

SPACE EXPLORATION SYMPOSIUM (A3)  
Small Bodies Missions and Technologies (4)

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OSIRIS-REX TOUCH-AND-GO (TAG) MISSION DESIGN FOR ASTEROID SAMPLE COLLECTION

**Abstract**

The Origins Spectral Interpretation Resource Identification Security Regolith Explorer (OSIRIS-REx) mission is a NASA New Frontiers mission launching in September 2016 to rendezvous with the near-Earth asteroid Bennu in October 2018. After several months of proximity operations to characterize the asteroid, OSIRIS-REx will fly a Touch-And-Go (TAG) trajectory to the asteroid's surface to collect at least 60 g of pristine regolith sample for Earth return. This paper will describe the TAG mission design and key events that occur to safely and successfully collect the sample. An overview of the navigation performed to determine relative location to a chosen sample site, along with the maneuvers to reach the desired site will be described. Safety monitoring during descent is performed with onboard sensors providing an option to abort, troubleshoot, and try again if necessary. Sample collection occurs using a collection device at the end of an articulating robotic arm during a brief five second contact period, while a pogo mechanism in the arm assists to rebound the spacecraft away from the surface. Finally, sample is measured quantitatively utilizing the law of conservation of angular momentum, along with qualitative data from imagery of the sampling device. Upon sample mass verification, the arm places the sample into the Stardust-heritage Sample Return Capsule for returning to Earth in September 2023.