

# **Balancing Authority ACE Limit Proof-of-Concept Field Trial**

Update Discussion  
October 25, 2007

Doug Hils

Reliability-Based Control SAR Drafting Team

# Balancing Authority ACE Limit Proof-of-Concept Field Trial

Balancing Authorities under Field Trial	Region	RC	2007 Bias (MW/0.1Hz)	Projected Peak (MWH)
AEP - Central and Southwest	SPP	SPP	-100.2	10,024
Alliant Energy (ALTE)	MRO	MISO	-42	2,989
Alliant Energy (ALTW)	MRO	MISO	-57	3,778
Duke Energy - Cinergy BA	RFC	MISO	-130	12,704
East Kentucky Power Cooperative	SERC	TVA	-36	2,901
Entergy Services Inc	SERC	Entergy	-223.46	22,346
Manitoba Hydro	MRO	MISO	-45	4,181
Michigan Electric Coordinated Systems	RFC	MISO	-231	23,077
Northern Indiana Public Service	RFC	MISO	-59	3,547
PJM	RFC	PJM	-1370	136,962
Santee Cooper	SERC	VACAR	-87.1	5,611
Southern Company	SERC	SOCO	-454	45,424
Tennessee Valley Authority	SERC	TVA	-326.78	32,678
Wisconsin Energy Corporation	RFC	MISO	-73	7,238
				<b>313,460</b>
ERCOT	ERCOT	ERCOT	-636	<b>63,312</b>

# 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

	JULY '05 - SEPTEMBER '07 Performance under BAL-007		SEPTEMBER 2007 Performance under BAL-007		
	Max MinCtLow	Max MinCtHigh	Max MinCtLow	Max MinCtHigh	
BA1	13	15	7	6	MinCtLow = Count of consecutive clock-minutes BAAL_Low was exceeded
BA2	20	16	10	8	
BA3	26	16	13	10	
BA4	17	18	8	12	
BA5	16	22	7	11	
BA6	26	23	20	9	MinCtHigh = Count of consecutive clock-minutes BAAL_High was exceeded
BA7	33	24	12	10	
BA8	28	26	19	14	
BA9	24	29	19	21	
BA10	25	31	13	27	
BA11	24	33	12	8	
BA12	22	38	10	12	
BA13	26	40	16	17	
BA14	28	43	11	9	

# FTL<sub>Low</sub> Exceedances

Clock-Minutes of Actual Frequency <= FTL <sub>Low</sub>												
Year	Month	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
2005	7	32	14	7	3	2						5
2005	8	56	36	20	12	8	2	1	1	1	1	10
2005	9	33	20	9	4	2	1	1	1			8
2005	10	43	21	12	5	2	2	1	1	1	1	11
2005	11	58	26	14	5	4	1					6
2005	12	41	18	5	4	2	2	1				7
2006	1	43	20	7	2	2	1					6
2006	2	39	17	4	2	1	1					6
2006	3	50	23	4	2							4
2006	4	58	30	10	5	2						5
2006	5	54	30	15	10	4	4	1	1			8
2006	6	41	22	11	4	1						5
2006	7	34	18	9	4	2	1	1	1	1		9
2006	8	50	26	15	8	3						5
2006	9	38	21	11	4	3	1					6
2006	10	51	26	9	6	2	1					6
2006	11	47	22	10	8	4						5
2006	12	34	14	3	1							4
2007	1	44	21	10	7	3	2	1				7
2007	2	33	13	2								3
2007	3	76	39	18	10	3	2	2	1	1	1	15 *
2007	4	45	18	7	4	3						5
2007	5	64	32	10	7	3						5
2007	6	48	24	12	6	2	1					6
2007	7	32	19	8	4	2	1					6
2007	8	31	16	9	3	2	1					6
2007	9	41	27	12	6	4	2	2	1			8
<b>SUM</b>		1216	613	263	136	66	26	11	7	4	3	

This chart lists the number of times that the duration of the FTL<sub>Low</sub> exceedance was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column. \*The 15-minute duration in March 2007 was for the Monday morning after the change to the new Daylight Savings Time.

# FTL<sub>Low</sub> Exceedances at 60 Hz Scheduled Frequency

Clock-Minutes of Actual Frequency <= FTL <sub>Low</sub> and 60 Hz Scheduled Frequency												
Year	Month	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
2005	7	16	8	4	1	1						5
2005	8	39	23	13	9	6	1					6
2005	9	16	9	6	3	2	1	1	1			8
2005	10	22	10	5	2	2	2	1	1	1	1	11
2005	11	26	10	4	1	1	1					6
2005	12	23	8	2	1	1	1					6
2006	1	21	7	2	1	1	1					6
2006	2	39	17	4	2	1	1					6
2006	3	33	15	2	1							4
2006	4	46	25	9	4	2						5
2006	5	33	19	8	5	1	1					6
2006	6	19	9	5	1							4
2006	7	22	11	6	1							4
2006	8	39	22	14	8	3						5
2006	9	29	17	8	2	2	1					6
2006	10	24	14	2	2							4
2006	11	19	8	4	3	1						5
2006	12	10	5	2	1							4
2007	1	14	7	3	2	1	1	1				7
2007	2	22	8	1								3
2007	3	41	17	7	6	2	1	1	1	1	1	15 *
2007	4	21	10	4	3	3						5
2007	5	26	10	4	4	2						5
2007	6	19	10	2								3
2007	7	11	5	2	1							4
2007	8	9	6	5	2	2	1					6
2007	9	28	22	10	6	4	2	2	1			8
<b>SUM</b>		667	332	138	72	38	15	6	4	2	2	

This chart lists the number of times that the duration of the FTL<sub>Low</sub> exceedance was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column. \*The 15-minute duration in March 2007 was for the Monday morning after the change to the new Daylight Savings Time.

# FTL<sub>Low</sub> Exceedances at 60 Hz Scheduled Frequency

Clock-Minutes of Actual Frequency <= FTL <sub>Low</sub> and 60 Hz Scheduled Frequency												
Year	Month	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
2005	7	16	8	4	1	1						5
2005	8	39	23	13	9	6	1					6
2005	9	16	9	6	3	2	1	1	1			8
2005	10	22	10	5	2	2						4
2005	11	26	10	4	1	1						4
2005	12	23	8	2	1	1						4
2006	1	21	7	2	1	1						4
2006	2	39	17	4	2	1						4
2006	3	33	15	2	1							4
2006	4	46	25	9	4	2						4
2006	5	33	19	8	5	1						4
2006	6	19	9	5	1							4
2006	7	22	11	6	1							4
2006	8	39	22	14	8	3						4
2006	9	29	17	8	2	2						4
2006	10	24	14	2	2							4
2006	11	19	8	4	3	1						4
2006	12	10	5	2	1							4
2007	1	14	7	3	2	1	1	1				7
2007	2	22	8	1								3
2007	3	41	17	7	6	2	1	1	1	1	1	15 *
2007	4	21	10	4	3	3						5
2007	5	26	10	4	4	2						5
2007	6	19	10	2								3
2007	7	11	5	2	1							4
2007	8	9	6	5	2	2	1					6
2007	9	28	22	10	6	4	2	2	1			8
<b>SUM</b>		667	332	138	72	38	15	6	4	2	2	

Since the start of the Field Trial in July 2005, FTL<sub>Low</sub> has been exceeded 0.20% of the clock-minutes.

Approximately 43.6% of the FTL<sub>Low</sub> exceedances occurred during time-error correction at 59.98 Hz where the frequency error did not exceed -0.05 Hz, indicating that FTL<sub>Low</sub> exceedances could be reduced by over 43% if time-error correction was eliminated.

This chart lists the number of times that the duration of the FTL<sub>Low</sub> exceedance was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column. \*The 15-minute duration in March 2007 was for the Monday morning after the change to the new Daylight Savings Time.

# FTL<sub>Low</sub> Exceedances by Hour

## July 2005 – September 2007

Clock-Minutes of Actual Frequency <= FTL <sub>Low</sub>											
Hour	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
0	71	37	16	9	4	2					6
1	41	18	8	4	1						5
2	13	7	2	1							4
3	10	5	1								3
4	11	5	2								3
5	114	72	36	20	10	4	2	2			8
6	101	41	14	6	4	3	2	1	1	1	15*
7	67	35	12	2	1						5
8	73	39	17	8	5	2	1	1	1	1	10
9	39	12	7	1							4
10	26	11	4	3							4
11	42	19	6	4	1	1	1				7
12	34	9	1	1							4
13	23	9	2	1							4
14	25	11	2								3
15	13	7	2								3
16	12	5	4	2	1	1					6
17	28	12	4	1							4
18	34	15	4	3							4
19	28	9	4	3	1						5
20	56	27	12	6	4						5
21	102	60	25	16	8	2	1				7
22	164	100	58	37	21	9	4	3	2	1	11
23	89	48	20	8	5	2					6
<b>Sum</b>	1216	613	263	136	66	26	11	7	4	3	

This chart lists the number of times that the duration of the FTL<sub>Low</sub> exceedance was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column. \*The 15-minute duration in March 2007 was for the Monday morning after the change to the new Daylight Savings Time.

# FTL<sub>Low</sub> Exceedances by Hour at 60 Hz Scheduled Frequency

## July 2005 – September 2007

Clock-Minutes of Actual Frequency <= FTL <sub>Low</sub> at 60 Hz Scheduled Frequency											
Hour	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
0	25	14	7	4	1						5
1	13	5	2	1							4
2	5	4	1								3
3	2	1									2
4	2	1									2
5	113	72	36	20	10	4	2	2			8
6	100	41	14	6	4	3	2	1	1	1	15*
7	39	21	4								3
8	36	16	7	4	2	1					6
9	23	12	7	1							4
10	16	7	2	1							4
11	19	6	2	2	1	1	1				7
12	7	2									2
13	5	2	1	1							4
14	5	1									2
15	4	2									2
16	4	2	1	1	1	1					6
17	18	8	2								3
18	20	8	1								3
19	13	7	3	2	1						5
20	20	11	4	2	2						5
21	47	22	6	4	1						5
22	94	54	32	20	12	3	1	1	1	1	11
23	37	13	6	3	3	2					6
<b>Sum</b>	667	332	138	72	38	15	6	4	2	2	

This chart lists the number of times that the duration of the FTL<sub>Low</sub> exceedance was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column. \*The 15-minute duration in March 2007 was for the Monday morning after the change to the new Daylight Savings Time.

# FTL<sub>High</sub> Exceedances

Clock-Minutes of Actual Frequency >= FTL <sub>High</sub>												
Year	Month	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
2005	7	11	4	1								3
2005	8	21	7	4	2	1						5
2005	9	21	9	3	2	2	1	1				7
2005	10	23	6	2	1	1						5
2005	11	22	7	4	1	1	1	1				7
2005	12	19	6	2								3
2006	1	27	15	11	6	2						5
2006	2	24	10	7	5							4
2006	3	33	12	4	2	1	1	1	1			8
2006	4	46	22	3	1	1	1	1	1			8
2006	5	39	20	9	4	1						5
2006	6	24	10	7	4	4	3	3	2	1	1	10
2006	7	29	11	8	2							4
2006	8	26	13	10	5	1	1	1	1			8
2006	9	33	14	4	2							4
2006	10	28	14	4	3	2	1	1	1			8
2006	11	22	11	4								3
2006	12	29	12	7	3	2	1					6
2007	1	31	14	5	2	1	1	1				7
2007	2	21	13	4	1							4
2007	3	39	21	10	4	2	1	1	1			8
2007	4	30	15	8	4							4
2007	5	49	20	11	7	4	4	1				7
2007	6	25	14	7	2	1	1	1				7
2007	7	20	12	8	2							4
2007	8	32	14	7	3	2						5
2007	9	17	7	5	2	1						5
<b>SUM</b>		741	333	159	70	30	17	13	7	1	1	

This chart lists the number of times that the duration of the FTL<sub>HIGH</sub> exceedance was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column.

# FTL<sub>High</sub> Exceedances and 60 Hz Scheduled Frequency

Clock-Minutes of Actual Frequency >= FTL <sub>High</sub> and 60 Hz Scheduled Frequency												
Year	Month	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
2005	7	11	4	1								3
2005	8	21	7	4	2	1						5
2005	9	21	9	3	2	2	1	1				7
2005	10	23	6	2	1	1						5
2005	11	20	7	4	1	1	1	1				7
2005	12	19	6	2								3
2006	1	27	15	11	6	2						5
2006	2	22	9	7	5							4
2006	3	20	8	3	2	1	1	1	1			8
2006	4	46	22	3	1	1	1	1	1			8
2006	5	38	20	9	4	1						5
2006	6	24	10	7	4	4	3	3	2	1	1	10
2006	7	29	11	8	2							4
2006	8	26	13	10	5	1	1	1	1			8
2006	9	33	14	4	2							4
2006	10	28	14	4	3	2	1	1	1			8
2006	11	21	11	4								3
2006	12	29	12	7	3	2	1					6
2007	1	31	14	5	2	1	1	1				7
2007	2	21	13	4	1							4
2007	3	39	21	10	4	2	1	1	1			8
2007	4	30	15	8	4							4
2007	5	48	20	11	7	4	4	1				7
2007	6	25	14	7	2	1	1	1				7
2007	7	19	11	7	2							4
2007	8	29	14	7	3	2						5
2007	9	16	6	5	2	1						5
<b>SUM</b>		716	326	157	70	30	17	13	7	1	1	

This chart lists the number of times that the duration of the FTL<sub>HIGH</sub> exceedance was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column.

# FTL<sub>High</sub> Exceedances by Hour

July 2005 – September 2007

Clock-Minutes of Actual Frequency >= FTL <sub>High</sub>											
Hour	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
0	24	8	2	1							4
1	7										1
2	5	4	1	1							4
3	3	1									2
4	12	5	1	1	1	1	1	1			8
5	75	34	21	7	4	2	1	1	1	1	10
6	49	22	15	9	7	3	2	2			8
7	11	3	2	1							4
8	1	1	1								3
9	6	3									2
10	8	4	2								3
11	9	3	2								3
12	6	5	2								3
13	3	1									2
14	5	4	1								3
15	4	2	1								3
16	15	7	1								3
17	52	30	12	6	1	1	1				7
18	38	18	11	6	3	2	2	1			8
19	4	1									2
20	32	7	2	1	1	1					6
21	172	78	36	22	8	4	4	2			8
22	129	68	35	9	4	3	2				7
23	71	24	11	6	1						5
<b>Sum</b>	741	333	159	70	30	17	13	7	1	1	

This chart lists the number of times that the duration of the FTL<sub>HIGH</sub> exceedance was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column.

# FTL<sub>High</sub> Exceedances by Hour and 60 Hz Scheduled Frequency

## July 2005 – September 2007

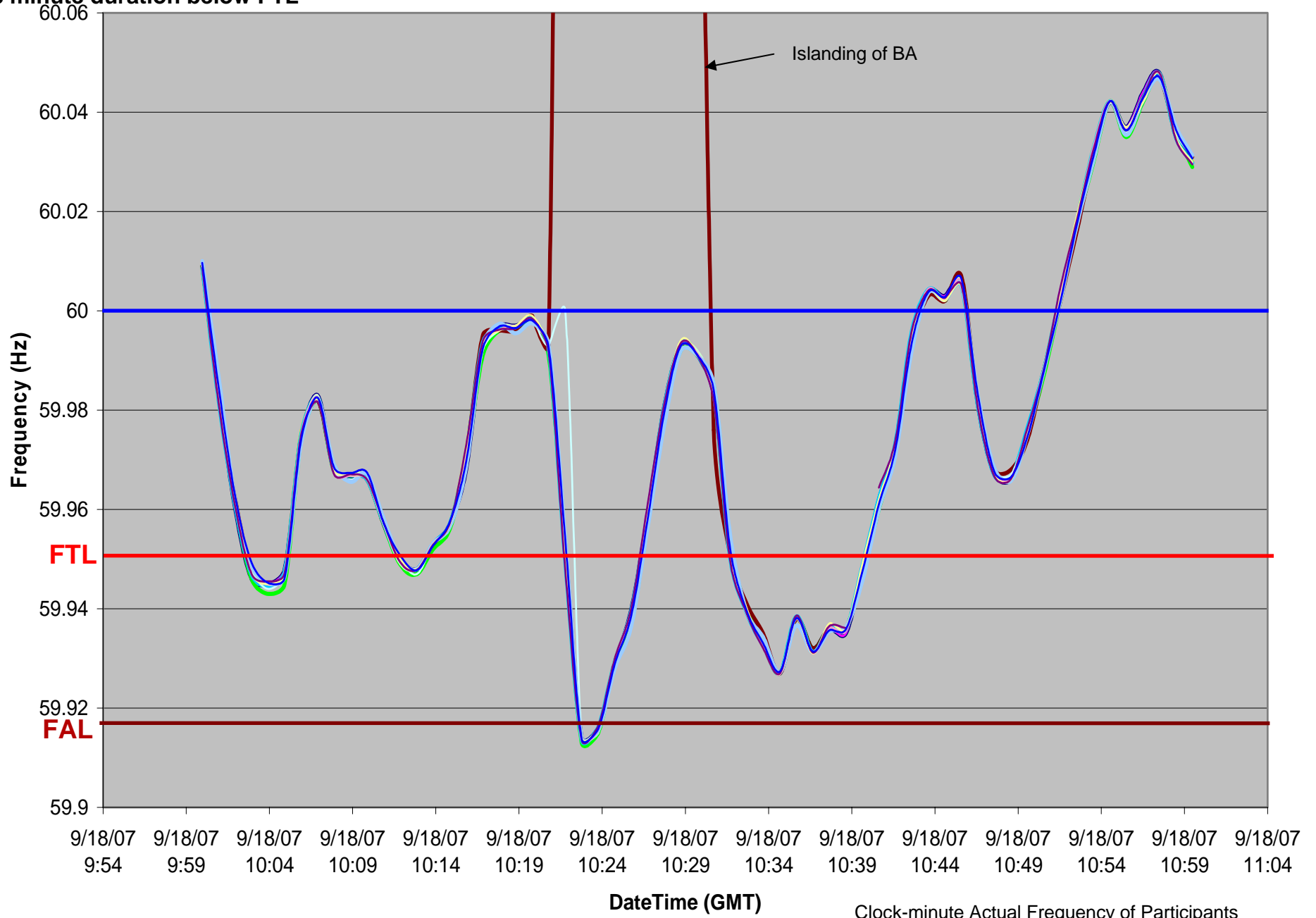
Clock-Minutes of Actual Frequency >= FTL <sub>High</sub> at 60 Hz Scheduled Frequency											
Hour	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
0	19	7	2	1							4
1	7										1
2	5	4	1	1							4
3	3	1									2
4	12	5	1	1	1	1	1	1			8
5	75	34	21	7	4	2	1	1	1	1	10
6	48	22	15	9	7	3	2	2			8
7	11	3	2	1							4
8	1	1	1								3
9	6	3									2
10	8	4	2								3
11	8	2	1								3
12	5	4	2								3
13	2	1									2
14	4	3									2
15	4	2	1								3
16	15	7	1								3
17	50	29	12	6	1	1	1				7
18	38	18	11	6	3	2	2	1			8
19	4	1									2
20	32	7	2	1	1	1					6
21	169	78	36	22	8	4	4	2			8
22	126	68	35	9	4	3	2				7
23	64	22	11	6	1						5
<b>Sum</b>	716	326	157	70	30	17	13	7	1	1	

This chart lists the number of times that the duration of the FTL<sub>HIGH</sub> exceedance was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column.

09/18/2007 5:32-5:39 EST

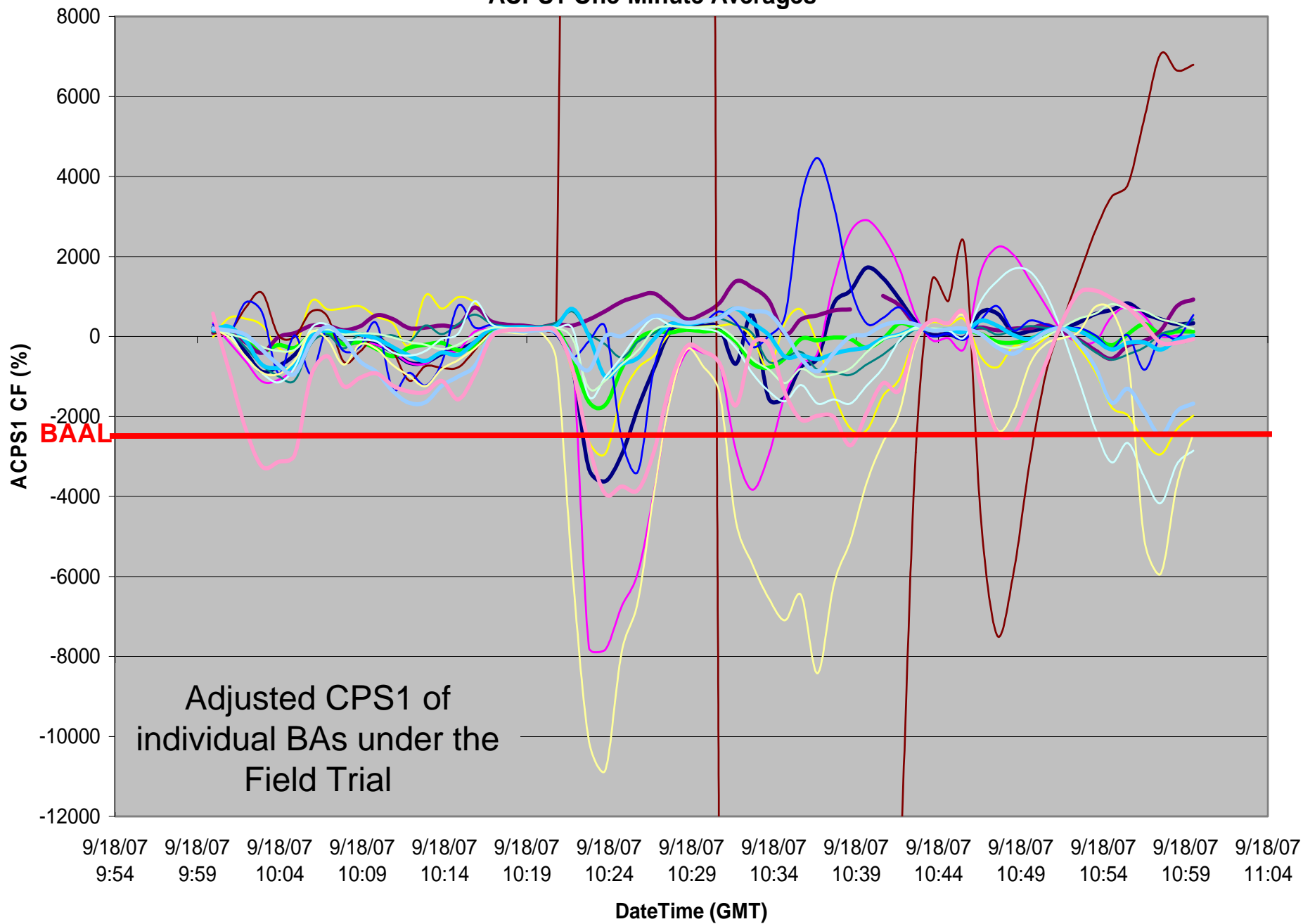
8 minute duration below FTL

### Frequency



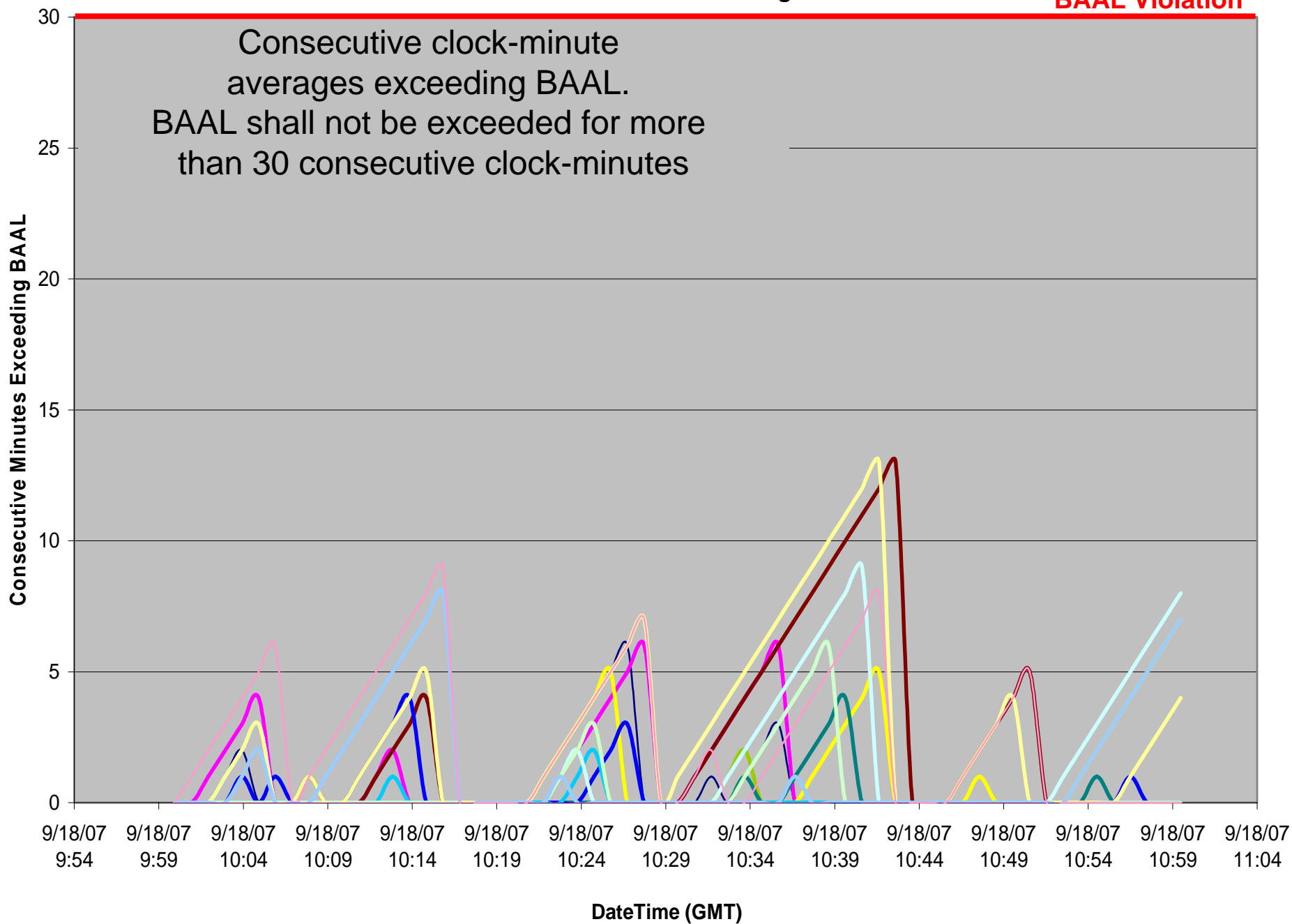
Clock-minute Actual Frequency of Participants

# ACPS1 One-Minute Averages



### Consecutive Minutes Exceeding BAAL

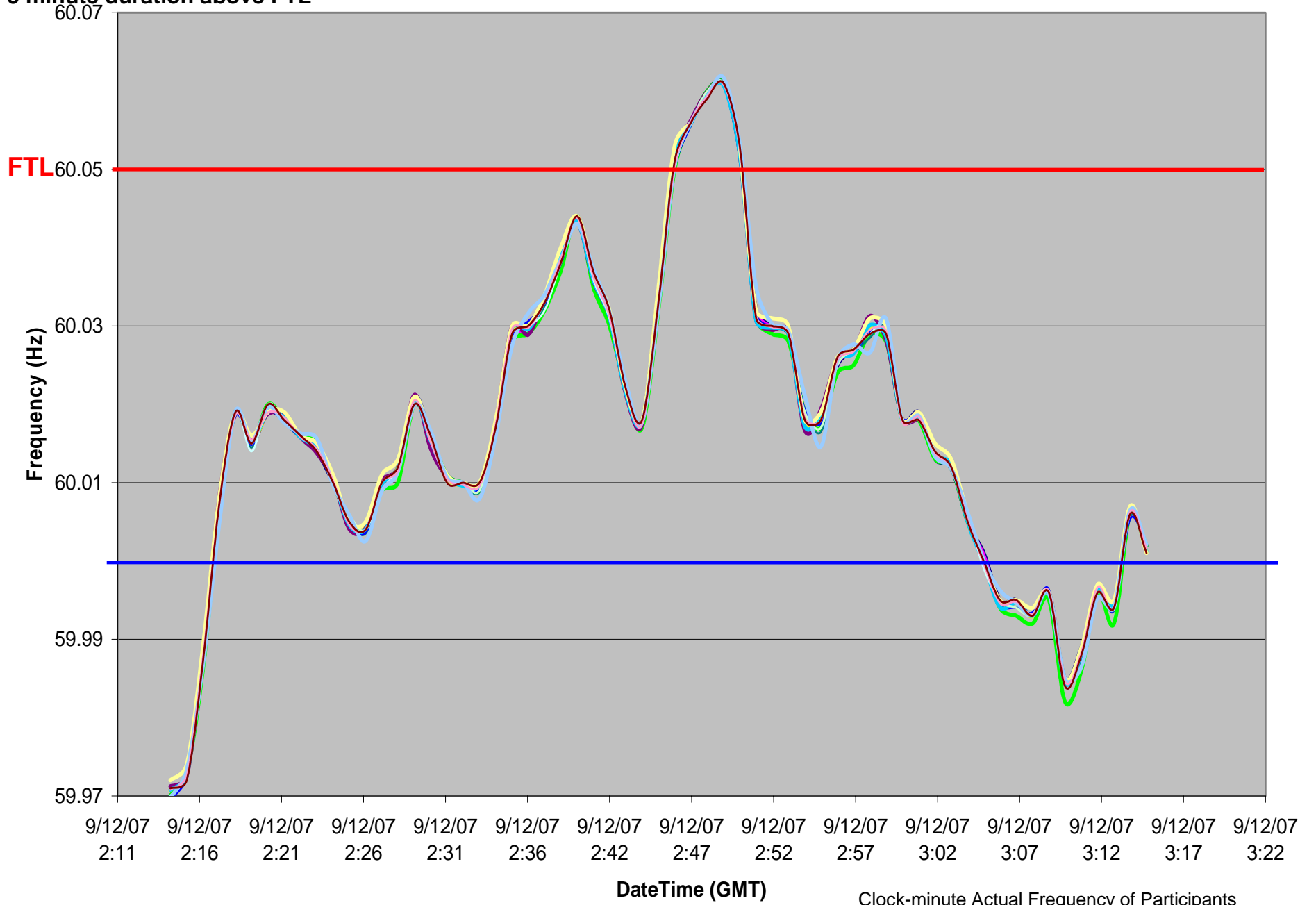
**BAAL Violation**



09/11/2007 21:45-21:49 EST

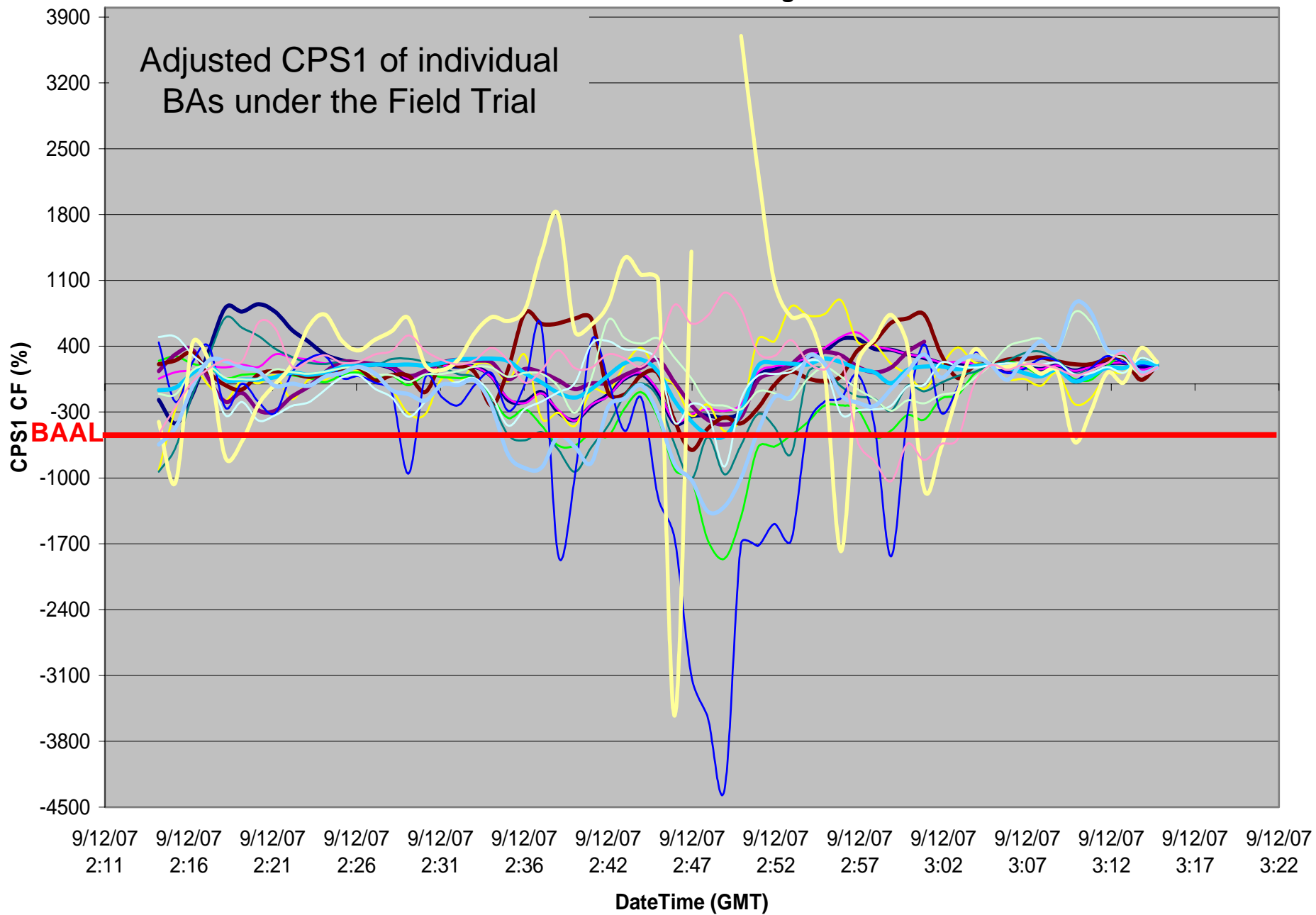
5 minute duration above FTL

### Frequency



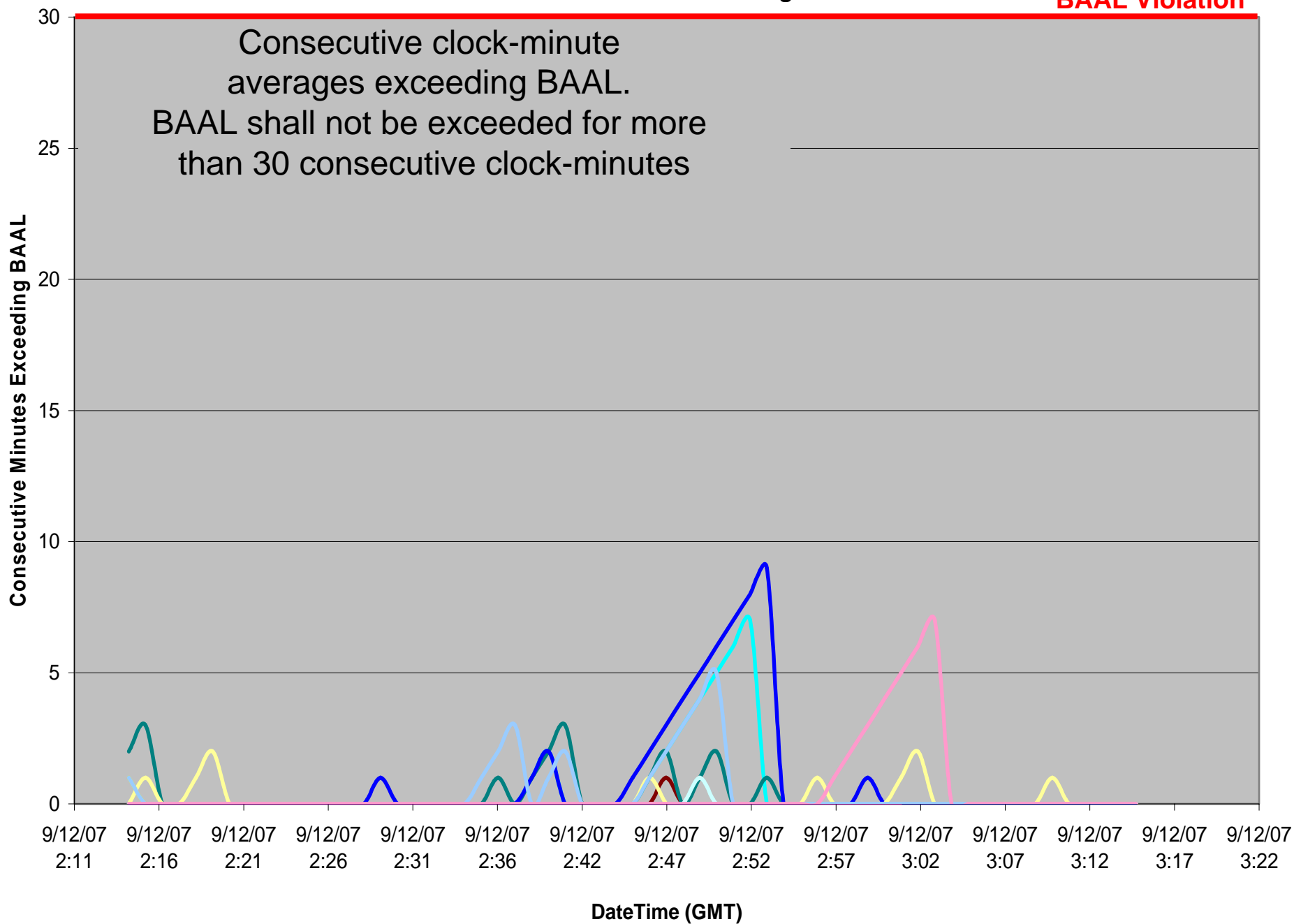
Clock-minute Actual Frequency of Participants

### ACPS1 One-Minute Averages



### Consecutive Minutes Exceeding BAAL

**BAAL Violation**



# **Balancing Authority ACE Limit Proof-of-Concept Field Trial**

## Discussion

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