

TRW_Star_Mixer

Where To Find This Example

Select **Help > Open Examples...** from the menus and type either the example name listed above or one of the keywords below.

Or in Version 13 or higher you can open the project directly from this page using this button. Make sure to select the **Enable Guided Help** before clicking this button.

Open Install Example

Design Notes

TRW Star Mixer Example

This is a design for a diode star mixer using two baluns to drive the diodes. The baluns and center cross-over have been simulated using Axiem.

Overview

The harmonic balance simulation for the conversion loss is defined as follows:

Tone 1 is on **PORT 1** and defines the LO frequency and power.

This frequency is set to 20 to 40 GHz by right clicking on the "Star Mixer" schematic and choosing **Options** and then the **Frequencies** tab. The power for this port is set by the variable "**Plo**", which has a default value of "**11 dBm**", and a sweep range of "**-5 to 15 dBm**".

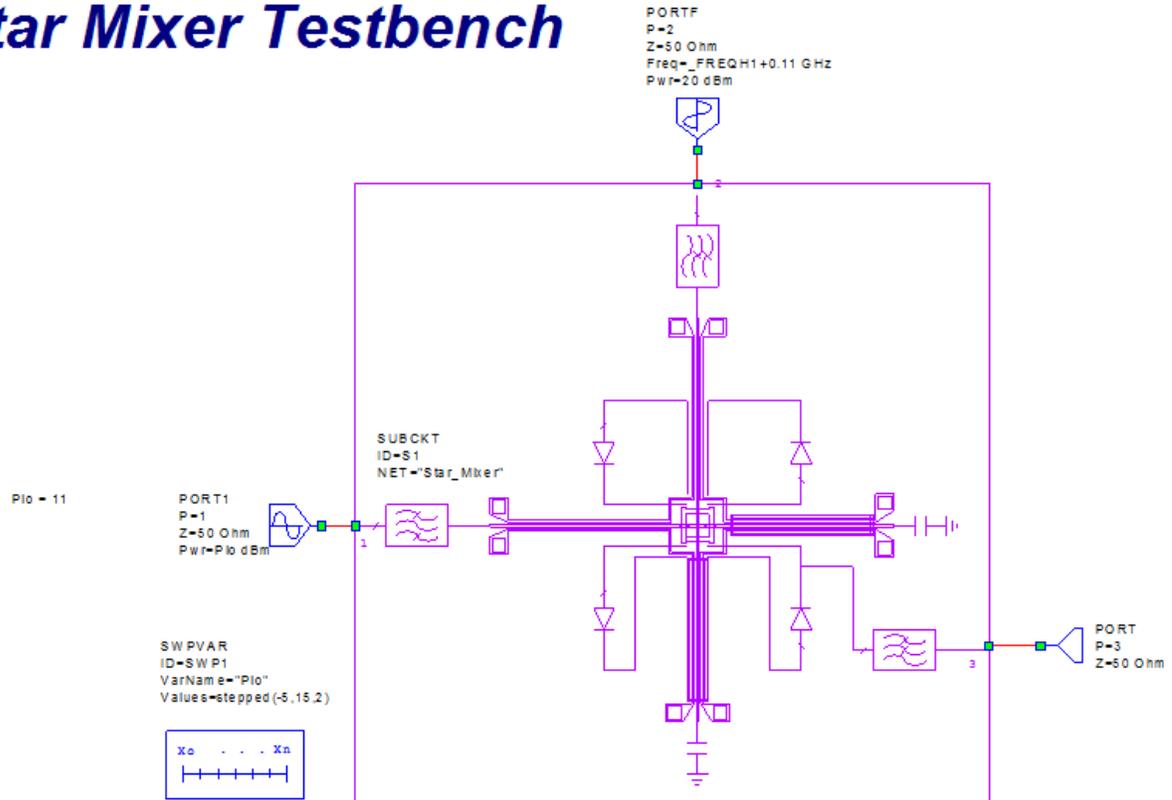
Tone 2 is on **PORT 2** and defines the RF frequency and power.

The frequency is defined explicitly by the equation "**_FREQH1 + 0.11 GHz**". The system variable "**_FREQH1**" returns the frequency of tone 1. The power has been set to "**20 dBm**".

The simulation options (Double click on **Circuit Schematics > APLAC Sim** tab):

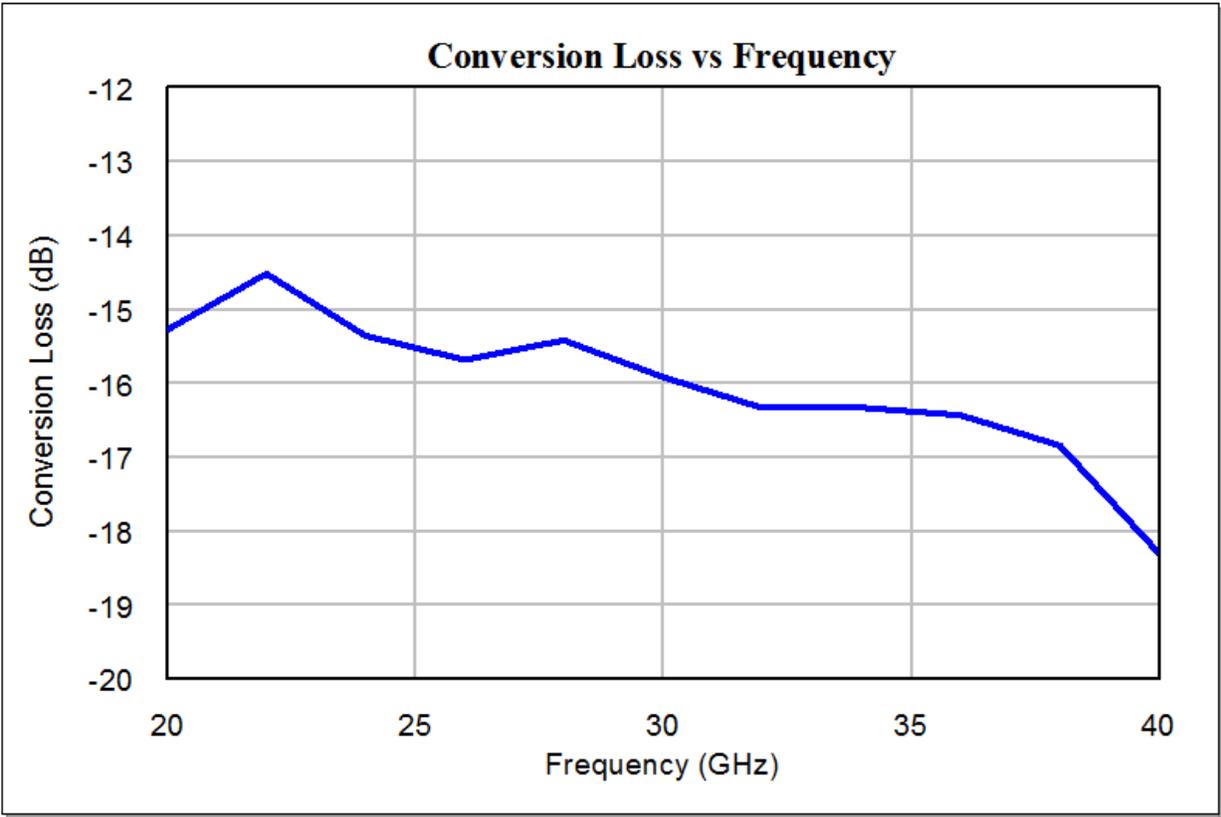
Number of Tone 1 Harmonics:	5
Number of Tone 2 Harmonics:	2
Limit Harmonic Order:	Yes
Max Order:	9

Star Mixer Testbench



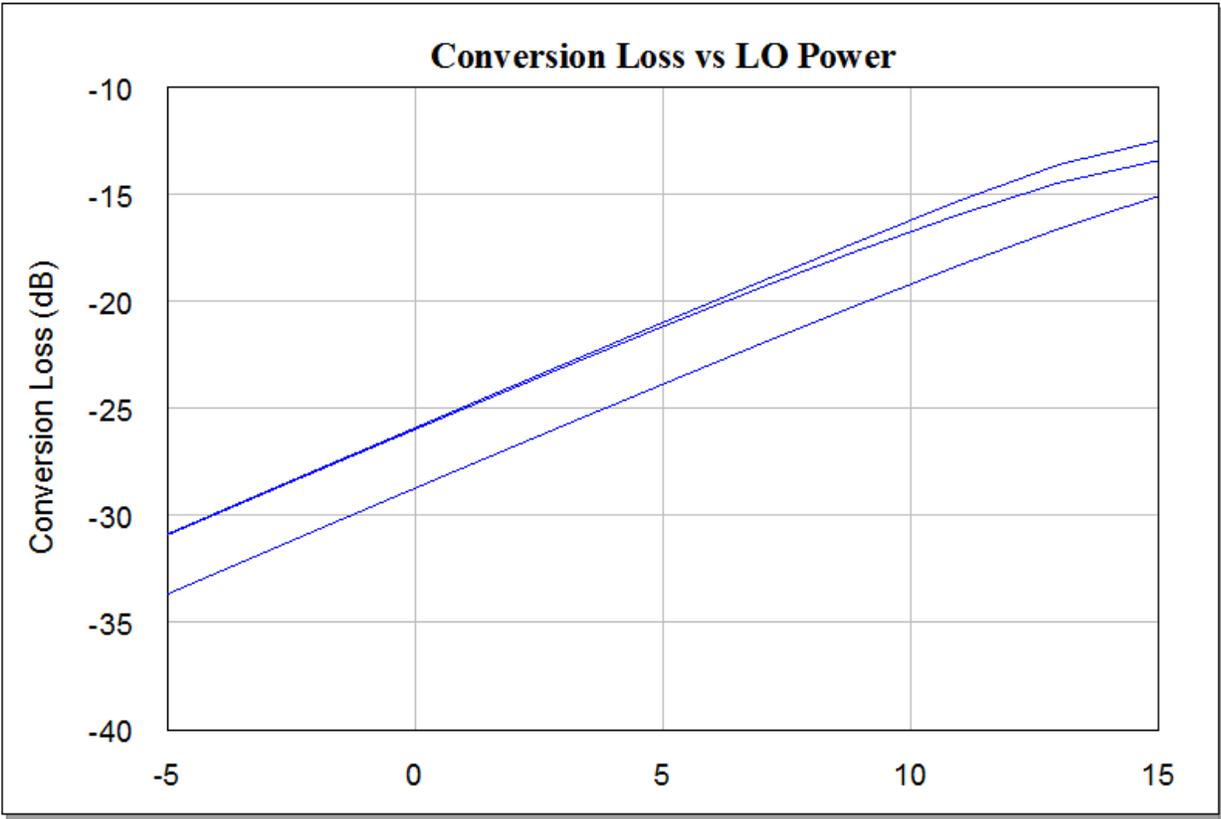
Conversion Loss vs Frequency Graph

This graph uses the large signal S-parameter measurement (**LSSnm**) to plot the (-1,1) product at port 3 relative to the (0,1) signal at port 2. Note that for this measurement the LO input power is set to the value of 11 dBm. The frequency sweep is from 20 to 40 GHz in 2 GHz steps (the "Star Mixer" schematic frequencies).



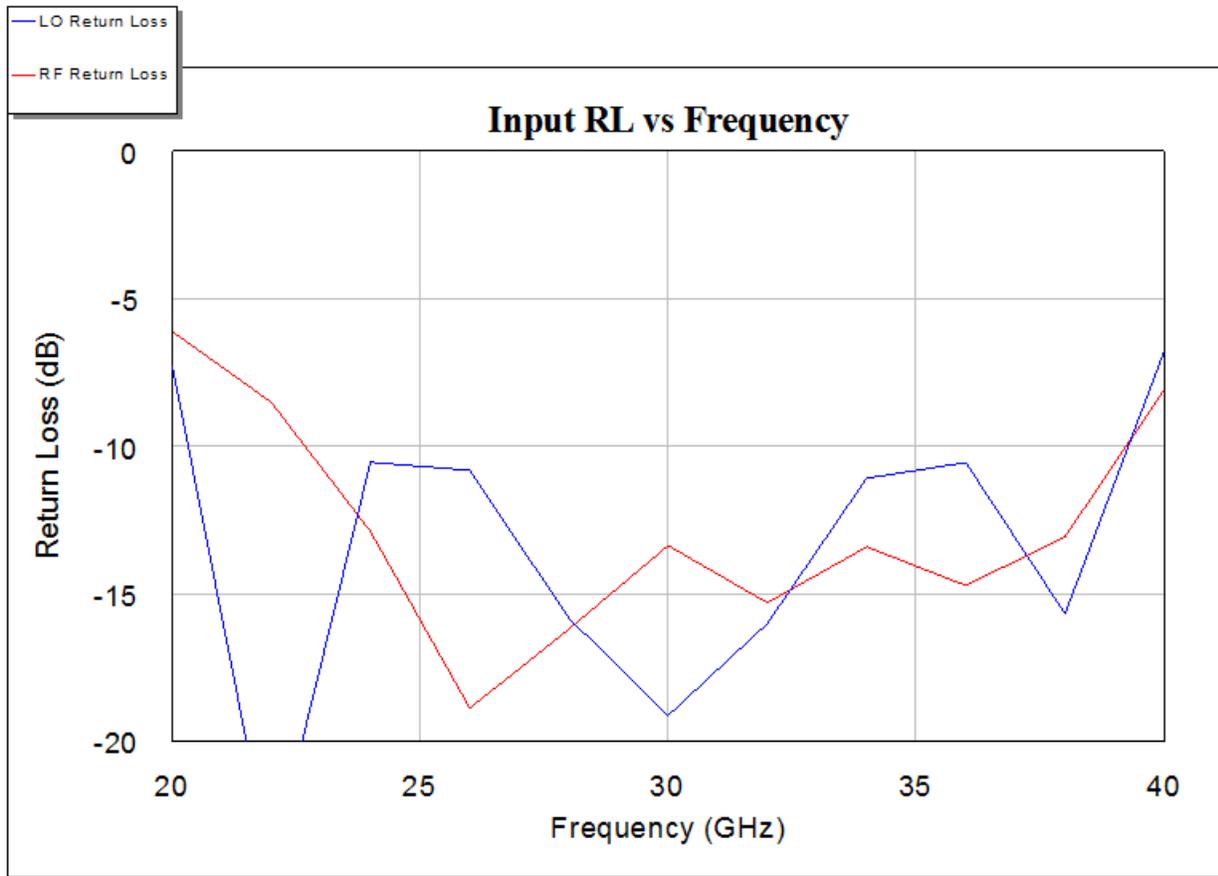
Conversion Loss vs LO Power Graph

Enable the measurements in this graph to see conversion loss plotted versus LO power as the x-axis, at 20, 30 and 40 GHz (the project frequencies).



Input RL vs Frequency Graph

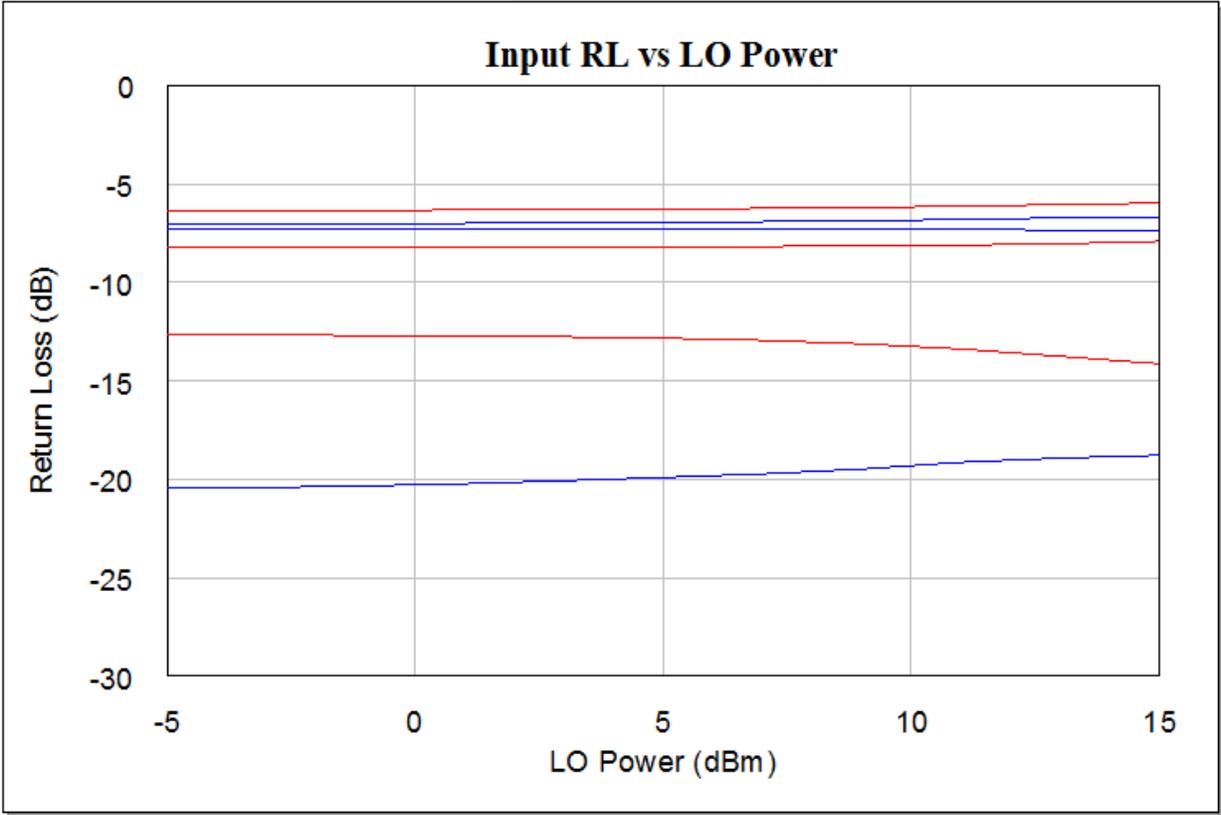
This graph shows LO and RF return loss versus frequency. The LO input power is set to the value of 11 dBm. The frequency sweep is from 20 to 40 GHz in 2 GHz steps (the "Star Mixer" schematic frequencies).



Input RL vs LO Power Graph

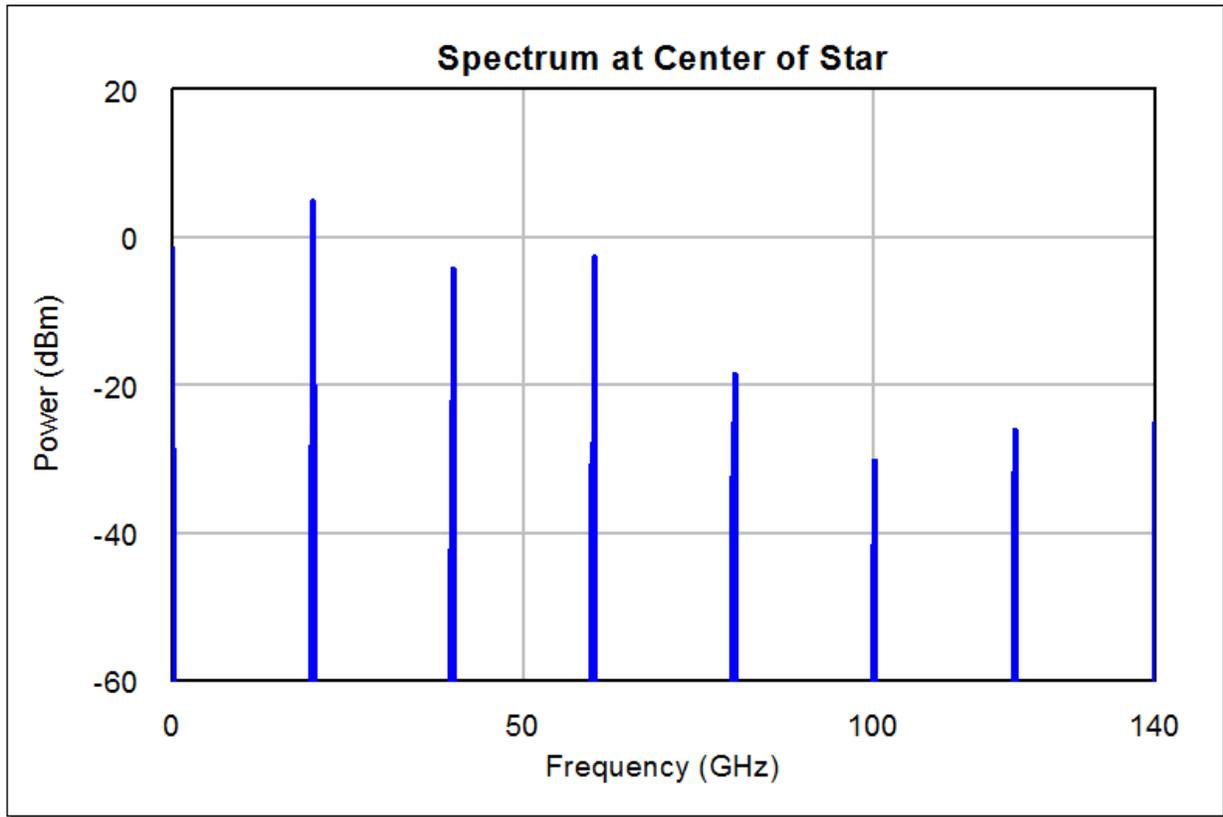
This graph shows input return loss vs LO power at 20, 30 and 40 GHz (the project frequencies).

— LO Return Loss — RF Return Loss



Spectrum at Center of Star Graph

This graph plots the power spectrum at node 1 of the lower-left diode in the "Star Mixer" schematic. For this measurement, a single frequency is plotted, but you can sweep through the simulated frequencies by bringing up the tuner (**Simulate > Tune**).



EM Current Display

The EM_CKT_CURR annotation added to the AXIEM EM document displays the currents on the 3D Layout view of the EM structure. This is an in-situ annotation which simulates the EM structure in place within the surrounding circuit, driven by circuit sources rather than EM ports. The current direction arrows can be added to the display and the entire display animated in time. em3d:EM_Star_Mixer_Currents