Many unconventional quantum matters, such as fractional quantum Hall effect and d-wave high-Tc superconductor, are discovered in strongly interacting systems. Understanding quantum many-body systems with strong interaction and the unconventional phases therein is one of the most challenging problems in physics nowadays. Gases of ultra-cold atoms provide an exquisite platform to study these problems since interactions are naturally created and well manipulated by bringing the system close to a scattering resonance. The studies have so far mostly been limited for s-wave resonance. In this talk, we report the experimental observation of a broad d-wave shape resonance in degenerate 41K gas. We have measured the molecular binding energy that splits into three branches as a hallmark of d-wave molecules, and find that the lifetime of this many-body system is reasonably long at strongly interacting regime. By analyzing the breathing mode excited by ramping through this resonance, we found that a quite stable low-temperature atom and molecule mixture is expected to be produced. Putting all the evidence together, our system offers great promise to reach a d-wave molecular superfluid.