

Supplemental document for experimental license extension application

1) Application details

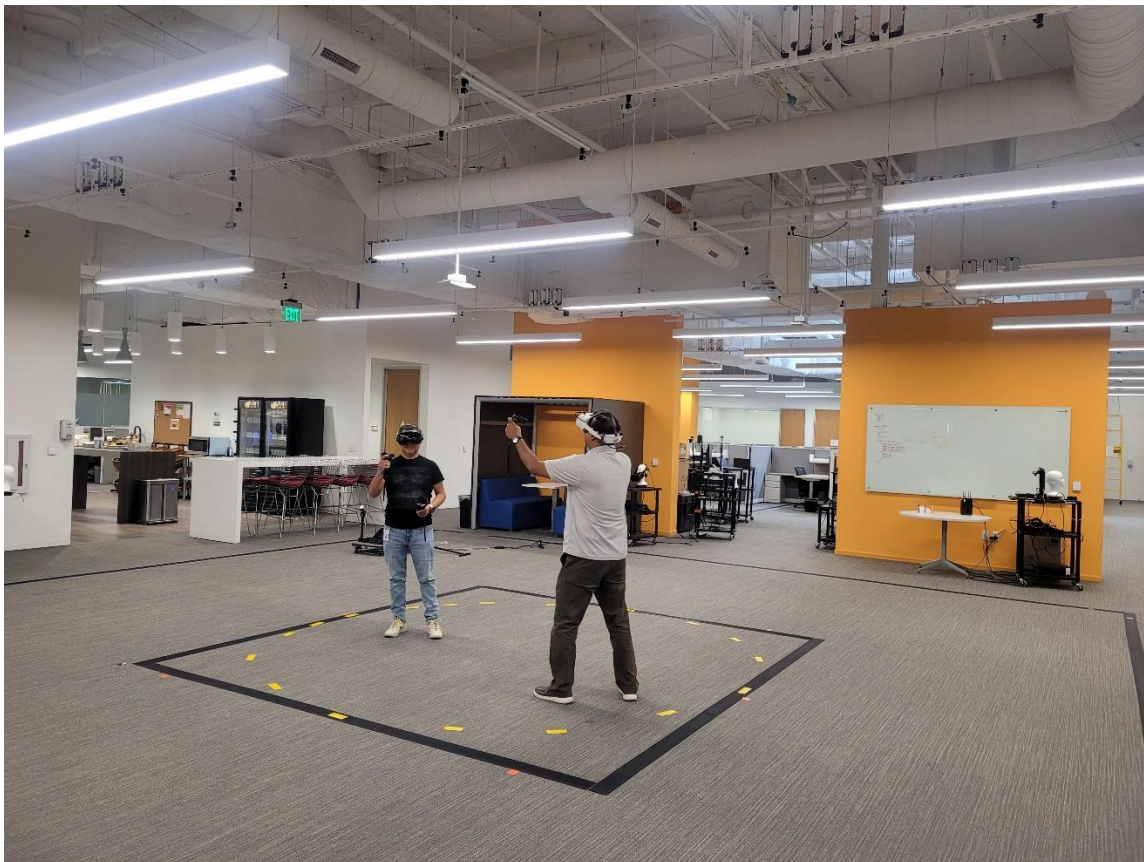
- a) Application type: experimental license extension
- b) Applicant: XCOM Labs
- c) File No.: 0711-EX-CN-2020
- d) Call Sign: WL2XFH
- e) FRN: 0028477628
- f) Station Locations
- g) San Diego (SAN DIEGO), CA - NL 32-53-13; WL 117-10-24
- h) Supplemental information:
- i) Frequency: 3650 MHz
- j) Station Class: FX
- k) Emission Designator: 100MW7W
- l) Authorized Power: 1 W ERP
- m) Frequency Tolerance (+/-): 1.0E-6 %

2) Explanation of why XCOM is requesting CBRS n48 Band experimental license extension:

- a) The experimental license renewal is to ensure operation and testing can continue during the interim period between expiration of the current license and FCC Part96 certification and completion of interop testing of the XCOM CBSDs.
- b) AR, VR, XR technology development and commercialization for real world educational and training, medical research and advanced interactive application development.
- c) The key performance indicator (KPI) measurements for mobility, user density (in 3 dimensions) and reliability require over-the-air validation (OTA) in XCOM test lab. The experimental license would enable the demonstration of the unique RF performance characteristics of the system to enable a novel industrial automation use case. XCOM has constructed a demonstration area of approximately 50ftx50ft that has been successfully used to demonstrate real world applications for/to commercial, military and educational representatives. The experimental license would be invaluable to ensure continued operation of this setup (see Figure 1) for both development and demonstration.
- d) Our indoor OTA system consists of 12 RRUs. It is permanently located in the XCOM lab facility and is not for outdoor use. The maximum transmit power of each RRU is limited 20mW (13dBm) in accordance with the experimental license. The RRU internal antenna are mounted downwards (towards the floor). Effective coordination is achieved by interference avoidance. Please see the response to (2) for more details. The system has been operated successfully without any interference issues for the period of the existing license.
- e) SAS capability is a feature in our commercial roadmap which is close to completion and to be operational with SAS administrator within the next 6 months' time period. We have contracted with Federated for SAS support and interop testing and have access to their SAS tool to monitor active CBSDs within the local area. We are actively working on the SAS certification and have begun the FCC RRU certification testing.
- f)

3) Explanation of how it would specifically avoid causing interference to incumbent and commercial operations in the band, including General Authorized Access (GAA).

- a) The system is currently operating at a maximum transmit power of 20mW (13dBm) EIRP (radio unit- antenna sum). The experimental license renewal maximum power could be limited to this power level.
- b) The system operation is limited to indoor-only locations at XCOM's facility.
- c) The radio units are ceiling mount design with a downward-facing antenna. Units are tested with a downward-facing antenna. Coverage is limited but is sufficient for testing.
- d) XCOM has performed calibrated EIRP measurements and determined outdoor referred EIRP is reduced at least 29dB due to the setup antenna orientation and building isolation. (refer to the measurement section for more details)
- e) The outdoor referred interference is -28.5dB/1MHz (20mW and 20MHz LTE). This is below the CBRS inband spurious emission limit for licensed operation -25dBm/1MHz. (refer to FCC Emission Limit Part 96.41(e) section).
- f) For 100MHz NR testing the emissions per 1MHz is further reduced by the bandwidth scaling.
- g) In conclusion, proponents are operating a low power indoor test system. Any interference in the band is at a level below the spurious emission limits of other operators in the band.



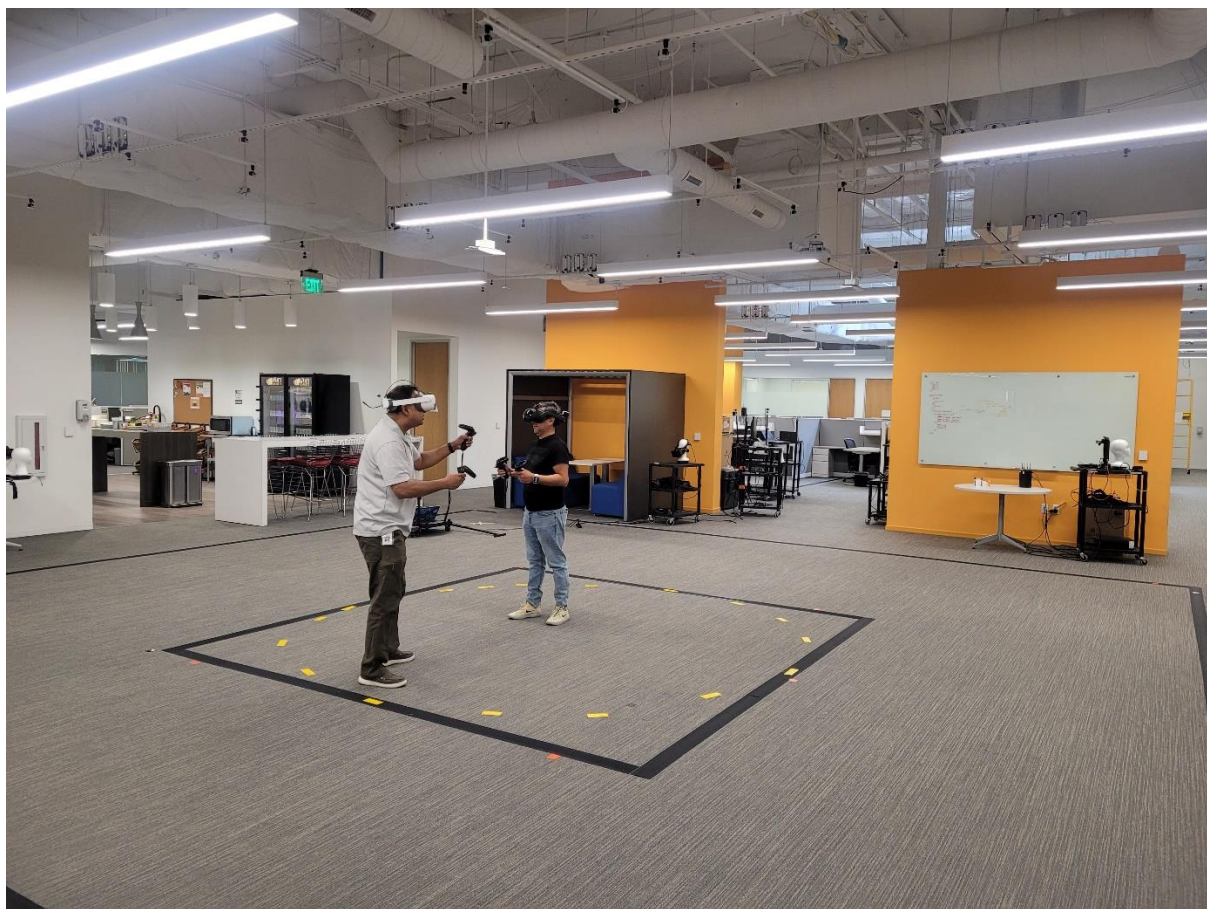


Figure 1: XCOM test lab

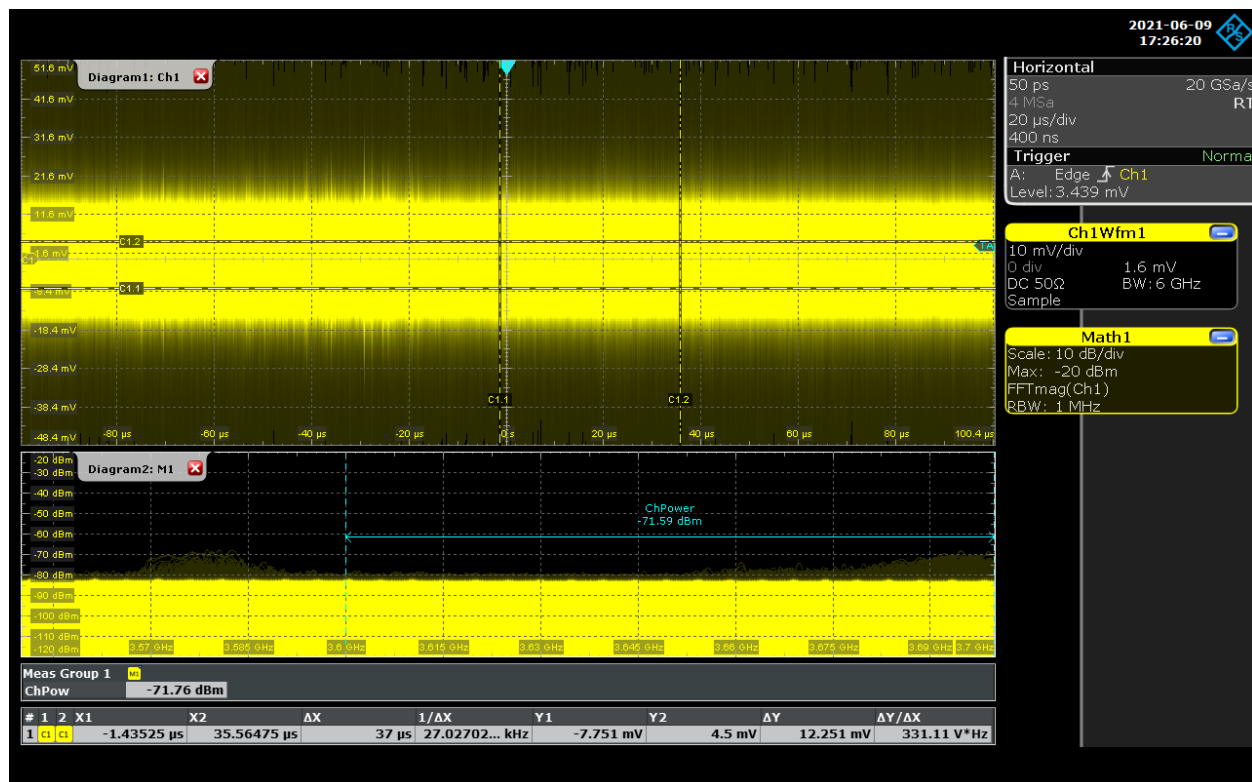
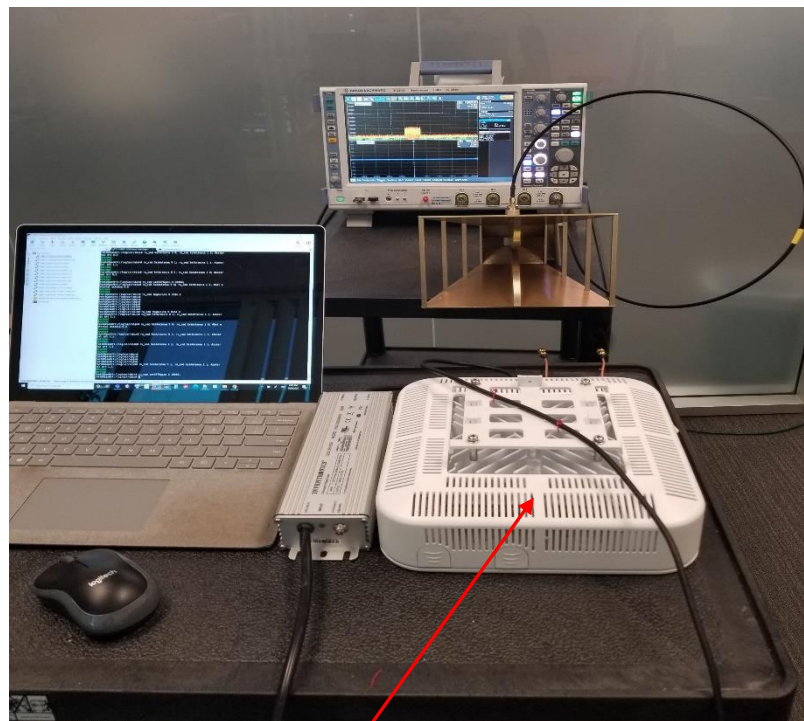
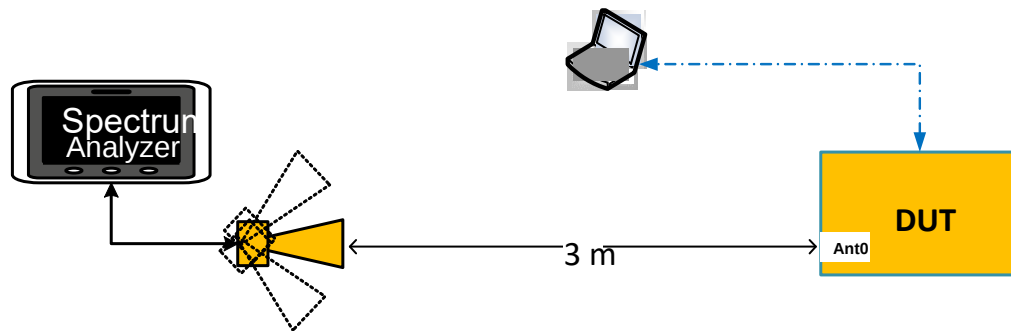


Fig2 :XCOM lab spectrum reading

- Measurements – Calibrated EIRP
 - Indoor to outdoor isolation was estimated from the differential between calibrated EIRP of the radio unit (RU) measured indoor at 3m reference distance and outdoor at 3m reference distance.
 - Measurements were made at two locations A and B representative of each end of the lab and closest to the exterior wall.
 - The test was conducted at the max EIRP of RU. Note this is NOT the proposed operational transmit power.
 - RU EIRP indoor = 24.4dBm
 - RU EIRP outdoor maximum = -4.9dBm
 - Indoor to outdoor isolation = $24.4 - (-4.9) = 29.3\text{dB}$.
- Calibration of the XCOM RRU device under test (DUT)
 - Calibration of the DUT to determine the EIRP at maximum conducted output power. Refer to 'Test Setup and Calibration' pictures of the calibration setup:
 - DUTs were tested in the CBRS band.
 - All field strength field measurements dBuV/m integrated in 1MHz.
 - All EIRP measurements dBm integrated in the modulation BW; 18MHz.
 - Nominal Conducted TX output power during calibration; 23.32 dBm.
 - Measured Field Strength during calibration at 3m; 107.1 dBuV/m.

- DUT EIRP 24.4 dBm.



DUT ceiling mount orientation.

- **Measured Field Strength, outside building in a typical setup.**

- The lab which will house all devices during development, is on the outside wall of the building. The calibrated DUT was placed in two locations closest to the outside wall where a 3m radiated measurement was possible. Measurement locations A and B are shown below.
- Measured Field Strength location A building 3m from DUT; 77.79 dBuV/m.
- Measured Field Strength location B building 3m from DUT; 73.39 dBuV/m.
- DUT at location A EIRP; -4.9 dBm.
- DUT at location B EIRP; -9.28 dBm.
- Isolation location A $(24.4 - -4.9) = 29.3\text{dB}$
- Isolation location B $(24.4 - -9.28) = 33.68\text{dB}$
- Minimum isolation 29dB.

Location A



Location B

