

WFIRST Microlensing

- NWNH - 500 day observing program
- JDEM- Ω allows 2 50-day observing periods per year – without interruptions!
- “Edge” effects penalize interruptions
 - Perhaps by a factor of 1.5-2
 - Gaudi is calculating this
- Require longer observing windows to allow the preferred SNe observing program
 - 1.3 or 1.8 SNe observing windows may be easier to accommodate.

Figure of Merit

$$FOM \equiv (N_{\oplus} N_{HZ} N_{ff} N_{20\%})^{1/8} \propto T^{1/2}$$

1. N_{\oplus} : Number of planets detected (at $\Delta\chi^2=160$) with a $M=M_{\text{Earth}}$ and $P=2$ yr, assuming every MS star has one such planet.
 - Region of parameter space difficult to access from the ground.
 - Uses period rather than semimajor axis as P/R_E is a weaker function of primary mass than a/R_E .
 - Designed to be diagnostic of the science yield for the experiment. If mission can detect these planets, guaranteed to detect more distant planets
2. N_{HZ} : Number of habitable planets detected assuming every MS star has one, where habitable means $0.1-10M_{\text{Earth}}$, and $[0.72-2.0 \text{ AU}](L/L_{\text{sun}})^{1/2}$
3. N_{ff} : The number of free-floating $1M_{\text{Earth}}$ planets detected, assuming one free floating planet per star.
4. $N_{20\%}$: The number of planets detected with a $M=M_{\text{Earth}}$ and $P=2$ yr for which the primary mass can be determined to 20%.

FOM Priors

- Stage 1 = now
- Stage 2 = at launch
- Stage 1 priors all ~ 0
- Stage 2 priors mostly ~ 0 or \ll WFIRST
 - FOM-2 N_{HZ} value from Kepler will depend on mission extension and assumed optimism about final results

Provisional Figure of Merit

$$FOM \equiv (N_{\oplus} N_{HZ} N_{ff})^{1/6} \propto T^{1/2}$$

We are unlikely to have a good calculation of $N_{20\%}$ prior to June 1