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clear all; close all; clc;

directory = 'C:\Users\Joseph\OneDrive - University of the Philippines\Extra 1\EE
200\Methodology Flow\data\' ;
locations = 6;
days = 5;
channel_width = 6;
frequency_min = 470;
frequency_max = 698;
num_channels = ceil((frequency_max - frequency_min) / channel_width);

for loc = 1:locations
    locPaths = cell(days, 1);
    locAmplitudes = zeros(1024, days);

    for day = 1:days
        filePath = fullfile(directory, [num2str(loc), num2str(day), '.csv']);
        locPaths{day} = filePath;

        locData = readmatrix(filePath);
        locAmplitudes(:, day) = locData(:, 2);
    end

    % Plot each CSV file in subplots
    figure('Position', [100, 100, 900, 1300]); % Set figure size here
    sgtitle(['Location ', num2str(loc)]);
    for day = 1:days
        subplot(days, 1, day);
        locData = readmatrix(locPaths{day});
        plot(locData(:, 1), locData(:, 2));
        xlabel('Frequency (in MHz)');
        ylabel('Power Received (in dBm)');
        title(['Day ', num2str(day)]);
        xlim([frequency_min, frequency_max]);
    end

    locAverage = mean(locAmplitudes, 2);

    % Threshold Calculation
    locSorted = sort(locAverage);
    lower_amplitude_count = round(0.2 * numel(locSorted));
    lower_amplitudes = locSorted(1:lower_amplitude_count);
    locNoise = mean(lower_amplitudes);
    locThreshold = locNoise + 5;

    % Plot locfinalMatrix
    locFinalMatrix = [locData(:, 1), locAverage];
    figure();
    plot(locFinalMatrix(:, 1), locFinalMatrix(:, 2));
    xlabel('Frequency (in MHz)');

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ylabel('Average Power Received (in dBm)');
title(['Location ', num2str(loc), ' Average Power Received vs. Frequency']);
hold on;
threshold_line = refline([0 locThreshold]);
threshold_line.Color = 'r';
threshold_line.LineStyle = '--';
legend('Average Power Received', 'Threshold');
xlim([frequency_min, frequency_max]);

% FBO Calculation
num_occupied_frequencies = sum(locAverage > locThreshold);
fbo = (num_occupied_frequencies / size(locAmplitudes, 1)) * 100;

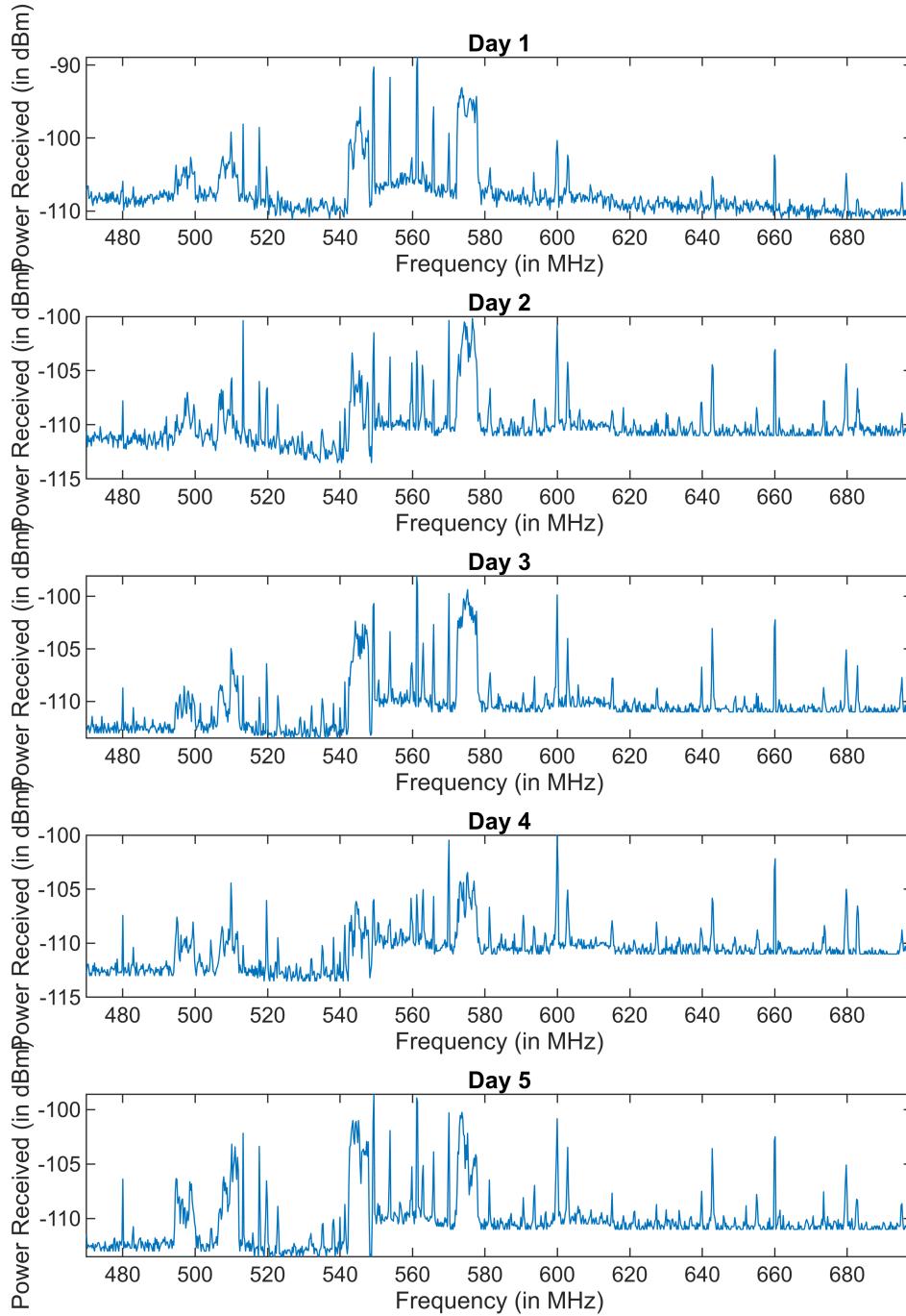
% SRO Calculation
occupied_channels = false(1, num_channels);
for i = 1:num_channels
    channelFreqRange = [frequency_min + (i-1)*channel_width, frequency_min + i*channel_width];
    indicesWithinChannel = locFinalMatrix(:, 1) >= channelFreqRange(1) &
locFinalMatrix(:, 1) <= channelFreqRange(2);
    amplitudesWithinChannel = locFinalMatrix(indicesWithinChannel, 2);
    if any(amplitudesWithinChannel > locThreshold)
        occupied_channels(i) = true;
    end
end
numOccupiedChannels = sum(occupied_channels);
sro = (numOccupiedChannels / num_channels) * 100;

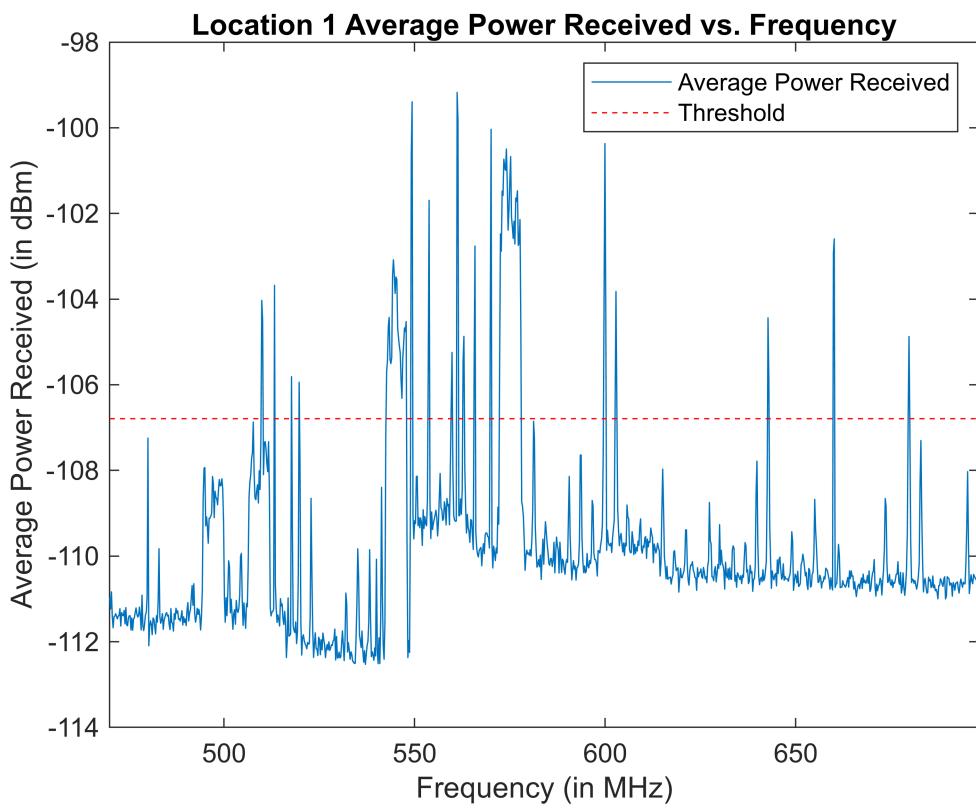
% Degree of Utilization Calculation
numHighlyUsedChannels = 0;
numUnderusedChannels = 0;
numVacantChannels = 0;
for i = 1:num_channels
    channelFreqRange = [frequency_min + (i-1)*channel_width, frequency_min + i*channel_width];
    indicesWithinChannel = locFinalMatrix(:, 1) >= channelFreqRange(1) &
locFinalMatrix(:, 1) <= channelFreqRange(2);
    numOccupiedBins = sum(locFinalMatrix(indicesWithinChannel, 2) >
locThreshold);
    occupancyRatio = numOccupiedBins / sum(indicesWithinChannel);
    if occupancyRatio >= 0.5
        numHighlyUsedChannels = numHighlyUsedChannels + 1;
    elseif occupancyRatio > 0 && occupancyRatio < 0.5
        numUnderusedChannels = numUnderusedChannels + 1;
    else
        numVacantChannels = numVacantChannels + 1;
    end
end

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% Display the results
disp(['Location ', num2str(loc)]);
disp(['Threshold: ', num2str(locThreshold), ' dB']);
disp(['Frequency Band Occupancy: ', num2str(fbo), '%']);
disp(['Spectrum Resource Occupancy: ', num2str(sro), '%']);
disp(['Number of Highly-Used Channels: ', num2str(numHighlyUsedChannels)]);
disp(['Number of Underused Channels: ', num2str(numUnderusedChannels)]);
disp(['Number of Vacant Channels: ', num2str(numVacantChannels)]);
end
```

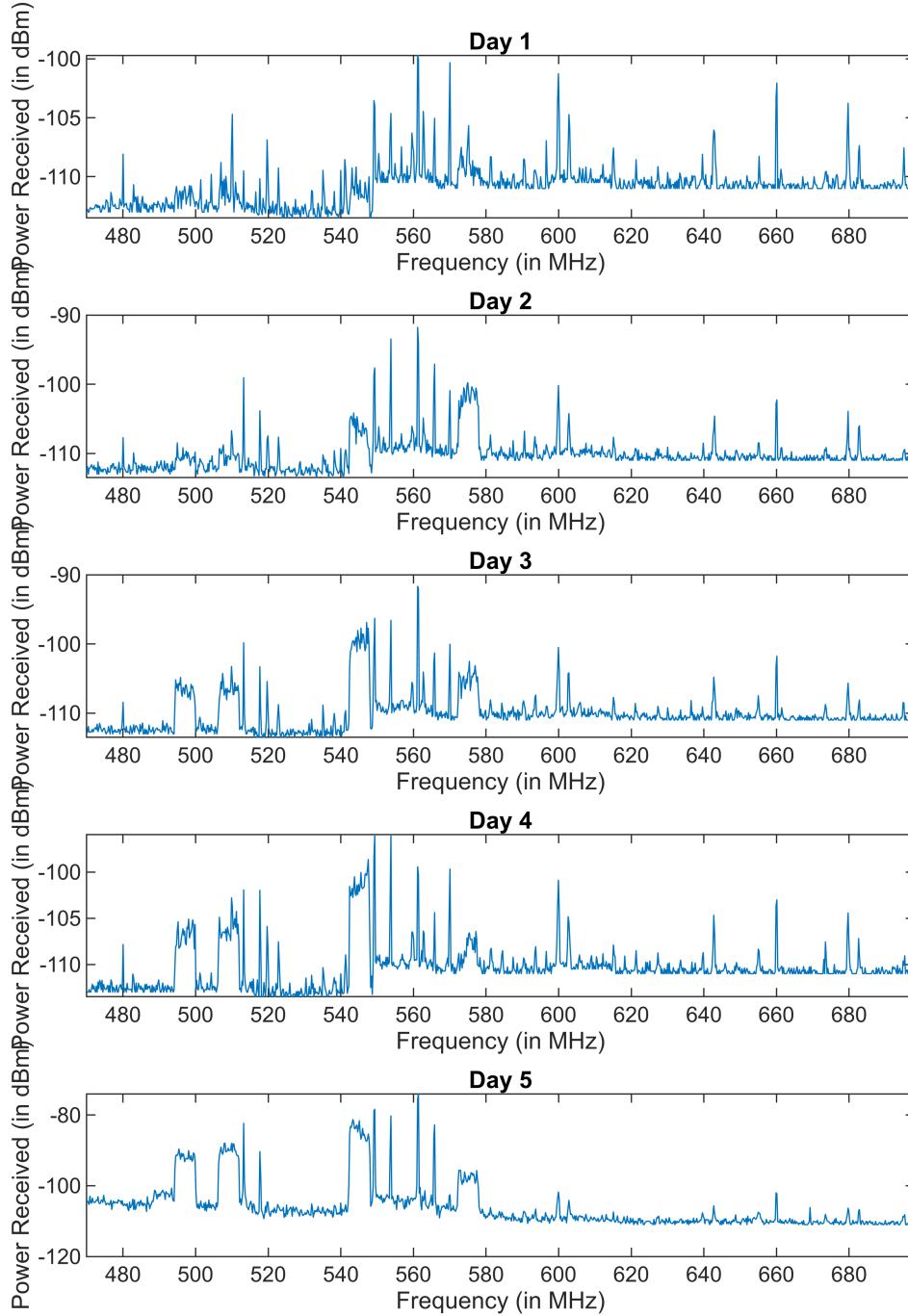
Location 1

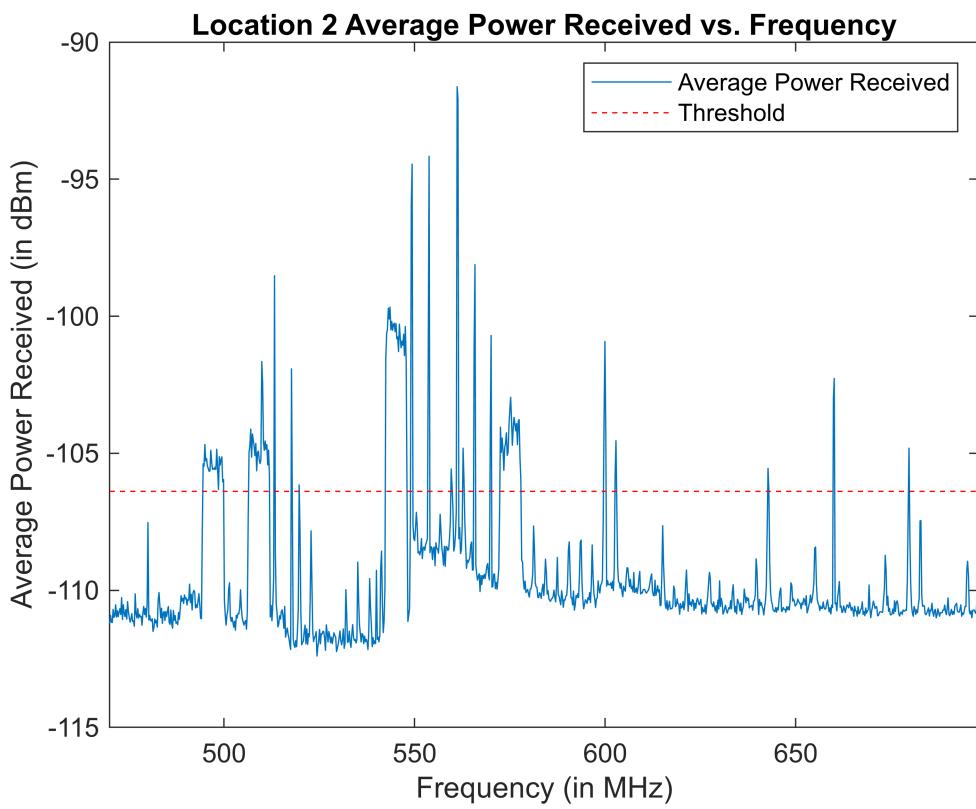




Location 1
Threshold: -106.792 dB
Frequency Band Occupancy: 7.9102%
Spectrum Resource Occupancy: 36.8421%
Number of Highly-Used Channels: 2
Number of Underused Channels: 12
Number of Vacant Channels: 24

Location 2





Location 2

Threshold: -106.3879 dB

Frequency Band Occupancy: 12.5%

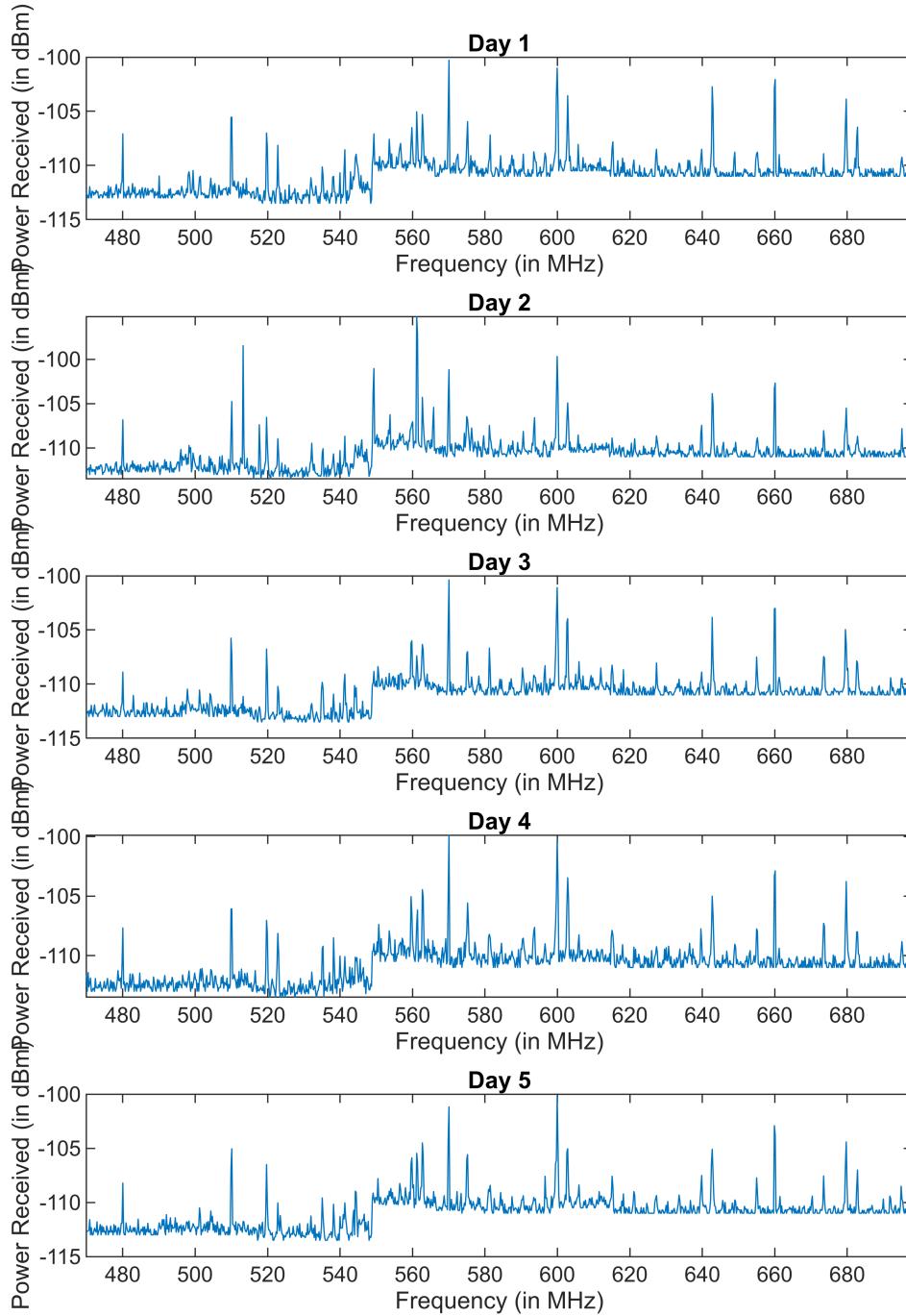
Spectrum Resource Occupancy: 39.4737%

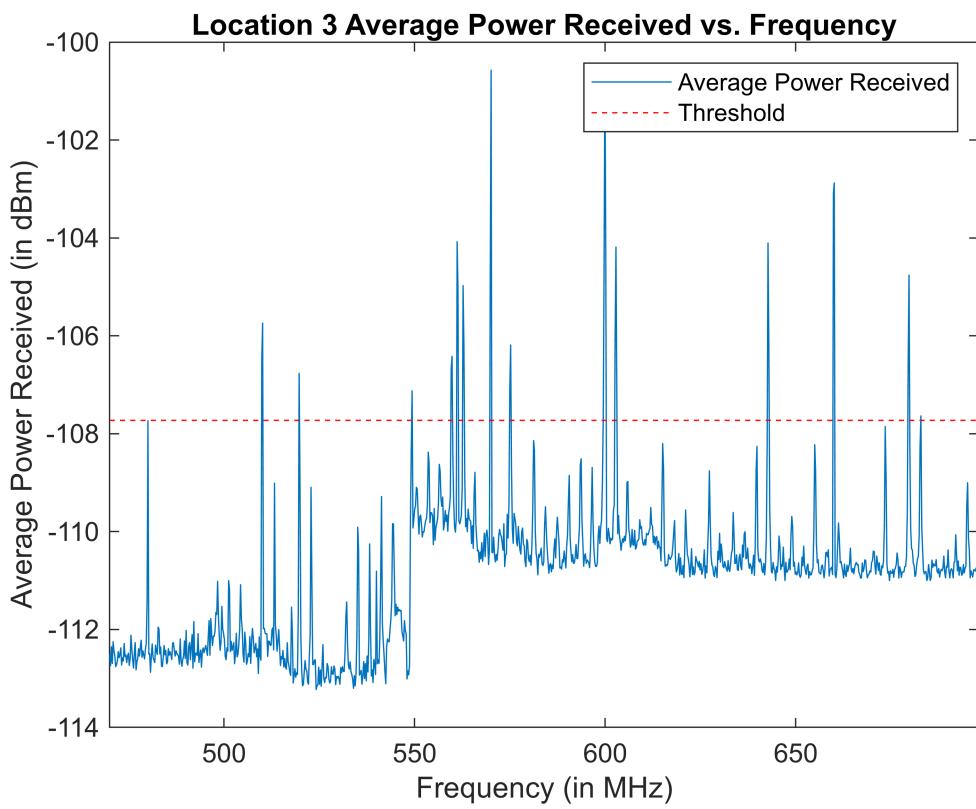
Number of Highly-Used Channels: 4

Number of Underused Channels: 11

Number of Vacant Channels: 23

Location 3





Location 3

Threshold: -107.7272 dB

Frequency Band Occupancy: 2.7344%

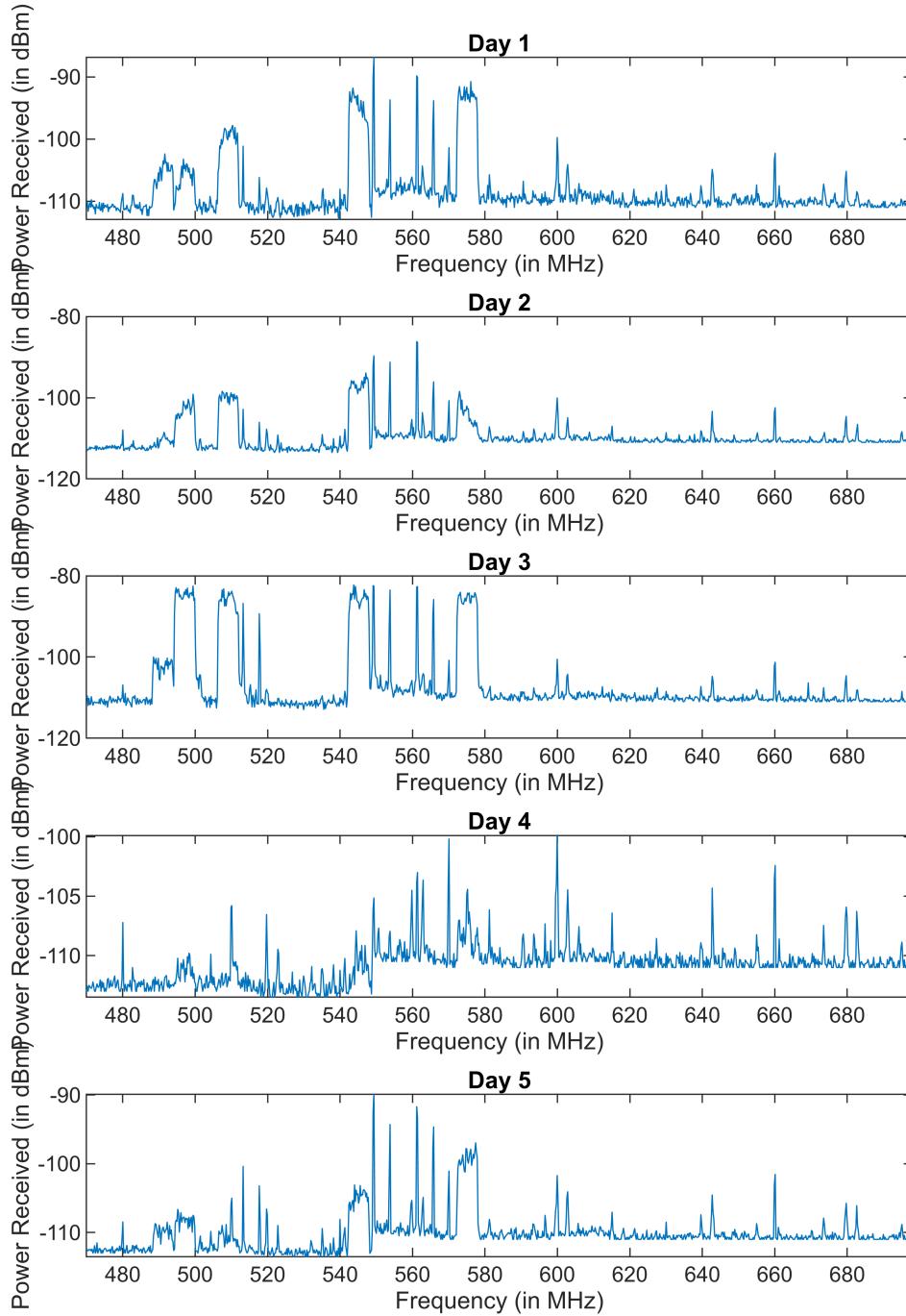
Spectrum Resource Occupancy: 34.2105%

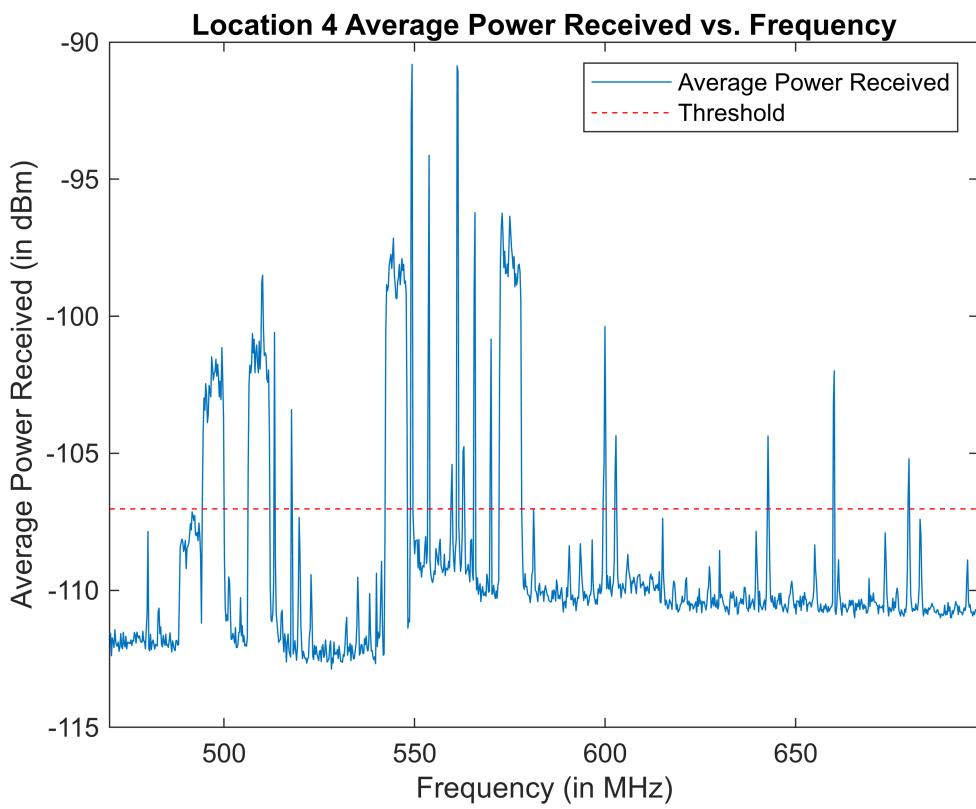
Number of Highly-Used Channels: 0

Number of Underused Channels: 13

Number of Vacant Channels: 25

Location 4





Location 4

Threshold: -107.0292 dB

Frequency Band Occupancy: 12.8906%

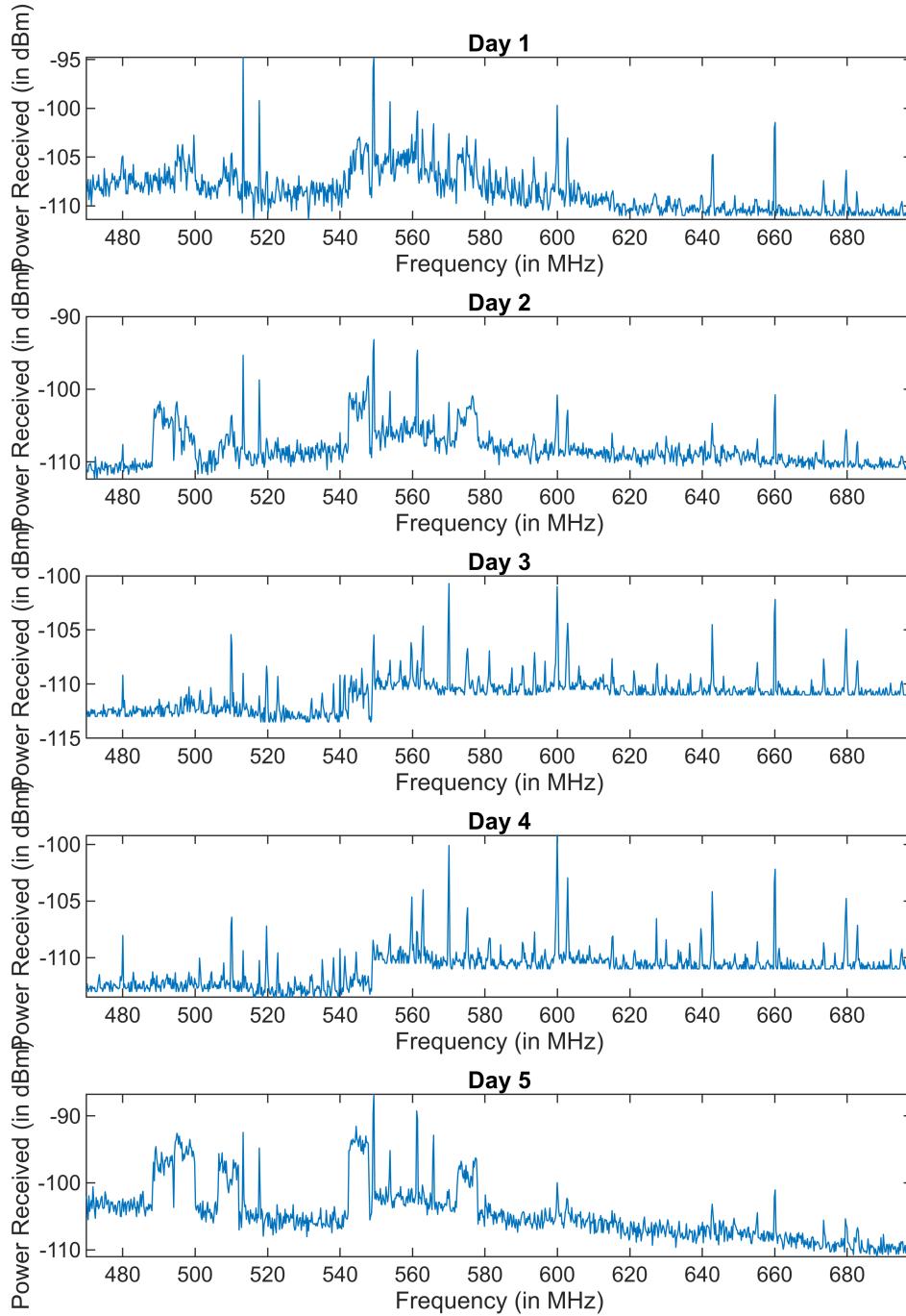
Spectrum Resource Occupancy: 36.8421%

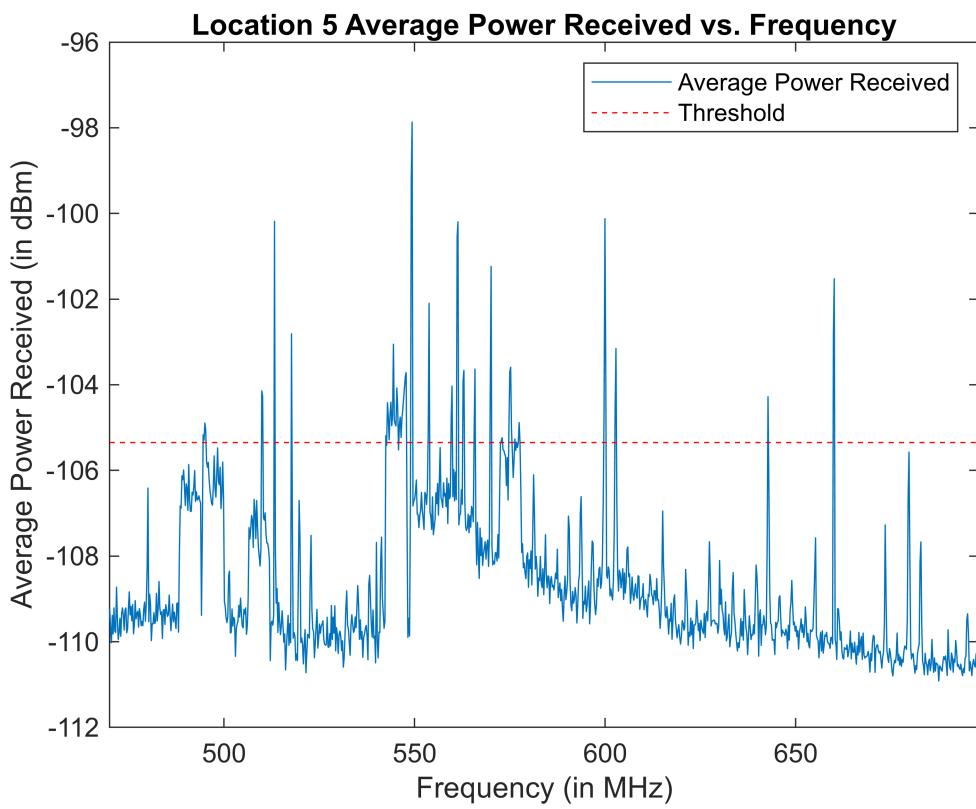
Number of Highly-Used Channels: 4

Number of Underused Channels: 10

Number of Vacant Channels: 24

Location 5





Location 5

Threshold: -105.3487 dB

Frequency Band Occupancy: 6.25%

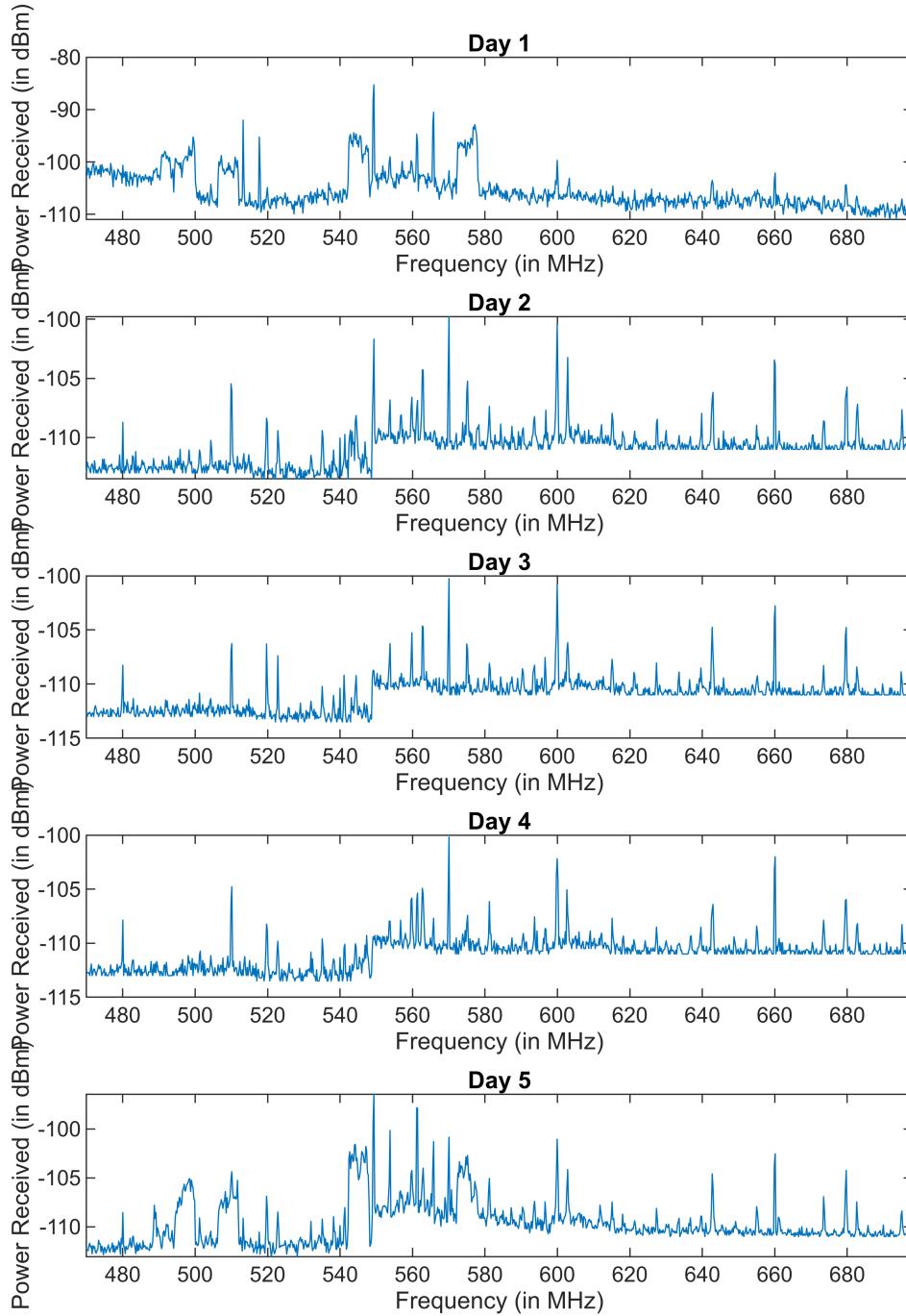
Spectrum Resource Occupancy: 34.2105%

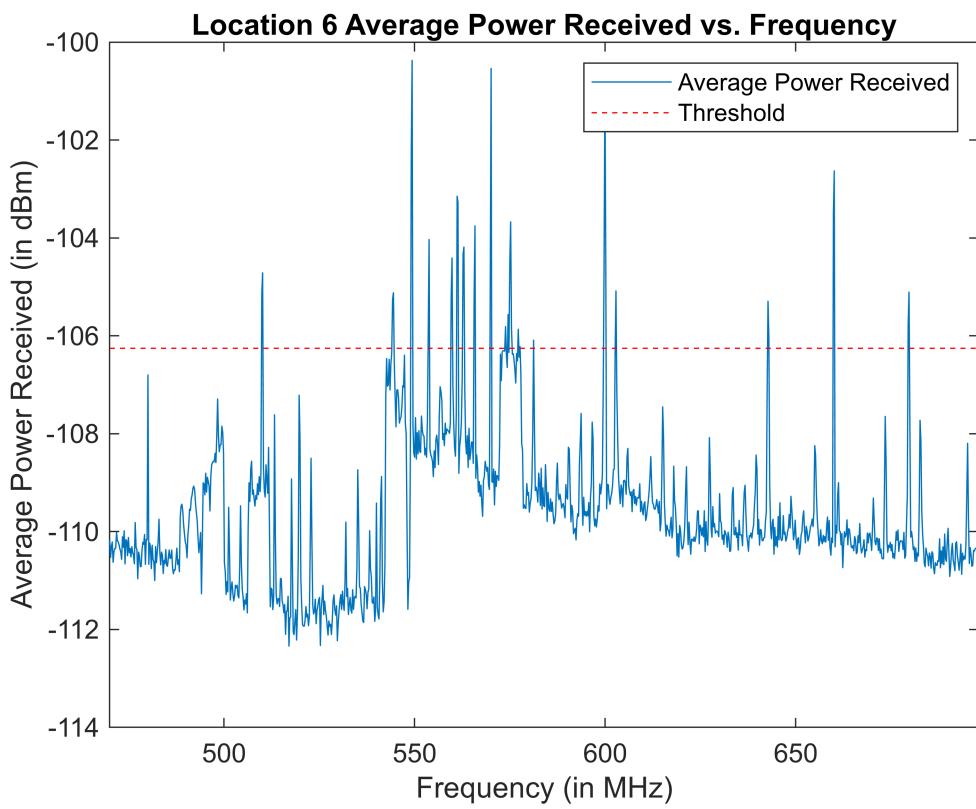
Number of Highly-Used Channels: 1

Number of Underused Channels: 12

Number of Vacant Channels: 25

Location 6





Location 6

Threshold: -106.255 dB

Frequency Band Occupancy: 3.5156%

Spectrum Resource Occupancy: 34.2105%

Number of Highly-Used Channels: 0

Number of Underused Channels: 13

Number of Vacant Channels: 25