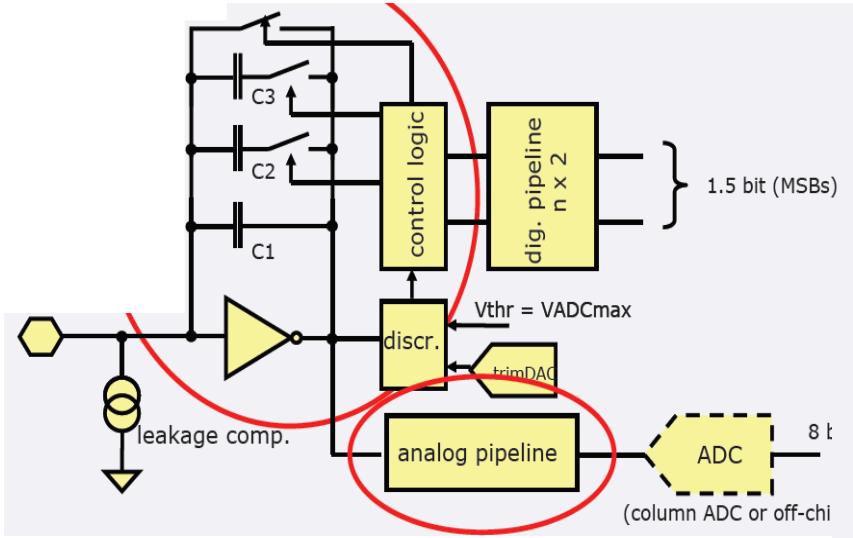
HPAD 0.2

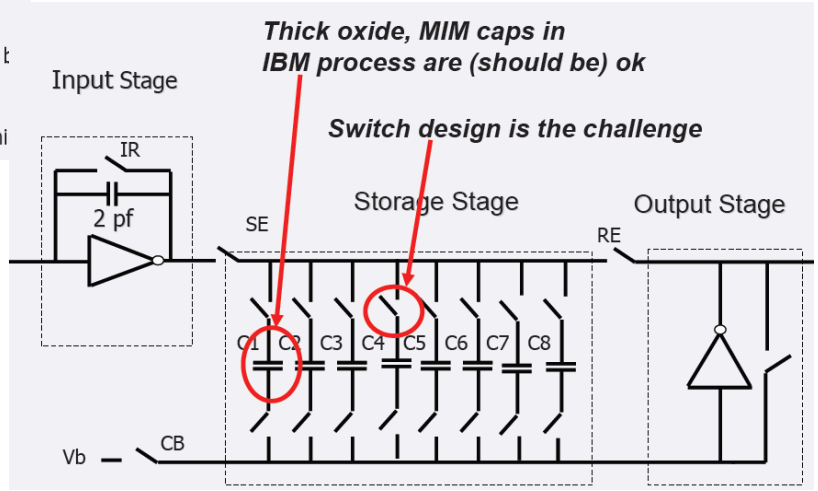
Measurement results HPAD 0.2

+ Proposal for a radiation hard Storage Cell

Sabine Sengelmann, Ulrich Trunk

Storage cells





HPAD 0.2

8 variants of storage cells:

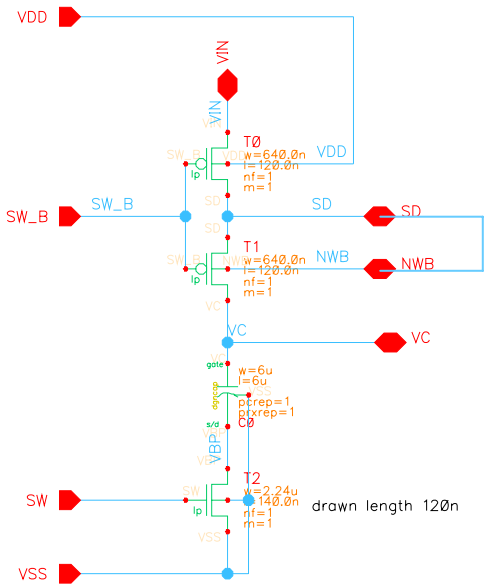
3 enclosed

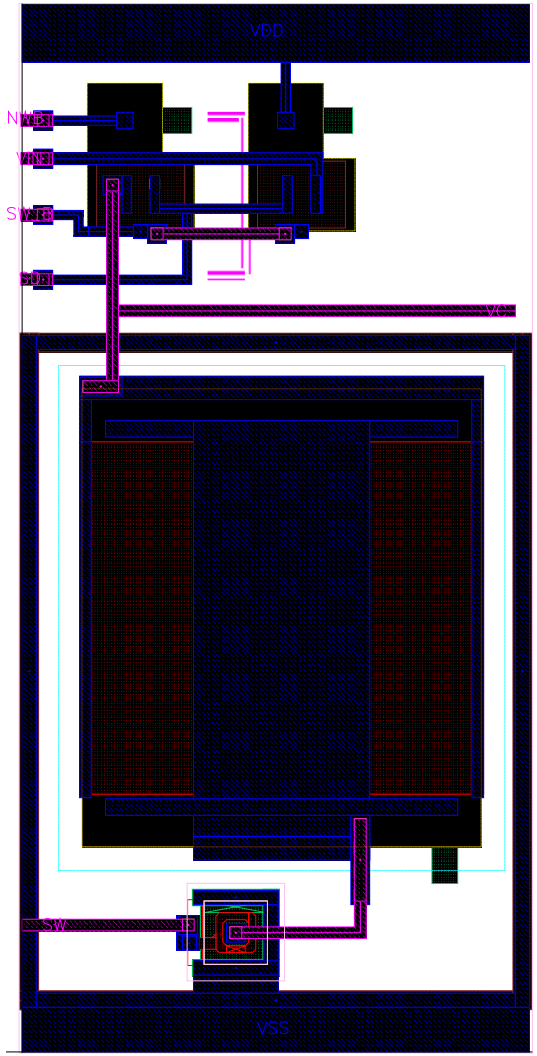
5 linear

Cell #	Enc.	D/S	V_{THR}	W/L	NWELL	SD	Comments
1	Y	S	LP	2.24/0.12	external	-	W_{min} = 2.24 for enc. layout
2	Y	S	LP	2.24/0.24	external	-	
3	Y	S	LP	2.24/0.36	external	-	
4	N	S	LP	0.32/0.12	external	-	
5	N	S	LP	0.64/0.12	external	-	
6	N	S	LP	0.64/0.24	external	-	
7	N	D	LP	0.64/0.12 (both)	external	external	
8	N	D	LP	0.64/0.12 (both)	-	-	Int. connection $V_{SD} = V_{NWELL}$

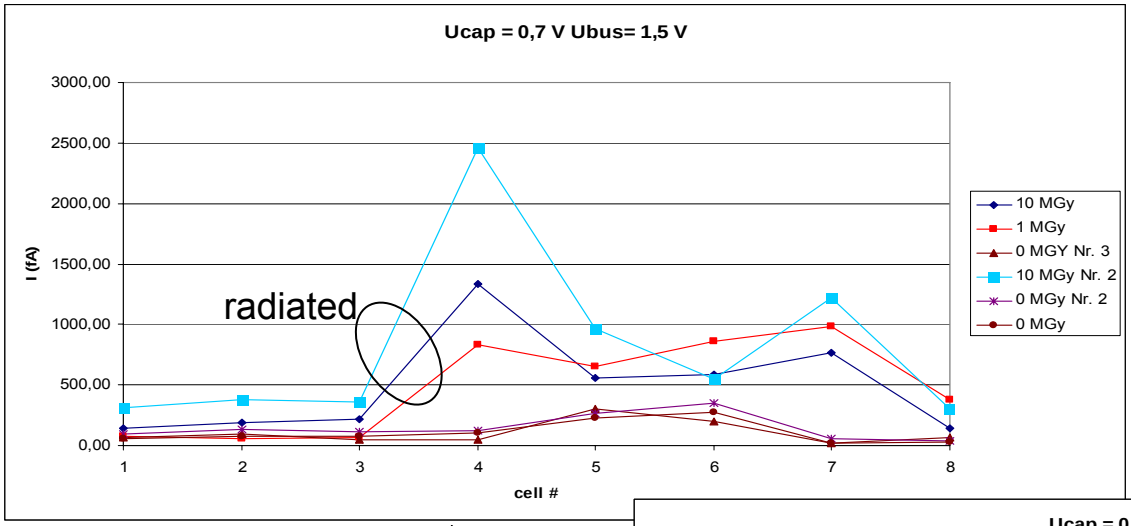
“Cell 8”

- Dual linear LPPMOS
- NWELL of lower FET connected to intermediate node



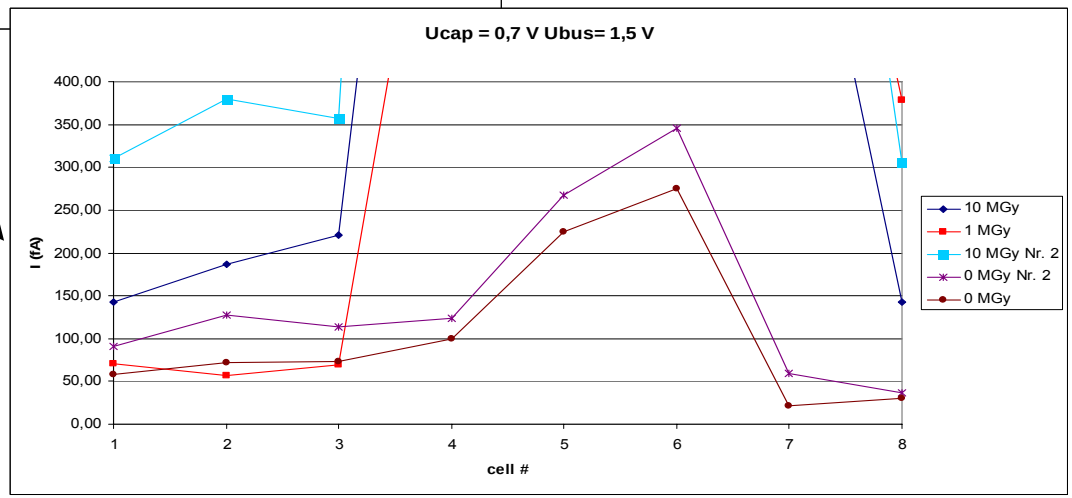


Leakage current
Performance of “Cell 1 - 8”



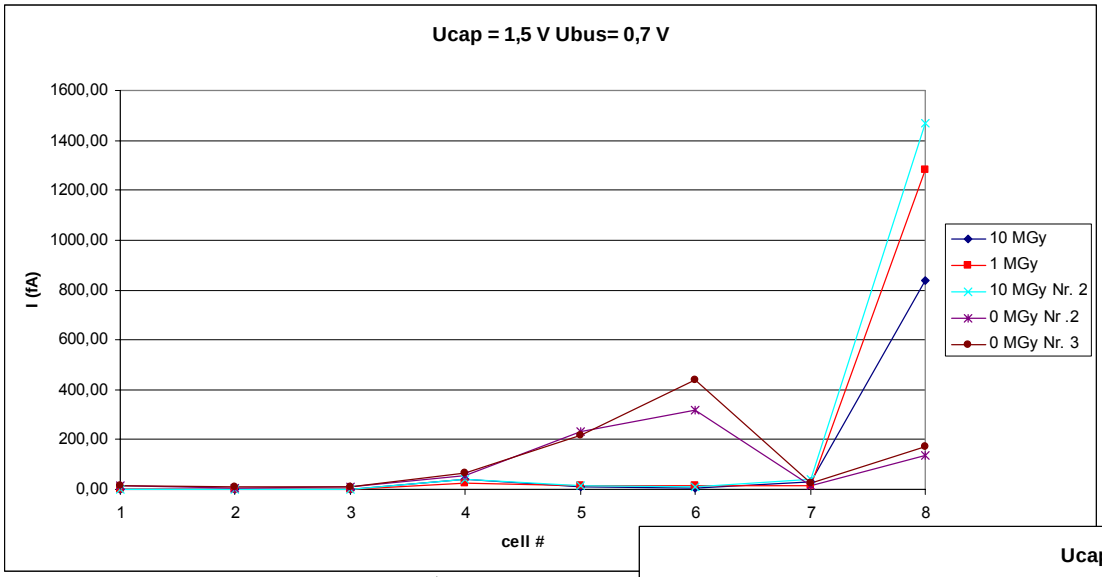
Ucap < Ubus

With expanded Y scale



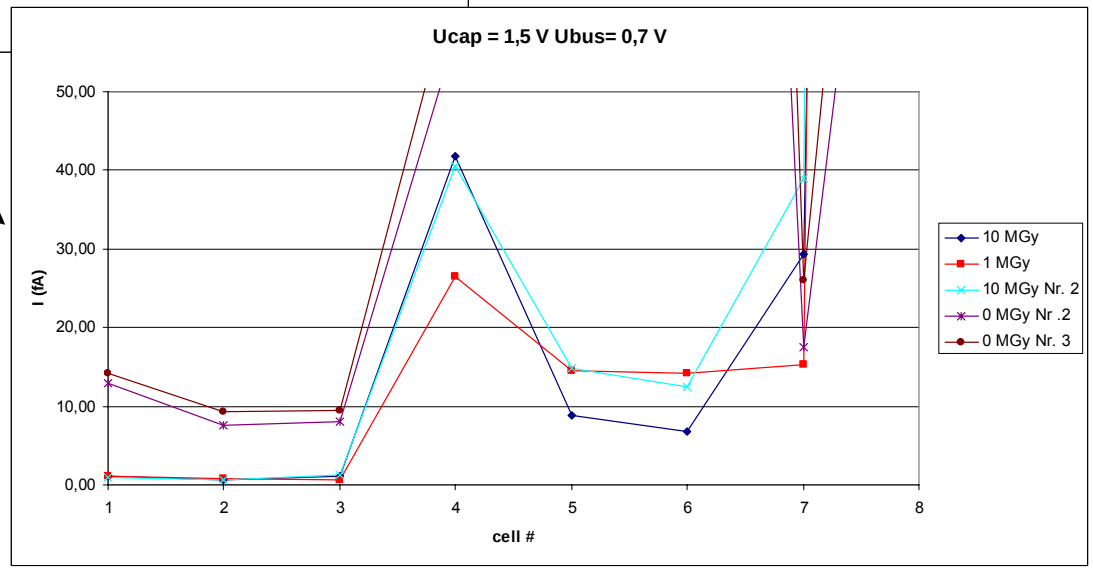
The measurement is done to check the different leakage currents of the cells of HPAD 0.2 (SC_ARRAY). The leakage current is derived from the drop ΔU on the capacitor for the storage time Δt; Ucap: Vin at the moment when the amplitude of the voltage is stored; UBUS: Vin shortly after the storage

Leakage current Performance of “Cell 1 - 8”

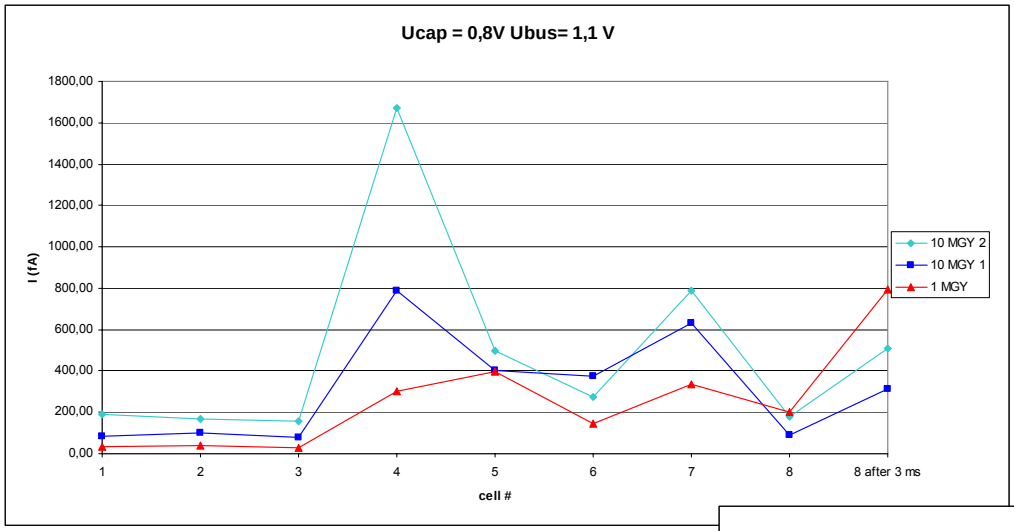


Ucap > Ubus

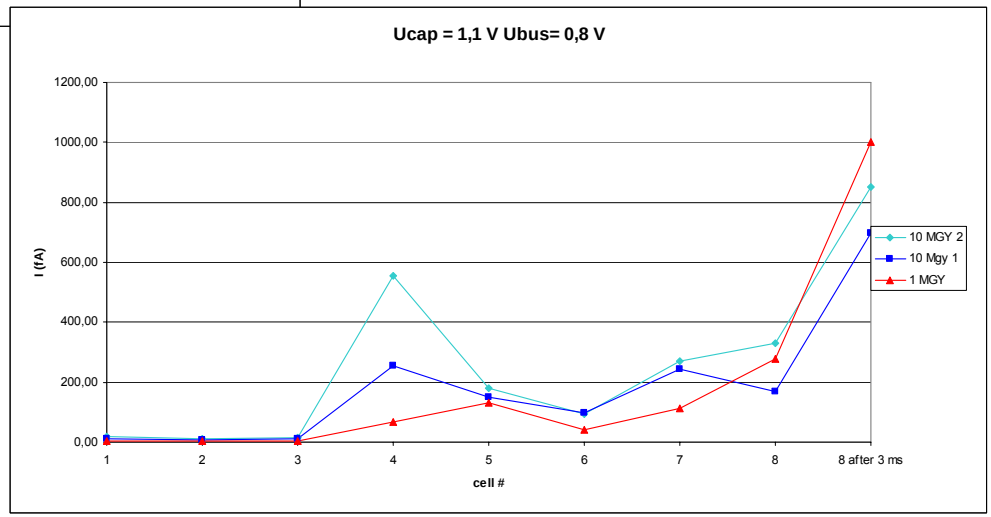
With expanded Y scale



Leakage current
Performance of “Cell 1 - 8”



Ucap < Ubus

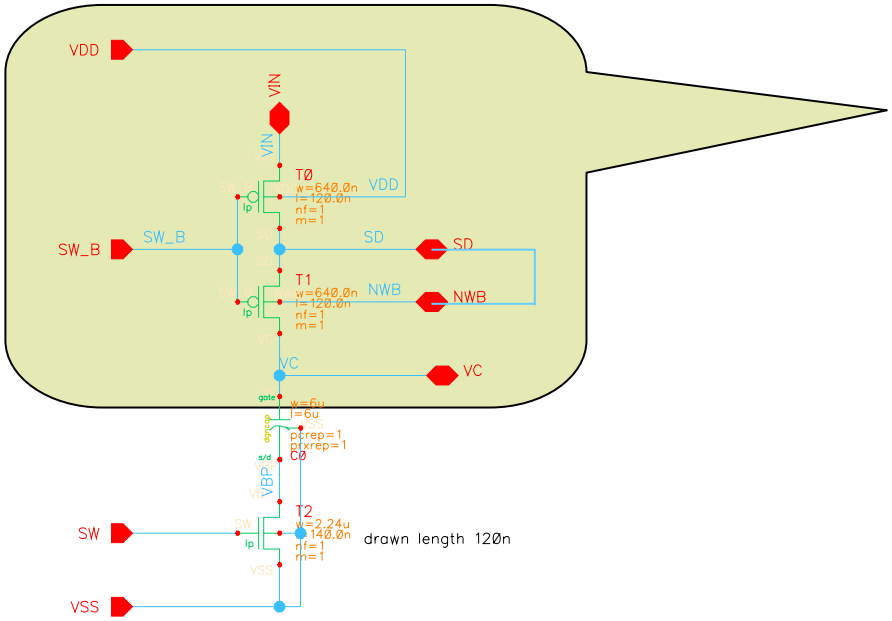


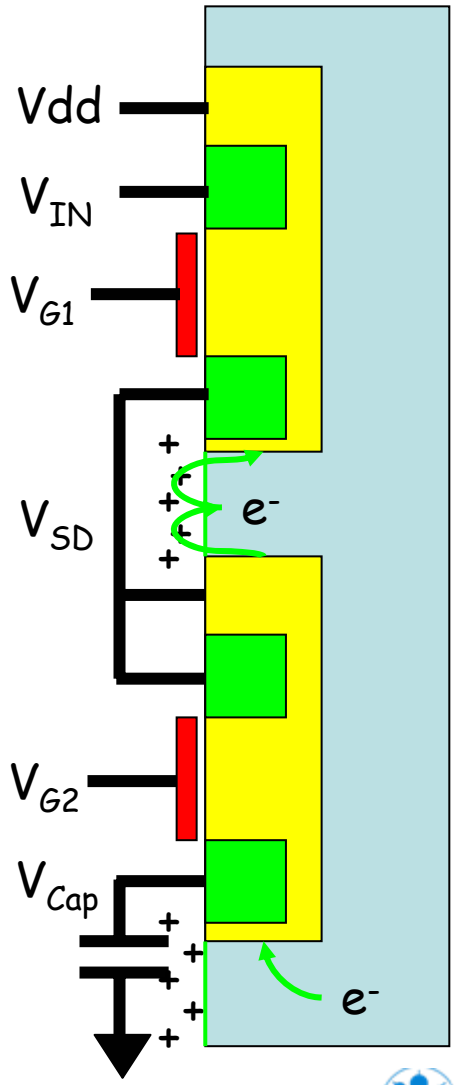
Ucap > Ubus

Failure Analysis of “Cell 8”

After Irradiation:

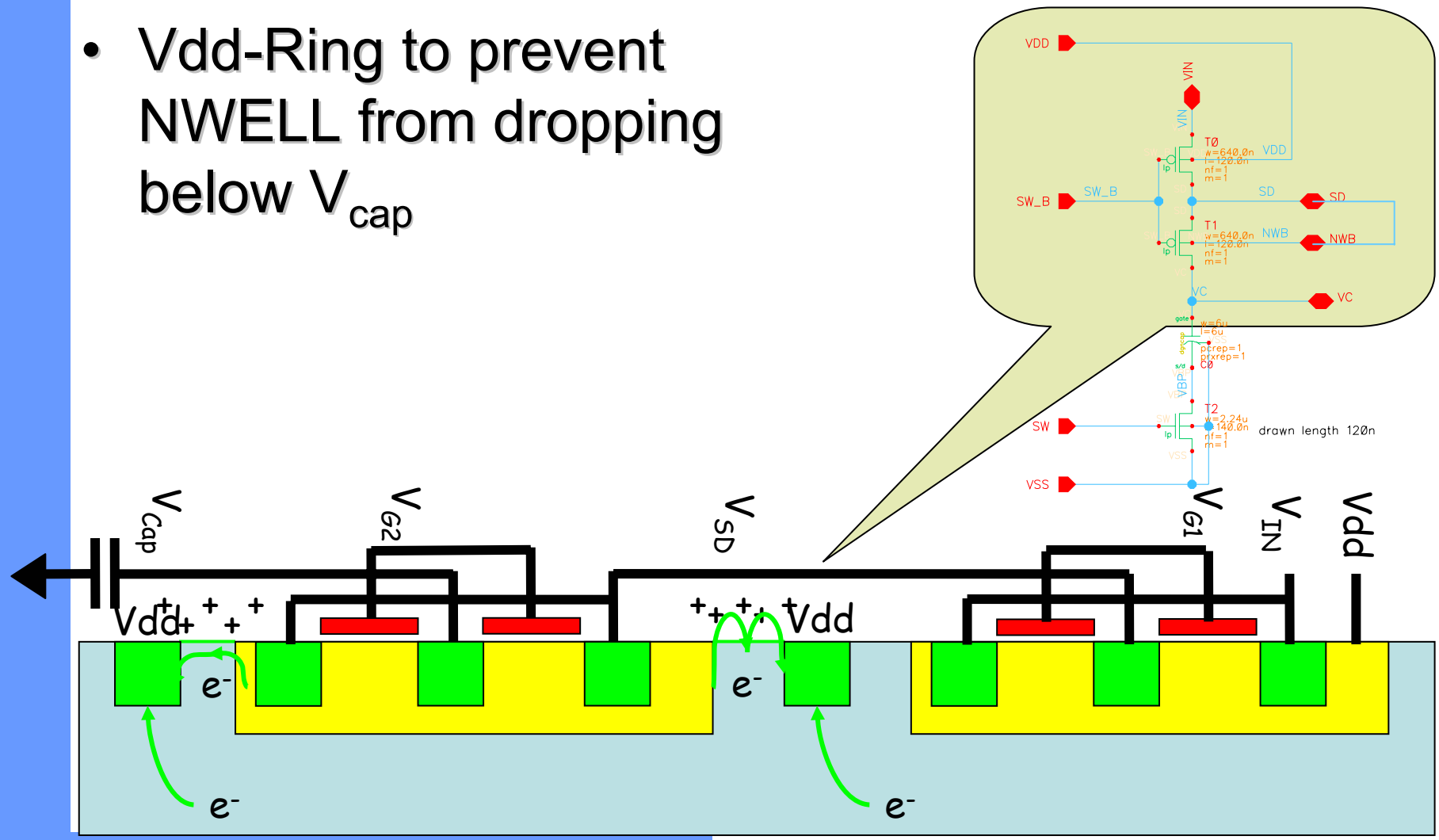
- Lower leakage of Enclosed Cells (1-3)
- High Leakage of “Cell 8”





Modified “Cell 8”

- Vdd-Ring to prevent NWELL from dropping below V_{cap}



Modified “Cell 8”

Modified “Cell 8” should combine the Advantages of

- Enclosed Layouts
- Suppression of Leakage

after Irradiation