

Coordination Documentation broken into 2 parts – Ligado and Lightwave - - - and Global Star – both completed successfully

L3 Coordination with Ligado and Lightwave

From: Tolman, David @ SSG - PE - MT
To: ["Maqbool Aliani"](#)
Subject: RE: FCC Experimental License Coordination
Date: Friday, June 22, 2018 1:06:11 PM
Attachments: [image005.png](#)

Thank you!

I appreciate the successful coordination. This coordination will be loaded as an attachment to the FCC experimental license.

Thanks again!

David Tolman

L3 Advanced Systems & Technologies
Principal Systems Engineer
6900 K Avenue
Plano, TX 75074
Direct – 469-568-2582
Cell – 469-910-5465
Fax - 972-747-7961



Advanced Systems & Technologies

From: Maqbool Aliani <maqbool@ligado.com>
Sent: Friday, June 22, 2018 12:17 PM
To: Tolman, David @ SSG - PE - MT <David.Tolman@L3T.com>; Bill Davenport <Bill@ligado.com>
Cc: JOHN.JANKA@LW.com; Serge Nguyen <serge@ligado.com>
Subject: [EXT] RE: FCC Experimental License Coordination

Hello David,

The address for Cedar Hill GW is:

777, Westar Lane
Cedar Hill, Dallas, TX. 75104.

Latitude32o 34' 40.8" N
Longitude.....96o 58' 55.2" W

And the point of contact for Ligado is:

NOC Tel # 877 277 2360

From: David.Tolman@L3T.com <David.Tolman@L3T.com>
Sent: Friday, June 22, 2018 10:23 AM
To: Maqbool Aliani <maqbool@ligado.com>; Bill Davenport <bill@ligado.com>
Cc: JOHN.JANKA@LW.com
Subject: RE: FCC Experimental License Coordination

Good Morning Mr. Aliani –

The below conditions are acceptable to L3. Can you clarify the following:

Item 1 – The address or latitude / longitude of Ligado’s Cedar Hill, TX gateway
Item 2 – Ligado’s point of contact for coordination.

For item #5 – I will be the point of contact for the stop buzzer. My desk phone is (469) 568-2582 and my cell phone is (469) 910-5465.

Thank you!

David Tolman

L3 Advanced Systems & Technologies
Principal Systems Engineer
6900 K Avenue
Plano, TX 75074
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Cell – 469-910-5465
Fax - 972-747-7961



Advanced Systems & Technologies

From: Maqbool Aliani <maqbool@ligado.com>
Sent: Friday, June 22, 2018 9:15 AM
To: Tolman, David @ SSG - PE - MT <David.Tolman@L3T.com>; Bill Davenport <Bill@ligado.com>
Cc: JOHN.JANKA@LW.com
Subject: [EXT] RE: FCC Experimental License Coordination

Hello David,

Let us know the status of the coordination.

Regards,

Maqbool

From: Maqbool Aliani
Sent: Tuesday, June 19, 2018 2:04 PM
To: 'David.Tolman@L3T.com' <David.Tolman@L3T.com>; Bill Davenport <bill@ligado.com>
Cc: JOHN.JANKA@LW.com
Subject: RE: FCC Experimental License Coordination

Hello David,

Ligado will consent to L3's experimental license, provided that L3 complies to the following:

1. L3's flight area of operations shall be away from Ligado's Cedar Hill, TX gateway – specifically avoiding operating within a 50 Km radius from the location of Ligado's gateway.
2. L3 shall coordinate times, durations and power levels prior to all tests, especially flight operations within 100 Km radius of Ligado's gateway.
3. L3 shall use directional antenna, with a main lobe pointing towards the ground (away from Ligado's satellite).
4. L3 shall limit transmitting on the frequencies of interest (1646.50 to 1661.050 MHz) to only 2 of the 6 flights planned over the next 3 years – limiting potential interference to extremely short bursts on two days over the next 3 years due to airborne operations.
5. L3 will interrupt testing upon Ligado's notification of interference. Testing can only be resumed after Ligado and L3 agree to the new test plan.

Regards,

Maqbool

From: David.Tolman@L3T.com <David.Tolman@L3T.com>
Sent: Tuesday, June 19, 2018 12:02 PM
To: Maqbool Aliani <maqbool@ligado.com>; Bill Davenport <bill@ligado.com>
Cc: JOHN.JANKA@LW.com
Subject: RE: FCC Experimental License Coordination

Good morning Mr. Aliani –

Are there other options aside from notching out the frequency band? In order to complete verification testing of our product we need to test the full operating band, but we would be open for tailoring the testing. Airborne testing is anticipated to occur about 6 times over the next 3 years within 100 Km radius of our facility in Plano TX. During flight testing, our product would transmit

and receive on the frequencies in question at very low power (3 watts) from an altitude of no more than 2438 meters. The transmitter in our product emits very narrow pulses and changes frequency multiple times per second. The duty cycle is on the order of 10% (transmit time vs receive time). During a typical flight test, multiple flight passes are performed, with each flight pass consisting of operation on the order of 15 seconds, followed by data download, and repositioning of the aircraft. With the duty cycle and the frequency hopping, I would estimate the product to be transmitting in your frequencies of concern only about $(15 \text{ MHz}/775 \text{ MHz [Frequency hopping]}) * (.1 \text{ [Duty Cycle]}) * 15 \text{ seconds [time of a single flight pass]} = \sim 30 \text{ msec}$. Each flight pass requires starting and ending at specific points, with several minutes between flight passes. Typically only about a dozen flight passes can be performed in an hour. On a good day of testing we may be able to fly for up to six hours.

Would any of the following be acceptable –

Location of our flight area of operations away from your Cedar Hill gateway – specifically avoiding operating within a 50 Km radius from the location of your gateway

Prior notification of any flight operations within 100 Km radius of your gateway – with coordination on times, durations, power levels

Utilization of an antenna during flight operation that is not omnidirectional – with a main lobe pointing towards the ground – and away from your satellite

Limitation on transmitting on the frequencies of interest (1646.50 to 1661.050 MHz) to only 2 of the 6 flights planned over the next 3 years – limiting potential interference to extremely short bursts on two days over the next 3 years due to airborne operations

If none of the above are acceptable we will agree to notch out the requested frequency band – but would prefer to explore other options if possible.

Thank you

David Tolman

L3 Advanced Systems & Technologies

Principal Systems Engineer

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Advanced Systems & Technologies

From: Maqbool Aliani <maqbool@ligado.com>
Sent: Tuesday, June 19, 2018 10:26 AM
To: Tolman, David @ SSG - PE - MT <David.Tolman@L3T.com>; Bill Davenport <Bill@ligado.com>
Cc: JOHN.JANKA@LW.com
Subject: [EXT] RE: FCC Experimental License Coordination

Hello David,

We had an internal review and discussion of L3's experimental license request with all Ligado's stakeholders. The consensus is that there is a potential risk of interference from your testing unit to our satellite - due to our satellite's large reflector with very high Rx G/T; and the ground equipment at our Cedar Hill, TX Gateway. As such, we would like to ask you to notch out the frequency band of 1646.50 to 1661.050 MHz.

Please let me know your comments.

Regards,

Maqbool Aliani | Senior Vice President

office. 703.390.2795 cell. 703.677.1267 ligado.com
10802 Parkridge Blvd, Reston, VA 20191



From: David.Tolman@L3T.com <David.Tolman@L3T.com>
Sent: Monday, June 18, 2018 4:45 PM
To: Maqbool Aliani <maqbool@ligado.com>; Bill Davenport <bill@ligado.com>
Cc: JOHN.JANKA@LW.com
Subject: RE: FCC Experimental License Coordination

Good afternoon Mr. Aliani –

If there any further information I can provide to assist in the review process? The FCC has requested the coordination be completed by June 20th. I can petition for a 2 week extension if additional time is required.

David Tolman
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Advanced Systems & Technologies

From: Tolman, David @ SSG - PE - MT
Sent: Thursday, June 14, 2018 9:24 AM
To: 'Maqbool Aliani' <maqbool@ligado.com>; Bill Davenport <Bill@ligado.com>
Cc: JOHN.JANKA@LW.com
Subject: RE: FCC Experimental License Coordination

Good morning Mr. Aliani –

Thank you for working with me to coordinate this experimental license.

In response to your questions -

Our original experimental license expired and this license is a replacement for it under a separate government contract.

There is no change to the bandwidth of the TX carrier signal from the prior license (WH2XNP) – 150 MHZ is the bandwidth of our pulse mode, the mode that has the widest bandwidth.

Our current test plan calls for operation of one unit at a time for evaluation and verification.

We need to operate across all requested frequencies our device is capable of transmitting on to verify device performance at each frequency and that the frequency hopping capability does not impact performance.

We are willing to interrupt or stop testing on notification of interference - I am listed as the “stop operations contact” in case of interference with any other system.

Please let me know if I additional information is needed!

Thank you for your prompt response!

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David Tolman

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Fax - 972-747-7961



Advanced Systems & Technologies

From: Maqbool Aliani <maqbool@ligado.com>
Sent: Thursday, June 14, 2018 9:10 AM
To: Tolman, David @ SSG - PE - MT <David.Tolman@L3T.com>; Bill Davenport <Bill@ligado.com>
Cc: JOHN.JANKA@LW.com
Subject: [EXT] RE: FCC Experimental License Coordination

Hello David,

Thanks for reaching out to us. I have some follow up questions.

- What is the status of the Experimental License and testing with call sign WH2XNP?
- What is the Tx carrier BW (of the new test program)?
- How many test units that will be transmitted simultaneously during the testing?
- Does L3 need to operate at specific frequencies?
- Is L3 willing to interrupt their testing should interference to Ligado's system becomes unacceptable?

Regards,

Maqbool

From: David.Tolman@L3T.com <David.Tolman@L3T.com>
Sent: Wednesday, June 13, 2018 11:53 AM
To: Maqbool Aliani <maqbool@ligado.com>; Bill Davenport <bill@ligado.com>
Cc: JOHN.JANKA@LW.com
Subject: RE: FCC Experimental License Coordination

Mr. Davenport / Mr. Aliani –

John Janka indicated you would be the best point of contact regarding our request for coordination of our FCC experimental license.

L3 Advanced Systems and Technology has submitted a request with the FCC for a temporary experimental license for a duration of 3 years. This license will be used to evaluate and test one of our products in support of a governmental contract. The FCC requested we coordinate with Lightsquared / Ligado Networks (Call sign E100051 and E080031) for potential interference in the 1626.5-1660.5 MHz portion of the band.

This experimental license we have applied for is similar to one we previously held, with call sign WH2XNP.

Details of interest in our FCC experimental application:

Frequency of Operation/ Power / Location: Our test units may radiate up to 3 watts peak in the frequency range of 1626.5-1660.5 MHz.

Our operational test area is limited to a 100 Km radius of our facility in Plano TX.

Testing is anticipated to occur ten to twenty times at our facility in Plano on the ground over the next 3 years. Airborne testing is anticipated to occur about 6 times (each of 1 day duration) over the next 3 years within 100 Km radius of our facility in Plano TX.

In order to minimize interference, we are willing to coordinate test plans ahead of time and limit the duration of testing in the frequencies of concern.

Our complete FCC experimental license application is attached for your reference.

Thank you for your assistance.

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David Tolman

L3 Advanced Systems & Technologies

Principal Systems Engineer

6900 K Avenue

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Direct – 469-568-2582

Cell – 469-910-5465

Fax - 972-747-7961



Advanced Systems & Technologies

From: JOHN.JANKA@LW.com <JOHN.JANKA@LW.com>
Sent: Thursday, June 7, 2018 12:42 PM
To: Tolman, David @ SSG - PE - MT <David.Tolman@L3T.com>
Cc: maqbool@ligado.com; Bill@ligado.com
Subject: [EXT] RE: FCC Experimental License Coordination

David,

It is probably most efficient for you to interface with Bill Davenport or Maqbool Aliani of Ligado, who are copied here.

Please let me know if you have any trouble connecting.

Regards,

John

From: David.Tolman@L3T.com [<mailto:David.Tolman@L3T.com>]
Sent: Friday, May 25, 2018 10:29 AM
To: Janka, John (DC) <JOHN.JANKA@LW.com>
Subject: RE: FCC Experimental License Coordination

Mr. Janka -

L3 Advanced Systems and Technology has submitted a request with the FCC for a temporary experimental license for a duration of 3 years. This license will be used to evaluate and test one of our products in support of a governmental contract. The FCC requested we coordinate with Mr. Jeffrey J. Carlisle of Lightsquared / Ligado Networks (Call sign E100051 and E080031) for potential interference in the 1626.5-1660.5 MHz portion of the band.

The contact information the FCC has for Mr. Jeffrey Carlisle is currently out of date, and they provided your contact information as the acquiring company after Lightsquared went into bankruptcy.

This experimental license we have applied for is similar to one we previously held, with call sign WH2XNP.

Thank you for your assistance.

David Tolman

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Advanced Systems & Technologies

From: JOHN.JANKA@LW.com [<mailto:JOHN.JANKA@LW.com>]

Sent: Thursday, May 24, 2018 9:34 AM

To: Tolman, David @ SSG - PE - MT <David.Tolman@L3T.com>

Subject: [EXT] RE: FCC Experimental License Coordination

David,

Would you please let me know the company on whose behalf you are contacting me, and the call sign?

Thank you

John

From: David.Tolman@L3T.com [<mailto:David.Tolman@L3T.com>]

Sent: Thursday, May 24, 2018 10:22 AM

To: Janka, John (DC) <JOHN.JANKA@LW.com>

Subject: FCC Experimental License Coordination

Mr. Janka -

L3 AS&T has submitted a request with the FCC for an experimental license to transmit in a frequency range that may be of concern. As part of the FCC experimental license process, I am requesting written consent of our proposed operations with any existing licensee that may be impacted by this experimental license.

I have attached our FCC experimental license request. The items I believe to be of interest are:

Frequency of Operation/ Power / Location: Our test units may radiate up to 3 watts peak in the frequency range of 1626.5-1660.5 MHz. Our operational test area is limited to a 100 Km radius of Plano TX.

Testing is anticipated to occur ten to twenty times at our facility in Plano on the ground over the next 3 years. Airborne testing is anticipated to occur about 6 times over the next 3 years within 100 Km radius of our facility in Plano TX.

In order to minimize interference, we are willing to coordinate test plans ahead of time and limit the duration of testing in the frequencies of concern.

Thank you for your assistance in this matter.

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David Tolman

L3 Advanced Systems & Technologies

Principal Systems Engineer

6900 K Avenue

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Direct – 469-568-2582

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Advanced Systems & Technologies

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L3 Coordination with Global Star

COMPLETED

From: Tolman, David @ SSG - PE - MT
To: ["David Weinreich"](#)
Cc: [Barbee Ponder](#); [Wen Doong](#); [David Milla](#)
Subject: RE: Experimental License Application File No. 0379-EX-CN2018
Date: Monday, June 18, 2018 2:37:16 PM

Mr. Weinreich -

Thank you for the coordination with this FCC experimental license.

I will be serving as the stop buzzer point of contact for this FCC license. My desk number is (469) 568-2582 and my Cell number is (469) 910-5465.

Please feel free to contact me with any concerns or issues.

Thank you -

David Tolman
L3 Advanced Systems & Technologies
Principal Systems Engineer
6900 K Avenue
Plano, TX 75074
Direct – 469-568-2582
Cell – 469-910-5465
Fax - 972-747-7961

-----Original Message-----

From: David Weinreich <David.Weinreich@globalstar.com>
Sent: Monday, June 18, 2018 2:13 PM
To: Tolman, David @ SSG - PE - MT <David.Tolman@L3T.com>
Cc: Barbee Ponder <Barbee.Ponder@globalstar.com>; Wen Doong <Wen.Doong@globalstar.com>; David Milla <David.Milla@globalstar.com>
Subject: [EXT] RE: Experimental License Application File No. 0379-EX-CN2018

Dear Mr. Tolman,

Globalstar has determined that your operations should not cause interference.

Please remind me of the name and number of the "Stopbuzzer" contact.

Best regards,
David Weinreich
Globalstar, Inc.

-----Original Message-----

From: David.Tolman@L3T.com [<mailto:David.Tolman@L3T.com>]
Sent: Monday, June 18, 2018 2:31 PM
To: David Weinreich
Cc: Barbee Ponder; Wen Doong; David Milla
Subject: RE: Experimental License Application File No. 0379-EX-CN2018

Mr. Weinreich -

The closing date for the FCC coordination is tomorrow. Is there any further information I can provide?

David Tolman
L3 Advanced Systems & Technologies
Principal Systems Engineer
6900 K Avenue
Plano, TX 75074
Direct - 469-568-2582
Cell - 469-910-5465
Fax - 972-747-7961

-----Original Message-----

From: Tolman, David @ SSG - PE - MT
Sent: Wednesday, June 13, 2018 11:44 AM
To: 'David Weinreich' <David.Weinreich@globalstar.com>
Cc: 'Barbee Ponder' <Barbee.Ponder@globalstar.com>; 'Wen Doong' <Wen.Doong@globalstar.com>; 'David Milla' <David.Milla@globalstar.com>
Subject: RE: Experimental License Application File No. 0379-EX-CN2018

Mr. Weinreich -

Is there anything further I can provide to assist with coordination? The FCC has requested coordination completion within the next week.

David Tolman
L3 Advanced Systems & Technologies
Principal Systems Engineer
6900 K Avenue
Plano, TX 75074
Direct - 469-568-2582
Cell - 469-910-5465
Fax - 972-747-7961

-----Original Message-----

From: Tolman, David @ SSG - PE - MT
Sent: Monday, May 21, 2018 3:14 PM
To: 'David Weinreich' <David.Weinreich@globalstar.com>
Cc: Barbee Ponder <Barbee.Ponder@globalstar.com>; Wen Doong <Wen.Doong@globalstar.com>; David Milla <David.Milla@globalstar.com>
Subject: RE: Experimental License Application File No. 0379-EX-CN2018

Mr. Weinreich -

The purpose of our request for the experimental license with the FCC is to perform integration and verification testing of our prototype design, make improvements and updates, and perform compliance testing for our government customer. The product in question is a low power radar unit. The majority of testing will take place at our Plano facility, however about 6 test flights will be required over the course of the 3 year license period.

These test flights would transmit and receive on the frequencies in question at very low power (3 watts) from an altitude of no more than 2438 meters. The transmitter in our product emits very narrow pulses and changes frequency multiple times per second. The duty cycle is on the order of 10% (transmit time vs receive time). During a typical flight test, multiple flight passes are performed, with each flight pass consisting of operation on the order of 15 seconds, followed by data download, and repositioning of the aircraft. With the duty cycle and the frequency hopping, I would estimate the product to be transmitting in your frequencies of interest only about $(10 \text{ MHz}/775 \text{ MHz} [\text{Frequency hopping}] * .1 [\text{Duty Cycle}] * 15 \text{ seconds} [\text{time of a single flight pass}] = \sim 20 \text{ msec}$. Each flight pass requires starting and ending at specific points, with several minutes between flight passes. Typically only

about a dozen flight passes can be performed in an hour. On a good day of testing we may be able to fly for up to six hours.

With the above information I believe during flight test our system could potentially interfere with your system sporadically (no more than once every 5 minutes) for a maximum duration of 20 msec no more than 72 times over the span of 6 hours during a day of flight testing. With a 3W peak output power, your products sensitivity and the distance from our system would determine the impact.

One of our product features is that it is difficult to detect in the RF spectrum, and to date we have not received any reports of interference from any other licensees.

This experimental license request reflects an update of one that was previously active from December 11 2014 through December 01 2017 with the same low power and frequency considerations (prior experimental license attached).

Please let me know if there is any additional technical data that I can provide.

Thank you

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David Tolman
L3 Advanced Systems & Technologies
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6900 K Avenue
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-----Original Message-----

From: David Weinreich [<mailto:David.Weinreich@globalstar.com>]
Sent: Monday, May 21, 2018 2:33 PM
To: Tolman, David @ SSG - PE - MT <David.Tolman@L3T.com>
Cc: Barbee Ponder <Barbee.Ponder@globalstar.com>; Wen Doong <Wen.Doong@globalstar.com>; David Milla <David.Milla@globalstar.com>
Subject: [EXT] Experimental License Application File No. 0379-EX-CN2018

Dear Mr. Tolman,

Given the frequency ranges, power levels and modulation characteristics of your proposed emissions, Globalstar feels that there is the potential for severe interference to our system operations.

In order to proceed, it would be beneficial for us to receive a detailed description of your proposed operations that

would be covered by this experimental license.

I look forward to your reply.

Best regards,

David Weinreich
Director,
Spectrum and Regulatory Engineering
Globalstar, Inc.

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From: [Tony Navarra](#)
To: [Tolman, David @ SSG - PE - MT](#)
Subject: [EXT] RE: FCC Experimental License Coordination
Date: Monday, May 21, 2018 1:02:03 PM

Thank you David.

I have forwarded to our regulatory team for review and commen.

Tony

Globalstar



Tony Navarra | Consultant

461 S. Milpitas Blvd. | Milpitas, California 95035

(OFFICE) [1-408-933-4525](tel:1-408-933-4525)

(EMAIL) Tony.Navarra@globalstar.com



From: David.Tolman@L3T.com [mailto:David.Tolman@L3T.com]

Sent: Monday, May 21, 2018 9:42 AM

To: Tony Navarra <Tony.Navarra@globalstar.com>

Subject: FCC Experimental License Coordination

Mr. Navarra -

L3 AS&T has submitted a request with the FCC for an experimental license to transmit in a frequency range that may be of concern. As part of the FCC experimental license process, I am requesting written consent of our proposed operations with any existing licensee that may be impacted by this experimental license.

I have attached our FCC experimental license request. The items I believe to be of interest are:

Frequency of Operation/ Power / Location: Our test units may radiate up to 3 watts peak in the frequency range of 1610-1620 MHz. Our operational test area is limited to a 100 Km radius of Plano TX.

Testing is anticipated to occur ten to twenty times at our facility in Plano on the ground over the next 3 years. Airborne testing is anticipated to occur about 6 times over the next 3 years within 100 Km radius of our facility in Plano TX.

In order to minimize interference, we are willing to coordinate test plans ahead of time and limit the duration of testing in the frequencies of concern.

Thank you for your assistance in this matter.

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David Tolman

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