# How can I create far-field plots in Sine Space or UV space in ANSYS HFSS

## Problem/Description:

How can I create a far-field radiation plot in ANSYS HFSS that defines the observation angle in sine space coordinates (a.k.a. UV Coordinates) instead of the standard spherical coordinate (a.k.a. Theta / Phi Coordinates).

## Solution:

As of the ANSYS Electronics Desktop R17, users can create far-field plots that use sine space coordinates instead of standard spherical coordinates. This is done entirely as a post-processing function by creating a *Rectangular Contour Plot in HFSS*. These plots allow users to plot the desired far-field quantity in terms of _u and _v variables where

$$\_u = \sin\theta\cos\emptyset$$
$$\_v = \sin\theta\sin\emptyset$$

These far-field plots will allow users to view the far-field quantities with regularly spaced _u and _v spaced points in the range of observation angles where $\sqrt{\_u^2 + \_v^2} \leq 1$.

Users need to setup two things to create a sine space far-field plot. The first is an infinite sphere that defines the far-field patterns where theta is between 0 deg and 90 deg and phi is between 0 deg and 360 deg. The second is the Rectangular Contour Plot. The steps for setting up these are outlined below.

### Define an Infinite Sphere Setup

Users need to create the infinite sphere setup when creating sine space plots. The infinite sphere setup, defines the observation angles (using spherical coordinates), the coordinate system the spherical coordinates are defined from and the surfaces used to perform the far-field integration. It is important to know that the sine space implementation assumes the spherical coordinates (theta and phi) are represented by positive numbers. Therefore, phi should be defined using numbers between 0 deg. and 360 deg. Likewise, theta should be defined using numbers between 0 deg. and 90 deg. To create such an infinite sphere please follow the steps below.

1. From the ANSYS Electronics Desktop Project Manager Tree, right click on the Radiation Branch and select the Insert Far-Field Setup > Infinite Sphere … option in the popup window

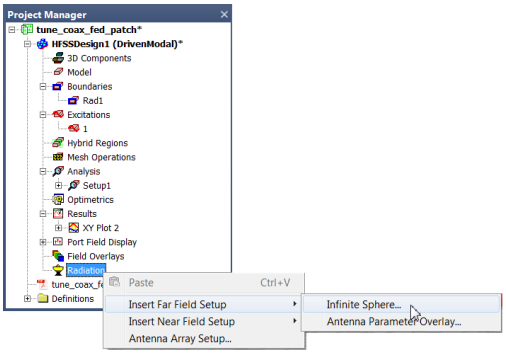


*Figure 1: Inserting Infinite Sphere Setup*

2. On the Far Field Radiation Sphere Setup Window open the Infinite Sphere Tab and define the spherical far-field observation points as described below.
    a. Phi Start: 0 deg
    b. Phi Stop: 360 deg
    c. Phi Step Size: 10 deg
    d. Theta Start: 0 deg
    e. Theta Stop: 90 deg
    f. Theta Step Size: 10 deg

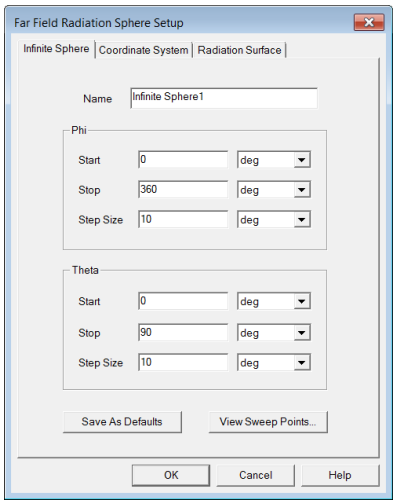


*Figure 2: Infinite Sphere Observation Point Definitions*

3. Accept the far-field Infinite Sphere setup by clicking the OK button

**Create the Rectangular Contour Plot**

Sine space plots can only be created on Rectangular Contour Plots after an infinite sphere has been defined. To create the plot please follow the steps outlined below.

1. From the ANSYS Electronics Desktop Project Manager Tree, right click on the Results Branch and select the Create Far Field Report > Rectangular Contour Plot option from the popup window.

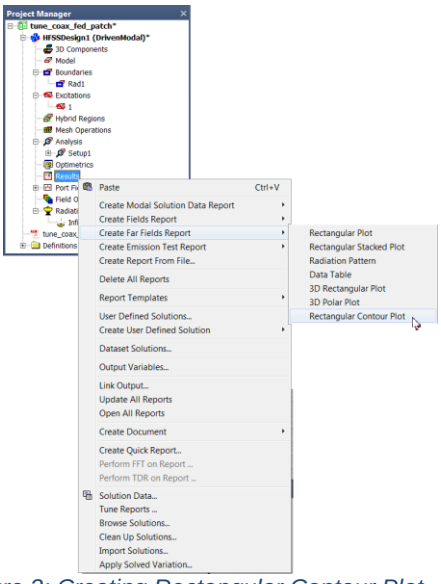


*Figure 3: Creating Rectangular Contour Plot*

2. On the Report Window open the Trace Tab and make the following changes
    a. Change the *Context* > *Domain* from Theta, Phi to Sine Space to change the primary and secondary sweep fields to _u and _v
    b. Select the Category, Quantity and Function you would like to plot

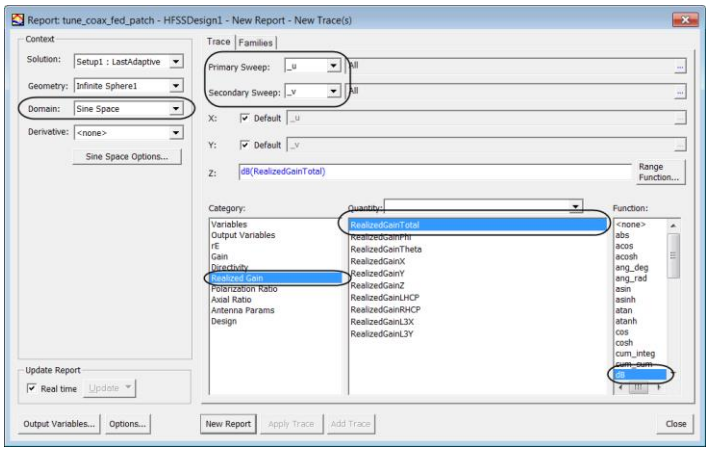


*Figure 4: Rectangular Contour Plot Definition*

3. Click the New Report button to create the plot
4. Click the Close button to close the Report Window.

When finished, the user should see a sine space far-field plot. Users can increase the resolution of the plots by decreasing the Phi Step Size and Theta Step Size values in the Infinite Sphere Setup.

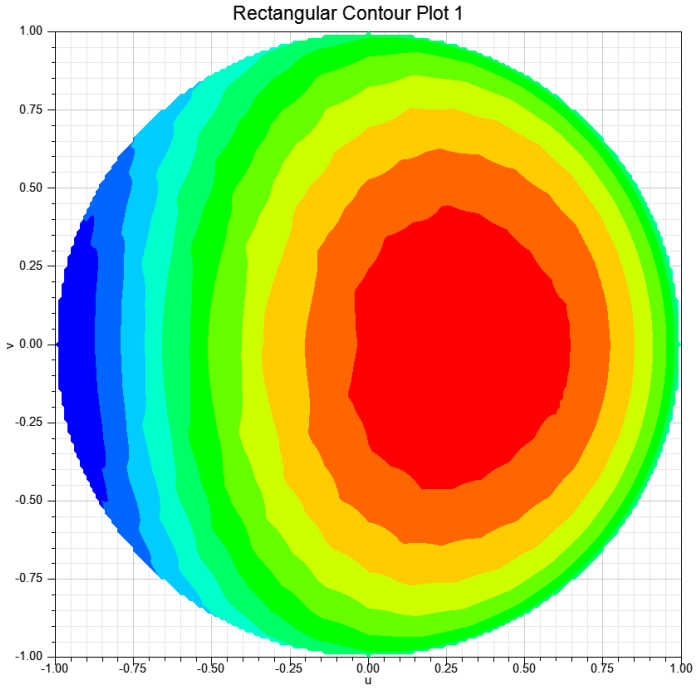


*Figure 5: Far-Field Plot in Sine Space*