1. **Design Project** (based on our Class 22 matching network discussion)

   **OBJECTIVE:**
   BUILD AN OUTPUT MATCHING NETWORK FOR A NE661M04 DEVICE AT 3GHz BY REPLACING THE ATF551M4 DEVICE. RETAIN THE TL AND STUB CONFIGURATION.

   FOR THE OUTPUT MATCHING NETWORK YOU NEED TO DETERMINE:
   TRACE WIDTH, L2, S2, AND THE LAMBDA/4 LENGTH.

   Note: Please detail all computational steps, and substantiate the design by verifying your results in the Smith Chart. Also, make reasonable, engineering approximations in your design approach.

---

**GIVEN:**

A) An active device involves an RF npn BJT device by NEC (NE661M04) with a transition frequency $f_T$ of 25GHz and a power gain rating that is listed at 3GHz as $G_0=6.8\text{dB}$ at a collect emitter voltage $V_{CE}=2\text{V}$, collector current $I_C=5\text{mA}$. The goal of this design is to develop matching networks such that maximum gain can be achieved while maintaining stability. The data sheet for the packaged device (SOT-343) provides for the above $V_{CE}$, $I_c$, and $f$ the following S-parameters:

   - $S_{11}=0.345\exp(-j124.2^0)$,
   - $S_{12}=0.050\exp(j34.7^0)$,
   - $S_{21}=4.809\exp(j67.8^0)$,
   - $S_{22}=0.649\exp(-j68^0)$

B) The board material is FR4 with 30mil (0.762mm) thickness and relative dielectric constant of $\varepsilon_r=4.4$. 


2. Page 553, Problem 9.3.
