APPENDIX M: IMPLEMENTATION OF AMSU-B CORRECTION ALGORITHM

The NOAA-15 S-band antenna anomaly was attributed to a mismatch of materials. The STX-1, STX-2, and STX-3 high gain antennas were fabricated using a non-conductive center core with four conductive strips coiled around it. A metal transition tab was attached to an end of each strip and is used to complete the antenna's electrical path. Regrettably, the metal transition tab and the center core had very different thermal expansion properties. As the STX antennas went in and out of sun conditions the material mismatch condition caused these tabs to experience a small movement. These movements introduced stresses and the tabs eventually cracked due to metal fatigue. The antenna's electrical path was then compromised.

The lost NOAA-15 STX down link capability was successfully recovered through the use of an operational work-around (as described in this appendix). The satellite's data sources were switched to use differently designed antennas, the STX-2 omni and the STX-4 omni.

A corrective redesign to future NOAA satellite antennas was performed. Starting with NOAA-16 the antennas now include stress relief in critical areas and a change of materials to better match the thermal expansion properties. A flight quality antenna was fabricated and subjected to 3675 thermal cycles. No electrical performance degradation was noted. The tested antenna was then disassembled, inspected, and the design was confirmed for flight.

The AMSU-B instruments on NOAA-16 and NOAA-17 were modified before launch to augment the radio frequency shielding within the receiver. Therefore their susceptibility to interference is much reduced compared with NOAA-15.

For NOAA-16 any interference effects are below the noise level of the instrument, so no correction tables are needed.

For NOAA-17 there is low-level interference on Channels 18 and 19. These biases are associated with STX-2 and STX-3. The maximum Earth view bias is 2K for Channel 19 and 1K for Channel 18.

The biases were characterized during the post-launch checkout period, and correction tables issued. Because the spacecraft transmitters are stable there is no need for any additional correction tables or bias detection schemes.

This appendix is an attempt to document the bias characteristics of the AMSU-B instrument for the NOAA KLM spacecraft. The changes are ordered chronologically in this appendix, beginning with the most recent to the earliest changes (note that the tables are numbered in reverse order because of this arrangement).

The current corrections for the RFI contamination can be found by using the tables below to cross-reference the transmitter to the version of the coefficients currently being used.

Table M-1. NOAA-15 RFI Coefficients for AMSU-B			
Transmitter	**Version**	**Date**	**Table**
STX1	1.7	Nov 11,1999	Table M.9-3
STX2	2.3	March 6, 2001	Table M.9-9
STX3	1.7	Nov 11,1999	Table M.9-3
SARR	2.3	March 6, 2001	Table M.9-9

Table M-2. NOAA-17 RFI Coefficients for AMSU-B			
Transmitter	**Version**	**Date**	**Table**
STX1	1.0	July 12, 2002	M.9-11
STX2	1.0	July 12, 2002	M.9-11
STX3	1.0	July 12, 2002	M.9-11
SARR	1.0	July 12, 2002	M.9-11

M.1 DISCUSSION

The AMSU-B Level 1b dataset currently provides the following primary information:

- Raw instrument counts for Earth views. 90 values per channel per scan line.

- Polynomial coefficients for converting the raw counts to 'antenna temperature', i.e. the brightness temperature seen by the instrument with no correction for beam side lobes. Three coefficients per channel per scan line.

Space view counts and internal target counts are also present in the Level 1b dataset but are not required by the user once the polynomial coefficients have been calculated.

The Level 1b dataset is derived from the Level 1a dataset, which contains only raw instrument telemetry (i.e. no conversion coefficients).

In August 1998, a modification was made to the NESDIS Level 1b format to include information on the S-band transmitter status and output power levels. Thus, for any scan line it is possible to determine which transmitters were on. This information is stored in the analog telemetry data field. In general, some of the transmitters are only used during data downlinks (currently, STX2 and STX3) while others are on continuously (currently, STX1 and SARR). The information available in the Level 1b dataset is as follows: STX1, STX2, STX3 and STX4 status; STX1, STX2 and STX3 output power; SARR-A and SARR-B output power. All values are in the range 0 to 255 counts (representing analog voltages in the range 0 to 5.1 volts). For users of direct HRPT transmissions, the transmitter information may be extracted from the TIP data which is embedded in the HRPT data frame - see Section M.8 for details.

The correction scheme may be summarized as follows:

- Information on the required Earth view, space view and internal target view corrections are to be included in the Level 1b header, i.e. applying to the whole orbit.

- The polynomial coefficients are calculated based on corrected space view and target view counts (though the counts values stored in the Level 1b dataset are **not** changed)

- Scan-dependent Earth view corrections are applied by the Level 1b user before converting to radiance.

The advantages of including the correction information in the Level 1b header are as follows:

- It guarantees that the information is available to all Level 1b users

- The user does not have to keep track of any updates to the corrections

The advantages of making the space view and internal target view corrections at the Level 1A-Level 1b stage are as follows:

- Fixed space view and internal target view corrections are already applied at the Level 1A-Level 1b stage, so it is logical to apply the new correction here.

- The Level 1b user only needs to apply an Earth view correction.

- It allows the correction to be made before the quality control procedures are carried out and before the 7-line calibration convolution function is applied. This improves the results at times of transmitter change.

Recent ground-based Electromagnetic Compatibility (EMC) measurements on the F3 instrument have shown that the counts (or temperature) error due to interference is proportional to transmitter power. This cannot be verified at present on the spacecraft since the transmitter powers do not vary significantly. However, it is recommended that the correction algorithm should make some allowance for future variations in transmitter power. The transmitter powers reported in the analog telemetry are sufficiently noise-free that they can be relied on to provide an instantaneous measure of power. Errors due to digitization of the analog powers are less than 0.5 percent, which would contribute less than 0.2K error if these powers were used to scale the AMSU-B corrections (as outlined in sections M.3 and M.4).

Strictly speaking the relationship between analog counts and actual transmitter power level is not linear. However, for the purpose of AMSU-B bias removal, a linear relationship may be assumed, particularly since the transmitters are normally either fully on (with nearly constant power level) or fully off (with zero counts).

M.2 INFORMATION TO BE STORED IN THE HEADER

Rather than attempting to identify which channels are susceptible to which transmitters,

corrections are provided for all channels and transmitters. Thus, some corrections may be zero.

Transmitter - STX1, STX2, STX3 and SARR. (STX4 is not normally used, so may be ignored. Also, no distinction is made between SARR-A and SARR-B: only one of these will be active at any given time).

The count corrections are stored in the AMSU-B header record at byte offset 1001 (420 2-byte integers). The bias corrections in the header are given for 5 channels, 21 views, and 4 transmitters, in that order. The 21 views include 19 Earth scene views (views 1, 5, 10, 15, 20, ..., 85, 90) followed by cold and warm calibration views. The order of the 4 transmitters is STX1, STX2, STX3, and SAR.

Transmitter reference powers - mean power at the time the above corrections were derived.

The reference transmitter powers are stored at byte offset 1849 (four 2-byte integers, scaled by 10 x value in counts, i.e. a precision of 0.1 counts). The mean transmitter power at which the bias corrections were determined are given for each transmitter, in the order STX1, STX2, STX3 and SAR.

M.3 ADDITIONAL TASKS FOR THE LEVEL 1A-LEVEL 1b CALIBRATION PROGRAM

This section applies to users of HRPT direct transmissions or to users of raw GAC or LAC data. Read the bias correction information and 'reference' transmitter powers from an external file (containing data generated by the UKMO- see Section M.9) and incorporate into the Level 1b header.

- For each scan line, extract the transmitter powers from the analog telemetry. Divide each transmitter power by the reference transmitter power.
- For each transmitter that has non-zero power, obtain the space view and target view corrections and multiply by the power ratio. Correct the space view and internal target view counts before doing the space view / target view counts convolution process. If more than one transmitter is on, the combined correction is the sum of the individual corrections. Proceed with the rest of the calibration as before.

The transmitter powers for each scan line can be found at byte offset 2793-2802 in the AMSU-B data record (five 2-byte integer values, corresponding to STX1, STX2, STX3, SARR-A and SARR-B).

Note that since the update time of the analog parameters giving transmitter status is eight seconds, one or two AMSU-B scans before a transmitter switch-on or switch-off could be wrongly corrected, both at this stage and at the later stage (see below) when scan-dependent corrections are made. To indicate this, a scan-line quality flag is set if a transition was detected within $\forall 3$ scan lines of the one being calibrated. The quality flag is bit 4 of the quality indicator at byte offset 25-28 in the AMSU-B Level 1b data record.

For comparison purposes, the NESDIS Level 1b product will contain the uncorrected calibration coefficients in the 'secondary' coefficients locations (byte offset 121-180 in the data record). These secondary coefficients are not normally used. Quality flags will be calculated based on the primary coefficients.

M.4 ADDITIONAL TASKS FOR THE LEVEL 1b USER

- Read the Earth-view correction tables from the Level 1b header and calculate the counts correction as a function of transmitter, channel and pixel (see Section M.6 for discussion of interpolation methods). Store results in a look-up table (4 transmitters x 5 channels x 90 pixels = 1800 values).
- For each scan line, extract the transmitter powers from the analog telemetry. Divide each transmitter power by the reference transmitter power.

- For each transmitter that has non-zero power, obtain the Earth-view corrections and multiply by the power ratio. Hence, correct the Earth view counts. If more than one transmitter is on, the combined correction is the sum of the individual corrections.

- Calculate antenna temperature using the corrected counts and the standard calibration coefficients a_0, a_1 and a_2 provided in the Level 1b file.

The transmitter powers for each scan line can be found at byte offset 2793-2802 in the AMSU-B data record (5 2-byte integer values, corresponding to STX1, STX2, STX3, SARR-A and SARR-B).

Example FORTRAN subroutines to correct the Earth-view data are provided in Section M.7

M.5 DERIVATION OF CORRECTION DATA

The correction data are obtained by examining the periods immediately before and immediately after a transmitter turn-off or turn-on. Changes in raw counts are measured. By examining several on/off occasions a measure of the repeatability may be obtained. It is preferable to work in units of raw counts in order to ensure that the space view, target view and Earth view corrections are independent. Also, it is known that the interference occurs in the 'back end' of the receiver, i.e. after the stages which have the largest gain variations, so a correction in counts is more appropriate.

The initial set of correction data (see Section M.9) are derived from the six transmitter on-off tests conducted between 24th August and 3rd September 1998. Three of these were conducted over land areas (Australia) and three over the South Pacific. There were no significant differences between the land and sea area results. Further tests will be conducted periodically in order to monitor any long-term changes.

Note that this is an objective test based purely on the AMSU-B data itself. It does not rely on any

particular radiance forward model, though comparisons with forward models can provide a useful additional check on the consistency of the AMSU-B radiances.

M.6 INTERPOLATION METHODS

The AMSU-B bias correction curves are essentially smooth curves that have been fitted to experimental data. Although there is insufficient space in the Level 1b header to provide corrections for all pixels, it is possible to show that by providing corrections at five pixel intervals there is no significant loss of accuracy, provided a suitable interpolation scheme is implemented. In other words, interpolation errors can be made small compared both with uncertainties in the bias and with instrument noise.

A simple linear interpolation method is simple to code and would result in interpolation errors of up to 0.5C; for many applications such errors may be acceptable. However, to achieve the best results higher order interpolations are required.

Many users will have access to cubic spline library routines, and these will give excellent results - within 1 or 2 counts of the original data values from which the correction tables were derived.

Alternatively, quadratic interpolation may be used in which a quadratic curve is provided between each pair of table samples. Any gradient discontinuities at the table sample points will be small provided the second derivative of the correction curve is slowly varying relative to the sample spacing of the table. This is a reasonable assumption for the AMSU-B application because of the underlying smooth nature of the correction curve. The overall accuracy is within 1 or 2 counts. This is the method used in the example in Section M.7, and is nearly as simple to code as the linear interpolation. It is recommended as an alternative to the use of cubic spline library routines.

M.7 FORTRAN EXAMPLES

Two example subroutines are provided below. The first may be used to interpolate the bias correction tables in an AMSU-B Level 1b header. The second may be used to apply corrections to Earth-view data.

```
!+
!ROUTINE    AMB_INTERPOLATE_EX
!
!DISCLAIMER The UK Meteorological Office does not guarantee the correctness
!          of this program and takes no responsibility for its use.
!
!PURPOSE    Example subroutine to interpolate AMSU-B bias correction values.
!          Quadratic interpolation - assumes 2nd derivative of correction
!          curve is approximately constant between input table points.
!
!VERSION    1.0      12 Oct 1998     N C Atkinson, UKMO
!
!ARGUMENTS  Integer*2 CorrTable(5,21,4)   Correction table in Level 1b header at
!                                byte offset 1001
!          Integer*2 CountsCorr(5,90,4)  Interpolated Earth-view corrections
!###############################################################################
```

```
      SUBROUTINE INTERPOLATE_EX(CorrTable,CountsCorr)

      INTEGER*2 CorrTable(5,21,4)
      INTEGER*2 CountsCorr(5,90,4)
      INTEGER Tx,Chan,Pix,Pix1,Pix2,P1,P2
      REAL F,FF
      REAL Grad(5,19,4)    !First derivative of correction curve
!
! Calculate Gradients
!
      DO Chan=1,5
       DO Tx=1,4
        DO Pix=2,18
         Grad(Chan,Pix,Tx) = 0.1*(CorrTable(Chan,Pix+1,Tx) -
     &                        CorrTable(Chan,Pix-1,Tx))
        ENDDO
        Grad(Chan,1,Tx) = 2*Grad(Chan,2,Tx) - Grad(Chan,3,Tx) !Special case
        Grad(Chan,19,Tx) = 2*Grad(Chan,18,Tx) - Grad(Chan,17,Tx)
       ENDDO
      ENDDO
!
! Interpolate
!
      DO Pix=1,90
       P1 = Pix/5 + 1      ! 1 to 19        !Find nearest 2 points in table
        P2 = Pix/5 + 2      ! 2 to 20
        Pix1 = (P1-1)*5     !0 to 90
        Pix2 = (P2-1)*5     !5 to 95
        IF (Pix1 .EQ. 0) Pix1=1              !First point is pixel 1
        IF (P2 .GT. 19) P2 = 19
        F = (Pix2-Pix)/(1.0*(Pix2-Pix1))     !Linear term
        FF = 0.5*F*(Pix-Pix1)                !Quadratic term
        DO Chan=1,5
         DO Tx=1,4
          CountsCorr(Chan,Pix,Tx)=NINT(CorrTable(Chan,P1,Tx)*F
     &         + CorrTable(Chan,P2,Tx)*(1.0-F)
     &         + (Grad(Chan,P1,Tx)-Grad(Chan,P2,Tx))*FF)
         ENDDO
        ENDDO
       ENDDO
       RETURN
       END
 !###############################################################################
 !+
 !ROUTINE    AMB_EarthCORRECT_EX
 !
 !DISCLAIMER The UK Meteorological Office does not guarantee the correctness
 !          of this program and takes no responsibility for its use.
 !
 !PURPOSE    Example subroutine to correct AMSU-B Earth-view counts for bias
 !          errors. First convert the I*2 instrument telemetry (byte offset
 !          1481-2560) to positive I*4 array. Returns with corrected Earth-view
 !          counts.
 !
 !VERSION    1.0      12 Oct 1998     N C Atkinson, UKMO
 !
 !ARGUMENTS
 !  Integer*4    Earthcounts(540)        AMSU-B sensor data converted to I*4
 !  Integer*2    CountsCorr(5,90,4)      Earth-view correction tables,
 !                                       from subroutine INTERPOLATE_EX
```

```
!  Integer*2   TxPow(5)              Actual powers, from analog telemetry
!  Integer*2   TxPow_ref(4)          10 X Ref Powers, in Level 1b header,
!                                    byte offset 1849
!###############################################################################

      SUBROUTINE AMB_EarthCORRECT_EX(Earthcounts,CountsCorr,TxPow,
     &   TxPow_ref)

      INTEGER*4 Earthcounts(540)      !AMSU-B sensor data
      INTEGER*2 CountsCorr(5,90,4)    !Earth-view Correction tables
      INTEGER*2 TxPow_ref(4)          !From Level 1b header
      INTEGER*2 TxPow(5)              !From analog telemetry
      INTEGER*2 ECorr(5,90)           !Overall correction: 5 channels, 90 views
      INTEGER Chan,Sample,I,Tx
      REAL F
!
! Initialise
!
      DO Chan=1,5
        DO I=1,90
          ECorr(Chan,I) = 0
        ENDDO
      ENDDO
!
! Calculate current corrections
!
      DO Tx=1,4
        IF (Tx.LT.4) THEN
          F = TxPow(Tx)/(0.1*TxPow_ref(Tx))
        ELSE                    !Use sum of SARR-A and SARR-B powers
          F = (TxPow(Tx)+TxPow(Tx+1))/(0.1*TxPow_ref(Tx))
        ENDIF
        IF (F.GT.0.01) THEN
          DO Chan=1,5
            DO I=1,90
              ECorr(Chan,I)=ECorr(Chan,I)+NINT(CountsCorr(Chan,I,Tx)*F)
            ENDDO
          ENDDO
        ENDIF
      ENDDO
!
! Apply current corrections, overwriting the original counts values
!
      DO Chan=1,5
        Do Sample=1,90
          I = (Sample-1)*6 + Chan + 1
          Earthcounts(I) = Earthcounts(I) + ECorr(Chan,Sample)
        ENDDO
      ENDDO
      RETURN
      END
!###############################################################################
```

M.8 **LOCATION OF TRANSMITTER POWER DATA**

Table M.8-1 provides the necessary information to extract the transmitter powers from the spacecraft telemetry. This information is required by users of HRPT transmissions or users of raw GAC or LAC data.

Table M.8-1. Location of Transmitter Power in Spacecraft Telemetry.				
Description	**Source**	**TIP Word #**	**TIP Minor Frame**	**AMSU-B Level 1b byte #**
STX1 Power	TIP 16-sec analog subcom-1	11	48, 128, 208, 288	2793
STX2 Power	TIP 16-sec analog subcom-1	11	50, 130, 210, 290	2795
STX3 Power	TIP 16-sec analog subcom-1	11	40, 120, 200, 280	2797
SARR-A Power	TIP 16-sec analog subcom-2	14	114, 274	2799
SARR-B Power	TIP 16-sec analog subcom-2	14	2, 162	2801

Note: The TIP data are contained in HRPT minor frame 1 (of 3) at HRPT word 104-623.

M.9 BIAS CORRECTION TABLES

AMSU-B Bias corrections, Version 1.1, 22 Sept 1998, UKMO

Table M.9-1 gives the bias corrections for AMSU-B for transmitters: STX1, STX2, STX3 and SARR(A). The corrections (in counts) are provided for Earth views 1, 5, 10...90, Space view (91) and Target view (92) and the mean transmitter power is also given.

Table M.9-1. AMSU-B Bias Corrections for NOAA-15 (as of 22 Sept 1998).					
Transmitter: STX1 Mean transmitter power = 111.3 counts					
View	**Channel 16**	**Channel 17**	**Channel 18**	**Channel 19**	**Channel 20**
1	45	-514	12	-101	113
5	43	-555	27	-117	132
10	44	-595	38	-132	147
15	45	-612	44	-140	159
20	48	-617	45	-148	171
25	52	-626	40	-161	182
30	55	-603	31	-166	183
35	56	-502	22	-143	162
40	57	-362	15	-106	128
45	55	-246	9	-78	97
50	50	-170	7	-59	77
55	43	-126	13	-44	68
60	36	-105	24	-33	66
65	28	-98	29	-30	64
70	2	98	31	-30	61
75	18	-98	35	-27	58
80	18	-86	38	-19	52
85	23	-56	38	-9	41
90	34	-33	39	3	34
91	0	-21	-6	-9	11
92	0	4	0	0	7

Transmitter: STX2 Mean transmitter power = 114.3 counts					
View	**Channel 16**	**Channel 17**	**Channel 18**	**Channel 19**	**Channel 20**
1	0	0	0	0	0
5	0	0	0	0	0
10	0	0	0	0	0
15	0	0	0	0	0
20	0	0	0	0	0
25	0	0	0	0	0
30	0	0	0	0	0
35	0	0	0	0	0
40	0	0	0	0	0
45	0	0	0	0	0
50	0	0	0	0	0
55	0	0	0	0	0
60	0	0	0	0	0
65	0	0	0	0	0
70	0	0	0	0	0
75	0	0	0	0	0
80	0	0	0	0	0
85	0	0	0	0	0
90	0	0	0	0	0
91	4	-26	0	-13	10
92	0	0	0	0	0
Transmitter: STX3 Mean transmitter power = 95.0 counts					
View	**Channel 16**	**Channel 17**	**Channel 18**	**Channel 19**	**Channel 20**
1	23	-48	33	-42	36
5	17	-40	25	-43	32
10	11	-16	18	-33	19
15	7	-2	14	-18	4
20	3	-6	12	-7	0
25	0	-26	14	-12	12
30	-1	-51	17	-21	29
35	-3	-62	19	-16	28
40	-4	-59	19	-5	12
45	-4	-49	16	0	0
50	-4	-36	12	-4	-4
55	-3	-25	9	-12	-1
60	-3	-16	7	-19	2
65	-2	-8	6	-17	0
70	0	-9	5	-10	-3
75	0	-28	3	-6	0
80	1	-50	0	-6	9
85	3	-52	-4	-9	12

90	4	-39	1	-9	13
91	6	-100	-1	-17	22
92	2	-17	1	0	1
Transmitter: SARR Mean transmitter power = 209.9 counts					
View	**Channel 16**	**Channel 17**	**Channel 18**	**Channel 19**	**Channel 20**
1	9	-1	36	-582	-214
5	0	-1	20	-556	-217
10	-6	2	20	-520	-215
15	-9	0	21	-456	-206
20	-9	-4	19	-363	-191
25	-7	-3	13	-252	-168
30	-3	2	6	-146	-138
35	0	6	1	-70	-104
40	4	6	-1	-27	-71
45	6	2	-2	-9	-47
50	7	-2	0	-10	-34
55	6	-3	3	-22	-34
60	5	-2	6	-53	-47
65	3	-4	7	-112	-69
70	1	-7	7	-187	-90
75	0	-7	7	-257	-100
80	1	-4	9	-304	-98
85	3	-2	12	-316	-87
90	8	0	7	-291	-71
91	0	-2	1	-74	-16
92	0	0	-2	-25	-15

Note that on 13th October 1998, an additional bias appeared, which was largest on channel 17 (up to 60K additional error) but was present to some extent on all channels. This new bias has been present on every orbit since then, and is present for typically 75% of every orbit. See Section M.10 for further discussion of this problem.

January 4, 1999:
The S band transmitters on NOAA-K have been shown to interfere with AMSU-B. The effect is largest on channels 17 and 19 but has been shown to be present in the other channels also. The errors are largest in the Earth views, but space views and to a lesser extent internal target views are also affected. This appendix describes the UK Meteorological Office (UKMO) recommendations for correcting the data.

The largest Earth view biases are in channels 17 and 19, with a strong scan-dependence and maximum errors of approximately 40K when the STX1 and SARR transmitters are active. Since these transmitters are normally switched on all the time, the bias appears constant.
The largest space view effect is in channel 17 when the STX3 transmitter is active. This

transmitter is currently used for data dumps to a ground station, typically for 5-10 minutes per orbit (not every orbit). When the transmitter is on, the space view counts rise by the equivalent of approximately 5K and the internal target view counts rise by approximately 1K. These rises cause errors in the calibration and result in Earth view brightness temperature errors of typically 2.5K at a scene temperature of 200K, decreasing to1K at warm scene temperatures.

The correction scheme described below applies both to users of the NESDIS Level 1b product and to users who receive the HRPT transmissions directly. When the scheme is implemented, it is expected that the overall error will be reduced to approximately 1K for all channels.

September 28, 1999:

Table M.9-2 gives the bias corrections for AMSU-B for transmitters: STX2 Omni, STX3 and SARR(A). The corrections (in counts) are provided for Earth views 1, 5, 10...90, Space view (91) and Target view (92) and the mean transmitter power is also given.

Table M.9-2. AMSU-B Bias Corrections for NOAA-15 (as of 28 Sept 1999).

Transmitter: STX2 Omni, Mean transmitter power: 112.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	0	-263	-30	-102	98
5	0	-288	-15	-105	100
10	0	-263	-1	-97	93
15	0	-204	7	-80	77
20	0	-137	11	-57	54
25	0	-77	12	-32	29
30	0	-34	10	-13	8
35	0	-14	7	-4	0
40	0	-13	4	-3	-1
45	0	-20	0	-5	1
50	0	-26	-1	-7	3
55	0	-27	-3	-7	3
60	0	-23	-3	-6	2
65	0	-15	-3	-4	0
70	0	-6	-1	-3	0
75	0	-1	0	-2	0
80	0	-5	1	-1	0
85	0	-11	2	0	0
90	0	-7	4	0	0
91	0	0	0	0	0
92	0	0	00	0	0
Transmitter: STX3 Mean transmitter power=95.0 counts					
View	**Channel #16**	**Channel #17**	**Channel #18**	**Channel #19**	**Channel #20**
1	23	-48	33	-42	36
5	17	-40	25	-43	32

10	11	-16	18	-33	19
15	7	-2	14	-18	4
20	3	-6	12	-7	0
25	0	-26	14	-12	12
30	-1	-51	17	-21	29
35	-3	-62	19	-16	28
40	-4	-59	19	-5	12
45	-4	-49	16	0	0
50	-4	-36	12	-4	-4
55	-3	-25	9	-12	-1
60	-3	-16	7	-19	2
65	-2	-8	6	-17	0
70	0	-9	5	-10	-3
75	0	-28	3	-6	0
80	1	-50	0	-6	
85	3	-52	-4	-9	1
90	4	-39	1	-9	13
91	6	-100	-1	-17	22
92	2	-17	1	0	1
Transmitter: SARR Mean transmitter power=209.9 counts					
View	**Channel #16**	**Channel #17**	**Channel #18**	**Channel #19**	**Channel #20**
1	9	-1	36	-582	-214
5	0	-1	20	-556	-217
10	-6	2	20	-520	-215
15	-9	0	21	-456	-206
20	-9	-4	19	-363	-191
25	-7	-3	13	-252	-168
30	-3	2	6	-146	-138
35	0	6	1	-70	-104
40	4	6	-1	-27	-71
45	6	2	-2	-9	-47
50	7	-2	0	-10	-34
55	6	-3	3	-22	-34
60	5	-2	6	-53	-47
65	3	-4	7	-112	-69
70	1	-7	7	-187	-90
75	0	-7	7	-257	-100
80	1	-4	9	-304	-98
85	3	-2	2	-316	87
90	8	0	7	-291	-71
91	0	-2	1	-74	16
92	0	0	-2	-25	-15

November 4, 1999:

Since the launch of NOAA-15, the three high-gain antennas connected to three of the four NOAA-15 transmitters (STX), specifically STX1, STX2 and STX3, have experienced increasing performance degradation. In addition, STX1 and STX3 radio frequency interference is being received by the AMSU-B instrument. The STX-1 high-gain HRPT antenna (1698.0 Mhz) is degraded to a level where small dish (1 m) users experience a significant number of HRPT dropouts, in many cases rendering the data unusable.

NOAA/NESDIS has reconfigured the spacecraft in an effort to maintain many of the missions of NOAA-15; i.e., readout of the full stored GAC data, HRPT direct readout (which also includes the HIRS and AMSU data), and HRPT Level 1b acquisitions at the NOAA CDAs.

At 0100 UTC on 28 September 1999, NOAA/NESDIS moved the HRPT service from STX-1 to the STX-2 OMNI antenna (1702.5 MHz). This transmitter/antenna combination has been tested with small dish receiving stations, and has been found to provide satisfactory reception under most conditions. (The EIRP for the STX-2 OMNI is equal to or greater than 24 dBm over 90% of a sphere). The STX-2 transmissions are Right Hand Circularly polarized and compatible with existing HRPT antenna systems. This change is permanent. APT service is not affected.

Because of these antenna interference problems, all Level 1b AMSU-B data from NOAA-15 received between launch and Sept. 28, 1999 should be considered unusable. A new bias correction table for the STX-2 OMNI antenna was included in the NOAA-K CPIDS AMSU-B preprocessor since Sept. 15, 1999, and is therefore included in the AMSU-B data set header record. These bias corrections must be applied by the user.

November 11, 1999:

AMSU-B Bias corrections, Version 1.7, 11 November 1999, include corrections for anomalous bias. Revised following trending tests of Oct 1999. STX-2 omni substituted for STX-2 high-gain based on October 1999 data. Transmitters STX1, STX2, STX3 and SARR(A) counts corrections for Earth views 1,5,10...90, Space view (91) and Target view (92). Mean transmitter power in counts, ID=4.

Table M.9-3. AMSU-B Bias Corrections for NOAA-15 Version 1.7 (11 Nov 1999).

Transmitter: STX1, Mean transmitter power: 111.3 counts

View	Channel # 16	Channel # 17	Channel # 18	Channel # 19	Channel # 20
1	33	-514	-12	-63	76
5	30	-555	13	-88	107
10	31	-595	19	-108	127
15	35	-612	24	-124	134
20	42	-617	32	-139	140
25	50	-626	32	-152	149
30	59	-603	28	-154	154
35	67	-501	28	-133	140

40	74	-362	28	-101	113
45	78	-246	24	-72	91
50	79	-170	17	-53	75
55	76	-126	12	-42	66
60	71	-105	13	-37	61
65	63	-98	17	-34	60
70	53	-98	23	-31	59
75	43	-98	27	-27	53
80	32	-86	29	-20	44
85	22	-56	31	-8	35
90	12	-33	39	3	32
91	0	-21	-6	-9	11
92	0	4	0	0	7
Transmitter: STX2 Omni, Mean transmitter power: 112.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	22	-254	-30	-92	95
5	21	-262	-15	-95	98
10	18	-236	-1	-88	93
15	13	-182	7	-70	76
20	8	-116	11	-45	52
25	5	-59	11	-19	31
30	2	-18	10	0	16
35	1	-1	7	3	7
40	0	-2	4	0	3
45	0	-16	0	-4	1
50	0	-29	-1	-5	2
55	0	-32	-3	-3	5
60	0	-25	-3	0	8
65	0	-14	-2	1	11
70	0	-4	-1	2	12
75	0	0	0	2	9
80	0	-2	1	3	6
85	0	-8	2	3	6
90	0	-4	4	4	8
91	0	0	0	0	0
92	0	0	0	0	0
Transmitter: STX3, Mean transmitter power: 95.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	8	-22	14	-41	29
5	12	-23	12	-37	20
10	16	-14	0	-31	9
15	19	-6	-9	-21	-4
20	22	-18	-11	-18	-6

25	23	-68	-1	-37	24
30	24	-127	15	-61	67
35	24	-156	30	-63	86
40	23	-155	39	7	78
45	21	-141	41	-30	53
50	18	-123	36	-21	28
55	15	-107	23	-24	21
60	10	-91	11	-32	23
65	6	-76	7	-35	20
70	1	-66	8	-31	18
75	-3	-65	9	-25	30
80	-8	-67	9	-19	42
85	-13	62	2	-17	34
90	-17	-54	8	-13	21
91	13	-110	2	-24	31
92	5	-20	-1	-1	3
Transmitter: SARR, Mean transmitter power: 210.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	0	-12	24	-469	-174
5	0	-5	20	-440	-167
10	0	0	14	-397	-165
15	0	3	8	-330	-164
20	0	4	4	-246	-158
25	0	5	0	-155	-141
30	0	4	-3	-74	-114
35	0	3	-5	-22	-82
40	0	1	-7	0	-51
45	0	0	-7	2	-31
50	0	-1	-5	-7	-23
55	0	-3	-2	-23	-28
60	0	-5	0	-54	-43
65	0	-5	4	-112	-66
70	0	-6	8	-187	-88
75	0	-6	10	-257	-102
80	0	-6	12	-306	-102
85	0	-6	12	-318	-85
90	0	-5	9	-294	-70
91	0	-2	1	-74	-16
92	0	0	-2	-25	-15
Anomalous STX1 correction tables for Scan 1					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	43	-831	261	-330	277
3	44	-749	243	-292	243

6	23	-462	213	-202	152
9	-16	-105	173	-97	48
12	-48	228	123	0	-43
15	-66	454	67	72	-108
18	-71	538	18	114	-147
21	-64	553	-15	133	-162
24	-50	516	-27	140	-159
27	-39	462	-19	134	-142
30	-31	393	5	119	-115
33	-20	304	37	97	-82
36	-11	220	67	76	-59
39	-10	156	87	60	-50
42	-15	101	98	47	-48
45	-21	52	102	36	-46
48	-26	12	99	28	-43
51	-30	-21	95	21	-44
54	-33	-39	90	17	-50
57	-35	-28	78	19	-52
60	-40	5	59	26	-52
63	-50	34	35	34	-54
66	-60	46	9	40	-56
69	-66	39	-16	43	-57
72	-65	22	-35	40	-56
75	-58	8	-44	34	-53
78	-47	6	-42	28	-49
81	-38	11	-33	21	-42
84	-30	15	-23	14	-34
87	-19	9	-14	7	-25
90	-14	0	-6	0	-19
91	0	-46	-12	-9	-16
92	16	-74	39	-22	25

Anomalous STX1 correction tables for Scan 2

View	Channel # 16	Channel # 17	Channel # 18	Channel # 19	Channel # 20
1	54	-895	291	-359	298
3	54	-804	274	-316	264
6	31	-502	238	-220	168
9	-10	-127	189	-104	58
12	-44	216	132	-4	-39
15	-64	436	73	69	-107
18	-71	536	21	113	-146
21	-66	555	-14	135	-162
24	-53	520	-27	139	-160
27	-43	466	-18	132	-143
30	-34	398	6	116	-115

33	-22	311	37	94	-85
36	-13	227	67	73	-62
39	-13	161	88	57	-53
42	-17	106	99	45	-51
45	-23	61	101	35	-50
48	-29	25	97	29	-48
51	-34	-6	91	24	-49
54	-38	-25	83	19	-55
57	-41	-18	69	20	-58
60	-45	8	49	25	-59
63	-52	32	27	31	-60
66	-61	41	3	35	-62
69	-66	34	-20	38	-62
72	-65	20	-37	36	-60
75	-57	8	-44	31	-56
78	-47	6	-42	26	-51
81	-38	10	-33	21	-44
84	-30	13	-23	14	-35
87	-20	9	-13	4	-25
90	-14	1	-3	-1	-18
91	0	-46	-12	-9	-16
92	16	-74	39	-22	25
Anomalous STX1 correction tables for Scan 3					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	51	-879	282	-352	301
3	52	-795	262	-313	260
6	29	-495	232	-219	168
9	-10	-135	190	-111	62
12	-45	202	136	-12	-33
15	-66	439	77	63	-104
18	-73	535	24	110	-143
21	-68	559	-12	135	-160
24	-56	528	-26	142	-160
27	-48	480	-22	137	-143
30	-41	414	-2	122	-114
33	-27	319	31	98	-81
36	-17	233	61	76	-57
39	-16	174	79	62	-49
42	-18	112	95	49	-46
45	-20	50	106	36	-43
48	-23	7	106	26	-39
51	-28	-22	100	21	-41
54	-33	-37	91	19	-49

57	-37	-26	76	23	-53
60	-42	2	54	31	-54
63	-50	28	28	40	-57
66	-59	38	2	45	-59
69	-65	29	-21	45	-59
72	-64	15	-37	40	-58
75	-57	7	-45	35	-54
78	-46	6	-43	32	-50
81	-37	11	-34	28	-42
84	-30	16	-23	22	-32
87	-20	11	-14	14	-25
90	-14	5	-3	8	-15
91	0	-46	-12	-9	-16
92	16	-74	39	-22	25

November 24, 1999:

The following updates to the AMSU-B RFI bias corrections are based on the October 1999 trending tests (performed by the UKMO).

These are the following differences compared with the previous version:

1) Only STX2 and SARR have changed (the other transmitters are not used operationally now, so the old values remain).
2) The largest change is for SARR in channel 19. Maximum change=3K. Would not expect any obvious difference in imagery products, but the new version gives a much flatter scan-dependence when compared with NWP model background.
3) Have left channel 18 completely unchanged. Changes in channels 17 and 20 are less than 1K.
4) Channel 16 uses a new technique involving AMSU-A to remove the unwanted effects of scene variation, the RFI corrections for this channel should be more accurate than before (probably about 0.2K). Other channels should be within 1K. Channel 19 is the one most likely to drift with time.

For RFI corrections, the users don't have to use the values in the Level 1b header if they don't want to.

December 1, 1999:

Updated values for the antenna bias will be implemented for NOAA-15. The changes are in response to the request to update the AMSU-B RFI Correction tables with data submitted by the UK Meteorological Office (UKMO) on Nov. 12, 1999. The first orbits to be processed will be: NSS.HRPT.NK.D99335.S1709.E1721.B0806464.GC scheduled to be ingested at 12:09 pm local time and NSS.GHRR.NK.D99335.S1535.E1707.B0806364.GC scheduled to be ingested at 12:23 pm local time.

January 4, 2000:

After re-configuring the STX antennas on NOAA-15, the previous AMSU-B bias has been minimized and stabilized. The monitoring of this new configuration since September 28, 1999 has shown little change in the bias. Therefore, it has been decided to declare the NOAA-15 1b, 1b* AMSU-B Level 1b an operational product as of January 6, 2000. Bias correction updates will still be implemented to perform bias corrections as deemed necessary by the instrument scientists.

January 10, 2000:

Revised following trending tests of 23 December 1999. STX-2 Omni antenna substituted for STX-2 high gain antenna. Transmitters STX2 Omni, STX4 and SARR(A) are operational per Nigel Atkinson (UKMO). It should be noted that there is no correction table for STX4 because it does not contribute to the interference with the AMSU-B instrument

Table M.9-4. AMSU-B Bias Corrections for NOAA-15, Version 1.8 (10 January 2000).

Transmitter: STX2 Omni, Mean transmitter power: 112.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	22	-240	-30	-86	87
5	21	-251	-15	-88	93
10	8	-228	-1	-78	89
15	13	-178	7	-61	72
20	8	-115	11	-42	48
25	5	-59	11	-24	24
30	2	-20	10	-11	6
35	1	-8	7	-5	-1
40	0	-12	4	-6	-2
45	0	-20	0	-7	-2
50	0	-25	-1	-8	-2
55	0	-26	-3	-8	0
60	0	-22	-3	-7	4
65	0	-12	-2	-6	7
70	0	-2	-1	-4	8
75	0	1	0	-2	6
80	0	-2	1	-1	3
85	0	-9	2	-3	4
90	0	-2	4	-2	6
91	0	0	0	0	0
92	0	0	0	0	0
Transmitter: SARR (A), Mean transmitter power: 210.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	0	-10	24	-443	-166
5	0	-3	20	-416	-165

10	0	2	14	-400	-168
15	0	5	8	-344	-164
20	0	5	4	-251	-152
25	0	5	0	-151	-131
30	0	4	-3	-69	-105
35	0	1	-5	-24	-77
40	0	-1	-7	-5	-51
45	0	-3	-7	-6	-33
50	0	-6	-5	-19	-25
55	0	-8	-2	-40	-31
60	0	-11	0	-77	-47
65	0	-11	4	-142	-70
70	0	-12	8	-217	-90
75	0	-11	10	-284	-101
80	0	-9	12	-326	-100
85	0	-6	12	-326	-87
90	0	-1	9	-294	-75
91	0	-2	1	-74	-16
92	0	0	-2	-25	-15

May 4, 2000

An AMSU-B bias trending test was conducted on 26-27 April 2000. Results of this test, plus monitoring of daily mean brightness temperatures, show that a minor update to the bias correction tables is required. The last update was issued in January 2000. Only the STX2 and SARR tables have been updated.

Differences are as follows:

Channel 16: None

Channel 17: Maximum change 1.3K, mainly affecting pixels 1-30. This is probably not an instrument change but rather an improvement in the characterization method. Globally-averaged brightness temperatures were showing unrealistic structure between pixels 1-30, which has now been removed.

Channel 18: None

Channel 19: Maximum change 1.7K at pixels 1-10. This is real, and is probably associated with a change in thermal forcing. The bias pattern changed slightly around 13th April, coinciding with a change from falling instrument temperatures to rising. Note that channel 19 shows the largest EMI effects and is therefore the most sensitive to environment changes.

Channel 20: None

AMSU-B Bias corrections, Version 1.9, 4 May 2000, include corrections for anomalous bias.

Revised following trending tests of 26-27 April 2000. STX-2 Omni substituted for STX-2 high-gain per Nigel Atkinson (UKMO). The other active transmitters include STX4 Omni and SARR. The STX-4 Omni does not appear to cause any interference, so there is no table for it.

Table M.9-5. AMSU-B Bias Corrections for NOAA-15, Version 1.9 (4 May 2000).					
Transmitter: STX2 Omni, Mean transmitter power: 112.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	22	-218	-30	-84	87
5	21	-249	-15	-86	93
10	18	-245	-1	-79	89
15	13	-208	7	-63	72
20	8	-138	11	-44	48
25	5	-67	11	-25	24
30	2	-24	10	-10	6
35	1	-15	7	-1	-1
40	0	-16	4	1	-2
45	0	-23	0	1	-2
50	0	-28	-1	-1	-2
55	0	-33	-3	-4	0
60	0	-23	-3	-6	4
65	0	-12	-2	-6	7
70	0	0	-1	-4	8
75	0	1	0	-2	6
80	0	-1	1	-1	3
85	0	-2	2	-1	4
90	0	-3	4	-3	6
91	0	0	0	0	0
92	0	0	0	0	0
Transmitter: SARR, Mean transmitter power: 210.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	0	-10	24	-423	-166
5	0	0	20	-394	-165
10	0	6	14	-387	-168
15	0	10	8	-337	-164
20	0	11	4	-247	-152
25	0	10	0	-144	-131
30	0	7	-3	-64	-105
35	0	3	-5	-20	-77
40	0	0	-7	-2	-51

45	0	-2	-7	-6	-33
50	0	-5	-5	-18	-25
55	0	-6	-2	-38	-31
60	0	-8	0	-76	-47
65	0	-7	4	-144	-70
70	0	-7	8	-223	-90
75	0	-7	10	-293	-101
80	0	-6	12	-335	-100
85	0	-5	12	-332	-87
90	0	-5	9	-288	-75
91	0	-2	1	-74	-16
92	0	0	-2	-25	-15

July 10, 2000

An AMSU-B bias trending test was conducted on 27-28 June 2000. Results of this test, plus monitoring of daily mean brightness temperatures and NWP model comparisons, show that an update to the bias correction tables is required. The last update was issued in May 2000. Channel 19 bias due to SARR interference, and to a lesser extent channel 20, is continuing to drift at up to 1K per month, depending on scan position. This does not appear to be directly related to temperature change, or any other external factor.

This time only the SARR table has been updated. STX-2 has not changed.

AMSU-B Bias corrections, Version 2.0, 10 July 2000

STX-2 omni was substituted for STX-2 high-gain per Nigel Atkinson (UKMO). The other active transmitters include STX2 omni, STX4 omni and SARR(A). Counts corrections for Earth views 1, 5, 10...90, space view (91) and Target view (92).

Table M.9-6. AMSU-B Bias Corrections for NOAA-15, Version 2.0 (10 July 2000).					
Transmitter: SARR, Mean transmitter power: 210.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	0	-10	24	-440	-166
5	0	0	20	-415	-165
10	0	6	14	-410	-168
15	0	10	8	-358	-164
20	0	11	4	-267	-152
25	0	10	0	-163	-135
30	0	7	-3	-80	-111
35	0	3	-5	-36	-83
40	0	0	-7	-17	-57
45	0	-2	-7	-20	-40

50	0	-5	-5	-33	-32
55	0	-6	-2	-58	-39
60	0	-8	0	-105	-60
65	0	-7	4	-179	-85
70	0	-7	8	-260	-106
75	0	-7	10	-326	-111
80	0	-6	12	-364	-105
85	0	-5	12	-357	-92
90	0	-5	9	-308	-75
91	0	-2	1	-74	-16
92	0	0	-2	-25	-15

November 9, 2000

An AMSU-B trending test was conducted on 3-4 November 2000. Results were as expected, i.e. a small change in the Channel 19 SARR interference, and otherwise no significant change. Results agree well with those obtained by other methods, including comparison with NOAA-16.

The only change in the new bias correction is the SARR table for channel 19. Changes range from -0.8K (around pixel 50) to +1.7K (pixel 20). The last update was issued in June 2000. The STX-2 omni antenna was substituted for STX-2 high-gain. Transmitters STX2 omni, STX4 omni and SARR(A) are active. Count corrections for Earth views 1, 5, 10...90, space view (91) and Target view (92).

Table M.9-7. AMSU-B Bias Corrections for NOAA-15, Version 2.1 (9 November 2000).

Transmitter: SARR, Mean transmitter power: 210.0 counts

View	Channel # 16	Channel # 17	Channel # 18	Channel # 19	Channel # 20
1	0	-10	24	-436	-166
5	0	0	20	-408	-165
10	0	6	14	-392	-168
15	0	0	8	-337	-164
20	0	11	4	-246	-152
25	0	10	0	-147	-135
30	0	7	-3	-75	-111
35	0	3	-5	-36	-83
40	0	0	-7	-20	-57
45	0	-2	-7	-29	-40
50	0	-5	-5	-45	-32
55	0	-6	-2	-68	-39
60	0	-8	0	-111	-60
65	0	-7	4	-177	-85
70	0	-7	8	-252	-106
75	0	-7	10	-316	-111

80	0	-6	12	-354	-105
85	0	-5	12	-354	-92
90	0	-5	9	-305	-75
91	0	-2	1	-74	-16
92	0	0	-2	-25	-15

December 8, 2000

An AMSU-B trending test was conducted on 4 December 2000 and was based on internal consistency and comparisons with NOAA-16. This revision includes corrections for anomalous bias, revised following trending tests of 3-4 November 2000 and updated for November drift. Only the channel 19 Earth-view SARR table was affected. The STX-2 omni antenna was substituted for the STX-2 high-gain antenna. Transmitters STX2 omni, STX4 omni and SARR(A) are active. Count corrections for Earth views 1,5,10...90, Space view (91) and Target view (92).

Table M.9-8. AMSU-B Bias Corrections for NOAA-15, Version 2.2 (4 December 2000).

Transmitter: SARR, Mean transmitter power: 210.0 counts

View	Channel # 16	Channel # 17	Channel # 18	Channel # 19	Channel # 20
1	0	-10	24	-441	-166
5	0	0	20	-414	-165
10	0	6	14	-396	-168
15	0	10	8	-336	-164
20	0	11	4	-242	-152
25	0	10	0	-143	-135
30	0	7	-3	-74	-111
35	0	3	-5	-37	-83
40	0	0	-7	-25	-57
45	0	-2	-7	-35	-40
50	0	-5	-5	-53	-32
55	0	-6	-2	-80	-39
60	0	-8	0	-125	-60
65	0	-7	4	-193	-85
70	0	-7	8	-271	-106
75	0	-7	10	-331	-111
80	0	-6	12	-367	-105
85	0	-5	12	-365	-92
90	0	-5	9	-314	-75
91	0	-2	1	-74	-16
92	0	0	-2	-25	-15

March 15, 2001

An AMSU-B trending test was conducted on 3 March 2001. Channels 19 and 20 of the SARR table were affected, as well as Channel 19 of the STX-2 omni table. Transmitters STX2 omni, STX4 omni and SARR(A) are active. Count corrections for Earth views 1,5,10...90, Space view (91) and Target view (92).

Table M.9-9. AMSU-B Bias Corrections for NOAA-15, Version 2.3 (6 March 2001).					
Transmitter: SARR, Mean transmitter power: 213.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	0	-10	24	-416	-162
5	0	0	20	-397	-168
10	0	6	14	-387	-171
15	0	10	8	-332	-160
20	0	11	4	-238	-142
25	0	10	0	-139	-125
30	0	7	-3	-73	-102
35	0	3	-5	-37	-75
40	0	0	-7	-26	-52
45	0	-2	-7	-37	-36
50	0	-5	-5	-59	-31
55	0	-6	-2	-91	-41
60	0	-8	0	-150	-63
65	0	-7	4	-239	-90
70	0	-7	8	-327	-113
75	0	-7	10	-391	-124
80	0	-6	12	-418	-117
85	0	-5	12	-407	-103
90	0	-5	9	-344	-77
91	0	-2	1	-74	-16
92	0	0	-2	-25	-15
Transmitter: STX2 Omni, Mean transmitter power: 114.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	22	-218	-30	-91	87
5	21	-249	-15	-92	93
10	18	-245	-1	-85	89
15	13	-208	7	-69	72
20	8	-138	11	-48	48
25	5	-67	11	-27	24
30	2	-24	10	-9	6
35	1	-15	7	0	-1
40	0	-16	4	2	-2
45	0	-23	0	4	-2

50	0	-28	-1	4	-2
55	0	-33	-3	1	0
60	0	-23	-3	-2	4
65	0	-12	-2	0	7
70	0	0	-1	2	8
75	0	1	0	3	6
80	0	-1	1	0	3
85	0	-2	2	-2	4
90	0	-3	4	-1	6
91	0	0	0	0	0
92	0	0	0	0	0

July 12, 2002

Table M.9-10. AMSU-B RFI Corrections for NOAA-17, Version 1.0 (12 July 2002).					
Transmitter: STX1, Mean transmitter power: 114.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	0	0	0	0	0
5	0	0	0	0	0
10	0	0	0	0	0
15	0	0	0	0	0
20	0	0	0	0	0
25	0	0	0	0	0
30	0	0	0	0	0
35	0	0	0	0	0
40	0	0	0	0	0
45	0	0	0	0	0
50	0	0	0	0	0
55	0	0	0	0	0
60	0	0	0	0	0
65	0	0	0	0	0
70	0	0	0	0	0
75	0	0	0	0	0
80	0	0	0	0	0
85	0	0	0	0	0
90	0	0	0	0	0
91	0	0	0	0	0
92	0	0	0	0	0
Transmitter: STX2, Mean transmitter power: 76.8 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	0	0	0	-2	0
5	0	0	0	-2	0

10	0	0	0	-2	0
15	0	0	0	-2	0
20	0	0	0	-4	0
25	0	0	0	-9	0
30	0	0	0	-16	0
35	0	0	0	-25	0
40	0	0	0	-29	0
45	0	0	0	-29	0
50	0	0	0	-25	0
55	0	0	0	-21	0
60	0	0	0	-18	0
65	0	0	0	-15	0
70	0	0	0	-5	0
75	0	0	0	-2	0
80	0	0	0	-6	0
85	0	0	-5	-21	0
90	0	0	-10	-34	0
91	0	0	-16	-81	0
92	0	0	0	0	0
Transmitter: STX3, Mean transmitter power: 88.7 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	0	0	0	0	0
5	0	0	0	3	0
10	0	0	0	3	0
15	0	0	0	-3	0
20	0	0	0	-13	0
25	0	0	0	-18	0
30	0	0	0	-19	0
35	0	0	0	-22	0
40	0	0	0	-30	0
45	0	0	0	-40	0
50	0	0	0	-37	0
55	0	0	0	-30	0
60	0	0	0	-19	0
65	0	0	0	-7	0
70	0	0	0	0	0
75	0	0	0	2	0
80	0	0	0	3	0
85	0	0	0	3	0
90	0	0	0	3	0
91	0	0	-8	-20	0
92	0	0	0	0	0

Transmitter: SARR, Mean transmitter power: 195.5 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	0	0	0	0	0
5	0	0	0	0	0
10	0	0	0	0	0
15	0	0	0	0	0
20	0	0	0	0	0
25	0	0	0	0	0
30	0	0	0	0	0
35	0	0	0	0	0
40	0	0	0	0	0
45	0	0	0	0	0
50	0	0	0	0	0
55	0	0	0	0	0
60	0	0	0	0	0
65	0	0	0	0	0
70	0	0	0	0	0
75	0	0	0	0	0
80	0	0	0	0	0
85	0	0	0	0	0
90	0	0	0	0	0
91	0	0	0	0	0
92	0	0	0	0	0

August 13, 2004

RFI corrections for the NOAA-15 SARR transmitter were updated in August of 2004. Only channels 19 and 20 of the SARR table were affected. Count corrections for Earth views 1,5,10...90, Space view (91) and Target view (92).

Table M.9-11. AMSU-B RFI Corrections for NOAA-15, Version 2.4 (13 Aug. 2004).					
Transmitter: SARR, Mean transmitter power: 213.0 counts					
View	**Channel # 16**	**Channel # 17**	**Channel # 18**	**Channel # 19**	**Channel # 20**
1	0	-10	24	-434	-173
5	0	0	20	-421	-180
10	0	6	14	-408	-178
15	0	10	8	-344	-162
20	0	11	4	-246	-143
25	0	10	0	-147	-125
30	0	7	-3	-79	-104
35	0	3	-5	-41	-81
40	0	0	-7	-26	-59

45	0	-2	-7	-35	-44
50	0	-5	-5	-55	-37
55	0	-6	-2	-93	-46
60	0	-8	0	-168	-70
65	0	-7	4	-277	-102
70	0	-7	8	-386	-136
75	0	-7	10	-461	-144
80	0	-6	12	-491	-139
85	0	-5	12	-472	-121
90	0	-5	9	-389	-83
91	0	-2	1	-74	-16
92	0	0	-2	-25	-15

M.10 IMPLEMENTATION OF NEW AMSU-B BIAS CORRECTION CHANGES (AFTER OCTOBER 13, 1998)

Nigel Atkinson of the UKMO has devised a scheme for correcting AMSU-B processing for the "new" transmitter bias, which began on October 13, 1998. This new bias is associated with a change in operating mode of the STX1 transmitter, and is characterized by a strong positive bias for Earth views 1 to 10, and a strong negative bias for views 11 to 20 in channel 17. In addition, the bias is dependent on the relative position of the AMSU-B and AMSU-A2 antennae; since there are three AMSU-B scans for each A2 scan, there are three sets of values for the AMSU-B new bias correction.

According to the UKMO scheme, the following changes will be implemented in the AMSU-B Level 1b dataset:

M.10.1 Level 1b header record

Spares in the Level 1b dataset header are replaced by arrays of bias count corrections for Earth and calibration views. Three sets of bias corrections are given, each set having values for five channels and 33 views, in that order. The first set is applied to the first scan in an 8 second cycle, the second set to the second scan, etc. The 33 views include 31 Earth scene views (views 1, 3, 6, 9, 12, ..., 87, 90) followed by cold and warm calibration views. These bias corrections are 2-byte integer values. The bias correction values begin at byte offset 1865 in the Level 1b header.

M.10.2 Level 1b data record

A flag in the scan data record indicates whether the new bias is on or off. This flag is useful for indicating to users if corrections for the new bias are needed for the Earth view data in the scan line. Availability of the flag obviates the need for users to implement the new bias detection algorithm in their code. This flag is contained in bit 5 of Quality Indicator Bit Field at byte offset 25 (see Table 8.3.1.7.3-1 for the AMSU-B Level 1b format).

For the scan line at which the bias first occurs, as well as for the preceding line, there is some uncertainty in the bias corrections since the exact point within these two lines where transmitter mode changes is unknown. Thus, the change in new bias condition adversely affects calibration of a scan line if the change occurs within the convolution interval for the scan. Consequently, if a new bias change is detected within three scan lines of the line being calibrated, the existing "transmitter switchover" flag (bit 4 of Quality Indicator Bit Field at byte offset 25) is set to indicate uncertainty in the calibration of the scan.

The scan number in an 8 second cycle may be found from the 'Scan Line Number' data field at byte 1 in the Level 1b data record. Using FORTRAN notation, the scan number is MOD(amb_scnlin-1,3)+1, where amb scnlin is the Scan Line Number. This value is used to select the correct set of new bias corrections from the Level 1b header record.

The bias count corrections supplied by UKMO are input to the algorithm for computation of the primary calibration coefficients a_0, a_1, a_2, which begin at byte offset 61 in the Level 1b data record. Secondary calibration coefficients (starting at byte offset 121) are computed without bias corrections. The quality flags in the header and data records reflect conditions pertaining to the primary calibration algorithm, as is currently the case.
The calibration algorithm includes gross count filtering and tests for consistency among readings within the scan. These tests are performed using the bias corrected values in the primary calibration procedure.