

John Kennedy

From: Wells, Claude [claude.wells@lmco.com]
Sent: Wednesday, May 07, 2008 9:57 AM
To: John Kennedy
Subject: Re: 0038-EX-ML-2007; WD2XIC
Attachments: FCC Application Renewal Questions and Answers_30-April-2008.doc

John,

You will find attached the technical responses to the email request for info on the referenced filing, per our conversation this AM.

Claude

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Please prior coordinate the use of the frequencies 1030 MHz and 1090 MHz with the appropriate FAA Regional Office(s). Please obtain the NGT number(s) from the FAA Regional Office(s) at the completion of the coordination and report it in your response to this correspondence.

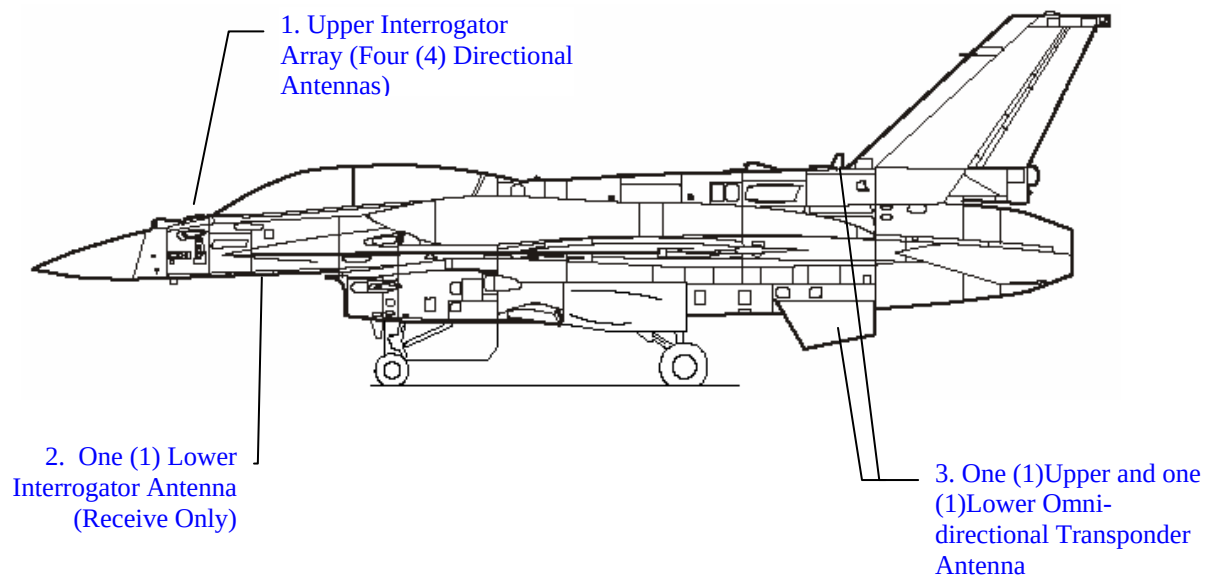
Please report the parameters below in your coordination with the FAA Regional Office(s):

- peak envelope power (PEP);

1. 1030 MHz PEP: 2500 W
2. 1090 MHz PEP: 500 W

- type of antenna;

1. AS-4349/APX-113(V) Antenna
TRANSMITTING (1030 MHz) AND RECEIVING (1090 MHz)
Four (4) AS-4349/APX-113(V) forward fuselage mounted array interrogator antennas are directional and cover an area +/- 60 degrees elevation and +/- 60 degrees in azimuth in front of the aircraft.
2. AS-4350/APX-113(V), Antenna
RECEIVING (1090MHz)
One (1) AS-4350/APX-113(V), lower interrogator antenna is receiving only.
3. 16VE248-1 and 16VE248-3 IFF Blade Antennas
TRANSMITTING (1090 MHz) AND RECEIVING (1030 MHz)
Two (2) transponder antennas, upper and lower, are omni-directional.



- transmit antenna gain;

1. AS-4349/APX-113(V) Antenna
MAIN BEAM
+11.4 dBi @ 1030 MHz @ +6 degree beam position
+10.9 dBi @ 1090 MHz @ -6 degree beam position
1ST MAJOR SIDE LOBE
-3.6 dBi @ 1030 MHz @ +6 degree beam position
-4 dBi @ 1090 MHz @ -6 degree beam position
2. AS-4350/APX-113(V), Antenna
MAIN BEAM
7 dBi @ 1090 MHz @ 0 degree azimuth and -20 degree elevation.
1ST MAJOR SIDE LOBE
2.1 dBi @ 1090 MHz @ +/- 125 degree azimuth and -50 degree elevation.
3. Transponder Antennas
-2 dBi

- elevation above sea level of the antenna site;

NA

- height above ground of the focal point of the antenna;

NA

- antenna polarization;

1. AS-4349/APX-113(V) Antennas
Vertical polarization
2. AS-4350/APX-113(V), Antenna
Vertical polarization
3. Transponder Antennas
Vertical polarization

- the azimuth that the antenna is pointed or appropriate designator to indicate whether the antenna is rotating, non-directional, etc.;

1. Interrogator antennas on the F-16 Block 60 aircraft are fixed to the airframe, i.e., no physical rotation. The four (4) AS-4349/APX-113(V) forward fuselage mounted array interrogator antennas are directional and cover an area +/- 60 degrees elevation and +/- 60 degrees in azimuth in front of the aircraft. One (1) fixed lower interrogator antenna is receiving only. Designators: 6M00M1D (SIF Modes 1, 2, 3/A, and C interrogations (0.8 us pulse width)) and 7M50M1D (Mode 4 interrogations (0.5 us pulse width)).
2. Transponder antennas on the F-16 Block 60 aircraft are fixed to the airframe, i.e., no physical rotation. The two (2) transponder antennas, upper and lower, are omni-directional. Designators: 6M90M1D (SIF Modes 1, 2, 3/A, C, and Mode 4 replies) and 7M00M1D (Mode S replies)

- pulse repetition rate (PRR) that the equipment is capable of operating on to include PRR stagger sequences if appropriate, whether the PRR is adjustable and what PRR's the

equipment can accept, and any other information that would be helpful in understanding the pulse characteristics of the equipment;

Our system operates on a fixed PRR defined by the Mode being used.

Interrogations are pilot initiated and modes can be individually enabled or disabled for interrogation by the pilot.

1. Interrogator (1030 MHz) maximum PRR:

SIF (Modes 1, 2, 3A, & 3C) maximum mode rate of 1200 pps sets the maximum interrogations per second at 400. The Mode 4 maximum rate of 7200 pps allows up to 200 interrogations per second. However, the maximum interrogation repetition frequency **for any combination of Modes 1, 2, 3/A, C, and 4** does not exceed 450 interrogations per second, averaged over one second (per DoD AIMS 97-1000, para 3.8.2).

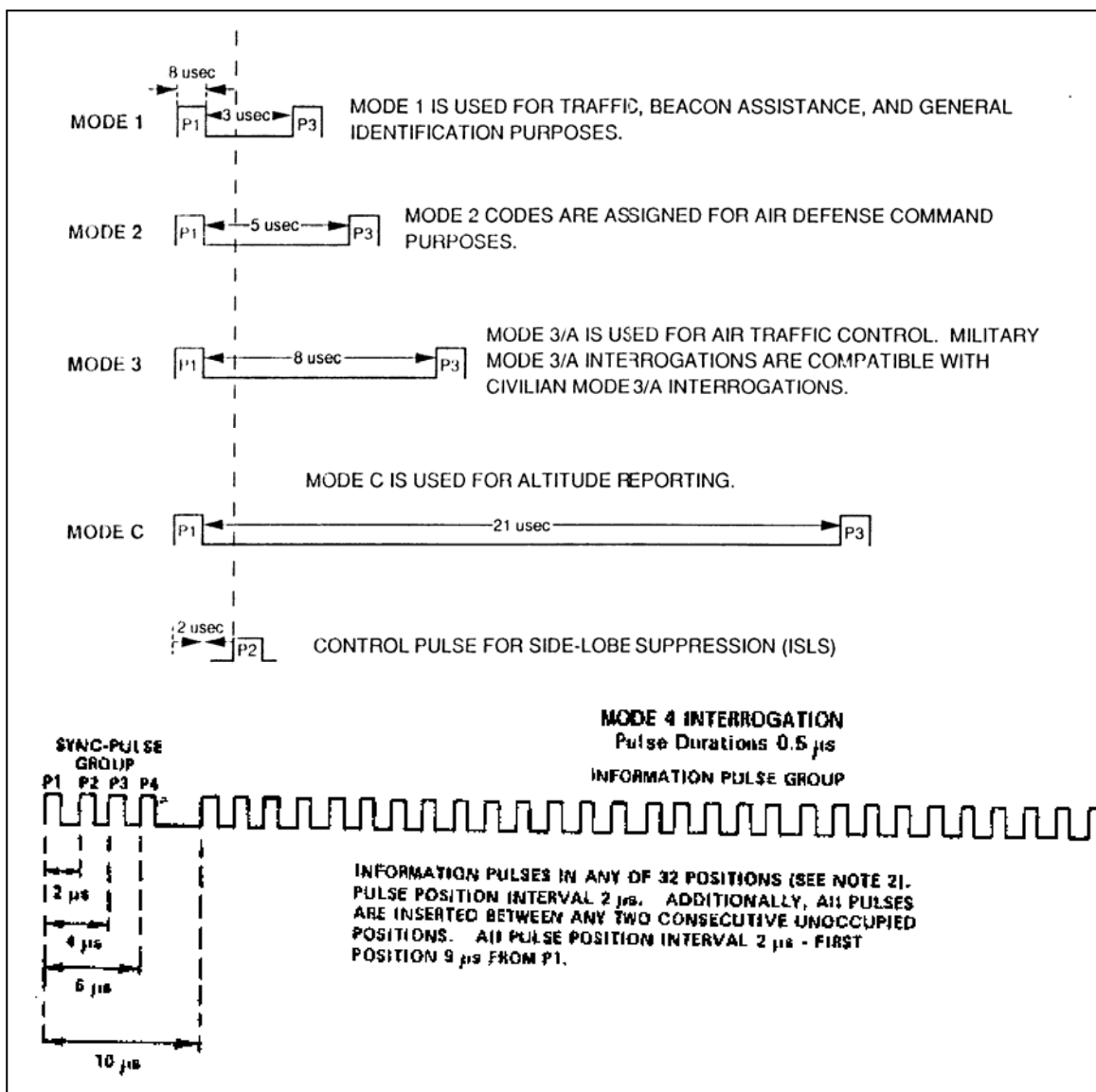


Figure 1: Interrogation Pulse Spacing for Modes 1, 2, 3A, 3C, and 4.

2. Transponder (1090 MHz) maximum PRR:

18 Kpps is peak pulse rate for IFF Modes 1, 2, 3/A, C replies (per RTCA/DO-181B, para. 2.2.3.4.1 b). 3.6 Kpps is max pulse rate for IFF Mode 4 replies.

7.0 pps is max pulse rate for IFF Mode S replies.

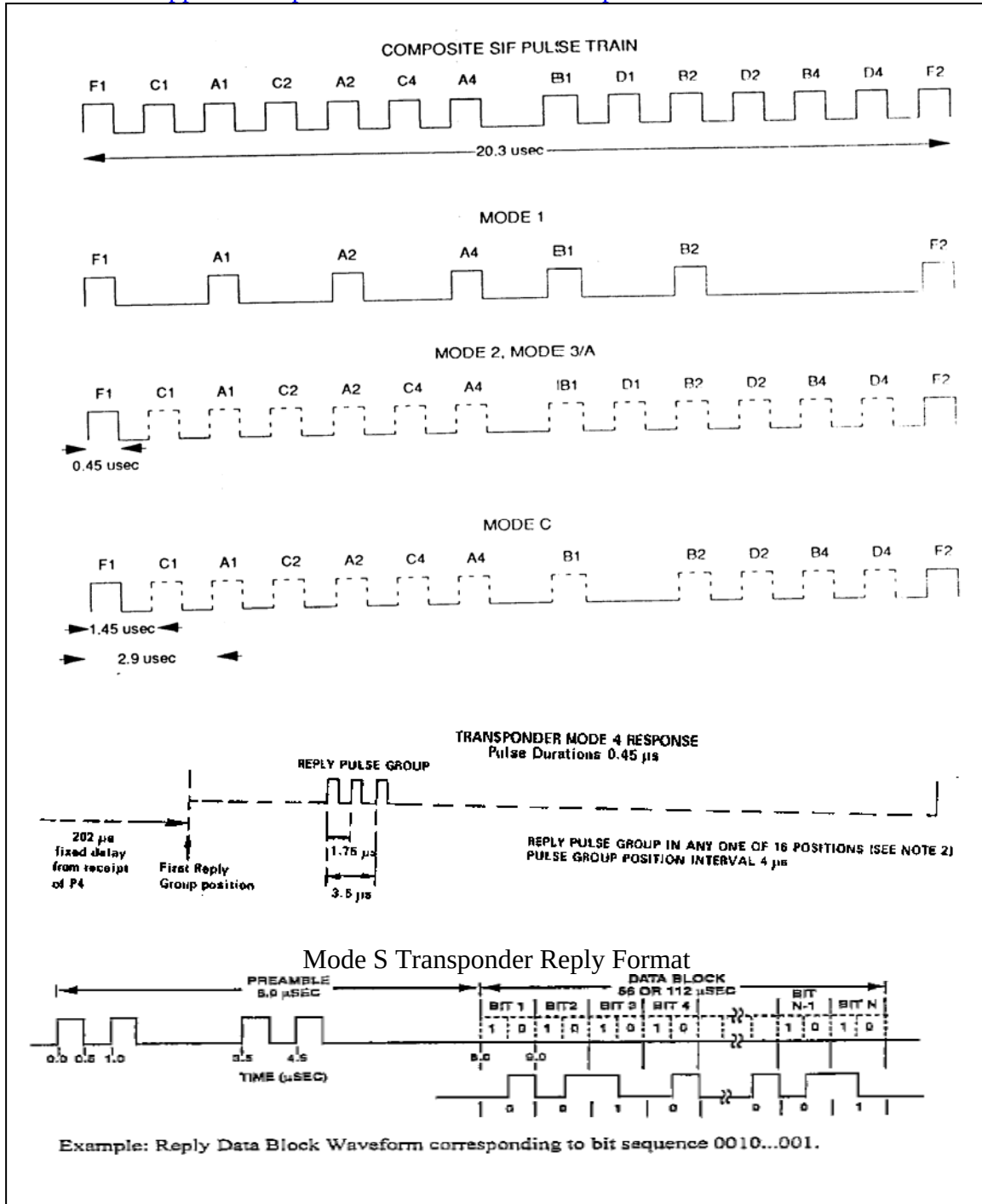


Figure 2: Transponder Pulse Spacing for Modes 1, 2, 3A, 3C, S and 4.

- pulse width;

Interrogator (1030 MHz) pulse widths are:

Mode	P1, P3 Pulse Width	P2 Pulse Width	Comments
1	$0.8 \pm 0.1 \mu\text{s}$	$0.8 +0.05, -0.1 \mu\text{s}$	Per DoD AIMS 97-1000, para. 3.4.4.2
2	$0.8 \pm 0.1 \mu\text{s}$	$0.8 +0.05, -0.1 \mu\text{s}$	Per DoD AIMS 97-1000, para. 3.4.4.2
3A	$0.8 \pm 0.1 \mu\text{s}$	$0.8 +0.05, -0.1 \mu\text{s}$	Per DoD AIMS 97-1000, para. 3.4.4.2 and RTCA/DO-181B, para. 2.1.11.3.1
3C	$0.8 \pm 0.1 \mu\text{s}$	$0.8 +0.05, -0.1 \mu\text{s}$	Per DoD AIMS 97-1000, para. 3.4.4.2 and RTCA/DO-181B, para. 2.1.11.3.1
4	All Mode 4 pulses: $0.5 \pm 0.1 \mu\text{s}$	All Mode 4 pulses: $0.5 \pm 0.1 \mu\text{s}$	Per DoD AIMS 97-1000, para. 3.4.6.2
5	N/A	N/A	Mode 5 will not be used.
S	N/A	N/A	No Mode S Interr. Capability

Transponder (1090 MHz) pulse widths are:

Mode	Reply Pulse Width	Comments
1	$0.45 \pm 0.1 \mu\text{s}$	Per DoD AIMS 97-1000, para. 3.6.4
2	$0.45 \pm 0.1 \mu\text{s}$	Per DoD AIMS 97-1000, para. 3.6.4
3A	$0.45 \pm 0.1 \mu\text{s}$	Per DoD AIMS 97-1000, para. 3.6.4 and RTCA/DO-181B, para. 2.1.11.3.1
3C	$0.45 \pm 0.1 \mu\text{s}$	Per DoD AIMS 97-1000, para. 3.6.4 and RTCA/DO-181B, para. 2.1.11.3.1
4	$0.45 \pm 0.1 \mu\text{s}$	Per DoD AIMS 97-1000, para. 3.6.4
5	N/A	Mode 5 will not be used.
S	$0.5 \pm 0.05 \mu\text{s}$	Per RTCA/DO-181B, para 2.2.4.2.1; Transponder is capable of Mode S Level 1 replies.

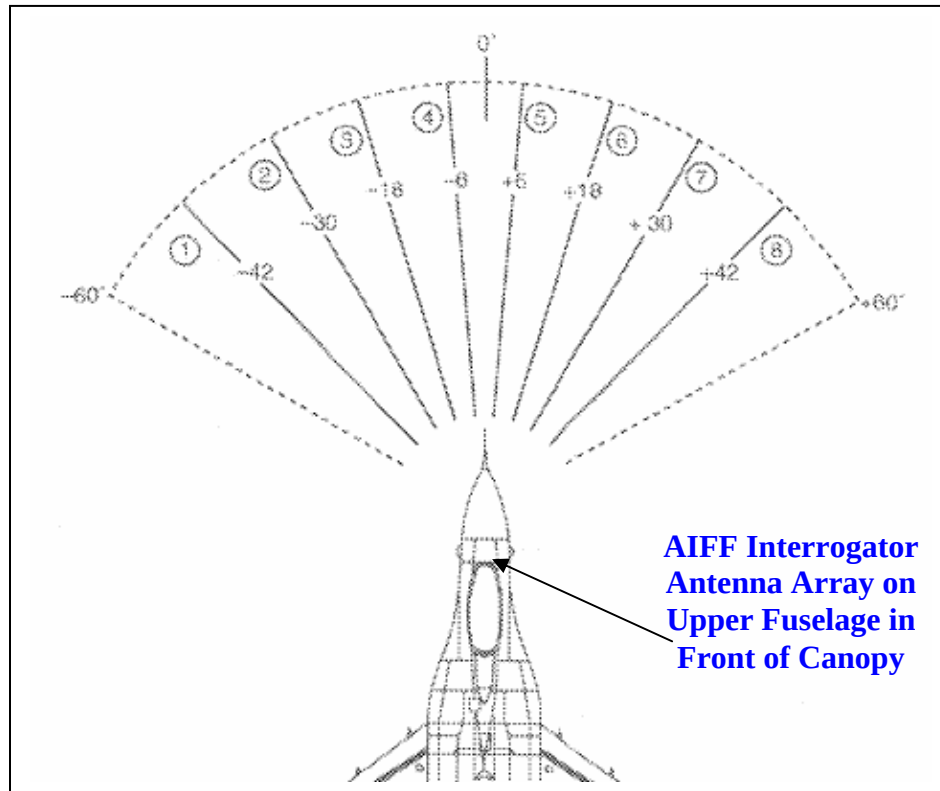
- equipment nomenclatures;

AN/APX-113(V) IFF Interrogator-Transponder Set

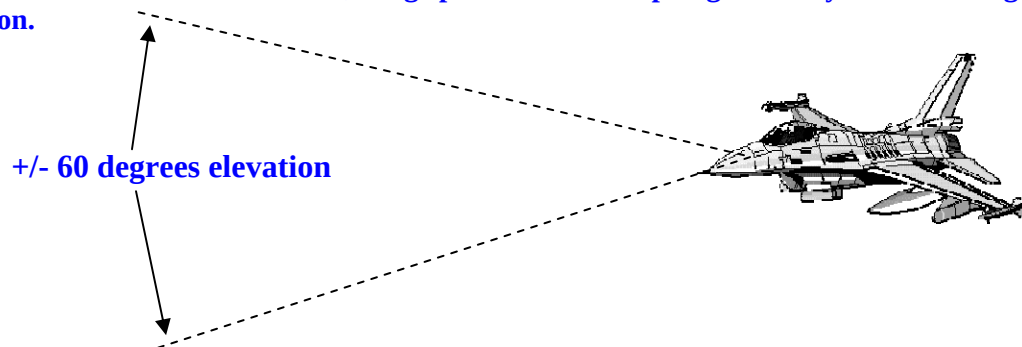
- whether the equipment is capable of blanking transmissions in certain azimuths and any limitations with respect to blanking;

The interrogator antennas form eight (8) beams that can be electronically steered to form a Field of Regard. The AIFF Interrogator Field of Regard can be adjusted, essentially narrowing the Interrogator beam around a particular target or group of targets if necessary.

Eight beams at the angles indicated below provide a +/- 60 degree Azimuth Field of Regard



The interrogator antenna provides a +/- 60 degree Elevation Field of View, however due to obscuration from the nose radome, range performance drops significantly below -20 degree in elevation.



- radius of operations if appropriate;

Station Locations

MOBILE: States of AR, LA, NM, OK, TX and within the two rectangles defined by 30 N, 98 W; 30 N, 94 W; 26, 30' N, 98 W; 26, 30' N, 94 W; and 30 N, 94 W; 30 N, 89 W; 28 N, 94 W; 28 N, 89 W.

- detailed description of the proposed operation to include any technical parameters that will be altered during operations.

The most commonly used modes will be 1, 2, 3A, and 3C. 99% of all IFF testing will be accomplished with these modes. Mode S transponder will be used on a very limited basis only to verify that Air Traffic Control can receive code/altitude data correctly. Mode 5 will not be used in any capacity because the aircraft is not equipped for it. Mode 4 will be used on a very limited basis (less than 1% of total test time) with no more than two aircraft (one target aircraft and the test aircraft) operating at one time. Mode 4 requires that a special encryption module be installed on the aircraft—of which the Block 60 program only has two. The AIFF Interrogator Field of Regard can be adjusted, essentially narrowing the Interrogator beam around a particular target or group of targets if necessary.

Mode	Interrogator (1030MHz)	Transponder (1090MHz)	Comments
1	Yes	Yes	
2	Yes	Yes	
3A	Yes	Yes	
3C	Yes	Yes	
4	Yes	Yes	Very limited use—no more than two aircraft at once.
5	No	No	Mode 5 will not be used.
S	No	Yes	Transponder Mode S Level 1

-the maximum flight altitude.

We can't really plan to be at a certain altitude when testing—we have to work with whatever ATC assigns to us or has available for us to use at the time of testing. In our experiences thus far, a realistic max altitude would be 45kft for high altitude long range performance assessments.

- Does the applicant want to interrogate (transmit) on 1090 MHz as well as 1030 MHz (airborne transponders typically transmit only on 1090 MHz and receive on 1030 MHz)?

Yes the we will be transmitting on 1090 MHz and 1030 MHz.

- If the applicant will be transmitting on 1030 MHz, in what modes of operation does the applicant want to operate (Modes 1, 2, 3A, 3C, 4, 5, Mode-S)?

Mode	Interrogator (1030MHz)	Comments
1	Yes	
2	Yes	
3A	Yes	
3C	Yes	
4	Yes	Very limited use—no more than two aircraft at once.
5	No	Mode 5 will not be used.
S	No	

-Is this a TCAS and is TCAS the only reason why the 1030 MHz transmissions are needed (airborne Mode 4 and/or 5 operations will be very difficult if not impossible to authorize and airborne Mode-S is not authorized)?

[No, the platform does not implement TCAS.](#)

- To whom is this product being sold (Is this confined to overseas customers or US customers)?

[United Arab Emirates](#)