

2023 MajGen Harold W. Chase Prize Essay Contest: Honorable Mention

RF Emissions Like Munitions, Radios Like Rifles

The much-needed *Warfighting* for the electromagnetic spectrum and what it might look like

by GySgt Steven M. Krugman

The Marine Corps has its own culture. Of course, other departments have their own but there is something that is quintessentially *successful* about ours in regard to our mission. It can be argued that our most important publications, doctrines, and policies are ones that tug on the heartstrings of our warrior spirit. *Warfighting*, to name one, is effortlessly baked into our ethos. From the lower enlisted to the general staff, these documents are known superficially, at the very least. Their strict adherence is almost guaranteed. Weapon safety rules, another “ism” lasered etched into every rifleman’s brain, are followed to the letter. The authority of these Marine scriptures is not questioned, and more importantly, the underlying message is understood. It is necessary to be familiar with warfighting. Following weapons safety rules is quite literally a matter of life and death. Why do we not have this with radio?

There is a need for doctrine expounding how we do business in the electromagnetic spectrum (EMS). The highest stakeholders have identified how crucial superiority in the EMS is: “Friendly forces must be able to disguise actions and intentions, as well as deceive the enemy, through the use of decoys, signature management, and signature reduction.”¹ However, for that doctrine

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to be another *Warfighting*, it must be holistic in its approach, be centered around concepts, pull from our culture, and answer questions posed by emerging threats. We must codify our own “weapon safety rules” for radio frequency (RF) propagation that are so unanimously agreed upon that their compliance is not only predicted but guaranteed. This doctrine must speak to survivability and availability in the spectrum as it relates to expeditionary advanced base operations.

Although calls for its modernization have been hotly debated, *Warfighting* has undeniably been a successful, thoroughly read publication in our past and present, and it will continue to be in the future. What gets *Warfighting* on a shelf of everyone’s professional library is its wide aperture. The doctrine’s applicability spans across the entire operating force. This perspective doctrine for RF propagation in a contested EMS (let us call it *emissions*) must be just as holistic—and it deserves to be; every

single facet of communication utilized in the combat environment generates some sort of RF. *Warfighting* explains how and why we wage war. *Emissions’* task is no less daunting—explain how to communicate effectively, efficiently, and better than our adversary in a contested EMS.

When considering the structure of *emissions*, we could use the adage, “The methods are many, the concepts are few,” with the idea that concepts and principles lay the foundation for how business is conducted (the “how” being the method). *Warfighting* is aligned with this; there are no methods discussed, only concepts, principles, and ideals related to warfighting. The methods can then be developed by any command at any level that is curtailed to their own specific mission. This can be as far-reaching as the National Defense Strategy or as specific as a battalion standard operating procedure, both methods in their own rights. Many methods are already written that are related to

RF propagation, like signature management (SIGMAN) or emissions control. However, concepts and principles of transmitter employment are loosely defined with SIGMAN and emissions control and instead focus on equipment specifics and defined capabilities. This pigeonholes our operation in the entire electromagnetic spectrum into specific lateral limits defined by the platform. *MCDP 1* does not talk about particular rifles, artillery, or fixed-wing aircraft when explaining how war is waged. (In fact, the world *rifle* is only mentioned twice in the entire text!) Neither should *emissions* talk about specific radios, radar, or electronic warfare equipment or capabilities. To be fair, *Warfighting* codifies and articulates a phenomenon that is vast in its material and its breadth is wide. Communicating is a facet of war, and it can be argued that those who communicate well tend to win wars well—tactically or interpersonally.² Firepower is subservient to win-

ning battles, as is communicating with RF. We have strict rules concerning the operation of these weapons systems that give us outcome-deciding firepower; it is time to do the same with transmitters.

When we discuss something as prolific as the service rifle, we understand its significance. Its characteristics memorized by many a professional, it is total influence in the deciding outcome of conflict is legendary. “The deadliest weapon in the world is a Marine and his Rifle,” by John Pershing is frequently quoted. Radios—one of the main drivers in the rapid expansion of our military over the last century—deserve that seriousness. The strict following to the conduct, handling, and operation of the radio should be fashioned after that of the service rifle.

As we have our weapon safety rules, why not pen *transmitter safety rules*?

- Treat every weapon as if it were loaded.

“If we lose the war in the electromagnetic spectrum, we lose the war in the air, and we lose it quickly.”

**—GEN Mark Kelly,
USAF Air Combat
Command 2021**

- *Every transmitter can be keyed at any time.*
- *Never point your weapon at anything you do not intend to shoot.*
- *Never propagate where you are not communicating.*
- *Keep your finger straight and off the trigger until you are ready to fire.*
- *Do not propagate when you are not communicating.*



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- Keep your weapon on safe until you intend to fire.
- *Only transmit when absolutely necessary.*
- Know your target and what lies beyond.

These all can apply to the operation of a transmitter. Consider a transmitter's RF propagation beyond its receiver station. Have we ever thought about that? It would not be too much to treat RF energy like ordinance, with clearly defined limits to where you can and cannot employ it. Radio waves are the munitions of the EMS, and we ought to handle them as such with deliberate care.

In the last quarter of a century, we have had freedom of movement within the electromagnetic spectrum, emitting RF in every possible direction for the sake of availability. No longer do we have this luxury. As we move into contested environments, we need to consider survivability in relation to availability.³ Much like the patriotic debate over freedom versus security, we must find a balance between our communications (data links, single channel radio, SATCOM) being readily available while also being survivable. No sound communications plan has one attribute solely without the other.

Emerging threats and unilateral movement by near-peer threats have recognized the need for dominance in the EMS while we fought terrorism in the Middle East with little to no electronic warfare capabilities. This initiative is not only true for the PLA and Russian military but Iran's IRGC as well.⁴ Extreme emphasis has been put on the electromagnetic spectrum by our adversaries. We need to match this enthusiasm, and by some accounts, we have at the joint level, with the DOD acknowledging this very real threat as well as the promulgation of *JP 3-85, Joint Electromagnetic Spectrum Operations*, in May of 2020.

For what it is worth, the Army along with the Marine Corps has begun to spearhead open standards for survivability in the EMS with a modular open suite of standards.⁵ Again, this approach is platform-centric. SIGMAN will inherently gravitate toward spe-

cific capabilities of communications equipment. This shared knowledge of tangibles is undeniably important. Yet, what has yet to be defined is the *intangible* element of operating in the EMS; the culture with baked-in concepts of survivability has yet to be realized. The Marine Corps has rehashed its identity and purpose in today's fight with expeditionary advanced base operations, citing "low signature" in its very definition and thus (re)inserting the idea of resource management and foraging into our mission set. This is

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only a first step toward developing a culture of covert operation in the EMS, yet a vital, important step, nonetheless. If doctrine could be so thoughtfully and deliberately written as *Warfighting* was for the Marine Corps, a culture of beneficial EMS "isms" could be born. A carefully crafted MCDP can drive policy tailored toward the Marine Corps' unique mission. This is in contrast to an overreaching joint-level publication with intentional ambiguity to apply to all branches and their respective mission sets.

Emissions will by no means be a one-stop-shop for all matters of operating within the EMS. Yet, it might lay the groundwork for how to survive in an EMS-contested environment while still providing available, realtime communications in the form of data links, single-channel radio, and sensors. It could have clearly defined concepts on RF propagation or perhaps principles of "least necessary" for radiation patterns. This doctrine would theoretically contain no platform specifics and be wildly available for dissemination. The sea of SIGMAN is fathomless, teeming with tactics, techniques and procedures, platforms, emerging technologies, and an

infinite amount of extracurriculars. A publication like *Emissions* would simply be a boat to navigate the waters.

Notes

1. Gen David H. Berger, *38th Commandant's planning Guidance*, (Washington, DC: July 2019).
2. Karen Grimaldi, "The Impact of Military Communication and Leadership on the Outcome of Defensive Battles during World War II," *DASH Home*, January 1, 1970, <https://dash.harvard.edu/handle/1/37365049>.
3. Bryan Clark et al., "Virtual Event: The US Military and Electromagnetic Spectrum Superiority," *Hudson*, April 12, 2023, <https://www.hudson.org/events/1956-virtual-event-the-us-military-and-electromagnetic-spectrum-superiority52021>.
4. Tzvi Joffe, "Meet the IRGC Official Threatening the IDF's Electronic Systems," *MSN*, September 13, 2022, <https://www.msn.com/en-us/news/world/meet-the-irgc-official-threatening-the-idf-s-electronic-systems/ar-AA11MJnl>.
5. Nathan Strout, "Sosa Consortium Unveils First Standards for Military Sensor Technologies," *Defense News*, *Defense News*, August 18, 2022, <https://www.defensenews.com/digital-show-dailies/ausa/2021/10/11/sosa-consortium-unveils-first-standards-for-military-sensor-technologies>.

>Author's Note: This article is solely conceptual and does not speak to any specific platform, capabilities; current standard operating procedures; or tactics, techniques, and procedures. Also, EMS is literally a wide spectrum of many, many different frequency bands. For the sake of brevity when discussing EMS, I am only referencing frequency bands used for communication between military units.



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