The two-point calibration is derived in radiance form as

\[ R_b = R_w + G_b^{-1}(C_s - C_w) + Q_b = R_{b,I} + Q_b \]

where the linear and nonlinear terms are expressed as

\[ R_{b,I} = R_w + G_b^{-1}(C_s - C_w) \]

\[ G_b = \frac{C_w - C_c}{T_w - T_c} \]

\[ \chi = \frac{R_{b,I} - R_c}{R_w - R_c} \]

The maximum nonlinearity value can be derived by performing the derivative with respect to \( \chi \). Using Taylor’s expansion for \( f(\chi) = \chi(\chi - 1) \) at \( \chi_0 = 0.5 \)

\[ Q_b = \mu G_b^{-2} (C_s - C_w)(C_s - C_c) = \mu (R_w - R_c)^2 \chi(\chi - 1) \]

\[ Q_b = Q_{\text{max}} [4 \cdot (\chi - 0.5)^2 - 1] \]

\[ Q_{\text{max}} = \frac{1}{4} \cdot \mu \cdot (R_w - R_c)^2 \]

“\( \mu \)” is a function of instrument temperature and can be characterized from TVAC data collected at different base plate temperature.


ATMS TDR Bias (Block2.0 – OPS[Block1.2])

S-NPP ATMS TDR Bias (BLOCK2.0 - OPS) Ch.1 23.8 GHz QV-POL
Scan UTC Date: 2014-02-25
S-NPP ATMS TDR Bias (BLOCK2.0 - OPS) Ch.9 55.5 GHz QH-POL
Scan UTC Date: 2014-02-25
ATMS TDR Bias (Block2.0 – OPS[Block1.2])
ATMS TDR/SDR Bias (Block2.0 – OPS[Block1.2])

S-NPP ATMS TDR/SDR Global Bias (BLOCK2.0 – OPS[BLOCK1.2])

Temperature Bias (K) vs Channels

-0.6 to 0