```
PDS_VERSION_ID                  = PDS3
RECORD_TYPE                     = STREAM

OBJECT                          = TEXT
  PUBLICATION_DATE              = 2003-09-30
  NOTE                          = "This document provides a discussion
of the noise model used in the processing of this data."
END_OBJECT                      = TEXT
END
```

Let $\mu = \sin(B) = 0.429$ (B is the ring inclination angle)
F_0 = unocculted stellar flux
F = measured stellar flux
s_F = the noise in the signal
epsilon = measured RMS fractional scintillation noise in the unocculted stellar signal.
s_{back} = uncertainty in the zero-level of the normalized flux, i.e. the background noise including background ring flux, read noise, and seeing noise.
Tau = normal optical depth
Tau_{max} = the maximum detectable optical depth, determined from background and noise.
Tau_{low} = lower bound for the normal optical depth
Tau_{up} = upper bound for the normal optical depth

Estimates for Tau_{low} and Tau_{up} are based on measured scintillation noise and maximum detectable optical depth.

Values for Tau_{max} and epsilon for each observation run are given below.

The measured stellar flux is the unocculted flux moderated by the rings:

$$F = F_0 * e^{(-Tau/\mu)}$$

and

$$Tau = -\mu * \ln(F/F_0)$$

$$Tau_{max} = -\mu * \ln(s_{back}/F_0)$$

so

$$s_{back} = F_0 * e^{(-Tau_{max}/\mu)}$$

The noise in the signal is given by

$$(s_F)^2 = (s_{back})^2 + (epsilon * F)^2$$

and the lower and upper values for the optical depth at each point are:

$$Tau_{low} = -\mu * \ln^{-1}(f_{max})$$

$$Tau_{up} = -\mu * \ln^{-1}(f_{min})$$

ES1 Ingress
  Tau_{max} = 9.999
  epsilon = 1.000

ES1 Egress
  Tau_{max} = 9.999
  epsilon = 1.000

ES2 Ingress
  Tau_{max} = 9.999
  epsilon = 1.000

ES2 Egress
  Tau_{max} = 9.999
  epsilon = 1.000

IRTF Ingress
  Tau_{max} = 2.900
  epsilon = 0.017

IRTF Egress
  Tau_{max} = 2.900
  epsilon = 0.014

LICK Ingress
  Tau_{max} = 1.16
  epsilon = 0.045

LICK Egress
  Tau_{max} = 1.57
  epsilon = 0.025

MCD Ingress
  Tau_{max} = 2.200
  epsilon = 0.020

MCD Egress
  Tau_{max} = 2.000
  epsilon = 0.020

PAL Ingress
  Tau_{max} = 2.800
  epsilon = 0.010

PAL Egress
  Tau_{max} = 2.100
  epsilon = 0.010