

Notes on PXL Alignment

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CVS Tree Structure

```
. % dtree hft
. /star/institutions/ksu/margetis/hft/calib/hft
. '-----CVS
. '-----ist
. | '-----CVS
. '-----pixel
. | '-----calib
. | | '-----alignment
. | | | '-----CVS
. | | | '-----global
. | | | | '-----CVS
. | | | '-----local
. | | | | '-----CVS
. | | '-----CVS
. | | '-----survey
. | | | '-----CVS
. | '-----CVS
. '-----ssd
. | '-----CVS
. '-----StRoot
. | '-----CVS
. | '-----StHftPool
. | | '-----CVS
```

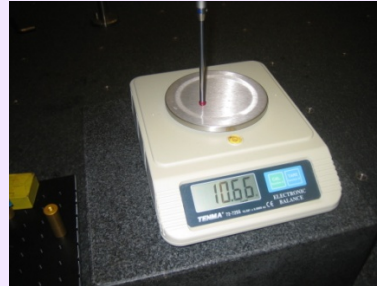
rcas6012 % dir hft/pixel/calib/survey

```
CVS/
Ball_test_30.dat
Ball_test_8.dat
f3d_minuit30.C
```

Outline

- The CMM
 - The tools and the accuracy (claimed and measured)
- Sample Data
 - Format
 - Code to manipulate it/reformat
 - Code to analyze it
- Outline of PXL survey procedure

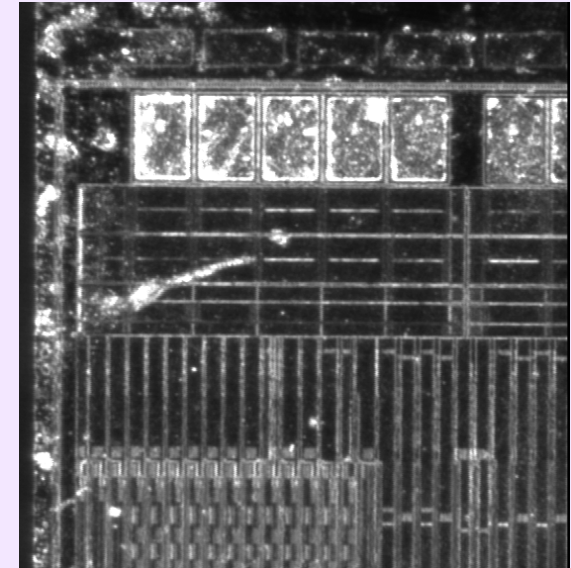
development of spatial map



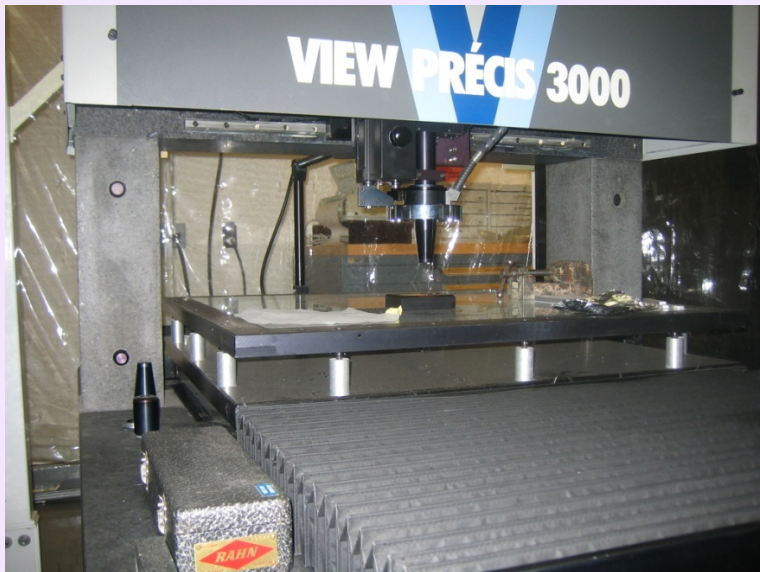
10 gm touch probe force

touch probe 2-3 μm (xyz) and visual 2-3 μm (xy) 50 μm (z)

active volume: huge



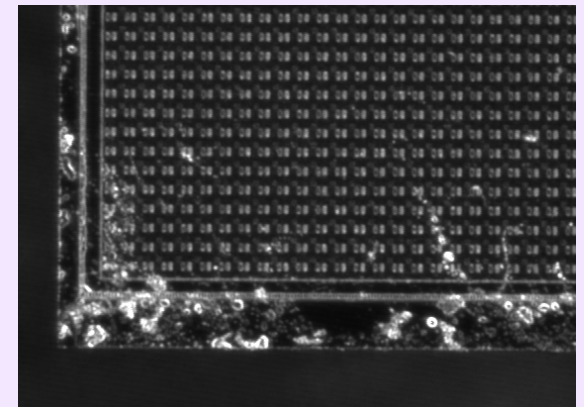
MEMOSTAR3, 30 μm pitch



visual sub micron (xyz) repeatability
5 μm accuracy over active volume

no touch probe

active volume:
30 in X 30 in X 12 in

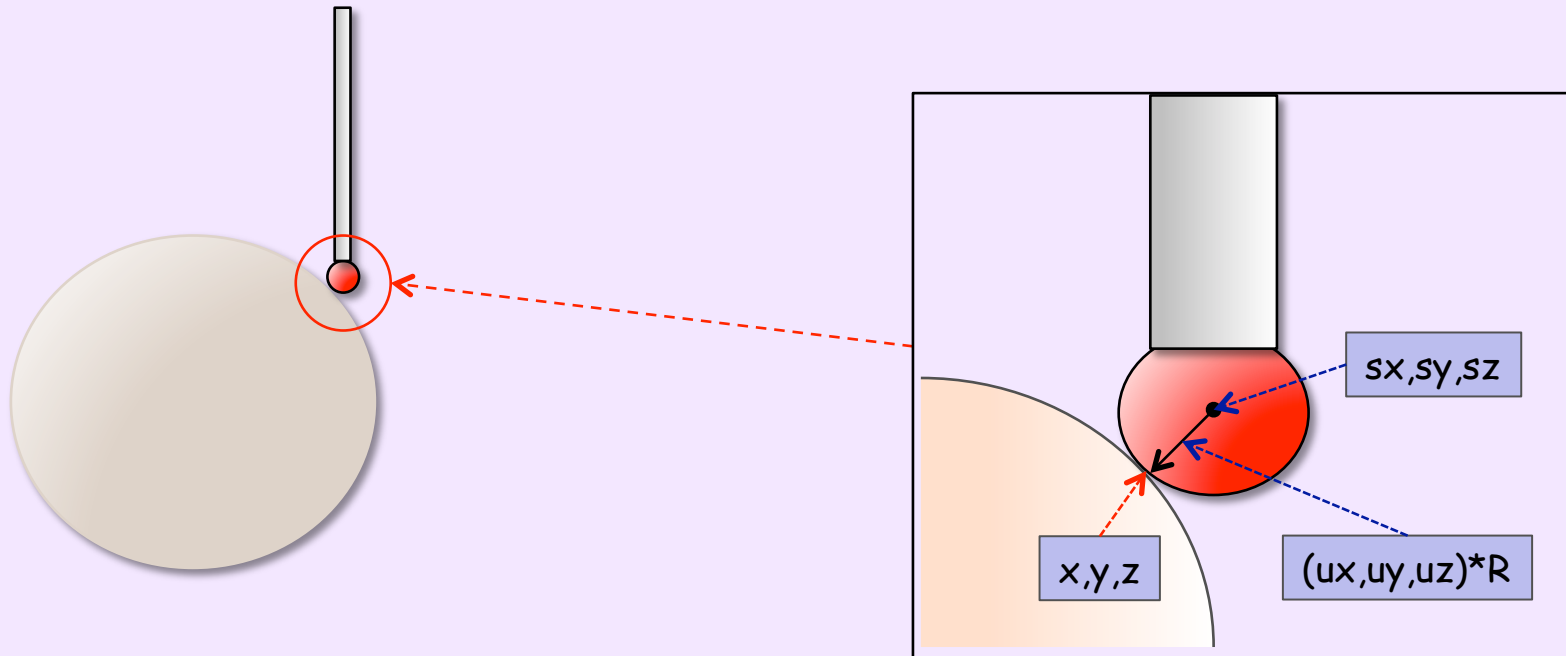


Data format

x	y	z
3.999321027720	-0.001003938440	-0.000767819730
3.998206983736	0.014041189594	0.009140107333
3.999429581487	0.486586482457	0.046341350006

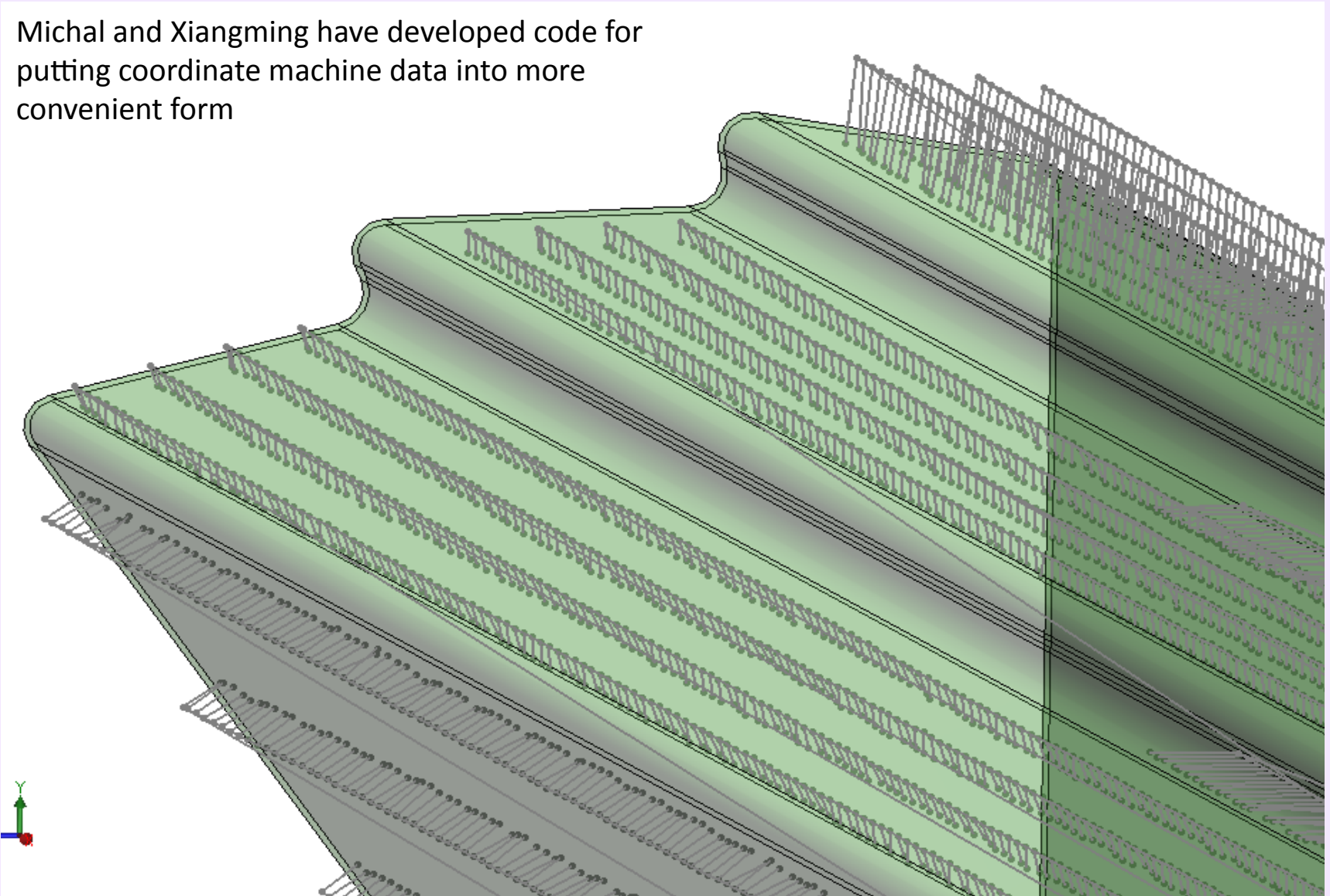
sx	sy	sz	ux	uy	uz	R
6.00099313695	-0.00100393844	-0.00076781973	-1.00000000000	0.00000000000	0.00000000000	2.00167210923
5.99979712073	-0.00110194800	-0.00080181117	-0.99995904812	0.00756524384	0.00496680673	2.00167210923
5.99115111246	0.29322055711	-0.00209618567	-0.99502886701	0.09660219796	0.02419853654	2.00167210923

$$(x,y,z) = (sx,sy,sz) + (ux,uy,uz)*R$$

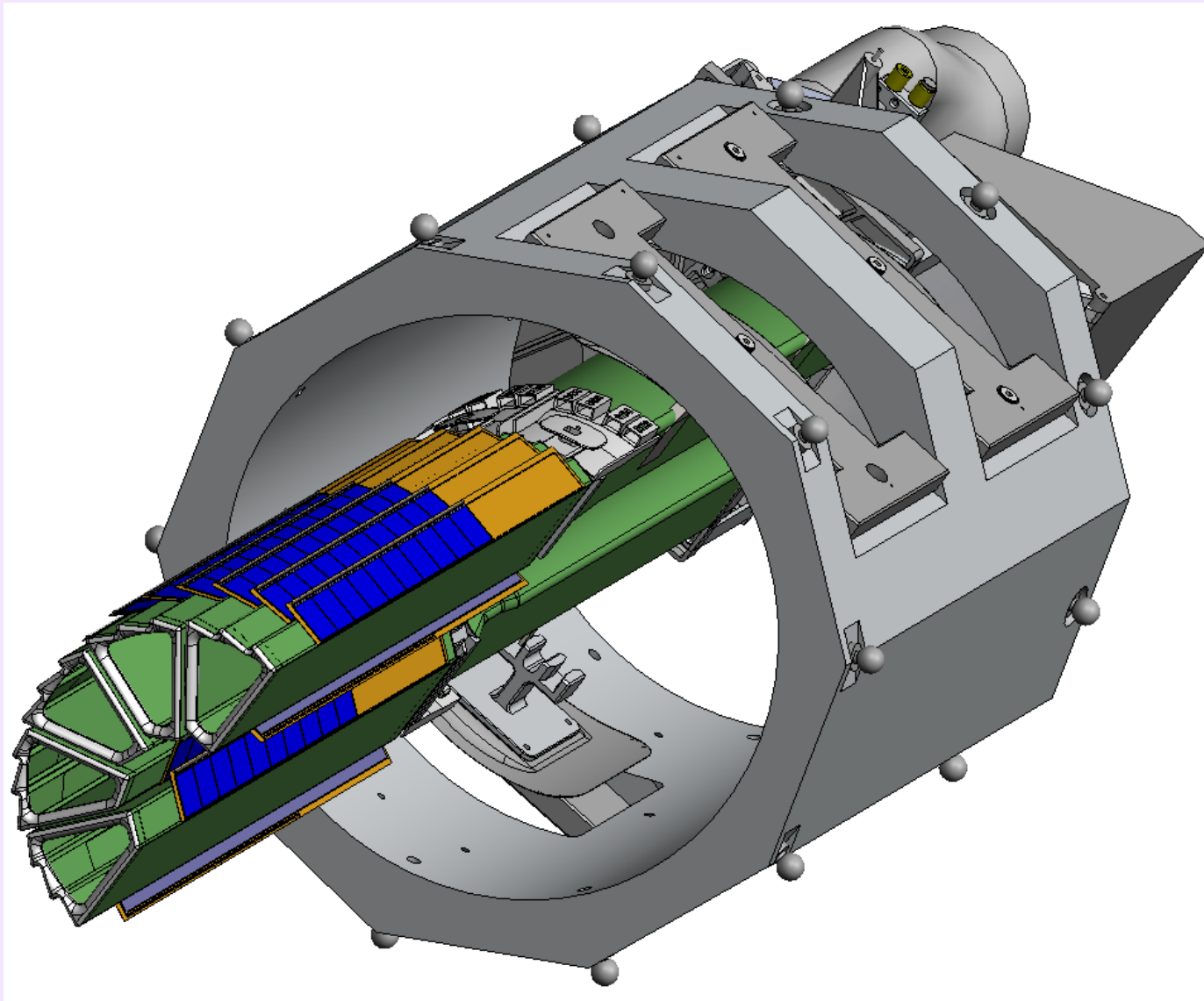


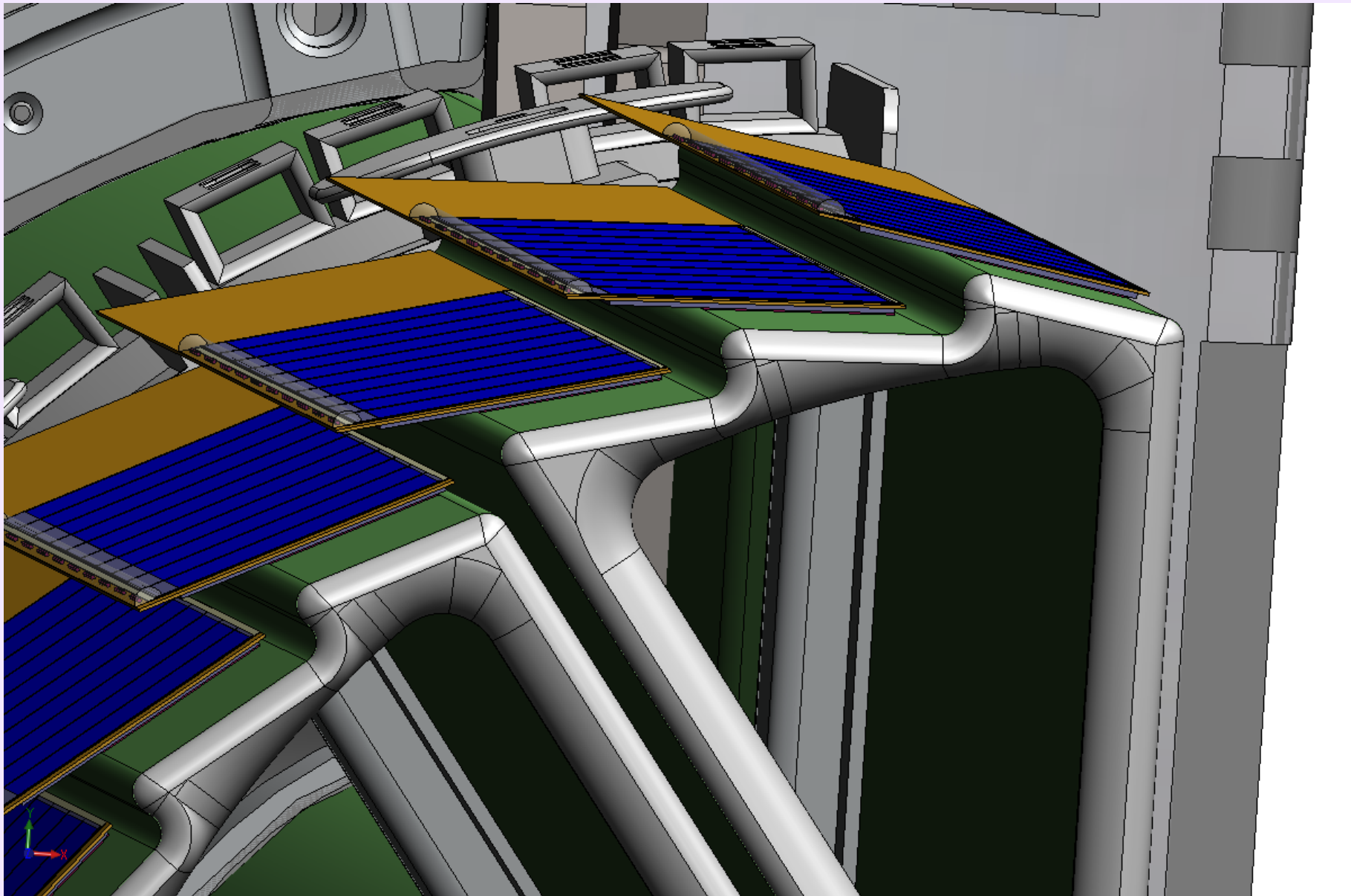
Visualization of touch probe data in solid works
Coordinate Measuring Machine gives touch probe ball location plus a unit vector in the direction of the touch force. This figure shows ball location plus ball radius times unit vector.

Michal and Xiangming have developed code for putting coordinate machine data into more convenient form



fixture also used for supporting half cylinder for CMM mapping of PXL surfaces





Summary