## Agostino Pirovano (apirovan)

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**Subject:** SSM JDP Project mtg: Minutes 2018-W03

### SSM JDP PROJECT MEETING: 2018-WW03 MINUTES

**SR71B data on lot 0170032.003 "BL tapering" (Mattia)**

- Lot testing comments
  - Testing has moved to 85C
  - Low confidence of actual BL profile due to misprocess (wrong BL W thickness)
- Vt medians and Vt shift
  - As previously observed, 20nm WL W thickness has the downside of less effective seasoning (especially on low state). So the Vt evolution from 1k to 128k cycles is larger
  - Set seasoning seems partially better on no lamina groups
  - Tapered vs straight profile has ~100mV higher reset Vt with same set Vt
- Median drift 1us-10s @85C (128k cycles)
  - For no lamina groups drift is slightly higher
  - For the other 20nm W WL groups, drift is slightly lower then POR
  - Straight vs tapered profile @BL has higher drift
- Vt window and sigma
  - No lamina groups (aggressive tapering @WL) show the usual boost in median window. Higher In% results in more boost (tapering)
  - Tapered profile @BL has similar window with POR. Straight profile has lower window
  - 1k cycles sigma data is affected by poor seasoning
  - Reset sigma is higher than set, as usual when we have tapering with negative reading
  - Tapered BL profile has worse sigma
- Projected Vt window @ 3.54sigma

- In general, lower WL W thickness needs more cycling to get a decent window
- Exceptions are the no lamina groups, that perform well even after 1k cycles

- Conclusions and recommendations
  - Lower WL W thickness is confirmed to have an ineffective seasoning, especially for set distributions, and this is mitigated in no lamina stacks. Upside is a small reduction for drift
  - Tapered profile @BL groups have distributions with worse sigma and presence of high Vt tails. Small toggle of tapered vs straight BL profile, with an increase of window ~100mV. The increase is due to higher reset Vt
  - No lamina groups (aggressive tapering @WL) confirm window boost (neg read), with In 4% having a larger window
  - PFA needed to check actual morphology of trials

**AR (Mattia): extend drift characterization to 2days@85C to completely assess the role of thin W**

**AR (Kolya): address physical analysis to verify the BL profiles for this lot**

**S26A probe data on lot 0173982.013 "K* camp on A1" (Lidia)**

- Periphery yield
  - Decent and matched to trendline for 1D0 FS S26
- Structure health
  - Decent and matched to 1D0 FS S26 baseline
  - WLWL 2E/3E have more wfs with EOW OEDWL can be under chop and w2w, eventually send for PFA
  - BLBL outer ring shading not SWR related, CMPs?
  - OPENS mostly driven by WLICS, 1E has higher quarter WL fail possibly broken WL
- Memory effect
  - Gain is proportional with In%
  - + 200mV from 1E to 3E possibly underestimated
- Set sigma and drift
  - Set Sigma is 20mV lower for exp alloys
  - drift slope at 54-57 mV/dec almost matched among exp
  - VL for this lot is higher than prev K*
- SET fail
  - downside for exp grp, Near Cells Set Fails

**SSM silicon update (Kolya)**

- PROD SWRs
    - K* second wave 3 lots (based on Rev3.3 )
        - 2 A0 7-way skews and 1 A1 4-way skew are all active in-line;
        - A1 lot shipped to Vimercate for testing
    - Additional SWRs in-line
        - A1 lot with reduced ambient is out
        - A1 lot with WSiN elimination skew
        - A1 with alloy #6 and WL single-step etch (Rev5 cell backup lot is also planned to start as soon as PVD chamber is ready)
        - A0 lot Camp N (with SiN-SAG)
    - Next development plan:
        - G* is more distant, Q2 activity
        - Dual deck setup is also Q2 activity, depending on the tape out schedule and first conversion layer
- Short term line conversions
    - Rev4.x – WSiN elimination; 55nm 2nd cut W
    - Rev5.x/6.x L1D and potential conversion in Q1'18
    - 65 NCMP FSL slurry and 350A 52 Nitride Cap
- Q1'18 priorities
    - Enable K* runner up alloy single step WL etch (Vt window demo)
        - NO Lamina (Cell rev5) – Mid February to probe
        - WITH lamina (Cell rev6) – Mid March to probe
    - Establish SSM Rev4.0 yield baseline (4-5 lots control groups on A1 material) as a basis for yield gap pareto to S26A full stack
        - **Initial yield summary can be based on control groups of lots SSM 30,34,36,37 lots by ww10**
- Dual-deck plan
    - Based on the reviewed tape-out plan, initial assessment on dual deck can be enabled by mid-Q2 (Si to probe)
    - Pull in and streamlining (reducing dependency on A3 and FPP) can potentially allow 2 full info-turns to probe on 2D before the end of Q2'18
    - Cell revision for 2D info-turns has to be defined before March (Rev6 D0 data still will not be available)