XIII. Safety

General
In our study we reviewed safety issues associated with candidate implementations of SAFIR. Ground testing, test facilities, launch facility range, and operational safety requirements were considered.

As likely implementations of SAFIR are based on previous and queued IR missions such as IRAS, ISO, SIRTF, SOFIA and JWST, as well as Astro-F, Herschel, and SPICA, hazard analysis can be fairly easily inferred.

Hazards may be categorized as Chemical, Physical, Biological, Ergonomic, Manufacturing and Test, or Maintenance and Operation related. Chemical hazards for SAFIR are principally associated with the propulsion system, thermal system (cryogenic and room temperature heat pipes) and potentially with toxic materials (e.g., beryllium) that may be used for their desirable technical properties. Physical hazards for SAFIR are associated with the necessary deployment system(s), reaction wheels, as well as the pressurized propulsion, electrical (battery), and cryogenic systems. A non-ionizing (RF) radiation physical hazard is associated with the X-Band communication system. The large cryogenic test facilities that SAFIR will use have associated with them asphyxiation and other occupational hazards. Due to its large size (even when not deployed), there are hazards associated with transportation and handling, including to and from test facilities, as well as at the launch site.

Although several hazards were identified during the study, since likely implementations of SAFIR are based on previous and queued IR missions as mentioned previously, so would be the hazard control plans. No hazard identified during the course of this study was judged to be of high probability and high severity. Should in-space operations involving humans be implemented with SAFIR (see Section XIV), a completely independent safety assessment that considers human ratings for spacecraft components will need to be undertaken.

Launch and Near-Earth Operations
SAFIR will need to be compliant with East-West Range, or other applicable launch vehicle / complex (e.g., European Space Agency and Ariane) safety requirements. But no safety hazards unique to SAFIR, that are not shared by previous and queued IR missions such as IRAS, ISO, SIRTF, SOFIA and JWST, as well as Astro-F, Herschel, and SPICA were identified in the course of this study.

Planetary Protection
As an astronomical observatory mission, planetary protection requirements are not applicable.

End of Mission Safety Issues
As the baseline orbital venue is the second sun – earth Lagrange point (L2), no significant end of mission safety issues were identified in the course of this study.