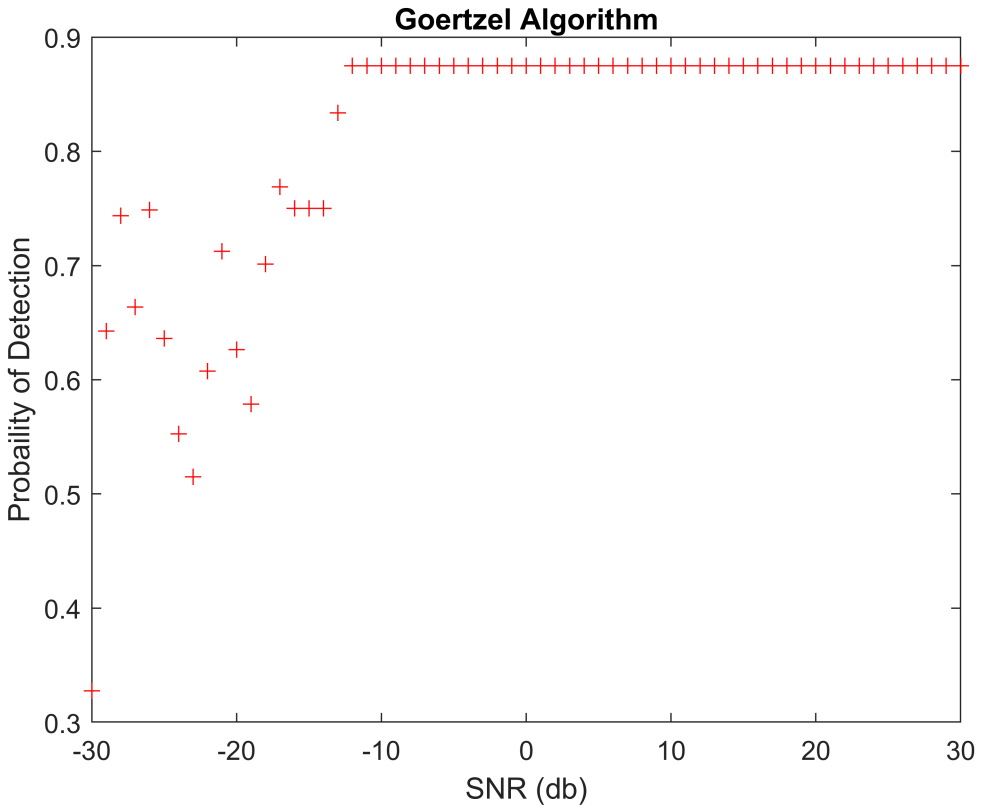
Goertzel Probabilty of Detection

```
clear                                   % Clear all data stored in variables
Am = 1;                                 % 1V Amplitude
SR = 48000;                             % 48 KHz Smapling Rate
f0 = 20e+3;                             % 20 KHz
duration = (127/SR);                    % ~ 2.6 ms
t = 0:1/SR:duration;                    % Time Vector
```

```
sinusPulse = Am*sin(2*pi*f0*t);  % Signal with multiple frequencies
```

```
mySNR = -30:30;
threshold = 300;
```

```
snrValues(sinusPulse,mySNR,threshold,f0,SR)
```




```
function snrValues(yourSignal,snr,threshold,f0,SR)
   for i = 1:length(snr)
       for j = 1:100
```

```
            Pd_buff(100) = 0;
            yourSignal = awgn(yourSignal,snr(i));
            N = length(yourSignal);
            Magnitude(N) = 0;
            k = round(0.5 + N*f0/SR);
            w = 2*pi*k/N;
            cosine = cos(w);
            coeff = 2*cosine;
            Q2 = 0;
            Q1 = 0;
            for k = 1:N
                Q0 = yourSignal(k) + coeff*Q1 - Q2;
                Q2 = Q1;
                Q1 = Q0;
                Magnitude(k) = sqrt(Q1*Q1 + Q2*Q2 - Q1*Q2*coeff);
            end
            Pd_buff(j) = sum(Magnitude > threshold)/N;
        end
        Pd = sum(Pd_buff)/100;
        plot(snr(i),Pd,'r+');
        hold on
        title('Goertzel Algorithm')
        xlabel('SNR (db)')
        ylabel('Probaility of Detection')
    end
    hold off
end
```