XMon Status

- XMon now monitors *instantaneous* cross section instead of average cross sections.
  - Really long runs were a problem for XMon.
  - Current version of XMon averages over 1.5 minutes - we now see alarms for hot and cold triggers that go away in a few minutes.
  - Testing version that extends average to 15 minutes - will evetually allow length to be set in .tcl file
- Fits are improved
- Experimental short version of XMon web page

Updated on March 28, 2003 by Charles Plager

Improvements to the Cross Section Fits

Intro

XMon is the monitoring software that looks at the cross sections of different L1, L2, and L3 triggers. To calculate the "instantaneous" cross section, XMon looks at how many times a given trigger line has fired during the last 3 minutes and divides that by the luminosity recorded during that time. It then compares this value to the expected value. The next question is, of course, how do we calculate the expected value.

Many of the cross sections vary with the instantaneous luminosity, so we want to study plots of cross sections versus instantaneous luminosity for all of the trigger lines. We have decided to look that these distribution on a run by run basis.

For the cross section, we use the average cross section for this line (= total number of times this line fired during this run / integrated live luminosity for this run).

The problem is to get an instantaneous luminosity for an entire run. The concept used is the *average instantaneous luminosity* which is a log average of the beginning and ending instantaneous luminosities ($e^{(\ln(\text{Initial Inst. Lum}) + \ln(\text{Final inst. lum}))/2}$).

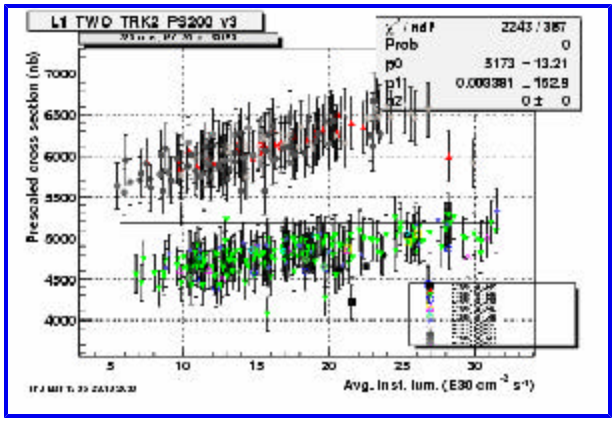
A distribution for each trigger line (assuming a mininum number of runs exists) is then fit with the funcitonal form $f(L) = \mathbf{P_0} + \mathbf{P_1} / L + \mathbf{P_2} L$. Currently, the database is set up to tell XMon that it should alarm if the actual instantaneous cross section is off by more than 20% than the expected value. An improvement that I am hoping to implement very soon is to calculate the RMS of the percent deviation from the fit for each point and to incorporate this number into the range. In other words, if we have a good fit, set tight limits and when the fits aren't so great, use looser limits.

Improvements

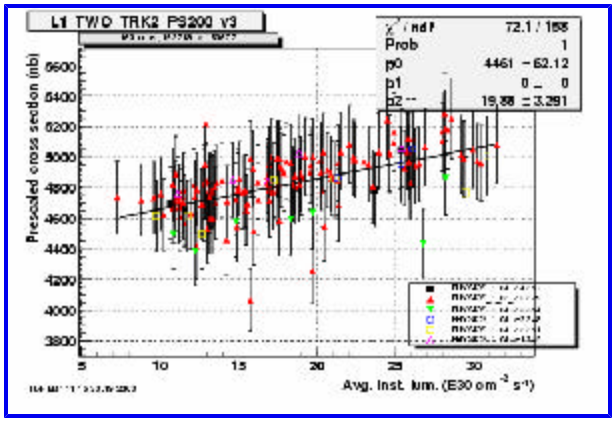
- Change minimum run number
- Throw out extreme points
- Stop fixing the slope term (or any term) to be positive
- Use average y error for each point (doesn't let points with small errors hijack fit).
- Change allowed range from 20% to variable depending on quality of fit.
- Automatically setup the database so that XMon doesn't check triggers with **PS0**, **DPS**, **COT_SPIKE**, **ERROR**, or**_RP** in the name.

- **Change the minimum run number from 150138 to 158733 (First 1_04 run after shutdown)**

Old **New**



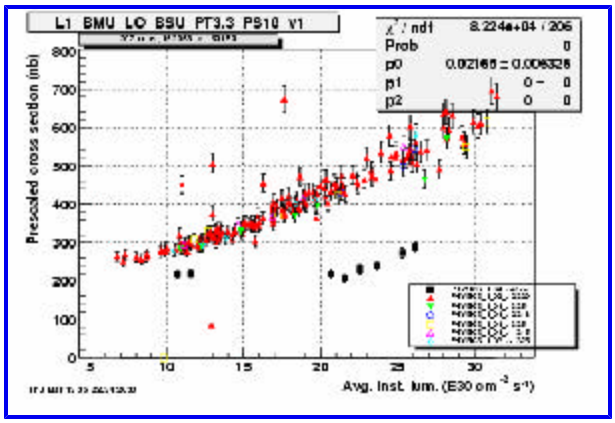
Official L1_TWO_TRK2_PS200_v3

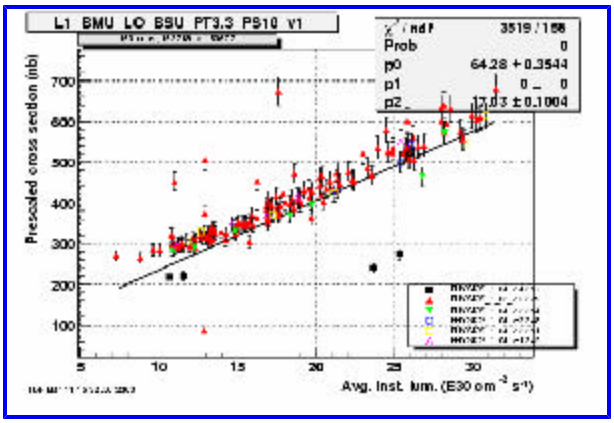


new L1_TWO_TRK2_PS200_v3

- **Throw out points that are a factor of 5 bigger/small than the arithmetic mean.**

Old **New**



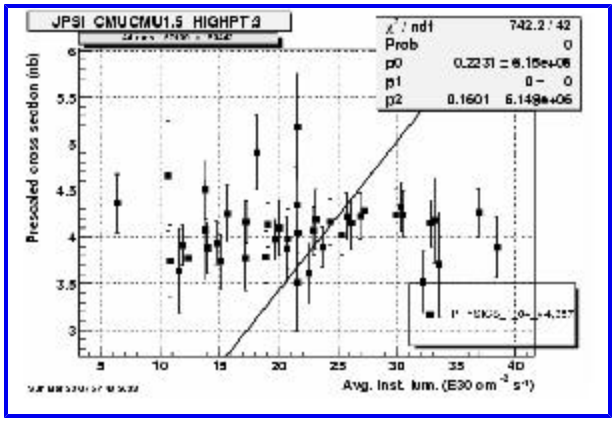


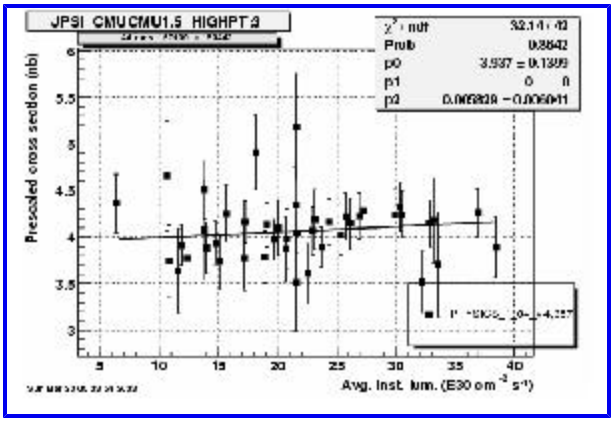
Official L1_BMU_LO_BSU_PT3.3_PS10_v1 new L1_BMU_LO_BSU_PT3.3_PS10_v1

- **Stop fixing slope term (P_2) to be positive.**

It isn't obvious from looking at the two graphs why this should help. The slope in the *new* plot is positive, so telling root (and therefore, I think, Minuit) that the slope has to be positive shouldn't make a difference. But it does (Minuit almost always seems happier the less you constrain her).

Old **New**





Official JPSI_CMUCMU1.5_HIGHPT:3 new JPSI_CMUCMU1.5_HIGHPT:3

Change allowed range from 20% to variable depending on quality of fit.

Before, XMon was told to alarm if any cross section varies by more than 20% of its expected cross section. While this worked well for good fits, we often had problems with distributions that weren't fit well. To alleviate this problem, we now take the maximum of 20% and 95th percentile percentage deviation of a run from the fit added in quadrature with 10%. Most fits still have the 20%, but there is a noticable minority with a much bigger limit.

Caveats

I just wanted to make a few last points of which we should be mindful. I'm also listing things that I think should be done in the future.

- We are fitting apples and then using the fits to measure oranges. XMon looks at very small sections of a run to decide what is in range or not. We feed it information that is extracted from looking at entire runs. This seems to work pretty well, but we *may* want to investigate other options in the future.
- The 95th percentile mentioned above in percent only includes runs that were not thrown away because of large deviations from the mean. In other words, if half of the points were to be thrown away because they were to far away from the mean, the 95th percentile would only be the 47th percentile. I don't think this is a big problem, but I want to mention it (before **I** forgot).

Run Number: 160663 **Events:** 2564320 **Run Type:** Physics **DataType:** Beam Data

Activation Time: 00:11:40 2003.03.28 **Current Time:** 07:39:25 2003.Mar.28

Full XMon Page

	Hot	Cold
Level 1	1 lines : 12	none.
Level 2	12 lines : 21 28 30 32 34 35 44 49 54 93 94 98	2 lines : 31 90
Level 3	none.	none.
Total	13	2

Hot and Cold Trigger Lines

	Trigger	(nb-1)	dev
Level 1	**12 L1_EM8_&_CMX1.5_PT2_CSX_v2**	**71.83**	**1.10**
Level 2	**21 L2_CEM12_ISO_RL10HZ_v1**	**1038.49**	**1.11**
Level 2	**28 L2_CEM8_PT8_CES2_RL6HZ_v2**	**597.06**	**1.30**
Level 2	**30 L2_EM10_ISO_PS1600_v2**	**2.99**	**2.00**
Level 2	**31 L2_EM12_ISO_&_CMU1.5_PT1.5_v2**	**28.43**	**-1.82**
Level 2	**32 L2_EM12_ISO_&_CMX1.5_PT2_CSX_v1**	**10.47**	**4.61**
Level 2	**34 L2_EM40_v2**	**92.78**	**1.06**
Level 2	**35 L2_EM70_v4**	**62.85**	**1.96**
Level 2	**44 L2_JET40_v3**	**62.85**	**1.82**
Level 2	**49 L2_JET90_v3**	**76.32**	**1.48**
Level 2	**54 L2_PEM8_&_CMX1.5_PT2_CSX_v1**	**22.45**	**1.36**
Level 2	**90 L2_TWO_EM10_ISO_v2**	**7.48**	**-2.08**
Level 2	**93 L2_TWO_PEM20_v2**	**1.50**	**1.65**
Level 2	**94 L2_TWO_PJET40_v1**	**19.45**	**1.95**
Level 2	**98 L2_TWO_TRK2.5_D150_DPHI150_v1**	**61.35**	**1.08**

L1 Trigger	(nb-1)	dev
0 L1_CEM4_PT4_v2	20048.48	-0.17
1 L1_JET5_PS20_v2	15954.39	-0.22
2 L1_CEM4_PT4_&_CMX1.5_PT2_CSX_v2	83.80	0.08
3 L1_BMU_LO_BSUR_TSUO_&_CLC_PS10_v1	1188.12	-0.22
4 L1_CEM8_PT8_v4	1247.98	-0.09
5 L1_BMU_LO_BSU_PT3.3_PS10_v1	179.57	0.08
7 L1_SEVEN_TRK2_PS1_v2	2750.34	-0.25
8 L1_EM8_v2	15022.15	-0.19
9 L1_TRK3_PS250_v1	4792.90	-0.11
10 L1_EM8_&_CMU1.5_PT1.5_v2	436.94	-0.82
11 L1_TRK7_PS250_v1	200.51	-0.13
12 L1_EM8_&_CMX1.5_PT2_CSX_v2	**71.83**	**1.10**
13 L1_TWO_TRK2_DPHI90_DPS_v1	595497.40	N/A
14 L1_EM8_&_MET15_v1	911.29	-0.39
15 L1_TWO_TRK2_OPPQ_DPHI135_SUMPT5.5_DPS_v2	217856.29	N/A
16 L1_GAP_EAST_&_JET5_v1	14374.21	0.48
17 L1_TWO_TRK2_PS200_v3	4599.87	-0.15

L1 Trigger	(nb-1)
22 L1_RP_&_JET5_v2	2489.97
23 L1_MB_XING_PS1M_v2	179.57
24 L1_JET10_&_SUMET90_v1	643.44
25 L1_TAU0_PT4_PS0_v1	0.00
26 L1_TWO_CEM2_PT2_OPPQ_v1	20344.77
27 L1_TWO_CEM4_PT4_v2	749.69
28 L1_CMU0_PT4_PS0_v2	0.00
32 L1_TWO_GAP_&_JET5_v1	1957.26
33 L1_TWO_TRK2_&_TWO_CJET5_v2	10957.98
34 L1_TWO_TRK6_DPHI30_&_TWO_CJET5_v1	942.72
35 L1_TRK4_PS0_v1	0.00
36 L1_CMUP6_PT4_v2	1568.20
40 L1_CMU1.5_PT1.5_&_CMX1.5_PT2_CSX_v1	255.88
41 L1_CMX6_PT8_CSX_v1	89.78
42 L1_TWO_CMU1.5_PT1.5_v3	746.69
43 L1_COT_SPIKE_v1	5.99
44 L1_MET15_&_TWO_TRK2_v1	2293.95

XMon Summary

Run 160663 **Latest Event** 2564320
Run Type Physics **Data Type** Beam Data
Experiment Type Physics Run 2a
Partition 0 **Tev Store** 2361
Physics Table PHYSICS_1_04[4,255,357]
Myron mode NO **Latest Event Flag** 0

Activate Time 00:11:40 2003.03.28 (from database)
Current Time 07:39:25 2003.Mar.28 (from LRIH bank)
Terminate Time 07:40:08 2003.03.28 (from database)

Time	seconds	%
Live	26708.08	99.61
Dead	105.13	0.39
Run	26813.22	100.00
Gfred	26777.93	99.87

Luminosity	no GLIVE			GLIVE		
Instantaneous (cm^{-2} s^{-1})	**Initial**	**Current Event**	**Run Average**	**Initial**	**Current Event**	**Run Average**
	1.26e+31	0.00e+00	1.09e+31	0.00e+00	0.00e+00	1.08e+31
Integrated (nb^{-1})	**Initial**	**Total Store**	**Current Run**	**Initial**	**Total Store**	**Current Run**
	298.59	591.68	293.09	248.49	538.91	290.41

Level	count	rate (Hz)	Hot trigger bits	Cold trigger bits
FRED L1 accepts	205160025	7661.53	N/A	N/A
L1 accepts	204466671	7635.64	**12**	**25 35**
L2 accepts	2564320	95.76	**21 28 30 32 34 35 44 49 54 93 94 98**	**0 7 8 31 63 90**
L2 rejects	201902324	7539.88		
L3 accepts	879712	32.94	None	None

	fred count	fred count	Average rate (Hz)	live count	
0 L1_CEM4_PT4_v2	5956330	5956330	222.43	5931537	19
1 L1_JET5_PS20_v2	94917974	4745899	177.23	4726583	15
2 L1_CEM4_PT4_&_CMX1.5_PT2_CSX_v2	23899	23899	0.89	23799	
3 L1_BMU_LO_BSUR_TSUO_&_CLC_PS10_v1	3773505	377351	14.09	375812	1
4 L1_CEM8_PT8_v4	368685	368685	13.77	367165	1
5 L1_BMU_LO_BSU_PT3.3_PS10_v1	568406	56841	2.12	56602	
7 L1_SEVEN_TRK2_PS1_v2	889502	889502	33.22	885797	2
8 L1_EM8_v2	4415507	4415507	164.89	4397055	14
9 L1_TRK3_PS250_v1	356421980	1425689	53.24	1419818	4
10 L1_EM8_&_CMU1.5_PT1.5_v2	143002	143002	5.34	142429	
11 L1_TRK7_PS250_v1	15336993	61348	2.29	61098	
12 L1_EM8_&_CMX1.5_PT2_CSX_v2	**17153**	**17153**	**0.64**	**17078**	
13 L1_TWO_TRK2_DPHI90_DPS_v1	178284150	177271134	6620.05	176535455	567
14 L1_EM8_&_MET15_v1	272278	272278	10.17	271138	
15 L1_TWO_TRK2_OPPQ_DPHI135_SUMPT5.5_DPS_v2	65337492	65161308	2433.40	64891076	207
16 L1_GAP_EAST_&_JET5_v1	3877604	3877604	144.81	3860758	13
17 L1_TWO_TRK2_PS200_v3	275416549	1377083	51.43	1371340	4
18 L1_GAP_EAST_&_JET5_&_RP_v2	22796	22796	0.85	22703	
19 L1_GAP_WEST_&_JET5_v1	3904799	3904799	145.82	3888281	13
20 L1_JET10_v1	6561892	6561892	245.05	6534647	21
21 L1_MB_CLC_PS10K_v2	9591502736	959152	35.82	955167	3
22 L1_RP_&_JET5_v2	817186	817186	30.52	813904	2
23 L1_MB_XING_PS1M_v2	45931274787	45932	1.72	45733	
24 L1_JET10_&_SUMET90_v1	190399	190399	7.11	189615	
25 L1_TAU0_PT4_PS0_v1	112717355	0	0.00	0	
26 L1_TWO_CEM2_PT2_OPPQ_v1	6180680	6180680	230.81	6155036	19
27 L1_TWO_CEM4_PT4_v2	242629	242629	9.06	241637	
28 L1_CMU0_PT4_PS0_v2	112717355	0	0.00	0	
32 L1_TWO_GAP_&_JET5_v1	494310	494310	18.46	492126	1
33 L1_TWO_TRK2_&_TWO_CJET5_v2	3300318	3300318	123.25	3286526	10