Applicant: Airbus U.S. Manufacturing Facility
                                              Greg.Rensink@airbus.com
Form 442 File Number: 1684-EX-CN-2023
Form 442 Confirmation Number: EL265365
Correspondence Reference Number: 81792
Date of Original Email: 11/16/2023

ATTN: Office of Engineering and Technology
          Nimesh.Sangani@fcc.gov

Dear FCC,
Thank you for your reply. See below in response to your request for more information, 1) thru 6).

Sincerely,
Greg RENSINK
A320^{family} Chief Engineering MAP-Systems U.S.
U.S. Manufacturing Facility
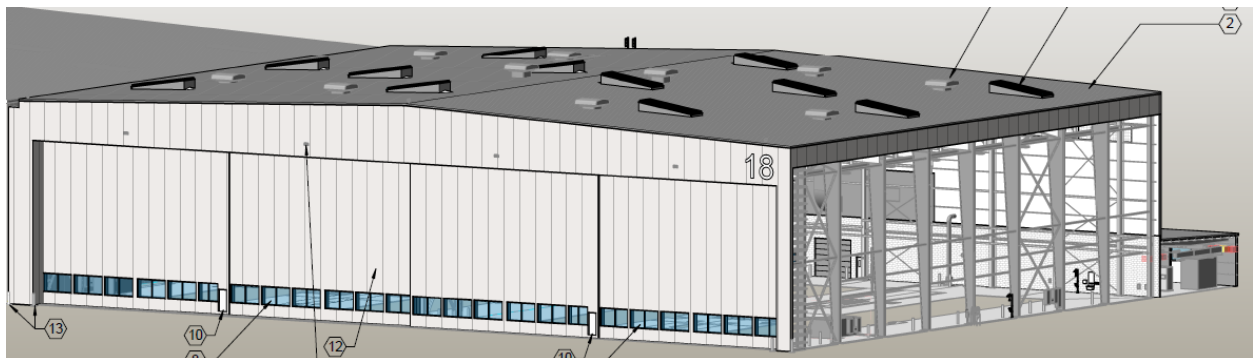T +1 251 439 4304
M +1 251 375 4733
E greg.rensink@airbus.com

1) Please submit a detailed application narrative. Describe the objectives you wish to accomplish. Manufacturer technical data sheet is not a narrative. What is the application for the frequency request?
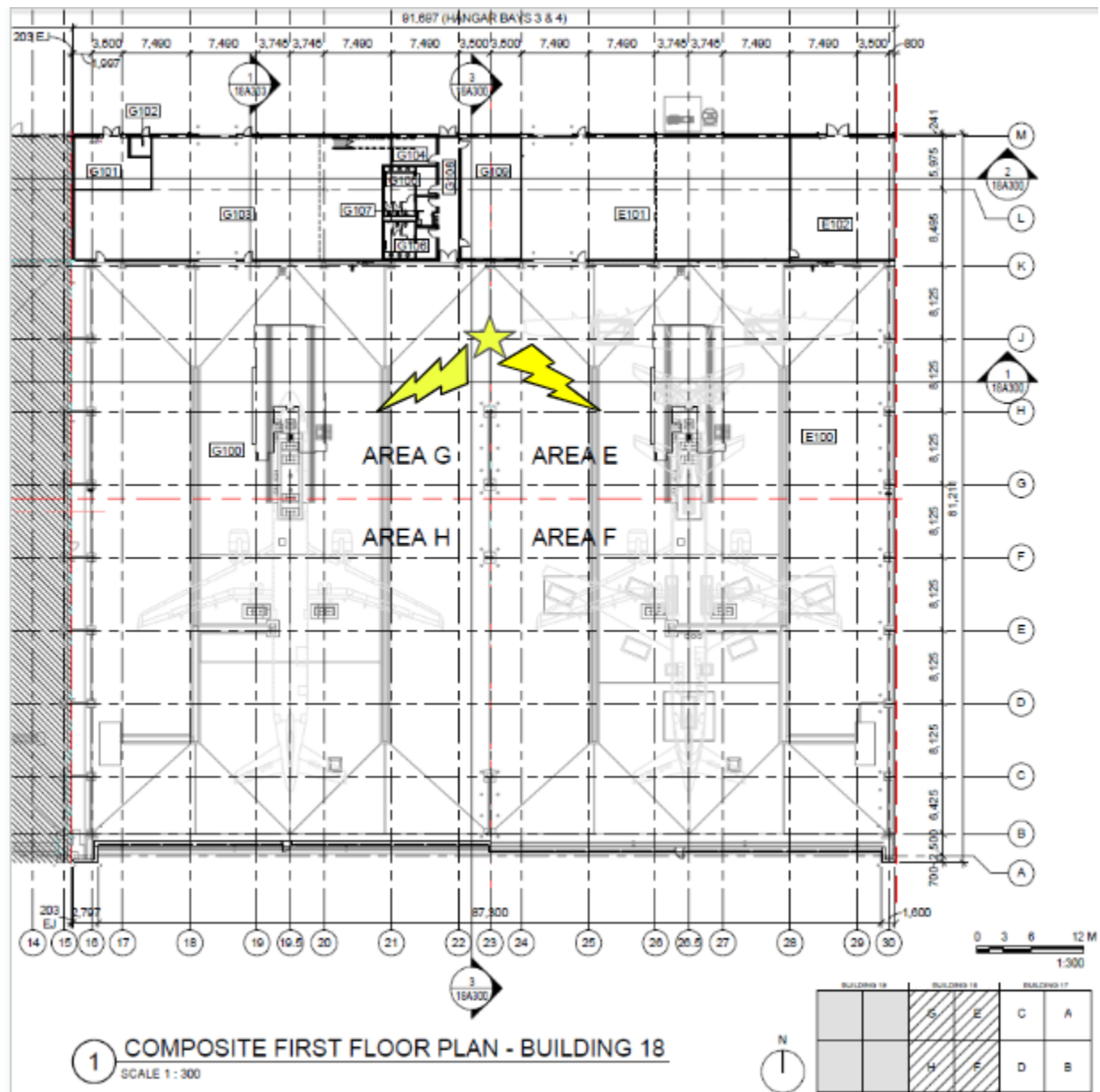
The Airbus U.S. Manufacturing Facility in Mobile, AL builds, tests, and delivers A220, A320, and A321-family aircraft for commercial customers. The Airbus site is located on the historic Brookley Field (KBFM, Mobile Downtown Airport). The purpose for the frequency request application is in order to hold a renewable license to use an indoor GPS L1 Repeater system for testing RNSS equipment/systems on the aircraft during production. Having a GPS signal available within the building will also facilitate the indoor operation of other subsystems that rely on GPS Position and Time to function properly. This will improve efficiency and reduce the time required for outdoor testing.

This specific request is for a new GPS repeater installed between Bay3 / Bay4 of Building 18.

Building 18
Bay3 / Bay4
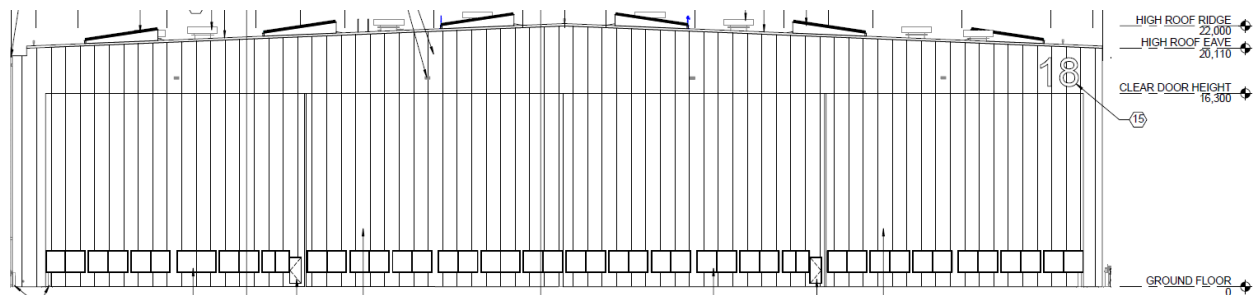
Airbus Flight Line
(not the airport)

The Building 18 dimensions are: 92m Wide x 81m Deep x 22m High. The GPS Repeater system includes a receiving antenna that is connected to two re-radiating antennas through a splitter and two line amplifiers. The re-radiating antennas are installed 55m from the outer wall (which can fully open for aircraft ingress / egress), and pointed at the nose of the two aircraft where the aircraft GPS receiver antennas are installed. The GPS Repeater system can be easily unplugged from the ground when not needed.
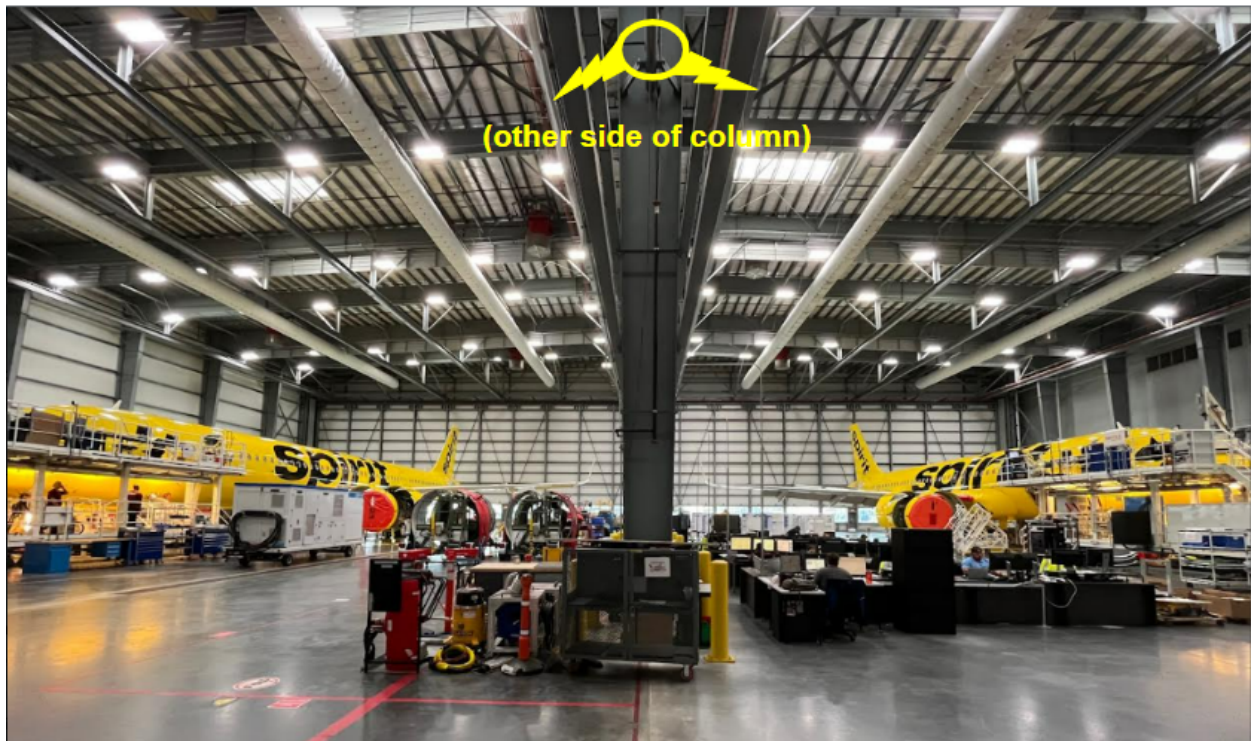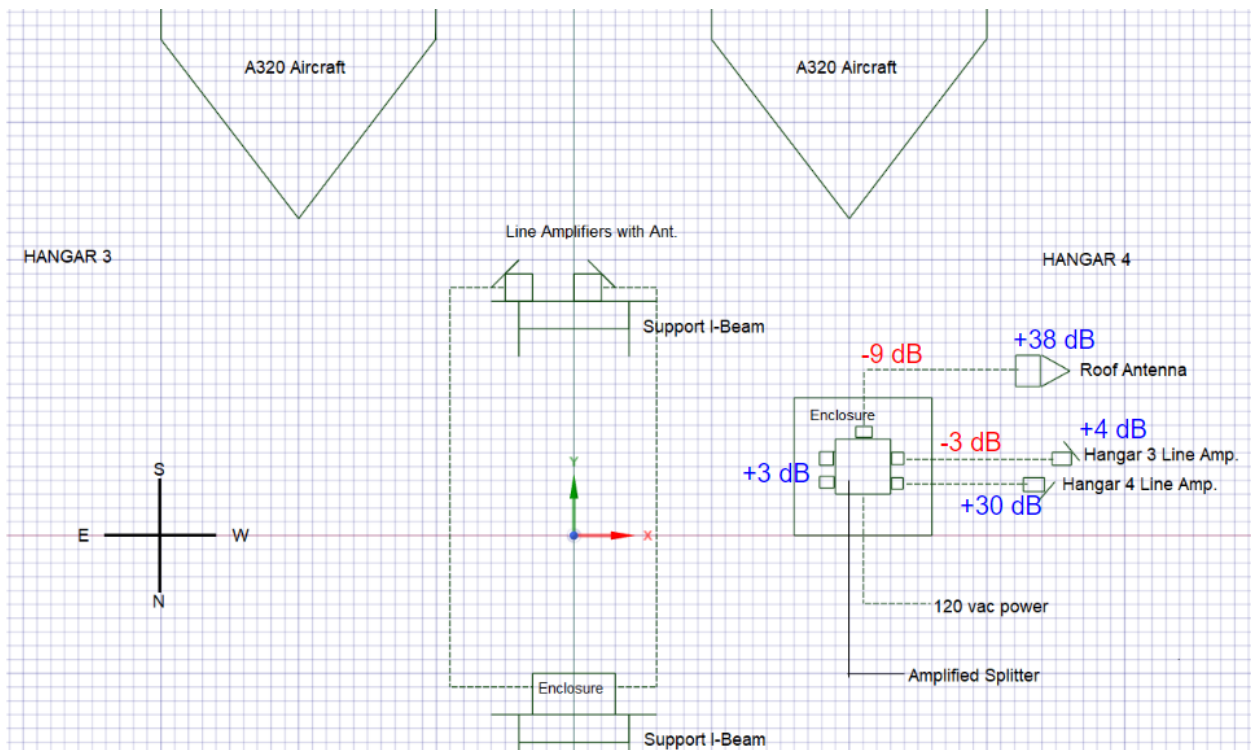
COMPOSITE FIRST FLOOR PLAN - BUILDING 18
SCALE 1 : 300

91.697 (HANGAR BAYS 3 & 4)

AREA G   AREA E

AREA H   AREA F

G100 G101 G102 G103 G104 G106 G107 G108 G109
E100 E101 E102

Hangar 18 Dimensions (92m Wide x 81m Deep)

HIGH ROOF RIDGE
22,000
HIGH ROOF EAVE
20,110
CLEAR DOOR HEIGHT
16,300
GROUND FLOOR
0

Hangar 18 Dimensions (22m High)

Re-radiating antennas are installed 55m from the outer wall

Re-radiating antennas are pointed at the nose of the two aircraft (Net System Gain = +63 dB)

https://www.ntia.gov/publications/redbook-manual
https://www.ntia.gov/sites/default/files/publications/8_2021_edition_rev._2022.pdf

8.3.28 Use of Fixed Devices That Re-Radiate Signals Received From the GPS

a) This application is an individual authorization request for a single fixed indoor device. New applications will be submitted for future additional indoor site installations, if that is to occur.

b) On the Form 442 Application, the only options for Station Class are "Fixed" or "Mobile". This is a Fixed installation. There is no option for "XT station class".

c) The Government Master File (GMF) is maintained by the NTIA.

d) On the Form 442 Application, the Estimated Duration is requested for "24 Months".

e) The area of potential interference to GPS reception is within the Airbus U.S. Manufacturing Facility perimeter. This includes the Airbus Flight Line, which is near the area 30m from Hangar 18, where the indoor test is being conducted.

f) For EIRP, see Item 3) below.

g) The only building attenuation taken into consideration is the distance from the interior re-radiating antenna installation to the nearest exterior wall.

h) All GPS users in the area of potential interference to GPS reception are Airbus employees responsible for testing RNSS equipment/systems, and are informed.

i) The GPS repeater system is for the purpose of indoor testing RNSS equipment/systems.

j) For "Stop Buzzer", see Item 4) below.

3) Please provide a detailed calculation(s) for the link budget specified on item f. of section 8.3.28

$P_{Tmax} = P_R + 20log_{10}f + 20log_{10}(30+d) - 27.55$

$P_R = -140dBm, f = 1575.42\ MHz, d = 55m$

$P_{Tmax\ (at\ d=55m)} = -140dBm + 20log_{10}(1575.42MHz) + 20log_{10}(30m+55m) - 27.55$

$P_{Tmax\ (at\ d=55m)} = -140 + 63.95 + 38.59 - 27.55$

$P_{Tmax\ (at\ d=55m)} = -65.01\ dBm$

$P_{Tmax\ (at\ d=0)} = -140 + 63.95 + 29.54 - 27.55$

$P_{Tmax\ (at\ d=0)} = -74.06\ dBm$

Equivalent Isotropic Radiated Power (EIRP) of the GPS Repeater System installed = -67 dBm

**********See attached LINK BUDGET Calculator Spreadsheet**********

Avg Receive Power L1 dBm North America =		-130 dBm
+	Receiving Antenna Gain =	+38 dB
+	System Gain =	+33 dB
+	Nominal Antenna Gain =	+4 dB
-	Antenna Cable Insertion Loss =	-12 dB
	EIRP of GPS Repeater System =	-67 dBm

$EIRP = P_R = P_T - 20log_{10}f - 20log_{10}(30+d) + 27.55$

$EIRP\ at\ 55m = P_{R\ (at\ d=55m)} = P_T - 20log_{10}f - 20log_{10}(30+55m) + 27.55$

$EIRP\ at\ 55m = P_{R\ (at\ d=55m)} = -67dBm - 20log_{10}(1575.42MHz) - 20log_{10}(30+55m) + 27.55$

$EIRP\ at\ 55m = P_{R\ (at\ d=55m)} = -67 - 63.95 - 38.59 + 27.55$

$EIRP\ at\ 55m = P_{R\ (at\ d=55m)} = -142\ dBm$

==4) Provide Stop Buzzer Point of Contact Information (Name and Direct Telephone Number)==

Gregg Blaize
Facilities Manager
251-487-1780
gregg.blaize@airbus.com

==5) Why did use letter X in your emission? Could another letter/number better describe your emission. If so, use that letter/number in the Form 442.==

After consulting with the supplier of the GPS Repeater system equipment, the following fields have been updated:
Lower Frequency: 1575.42 for L1
Upper Frequency: 1575.42 for L1
Frequency Tolerance: 10
Emission Designator: W7D
Modulating Signal: 10.23 MHz
Necessary Bandwidth: 20.46 MHz

==6) Your Frequency Request is 1572 - 1578 MHz while your necessary bandwidth for the signal is 1575 MHz. I believe you made an error. Please correct this in your Form 442.==

After consulting with the supplier of the GPS Repeater system equipment, the following fields have been updated:
Lower Frequency: 1575.42 for L1
Upper Frequency: 1575.42 for L1
Frequency Tolerance: 10
Emission Designator: W7D
Modulating Signal: 10.23 MHz
Necessary Bandwidth: 20.46 MHz