

The Six Military Uses of the EM Spectrum and Phased Arrays

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The Six Military Uses of the EM Spectrum and Phased Arrays

-Bothered by statements about controlling or dominating the spectrum

- Electromagnetic (EM) Spectrum here means open air or space

- can an EM wave be shot down like an airplane

-existing description of the EM battle space as Radars, Electronic Warfare, Optics, Stealth, Communication Links, etc seems inadequate.

-Proposing a different functional description of the EM Battle Space and the impact of low cost phased arrays and digital signal processing.

-Intent is to invoke useful debate and insight.

The Six Military Uses of the EM Spectrum and Phased Arrays

• Six Functions

–Sense

–Deny Sense

–Command and Report

–Deny Command and Report

–Destroy, Directed Energy

–Socialize, Entertain, and Persuade (SEP)

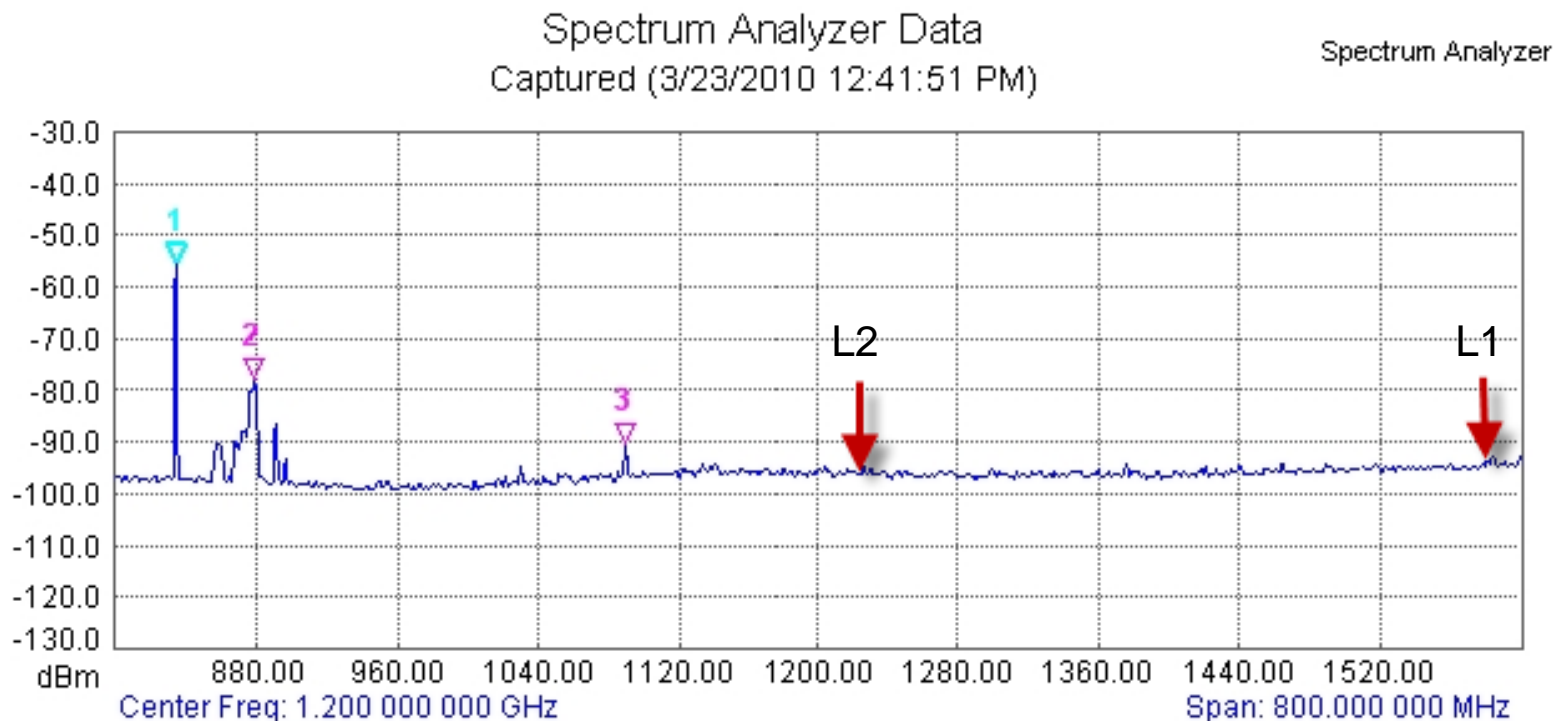
• **First Four** are mostly digital and time critical

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•Digital

- A bit is determined by energy/bit/noise not signal/noise
- With digital signal processing energy representing a bit can be spread in frequency and/or time then integrated on receive
- So lower digit rates are harder to find or deny

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The Six Military Uses of the EM Spectrum and Phased Arrays

- Phased Arrays greatly effect the four functions
 - Lowering cost
 - Scalable (active)
 - N^2 effect on EIRP (active)
 - Lower net power for same EIRP
 - Fast beam steering
 - Low sidelobe possible (hard to find/attack)
 - Null steering possible (really hard to find/attack)
 - Digital beam forming possible

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Sense (many bits)

-Radar	-Electronic Support (ES) (Part of Electronic Warfare (EW))	-Optics/IR
-Electronic Protection (EP) (part of EW)		

Phase Array Attributes



- scalable
- N² effect
- digital beams

- low sidelobes
- null steering

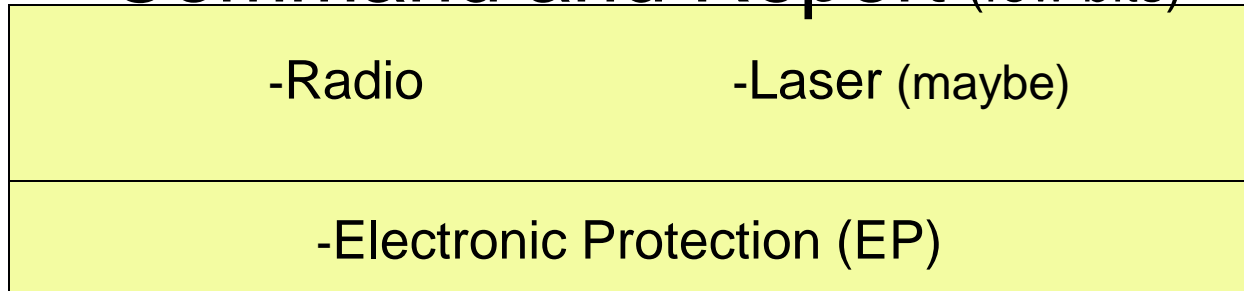
Deny Sense (many bits, easier to disrupt)

-Overwhelm electronic attack (EA) -EA/Jam -Laser -DRFM	-Deceive -DRFM -EA -Chaff/Flare	-Hide -LPI Radar -LPI Comms -Stealth -Camouflage
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- scalable
- N² effect
- low sidelobes
- null steering

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Command and Report (few bits)



Phase Array Attributes

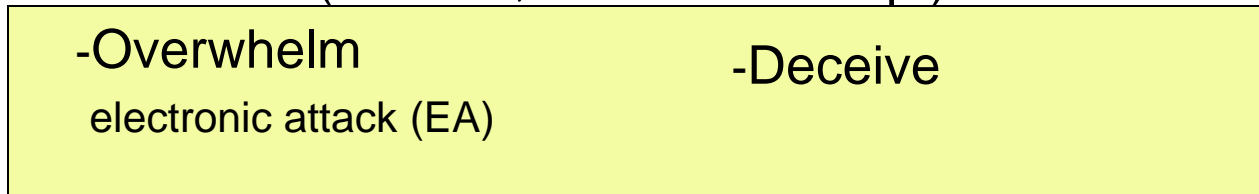


-scalable
-N² effect

-low sidelobes
-null steering

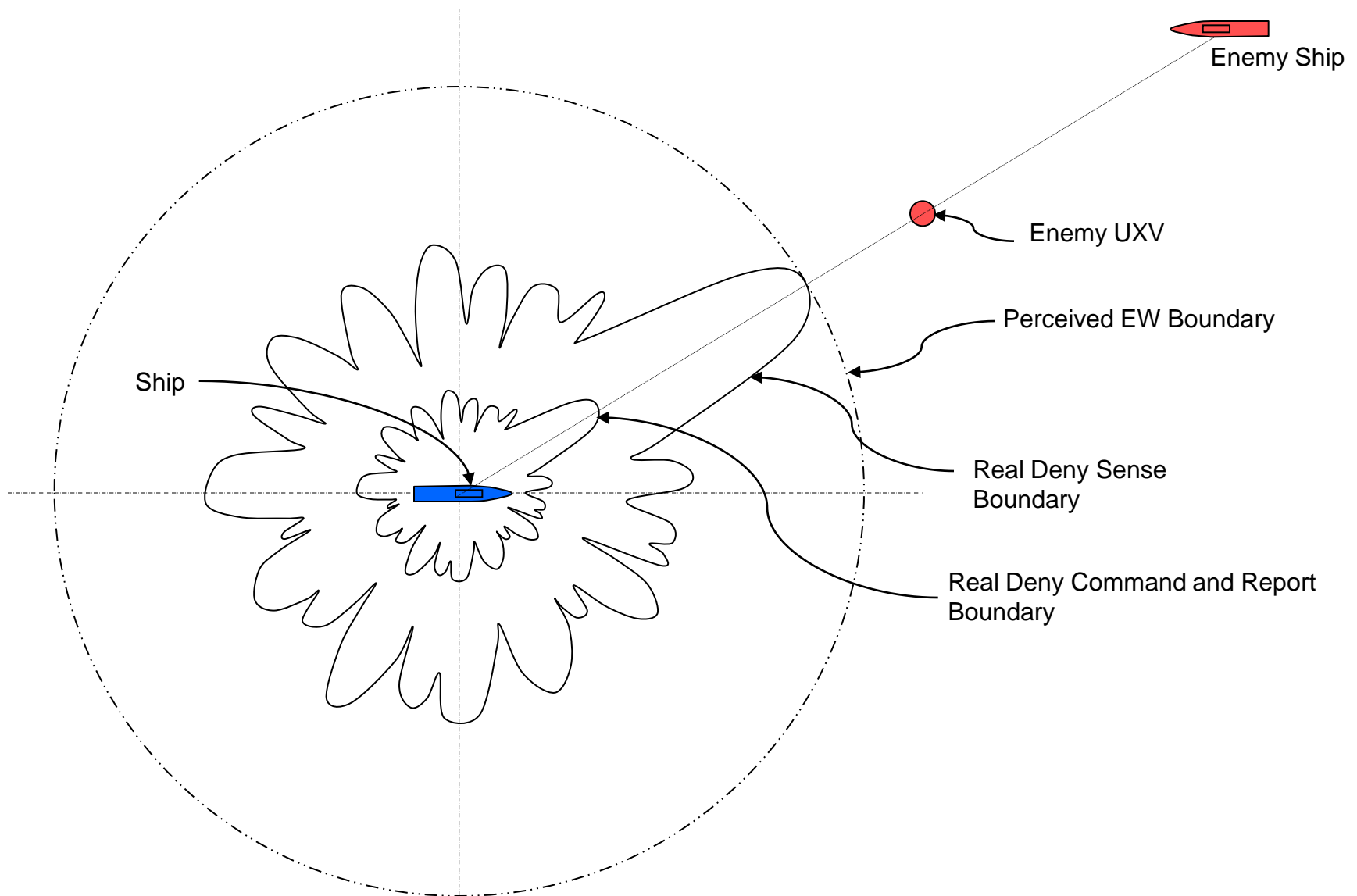
Deny Command and Report

(few bits, harder to disrupt)



-scalable
-N² effect

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•Conclusion

- Phased Arrays and digital signal processing technologies have a profound effect on the military uses of the EM spectrum.
- The effective distances for military uses depends on the military use and spatial arrangement of the friendly and enemy forces
- The statement to “control or dominate the EM spectrum” provides a false sense of control.