Double-Stub Matching

Content not in textbook.  Part of Lab (optional this semester).  Incentive: 10 points added to Final based on report explaining how this method works in your own words.

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.”

\( g = 1 \) circle of the y-chart

\( g = 1 \) circle of the z-chart

Locate \( z_L \) and then find \( y_L \).
$d_1$ 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.

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

Stub purely reactive. Therefore trajectory of $y_{\text{total}}(d_1)$ 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:  

\( g = 1 \) circle of the y-chart
\( g = 1 \) circle of the z-chart
\[ y_{total}(d_1) = y(d_1) + y_{stub1} = g(d_1) + jb(d_1) + jb_{stub1} \]

Mark these points: \( \bigcirc \)

Moving from \( d_1 \) to \( d_2 \) is rotating the \( g = g(d_1) \) circle into the violet circle. (Follow the marked points.)
\[ y_{total}(d_1) = y(d_1) + y_{stub1} = g(d_1) + jb(d_1) + jb_{stub1} \]

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

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

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

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?
Test 1

- Thu 3/18/2021, in-class. Will give extra time. When will be your next commitment?
- Covers contents up to Thu 3/11 lecture
- Concerns and suggestions?

75 min (11:30 am – 12:45 pm class)
15 min (extra time always given in past semesters)
10 min (for scanning, photo taking, submission)
100

11:15 am – 12:55 pm