Detector "Options and Decisions" **

(Detector Parallel Session)

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3/9/2021

** But not dark detectors (see Lorenzo's talk), or rhomb/hex (see Brenna's talk)

Detector Wafer Types

DSR: 11 types

SATs									
Tube name		L	F	м	F1	MF2		UHF	
Band Centers (GHz)		30	40	85	145	95	155	220	270
Lenses		~60cm	HDPE	~60cm	HDPE	~60cm	HDPE	~45cm	Silicon
Wafers/Tube		1	12 12		2	12		6 + 0.5*6	
Pixels/Wafer		1	2	14	47	14	47	4	69
Tubes			2		6	e	5		4
LATs									
Tube name	ULF	L	F		N	IF		U	HF
Band Centers (GHz)	20	27	39		93	145		225	278
Lenses	20cm Si	20c	m Si		20c	m Si		200	m Si
Pixels/Wafer	27	48		4		32		432	
Tubes in SPLAT	4	9	9		5	4		(18
Tubes in two CHLATs	0		6		10	08			46

Detector Wafer Types

PBD: 8 types

SATsTube nameBand Centers (GHz)LensesWafers/TubePixels/WaferTubesImage: Second secon								
Band Centers (GHz)LensesWafers/TubePixels/Wafer								
Lenses Wafers/Tube Pixels/Wafer	L	LF		MF1		-2	UHF	
Wafers/Tube Pixels/Wafer	27	39	85	145	95	155	225	278
Pixels/Wafer	~60cm	~60cm HDPE		~60cm HDPE ~60cm HDF		HDPE	~45cm	Silicon
	1	12		12		2	6 + 0.5*6	
Tubes	1	12		147		7	469	
		2		6	6		(4
LATs								
Tube name ULF	L	LF		MF			Uł	
Band Centers (GHz) 20	27	39		93	145		225	278
Lenses 20cm S	200	20cm Si		20c			20cm Si	
Pixels/Wafer 27	4	48		4			432	
Tubes in SPLAT (4)		9		5	4		1	8
Tubes in two CHLATs 0	1	16		1(08		4	6

Detector Wafer Types

PBD: SAT MF wafers (shifted bands)

SATs		h	ave sa	me Ps	ats				
Tube name		L	.F	м	F1	м	F2	UHF	
Band Centers (GHz)		27	39	85	145	95	155	225	278
Lenses		~60cm HDPE		~60cm HDPE		~60cm HDPE		~45cm Silicon	
Wafers/Tube		12 12 12		6 + 0.5*6					
Pixels/Wafer		12 147 147		469					
Tubes		2		66		6	4		
LATs									
Tube name	ULF	L	.F		N	IF		U	HF
Band Centers (GHz)	20	27	39		93	145		225	278
Lenses	20cm Si	20c	m Si		20c	m Si		20c	m Si
Pixels/Wafer	27	4	.8		4	32		4	32
Tubes in SPLAT	4		9		5	54		1	8
Tubes in two CHLATs	0	1	6		1	08		4	6

Questions and Options

Q1: Should there be only one type of SAT MF wafer, with mixed bands on it?

SATs										
Tube name		L	.F	м	F1	м	F2			
Band Centers (GHz)		27	39	85	145	95	155			
Lenses		~60cm	HDPE	~60cm	HDPE	~60cm HDPE				
Wafers/Tube		1	2	1	12 12		12 12		12	
Pixels/Wafer		1	2	1	47	14	47			
Tubes			2		6		6			
LATs										
Tube name	ULF	L	.F		MF					
Band Centers (GHz)	20	27	39		93	145				
Lenses	20cm Si	20c	m Si		20c	m Si				
Pixels/Wafer	27	4	8		4	32				
Tubes in SPLAT	4		9		5	54				
Tubes in two CHLATs	0	1	6		10	08				

Q1: Should there be only one type of SAT MF wafer, with mixed bands on it?

Pros:

- Only one wafer type!
- ?

Cons:

- Keeping test data straight is more difficult.
- Potential biasing issue, different required P_electricals for 85/95 or 145/155.

Q2: Three high-density wafers have very similar pixel counts: can they, should they, be the same?

(UHF's could have same horn array)

	L	LF		MF1		-2	L	JHF	
	27	39	85	145	95	155	225	278	
	~60cm	~60cm HDPE		~60cm HDPE		HDPE	~45cm Silicon		
	12		12 12		12		2	6 +	0.5*6
	1	12	14	47	14	17		169	
		2		6 – – –	(6	5			
								Y	
ULF	L	LF		MF				UHF	
	27	00					005	070	
20	21	39		93	145		225	278	
20 20cm Si		m Si			145 m Si			278 cm Si	
	20c				m Si		20		
20cm Si	20c	m Si		20c	m Si		20	cm Si	
		ULF	27 39 ~60cm HDPE 12 12 2 ULF LF	27 39 85 ~60cm HDPE ~60cm 12 1 12 1 2 1 2 1	27 39 85 145 ~60cm HDPE ~60cm HDPE 12 12 12 147 2 6 ULF LF	27 39 85 145 95 ~60cm HDPE ~60cm HDPE ~60cm HDPE ~60cm 12 12 12 12 12 147 14 2 6 - ULF LF MF	27 39 85 145 95 155 ~60cm HDPE ~60cm HDPE ~60cm HDPE ~60cm HDPE 12 12 12 12 12 147 147 2 6 - - ULF LF MF	27 39 85 145 95 155 225 ~60cm HDPE ~60cm HDPE ~60cm HDPE ~60cm HDPE ~45cm 12 12 12 12 6 + 12 147 147 6 2 6 6 0 0 ULF LF MF L	

Q2: Three high-density wafers have very similar pixel counts: can they, should they, be the same?

Pros:

- If they're all the same,
 - \circ $\,$ easier for fabs to move from one to the other.
 - homogenizes readout
- If UHF's are the same, they could share the same horn array, interface wafers, etc. (Q: MF's different?)
- ?

Cons:

- Rhomb/hex: could affect what fabs can make what, and/or how.
- ?

(Any changes have sensitivity implications that need to be weighed.)

Q3: Is it okay for SATs to adopt LAT frequency bands at 30/40 and 220/270 GHz?

SATs									
Tube name				М	F1	MF2		ШЦЕ	
Band Centers (GHz)		30	40	85	145	95	155	220	270
Lenses		~60cr	HDPE	~60cm	HDPE	~60cm	HDPE	~45cm	Silicon
Wafers/Tube			12	1	2	1	2	6 +	u.5*6
Pixels/Wafer			12	14	17	14	47	4	9
Tubes			2	e	5)	6	5	(4
LATs									•
Tube name	ULF				M	IF		U	F
Band Centers (GHz)	20	27	39		93	145		225	278
Lenses	20cm Si	20	cm Si		20c	m Si		200	m SI
Pixels/Wafer	27	32	48		43	32		4	32
Tubes in SPLAT	4		9		5	4			18

Q3: Is it okay for SATs to adopt LAT frequency bands at 30/40 and 220/270 GHz?

Pros:

- easier for fabs to move from one wafer to the other.
- makes testing somewhat easier to follow/analyze.
- ?

Cons:

- Need to validate SAT foreground subtraction... ie it's a change.
- ?

Q4: Are "low density" wafers wired out using only one side?

Extreme Example: SAT 30/40 has only 48 detectors. That is less than one MUX column, ideally read out to one side. (LAT 30/40 is ~3 columns)

Pros:

- Easier readout: fewer flexis, mux columns, boxes etc.
- ?

Cons:

- Large wafer area on one bias. (SAT 30/40 would have same bias for all detectors of a given color). Is Pelectrical spread (driven by Psat and optical efficiency homogeneity) okay with that?
- Incompatible with NIST-style stepper wiring?
- ?

Things to keep in mind (may or may not be real issues)

• Detector stability

• "Science TES": readout bandwidth, taus, tau requirements

- "High-Tc TEs" : taus via fab choices about C, n, Tc, etc
- Variations in P_electrical across wafer, and bias groupings
 - f/# variation. Order(20% Poptical issue)
 - SAT: higher near edge of focal plane, so Popt varies from wafer to wafer and a little across wafers.
 - LAT: higher near edge of each wafer.
- Can we "flash" detectors to unlatch?