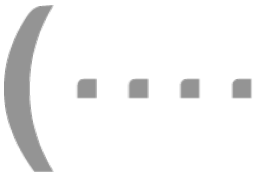# Low latency update
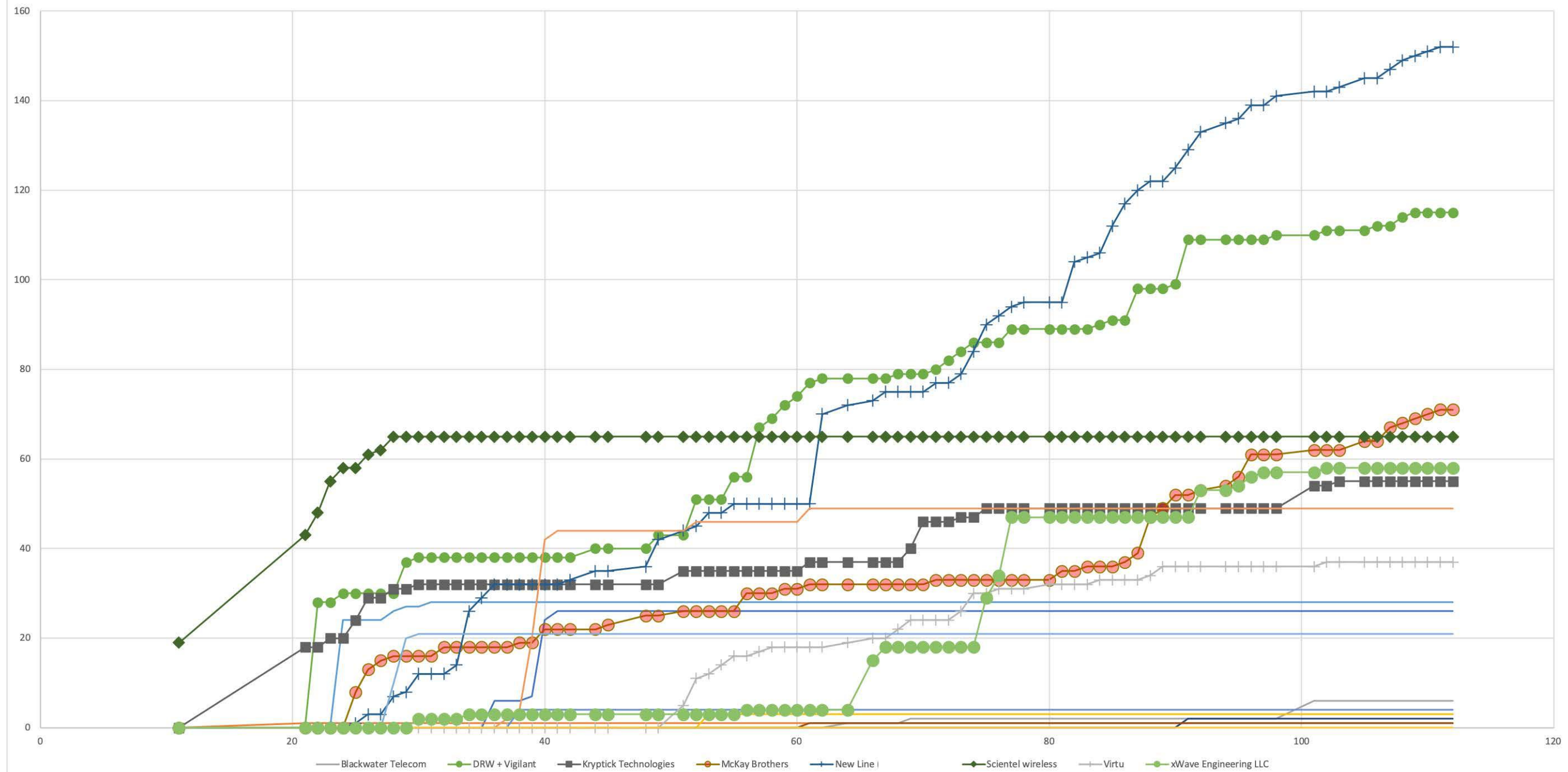
Stéphane Tyc, Sep 2019

Quincy Data — McKay Brothers

Chicago to New Jersey

Active licence count per company vs months since 2011

Legend: Blackwater Telecom · DRW + Vigilant · Kryptick Technologies · McKay Brothers · New Line · Scientel wireless · Virtu · xWave Engineering LLC

Quincy Data — McKay Brothers

All active licenses filed since 2018

By the end of 2019 the three best networks will be within 1µs of each other
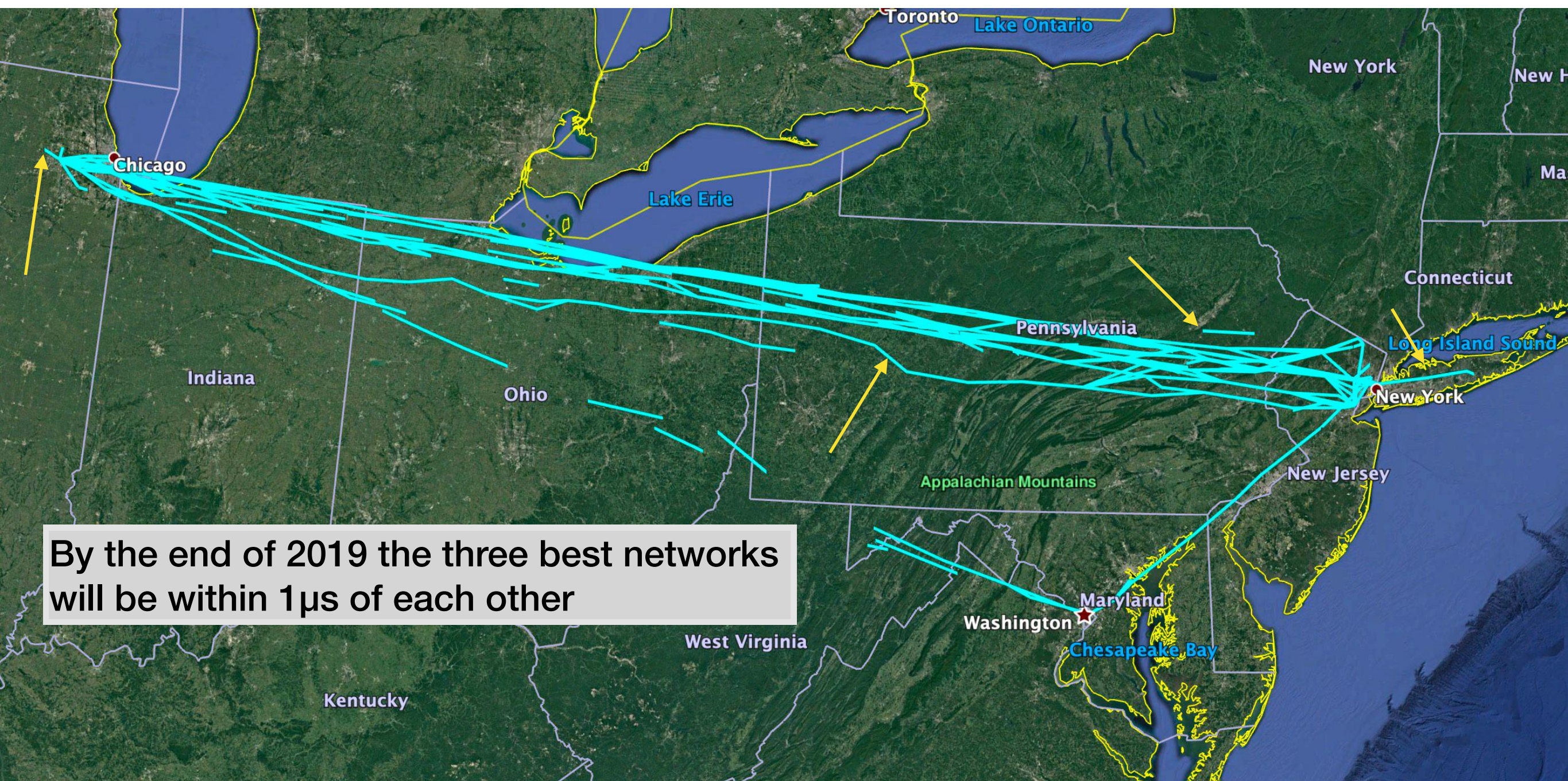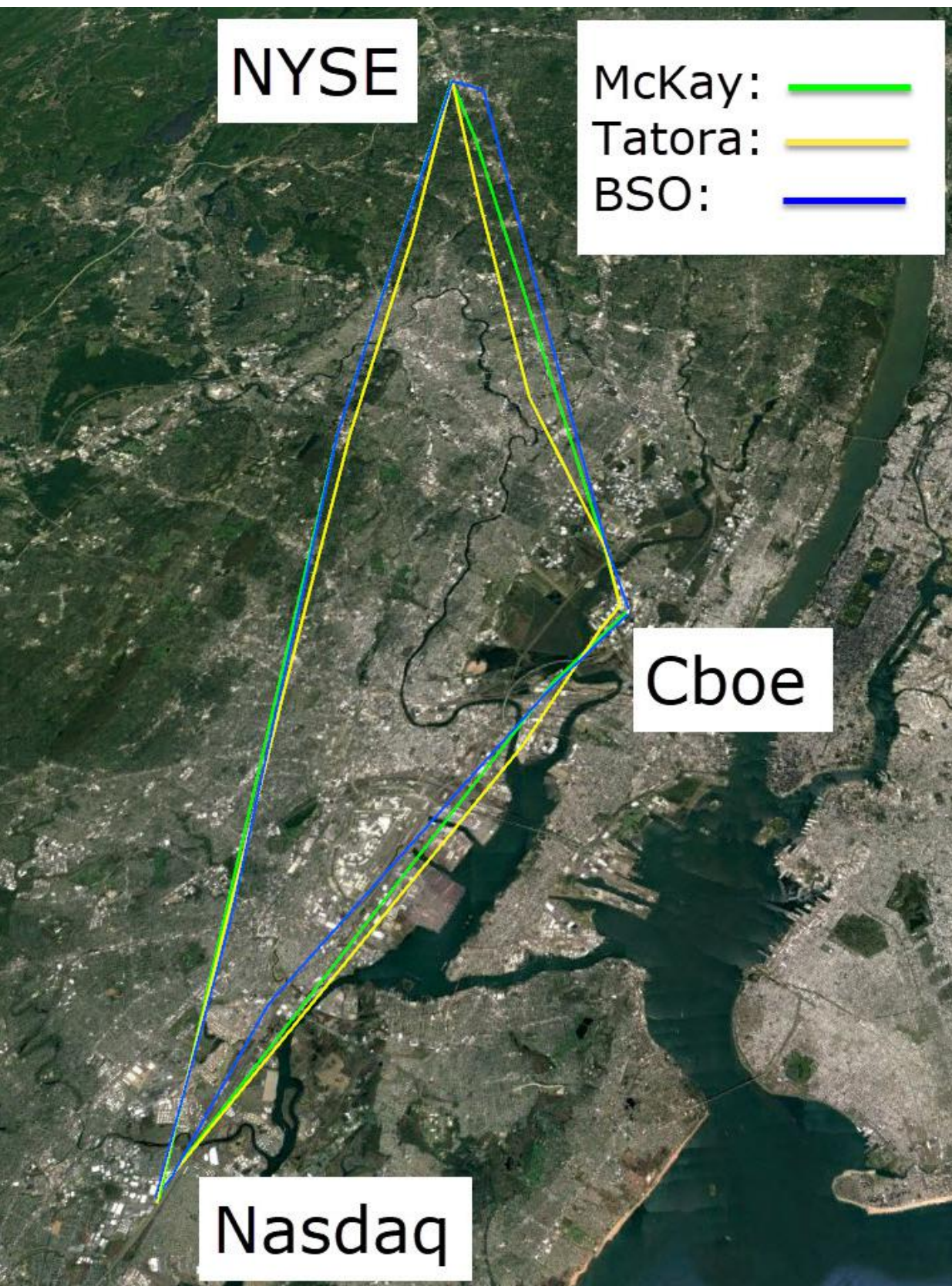
Top three wireless networks
for each leg of the triangle
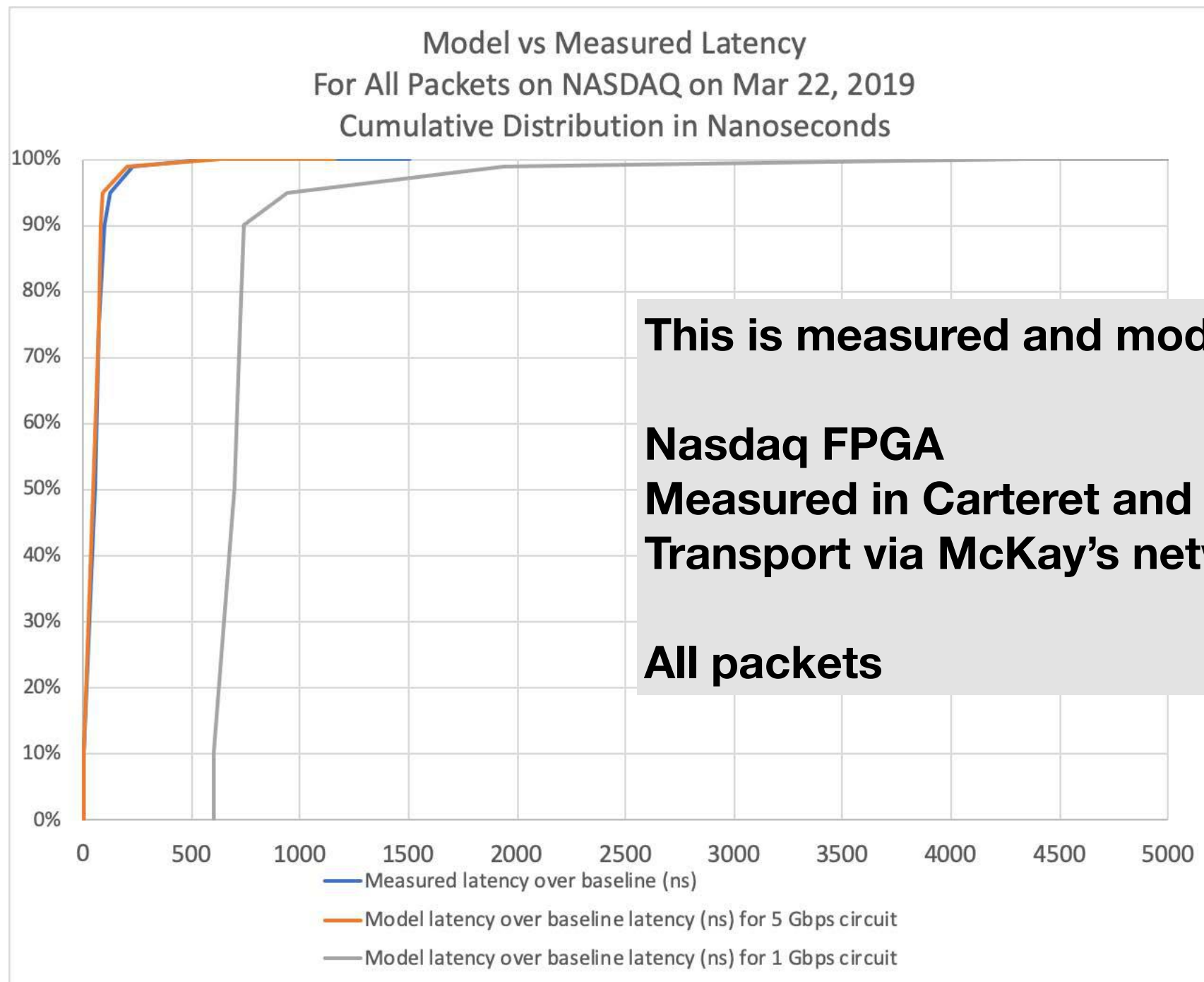
McKay has exclusive use of the LMDS
band at 28 GHz.
1. Straighter
2. More reliable
3. More bandwidth

All other networks use E-Band which is
congested.

Adding bandwidth will add path length.
Reducing path length with existing
bandwidth is hard.

Quincy Data — McKay Brothers

Model vs Measured Latency
For All Packets on NASDAQ on Mar 22, 2019
Cumulative Distribution in Nanoseconds

Measured latency over baseline (ns)
Model latency over baseline latency (ns) for 5 Gbps circuit
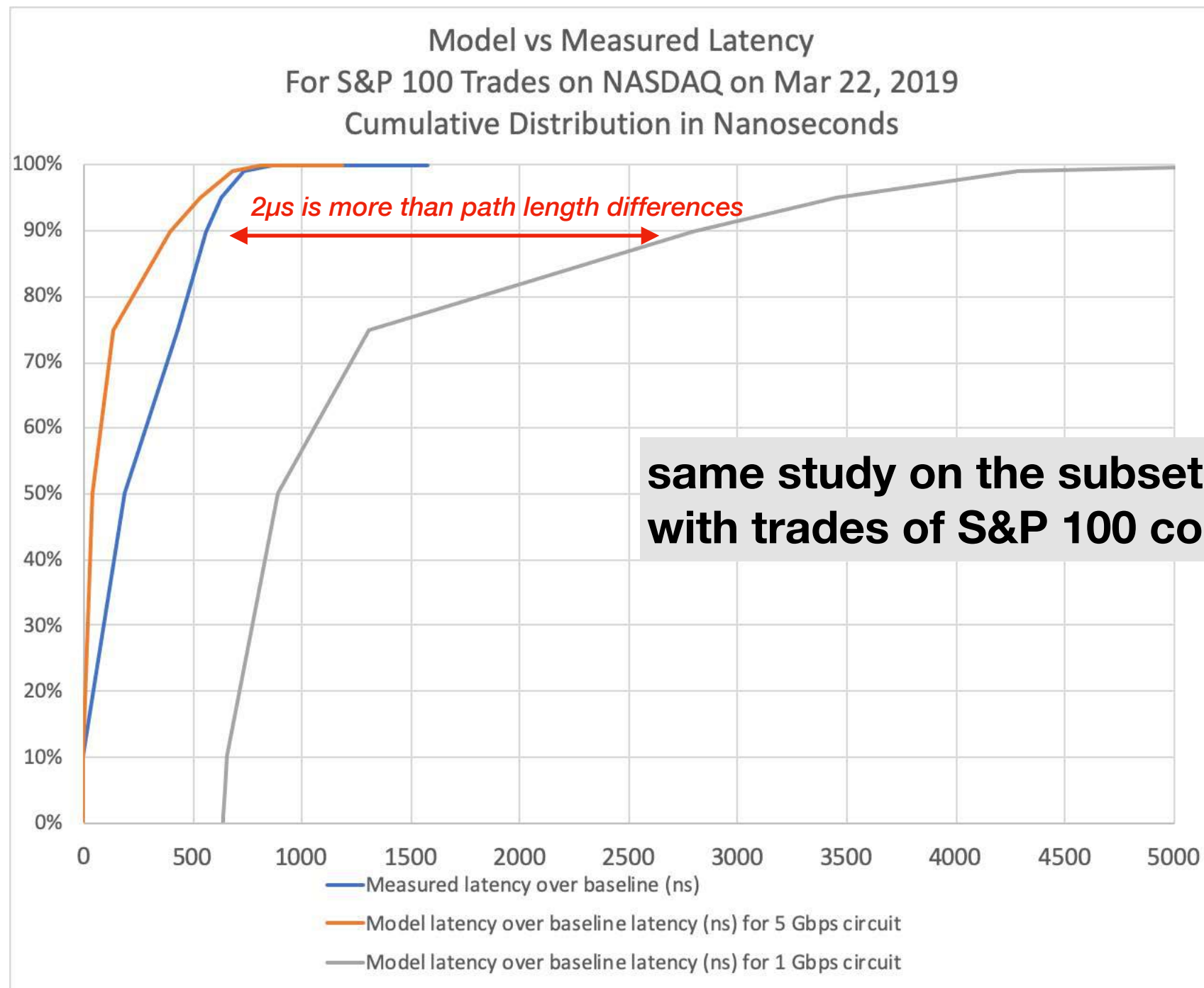Model latency over baseline latency (ns) for 1 Gbps circuit

This is measured and modelled data

Nasdaq FPGA
Measured in Carteret and Mahwah
Transport via McKay's network

All packets

Model vs Measured Latency
For S&P 100 Trades on NASDAQ on Mar 22, 2019
Cumulative Distribution in Nanoseconds

2µs is more than path length differences

same study on the subset of packets
with trades of S&P 100 components

Measured latency over baseline (ns)
Model latency over baseline latency (ns) for 5 Gbps circuit
Model latency over baseline latency (ns) for 1 Gbps circuit

As announced we enabled level playing field competition

Nb of experimental licenses granted per year
200 km radius around Aurora
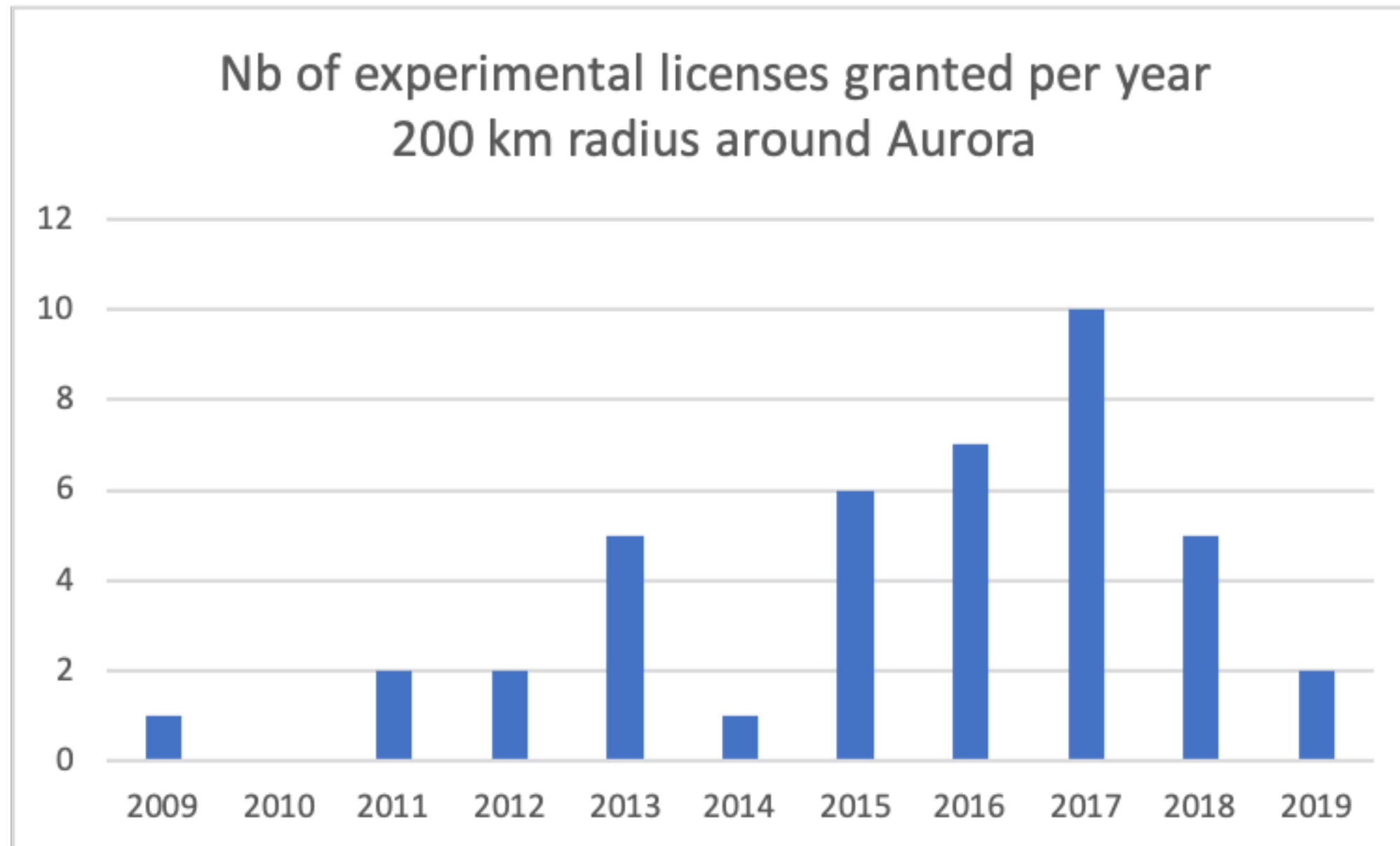
HF has been worked at for a long time

Quincy Data — McKay Brothers

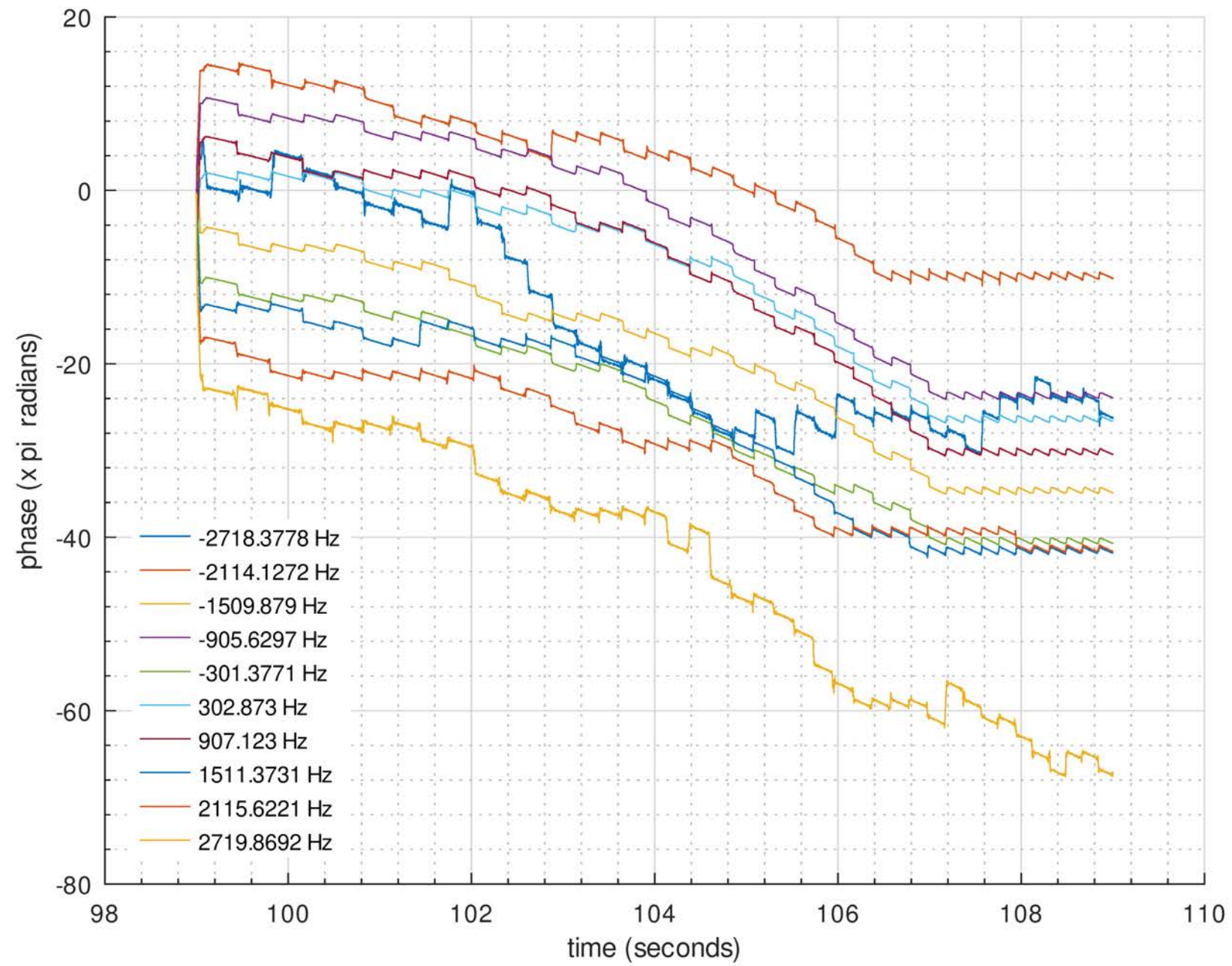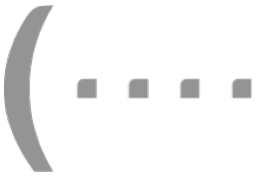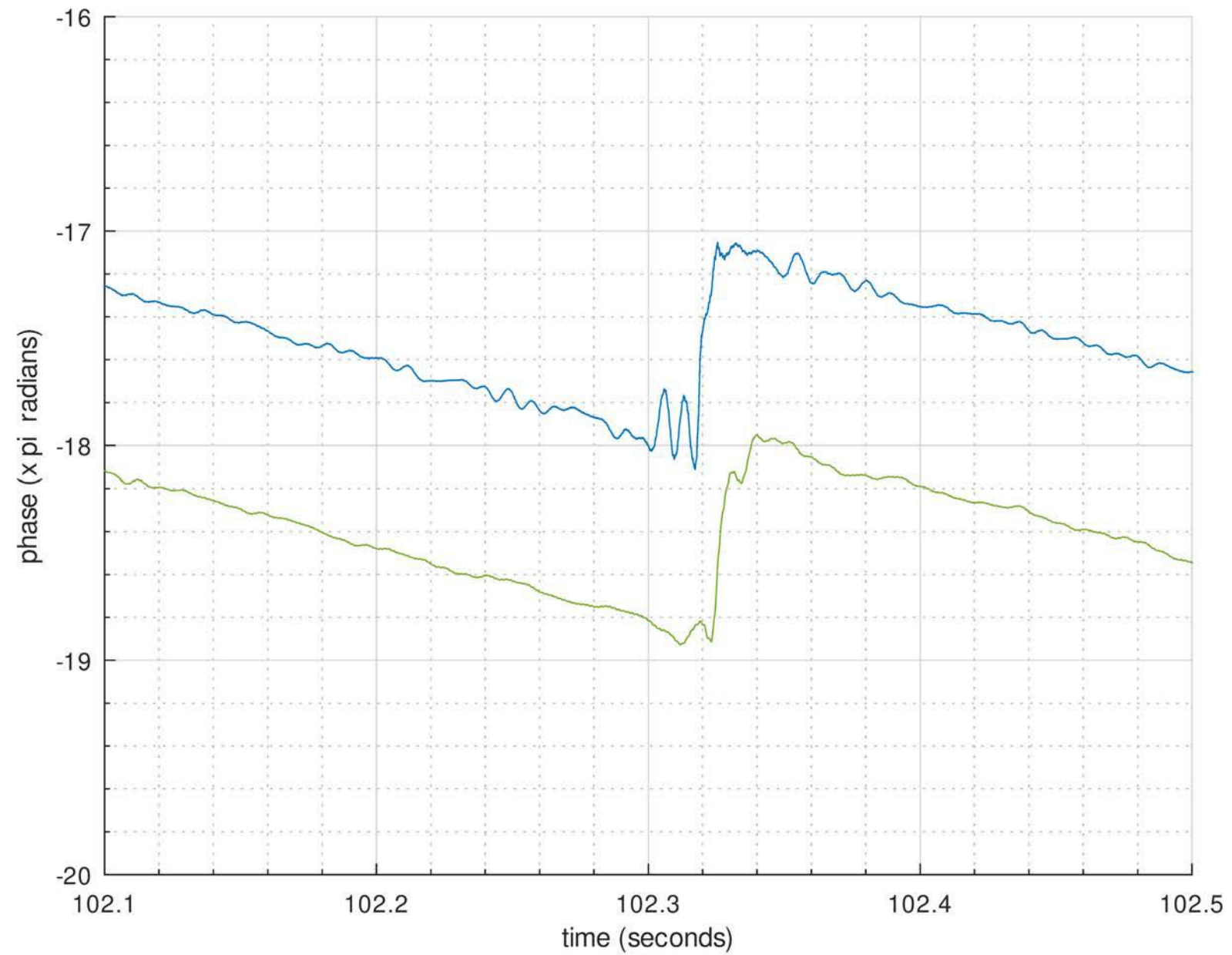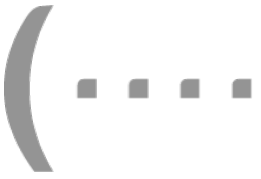| Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Number of grants	1	0	2	2	5	1	6	7	10	5	2
10Band LLC									1		
3DB Communication Inc.									2	1	1
Blueline Comm LLC									1		
CATERPILLAR, INC.				1			1	1	1		
Cognitive Data Dispatch, LLC			1								
COUNTY INFORMATION SERVICES, LLC								1			
Delmarva Broadband Services, LLC											1
DuPage Public Safety Communications	1		1		1		1				
Intel Corp.					1						
Jo-Carroll					1						
M-WAVE NETWORKS LLC										1	
Midwest Mobile					1						
POLRCOM LLC									2		
Rockwell Collins, Inc.				1	1						
Services Development Company LLC						1	2	3	2		
Toggle Communications LLC							1		1	2	
Transeastern Holding Corporate DBA Observant Network									1	1	
Ubiquiti Networks, Inc.									1		
Virtu Financial Operating LLC									1		

Quincy Data — McKay Brothers

Quincy Data — McKay Brothers

Quincy Data — McKay Brothers
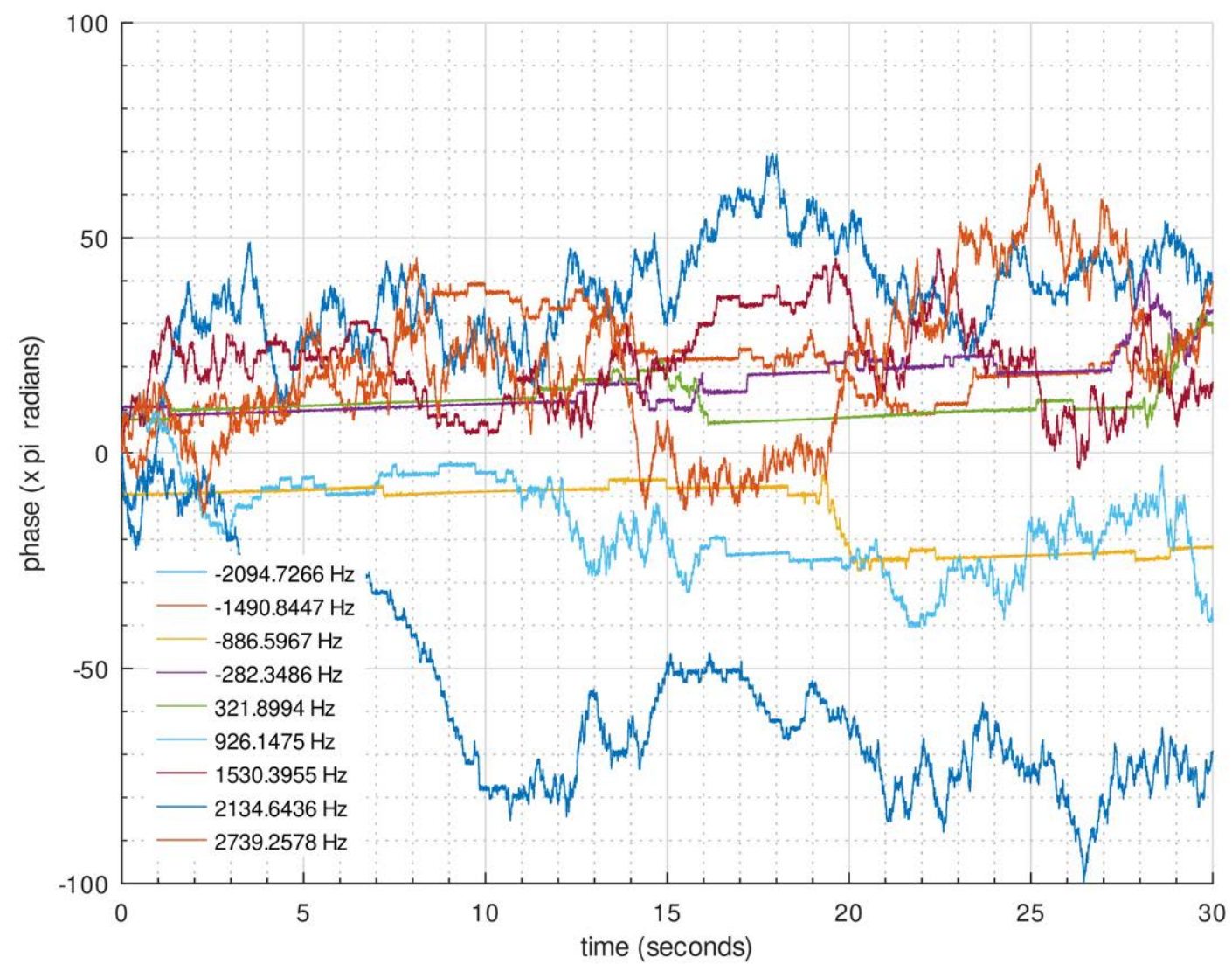
Somewhere in Europe

Same signal, more noise

You can trade with this but you have to control risk
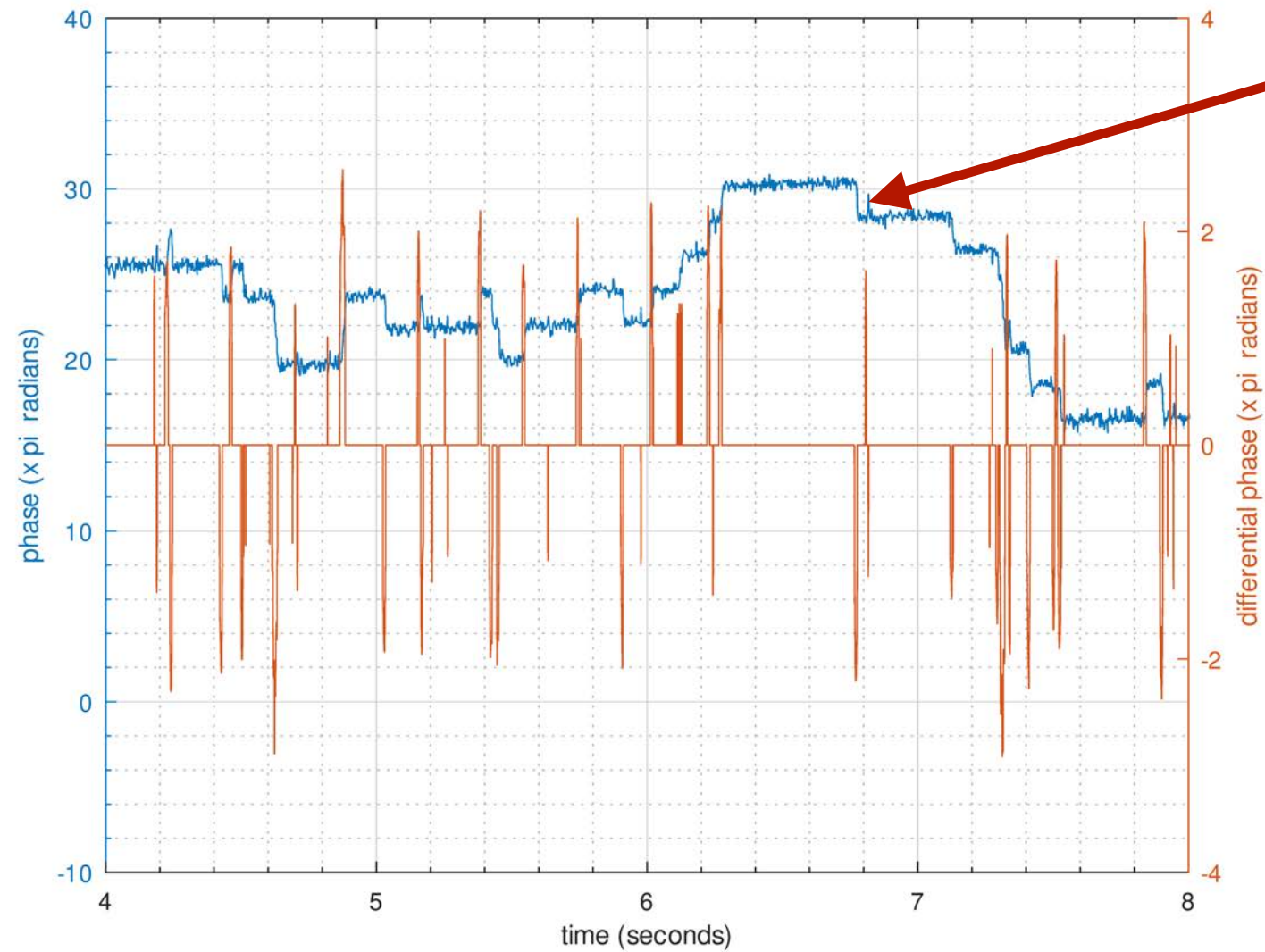
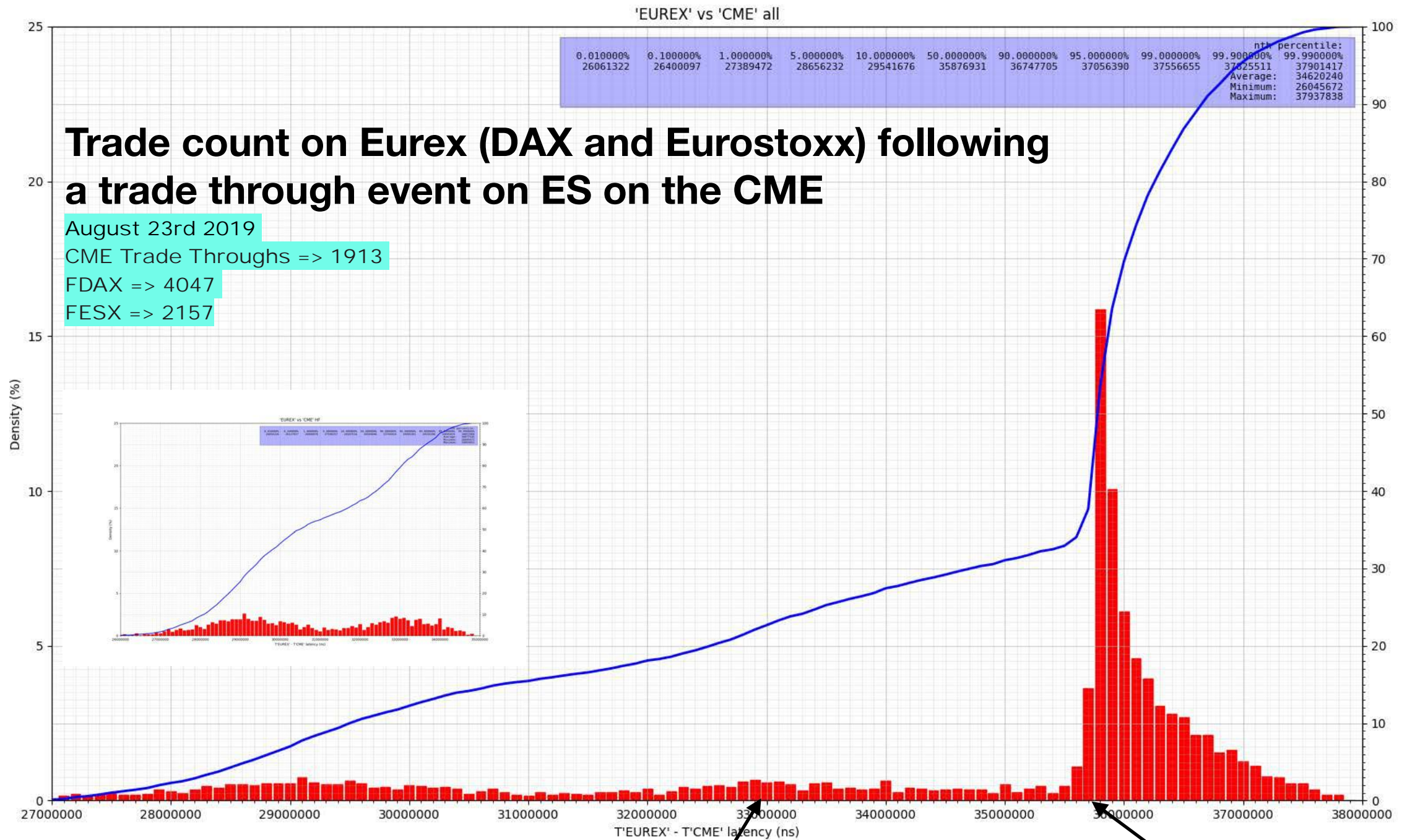|	16/04/2019		22/03/2019	
CLK9				
2	382		2	544
3	33		3	39
4	11		4	3
5	2		5	0
10	1			
CLM9				
2	582			
3	23			
4	2			
5	2			
6	1			
ESM9				
2	175		2	1341
3	11		3	99
4	1		4	14
			5	2
			6	1
6EM9				
2	267		2	800
3	22		3	82
5	2		4	31
			5	8
			6	3
			7	1
			8	1
			10	1
			12	1
			13	1
			20	1
ZNM9				
2	8		2	14

What to send?

"Trade throughs": an aggressor order removes completely the first limit and takes some of the second or third….

This is a sample count for two days and for relevant futures contracts on the CME

The order of magnitude of these trades is 10 000 per day.

Approximately 10% of the events occur in a 30 ms window.

Quincy Data — McKay Brothers