Technical Evaluation Report
“ND2 Attenuation of the COS Bright Object Aperture”

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**THE UNIVERSITY OF COLORADO**  
At Boulder  
The Center for Astrophysics and Space Astronomy  
Technical Evaluation Report  
“Sub-Arrays for COS Time-Tag Science Observations”

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1. INTRODUCTION

We review the COS Bright Object Aperture (BOA) attenuation specification. A factor of 100 neutral density attenuation (ND2) will provide adequate extension of the COS flux dynamic range for observing bright sensitivity or reddening calibration stars and for backing up some STIS UV spectroscopic capability.

2. BOA ATTENUATION SPECIFICATION

The brightest flux density COS should observe through its Primary Science Aperture (PSA) over the 1150-1800Å (FUV) wavelength region is \( \sim 10^{-12} \) ergs/cm\(^2\)/sec/Å for the R=20,000 modes and \( \sim 10^{-13} \) ergs/cm\(^2\)/sec/Å with G140L. These provide an average count rate of \( \sim 10 \) counts/sec per spectral resolution element (see Ball SER COS-SYS-022 by D. Ebbets, April 2000) and a global count rate of \( \sim 25,000 \) counts/sec per FUV detector segment. (Brighter fluxes could be safely observed, up to 40,000 counts/sec per segment, but the MCPs would suffer rapid gain depletion after only a few such observations. NUV observations can access flux densities \( \sim 10 \) times brighter.)

We have sought the advice of COS Science Team member, Dr. Claus Leitherer (STScI), and Dr. Geoff Clayton (LSU) on the flux range of suitable standard stars for use as FUV sensitivity and reddening calibrators. The HST-STIS/COS Faint Standard Extension Program and the UV extinction projects conducted so far include stars (mostly white dwarfs) with flux densities in the range \( 7 \times 10^{-12} \) ergs/cm\(^2\)/sec/Å to \( 2 \times 10^{-11} \) ergs/cm\(^2\)/sec/Å. Thus, in order to have access to a suitable number of standard stars with reasonable count rates using the G140L grating, we require an attenuation factor of \( \sim 100 \) for the Bright Object Aperture (BOA). This attenuation also provides, as a back-up capability, significant overlap in accessible fluxes between the COS G130M/G160M modes and the STIS E140M mode. Hence, we baseline a factor of 100 attenuation (ND2) for the neutral density filter to be used with the BOA.