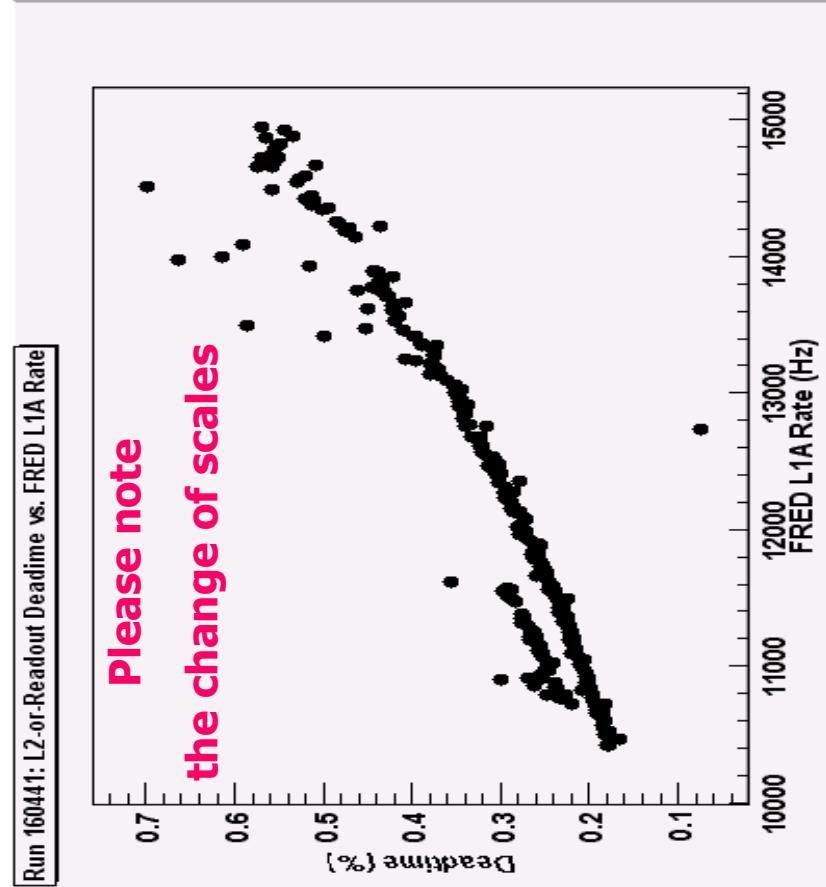
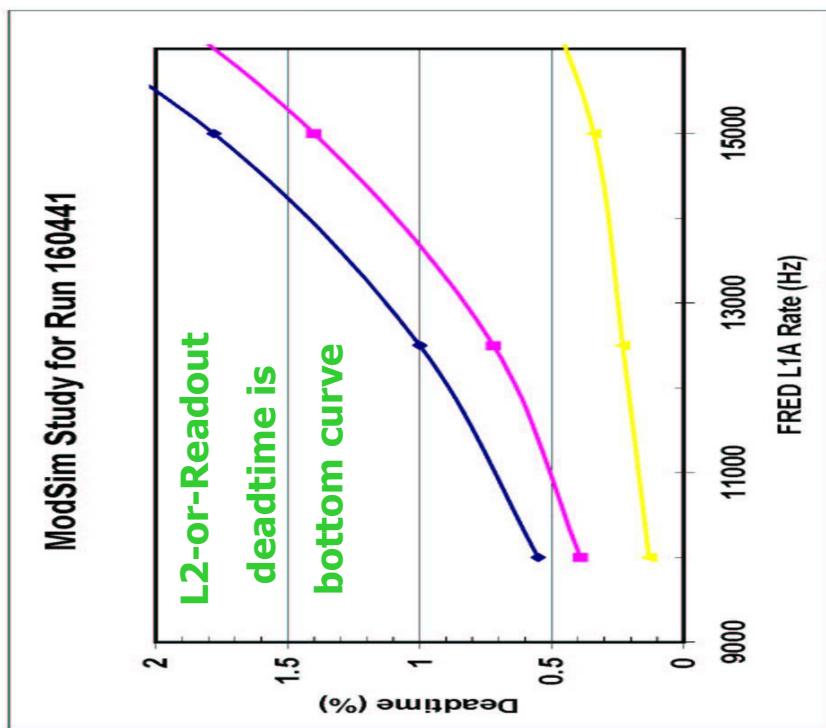


L2 Deadtime (Sim vs. Data)





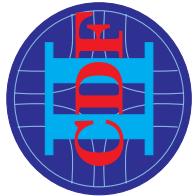
L2-Or-Rd Deadtime (Sim vs. Data)





Simulation Extrapolations

- 1 Just trying to mimic Run 160441
- 2 Keep Running with 1 SRC & make L2 improvements
 - a) Assume no correlations
 - b) Raise L2A rate to 300 Hz and ISL/L00 readout $\leq 16 \mu\text{sec}$
 - c) a&b and shorten L2 DMA configuration by 2 μsec
 - d) a&b and shorten L2 mean processing time by 3 μsec
 - e) a&b and shorten L2 processing tail by 7 μsec
 - f) all of the above at once
- 3 Move to 2 SRCS
 - a) like 2b
 - b) like 2f
 - c) a&b and change from 8 to 7 bit digitization for SVXII
 - (9 μsec goes to 6.5 μsec)
 - d) c and shorten SVT mean processing time by 3 μsec
 - e) d and truncate the long SVT processing tail



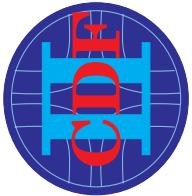
Simulation Projections with 1 SRC

Study	1	2a	2b	2c	2d	2e	2f
Total Deadtime (%)							
10	0.56	0.42	0.68	0.63	0.67	0.7	0.55
15	1.85	1.55	1.85	1.9	1.65	1.65	1.48
20	4.4	4	4.4	3.9	3.7	4.1	3.2
25	8.3	8	7.3	7	6.8	6.9	6.3
30	13.4	12.6	11.5	11	10.8	10.8	10
40	25	24.8	22	20.8	20.8	21.1	20.4

FRED L1A (kHz)

Conditions

L2A	140	140	300	300	300	300	300
L2P	as is	as is	< DMA	< mean	< tail	< all	
SVXII	8 bit	8 bit	8 bit	8 bit	8 bit	8 bit	8 bit
SVT	as is	as is	as is	as is	as is	as is	as is
corr	yes	no	no	no	no	no	no



Simulation Projections with 2 SRCS

Study	3a	3b	3c	3d	3e
Total Deadtime(%)					
10	0.57	0.67	0.39	0.39	0.25
15	1.93	1.49	1.4	1	0.66
20	3.8	2.8	2.7	2.1	1.3
25	6.6	5.2	4.8	4.1	2.3
30	10	7.9	7.1	6.1	3.8
40	17	14.5	12.7	11.8	7.8
FRED L1A (kHz)					

Conditions	L2A	300	300	300	300
L2P	as is	< all	< all	< all	< all
SVXII	8 bit	8 bit	7 bit	7 bit	7 bit
SVT	as is	as is	as is	< mean	< mean & tail



My Conclusions

- ❑ Found another use for nice long runs starting at high luminosity
- ❑ ModSim provides useful guidance for today's subject
- ❑ If we want keep the total deadtime below 5% and yet raise the L1A ceiling to 25 or even 30 kHz we have to:
 - Do everything:
 - Incorporate the suggested L2P improvements
 - Use 2 SRCS
 - Go to 7 bit digitization for SVXII
 - Speed up SVT
 - Accept the reality that there is no silver bullet
 - e.g. each of the suggested L2 improvements helps a bit ...
- ❑ If we want to do better, we will have to try even harder ...
- ❑ We may need to make all of these improvements and more just to keep the status quo if the instantaneous luminosity increases and runs don't look like 160441 (event occupancy, complexity).