

EMC Analysis of INCA

Summary of INCA

The INCA is a 3U cubesat being launched into orbit at 500-km altitude, and 90-degree inclination. INCA is operated from a single ground station location at New Mexico State University. The frequency used for space to earth communication and earth to space communication is 437.125 MHz. This report reviews with other authorized operators in this frequency range and operating range. It shows that no interference is reasonably expected to occur with the local amateur radio club and no interference with any preexisting operators in our operating range.

Compliance with Local Amateur Radio Operators

Because the operating frequency is in the amateur frequency range, we coordinated with the local amateur radio club. The amateur radio club near New Mexico State University, has provided a letter, included in the Appendix of this report, stating that the INCA ground station will not cause unacceptable interference with local operations.

Compatibility within the Operating Range

ITU radio regulations provide power flux density (PFD) limits, above which coordination with terrestrial and aeronautical mobile systems is required. The PFD thresholds for these terrestrial and aeronautical mobile systems are as follows:

- Terrestrial Services: $-125 \text{ dBW/m}^2/4\text{KHz}$
- Aeronautical Mobile (R): $-125 \text{ dBW/m}^2/4\text{KHz}$
- Aeronautical Mobile (OR): $-140 \text{ dBW/m}^2/4\text{KHz}$

The most critical threshold for the INCA satellite is the Aeronautical Mobile (OR) threshold where INCA goes above the $-140 \text{ dBW/m}^2/4\text{KHz}$ limit at a distance of less than 864 km, which can be seen in figure 1. Also, a calculation was done to

analyze the coverage area of the satellite when communicating with the ground, see figure 2.

The area of coverage is approximately a 2700-km radius of the ground station location. This radius covers the majority of the US, most of Mexico, and parts of Canada, Guatemala, and Cuba. FCC and ITU database searches were conducted in those areas to identify other users near our frequency. Using the Master International Frequency Register (MIFR) and FCC database, no results were returned for our frequency range of 437.125 MHz $\pm$ 200 KHz. See Figures 3 and 4.

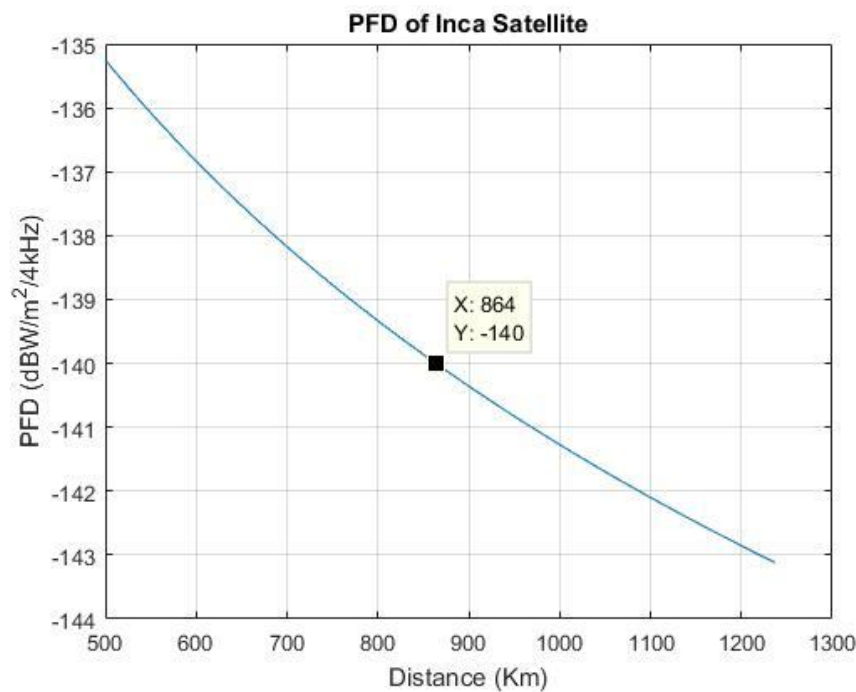


Figure 1: PFD of INCA over different distances

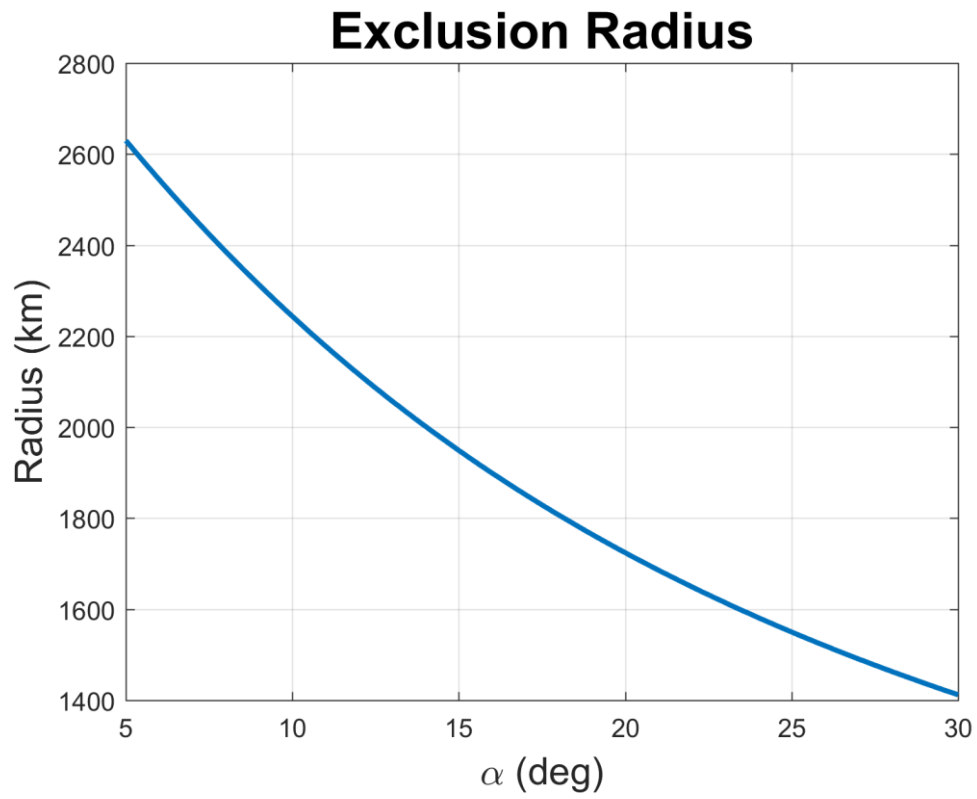


Figure 2: Exclusion radius of INCA's transmission

MIFR (Terrestrial Services) on-line query (BETA2 release)

☐ MIFR (Broadcasting) ☐ MIFR (FXM) ☒ MIFR (all)			
MIFR (ALL): Selection Criteria			
Administration AFG ▲ AFS ▲ AGL > ALB >> ALG < ARG << ADM ▼	Geographic Area CAN ▲ CUB ▲ GTM ▲ MEX ▲	Notice Type ABW ▲ AFG ▲ AFS ▲ AGL ▲ AIA ▲ ALB ▲ ALC ▲	Class of Station 1A1 ▲ 1A2 ▲ 1A4 ▲ 1A5 ▲ 1A7 ▲ 1B1 ▲ 1C1 ▲
Status ☒ Recorded ☒ Pending ☒ Not published			
Assigned Frequency MHz ▼ f _{mi} 436.9 f _{mx} 437.33 ☐ f _{min} ≤ Assigned Frequency ≤ f _{max} only			
Unique Id. code given by Administration		Identifier assigned by the BR from to	
Date of Receipt (from) 01/03/2007		Date of Receipt (to) 15/03/2018	
Site Name 			
Apply Filter Remove Filter			

MIFR (All)
No records

Figure 3: ITU Database Search

FCC Federal Communications Commission

FCC Home | Search | Updates | E-Filing | Initiatives | For Consumers | Find People

Universal Licensing System

FCC > WTB > ULS > Online Systems > License Search

License Search

Search Results [New Search](#) [Refine Search](#) [Printable Page](#) [HELP](#)

Specified Search

Frequency Assigned = 437.125

No matches found To try again, you can perform a [new search](#) or [refine your existing search](#).

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Basic Search By Call Sign ▼ =

Figure 4: FCC Database Search

Appendix

I, Sven Breden K5SHB as a President of the Mesilla Valley Radio Club hereby recognize and have no objections to the New Mexico State Universities' Nano Satellite Lab operating a satellite ground station at a frequency of 437.125 MHz under an experimental license on the New Mexico State University campus. This ground station will not result in unacceptable interference to local amateur operators.

Name: Sven H Breden K5SHB
Signature: Sven H Breden
Date: 2/22/2018