RTCA Special Committee 186, Working Group 5

ADS-B UAT MOPS

Meeting #3

UAT – DME Interference Testing

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SUMMARY
The objective is to determine impact of UAT signals on DME interrogator avionics operating in the vicinity of the proposed UAT f_0. This frequency is likely to be somewhere in the range 978-982.

1. Objective/Background

The objective of this testing is to determine impact of UAT signals on DME interrogator avionics operating in the vicinity of the proposed UAT f_0. This frequency is likely to be somewhere in the range 978-982. In this frequency range, DME desired signals always emanate from ground beacons, thus making the DME interrogator avionics the victim receiver. Therefore this test plan focuses on interference effect to the DME interrogator receiver.

2. Interference Criteria

Two basic criteria will be used as listed below:

a) Acquire Stable Operating Point (ASOP): signal threshold which allows transition from search mode to track mode to occur within 2 seconds and is held for at least 30 seconds thereafter. This must be successful for 4 out of 5 trials.[1]
b) Break Stable Operating Point (BSOP): signal threshold at which loss of track first occurs

Conditions for determining the above thresholds shall be as follows:

i. DME Test Set Reply Efficiency set to 70%
ii. Desired beacon reply level at –77 dBm, –83 dBm, and -89 dBm at interrogator input.
iii. Ground beacon reply rate is 2700 pulse pairs per second
iv. Test Set Range = 200 nmi

[1] The only DME interrogator under test available initially is a Bendix King 7000, which is an old model certified to DO-108, while newer models follow DO-189. For the ASOP data point, this interrogator is allowed 2 minutes to acquire track.

3. UAT Signal Parameters

UAT interfering signals are to be generated as follows:

Modulation Rate:

(a) Use R&S signal generator to generate the UAT modulation with settings as shown in Figure 1.

Waveform Timeline:

There are three waveform timeline variations that are used to emulate different levels of UAT traffic on the channel:

(a) Continuous: continuous random bits using the UAT modulation

(b) ADS-B X%: simulates Long ADS-B message for ~400 usec on followed by 400*{(100/X) – 1} usec off followed by 400 usec on…etc for an X% duty factor. This is unsynchronized to DME beacon replies and at constant power.

(c) Uplink X%: simulates Long ADS-B message for ~4.0 msec on followed by 4.0*{(100/X) – 1} msec off followed by 4.0 msec on…etc for an X% duty factor. This is unsynchronized to DME beacon replies and at constant power.

Where X will take on the values of 10%, 25% and 50%

4. Test Setup

Figure 1 below shows the test setup.

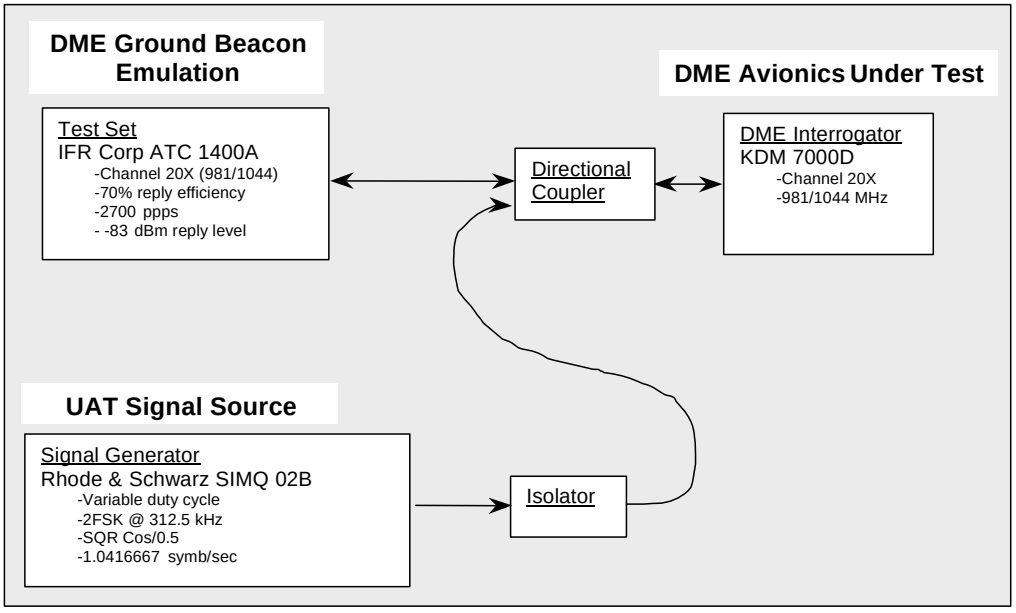

Figure 1. Setup for DME Interrogator Tests

5. Test Procedure

1. Set the DME reply frequency to 981 MHz and keep this fixed for the testing. DME-UAT frequency offset will be achieved by adjusting the UAT center frequency of the signal generator.

2. Establish sensitivity of DME interrogator unit under test by determining the ASOP in the absence of all interference.

3. Capture spectrum plots of the UAT signal from the signal generator (once).

4. Determine ASOP/BSOP with the desired signal at –83 dBm as a function of UAT-DME frequency offset in Continuous mode for each of the frequency offsets shown in the Table below

UAT f_0 Offset from DME (MHz)						
-3	-2	-1	0	1	2	3
[ASOP/ BSOP]	[ASOP/ BSOP]	[ASOP/ BSOP]	[ASOP/ BSOP]	[ASOP/ BSOP]	[ASOP/ BSOP]	[ASOP/ BSOP]
Maximum Tolerable UAT Signal Level (dBm)						

5. Repeat Step 4 for the other specified UAT duty cycle conditions

6. Repeat Steps 4 and 5 for the other specified DME desired signal levels

6. Status/Future Work

The status on testing to date and plans for additional testing will be presented separately.