Experiments on WLAN Interference Reduction by Dynamic Frequency Selection in C-Band Weather Radars

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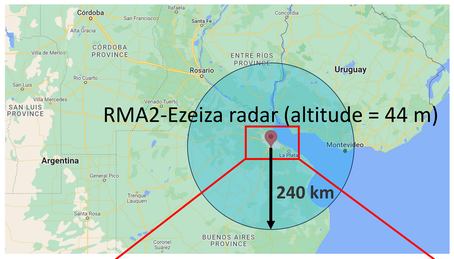
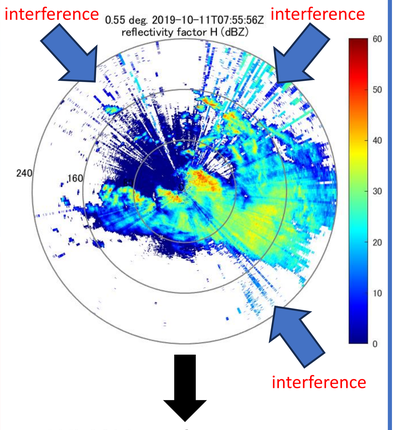
Background and Objective

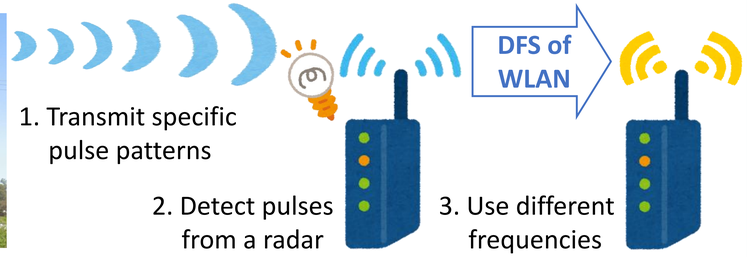
- C-band weather radars in Argentina receive **interference from urban wireless LANs (WLANs).** ➡ inaccurate weather observations





WLAN Interference may lead to wrong QPE results

- WLANs using the 5.6 GHz frequency band are required to have the **dynamic frequency selection (DFS)**, to avoid interference with radars.



- We had a radar in Buenos Aires **transmit pulse patterns that satisfied the DFS specifications**, and we **investigated whether the received signal power changed or not** before and after the pulse transmission.

Experimental Settings

- **On a sunny, cloudless day** (Nov. 24, 2022), **with the help of INVAP engineers specializing in radar, experiments were conducted** according to the time schedule in Table 1.

photo taken on Nov. 24, 2022

- Receive-Only mode (Steps 1, 3, 5, and 7) receives signals **without transmitting pulses.**

Table 1: Time Schedule of the Experiments

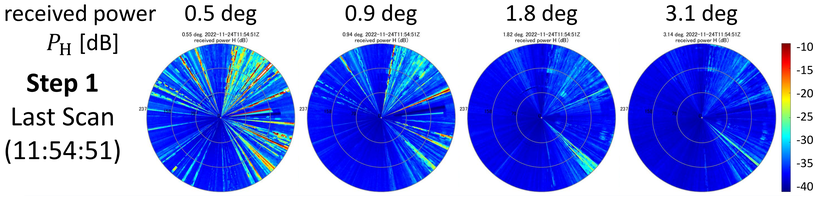
Step	VCP	First Scan Time	Last Scan Time
Step 1: Receive-Only	9222	11:01:53	11:54:51
Step 2: Pulse Pattern 1	9400	12:03:38	13:06:15
Step 3: Receive-Only	9222	13:15:21	14:08:31
Step 4: Pulse Pattern 2	9401	14:18:32	15:25:41
Step 5: Receive-Only	9222	15:30:49	16:24:18
Step 6: Pulse Pattern 3	9402	16:36:13	17:35:03
Step 7: Receive-Only	9222	18:21:49	19:15:21

- In Steps 2, 4, and 6, the radar transmits pulses as shown in Table 2. These pulse patterns **satisfy both DFS specifications defined by** the US Federal Communications Commission (**FCC**) and the European Telecommunications Standards Institute (**ETSI**). (**Pulse Width = 1 μs is important to meet both DFS specifications**)

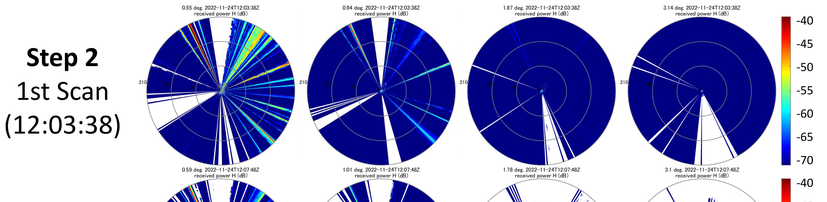
Table 2: Radar Configurations for Steps 2, 4, and 6

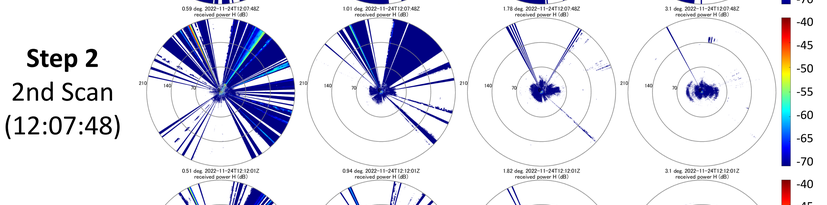
Configurations	Volume Coverage Pattern (VCP)		
	9400	9401	9402
Elevation Angles [deg]	0.5, 0.9, 1.3, 1.8, 2.3, and 3.1		
Pulse Width [μs]	1		
Number of Pulses	70	95	50
Pulse Repetition Time (PRI) [μs]	1428	1050	2000
Max Range [km]	212	155	298
Scan Speed [deg/s]	10		

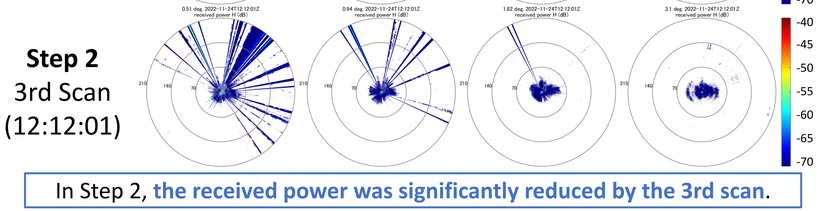
Results and Conclusion



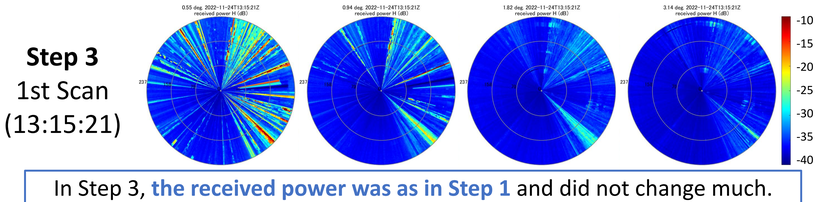
In Step 1, as elevation angle increased, WLAN interference decreased.







In Step 2, **the received power was significantly reduced by the 3rd scan.**



In Step 3, **the received power was as in Step 1** and did not change much.
(Steps 4-7 were similar to Steps 1-3, and P_V [dB] was similar to P_H [dB])

- **DFS appeared to work, but interference returned within 10 minutes** from Steps 2 to 3, probably due to WLAN specifications or rebooting.