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 Silicon	
Wafers/Tube	12		12		12		6 + 0.5*6	
Pixels/Wafer	12		147		147		469	
Tubes	2		6		6		4	

LATs

Tube name	ULF	LF		MF		UHF	
Band Centers (GHz)	20	27	39	93	145	225	278
Lenses	20cm Si	20cm Si		20cm Si		20cm Si	
Pixels/Wafer	27	48		432		432	
Tubes in SPLAT	4	9		54		18	
Tubes in two CHLATs	0	16		108		46	

Detector Wafer Types

PBD: 8 types

SATs

Tube name	LF		MF1		MF2		UHF	
Band Centers (GHz)	27	39	85	145	95	155	225	278
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Wafers/Tube	12		12		12		6 + 0.5*6	
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Detector Wafer Types

PBD: SAT MF wafers (shifted bands) have same Psats

SATs

Tube name	LF		MF1		MF2		UHF	
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Lenses	~60cm HDPE		~60cm HDPE		~60cm HDPE		~45cm Silicon	
Wafers/Tube	12		12		12		6 + 0.5*6	
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Questions and Options

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

SATs

Tube name	LF		MF1		MF2		UHF	
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Lenses	~60cm HDPE		~60cm HDPE		~60cm HDPE		~45cm Silicon	
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Pixels/Wafer	12		147		147		469	
Tubes	2		6		6		4	

LATs

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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)

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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		6		6		1	

LATs

Tube name	ULF	LF		MF		UHF	
Band Centers (GHz)	20	27	39	93	145	225	278
Lenses	20cm Si	20cm Si		20cm Si		20cm Si	
Pixels/Wafer	27	48		432		432	
Tubes in SPLAT	4	9		54		18	
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Q2: Three high-density wafers have very similar pixel counts: can they, should they, be the same?

Pros:

- If they're all the same,
  - 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?

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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?**