# PROJECT REPORT

## ANTENNA DESIGN

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# DESIGN OF RECTANGULAR MICROSTRIP PATCH ANTENNA USING LINE FEED

## AIM

To design and simulate rectangular microstrip patch antenna for the frequency 3GHz using line feed.

## SOFTWARE REQUIRED

HFSS software in PC.

## THEORY

Microstrip patch antennas have more advantages and better prospects compared to conventional antennas, such as lighter in weight, low volume, low cost, low profile, smaller in dimension and ease of fabrication and conformity. Moreover, the microstrip patch antennas can provide frequency agility, broad band-width, feedline flexibility and beam scanning omnidirectional patterning. In its basic form, a microstrip Patch antenna consists of a radiating patch on one side of a dielectric substrate which has a ground plane on the other side.

The patch is normally made of conducting material such as copper or gold and can take any possible shape. The radiating patch and the feed lines are usually photo etched on the dielectric substrate.

**Feeding Techniques to Microstrip Antennas:**

The four most popular feed techniques used are the microstrip line, coaxial probe (both contacting schemes), aperture coupling and proximity coupling (both noncontacting schemes).

Microstrip (Offset Microstrip) Line Feed

In this type of feed technique, a conducting strip is connected directly to the edge of the microstrip patch. The conducting strip is smaller in width as compared to the patch. This kind of feed arrangement has the advantage that the feed can be etched on the same substrate to provide a planar structure. An inset cut can be incorporated into the patch in order to obtain good impedance matching without the need for any additional matching element. This is achieved by properly controlling the inset position.

Hence this is an easy feeding technique, since it provides ease of fabrication and simplicity in modeling as well as impedance matching. However as the thickness of the dielectric substrate increases, surface waves and spurious feed radiation also increases, which hampers the bandwidth of the antenna. This type of feeding technique results in undesirable cross polarization effects.

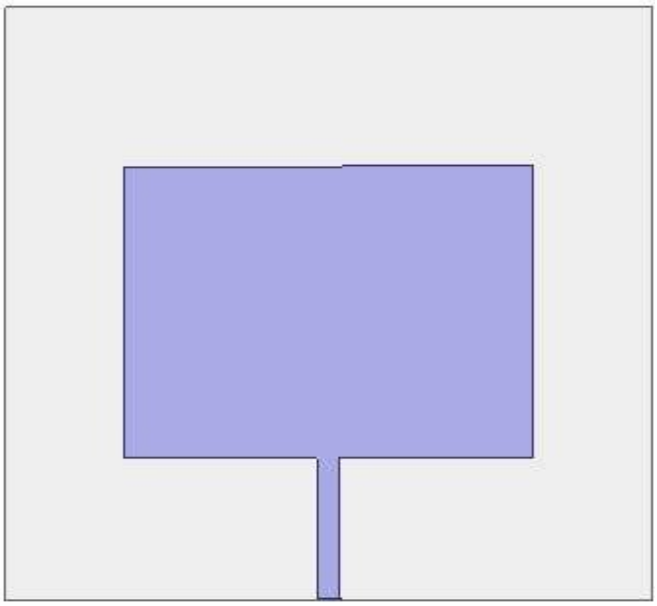


**Fig.1:** Rectangular microstrip patch antenna fusing line feed.

## PROCEDURE

- Open HFSS software in PC and click on to insert HFSS design.
- Adjust the coordinate axis system in xy plane.
- Create a ground plane by click on rectangle and give dimensions.
- Create a dielectric box by click on box and give dimensions.
- Create a patch by click on rectangle and give dimensions and createline by click on rectangle and unite both.
- Click on HFSS -click on analysis setup then give frequency and number of passes then click on add solution sweep give fast and linear count.
- Create feed by click on rectangle in zx plane and give dimensions and excitation as lumped port.
- Give perfect e boundary condition to both ground and patch.
- Create radiation box by click on box and give dimensions and radiation to it.
- Click on validation check.
- Then click on analyze all.
- Now click on results-create model solution-plot both return loss and vswr.

## CALCULATIONS

DESIGN CONSIDERATIONS

| Parameter | Width(x) | **Length(y)** | Height(z) | **Position** |
|---|---|---|---|---|
| **Ground** plane | 35.9mm | 58.4mm | - | -17.95,0,-1.6 |
| Dielectric | 35.9mm | 58.94mm | -1.6mm | -17.95,0,0 |
| **Patch** | 17.56mm | 12.56mm | - | -8.78,23.19,0 |
| Line feed | 0.723mm | 8.294mm | - | -0.3615,14.896,0 |
| **Radiation box** | 64.74mm | 87.78mm | 30.44mm | -32.37,-14.42,-16.02 |

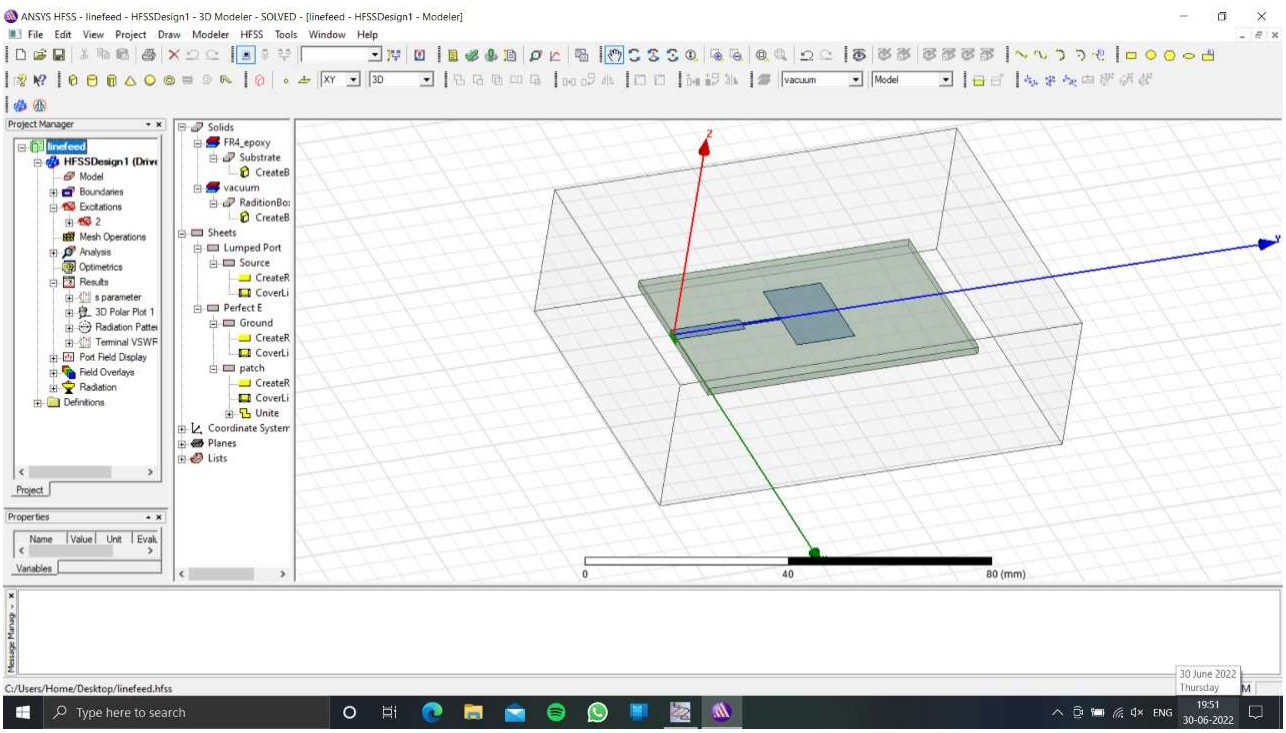
## PRECAUTIONS

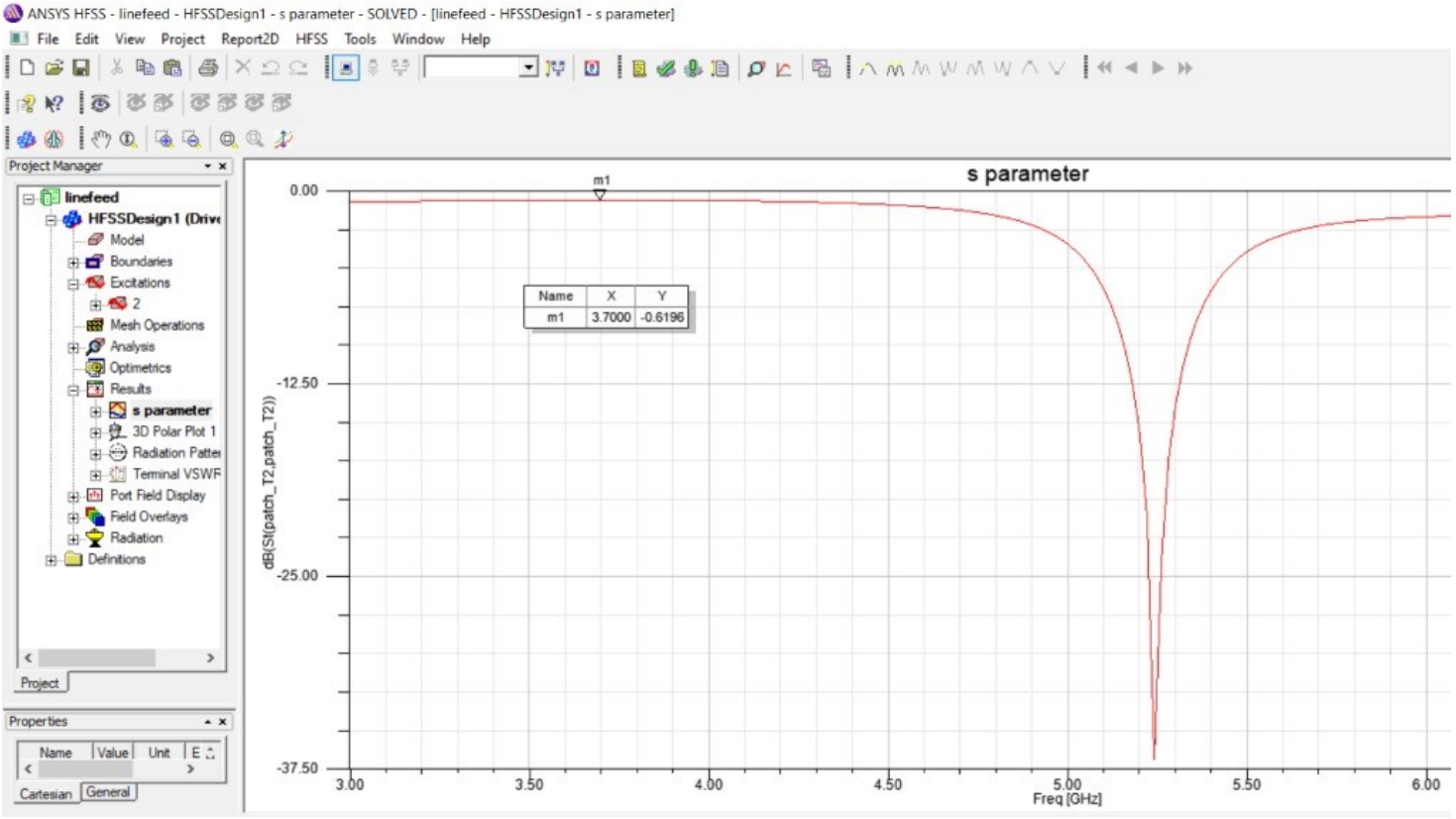
& Make sure whether the excitation is correctly given or not.
& Make sure about the given boundaries and the feed should be given properly.

## RESULT

Designed and simulated rectangular patch antenna using line feed and observed theReturn loss, VSWR plots.

For frequency=5.2GHz,
Return loss (dB): -23.0256
VSWR: 1.1519

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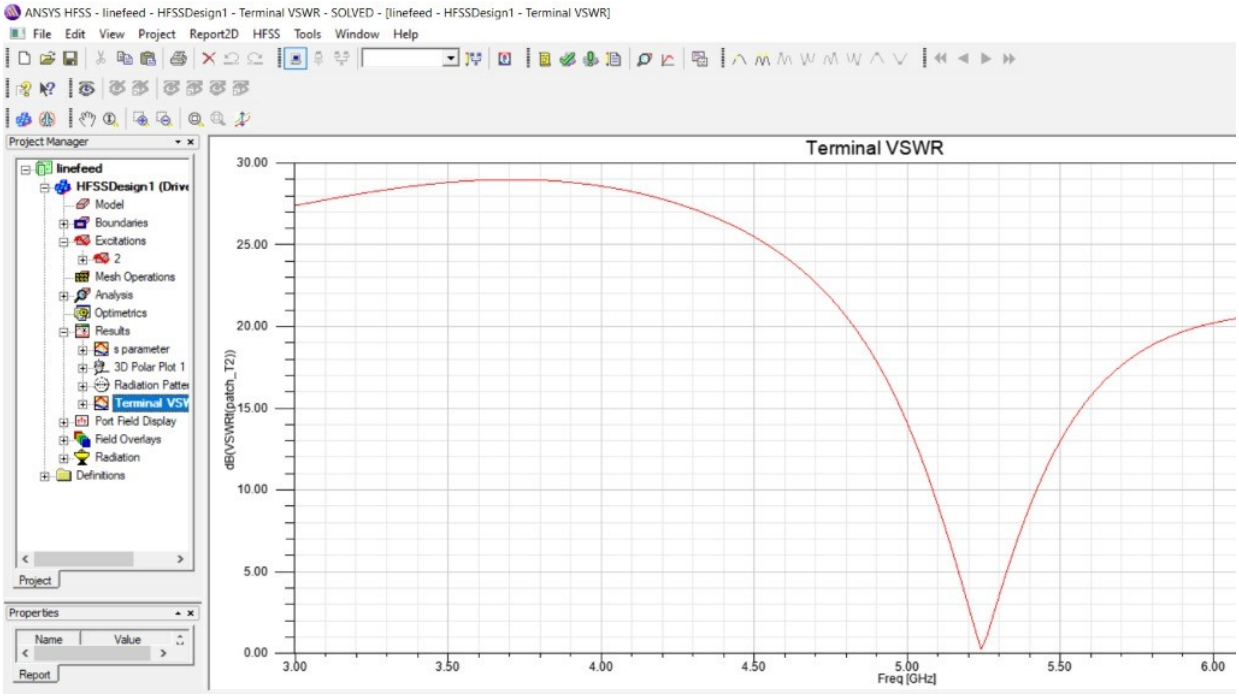
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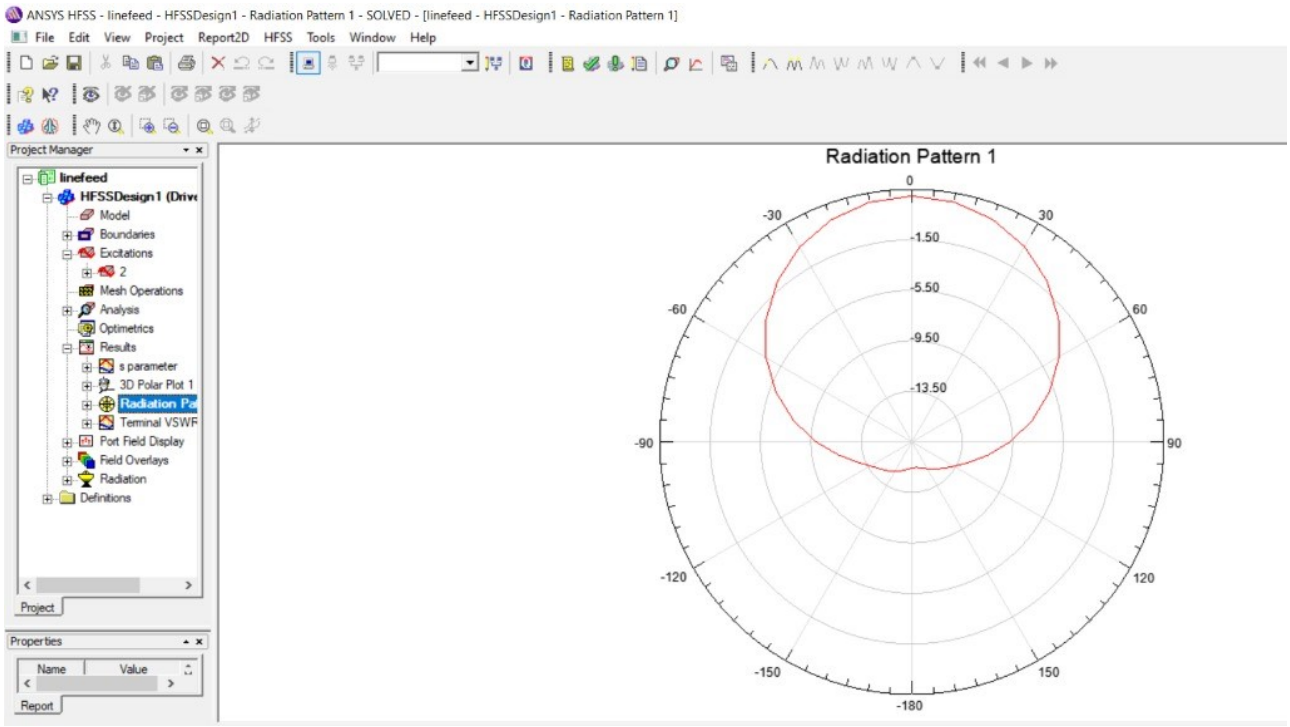
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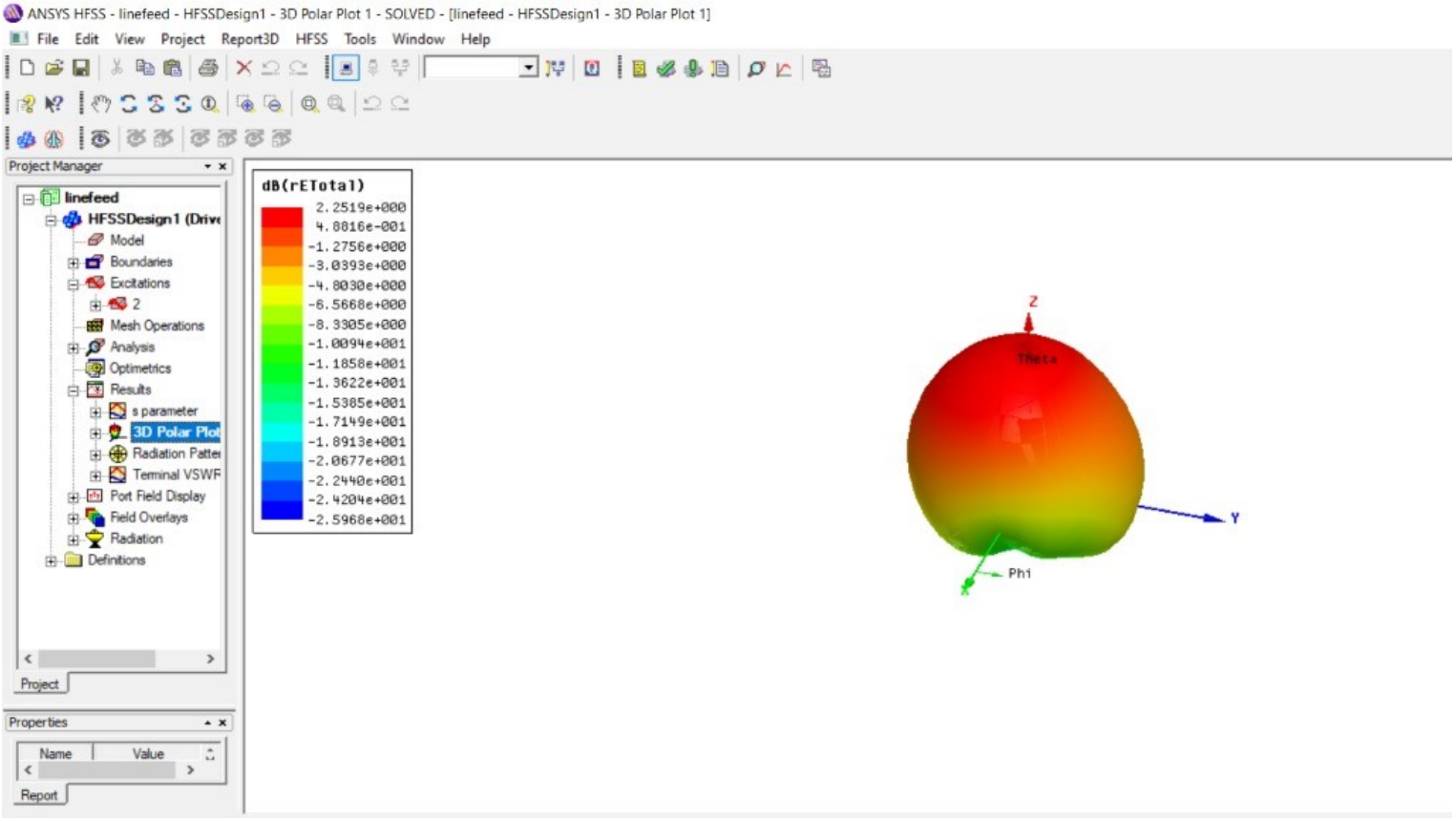
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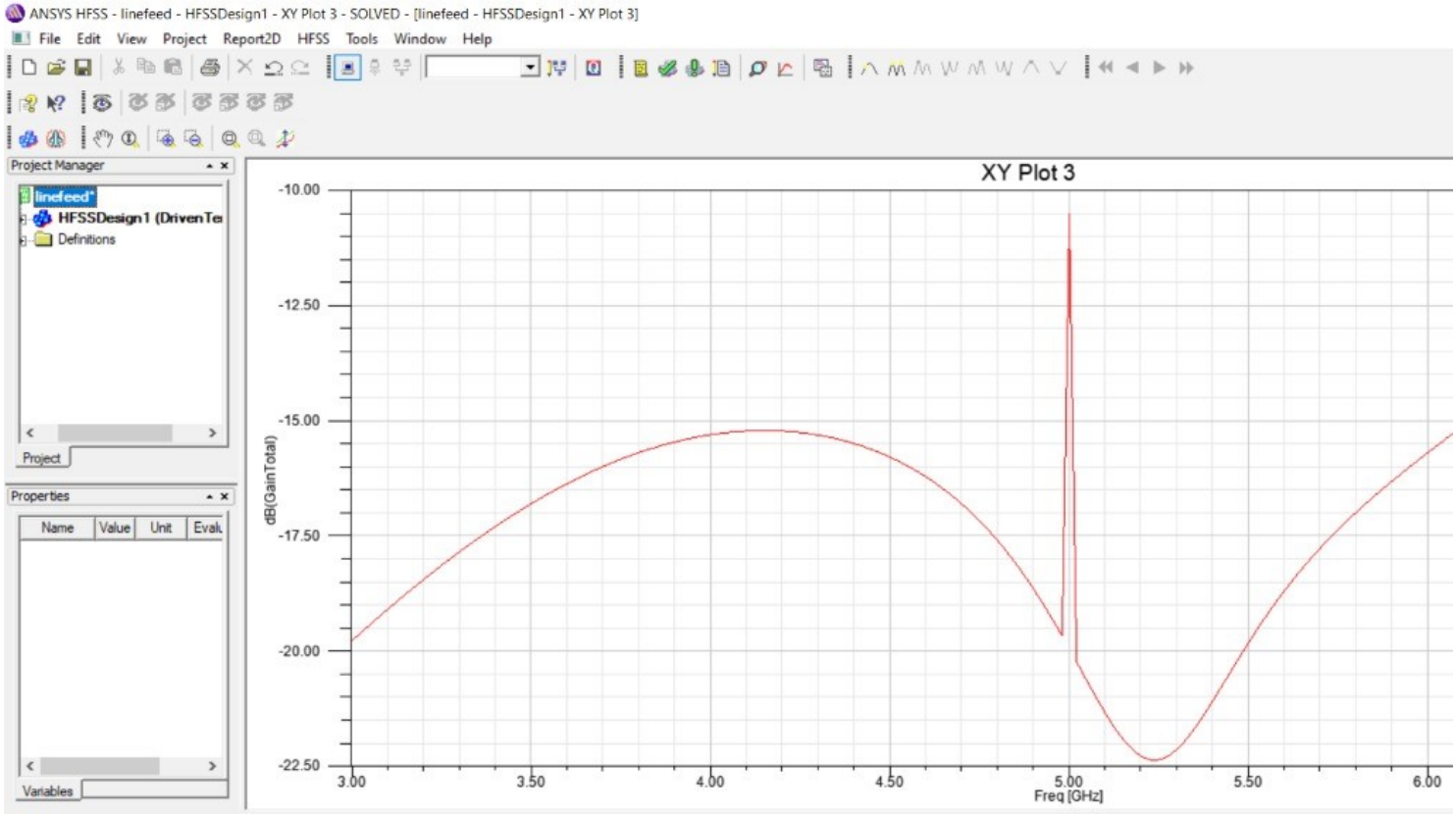
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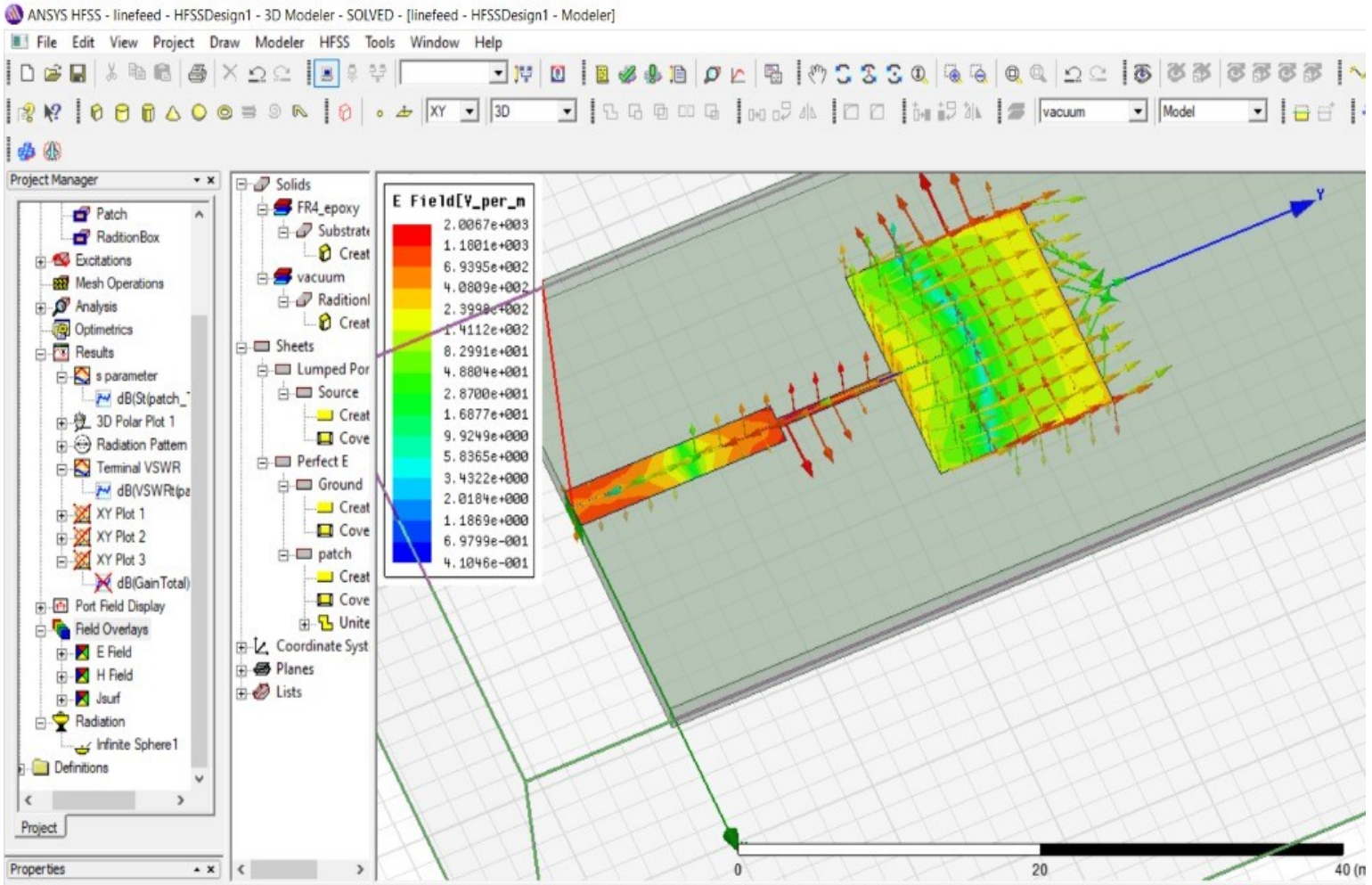
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