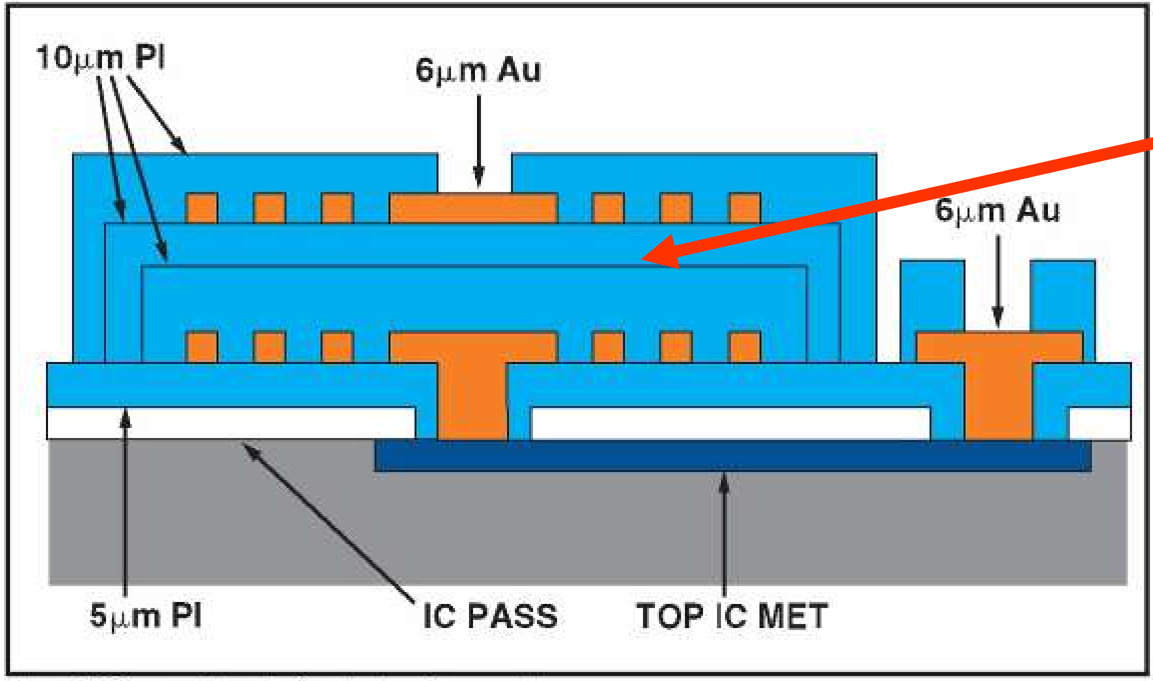


Figure 2. Cross section of iCoupler transformer coil.

Intra coil Insulation

Polyimide (Kapton)

Q @300 MHz

Top Coil = 20

Bottom Coil = 15

Technology CMOS

0.35 µm & 0.6 µm

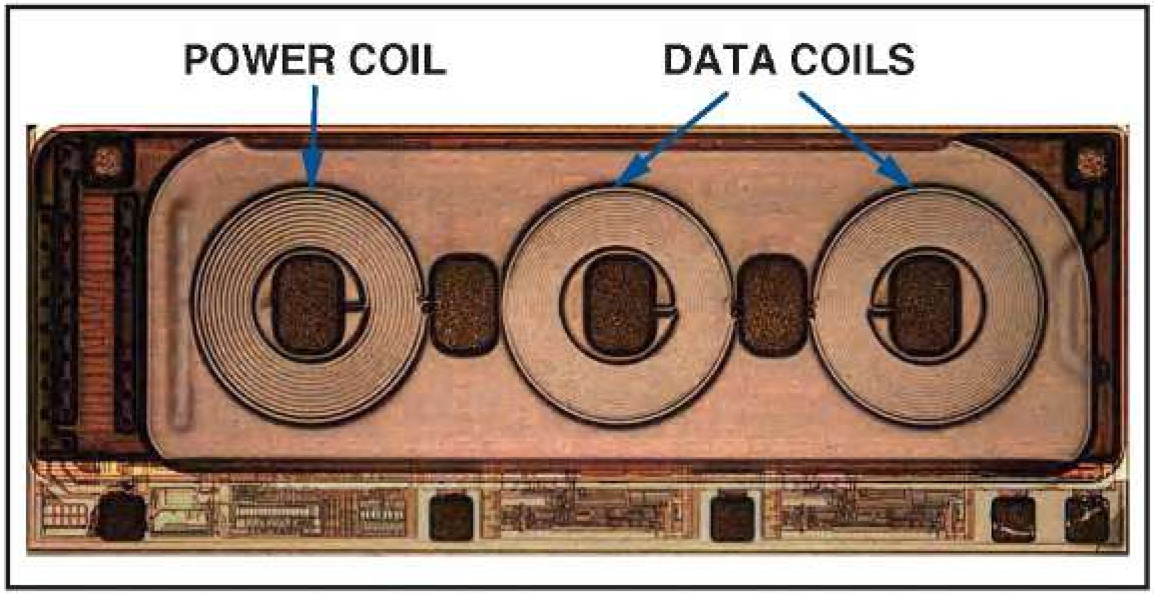
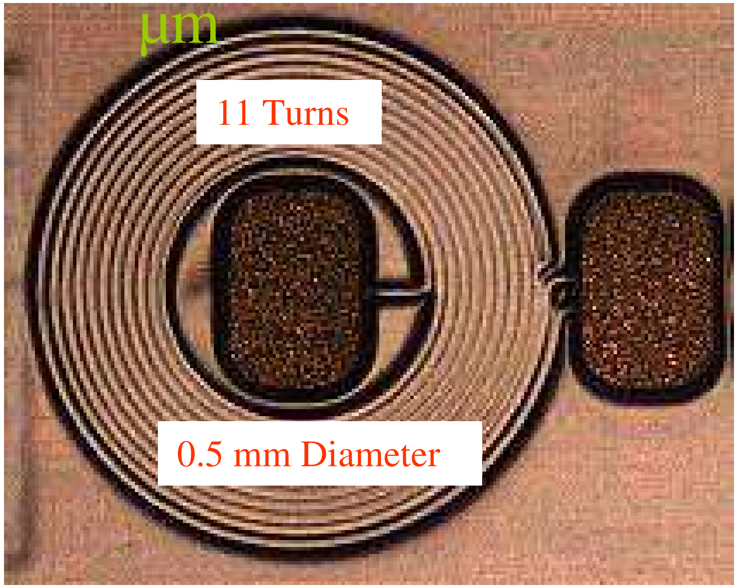
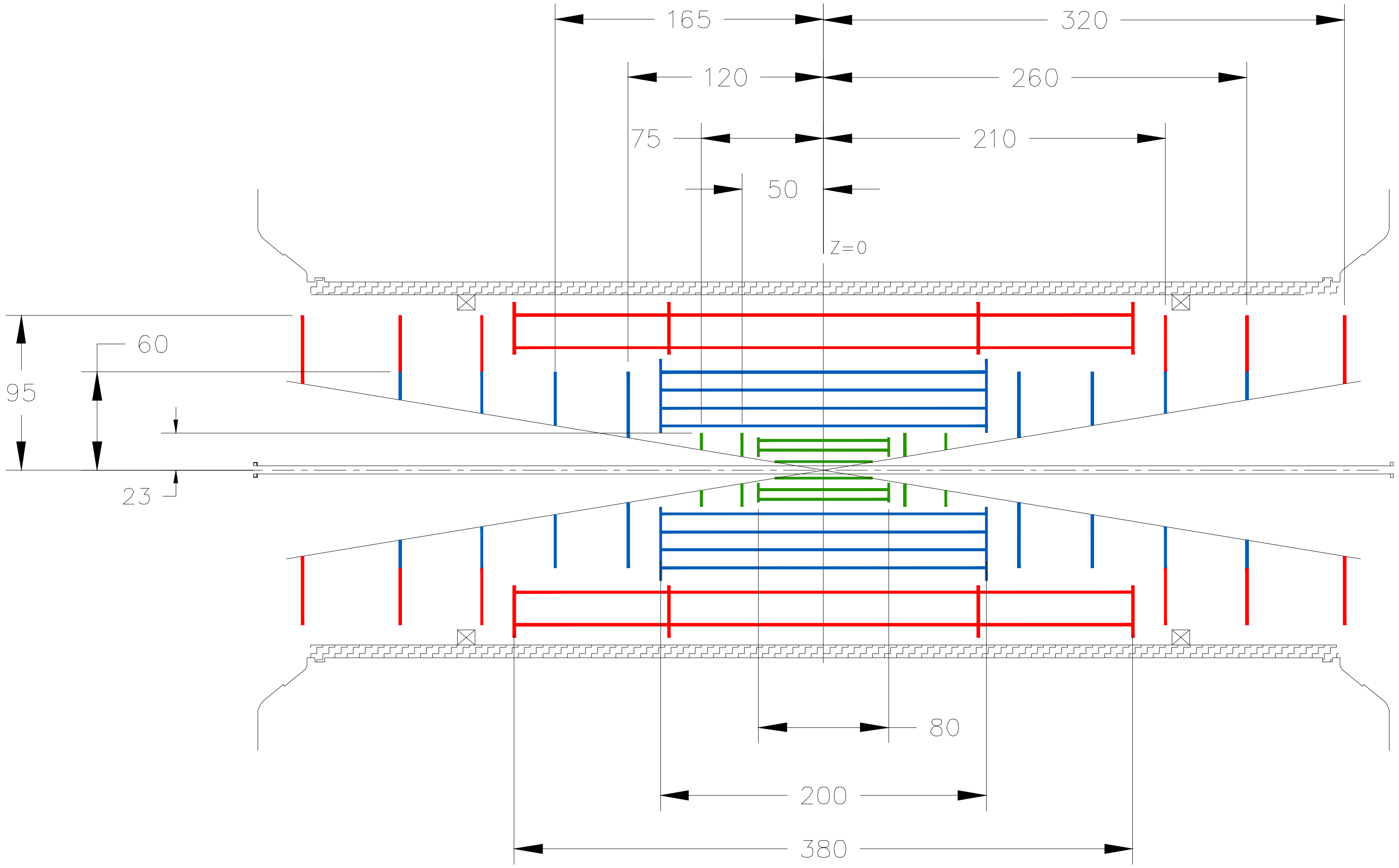


Figure 3. Photograph of transformer die showing the power transformer coil and the two data transformer coils.



ID Strawman Layout 3+4+2 (P+SS+LS)



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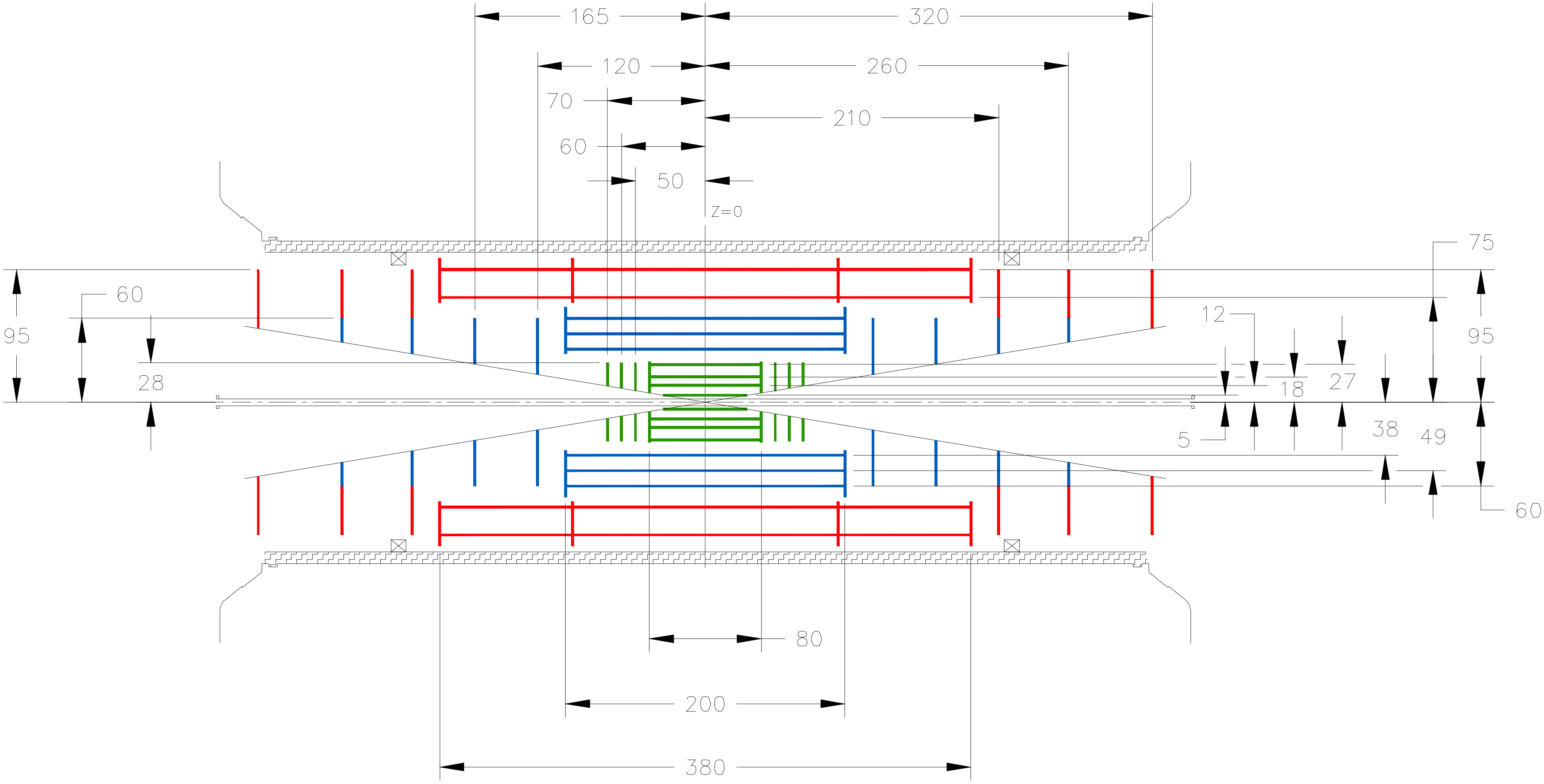
4+3+2 (Pixel, SS, LS) - Strawman



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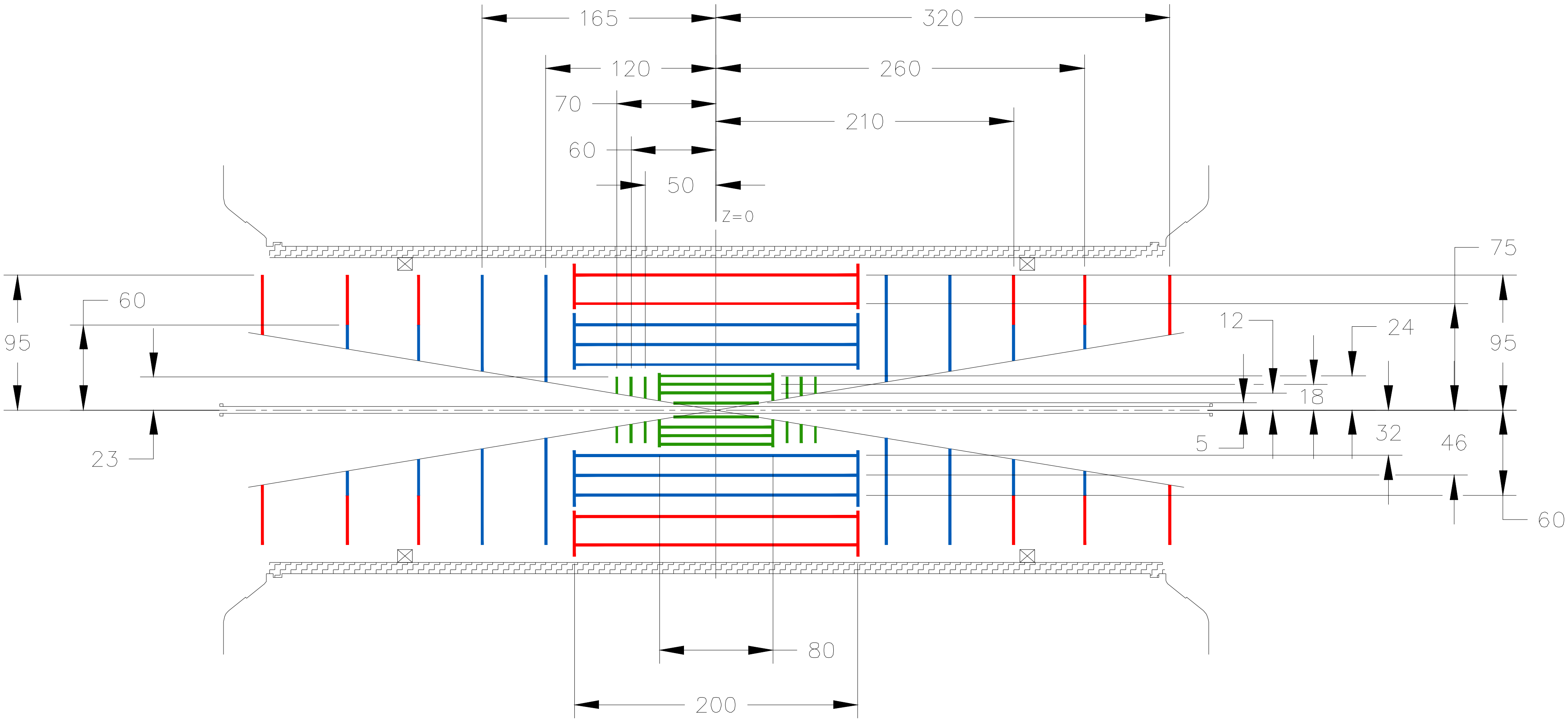
SS/LS FIXED LENGTH



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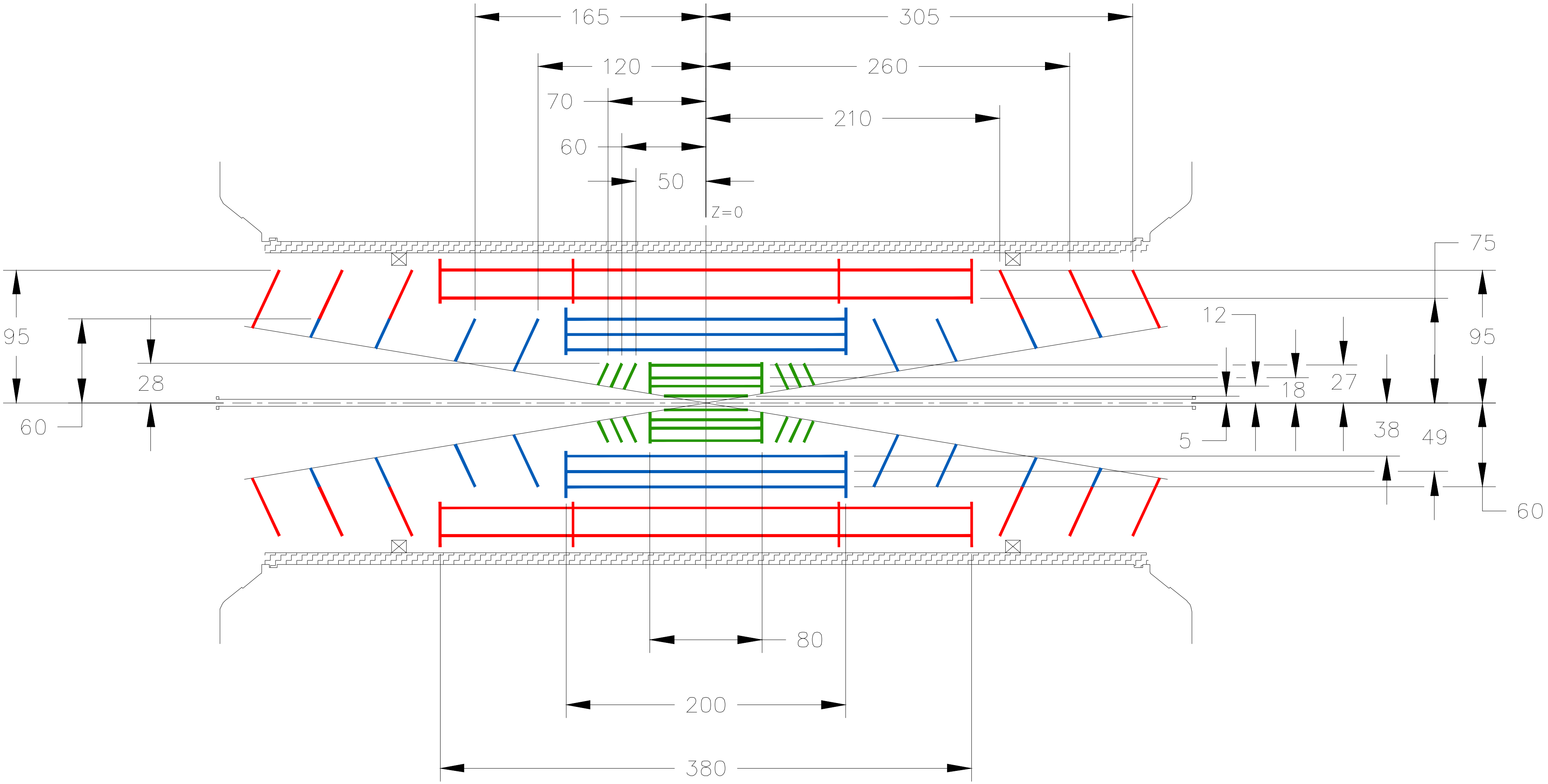
4+3+2   25 Degree Cone Ends



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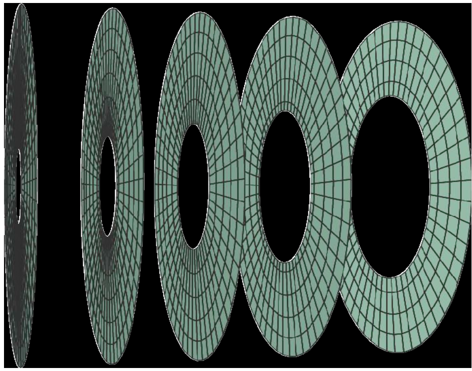
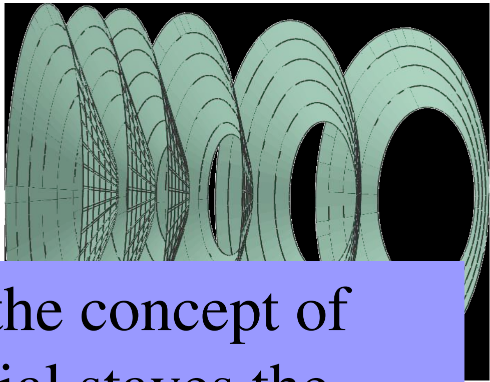
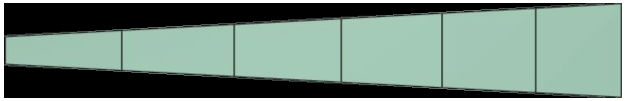
Conical-flat disk



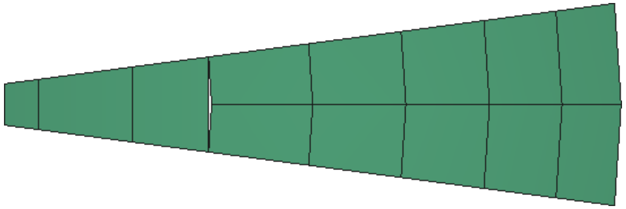
Internal wheel		Rout (cm)	Rin (cm)	N. staves	N. rings	Area (cm2)
Cone wheel	**1 row stave**	95,0	24,4	61,0	7,0	32100,5
Flat wheel	**1 row stave**	95,0	19,8	55,0	6,0	26949,7
Cone wheel	**2 row stave**	95,0	24,4	24,0	9,0	34190,1
Flat wheel	**2 row stave**	95,0	19,8	24,0	8,0	28709,4

- To reach the same inner radio more rings (more silicon) is needed with conical disk.
- 2 row staves more complicated to assemble, but smaller number/disk needed.





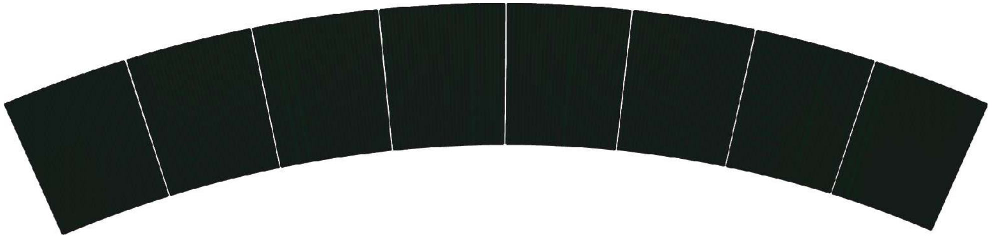
To narrow wafer for low radio, small pitch, place the hybrids an issue



Gap at a fixed radio and larger diversity of sensors

In the concept of radial staves the implementation of services may lock "easy", it looks natural at a first glance.

Circumferential stave



- 8 round edges wafer to built a circumferential stave.
- Pitch fixed to 80 µm at half height of the wafer.
- 8 chips per wafer
- All strips in a ring have the same length.
- One type of sensor per ring.
- Cones difficult to implement.

Ring	Up width (cm)	Bot. width (cm)	Number Staves
1	8,7	7,2	9
2	8,7	7,6	8
3	8,6	7,4	7
4	8,6	7,0	6
5	8,4	6,6	5
6	10,9	8,3	3
7	8,3	5,1	3

TOTAL = 41 staves for the more internal disk

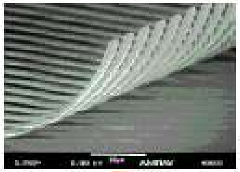
Main problem: how to "route" the services out of the staves.

Elastic Contact Structures

ELASTec®

Source: Infineon

ClawConnect™ made of StressedMetall™:



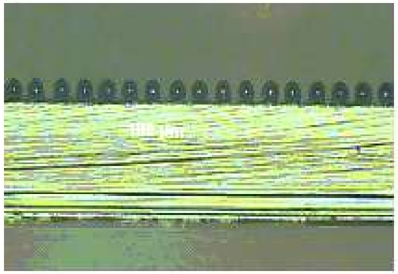
Source: NanoNexus, Xerox Co., PARC

J-shaped planar microspring

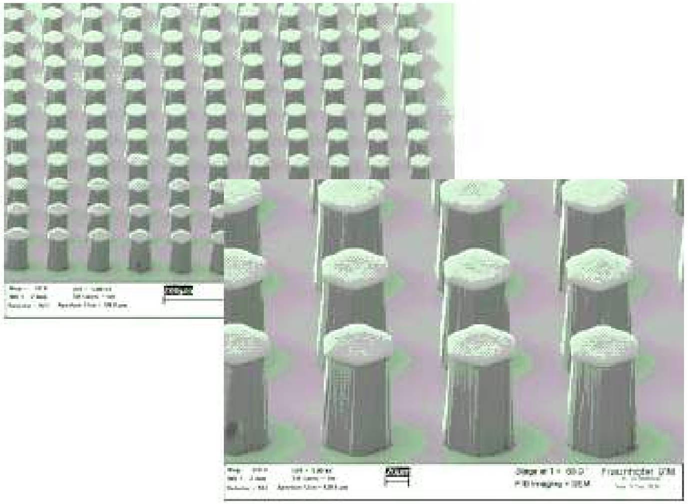
Source: Georgia Tech

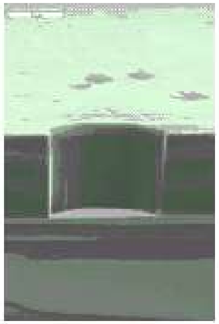
Future Requirements: Thin Silicon

Thinning of bumped wafers:



Cu Pillar Bumps (Height: 80 µm, Diameter: 60 µm)



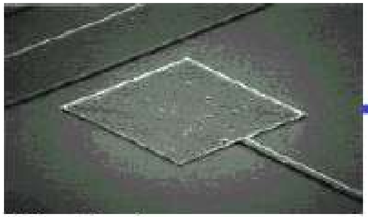


Technische Universität Berlin
Research Center of
Microperipheric Technologies

Fraunhofer Institut
Zuverlässigkeit und
Mikrointegration

Department
High Density Interconnect & Waferlevel Packaging
Phone: +49-(0)30-46403-124
Fax: +49-(0)30-46403-123
E-Mail: erwin.ehrmann@izm.fraunhofer.de

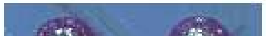
Process Flow - Stencil Printing



Al bond pad

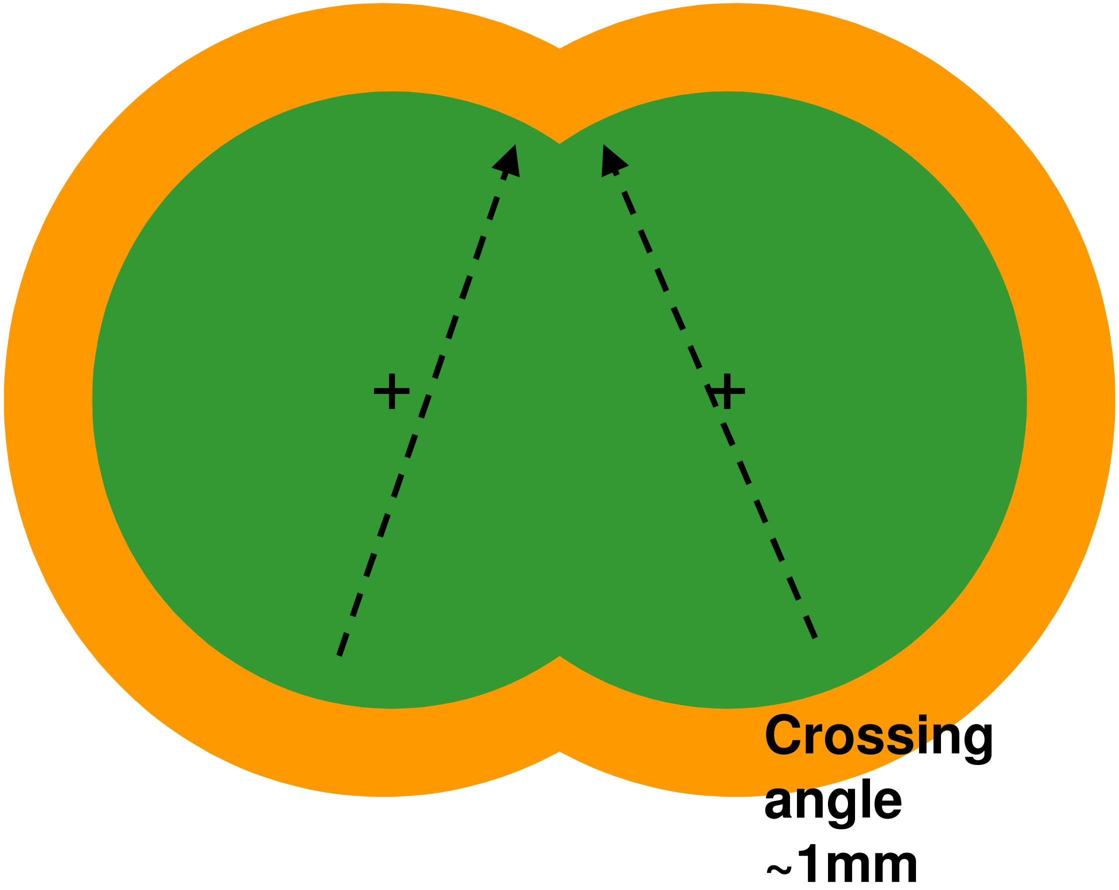
Ni UBM

Solder paste



Beam stay-clear radius composition

Component		mm
Separation	5	2.5
Beam size	15	7.5
Closed orbit	-	3
Crossing angle	-	1
TOTAL		14



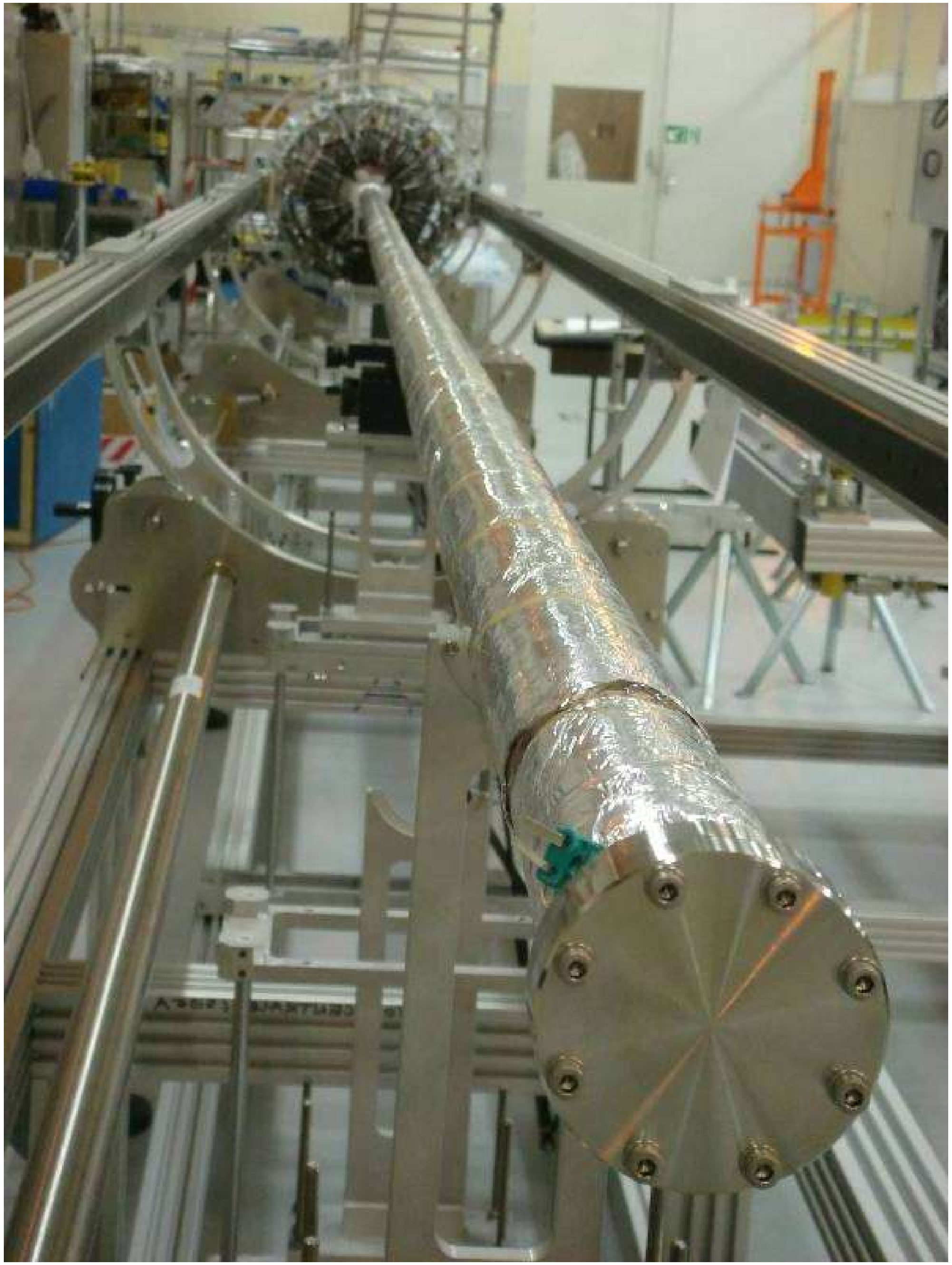
Crossing half-angle of ~200µ rad for upgraded LHC

Beampipe Diameter for LHC Baseline (1997 values)

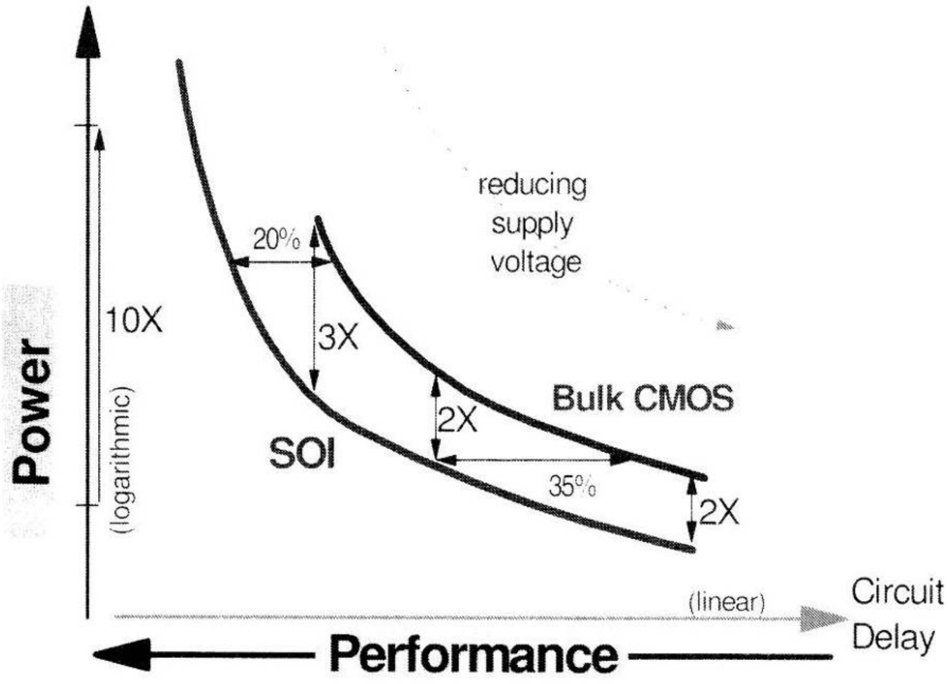
  - In forward regions, this may be higher for collision optics

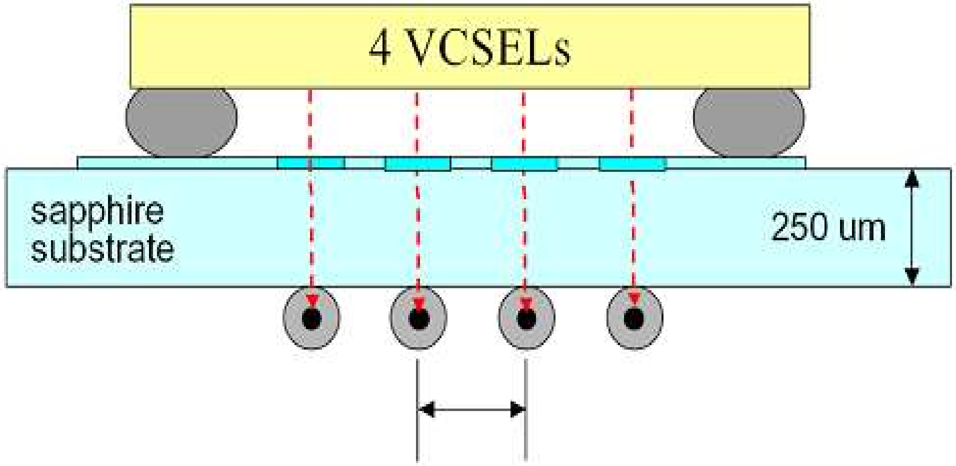
- Survey Precision ~ 2.6mm
  - A given survey target in the tracker region was expected to be placed within 2.6mm of the nominal beam axis with a 2σ (95%) confidence, using the survey techniques planned for ATLAS
- Mechanical construction ~ 2.6mm
  - Tolerances on straightness, circularity, wall thickness, sag under self-weight etc
- Instabilities ~ 9.8mm
  - Stability of the cavern, movements due to electro-magnetic forces, thermal expansion

Central beampipe (spare) in final configuration on the pixel assembly bench



SoS Technology Features





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