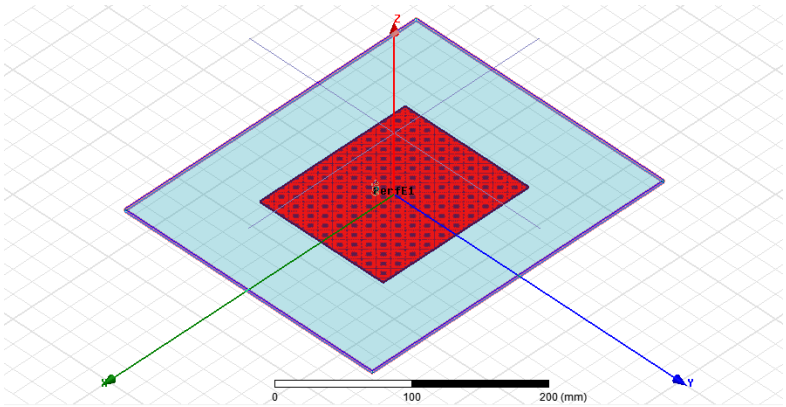
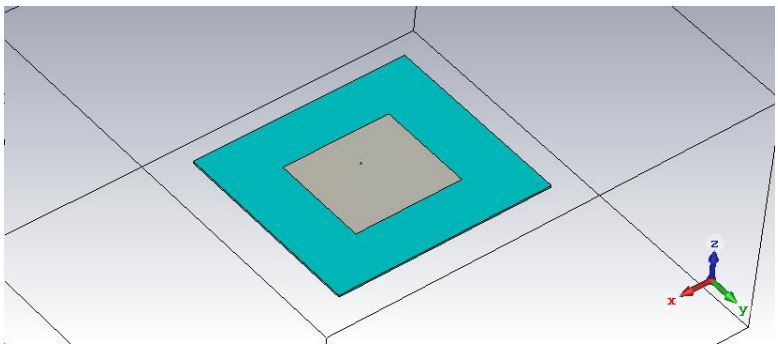
Investigating
HFSS, FEKO and CST
Field Results for an Antenna

A coax-fed patch antenna with dimensions given in table below, is simulated in HFSS, CST and FEKO softwares.

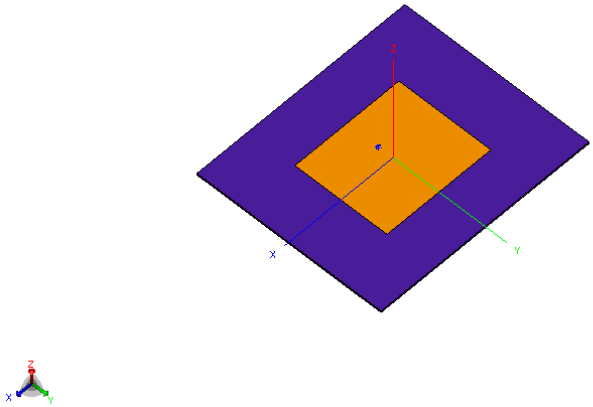
Patch length	Patch width	Substrate length	Substrate width	Substrate height	Coax feed pin diameter	Coax diameter	Pin offset (x,y)	Relative permittivity
١٢,٩٨١٢ cm	١٥,٢٩٨٧ cm	٢٥,٩٦٢٥ cm	٣٠٥٩٧٤ cm	٠,٢٦ cm	٠,١٨٧٤ cm	٠,٤٣١٤ cm	(٠,٤,٥٠٤٩) cm	٢,١



***(a)**.HFSS*

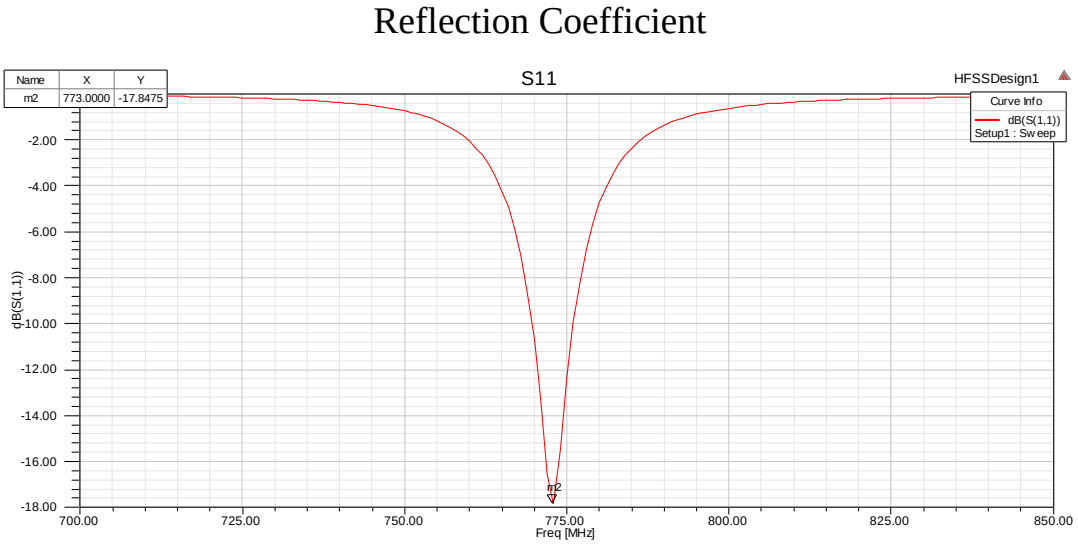


***(b)**.CST*

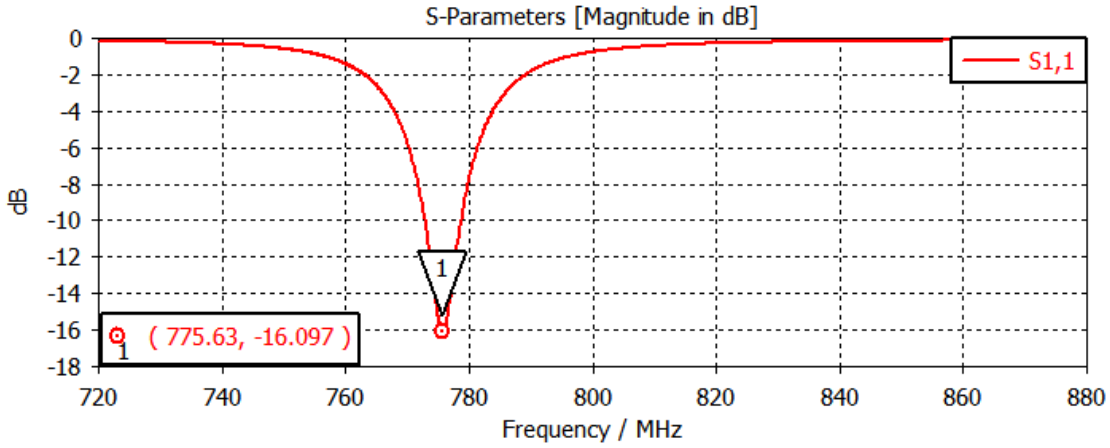


***(c)**.FEKO*

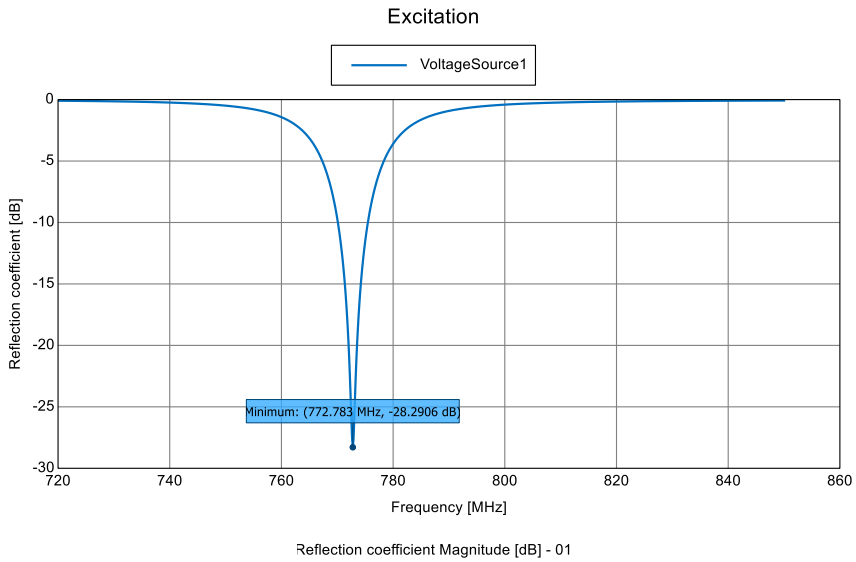
The reflection Coefficient resulted from each of these softwares is as below:



(a). HFSS



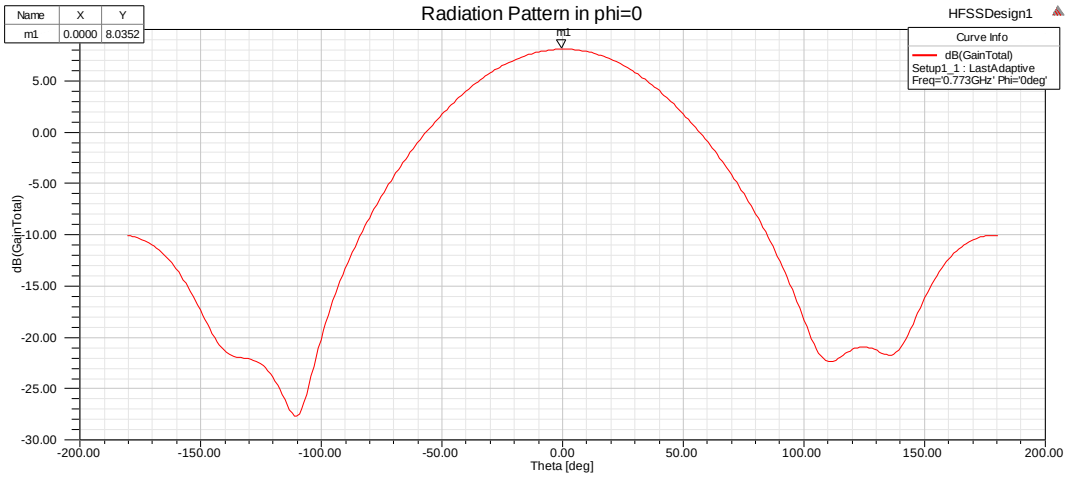
***(b)**. CST*



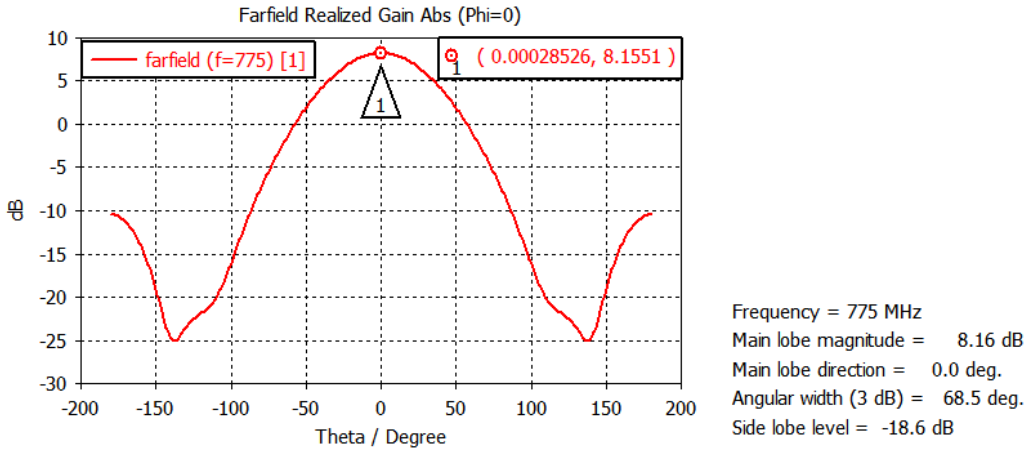
***(c)** . FEKO*

The radiation pattern results (at the corresponding resonant frequency) is as follows:

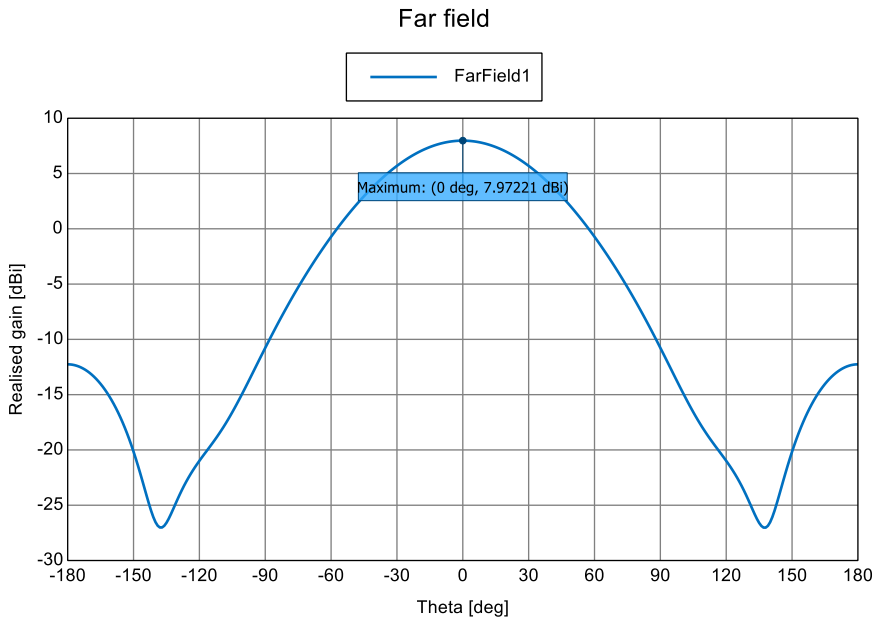
Radiation Pattern in phi = ۰



۱.HFSS



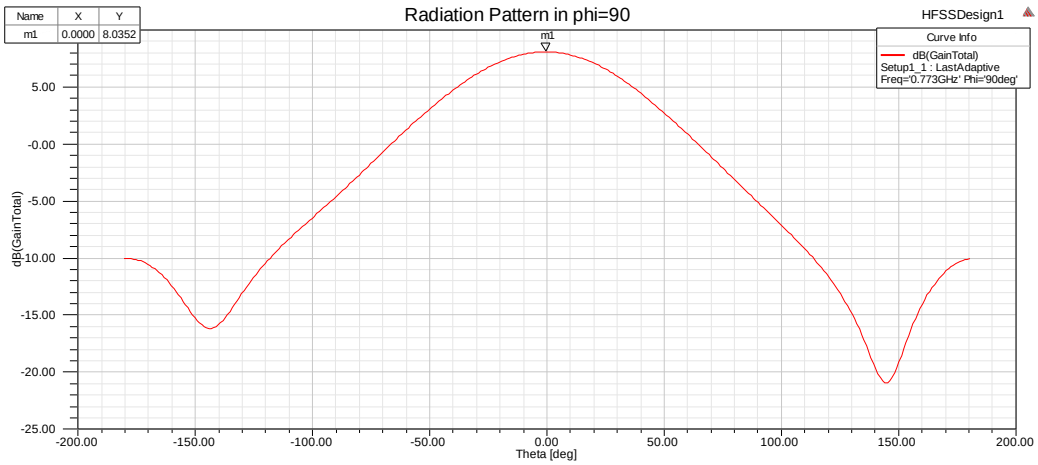
۲.CST



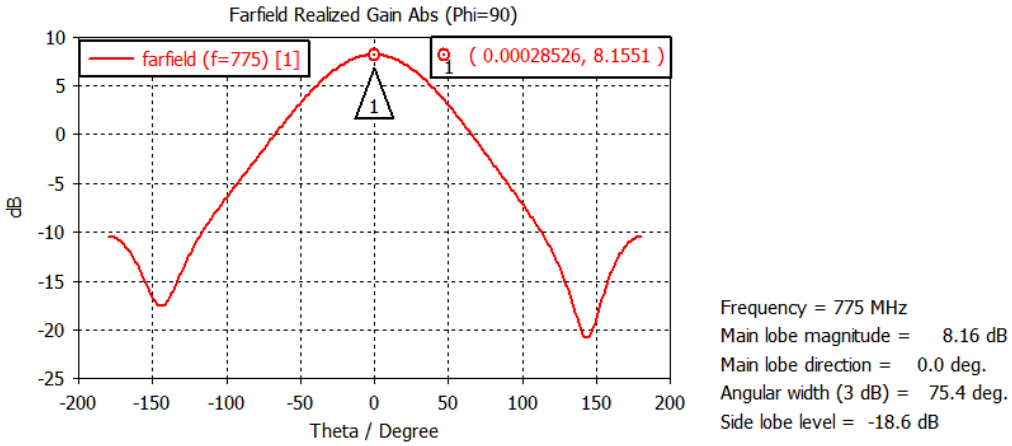
otal Realised gain [dBi] (Frequency = 774 MHz; Phi = 0 deg) - 0

۳.feko

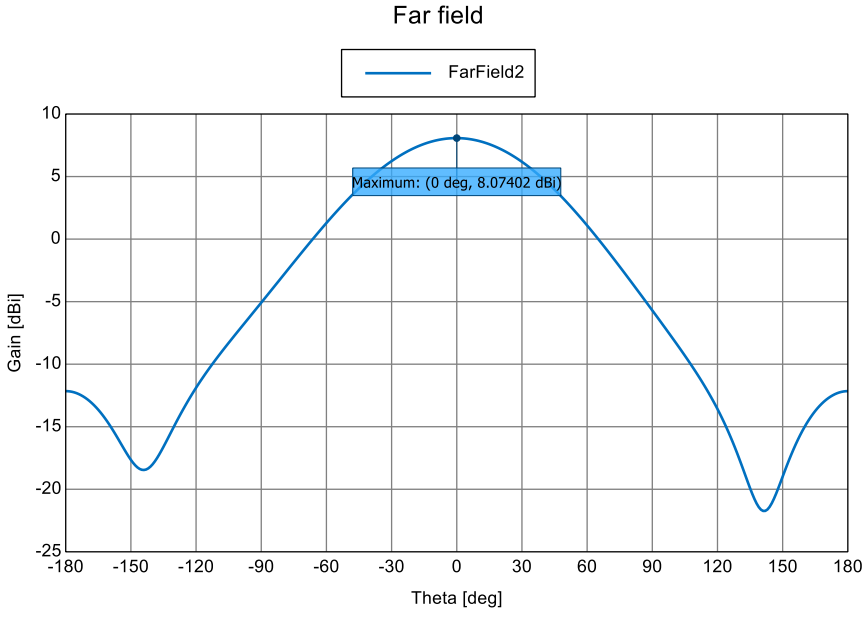
Radiation Pattern in phi = ۹۰



۴. *HFSS*



۵. *CST*



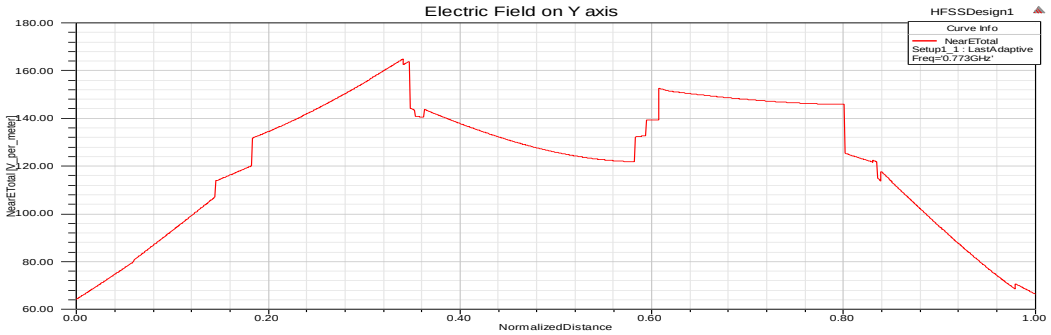
Total Gain [dBi] (Frequency = 774 MHz; Phi = 90 deg) - 01

۶.*FEKO*

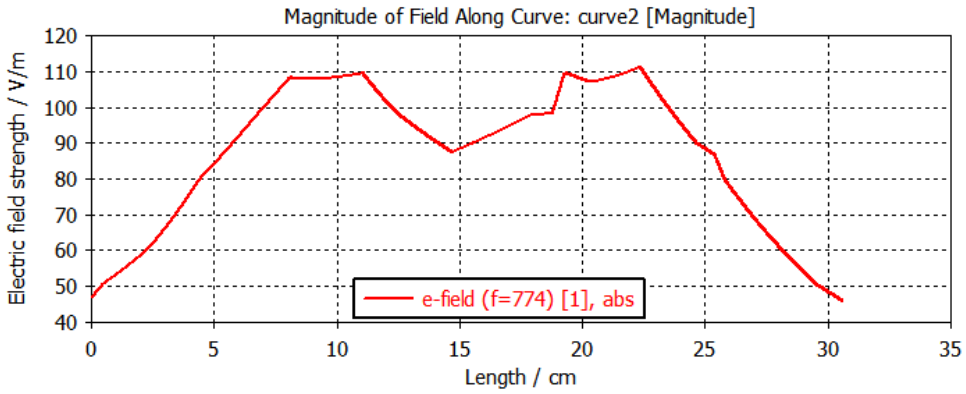
As one can see, the reflection coefficient and the (far field) radiation pattern results obtained from these three softwares are almost convergent

Above the antenna, two ۳۰,۶cm long lines perpendicular to each other (parallel to x and y axes), with ۶cm distance from the top face of the antenna (in near field region) are defined. The electric field is investigated on these two lines:

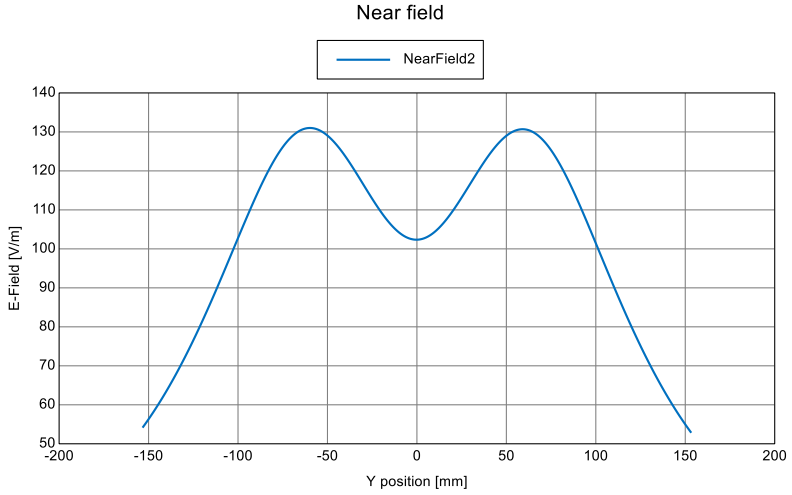
Magnitude of the electric field on the line parallel to y axis



۷HFSS



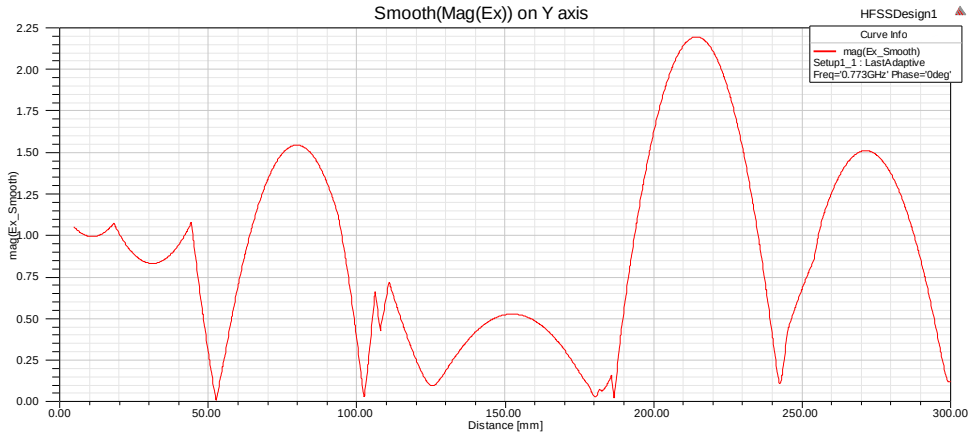
۸.CST



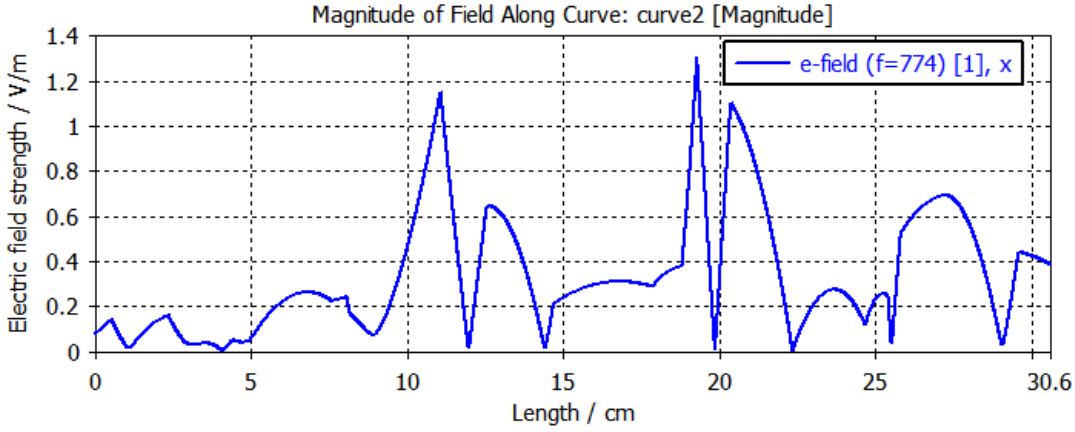
:YZ E-Field [V/m] (Frequency = 774 MHz; X position = 0 m; Z position = 60 mm) - 0

۹.FEKO

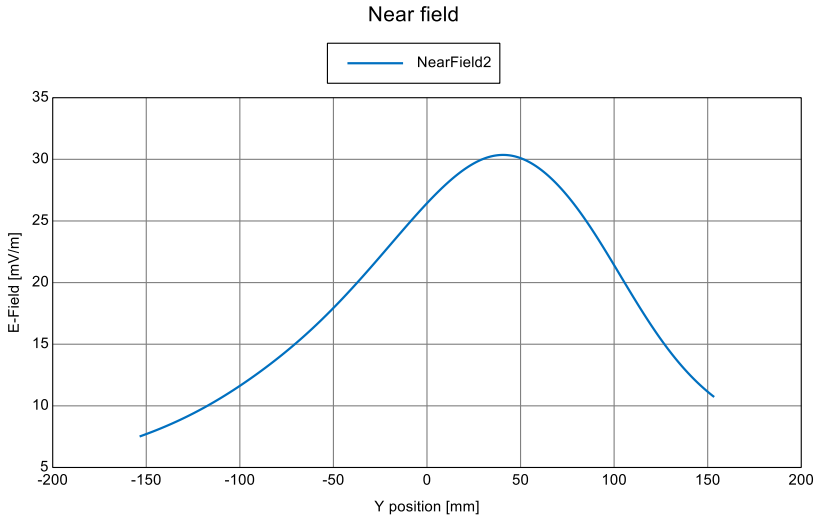
Magnitude of the x-component of the electric field on the line parallel to y axis



۱.HFSS



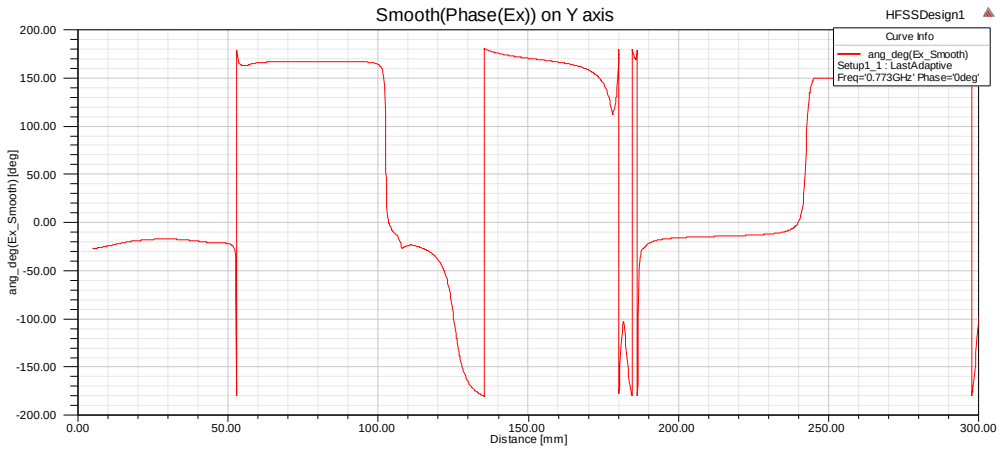
۲.CST



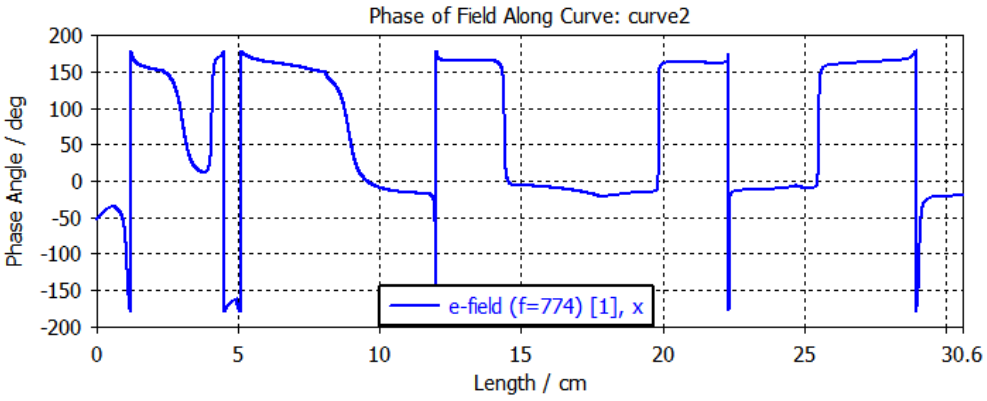
E-Field Magnitude [mV/m] (Frequency = 774 MHz; X position = 0 m; Z position = 60 mm) - 0

۳.FEKO

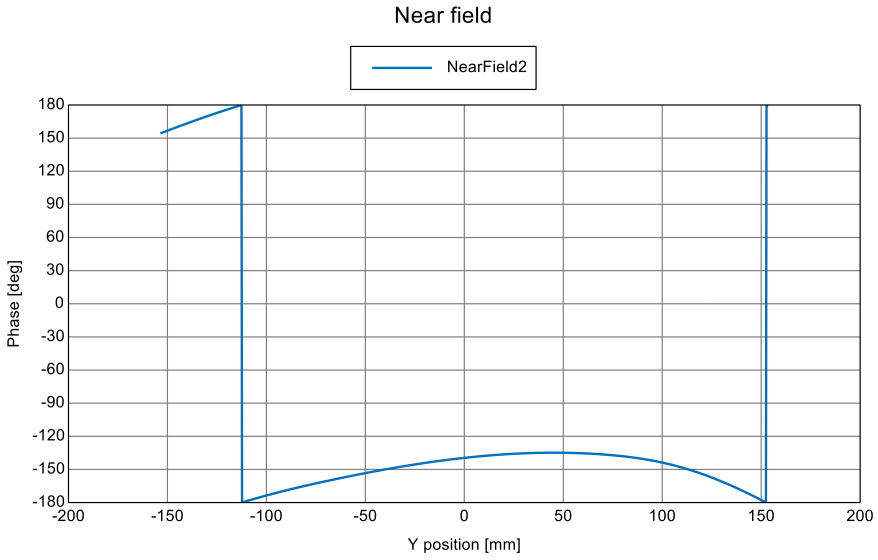
Phase of the x-component of the electric field on the line parallel to y axis



۱۳.*HFSS*



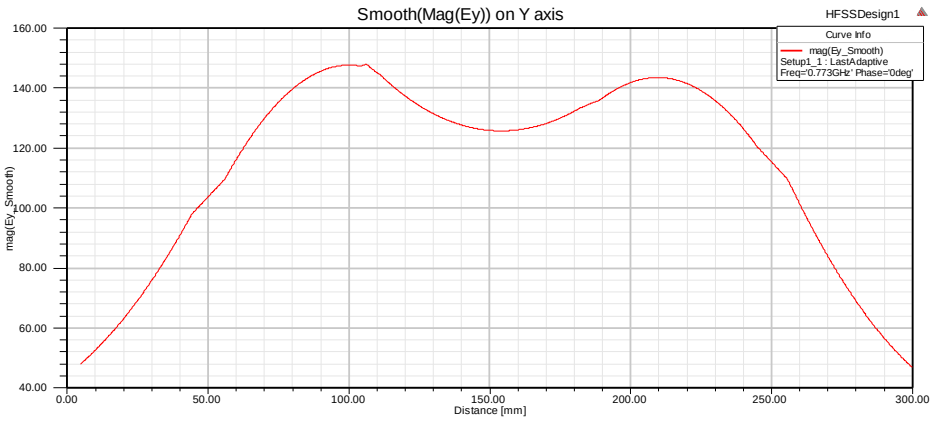
۱۴.*CST*



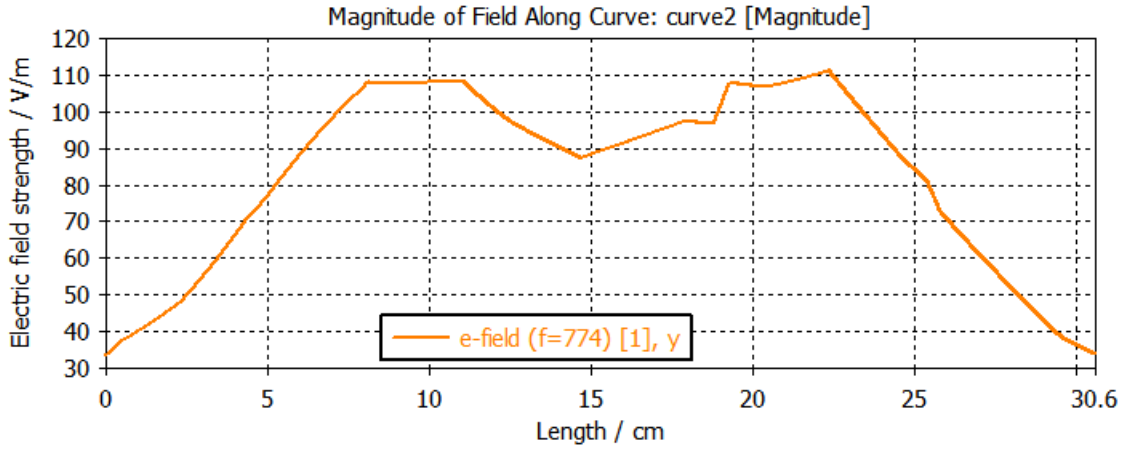
E-Field Phase [deg] (Frequency = 774 MHz; X position = 0 m; Z position = 60 mm) - 0

۱۵.*FEKO*

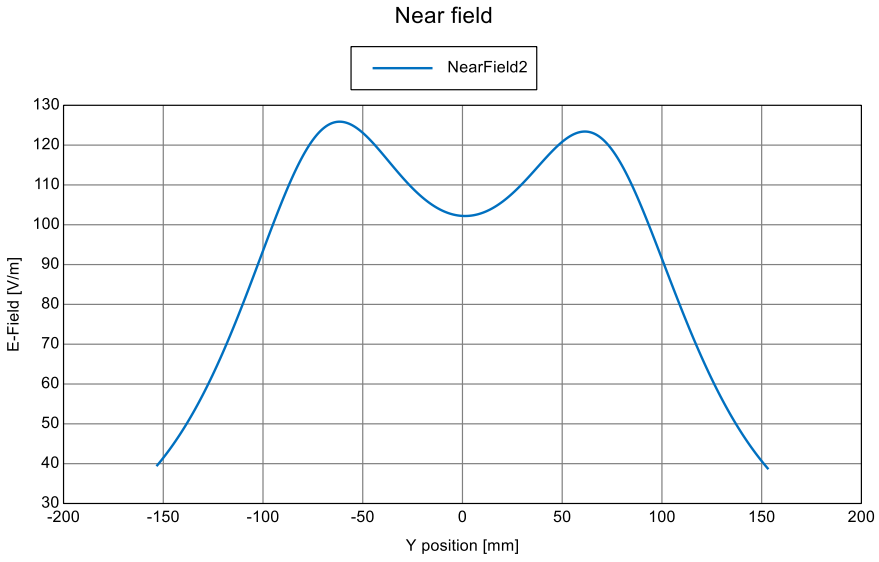
Magnitude of the y-component of the electric field on the line parallel to y axis



۶.HFSS ۱



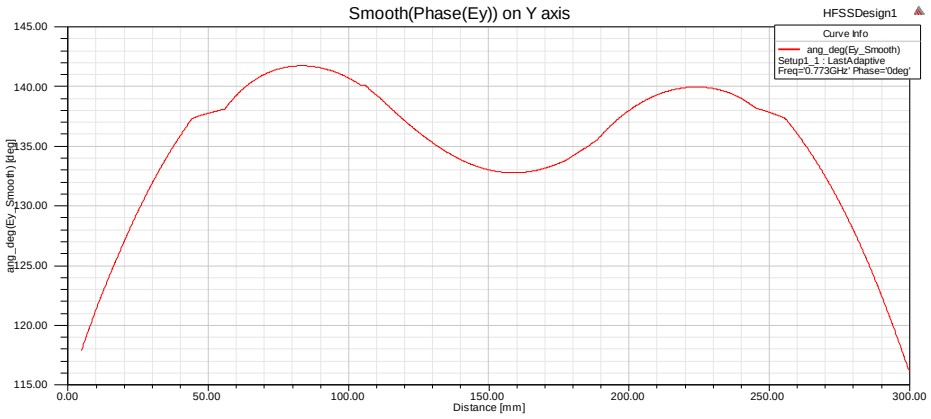
۱۷.CST



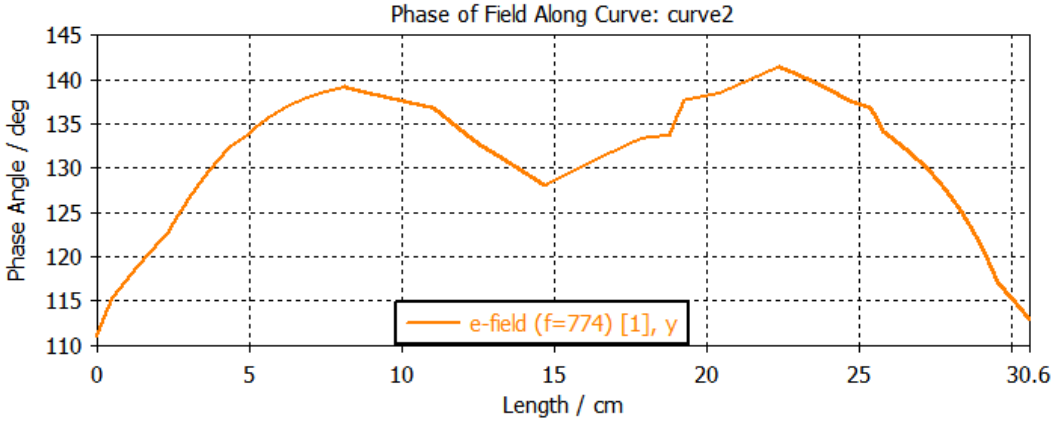
' E-Field Magnitude [V/m] (Frequency = 774 MHz; X position = 0 m; Z position = 60 mm) - 0

۱۸.FEKO

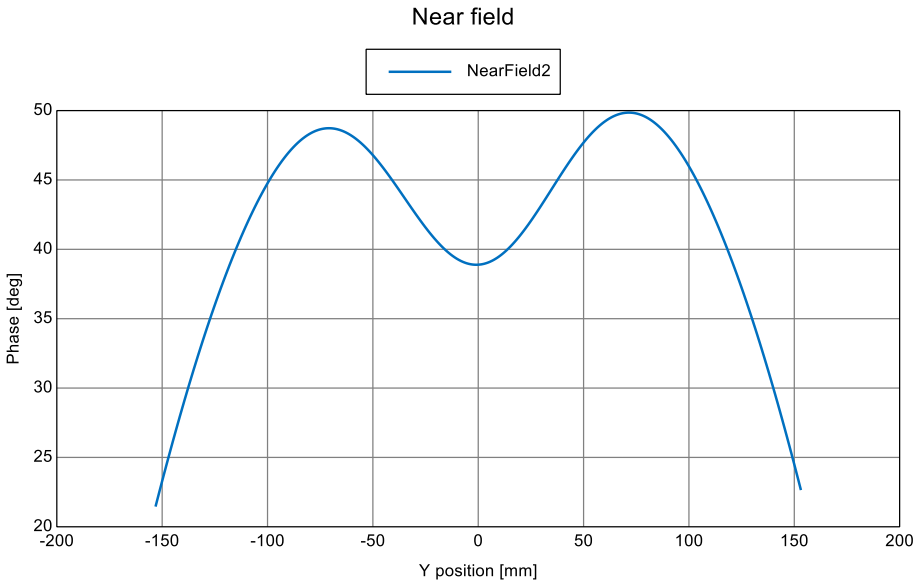
Phase of the y-component of the electric field on the line parallel to y axis



۱۹.*HFSS*



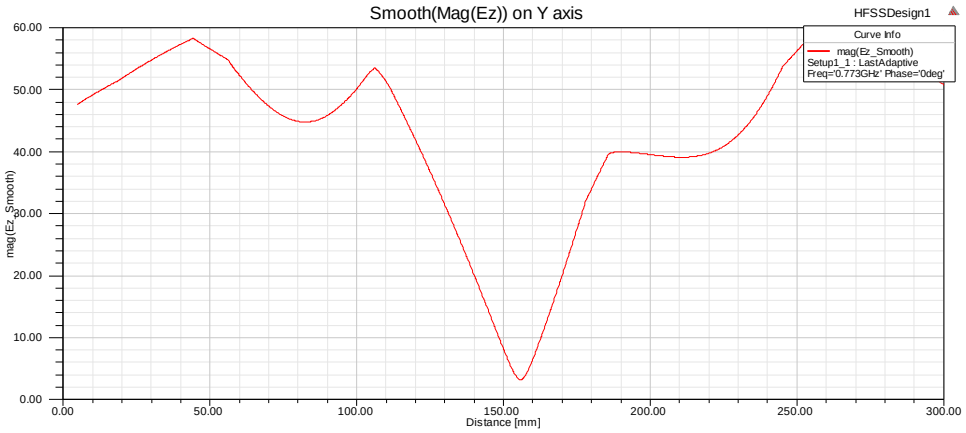
۲۰.*CST*



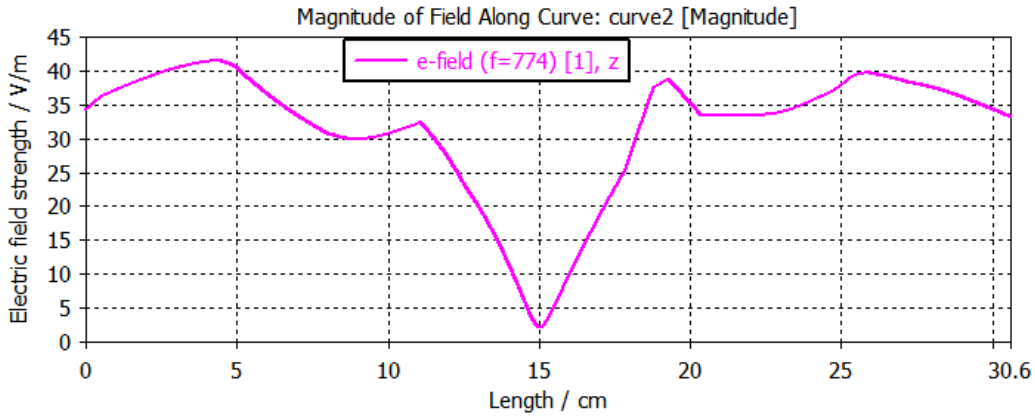
' E-Field Phase [deg] (Frequency = 774 MHz; X position = 0 m; Z position = 60 mm) - 0

۲۱.*FEKO*

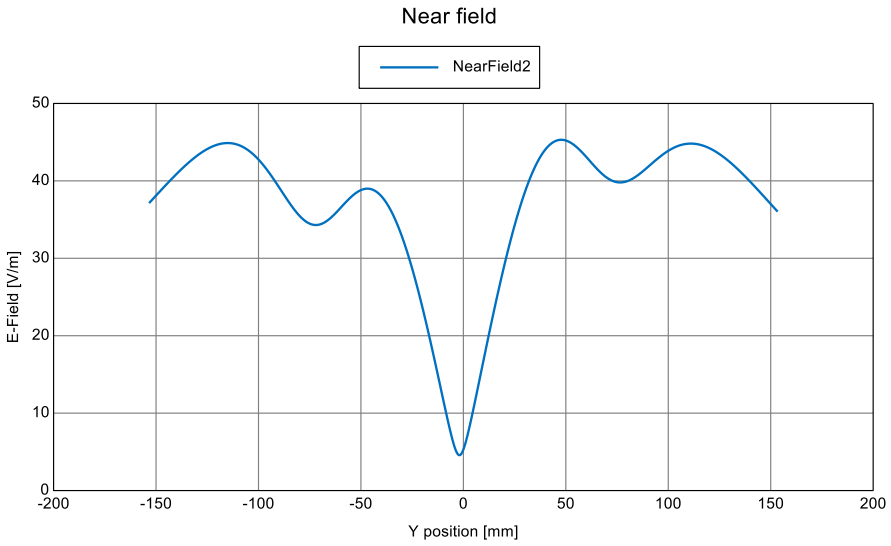
Magnitude of the z-component of the electric field on the line parallel to y axis



۲۲.HFSS



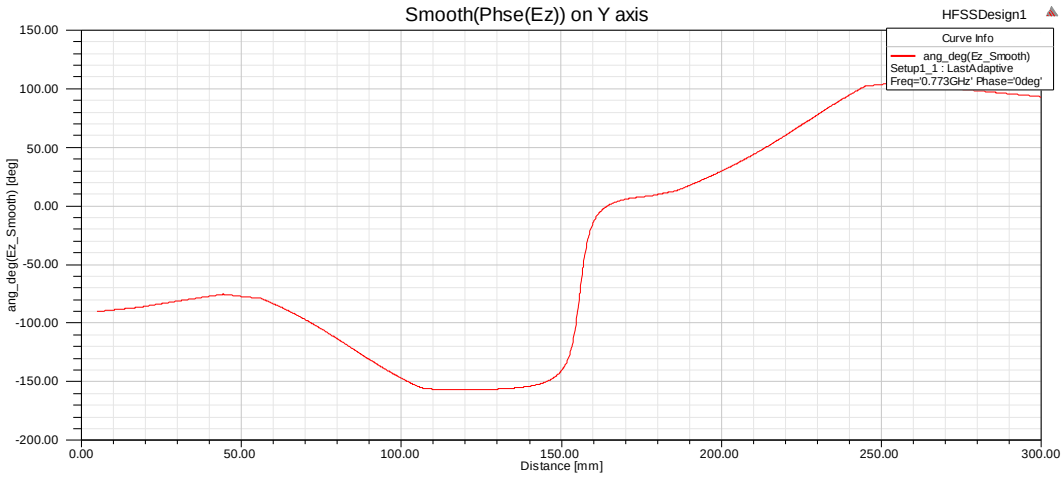
۲۲.CST



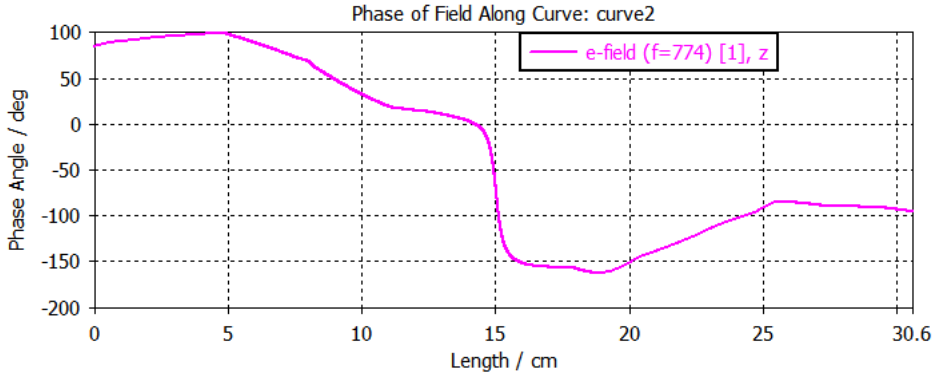
E-Field Magnitude [V/m] (Frequency = 774 MHz; X position = 0 m; Z position = 60 mm) - 0

۲۲.FEKO

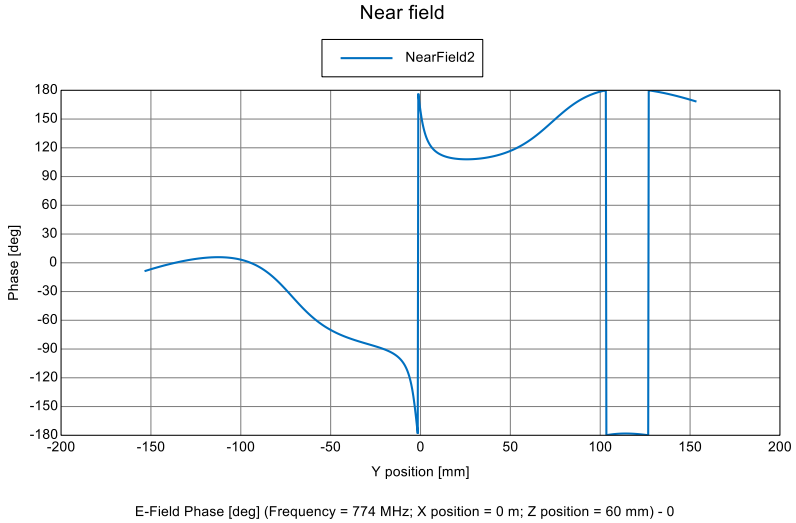
Phase of the z-component of the electric field on the line parallel to y axis



۲۵.HFSS

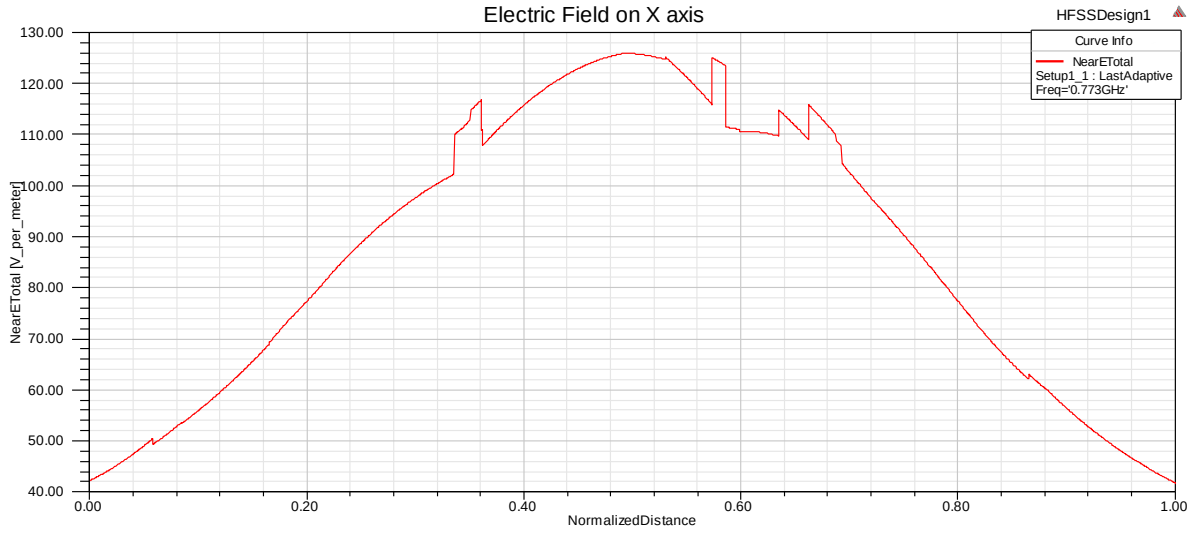


۲۶.CST

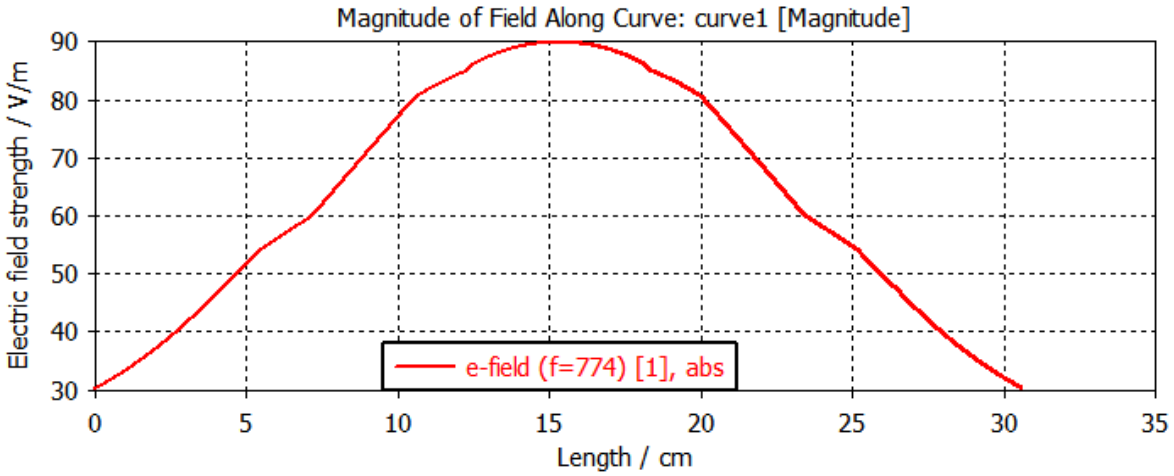


۲۷.FEKO

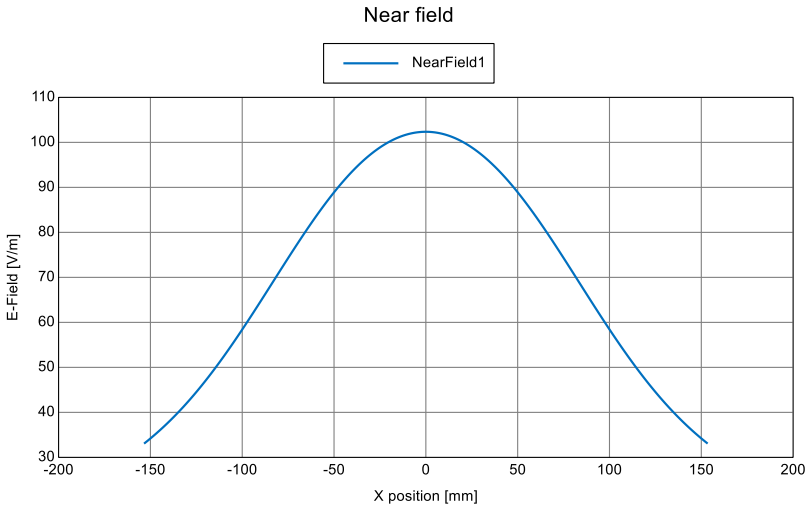
Magnitude of the electric field on the line parallel to x axis



۲۸.*HFSS*



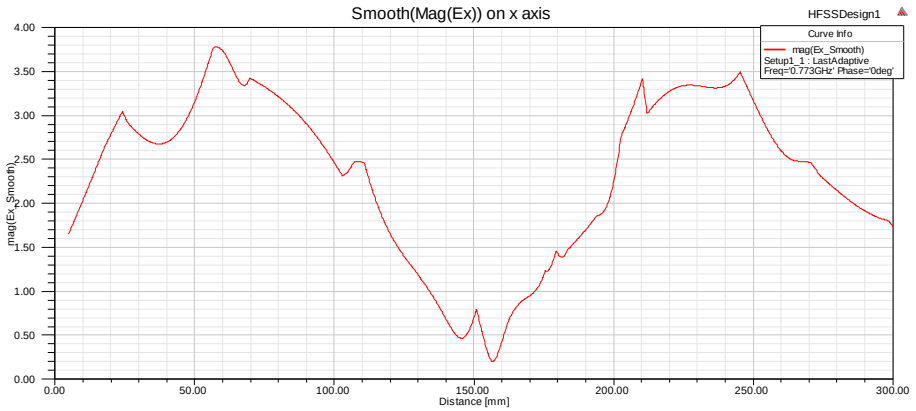
۲۹.*CST*



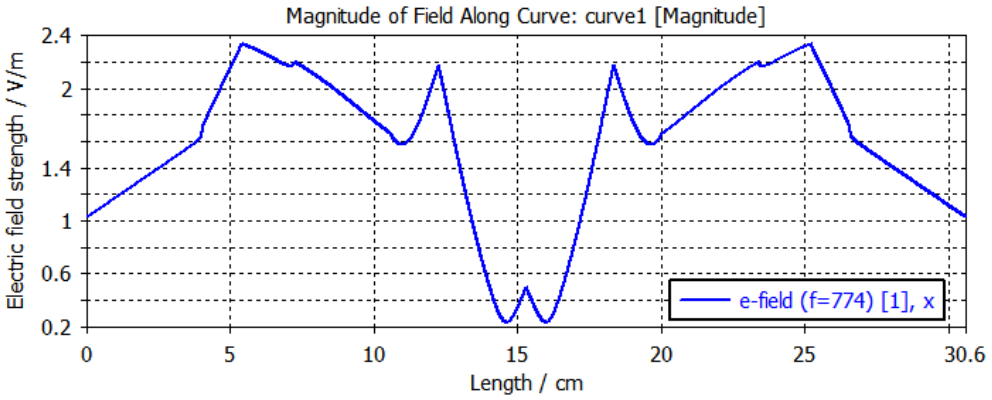
:YZ E-Field [V/m] (Frequency = 774 MHz; Y position = 0 m; Z position = 60 mm) - 0

۳۰.*FEKO*

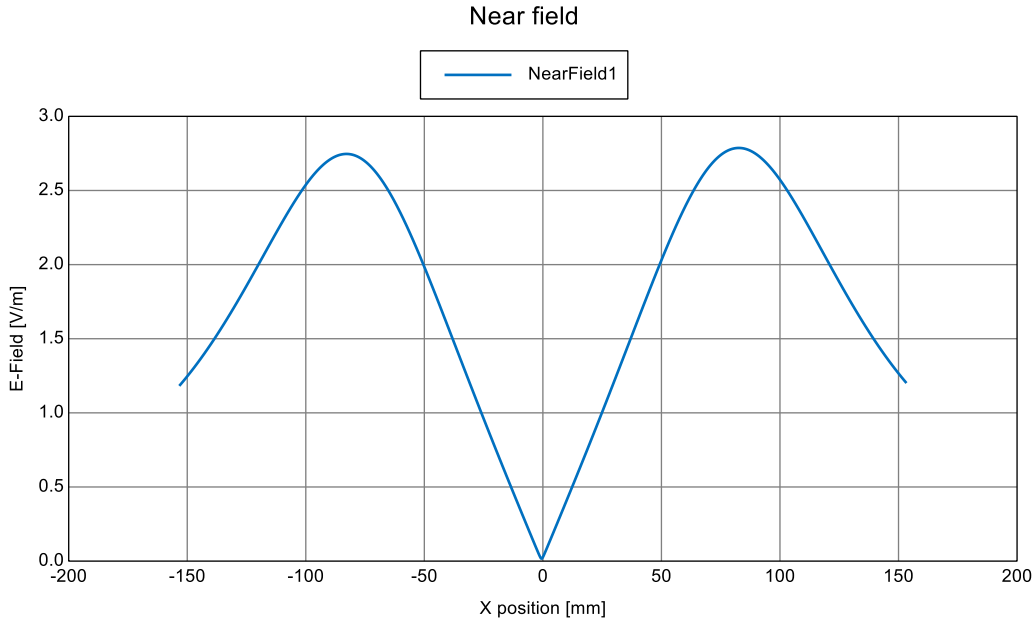
Magnitude of the x-component of the electric field on the line parallel to x axis



ر١.HFSS



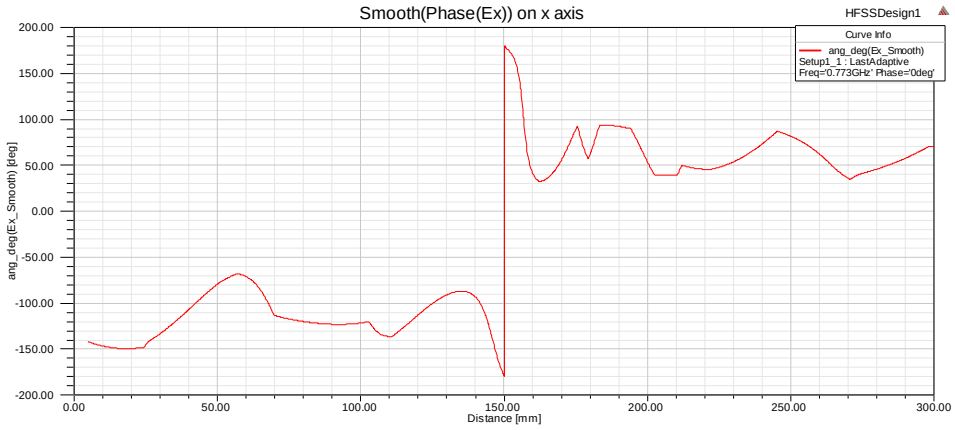
ر٢.CST



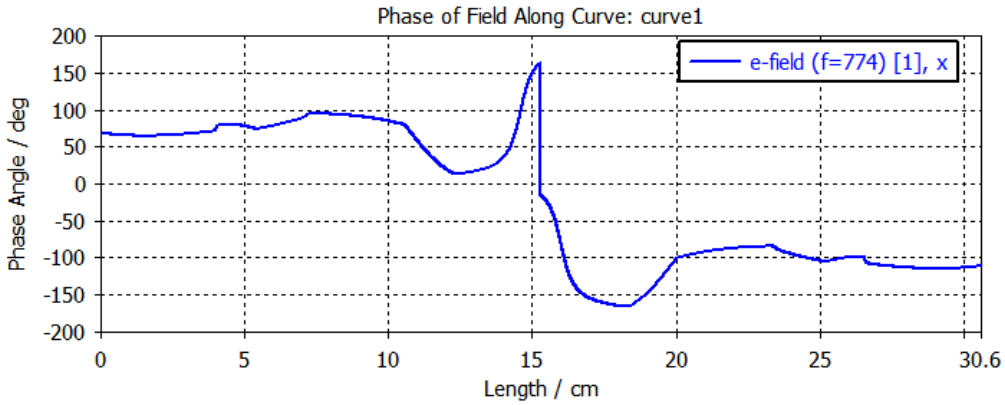
. E-Field Magnitude [V/m] (Frequency = 774 MHz; Y position = 0 m; Z position = 60 mm) - 0

ر٣. FEKO

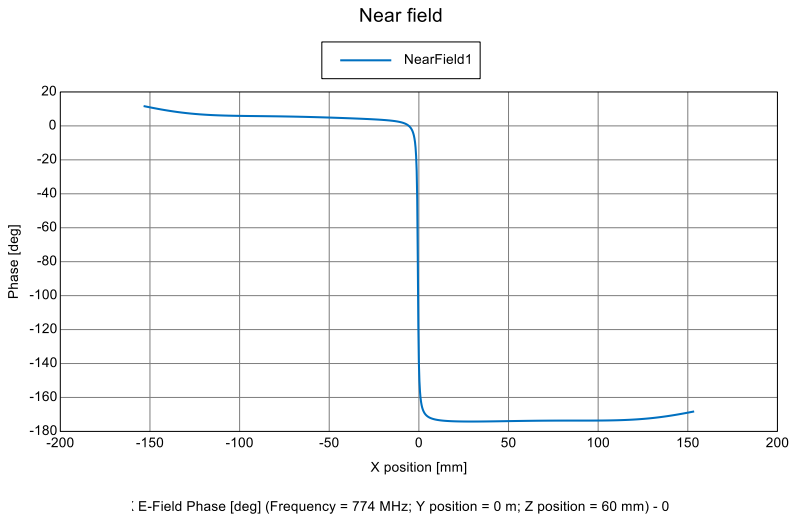
Phase of the x-component of the electric field on the line parallel to x axis



شکل۳-۶HFSS



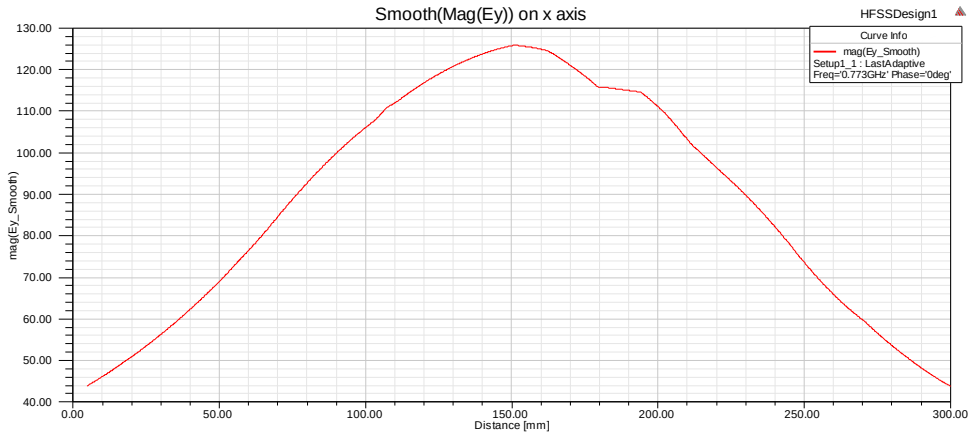
شکل۳-۵.CST



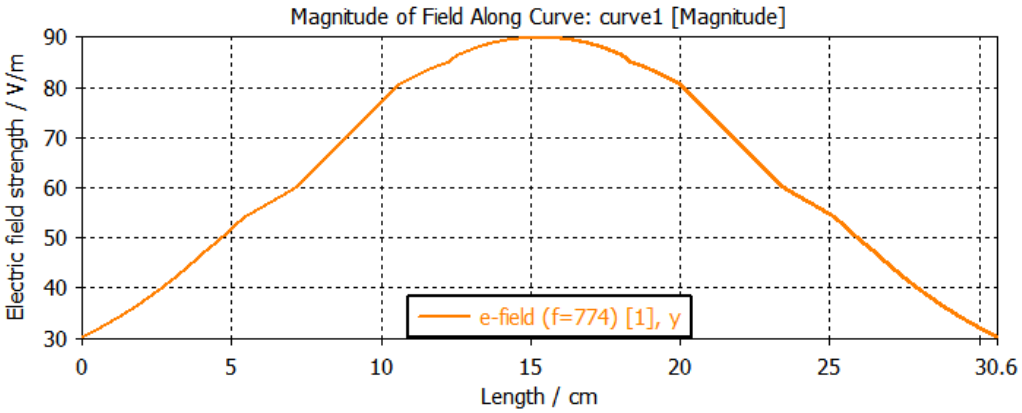
: E-Field Phase [deg] (Frequency = 774 MHz; Y position = 0 m; Z position = 60 mm) - 0

شکل۳-۷FEKO

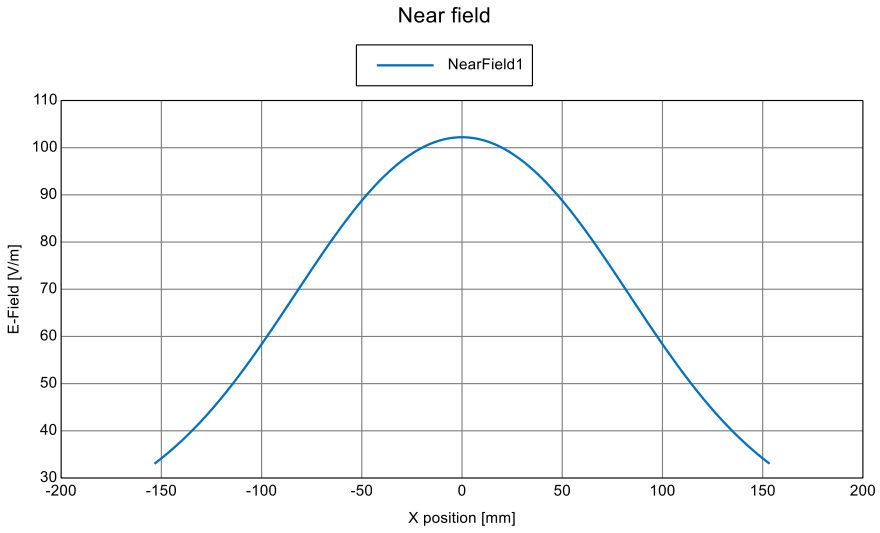
Magnitude of the y-component of the electric field on the line parallel to x axis



شکل ۲۷ HFSS



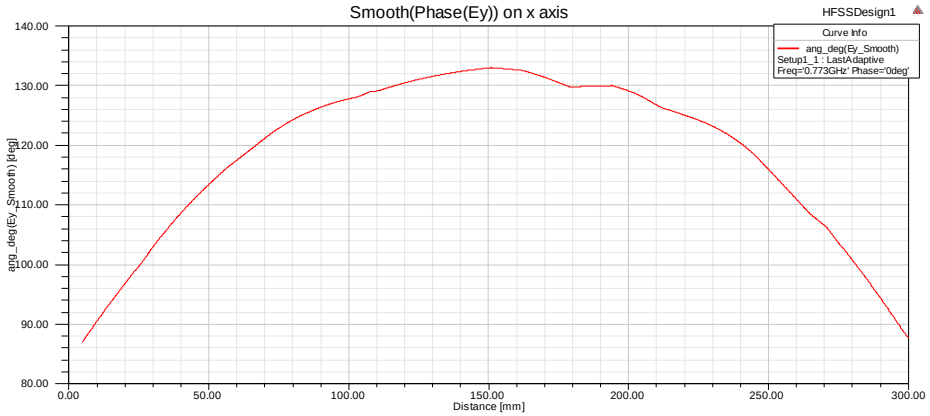
شکل ۲۸ CST



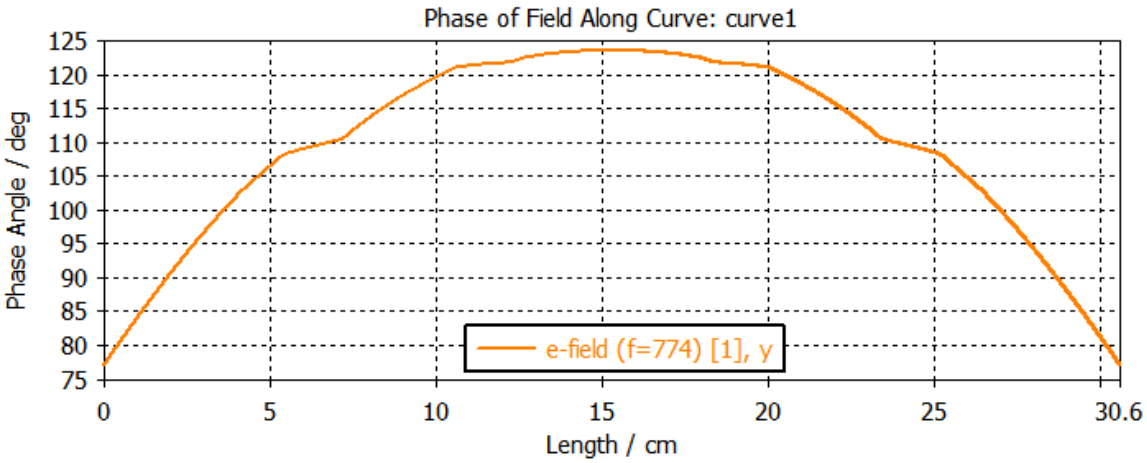
′ E-Field Magnitude [V/m] (Frequency = 774 MHz; Y position = 0 m; Z position = 60 mm) - 0

شکل ۲۹ FEKO

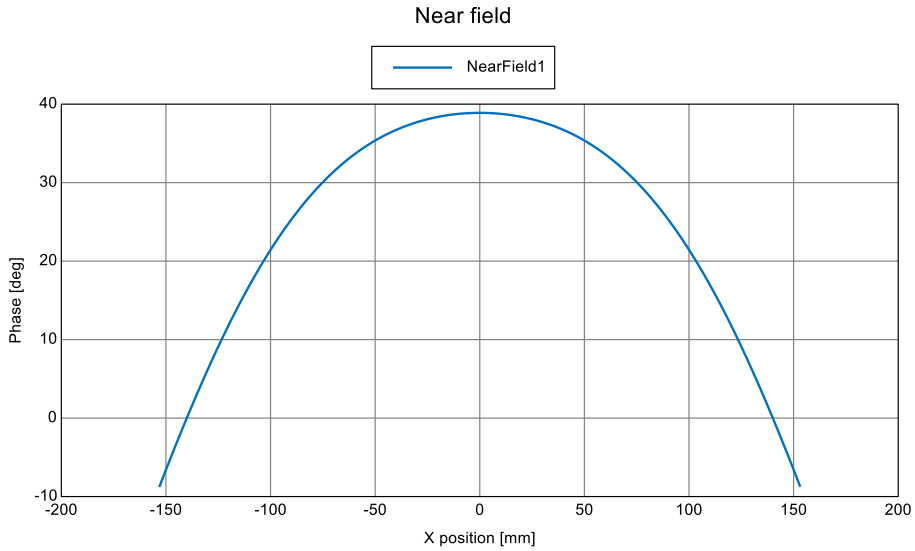
Phase of the y-component of the electric field on the line parallel to x axis



۴۰HFSS



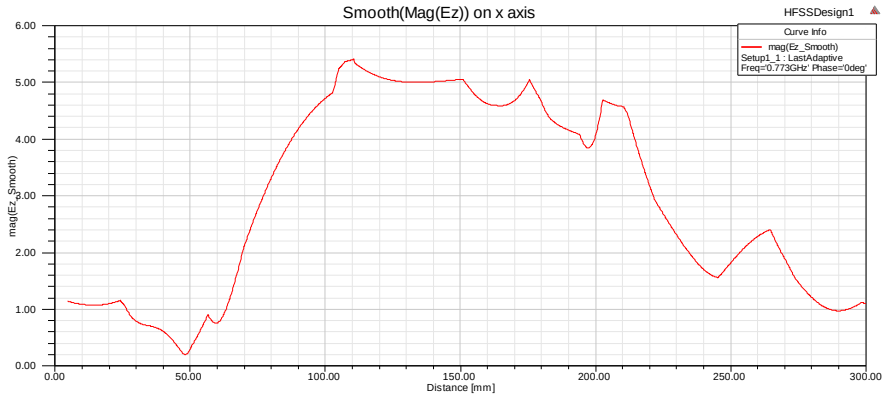
۴۱CST



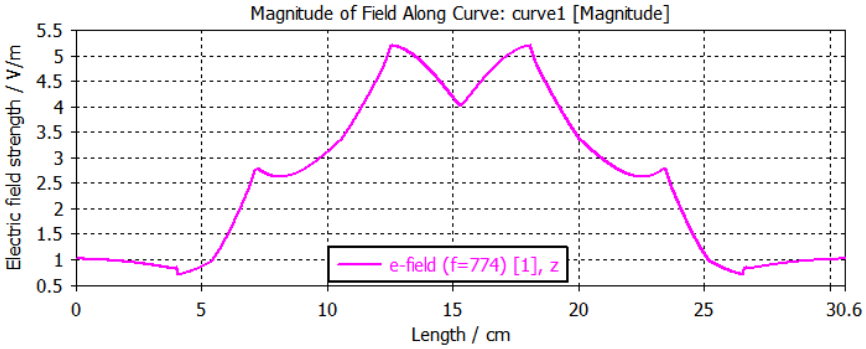
' E-Field Phase [deg] (Frequency = 774 MHz; Y position = 0 m; Z position = 60 mm) - 0

۴۲FEKO

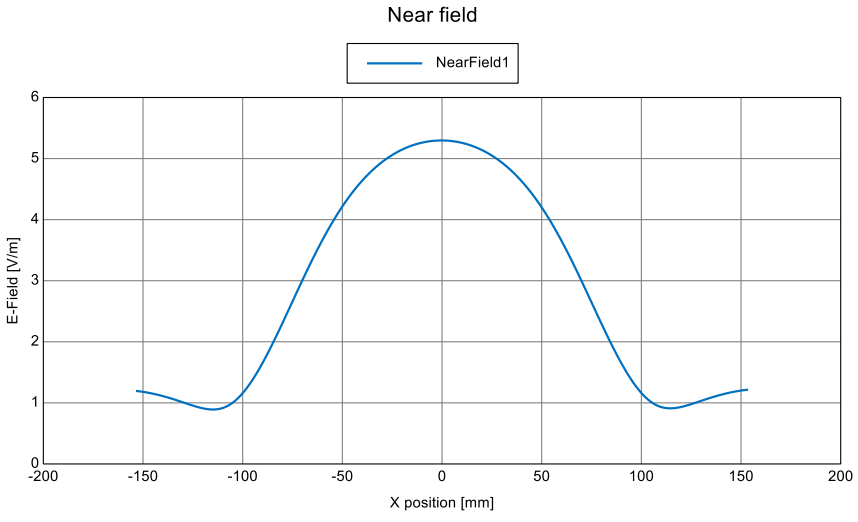
Magnitude of the z-component of the electric field on the line parallel to x axis



۴۳.*HFSS*



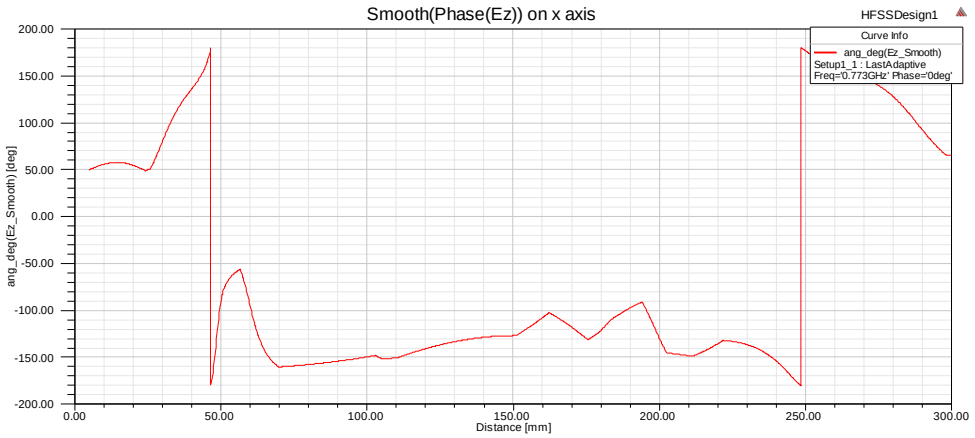
۴۴ *CST*



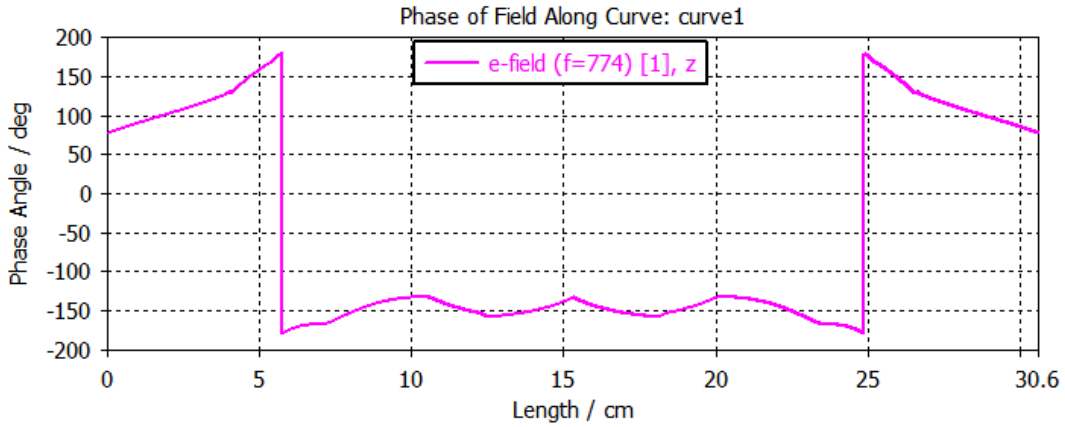
: E-Field Magnitude [V/m] (Frequency = 774 MHz; Y position = 0 m; Z position = 60 mm) - 0

۴۵*FEKO*

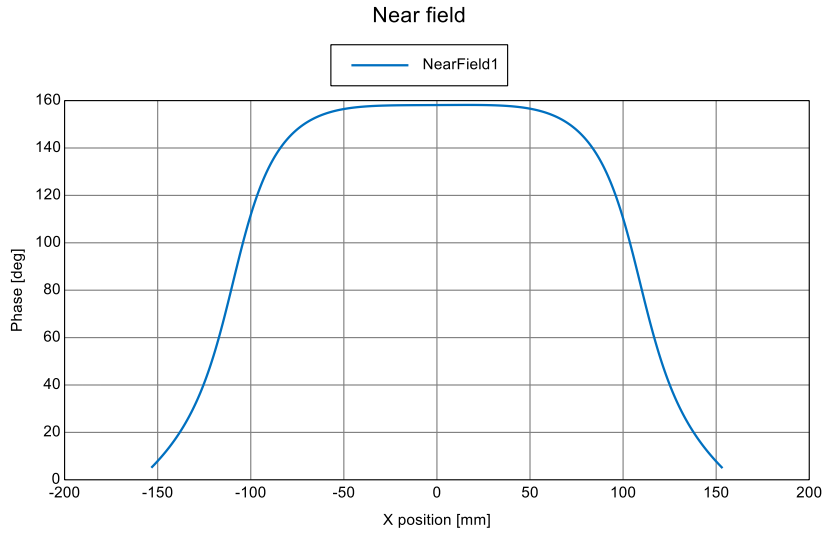
Phase of the z-component of the electric field on the line parallel to x axis



۴۶HFSS



۴۷.CST



: E-Field Phase [deg] (Frequency = 774 MHz; Y position = 0 m; Z position = 60 mm) - 0

۴۸.FEKO

It is seen that:

The results of the CST software in the case of

- The phase Z component of the electric field on the line parallel to y axis

and

The results of the FEKO software in the case of

- The magnitude of X component of the electric field on the line parallel to y axis
- The phase of X component of the electric field on the line parallel to y axis
- The phase of Z component of the electric field on the line parallel to y axis
- The phase of Z component of the electric field on the line parallel to x axis

and

The results of the HFSS software in the case of

- The phase of X component of the electric field on the line parallel to y axis
- The phase of Z component of the electric field on the line parallel to y axis

are completely different from the results of the two other softwares (despite partial similarity of the field behavior in other cases).

The question is why it is such different.