6 GHz CBP TESTING

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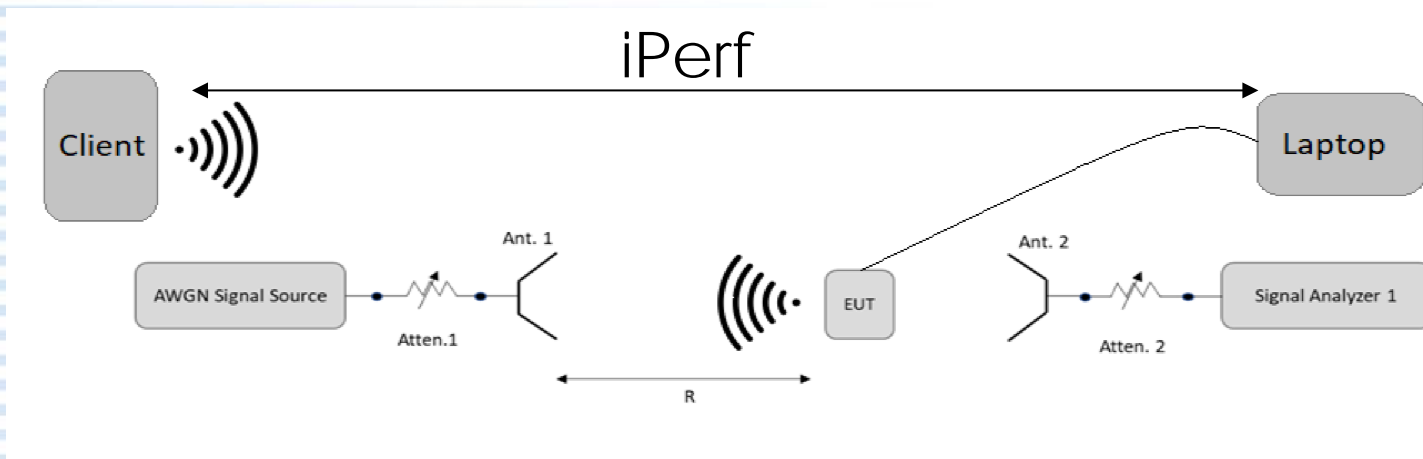
6ID Testing

- Devices tested
  - 3 certified 6ID Access Points (APs) tested at FCC lab
  - APs tested were purchased by the lab and directly requested from the manufacturer
    - AP1: Sample request only
    - AP2: Sample request and lab purchase device tested
    - AP3: Sample request and lab purchase device tested
  - APs were tested without factory test mode enabled
  - Purpose:

    -Verify Contention Based Protocol (CBP) requirement for 6 GHz low power indoor APs in a real-world scenario.

6ID Testing

- CBP Test procedures:
  - Radiated testing performed
  - AWGN source calibrated for power level of -62 dBm at AP placement
  - Client connected to AP via 6 GHz band
    - Client was physically located outside of AWGN transmit envelope during testing to insure only AP was detecting AWGN signal
  - Laptop connected to AP via ethernet cable
    - iPerf ran between client and laptop via AP to generate traffic on 6 GHz band

6ID Testing

- CBP Test procedures(cont.)
  - All APs tested operating on 160 MHz BW
    - 10 MHz wide AWGN signal center frequency (F_center) injected at AP on different frequencies with AP OBW
      - F_low of OBW (AWGN F_center = +5 MHz from OBW low edge)
      - F_center of OBW
      - F_high of OBW (AWGN F_center = -5 MHz from OBW high edge)
  - 2 out of 3 APs provided end user ability to adjust AP OBW down to 20 MHz
    - 10 MHz wide AWGN signal F_center injected at EUT on OBW 20 MHz center frequency
  - Additional AWGN $F\_centers$ tested if AP did not beacon across entire OBW (160 MHz mode)
    - 10 MHz wide AWGN signal injected at AP on beaconing channel

Center Frequency (MHz)	6595	6615	6635	6655	6675	6695	6715	6735
20 MHz Channel	129	133	137	141	145	149	153	157
EUT OBW 160 MHz Channel	143							
EUT Beacon Channel		X						
10 MHz AWGN F_center		X						

6ID Testing

- CBP Test procedures(cont.)
  - Power levels of APs were not investigated
  - No timing measurements were made
  - Lab purchased devices were updated to the latest publicly available firmware from the manufacturer
  - 10 MHz wide AWGN signal was monitored during testing
    - Verify that AP ceased all transmissions at AWGN power level of -62 dBm or greater
    - Monitor behavior of AP as AWGN power increased up to the appropriate threshold power
    - Monitor behavior of AP as AWGN signal is removed (or power level reduced to below the threshold)
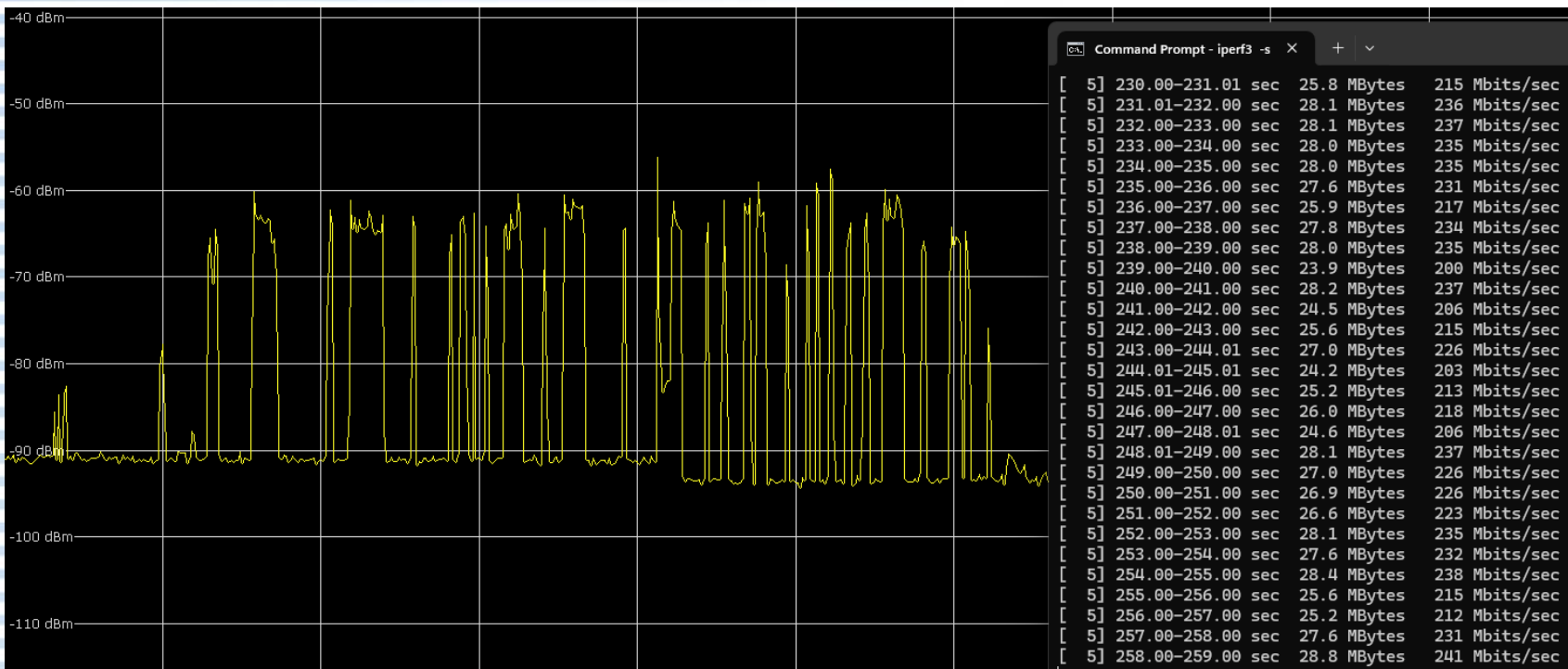
6ID Testing

- Test results
  - AP1 (sample request only)
    - Utilized adaptive data rate to maintain link with client at a lower throughput in presence of AWGN
      - Modulation reduction did not trigger until AWGN power level > -62 dBm
      - All traffic would not cease on 10 MHz AWGN band until AWGN power level -58 dBm
    - Utilized BW reduction from 160 MHz -> 80 MHz in some test cases
      - AP1 would still transmit beacons within 10 MHz AWGN band after BW reduction and AWGN power level of -62 dBm greater

6ID Testing

Adaptive data rate
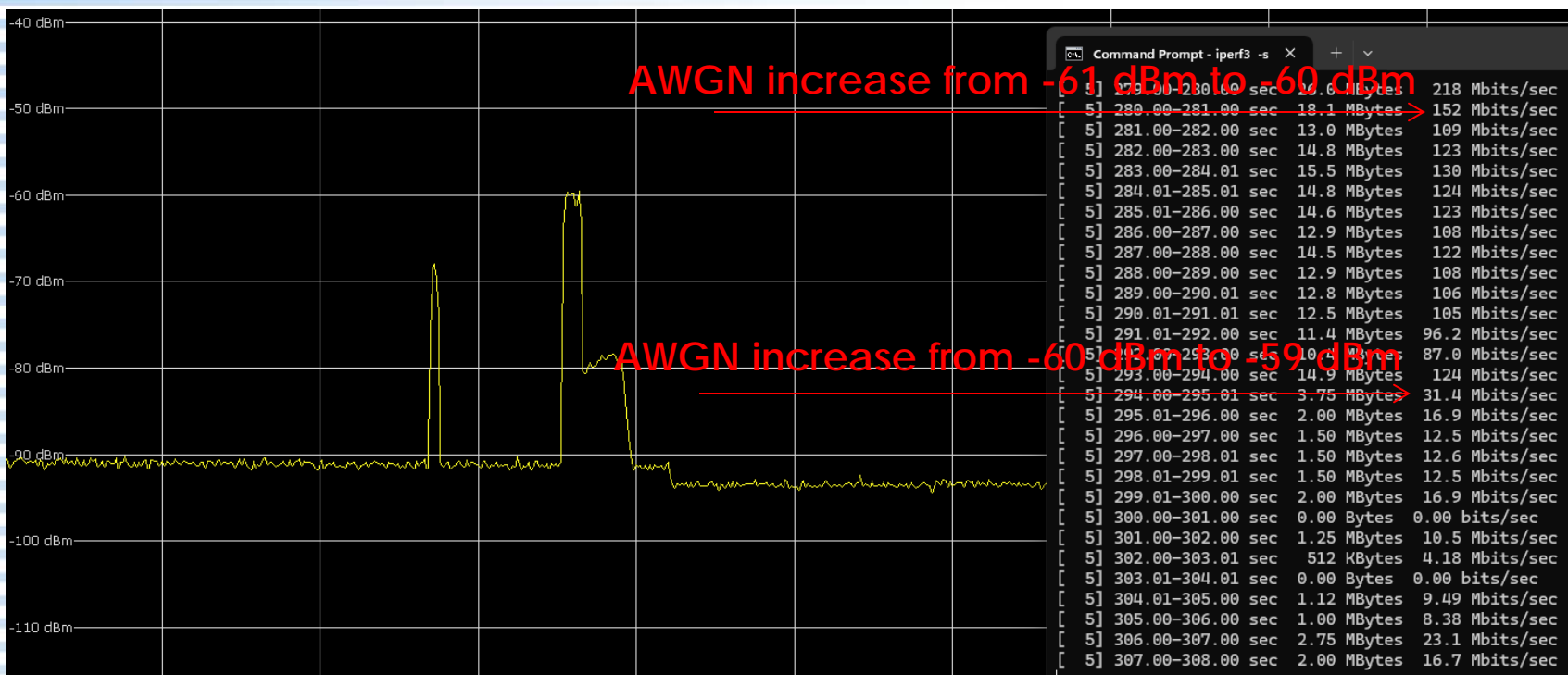(Throughput with no AWGN present)
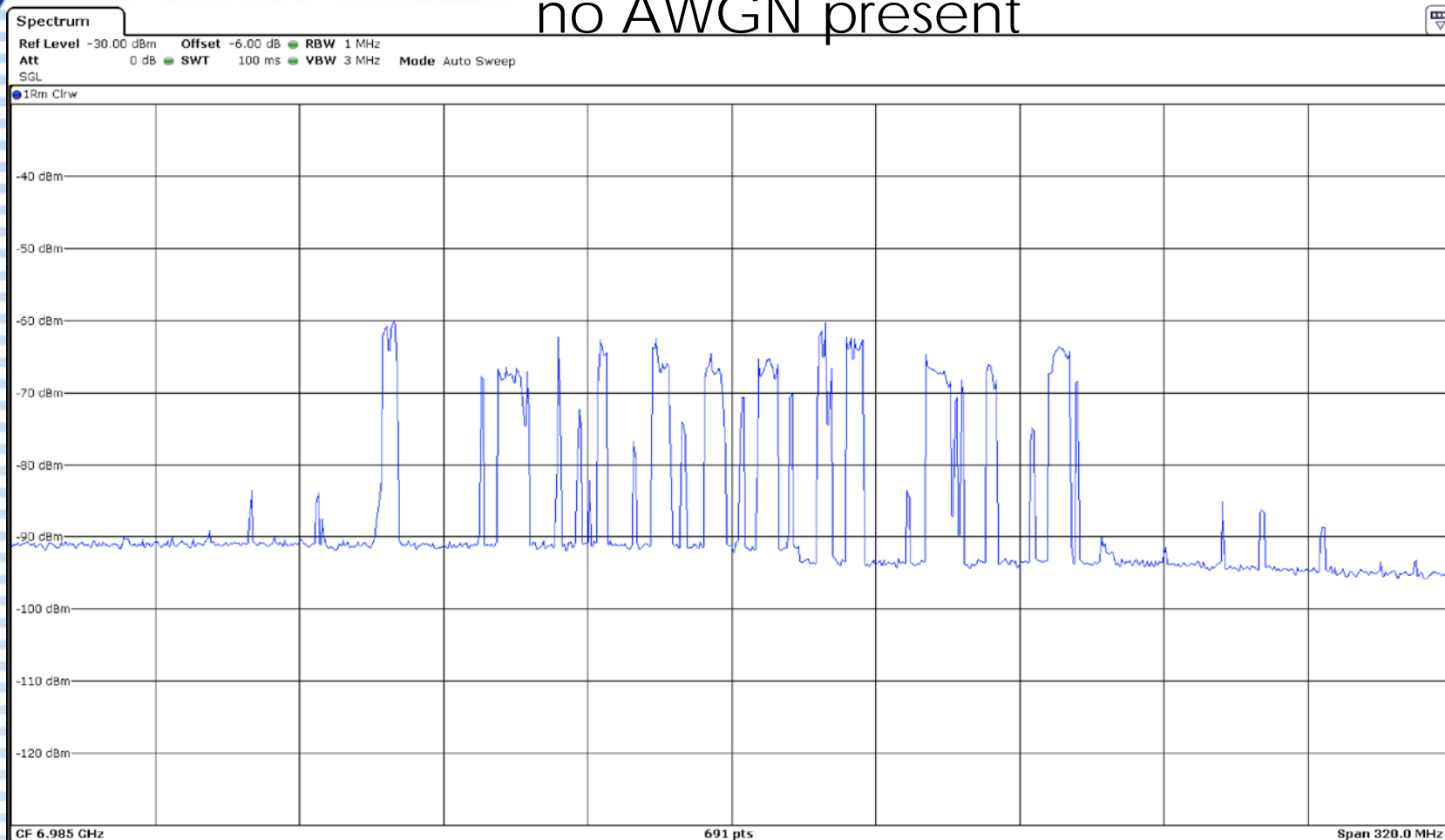
6ID Testing

Adaptive data rate

(Throughput with AWGN present at different power levels)

6ID Testing
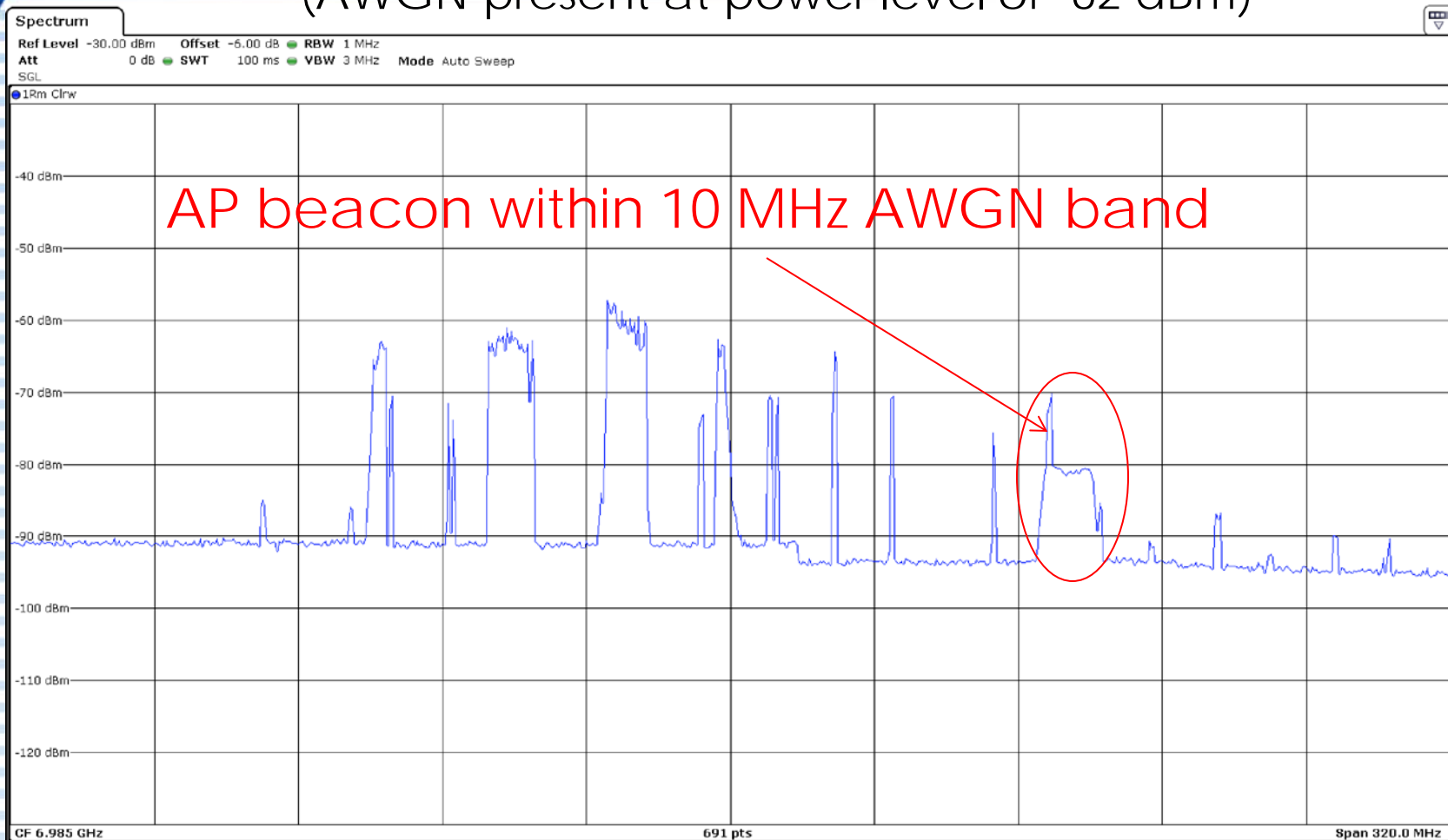## Full 160 MHz spectrum before BW reduction, no AWGN present

6ID Testing
BW Reduction
(AWGN present at power level of -62 dBm)

AP beacon within 10 MHz AWGN band
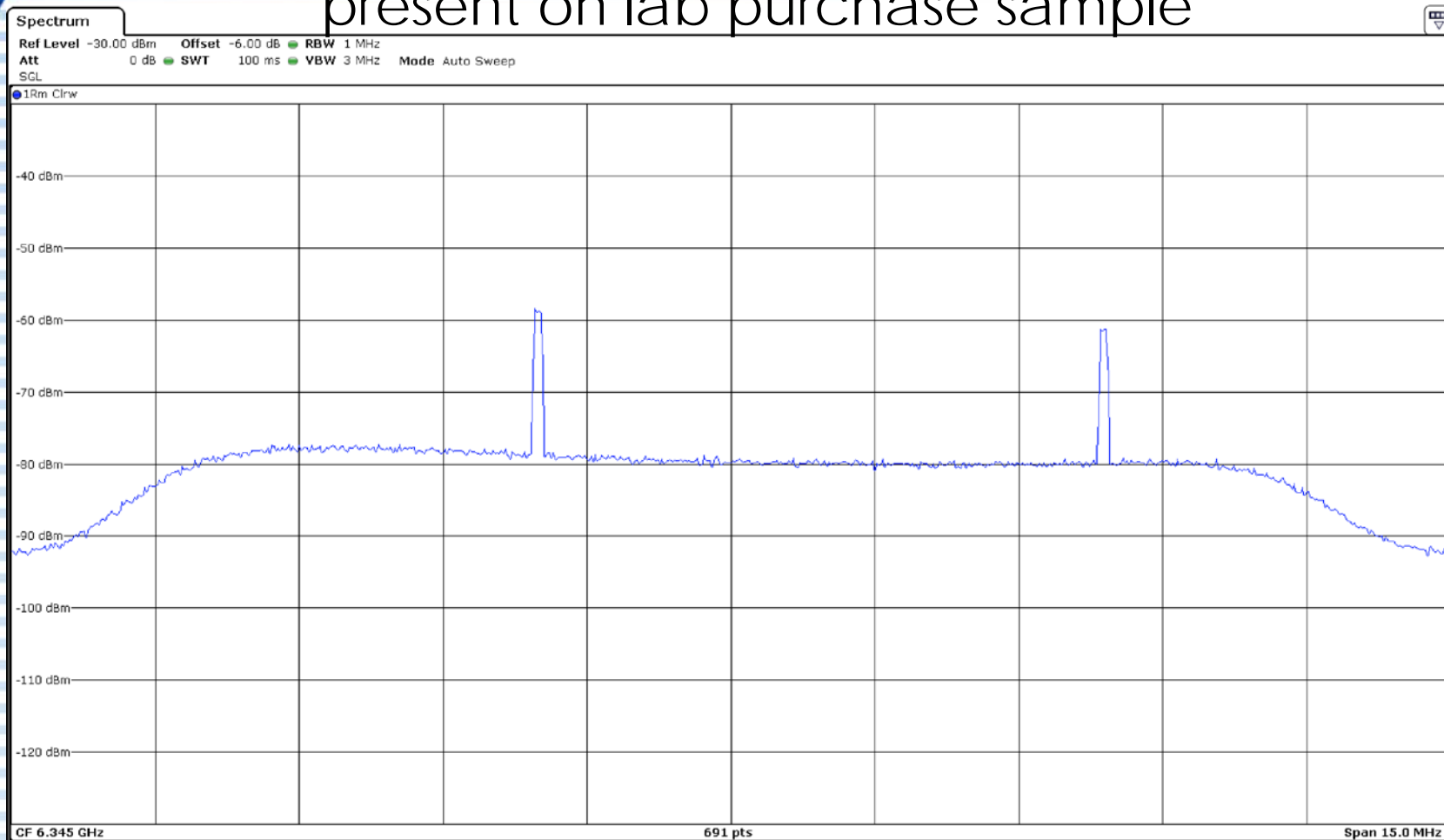
6ID Testing

- Test results
    - AP2 (lab purchase/sample request)
        - Lab purchase
            - Would cease network traffic at AWGN power levels of -62 dBm or greater
            - Beacons from AP2 would remain regardless of AWGN power level
        - Sample request
            - Would cease network traffic at AWGN power levels of -62 dBm or greater
            - No beacons would remain

6ID Testing
10 MHz AWGN band at -56 dBm with AP beacons present on lab purchase sample

6ID Testing

- Test results
  - AP3 (lab purchase/sample request)
    - Lab purchase
      - Would cease network traffic at AWGN power levels of -62 dBm
      - No beacons would remain
    - Sample request
      - Would cease network traffic at AWGN power levels of -62 dBm
      - No beacons would remain

6ID Testing

CBP Testing Results Summary
(AWGN Power level -62 dBm)

	AP1	AP2	AP3
Lab Purchased	NA	Fail	Pass
Sample Request	Fail	Pass	Pass
Failure Mode	Tx network traffic and beacons	Tx beacons	NA

6ID Testing

- Observations
  - Adaptive data rate to maintain link
  - If AP has multiple 6 GHz radios it had the ability to move network traffic to radio 2 when AWGN present on radio 1 on a different 6 GHz channel
  - BW reduction
  - Channel move for a single radio AP
  - Some FCC IDs had multiple units tested
    - Lab purchased unit and a sample request to the manufacturer
      - AP2: There was a clear difference found on CBP testing between what the manufacturer provided as a sample request and the unit the lab purchased on the open market.
        - The manufacturer provided sample request unit was able to pass CBP
        - The unit the lab purchased on the open market failed CBP
      - AP3: Both units met CBP requirements and had similar test results

6ID Testing

- Conclusions
  - APs must cease all transmissions on incumbent occupied band at appropriate threshold power level (> -62 dBm)
    - This includes all management packets. Reference KDB 987594 D03:
      - Q15. During contention-based protocol testing, once the EUT has detected an AWGN signal and ceased transmission is it allowed to send intermittent control signals?
      - A15. No. Signals of any kind are not allowed to be sent.
    - BW reduction is allowed
      - If the AP is utilizing BW reduction to clear the incumbent band, it must make sure to cease all transmissions within occupied band once the signal is detected at the appropriate threshold power level.
  - More testing on 6 GHz devices planned

Questions?

THANK YOU