



NHTSA

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

DSRC and Wi-Fi Baseline Cross-channel Interference Test and Measurement

SAE Government Industry Meeting

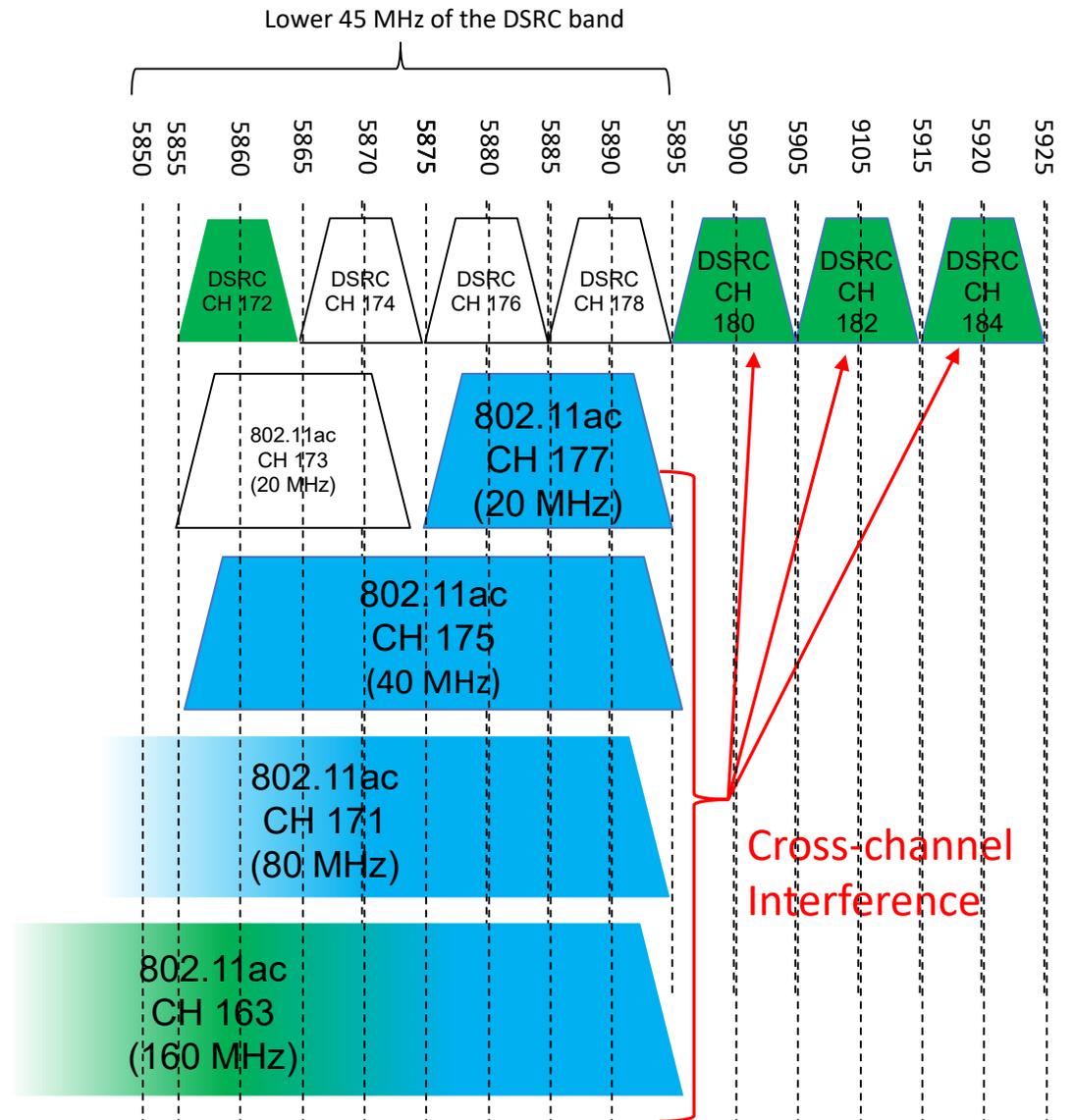
Washington DC,

January 2020

Background

- FCC considering reallocation of the 5.9 GHz Safety Band
- NHTSA and CAMP conducted research to evaluate potential interference on DSRC from 802.11ac (Wi-Fi) devices operating in adjacent bands

802.11ac (Wi-Fi)	DSRC 180	DSRC 182	DSRC 184
177: 20 MHz	X	X	X
175: 40 MHz	X	X	X
171: 80 MHz	X	X	X
163: 160 MHz	X	X	X



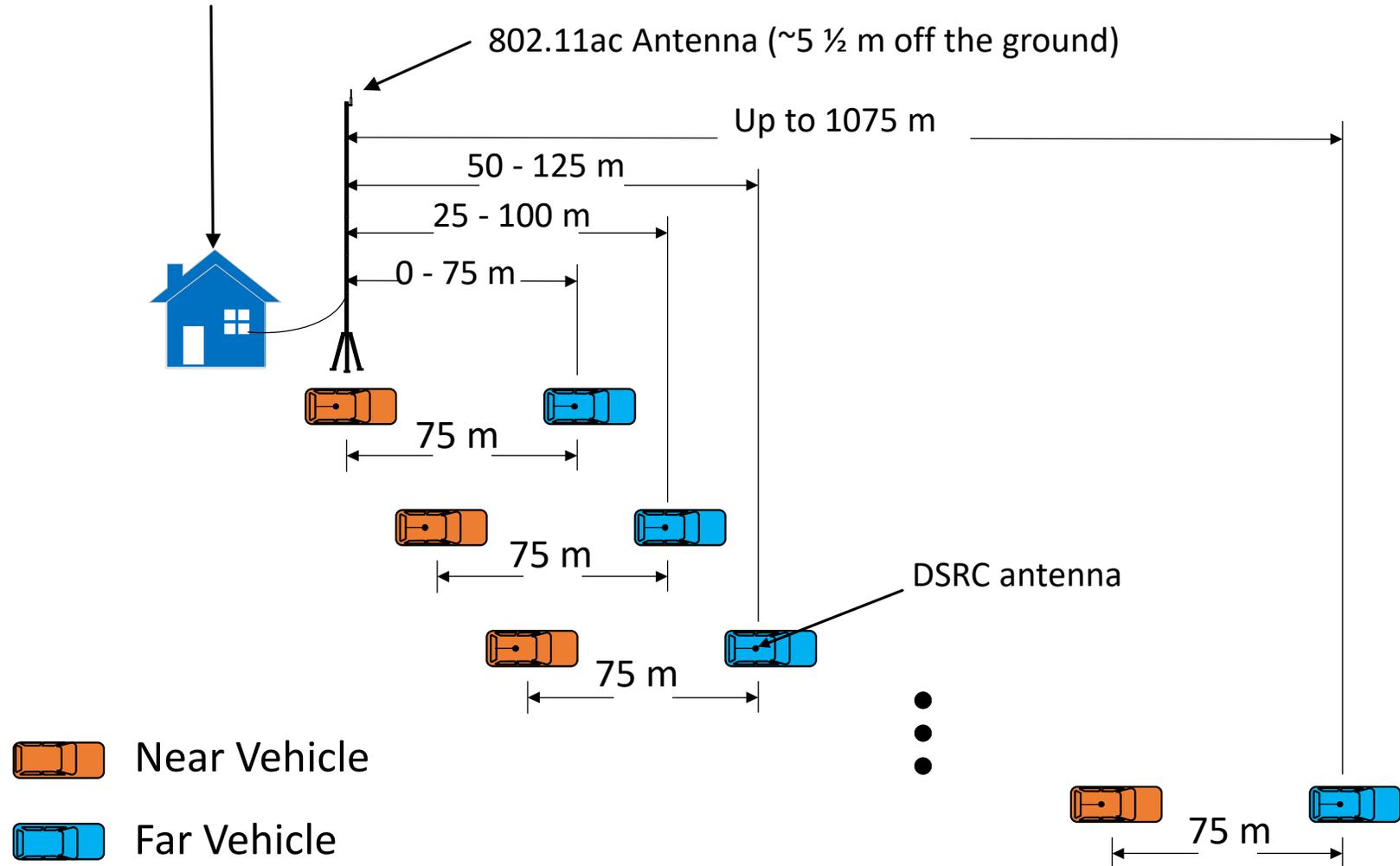
Test Procedure and Set Up

- All devices compliant with FCC rules
- Wi-Fi devices adjusted to 36 dBm EIRP –highest allowable per FCC rules
- DSRC devices adjusted to 17 dBm transmit power—resulting a very strong signal strength condition (~68 dbm compared to -92dbm minimum specification)
- Vehicles positioned 75m apart, fixed.
- Maximum range tested (1,000 -1,075 m)
- Captured Packet Error Rate (PER), Channel Busy Percentage (CBP), Received Signal Strength Indicator (RSSI), and Information Age (IA) during each test.

Experimental Set-Up



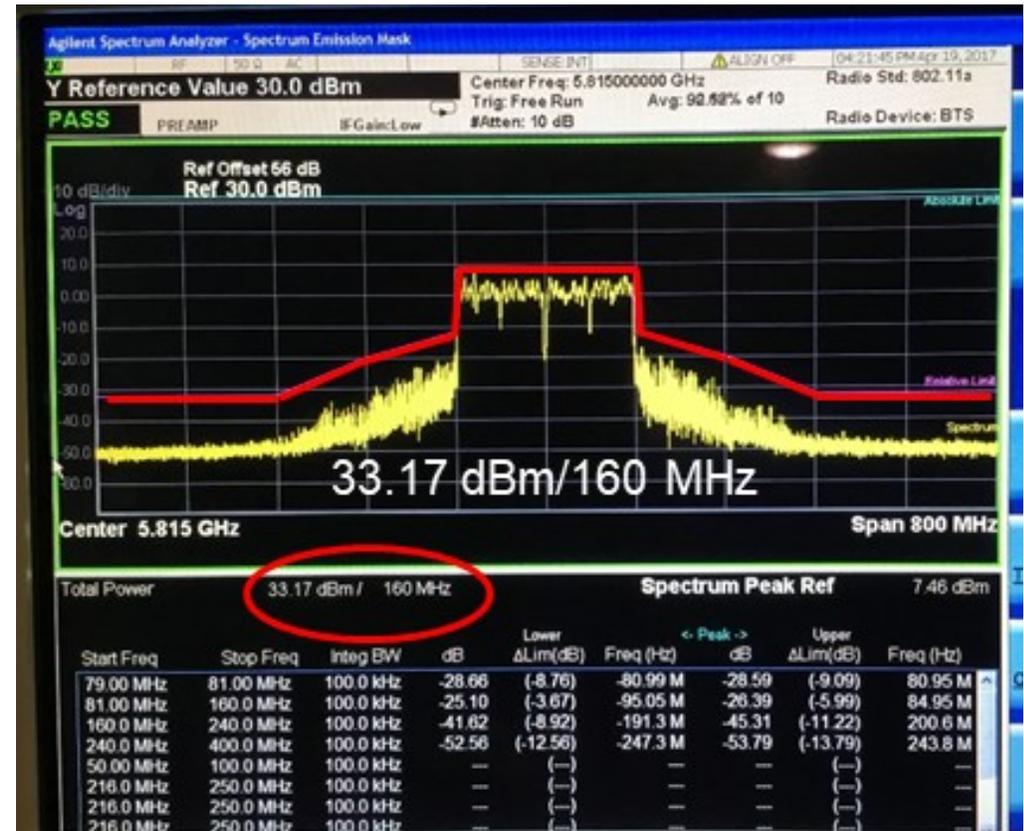
802.11ac Device
(In building w/ ~6 m LMR400 cable to antenna)



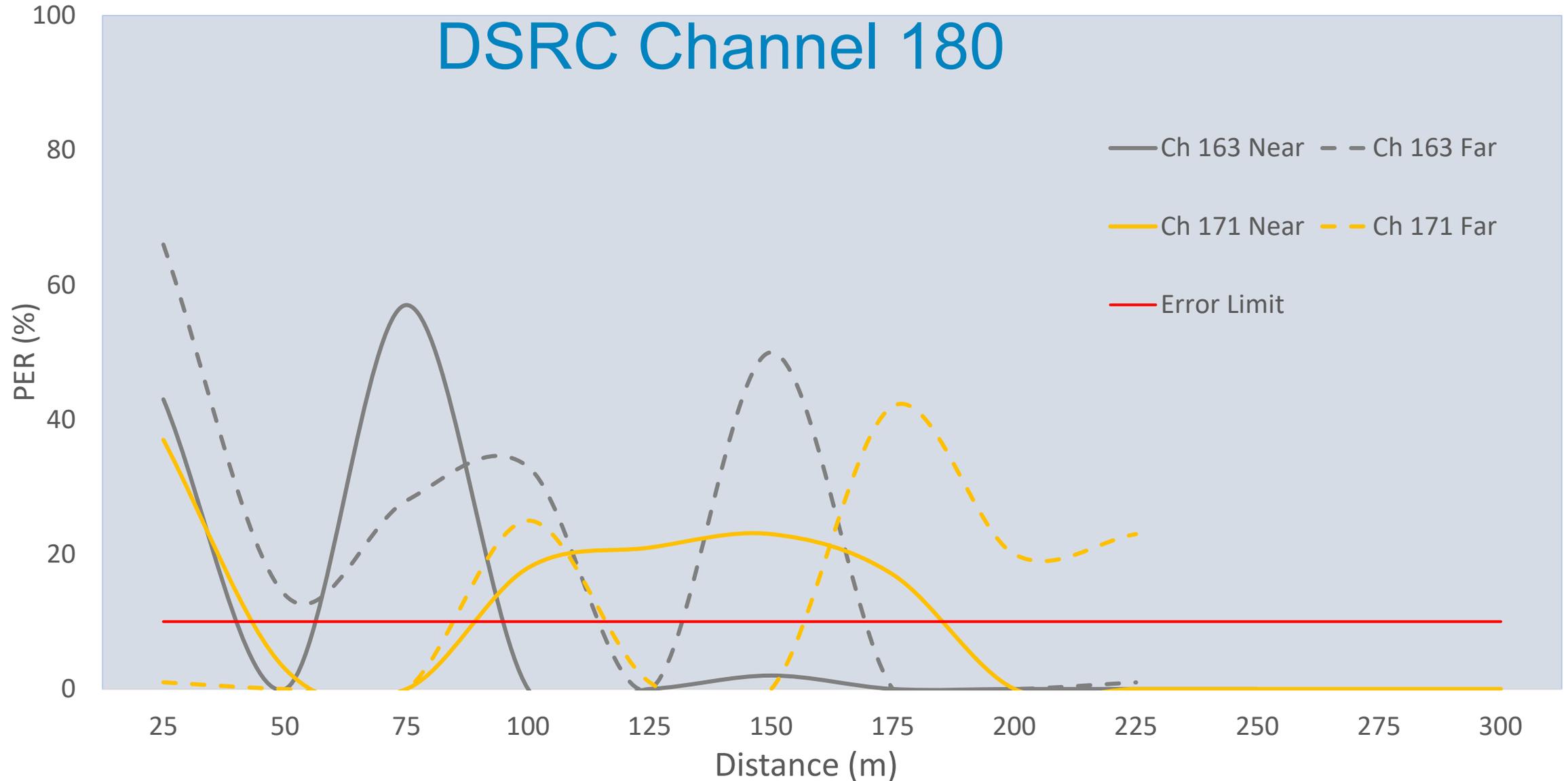
Results Preview....

Highly variable, dependent on distance and channel

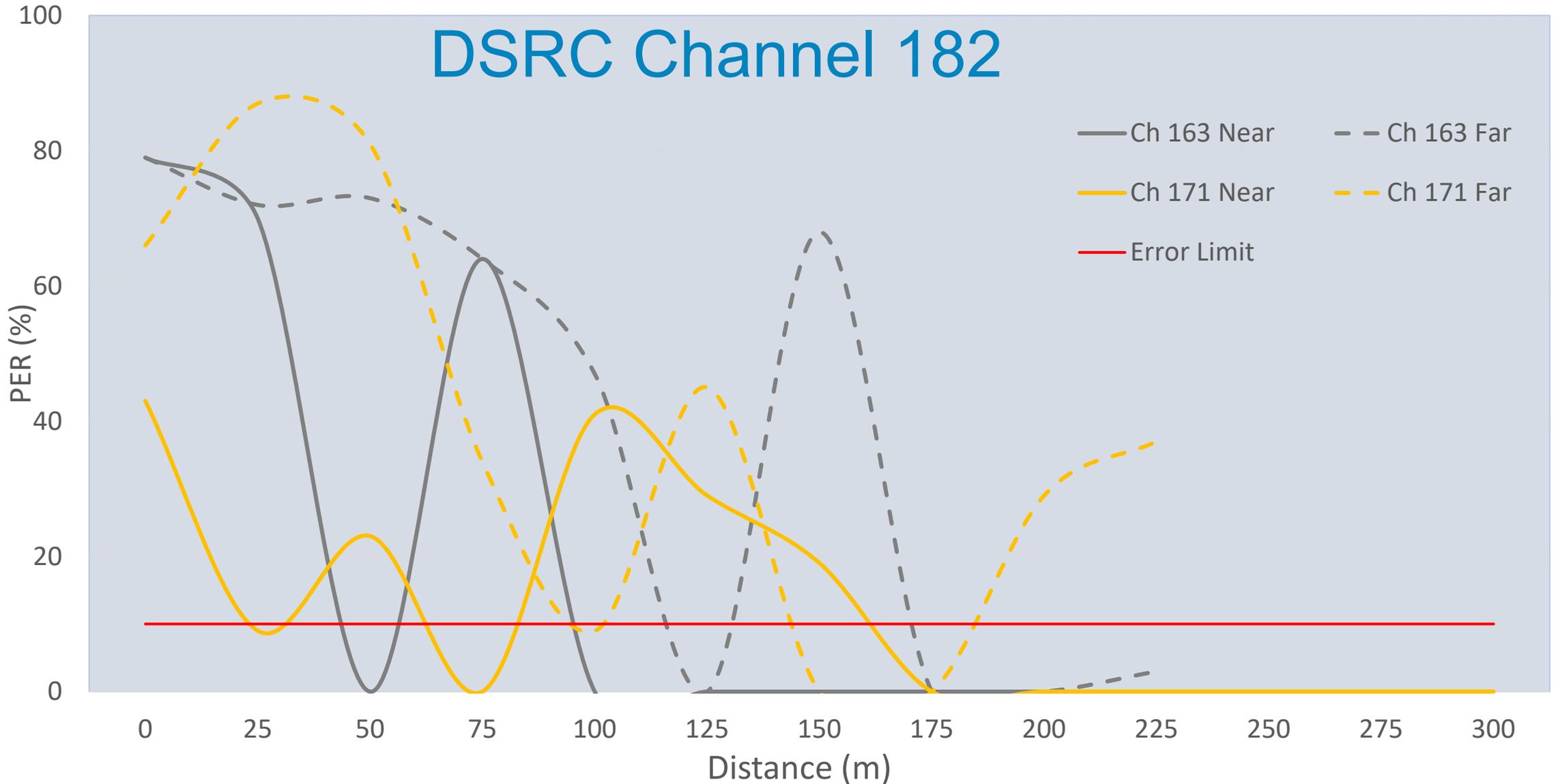
- Packet Error Rate (PER) does not decay uniformly with distance
- Close channels (180/177) showed greatest interference as expected
- Cross-channel effects generally disappear after 250m



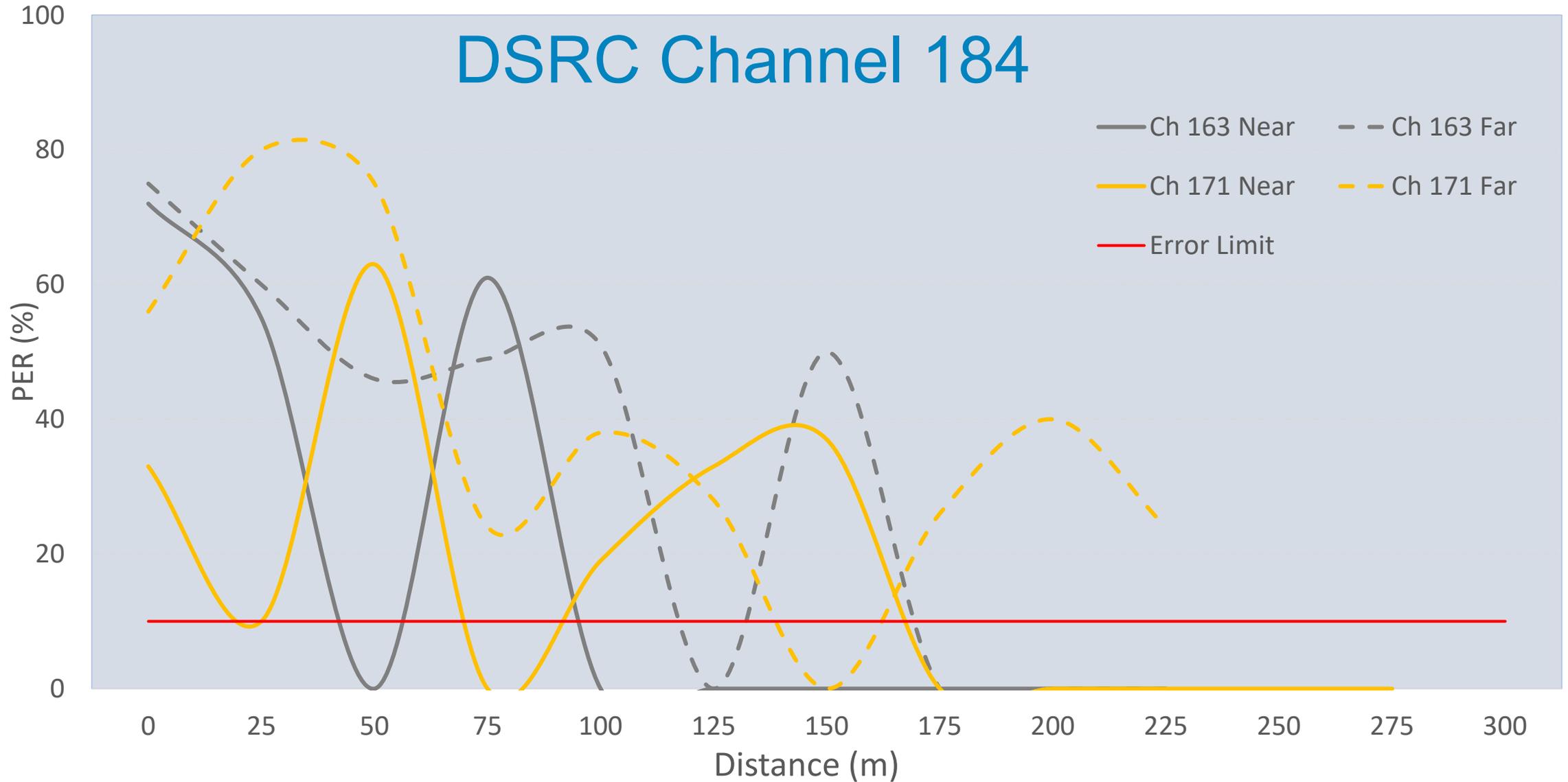
Sample Results: PER at various ranges



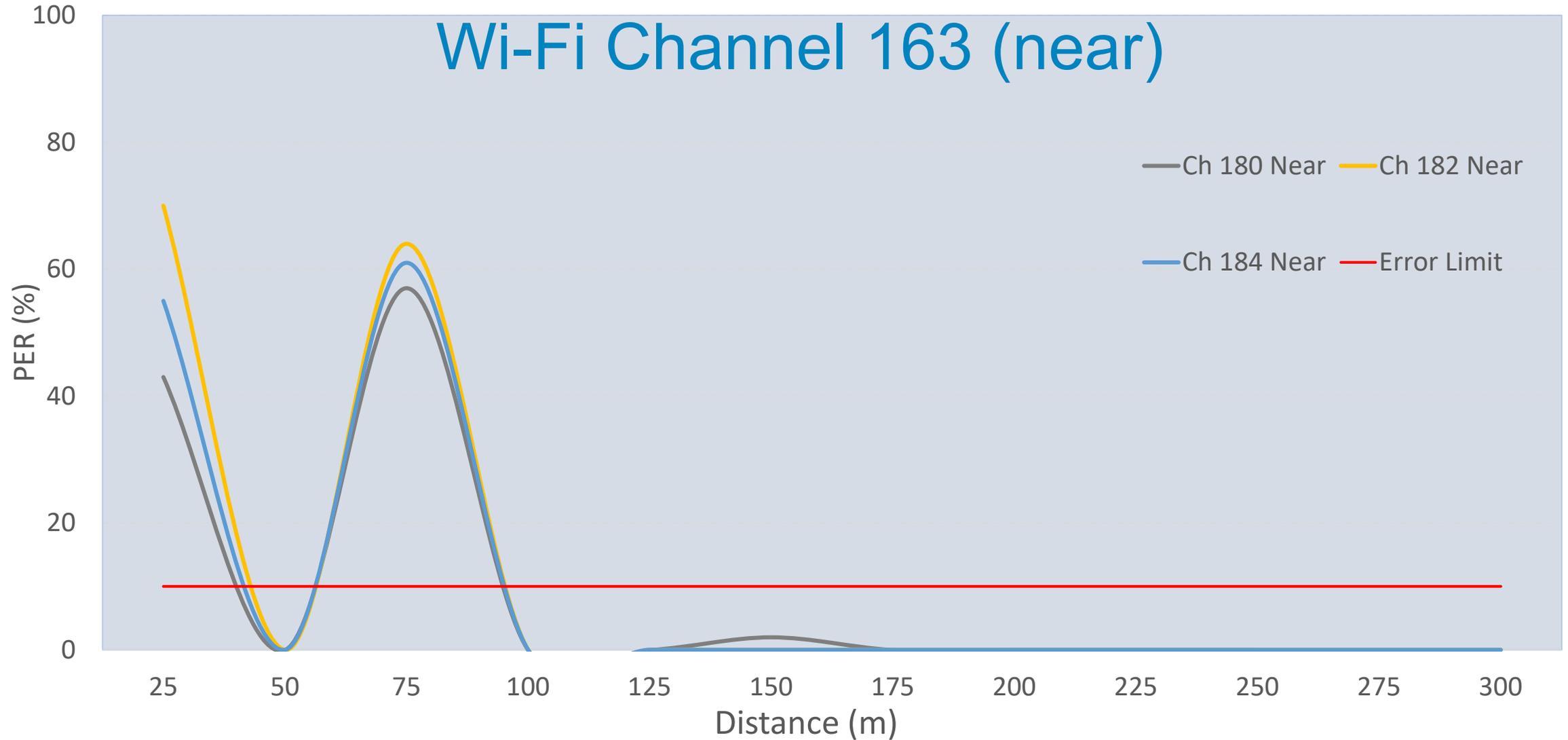
Sample Results: PER at various ranges



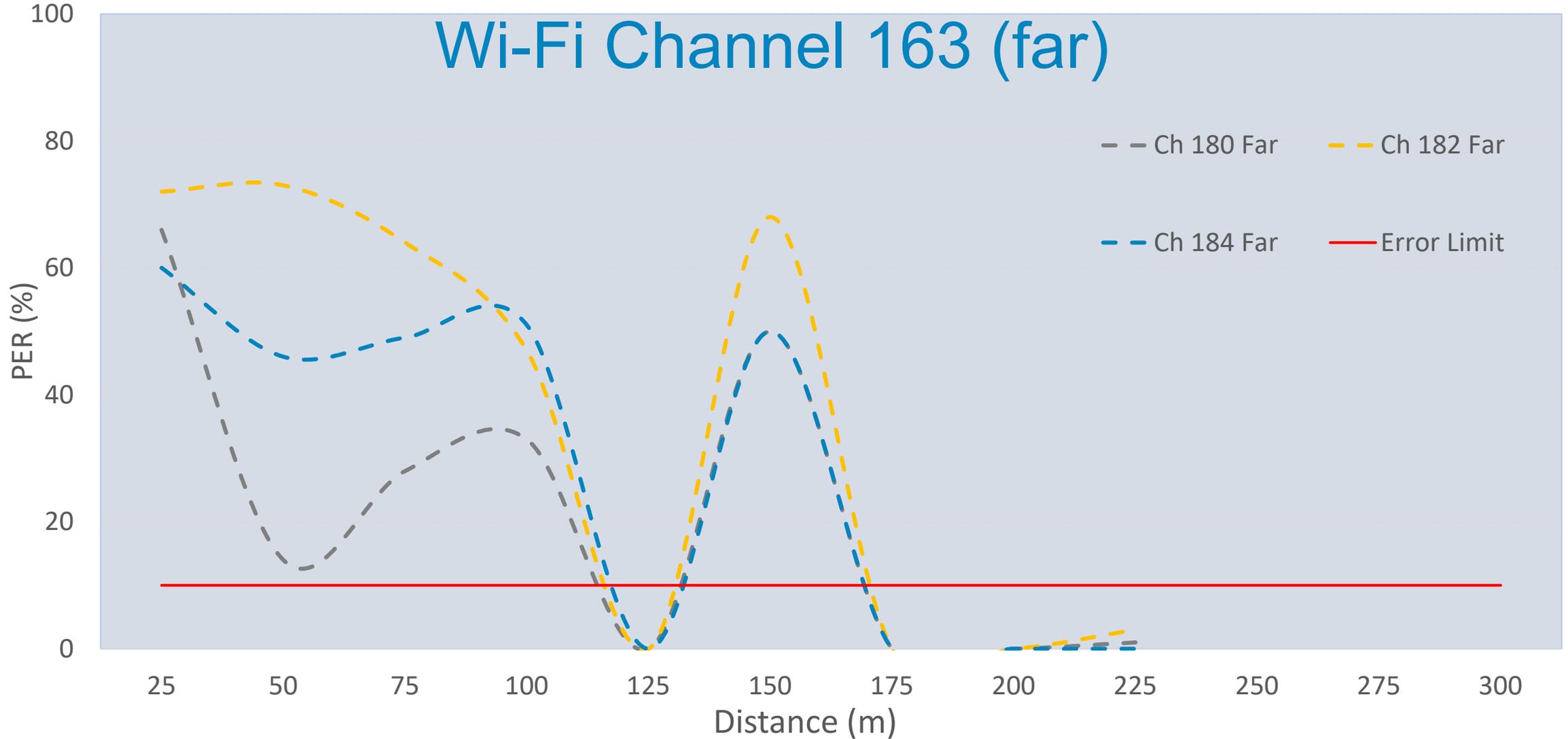
Sample Results: PER at various ranges



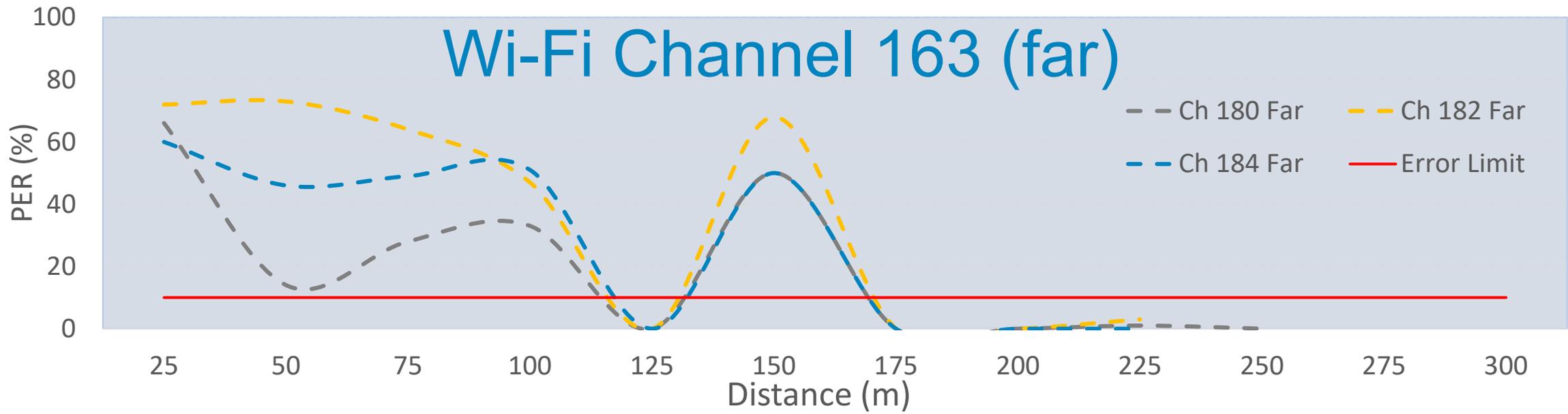
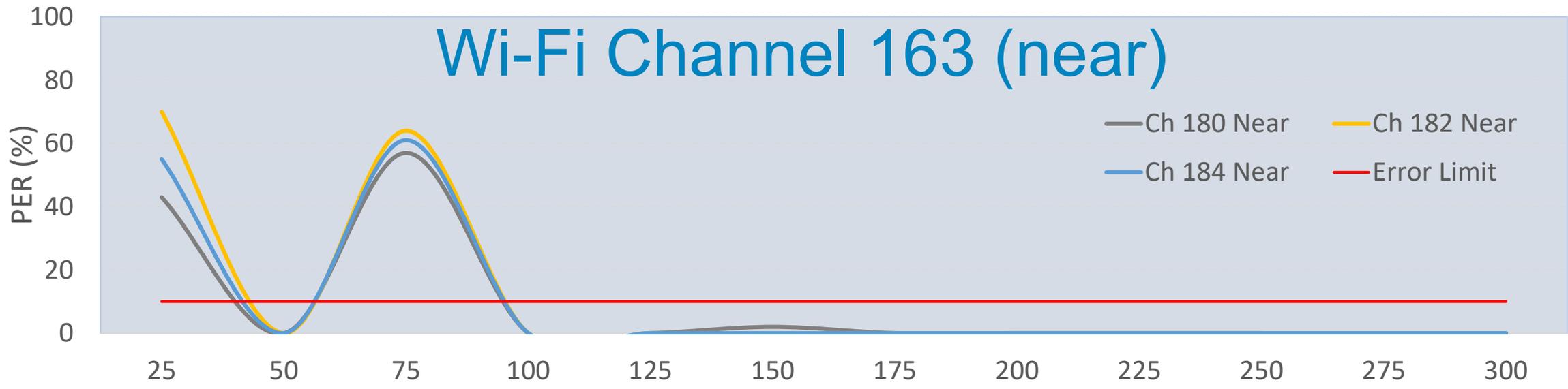
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Sample Results: PER at various ranges



Conclusions and Potential Next Steps

- Cross-channel interference characterization was successfully measured along multiple DSCR and 802.11ac channels
- No attempt was made to model wireless LAN network traffic patterns
- Potentially performance disrupting interference was found up to a range of 400m, but 100m-200m was more typical
- As expected, closer channels generally showed greater interference potential
- Needs:
 - Evaluate impact of multiple 802.11ac network traffic patterns (video streaming, LAN, more clients, etc)
 - Evaluate impacts in more congested V2X environments, and,
 - Evaluate impact of 802.11ac traffic on C-V2X devices and operation

You can find the report at....

- <https://www.nhtsa.gov/about-nhtsa/briefing-room>

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