Double-Stub Matching

Content not in textbook. Part of Lab. Report to explain how this method works in your own words.

We quickly went through this slide set on Tue 9/28/2021. Please review offline.

The positions of the two stubs, $d_1$ and $d_2$, are fixed.

We adjust the two stub lengths, $l_1$ and $l_2$, to achieve matching.

**General strategy:**
First, adjust $l_1$ to get $y(d_2) = 1 + jb_2$.

And then?

The 2\textsuperscript{nd} step is trivial; we focus on the 1\textsuperscript{st} step.
We use the “y-chart.”

\[ g = 1 \text{ circle of the y-chart} \]

\[ g = 1 \text{ circle of the z-chart} \]

Locate \( z_L \) and then find \( y_L \).
\( y_1 \text{ is fixed.} \)

\[
y_{\text{total}}(d_1) = y(d_1) + y_{\text{stub1}} \\
= g(d_1) + jb(d_1) + jb_{\text{stub1}}
\]

Stub purely reactive.
$d_1$ is fixed.

$$y_{total}(d_1) = y(d_1) + y_{stub1} = g(d_1) + jb(d_1) + jb_{stub1}$$

Stub purely reactive. Therefore trajectory of $y_{total}(d_1)$ is the $g = g(d_1)$ circle when $l_1$ is adjusted.
\[ y_{\text{total}}(d_1) = y(d_1) + y_{\text{stub1}} = g(d_1) + jb(d_1) + jb_{\text{stub1}} \]

Mark these points: \( y_L \) and \( z_L \).
$y_{total}(d_1) = y(d_1) + y_{stub1}$
$= g(d_1) + jb(d_1) + jb_{stub1}$

Mark these points: ○

Moving from $d_1$ to $d_2$ is rotating the $g = g(d_1)$ circle into the violet circle (locus of $y(d_2)$ for all possible $l_1$). (Follow the marked points.)
\[ y_{\text{total}}(d_1) = y(d_1) + y_{\text{stub1}} = g(d_1) + jb(d_1) + jb_{\text{stub1}} \]

The **violet circle** intersects the \( g = 1 \) circle of the \( y \)-chart. The intersection is the desired \( y(d_2) \).

When stub\(_1\) is done, \( z(d_2) \) falls on the **green circle**.

In the lab, the network analyzer displays a \( z \)-chart. The TAs put this circle on the screen to help you.
\[ y_{total}(d_1) = y(d_1) + y_{stub1} = g(d_1) + jb(d_1) + jb_{stub1} \]

The violet circle intersects the \( g = 1 \) circle of the \( y \)-chart. The intersection is the desired \( y(d_2) \).

As in single-stub matching, there are two solutions. Can you spot the other solution?
\[ y_{\text{total}}(d_1) = y(d_1) + y_{\text{stub1}} = g(d_1) + jb(d_1) + jb_{\text{stub1}} \]

The **violet circle** intersects the \( g = 1 \) circle of the \( y \)-chart.
The intersection is the desired \( y(d_2) \).

As in single-stub matching, there are two solutions. Can you spot the other solution?