

**[☞ST-02] Wide-orbit companion candidates and Stellar Disk
around T-Tauri Star**

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Two substellar companion candidates with planetary mass, around a T-Tauri star in the ρ Ophiuchi star-forming region, are discovered by results of Subaru Telescope's near-infrared imaging. Candidates are separated by 1400au and 500au. If these candidates were real companions, they are the widest-orbit and the lowest mass planetary-mass companions(PMCs) candidates. This discovery may suggest that PMCs form via extreme case of cloud core fragmentation for multiple stars. And also stellar disk are imaged by HiCIAO, high contrast instrument for exoplanets and disks, with Subaru Telescope. This could be the first case, which imaged both of planetary mass companions and disk around same star. Even two companions candidates are not bounded around the star, they still could be one of the lowest mass objects. In this presentation, I will discuss about observations and confirmations of these objects, and the latest results about their properties.

**[☞ST-03] Odyssey: a new GPU-based ray-tracing code
for the Kerr Spacetime**

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We present a new ray-tracing code, "Odyssey", for the Kerr spacetime accelerated by the Graphics Processing Unit (GPU). Taking advantage of the ability of nVidia graphic cards to evaluate trajectories of a large amount of photon simultaneously, the code is two orders of magnitude as fast as the previous CPU-based code corresponding to the speed of few nanoseconds per photon per time step. In the light of the Graphic User Interface (GUI) powered by the GPU-enhanced 2D/3D displaying technique, DirectX, it is feasible for users to manipulate diverse results such as rotating and zooming in/out the trajectories of photon instantly near the black hole. Thus the Odyssey can serve as a tool not only for scientific but also for the educational purpose. We discuss possible applications in detail in light of several results such as the shape of the silhouette of a black hole, the shape of a hot spot orbiting a black hole, and 3D photon trajectories.