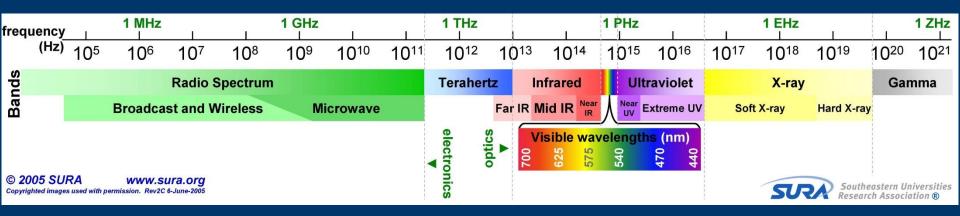
An Approach to Electromagnetic Spectrum Evaluation and Control for Situational Awareness

4<sup>th</sup> Biennial Conference

Presented by K Olivier Co-Authored by C Cloete Date 10 October 2012



### **Electromagnetic Spectrum (EMS) Overview**





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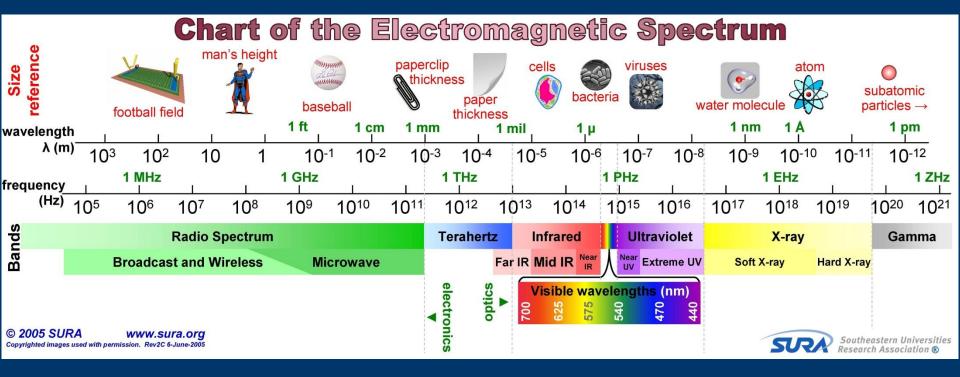
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## **Electromagnetic Spectrum (EMS) Overview**

wave	-	See .	I	1	1	1 ft	1 cm	1 m	Im	1	mil	1 µ		1	1 nm	<b>1 A</b>	1	1 pi	m
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frequ		1	1 MHz	I	Т	1 GHz	I		1 TH	z			1 PHz	ſ		1 EHz	1		1 ZHz
	(Hz)	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>7</sup>	10 <sup>8</sup>	10 <sup>9</sup>	<b>10</b> <sup>10</sup>	1011	10 <sup>1</sup>	2 1	10 <sup>13</sup>	1014	10 <sup>15</sup>	<b>10</b> <sup>16</sup>	10 <sup>17</sup>	10 <sup>18</sup>	10 <sup>19</sup>	10 <sup>20</sup>	10 <sup>21</sup>
Bands				Radio Sp	pectrum				Teral	nertz	Int	frared	UI	traviolet		X-ray		Gar	nma
Baı		Broadcast and Wireless Microwave								Fa	ar IR <mark>M</mark>	id IR Near	Near UV	Extreme UV	Soft X	(-ray	Hard X-ray		
									elec	ics		sible wav	elengt	<mark>hs (</mark> nm)				1	
										optics	200	625 575	540	470 440					
	© 2005 SURA www.sura.org Copyrighted images used with permission. Rev2C 6-June-2005														-	SUR		astern Un h Associa	niversities ation ®



## **Electromagnetic Spectrum (EMS) Overview**





## **Electromagnetic Spectrum (EMS) – RF Band Only**

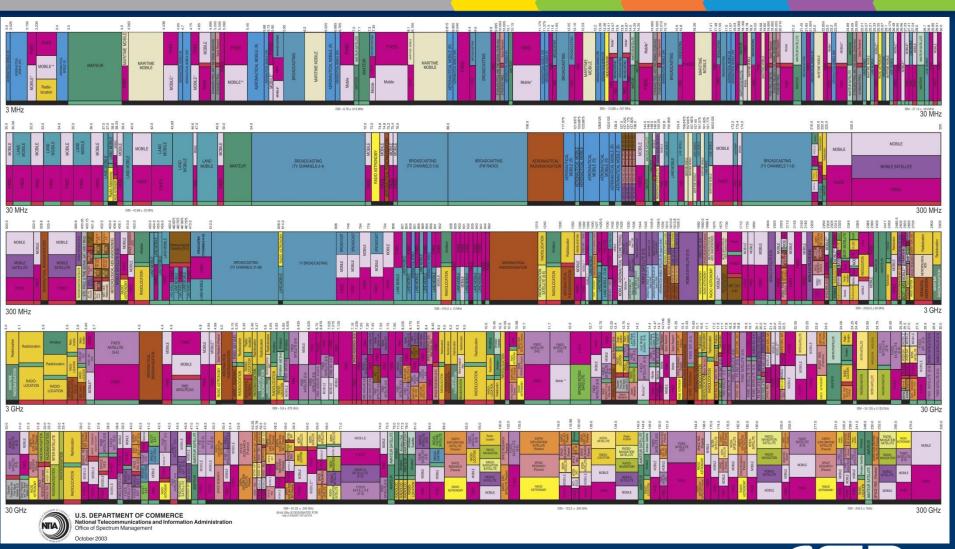


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## **RF Spectrum Allocation Chart**



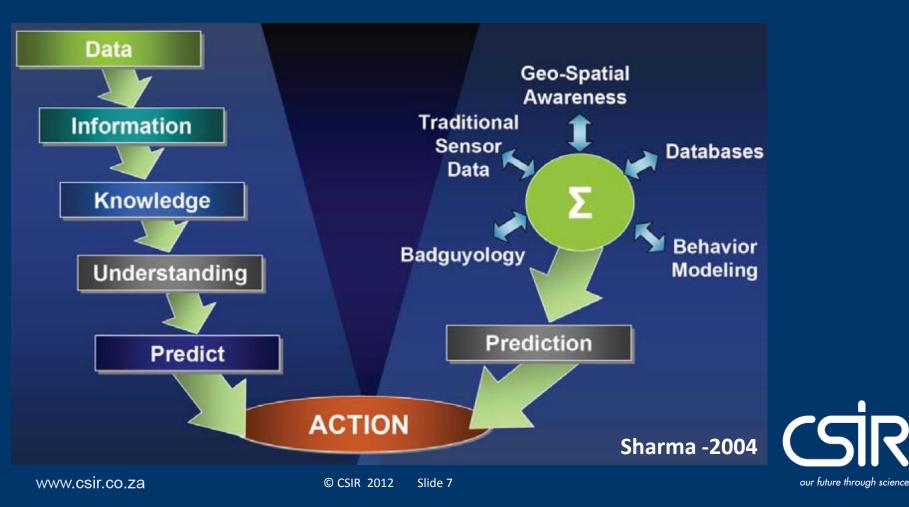


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### **Situational Awareness**

"The perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future" - Endsley



## **Electronic Warfare (EW) Concept**

### **Electronic Warfare (EW)**

Any action that allow Control of the Electromagnetic Spectrum

### **EW Support (ES)**

- search for
- > intercept
- > identify
- locate sources of intentional and un-intentional radiated electromagnetic energy



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## **Electronic Warfare (EW) Concept**



Any action that allow **Control of the Electromagnetic** Spectrum

### **Electronic Attack (EA)**

Attack:

- personnel
- facilities >
- equipment

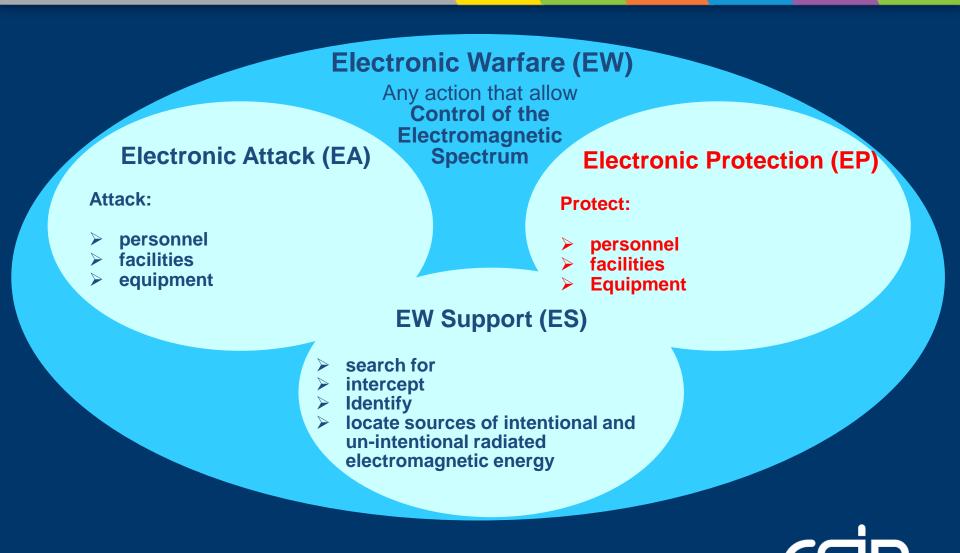
### EW Support (ES)

- search for
- intercept  $\succ$
- Identify
- locate sources of intentional and un-intentional radiated electromagnetic energy



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## **Electronic Warfare (EW) Concept**



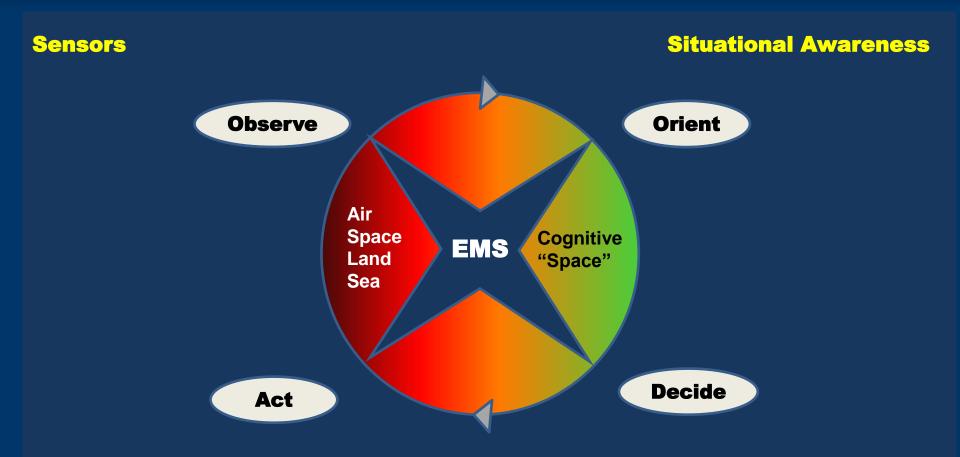
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## "An Approach to Electromagnetic Spectrum Evaluation and Control for Situational Awareness"







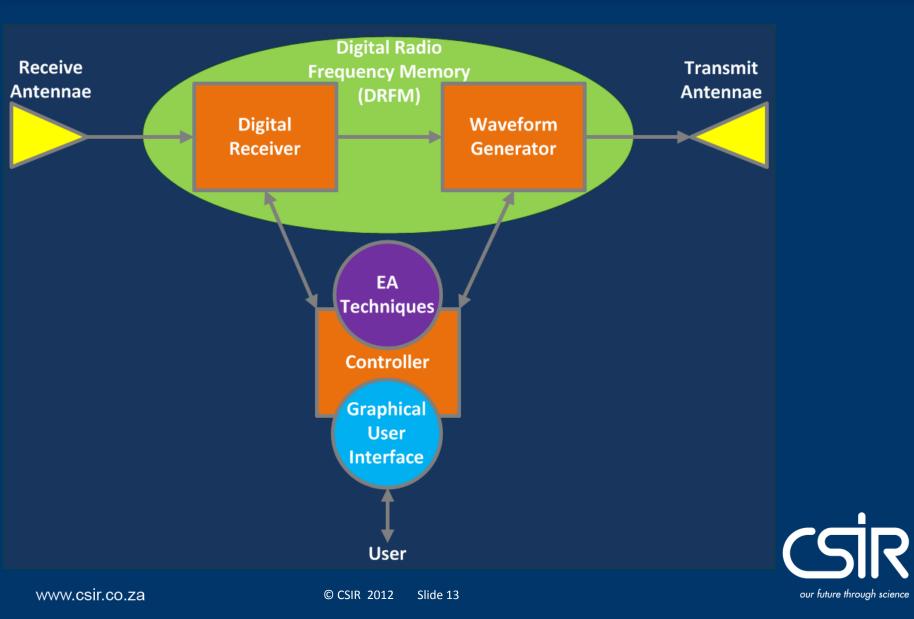
#### OODA Loop – John Boyd



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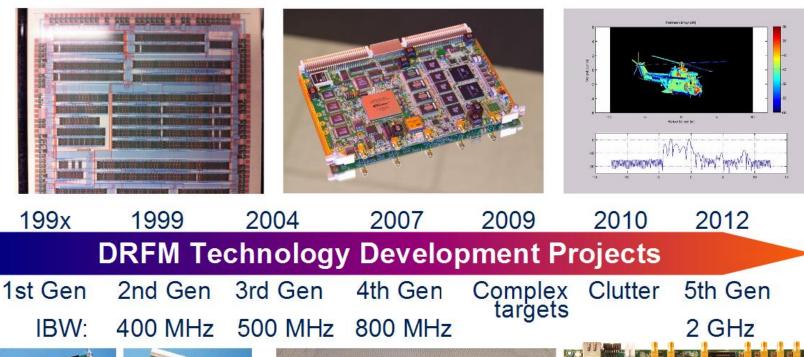
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## **CSIR Developed EW Research and Evaluation Facility**



## **DRFM History at CSIR**

## Digital Radio Frequency Memory History





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### **User Benefits**

### Support Smart Buyer and Doctrine Development

- CSIR provides EW related advise to the SANDF
- CSIR provides inputs for Doctrine development by the SANDF
- Operational Support
  - EW Facility can be used for Situational Awareness
  - CSIR performs the actual evaluations
  - Examples of major platform support includes:
    - SAAF Gripen Radar
    - SA Navy Frigates Radars







### **User Benefits**

### CSIR Industry Collaboration

- Communications EW
  - Peralex
  - GEW Technologies
- Radar evaluation
  - Reutech Radar Systems
- Missile sensor technology
  - Denel Dynamics

### SANDF Exercises and Operations

- CSIR is involved in regular scheduled EW camps Force preparation
- Operation Corona



## Conclusion

- ES role is crucial to establishment of Situational Awareness
- Adversary changes approach regularly
- CSIR aims to enhance the survivability of platforms and personnel



# Thank you

