

Info for Paul

- Combined piezoresistive and piezoelectric cantilevers were fabricated for several high-speed biological and chemical force sensing applications.
- Three fabrication runs were performed in October and November of this year yielding devices incorporating piezoresistors, piezoelectrics, and both.
- The 3D align feature of the system was used for the final backside lithography step to release the cantilevers with DRIE.
- Four PM marks were patterned on the frontside of the wafer for 3D align at the same time as the other four alignment marks were patterned.

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- Key benefits of the ASML for our application...
 - **Flexibility:** We changed our process at the 11th hour, which normally would have required a mask redesign. Instead, we created a custom clearout image to remove material that would have otherwise prevented a subsequent etch step, allowing us to meet our deadlines. Also, separating the wafer layout from the reticle layout allowed us to modify our die layout several times through the process based upon lessons learned (e.g. wafer fragility due to the clamps in AMTEtcher)
 - **Performance:** The alignment accuracy and resolution allowed our designs to be extremely aggressive. Smallest features were 500nm.
 - **Cost:** We fit the designs for the three different fabrication runs with up to 6 layers onto a single reticle, with 40 total designs by mixing and matching images. This would have required at least 10 masks with a contact aligner.
- Without the 3D align feature of the ASML tool, we would have been forced to use a contact aligner for the backside lithography step, mitigating these benefits and slowing the fabrication process significantly.

Piezoresistive Microcantilevers

