The ability to accurately characterize the wireless communication channel is essential for testing and designing any wireless communication systems. It fulfills the demand for a better quality of communication service in terms of higher bits rate and the use of spread spectrum technology. One of the challenges for wireless channel characterization is the need to demonstrate an appropriate method to characterize the wireless channel hence, effective channel mitigation technique can be developed to minimize deleterious effect arise from the channel namely the short terms variations due to multipath fading. This propagation environment affects the transmitted signal in terms of scattering, diffraction and reflection as it traveled towards the receiver causing the signals to be received distorted or interfered. Therefore, the central issue in this thesis is to determine appropriate techniques to characterize such a channel. A statistical property was adopted to represent properties of the channel which was categorized under wide sense stationary uncorrelated scattering (WSSUS) conditions. In achieving research objectives, four methods are employed namely Cross Correlation Function (CCF), Cross Ambiguity Function (CAF), Cross Wigner Ville Distribution (CWVD) and Cross $S$ Transform (CST). The methods proposed in the time frequency domain were able to perform channel characterization under multipath condition regardless of the propagation media encountered and the number of paths existed in the channel.

Metals generally tend to move to its original state by corrosion process. Mild steel is an alloy form of iron, which undergoes corrosion easily in acidic medium. Palm cooking oil waste (PCOW) was introduced as a new organic corrosion inhibitor for mild steel in 1 M HCl solution. Corrosion inhibition could be explained by considering an interaction between metal surface and the inhibitor. Data obtained from EIS measurements, were analyzed to model the corrosion inhibition process through appropriate equivalent circuit model, a constant phase element (CPE) has been used. Surface morphology of the mild steel. SEM studies reveal the formation of film on the metal surface. X-ray photoelectron spectroscopy (XPS) analysis was carried out to study the inhibition mechanism of PCOWAI on corrosion of mild steel in 1 M HCl solution. The binding energy values revealed the presence of carboxyl and amide group enhance the adsorption process of PCOWAI molecules on mild steel surface.

The reaction between fatty acid in PCOW with NaOH was produced surfactants which solubilise oil in water and produce o/w emulsion. The fatty acids in PCOW were further reacted with diethylene triamine to increase the stability of the reaction and decrease the solubility of the product. PCOW was soluble and stable in water at pH 11, 50°C with ratio 75:25 oil to water respectively. The binding energy values revealed the presence of carboxyl and amide group enhance the adsorption process of PCOWAI molecules on mild steel surface. SEM studies reveal the formation of film on the metal surface. X-ray photoelectron spectroscopy (XPS) analysis was carried out to study the inhibition mechanism of PCOWAI on corrosion of mild steel in 1 M HCl solution. The binding energy values revealed the presence of carboxyl and amide group enhance the adsorption process of PCOWAI molecules on mild steel surface.