EIC-UK WP1
Tiled Outer Barrel Layout Options

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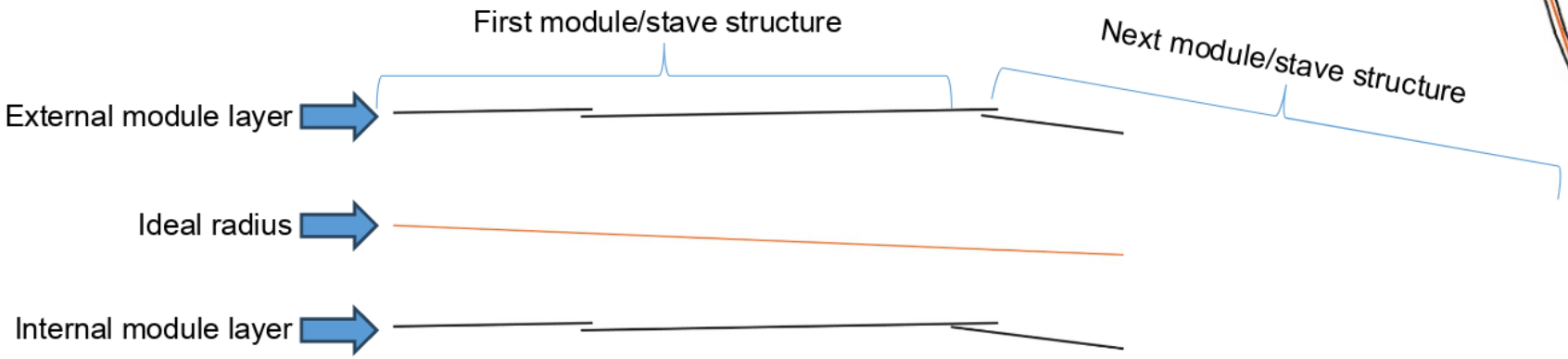
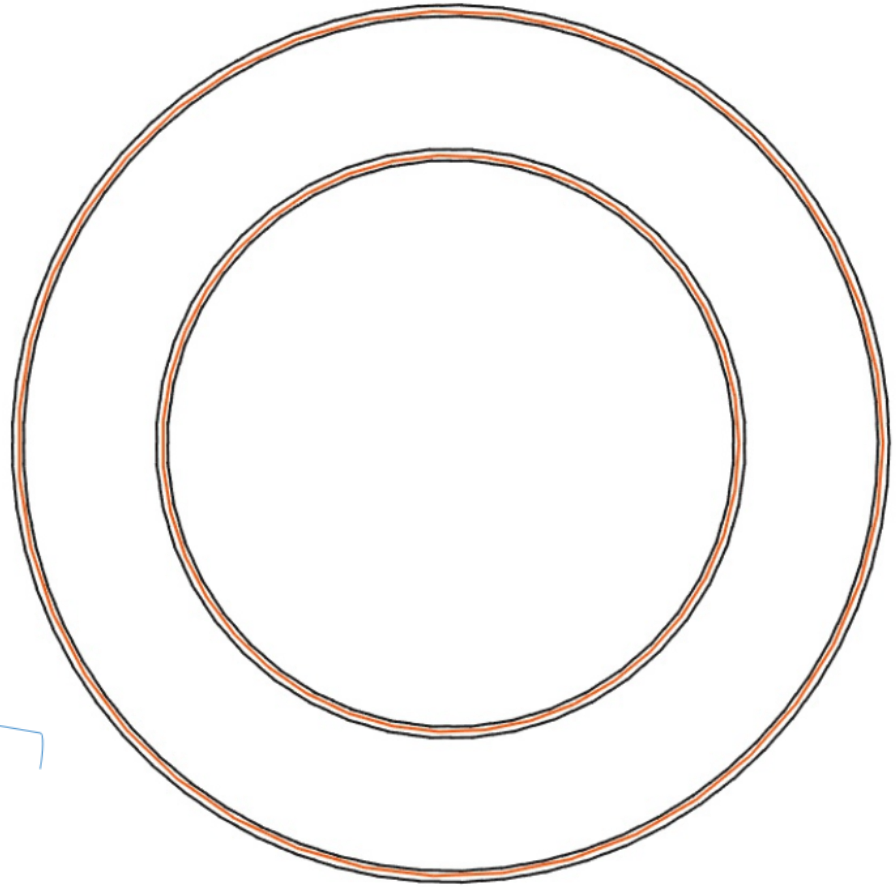
Recap

Slide summary of previous CAD model walk-through

- Looked at simple barrel structure to get a feel for quantity of staves needed.
- Focused on minimum numbers to get things started.
- Resulted in a structure that would be complicated to fabricate.
- Uses a plank-based stave design with a layer of sensors on both the internal and external sides.
- Neighbouring staves are inter-linked, so there is a small overlap between internal sensors and external sensors, but not the whole stave.
  - Requires sensors to be poorly supported at the edges





Inter-linked Stave Numbers (1)

Per stave (2 sensors/segments/RSUs wide).

	Layer	r (mm)	L (mm)	n_rsu	T6 sensors	T5 sensors	Min # of staves needed
OB Opt 1	L3	260	520	48	8	0	44
	L4	390	780	72	12	0	65
OB Opt 2	L3	270	520	48	8	0	45
	L4	420	780	72	12	0	70
OB Opt 3	L3	271	542	50	0	10	45
	L4	422	845	78	8	6	70

Inter-linked Stave Numbers (2)

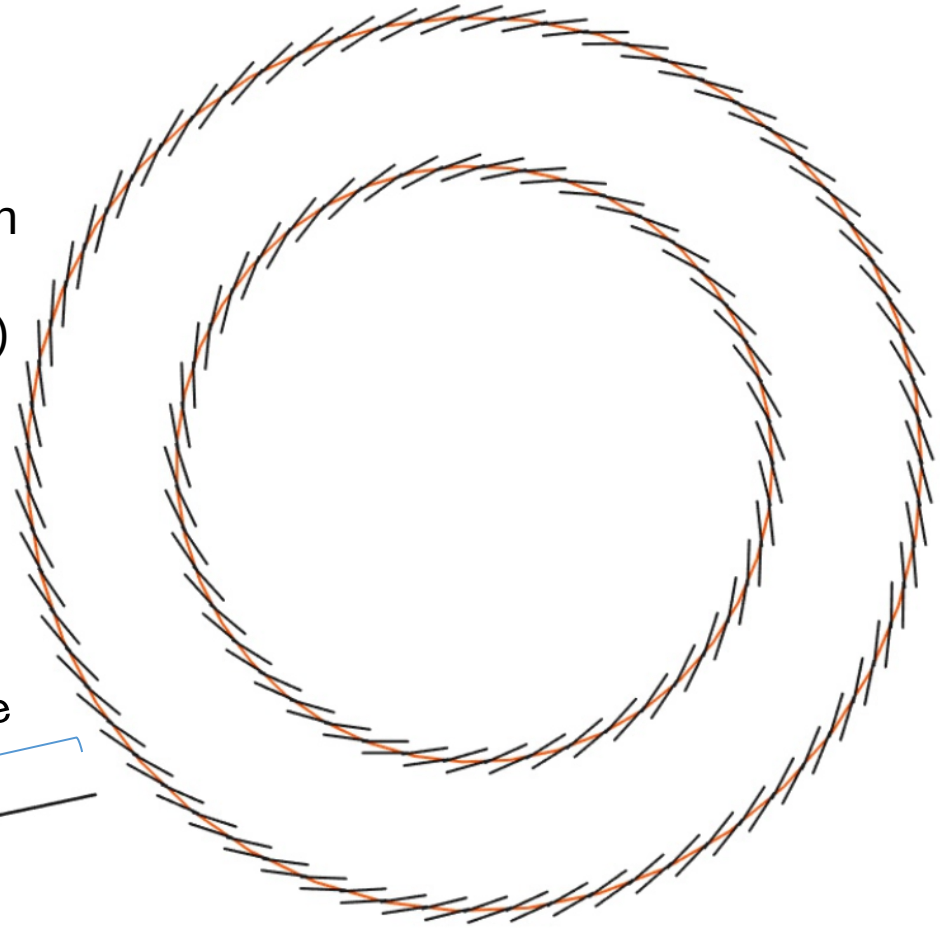
Per layer. As more staves are likely needed to have a constructable barrel, these number could be considered as the minimum required to assemble the ePIC Outer Barrel (OB).

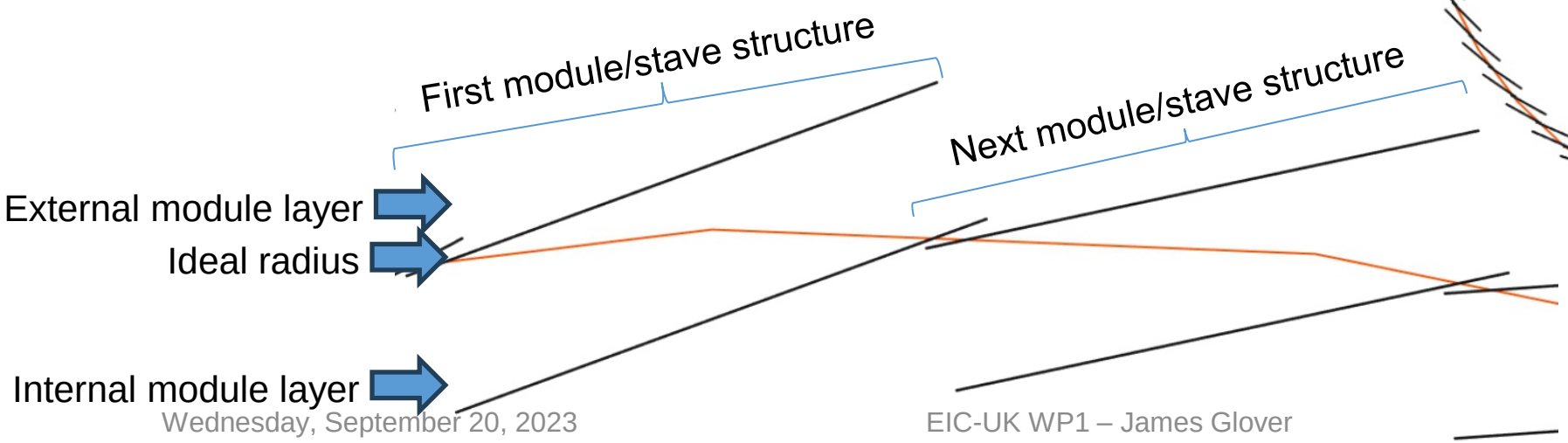
	Layer	r (mm)	L (mm)	n_rsu	T6 sensors	T5 sensors	T6 wafers (16 sensors)	T5 wafers (22 sensors)
OB Opt 1	L3	260	520	2112	352	0	20	0
	L4	390	780	4680	780	0	44	0
OB Opt 2	L3	270	520	2160	360	0	20	0
	L4	420	780	5040	840	0	47	0
OB Opt 3	L3	271	542	2250	0	450	0	21
	L4	422	845	5460	560	420	32	20

An estimate for the number of sensors able to fit on a single production wafer can be found on the final of Peter's slides.

Switching to a tiled stave

- Simpler to construct.
- A more realistic number of staves accounted for.
- Still uses a plank-based stave design with a layer of sensors on both the internal and external sides.
- Staves are inclined so that one entire stave (not just a module layer) overlaps the next stave.
  - Enables better sensor support at the edges.





Tiled Stave Numbers (1)

Per stave (2 sensors/segments/RSUs wide).

	Layer	r (mm)	L (mm)	n_rsu	T6 sensors	T5 sensors	Min # of staves needed
OB Opt 1	L3	260	520	48	8	0	45
	L4	390	780	72	12	0	67
OB Opt 2	L3	270	520	48	8	0	48
	L4	420	780	72	12	0	74
OB Opt 3	L3	271	542	50	0	10	48
	L4	422	845	78	8	6	74

Tiled Stave Numbers (2)

Per layer.

	Layer	r (mm)	L (mm)	n_rsu	T6 sensors	T5 sensors	T6 wafers (16 sensors)	T5 wafers (22 sensors)
OB Opt 1	L3	260	520	2160	2160	0	20	0
	L4	390	780	4824	4824	0	45	0
OB Opt 2	L3	270	520	2304	2304	0	22	0
	L4	420	780	5328	5328	0	50	0
OB Opt 3	L3	271	542	2400	2400	480	0	22
	L4	422	845	5772	5772	592	33	21

An estimate for the number of sensors able to fit on a single production wafer can be found on the final of Peter's slides.

Inter-linked vs. Tiled Stave Numbers

	Layer	Inter-linked				Tiled			
		staves	RSUs	T6 wafers	T5 wafers	staves	RSUs	T6 wafers	T5 wafers
OB Opt 1	L3	44	2112	20	0	45	2160	20	0
	L4	65	4680	44	0	67	4824	45	0
OB Opt 2	L3	45	2160	20	0	48	2304	22	0
	L4	70	5040	47	0	74	5328	50	0
OB Opt 3	L3	45	2250	0	21	48	2400	0	22
	L4	70	5460	32	20	74	5772	33	21

Still to be done.

- Consider RSU overlap along the stave lengths.

Caveats.

- Focus (so far) has been on straight tracks that start from an ideal interaction point (X=0, Y=0, Z=0).
- Overlap required along the stave length would depend on the stave thickness, I have (arbitrarily) set this to only 10 mm (see additional slides for dimensions used).

Additional slides

Reference table used for inter-linked model

'Segment/RSU width	=19.564 mm
'RSU length	=21.666 mm
'Power+Data Endcap Length	=4.5 mm
'PowerOnly Endacp Length	=1.5 mm
'Sensor Thickness	=50 um
'Overhange (Seg Width)	=500 um
'Module Role	=1 deg
'Stave Thickness	=10 mm

Reference table used for tiled model

'Segment/RSU width	=19.564 mm
'RSU length	=21.666 mm
'Power+Data Endcap Length	=4.5 mm
'PowerOnly Endacp Length	=1.5 mm
'Sensor Thickness	=50 um
'Overhange (Seg Width)	=0 um
'Module Role	=0 deg
'Stave Thickness	=10 mm
'Opt1 Stave Incline	=18 deg
'Opt2&3 Stave Incline	=19 deg