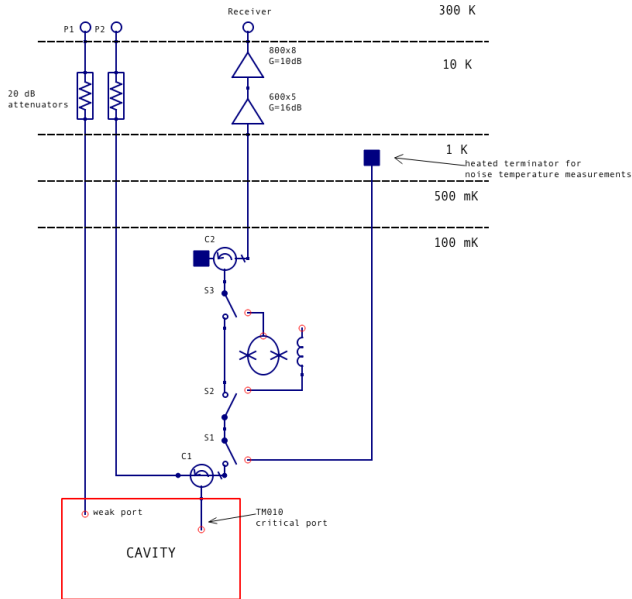


# Cryo Microwave Status

Ana Malagón

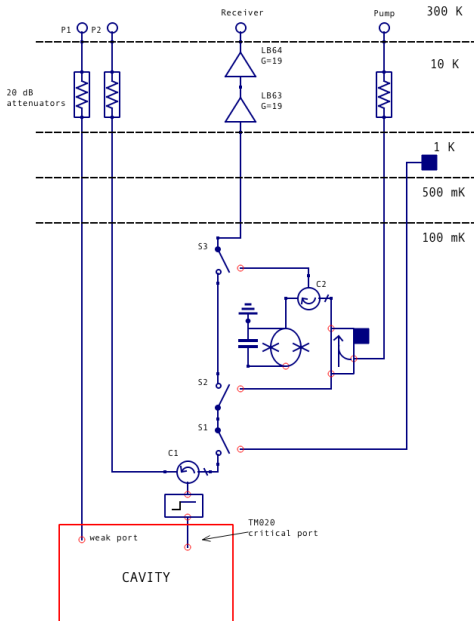
May 3, 2015

# ADMX Channel 1 Cryogenic RF Layout



- ▶ Quinstar Circulators:  
UTE1255KCS
- ▶ MSA: LFF-12A  
 $T_{MSA} @ 100\text{mK} = ?$
- Gain = 20 dB
- ▶ HEMTs:  
 $T_{600-5} = 2 \text{ K}$   
 $T_{800-8} = 10 \text{ K}$

# ADMX Channel 2 Cryogenic RF Layout



► Quinstar Circulators:

LTG0102KCS

► JPA:

$T_{JPA} @ 100 \text{ mK} = ?$

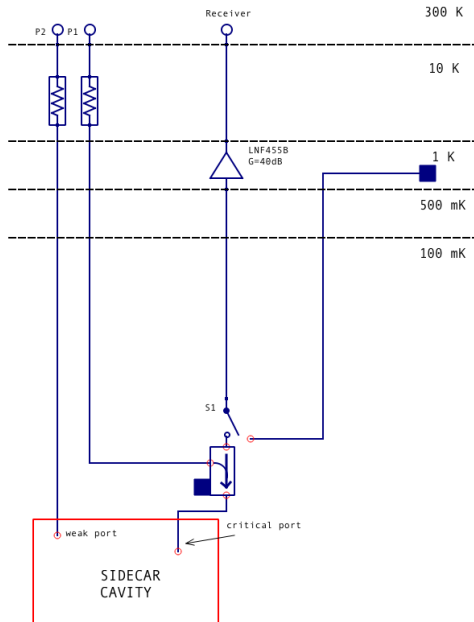
Gain = 21 dB

► HEMTs:

$T_{LB63} = 6 \text{ K}$

$T_{LB64} = 6 \text{ K}$

# ADMX Sidecar Cryogenic RF Layout



► Directional Coupler: PE220120

20dB coupling

► HEMT:

$$T_{LNF455B} = 4 \text{ K}$$

► \*Raditek Circulator:

SN102

► \*JPA:

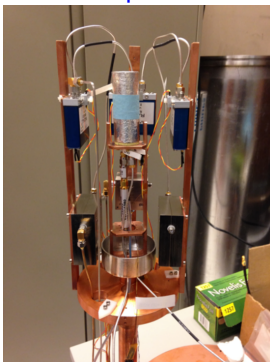
$$T_{JPA} @ 100 \text{ mK} = ?$$

Gain = ?

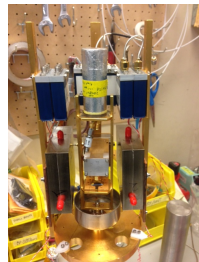
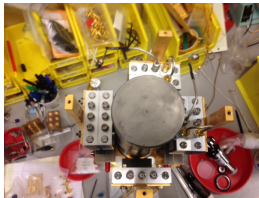
\* to be put in for second iteration.

## 2015 Squidadel

### 2014 Squidadel



add 4 more  
switches... →



## controls

EPICs Driver for JPA Power Supply [Cliff]

EPICs Driver for JPA Pump Tone [Cliff]

Upgrade MSA Current Source [Cliff]

## wiring/sensors

Bundle squidadel dc wiring [Gray]

Set up Cable E for Sidecar piezo/temp  
sensor wires + JPA bias [Cliff]

Replace RF feedthrough 'nuzzlie' [Lisa]

Remake holder for noise sources [Ana]

Mount Sidecar hall probe/temp sensor

## hemts

Set up Sidecar HEMT [Gray]

Resolder LB63 connector for bias pins

Rebias Ch1 and Ch2 HEMTs

## cabling

RF feedthrough collar [Dima]

Epoxy RF feedthroughs in anchoring rows [Kiva]

**\*\*Install Coax Co. cables\*\***

Heat sink cables

Put in attenuators

Check transmission through cable assemblies

## squidadel (this iteration)

Make adaptor plates to hold circulators on posts [Ana]

Make JPA mount [Machine Shop]

Remount temperature sensors and hall probe

## squidadel (next iteration)

Remake posts to fit more circulators

Remake holder to fit more JPAs

Install superconducting RF cable

# Side Dewar

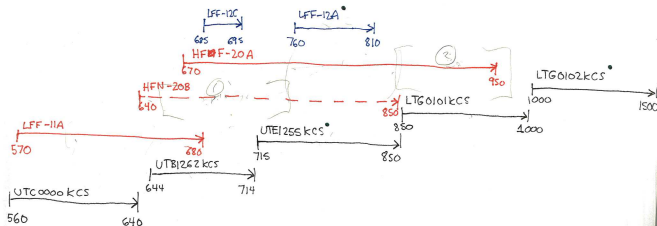


# Additional



# Coverage

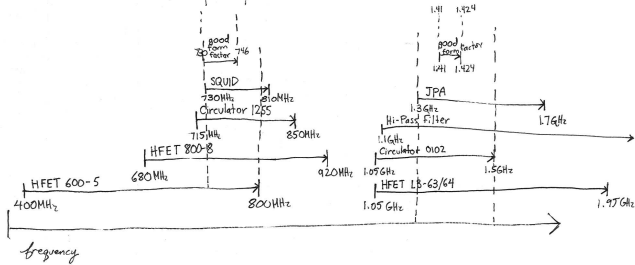
## SQUID / Circulator Coverage



frequency [MHz]

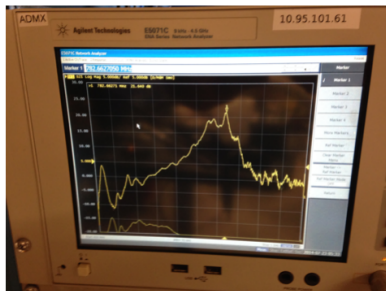
# Run Coverage

## Frequency Bands for Ch1/Ch2 (2/13/15)





## Installation of new MSA



- New MSA designed by Sean and fabricated at NIST replaced MIT LL device
- Gain of  $\sim 20$  dB near 730-760 MHz measured

[http://admxdatastore.npl.washington.edu/mediawiki/images/2/20/MSA\\_update\\_sept2014\\_Wagner.pdf](http://admxdatastore.npl.washington.edu/mediawiki/images/2/20/MSA_update_sept2014_Wagner.pdf)

## RF Characteristics

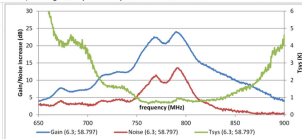
Monday, June 02, 2014 6:41 PM

[http://admxdatastore.npl.washington.edu/mediawiki/index.php/Amplifiers\\_SQUID](http://admxdatastore.npl.washington.edu/mediawiki/index.php/Amplifiers_SQUID)

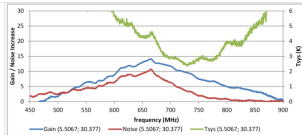
### Typical Performance

A note on Toys: Toys was calculated from S/N Improvement, assuming a 10K Toys for the amplifier chain without the MSA.

There are two local extrema for gain and noise performance, different by about 1/2 phi0 in flux bias. This data shows the higher frequency, higher gain, lower noise parameters.



Typical Gain, Noise and Toys at 85mK  
I bias= 6.3uA, flux bias current=58.8uA (flux bias current will have variable offset on each cooldown)  
There



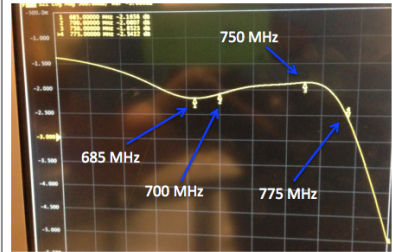
Flux bias offset by 1/2 phi0.  
Device has lower gain and higher noise.  
Very little data was taken around this bias point.

# Antenna 1 Filter Cutoff



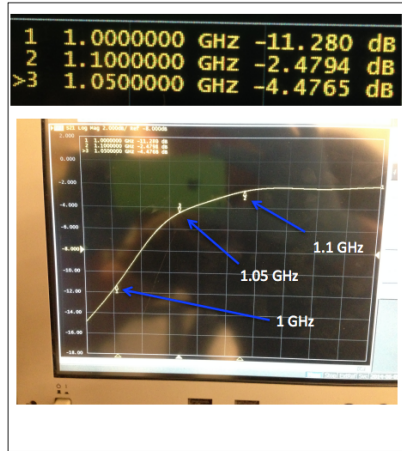
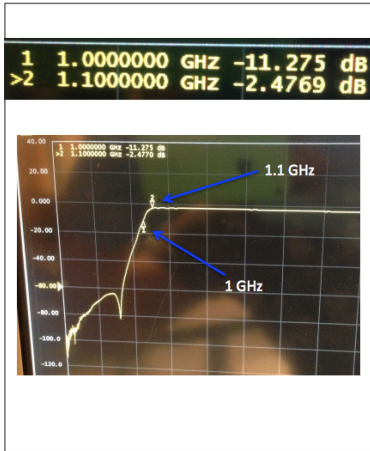
1	900.00000 MHz	-20.087 dB
2	800.00000 MHz	-4.9870 dB
3	700.00000 MHz	-2.0828 dB
>4	750.00000 MHz	-1.8555 dB

1	685.00000 MHz	-2.1657 dB
2	700.00000 MHz	-2.0803 dB
3	750.00000 MHz	-1.8525 dB
>4	775.00000 MHz	-2.5420 dB



[http://admxdatastore.npl.washington.edu/mediawiki/images/1/15/Antenna\\_1\\_Filter\\_Cutoff\\_.pdf](http://admxdatastore.npl.washington.edu/mediawiki/images/1/15/Antenna_1_Filter_Cutoff_.pdf)

# Antenna 2 Filter Cutoff



[http://admxdatastore.npl.washington.edu/mediawiki/images/4/4c/Antenna\\_2\\_Filter\\_Cutoff.pdf](http://admxdatastore.npl.washington.edu/mediawiki/images/4/4c/Antenna_2_Filter_Cutoff.pdf)