

Balancing Authority ACE Limit Proof-of-Concept Field Trial

WECC Update Discussion
June 28, 2010

Doug Hils – Duke Energy

Reliability-Based Control Standard Drafting Team

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

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	Max_MinCtLow	Max_MinCtHigh	Max_MinCtLow2	Max_MinCtHigh2	Max_LowLimitCt	Max_HighLimitCt
BA01	0	0	2	0	2	0
BA02	7	0	25	2	25	2
BA03	2	2	0	0	2	2
BA04	6	3	4	15	6	15
BA05	10	3	10	4	10	4
BA06	3	4	5	7	5	7
BA07	4	4	6	12	6	12
BA08	5	4	18	29	18	29
BA09	5	5	5	11	5	11
BA10	6	6	10	6	10	6
BA11	19	6	22	22	22	22
BA12	4	6	16	20	16	20
BA13	1	7	15	31	15	31
BA14	6	7	6	14	7	14
BA15	13	8	5	31	13	31
BA16	4	8	11	12	11	12
BA17	2	9	6	20	6	20
BA18	9	11	21	29	21	29
BA19	12	11	26	26	26	26
BA20	6	13	17	24	17	24
BA21	11	16	24	32	24	35
BA22	5	20	2	38	5	38
BA23	11	23	28	30	28	30
BA24	27	24	28	39	28	40
BA25	3	27	4	45	4	45

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 proposed BAL-007 standard.**

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

DateTime	TimeZone	FreqError	ActualFreq	SchedFreq
5/21/10 4:40	PDT	-0.0786	59.9214	60.00
5/30/10 14:24	PDT	-0.0715	59.9285	60.00
DateTime	TimeZone	FreqError	ActualFreq	SchedFreq
5/21/10 5:55	PDT	0.069	60.069	60.00
5/21/10 5:56	PDT	0.0698	60.0698	60.00
5/21/10 5:57	PDT	0.0723	60.0723	60.00
5/21/10 5:59	PDT	0.0814	60.0814	60.00
5/21/10 6:00	PDT	0.0725	60.0725	60.00

Generation loss events in April 2010:

- April 4 Event Earthquake in Southern California that cause several lines and some generation to trip.
- April 17 Event – 722 MW generation loss in the Northwest region
- April 26 Event – 670 MW generation loss in Southwest region
- April 27 Event – 727 MW generation loss in the Northwest region

Dates in this presentation:

Clock-minute Frequency less than FTL_{Low} on May 21, 2010,
ending 4:40 PDT: 1 clock-minute¹

Clock-minute Frequency less than FTL_{Low} on May 30, 2010,
ending 14:24 PDT: 1 clock-minute

Clock-minute Frequency greater than FTL_{High} on May 21, 2010,
ending 6:00 PDT: 5 consecutive clock-minutes

Clock-minute ACE greater than the $BAAL_{High}$ on May 24, 2010,
ending 18:39 PDT: 27 consecutive clock-minutes coincident with ATL being
exceeded for 45 consecutive clock-minutes

Clock-minute ACE less than the $BAAL_{Low}$ on May 26, 2010,
ending 6:39 PDT: 27 consecutive clock-minutes

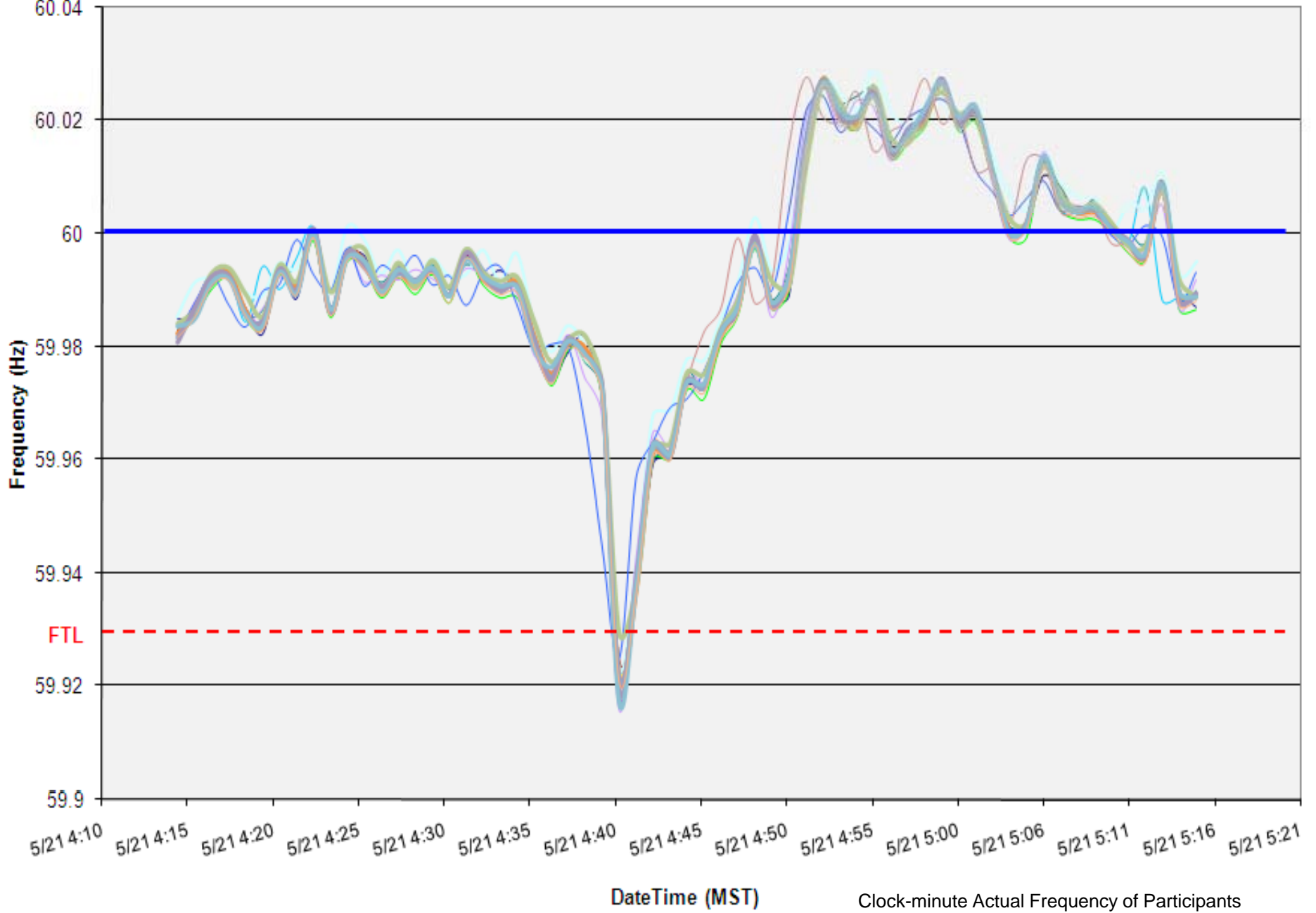
Clock-minute ACE greater than the $BAAL_{High}$ on May 20, 2010,
ending 23:41 PDT: 13 consecutive clock-minutes coincident with ATL being
exceeded for 38 consecutive clock-minutes

¹ Under draft BAL-008, a proposed FTL_{Low} violation would occur when the actual frequency is lower than FTL_{Low} for more than 30 consecutive clock-minutes and a proposed FTL_{High} violation would occur when the actual frequency is greater than FTL_{High} for more than 30 consecutive clock-minutes. Under draft BAL-007, a proposed $BAAL_{Low}$ violation would occur when the ACE is lower than $BAAL_{Low}$ for more than 30 consecutive clock-minutes and a proposed $BAAL_{High}$ violation would occur when the ACE is greater than $BAAL_{High}$ for more than 30 consecutive clock-minutes.

5/21/2010 4:40 PDT

1 minute duration below FTL_{Low}

Clock-Minute Average Frequency

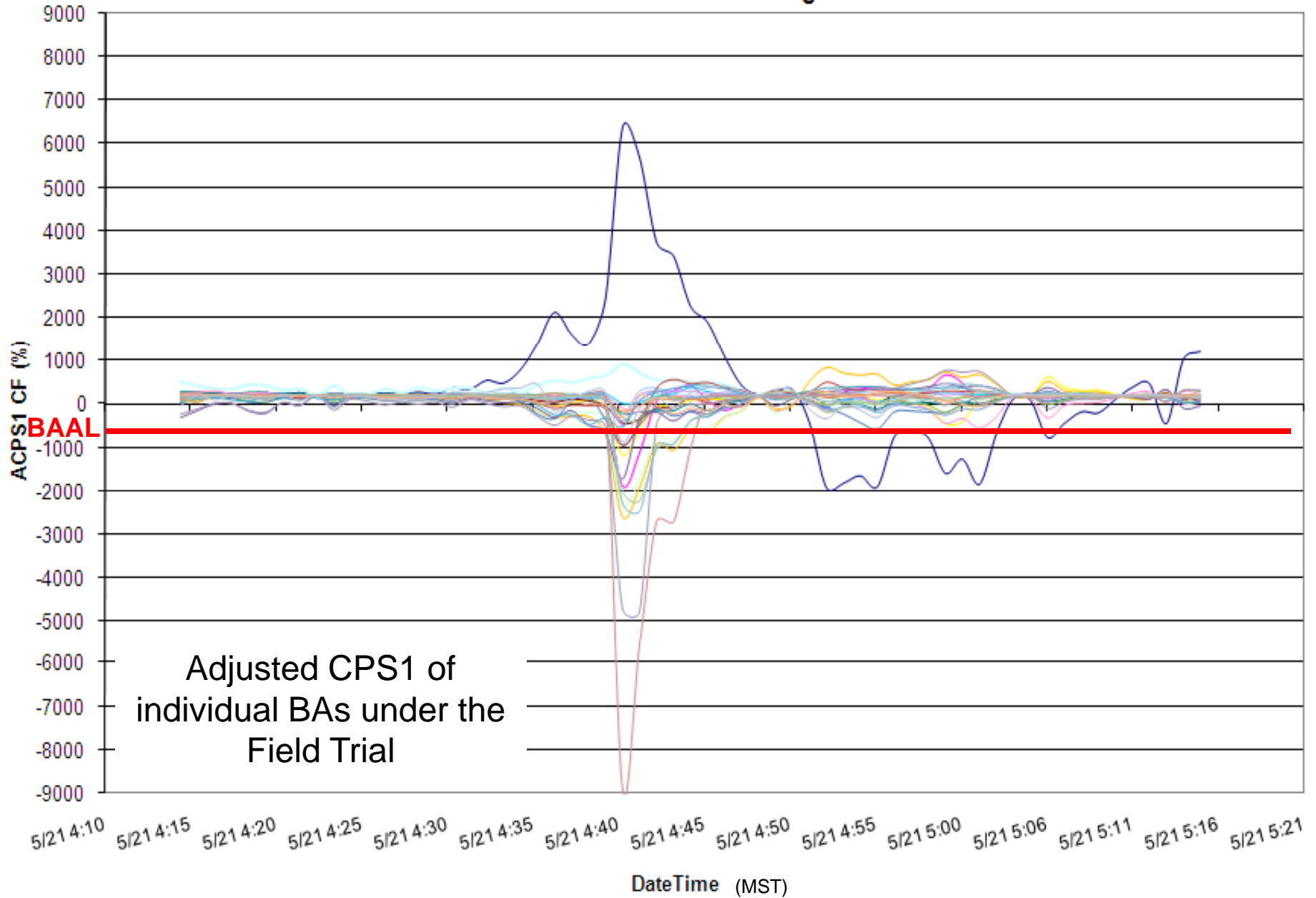


Clock-minute Actual Frequency of Participants

5/21/2010 4:40 PDT

1 minute duration below FTL_{Low}

ACPS1 Clock-Minute Averages

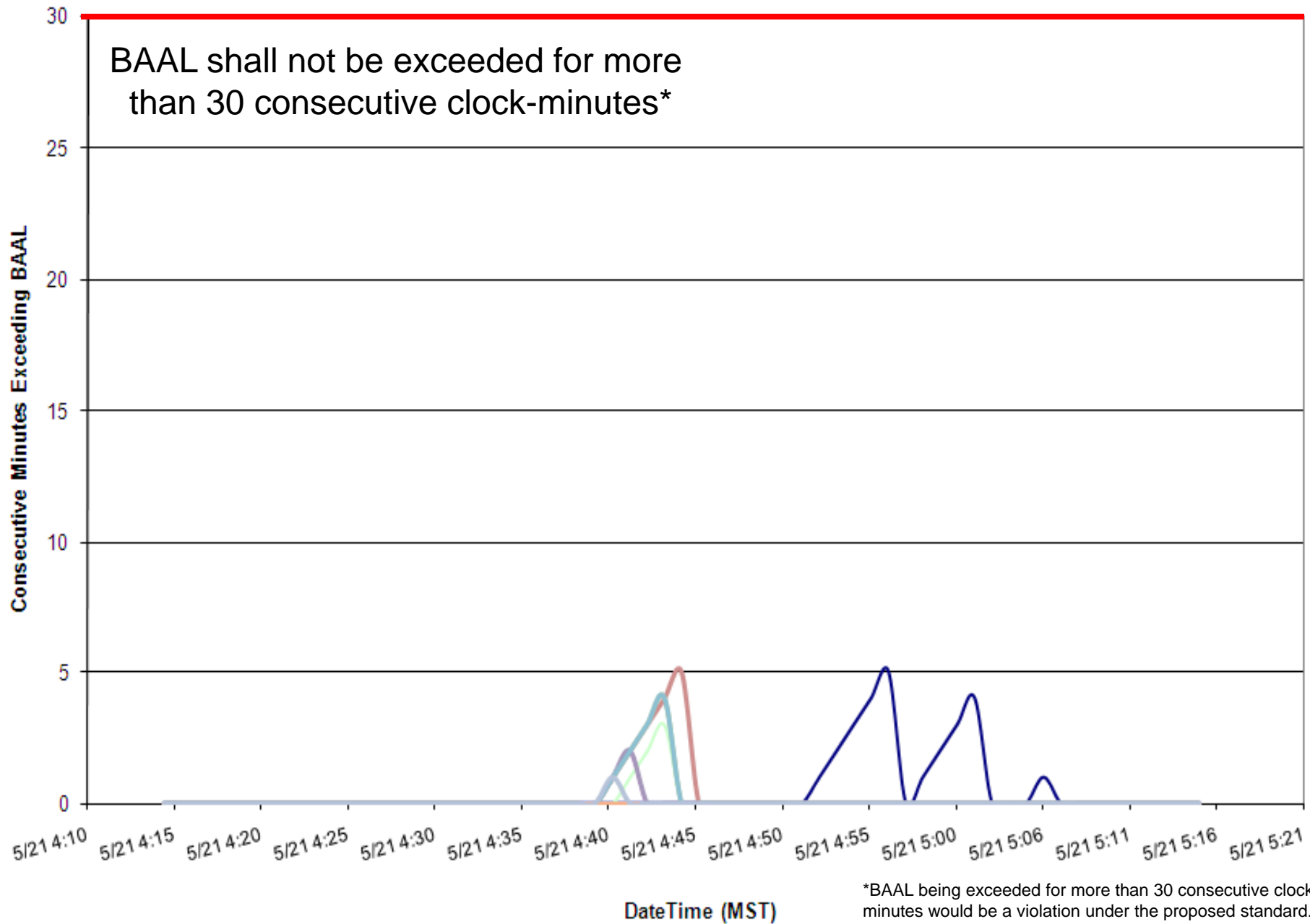


5/21/2010 4:40 PDT

1 minute duration below FTL_{Low}

Consecutive Minutes Exceeding BAAL

BAAL Violation*

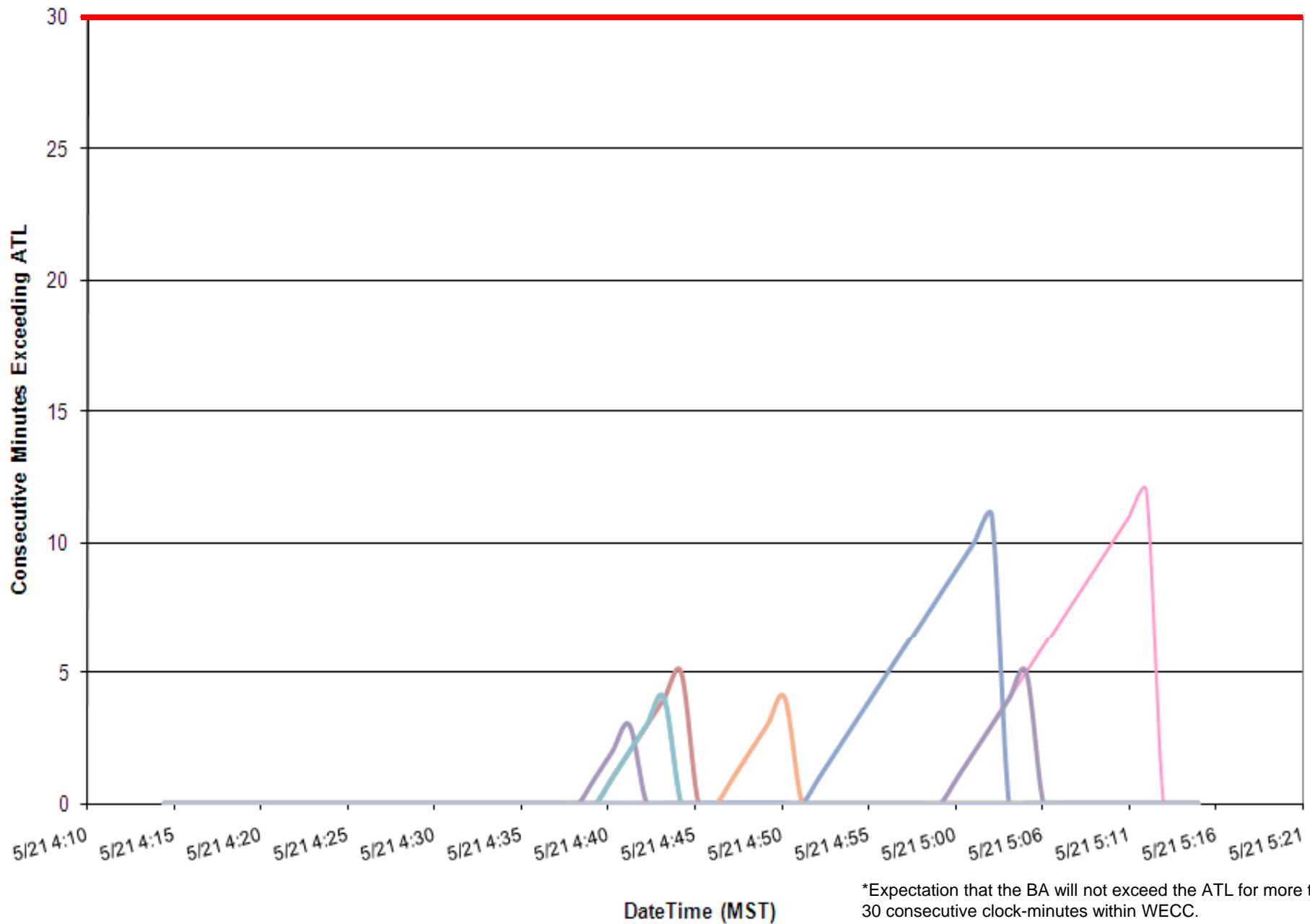


5/21/2010 4:40 PDT

1 minute duration below FTL_{Low}

Consecutive Minutes Exceeding ATL

ATL 30 Min Limit*

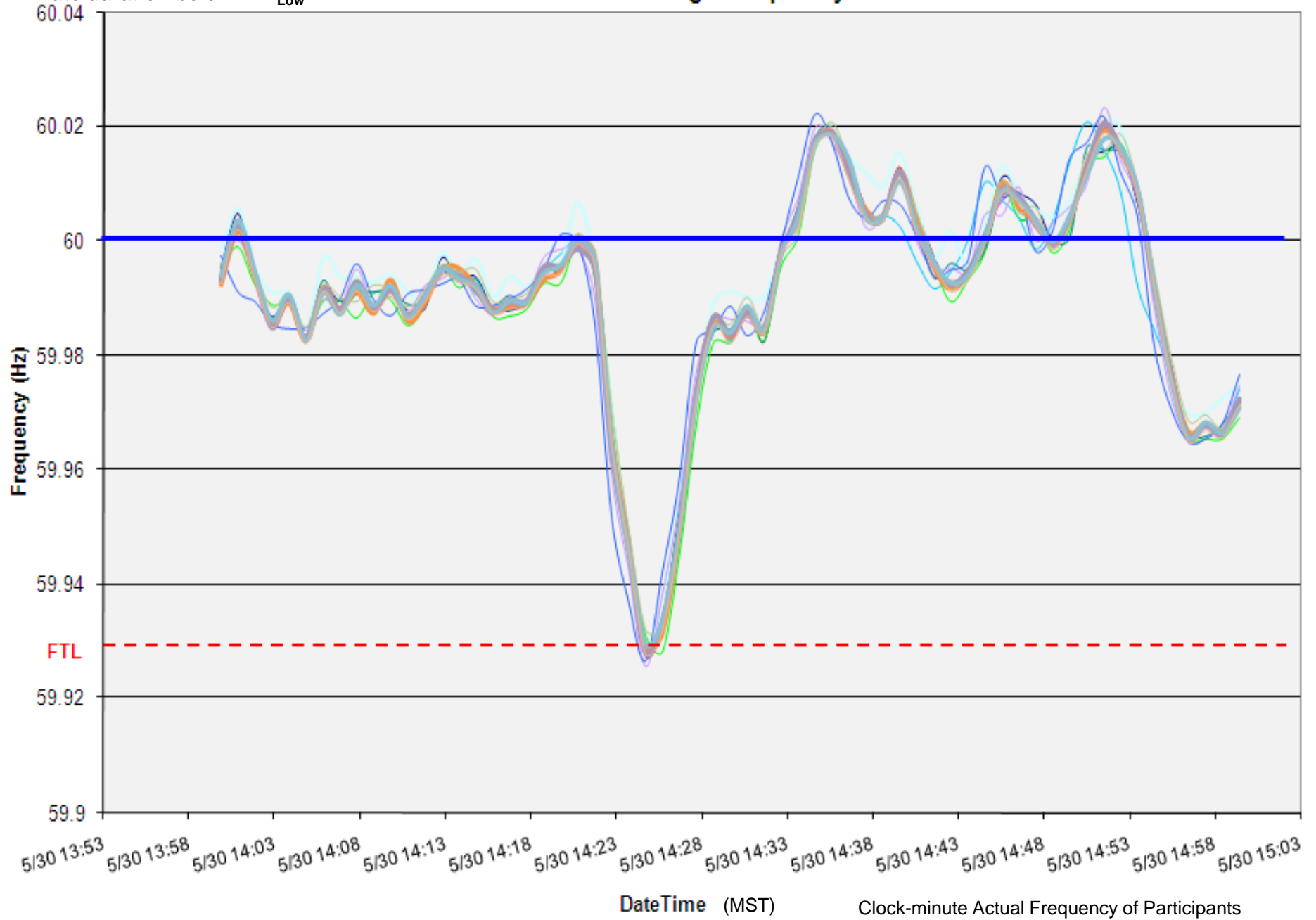


*Expectation that the BA will not exceed the ATL for more than 30 consecutive clock-minutes within WECC.

5/30/2010 14:24 PDT

1 minute duration below FTL_{Low}

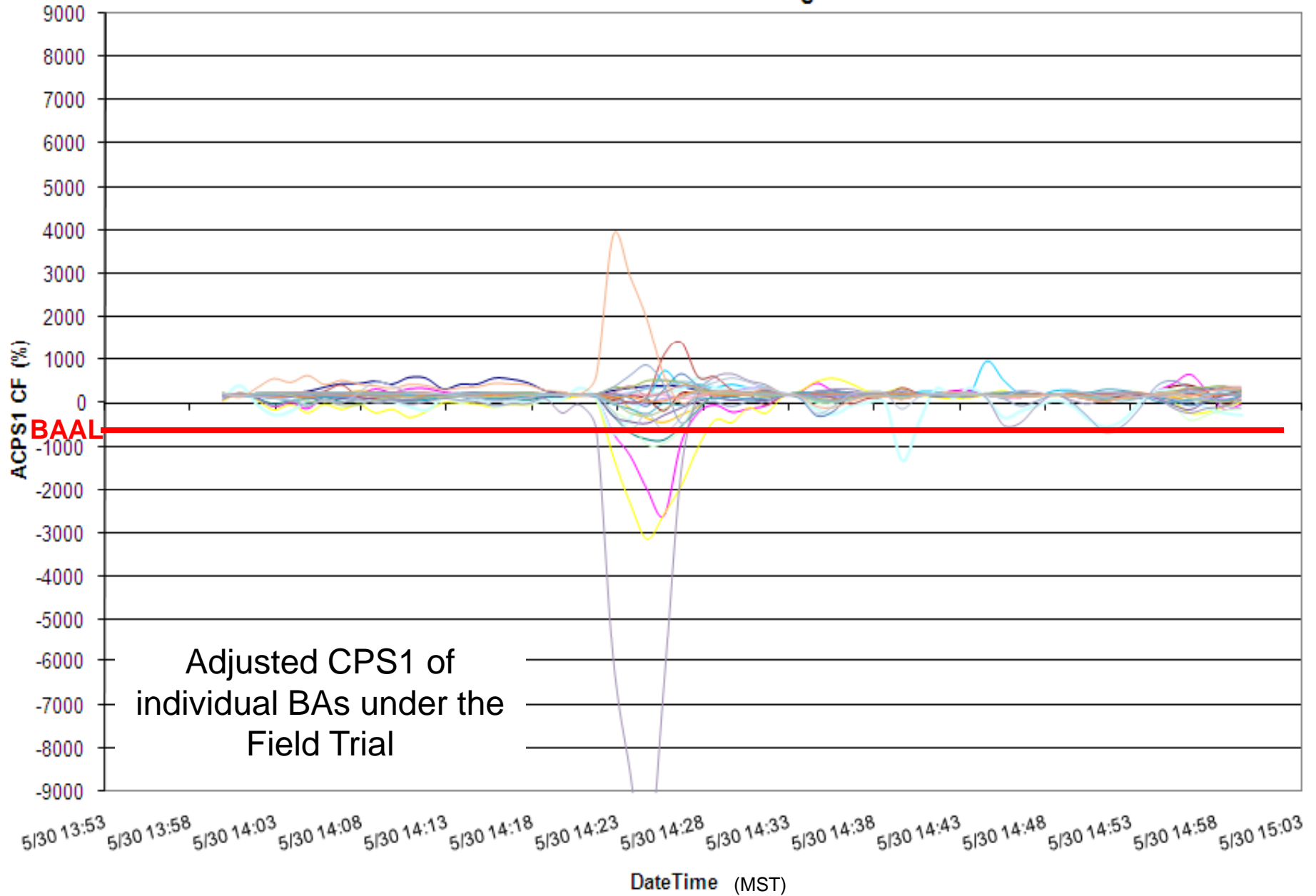
Clock-Minute Average Frequency



5/30/2010 14:24 PDT

1 minute duration below FTL_{Low}

ACPS1 Clock-Minute Averages

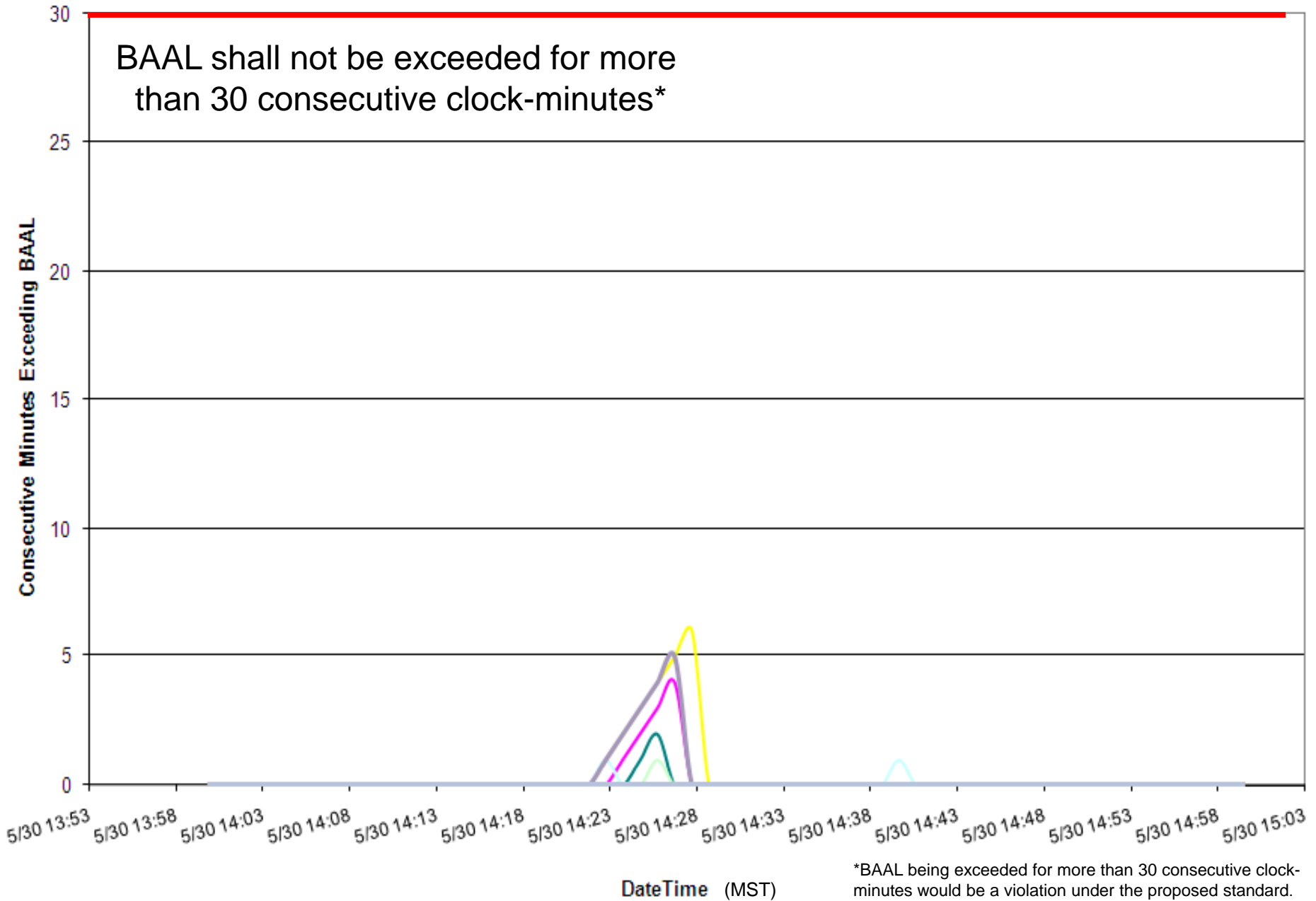


5/30/2010 14:24 PDT

1 minute duration below FTL_{Low}

Consecutive Minutes Exceeding BAAL

BAAL Violation*



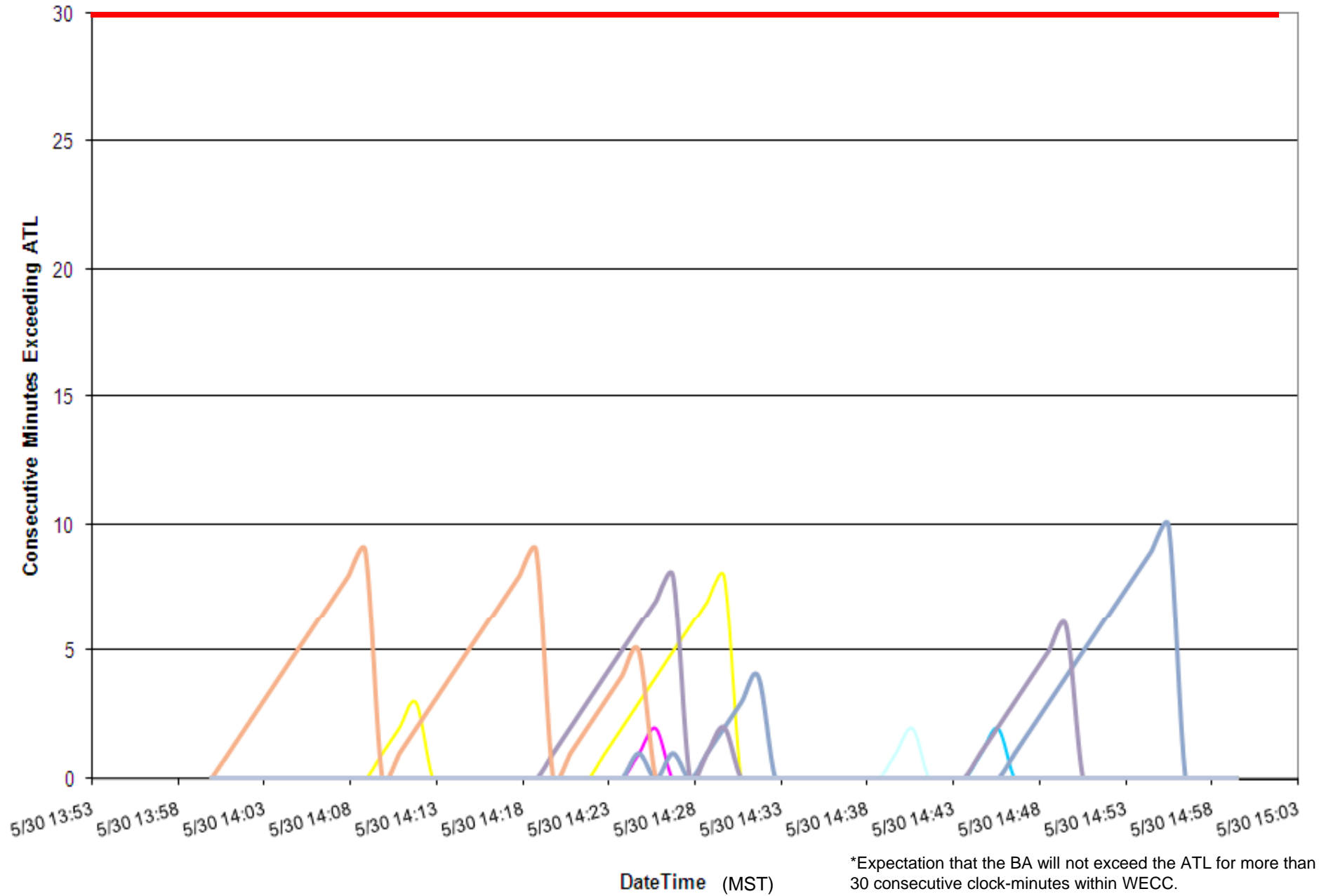
*BAAL being exceeded for more than 30 consecutive clock-minutes would be a violation under the proposed standard.

5/30/2010 14:24 PDT

1 minute duration below FTL_{Low}

Consecutive Minutes Exceeding ATL

ATL 30 Min Limit

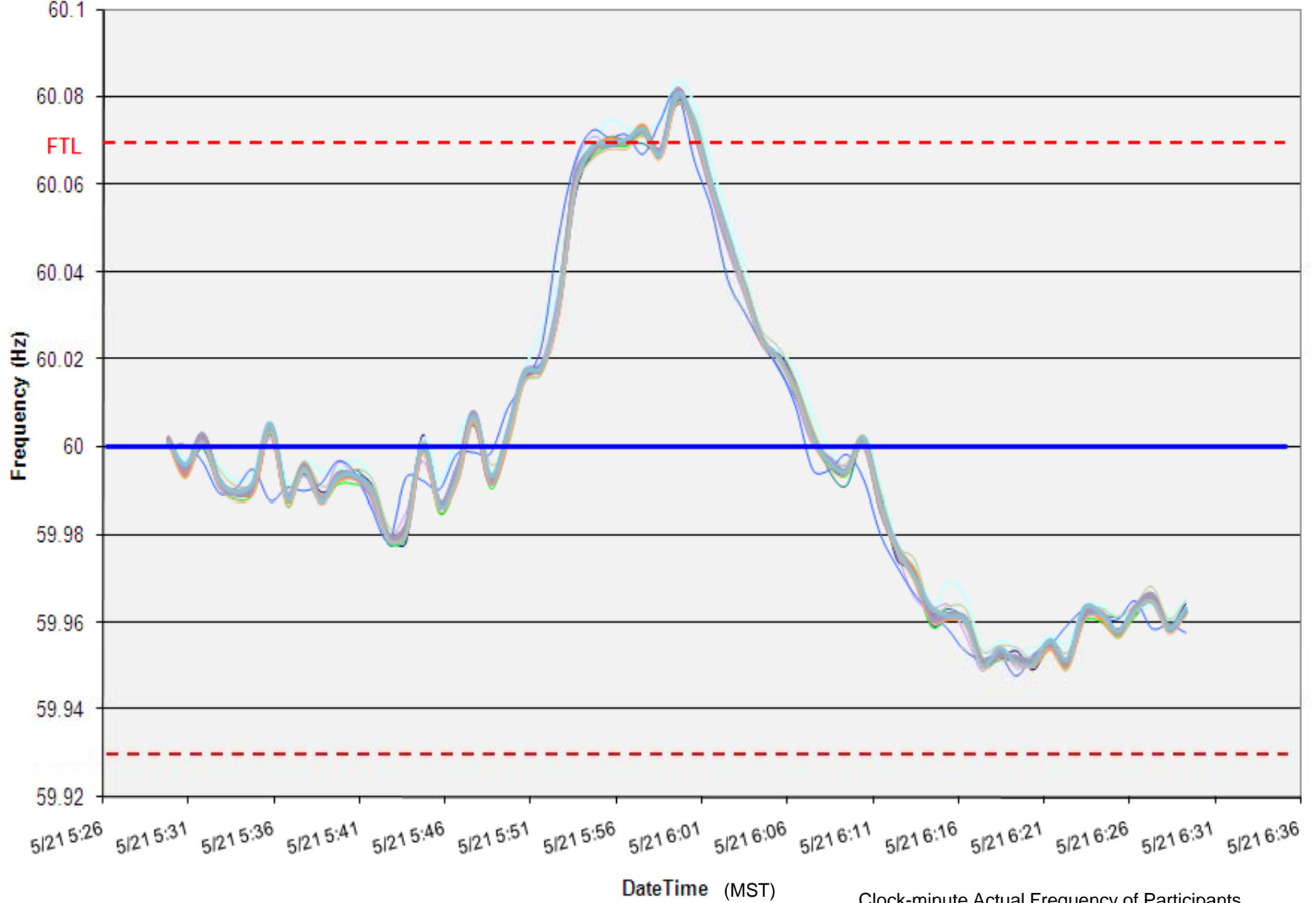


*Expectation that the BA will not exceed the ATL for more than 30 consecutive clock-minutes within WECC.

5/21/2010 5:55-6:00 PDT

5 minute duration above FTL_{High}

Clock-Minute Average Frequency

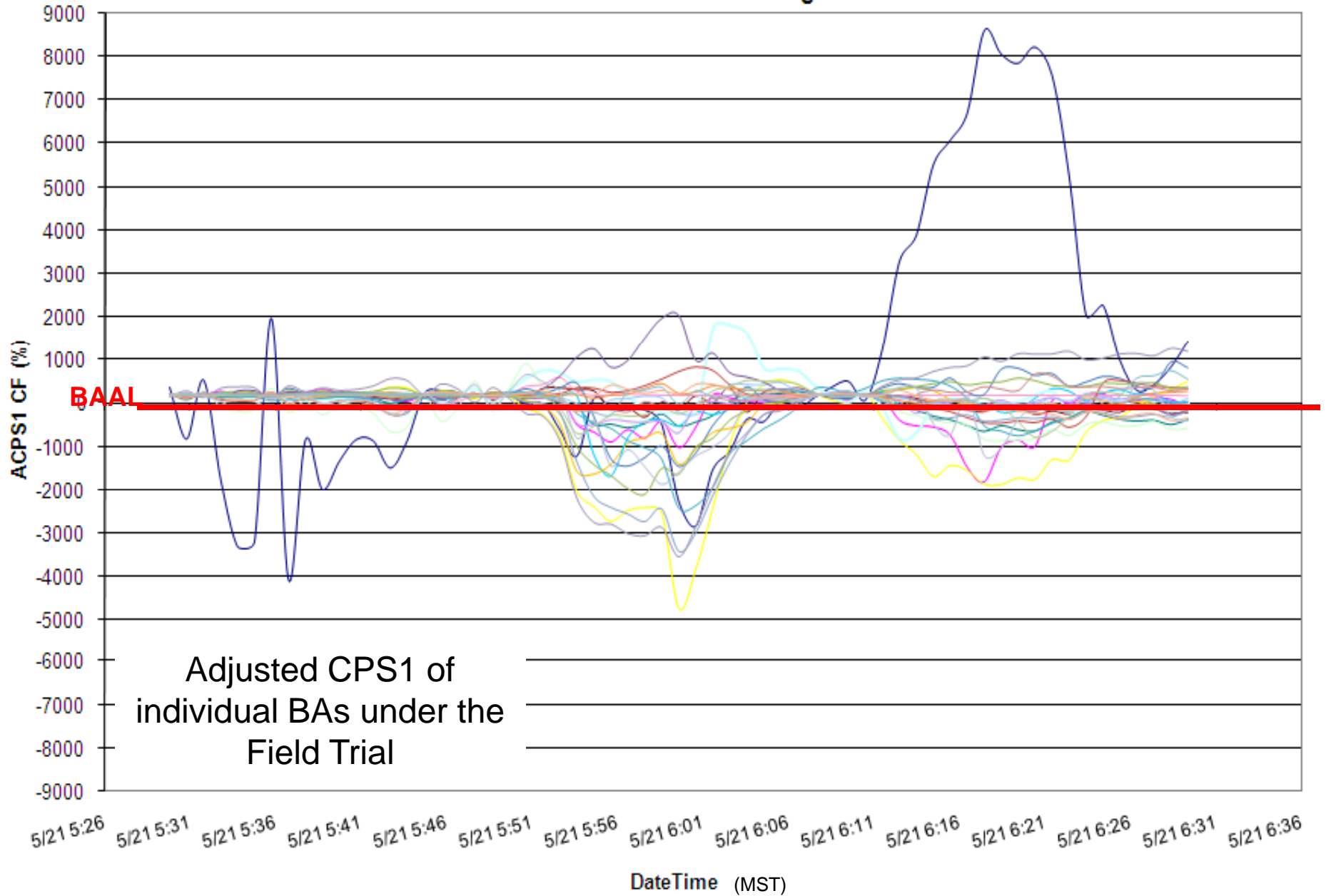


Clock-minute Actual Frequency of Participants

5/21/2010 5:55-6:00 PDT

5 minute duration above FTL_{High}

ACPS1 Clock-Minute Averages

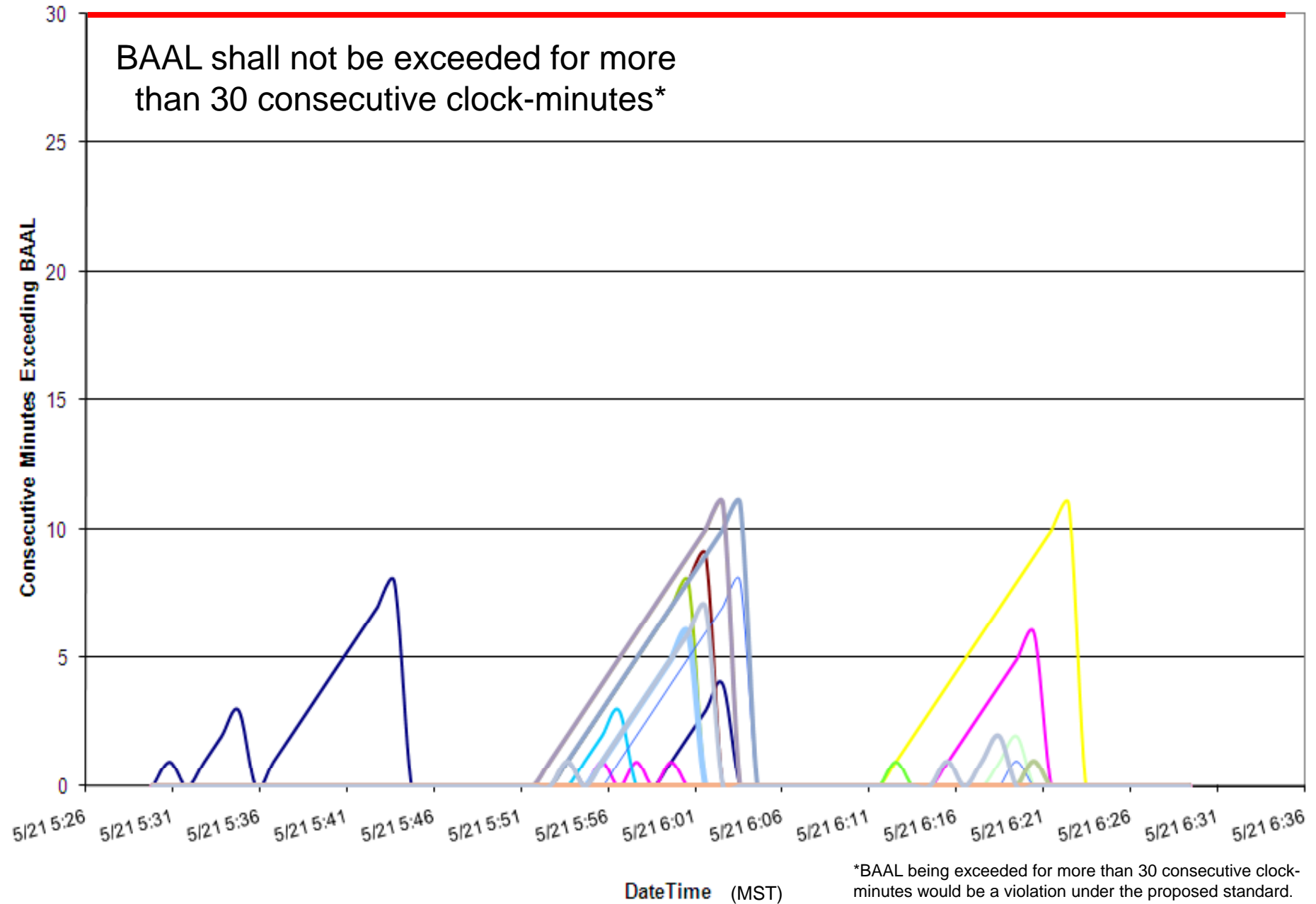


5/21/2010 5:55-6:00 PDT

5 minute duration above FTL_{High}

Consecutive Minutes Exceeding BAAL

BAAL Violation*

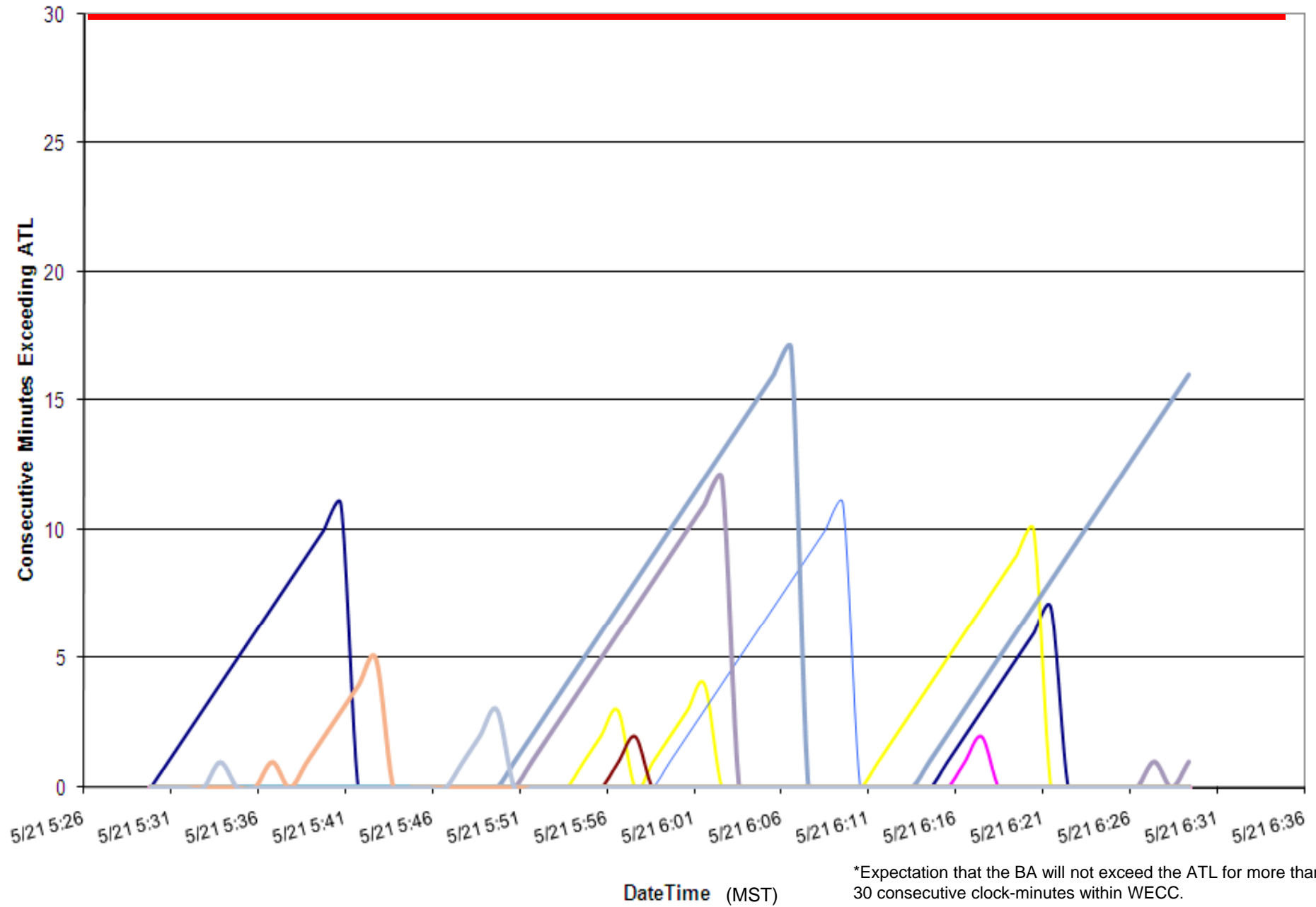


5/21/2010 5:55-6:00 PDT

5 minute duration above FTL_{High}

Consecutive Minutes Exceeding ATL

ATL 30 Min Limit*



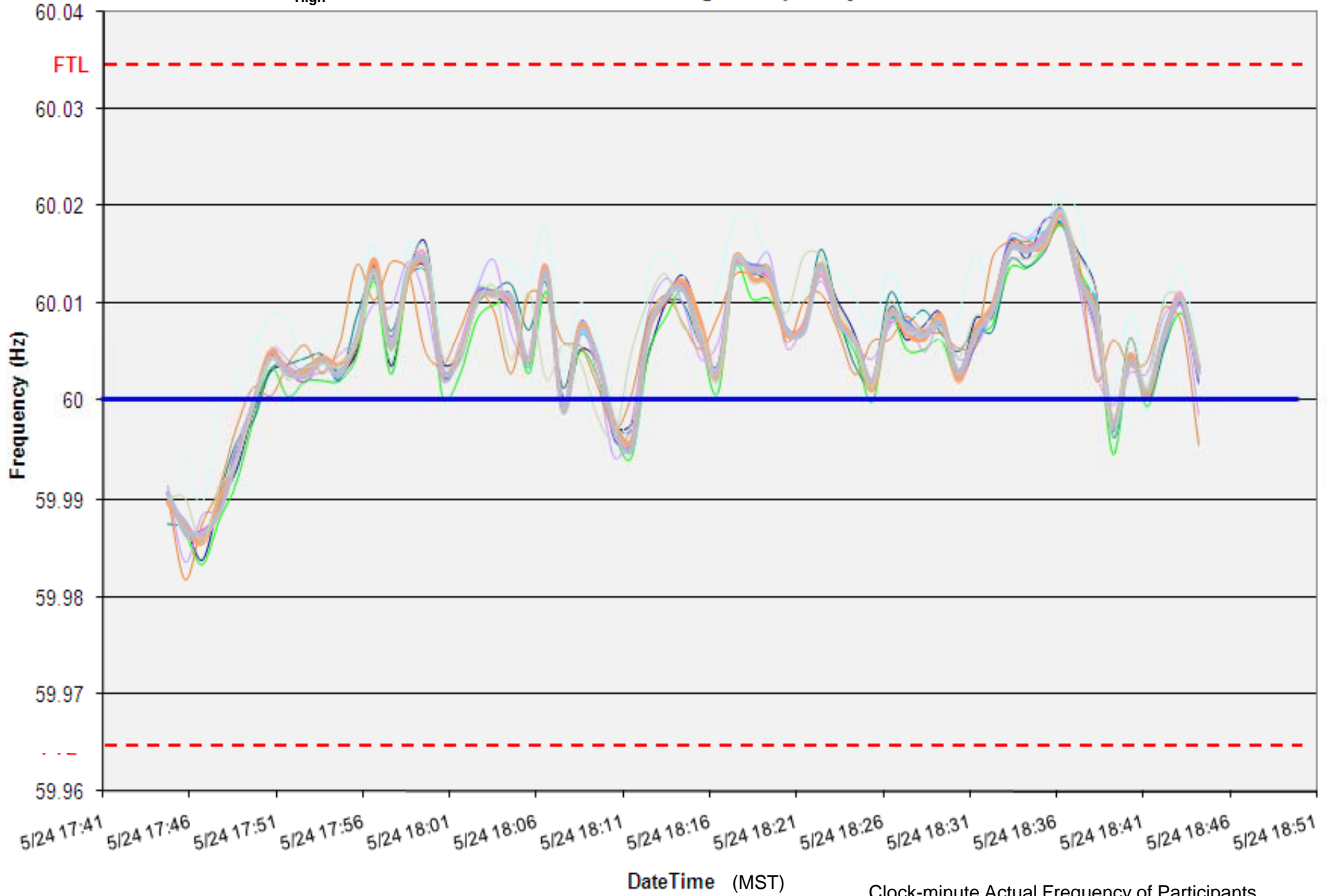
*Expectation that the BA will not exceed the ATL for more than 30 consecutive clock-minutes within WECC.

5/24/2010 18:12-18:39 PDT

27 minute duration above BAAL_{High}

45 minute duration above ATL_{High}

Clock-Minute Average Frequency



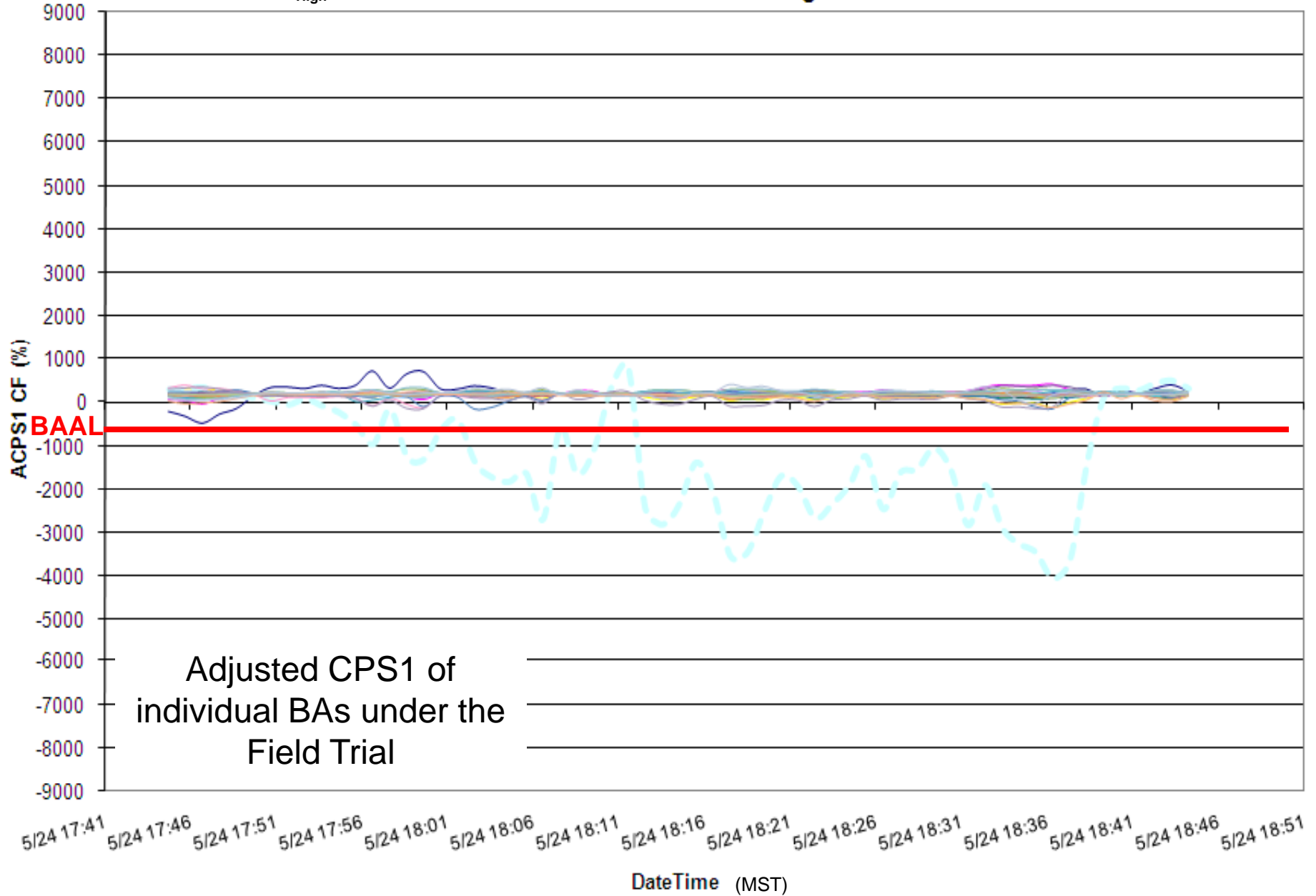
Clock-minute Actual Frequency of Participants

5/24/2010 18:12-18:39 PDT

27 minute duration above BAAL_{High}

45 minute duration above ATL_{High}

ACPS1 Clock-Minute Averages



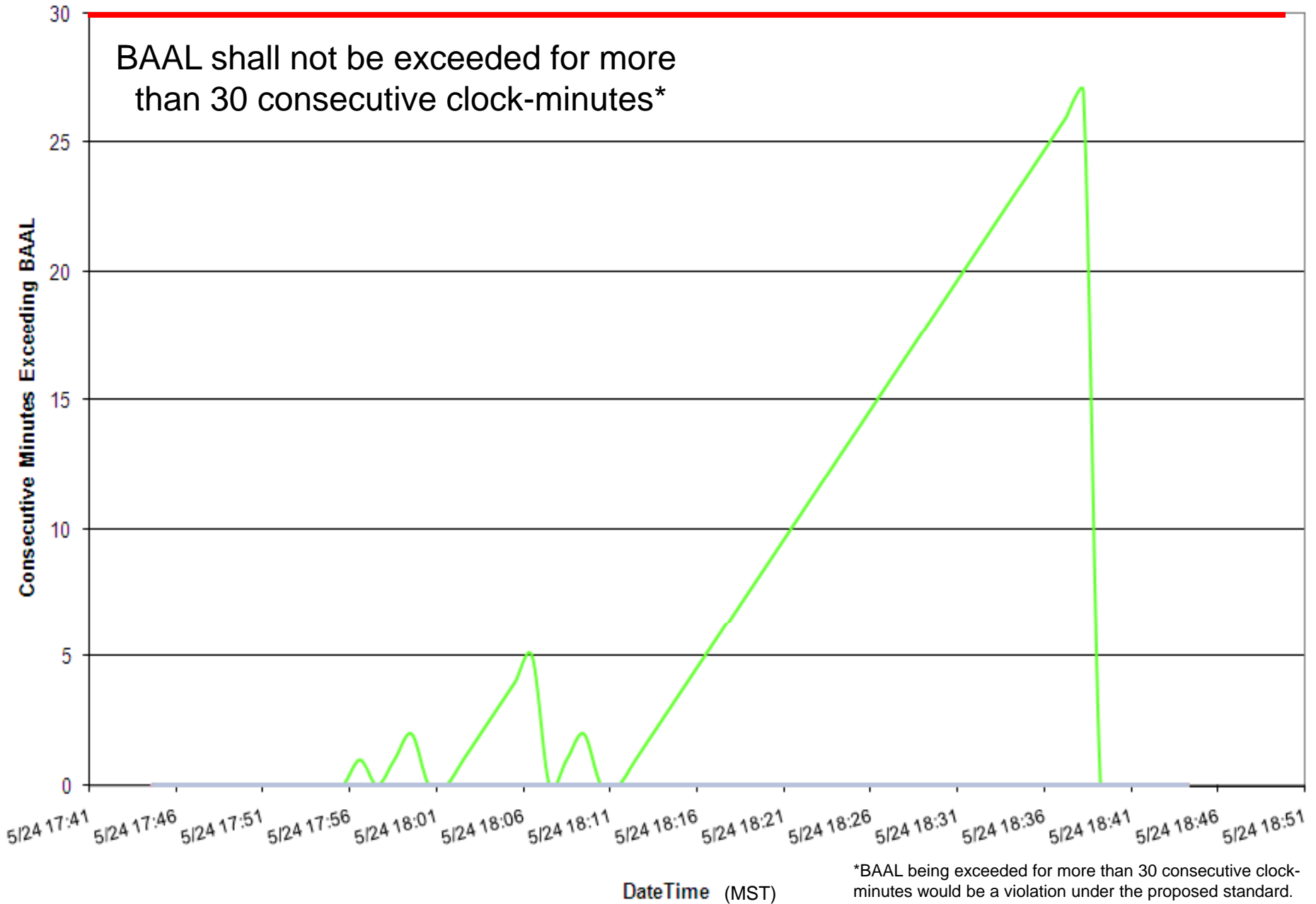
5/24/2010 18:12-18:39 PDT

27 minute duration above BAAL_{High}

45 minute duration above ATL_{High}

Consecutive Minutes Exceeding BAAL

BAAL Violation*

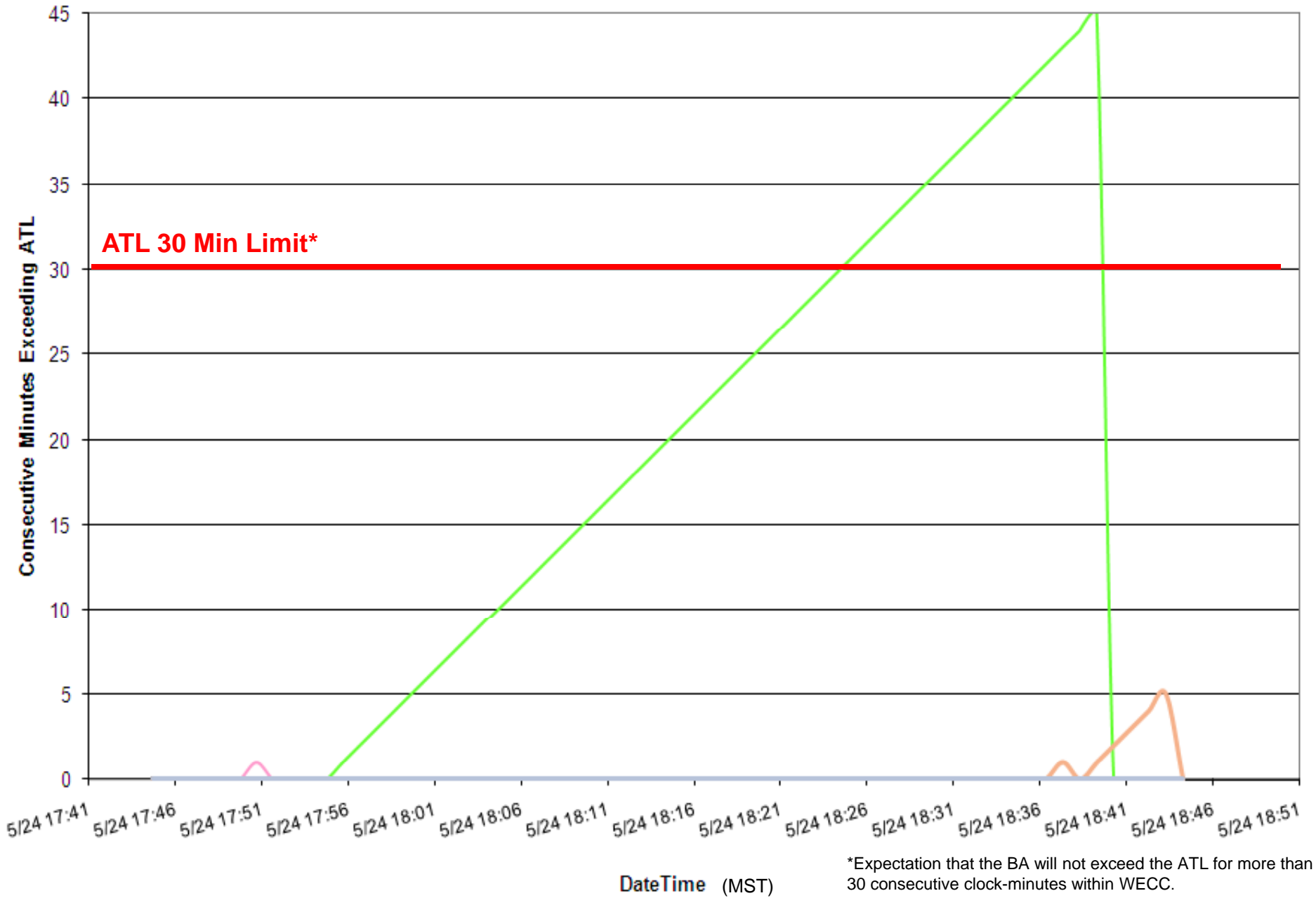


5/24/2010 18:12-18:39 PDT

27 minute duration above BAAL_{High}

45 minute duration above ATL_{High}

Consecutive Minutes Exceeding ATL

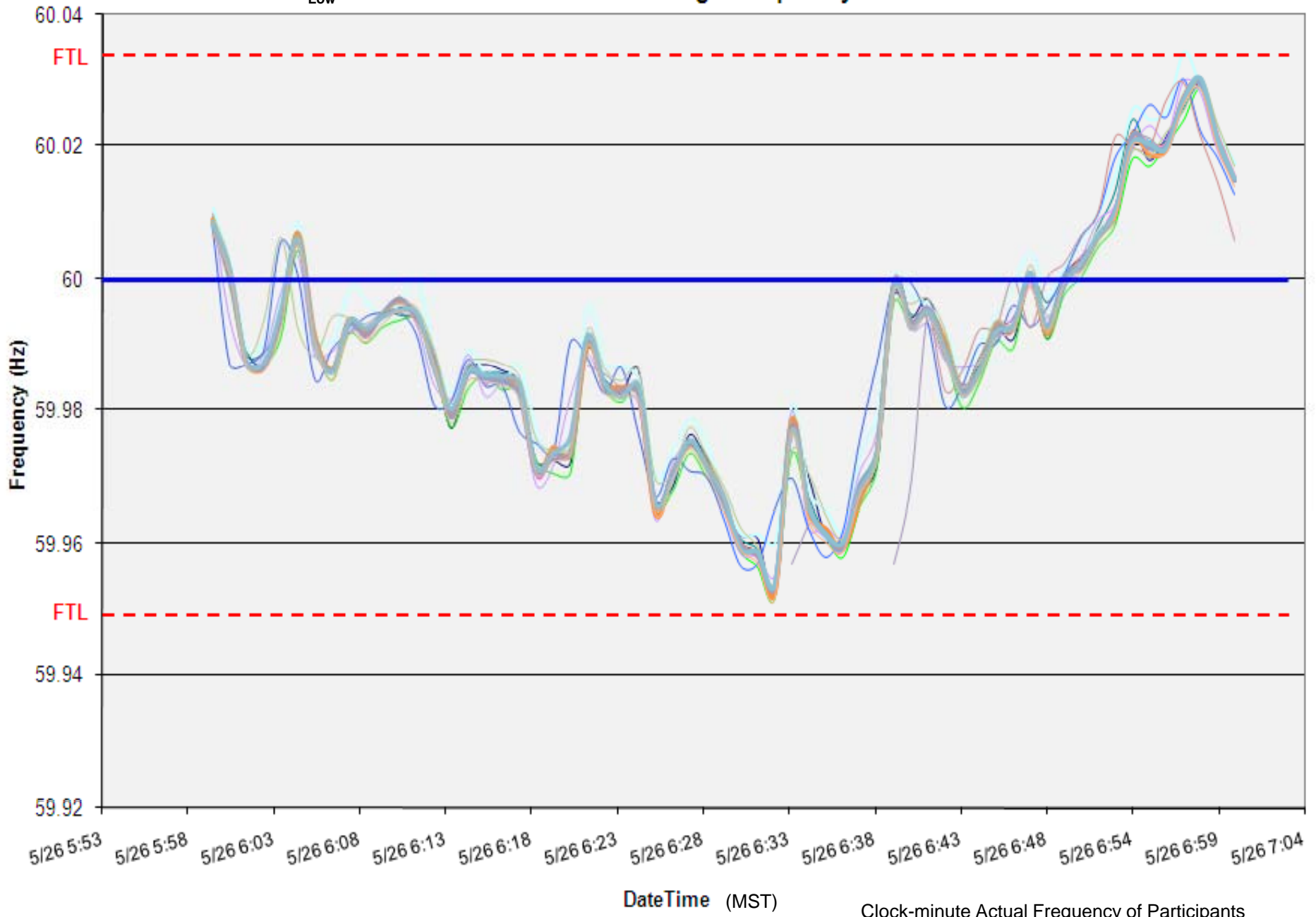


*Expectation that the BA will not exceed the ATL for more than 30 consecutive clock-minutes within WECC.

5/26/2010 6:02-6:29 PDT

27 minute duration below BAAL_{Low}

Clock-Minute Average Frequency

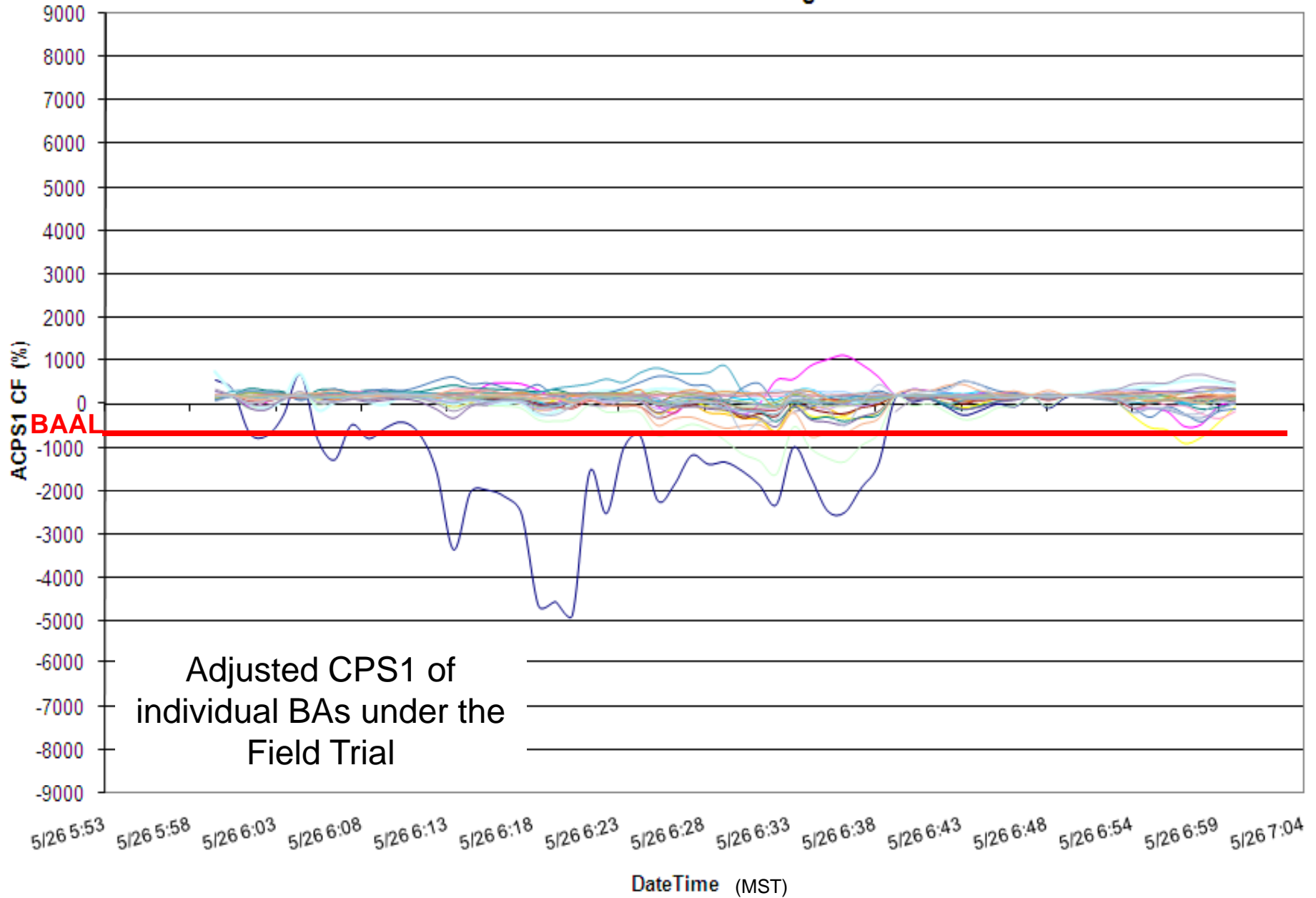


Clock-minute Actual Frequency of Participants

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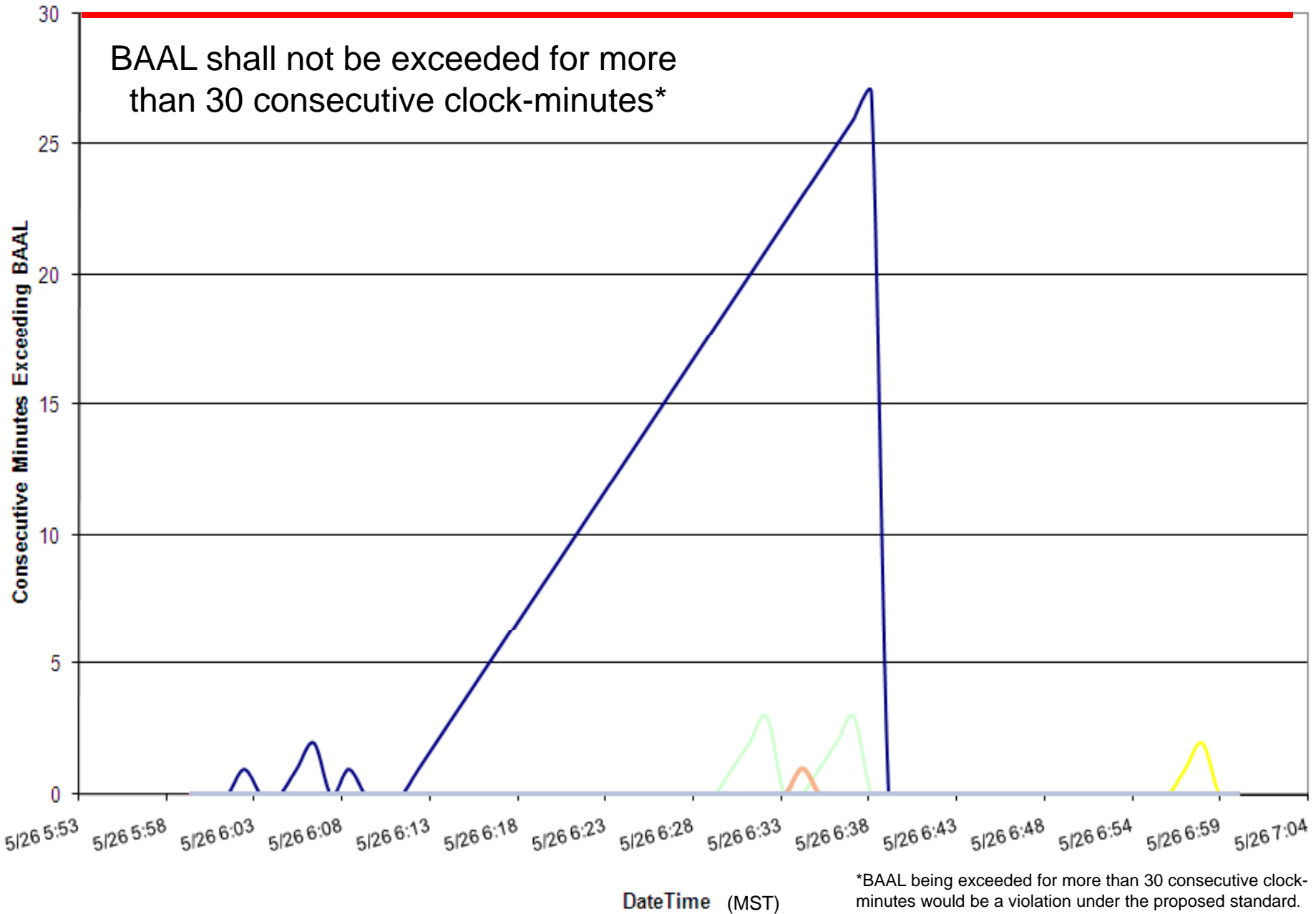


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Consecutive Minutes Exceeding BAAL

BAAL Violation*

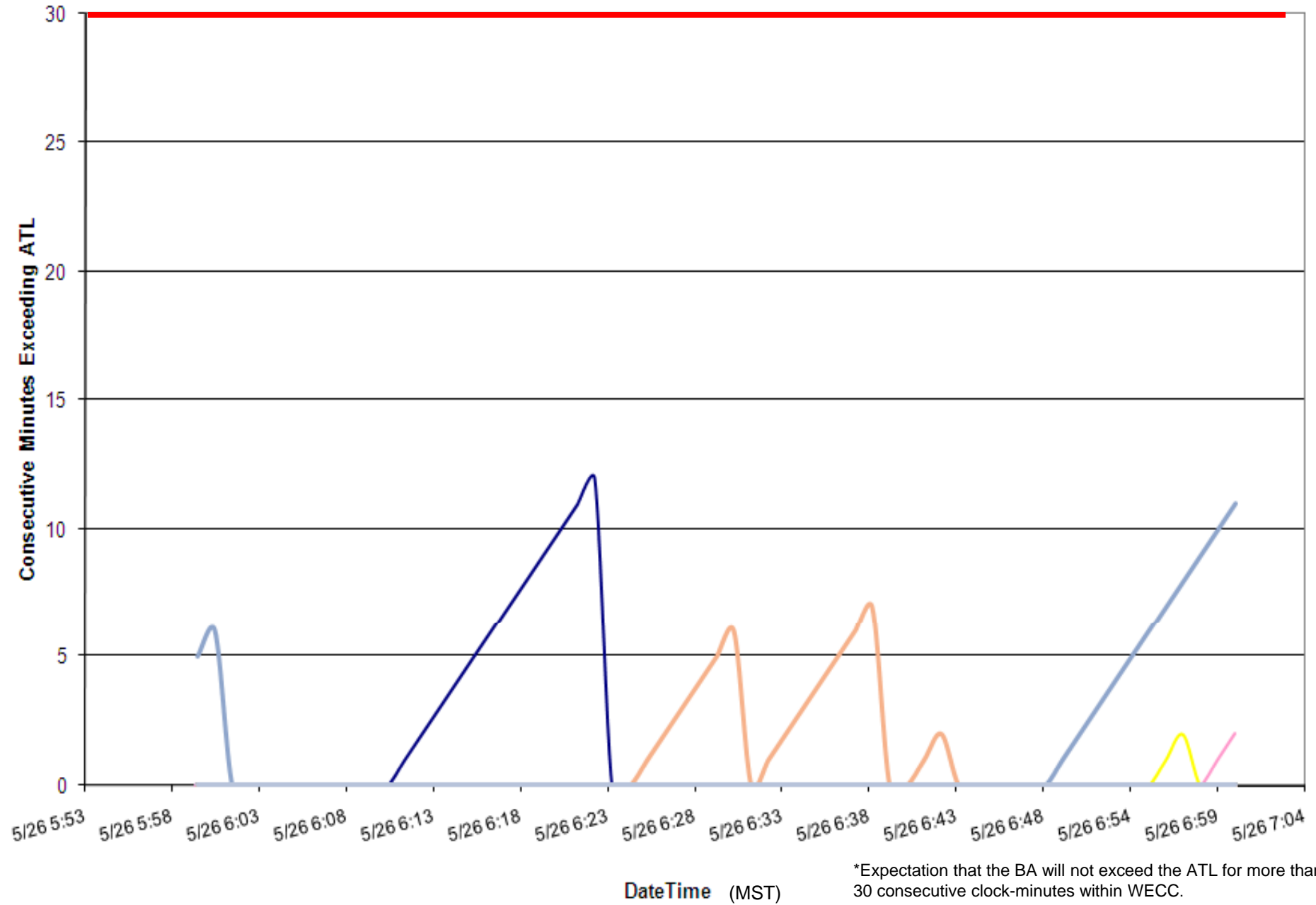


5/26/2010 6:02-6:29 PDT

27 minute duration below BAAL_{Low}

Consecutive Minutes Exceeding ATL

ATL 30 Min Limit*



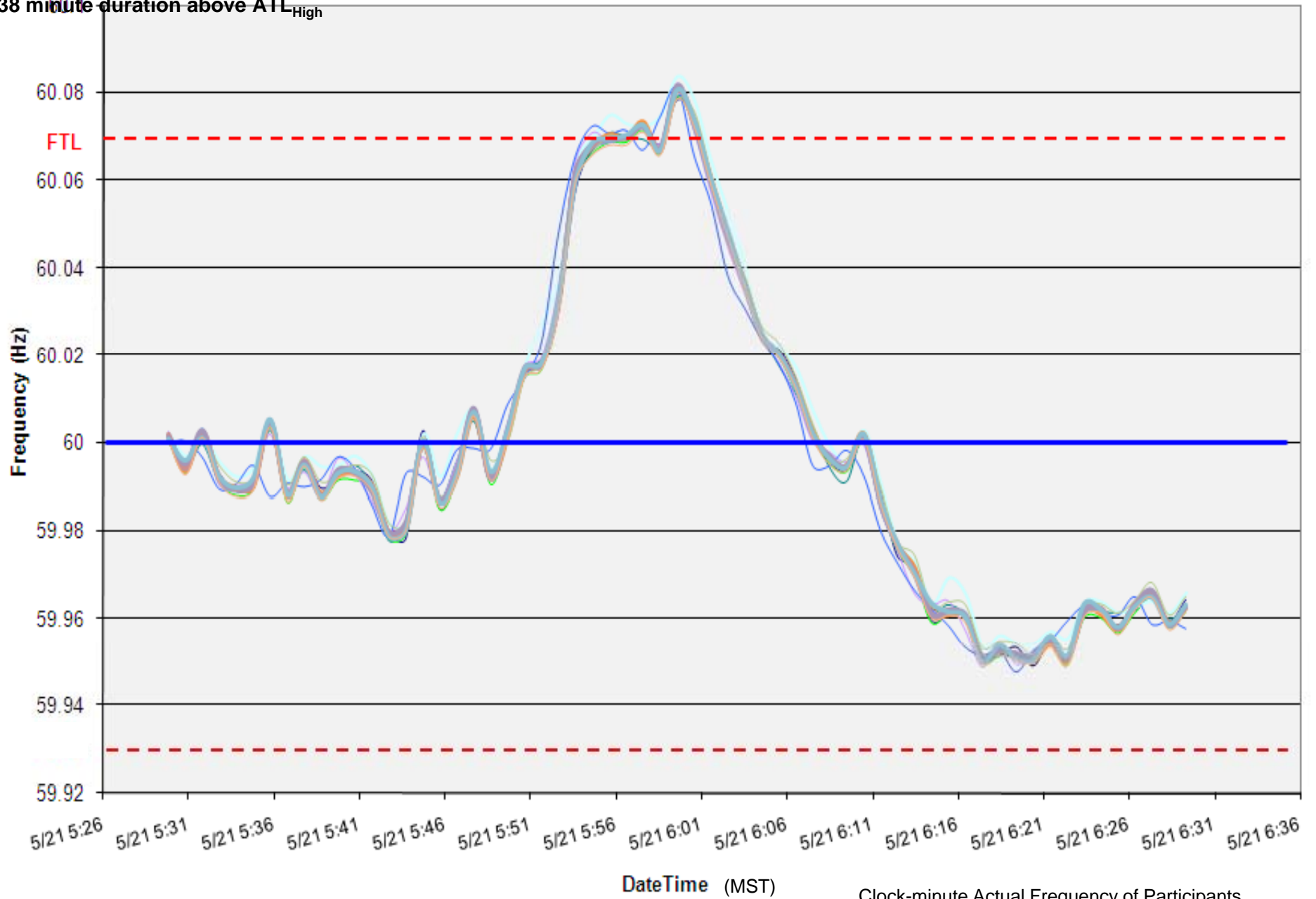
*Expectation that the BA will not exceed the ATL for more than 30 consecutive clock-minutes within WECC.

5/20/2010 23:28-23:41 PDT

13 minute duration above BAAL_{High}

38 minute duration above ATL_{High}

Clock-Minute Average Frequency

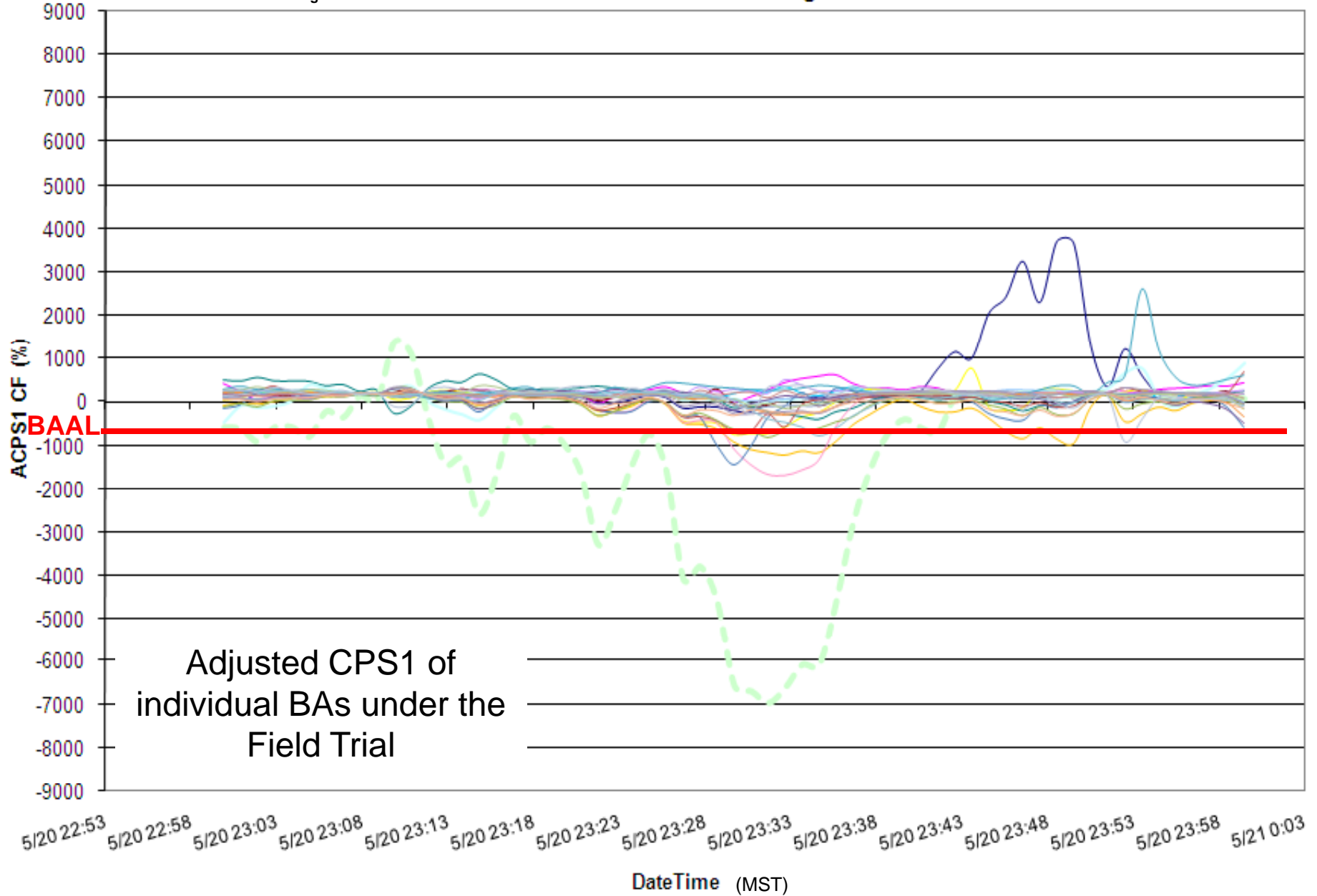


5/20/2010 23:28-23:41 PDT

13 minute duration above BAAL_{High}

38 minute duration above ATL_{High}

ACPS1 Clock-Minute Averages



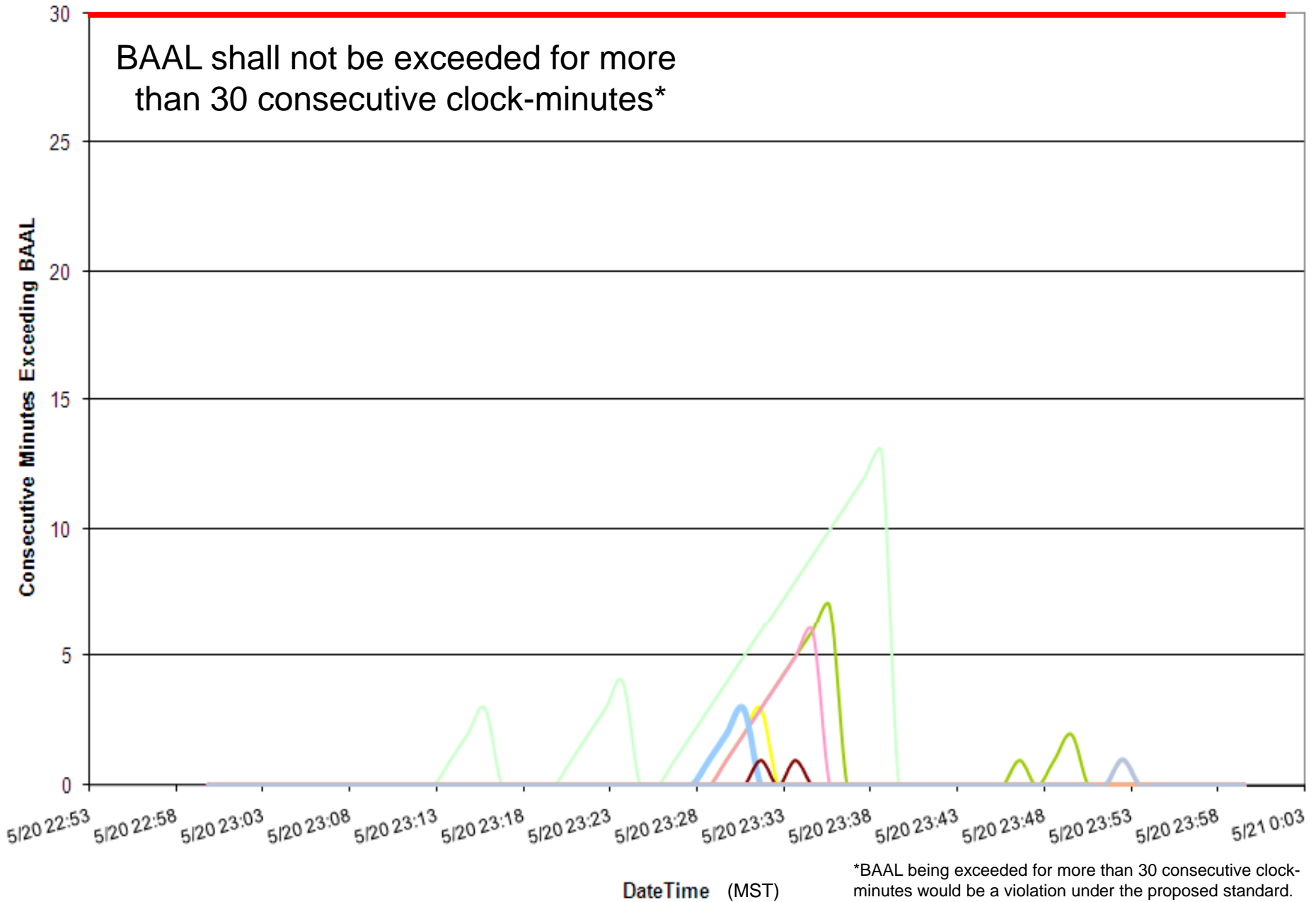
5/20/2010 23:28-23:41 PDT

13 minute duration above BAAL_{High}

38 minute duration above ATL_{High}

Consecutive Minutes Exceeding BAAL

BAAL Violation*

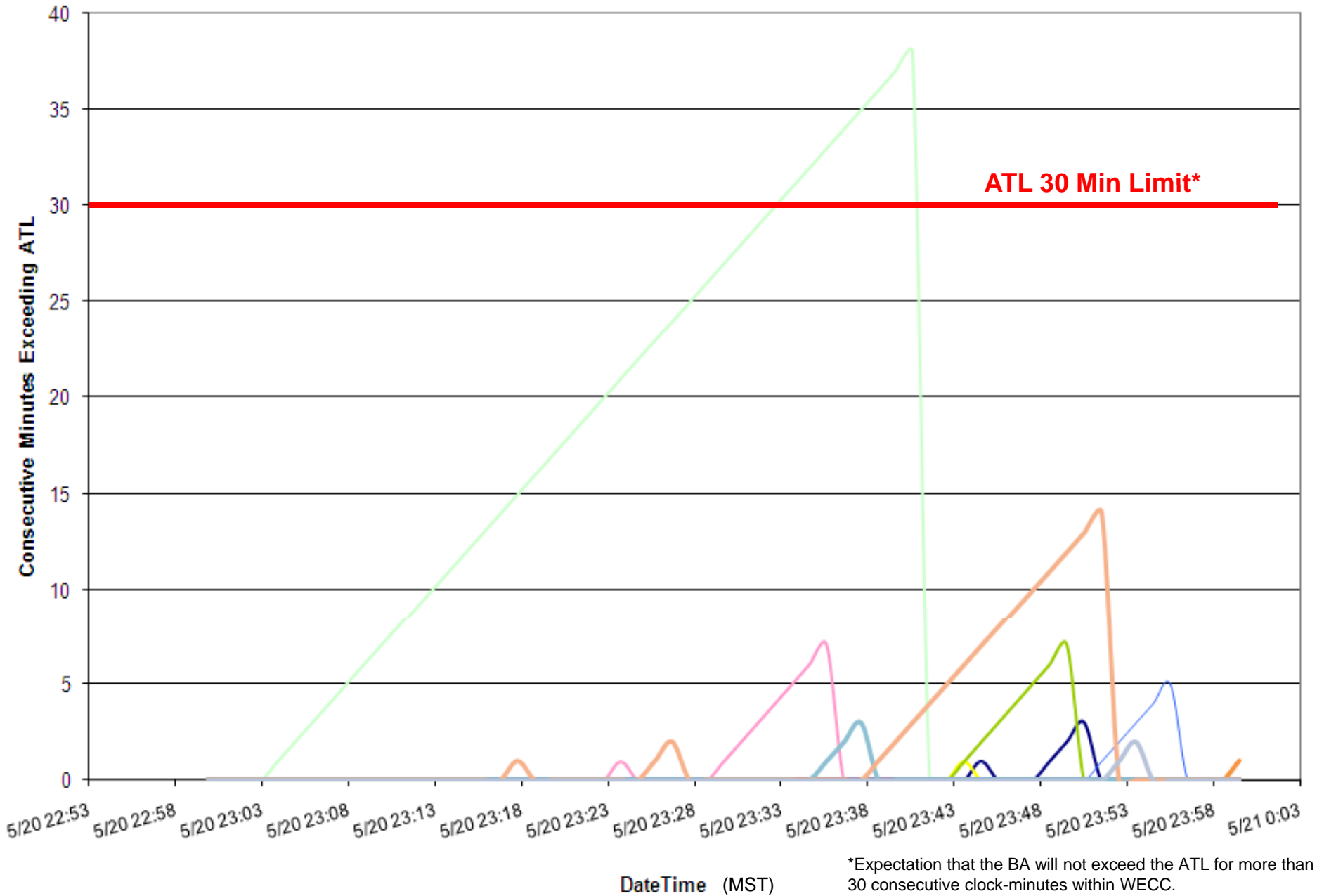


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