Detector "Options and Decisions" **

(Detector Parallel Session)

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

Detector Wafer Types

DSR: 11 types

SATs						
Tube name		LF	MF1	MF2	UHF	
Band Centers (GHz)		30 40	85 145	95 155	220 270	
Lenses		~60cm HDPE	~60cm HDPE	~60cm HDPE	~45cm Silice	
Wafers/Tube		12	12	12	6 + 0.5*6	
Pixels/Wafer		12	147	147	469	
Tubes		2	6	6	4	
LAIS						
Tube name	ULF	LF	N	1F	UHF	
Band Centers (GHz)	20	27 39	93	145	225 27	
Lenses	20cm Si	20cm Si	20c	m Si	20cm Si	
Pixels/Wafer	27	48	4	32	432	
Tubes in SPLAT	4	(9)	E	54	18	
Tubes in two CHLATs	0	(16)		08	46	

Detector Wafer Types

PBD: 8 types

SATs									
Tube name		L	.F	M	MF1		F2	U	HF
Band Centers (GHz)		27	39	85	145	95 155		225	278
Lenses		~60cm	HDPE	~60cm	~60cm HDPE		HDPE	~45cm Sili	
Wafers/Tube		1	12		12		2	6 + 0.5*	
Pixels/Wafer		1	12		147		47	469	
Tubes		2			6		6		4
LATs									
Tube name	ULF	L	LF		MF			UHI	
Band Centers (GHz)	20	27	39		93	145		225	278
Lenses	20cm Si	20c	20cm Si		20cm			20cm Si	
Pixels/Wafer	27	4	48		4			432	
Tubes in SPLAT	4	9	9		5	54		18	
Tubes in two CHLATs	0	1	6		10	108			16

Detector Wafer Types

PBD: SAT MF wafers (shifted bands)

SATs		h	ave sa	me Ps	ats						
Tube name		L	F	м	F1	м	F2	Uł	łF		
Band Centers (GHz)		27	39	85	145	95	155	225	278		
Lenses		~60cm	~60cm HDPE		~60cm HDPE		HDPE	~45cm Silico			
Wafers/Tube		12		12		12		6 + 0).5*6		
Pixels/Wafer		1	2	1	47	1	47	46	69		
Tubes			2		6 – – -	(6	4			
LATs											
Tube name	ULF	L L	LF		MF			UHF			
Band Centers (GHz)	20	27	39		93	145		225	278		
Lenses	20cm Si	20c	20cm Si		20cm			20cr	n Si		
Pixels/Wafer	27	48		4		32		43	32		
Tubes in SPLAT	4	9	Э		5	54		1	8		
Tubes in two CHLATs	0	1	6		1	08		46			

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	MF1 MF2 UHF 85 145 95 155 225 2 -60cm HDPE ~60cm HDPE ~45cm Silic 12 12 6 + 0.5*6 147 147 469 6 6 4 93 145 225 2 20cm Si 20cm Si 20cm Si 432 432 432 18 18 108 46 46		
Band Centers (GHz)		27	39	85	145	95	155
Lenses		~60cm	HDPE	~60cm	HDPE	~60cm	HDPE
Wafers/Tube		1	2	1	2	1	2
Pixels/Wafer		1	2	14	47	1	47
Tubes			2		6		6
LATs							
Tube name	ULF	L	F		N	IF	
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	9		5	i4	
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!
- Relative shifts in bands easier on one wafer (rather than absolute between two wafers)

Cons:

- Keeping test data straight is more difficult.
- Potential biasing issue, different required P_electricals for 85/95 or 145/155.
- May push fab...?
- Horn/OMT optimization?
- AR coatings on optics more difficult.

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

(UHF's could have same horn array)

SATs											
Tube name	LF			MF1		MF2		UHF			
Band Centers (GHz)	LF 27 39 ~60cm HDPE 12 12 2 ULF LF		39		85	145	95	155		225	278
Lenses		~60cm	~60cm HDPE		~60cm HDPE		~60cm	HDPE	~45cm Sili		Silicon
Wafers/Tube		1:	12		12		1	2	6+0		0.5*6
Pixels/Wafer		1:	2		14	47	14	47		69	
Tubes		2	2		e e	3)	(6)
										<u>۲</u>	
LATs											
Tube name	ULF	L	LF		MF		IF	F		U	HF
Band Centers (GHz)	20	27	39			93	145			225	278
Lenses	20cm Si	20cr	20cm Si		20ci		m Si		20cm \$		m Si
Pixels/Wafer	27	48			4		32			4	32
Tubes in SPLAT	4	9			5		54				8
Tubes in two CHLATs	0	1	6			1(08			4	.6

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.
 - Also horn diameters

(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					M	=1 M		F2					
Band Centers (GHz)		30	40		85	145	95	155		220	270		
Lenses		~60cr	~60cn HDPE		~60cm HDPE		~60cm HDPE		Crm HDPE ~60cm HDPE		~45cm S		Silico
Wafers/Tube			12		12		12			6 +	J.5*6		
Pixels/Wafer			2		147		147		4		9		
Tubes			(2)		6		6				+)		
			Ĭ										
LATs													
Tube name	ULF						IF			U	F		
Band Centers (GHz)	20	27	39			93	145			225	27		
Lenses	20cm Si	200	20cm Si		20c		m Si		20cm S		m SI		
Pixels/Wafer	27		48		4:		432		32		432		32
Tubes in SPLAT	(4)		9		5		54		18		8		
Tubes in two CHLATs	0		16			10	108		108			4	6

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?