

MEMORANDUM OF UNDERSTANDING BETWEEN THE NATIONAL RADIO ASTRONOMY OBSERVATORY AND THE SWIFT GAMMA-RAY BURST MISSION

1. Purpose

In recognition of the importance of radio observations using the National Radio Astronomy Observatory (NRAO) facilities for scientific exploration by the Swift Gamma-Ray Burst Mission, and of optical, UV, X-ray, and gamma-ray observations by Swift to certain scientific programs conducted on NRAO facilities, this agreement aims to establish a reciprocal and cooperative arrangement in which observing time on NRAO telescopes and on Swift is made for coordinated observations on a competitive basis. The scientific programs that will be supported by this agreement are those that are enhanced by the combination of Swift observations with investigations using the radio facilities operated by the NRAO. The intent, in keeping with the missions of both Swift and the NRAO, is to maximize data availability and scientific return for the entire user community.

2. Background Description of the Swift Gamma-Ray Burst Mission

Swift, launched on 20th Nov 2004, is a robotic, multi-wavelength observatory with instruments covering the following energy bandpasses: 15-150 keV (Burst Alert Telescope; BAT), 0.3-10 keV (X-ray Telescope; XRT), and 160-800 nm (UltraViolet/Optical Telescope; UVOT). With nearly instantaneous data dissemination, Swift is the premier observatory for discovery and follow-up of gamma-ray bursts (GRBs) and other transient sources. Observing time (up to 5 Ms per year) is made available to scientists at U.S. and non-U.S. institutions to study a wide variety of astrophysical sources. Consistent with Explorer Program policy, there are no proprietary data rights to observations conducted with Swift.

3. Background Description of NRAO Radio Telescopes

The NRAO operates the Very Long Baseline Array (VLBA), a milliarcsecond-resolution continent-wide interferometer array; the Karl G. Jansky Very Large Array (Jansky VLA), and arcsecond-resolution centimeter-wave interferometer array; and the Robert C. Byrd Green Bank Telescope (GBT), a precise 100m single-aperture telescope. In addition, the NRAO is the North American Executive of the Atacama Large Millimeter/Submillimeter Array (ALMA), to be completed in 2014. The present agreement covers the use of the GBT, VLBA, and VLA, with the potential of adding ALMA at a future date. The total amount of scientific observing time used on the operational NRAO telescopes ranges from 4500 to 6500 hours per year. The GBT, VLBA, and VLA are pointed telescopes generally allocated for PI proposals; their data proprietary period is 12 months, beginning at the time of the last observations associated with a proposal. NRAO accepts proposal submissions on

February 1 and on August 1 annually. NRAO is funded by NSF as a research facility that operates state-of-the-art telescopes in an “open skies” mode for the entire astronomical community.

4. Scope and Purpose of Joint Program:

This agreement commits observing time on NRAO telescopes for correlative observations of Swift sources, and observing time on the Swift mission for correlative observations of NRAO sources. The available time will be awarded on a competitive basis, and will be subject to approval by the NRAO Director and the Swift Guest Investigator Program.

4.1 The scientific programs supported under this program are restricted to those that are enhanced by the combination of Swift observations with investigations using the radio facilities operated by NRAO.

4.2 All standard observing restrictions for both observatories will apply to joint proposals under this program.

4.3 This program supports two distinct types of joint opportunities between NRAO and Swift that will take place within the GI program. The two opportunities are described below.

5. Joint Proposals Opportunity: Access to NRAO Telescopes

By this agreement, NRAO permits the Swift GI Program to award NRAO observing time.

5.1 No more than 5% of the NRAO scientific observing time will be made available on NRAO’s [VLA](#), [GBT](#) and [VLBA](#), or up to 200-300 hours per year on each telescope. The allocation of time on the Atacama Large Millimeter/Submillimeter Array (ALMA) is not covered by this agreement.

5.2 The Swift Mission Project will make funding available to successful U.S.-based investigators who request NRAO observing time through the Swift GI process.

5.3 Requests for 200 hours or more of time on NRAO telescopes will not be eligible for time, but will be eligible for funding via the “Correlative Observations” Opportunity (see item 9 below).

5.4 Radio data acquired through the Swift GI Program will be the property of the proposers for the standard NRAO 12-month proprietary period. Unless the users petition for an extension of the proprietary period, the data will then become publicly available in the NRAO Archive.

5.5 The peer-reviewed Swift GI proposal-evaluation process will identify programs with sufficient merit to be allocated observing time and funding by

Swift, and those that fall within the agreed-on range of NRAO observing time will be allocated NRAO observing time without additional scientific review, if judged technically feasible. NRAO will perform feasibility checks on the proposed observations and reserves the right to reject any observation determined for any reason to be technically unfeasible or to jeopardize NRAO instrumentation. Such a rejection could jeopardize the entire proposed science program and impact the award of Swift observing time as well.

6. Joint Proposals Opportunity: Access to Swift Observations

By this agreement, the Swift Program permits NRAO to award up to 300ks of Swift observing time per year. This award of time shall occur without further scientific review by the Swift mission, provided compelling justification is provided to NRAO that such observations substantially enhance the scientific reach of the proposed observations.

6.1 Proposed observing time on Swift may be time-constrained, including coordinated and monitoring observations, and Targets of Opportunity, if full justification is included in the proposal. Note that proposed Swift observing time can include monitoring that precedes, follows and/or (for TOOs) triggers NRAO observing time.

6.2 Swift data sets obtained under this agreement will not be proprietary to the PI and will be immediately released publicly via the HEASARC data archive. No funds will be awarded from the Swift Project for such joint NRAO/Swift investigations. However, successful U.S.-based investigators are eligible for funding via the “Correlative Observations” Opportunity (see below).

6.3 The peer-reviewed NRAO proposal-evaluation process will identify programs with sufficient merit to be allocated observing time by NRAO, and those that fall within the agreed-on range of joint programs will be allocated Swift observing time without additional scientific review if they to be judged technically feasible. The Swift Project will perform feasibility checks on the proposed observations and reserves the right to reject any observation determined to be technically unfeasible for any reason. Such a rejection could jeopardize the entire proposed science program and impact the award of NRAO observing time as well.

7. Criteria for Award of Joint Observing

Observing time under this program will be awarded only to proposals that require use of both observatories to meet the primary science goals and shall not apply to usage of archival data. No NRAO time will be allocated without Swift time, and *vice versa*.

8. Establishing Technical Feasibility

Establishing technical feasibility is the responsibility of the PI. To do so, proposers are strongly encouraged to:

- review the NRAO Call for Proposals
- consult the [Swift Technical Handbook](#), or the Swift GI [webpage](#)
- contact the [Swift Helpdesk](#) and/or the [NRAO Helpdesk in case of questions](#)

9. Correlative (Funded) Observations Opportunity

9.1 Successful NRAO investigators may be eligible for Swift GI funding, provided their observing programs complement the Swift science program. In making their case for such funding, Proposers should address how the use of NRAO time will enhance the Swift science return. The extent to which such proposed “correlative investigations” will augment the science return from Swift will be considered in the proposal evaluation process, and the peer-reviewed Swift GI proposal-evaluation process will identify programs with sufficient merit to be allocated funding by Swift.

9.2 Proposals falling in the NRAO [Regular proposals](#), [Triggered proposals](#), and [Large proposals](#) categories, are eligible for funding through this joint opportunity.

9.3 For all correlative investigations funded by Swift, rapid public availability of the data or results is strongly encouraged. Public data availability for correlative studies should be discussed in these proposals and will be considered in the evaluation of the proposals.

9.4 Funded correlative proposals involve requests for Swift GI funding that are made subsequent to NRAO approval of observing time. The award of NRAO observing time will not be a guarantee of Swift funding; likewise, the granting of observing time is not contingent on Swift funding.

10. Credits and Attributions

10.1 For results obtained using Swift and NRAO facilities, proper attribution to NRAO facilities must be included in all publications, conference proceedings, posters, abstracts and talks and colloquia. Such attribution should read: "The National Radio Astronomy Observatory is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc."

10.2 Swift attribution is required for all Swift observations made under this program. Attribution for the observations and funding (if any) will be the same as for all other use of Swift data products.

11. Effective Date, Term, Termination, and Amendments

11.1 This agreement shall begin on day 1 July 2014 or upon the date of its signing by both Parties, whichever is later, and will thereafter be subject to renewal by mutual agreement annually.

11.2 This agreement may be suspended by mutual agreement of the signatories in the event of a major equipment failure on the Swift spacecraft or in the case of a major event that renders NRAO infrastructure incapable of supporting antenna operations for an extended period of time.

11.3 This agreement may be amended, subject to the written agreement of both signatories or their designated representatives.

Dr. Anthony Beasley, Director _____ Date
NRAO

Dr. Neil Gehrels, Swift PI _____ Date
NASA/GSFC