BARON SERVICES, INC.
FCC ID NX5XDD-1000C
Confirmation Number: **EA971837**

Correspondence Reference Number: **26020**

Baron submits the following response to the Staff's additional questions:

General Discussion

This radar emits a rotating narrow focused beam that covers a 1 degree arc, which is elevated +0.5 degrees above the horizon. During the siting process, the antenna is sited in a manner that both the main and first side lobe are well above ground level within distances where maximum permissible exposure (MPE) limits for controlled and uncontrolled access could be exceeded. In addition, the radar has a number of features to provide specific technical solutions to resolve potential RF hazard issues. Baron has updated the operations and maintenance manuals to discuss RF hazard issues and intends to make this MPE information available to purchasers. Baron will address MPE issues as part of the siting and installation process. Baron can recommend specific software or hardware solutions in addition to or as alternatives to traditional fencing/signage depending on the particulars of the site.

Additional MPE Calculations. Baron's original MPE calculations were based on a "worst case scenario" of continuous radiation in one direction with no-rotation. However, the normal operating mode is continuous 360 degree rotation. The radar can also be operated in a "sector sweep" mode (*i.e.*, where it would sweep a limited sector of interest, such as particular storm system). Based its experience this sector sweep mode is rarely used. Because the MPE calculations would vary depending on the size of the sector, Baron considers the "worst case" in determining MPE distances. The operations manual addresses the potential for increased MPE when in sector sweep mode.

Attached as Exhibit S11 are four revised charts showing On-Axis and First Side-lobe (off-axis) calculations during rotation (normal operations) and when not rotating (worst-case). A summary of this data is as follows:

Minimum Distance - Compliance with MPE Limits

Mode	On/Off Axis	Controlled Access	Uncontrolled Access
Rotating	Mainlobe	28.6 feet	64.1 feet
Fixed	Mainlobe	571.6 feet	1278 feet
Rotating	Sidelobe	1.6 feet	3.6 feet
Fixed	Sidelobe	32.1 feet	71.9 feet

The calculations for rotating (normal operations) are as follows: Since the antenna beam width is only 1 degree and a scan is 360 degrees, the duty cycle (or average exposure time) can be calculated as 1/360 or .002778. This duty cycle correction reduces average transmitter power from 1,000,000 milliwatts average RF power to 2,778 milliwatts average power in the point of interest. This changes the average transmitter power entry from 60 dBm to 34.43 dBm. Similar calculations apply for the antenna side lobes. In the first sidelobe the antenna gain is reduced from 44.7 dBi to 19.7 dBi, since all side lobes are a minimum of -25dB with respect to the main lobe gain (44.7dB – 25dB = 19.7dB), which now becomes the average side lobe power. The change or substitution of 19.7dB, in place of 44.7dB, allows the formula to calculate and plot the side lobe power directly. Because of the high-gain/low side lobe design of the antenna, the energy levels radiated below the first side lobe falls well below levels where MPE limits would be reached. See the manufacturer's antenna pattern test data and plots that are attached as Exhibit S15.

Elevation of Antenna and MPE. The antenna is typically mounted on a tower fifty-feet or more above ground level and is set at a +0.5 degree elevation subject to the adjustments to meet FCC MPE safety requirements described above. In most U.S. installations, the radar is located on a tower in a remote location away from multi-story buildings and higher than the surrounding landscape. This is the case because any on-axis obstructions (land/trees/buildings etc.) would create blind or impaired zones for the radar and are avoided wherever possible. This means that the main-lobe of the antenna radiates above the ground at a +0.5 degree rate from the height of the antenna and away from any on-axis obstructions. Because of the focused nature of the main beam (within 0.5 degrees of centerline), in a typical installation, the main lobe radiation pattern will remain at approximately the height of the tower well past the MPE distances for controlled or uncontrolled access (even if using the "worst case" non-rotating scenario). See Exhibit S12. The first side lobe radiates an additional 1 degree off centerline (*i.e*., at a $^{+}$/-1 degree angle) and thus would remain near the tower height until well beyond the 71.9 foot "worst case" uncontrolled limit. In addition, the antenna radome is typically mounted on a 24 foot diameter steel plate , creating a substantial cone below the radome shielded from RF emissions. See Exhibit S12. Hence, depending on the installation no fencing/signage other than on the tower and radome may be needed.

Hardware/Software Features: The radar has a number of built-in hardware and software features available to solve specific RF hazard issues depending on the site. For example the radar is programmed to cease radiation if rotation stops for a set-time period; hardware ("hard") stops and software stops can be used for sector blanking (*i.e*., creating a blank sector where the radar does not radiate). Similarly, hardware and software stops can be set to increase the elevation of the main beam of the antenna in any sector. In addition, the access door to the radome is equipped with an interlock that will automatically cut-off power to the antenna when the access door is opened.

Revised RF Radiation Safety Insert for Operations and Maintenance Manual. Exhibit S13 is a revised radar safety insert which address issues relating to RF safety in the operation, maintenance, and installation of the radar.

Response to Specific Questions

1. Will the RADAR be sold to and installed in other facilities beside Atlanta?

Yes, the Baron VDD and XDD radar systems are designed for commercial meteorological use by weather forecasters.

2. Please provide photographs or drawings of antenna and installation facility.

Exhibit S14 contains photographs of a typical antenna and installation. Baron does not manufacture the radar antenna. The antennas used for this radar are manufactured to Baron's specifications. Currently Baron is using a Seavey Model AS146-54 antenna manufactured by Seavey Engineering Associates, Inc., in Pembroke Massachusetts (www.seaveyantenna.com). Critical specifications for the antenna are listed below and diagrams and detailed antenna gain information is provided in the attached Electrical Test Report for the Antenna. See Exhibit S15:

Specification - Seavey Model AS146-54

3.7 M C-Band Weather Radar Antenna

Item	3.7 M Low Sidelobe C-Band Weather Radar Antenna
Antenna Type	Prime Focus, Circular Paraboloid, 16-Panel
Frequency	5.40 - 5.70 GHz
Polarization	Horizontal Linear
Gain	44.7 dBi nominal
Beamwidth, 3 dB	1.1 degree, nominal
Sidelobes, co-pol,	-25 dB +/- 0.5 dB
Power Handling	1MW peak, 1% duty cycle
VSWR	1.25, maximum
Reflector Diameter	151 inches nominal
RF Ports	(1) WR-187 choke flange (round style) at reflectors edge
Pressurization	7.5 psig desiccated air thru feeders
	Pressure leak tested thru waveguide & feed assembly @ 15psig
Mechanical Data	a) Alodine (or equal), primed and white paint
	b) Mounting holes, 4x) 1.062 dia on 36 inch square

3. [a] Is the transmission possible with rotation stopped? [b] If so and there is access to general public within 1278 ft please update operational instructions to prevent dwell on accessible areas such as control towers, buildings or hills. [c] Please consider putting in software or hardware blocks to prevent this situation.

(a) As discussed above, the radar can be programmed to cease radiation if the rotation is stopped for more than a certain period of time. Baron intends to program the radar to cease radiation if rotation stops for more than 5 seconds during normal operations. This cut-out time builds in a significant safety factor. For example, at a distance of 64.1 feet (the MPE for restricted access *(i.e.*, uncontrolled space during normal rotation) a person would need to stand in the main beam when fixed for about 40 seconds to receive radiation above the uncontrolled limits (i.e., the 5 second cut-off has a 8:1 safety margin). In the specific situation, such as high surrounding terrain, Baron would preset minimum elevation to avoid having the beam radiate at terrain/building within MPE distances.

For certain types of maintenance it may be necessary to radiate without rotating. Baron has updated its procedures, see Exhibit S13, to require the operator to rotate and elevate the radar away from any obstructions during such maintenance. Although it is possible an aircraft could fly through this beam in a fixed position, the time-period of exposure would be insufficient raise MPE issues.

(b) Baron performs a Radar Site Survey to evaluate sites proposed by the buyer for any installation. Both for operational efficiency and RF safety reasons, the on-axis beam will be set above the height of any obstructing buildings or hills. In addition to the default dwell cutoff, Baron would propose either the use of hardware/software cutouts described above to include fences and signage as necessary in the event there are areas within the on-axis beam within 1278 feet. The operational manual section on RF emissions safety has been updated to discuss these factors.

(c) See discussion in (a) and (b) regarding availability of hardware/software blocks.

4. MPE analysis investigates Occupational Exposure within a 200 m radius cone of the transmitter. How will untrained personnel be prevented from entering this region?

In a typical tower installation, Baron requires fencing and signs to prevent inadvertent access to the tower and radome. In addition, typically the facilities in the vicinity of the tower are fenced because of security, and other safety concerns of the customer (*e.g.*, high voltage lines). Due to the narrow radiation pattern of the antenna and shadowing of the tower platform, personnel are physically prevented from entering into the MPE zone while on the ground.

5. If the general public can access closer than 1278 feet such as in a taxiing aircraft or untrained maintenance workers please address uncontrolled exposure in a similar way as done for the 200 m "cone" for occupational.

As long as the antenna is rotating the uncontrolled hazard zone is only 64 ft. When the antenna is stopped for a period of 5 seconds or greater, the transmitter radiation is inhibited by a software timer in the signal processor. - As discussed above, in normal operations the cone of concern for MPE will not require any signage on the ground because of the height of the antenna and elevation limits preventing rotation below specified levels so that uncontrolled access is normally not possible level within relevant MPE distances. In the event it is necessary, the height of the antenna supporting structure can be increased to assure compliance with these distance limits for compliance with FCC RF safety requirements or, where this is not possible, fences can be installed to prevent uncontrolled access within the distances required for RF safety. For example, if installed at an airport, it may be necessary to raise the height of the tower or make other adjustments to elevation to protect taxiing aircraft. When rotation is stopped, the radar will cease radiating, except where manually overridden for maintenance, where separate procedures exist to ensure that the antenna is rotated and elevated away from areas that persons could access.

6. Please provide MPE analysis along with antenna data (plots or gain) for the regions below 0 degrees azimuth. Please address exposure of persons that are within 1200 ft of the RADAR.

The antenna is typically set at a +0.5 degree elevation. This means that the main-lobe of the antenna radiation does not radiate toward the ground from the height of the antenna. The side lobe does radiate down but would not strike the ground within MPE relevant distances. Attached as Exhibit S12 are charts depicting the main and side lobes showing the height of the beam over level ground at the MPE limits. A copy of this chart is included in the operations manual and will be used in the siting process. In addition, Antenna gain data is attached as Exhibit S15.

Exhibits

S11 Revised MPE Charts for Rotating, Non-Rotating, and Sector Scan.
S12 Pictorial Representation of MPE areas for Rotating, Non-Rotating and Sector Scan
S13 Revised RF Safety Portion of Operations and Maintenance Manual
S14 Photographs of typical antenna and installation
S15 Antenna Electrical Test Report

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