

Outline for FEPS 30% IRAC paper, To be coordinated with other 30% papers (Kim, Bouwman, Carpenter?)

Plan A:

Summary Title: 30% Sample: IRAC 3-8um Disks/Evolution?

Lead/Deputy: Silverstone/Meyer

Suggested Co-Authors: Kim, Hines, Hillenbrand, Carpenter, Backman, Stauffer, other interested FEPS team members

Hypothesis: Zodiacal Clouds are common in our galaxy

Brief Description: This paper will present the IRAC 3-band fluxes for 80 FEPS targets, and will seek trends of excess with systemic age. This data set will be used to test the flux predictions of DB's toy model to commend on the prevalence of exo-zodiacal clouds. We will also seek the epoch at which optically thin disks become optically thick, identifying transition objects which are currently spanning these evolutionary states.

- *Open questions:* What limits the statistical significance of the 80 targets whose observations we currently have in hand. *Next Step:* adapt DB toy model to best prediction of sensitivities of each target observation, predict whether individual targets or if binned systems can address these predictions.

Rough age breakdown for the 80 FEPS targets with IRAC data in hand

| Age range | # stars in bin |
|-----------------------|----------------|
| $t < 10^{7.5}$ | 17 |
| $10^{7.5} < t < 10^8$ | 18 |
| $10^8 < t < 10^{8.5}$ | 11 |
| $10^{8.5} < t < 10^9$ | 13 |
| $t > 10^9$ | 21 |

1. Introduction

A) Brief description of FEPS project, refer to e.g. First Results paper

B) Brief summary of near-IR observations of zody, its evolutionary state, and how comparisons of such observations of other systems and the toy model will test the prevalence of such systems in our galaxy

C) Brief description of significance of 30% sample vs. 100% sample

2. Statistically define observed sample, ~80 targets

A) Brief literature review: Refer to LAH paper

B) Summary of stellar properties of the sample, presented with a table

i) Photometry

ii) Age determinations, classification, evolutionary state

iii) Multiplicity, metallicity, variability, etc.?

3. IRAC Data Reduction methods & error analysis

A) Brief description of data reduction cookbook (Refer to explanatory supplement?)

B) Description of statistical and photometric propagation of errors

4. Define photospheric models

A) refer to JMC Paper

B) Give BRIEF description here

5. Characteristics of excesses

A) Plot SEDs

- i) observed photometry (& spectra)
- ii) model photosphere

B) characterize excess SED

- i) dust mid-plane optical depth?
- ii) range of temperatures/radii? (is this consistent with IRS spectra)
- iii) fractional IR excess
- iv) dust mass estimates
- v) color-color plots: if these provide insight into the excess systems' physical states

6. Discussion of evolutionary picture?

A) plot excess vs. age for all targets

B) excess vs. binned ages

C) place trends in context

- i) describe DB toy model, refer to DB paper?
- ii) compare statistical significance of trends with toy model predictions
- iii) report variation of SED with evolution (temperatures, radii, dust density, grain evolution)
- v) prevalence of zody disks (extrapolate to full sample, full galaxy)
Asteroid belts?
- vi) implications of planets/planetary formation

D) Refer to interesting sources with further analysis in JSK & JB 30% papers, ancillary data, etc

7. Propose follow-up investigations and refer to planned publications

A) Detailed modeling paper (e.g. Plan B)

B) FEPS 100% paper

C) predict power of further observations, hooks into proposals?

- i) Spitzer (high-res spectra if indicated),
- ii) ground-based imaging, space-based imaging? variability?
- iii) further sub-mm observations

Plan B:

Summary Title: Newly discovered exo-Zodiacal clouds

Lead/Deputy: Silverstone/Meyer

Suggested Co-Authors: Kim, Hines, Bouwman, Wolf, Hillenbrand, Carpenter, Backman, Stauffer, other interested FEPS team members

Hypothesis: Selected FEPS targets have interesting exo-zodiacal cloud emission as well as MIPS photometry and IRS spectra.

Model after FEPS First Results paper

Explore more details of models of dust distribution/mineralogy?

Less statistical analysis, but leave hooks into stats paper (Carpenter et al?)

Compare evolutionary state with other known disks

Implications for planet formation, co-orbital bodies, etc.