

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)
)
)
Pointview Tech, LLC) File No. 2018-EX-PL-_____
)
Application for Authority to Launch and)
Operate an Experimental Low-Earth Orbit,)
Non-Geostationary Orbit Satellite and)
Communicate with Certain Earth Stations)
)

APPLICATION NARRATIVE

Pursuant to Sections 308 and 309 of the Communications Act of 1934, as amended,¹ and Part 5 of the Commission’s rules,² Pointview Tech, LLC (“Pointview”) files this application for experimental authorization to launch and operate a single low-earth orbit (“LEO”), non-geostationary orbit (“NGSO”) satellite (the “Athena” satellite). [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] The satellite’s narrowband Tracking, Telemetry & Command (“TT&C”) beams will operate in the S-band at 2082 MHz, using less than 1.5 MHz occupied bandwidth, for

¹ 47 U.S.C. §§ 309, 310.

² 47 C.F.R. §§ 5.55, 5.63.

the uplink, and in the X-band at 8496.25 MHz, using less than 2.3 MHz occupied bandwidth, for the downlink. Pointview’s partners, Space Systems Loral (“SSL”) and Atlas Space Operations (“Atlas”), are requesting the appropriate authority to operate three earth stations for TT&C communications and for receiving remote sensing signals.

This application provides an overview of the Athena experiment, including its objective and operations; a description of the spacecraft; a summary of the ground operations, including the TT&C functions; a discussion of the power levels, which are all within any and all limits applicable to the frequency bands in question, as well as the steps taken to mitigate any risk of harmful interference; and an explanation of why the experiment serves the public interest. Specifically, the public interest rationale in support of the Athena experiment is strong –

Pointview will examine the suitability of LEO satellites [REDACTED]
[REDACTED]

[REDACTED] The application shows that the proposed experiment meets all applicable legal and technical requirements. Finally, the application certifies that Pointview will meet any and all international obligations related to the Athena satellite.

Attached to this application are supporting exhibits providing the technical and operational characteristics of the Athena satellite (“Technical Annex”), the orbital debris mitigation plan, and radiation hazard studies [REDACTED]

I. OVERVIEW OF THE ATHENA EXPERIMENT

[REDACTED]
[REDACTED]

[REDACTED] between earth stations in the western United States and a non-geostationary

orbit (“NGSO”) satellite operating in the low-earth orbit.³ [REDACTED]

[REDACTED] The satellite is slated to be launched in early 2019. The tests will run for approximately two years after the start of in-orbit operations, after which point the satellite will be permanently switched off by irreversible ground command and naturally de-orbit within the 25-year requirement.⁴

A. The Athena Spacecraft

The Athena spacecraft is being designed and manufactured by Space Systems Loral, LLC. Space Systems Loral has a contract for launch as a secondary payload on the Arianespace Vega launcher, and is scheduled for launch in early 2019. It will operate in the low-earth orbit, specifically at a sun-synchronous orbit between 500-550 km. Only one spacecraft will be used in the demonstration. It will be a small, lightweight satellite, with a size of approximately 0.33 cubic meters and a weight of less than 150 kg. It will also feature a low-resolution earth observation camera.⁵ There will be no on-board propulsion system for orbit change. The operational lifetime of spacecraft is approximately two years.

B. Ground Operations

[REDACTED]

³ [REDACTED]

⁴ See NASA, Process for Limiting Orbital Debris, NSA-STS-8719.14A (with Change 1) § 4.3.2, Requirement 4.3-1 at 21 (approved May 25, 2012).

⁵ Pointview will soon apply for a remote sensing application with the National Oceanic and Atmospheric Administration to permit use of the earth observation camera on the satellite.

[REDACTED]

Atlas will serve as the TT&C earth station operator and will apply for the TT&C earth station licenses. TT&C will be conducted in the S-band at 2082 MHz, using less than 1.5 MHz occupied bandwidth, for the uplink, and in the X-band at 8496.25 MHz, using less than 2.3 MHz occupied bandwidth, for the downlink. The TT&C earth stations will be located in Mojave, California; Albuquerque, New Mexico; and Brewster, Washington.

C. Power Levels

The power levels for the Athena experiment are within established limits for the proposed bands.⁷ The maximum DC power dissipation level of the spacecraft is 1200 W. The X-band TT&C radio consumes less than 50 W DC. The transmit power is 3.64 dBW EIRP with 2.3 MHz bandwidth. The maximum power flux density at the surface of the earth is -148.96 dBW/m²/4 kHz. These operations meet all International Telecommunication Union (“ITU”) limits in this band, including those for deep space network (“DSN”) protection. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

D. No Harmful Interference – Generally

⁶ [REDACTED]

⁷ The power levels were calculated using an altitude of 500 km to assume the highest levels for the altitude range for Athena’s orbit.

Pointview has taken a number of measures to ensure that no harmful interference will result from its operations. As a threshold matter, the frequency bands and earth station locations were selected to minimize the risk of harmful interference to, or from, other systems. Throughout the development of this application, Pointview has been in contact with government users operating in the proposed bands and adjacent bands, including NASA. Pointview has taken the input it has received in developing its operational plan. It will continue to coordinate with government agencies and other potential spectrum users prior to launch and while the satellite is in operation. Pointview intends to conduct an interference analysis and coordination study six months prior to launch so it can finalize coordination with all users in a timely manner.

Pointview has established and will maintain a 24/7 point-of-contact to handle interference issues. That contact will be George Leris. His contact number is 571-216-3381.

Transmissions will also be limited: [REDACTED]

[REDACTED] X-band transmissions will last for less than 10 minutes per contact (up to 10 contacts per day); S-band transmissions will last for less than 10 minutes per contact (up to three contacts per day). Command files to alter or mute operations can be uploaded at each available TT&C contact.

E. No Harmful Interference or Unwanted Emissions – Specifically for TT&C

The proposed TT&C frequencies were identified based on careful interference analysis and discussions with government users of the spectrum. Pointview initially identified several frequency bands in the 8025-8400 MHz and 8450-8500 MHz ranges before deciding on 8496.25 MHz for its telemetry downlink frequency based on communications with NTIA and NASA. The 8496-8500 MHz band is allocated to the Space Research Service on a primary basis for both Federal and non-Federal use, and to the Fixed Service for Federal use. Pointview believes it can

coordinate with systems currently operating in these services, as well as with NASA's EM-1 system, announced for launch in December 2019, and will accept a condition to do so.

Moreover, Athena will not cause unwanted out-of-band emissions into NASA's DSN satellites operating at 8400-8450 MHz. Pointview's interference analysis shows that it complies with the ITU's SA.1157 out-of-band emissions mask for DSNs operating in the 8400-8450 MHz band. Pointview has had several productive discussions with NASA regarding the use of the X-band spectrum, and is continuing coordination. Similarly, spacecraft manufacturer SSL and TT&C provider Atlas Space Operations have coordinated with government stakeholders regarding the use of 2082 MHz for the command uplink.

II. GRANT OF THIS APPLICATION WILL SERVE THE PUBLIC INTEREST

Grant of this application will serve the public interest because it [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

III. THIS APPLICATION IS LEGALLY AND TECHNICALLY COMPLETE

In this application and its exhibits, Pointview is providing all the legal and technical information required by the FCC.

A. Part 5 Narrative Application Requirements

The application complies with all of the requirements of Part 5 of the Commission’s rules for experimental applications. In addition to the material provided on FCC Form 442, Pointview provides the following narrative information.

1. Question 7a and Section 5.63(c)(1) – The complete program of research and experimentation proposed, including a description of equipment and theory of operation⁸

The equipment and operations that make up the program of research and experimentation are described in the Technical Annex.

2. Question 7b – The specific objectives sought to be accomplished

[REDACTED]

3. Question 7c – How the program of experimentation has a reasonable promise of contributions to the development, extension, expansion or utilization of the radio art, or is along line not already investigated

⁸ 47 C.F.R. § 5.63(c)(1).

[REDACTED]

4. Estimated duration of the experiment

Pointview anticipates that its testing will require approximately two years from start of in-orbit operations. After that point, the satellite will be permanently switched off by irreversible ground command.

5. Section 5.64(a) – Construction at own risk⁹

Pointview has begun construction of the proposed satellite facilities at its own risk. It notified the Commission’s Office of Engineering and Technology in writing that it planned to begin construction at its own risk in July 2016.

B. Part 25 Application Requirements

While this application is being filed under Part 5 of the Commission’s rules for experimental licensing rather than Part 25 for satellite operations, Pointview also provides the information required by Part 25 to allow the Commission to fully evaluate the application. In the narrative below and in the accompanying Technical Annex, Pointview is specifically submitting all of the technical information required by Part 25 of the Commission’s Rules, radiation hazard studies, and orbital debris assessment review.

1. Section 25.114(c)(4) – Radio Frequency Plan¹⁰

Pointview’s proposed frequency plan is provided in the Technical Annex.

⁹ 47 C.F.R. § 5.64(a).

¹⁰ 47 C.F.R. § 25.114(c)(4).

2. Section 25.114(c)(6) – NGSO Orbital Characteristics¹¹

The Athena satellite will consist of one NGSO satellite operating in low earth orbit. The Technical Annex provides: the number of orbital planes and the number of space stations in each plane; the inclination of the orbital planes; the orbital period; the apogee; the perigee; the active service arc; and the local time of descending node.¹² The right ascension of the ascending node is dependent upon the specific launch date. It will change by 0.9856° per day in order to keep up with the Earth’s rotation around the sun in 365.25 days.¹³ Additional orbital parameters, such as the argument of perigee and the initial phase angle of the satellite, are not applicable to a one-satellite non-GSO system in a circular orbit.

3. Section 25.114(c)(7) - Frequency Bands and Coverage Areas¹⁴

Pointview’s proposed frequency bands and coverage areas are provided in the Technical Annex.

4. Section 25.114(c)(8) - Calculated Maximum Power Flux Density Levels¹⁵

The calculated maximum power flux density levels are provided in the Technical Annex.

5. Section 25.114(c)(10) – Estimated Operational Lifetime¹⁶

The estimated operational lifetime of the Athena satellite is approximately two years from the start or in-orbit operations.

6. Section 25.114(d)(1) – Overall Description of System Facilities and Operations¹⁷

¹¹ 47 C.F.R. § 25.114(c)(6).

¹² Technical Annex § A.3.

¹³ *Id.*

¹⁴ 47 C.F.R. § 25.114(c)(7).

¹⁵ 47 C.F.R. § 25.114(c)(10).

¹⁶ 47 C.F.R. § 25.114(d)(1).

The overall description of system facilities and operations, including an explanation of the manner in which the uplink frequency bands will be connected to the downlink frequency bands, is provided in the Technical Annex.

7. Section 25.114(d)(6) – Public Interest Rationale¹⁸

The public interest rationale for the application has been provided in Section II of this narrative.

8. Sections 5.64(b) and 25.114(d)(14) – Orbital Debris Mitigation¹⁹

The Orbital Debris Assessment Report (“ODAR”) is attached as Exhibit 2 to this narrative.²⁰ The design of the satellite will limit the amount of debris and the probability of the satellite becoming a source of debris. The satellite has been designed with no separable materials or solar panels. This means that all parts will remain attached during launch, operations, and de-orbiting. The lack of any pressurized vessels on the spacecraft means that there is no risk of accidental explosions during or after completion of mission operations.

The ODAR was prepared using NASA’s Debris Assessment Software for orbital debris control and risk mitigation. It shows that the Athena spacecraft is compliant with NASA’s standards for orbital debris mitigation and with the objective of limiting the risk for human casualties. Three items are expected to survive re-entry, resulting in a low 1 in 31,800 chance of human casualty, which is well within NASA requirement 4.7-1 in NASA-std-8719.14. In addition, the Athena spacecraft has been manufactured following a “design to demise” approach in choosing materials.

¹⁷ 47 C.F.R. § 25.114(d)(6).

¹⁸ 47 C.F.R. § 25.114(d)(6).

¹⁹ 47 C.F.R. §§ 5.64, 25.114(d)(14).

²⁰ The calculations for the ODAR assume an orbit of 550 km, the worst-case reentry scenario for the Athena satellite.

The spacecraft is compliant with de-orbit timeframe requirements. Under worst case conditions of 565 km circular orbit, including the 550 km maximum altitude, plus 15 km orbit insertion range from the launch vehicle provider, the spacecraft will de-orbit within 17 years from launch, or 15 years from the nominal end of mission. This is well within NASA Requirement 4.3-1 to de-orbit within 25 years of end of mission.²¹

9. Section 25.132 – Radiation Hazard Studies²²

Radiation hazard studies for the payload communications are provided in Exhibit 3. Pointview will take the appropriate steps recommended in those studies.

10. Section 25.207 – Cessation of Emissions²³

Ground TT&C operations will have the power to cease satellite transmissions. The Technical Annex explains how this will be accomplished.

C. TT&C Earth Stations

Authority for the TT&C earth stations is being sought separately by the operators of those stations,²⁴ who are contractors for Pointview. Nevertheless, the technical information for these earth stations is included in Form 442. The Technical Annex provides a description of the manner in which TT&C will be provided for the experiment.

IV. ITU COST RECOVERY

International registration is not always required for experimental satellite authorizations. Nevertheless, to the extent necessary, Pointview will provide all necessary information for filing

²¹ See NASA, Process for Limiting Orbital Debris, NSA-STS-8719.14A (with Change 1) § 4.3.2, Requirement 4.3-1 at 21 (approved May 25, 2012).

²² 47 C.F.R. § 25.132.

²³ 47 C.F.R. § 25.207.

²⁴ [See SES-MOD-20180418-xxxxx (Brewster TT&C station); SES-LIC-20180418-xxxxx (Mojave TT&C station); Naval Postgraduate School Application for Equipment Frequency Allocation, DD Form 1494 (filed July 7, 2015) (Albuquerque TT&C station).]

any Advance Publication Information with the ITU. Pointview accepts all international and national frequency coordination obligations for the Athena satellite. Pointview will provide the FCC and the State Department any information necessary for filing any required Space Object Registration with the United Nations Office for Outer Space Affairs.

Pointview is aware that, as a result of the actions taken at the 1998 Plenipotentiary Conference, as modified by the ITU Council in June 2001, processing fees are now charged by the ITU for satellite network filings. As a consequence, Commission applicants are responsible for any and all fees charged by the ITU. Pointview affirms it is aware of, and unconditionally accepts, this requirement and its responsibility to pay any ITU cost recovery fees for the ITU filings associated with this application. Invoices for such fees may be sent to the undersigned.

V. CONCLUSION

For the foregoing reasons, Pointview respectfully requests that the Commission promptly grant this application for launch and operating authority for the Athena satellite as in the public interest, convenience and necessity.

Respectfully submitted,

_____/s/_____
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