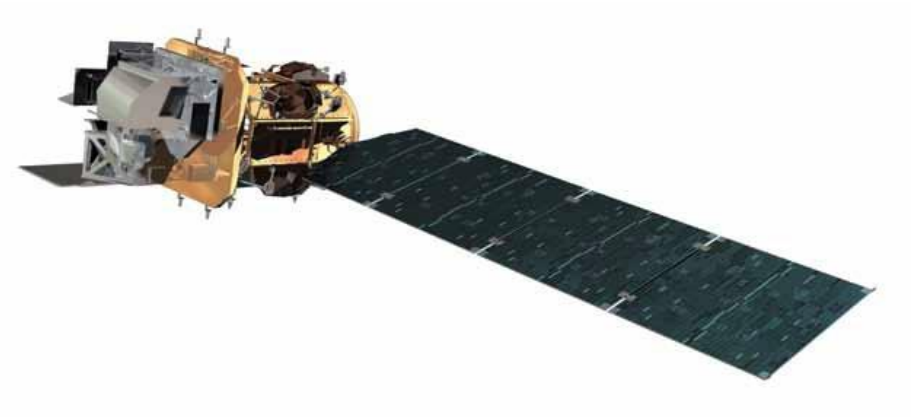
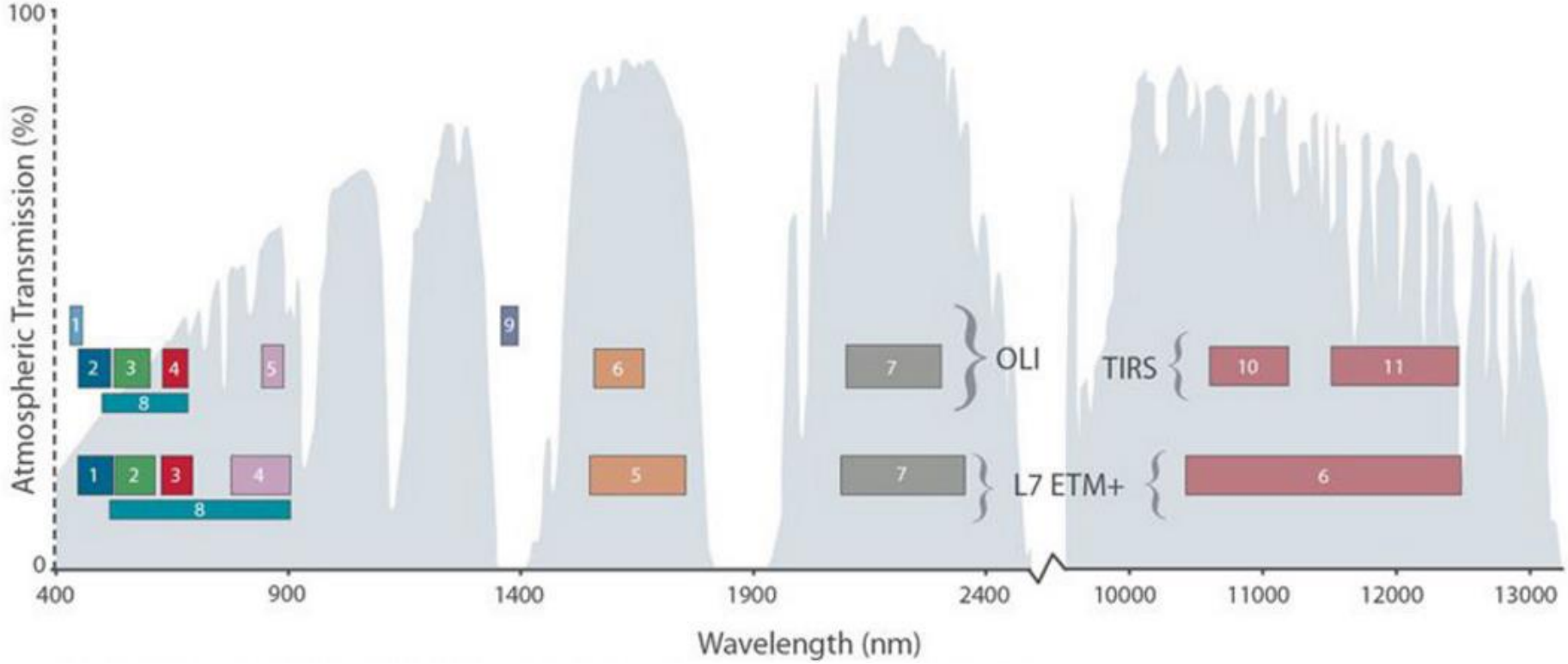
Disclaimer: The views, opinions, findings, and conclusions reflected in this presentation are the responsibility of the authors only and do not represent the official policy or position of the USDOT/OST-R, or any state or other entity.

Landsat Mission Sensors

- Imagery for wildfire mapping operations in the US from Landsat (NASA/USGS)
- Mostly 30x30 meter spatial resolution
- Landsat 1-3, Landsat 4-5 – Multispectral Scanner (MSS)
- Landsat 4-5 – Thematic Mapper (TM)
- Landsat 7 (launched 1999) – Enhanced Thematic Mapper Plus (ETM+)
  Bands 1-8
- Landsat 8 (launched 2013) – Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS)
  Bands 1-11



Landsat Bands



(Source: USGS)

Landsat Band Combinations

	Landsat 7 Landsat 5	Landsat 8
 Color Infrared:	4, 3, 2	5,4,3
 Natural Color:	3, 2, 1	4,3,2
 False Color:	5,4,3	6,5,4
 False Color:	7,5,3	7,6,4
 False Color:	7,4,2	7,5,3

(Source: USGS)

Soil Burn Severity

Near-infrared (NIR) and short-wave infrared (SWIR) bands

- Normalized Burn Ratio (NBR)

$$NBR = (NIR - SWIR) / (NIR + SWIR)$$

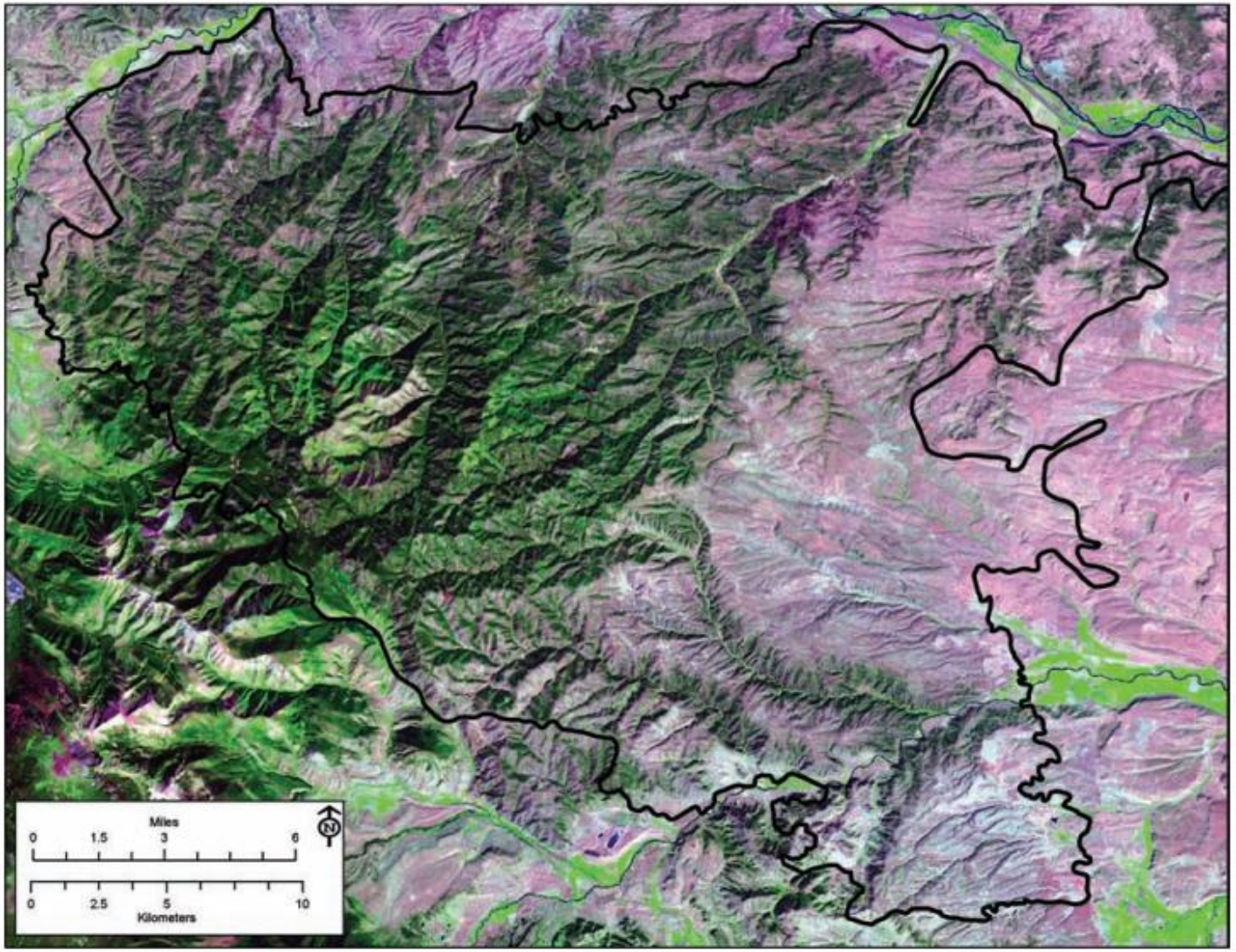
- Differenced Normalized Burn Ratio (dNBR)

$$dBNR = NBR_{pre\text{-}fire} - NBR_{post\text{-}fire}$$

Burn Severity Products:

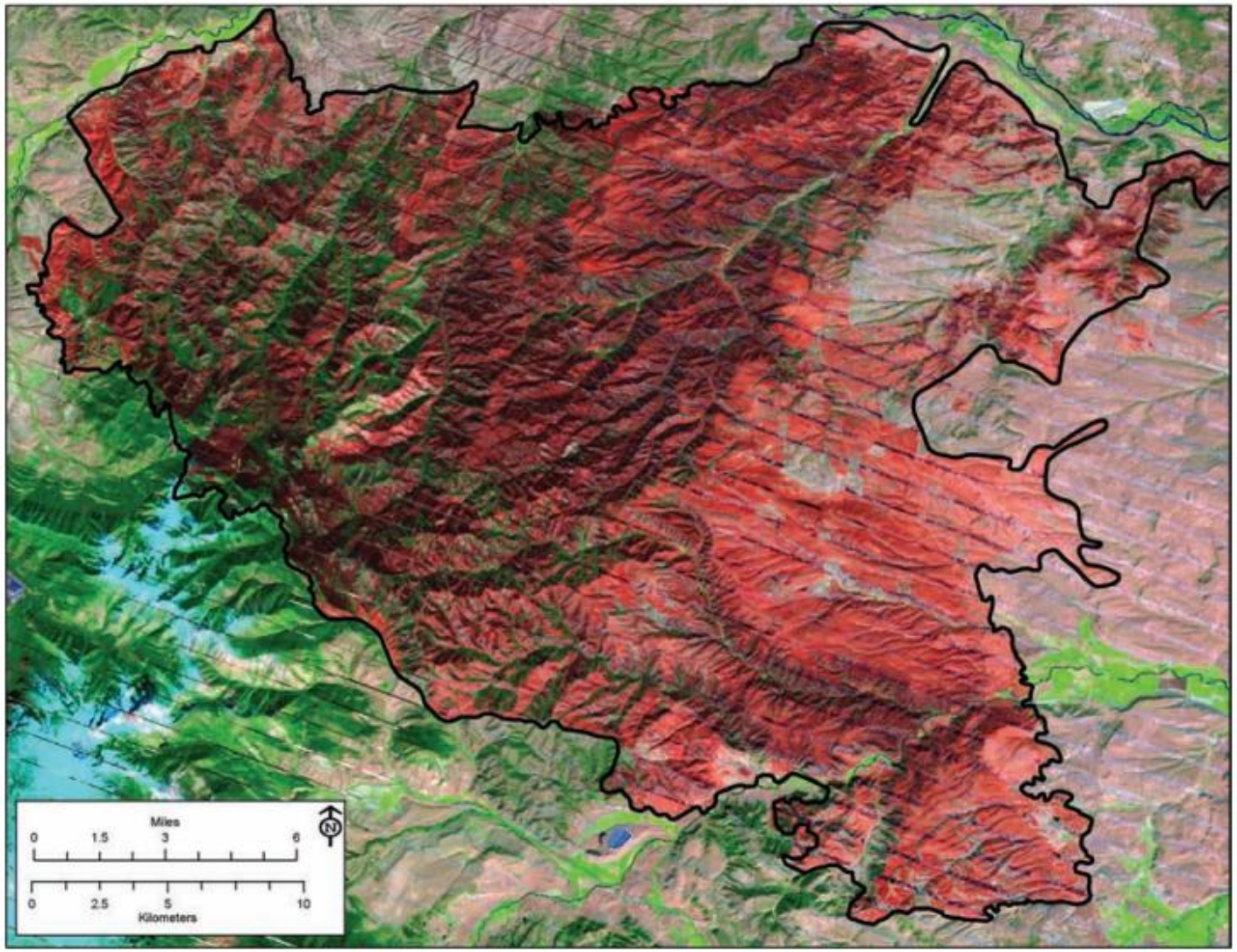
- Burned Area Reflectance Classification (BARC) – USDA Forest Service
- Burn Severity layer – NASA RECOVER Platform

Pre-fire Landsat Imagery



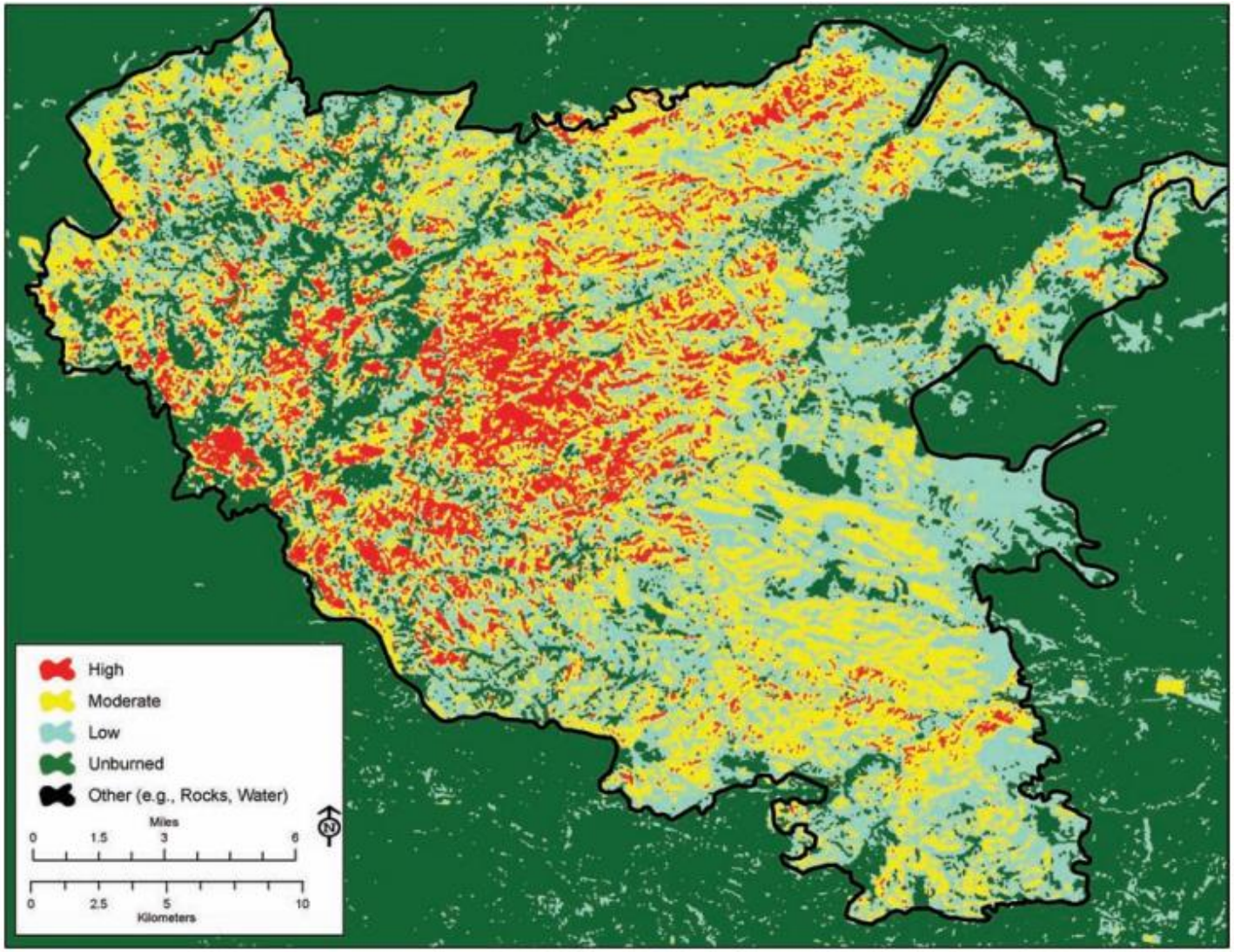
(Source: US Forest Service)

Post-fire Landsat Imagery



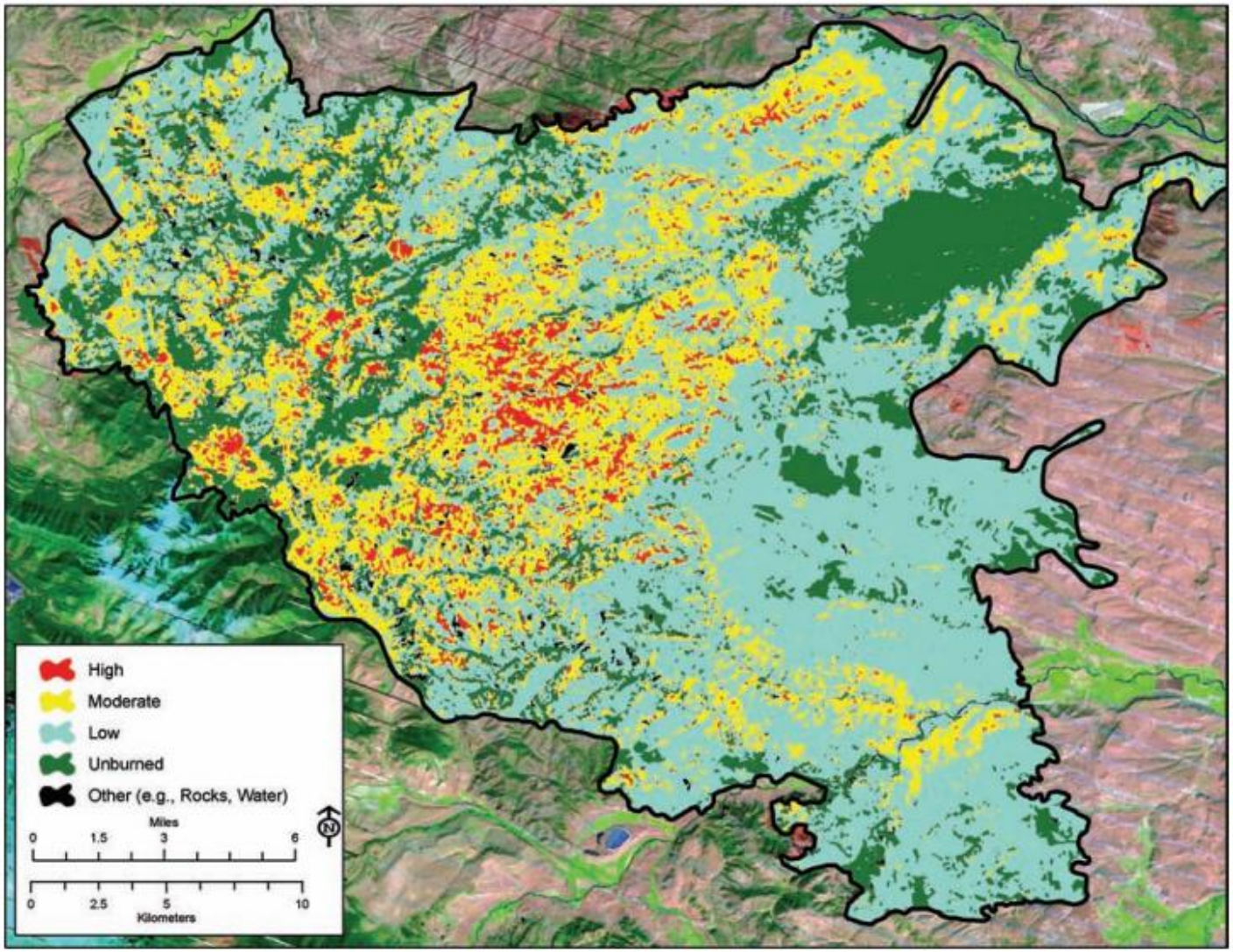
(Source: US Forest Service)

BARC Map



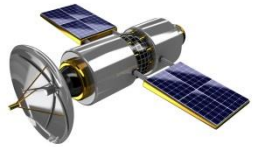
(Source: US Forest Service)

Field-adjusted BARC Map



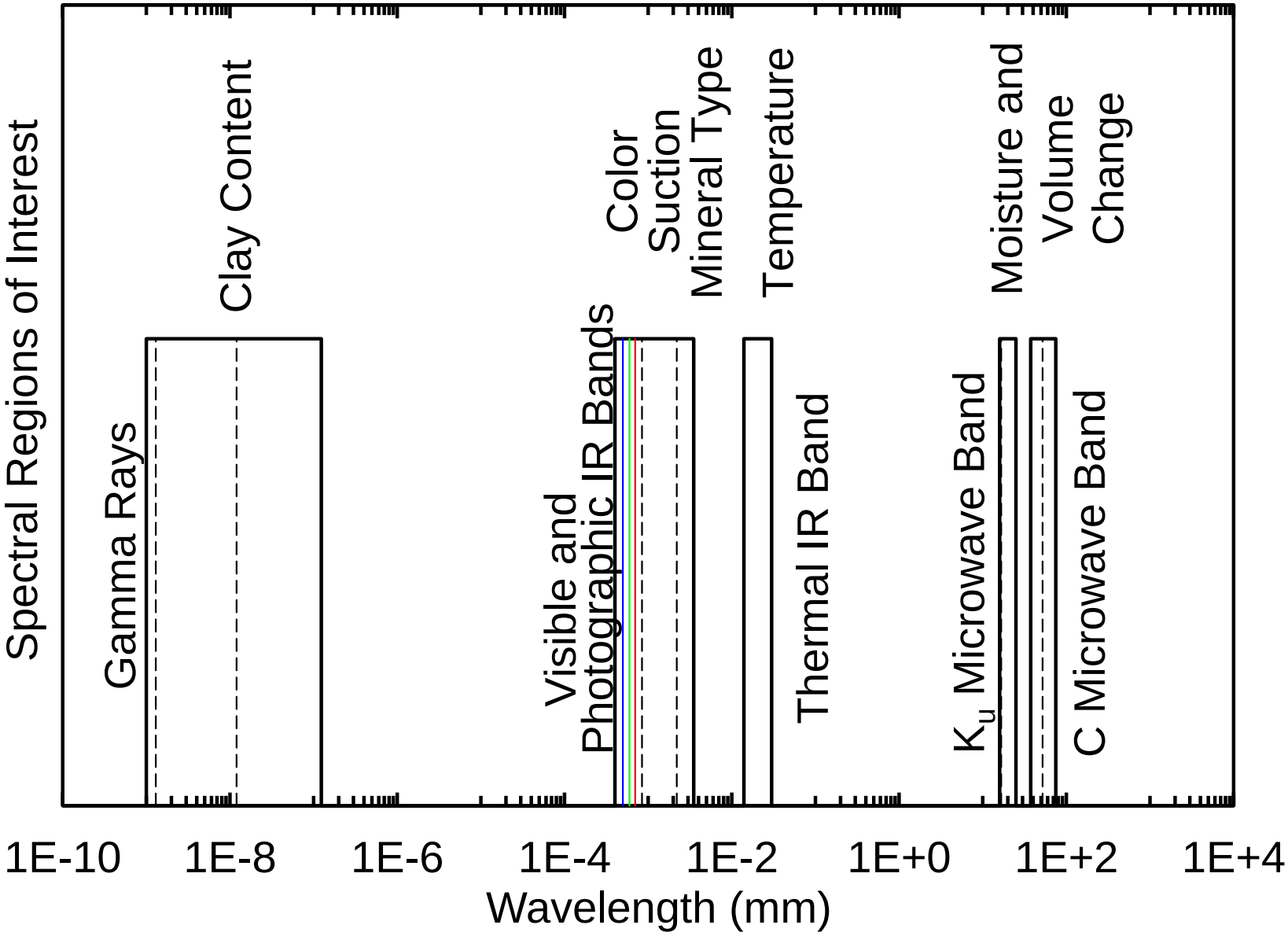
(Source: US Forest Service)

The Case for Ground-based Remote Sensing

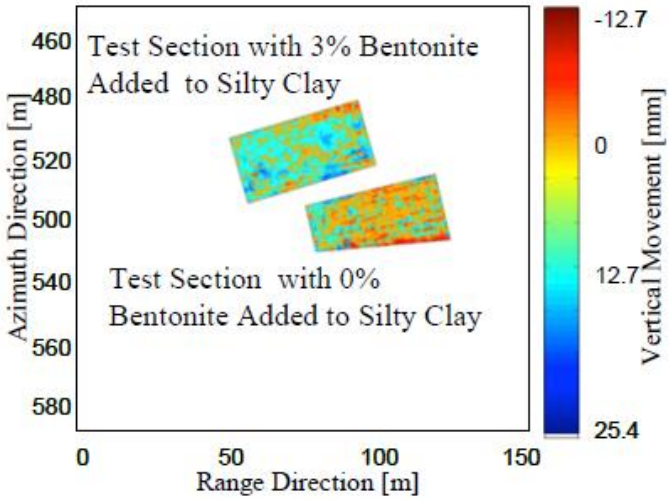


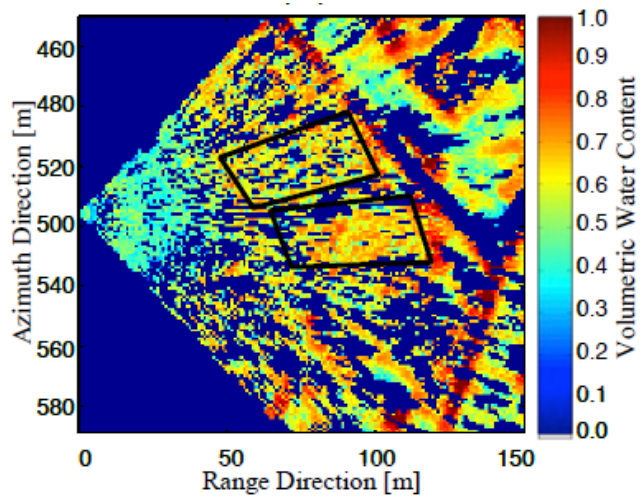
(Photo credit: NASA)

Operating Wavelengths for Remote Sensing of Soils

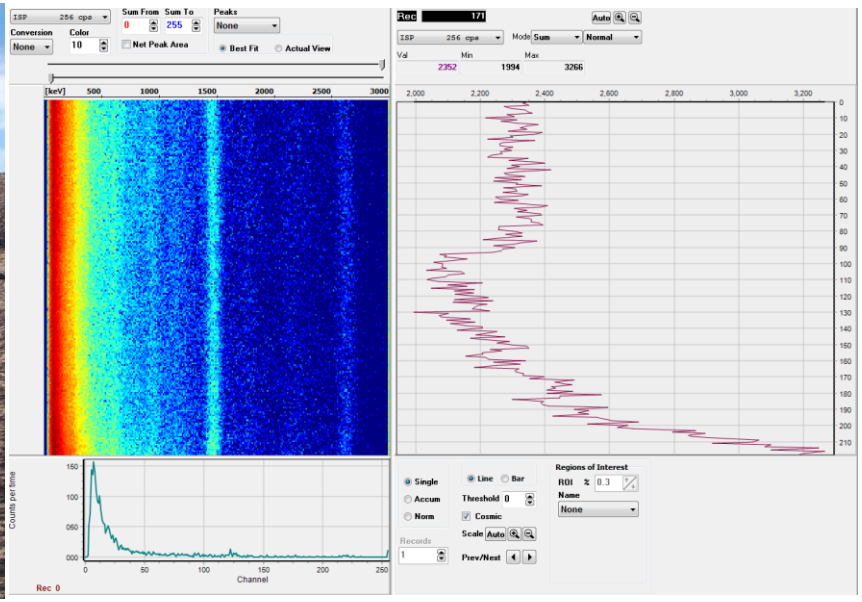


Ground-based RaDAR Interferometry





Gamma-Ray Spectrometry



Topographic Differential Absorption LiDAR (TDiAL)

- Field-deployable device with active and passive sensor capability
- Remote measurement of soil suction (active)
- Reflectance (passive)

DAQ system (TDiAL)

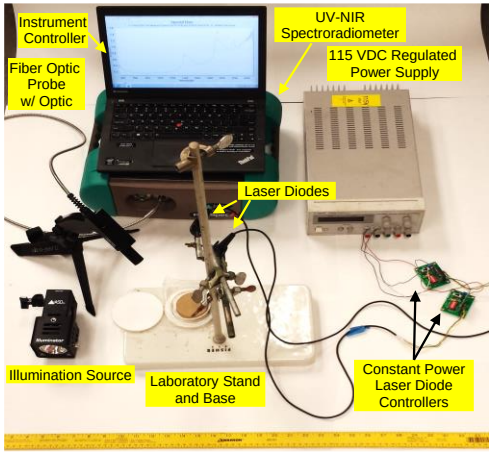
Telescope aperture (TDiAL)

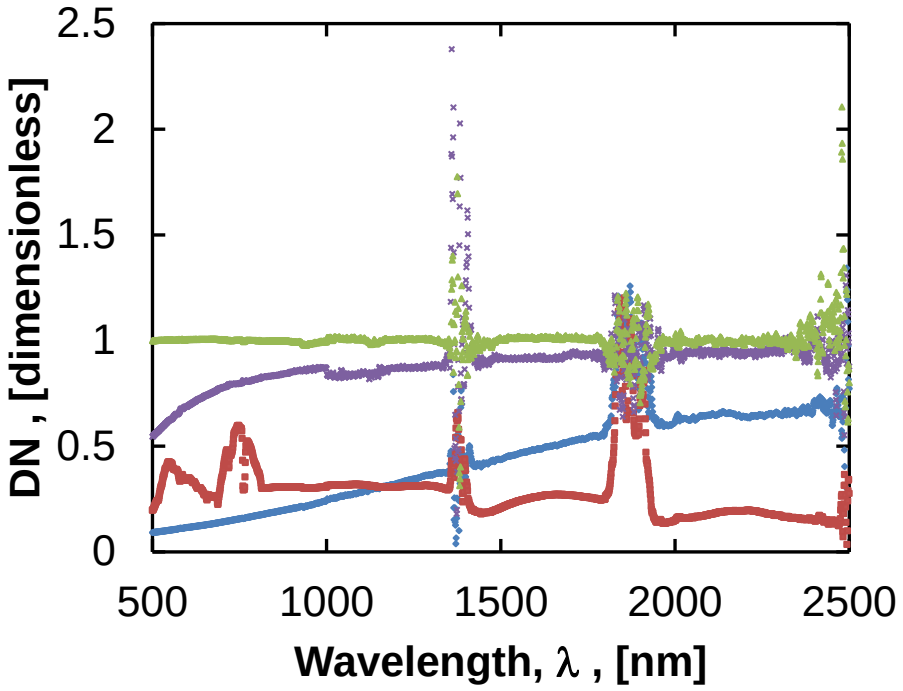
Field box with internal components (TDiAL)

TDiAL (Passive Only)

Field-scale device (Passive only)

Bench-scale device (Passive & active)





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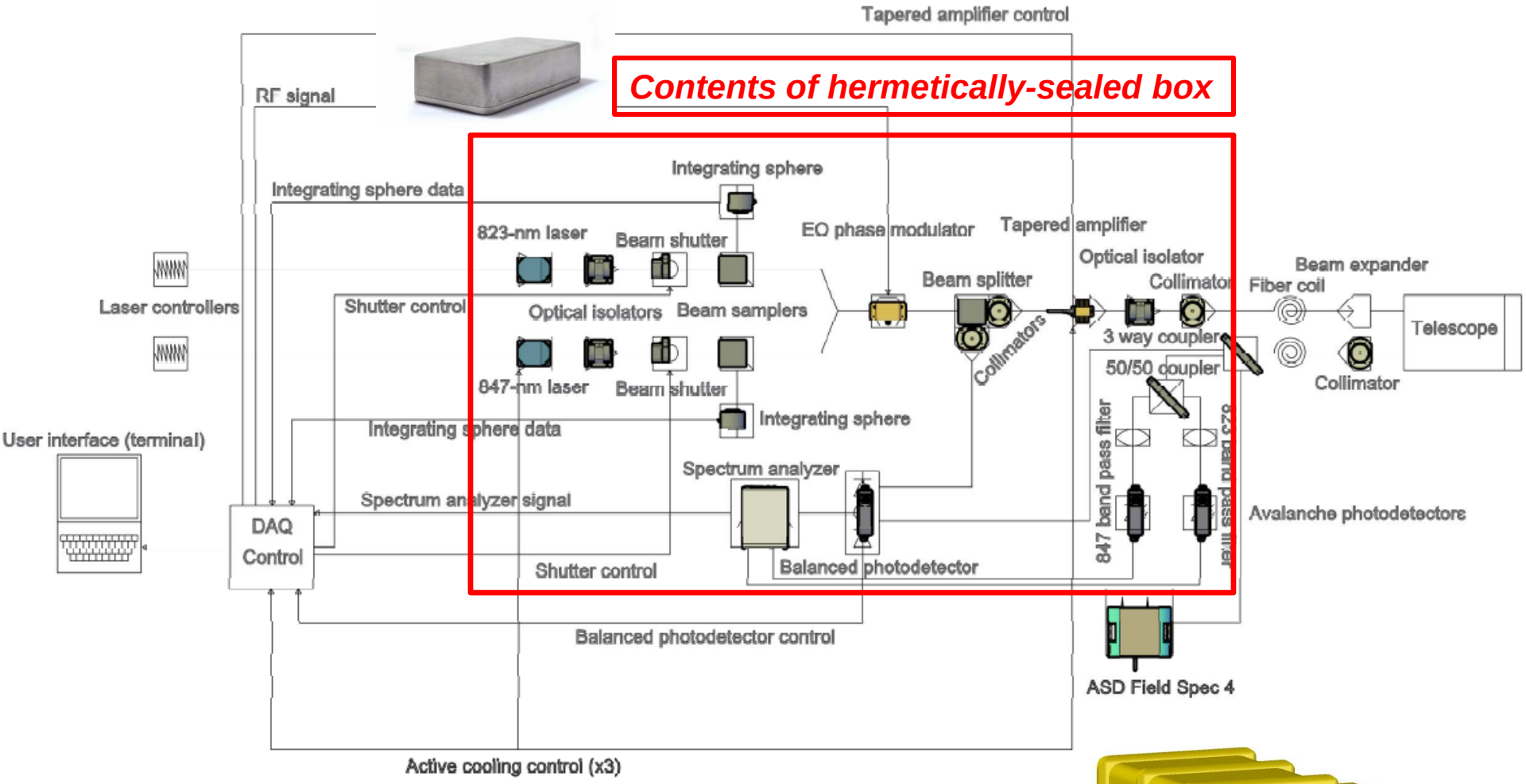
Development of Topographic Differential Absorption LiDAR (TDiAL)



1-line diagram of TDiAL device

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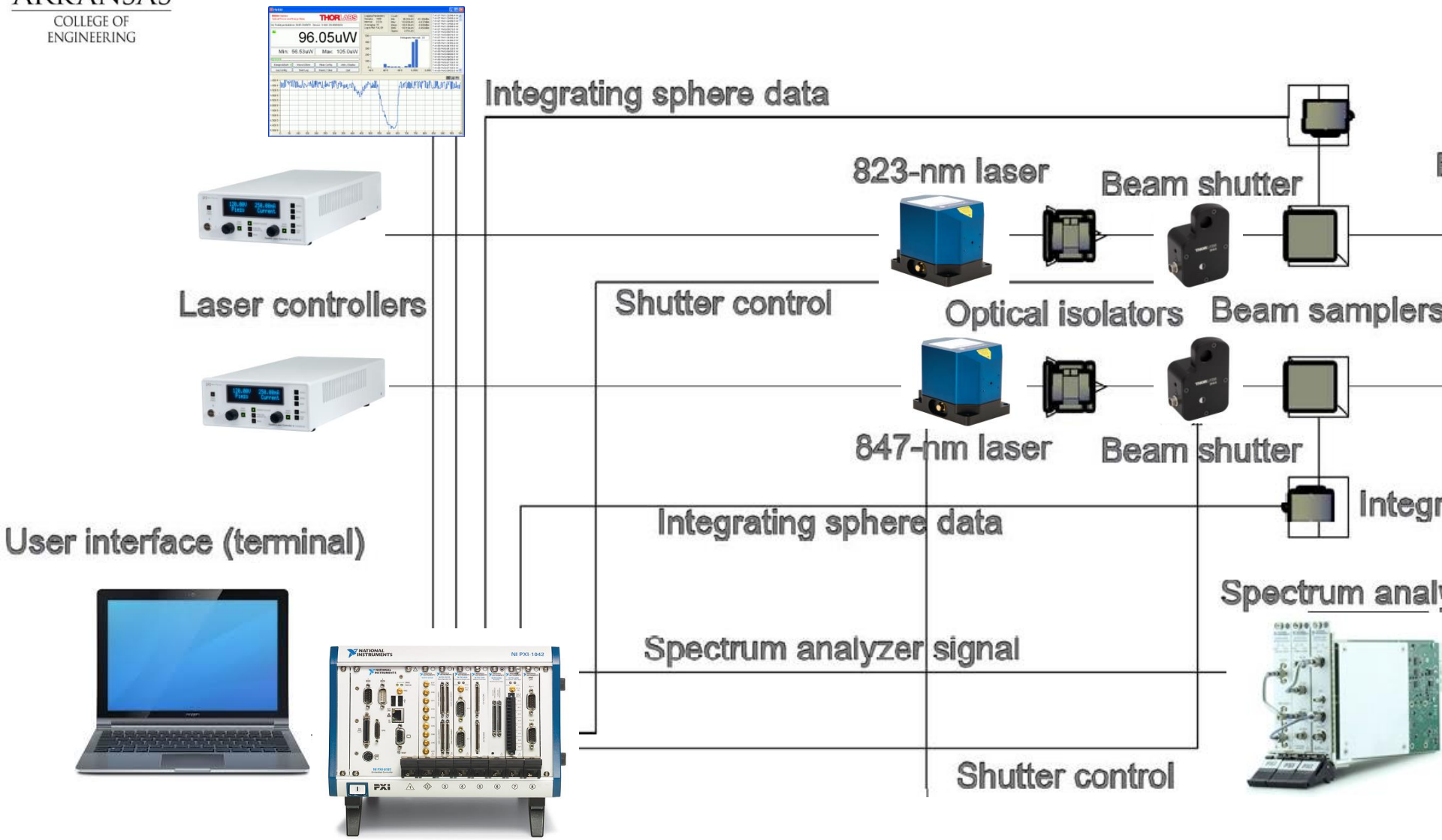

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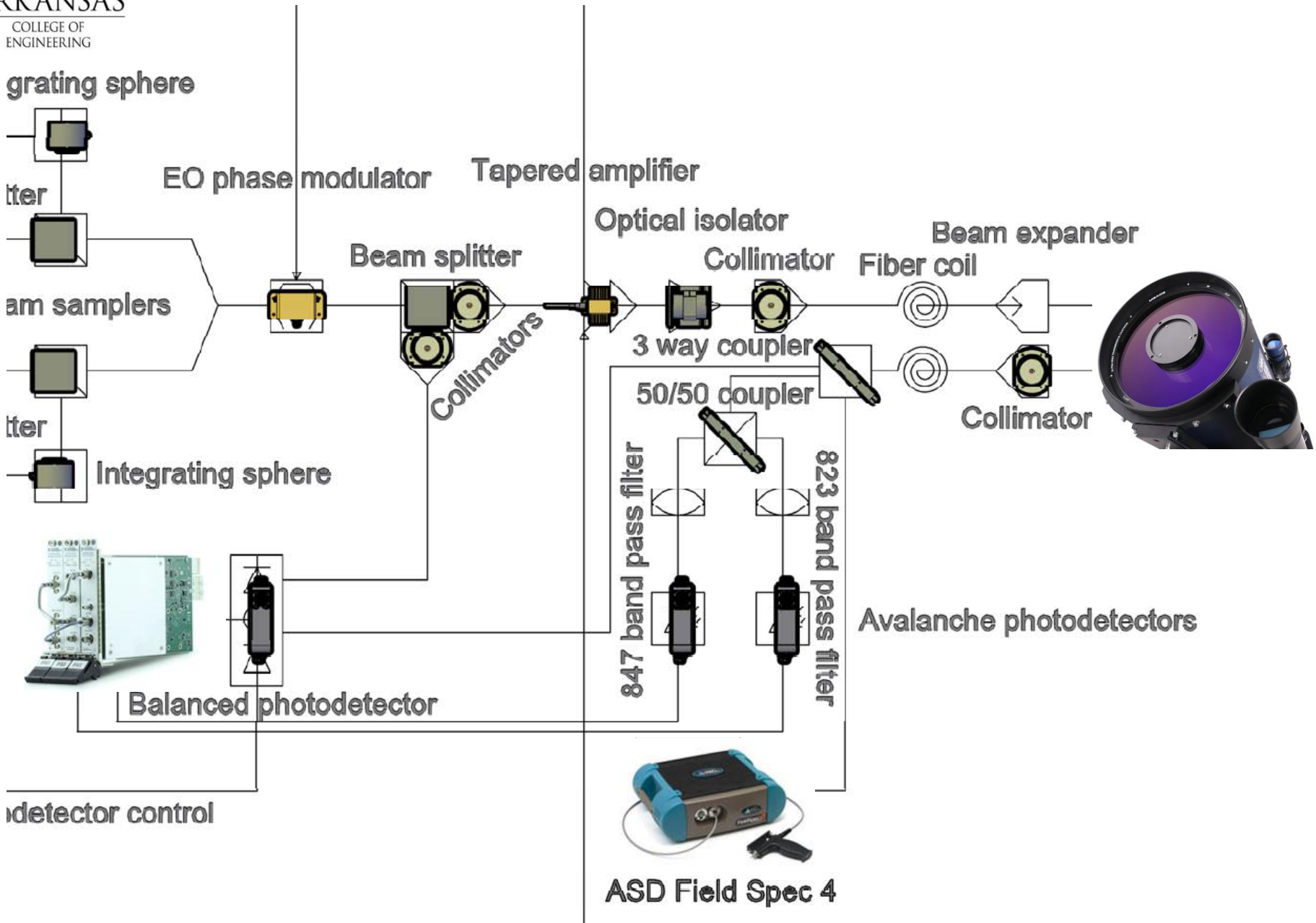

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