LC Matching Network

$$Z_c = 50;\ Z_1 = 100;\ \alpha = \frac{Z_1}{Z_c};\ Y_1 = \frac{1}{Z_1};\ Y_c = \frac{1}{Z_c};$$

(*x will represent βl_1 and y will represent βl_s*)

$$X_b = \text{Sqrt}\left[\frac{\alpha^2 Z_c^2}{\alpha - 1}\right]$$

```
100
```

$$X_a = -Z_c\ \text{Sqrt}[\alpha - 1]$$

```
-50
```

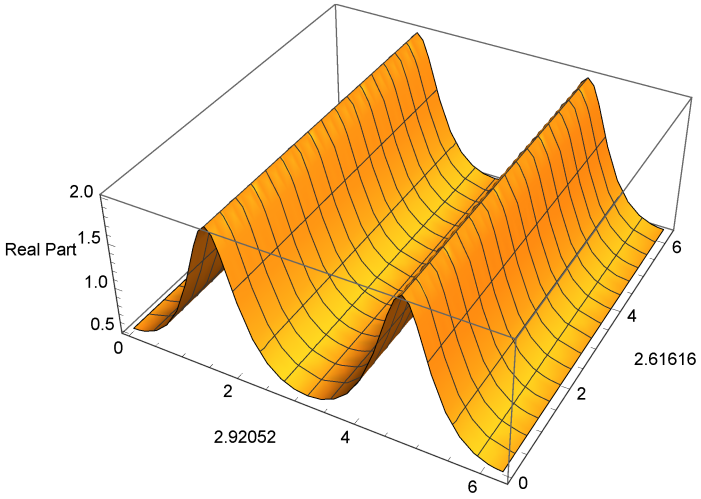
Single Open Stub

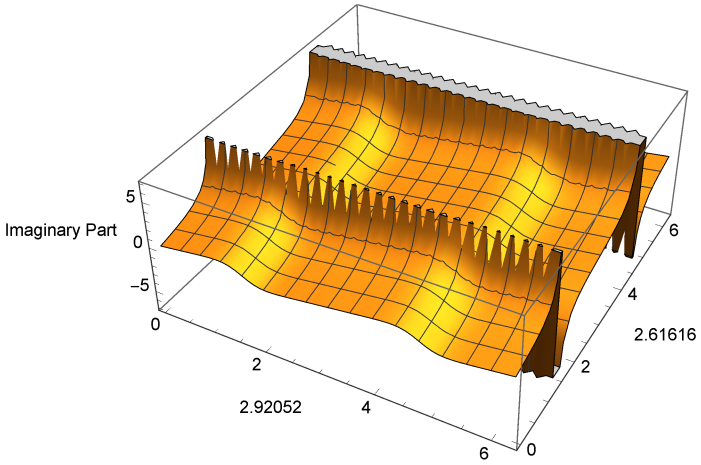
$$\text{RealEq}[x\_, y\_] := \text{Re}\left[\frac{(Y_1 + I\ Y_c\ \text{Tan}[x])}{Y_c + I\ Y_1\ \text{Tan}[x]} + I\ \text{Tan}[y]\right]$$

$$\text{ImagEq}[x\_, y\_] := \text{Im}\left[\frac{(Y_1 + I\ Y_c\ \text{Tan}[x])}{Y_c + I\ Y_1\ \text{Tan}[x]} + I\ \text{Tan}[y]\right]$$

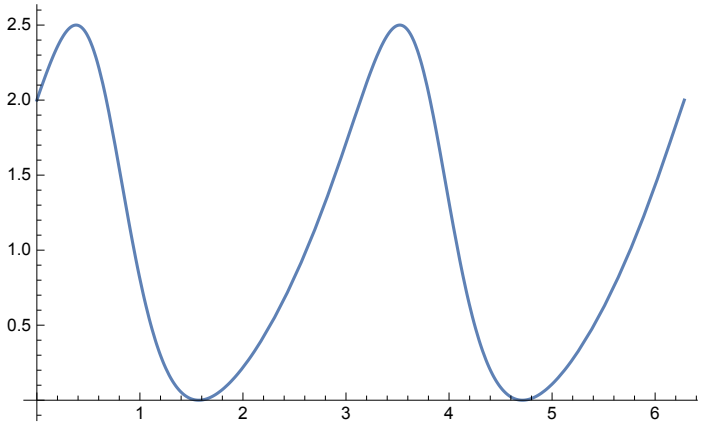
```
FindRoot[{RealEq[x, y] == 1, ImagEq[x, y] == 0}, {x, 1}, {y, 2.5}]
Plot3D[RealEq[x, y], {x, 0, 2 π}, {y, 0, 2 π}, AxesLabel → {β1ₗ, β1ₛ, "Real Part"}]
Plot3D[ImagEq[x, y], {x, 0, 2 π}, {y, 0, 2 π}, AxesLabel → {β1ₗ, β1ₛ, "Imaginary Part"}]
```

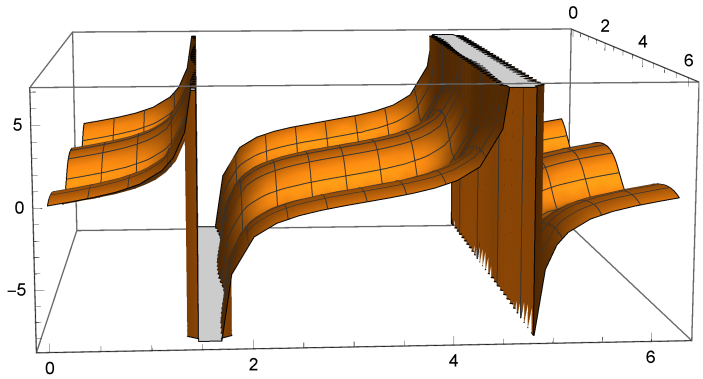
```
{x → 0.955317, y → 2.52611}
```






```
d = Pi / 4;
StubAdmittance[l_] := I Yc Tan[l];
LoadAdmittance[length_] := Yc (Y1 + I Yc Tan[length]) / (Yc + I Y1 Tan[length]);
Y1[t_, l_] := StubAdmittance[t] + LoadAdmittance[l];
Y2[t_, l_] := Yc (Y1[t, l] + I Yc Tan[l]) / (Yc + I Y1 [t, l] Tan[l]);
Plot[Re[Y2[x, d] / Yc], {x, 0, 2 Pi}]
Plot3D[Zc (Im[Y2[x, d]] + Im[StubAdmittance[y]]), {x, 0, 2 Pi}, {y, 0, 2 Pi}]
{β1ₛ, β1ₗ} = {x, y} /. FindRoot[
    {Re[Y2[x, d]] == Yc, Im[Y2[x, d]] == -Im[StubAdmittance[y]]}, {x, .5}, {y, .1}]
```






```
{0.943655, 1.14837}
```

```
{β1s, β1l} * 180 / Pi
```

```
{54.0675, 65.7966}
```