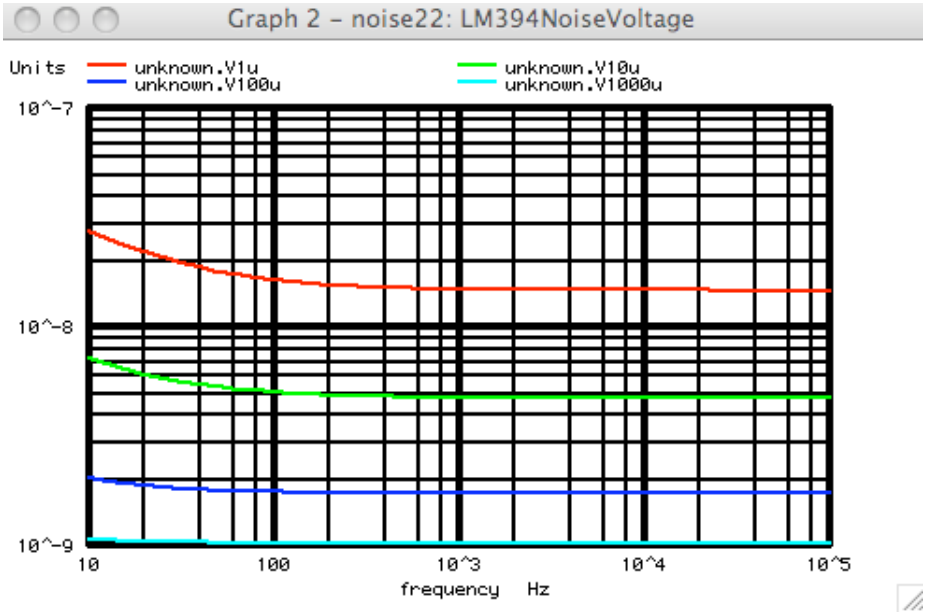
========BJT Noise Voltage Test=========

HOW TO DO NOISE MODEL VERIFICATION.



BJT Noise Voltage Test

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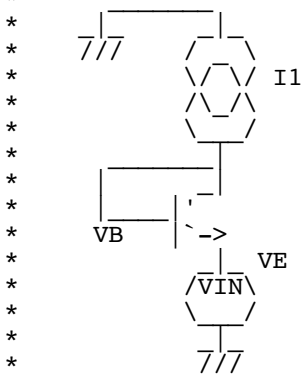
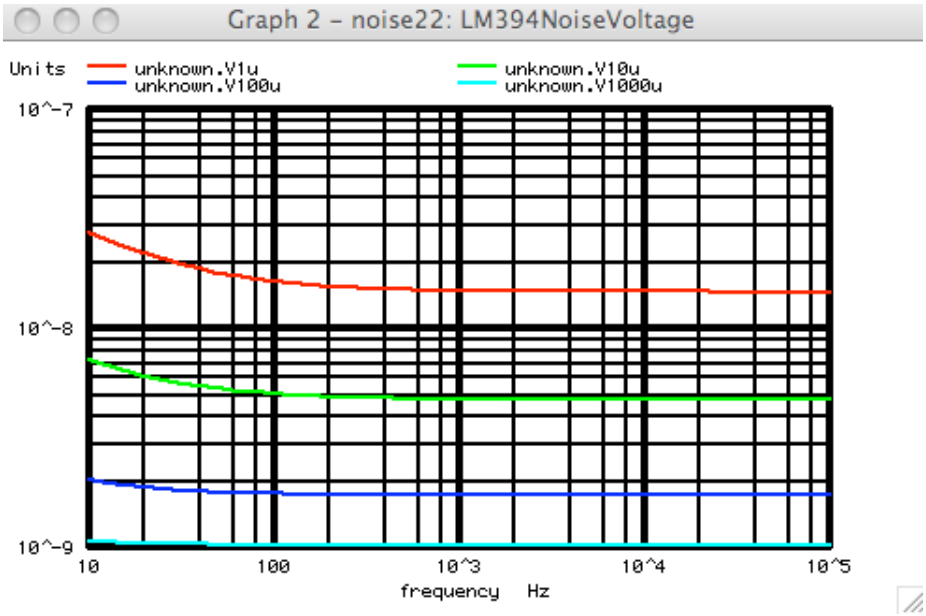



```
vin                VE   0   DC     0.0 ac 1.0u
I1                 0    VB  1uA
q1                 VB   VB  VE     LM394
.model             LM394 npn kf=.3e-16 af=.75 bf=600 rb=50
.control
setplot            new
let                "V1u"     =      0*vector(41)
let                "V10u"    =      0*vector(41)
let                "V100u"   =      0*vector(41)
let                "V1000u"  =      0*vector(41)

op
noise              v(vb) vin dec 10 10 100k 1
destroy
let                unknown.V1u = sqrt(v(onoise_spectrum))

alter              I1       dc   = 10u
op
noise              v(vb) vin dec 10 10 100k 1
```

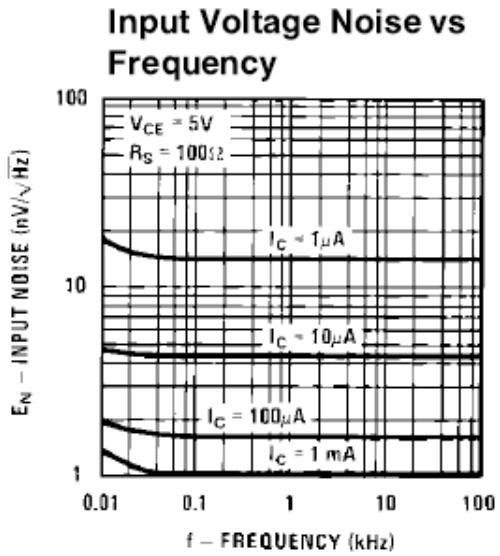
```
destroy
let               unknown.V10u = sqrt(v(onoise_spectrum))

alter             I1      dc  = 100u
op
noise             v(vb) vin dec 10 10 100k 1
destroy
let               unknown.V100u = sqrt(v(onoise_spectrum))

alter             I1      dc  = 1000u
op
noise             v(vb) vin dec 10 10 100k 1
destroy
let               unknown.V1000u = sqrt(v(onoise_spectrum))

set               pensize = 2
plot unknown.V1u unknown.V10u unknown.V100u unknown.V1000u vs frequency loglog title
LM394NoiseVoltage

echo              "    ... done."
.endcontrol
.end
```

==========END==========

Them match between the LM394 data sheet and the simulation may not be perfect, but one can play around with the parameter values in the model.



Spice likes to think in terms of power. Therefore a square root function needs to be applied to the output noise. In the output noise is onoise_spectrum. The refered to input noise is the should equal the output noise divided by the gain.



For the LM394, noise is pretty much set by the base resistance RB = 50 and the shot noise of a perfect transistor. At the 1mA current level the base current 1/f noise is just beginning to be felt. The match of the simulation and the Silicon may need some finer adjustments in the KF and AF values.

```
.model              LM394 npn kf=.3e-16 af=.75 bf=600 rb=50
```