

Balancing Authority ACE Limit Proof-of-Concept Field Trial Project 2010-14

WECC Update Discussion
July 29, 2011

DISCUSSION STARTING AT 3:30 PM EDT

Bob Klueber- Midwest ISO

Balancing Authority Reliability-based Control Standard Drafting Team
(BARCSDT)

Balancing Authority ACE Limit Proof-of-Concept Field Trial

Western Interconnection Balancing Authority Participants	2010 Frequency Bias	WECC Region	Reliability Coordinator	Start Date
Alberta Electric System Operator (AESO)	-125	NWPP	WECC	3/1/2010
Arizona Public Service Company (AZPS)	-74.5	AZNMSNV	WECC	3/1/2010
Bonneville Power Administration (BPAT)	-157.3	NWPP	WECC	3/1/2010
British Columbia Transmission Corporation (BCTC)	-118	NWPP	WECC	4/1/2010
California Independent System Operator (CISO)	-485	CAMX	WECC	3/1/2010
El Paso Electric Company (EPE)	-19	AZNMSNV	WECC	3/1/2010
NaturEner Power Watch, LLC (GWA)	-2.1	NWPP	WECC	3/1/2010
Idaho Power Company (IPCO)	-40	NWPP	WECC	3/1/2010
Los Angeles Department of Water and Power (LDWP)	-62.3	CAMX	WECC	3/1/2010
Nevada Power Company (NEVP)	-62.29	AZNMSNV	WECC	3/1/2010
PacifiCorp East (PACE)	-77	NWPP	WECC	3/1/2010
PacifiCorp West (PACW)	-45	NWPP	WECC	3/1/2010
Portland General Electric (PGE)	-50	NWPP	WECC	4/1/2010
Public Service Company of Colorado (PSCO)	-80	RMPA	WECC	3/1/2010
Public Service Company of New Mexico (PNM)	-27.3	AZNMSNV	WECC	6/1/2011
Public Utility District No. 1 of Chelan County (CHPD)	-12	NWPP	WECC	3/1/2010
Public Utility District No. 1 of Douglas County (DOPD)	-7	NWPP	WECC	4/1/2010
Public Utility District No. 2 of Grant County (GCPD)	-25	NWPP	WECC	3/1/2010
Seattle City Light (SCL)	-40	NWPP	WECC	3/1/2010
Sacramento Municipal Utility District (SMUD)	-45.18	NWPP	WECC	3/1/2010
Salt River Project (SRP)	-65.2	AZNMSNV	WECC	5/1/2010
Sierra Pacific Power Company (SPPC)	-20.04	NWPP	WECC	3/1/2010
Tucson Electric Power (TEPC)	-30.4	AZNMSNV	WECC	3/1/2010
Turlock Irrigation District (TIDC)	-6.7	NWPP	WECC	3/1/2010
Western Area Power Administration- Rocky Mountain Region (WACM)	-55	RMPA	WECC	3/1/2010
Western Area Power Administration- Desert Southwest Region (WALC)	-54.8	AZNMSNV	WECC	3/1/2010

Clock-Minute Frequency Below 59.932 Hz FTL_{Low} or Above 60.068 Hz FTL_{High}

PrevailingTime	PTimeZone	FreqError	ActualFreq	SchedFreq
6/3/11 13:14	PDT	-0.0708	59.9292	60
6/3/11 13:15	PDT	-0.0778	59.9222	60
6/3/11 13:16	PDT	-0.07	59.93	60
6/3/11 13:17	PDT	-0.0697	59.9303	60
6/3/11 13:18	PDT	-0.069	59.931	60
6/3/11 13:19	PDT	-0.0764	59.9236	60
6/3/11 13:20	PDT	-0.0697	59.9303	60
6/3/11 13:21	PDT	-0.0707	59.9293	60
6/3/11 13:25	PDT	-0.0745	59.9255	60
6/3/11 13:26	PDT	-0.0789	59.9211	60
6/3/11 13:27	PDT	-0.0712	59.9288	60
6/3/11 13:28	PDT	-0.068	59.932	60
6/6/11 13:57	PDT	-0.0781	59.9219	60
6/6/11 13:58	PDT	-0.0834	59.9166	60
6/6/11 13:59	PDT	-0.0763	59.9237	60
6/30/11 10:40	PDT	-0.0482	59.9318	59.98
6/30/11 10:41	PDT	-0.0641	59.9159	59.98
6/30/11 10:42	PDT	-0.0571	59.9229	59.98
PrevailingTime	PTimeZone	FreqError	ActualFreq	SchedFreq
6/3/11 13:39	PDT	0.0747	60.0747	60
6/3/11 13:40	PDT	0.0817	60.0817	60
6/3/11 13:41	PDT	0.082	60.082	60
6/3/11 13:46	PDT	0.0683	60.0683	60
6/3/11 13:47	PDT	0.0775	60.0775	60
6/3/11 13:48	PDT	0.0704	60.0704	60
6/23/11 5:59	PDT	0.0743	60.0743	60
6/23/11 6:04	PDT	0.0699	60.0699	60
6/30/11 10:51	PDT	0.0911	60.0711	59.98

06/03/11 ending 13:21 PDT– 8 min FTL_{Low}

06/03/11 ending 13:28 PDT– 4 min FTL_{Low}

500-kV line relayed and RAS action tripped 1422 MW in the Pacific NorthWest.

06/06/11 ending 13:59 PDT– 3 min FTL_{Low}

3 generators tripped with loss of 1178 MW in Central WECC.

06/30/11 ending 10:42 PDT– 3 min FTL_{Low}

Loss of Converter Station followed by massive schedule cuts and resulting in a high trigger at 10:52 .

06/03/11 ending 13:41 PDT– 3 min FTL_{High}

06/03/11 ending 13:48 PDT– 3 min FTL_{High}

Recovery from earlier Low triggers – overshoot ACE.

06/23/11 ending 05:59 PDT– 1 min FTL_{High}

06/23/11 ending 06:04 PDT– 1 min FTL_{High}

Gradual increase of Frequency caused by excessive ACE in ISO – cause unknown.

06/30/11 ending 10:51 PDT– 1 min FTL_{High}

Loss of Converter Station followed by massive Schedule cuts – resulted in high trigger after earlier low trigger

Balancing Authority ACE Limit Proof-of-Concept Field Trial

The Balancing Authority ACE Limit (BAAL) shall not be exceeded for more than 30 consecutive clock-minutes*

BA_Number	Performance Since Entering the Field Trial				Current Month Statistics					
	BAAL _{Low}	BAAL _{High}	ATL _{Low}	ATL _{High}	BAAL _{Low}	BAAL _{High}	ATL _{Low}	ATL _{High}	BAAL _{Low} or ATL _{Low}	BAAL _{High} or ATL _{High}
	Max_MinCtLow	Max_MinCtHigh	Max_MinCtLow2	Max_MinCtHigh2	Max_MinCtLow	Max_MinCtHigh	Max_MinCtLow2	Max_MinCtHigh2	Max_LowLimitCt	Max_HighLimitCt
BA05	44	42	58	49	33	34	0	0	33	34
BA06	16	15	13	15	8	4	0	0	8	4
BA07	43	36	29	41	43	36	0	0	43	36
BA08	35	41	19	34	11	22	0	0	11	22
BA09	11	9	15	55	8	4	0	0	8	4
BA11	12	14	16	7	12	4	0	0	12	4
BA12	14	13	14	17	4	3	0	0	4	3
BA13	9	27	12	45	9	4	0	0	9	4
BA14	23	31	13	55	5	20	0	0	5	20
BA15	5	7	7	5	5	0	0	0	5	0
BA16	14	20	25	34	12	10	0	0	12	10
BA18	10	13	25	15	1	4	0	0	1	4
BA19	24	38	30	34	15	38	0	0	15	38
BA22	7	10	15	14	5	6	0	0	5	6
BA23	20	18	13	27	6	9	0	0	6	9
BA24	15	16	0	0	15	16	0	0	15	21
BA25	15	22	21	14	6	5	0	0	6	5
BA26	19	23	43	41	15	13	0	0	15	13
BA27	23	22	16	15	5	2	0	0	5	2
BA28	22	24	38	39	7	14	0	0	7	14
BA29	17	15	16	16	4	15	0	0	4	15
BA30	26	38	47	39	17	38	0	0	17	38
BA31	20	23	29	28	15	21	0	0	15	21
BA33	26	28	28	58	14	28	0	0	14	28
BA34	16	17	23	29	3	4	0	0	3	4
BA36	69	33	114	25	45	31	0	0	45	31

MinCtLow = Count of consecutive clock-minutes BAAL_{Low} was exceeded

MinCtHigh = Count of consecutive clock-minutes BAAL_{High} was exceeded

MinCtLow2 = Count of consecutive clock-minutes ATL_{Low} was exceeded

MinCtHigh2 = Count of consecutive clock-minutes ATL_{High} was exceeded

***BAAL being exceeded for more than 30 consecutive clock-minutes would be a violation under the draft BAAL standard.**

Statistics of BAAL being exceeded > 25 consecutive clock-minutes :

Date	Time	TimeZone	ActualFreq	SchedFreq	MinCtLow	MinCtHigh	CPS1	ACPS1	MinCtLow2	MinCtHigh2	LowLimitCt	HighLimitCt
06/02/11	9:41	MDT	59.97520	59.98	26	0	-701.8	-4459.5	0	0	26	0
06/03/11	20:35	MDT	59.98700	59.98	26	0	3232.3	-5431.4	0	0	26	0
06/03/11	20:36	MDT	59.98900	59.98	27	0	3747.7	-4136.0	0	0	27	0
06/03/11	20:37	MDT	59.98480	59.98	28	0	1200.9	-2969.4	0	0	28	0
06/03/11	21:04	MDT	59.96930	59.98	26	0	-2019.3	-6167.5	0	0	26	0
06/03/11	21:05	MDT	59.96730	59.98	27	0	-2550.2	-6881.2	0	0	27	0
06/03/11	21:06	MDT	59.96300	59.98	28	0	-3642.8	-8163.7	0	0	28	0
06/03/11	21:07	MDT	59.96380	59.98	29	0	-682.8	-1772.6	0	0	29	0
06/05/11	23:45	MST	60.02847	60	0	26	-6343.2	-6343.2	0	0	0	26
06/05/11	23:46	MST	60.01760	60	0	27	-3104.1	-3104.1	0	0	0	27
06/05/11	23:47	MST	60.02713	60	0	28	-4073.1	-4073.1	0	0	0	28
06/05/11	23:48	MST	60.01930	60	0	29	-2176.3	-2176.3	0	0	0	29
06/05/11	23:49	MST	60.01444	60	0	30	-1069.0	-1069.0	0	0	0	30
06/05/11	23:50	MST	60.02004	60	0	31	-1251.8	-1251.8	0	0	0	31
06/05/11	23:51	MST	60.02054	60	0	32	-775.3	-775.3	0	0	0	32
06/06/11	10:43	MDT	59.96820	59.98	26	0	-1713.8	-4957.5	0	0	26	0
06/07/11	0:23	MST	60.02500	60	0	26	-1326.1	-1326.1	0	0	0	26
06/07/11	0:24	MST	60.01860	60	0	27	-833.9	-833.9	0	0	0	27
06/07/11	0:25	MST	60.02500	60	0	28	-1237.9	-1237.9	0	0	0	28
06/07/11	5:57	MDT	59.99440	59.98	26	0	5706.9	-1941.6	0	0	26	0
06/07/11	5:58	MDT	59.99700	59.98	27	0	9045.1	-1360.9	0	0	27	0
06/07/11	5:59	MDT	59.98630	59.98	28	0	3105.2	-6117.7	0	0	28	0
06/07/11	6:00	MDT	59.97730	59.98	29	0	-1098.2	-10714.6	0	0	29	0
06/07/11	6:01	MDT	59.96330	59.98	30	0	-10601.1	-23536.6	0	0	30	0
06/07/11	6:02	MDT	59.98030	59.98	31	0	435.5	-15264.8	0	0	31	0
06/07/11	6:03	MDT	59.98660	59.98	32	0	2470.8	-4410.4	0	0	32	0
06/07/11	6:04	MDT	59.98860	59.98	33	0	1045.7	-921.1	0	0	33	0

Statistics of BAAL being exceeded > 25 consecutive clock-minutes :

Date	Time	TimeZone	ActualFreq	SchedFreq	MinCtLow	MinCtHigh	CPS1	ACPS1	MinCtLow2	MinCtHigh2	LowLimitCt	HighLimitCt
06/07/11	23:42	MST	60.03978	60.02	0	26	-585.1	-1378.9	0	0	0	26
06/07/11	23:43	MST	60.04231	60.02	0	27	-689.7	-1487.3	0	0	0	27
06/07/11	23:44	MST	60.03429	60.02	0	28	-323.0	-1054.9	0	0	0	28
06/07/11	23:45	MST	60.03458	60.02	0	29	-327.6	-1051.2	0	0	0	29
06/07/11	23:46	MST	60.03852	60.02	0	30	-422.4	-1094.5	0	0	0	30
06/07/11	23:47	MST	60.02927	60.02	0	31	-93.1	-725.5	0	0	0	31
06/07/11	23:48	MST	60.04478	60.02	0	32	-652.0	-1339.6	0	0	0	32
06/07/11	23:49	MST	60.03914	60.02	0	33	-381.3	-988.6	0	0	0	33
06/07/11	23:50	MST	60.03714	60.02	0	34	-378.3	-1053.1	0	0	0	34
06/07/11	23:51	MST	60.03779	60.02	0	35	-362.3	-994.5	0	0	0	35
06/07/11	23:52	MST	60.03488	60.02	0	36	-204.6	-748.4	0	0	0	36
06/08/11	0:42	MDT	60.03560	60.02	0	26	-510.5	-1421.4	0	0	0	26
06/08/11	0:43	MDT	60.04140	60.02	0	27	-775.5	-1687.1	0	0	0	27
06/08/11	0:44	MDT	60.04380	60.02	0	28	-928.0	-1875.9	0	0	0	28
06/08/11	0:45	MDT	60.03620	60.02	0	29	-541.9	-1457.9	0	0	0	29
06/08/11	0:46	MDT	60.03540	60.02	0	30	-503.8	-1417.9	0	0	0	30
06/08/11	0:47	MDT	60.04090	60.02	0	31	-729.2	-1618.4	0	0	0	31
06/08/11	0:48	MDT	60.03250	60.02	0	32	-345.7	-1218.8	0	0	0	32
06/08/11	0:49	MDT	60.04660	60.02	0	33	-1037.8	-1968.4	0	0	0	33
06/08/11	0:50	MDT	60.04130	60.02	0	34	-261.0	-693.8	0	0	0	34
06/08/11	5:56	PDT	60.07586	60	0	26	-8978.3	-8978.3	0	0	0	26
06/08/11	5:57	PDT	60.08372	60	0	27	-9651.7	-9651.7	0	0	0	27
06/08/11	5:58	PDT	60.08236	60	0	28	-9065.0	-9065.0	0	0	0	28
06/08/11	5:59	PDT	60.08358	60	0	29	-8638.3	-8638.3	0	0	0	29
06/08/11	6:00	PDT	60.07278	60	0	30	-7026.1	-7026.1	0	0	0	30
06/08/11	6:01	PDT	60.06985	60	0	31	-5886.3	-5886.3	0	0	0	31
06/08/11	6:02	PDT	60.05607	60	0	32	-4089.0	-4089.0	0	0	0	32
06/08/11	6:03	PDT	60.06036	60	0	33	-3693.4	-3693.4	0	0	0	33
06/08/11	6:04	PDT	60.04307	60	0	34	-2238.9	-2238.9	0	0	0	34
06/08/11	6:05	PDT	60.04422	60	0	35	-1942.4	-1942.4	0	0	0	35
06/08/11	6:06	PDT	60.03857	60	0	36	-1452.7	-1452.7	0	0	0	36
06/08/11	6:07	PDT	60.03286	60	0	37	-1042.0	-1042.0	0	0	0	37

Statistics of BAAL being exceeded > 25 consecutive clock-minutes :

Date	Time	TimeZone	ActualFreq	SchedFreq	MinCtLow	MinCtHigh	CPS1	ACPS1	MinCtLow2	MinCtHigh2	LowLimitCt	HighLimitCt
06/09/11	8:27	MDT	59.95960	59.98	26	0	-1886.7	-3932.5	0	0	26	0
06/09/11	8:28	MDT	59.95020	59.98	27	0	-3033.0	-5202.8	0	0	27	0
06/09/11	8:29	MDT	59.94420	59.98	28	0	-3373.3	-5369.5	0	0	28	0
06/10/11	5:47	PDT	60.05500	60	0	26	-3089.7	-3089.7	0	0	0	26
06/10/11	5:48	PDT	60.04856	60	0	27	-2626.7	-2626.7	0	0	0	27
06/10/11	5:49	PDT	60.04071	60	0	28	-2256.0	-2256.0	0	0	0	28
06/10/11	5:50	PDT	60.04071	60	0	29	-2278.4	-2278.4	0	0	0	29
06/10/11	5:51	PDT	60.05286	60	0	30	-2939.4	-2939.4	0	0	0	30
06/10/11	5:52	PDT	60.05286	60	0	31	-2685.0	-2685.0	0	0	0	31
06/10/11	5:53	PDT	60.05964	60	0	32	-2679.0	-2679.0	0	0	0	32
06/10/11	5:54	PDT	60.06493	60	0	33	-2523.8	-2523.8	0	0	0	33
06/10/11	5:55	PDT	60.06400	60	0	34	-2032.1	-2032.1	0	0	0	34
06/10/11	5:56	PDT	60.06501	60	0	35	-1620.6	-1620.6	0	0	0	35
06/10/11	5:57	PDT	60.05986	60	0	36	-1205.3	-1205.3	0	0	0	36
06/10/11	5:58	PDT	60.05543	60	0	37	-696.9	-696.9	0	0	0	37
06/10/11	5:59	PDT	60.06371	60	0	38	-723.6	-723.6	0	0	0	38
06/14/11	5:34	PDT	60.02613	60	0	26	-1361.1	-1361.1	0	0	0	26
06/14/11	5:35	PDT	60.01961	60	0	27	-998.6	-998.6	0	0	0	27
06/14/11	5:36	PDT	60.02074	60	0	28	-940.6	-940.6	0	0	0	28
06/14/11	5:37	PDT	60.02034	60	0	29	-861.2	-861.2	0	0	0	29
06/14/11	5:38	PDT	60.01869	60	0	30	-819.4	-819.4	0	0	0	30
06/15/11	9:53	MST	59.96228	59.98	26	0	-690.0	-1694.6	0	0	26	0
06/15/11	9:54	MST	59.97370	59.98	27	0	-42.3	-811.4	0	0	27	0

Statistics of BAAL being exceeded > 25 consecutive clock-minutes :

Date	Time	TimeZone	ActualFreq	SchedFreq	MinCtLow	MinCtHigh	CPS1	ACPS1	MinCtLow2	MinCtHigh2	LowLimitCt	HighLimitCt
06/15/11	9:55	PDT	59.98286	59.98	26	0	424.8	-1144.9	0	0	26	0
06/15/11	9:56	PDT	59.98187	59.98	27	0	399.0	-1729.6	0	0	27	0
06/15/11	9:57	PDT	59.98170	59.98	28	0	401.3	-1969.3	0	0	28	0
06/15/11	9:58	PDT	59.98697	59.98	29	0	823.3	-963.8	0	0	29	0
06/15/11	9:59	PDT	59.98432	59.98	30	0	515.9	-945.8	0	0	30	0
06/15/11	10:00	PDT	59.97508	59.98	31	0	-171.2	-1680.6	0	0	31	0
06/15/11	10:01	PDT	59.97677	59.98	32	0	-90.9	-1894.3	0	0	32	0
06/15/11	10:02	PDT	59.97451	59.98	33	0	-323.6	-2230.8	0	0	33	0
06/15/11	10:03	PDT	59.96617	59.98	34	0	-1129.7	-3052.3	0	0	34	0
06/15/11	10:04	PDT	59.96907	59.98	35	0	-820.9	-2688.4	0	0	35	0
06/15/11	10:05	PDT	59.97169	59.98	36	0	-542.3	-2329.9	0	0	36	0
06/15/11	10:06	PDT	59.97462	59.98	37	0	-243.5	-1892.8	0	0	37	0
06/15/11	10:07	PDT	59.96698	59.98	38	0	-1116.2	-3138.0	0	0	38	0
06/15/11	10:08	PDT	59.97586	59.98	39	0	-255.8	-2457.2	0	0	39	0
06/15/11	10:09	PDT	59.98279	59.98	40	0	427.3	-1203.9	0	0	40	0
06/15/11	10:10	PDT	59.96697	59.98	41	0	-1072.7	-3025.7	0	0	41	0
06/15/11	10:11	PDT	59.97143	59.98	42	0	-540.3	-2268.7	0	0	42	0
06/15/11	10:12	PDT	59.97400	59.98	43	0	-174.9	-1424.1	0	0	43	0
06/15/11	10:13	PDT	59.97283	59.98	44	0	-180.6	-1241.9	0	0	44	0
06/15/11	10:14	PDT	59.97561	59.98	45	0	21.4	-793.4	0	0	45	0
06/16/11	20:58	MDT	59.98850	60	26	0	-3075.1	-3075.1	0	0	26	0
06/16/11	20:59	MDT	59.98950	60	27	0	-2491.0	-2491.0	0	0	27	0
06/16/11	21:00	MDT	59.99000	60	28	0	-2814.5	-2814.5	0	0	28	0
06/16/11	21:01	MDT	59.99490	60	29	0	-1314.3	-1314.3	0	0	29	0
06/16/11	21:02	MDT	59.99170	60	30	0	-1746.9	-1746.9	0	0	30	0

Statistics of BAAL being exceeded > 25 consecutive clock-minutes :

Date	Time	TimeZone	ActualFreq	SchedFreq	MinCtLow	MinCtHigh	CPS1	ACPS1	MinCtLow2	MinCtHigh2	LowLimitCt	HighLimitCt
06/19/11	5:29	MST	60.03170	60	0	26	-1257.5	-1257.5	0	0	0	26
06/19/11	5:30	MST	60.02484	60	0	27	-968.8	-968.8	0	0	0	27
06/19/11	5:31	MST	60.02652	60	0	28	-1021.7	-1021.7	0	0	0	28
06/19/11	5:32	MST	60.02785	60	0	29	-1050.8	-1050.8	0	0	0	29
06/19/11	5:33	MST	60.03100	60	0	30	-1213.5	-1213.5	0	0	0	30
06/19/11	5:34	MST	60.03109	60	0	31	-1202.0	-1202.0	0	0	0	31
06/19/11	5:35	MST	60.03546	60	0	32	-1413.1	-1413.1	0	0	0	32
06/19/11	5:36	MST	60.03226	60	0	33	-1244.3	-1244.3	0	0	0	33
06/19/11	5:37	MST	60.02976	60	0	34	-1123.3	-1123.3	0	0	0	34
06/19/11	5:38	MST	60.02985	60	0	35	-1158.1	-1158.1	0	0	0	35
06/19/11	5:39	MST	60.02293	60	0	36	-796.5	-796.5	0	0	0	36
06/19/11	5:40	MST	60.02455	60	0	37	-829.5	-829.5	0	0	0	37
06/19/11	5:41	MST	60.02501	60	0	38	-852.5	-852.5	0	0	0	38
06/26/11	9:36	MST	59.97163	59.98	26	0	-76.5	-737.1	0	0	26	0
06/26/11	9:37	MST	59.96654	59.98	27	0	-175.4	-733.1	0	0	27	0
06/26/11	10:26	MST	59.97156	59.98	26	0	-367.6	-1712.6	0	0	26	0
06/26/11	10:27	MST	59.97141	59.98	27	0	-413.1	-1840.7	0	0	27	0
06/26/11	10:28	MST	59.97814	59.98	28	0	68.8	-1342.1	0	0	28	0
06/26/11	10:29	MST	59.96479	59.98	29	0	-986.7	-2547.2	0	0	29	0
06/26/11	10:30	MST	59.96788	59.98	30	0	-795.7	-2438.6	0	0	30	0
06/26/11	10:31	MST	59.97963	59.98	31	0	169.7	-1465.9	0	0	31	0
06/26/11	10:32	MST	59.98240	59.98	32	0	390.4	-1196.1	0	0	32	0
06/26/11	10:33	MST	59.97708	59.98	33	0	-48.1	-1747.5	0	0	33	0
06/26/11	10:34	MST	59.97173	59.98	34	0	-515.0	-2247.0	0	0	34	0
06/26/11	10:35	MST	59.97127	59.98	35	0	-585.6	-2385.5	0	0	35	0
06/26/11	10:36	MST	59.96543	59.98	36	0	-1199.1	-3119.7	0	0	36	0
06/26/11	10:37	MST	59.96511	59.98	37	0	-1293.2	-3298.9	0	0	37	0
06/26/11	10:38	MST	59.96618	59.98	38	0	-1151.5	-3107.4	0	0	38	0
06/26/11	10:39	MST	59.98106	59.98	39	0	293.1	-1463.9	0	0	39	0
06/26/11	10:40	MST	59.97220	59.98	40	0	-464.9	-2169.9	0	0	40	0
06/26/11	10:41	MST	59.97243	59.98	41	0	-388.4	-1942.8	0	0	41	0
06/26/11	10:42	MST	59.97753	59.98	42	0	32.1	-1327.0	0	0	42	0
06/26/11	10:43	MST	59.97318	59.98	43	0	-180.1	-1294.8	0	0	43	0

Statistics of BAAL being exceeded > 25 consecutive clock-minutes :

Date	Time	TimeZone	ActualFreq	SchedFreq	MinCtLow	MinCtHigh	CPS1	ACPS1	MinCtLow2	MinCtHigh2	LowLimitCt	HighLimitCt
06/26/11	17:17	MDT	59.97520	60	26	0	-7818.5	-7818.5	0	0	26	0
06/30/11	11:13	PDT	60.04388	60	0	26	-2748.6	-2748.6	0	0	0	26
06/30/11	11:14	PDT	60.03620	60	0	27	-2029.4	-2029.4	0	0	0	27
06/30/11	11:15	PDT	60.03144	60	0	28	-1803.2	-1803.2	0	0	0	28
06/30/11	11:16	PDT	60.03067	60	0	29	-1538.8	-1538.8	0	0	0	29
06/30/11	11:17	PDT	60.02011	60	0	30	-786.4	-786.4	0	0	0	30
06/30/11	11:18	PDT	60.02190	60	0	31	-809.0	-809.0	0	0	0	31

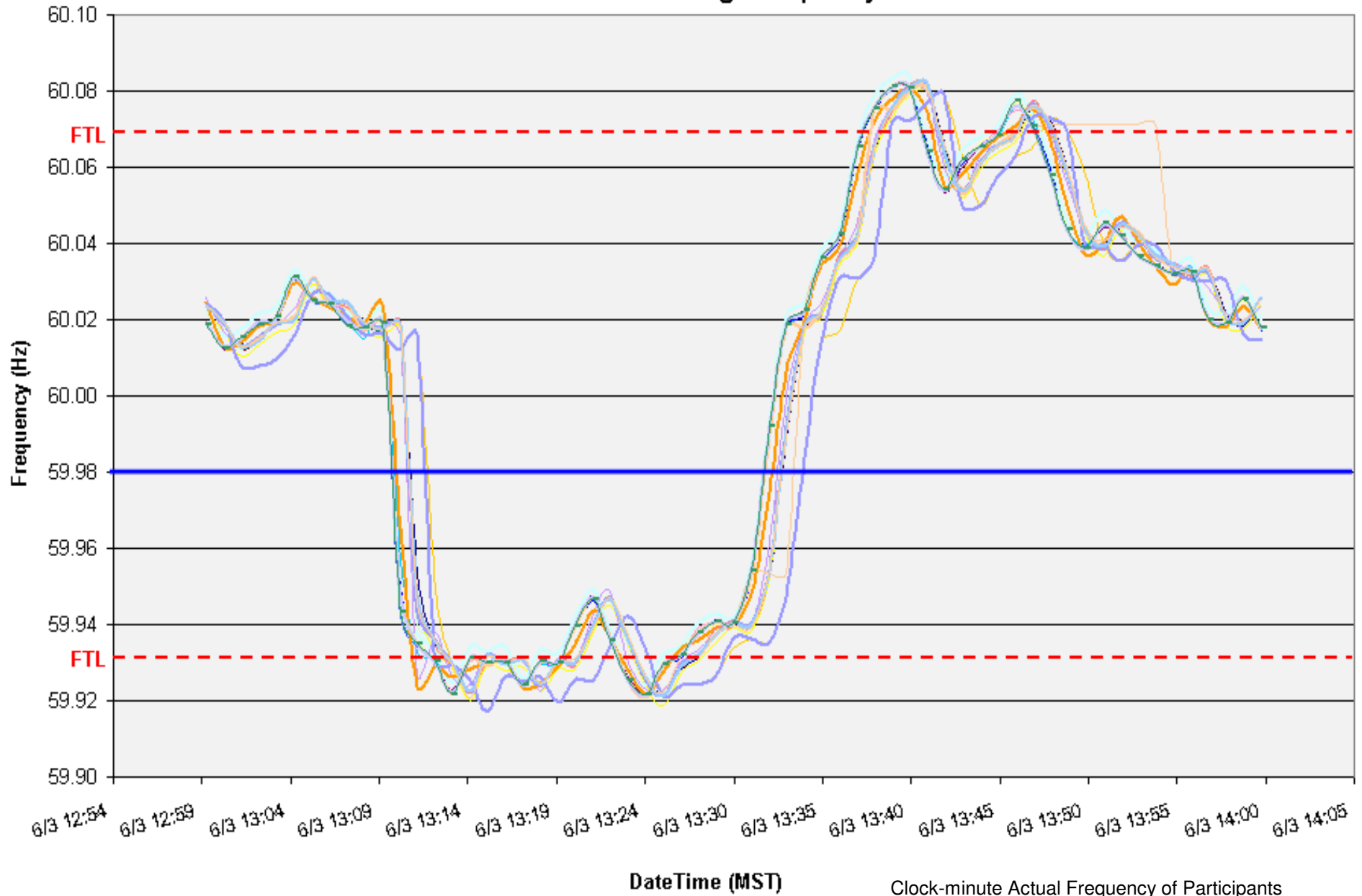
Examples in this Presentation

Example#	Type	#mins	Sched Freq	start time	Time Zone	stop time	Time Zone
1	FTL Low	8	60	6/3/11 13:14	PDT	6/3/11 13:21	PDT
	FTL Low	4	60	6/3/11 13:25	PDT	6/3/11 13:28	PDT
	FTL High	3	60	6/3/11 13:39	PDT	6/3/11 13:41	PDT
	FTL High	3	60	6/3/11 13:46	PDT	6/3/11 13:48	PDT
2	FTL Low	3	60	6/6/11 13:57	PDT	6/6/11 13:59	PDT
3	BAAL High	32	60	6/5/11 23:20	MST	6/5/11 23:51	MST
4	BAAL Low	33	59.98	6/7/11 5:32	MDT	6/7/11 6:04	MDT
5	BAAL High	36	60.02	6/7/11 23:17	MST	6/7/11 23:52	MST
	BAAL High	34	60.02	6/8/11 0:17	MDT	6/8/11 0:50	MDT
6	BAAL High	37	60	6/8/11 5:31	PDT	6/8/11 6:07	PDT
7	BAAL High	38	60	6/10/11 5:22	PDT	6/10/11 5:59	PDT
8	BAAL Low	27	59.98	6/15/11 9:28	MST	6/15/11 9:54	MST
	BAAL Low	45	59.98	6/15/11 9:30	PDT	6/15/11 10:14	PDT
9	BAAL High	38	60	6/19/11 5:04	MST	6/19/11 5:41	MST
10	BAAL Low	43	59.98	6/26/11 10:01	MST	6/26/11 10:43	MST
11	FTL Low	3	59.98	6/30/11 10:40	PDT	6/30/11 10:42	PDT
	FTL High	1	59.98	6/30/11 10:51	PDT	6/30/11 10:51	PDT
	BAAL High	31	60	6/30/11 10:48	PDT	6/30/11 11:18	PDT

EXAMPLE 1

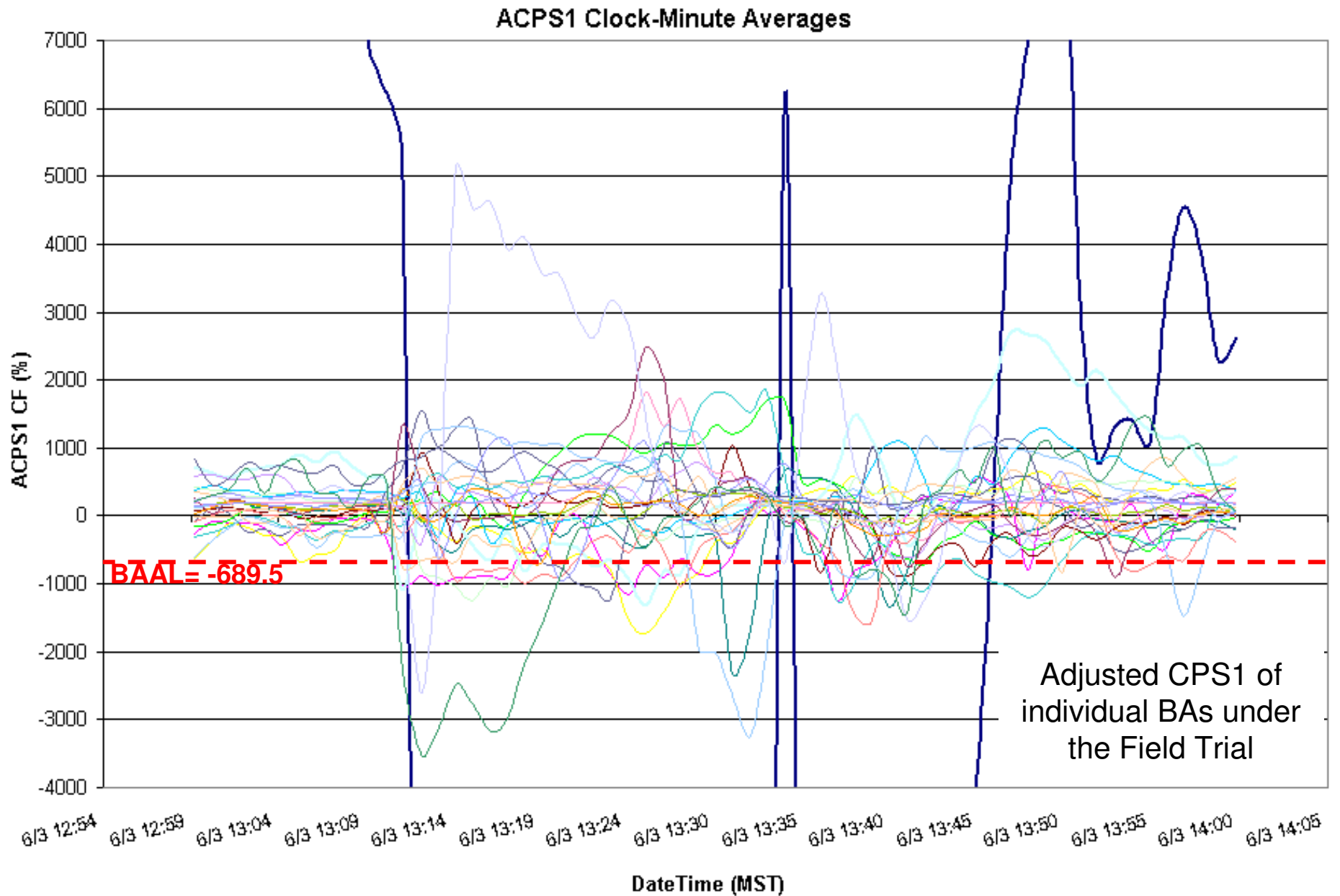
06/03/11 ending 13:21 PDT 06/03/11 ending 13:28 PDT 06/03/11 ending 13:41 PDT 06/03/11 ending 13:48 PDT
8 minute duration below FTL_{Low} 4 minute duration below FTL_{Low} 3 minute duration above FTL_{High} 3 minute duration above FTL_{High}

Clock-Minute Average Frequency



Clock-minute Actual Frequency of Participants

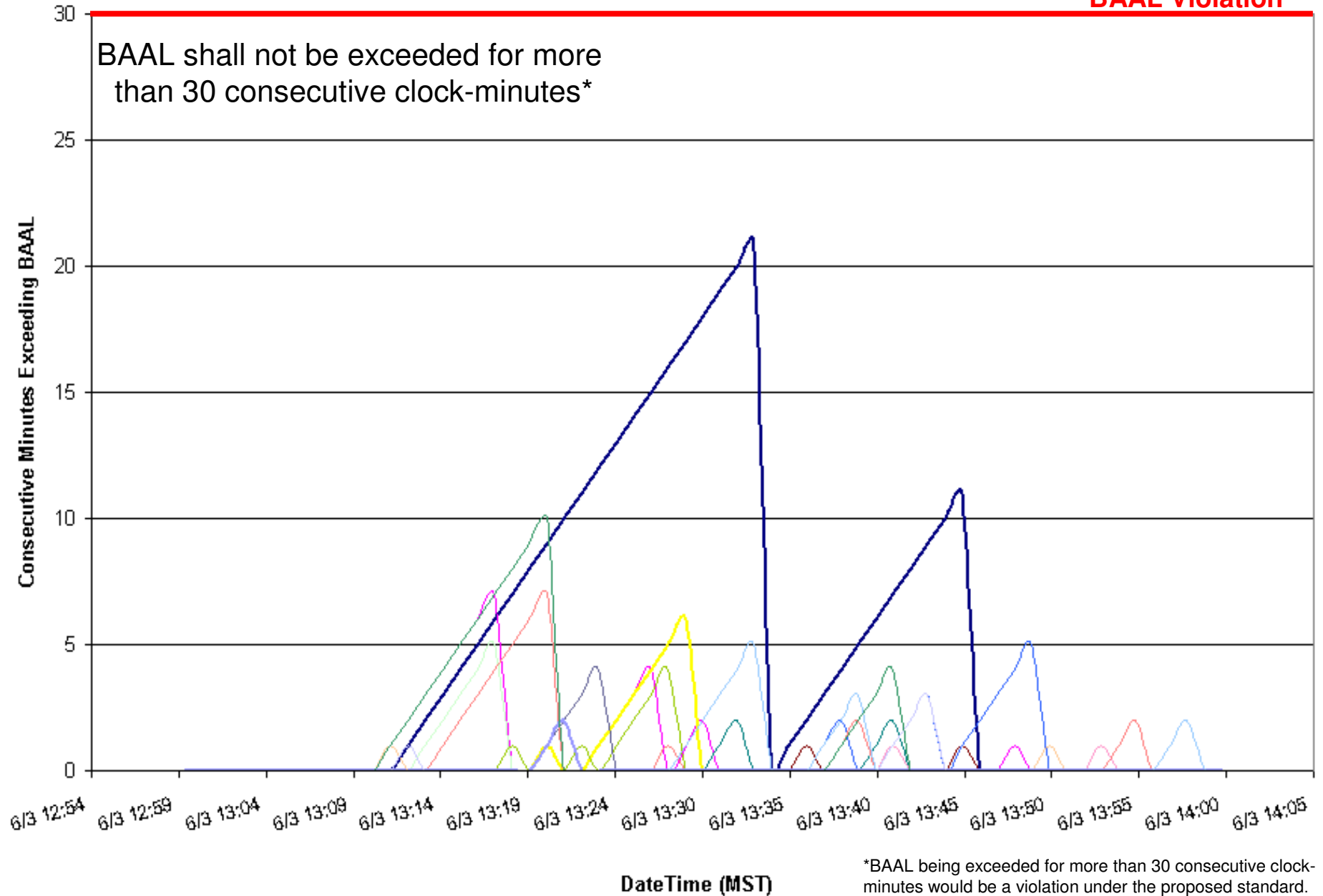
06/03/11 ending 13:21 PDT 06/03/11 ending 13:28 PDT 06/03/11 ending 13:41 PDT 06/03/11 ending 13:48 PDT
8 minute duration below FTL_{Low} 4 minute duration below FTL_{Low} 3 minute duration above FTL_{High} 3 minute duration above FTL_{High}



06/03/11 ending 13:21 PDT 06/03/11 ending 13:28 PDT 06/03/11 ending 13:41 PDT 06/03/11 ending 13:48 PDT
8 minute duration below FTL_{Low} 4 minute duration below FTL_{Low} 3 minute duration above FTL_{High} 3 minute duration above FTL_{High}

Consecutive Minutes Exceeding BAAL

BAAL Violation*



EXAMPLE 2

06/06/11 ending 13:59 PDT

3 minute duration below FTL_{Low}

Clock-Minute Average Frequency

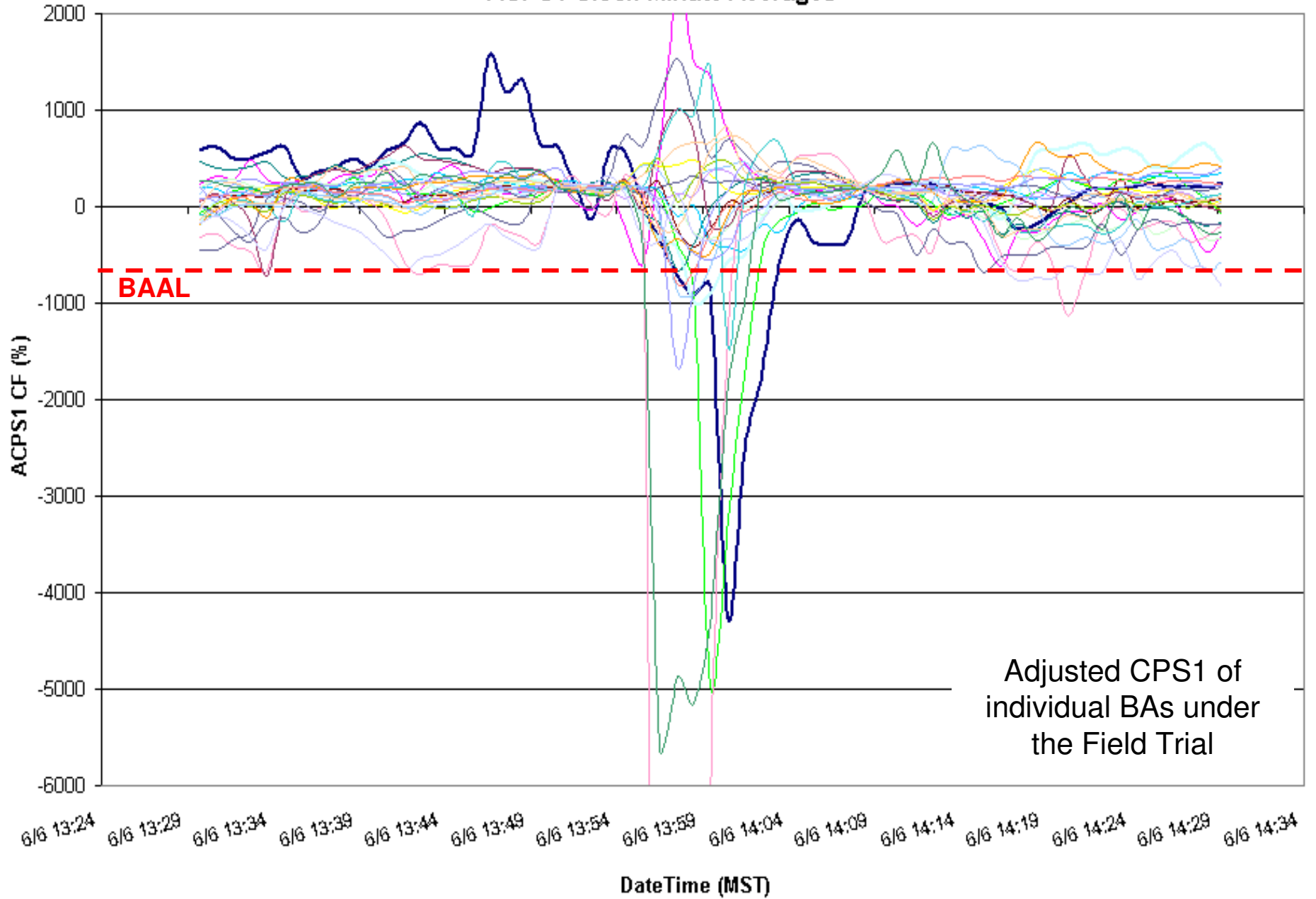


Clock-minute Actual Frequency of Participants

06/06/11 ending 13:59 PDT

3 minute duration below FTL_{Low}

ACPS1 Clock-Minute Averages

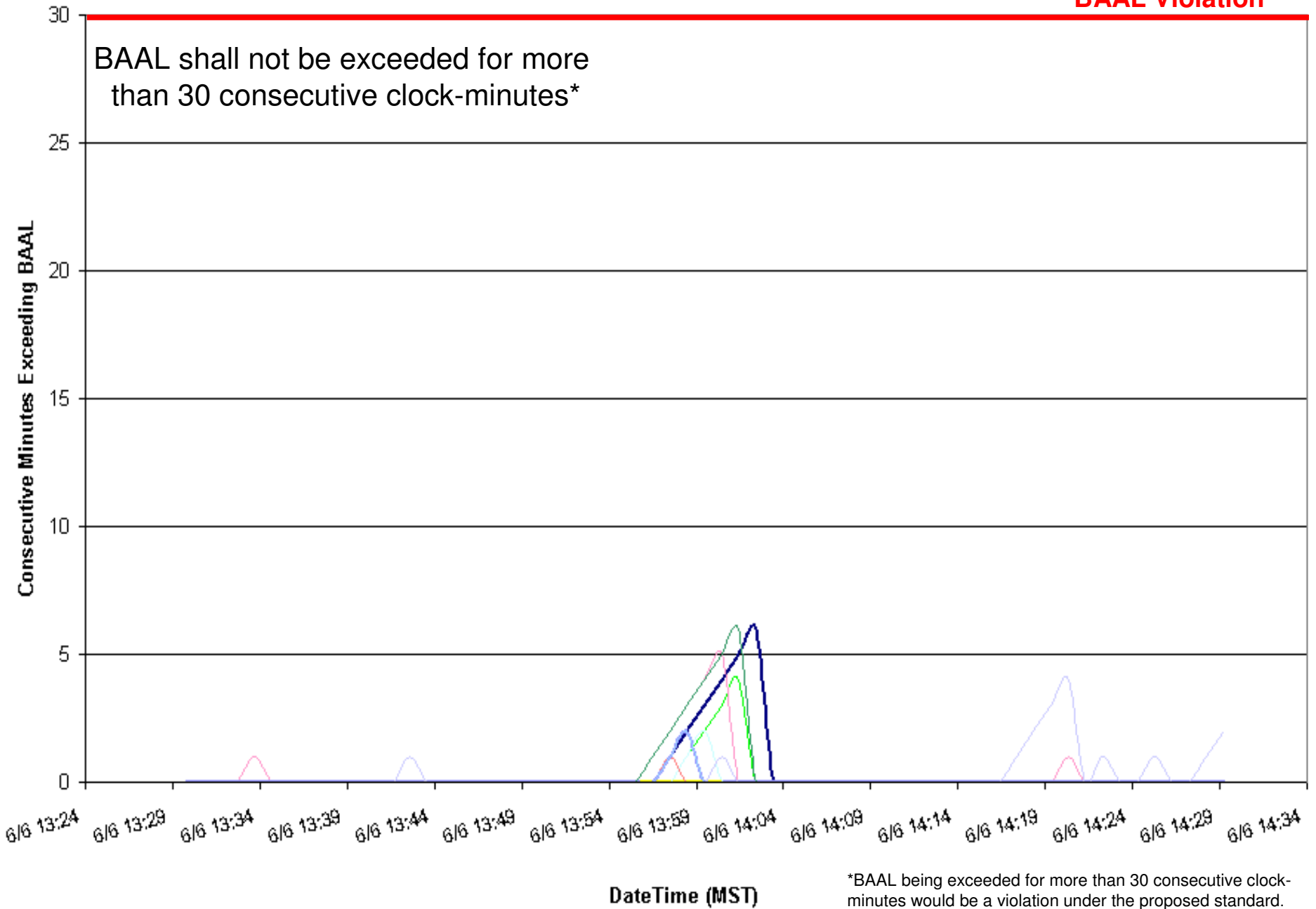


06/06/11 ending 13:59 PDT

3 minute duration below FTL_{Low}

Consecutive Minutes Exceeding BAAL

BAAL Violation*



EXAMPLE 3

06/05/11 ending 23:51 MST

32 minute duration above BAAL_{High}

Clock-Minute Average Frequency

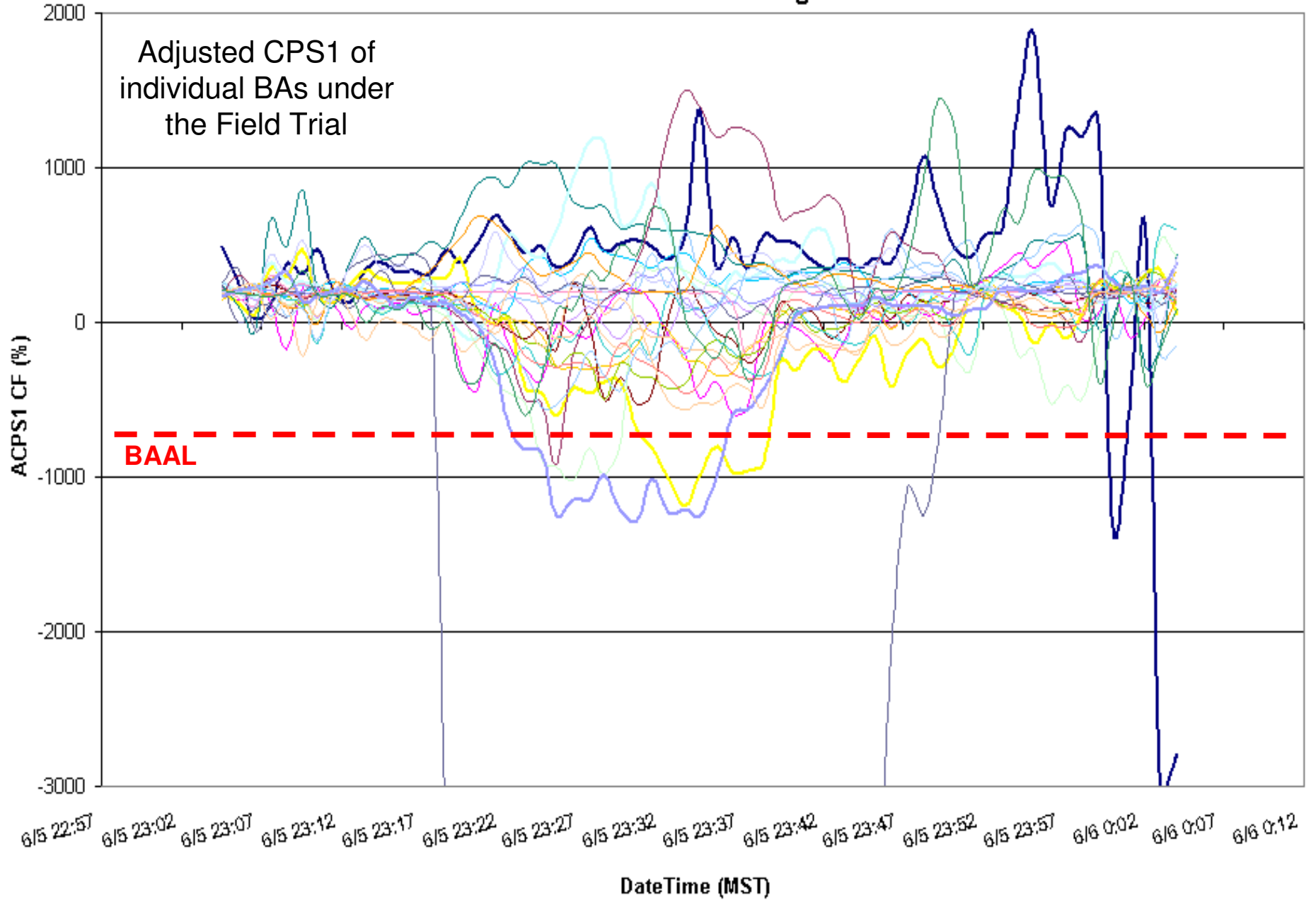


Clock-minute Actual Frequency of Participants

06/05/11 ending 23:51 MST

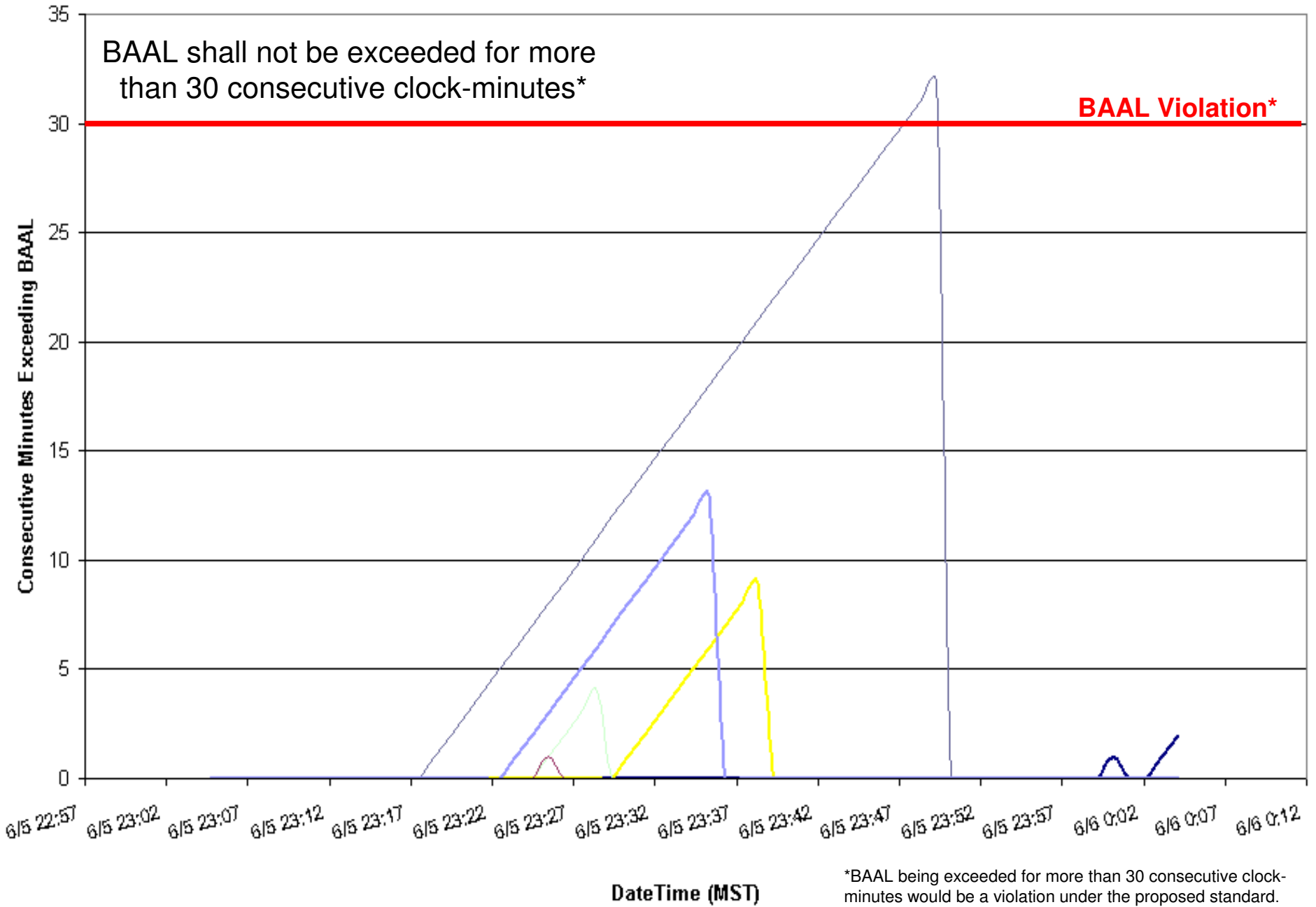
32 minute duration above BAAL_{High}

ACPS1 Clock-Minute Averages



06/05/11 ending 23:51 MST
32 minute duration above BAAL_{High}

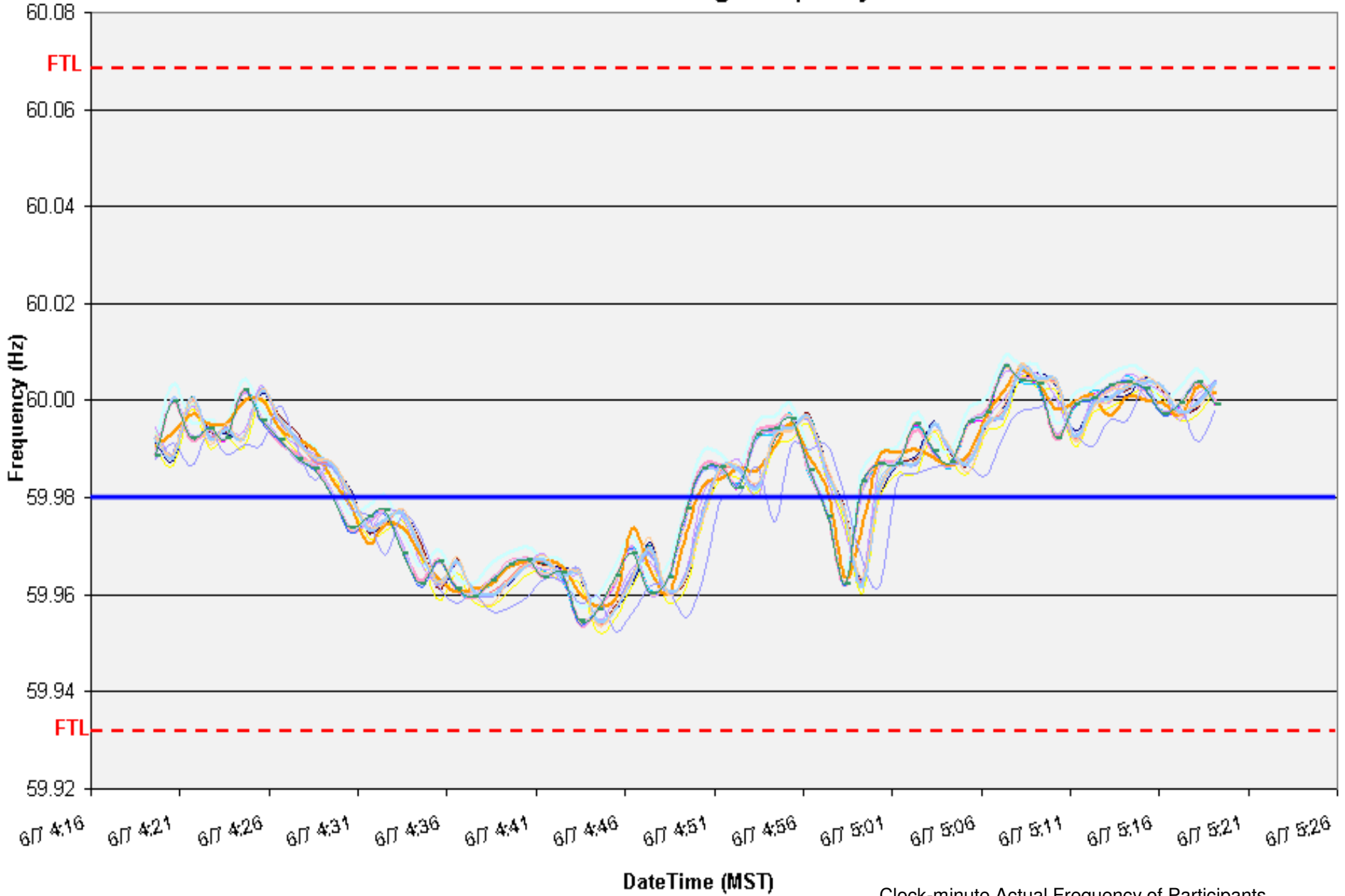
Consecutive Minutes Exceeding BAAL



EXAMPLE 4

06/07/11 ending 06:04 MDT
33 minute duration below BAAL_{Low}
59.98 Scheduled Frequency TEC

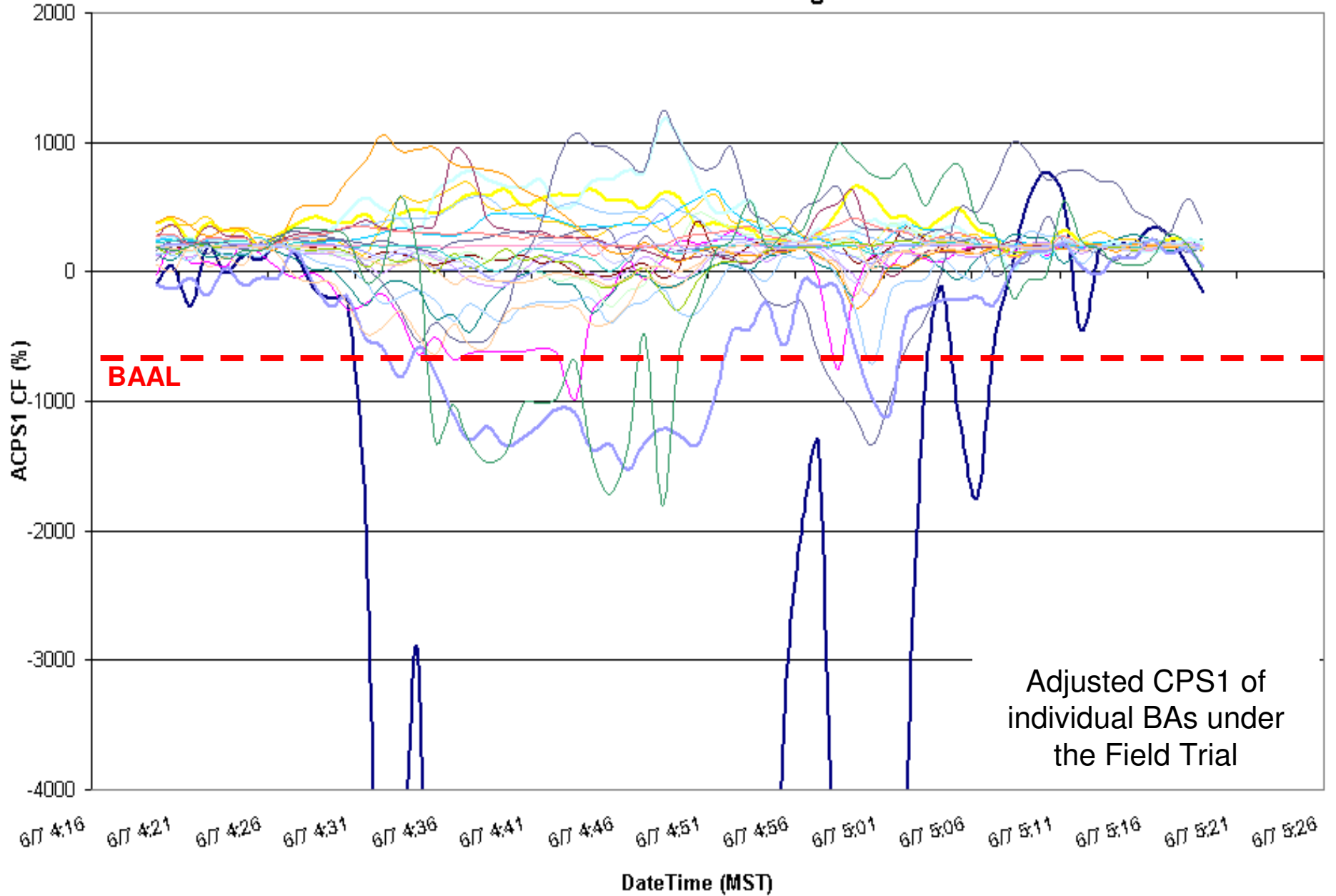
Clock-Minute Average Frequency



Clock-minute Actual Frequency of Participants

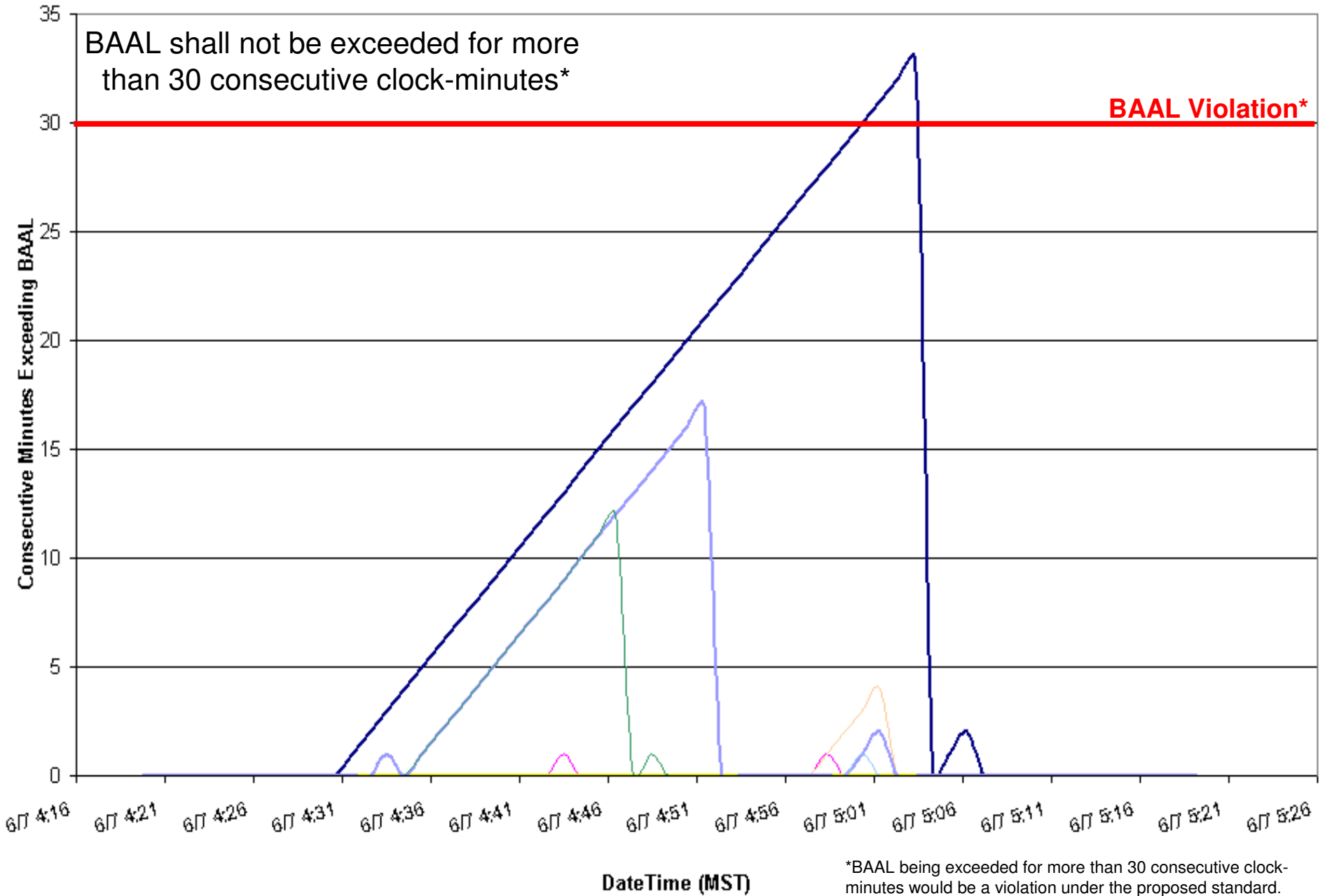
06/07/11 ending 06:04 MDT
33 minute duration below BAAL_{Low}
59.98 Scheduled Frequency TEC

ACPS1 Clock-Minute Averages



06/07/11 ending 06:04 MDT
33 minute duration below BAAL_{Low}
59.98 Scheduled Frequency TEC

Consecutive Minutes Exceeding BAAL



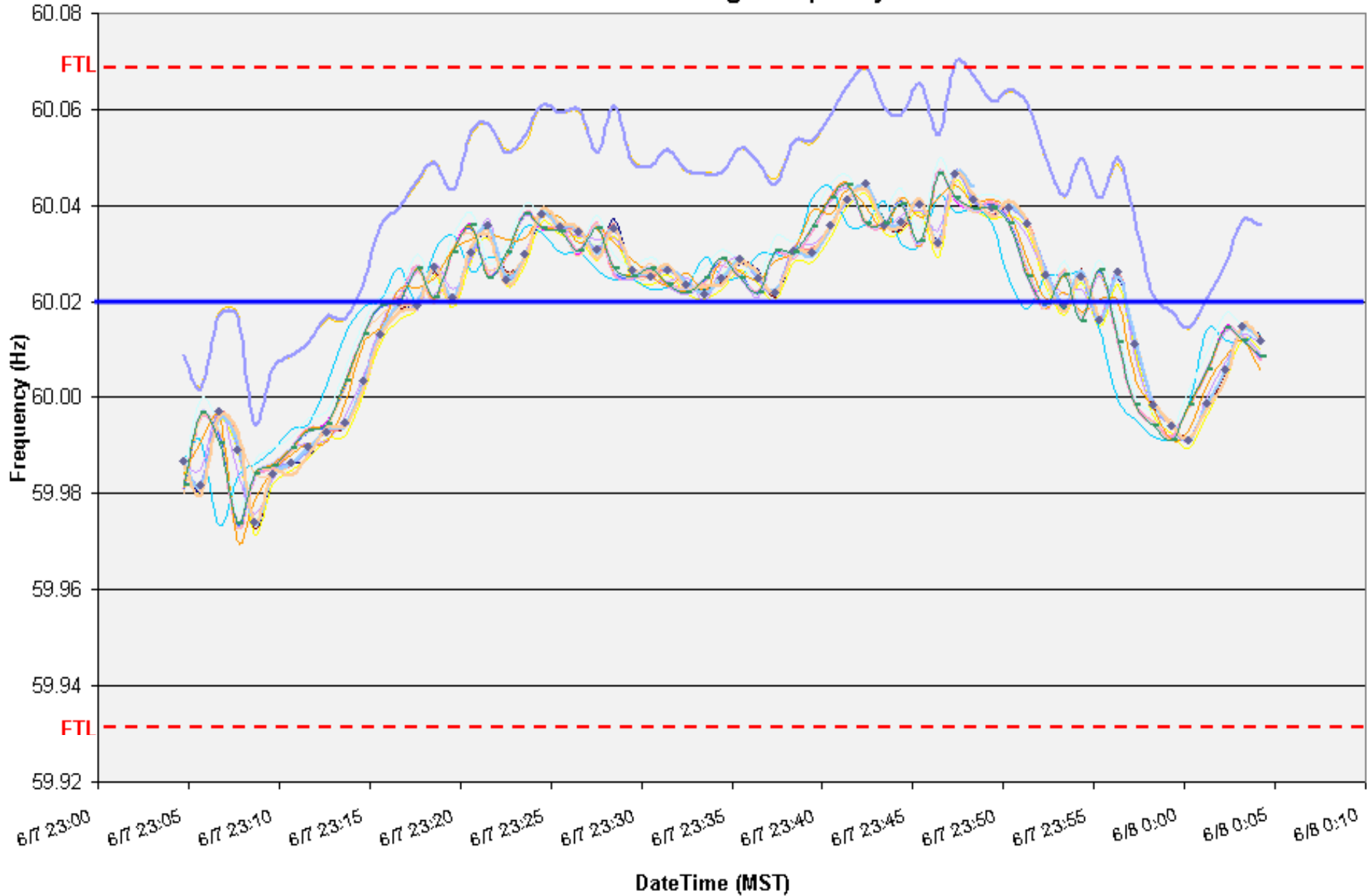
*BAAL being exceeded for more than 30 consecutive clock-minutes would be a violation under the proposed standard.

EXAMPLE 5

06/07/11 ending 23:52 MST
36 minute duration above BAAL_{High}
60.02 Scheduled Frequency TEC

06/08/11 ending 00:50 MDT
34 minute duration above BAAL_{High}
60.02 Scheduled Frequency TEC

Clock-Minute Average Frequency

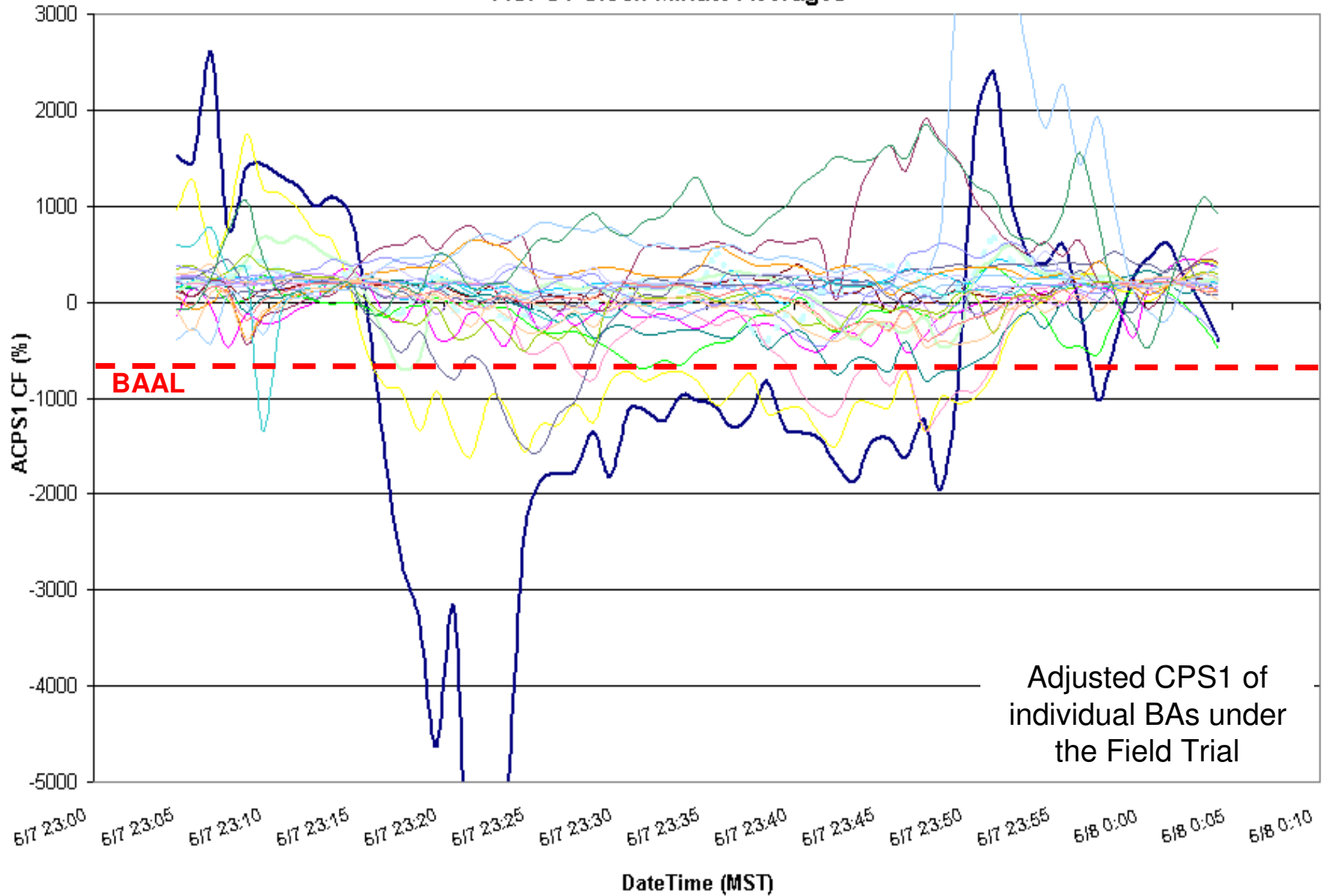


Clock-minute Actual Frequency of Participants

06/07/11 ending 23:52 MST
36 minute duration above BAAL_{High}
60.02 Scheduled Frequency TEC

06/08/11 ending 00:50 MDT
34 minute duration above BAAL_{High}
60.02 Scheduled Frequency TEC

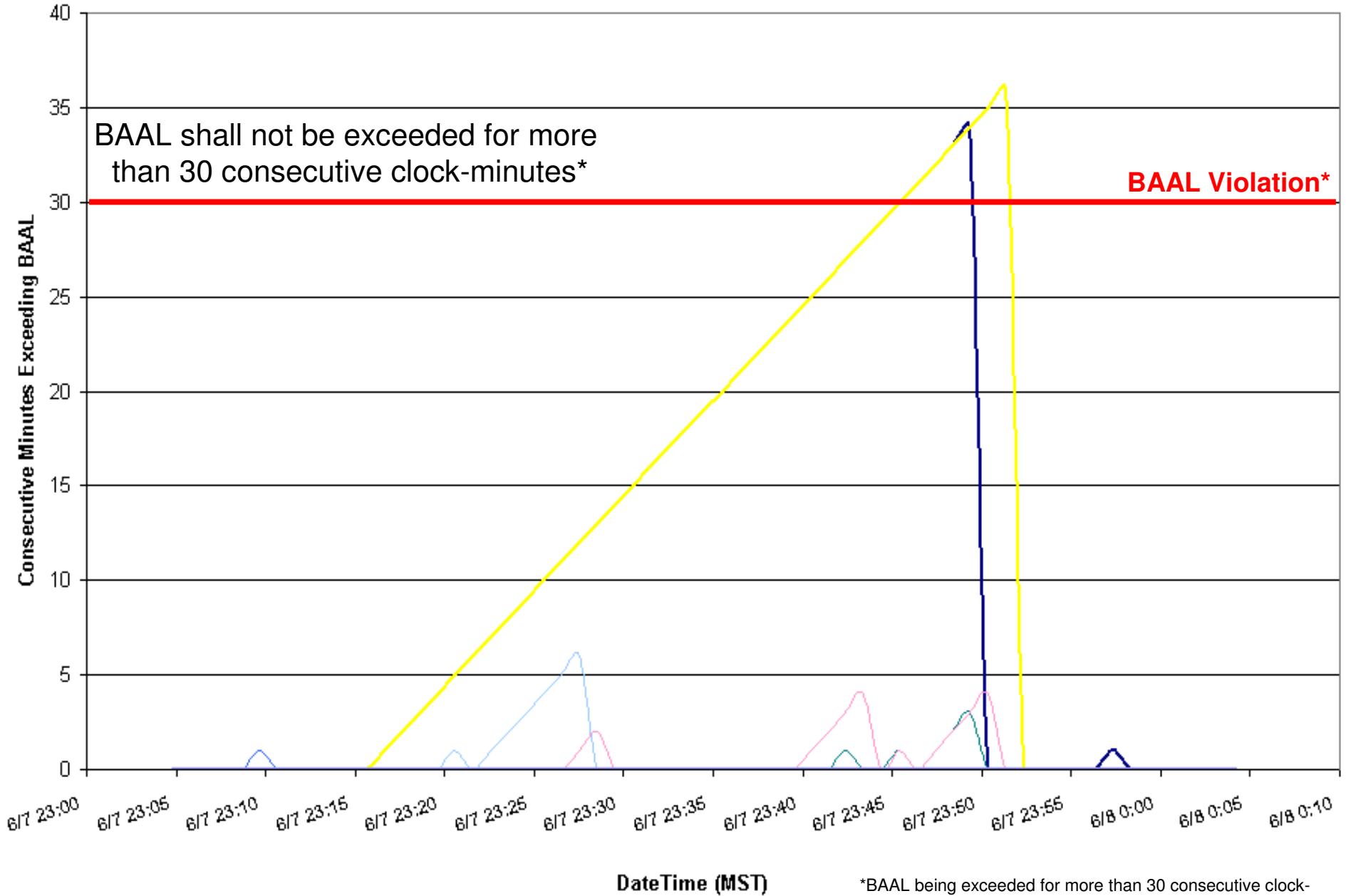
ACPS1 Clock-Minute Averages



06/07/11 ending 23:52 MST
36 minute duration above BAAL_{High}
60.02 Scheduled Frequency TEC

Consecutive Minutes Exceeding BAAL

06/08/11 ending 00:50 MDT
34 minute duration above BAAL_{High}
60.02 Scheduled Frequency TEC

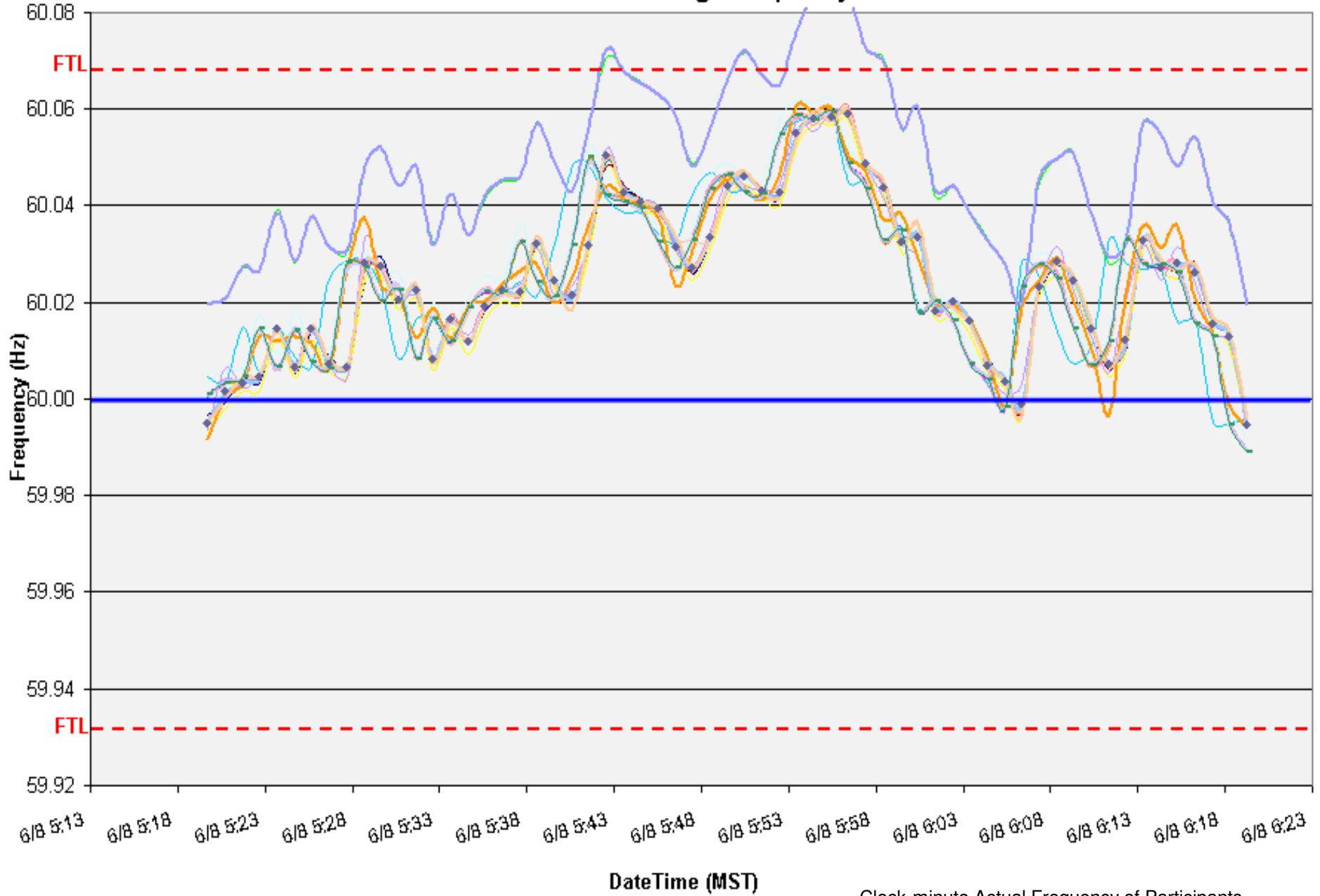


*BAAL being exceeded for more than 30 consecutive clock-minutes would be a violation under the proposed standard.

EXAMPLE 6

06/08/11 ending 06:07 PDT
37 minute duration above BAAL_{High}

Clock-Minute Average Frequency

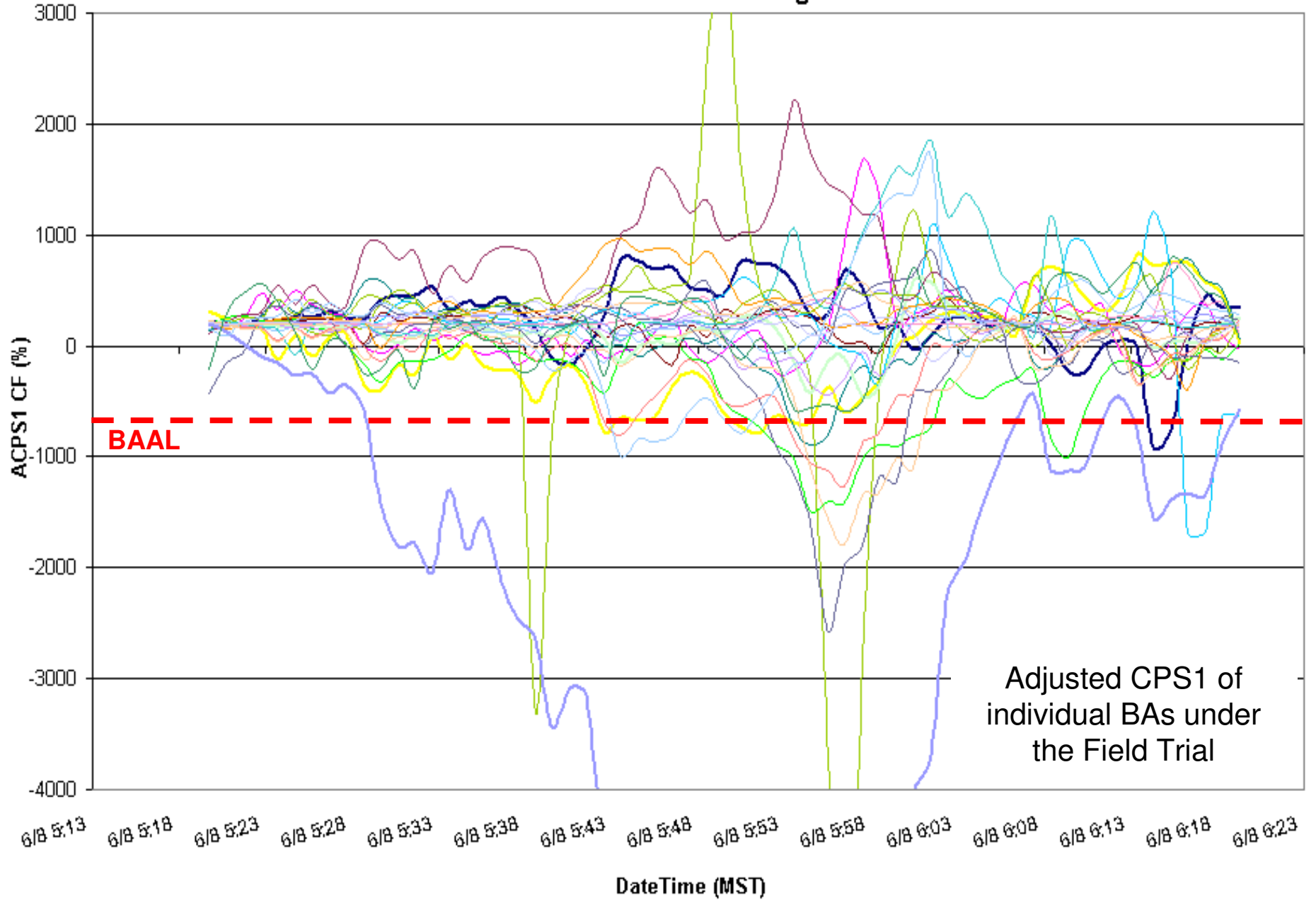


Clock-minute Actual Frequency of Participants

06/08/11 ending 06:07 PDT

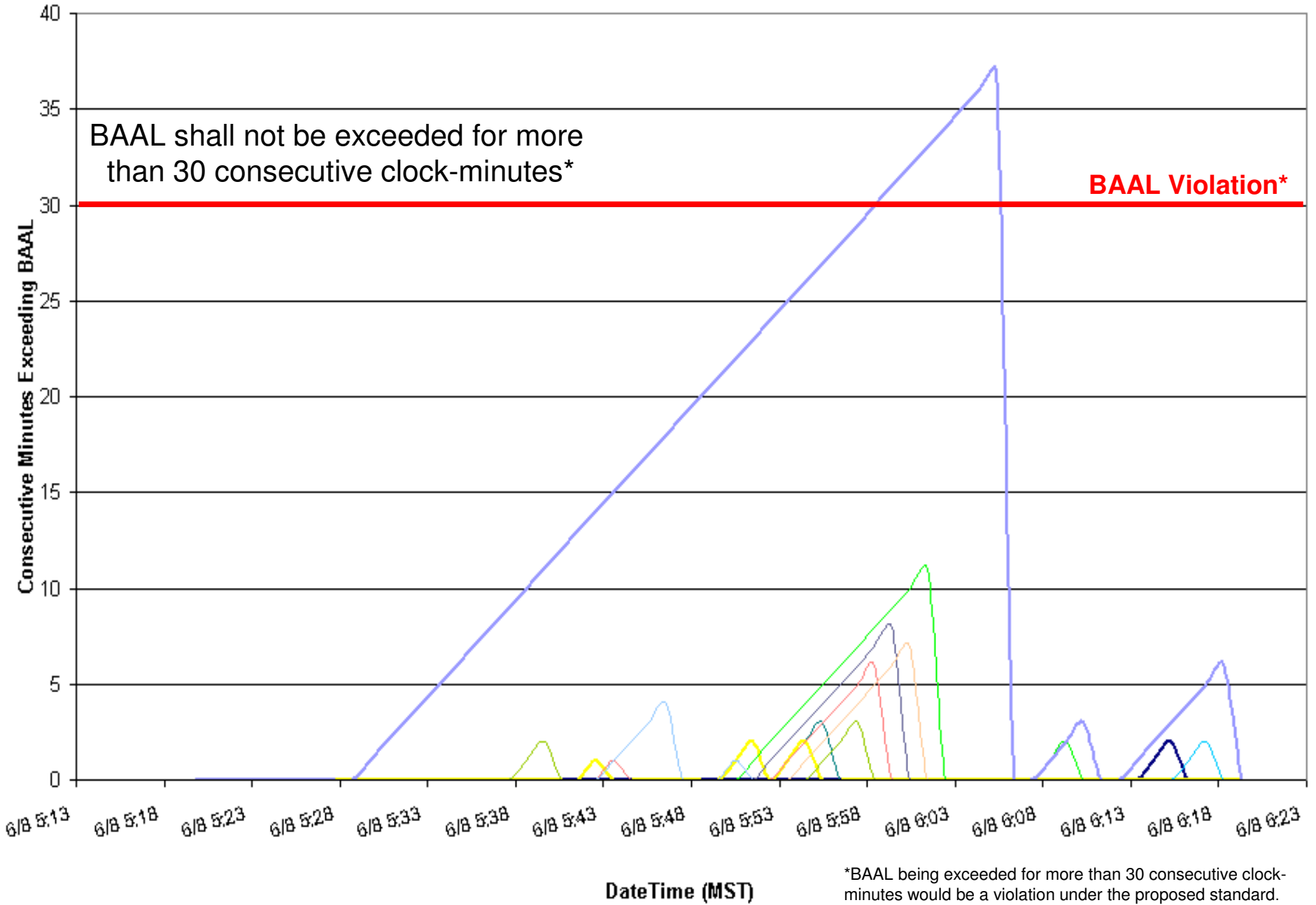
37 minute duration above BAAL_{High}

ACPS1 Clock-Minute Averages



06/08/11 ending 06:07 PDT
37 minute duration above BAAL_{High}

Consecutive Minutes Exceeding BAAL

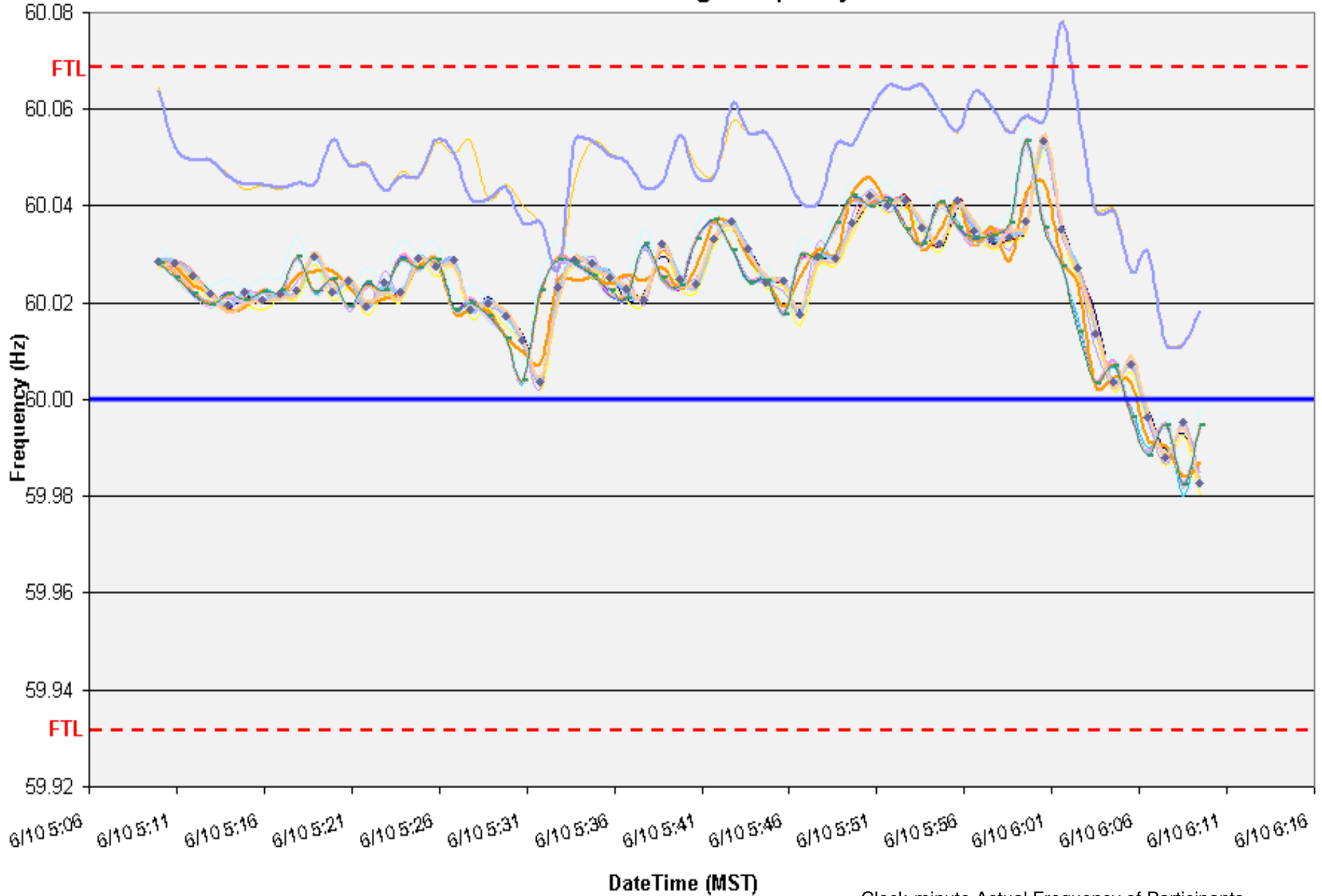


EXAMPLE 7

06/10/11 ending 05:59 PDT

38 minute duration above BAAL_{High}

Clock-Minute Average Frequency

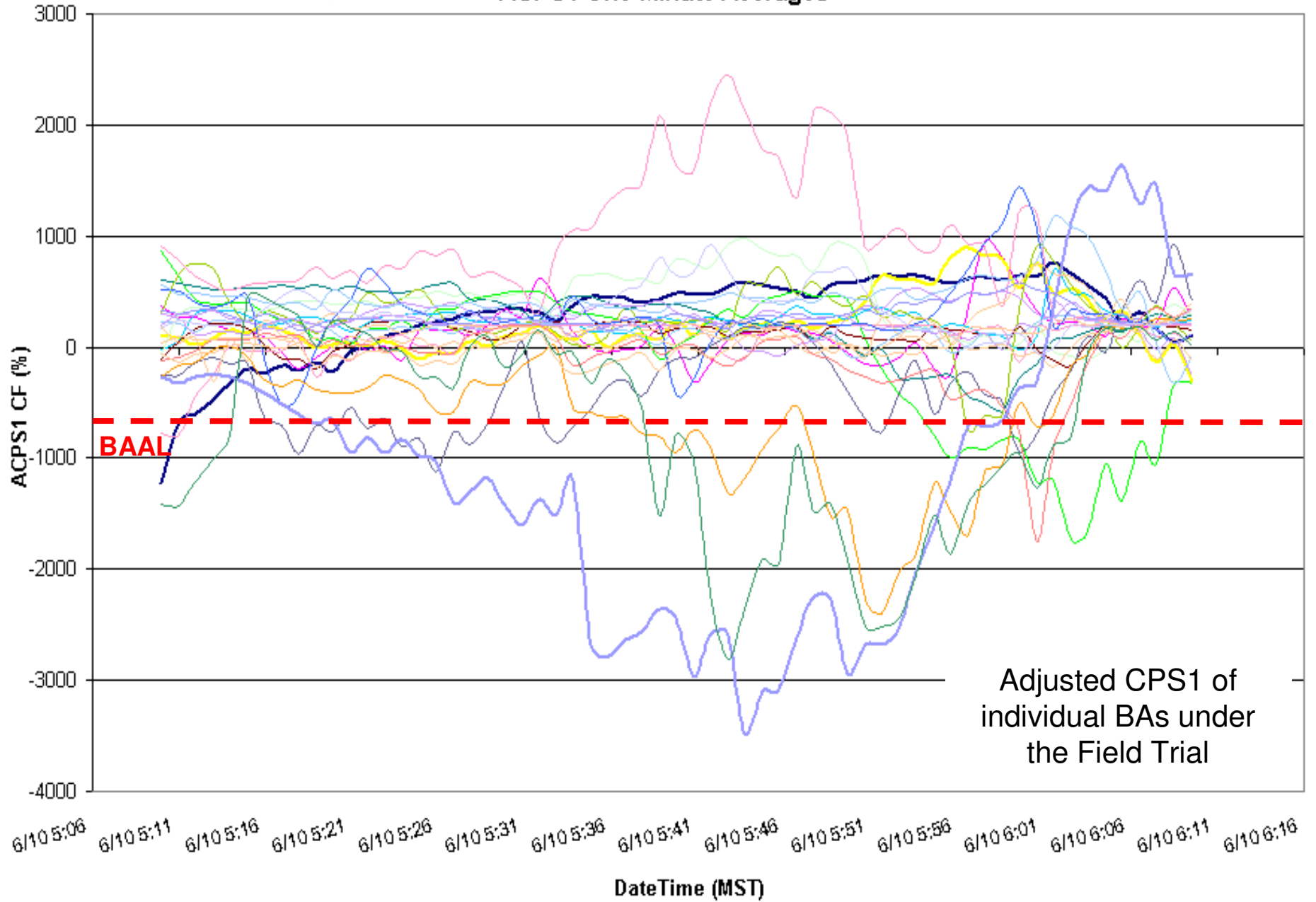


Clock-minute Actual Frequency of Participants

06/10/11 ending 05:59 PDT

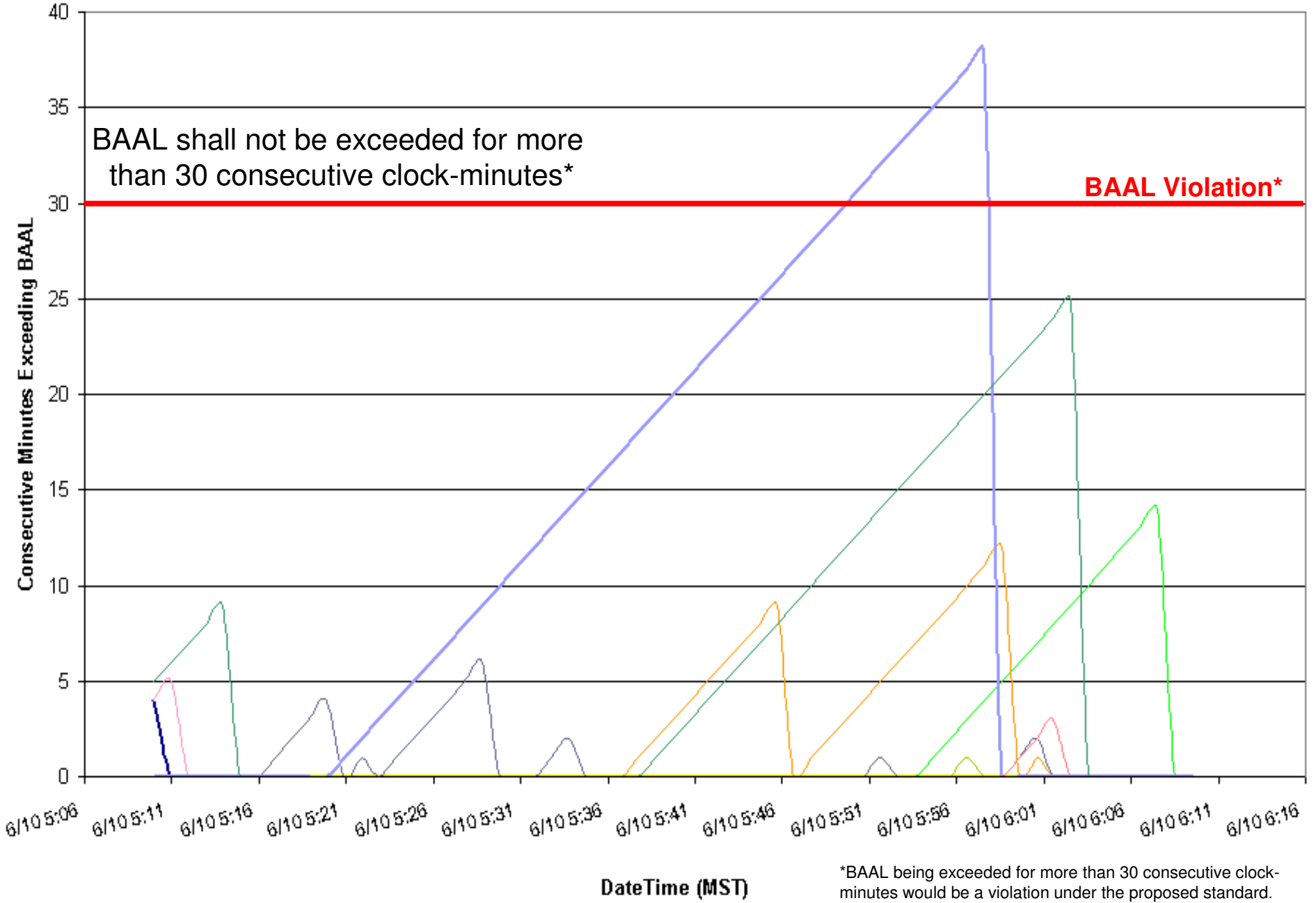
38 minute duration above BAAL_{High}

ACPS1 One-Minute Averages



06/10/11 ending 05:59 PDT
38 minute duration above BAAL_{High}

Consecutive Minutes Exceeding BAAL

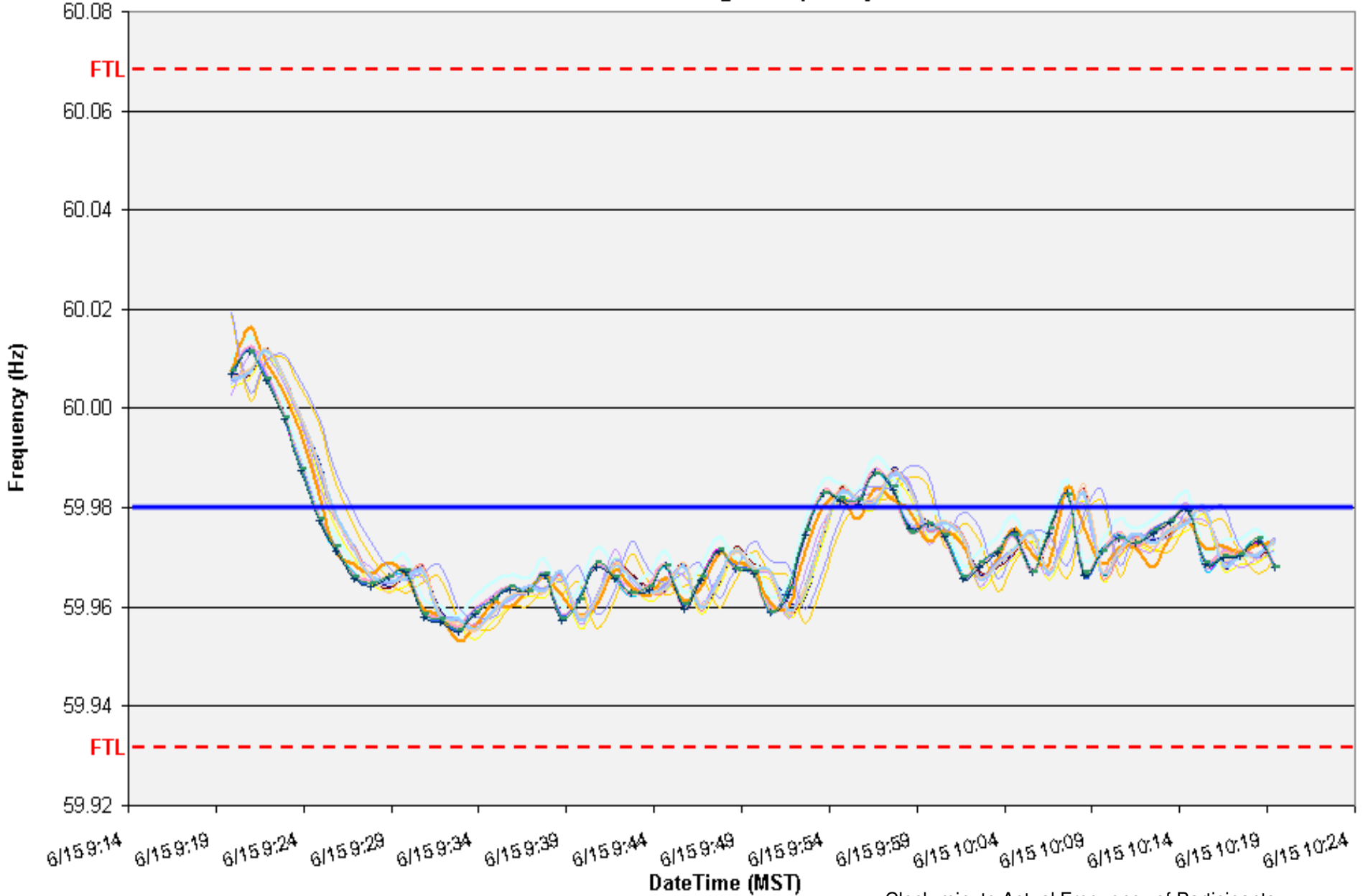


EXAMPLE 8

06/15/11 ending 09:54 MST
27 minute duration below BAAL_{Low}
59.98 Scheduled Frequency TEC

06/15/11 ending 10:14 PDT
45 minute duration below BAAL_{Low}
59.98 Scheduled Frequency TEC

Clock-Minute Average Frequency

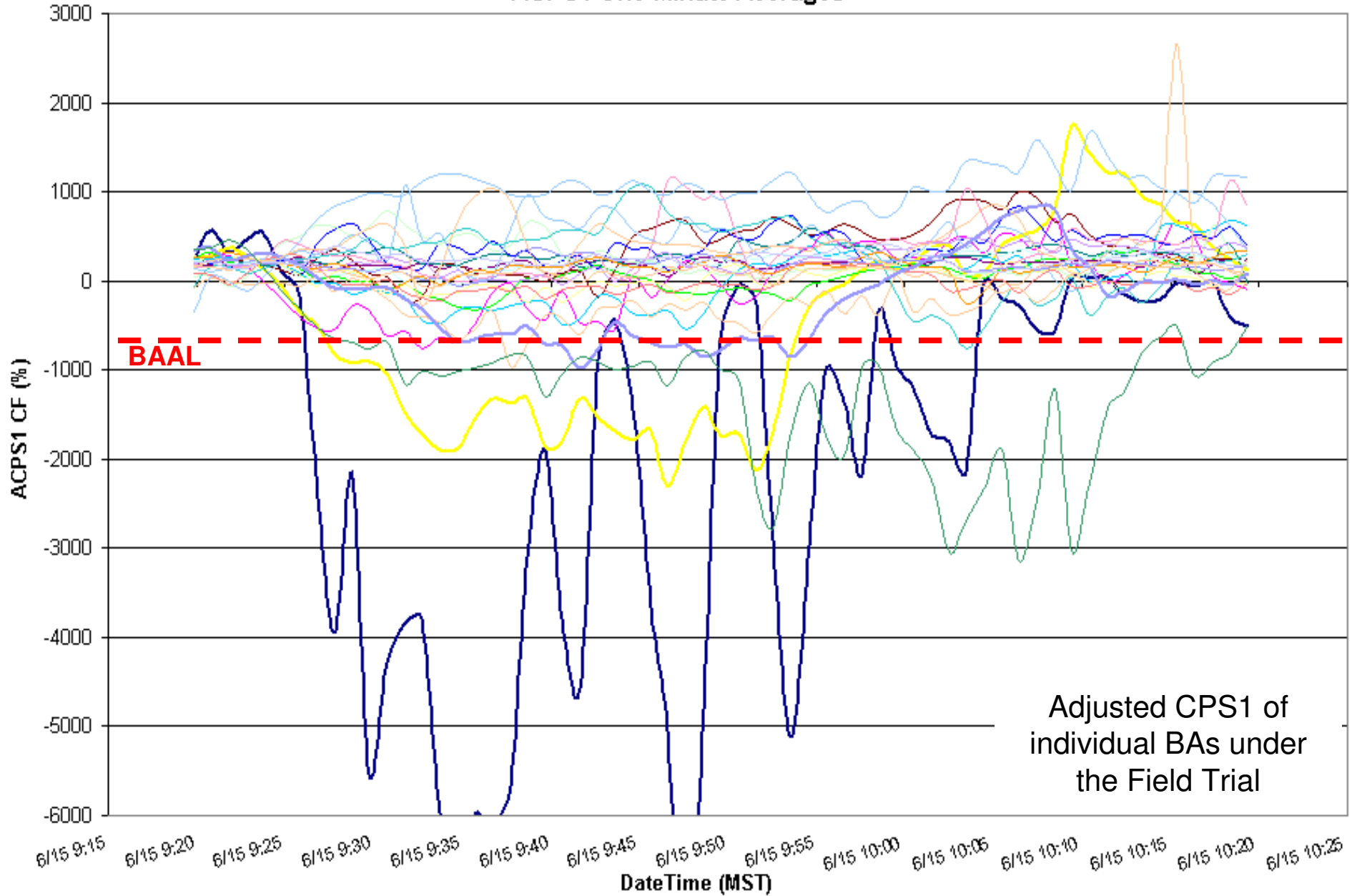


Clock-minute Actual Frequency of Participants

06/15/11 ending 09:54 MST
27 minute duration below BAAL_{Low}
59.98 Scheduled Frequency TEC

06/15/11 ending 10:14 PDT
45 minute duration below BAAL_{Low}
59.98 Scheduled Frequency TEC

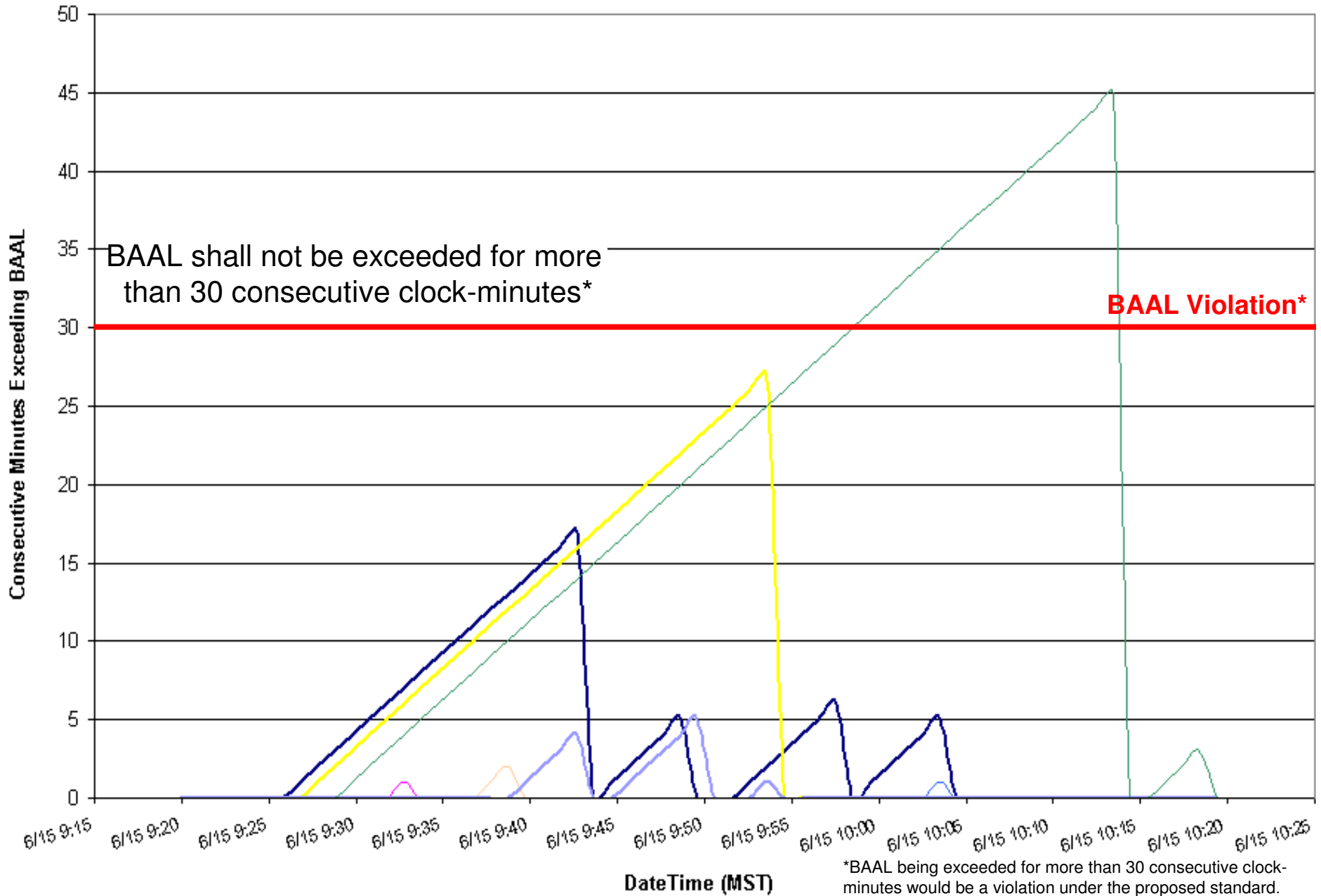
ACPS1 One-Minute Averages



06/15/11 ending 09:54 MST
27 minute duration below BAAL_{Low}
59.98 Scheduled Frequency TEC

06/15/11 ending 10:14 PDT
45 minute duration below BAAL_{Low}
59.98 Scheduled Frequency TEC

Consecutive Minutes Exceeding BAAL



EXAMPLE 9

06/19/11 ending 05:41 MST

38 minute duration above BAAL_{High}

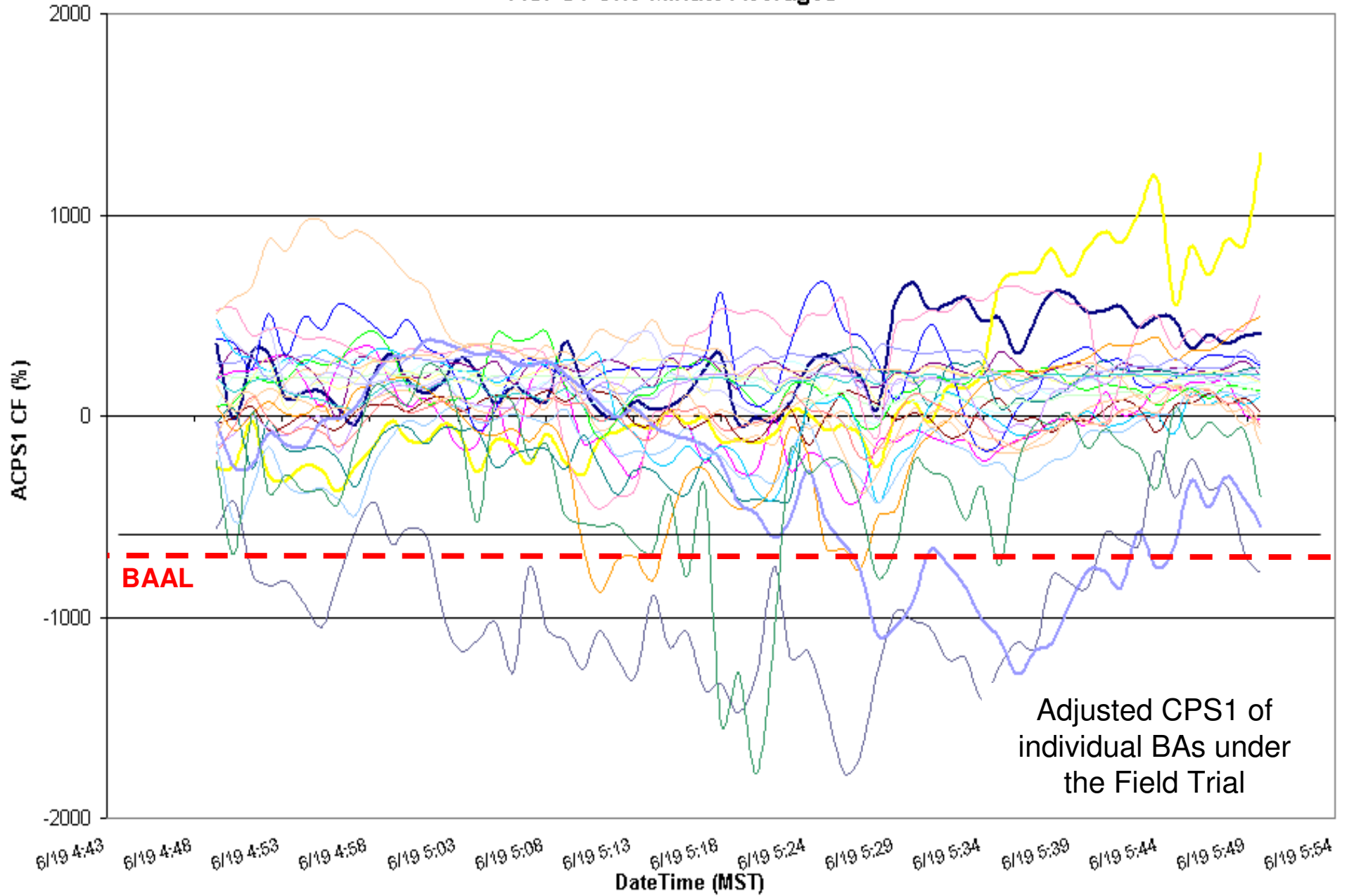
Clock-Minute Average Frequency



Clock-minute Actual Frequency of Participants

06/19/11 ending 05:41 MST
38 minute duration above BAAL_{High}

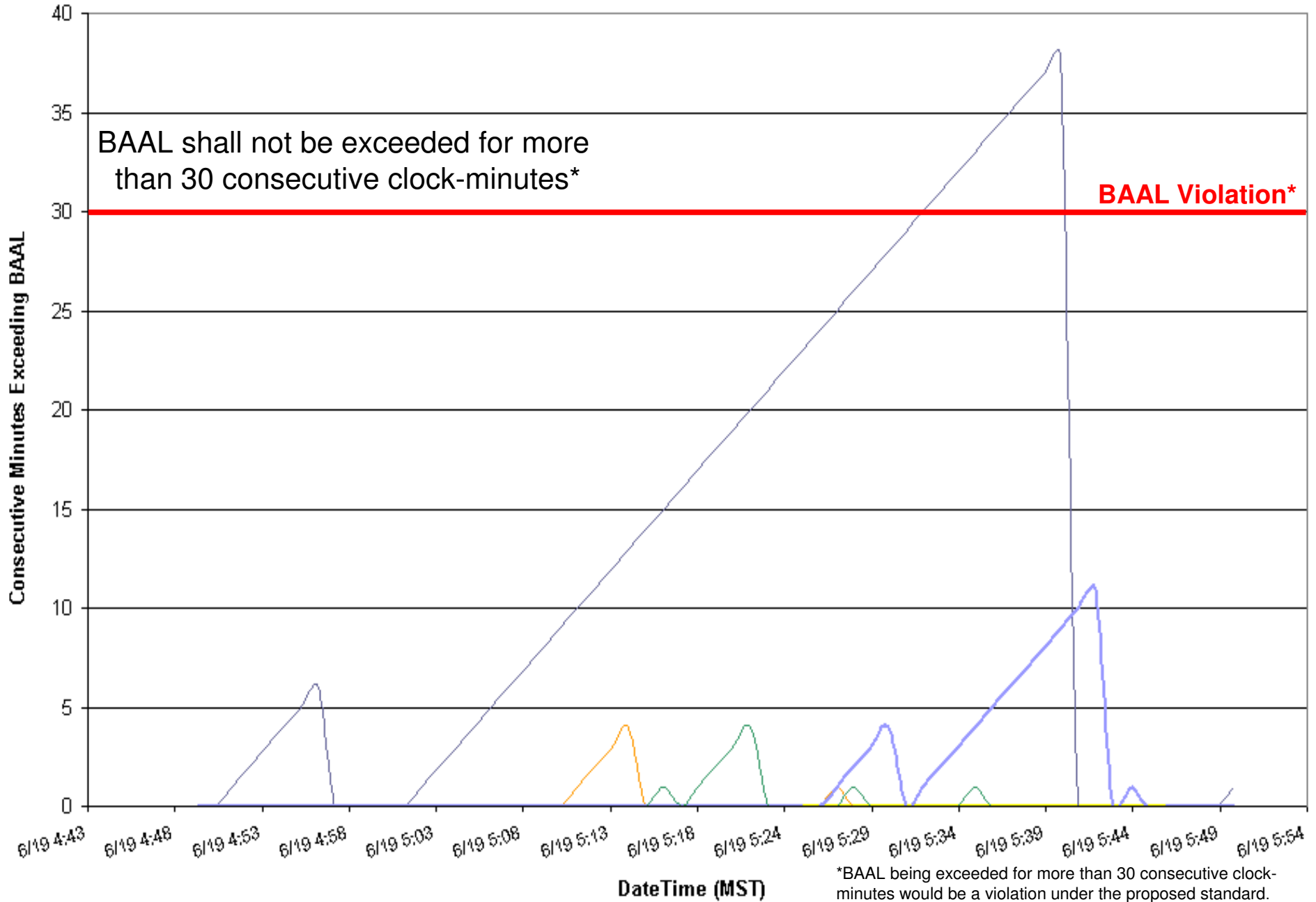
ACPS1 One-Minute Averages



06/19/11 ending 05:41 MST

38 minute duration above BAAL_{High}

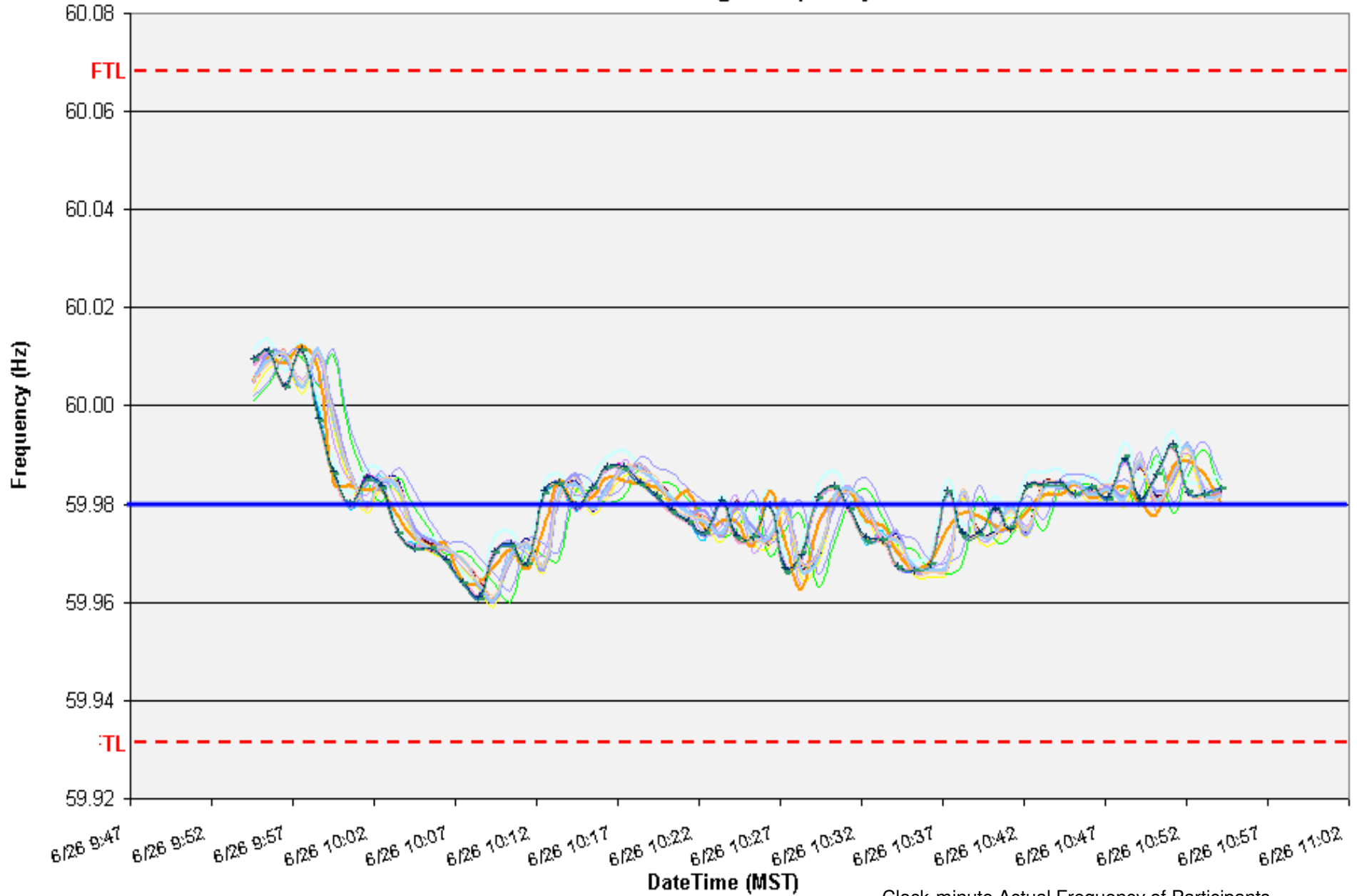
Consecutive Minutes Exceeding BAAL



EXAMPLE 10

06/26/11 ending 10:43 MST
43 minute duration below BAAL_{Low}
59.98 Scheduled Frequency TEC

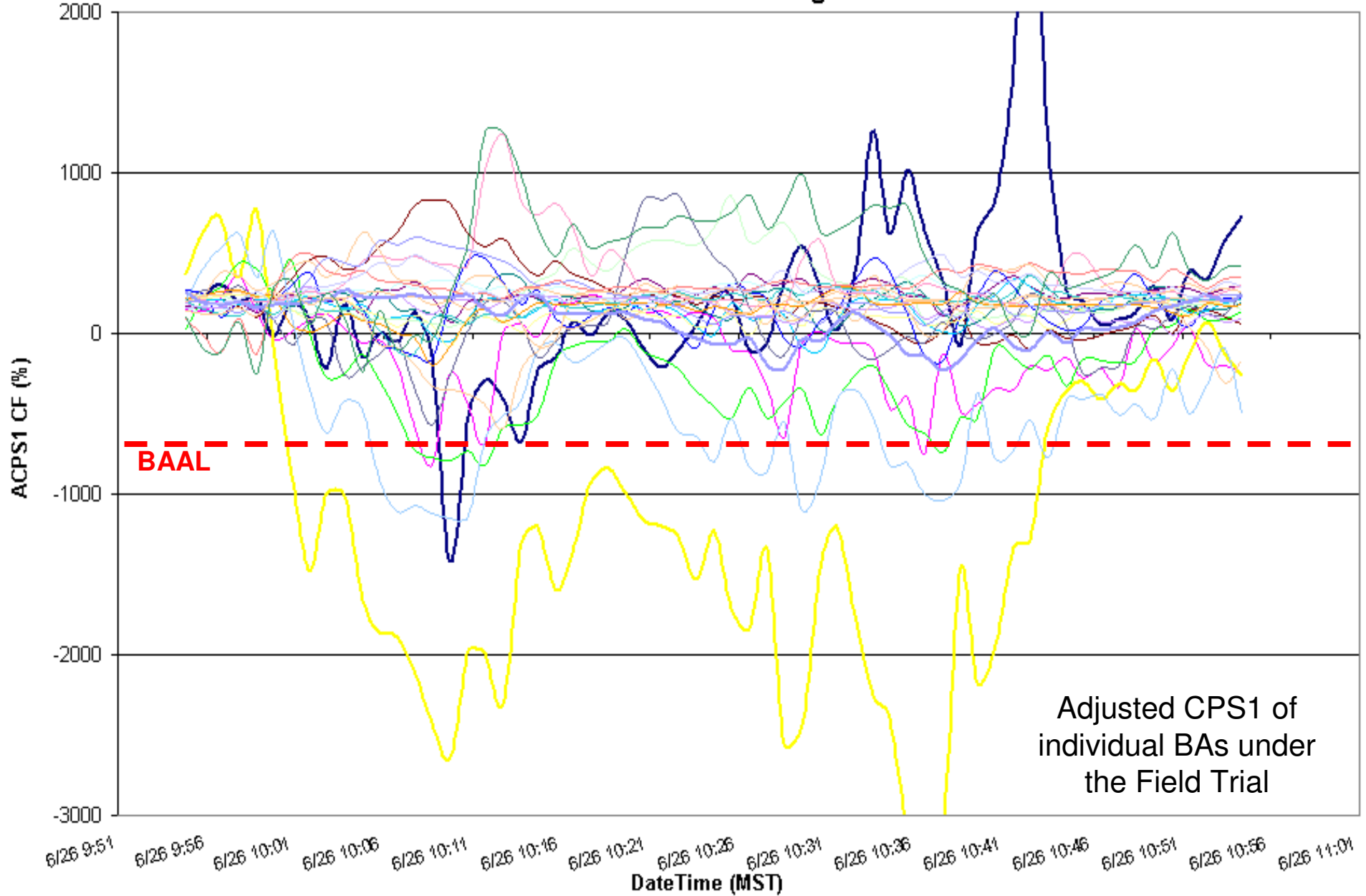
Clock-Minute Average Frequency



Clock-minute Actual Frequency of Participants

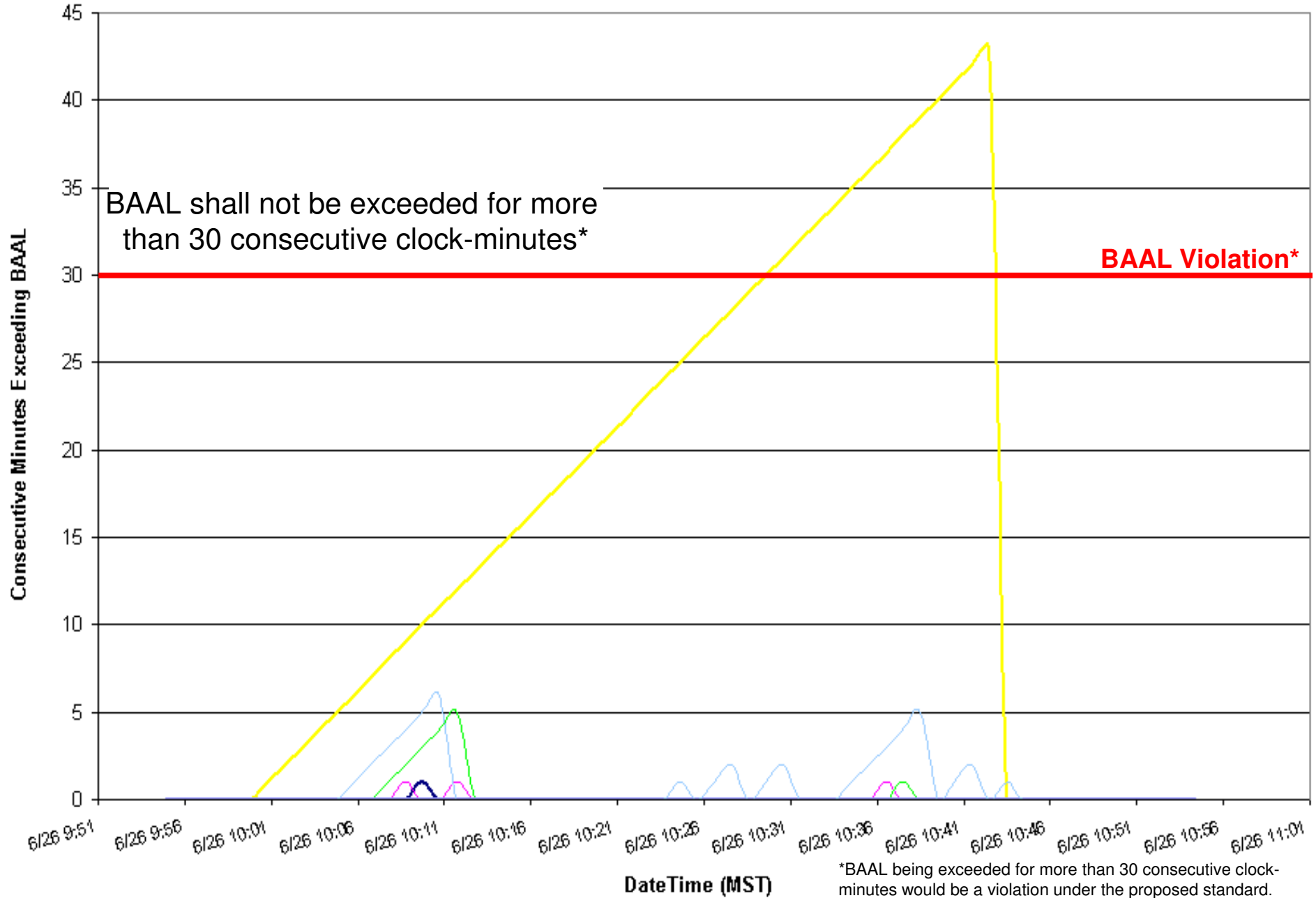
06/26/11 ending 10:43 MST
43 minute duration below BAAL_{Low}
59.98 Scheduled Frequency TEC

ACPS1 One-Minute Averages



06/26/11 ending 10:43 MST
43 minute duration below BAAL_{Low}
59.98 Scheduled Frequency TEC

Consecutive Minutes Exceeding BAAL



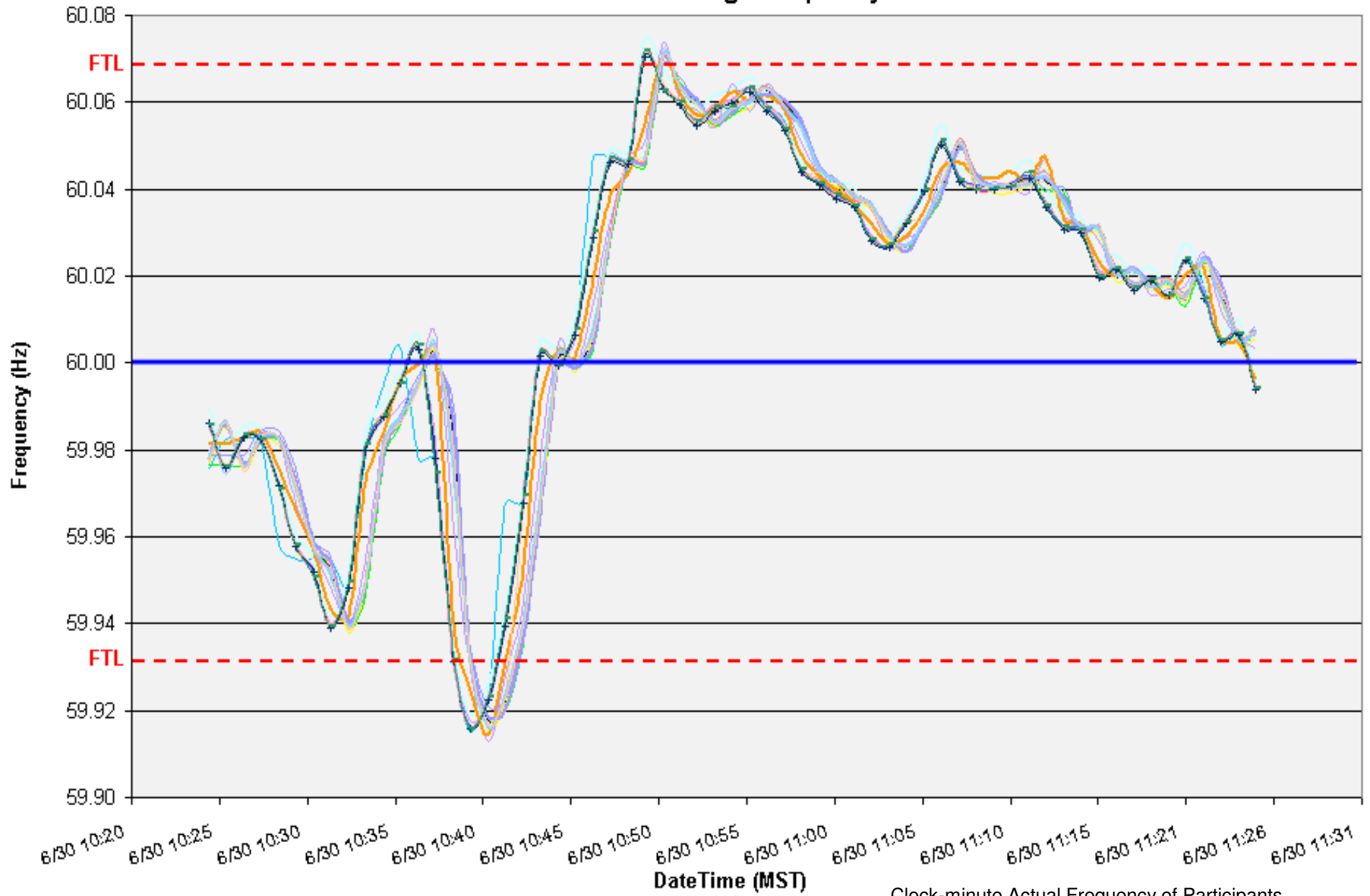
*BAAL being exceeded for more than 30 consecutive clock-minutes would be a violation under the proposed standard.

EXAMPLE 11

06/30/11 ending 10:42 PDT
3 minute duration below FTL_{Low}
59.98 Scheduled Frequency TEC

06/30/11 ending 11:18 PDT
31 minute duration above $BAAL_{High}$
Clock-Minute Average Frequency

06/30/11 ending 10:51 PDT
1 minute duration above FTL_{High}
59.98 Scheduled Frequency TEC



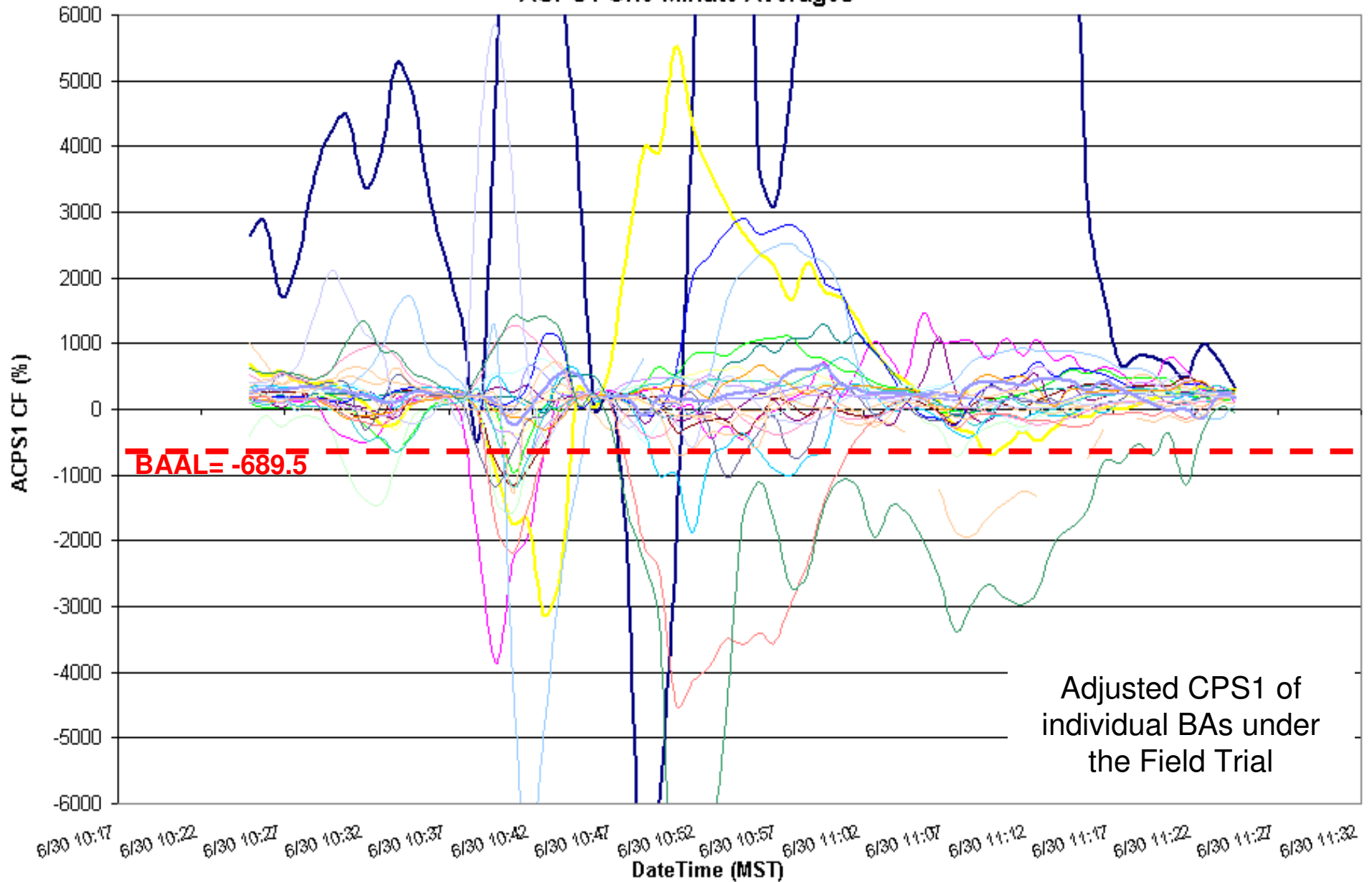
Clock-minute Actual Frequency of Participants

06/30/11 ending 10:42 PDT
3 minute duration below FTL_{Low}
59.98 Scheduled Frequency TEC

06/30/11 ending 11:18 PDT
31 minute duration above $BAAL_{High}$

06/30/11 ending 10:51 PDT
1 minute duration above FTL_{High}
59.98 Scheduled Frequency TEC

ACPS1 One-Minute Averages

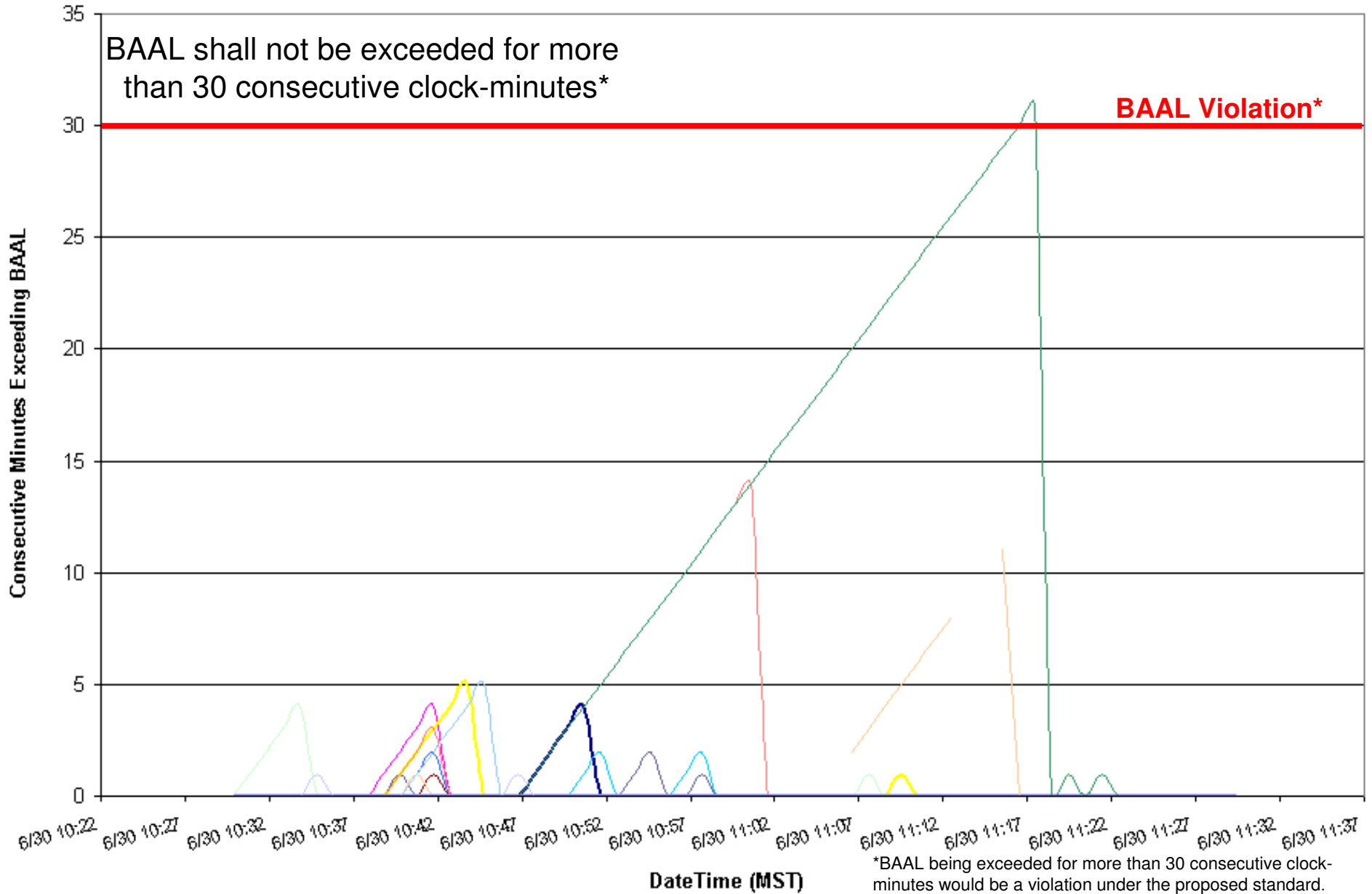


06/30/11 ending 10:42 PDT
3 minute duration below FTL_{Low}
59.98 Scheduled Frequency TEC

06/30/11 ending 11:18 PDT
31 minute duration above $BAAL_{High}$

06/30/11 ending 10:51 PDT
1 minute duration above FTL_{High}
59.98 Scheduled Frequency TEC

Consecutive Minutes Exceeding BAAL



Balancing Authority ACE Limit Proof-of-Concept Field Trial

Examples of circumstances when BAAL was exceeded and actions taken if appropriate

On a monthly basis, each Balancing Authority will review its performance for the prior month and identify any periods where the ACE exceeded the low BAAL ("BAAL_{Low}"), the high BAAL ("BAAL_{High}"), the low ATL or high ATL for more than 30 consecutive clock-minutes. To help the RBCSDT gain a better understanding of the circumstances that all Balancing Authorities may be faced while operating under BAL-007, each Balancing Authority will provide a brief explanation of the circumstances related to any periods where the duration of consecutive clock-minutes exceeded 30 minutes. In the event that no period exceeded 30 minutes in the prior month, but the longest duration exceeded 25 minutes, the Balancing Authority will provide a brief explanation of the circumstances related to that longest-duration event.

Limit Exceeded (Enter one of the following: BAAL high, BAAL low, ATL high, ATL low)	Clock-minute of ACE exceeding the BAAL or ATL (mm/dd/yy hh:mm)	Clock-minute of ACE returning within the BAAL or ATL (mm/dd/yy hh:mm)	Time Zone	Total duration of ACE exceeding the BAAL or ATL (minutes)	Event associated with a DCS-Reportable Event? (0=No, 1=Yes)	Event associated with a resource loss other than a DCS-Reportable Event? (0=No, 1=Yes)	Brief explanation of circumstances and notable actions taken if applicable
BAAL Low	6/7/11 5:32	6/7/11 6:04	MDT	33	0	0	Wind speed dropped earlier than was forecast causing generation to decrease with frequency trending below 59.98 Hz (WECC was in a TEC at the time). Operator deployed all available INC resources to attempt to recover ACE to zero. Operator took action to curtail NF schedules at 5:50 (19 minutes into exceedance), but failed to account for new schedules ramping in at the top of the hour. By the time the operator recognized his error, frequency had increased to the point that the BaaL (Low) violation limit was cleared.
BAAL High	6/8/11 0:17	6/8/11 0:50	MDT	34	0	0	Operator began deploying DEC resources at 00:25. At 00:37 (21 minutes into exceedance), the operator believed he had capped sufficient generation to recover ACE within the BaaL high limit, however, the control center experienced multiple telemetry failures that were later attributed to server maintenance that was not appropriately coordinated. Telemetry was restored at 00:48, and the operator immediately recognized that he had not capped enough generation to recover ACE within the BaaL High limit - he immediately capped additional generation, but the units did not respond quickly enough to recover within the 30-minute limit. Note - ACE was within L ₁₀ from 00:25 on.
BAAL High	6/7/11 23:17	6/7/11 23:52	MST	36	0	0	A scheduled time correction of 60.02 was in progress.
BAAL Low	6/26/11 10:07	6/26/11 10:43	MST	42	0	0	A scheduled time correction of 59.98 was in progress.
BAAL High	6/5/11 23:20	6/5/11 23:51	MST	32	0	0	An Under-Voltage Load Shedding event occurred where approximately 450 MW was shed. Load was not restored quick enough to avoid exceeding BAAL for less than 20 minutes.

Balancing Authority ACE Limit Proof-of-Concept Field Trial

Limit Exceeded (Enter one of the following: BAAL high, BAAL low, ATL high, ATL low)	Clock-minute of ACE exceeding the BAAL or ATL (mm/dd/yy hh:mm)	Clock-minute of ACE returning within the BAAL or ATL (mm/dd/yy hh:mm)	Time Zone	Total duration of ACE exceeding the BAAL or ATL (minutes)	Event associated with a DCS-Reportable Event? (0=No, 1=Yes)	Event associated with a resource loss other than a DCS-Reportable Event? (0=No, 1=Yes)	Brief explanation of circumstances and notable actions taken if applicable
BAAL High	6/19/11 5:04	6/19/11 5:41	MST	38	0	0	The system operator requested its marketing department sell power to reduce ACE which has a time lag before it actually occurs. Therefore, he ordered that remote generation be lowered and was informed that it was already at its minimum value.
BAAL High	6/5/11 5:37	6/5/11 6:01	PDT	25	0	0	All three of these events shared a common cause. When transitioning from off-peak to on-peak the area net schedule changes dramatically. In order to prepare for the large schedule change, concurrent with getting ready for a large early morning load ramp up, many generators are held in on-line. Unfortunately, those units must be held at minimum output meaning little down regulation exists. Hence, the BA is over-generating in the hour before transition to on-peak. This, coupled with system frequency being high at the same time makes for a relatively small BAAL limit. Due to the high frequency, BA is pushed into a BAAL violation.
BAAL High	6/8/11 5:31	6/8/11 6:07	PDT	37	0	0	SAME AS ABOVE
BAAL High	6/10/11 5:22	6/10/11 5:59	PDT	38	0	0	SAME AS ABOVE
BAAL High	6/6/11 23:58	6/7/11 0:25	MST	28	0	0	Resource Operations was importing 320MW over the midnight ramp. In addition, load had dropped 225MW during the time period. Most of the generation decrease had to be absorbed by slow responsive coal units. Also, the interconnection frequency deviation (60.02-60.05) during the time period considerably narrowed the BAAL margin.
BAAL High	6/14/11 5:09	6/14/11 5:38	PPT	30	0	0	Overgeneration condition for HE 0600. Ramped in too much energy from 4:50 to 5:10 and did not have enough generation to back down and load did not increase as quickly as expected. Eventually backed off BA units to reduce overlay transfer from BA to BA.
BAAL Low	6/15/11 9:30	6/15/11 10:14	PPT	45	0	0	Generator slow to ramp up to meet load and schedules for HE 11:00. All other generation sources were loaded except for reserve supply. Plant eventually ramped up to meet schedules.
BAAL High	6/30/11 10:48	6/30/11 11:18	PPT	31	0	0	Generator slow to ramp down to meet load and schedules for HE 12:00. All other generation sources were at minimum loading levels. 6/30/2011. Plant eventually ramped down 200 mw plus to restore ACE.

Balancing Authority ACE Limit Proof-of-Concept Field Trial Project 2010-14

Discussion

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