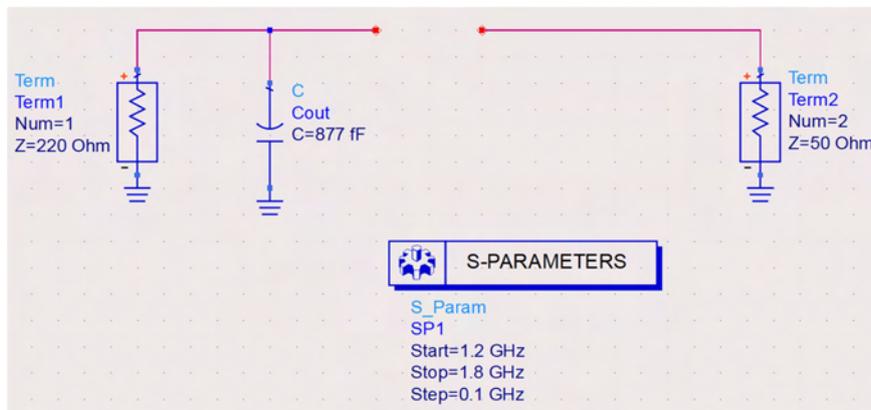


Design a matching circuit to match the impedance to 50 Ω, with center frequency of 1.5GHz. Attempt to get > 200MHz bandwidth with a maximum return loss i.e. |S11|, |S22| below -9dB



What is supposed to be output

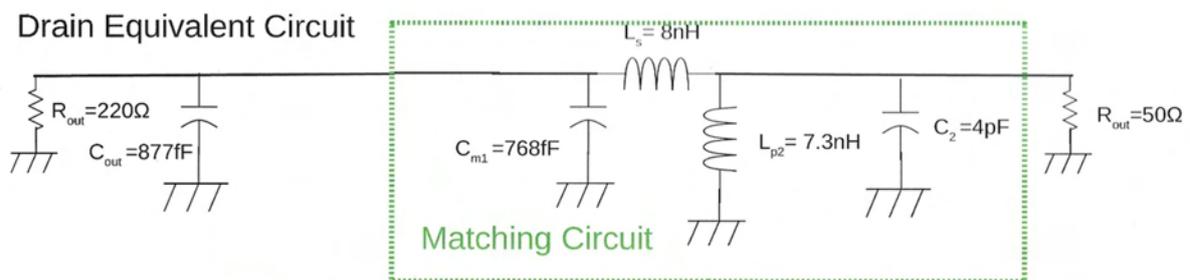


Fig 21

Simulating the drain matching circuit yields an 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.

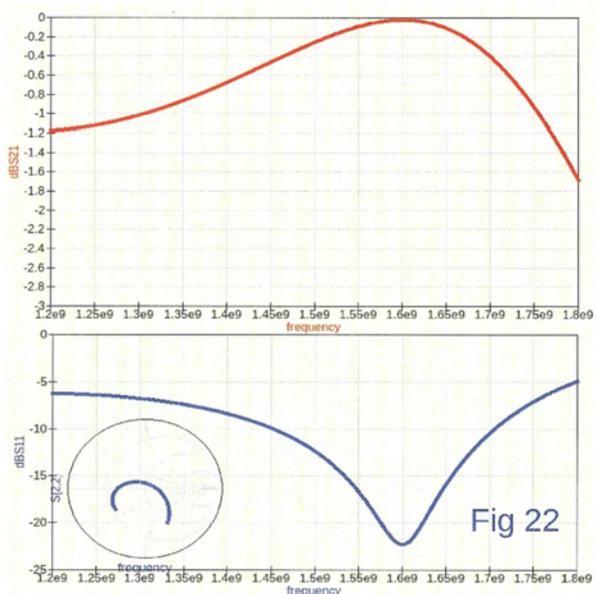


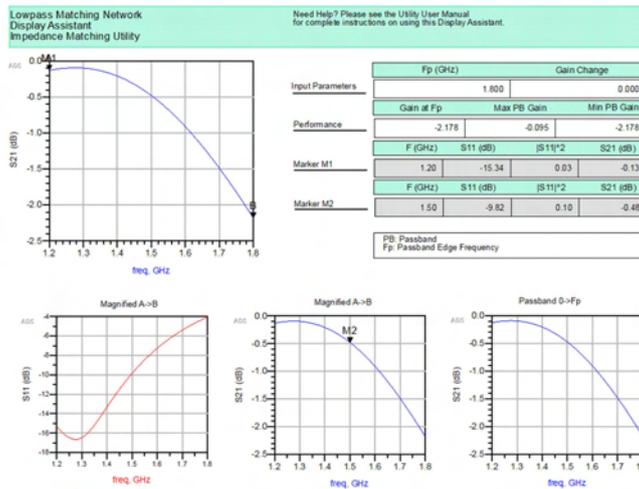
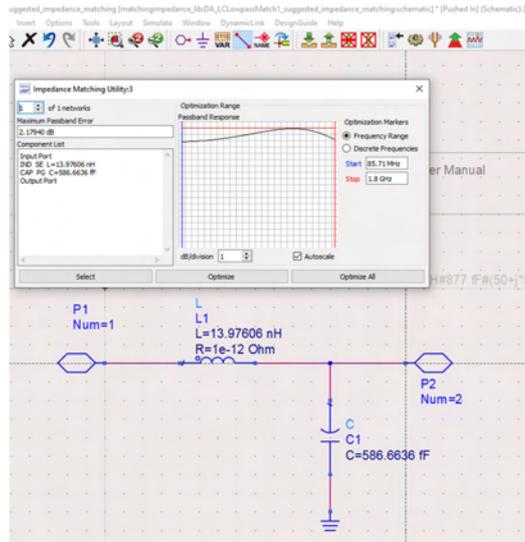
Fig 22

I tried to use ADS matching with different network

Case#1: lowpass network matching



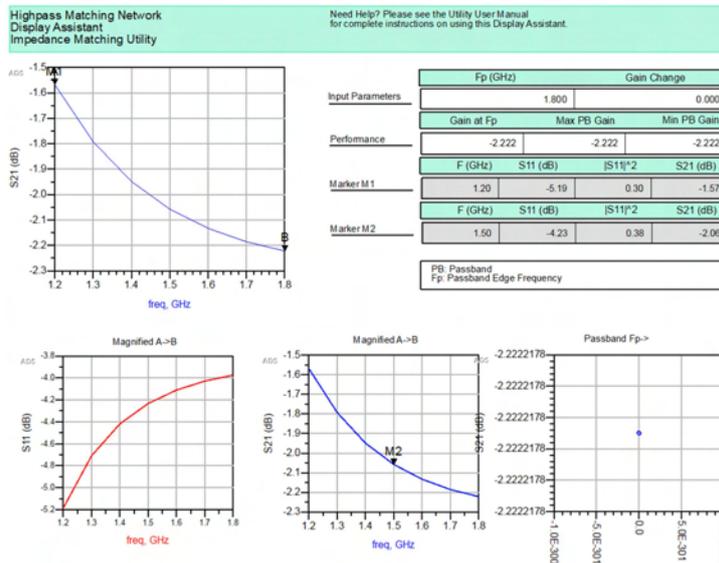
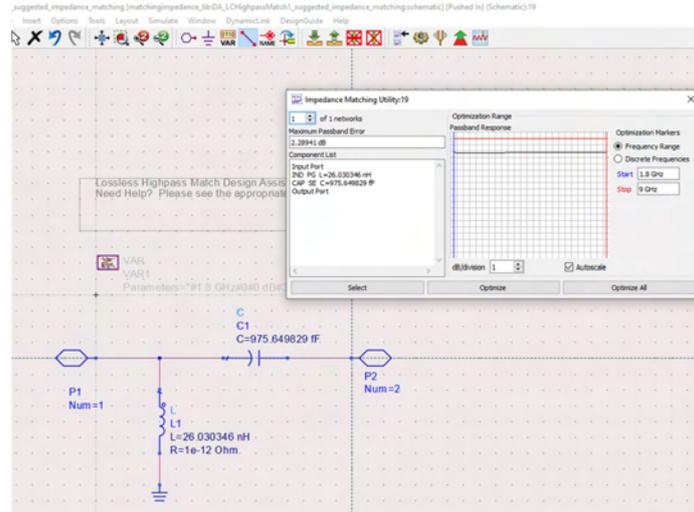
In ADS help: A lowpass matching network provides a lowpass frequency response between the input (pin 1) and output (pin 2) ports. The source or load terminations can be specified using either a lumped component approximation, a frequency independent complex impedance, or a Touchstone format S-parameter 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



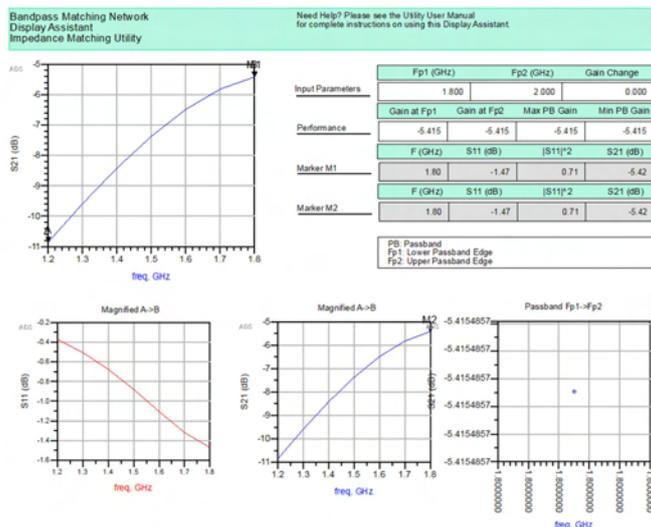
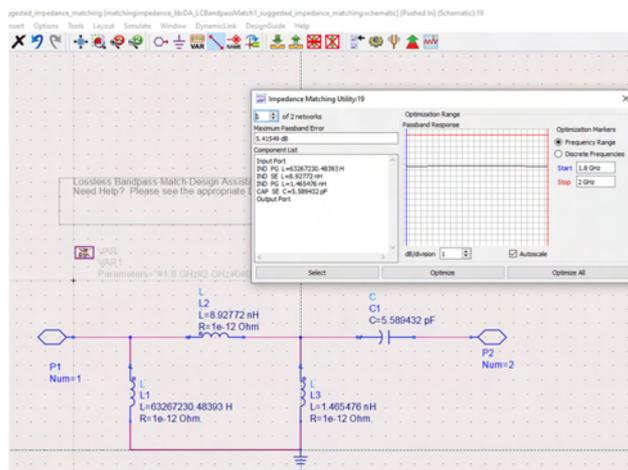
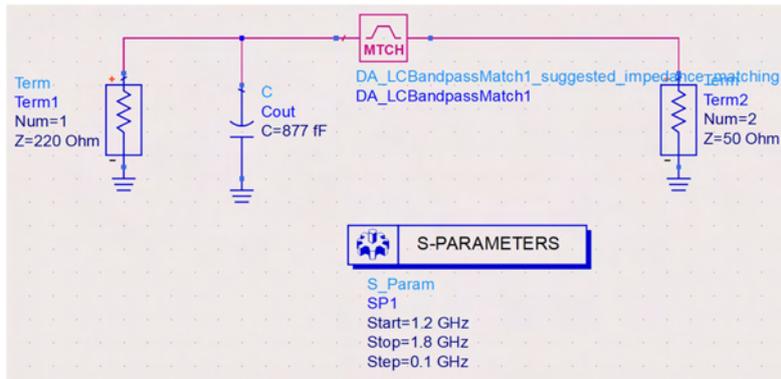
In ADS help: A highpass matching network provides a highpass frequency response between the input (pin 1) and output (pin 2) ports. The source or load terminations can be specified using either a lumped component approximation, a frequency independent complex impedance, or a Touchstone format S-parameter 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.

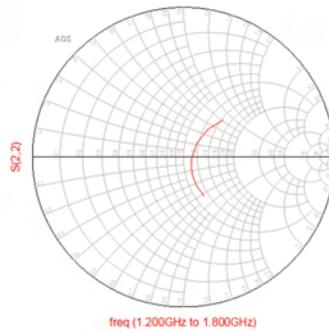
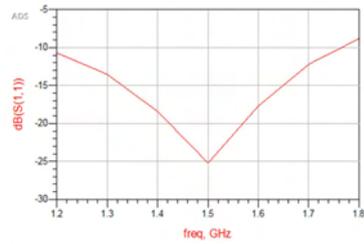
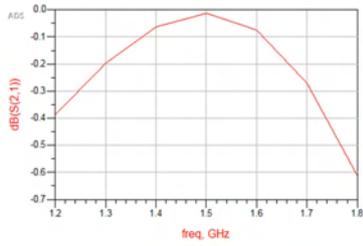
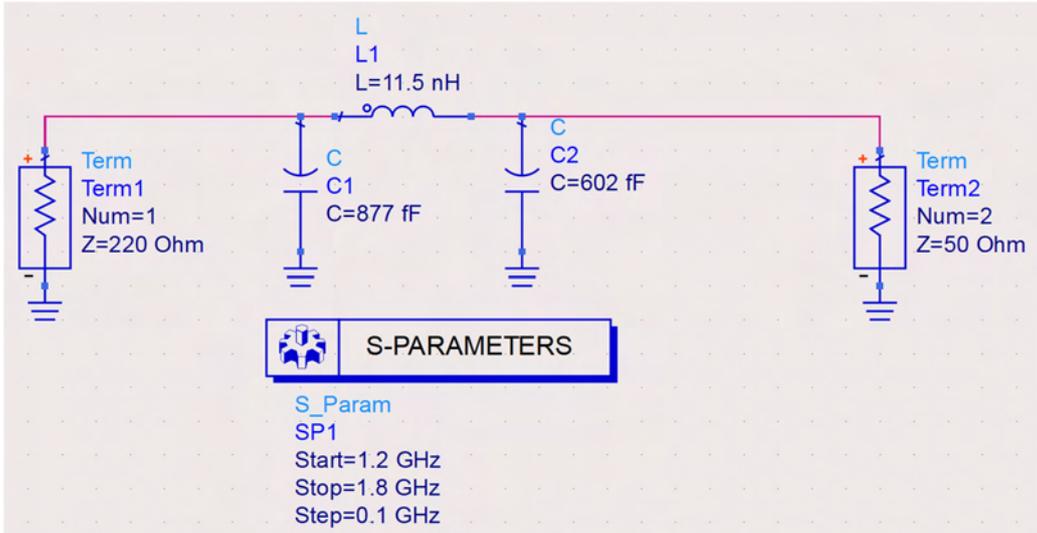


I tried then manual matching by L-Network, all example I saw was source pure resistive, so I tried EEweb to help me calculate the design parameter.

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

The screenshot shows the EEWeb L-Match Topology calculator. The interface is divided into several sections:

- Header:** EEWeb logo and navigation tabs: TOOLS, FORUMS & COMMUNITY, DESIGN & COMPONENTS, PROJECTS & VIDEO.
- L-MATCH TOPOLOGY:** A circuit diagram showing a source with resistance $R_S + jX_S$ connected to an L-match network consisting of a series inductor L and a shunt capacitor C , which is then connected to a load with resistance $R_L + jX_L$.
- Choose Type:** Three options are shown: L-Match (selected), Pi-Match, and T-Match.
- INPUTS:**
 - Frequency **F**: 1.5 GHz
 - Source Resistance **RS**: 220 Ohm
 - Source Reactance **XS**: -121 Ohm
 - Load Resistance **RL**: 50 Ohm
 - Load Reactance **XL**: 0 Ohm
 - Q Factor **Q**: 1.843 Ohm
 - Circuit DC Current: Pass DC Current
- OUTPUTS:**
 - L: 1.15e-8
 - C: 6.02e-13
 - Q: 2.2
- Plots:** Two tabs are available: Mag & Phase and Real & Complex. The Real & Complex plot shows the Real (yellow line) and Imag (blue line) components of the impedance versus frequency. The Real component increases from approximately 150 Ohms at 1 GHz to 300 Ohms at 2 GHz. The Imag component starts at approximately 250 Ohms at 1 GHz, peaks at 300 Ohms around 1.5 GHz, and then decreases to 0 Ohms at 2 GHz.



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

