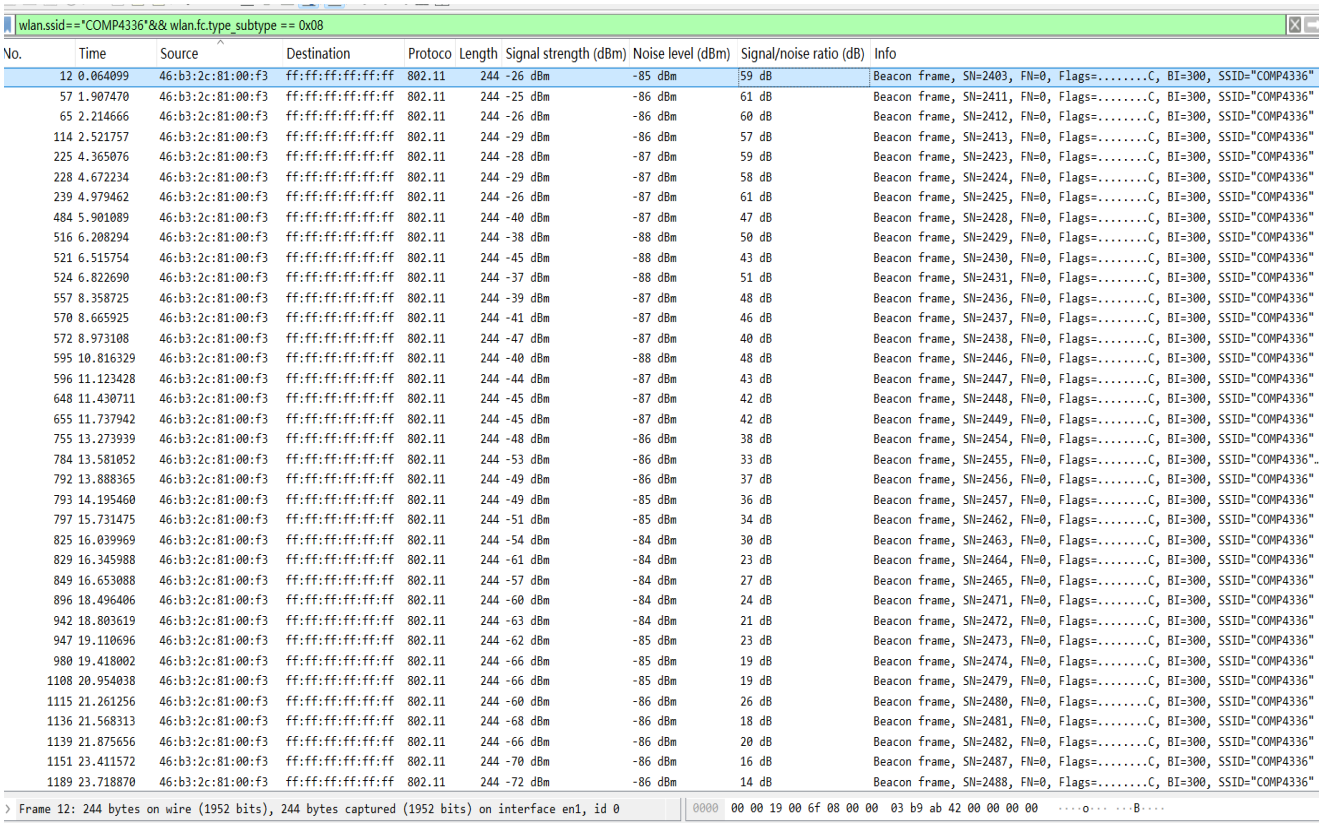
COMP9336 Mobile Data Networking

Written by Jiayang Jiang

a. Task 1: Wireshark screen shot showing the filter expression, display of all beacon frames from SSID=COMP4336 (“COMP4336” should be visible) including columns for S, N, and SNR.



wlan.ssid=="COMP4336"&& wlan.fc.type_subtype == 0x08

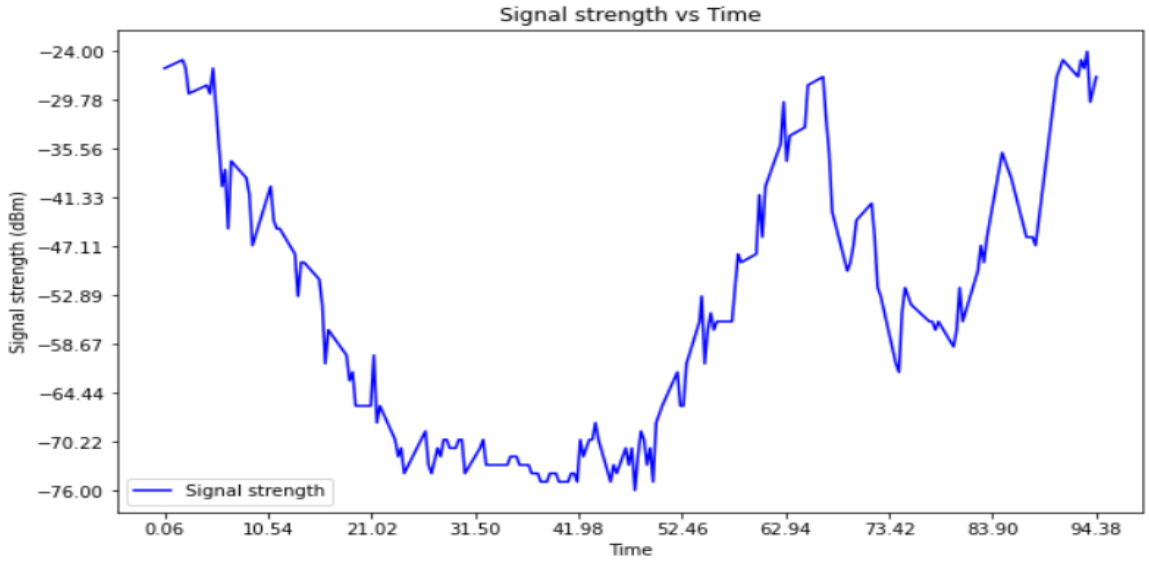
No.	Time	Source	Destination	Protoco	Length	Signal strength (dBm)	Noise level (dBm)	Signal/noise ratio (dB)	Info
12	0.064099	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-26 dBm	-85 dBm	59 dB	Beacon frame, SN=2403, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
57	1.907470	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-25 dBm	-86 dBm	61 dB	Beacon frame, SN=2411, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
65	2.214666	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-26 dBm	-86 dBm	60 dB	Beacon frame, SN=2412, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
114	2.521757	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-29 dBm	-86 dBm	57 dB	Beacon frame, SN=2413, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
225	4.365076	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-28 dBm	-87 dBm	59 dB	Beacon frame, SN=2423, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
228	4.672234	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-29 dBm	-87 dBm	58 dB	Beacon frame, SN=2424, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
239	4.979462	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-26 dBm	-87 dBm	61 dB	Beacon frame, SN=2425, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
484	5.901089	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-40 dBm	-87 dBm	47 dB	Beacon frame, SN=2428, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
516	6.208294	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-38 dBm	-88 dBm	50 dB	Beacon frame, SN=2429, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
521	6.515754	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-45 dBm	-88 dBm	43 dB	Beacon frame, SN=2430, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
524	6.822690	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-37 dBm	-88 dBm	51 dB	Beacon frame, SN=2431, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
557	8.358725	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-39 dBm	-87 dBm	48 dB	Beacon frame, SN=2436, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
570	8.665925	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-41 dBm	-87 dBm	46 dB	Beacon frame, SN=2437, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
572	8.973108	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-47 dBm	-87 dBm	40 dB	Beacon frame, SN=2438, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
595	10.816329	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-40 dBm	-88 dBm	48 dB	Beacon frame, SN=2446, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
596	11.123428	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-44 dBm	-87 dBm	43 dB	Beacon frame, SN=2447, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
648	11.430711	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-45 dBm	-87 dBm	42 dB	Beacon frame, SN=2448, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
655	11.737942	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-45 dBm	-87 dBm	42 dB	Beacon frame, SN=2449, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
755	13.273939	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-48 dBm	-86 dBm	38 dB	Beacon frame, SN=2454, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
784	13.581052	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-53 dBm	-86 dBm	33 dB	Beacon frame, SN=2455, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
792	13.888365	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-49 dBm	-86 dBm	37 dB	Beacon frame, SN=2456, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
793	14.195460	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-49 dBm	-85 dBm	36 dB	Beacon frame, SN=2457, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
797	15.731475	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-51 dBm	-85 dBm	34 dB	Beacon frame, SN=2462, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
825	16.039969	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-54 dBm	-84 dBm	30 dB	Beacon frame, SN=2463, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
829	16.345988	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-61 dBm	-84 dBm	23 dB	Beacon frame, SN=2464, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
849	16.653088	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-57 dBm	-84 dBm	27 dB	Beacon frame, SN=2465, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
896	18.496406	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-60 dBm	-84 dBm	24 dB	Beacon frame, SN=2471, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
942	18.803619	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-63 dBm	-84 dBm	21 dB	Beacon frame, SN=2472, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
947	19.110696	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-62 dBm	-85 dBm	23 dB	Beacon frame, SN=2473, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
980	19.418002	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-66 dBm	-85 dBm	19 dB	Beacon frame, SN=2474, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
1108	20.954038	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-66 dBm	-85 dBm	19 dB	Beacon frame, SN=2479, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
1115	21.261256	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-60 dBm	-86 dBm	26 dB	Beacon frame, SN=2480, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
1136	21.568313	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-68 dBm	-86 dBm	18 dB	Beacon frame, SN=2481, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
1139	21.875656	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-66 dBm	-86 dBm	20 dB	Beacon frame, SN=2482, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
1151	23.411572	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-70 dBm	-86 dBm	16 dB	Beacon frame, SN=2487, FN=0, Flags=.....C, BI=300, SSID="COMP4336"
1189	23.718870	46:b3:2c:81:00:f3	ff:ff:ff:ff:ff:ff	802.11	244	-72 dBm	-86 dBm	14 dB	Beacon frame, SN=2488, FN=0, Flags=.....C, BI=300, SSID="COMP4336"

> Frame 12: 244 bytes on wire (1952 bits), 244 bytes captured (1952 bits) on interface en1, id 0

0000 00 00 19 00 6f 08 00 00 03 b9 ab 42 00 00 00 00 ····o··· ···B····

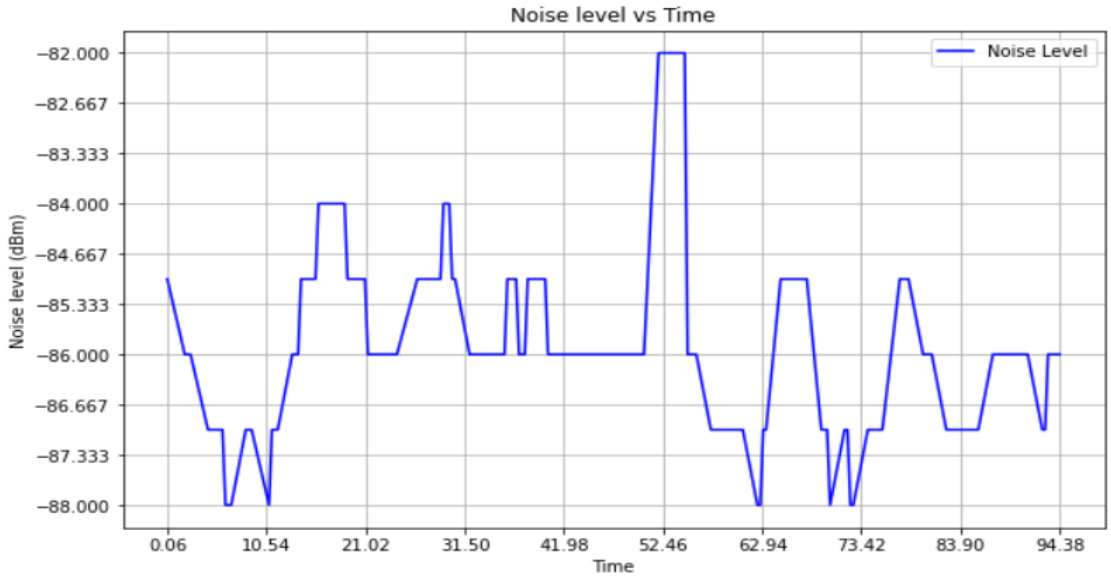
Imported the trace file into Wireshark and used a filter “**wlan.ssid=="COMP4336"&& wlan.fc.type_subtype == 0x08**” to remove all other packets except the beacons from SSID=COMP4336. Add signal strength, noise level, and SNR columns to the display and the above screenshot shows part of the SSID beacon frames information.

b&c. Task 1: 3 graphs (S, N, and SNR) and commentary on the graphs following the guidelines given under Task 1



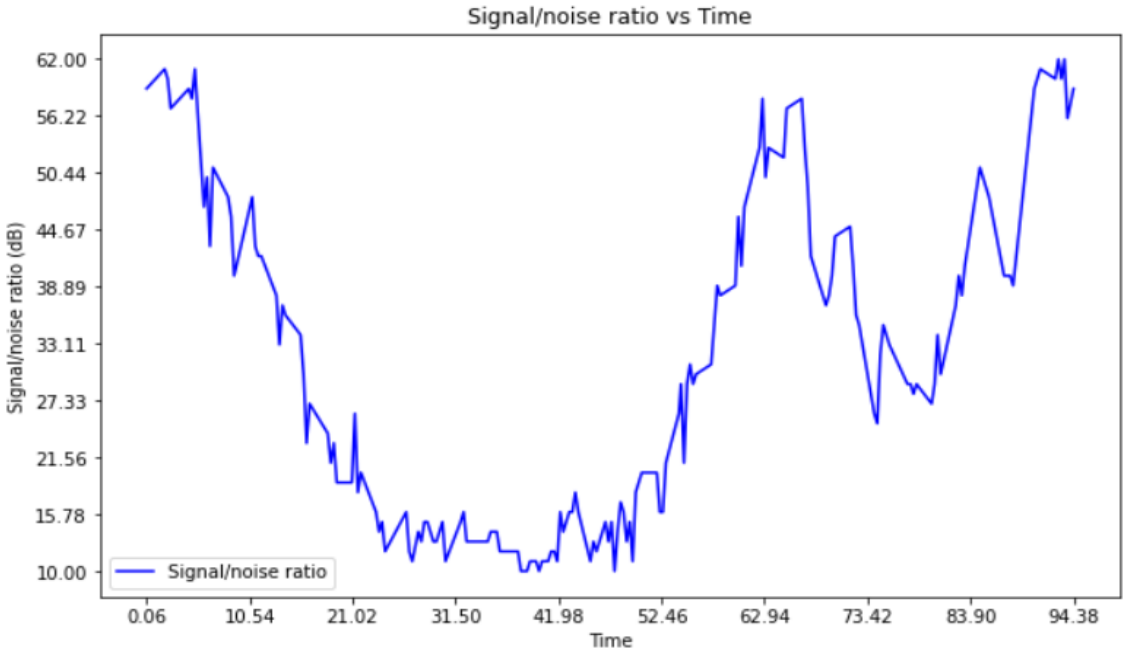
Commentary:

From the Signal Strength Diagram shown above, we can see that the signal strength starts from around **-25 dBm**, then gradually decreases. Around the 50-second mark, the signal strength begins to rise again, and by the end of the observation period, it returns to approximately **-25 dBm.** This is because that before the 50-second mark, the phone was moving away from the computer, causing the signal strength to drop due to the increased distance. After 50 seconds, as the phone moved closer again, the signal strength recovered. This is typical in wireless communication where signal strength changes with distance between devices and it could also be affected by obstacle such as Wall, glass and doors.



Commentary:

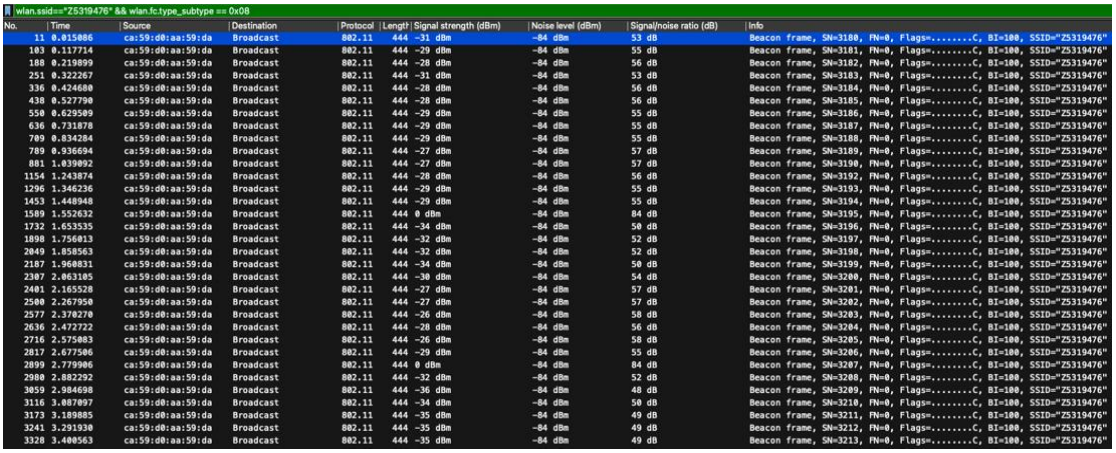
The noise level is influenced by the environment and can be affected by other devices operating on the same frequency bands, such as 2.4 GHz or 5 GHz, depending on which Wi-Fi frequency is in use. While these external signals can introduce interference, in this case, the noise level shows some fluctuations, which could be due to external factors. (devices like microwaves, fridge)



Commentary:

The Signal-to-Noise Ratio is determined by the relationship between signal strength and noise level. In this case, since the noise level remains relatively stable, the SNR diagram closely mirrors the signal strength diagram, resulting in minimal differences between the two. However, some minor variations may still be observed, reflecting subtle fluctuations in signal strength that occur over time.

d. Task 2: Wireshark screen shot showing the filter expression, display of all beacon frames from SSID=" your ZID" ("your ZID" should be visible) including columns for S, N, and SNR

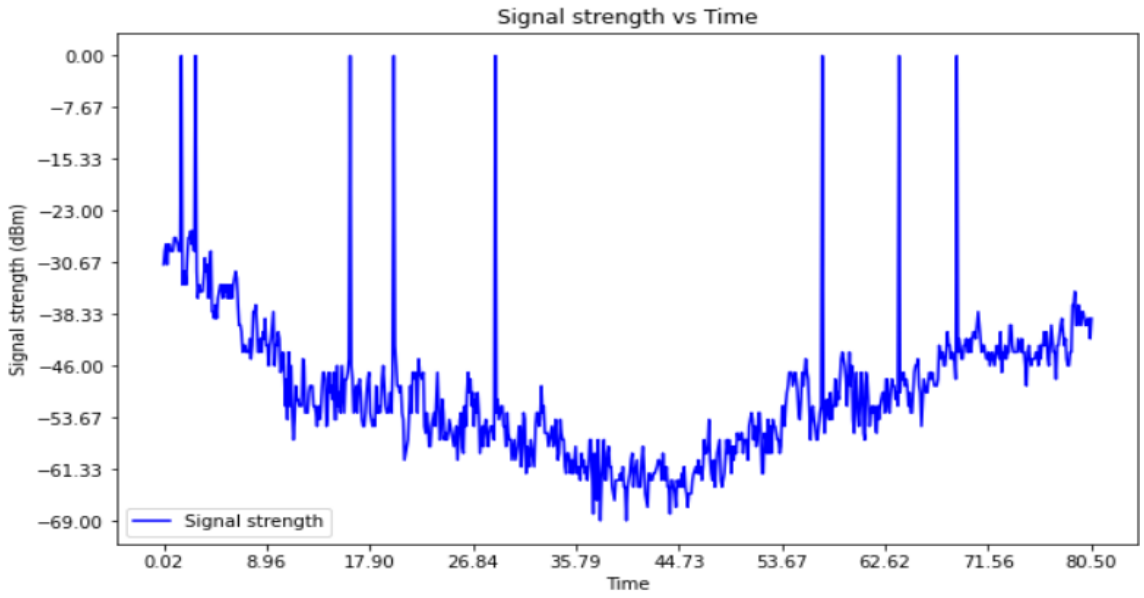


wlan.ssid=="Z5319476" && wlan.fc.type_subtype == 0x08

No.	Time	Source	Destination	Protocol	Length	Signal strength (dBm)	Noise level (dBm)	Signal/noise ratio (dB)	Info
11	0.015086	ca:59:d0:aa:59:da	Broadcast	802.11	444	-31 dBm	-84 dBm	53 dB	Beacon frame, SN=3180, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
103	0.117714	ca:59:d0:aa:59:da	Broadcast	802.11	444	-29 dBm	-84 dBm	55 dB	Beacon frame, SN=3181, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
188	0.219899	ca:59:d0:aa:59:da	Broadcast	802.11	444	-28 dBm	-84 dBm	56 dB	Beacon frame, SN=3182, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
251	0.322267	ca:59:d0:aa:59:da	Broadcast	802.11	444	-31 dBm	-84 dBm	53 dB	Beacon frame, SN=3183, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
336	0.424680	ca:59:d0:aa:59:da	Broadcast	802.11	444	-28 dBm	-84 dBm	56 dB	Beacon frame, SN=3184, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
438	0.527790	ca:59:d0:aa:59:da	Broadcast	802.11	444	-28 dBm	-84 dBm	56 dB	Beacon frame, SN=3185, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
550	0.629589	ca:59:d0:aa:59:da	Broadcast	802.11	444	-29 dBm	-84 dBm	55 dB	Beacon frame, SN=3186, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
636	0.731878	ca:59:d0:aa:59:da	Broadcast	802.11	444	-29 dBm	-84 dBm	55 dB	Beacon frame, SN=3187, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
709	0.834284	ca:59:d0:aa:59:da	Broadcast	802.11	444	-29 dBm	-84 dBm	55 dB	Beacon frame, SN=3188, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
789	0.936694	ca:59:d0:aa:59:da	Broadcast	802.11	444	-27 dBm	-84 dBm	57 dB	Beacon frame, SN=3189, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
881	1.039092	ca:59:d0:aa:59:da	Broadcast	802.11	444	-27 dBm	-84 dBm	57 dB	Beacon frame, SN=3190, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
1154	1.243874	ca:59:d0:aa:59:da	Broadcast	802.11	444	-28 dBm	-84 dBm	56 dB	Beacon frame, SN=3192, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
1296	1.346236	ca:59:d0:aa:59:da	Broadcast	802.11	444	-29 dBm	-84 dBm	55 dB	Beacon frame, SN=3193, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
1453	1.448948	ca:59:d0:aa:59:da	Broadcast	802.11	444	-29 dBm	-84 dBm	55 dB	Beacon frame, SN=3194, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
1589	1.552632	ca:59:d0:aa:59:da	Broadcast	802.11	444	0 dBm	-84 dBm	84 dB	Beacon frame, SN=3195, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
1732	1.653535	ca:59:d0:aa:59:da	Broadcast	802.11	444	-34 dBm	-84 dBm	50 dB	Beacon frame, SN=3196, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
1898	1.756013	ca:59:d0:aa:59:da	Broadcast	802.11	444	-32 dBm	-84 dBm	52 dB	Beacon frame, SN=3197, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
2049	1.858563	ca:59:d0:aa:59:da	Broadcast	802.11	444	-32 dBm	-84 dBm	52 dB	Beacon frame, SN=3198, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
2187	1.960831	ca:59:d0:aa:59:da	Broadcast	802.11	444	-34 dBm	-84 dBm	50 dB	Beacon frame, SN=3199, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
2307	2.063105	ca:59:d0:aa:59:da	Broadcast	802.11	444	-30 dBm	-84 dBm	54 dB	Beacon frame, SN=3200, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
2401	2.165528	ca:59:d0:aa:59:da	Broadcast	802.11	444	-27 dBm	-84 dBm	57 dB	Beacon frame, SN=3201, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
2500	2.267950	ca:59:d0:aa:59:da	Broadcast	802.11	444	-27 dBm	-84 dBm	57 dB	Beacon frame, SN=3202, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
2577	2.370270	ca:59:d0:aa:59:da	Broadcast	802.11	444	-26 dBm	-84 dBm	58 dB	Beacon frame, SN=3203, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
2636	2.472722	ca:59:d0:aa:59:da	Broadcast	802.11	444	-28 dBm	-84 dBm	56 dB	Beacon frame, SN=3204, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
2716	2.575083	ca:59:d0:aa:59:da	Broadcast	802.11	444	-26 dBm	-84 dBm	58 dB	Beacon frame, SN=3205, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
2817	2.677506	ca:59:d0:aa:59:da	Broadcast	802.11	444	-29 dBm	-84 dBm	55 dB	Beacon frame, SN=3206, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
2899	2.779986	ca:59:d0:aa:59:da	Broadcast	802.11	444	0 dBm	-84 dBm	84 dB	Beacon frame, SN=3207, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
2980	2.882292	ca:59:d0:aa:59:da	Broadcast	802.11	444	-32 dBm	-84 dBm	52 dB	Beacon frame, SN=3208, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
3059	2.984698	ca:59:d0:aa:59:da	Broadcast	802.11	444	-36 dBm	-84 dBm	48 dB	Beacon frame, SN=3209, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
3116	3.087097	ca:59:d0:aa:59:da	Broadcast	802.11	444	-34 dBm	-84 dBm	50 dB	Beacon frame, SN=3210, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
3173	3.189885	ca:59:d0:aa:59:da	Broadcast	802.11	444	-35 dBm	-84 dBm	49 dB	Beacon frame, SN=3211, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
3241	3.291930	ca:59:d0:aa:59:da	Broadcast	802.11	444	-35 dBm	-84 dBm	49 dB	Beacon frame, SN=3212, FN=0, Flags=.....C, BI=100, SSID="Z5319476"
3328	3.400563	ca:59:d0:aa:59:da	Broadcast	802.11	444	-35 dBm	-84 dBm	49 dB	Beacon frame, SN=3213, FN=0, Flags=.....C, BI=100, SSID="Z5319476"

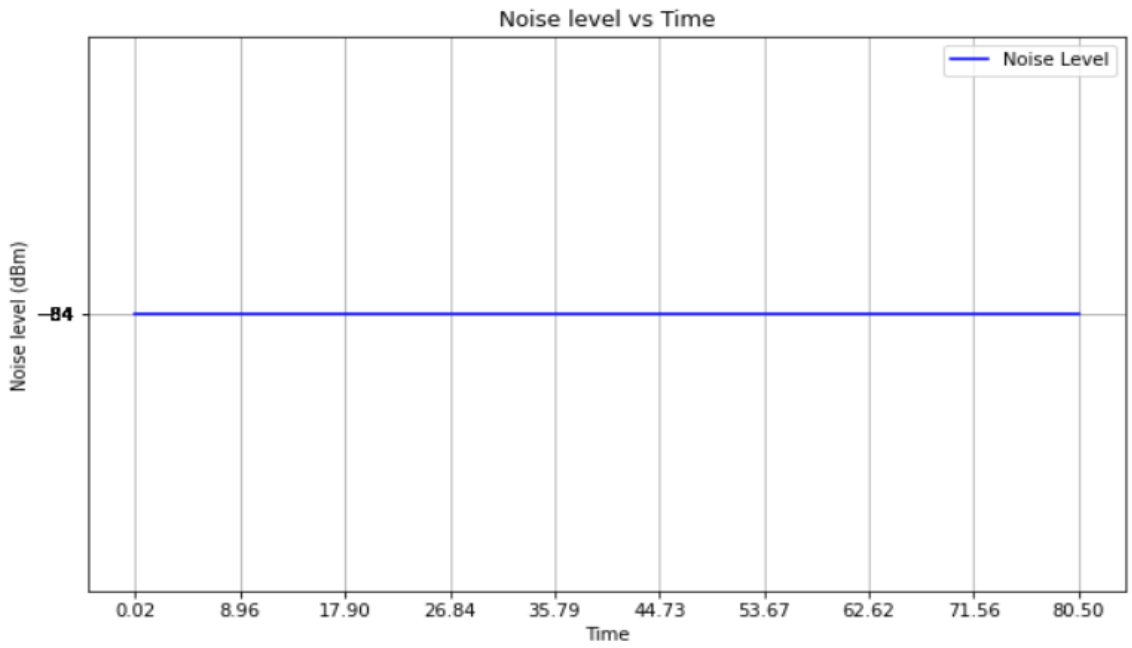
Use mac and smartphone to capture the packet.

e&f. Task 2: 3 graphs (S, N, and SNR) and task 2: Commentary on the graphs following the guidelines given under Task 1



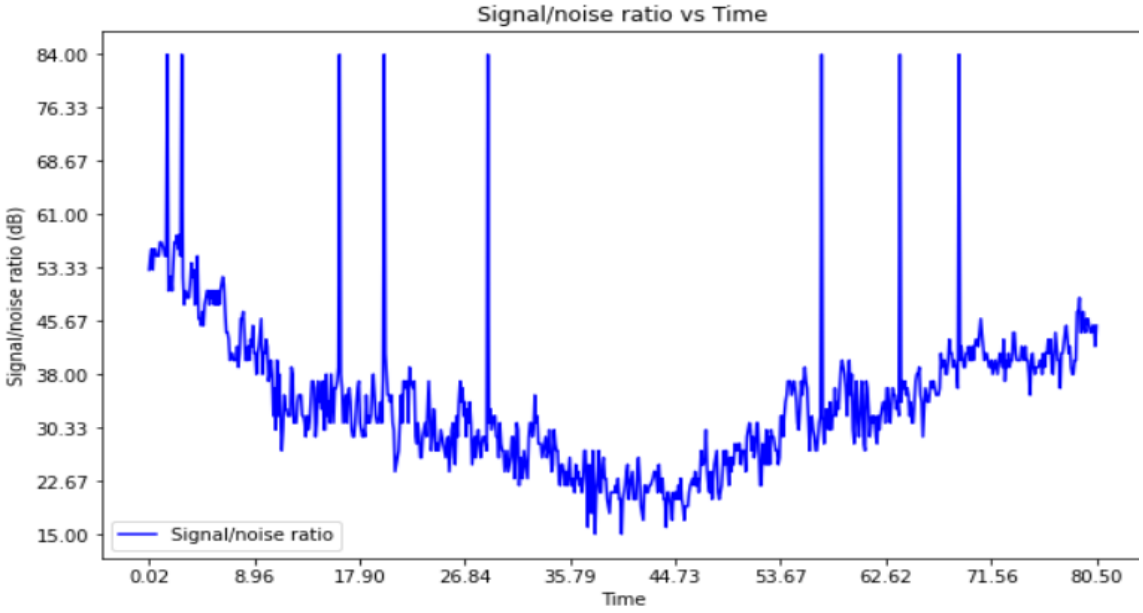
Commentary:

As in the first scenario from task 1, I gradually moved my phone away from the computer and then brought it closer again. I noticed that the signal strength initially decreased and then improved as the phone got closer. Additionally, in some cases, the signal strength became zero. This could be due to device or network issues, as well as physical obstacles, like a wall between the phone and the computer.



Commentary:

For task 2, the noise level remains the same regardless of the phone's distance from the signal source. I was simply walking around, and there were no other high-power devices nearby, which could explain why the noise level stayed consistent. The absence of significant interference from surrounding equipment shows that the environment was relatively stable, allowing the noise level to remain unchanged during the movement.



Commentary:

The Signal-to-Noise Ratio (SNR) diagram is almost the same as the signal strength diagram. In this case, since the noise level remains constant, any increase in signal strength directly contributes to a higher SNR. This relationship highlights the importance of a strong signal in maintaining good communication quality, even when the noise remains unchanged. However, it's essential to consider that while the SNR follows a similar trend to signal strength, the absolute levels of signal and noise can still vary independently in different scenarios.