

POLARBEAR KT7 Comb A

Detectors

This document reports noise results. There is one page per detector that describes the parameters used, the noise calculation and a plot of the timestream used and its power spectrum. Also, one plot per comb is shown showing measured and predicted noise as a function of bias frequency.

The demodulator gain and frequency, the carrier gain and amplitude, the nuller gain and amplitude and the SQUID feedback loop, flux bias and current bias are parameters read from the DfMUX and SQUID controller boards. Values of -1 indicates that the value was not known at the time and other values can be wrong (do not trust calculated numbers if a -1 is present).

The voltage bias is calculated using the transfer function (refer to the DfMUXTransferFunctionsMemo memo). R normal is obtained from the width of the peaks in the network analysis. R is assumed to be $x \times R_n$ for a bolometer in transition where x is the position in the transition (0.8 for 80% in transition for example). The leadlag resistance is assumed to be 20Ω . The optical loading is approximated by subtracting the power at turnaround when bolometers were tuned from the power at turnaround when bolometers were tuned dark. T_c is a measured value and the bath temperature is simply the temperature the detectors are heatsunk to. The average thermal conductance is obtained from the bolometer tuning dark and the dynamical G is calculated from it (refer to the BoloNoiseMemo memo).

The list of operations done to the data is also listed. Each of the components of the calculated noise are listed. The predicted noise as well as the measured average noise between two given frequencies with its variance and the ratio of measured over predicted noise are finally listed. The frequencies between which the PSD is averaged are quoted as well.

b153-w0-c0

Removing gradient
Applying Hanning window
Correcting PSD for Hanning window

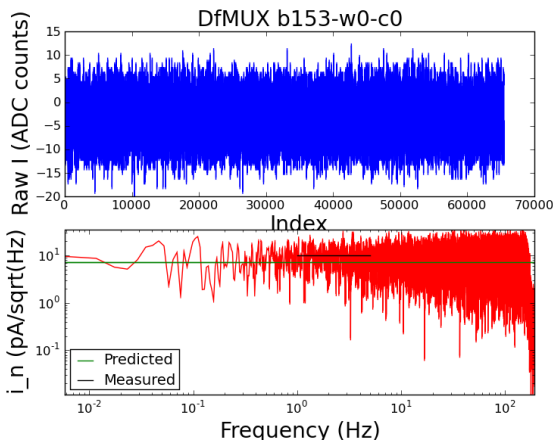
Measured I increased by 5% for DMFD imperfections.

Measured value is the average between 1.0 and 5.0Hz.

Demod gain is : 2
Demod frequency is : 273633 Hz
Carrier gain is : 0
Carrier amplitude : 0.0
Nuller gain is : 0
Nuller amplitude : 0.0
Voltage bias is : 0.0 uV_RMS
R normal is : 0.0 ohm
R is : 0.0 ohm
SQUID feedback loop: 10000 ohm
SQUID flux bias : -0.260864257812 V
SQUID current bias : 4.04193115234 V
Leadlag R : 20 ohm
Optical loading : 0.0 pW
Frequency band : 0 GHz
Tc is : 0.706 K
T_bath is : 0.235 K
G is guessed : -1.0 pW/K

Dark Squid
SQUID noise : 3.53553390593 pA/sqrt(Hz)
SQUID ctrl 1st stage noise : 2.88629089133 pA/sqrt(Hz)
20 ohms noise : 1.65961726252 pA/sqrt(Hz)
Feedback resistor noise : 1.81971212009 pA/sqrt(Hz)
SQUID ctrl 2nd stage noise : 0.183847763109 pA/sqrt(Hz)
Flux bias 50kOhm noise : 0.820243866176 pA/sqrt(Hz)
Flux bias shot noise : 1.82743865989 pA/sqrt(Hz)
Flux bias shot noise : 3.28146037202 pA/sqrt(Hz)
Demod digitization stage noise : 0.00810783178394 pA/sqrt(Hz)
Nuller 1st stage noise : 0.51328889459 pA/sqrt(Hz)
Nuller 2nd stage noise : 0.133455112593 pA/sqrt(Hz)
4x820 Ohm resistors noise : 3.11126983722 pA/sqrt(Hz)

Predicted noise : 7.1883108231 pA/sqrt(Hz)
Measured noise : 10.1908231319 pA/sqrt(Hz)
Standard deviation : 5.2460264547 pA/sqrt(Hz)
Measured/predicted : 1.41769372286



b153-w0-c1

Removing gradient
Applying Hanning window
Correcting PSD for Hanning window

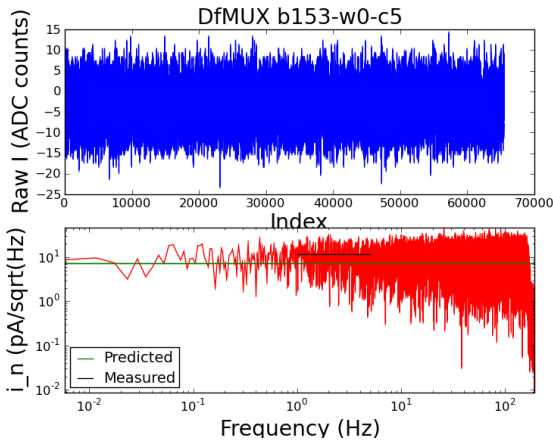
Measured I increased by 5% for DMFD imperfections.

Measured value is the average between 1.0 and 5.0Hz.

Demod gain is : 2
Demod frequency is : 334842 Hz
Carrier gain is : 0
Carrier amplitude : 0.0
Nuller gain is : 0
Nuller amplitude : 0.0
Voltage bias is : 0.0 uV_RMS
R normal is : 0.0 ohm
R is : 0.0 ohm
SQUID feedback loop: 10000 ohm
SQUID flux bias : -0.260864257812 V
SQUID current bias : 4.04193115234 V
Leadlag R : 20 ohm
Optical loading : 0.0 pW
Frequency band : 0 GHz
Tc is : 0.706 K
T_bath is : 0.235 K
G is guessed : -1.0 pW/K

Dark Squid
SQUID noise : 3.53553390593 pA/sqrt(Hz)
SQUID ctrl 1st stage noise : 2.91459568329 pA/sqrt(Hz)
20 ohms noise : 1.67589251789 pA/sqrt(Hz)
Feedback resistor noise : 1.81971212009 pA/sqrt(Hz)
SQUID ctrl 2nd stage noise : 0.183847763109 pA/sqrt(Hz)
Flux bias 50kOhm noise : 0.820243866176 pA/sqrt(Hz)
Flux bias shot noise : 1.82743865989 pA/sqrt(Hz)
Flux bias shot noise : 3.31364044555 pA/sqrt(Hz)
Demod digitization stage noise : 0.00810783178394 pA/sqrt(Hz)
Nuller 1st stage noise : 0.51328889459 pA/sqrt(Hz)
Nuller 2nd stage noise : 0.133455112593 pA/sqrt(Hz)
4x820 Ohm resistors noise : 3.11126983722 pA/sqrt(Hz)

Predicted noise : 7.21820770551 pA/sqrt(Hz)
Measured noise : 11.4413544579 pA/sqrt(Hz)
Standard deviation : 5.78249784374 pA/sqrt(Hz)
Measured/predicted : 1.58506861048



b153-w0-c2

Removing gradient
Applying Hanning window
Correcting PSD for Hanning window

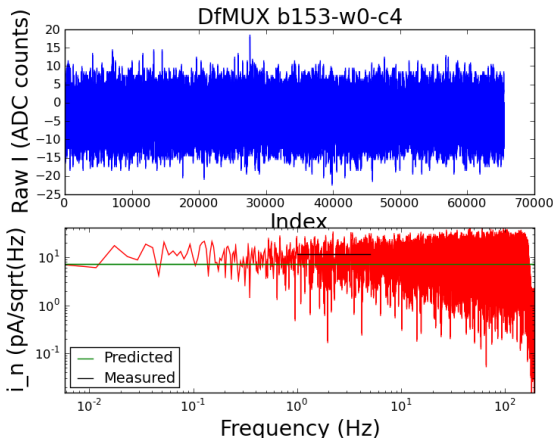
Measured I increased by 5% for DMFD imperfections.

Measured value is the average between 1.0 and 5.0Hz.

Demod gain is : 2
Demod frequency is : 399900 Hz
Carrier gain is : 0
Carrier amplitude : 0.0
Nuller gain is : 0
Nuller amplitude : 0.0
Voltage bias is : 0.0 uV_RMS
R normal is : 0.0 ohm
R is : 0.0 ohm
SQUID feedback loop: 10000 ohm
SQUID flux bias : -0.260864257812 V
SQUID current bias : 4.04193115234 V
Leadlag R : 20 ohm
Optical loading : 0.0 pW
Frequency band : 0 GHz
Tc is : 0.706 K
T_bath is : 0.235 K
G is guessed : -1.0 pW/K

Dark Squid
SQUID noise : 3.53553390593 pA/sqrt(Hz)
SQUID ctrl 1st stage noise : 2.95047765309 pA/sqrt(Hz)
20 ohms noise : 1.69652465052 pA/sqrt(Hz)
Feedback resistor noise : 1.81971212009 pA/sqrt(Hz)
SQUID ctrl 2nd stage noise : 0.183847763109 pA/sqrt(Hz)
Flux bias 50kOhm noise : 0.820243866176 pA/sqrt(Hz)
Flux bias shot noise : 1.82743865989 pA/sqrt(Hz)
Flux bias shot noise : 3.35443510777 pA/sqrt(Hz)
Demod digitization stage noise : 0.00810783178394 pA/sqrt(Hz)
Nuller 1st stage noise : 0.51328889459 pA/sqrt(Hz)
Nuller 2nd stage noise : 0.133455112593 pA/sqrt(Hz)
4x820 Ohm resistors noise : 3.11126983722 pA/sqrt(Hz)

Predicted noise : 7.25634721554 pA/sqrt(Hz)
Measured noise : 10.9869515289 pA/sqrt(Hz)
Standard deviation : 5.72250800642 pA/sqrt(Hz)
Measured/predicted : 1.51411601493



b153-w0-c3

Removing gradient
Applying Hanning window
Correcting PSD for Hanning window

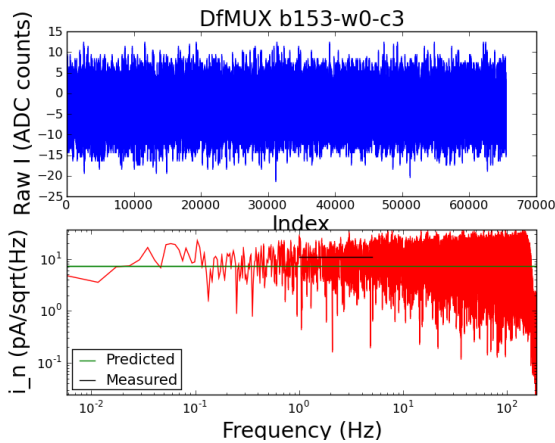
Measured I increased by 5% for DMFD imperfections.

Measured value is the average between 1.0 and 5.0Hz.

Demod gain is : 2
Demod frequency is : 457428 Hz
Carrier gain is : 0
Carrier amplitude : 0.0
Nuller gain is : 0
Nuller amplitude : 0.0
Voltage bias is : 0.0 uV_RMS
R normal is : 0.0 ohm
R is : 0.0 ohm
SQUID feedback loop: 10000 ohm
SQUID flux bias : -0.260864257812 V
SQUID current bias : 4.04193115234 V
Leadlag R : 20 ohm
Optical loading : 0.0 pW
Frequency band : 0 GHz
Tc is : 0.706 K
T_bath is : 0.235 K
G is guessed : -1.0 pW/K

Dark Squid
SQUID noise : 3.53553390593 pA/sqrt(Hz)
SQUID ctrl 1st stage noise : 2.98699292845 pA/sqrt(Hz)
20 ohms noise : 1.71752093386 pA/sqrt(Hz)
Feedback resistor noise : 1.81971212009 pA/sqrt(Hz)
SQUID ctrl 2nd stage noise : 0.183847763109 pA/sqrt(Hz)
Flux bias 50kOhm noise : 0.820243866176 pA/sqrt(Hz)
Flux bias shot noise : 1.82743865989 pA/sqrt(Hz)
Flux bias shot noise : 3.39594978304 pA/sqrt(Hz)
Demod digitization stage noise : 0.00810783178394 pA/sqrt(Hz)
Nuller 1st stage noise : 0.51328889459 pA/sqrt(Hz)
Nuller 2nd stage noise : 0.133455112593 pA/sqrt(Hz)
4x820 Ohm resistors noise : 3.11126983722 pA/sqrt(Hz)

Predicted noise : 7.29543045959 pA/sqrt(Hz)
Measured noise : 10.9779217126 pA/sqrt(Hz)
Standard deviation : 5.73811604337 pA/sqrt(Hz)
Measured/predicted : 1.50476682266



b153-w0-c4

Removing gradient
Applying Hanning window
Correcting PSD for Hanning window

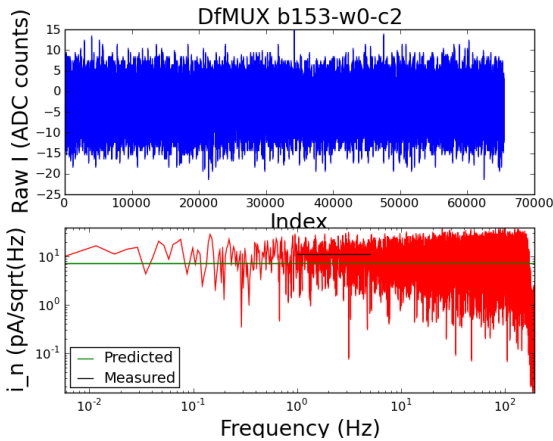
Measured I increased by 5% for DMFD imperfections.

Measured value is the average between 1.0 and 5.0Hz.

Demod gain is : 2
Demod frequency is : 515256 Hz
Carrier gain is : 0
Carrier amplitude : 0.0
Nuller gain is : 0
Nuller amplitude : 0.0
Voltage bias is : 0.0 uV_RMS
R normal is : 0.0 ohm
R is : 0.0 ohm
SQUID feedback loop: 10000 ohm
SQUID flux bias : -0.260864257812 V
SQUID current bias : 4.04193115234 V
Leadlag R : 20 ohm
Optical loading : 0.0 pW
Frequency band : 0 GHz
Tc is : 0.706 K
T_bath is : 0.235 K
G is guessed : -1.0 pW/K

Dark Squid
SQUID noise : 3.53553390593 pA/sqrt(Hz)
SQUID ctrl 1st stage noise : 3.02803229803 pA/sqrt(Hz)
20 ohms noise : 1.74111857137 pA/sqrt(Hz)
Feedback resistor noise : 1.81971212009 pA/sqrt(Hz)
SQUID ctrl 2nd stage noise : 0.183847763109 pA/sqrt(Hz)
Flux bias 50kOhm noise : 0.820243866176 pA/sqrt(Hz)
Flux bias shot noise : 1.82743865989 pA/sqrt(Hz)
Flux bias shot noise : 3.44260795785 pA/sqrt(Hz)
Demod digitization stage noise : 0.00810783178394 pA/sqrt(Hz)
Nuller 1st stage noise : 0.51328889459 pA/sqrt(Hz)
Nuller 2nd stage noise : 0.133455112593 pA/sqrt(Hz)
4x820 Ohm resistors noise : 3.11126983722 pA/sqrt(Hz)

Predicted noise : 7.33967634014 pA/sqrt(Hz)
Measured noise : 11.4951009638 pA/sqrt(Hz)
Standard deviation : 6.11115894417 pA/sqrt(Hz)
Measured/predicted : 1.5661591099



b153-w0-c5

Removing gradient
Applying Hanning window
Correcting PSD for Hanning window

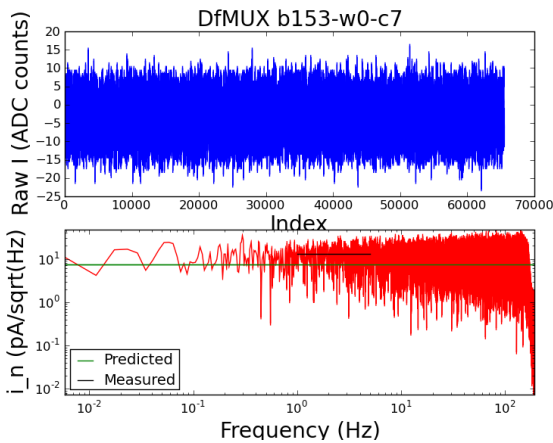
Measured I increased by 5% for DMFD imperfections.

Measured value is the average between 1.0 and 5.0Hz.

Demod gain is : 2
Demod frequency is : 568704 Hz
Carrier gain is : 0
Carrier amplitude : 0.0
Nuller gain is : 0
Nuller amplitude : 0.0
Voltage bias is : 0.0 uV_RMS
R normal is : 0.0 ohm
R is : 0.0 ohm
SQUID feedback loop: 10000 ohm
SQUID flux bias : -0.260864257812 V
SQUID current bias : 4.04193115234 V
Leadlag R : 20 ohm
Optical loading : 0.0 pW
Frequency band : 0 GHz
Tc is : 0.706 K
T_bath is : 0.235 K
G is guessed : -1.0 pW/K

Dark Squid
SQUID noise : 3.53553390593 pA/sqrt(Hz)
SQUID ctrl 1st stage noise : 3.06965477924 pA/sqrt(Hz)
20 ohms noise : 1.76505149806 pA/sqrt(Hz)
Feedback resistor noise : 1.81971212009 pA/sqrt(Hz)
SQUID ctrl 2nd stage noise : 0.183847763109 pA/sqrt(Hz)
Flux bias 50kOhm noise : 0.820243866176 pA/sqrt(Hz)
Flux bias shot noise : 1.82743865989 pA/sqrt(Hz)
Flux bias shot noise : 3.4899290796 pA/sqrt(Hz)
Demod digitization stage noise : 0.00810783178394 pA/sqrt(Hz)
Nuller 1st stage noise : 0.51328889459 pA/sqrt(Hz)
Nuller 2nd stage noise : 0.133455112593 pA/sqrt(Hz)
4x820 Ohm resistors noise : 3.11126983722 pA/sqrt(Hz)

Predicted noise : 7.3848911965 pA/sqrt(Hz)
Measured noise : 11.8070248164 pA/sqrt(Hz)
Standard deviation : 6.40092652208 pA/sqrt(Hz)
Measured/predicted : 1.59880822916



b153-w0-c6

Removing gradient
Applying Hanning window
Correcting PSD for Hanning window

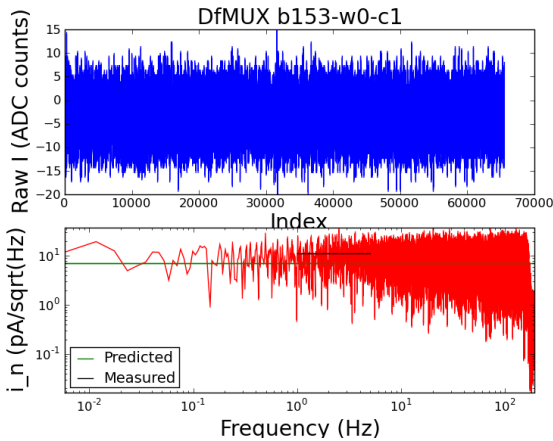
Measured I increased by 5% for DMFD imperfections.

Measured value is the average between 1.0 and 5.0Hz.

Demod gain is : 2
Demod frequency is : 631542 Hz
Carrier gain is : 0
Carrier amplitude : 0.0
Nuller gain is : 0
Nuller amplitude : 0.0
Voltage bias is : 0.0 uV_RMS
R normal is : 0.0 ohm
R is : 0.0 ohm
SQUID feedback loop: 10000 ohm
SQUID flux bias : -0.260864257812 V
SQUID current bias : 4.04193115234 V
Leadlag R : 20 ohm
Optical loading : 0.0 pW
Frequency band : 0 GHz
Tc is : 0.706 K
T_bath is : 0.235 K
G is guessed : -1.0 pW/K

Dark Squid
SQUID noise : 3.53553390593 pA/sqrt(Hz)
SQUID ctrl 1st stage noise : 3.12289765586 pA/sqrt(Hz)
20 ohms noise : 1.79566615212 pA/sqrt(Hz)
Feedback resistor noise : 1.81971212009 pA/sqrt(Hz)
SQUID ctrl 2nd stage noise : 0.183847763109 pA/sqrt(Hz)
Flux bias 50kOhm noise : 0.820243866176 pA/sqrt(Hz)
Flux bias shot noise : 1.82743865989 pA/sqrt(Hz)
Flux bias shot noise : 3.55046157486 pA/sqrt(Hz)
Demod digitization stage noise : 0.00810783178394 pA/sqrt(Hz)
Nuller 1st stage noise : 0.51328889459 pA/sqrt(Hz)
Nuller 2nd stage noise : 0.133455112593 pA/sqrt(Hz)
4x820 Ohm resistors noise : 3.11126983722 pA/sqrt(Hz)

Predicted noise : 7.44321905108 pA/sqrt(Hz)
Measured noise : 12.1899037117 pA/sqrt(Hz)
Standard deviation : 6.45603684236 pA/sqrt(Hz)
Measured/predicted : 1.63771932924



b153-w0-c7

Removing gradient
Applying Hanning window
Correcting PSD for Hanning window

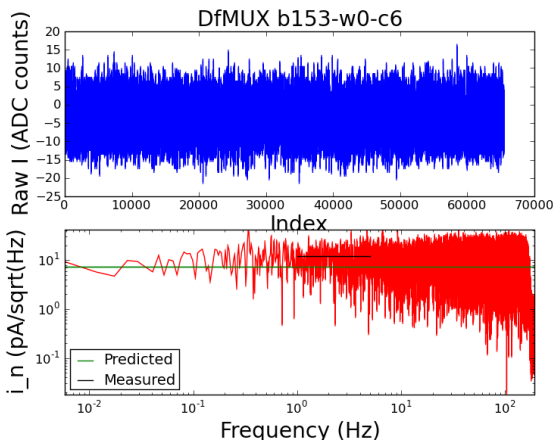
Measured I increased by 5% for DMFD imperfections.

Measured value is the average between 1.0 and 5.0Hz.

Demod gain is : 2
Demod frequency is : 720069 Hz
Carrier gain is : 0
Carrier amplitude : 0.0
Nuller gain is : 0
Nuller amplitude : 0.0
Voltage bias is : 0.0 uV_RMS
R normal is : 0.0 ohm
R is : 0.0 ohm
SQUID feedback loop: 10000 ohm
SQUID flux bias : -0.260864257812 V
SQUID current bias : 4.04193115234 V
Leadlag R : 20 ohm
Optical loading : 0.0 pW
Frequency band : 0 GHz
Tc is : 0.706 K
T_bath is : 0.235 K
G is guessed : -1.0 pW/K

Dark Squid
SQUID noise : 3.53553390593 pA/sqrt(Hz)
SQUID ctrl 1st stage noise : 3.20530326544 pA/sqrt(Hz)
20 ohms noise : 1.84304937763 pA/sqrt(Hz)
Feedback resistor noise : 1.81971212009 pA/sqrt(Hz)
SQUID ctrl 2nd stage noise : 0.183847763109 pA/sqrt(Hz)
Flux bias 50kOhm noise : 0.820243866176 pA/sqrt(Hz)
Flux bias shot noise : 1.82743865989 pA/sqrt(Hz)
Flux bias shot noise : 3.64414954758 pA/sqrt(Hz)
Demod digitization stage noise : 0.00810783178394 pA/sqrt(Hz)
Nuller 1st stage noise : 0.51328889459 pA/sqrt(Hz)
Nuller 2nd stage noise : 0.133455112593 pA/sqrt(Hz)
4x820 Ohm resistors noise : 3.11126983722 pA/sqrt(Hz)

Predicted noise : 7.53455053112 pA/sqrt(Hz)
Measured noise : 12.7934261128 pA/sqrt(Hz)
Standard deviation : 6.48959439921 pA/sqrt(Hz)
Measured/predicted : 1.6979680529



b153-w0

