K-band (24 GHz) Celestial Reference Frame

Christopher S. Jacobs*[1]

[1]et Propulsion Laboratory - California Institute of Technology – United States

Abstract

The K-band (24 GHz) Celestial Reference Frame became one of three components of the ICRF-3 in 2018 (Charlot et al, 2020). As of August 2023, the K-band data set has increased to 1187 sources, 153 sessions (48 sessions since 2019 are dual polarization),

and 2.32 million observations (4.8X increase)—as well as adding north-south geometry

from Spain to South Africa and Korea to Australia. This solution from 2023 August 24th

has median formal precisions of 50 μas in α cosδ and 84 μas in δ. The largest spherical

harmonic distortions seen in the K-band CRF vs. ICRF3-SX are a Z-dipole term of 58 +- 6 μas

and a quadrupole 2,0 magnetic term of -48 +- 5 μas and quadrupole 2,0 electric

term of -64 +- 7 μas. The K-band frame is dominated by the northern geometry of the VLBA.

Recently begun observing programs from Yebes, Spain to Hartebeesthoek, South

Africa and from the Korean VLBI Network to Mopra, Australia are expected to improve

declination precision as well as reduce the above systematic distortions. The prospects

for future improvements are bright with the aforementioned north-south baselines as well as

plans for increasing VLBA data rates to 8 Gbps, and potentially adding dual band X/K (8/ 24 GHz) to the VLBA with the JPL designed broadband receiver (Kooi et al, 2023) in order to improve ionosphere calibrations.

*Speaker