
ATMEL

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Comparing HICUM v2.1 simulation results (ELDO, ADS, SPECTRE)

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approach used for comparison

- use same model card of reference BJT for each simulator tested
- run same simulations
- post processor used : IC-CAP
- extract spread of results

The next slide shows the simulation results with different simulators and the difference of each one vs mean.

Legend :

black color : difference < 1%

blue color : 1% <= difference < 5%

pink color : 5%<= difference<10%

red color : 10% <= difference



HICUM LEVEL 2.1		Spectre	ELDO	HPEESOFSIM		Spectre	ELDO	HPEESOFSIM
Comparison of Simulation Results		4.46.011302)	v5.6_1.2	190.300				
simulation conditions					average	deviation	deviation	deviation
						(%)		
IC(A)	VCE=0.3V VBE=0.91V	2.014E-02	2.016E-02	1.864E-02	1.965E-02	2.5	2.6	-5.1
IB(A)	VCE=0.3V VBE=0.91V	1.540E-03	1.520E-03	1.493E-03	1.518E-03	1.5	0.2	-1.6
IC(A)	VCE=0.8V VBE=0.6V	3.005E-06	2.983E-06	2.993E-06	2.994E-06	0.4	-0.4	0.0
IB(A)	VCE=0.8V VBE=0.6V	4.721E-08	4.590E-08	4.680E-08	4.664E-08	1.2	-1.6	0.4
IC(A)	VCE=2.8V VBE=1.0V	5.863E-02	5.885E-02	6.546E-02	6.098E-02	-3.9	-3.5	7.3
IB(A)	VCE=2.8V VBE=1.0V	4.749E-03	4.693E-03	4.524E-03	4.655E-03	2.0	0.8	-2.8
IC(A)	VCE=0.8V VBE=0.6V TEMP=125°C	5.848E-04	5.670E-04	5.710E-04	5.743E-04	1.8	-1.3	-0.6
IB(A)	VCE=0.8V VBE=0.6V TEMP=125°C	1.391E-05	1.872E-05	1.379E-05	1.547E-05	-10.1	21.0	-10.9
IC(A)	VCE=0.8V VBE=0.6V TEMP=-50°C	5.340E-09	5.311E-09	5.688E-09	5.446E-09	-2.0	-2.5	4.4
IB(A)	VCE=0.8V VBE=0.6V TEMP=-50°C	9.890E-11	6.900E-11	9.870E-11	8.887E-11	11.3	-22.4	11.1
ISUB(A)	VEC=0.5V VBE=0.6V	-3.615E-09	-3.599E-09	-3.589E-09	-3.601E-09	0.4	-0.1	-0.3
MSG(dB)	VCE=0.8V VBE=0.79V F=1.077GHz	2.303E+01	2.284E+01	2.281E+01	2.289E+01	0.6	-0.2	-0.4
MAG(dB)	VCE=0.8V VBE=0.79V F=10.77GHz	6.357E+00	6.260E+00	6.408E+00	6.342E+00	0.2	-1.3	1.0
GU(dB)	VCE=0.8V VBE=0.79V F=10.77GHz	6.734E+00	6.638E+00	6.789E+00	6.720E+00	0.2	-1.2	1.0
Ftmax(GHz)	VCE=2.8V F=1.797GHz	2.283E+01	2.275E+01	2.283E+01	2.280E+01	0.1	-0.2	0.1
Ftmax(GHz)	VCE=2.8V F=1.797GHz TEMP=125°C	1.733E+01	1.632E+01	1.730E+01	1.698E+01	2.0	-3.9	1.9
Ftmax(GHz)	VCE=2.8V F=1.797GHz TEMP=-50°C	2.819E+01	2.818E+01	2.821E+01	2.819E+01	0.0	0.0	0.1
Y21	VCE=0.8V VBE=0.835V F=179.7MHz	3.410E-01	3.290E-01	3.230E-01	3.310E-01	3.0	-0.6	-2.4
CBE(F)	VBE=0V F=1MHz	2.494E-13	2.494E-13	2.489E-13	2.492E-13	0.1	0.1	-0.1
CBE(F)	VBE=1V F=1MHz	1.898E-13	1.899E-13	1.896E-13	1.898E-13	0.0	0.1	-0.1
CCB(F)	VBC=0V F=1MHz	8.264E-14	8.265E-14	8.247E-14	8.259E-14	0.1	0.1	-0.1
CCB(F)	VBC=1V F=1MHz	6.301E-14	6.301E-14	6.295E-14	6.299E-14	0.0	0.0	-0.1
CSC(F)	VSC=0V F=1MHz	6.000E-14	6.001E-14	5.979E-14	5.993E-14	0.1	0.1	-0.2
CSC(F)	VSC=1V F=1MHz	4.020E-14	4.020E-14	4.015E-14	4.018E-14	0.0	0.0	-0.1

Conclusion

unexpected differences found with simulation results using different simulators

possible reason :

- **implementation differences**
- **influence of simulator default values**

possible workaround for default value differences :

- **add default values of one simulator to models for the other ones**

test cases and reference simulation results would be extremely usefull

largest differences :

- **base current vs temperature in ELDO**
- **collector current, esp. saturation in ADS**
- **y21 in Spectre**