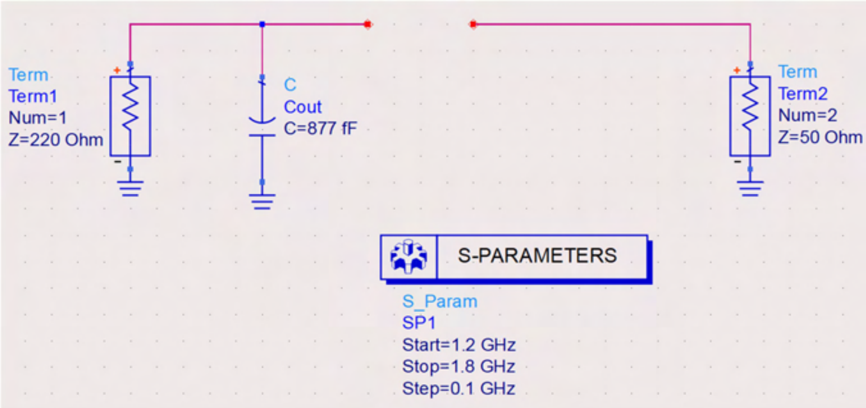
Design a matching circuit to match the impedance to 50 Ω, with center frequency of 1.5GHz. Attempt to get > 200MHz bandwidth with a maximum return loss i.e. |S11|, |S22| below -9dB




What is supposed to be output

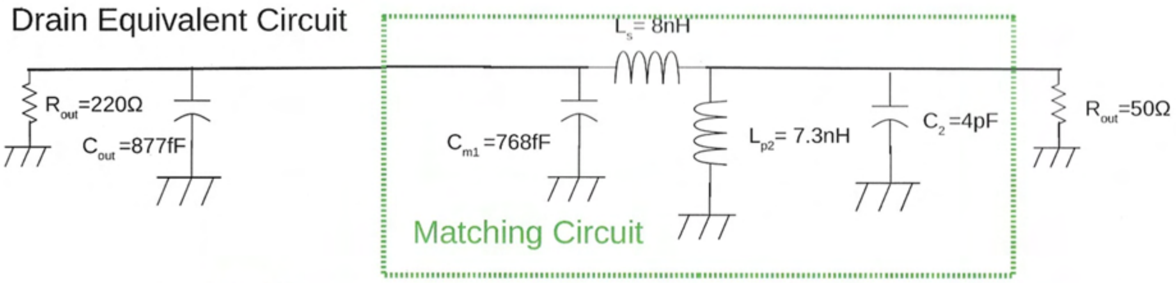



Fig 21

Simulating the drain matching circuit yields and initial output match that appears to provide a reasonably good match to the drain equivalent circuit near the design frequency of 1.5GHz.
This initial attempt at the output match appears to be centered at 1.6GHz and an improved initial design could be had by lowering the cutoff frequency of the lowpass Chebyshev prototype filter which would place the peak S21 at 1.5GHz.
However, at this point, it would be just easier to use the ADS optimizer to make the fine adjustments to the matching circuit element values.

Overall, this whole design process is iterative and in a real CNTFET, the gate and drain matching circuits interact and must be optimized together in the final design in any case.

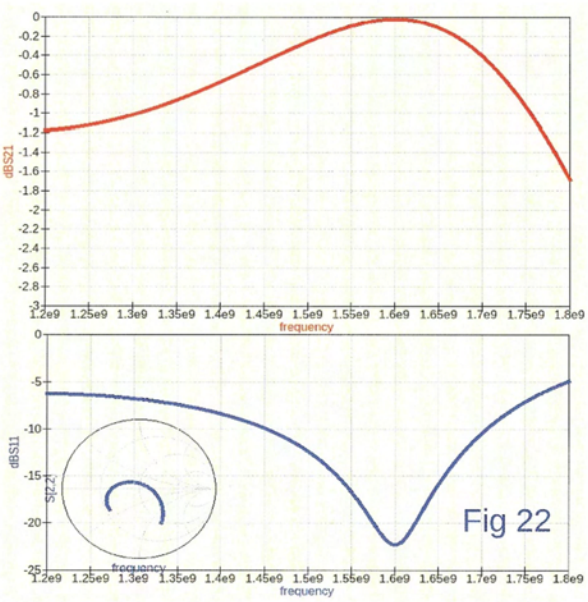
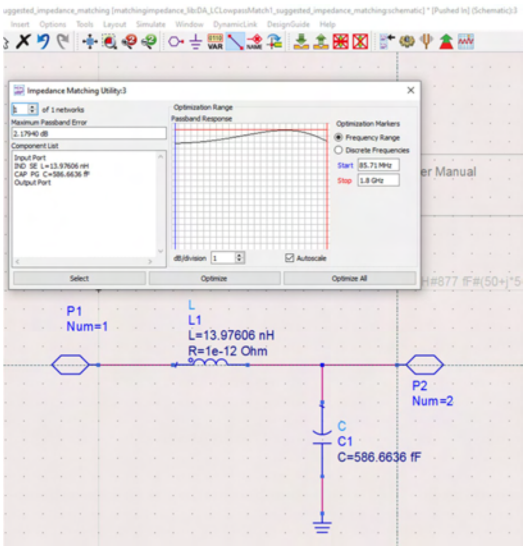


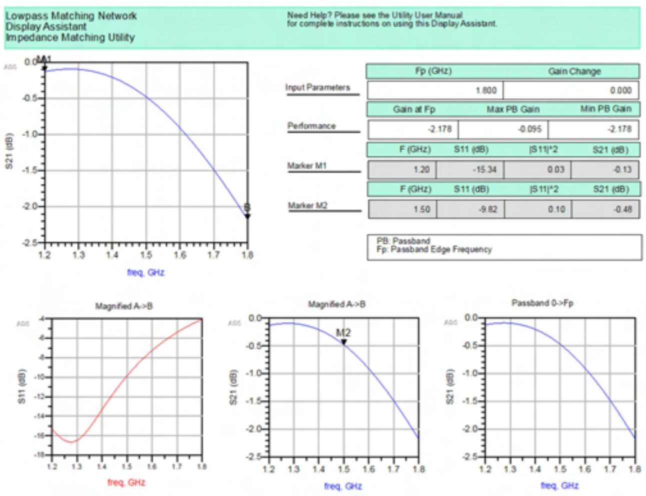

Fig 22

### I tried to use ADS matching with different network

Case#1: lowpass network matching 

In ADS help: A lowpass matching network provides a lowpass frequency response between the input (pin 1) and output (pin 2) ports. The source or load terminations can be specified using either a lumped component approximation, a frequency independent complex impedance, or a Touchstone format S-parameter file. Analytic and Real Frequency synthesis methods are both possible. The network order (N) is approximate due to potential component absorption.

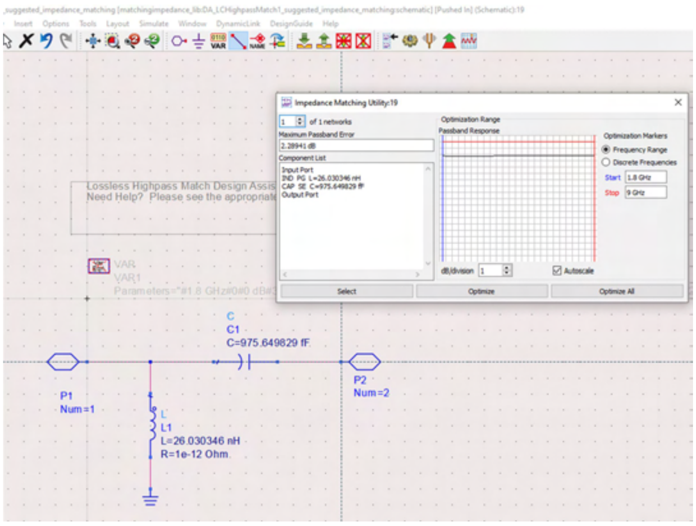


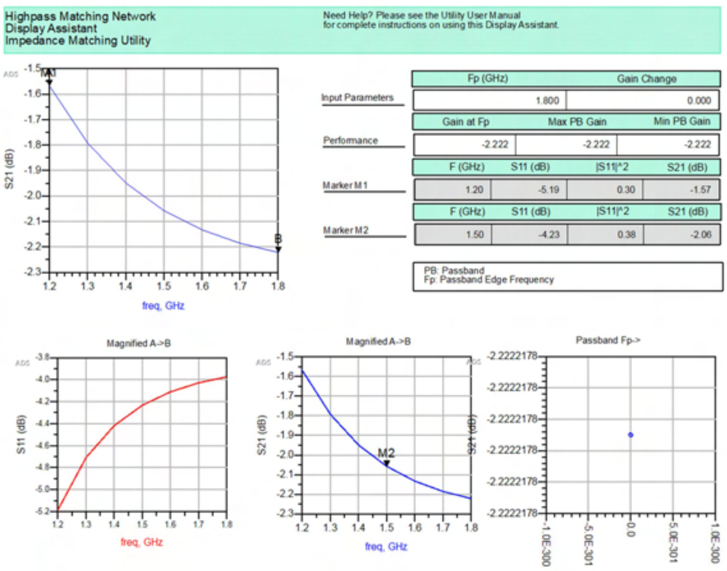
## Case#2: highpass network matching element 



In ADS help: A highpass matching network provides a highpass frequency response between the input (pin 1) and output (pin 2) ports. The source or load terminations can be specified using either a lumped component approximation, a frequency independent complex impedance, or a Touchstone format S-parameter file. Analytic and Real Frequency synthesis methods are both possible. The network order (N) is approximate due to potential component absorption.

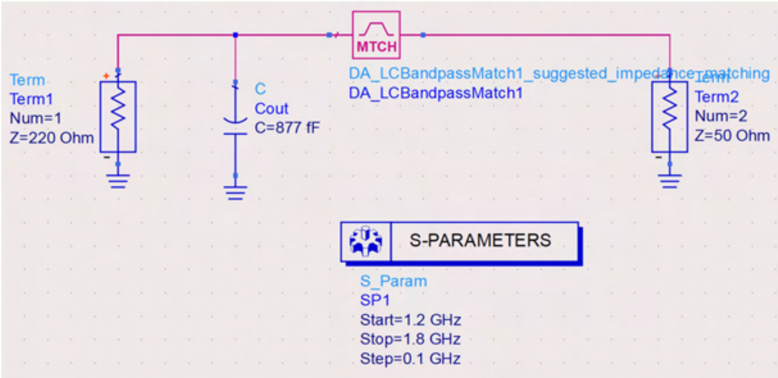


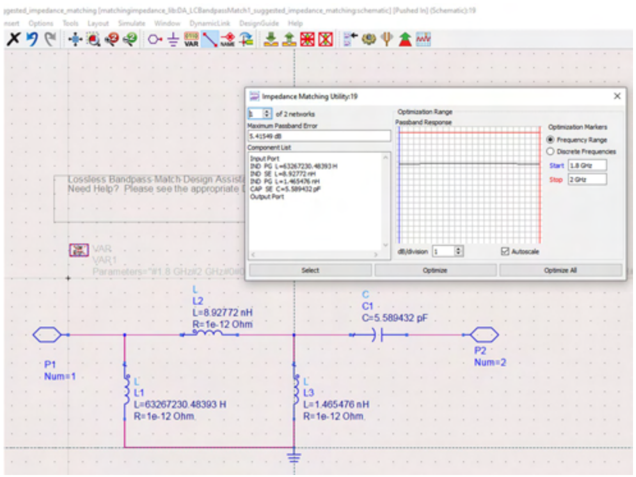


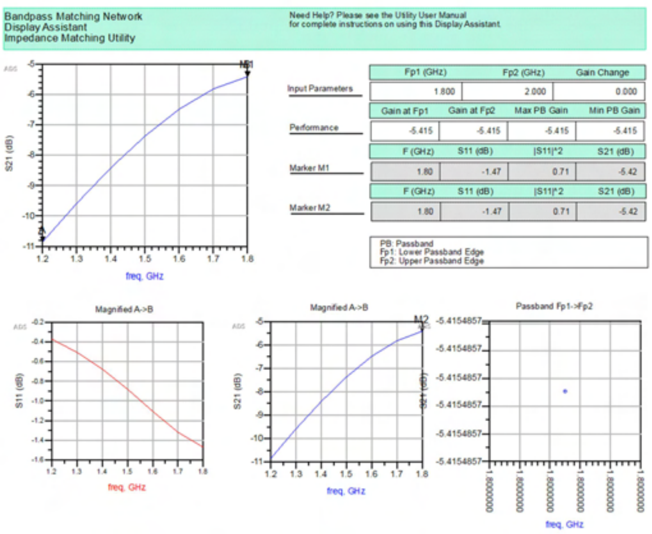


Case#3: bandpass network matching element 

In ADS help: A bandpass matching network provides a bandpass frequency response between the input (pin 1) and output (pin 2) ports. The source or load terminations can be specified using either a lumped component approximation, a frequency independent complex impedance, or a Touchstone format S-parameter file. Analytic and Real Frequency synthesis methods are both possible. The number of reactive components (N) is approximate due to potential component absorption.

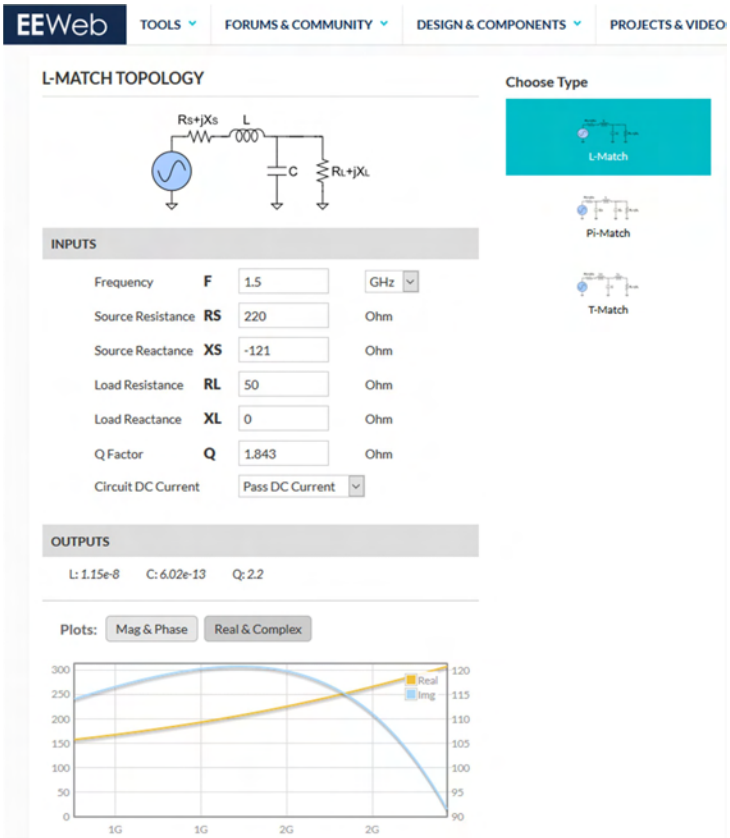


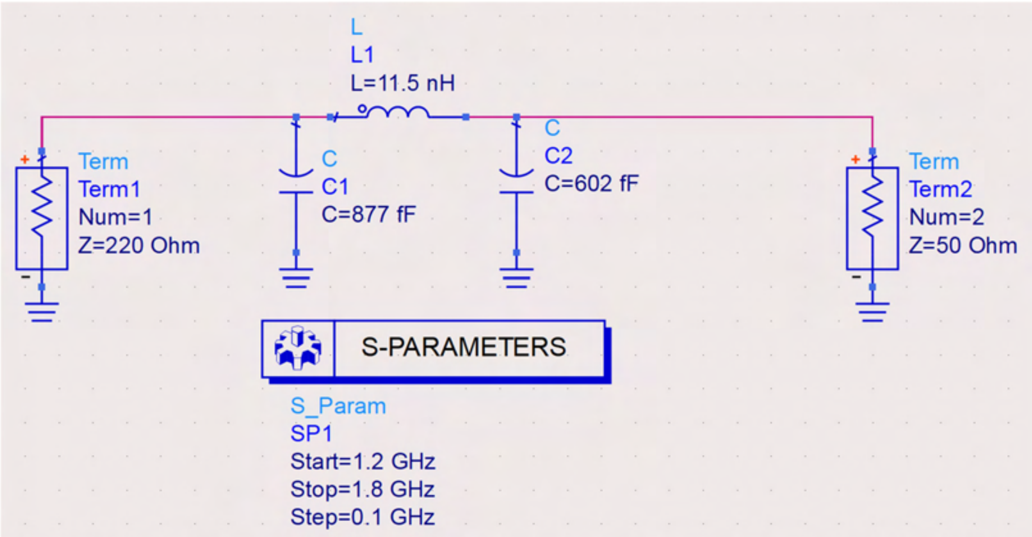



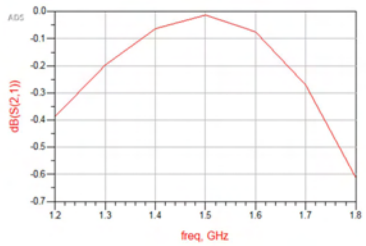



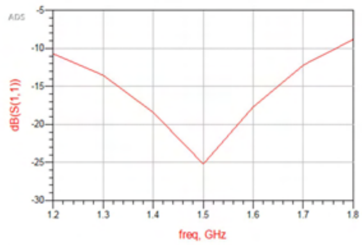
I tried then manual matching by L-Network, all example I saw was source pure resistive, so I tried EEweb to help me calculate the design parameter.

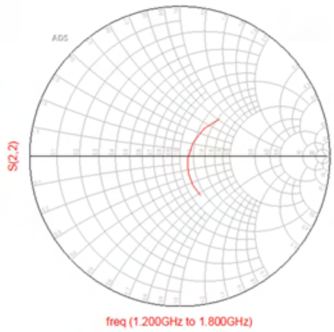
Operating frequency = 1.5 GHz, In L-Network $R_s$>$R_L$ so $Q = \sqrt{\frac{R_S}{R_L} - 1} = 1.843$ $\quad X_s = X_c = \frac{R_S}{Q} = 121\Omega$




L
L1
L=11.5 nH
Term
Term1
Num=1
Z=220 Ohm
C
C1
C=877 fF
C
C2
C=602 fF
Term
Term2
Num=2
Z=50 Ohm
S-PARAMETERS
S_Param
SP1
Start=1.2 GHz
Stop=1.8 GHz
Step=0.1 GHz


ADS
dB(S(2,1))
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
1.2
1.3
1.4
1.5
1.6
1.7
1.8
freq, GHz


ADS
dB(S(1,1))
-5
-10
-15
-20
-25
-30
1.2
1.3
1.4
1.5
1.6
1.7
1.8
freq, GHz


ADS
S(2,2)
freq (1.200GHz to 1.800GHz)

I tried to simulate the final equivalent circuit in page one, the result is close but I couldn't reach the requirements.