NPN_Curve

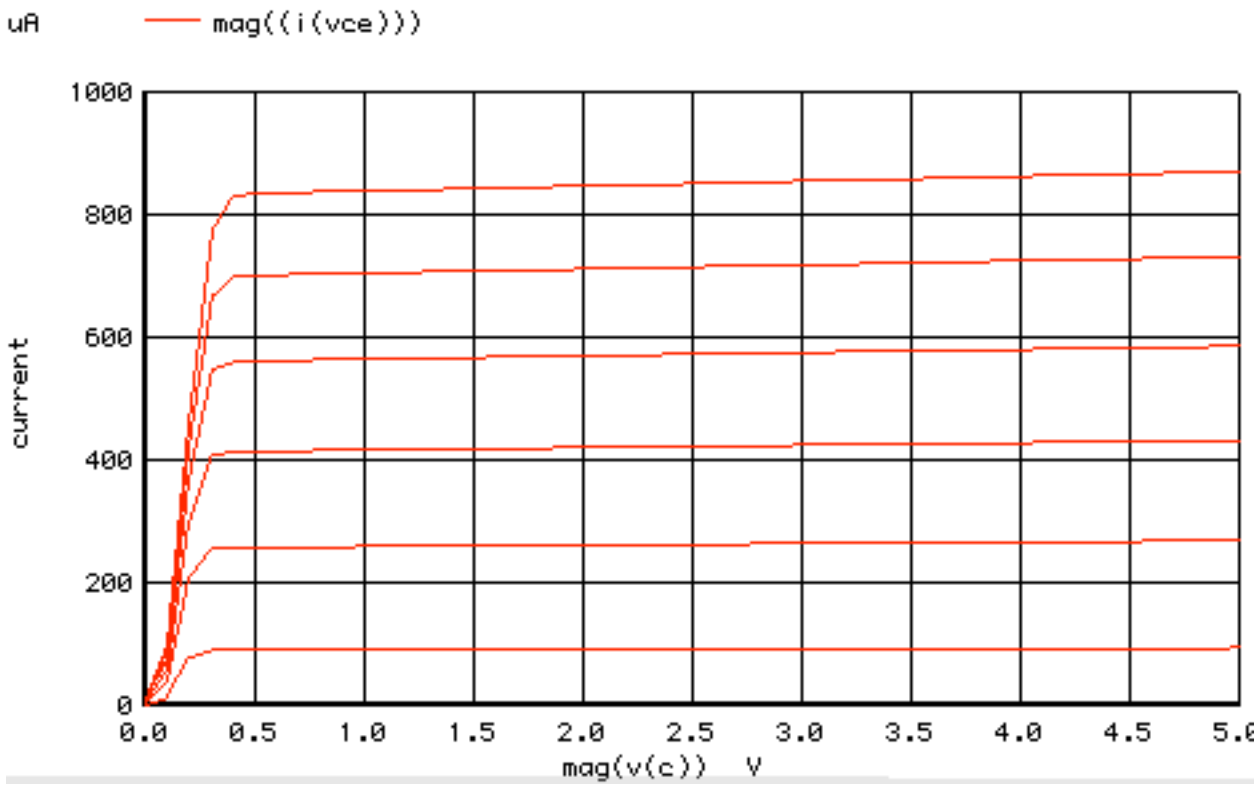
```
* LOOK At  Beta, RC, VAF, VSAT
*
*
*     ____
*    |    0|                    _________
*    |     _|_                  |         | VCE
*    |    /   \                 |C       _|_
*    |    \ _ /                 |       /2v \
*   _|_   /|_|\              _  |'  npnv  \___/
*   ///  /\_/\          B  __|`->
*        \___/                |   0       |
*     IB  |                   |           |
*         |___________        |___________|
*                                  |
*                                 _|_
*                                 ///
*

VCE       C   0   DC   2V
IB        0   B   DC   10u
Q1        C   B   0    NPNV

.control
dc        vce 0V 5V .1V  ib 1uA 10uA 2uA
run
plot      mag((i(vce))) vs mag(v(c))  title Typical_CurveTracer
setscale c
plot      -i(vce)                     title Typical_CurveTracer
.endc

.MODEL  NPNV    NPN(
+ IS=15.51E-18  NF=1.005     BF=110      VAF=130.2    IKF=0.0057
+               NR=1.006     BR=0.4822   VAR=4.286    IKR=
0.0002472
+ ISE=9.15E-17  NE=2
+ ISC=1E-21     NC=2
+ RB=732        RBM=441.2                             IRB=7.5E-04
+ RE=15.33      RC=109.1
+ CJE=1.727E-14 VJE=0.6408   MJE=0.2563
+ CJC=1.826E-14 VJC=0.6399   MJC=0.3531
+ CJS=2.939E-14 VJS=0.3488   MJS=0.1813  XCJC=0.4201
+ TF=1.65E-11   XTF=1.25     VTF=1       ITF=0.003532
+ TR=6E-09      FC=0.88      PTF=205
+ KF=1.000E-16  AF=1
+ XTB=2         EG=1.11      XTI=5       TNOM=25       )
.END
```

```
**
**
**                                  (C)     NPN
**     SPICE MODEL
**    <actual_behavior>
**    <varies from spice model !>   / RC 110ohms    VAF=215
**                                  \
**                                  /                    4fF
**
**
**
```


uA
mag((i(vce)))
1000
800
600
400
200
0
current
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
mag(v(c)) V