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RTCA Special Committee 186, Working Group 3

ADS-B 1090ES MOPS

Meeting #20

Teleconference

Proposed Change to Test Procedures for the Preamble Tests 1090ES MOPS §2.4.4.4.2.2 and §2.4.4.4.2.3

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SUMMARY
This Working Paper summarizes the proposed changes that are necessary to the Preamble Test Procedures in §2.4.4.4.2.2 and §2.4.4.4.2.3 that were previously identified as problems in Meeting #19 in Working Paper 1090-WP19-10.

2.4.4.4.2.2 Four-Pulse Preamble Detection Tests

Purpose/Introduction:

These tests verify that the ADS-B reply processor correctly detects the presence of a valid ADS-B preamble whose pulse characteristics are within the allowable limits and rejects preambles having pulse spacing and position characteristics that are outside the allowable limits.

Reference Input:

Provide a method of supplying the UUT with:

Any Valid ADS-B Message having:

"DF"	=	17
"CA"	=	0
"AA"	=	Any discrete address
Message Rate	=	50 Hz
Frequency	=	1090 MHz
Power	=	-23 dBm (for the first preamble pulse level)

Input A:

Same as the **Reference Input**, but having the following preamble pulse characteristics:

Table 2-150: Input A: Preamble Pulse Characteristics

Input A: Preamble Pulse Characteristics					
Pulse	**Rise time** (μsec)	**Fall time** (μsec)	**Δ Width** (μsec)	**Δ Position** (μsec)	**Δ Amplitude** (dB)
1	0.05 - 0.1	0.05 - 0.2	+0.05	—	—
2	0.05 - 0.1	0.05 - 0.2	-0.05	+0.100	+2
3	0.05 - 0.1	0.05 - 0.2	+0.05	+0.100	+2
4	0.05 - 0.1	0.05 - 0.2	-0.05	+0.100	0

Input B:

Same as the **Reference Input**, but having the following preamble pulse characteristics:

Table 2-151: Input B: Preamble Pulse Characteristics

Input B: Preamble Pulse Characteristics					
Pulse	**Rise time** (μsec)	**Fall time** (μsec)	**Δ Width** (μsec)	**Δ Position** (μsec)	**Δ Amplitude** (dB)
1	0.05 - 0.1	0.05 - 0.2	+0.05	—	—
2	0.05 - 0.1	0.05 - 0.2	-0.05	-0.100	+2
3	0.05 - 0.1	0.05 - 0.2	+0.05	-0.100	+2
4	0.05 - 0.1	0.05 - 0.2	-0.05	-0.100	0

Input C:

Same as the **Reference Input**, but having the following preamble pulse characteristics:

Table 2-152: Input C: Preamble Pulse Characteristics

Input C: Preamble Pulse Characteristics					
Pulse	**Rise time** (μsec)	**Fall time** (μsec)	**Δ Width** (μsec)	**Δ Position** (μsec)	**Δ Amplitude** (dB)
1	0.05 - 0.1	0.05 - 0.2	0	—	—
2	0.05 - 0.1	0.05 - 0.2	+3.5	0	0
3	Pulse Not Present				
4	Pulse Not Present				

Note: *Input C sets up a preamble where only P1 and P2 have actual leading edges, while P3 and P4 have pulse positions provided by the extended P2 pulse. All pulse positions and leading edges are at nominal positions. This test input verifies that the UUT accepts a preamble with the minimum 2 actual leading edges using P1 and P2. The test procedure requires that the UUT accepts this input at a rate of at least 90%.*

Input D:

Same as the **Reference Input**, but having the following preamble pulse characteristics:

Table 2-153: Input D: Preamble Pulse Characteristics

Input D: Preamble Pulse Characteristics					
Pulse	**Rise time** (μsec)	**Fall time** (μsec)	**Δ Width** (μsec)	**Δ Position** (μsec)	**Δ Amplitude** (dB)
1	0.05 - 0.1	0.05 - 0.2	+1.0	—	—
2	Pulse Not Present				
3	0.05 - 0.1	0.05 - 0.2	+1.0	0	0
4	Pulse Not Present				

Note: *Input D sets up a preamble where only P1 and P3 have actual leading edges, while P2 and P4 have pulse positions provided by the extended P1 and P3 pulses. All pulse positions and leading edges are at nominal positions. This test input verifies that the UUT accepts a preamble with the minimum 2 actual leading edges using P1 and P3. The test procedure requires that the UUT accepts this input at a rate of at least 90%.*

Input E:

Same as the **Reference Input**, but having the following preamble pulse characteristics:

Table 2-154: Input E: Preamble Pulse Characteristics

Input E: Preamble Pulse Characteristics					
Pulse	**Rise time** (μsec)	**Fall time** (μsec)	**Δ Width** (μsec)	**Δ Position** (μsec)	**Δ Amplitude** (dB)
1	0.05 - 0.1	0.05 - 0.2	+3.5	—	—
2	Pulse Not Present				
3	Pulse Not Present				
4	0.05 - 0.1	0.05 - 0.2	0	0	0

Note: *Input E sets up a preamble where only P1 and P4 have actual leading edges, while P2 and P3 have pulse positions provided by the extended P1 pulse. All pulse positions and leading edges are at nominal positions. This test input verifies that the UUT accepts a preamble with the minimum 2 actual leading edges using P1 and P4. The test procedure requires that the UUT accepts this input at a rate of at least 90%.*

Input F:

Same as the **Reference Input**, but having the following preamble pulse characteristics:

Table 2-155: Input F: Preamble Pulse Characteristics

Input F: Preamble Pulse Characteristics					
Pulse	**Rise time** (μsec)	**Fall time** (μsec)	**Δ Width** (μsec)	**Δ Position** (μsec)	**Δ Amplitude** (dB)
1	0.05 - 0.1	0.05 - 0.2	+1.3	-0.3	—
2	Pulse Not Present				
3	0.05 - 0.1	0.05 - 0.2	0	0	0
4	0.05 - 0.1	0.05 - 0.2	0	0	0

Note: *Input F sets up a preamble where only P3 and P4 provide actual leading edges within the allowable position limits, while P1 and P2 have pulse positions provided by the extended P1 pulse. Pulse positions and leading edges are located at nominal positions. This test input verifies that the UUT accepts a preamble with the minimum 2 actual leading edges using P3 and P4. The test procedure requires that the UUT accepts this input at a rate of at least 90%.*

Inputs G through W:

The Inputs for G through W are the same as the **Reference Input**, but having the following preamble pulse characteristics:

Table 2-156: Inputs G thru W: Preamble Pulse Characteristics

Input Set	Pulse	**Rise time** (μsec)	**Fall time** (μsec)	**Δ Width** (μsec)	**Δ Position** (μsec)	**Δ Amplitude (dB)**
Input G	1	0.05 - 0.1	0.05 - 0.2	+0.3	-0.3	—
	2	0.05 - 0.1	0.05 - 0.2	0	0	0
	3	0.05 - 0.1	0.05 - 0.2	+0.3	-0.3	0
	4	0.05- 0.1	0.05 - 0.2	0	0	0
Input H	1	0.05 - 0.1	0.05 - 0.2	+0.3	-0.3	—
	2	0.05 - 0.1	0.05 - 0.2	0	0	0
	3	0.05 - 0.1	0.05 - 0.2	+1.0	0	0
	4	Pulse Not Present				
Input I	1	0.05 - 0.1	0.05 - 0.2	-0.3	—	—
	2	0.05 - 0.1	0.05 - 0.2	-0.3	0	0
	3	0.05 - 0.1	0.05 - 0.2	-0.3	0	0
	4	0.05 - 0.1	0.05 - 0.2	-0.3	0	0
Input J	1	0.05 - 0.1	0.05 - 0.2	+4.5	—	—
	2	Pulse Not Present				
	3	Pulse Not Present				
	4	Pulse Not Present				
Input K	1	0.05 - 0.1	0.05 – 0.2	0	—	—
	2	0.05 - 0.1	0.05 – 0.2	+3.5	-0.2	0

Input Set	Pulse	**Rise time** (μsec)	**Fall time** (μsec)	**Δ Width** (μsec)	**Δ Position** (μsec)	**Δ Amplitude (dB)**
	3	Pulse Not Present				
	4	Pulse Not Present				
Input L	1	0.05 - 0.1	0.05 – 0.2	0	—	—
	2	0.05 - 0.1	0.05 – 0.2	+3.5	+0.2	0
	3	Pulse Not Present				
	4	Pulse Not Present				
Input M	1	0.05 - 0.1	0.05 - 0.2	+1.0	—	—
	2	Pulse Not Present				
	3	0.05 - 0.1	0.05 - 0.2	+1.0	-0.2	0
	4	Pulse Not Present				
Input N	1	0.05 - 0.1	0.05 - 0.2	+1.0	—	—
	2	Pulse Not Present				
	3	0.05 - 0.1	0.05 - 0.2	+1.0	+0.2	0
	4	Pulse Not Present				
Input O	1	0.05 - 0.1	0.05 - 0.2	+3.5	—	—
	2	Pulse Not Present				
	3	Pulse Not Present				
	4	0.05 - 0.1	0.05 - 0.2	0	-0.2	0
Input P	1	0.05 - 0.1	0.05 - 0.2	+3.5	—	—
	2	Pulse Not Present				
	3	Pulse Not Present				
	4	0.05 - 0.1	0.05 - 0.2	0	+0.2	0
Input Q	1	0.05 - 0.1	0.05 - 0.2	+1.3	-0.3	—
	2	Pulse Not Present				
	3	0.05 - 0.1	0.05 - 0.2	0	-0.125	0
	4	0.05 - 0.1	0.05 - 0.2	0	+0.125	0
Input R	1	0.05 - 0.1	0.05 - 0.2	+1.3	-0.3	—
	2	Pulse Not Present				
	3	0.05 - 0.1	0.05 - 0.2	0	+0.125	0
	4	0.05 - 0.1	0.05 - 0.2	0	-0.125	0
Input S	1	0.05 – 0.1	0.05 - 0.2	+0.3	-0.3	—
	2	0.05 – 0.1	0.05 - 0.2	0	-0.125	0
	3	0.05 – 0.1	0.05 - 0.2	+0.3	-0.3	0
	4	0.05 – 0.1	0.05 - 0.2	0	+0.125	0
Input T	1	0.05 – 0.1	0.05 - 0.2	+0.3	-0.3	—
	2	0.05 - 0.1	0.05 - 0.2	0	+0.125	0
	3	0.05 - 0.1	0.05 - 0.2	+0.3	-0.3	0
	4	0.05 - 0.1	0.05 - 0.2	0	-0.125	0
Input U	1	0.05 - 0.1	0.05 - 0.2	+0.3	-0.3	—
	2	0.05 - 0.1	0.05 - 0.2	0	-0.125	0
	3	0.05 - 0.1	0.05 - 0.2	+1.0	+.125	0
	4	Pulse Not Present				
Input V	1	0.05 - 0.1	0.05 - 0.2	+0.3	-0.3	—
	2	0.05 - 0.1	0.05 - 0.2	0	+0.125	0
	3	0.05 - 0.1	0.05 - 0.2	+1.0	-.125	0
	4	Pulse Not Present				
Input W	1	Pulse Not Present				

Input Set	Pulse	**Rise time** (μsec)	**Fall time** (μsec)	**Δ Width** (μsec)	**Δ Position** (μsec)	**Δ Amplitude (dB)**
	2	0.05 - 0.1	0.05 – 0.2	0	0	0
	3	0.05 - 0.1	0.05 – 0.2	0	0	0
	4	0.05 - 0.1	0.05 – 0.2	0	0	0

Notes:

1. *Input G sets up a preamble where only P2 and P4 provide actual leading edges within the allowable position limits, while P1 and P3 have pulse positions. Pulse positions and leading edges are located at nominal positions. This test input verifies that the UUT accepts a preamble with the minimum 2 actual leading edges using P2 and P4. The test procedure requires that the UUT accepts this input at a rate of at least 90%.*

2. *Input H sets up a preamble where only P2 and P3 provide actual leading edges within the allowable position limits, while P1 and P4 have pulse positions provided by the extended P1 and P3 pulses. Pulse positions and leading edges are located at nominal positions. This test input verifies that the UUT accepts a preamble with the minimum 2 actual leading edges using P2 and P3. The test procedure requires that the UUT accepts this input at a rate of at least 90%.*

3. *Input K sets up a preamble where only P1 and P2 have actual leading edges, while P3 and P4 will have pulse positions provided by the extended P2 pulse. The P2 leading edge position is offset by -0.2 microseconds. This test input step verifies that the UUT uses a maximum ± 0.1 sample pulse leading edge position tolerance using P1 and P2. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.*

4. *Input L sets up a preamble where only P1 and P2 have actual leading edges, while P3 and P4 will have pulse positions provided by the extended P2 pulse. The P2 leading edge position is offset by +0.2 microseconds. This test input step verifies that the UUT uses a maximum ± 0.1 sample pulse leading edge position tolerance using P1 and P2. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.*

5. *Input M sets up a preamble where only P1 and P3 have actual leading edges, while P2 and P4 will have pulse positions provided by the extended P1 and P3 pulses. The P3 leading edge position is offset by -0.2 microseconds. This test input step verifies that the UUT uses a maximum ± 1 sample pulse leading edge position tolerance using P1 and P3. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.*

6. *Input N sets up a preamble where only P1 and P3 have actual leading edges, while P2 and P4 will have pulse positions provided by the extended P1 and P3 pulses. The P3 leading edge position is offset by +0.2 microseconds. This test input step verifies that the UUT uses a maximum ± 1 sample pulse leading edge position tolerance using P1 and P3. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.*

7. *Input O sets up a preamble where only P1 and P4 have actual leading edges, while P2 and P3 will have pulse positions provided by the extended P1 pulse. The P4 leading edge position is offset by -0.2 microseconds. This test input step verifies that the UUT uses a maximum ± 1 sample pulse leading edge position tolerance using P1 and P4. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.*

8. Input P sets up a preamble where only P1 and P4 have actual leading edges, while P2 and P3 will have pulse positions provided by the extended P1 pulse. The P4 leading edge position is offset by +0.2 microseconds. This test input step verifies that the UUT uses a maximum ± 1 sample pulse leading edge position tolerance using P1 and P4. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.

9. The purpose of Input Q is to test that the UUT does not simultaneously apply both a + and – sample tolerance. Input Q sets up a preamble with no actual preamble pulse leading edges in their nominal positions. The P1 position is offset by -0.3 microseconds and width is offset by +1.3 microseconds to replace the missing P2 pulse. This places the P1 and P2 actual leading edges out of detection range but provides pulse positions at nominal positions. This focuses the actual leading edge detection on P3 and P4 whose leading edges are offset by -0.125 microseconds and +0.125 microseconds respectively. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.

10. The purpose of Input R is to test that the UUT does not simultaneously apply both a + and – sample tolerance. Input R sets up a preamble with no actual preamble pulse leading edges in their nominal positions. The P1 position is offset by -0.3 microseconds and width is offset by +1.3 microseconds to replace the missing P2 pulse. This places the P1 and P2 actual leading edges out of detection range but provides pulse positions at nominal positions. This focuses the actual leading edge detection on P3 and P4 whose leading edges are offset by +0.125 microseconds and -0.125 microseconds respectively. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.

11. The purpose of Input S is to test that the UUT does not simultaneously apply both a + and – sample tolerance. Input S sets up a preamble with no actual preamble pulse leading edges in their nominal positions. The P1 and P3 positions are offset by -0.3 microseconds and widths are offset by +0.3 microseconds. This places the P1 and P3 actual leading edges out of detection range but provides pulse positions at nominal positions. This focuses the actual leading edge detection on P2 and P4 whose leading edges are offset by -0.125 microseconds and +0.125 microseconds respectively. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.

12. The purpose of Input T is to test that the UUT does not simultaneously apply both a + and – sample tolerance. Input T sets up a preamble with no actual preamble pulse leading edges in their nominal positions. The P1 and P3 positions are offset by -0.3 microseconds and widths are offset by +0.3 microseconds. This places the P1 and P3 actual leading edges out of detection range but provides pulse positions at nominal positions. This focuses the actual leading edge detection on P2 and P4 whose leading edges are offset by +0.125 microseconds and -0.125 microseconds respectively. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.

13. The purpose of Input U is to test that the UUT does not simultaneously apply both a + and – sample tolerance. Input U sets up a preamble with no actual preamble pulse leading edges in their nominal positions. The P1 position is offset by -0.3 microseconds and width is offset by +0.3 microseconds. The P3 width is offset by +1.0 microsecond to replace the missing P4 pulse. This places the P1 and P4 actual leading edges out of detection range but provides pulse positions at nominal positions. This focuses the actual leading edge detection on P2 and P3 whose leading edges are offset by -0.125 microseconds and +0.125 microseconds respectively. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.

14. *The purpose of Input V is to test that the UUT does not simultaneously apply both a + and – sample tolerance. Input V sets up a preamble with no actual preamble pulse leading edges in their nominal positions. The P1 position is offset by -0.3 microseconds and width is offset by +0.3 microseconds. The P3 width is offset by +1.0 microsecond to replace the missing P4 pulse. This places the P1 and P4 actual leading edges out of detection range but provides pulse positions at nominal positions. This focuses the actual leading edge detection on P2 and P3 whose leading edges are offset by +0.125 microseconds and -0.125 microseconds respectively. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.*

15. *Input W verifies that the UUT requires all 4 preamble pulses to be present. This test step will be repeated 3 times with each preamble pulse taking a turn as the missing pulse. This is a negative test procedure and requires that the UUT accepts this input at a rate of 10% or less.*

Measurement Procedure:

The ADS-B receiver power levels specified in this procedure are relative to the loss at the RF message source end of the transmission line used to interface the RF message source to the UUT receiver input port. For each ADS-B equipage class, the specified power level is adjusted to compensate for the maximum line loss for which the UUT receiver has been designed. For example, if the line loss is 3 dB, then each of the RF message power levels specified in the test procedures is lowered by 3 dB.

Step 1: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 1

Apply **Input A** at the receiver input and verify that at least 90 percent of the ADS-B Messages are correctly decoded.

Step 2: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 2

Repeat Step 1 with the signal power level at -65 dBm.

Step 3: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 3

Apply **Input B** at the receiver input and verify that at least 90 percent of the ADS-B Messages are correctly decoded.

Step 4: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 4

Repeat Step 3 with the signal power level at -65 dBm.

Step 5: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 5

Apply **Input C** at the receiver input and verify that at least 90 percent of the ADS-B Messages are correctly decoded.

Step 6: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 6

Repeat Step 5 with the signal power level at -65 dBm.

Step 7: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 7

Apply **Input D** at the receiver input and verify that at least 90 percent of the ADS-B Messages are correctly decoded.

Step 8: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 8

Repeat Step 7 with the signal power level at -65 dBm.

Step 9: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 9

Apply **Input E** at the receiver input and verify that at least 90 percent of the ADS-B Messages are correctly decoded.

Step 10: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 10

Repeat Step 9 with the signal power level at -65 dBm.

Step 11: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 11

Apply **Input F** at the receiver input and verify that at least 90 percent of the ADS-B Messages are correctly decoded.

Step 12: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 12

Repeat Step 11 with the signal power level at -65 dBm.

Step 13: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 13

Apply **Input G** at the receiver input and verify that at least 90 percent of the ADS-B Messages are correctly decoded.

Step 14: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 14

Repeat Step 13 with the signal power level at -65 dBm.

Step 15: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 15

Apply **Input H** at the receiver input and verify that at least 90 percent of the ADS-B Messages are correctly decoded.

Step 16: Preamble Pulse Characteristics set to the Extreme Limits of their Tolerance Range - Part 16

Repeat Step 15 with the signal power level at -65 dBm.

Step 17: Preamble Pulse Widths set to Out-of-Tolerance Values - Part 1

Apply **Input I** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 18: Preamble Pulse Widths set to Out-of-Tolerance Values - Part 2

Repeat Step 17 with the signal power level at -65 dBm.

Step 19: Preamble Single Pulse - Part 1

Apply **Input J** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 20: Preamble Single Pulse - Part 2

Repeat Step 19 with the signal power level at -65 dBm.

Step 21: Preamble Pulse Positionss set to Out-of-Tolerance Values - Part 1

Apply **Input K** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 22: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 2

Repeat Step 21 with the signal power level at -65 dBm.

Step 23: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 3

Apply **Input L** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 24: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 4

Repeat Step 23 with the signal power level at -65 dBm.

Step 25: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 5

Apply **Input M** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 26: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 6

Repeat Step 25 with the signal power level at -65 dBm.

Step 27: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 7

Apply **Input N** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 28: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 8

Repeat Step 27 with the signal power level at -65 dBm.

Step 29: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 9

Apply **Input O** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 30: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 10

Repeat Step 29 with the signal power level at -65 dBm.

Step 31: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 11

Apply **Input P** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 32: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 12

Repeat Step 31 with the signal power level at -65 dBm.

Step 33: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 13

Apply **Input Q** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 34: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 14

Repeat Step 33 with the signal power level at -65 dBm.

Step 35: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 15

Apply **Input R** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 36: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 16

Repeat Step 35 with the signal power level at -65 dBm.

Step 37: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 17

Apply **Input S** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 38: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 18

Repeat Step 37 with the signal power level at -65 dBm.

Step 39: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 19

Apply **Input T** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 40: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 20

Repeat Step 39 with the signal power level at -65 dBm.

Step 41: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 21

Apply **Input U** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 42: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 22

Repeat Step 41 with the signal power level at -65 dBm.

Step 43: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 23

Apply **Input V** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 44: Preamble Pulse Positions set to Out-of-Tolerance Values - Part 24

Repeat Step 43 with the signal power level at -65 dBm.

Step 45: Missing Preamble Pulse - Part 1

Apply **Input W** at the receiver input and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 46: Missing Preamble Pulse - Part 2

Repeat Step 45 with the signal power level at -65 dBm.

Step 47: Missing Preamble Pulse - Part 3

Apply **Input W** at the receiver input except restore the P1 pulse and remove the P2 pulse and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 48: Missing Preamble Pulse - Part 4

Repeat Step 47 with the signal power level at -65 dBm.

Step 49: Missing Preamble Pulse - Part 5

Apply **Input W** at the receiver input except restore the P1 pulse and remove the P3 pulse and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 50: Missing Preamble Pulse - Part 6

Repeat Step 49 with the signal power level at -65 dBm.

Step 51: Missing Preamble Pulse - Part 7

Apply **Input W** at the receiver input except restore the P1 pulse and remove the P4 pulse and verify that no more than 10 percent of the ADS-B Messages are correctly decoded.

Step 52: Missing Preamble Pulse - Part 8

Repeat Step 51 with the signal power level at -65 dBm.

2.4.4.4.2.3 Preamble Validation Tests

Purpose/Introduction:

These tests verify that the ADS-B reply processor correctly validates the ADS-B preamble. It is verified that when energy with an amplitude within 6 dB of the preamble reference level is contained in at least one chip of the first five data bits the preamble is accepted and the preamble is rejected if one or more of the first five data bits has insufficient energy in either chip.

Reference Input:

Provide a method of supplying the UUT with:

Any Valid ADS-B Message having:

"DF"	=	17 (or 18 as indicated in the test procedures)
"CA"	=	0
"AA"	=	Any discrete address
Message Rate	=	50 Hz
Frequency	=	1090 MHz
Power	=	-23 dBm

The transmitted power in the first six data bits is controlled in such a way that the amplitude of a data ~~bit~~ pulse can be set independently of the others.

Measurement Procedure:

The ADS-B receiver power levels specified in this procedure are relative to the loss at the RF message source end of the transmission line used to interface the RF message source to the UUT receiver input port. For each ADS-B equipage class, the specified power level is adjusted to compensate for the maximum line loss for which the UUT receiver has been designed. For example, if the line loss is 3 dB, then each of the RF message power levels specified in the test procedures is lowered by 3 dB.

For this test to be valid the receiver must perform error correction.

Step 1: Preamble Validation – Missing First Data Bit - Part 1

Input the **Reference Input** DF=17 messages with the amplitude of the first data bit set to –30 dB into the receiver and verify that less than 10 percent of the ADS-B Messages are correctly decoded.

Step 2: Preamble Validation – Missing First Data Bit - Part 2

Repeat Step 1 with the signal power level at -65 dBm and the first bit at –72 dBm.

Step 3: Preamble Validation – Missing Second Data Bit - Part 1

Input the **Reference Input** DF=17 messages with the amplitude of the second data bit set to –30 dBm into the receiver and verify that less than 10 percent of the ADS-B Messages are correctly decoded.

Step 4: Preamble Validation – Missing Second Data Bit - Part 2

Repeat Step 3 with the signal power level at -65 dBm and the second bit at –72 dBm.

Step 5: Preamble Validation – Missing Third Data Bit - Part 1

Input the **Reference Input** DF=17 messages with the amplitude of the third data bit set to –30 dBm into the receiver and verify that less than 10 percent of the ADS-B Messages are correctly decoded.

Step 6: Preamble Validation – Missing Third Data Bit - Part 2

Repeat Step 5 with the signal power level at -65 dBm and the third bit at –72 dBm.

Step 7: Preamble Validation – Missing Third and Fourth Data Bits - Part 1

Input the **Reference Input** DF=18 messages with the amplitude of the third data pulse (that comprises the third and fourth data bits) set to –30 dBm into the receiver and verify that less than 10 percent of the ADS-B Messages are correctly decoded.

Step 8: Preamble Validation – Missing Third and Fourth Data Bits - Part 2

Repeat Step 7 with the signal power level at -65 dBm and the third data pulse at –72 dBm.

Step 9: Preamble Validation – Missing Fourth and Fifth Data Bits - Part 1

Input the **Reference Input** DF=17 messages with the amplitude of the fourth data ~~bit~~ pulse (that comprises the fourth and fifth data bits) set to –30 dBm into the receiver and verify that less than 10 percent of the ADS-B Messages are correctly decoded.

Step 10: Preamble Validation – Missing Fourth and Fifth Data Bits - Part 2

Repeat Step 9 with the signal power level at -65 dBm and the fourth ~~bit~~ data pulse at –72 dBm.

Step 11: Preamble Validation – Missing Sixth Data Bit - Part 1

Input the **Reference Input** DF=17 messages with no energy in either chip of the sixth data bit into the receiver and verify that greater than 90 percent of the ADS-B Messages are correctly decoded.

Step 12: Preamble Validation – Missing Sixth Data Bit - Part 2

Repeat Step 11 with the signal power level at -65 dBm.