

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

In the Matter of _____)
 _____)
 Request by IDS GeoRadar _____)
 For Waiver of Section 90.103(b) _____) File No. _____
 of the Commission's Rules _____)

To: Chief, Wireless Telecommunications Bureau

REQUEST FOR WAIVER

IDS GeoRadar (“IDS”), pursuant to Sections 1.3 and 1.925 of the Federal Communications Commission’s (“FCC” or “Commission”) rules,¹ hereby requests a waiver of Section 90.103(b),² which specifies the frequencies available for radiolocation, in order to market its HYDRA system in the United States. HYDRA is a remote sensing monitoring system that uses radiolocation to monitor rock and soil surface deformations, allowing geotechnical engineers the ability to better detect potential collapses, landslides and rockfalls in mines and tunnels. Grant of this request is consistent with the intent of the rule, and will make available a device that can be used to reduce injuries and deaths related to underground mining, open pit mining, and tunnel construction.

BACKGROUND

IDS, based in Pisa, Italy, is a leading provider of interferometric technology solutions and ground penetrating radar. IDS was founded in 1980 and was recently acquired by Hexagon.

¹ 47 C.F.R. §§ 1.3, 1.925.

2 47 C.F.R. § 90.103(b).

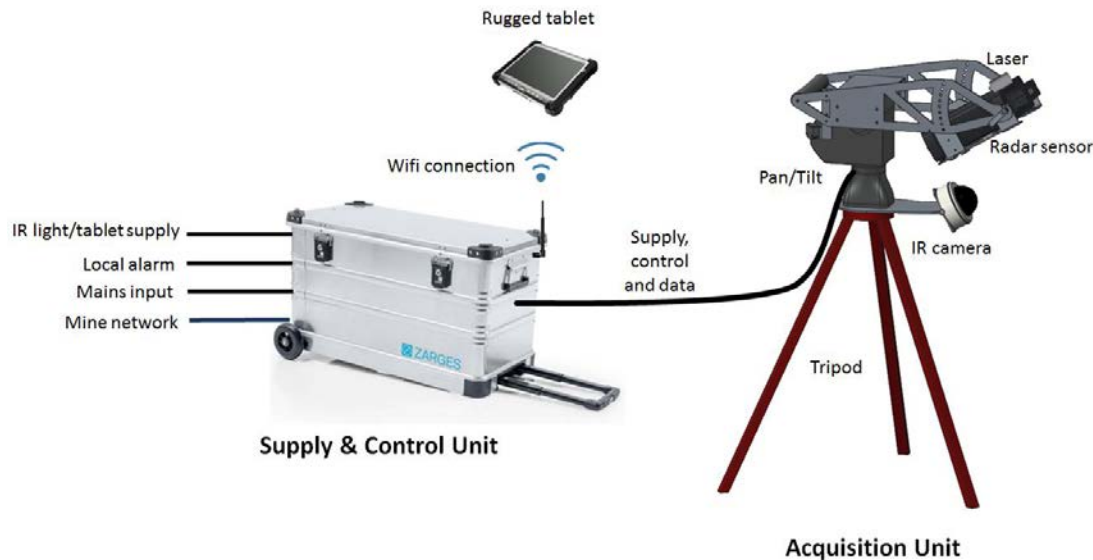
Since its inception, IDS has pioneered radar technologies through the creation of application-specific, innovative and cost efficient systems for a wide range of applications and users, including mining, utilities, civil engineering, geology, and environment management.

IDS' latest radar innovation is Hyper Definition Radar ("HYDRA"), a remote sensing radar system that operates over short ranges (200 or 800 meters) to monitor real time changes in surface deformations. Because HYDRA operates at 76-77 GHz, it is able to achieve readings with sub-millimeter accuracy and very high spatial resolution, a substantial improvement over current technologies. The system uses rotating Synthetic Aperture Radar and can perform an acquisition every 30 seconds, which is then formatted into a displacement "heat-map" of the monitored scenario. This information provides early warnings of deformations having the magnitude and rate of change indicative of hazardous instabilities of the rock and soil where work is being performed.

The one part of the HYDRA system that emits radio frequency is the radar, and it does so only over short ranges. The low-power version of the HYDRA system is used for monitoring at close ranges in underground mines and tunnels, of up to 200 meters, while the high-power version is used for monitoring open pit mines, with a range of up to 800 meters. The radar emits a Linear Frequency Modulated Continuous Wave signal sweeping a bandwidth of 1 GHz, centered at 76.5 GHz, at a rate of 1 millisecond. It operates with an EIRP of 28 dBm for short-range applications and 45 dBm for long-range applications.³

³ Additional technical specifications are provided in Appendix A.

A typical HYDRA configuration is shown below:



IDS designed HYDRA in response to requests from its mining customers seeking improved geotechnical monitoring instruments. IDS presently markets a monitoring system (“IBIS”) that operates at 17.2 GHz with a bandwidth of 200 MHz. The HYDRA system, operating at a much higher mmWave frequency range, is able to provide displacement measurements with an accuracy better than 0.1 mm and a spatial resolution of 15 cm, a great improvement over the current technology, which provides an accuracy level better than 1 mm and a spatial resolution of 75 cm.

The other benefit of operating at a higher mmWave frequency is that smaller antennas are required, allowing for the design of much more compact equipment that can be moved more easily from one section of a mine or tunnel to another section as mining or construction progresses.⁴ This portability feature will allow geotechnical engineers to place the system at

⁴ The 17 GHz system must be placed on a trailer to be moved, while the 76 GHz design can be placed in the trunk of a vehicle.

particular areas of concern, as well as close to workers who may be at risk from falling rocks, a significant cause of injury.

IDS proposes to use HYDRA in three specific ways:

- Underground mine monitoring, specifically to conduct deformation measurements to provide early warning of surface deformations that serve as precursors of an impending collapse. The accuracy of HYDRA's displacement measurements and the high spatial resolution enables it to identify the deformation of small rocks more quickly than any other technologies on the market, providing better early warnings to allow for the evacuation of people and machinery located in suspect areas.
- Tunnel construction, used for deformation monitoring in order to assess the stability of a work area or to perform convergence measurements. Tunnel construction requires the frequent movement of engineers and other personnel as the tunnel is being constructed, and HYDRA is more suited for monitoring these projects than other monitoring instruments due to its mobility.
- Open pit mining⁵, to monitor slopes for superficial deformations. The displacement information is georeferenced in a 3D model of the monitored scenario and is used to trigger early-warning alerts of precursors to rockfall and slope failure. The high resolution of HYDRA allows it to identify small rock (20 cm) deformations that are precursors to rockfalls, one of the major cause of fatalities in the open pit mine working area.

DISCUSSION

IDS seeks a waiver of Section 90.103(b) to allow for its proposed limited-purpose radiolocation operation in the 76-77 GHz band. Waiver is in the public interest because it will allow for the marketing of a device that will improve safety monitoring in mines and tunnel construction sites, while not impeding the use of the spectrum by other technologies.

⁵ Open pit mining is a form of surface mining performed when the mining deposits are located at or near the surface of the ground and require the repeated movement and relocation of immense quantities of earth, containing waste rock and minerals, from the mining site. *See* Casey Dawson, *Why Honduras Should Not Jump on the Ban Wagon: A Study of Open Pit Mining Bans and Their Pitfalls*, 37 SUFFOLK TRANSNAT'L L. REV. 67, 70 (2014).

A. Request for Waiver.

IDS seeks waiver of the Commission's rules to market a fixed radar device in the 76-77 GHz band. The U.S. Table of Allocations provides for co-primary allocations in this band for radio astronomy and radiolocation, with amateur and space research allowed on a secondary basis.⁶ Section 90.103(b), however, which sets out frequencies available for radiolocation, does not make 76-77 GHz available for the Radiolocation Service.⁷

The Commission recently considered whether to allow the operation of fixed radar in the 76-81 GHz band, outside of airports.⁸ Ultimately, the Commission declined to permit additional types of fixed radar in the band to “avoid any possible hindrance to the successful migration of vehicular radars to the 76-81 GHz band.”⁹ However, the Commission also acknowledged the possibility that other radar systems could operate in the band without causing harmful interference to vehicular radars, and stated that it would be “open to the possibility that specific, limited fixed uses of 76-81 GHz radars outside of airport locations may be possible,” so long as the Commission could “be convinced that such use would not cause harmful interference to vehicular radar operations in the band.”¹⁰

HYDRA is one instance of a specific and limited use of fixed radar outside of airport operations that should be allowed, as it will not pose a risk of harmful interference to vehicular radar operations. The use of HYDRA for monitoring underground mines and tunnels will not interfere with vehicular radar operations because the emitted radiofrequency signals will be

⁶ 47 C.F.R. § 2.106.

⁷ 47 C.F.R. § 90.103(b).

⁸ *In the Matter of Amendment of Parts 1, 2, 15, 90 and 95 of the Commission's Rules to Permit Radar Services in the 76-81 GHz Band*, Report and Order, 2017 WL 3033460, FCC 17-94 (2017) (“76-81 GHz Order”).

⁹ 76-81 GHz Order at ¶.

¹⁰ *Id.*

confined within the mines and tunnels themselves.¹¹ Moreover, all of these sites are closed to the public, whether because they are privately owned or are hazardous work zones.¹² This provides for geographic distance between the mining operations and public roadways which, at this frequency range, is sufficient to mitigate against concerns about harmful interference to vehicular radar.

Under Part 90, all HYDRA customers will need to obtain site specific licenses for operation of the system.¹³ The Commission's licensing procedures will allow staff to conduct a case-by-case review of the proposed use and location by each potential licensee to determine whether there would be any risk to vehicular radars at any particular site.

For many of the same reasons, HYDRA does not pose a threat of interference to the Amateur and Amateur-Satellite radio services ("Amateur Services"). Amateur radio operators will not be present in any of the mines or tunnel construction sites where HYDRA will be operating. At this frequency range, the free space path loss at 1 km is approximately 130 dB, without accounting for mitigation factors such as free space path loss and shielding.¹⁴ Additionally, the Amateur Services operate in the 76-81 GHz band at a higher power of 316 W.¹⁵

Finally, HYDRA will not pose a threat of harmful interference to the Radio Astronomy Service ("RAS"). There are two active RAS observatories in this frequency range, Kitts Peak and

¹¹ Engineers operating radar sensors in open pit mines set up the acquisition unit to maximize reflection from the ground and obtain maximum slope coverage, which minimizes the radiofrequency spill outside the top of the mine.

¹² Mine owners hold the exclusive right of possession and enjoyment of the surface of their mines and their depths. *See* 30 U.S.C. § 26 (2017). In addition, signs and markers must be posted around the perimeters of mines while all mining activities take place. *See* 30 C.F.R. § 817.11 (2017).

¹³ 47 C.F.R. Subparts F and G.

¹⁴ 76-81 GHz Order at n.62.

¹⁵ 47 C.F.R. § 97.313(m).

Green Bank.¹⁶ According to Google Earth, the closest open pit mine is 41 km from an RAS site (Kitts Peak).¹⁷ The FCC can ensure that any proposed use of HYDRA will not impact radio astronomy observations by requiring as a condition of a license that any customer located within line of sight of an observatory agree to take all practical steps to protect the observatory from harmful interference, whether by maintaining transmissions (through the setting of the angle of the acquisition unit) within the mine or by other means.

IDS would also agree to limit the number of units sold in the United States to 150 over the course of five years. Limiting the ubiquity of HYDRA will allow for the FCC to properly oversee its use as it relates to other users.

B. Public Interest.

When Congress constituted the Commission in 1934, it did so in part “for the purpose of promoting safety of life and property through the use of wire and radio communications.”¹⁸ HYDRA directly serves this purpose by providing a greatly improved means for geotechnical engineers to monitor work sites to better prevent injuries and deaths related to mining and tunnel construction.

According to the U.S. Department of Labor’s Mine Safety and Health Administration, there already have been 14 fatalities related to coal mining in the United States in this calendar year alone, an increase in such fatalities from 2016.¹⁹ In 2013, two massive landslides carried approximately 145 million tons of waste rock into an open pit mine located at Bingham

¹⁶ 76-81 GHz Order at n.77.

¹⁷ There does not appear to be any open pit mines in the vicinity of Green Bank.

¹⁸ 47 U.S.C. § 151.

¹⁹ Preliminary Accident Reports, Fatality Alerts and Fatal Investigation Reports – Coal Mines, *available at* <https://arlweb.msha.gov/fatals/coal/2017/>.

Canyon.²⁰ Fortunately, the mining engineers noticed instability in the area of the landslides with the use of geotechnical monitors far enough in advance to evacuate all personnel from the mine.

No lives were lost in Bingham Canyon as a result of the very noticeable surface deformations (as large as two inches per day) indicative of landslides. However, extremely small increments of movement can predict a collapse, and also the potential for smaller rocks to fall on workers. HYDRA technology can detect these smaller increments of movement with measurement accuracy far greater than the currently available technology. Bingham Canyon demonstrated that geotechnical monitors can, and do, save lives, but HYDRA is needed for when the surface deformations are less obvious than in Bingham Canyon.

C. Legal Basis.

The Commission assesses waiver requests according to the standards set out in *WAIT Radio v. FCC*.²¹ In that case, as here, the applicant sought authority in contravention of the rules while explaining how it would nonetheless accomplish the purpose of the rules.²² The court required the Commission to consider the request:

[A] general rule, deemed valid because its overall objectives are in the public interest, may not be in the “public interest” if extended to an applicant who proposes a new service that will not undermine the policy, served by the rule, that has been adjudged in the public interest.²³

²⁰ Ken Krahulec, *Bingham Canyon’s Manefay Landslides and the Future of the Mine*, UTAH GEOLOGICAL SURVEY (Sept. 3, 2016), available at <https://geology.utah.gov/map-pub/survey-notes/ingham-canyon-manefay-landslides/>.

²¹ 418 F.2d 1153 (D.C. Cir. 1969). See also *2002 Biennial Regulatory Review*, 18 FCC Rcd 13620 at para. 85 n.130 (2003) (citing *WAIT Radio* as “setting out criteria for waivers of Commission rules.”)

²² *WAIT Radio* operated an AM broadcast station, limited to daylight hours to protect “white areas” that had no local service and that relied on nighttime “skywave” propagation from another station. *WAIT Radio* proposed to transmit at night using a directional antenna that would limit its signal in the white areas. *WAIT Radio v. FCC*, 418 F.2d at 1154-55.

²³ *WAIT Radio v. FCC*, 418 F.2d at 1157.

The meaning is clear: Waiver is appropriate where the applicant furthers the public interest inherent in the underlying rules.

The waiver requested here meets the *WAIT Radio* standard, as it proposes a system that will advance the policy served by the rules. The Part 90 rules are designed to allow for important radio operations by industry while limiting a wireless systems' interference potential.²⁴ The Commission has previously found that public safety benefits weigh in favor of granting a waiver of Part 90 rules.²⁵ A waiver in this case would further the purpose of allow industry use of the radio services while limiting interference because the radiofrequency emitted by HYDRA is confined underground or emitted at a sufficient distance from other authorized users. HYDRA will provide a useful and life-saving device to mining, engineering, and construction companies with minimal likelihood of added risk of harmful interference to other users. The requested waiver fits easily into the boundaries drawn by *WAIT Radio*.

The Court of Appeals emphasized the importance of waiver procedures as part of the regulatory scheme:

The agency's discretion to proceed in difficult areas through general rules is intimately linked to the existence of a safety valve procedure for consideration of an application for exemption based on special circumstances.²⁶

Thus, it said, "allegations such as those made by petitioners, stated with clarity and accompanied by supporting data ... must be given a 'hard look.'"²⁷ Here, too, the request fully qualifies. The

²⁴ See Biennial Regulatory Review -- Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services, Report and Order and Notice of Proposed Rulemaking, WT Docket No. 03-264, 20 FCC Rcd 13900, 13923 n.168 (2005).

²⁵ In the Matter of L-3 Cyterra, 24 F.C.C. Rcd. 14147, 14150 (2009) ("We also conclude, given the public safety benefits of the EMMDAR, that a waiver grant is in the public interest.").

²⁶ *WAIT Radio v. FCC*, 418 F.2d at 1157.

“safety valve” of the waiver procedure is needed to make available a device not otherwise available. The requested waiver is in the public interest, not only in terms of benefits to the public, but also in the absence of any downside. The request is entitled not only to the “hard look” mandated in *WAIT Radio*, but to a grant of the waiver.²⁸

CONCLUSION

For the foregoing reasons, IDS respectfully requests that the Wireless Telecommunications Bureau grant waiver of the rules so that IDS may market its HYDRA system.

Respectfully submitted,

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²⁷ *Id.* (citation footnote omitted).

²⁸ *See e.g. Multispectral Solutions, Inc.* (granting a waiver of the peak power limit provision of Section 15.250(d)(3) because it will serve the public interest in that it will help improve safety of life for personnel working in high risk industrial facilities).

Appendix A

Parameter	Value
Modulation	LFMCW
Center Frequency	76.5 GHz
Bandwidth	1 GHz
Sweep Duration	1 ms
Power at the antenna connector	11 dBm short range version 24 dBm long range version
EIRP	28 dBm short range version 45 dBm long range version
Antenna type	Horn