



Federal Aviation  
Administration

# GOLD Data Link Analysis (ATTACHMENT A)

ISPACG/26 FIT/19

27 February – 2 March 2012



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# Summary of Inmarsat Reported Service Outages/Degradations 2010 to Present

Date	DSP	Region Affected	Start Time (UTC)	Duration (min)	Explanation
01-Feb-2010	Sita	POR AOW/AOE	18:00:00	45	Failure of an X25 to IP gateway cluster in Montreal which impacted all connections to the AIRCOM VHF stations, satellite GES and X25 hosts Customer Hosts
03-Feb-2010	Sita	POR AOW/AOE	23:10:00	16	Unknown
01-Mar-2010	ARINC	POR	12:22:00	473	The ARINC GLOBALINK GES XXC located in Santa Paula, CA was impaired due to problems with AERO Voice calls supporting the Pacific Ocean Region (POR).
10-Mar-2010	ARINC	POR	11:01:50	55	The ARINC AGN AT&T MPLS core node in Livermore, California was out of service due to a major network failure in the AT&T Sonet Network
07-Oct-2010	Sita	AOW	18:21:00	11	Faulty part caused equipment failure at GES.
19-Mar-2011	Sita	IOR	07:08:00	72	Satellite Voice, Fax and PC Data and Data Services were not available over IOR2 region due to an equipment failure. POR2 was not affected by the interruption.
02-Apr-2011	Sita	AOW/AOE	19:41:00	71	Power outage at Aussaguel GES.
27-Jul-2011	Sita	IOR	14:35:00	163	Antenna fault at Perth GES.
22-Sep-2011	Sita	AOW/AOE	04:00:00	10	Unknown
22-Oct-2011	Sita	POR/AOE	8:58:00	832	POR satellite outage



# Summary of Reported Iridium Service Outages/Degradations 2011 to Present

Date	Start Time (UTC)	Duration (hh:mm:ss)	Explanation
01-Feb-2011	21:32	00:38:02	Iridium's SBD service was unavailable.
24-Mar-2011	19:47	06:16:00	The Short Burst Data Systems experienced an unexpected anomaly, SBD messaging may have been delayed and users may have received duplicate messages during this time.
5-May-2011	7:01	1:29:00	Some customers utilizing SBD Direct IP for Mobile Terminated messages may have seen messages queued due difficulties connecting with the Iridium server. No messages were lost or service outage experienced; only the possibility of Direct IP Mobile Terminated messages being queued and some difficulty connecting to the Iridium SBD DIP MT server
11-Jul-2011	10:06	3:00:00	Due to severe thunderstorms which occurred in the vicinity of the Tempe Gateway, customers may have experienced dropped calls and the inability to place or receive calls. Telephony, Paging, SMS messaging, and all Data services may have been affected until the weather anomaly passed. Iridium OpenPort service not affected.
19-Aug-2011	00:57:00	02:03:00	Due to thunderstorms in the vicinity of Tempe Gateway, customers may experience dropped calls and the inability to place or receive calls. Telephony and data serviced may be affected until weather anomaly has passed.

# Summary of Reported Iridium Service Outages/Degradations 2011 to Present (Continued)

Date	Start Time (UTC)	Duration (hh:mm:ss)	Explanation
9-Sep-2011	07:00:00	0:30:00	SBD Email MT users may have seen intermittent communications issue with Iridium email servers during this timeframe. All messages that were queued were sent.
9-Sep-2011	05:15:00	10:45:00	Iridium Datalink ACARS service is now back to normal. The root cause for the anomaly is still under investigation.
11-Sep-2011	10:45:00	01:06:00	During the time frame some customers may have experienced service degradation. All services at this time are back to normal operation.
14-Sep-2011	04:56:00	05:04:00	Due to severe thunderstorms in the vicinity of the Tempe Gateway, customers may experience dropped calls and the inability to place or receive calls. Telephony, Paging, SMS messaging, and all Data services may be affected until the weather anomaly has passed. Iridium OpenPort service is not affected.
1-Nov-2011	18:16:00	00:17:00	IRIDIUM / SATCOM was degraded
2-Nov-2011	01:09:00	02:35:00	ARINC GL/IRIDIUM service outage
17-Jan-2012	21:45:00	00:33:00	Description of Maintenance: During the above timeframe, Short Burst Data customers were unable to use Short Burst Data services. This affected all Short Burst Data traffic. All other data and voice services are not impacted. New messages were not queued during this timeframe so they may need to be resent. Messages that were queued before the outage should not have been lost.



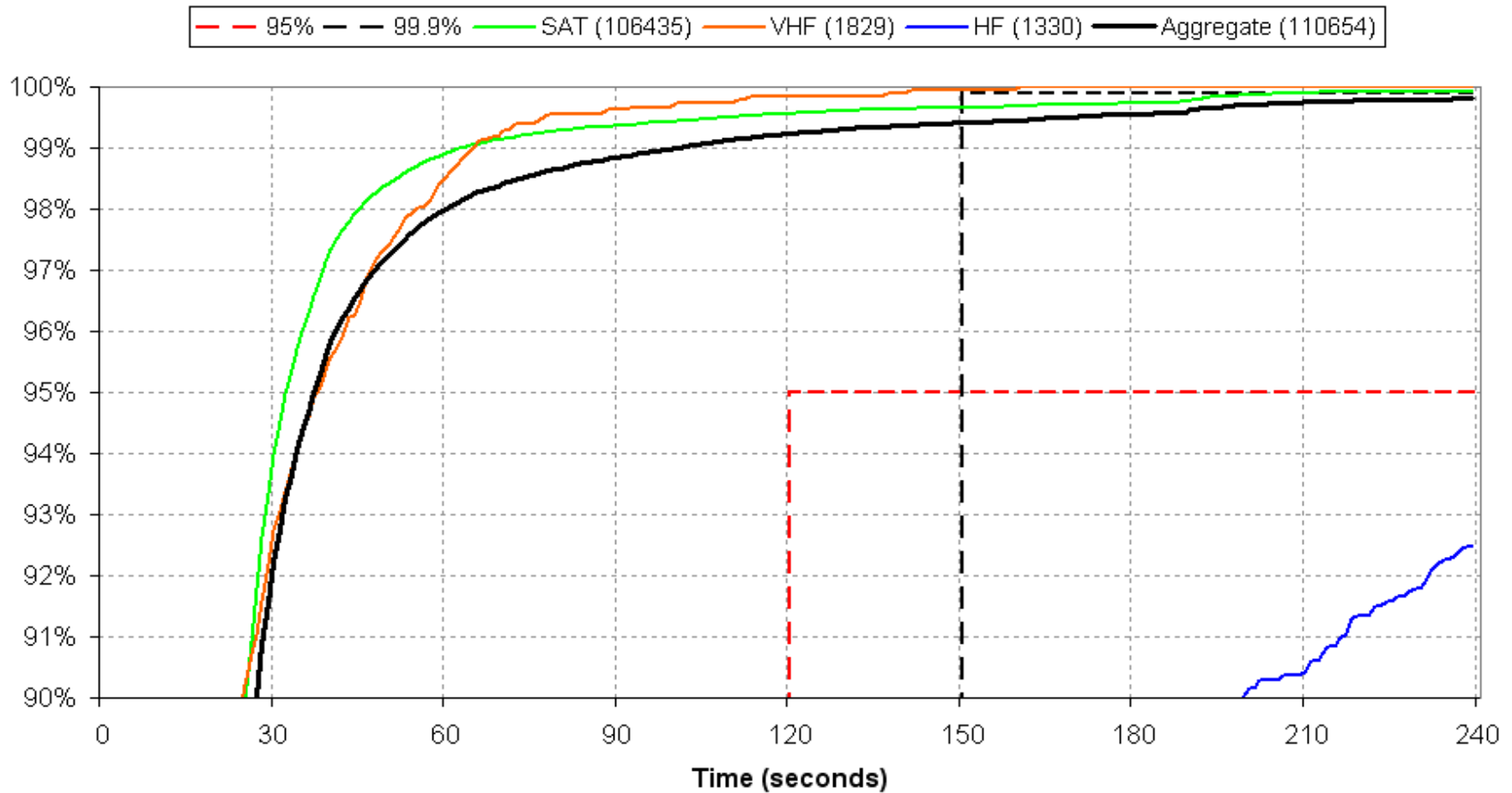
# Oakland Monthly Performance July to December 2011



# Oakland FIR - Performance by Media Type - July to December 2011

## CPDLC Actual Communication Technical Performance (ACTP)

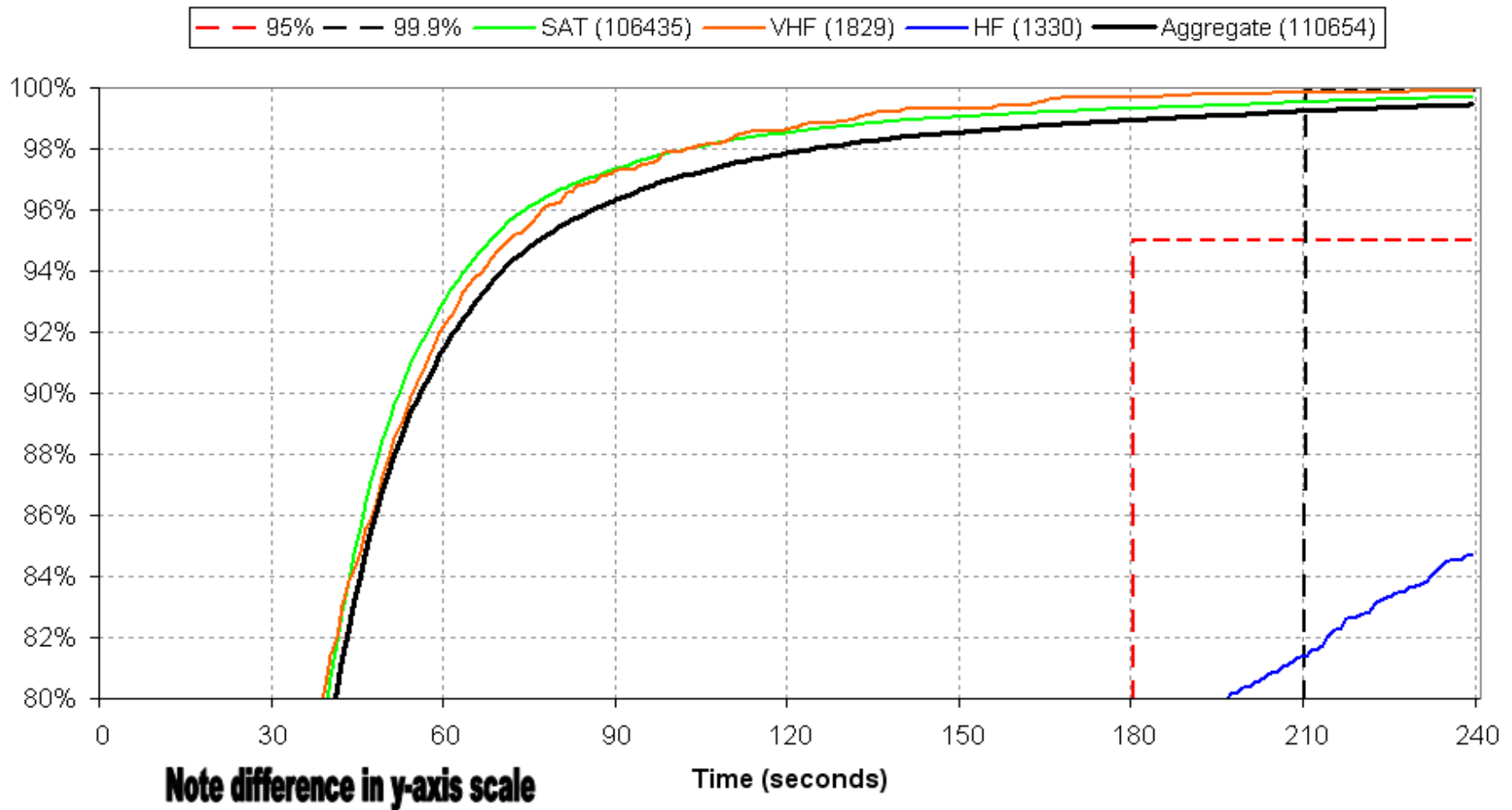
(Reported DSP Outages Excluded)



# Oakland FIR - Performance by Media Type - July to December 2011

## CPDLC Actual Communication Performance (ACP)

(Reported DSP Outages Excluded)

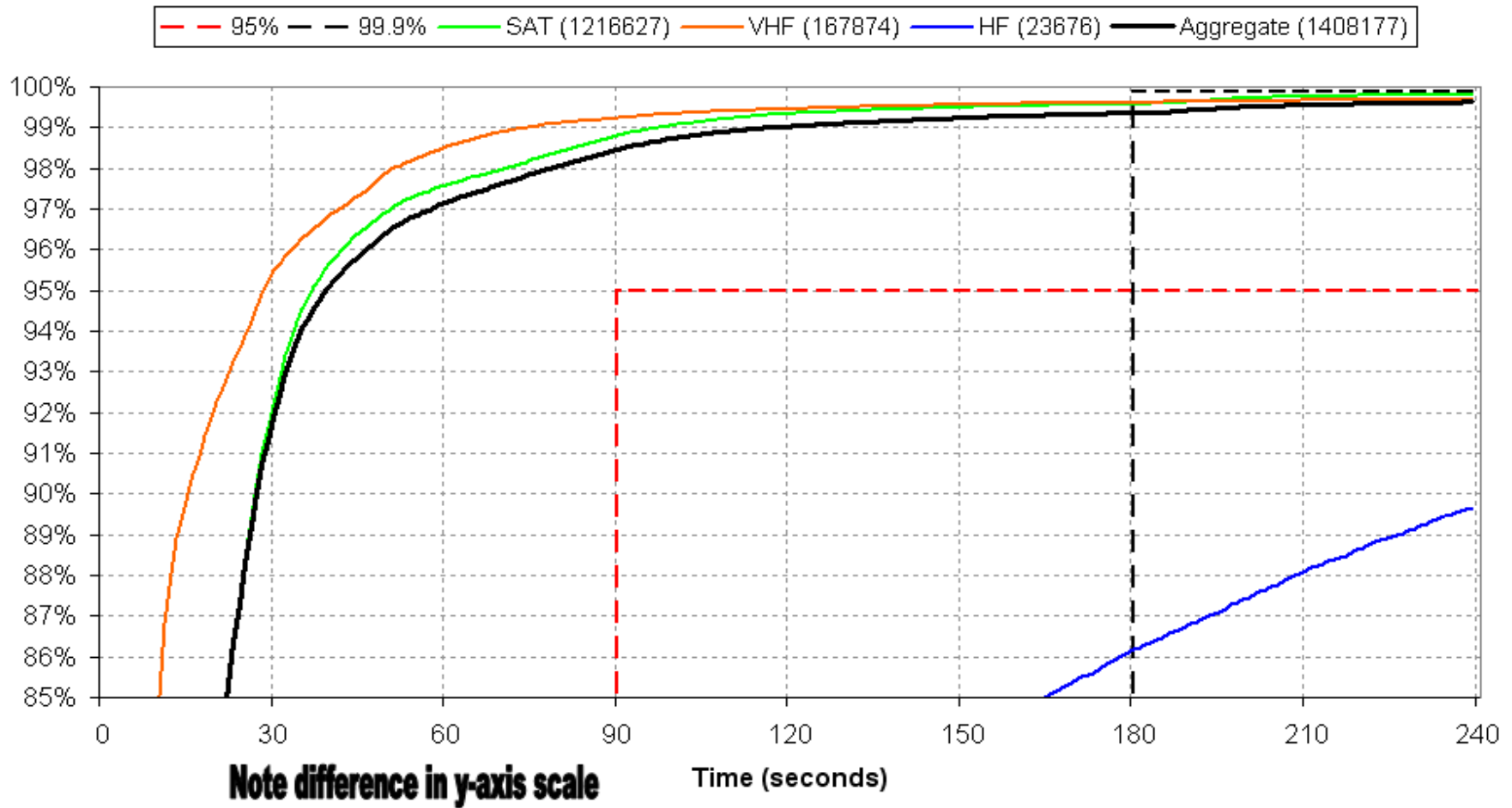




# Oakland FIR - Performance by Media Type - July to December 2011

## ADS-C Downlink Latency

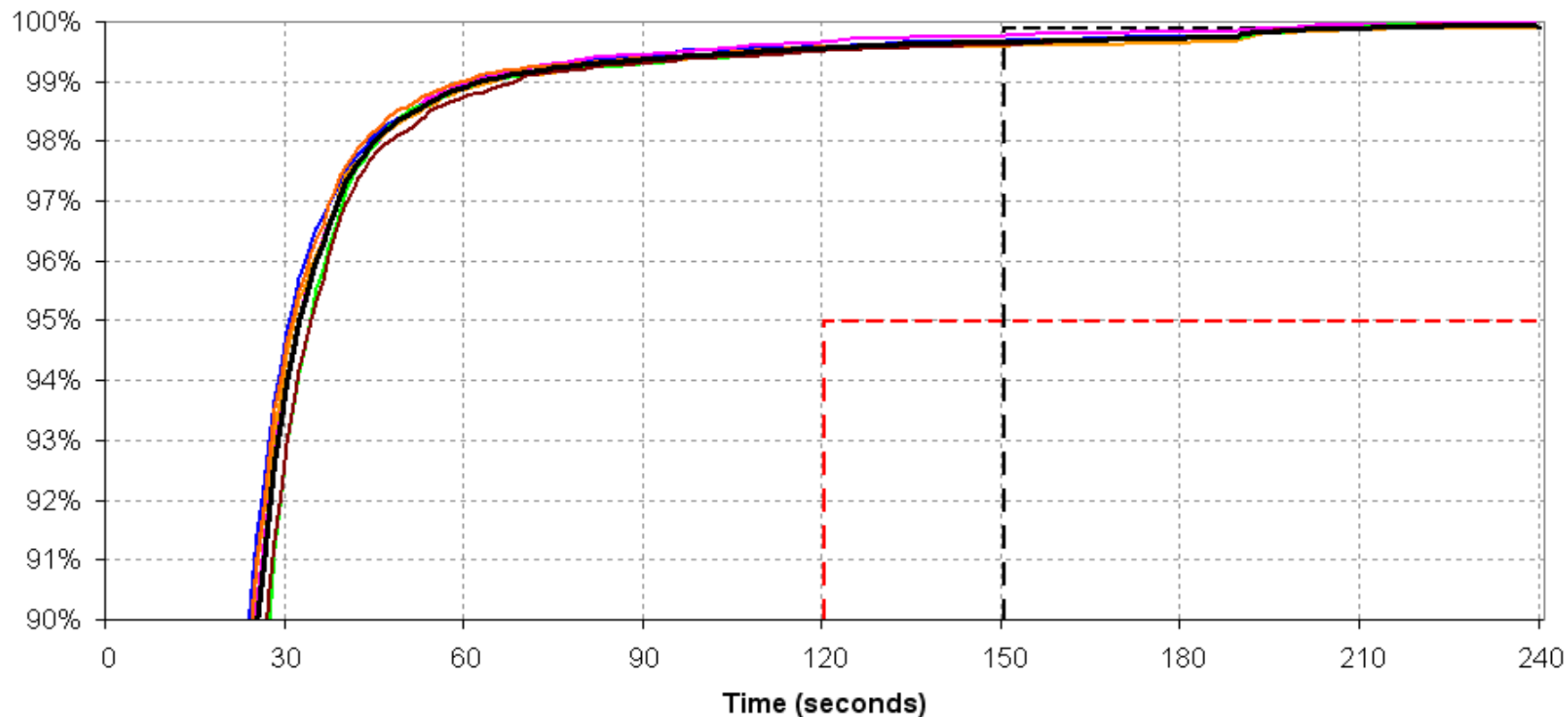
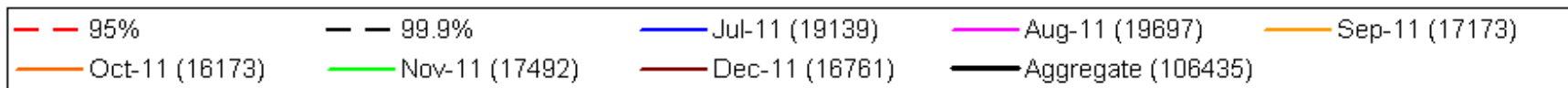
(Duplicate Messages and Messages During Reported DSP Outages Excluded)



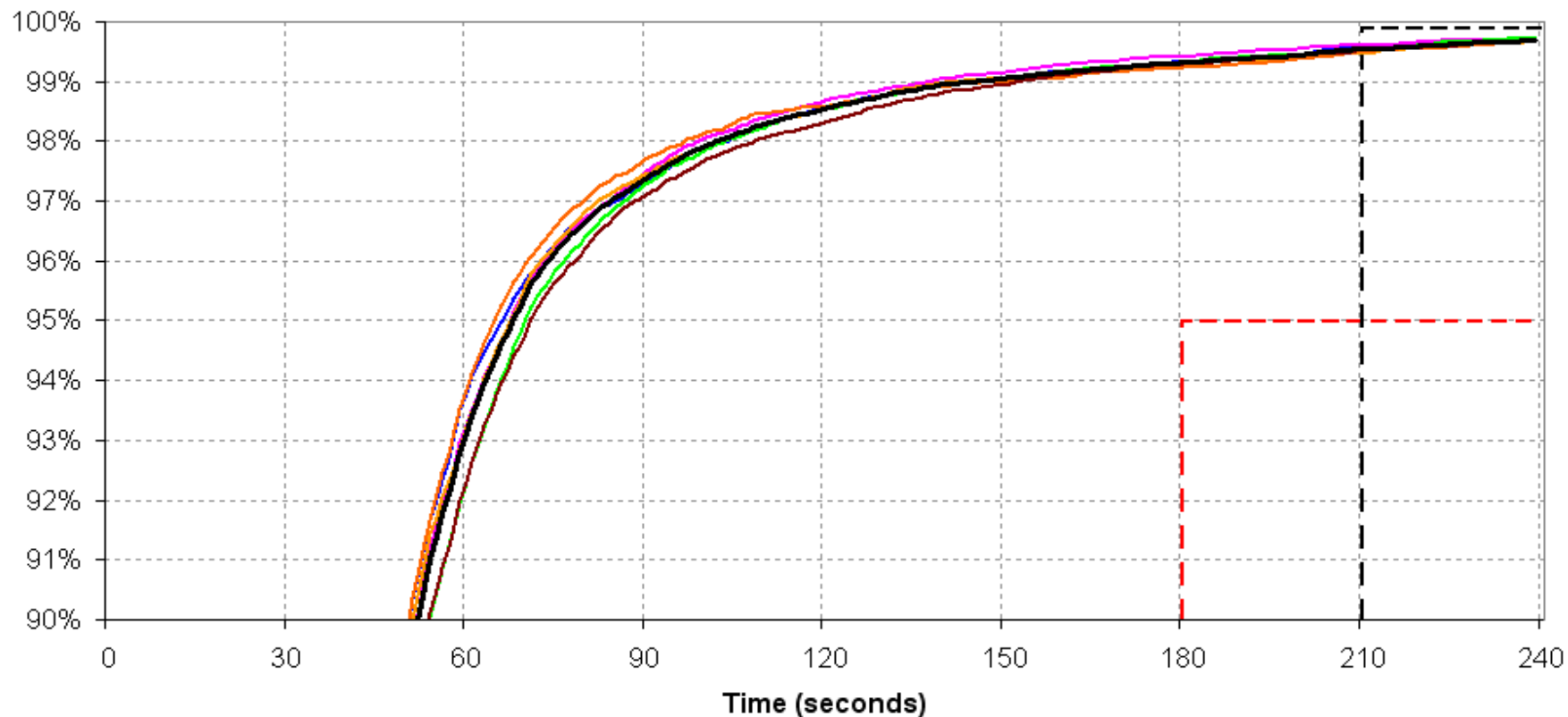
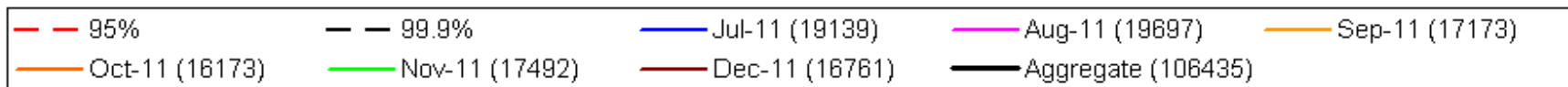
# Summary of Observed Datalink Media Usage

Media	Percent of ADS-C Messages	Percent of RCP CPDLC Messages
SAT	86.4%	96.2%
VHF	11.9%	1.6%
HF	1.7%	1.2%
Mixed Media	--	1.0%

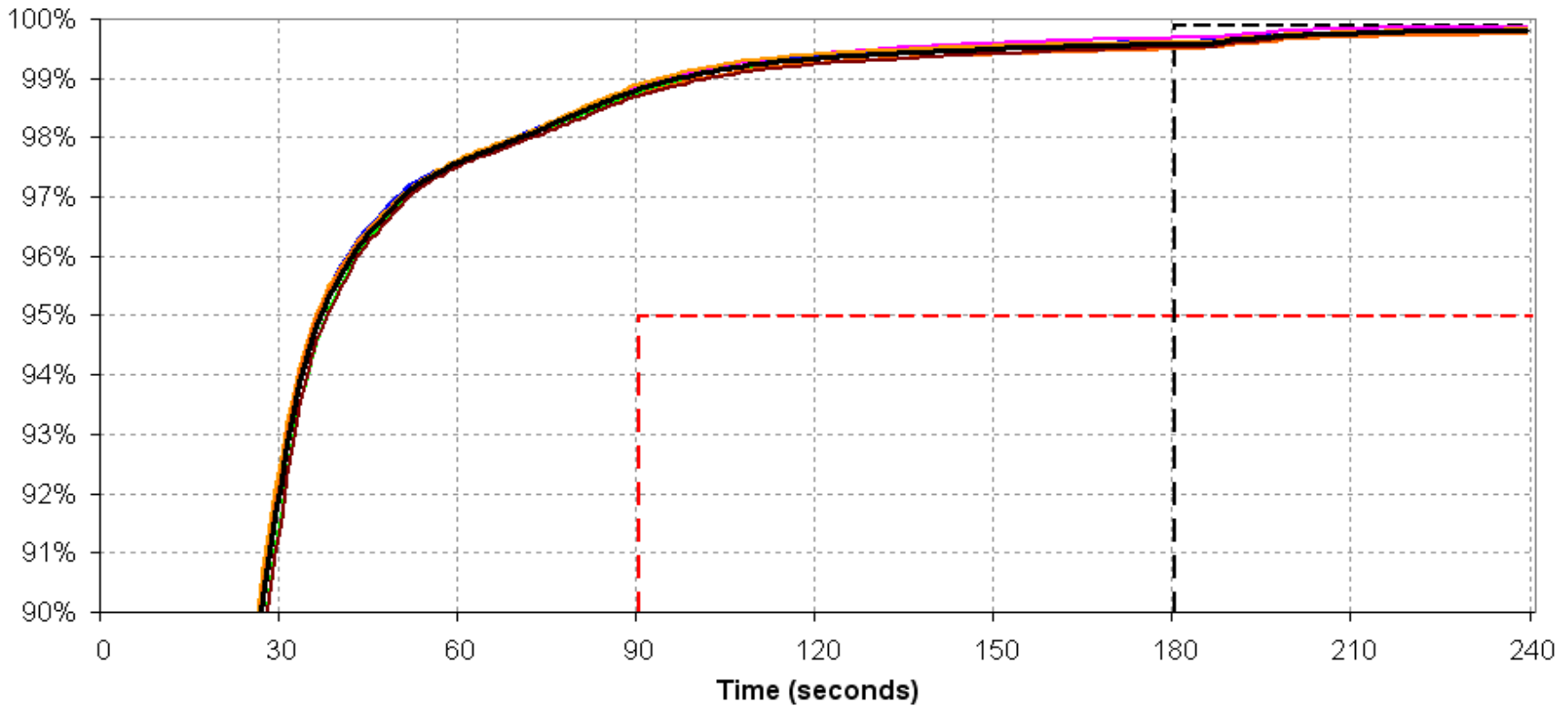
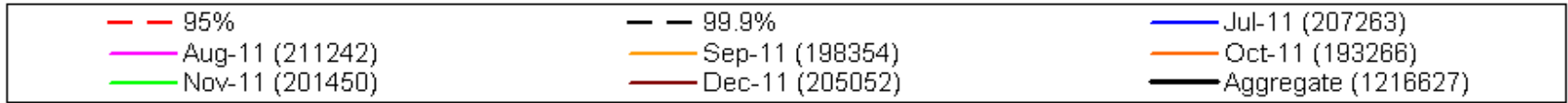
## Oakland FIR - SAT Performance by Month CPDLC Actual Communication Technical Performance (ACTP) (Reported DSP Outages Excluded)



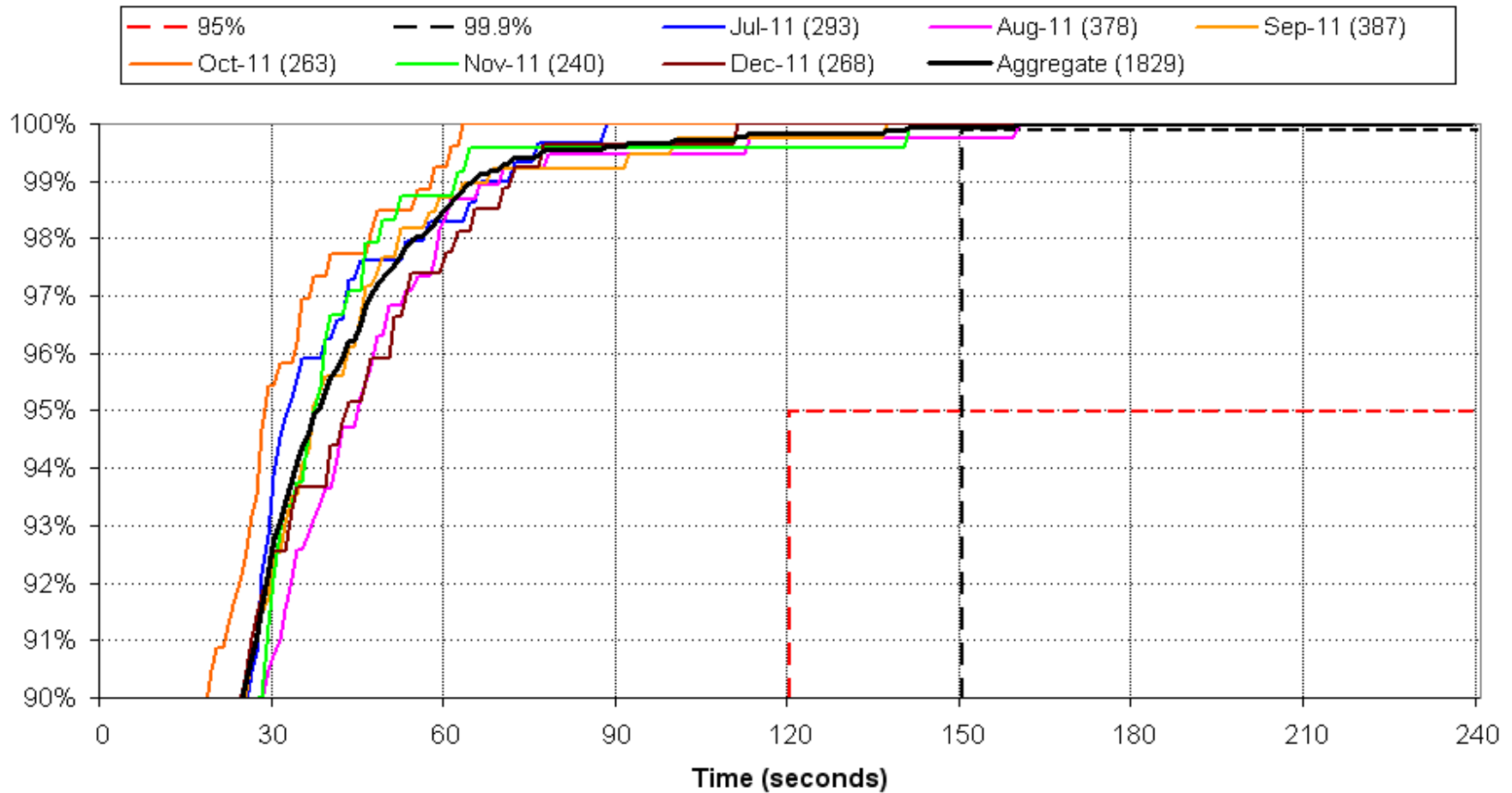
## Oakland FIR - SAT Performance by Month CPDLC Actual Communication Performance (ACP) (Reported DSP Outages Excluded)



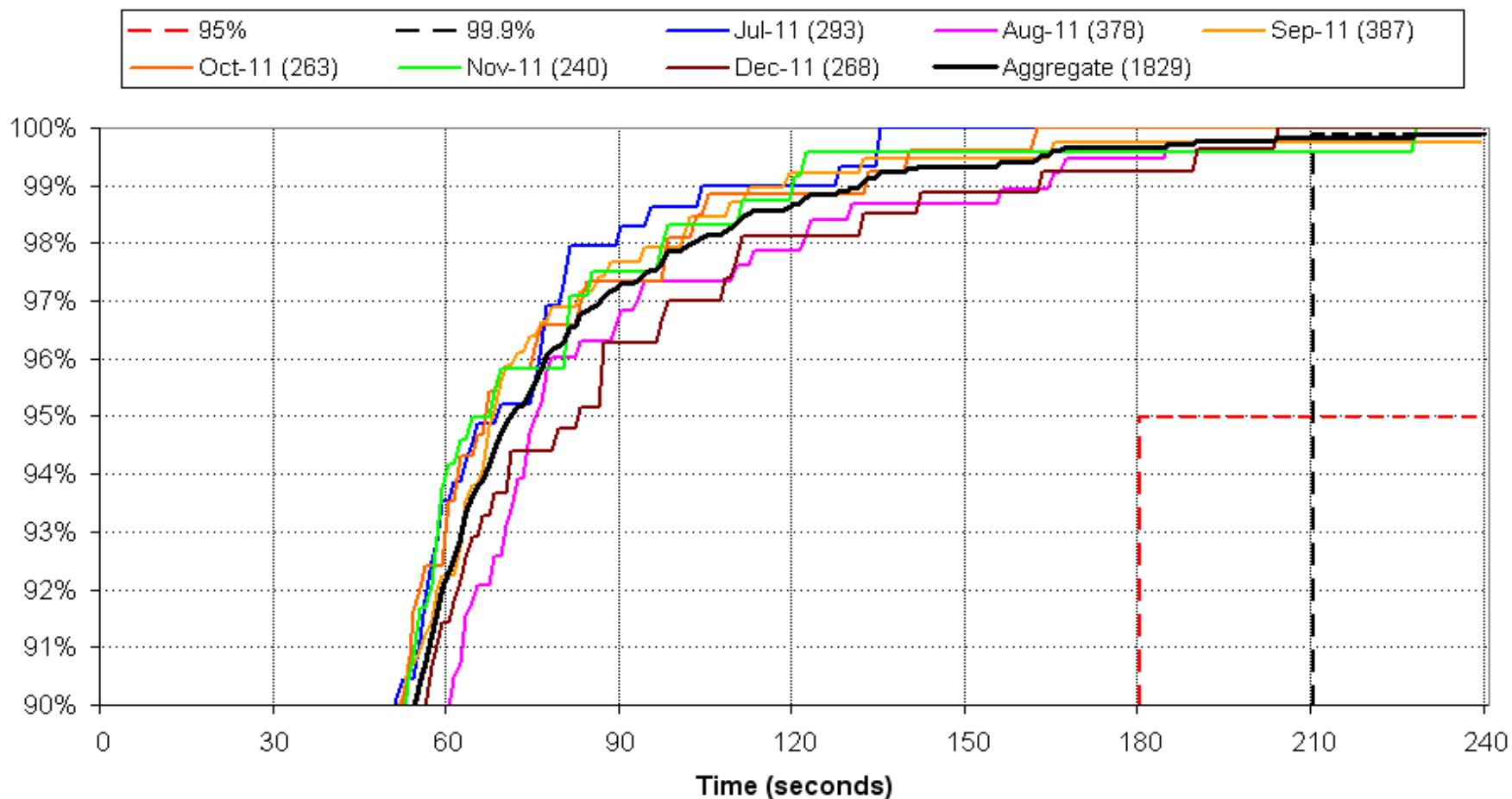
## Oakland FIR - SAT Performance by Month ADS-C Downlink Latency (Duplicate Messages and Messages During Reported DSP Outages Excluded)



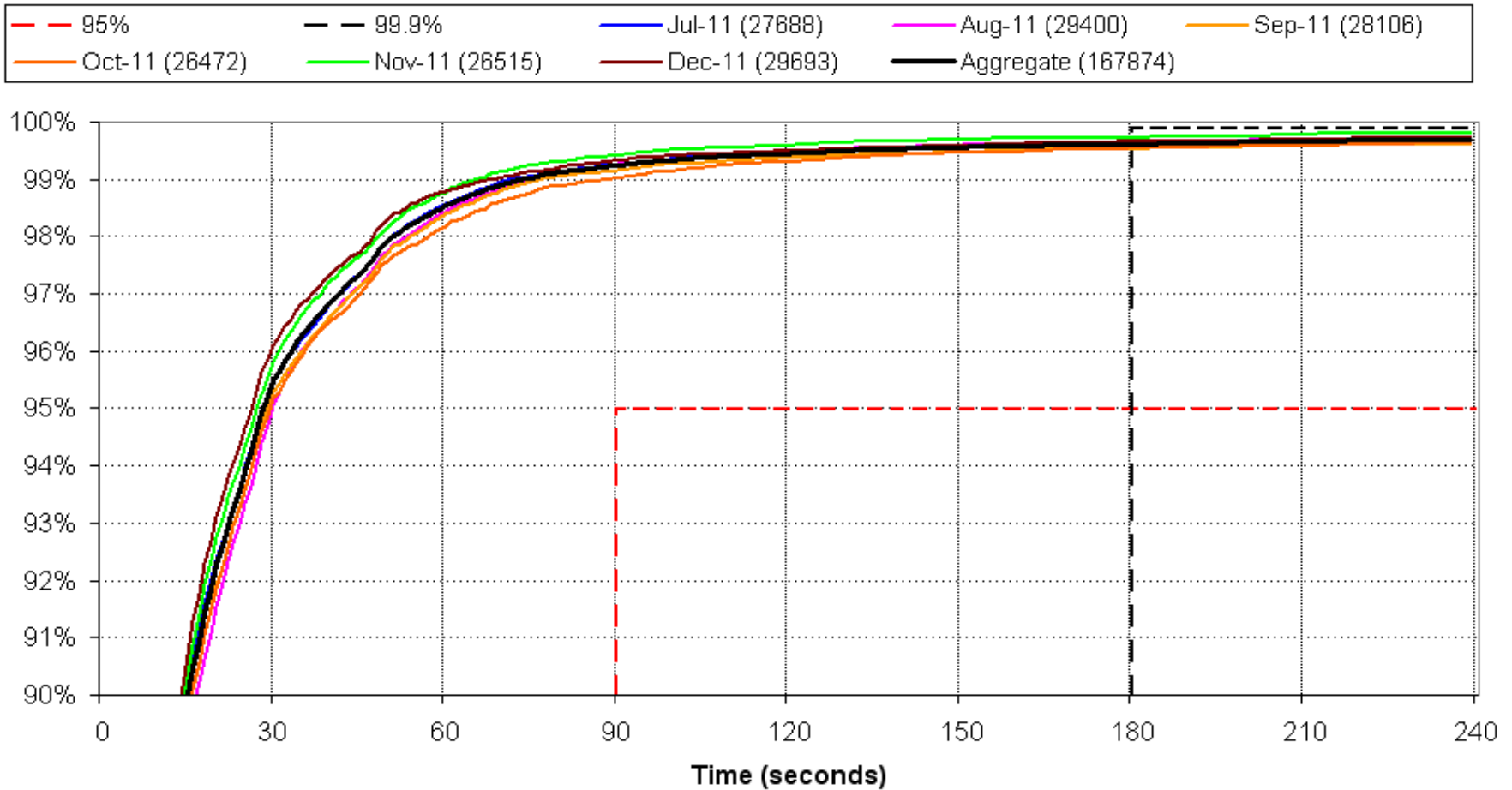
## Oakland FIR - VHF Performance by Month CPDLC Actual Communication Technical Performance (ACTP) (Reported DSP Outages Excluded)



## Oakland FIR - VHF Performance by Month CPDLC Actual Communication Performance (ACP) (Reported DSP Outages Excluded)



## Oakland FIR - VHF Performance by Month ADS-C Downlink Latency (Duplicate Messages and Messages During Reported DSP Outages Excluded)

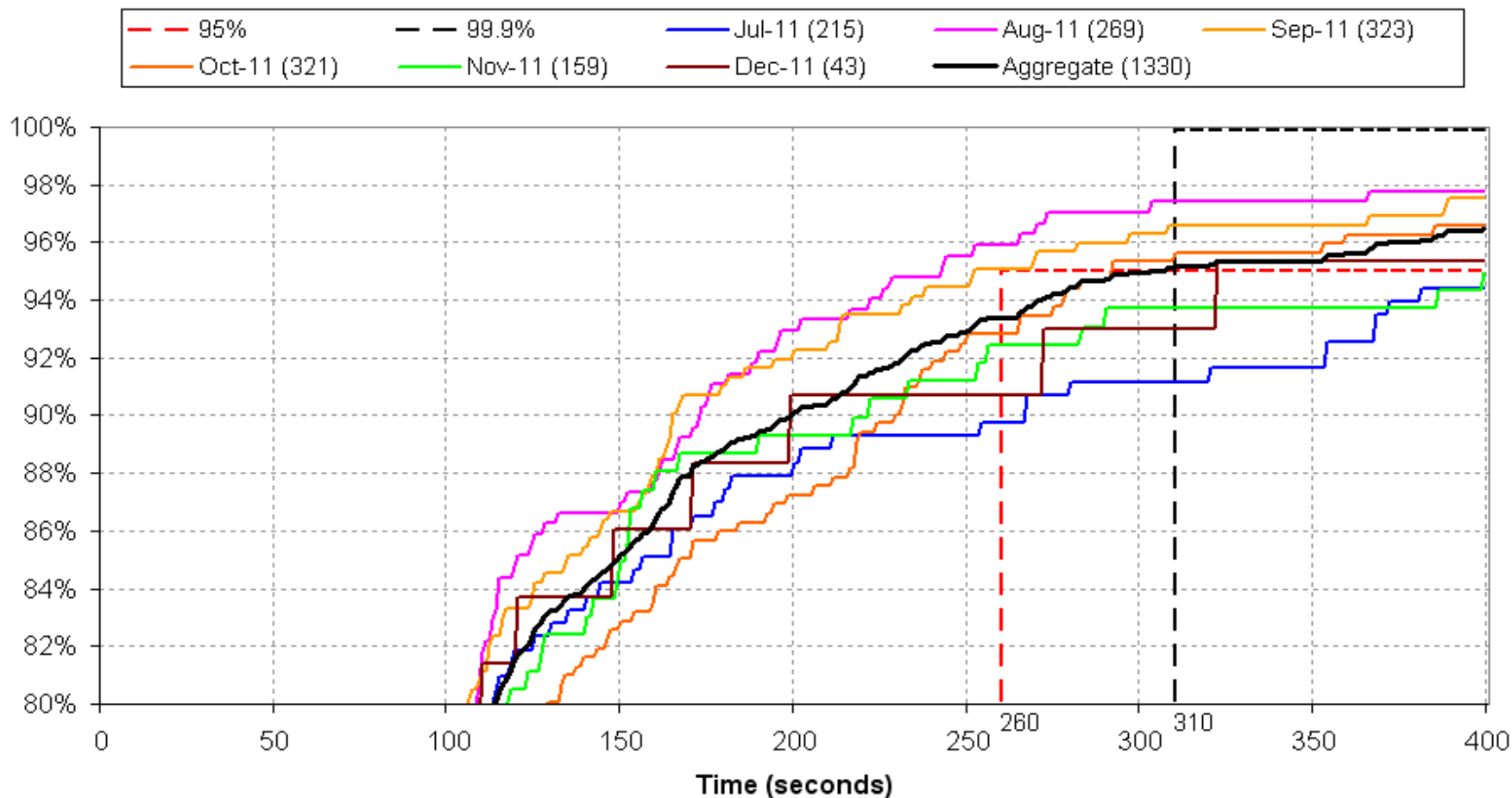




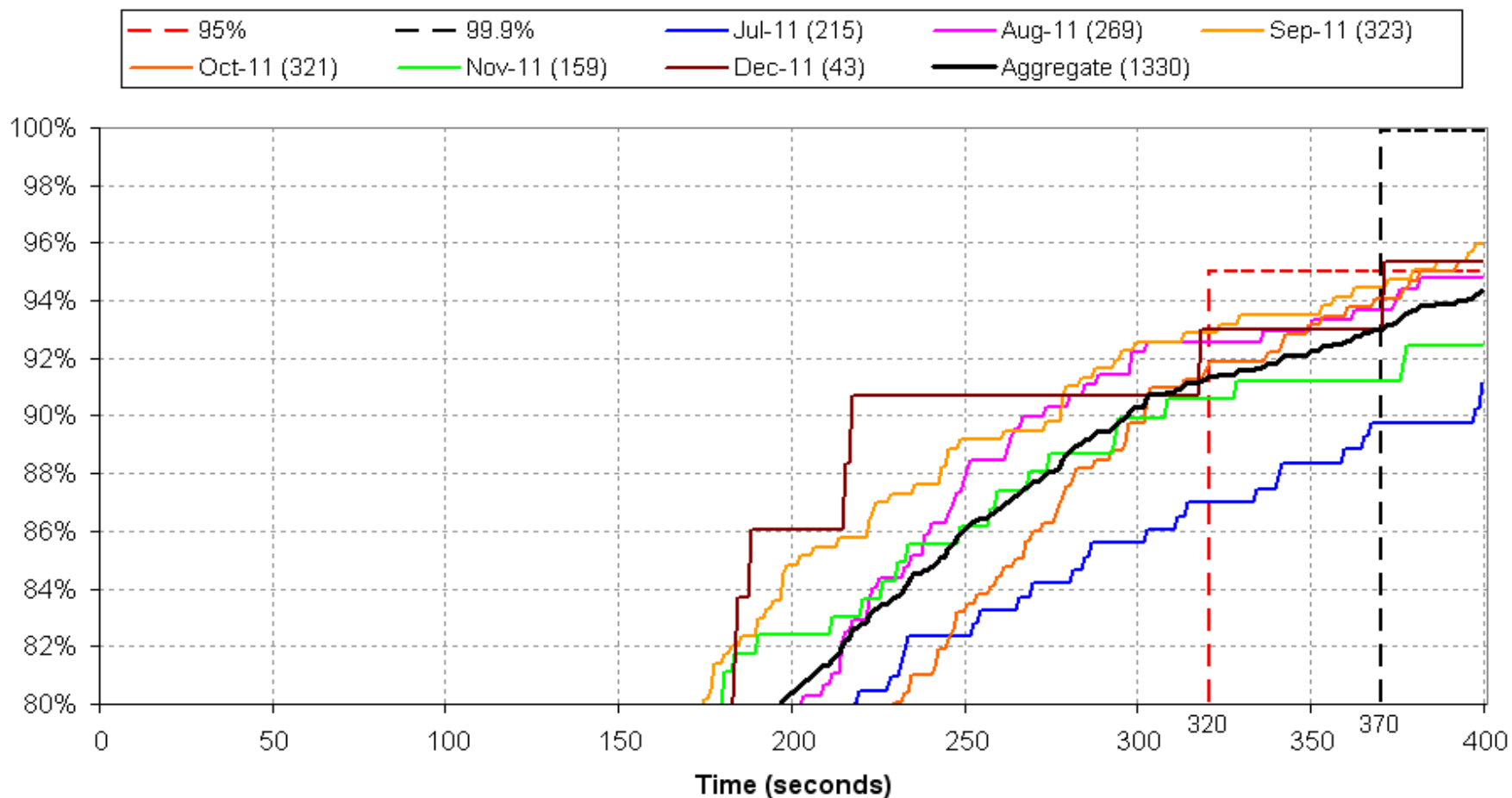
## Oakland FIR - HF Performance by Month

### CPDLC Actual Communication Technical Performance (ACTP)

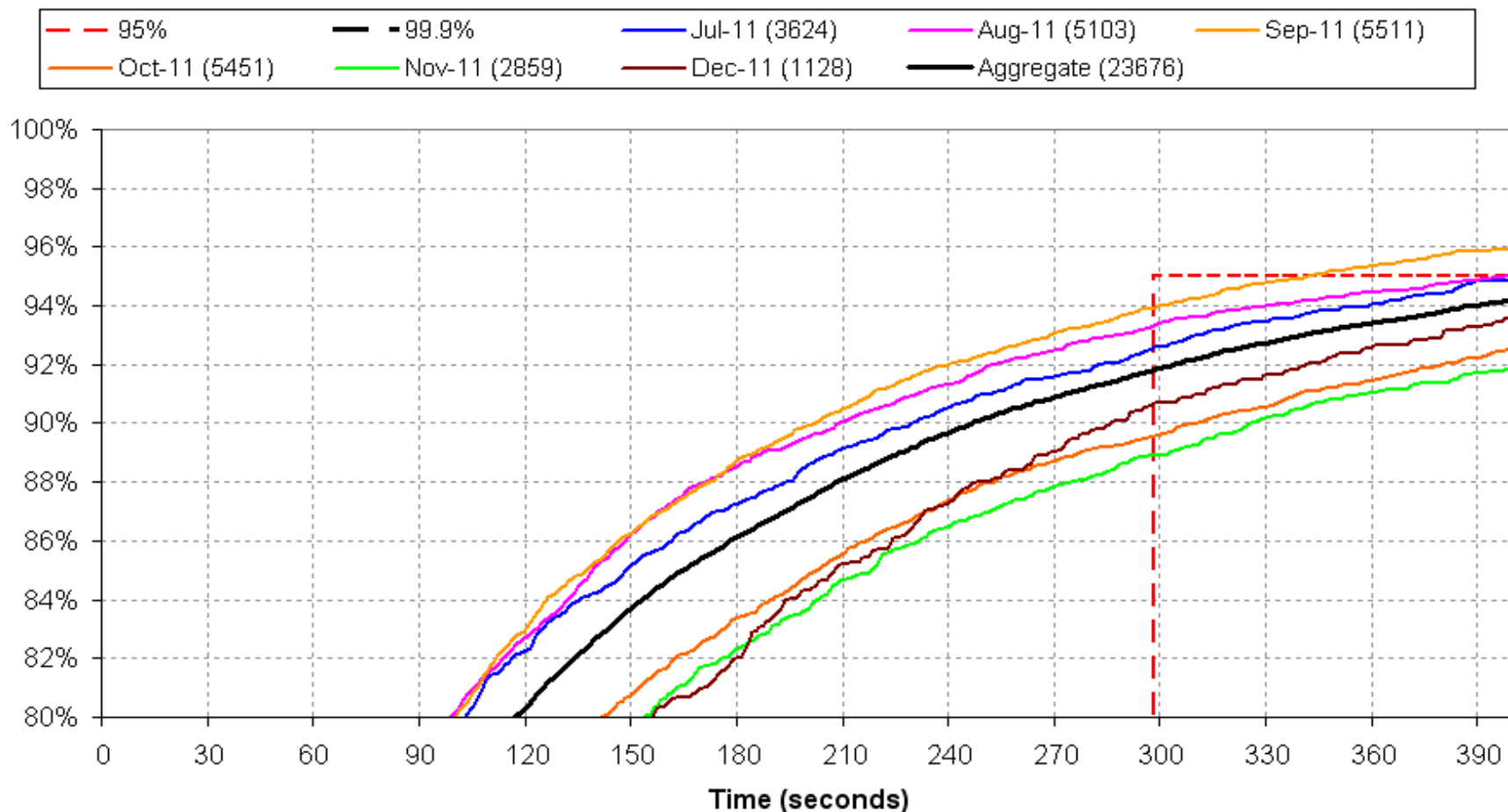
(Reported DSP Outages Excluded)



## Oakland FIR - HF Performance by Month CPDLC Actual Communication Performance (ACP) (Reported DSP Outages Excluded)



## Oakland FIR - HF Performance by Month ADS-C Downlink Latency (Duplicate Messages and Messages During Reported DSP Outages Excluded)



# Summary of Performance in Oakland

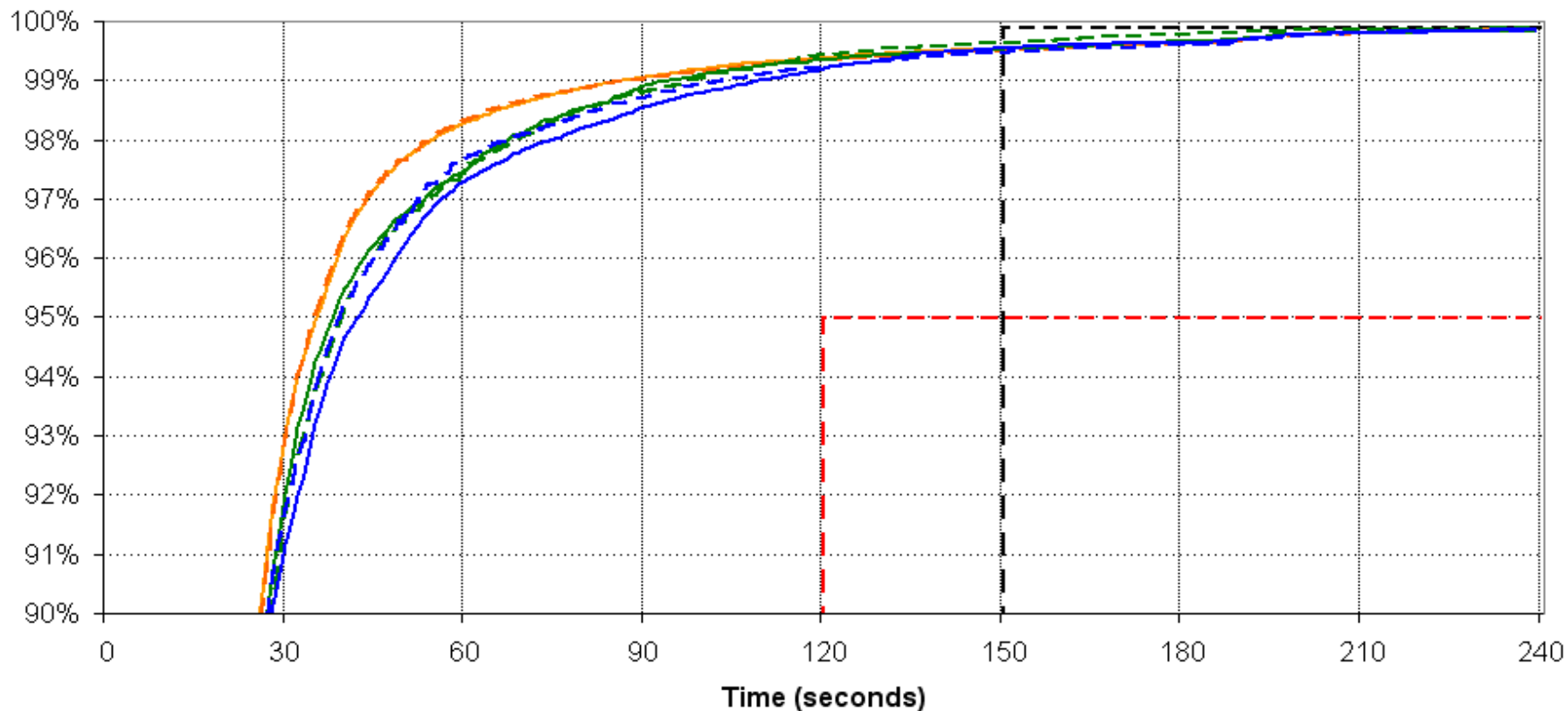
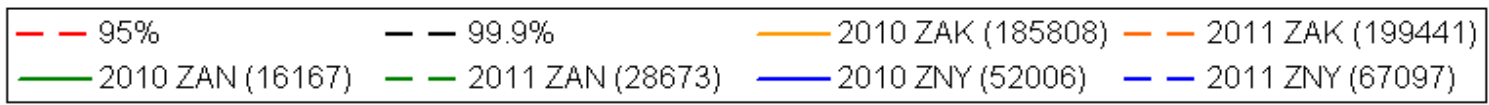
- **SAT and VHF meet 95% criteria for RCP240 ACP, ACTP and RSP180 ADS-C for the last 6 months**
- **HF meets 95% criteria for RCP400 for ACTP in 2 of the last 6 months**
- **HF does not meet 95% criteria for RSP400 for ADS-C or the 95% criteria for RCP400 for ACP in any of the last 6 months**



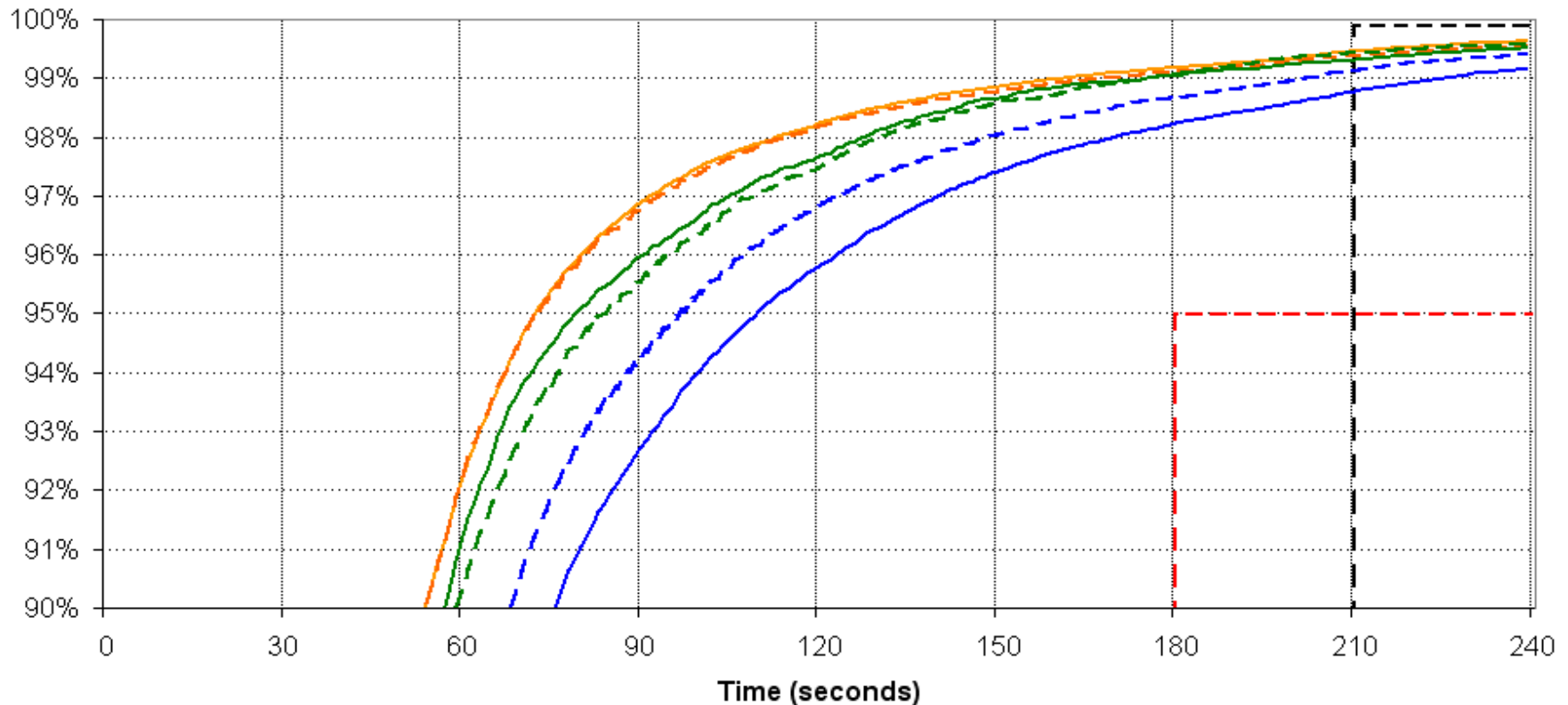
# Comparison of Datalink Performance by FIR Aggregate 2010 and 2011



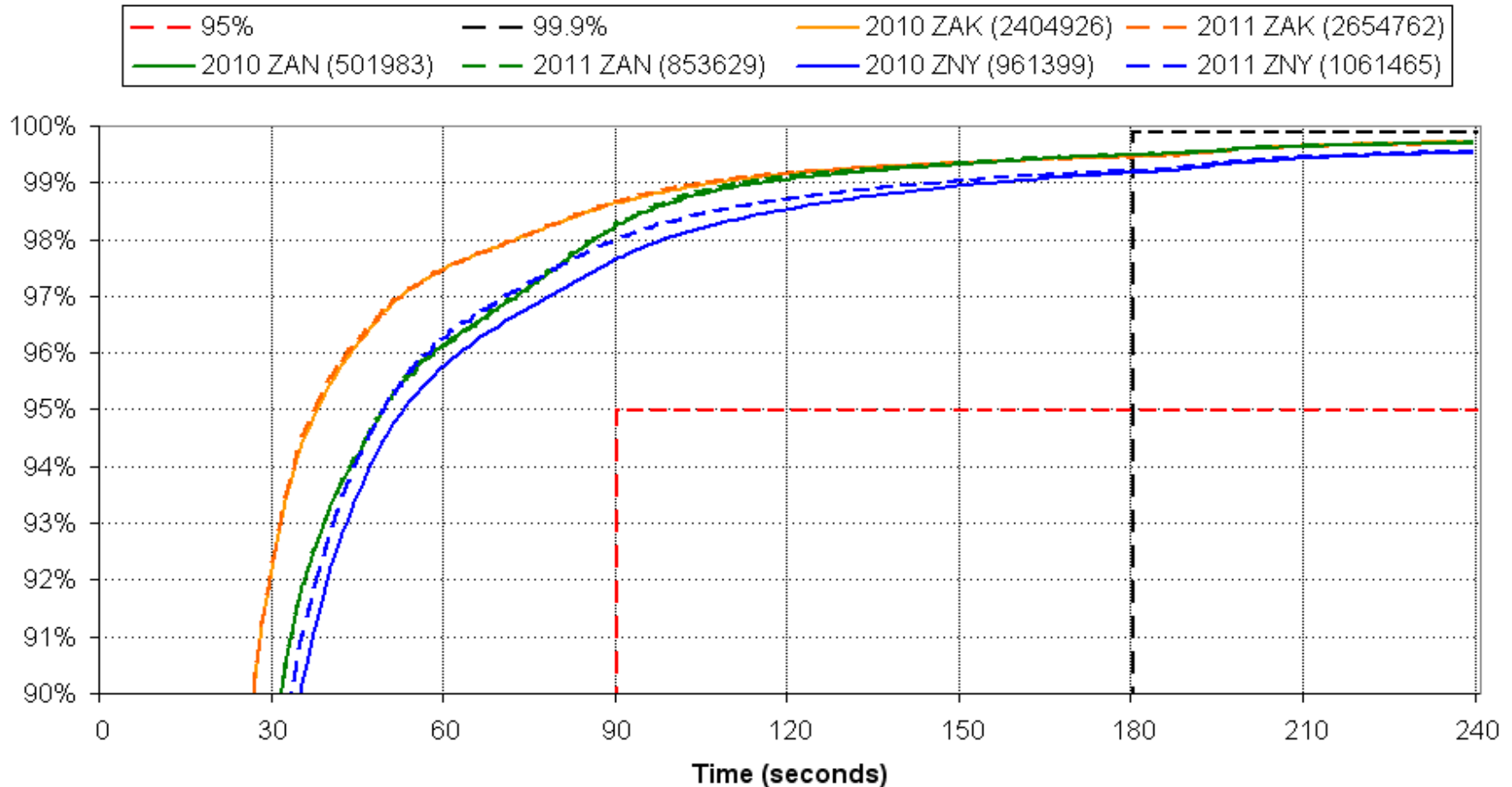
## Comparison of Datalink Performance By FIR - All Media CPDLC Actual Communication Technical Performance (ACTP) (Reported DSP Outages Excluded)



## Comparison of Datalink Performance By FIR - All Media CPDLC Actual Communication Performance (ACP) (Reported DSP Outages Excluded)

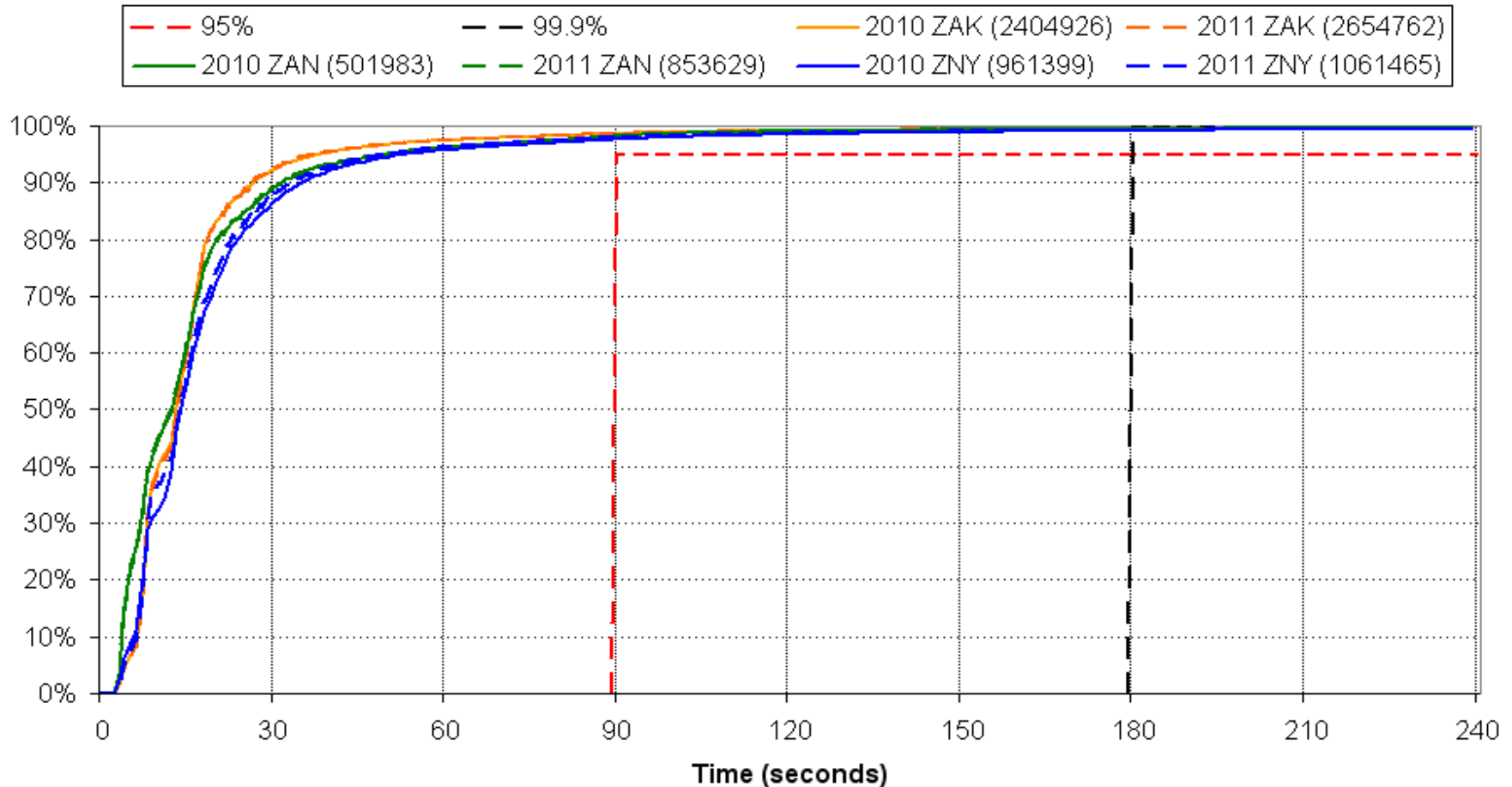


## Comparison of Datalink Performance By FIR - All Media ADS-C Downlink Latency (Reported DSP Outages Excluded)

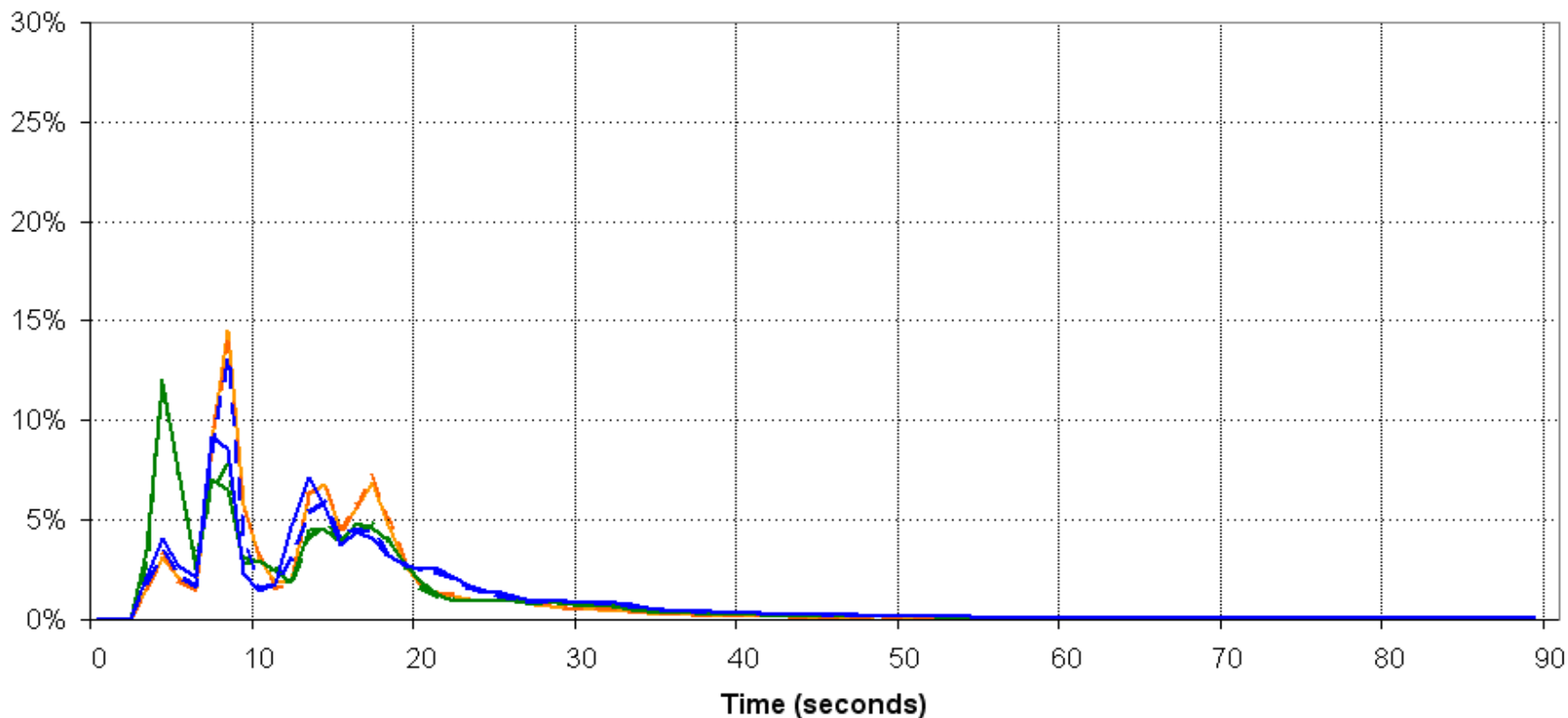
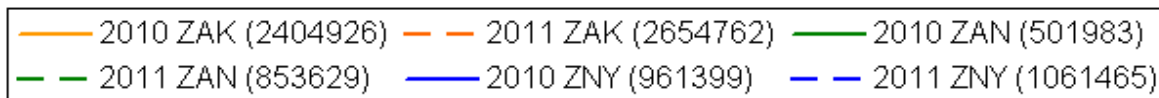




## Comparison of Datalink Performance By FIR - All Media ADS-C Downlink Latency (Reported DSP Outages Excluded)



## Comparison of Datalink Performance By FIR - All Media ADS-C Downlink Latency - Relative Frequency Distribution (Reported DSP Outages Excluded)



# Summary of Comparison of Performance by FIR

- **All 3 FIR meet 95% criteria for RCP240 ACP, ACTP and RSP180 ADS-C**
- **Between 2010 and 2011:**
  - Oakland FIR:
    - Performance observed to be stable
    - 10% increase in ADS-C data
    - 7% increase in RCP CPDLC transaction data
  - Anchorage FIR:
    - Performance observed to be relatively stable – improvement at upper tails
    - 70% increase\* in ADS-C data
    - 77% increase\* in RCP CPDLC transaction data
  - New York FIR
    - Notable improvement in performance
    - 10% increase in ADS-C data
    - 29% increase in RCP transaction data

\* Significant data missing in 2010



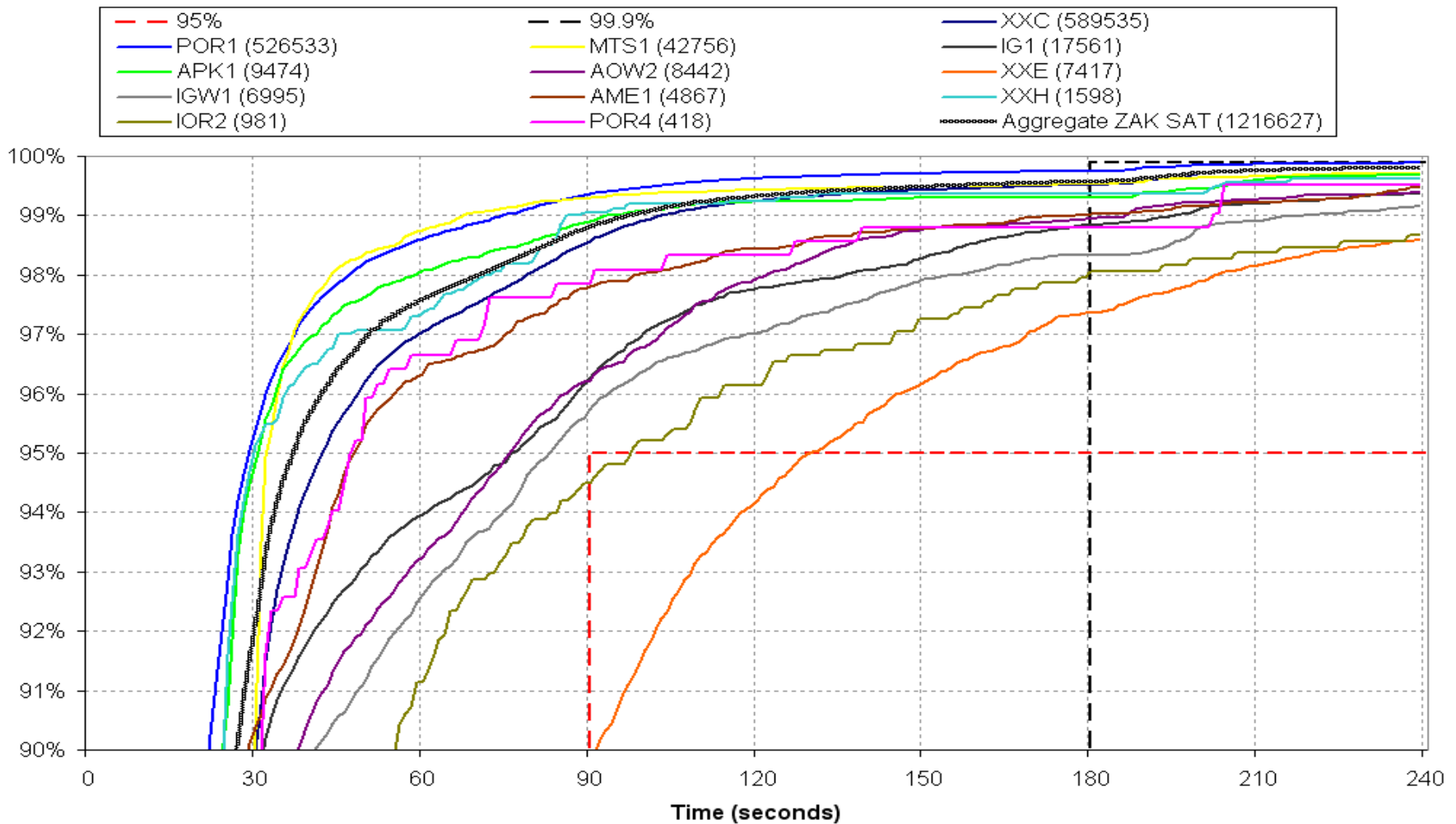
# ADS-C Performance by Station Identifier Aggregate July to December 2011



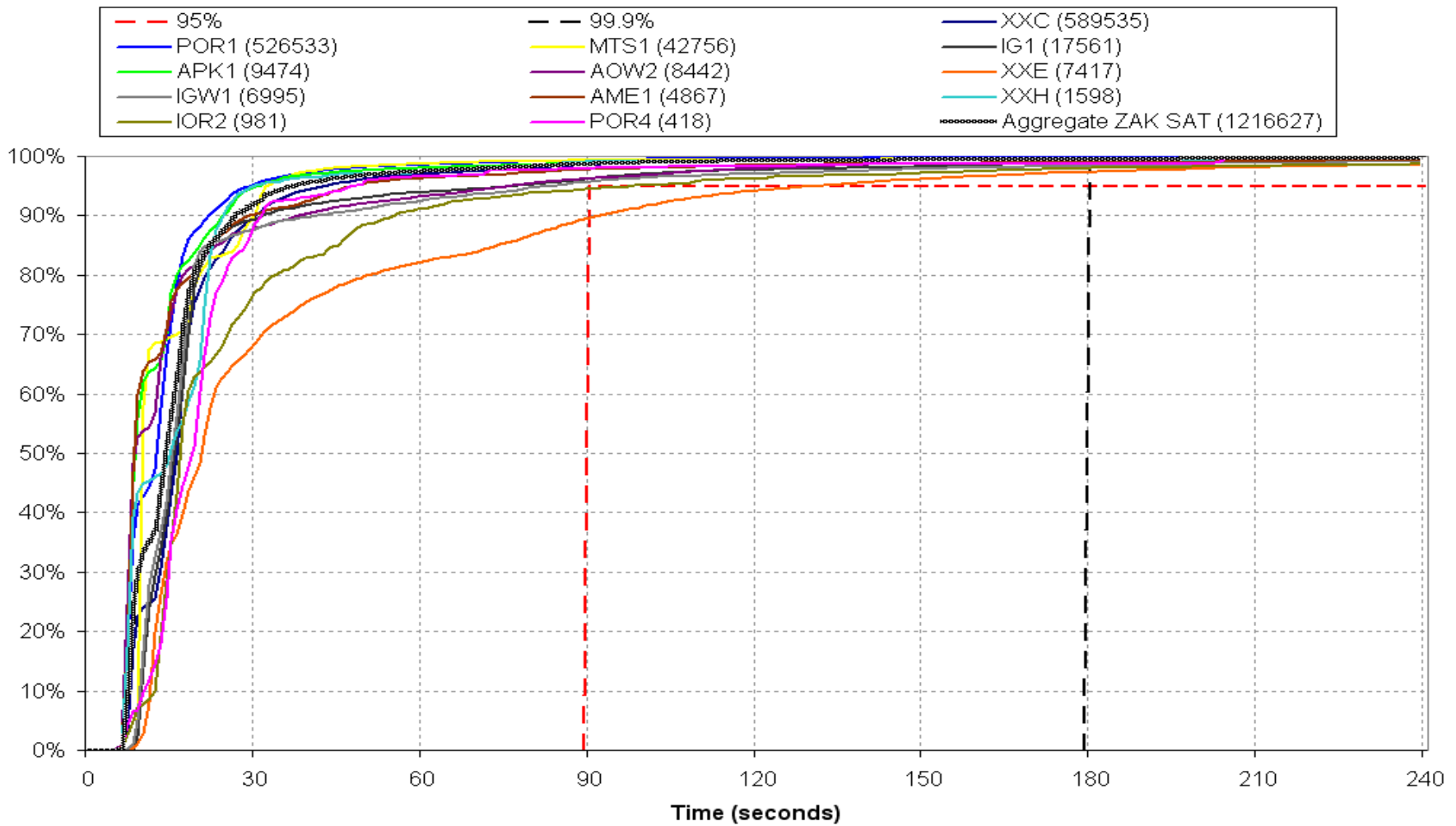
# Station/Gateway Identifiers

Satellite	GES Location(s)	SITA	ARINC
Inmarsat I-3	Aussaguel, France:	AOW2 AOE2	--
	Eik, Norway:	AOW3 AOE3 IOR5	XXE
	Perth, Australia:	POR1 IOR2	--
	Santa Paula, California, US:	POR4	XXC
Inmarsat I-4	Fucino, Italy	EUA1	XXF
	Paumalu, HI, US	APK1 AME1	XXH
MTSAT	Kobe and Hitachiota, Japan	MTS1	--
Iridium	Phoenix, Arizona, US	IGW1	IG1

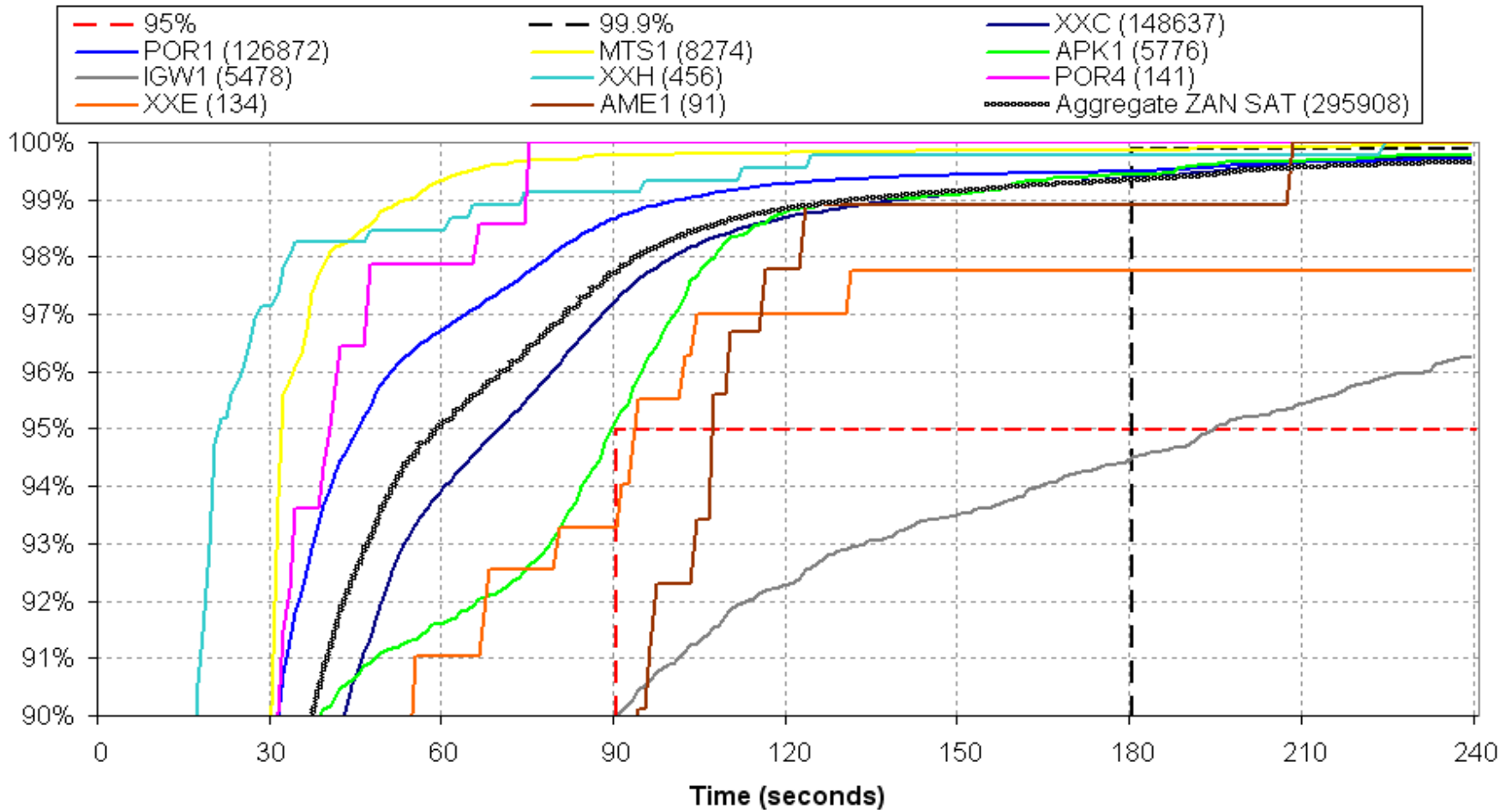
**Oakland FIR - Performance By Station Identifier - July to December 2011**  
**ADS-C Downlink Latency**  
(Duplicate Messages and Messages During Reported DSP Outages Excluded)



**Oakland FIR - Performance By Station Identifier - July to December 2011**  
**ADS-C Downlink Latency**  
(Duplicate Messages and Messages During Reported DSP Outages Excluded)

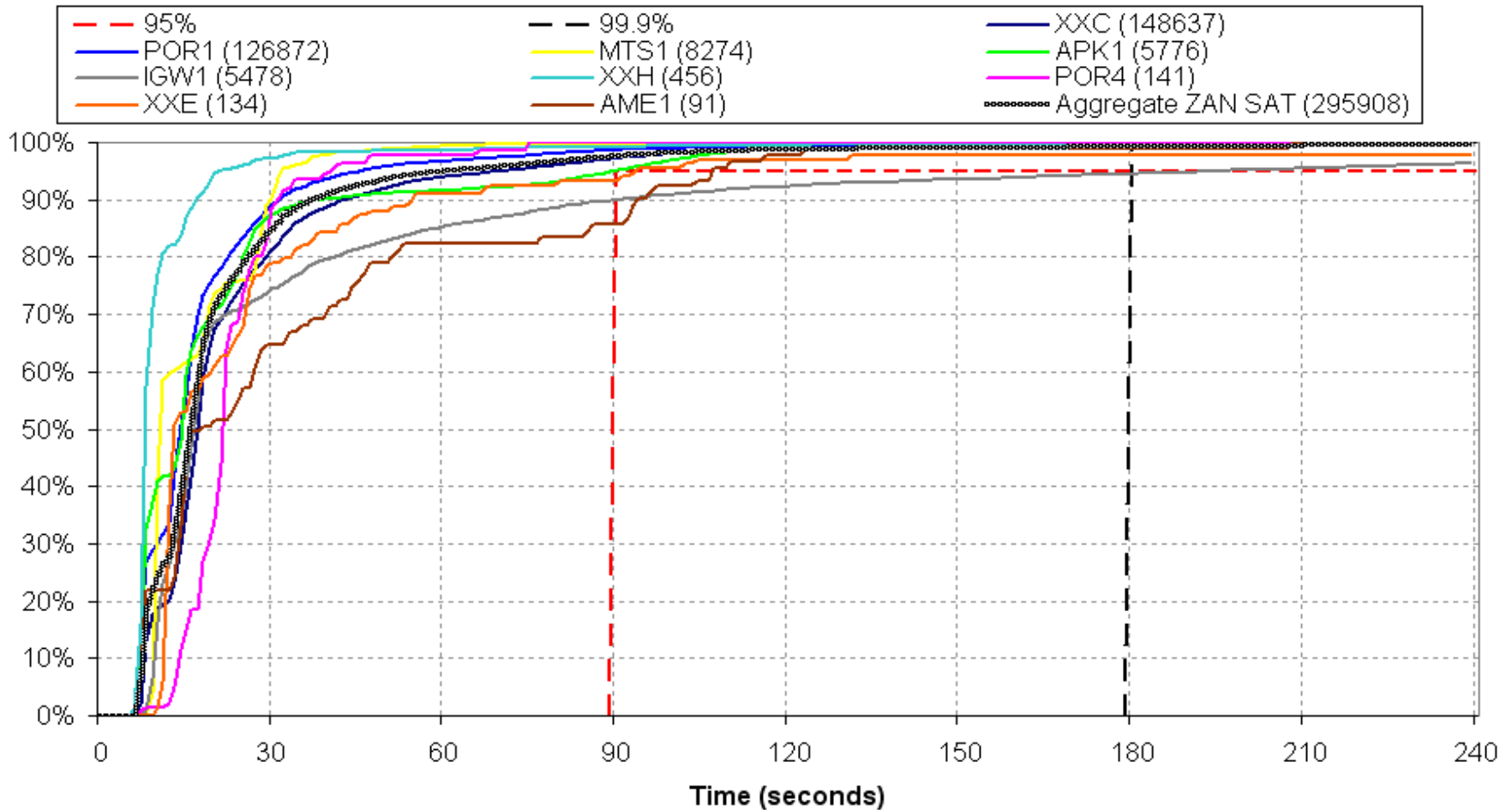


**Anchorage FIR - Performance By Station Identifier - July to December 2011**  
**ADS-C Downlink Latency**  
 (Duplicate Messages and Messages During Reported DSP Outages Excluded)

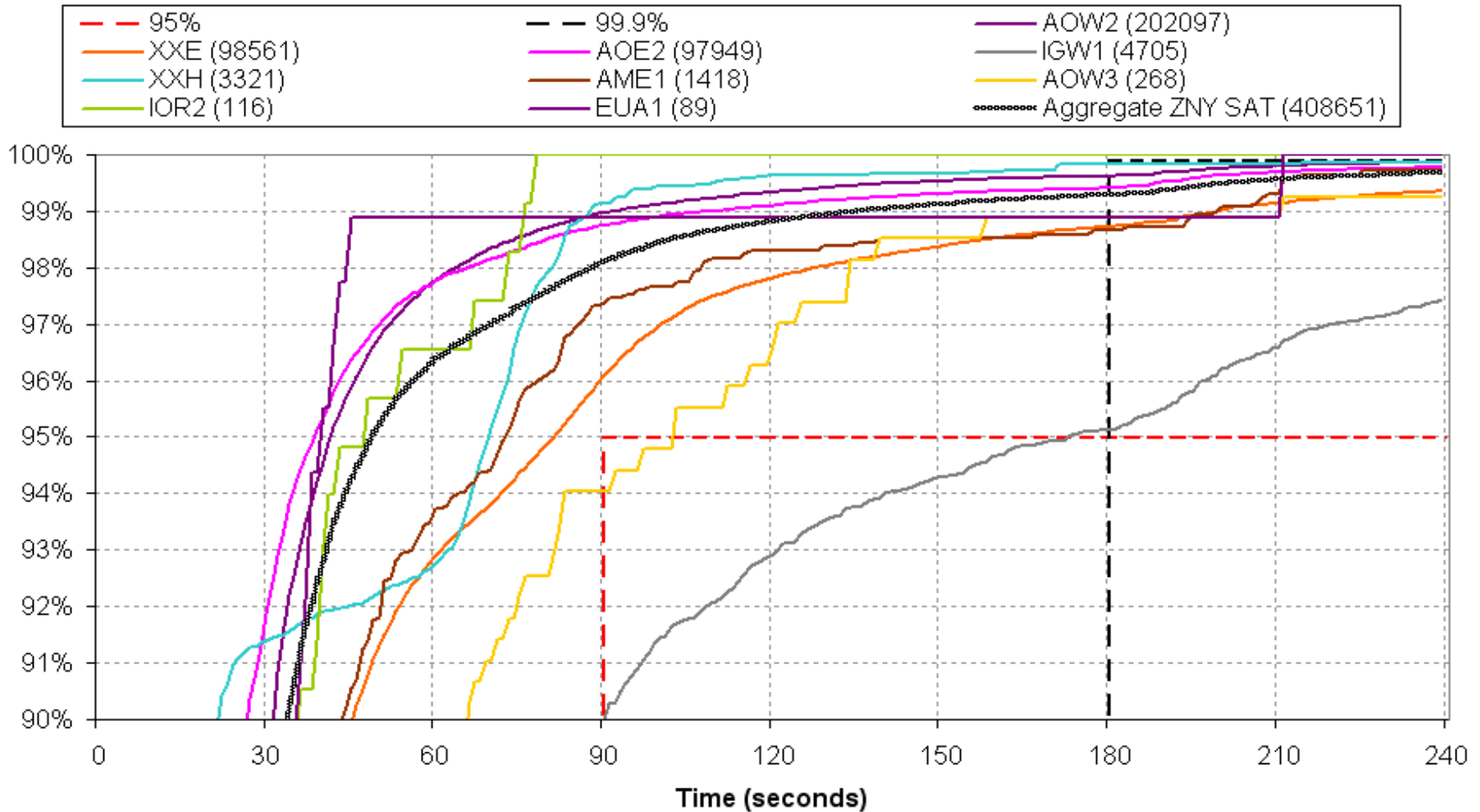




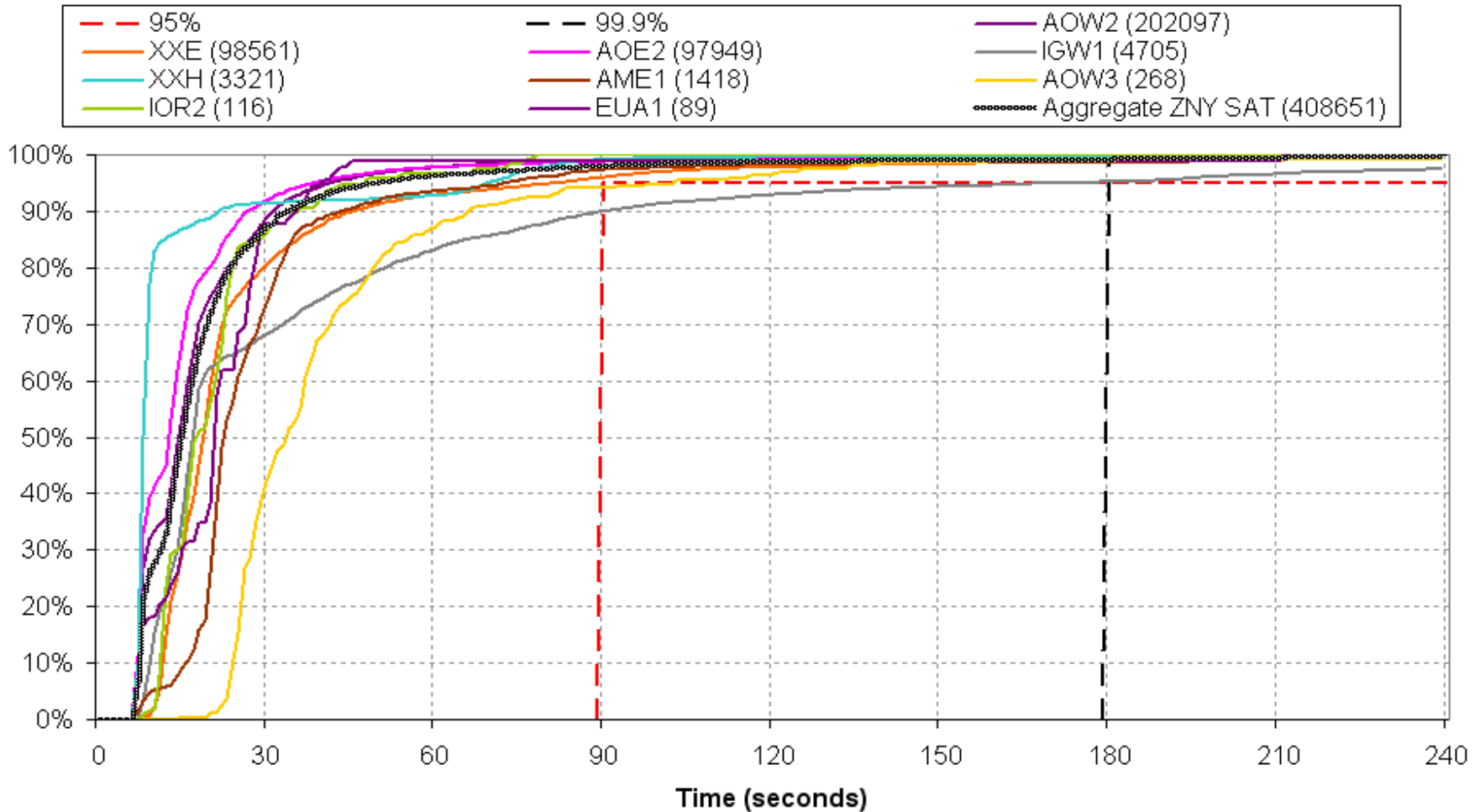
**Anchorage FIR - Performance By Station Identifier - July to December 2011**  
**ADS-C Downlink Latency**  
 (Duplicate Messages and Messages During Reported DSP Outages Excluded)



**New York FIR - Performance By Station Identifier - July to December 2011**  
**ADS-C Downlink Latency**  
(Duplicate Messages and Messages During Reported DSP Outages Excluded)



**New York FIR - Performance By Station Identifier - July to December 2011**  
**ADS-C Downlink Latency**  
(Duplicate Messages and Messages During Reported DSP Outages Excluded)



## Summary of Observed ADS-C Performance by Station Identifier

- All stations meet RSP180 95% criteria in New York except for AOW3 and IGW1
- All GES meet RSP180 95% criteria in Anchorage except for IGW1, XXE and AME1
- All GES meet RSP180 95% criteria in Oakland except for XXE and IOR2
- Performance for the two main Pacific GES, XXC and POR1, is noticeably better in Oakland than in Anchorage

# Performance By Operator



# Performance By Operator

- Analysis period: aggregate July to December 2011
- Operations through all media combined
- RSP180 and RCP240 performance criteria
- Operators contributing top 90% of ADS-C downlink messages from all media
- Operators ordered in summary tables by descending count of ADS-C downlink messages
- Operators not meeting 95% criteria highlighted in **red**
- Operators meeting 99.9% criteria highlighted in **blue**
- Additional charts by aircraft type and by airframe for operators not meeting 95% criteria

# Observed Datalink Performance by Operator Oakland FIR – July to December 2011

Oper Code	Count of ADS-C	% of Total ADS-C	ADS-C 95%	ADS-C 99.9%	Count of CPDLC	% of Total CPDLC	ACTP 95%	ACTP 99.9%	ACP 95%	ACP 99.9%	PORT 95%
A	14.72%	207,308	98.29%	99.48%	13,988	12.64%	99.22%	99.42%	98.92%	99.31%	95.12%
D	9.34%	131,519	98.53%	99.60%	7,408	6.69%	99.45%	99.62%	99.46%	99.59%	97.50%
B	7.44%	104,703	99.02%	99.54%	8,074	7.30%	99.41%	99.53%	99.15%	99.43%	97.99%
L	6.27%	88,240	98.84%	99.69%	7,898	7.14%	99.28%	99.42%	98.47%	98.92%	95.44%
G	5.97%	84,056	99.72%	99.83%	11,595	10.48%	99.84%	<b>99.88%</b>	99.74%	99.80%	99.28%
Q	5.89%	82,963	98.54%	99.55%	6,441	5.82%	99.21%	99.52%	99.46%	99.61%	97.97%
E	4.00%	56,295	99.21%	99.61%	4,097	3.70%	99.66%	99.76%	99.56%	99.71%	98.68%
NNN	3.86%	54,342	<b>88.99%</b>	94.30%	3,394	3.07%	<b>90.75%</b>	92.63%	<b>87.77%</b>	90.31%	<b>83.44%</b>
O	3.50%	49,312	99.20%	99.79%	3,261	2.95%	99.79%	<b>99.91%</b>	99.85%	<b>99.97%</b>	98.56%
F	3.39%	47,724	99.37%	99.83%	6,142	5.55%	99.92%	<b>99.93%</b>	99.74%	99.82%	99.09%
J	3.39%	47,691	99.63%	<b>99.88%</b>	5,416	4.89%	99.85%	99.85%	99.72%	<b>99.89%</b>	99.17%



# Observed Datalink Performance by Operator Oakland FIR – July to December 2011(Continued)

Oper Code	Count of ADS-C	% of Total ADS-C	ADS-C 95%	ADS-C 99.9%	Count of CPDLC	% of Total CPDLC	ACTP 95%	ACTP 99.9%	ACP 95%	ACP 99.9%	PORT 95%
M	2.98%	42,019	98.06%	99.17%	2,414	2.18%	99.25%	99.54%	99.13%	99.46%	97.80%
H	2.82%	39,667	99.57%	99.82%	5,022	4.54%	99.72%	<b>99.88%</b>	99.84%	<b>99.96%</b>	98.98%
N	2.59%	36,506	99.44%	99.59%	2,036	1.84%	99.21%	99.26%	99.02%	99.46%	98.62%
T	2.42%	34,026	99.19%	99.69%	3,316	3.00%	99.61%	99.73%	99.49%	99.61%	98.67%
S	2.40%	33,786	98.60%	99.43%	1,915	1.73%	99.79%	<b>99.90%</b>	99.63%	99.69%	98.12%
K	2.22%	31,273	98.65%	99.27%	2,808	2.54%	99.15%	99.25%	99.36%	99.75%	98.11%
R	2.16%	30,464	98.36%	99.52%	2,296	2.07%	99.56%	99.65%	99.65%	<b>99.96%</b>	97.91%
Y	2.10%	29,549	97.89%	98.83%	873	0.79%	98.85%	99.08%	98.51%	98.85%	97.14%
V	1.45%	20,439	99.84%	<b>99.89%</b>	1,499	1.35%	100.0%	<b>100.0%</b>	99.93%	<b>100.0%</b>	99.60%
ZZZZ	1.36%	19,140	98.74%	99.20%	910	0.82%	99.12%	99.12%	96.70%	97.03%	<b>86.70%</b>

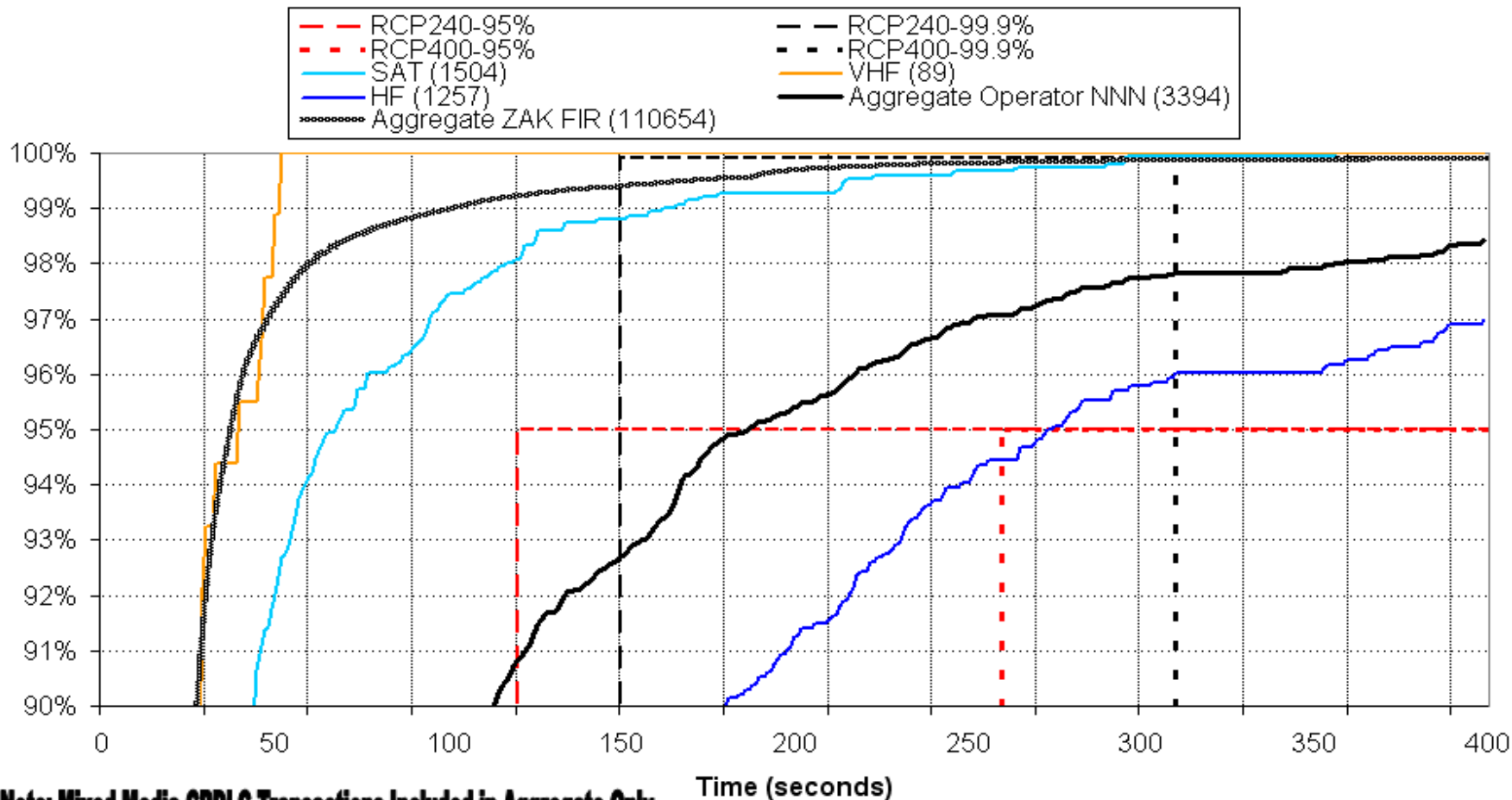




# Operators Not Meeting 95% Criteria in Oakland FIR

- **Operator NNN does not meet 95% criteria for RCP240 ACTP, RCP240 ACP or RSP180 ADS-C**
- **Further analysis conducted**
  - Operator NNN by media type
  - Operator NNN by airframe (only 1 aircraft type observed)

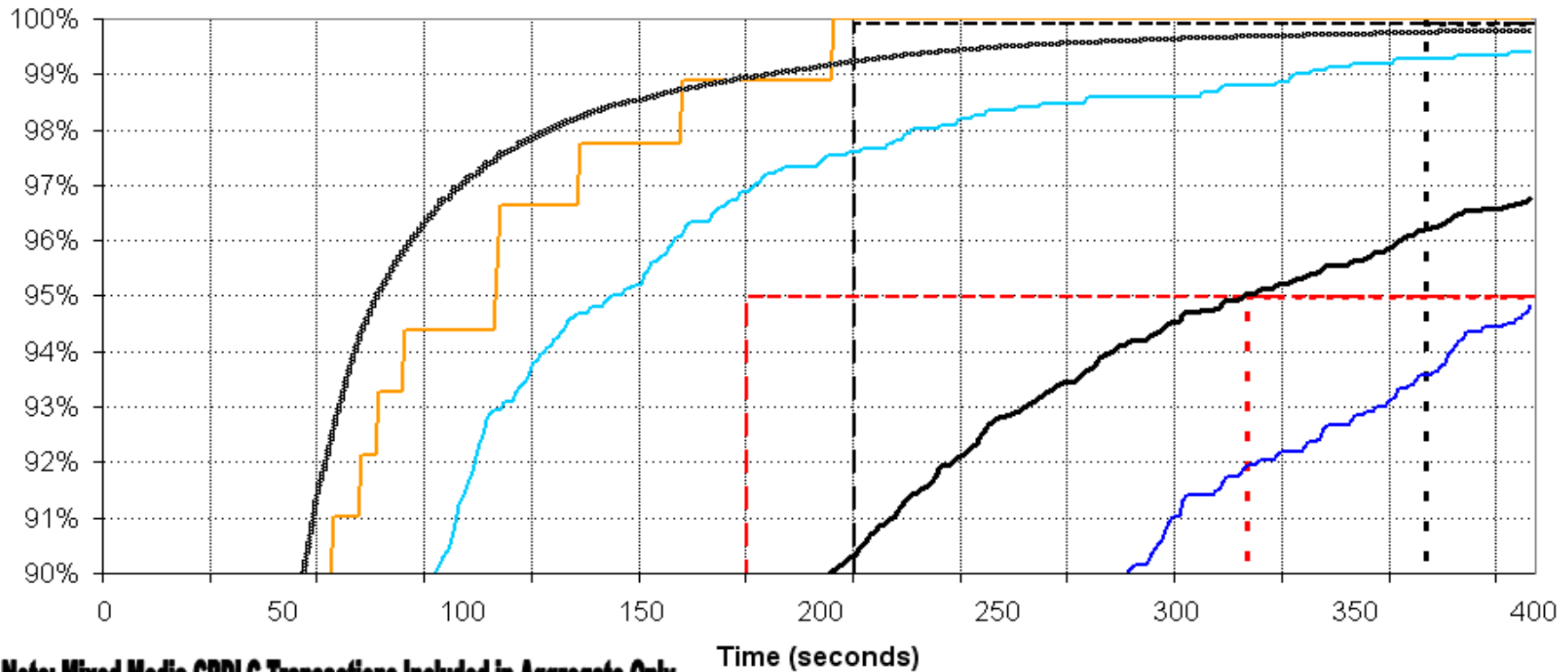
## Operator NNN B763 - Oakland FIR - July to December 2011 CPDLC Actual Communication Technical Performance (ACTP) (Reported DSP Outages Excluded)



**Note: Mixed Media CPDLC Transactions Included in Aggregate Only**



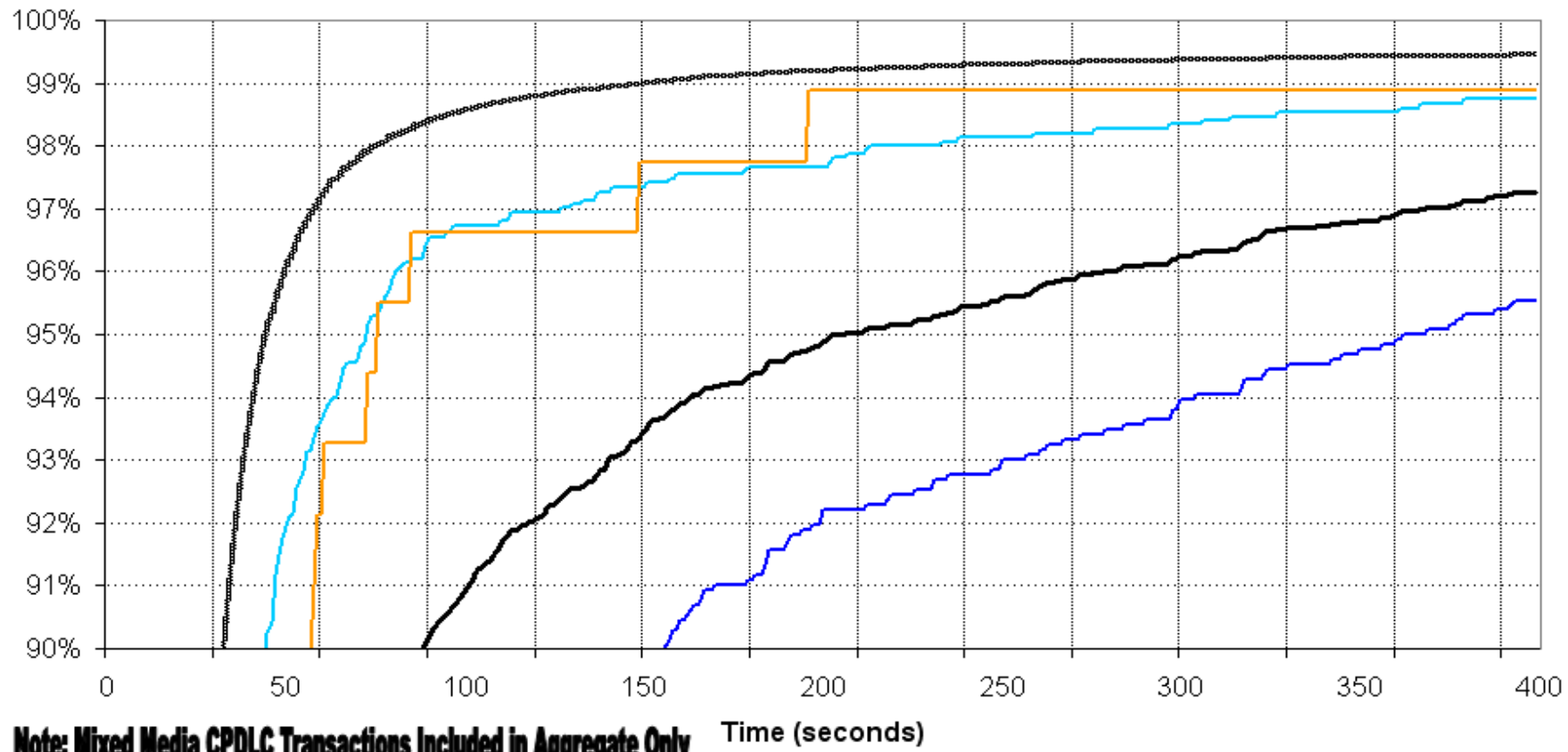
## Operator NNN B763 - Oakland FIR - July to December 2011 CPDLC Actual Communication Performance (ACP) (Reported DSP Outages Excluded)



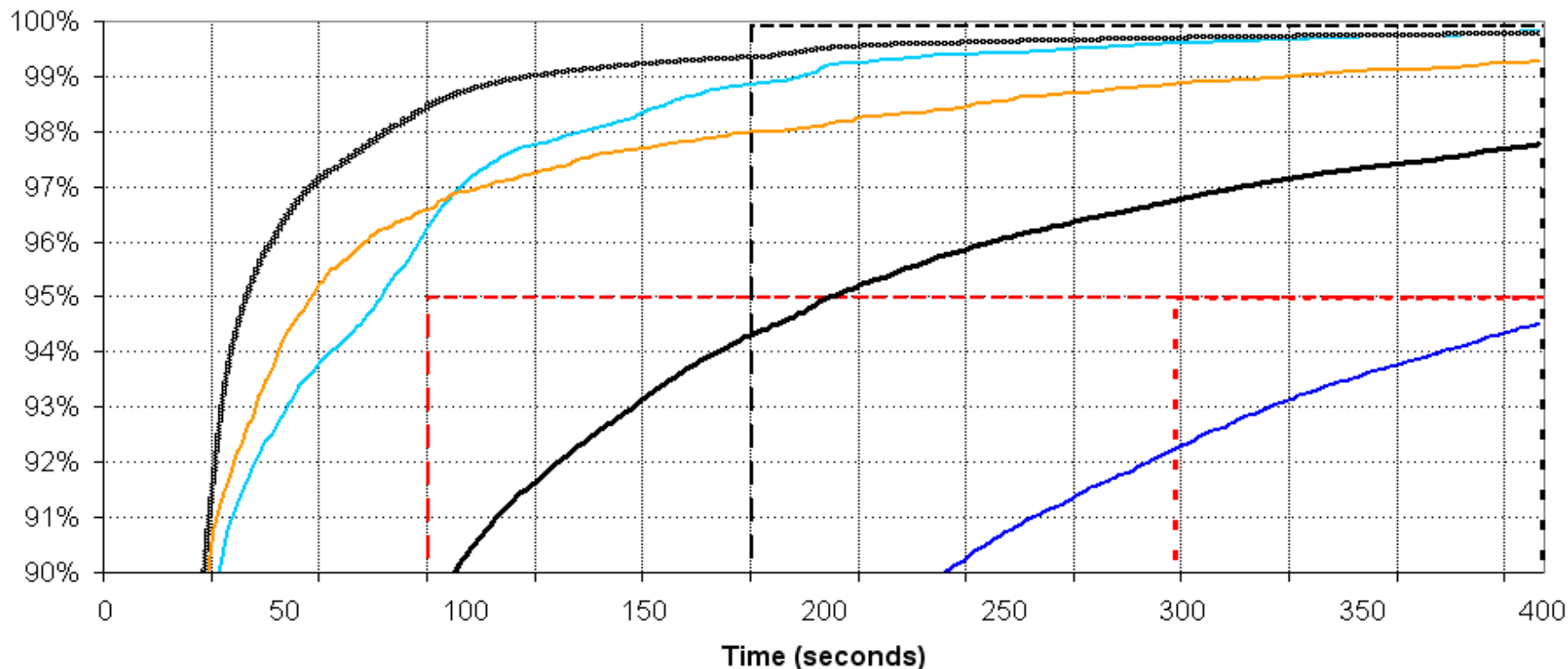
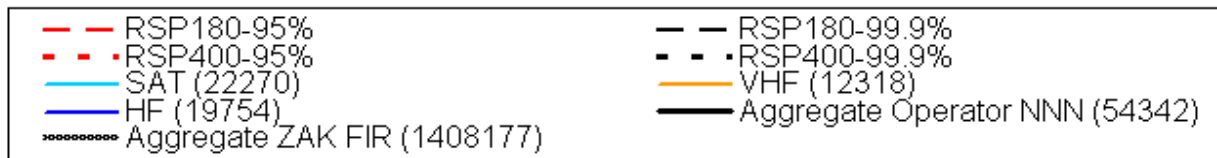
**Note: Mixed Media CPDLC Transactions Included in Aggregate Only**

## Operator NNN B763 - Oakland FIR - July to December 2011 CPDLC Pilot Operational Response Time (PORT) (Reported DSP Outages Excluded)

— SAT (1504)   
 — VHF (89)   
 — HF (1257)   
 — Aggregate Operator NNN (3394)   
 - - - - - Aggregate ZAK FIR (110654)



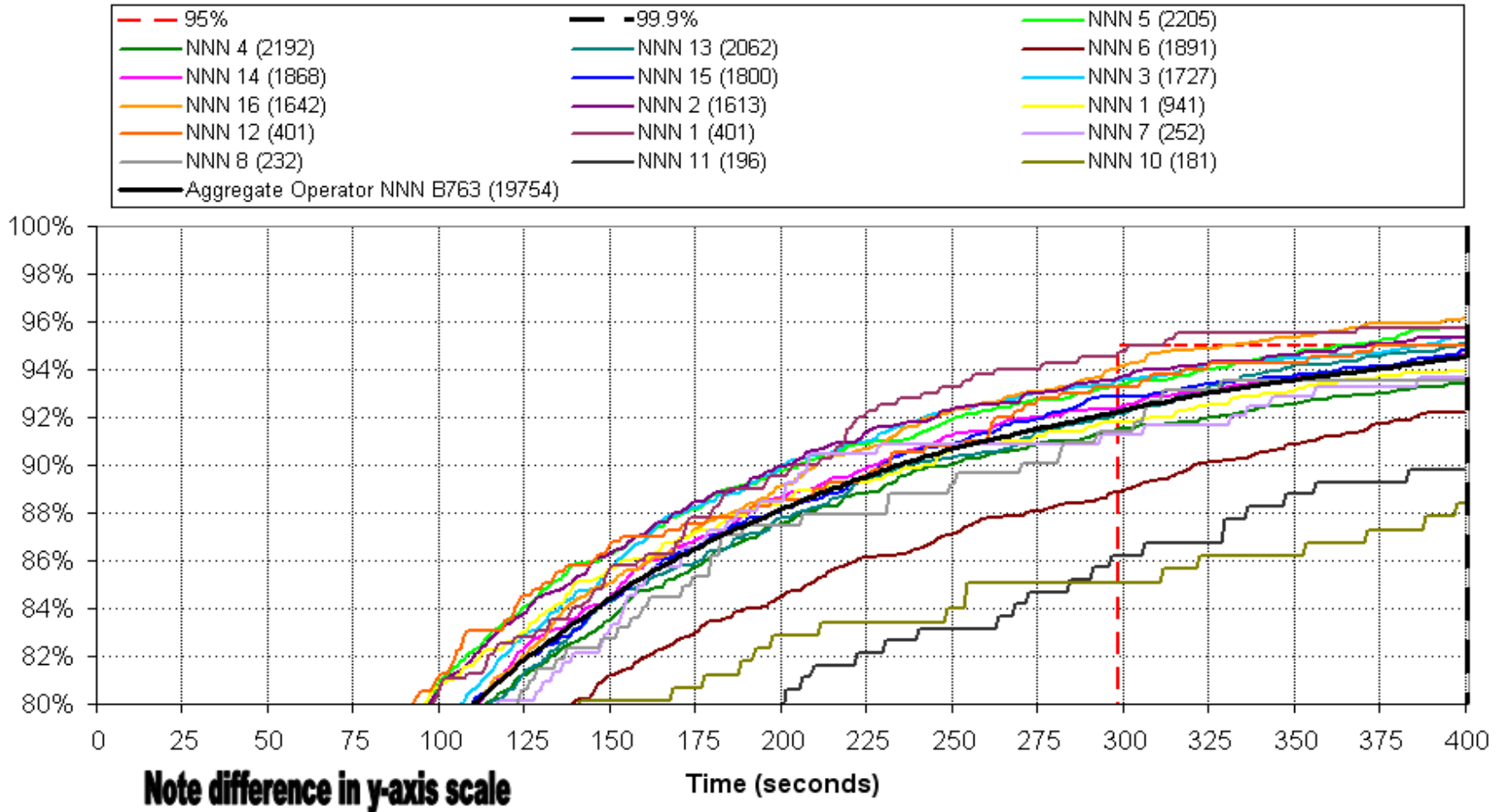
**Operator NNN B763 - Oakland FIR - July to December 2011  
ADS-C Downlink Latency  
(Reported DSP Outages and Duplicate Messages Excluded)**



# Operator NNN B763 - Oakland FIR - HF Media - July to December 2011

## ADS-C Downlink Latency

(Duplicate Messages and Messages During Reported DSP Outages Excluded)



# Summary of Observed Datalink Performance By Operator Oakland FIR – July to December 2011

- **There are 21 commercial operators contributing to the top 90% of ADS-C downlink messages from all media**
- **20 of the 21 operators meet the 95% criteria for RSP180 ADS-C and RCP240 ACTP and ACP**
- **19 of the 21 operators meet the 95% criteria for PORT within 60 seconds**
- **2 of the operators meet the 99.9% criteria for RSP180 ADS-C**
- **6 of the operators meet the 99.9% criteria for RCP240 ACTP**
- **5 of the operators meets the 99.9% criteria for RCP240 ACP**
  
- **Operator NNN (only one aircraft type, B763 observed) does not meet the 95% criteria for any of the RSP180 or RCP240 performance measures when all media combined**
  - **SAT and VHF** performance meets at least 95% criteria for all RSP180/RCP240 performance measures
  - **HF** performance does not 95% criteria for any RSP400/RCP400 performance measures
  - 3 airframes performing noticeably below average