

Synthetic Aperture Radar (SAR)



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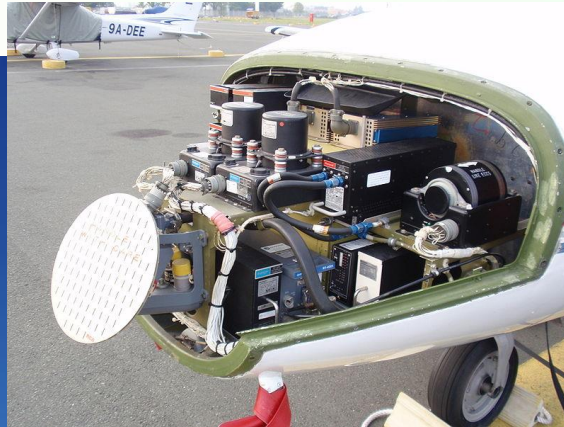
Ministry of Security and Public Administration



National Disaster Management Institute

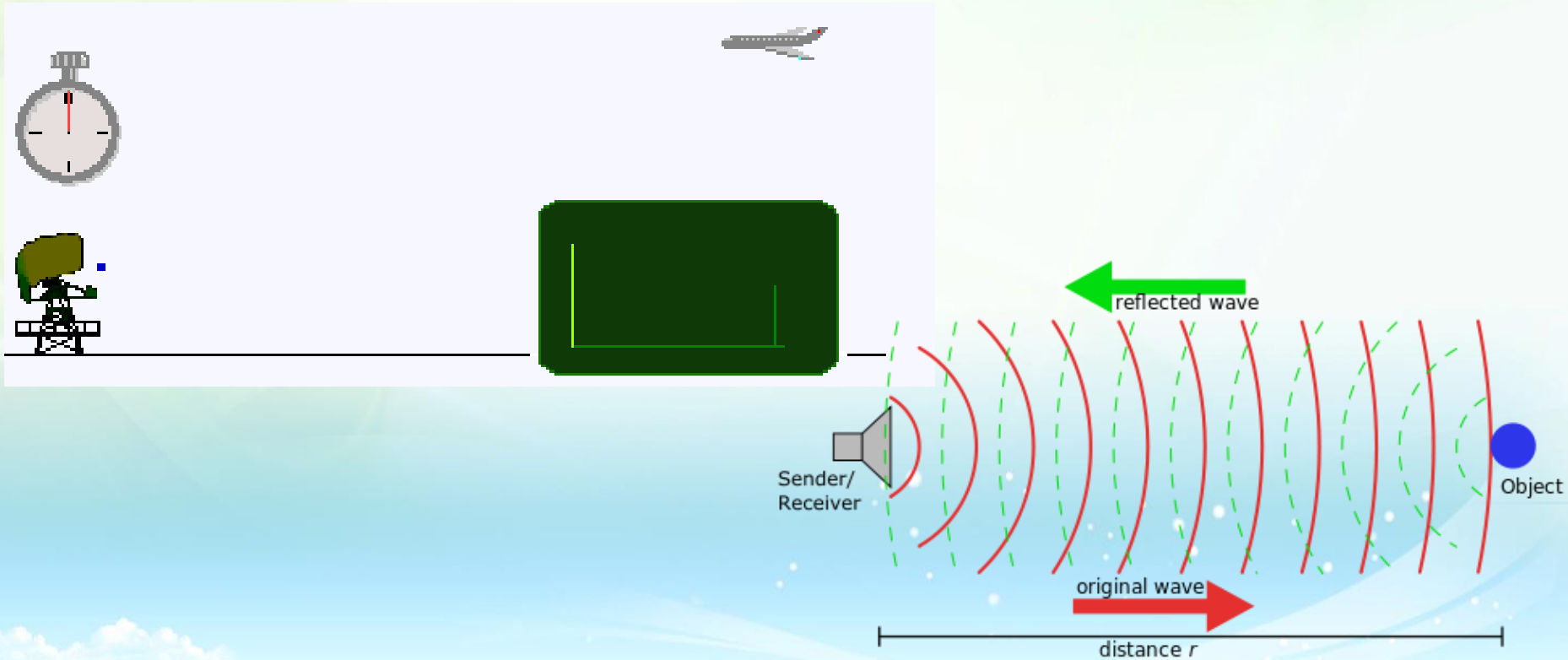
RADAR

- **RA**dio **D**etection **A**nd **R**anging



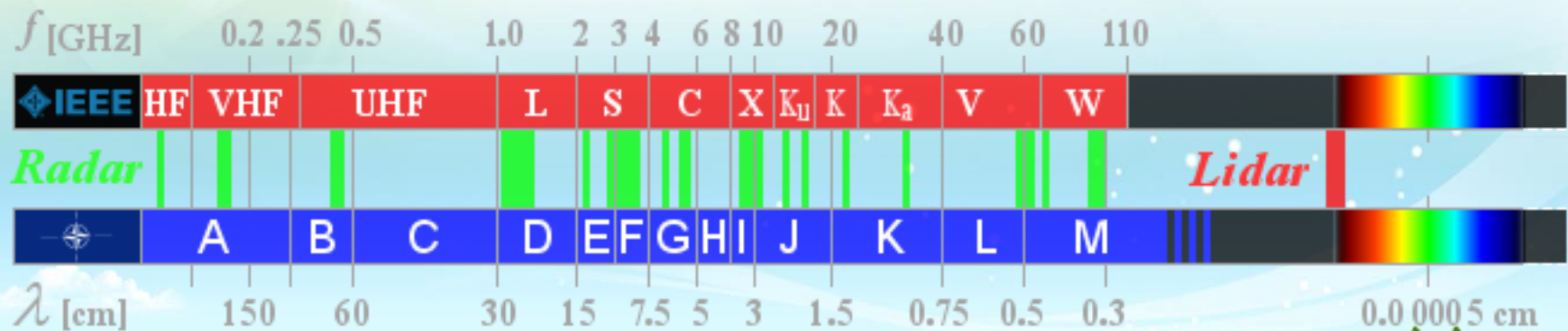
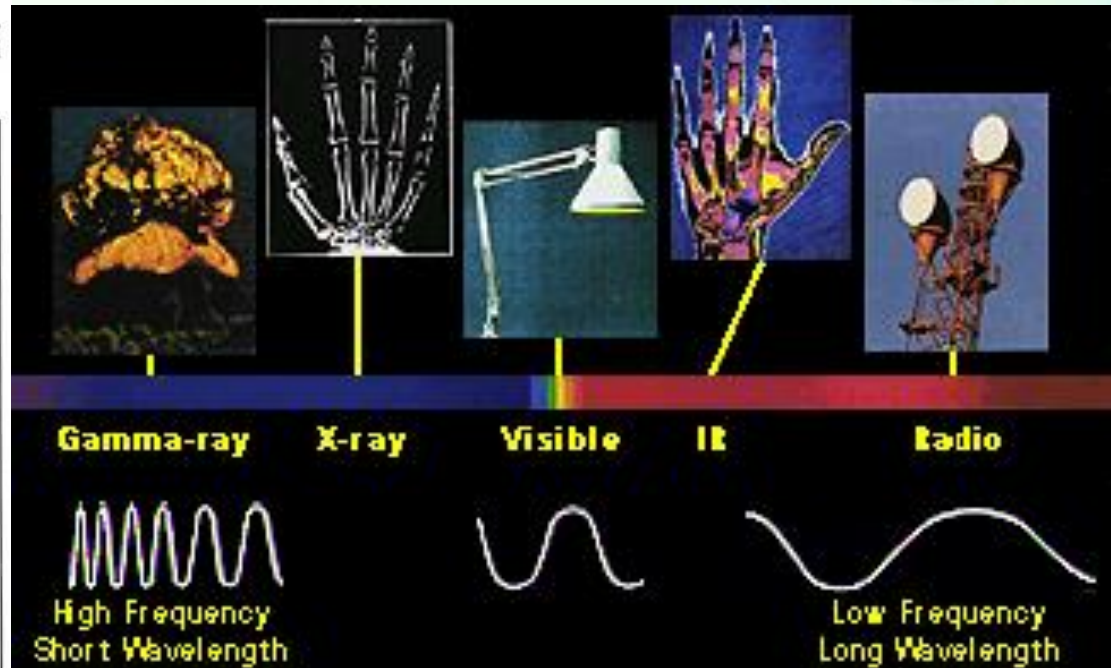
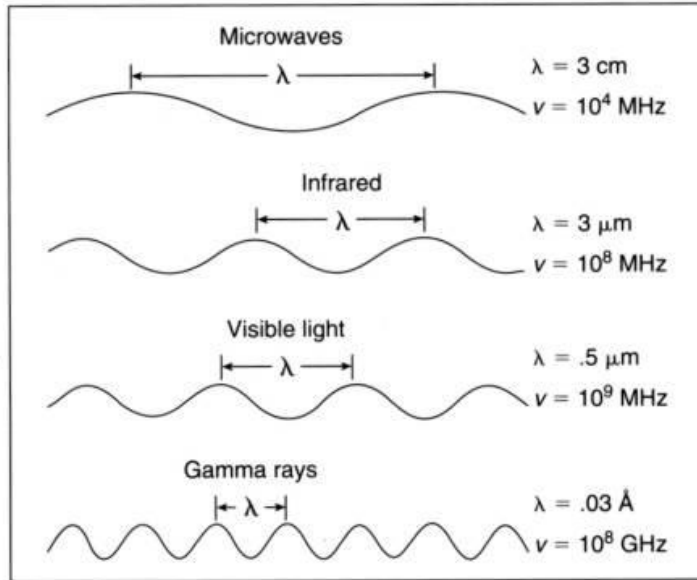
RADAR

- An object-detection system that uses radio waves to determine the range, altitude, direction, or speed of objects
- It was developed by several nations before and during World War 2. The term RADAR itself was coined in 1940 by the United Navy



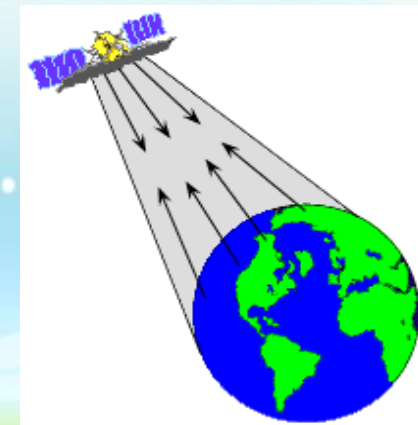
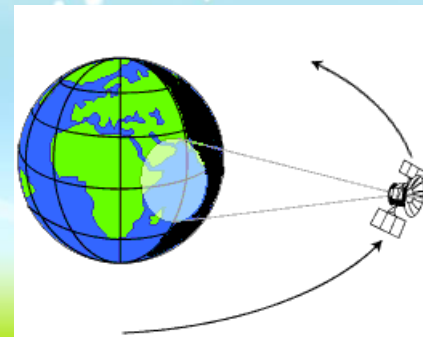
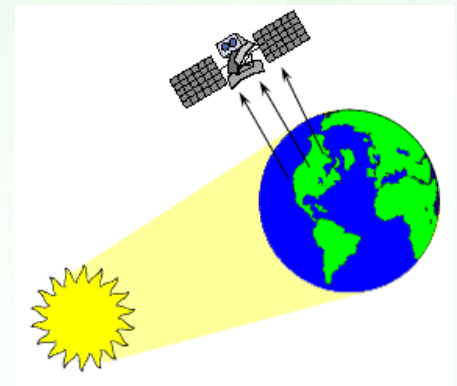
Wavelength

Figure 1-4 Four different types of electromagnetic waves, illustrating the inverse relationship between wavelength and frequency.



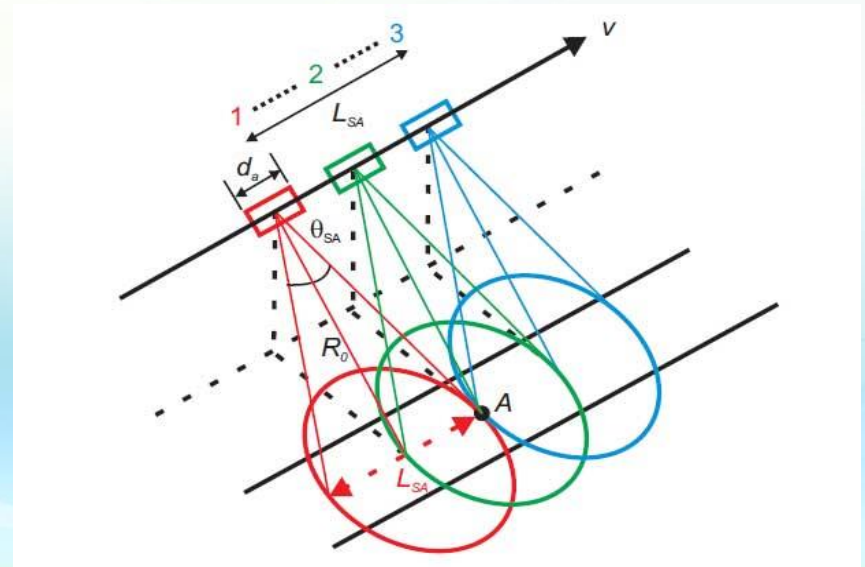
Passive vs. Active Satellite

- Passive satellite
 - reflect the incident electromagnetic radiation without any modification or amplification
 - It can not generate power they simply reflect the incident power
 - Optical satellites (Kompsat-2,3, Landsat, MODIS...)
 - Observation time: after sunrise until sunset
 - high spatial resolution
- Active satellite
 - Satellites which can transmit power
 - They can amplify or modify the incident signal for transmission
 - SAR satellites (Kompsat-5, ALOS-1, ENVISAT, TerraSAR-X)
 - Unlimited observation time
 - low spatial resolution
 - high expense



Synthetic Aperture Radar (SAR)

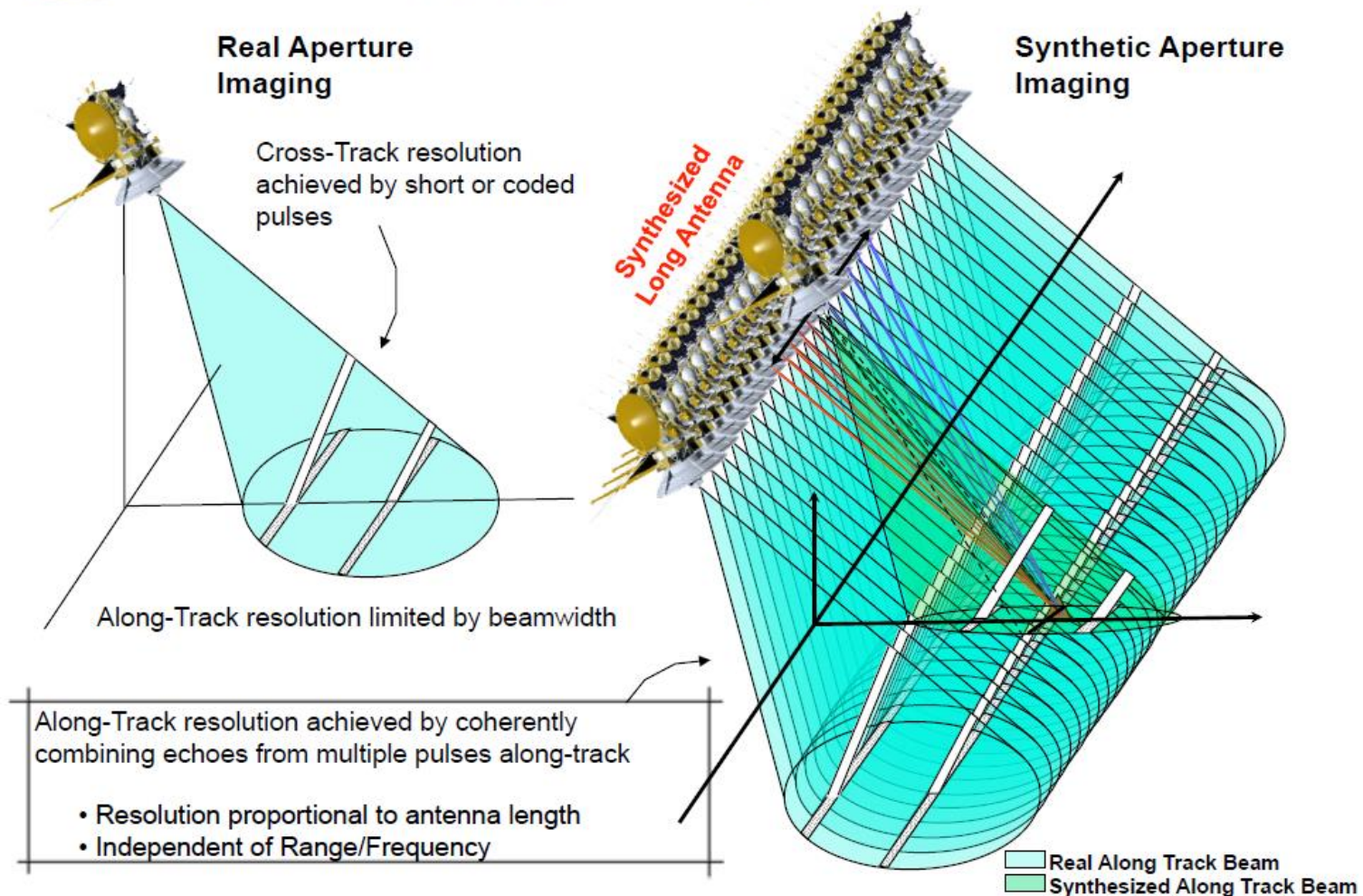
- SAR is a form of radar whose defining characteristic is its use of relative motion, between an antenna and its target region, to provide distinctive long-term coherent-signal variations, that are exploited to obtain finer spatial resolution that is possible with conventional beam-scanning means
- First civilian SAR satellite: SEASAT (1978, US)
- Resolution $\uparrow$, Antenna length $\uparrow$, high frequency $\uparrow$, short wavelength $\downarrow$
- Interferometry, Polarimetry: Phase
- Radiogrammetry: (Intensity)



Real vs. Synthetic



SAR Imaging Concept

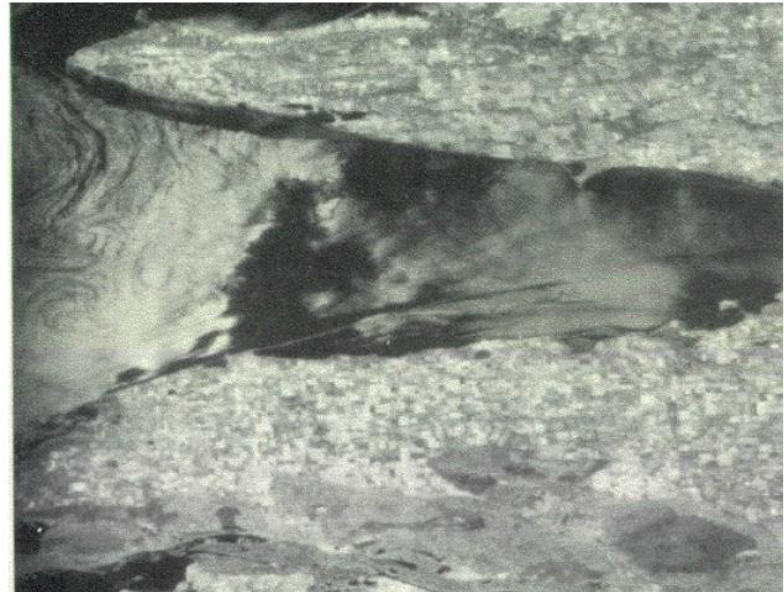


Real vs. Synthetic

Real Aperture Radar



Synthetic Aperture Radar



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