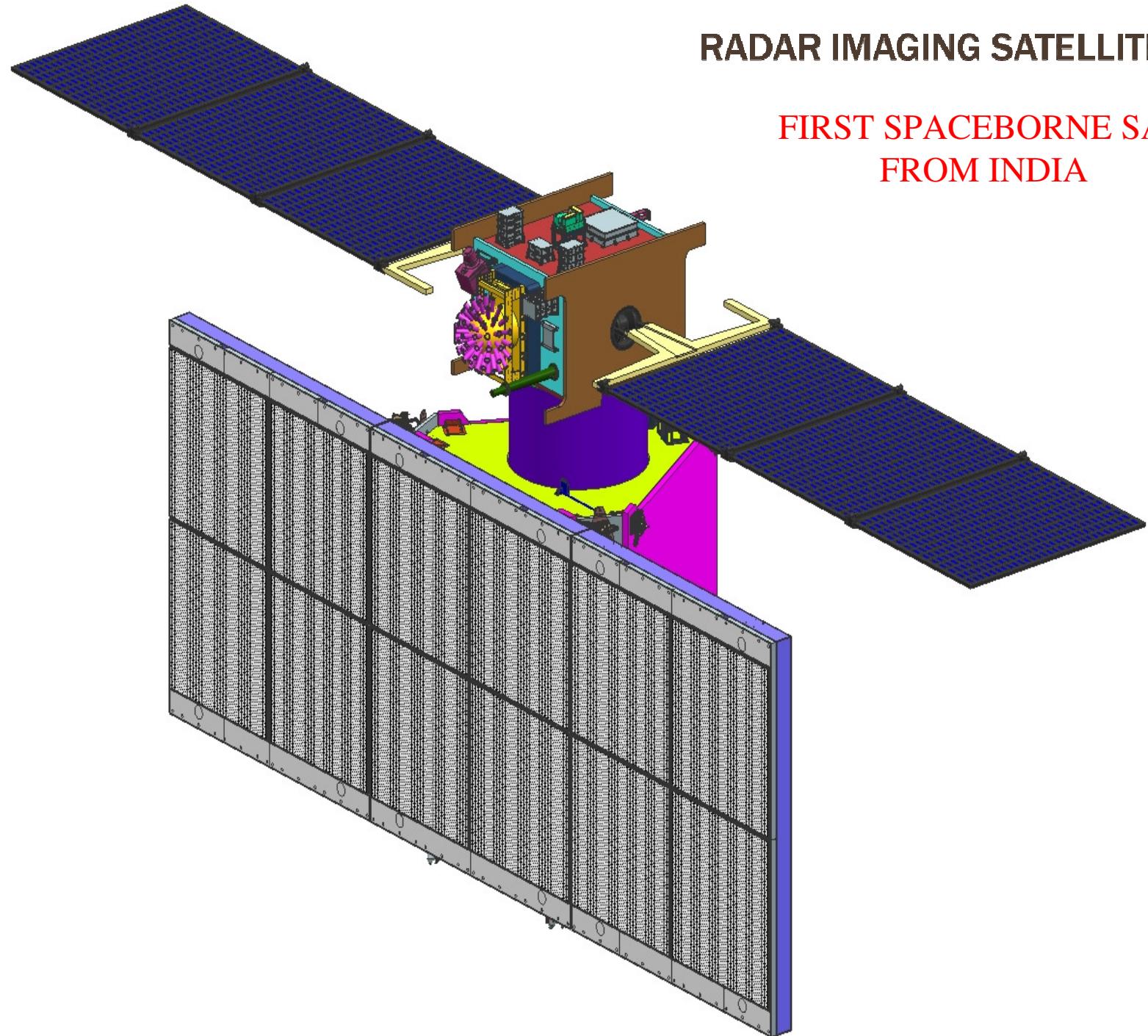


RADAR IMAGING SATELLITE - 1

INDIAN DELEGATION

RADAR IMAGING SATELLITE - 1

FIRST SPACEBORNE SAR
FROM INDIA



RADAR IMAGING SATELLITE (RISAT-1)

- ❖ C-BAND SYNTHETIC APERTURE RADAR (SAR)
- ❖ 5.35 GHz FREQUENCY WITH MULTIPOLARIZATION CAPABILITY
- ❖ CATERSTO WIDE RANGE OF APPLICATIONS FROM AGRICULTURE TO LAND MAPPING
- ❖ MULTIMODE CONFIGURATION TO MEET APPLICATION REQUIREMENTS
- ❖ FIRST SPACEBORNE SAR FOR EARTH-APPLICATIONS TO HAVE CIRCULAR POLARIZATION
- ❖ ACTIVE ANTENNA CONFIGURATION WITH STATE-OF-THE-ART TECHNOLOGY

RISAT1

IMAGING GEOMETRY

ALTITUDE: 536 km (NOMINAL)

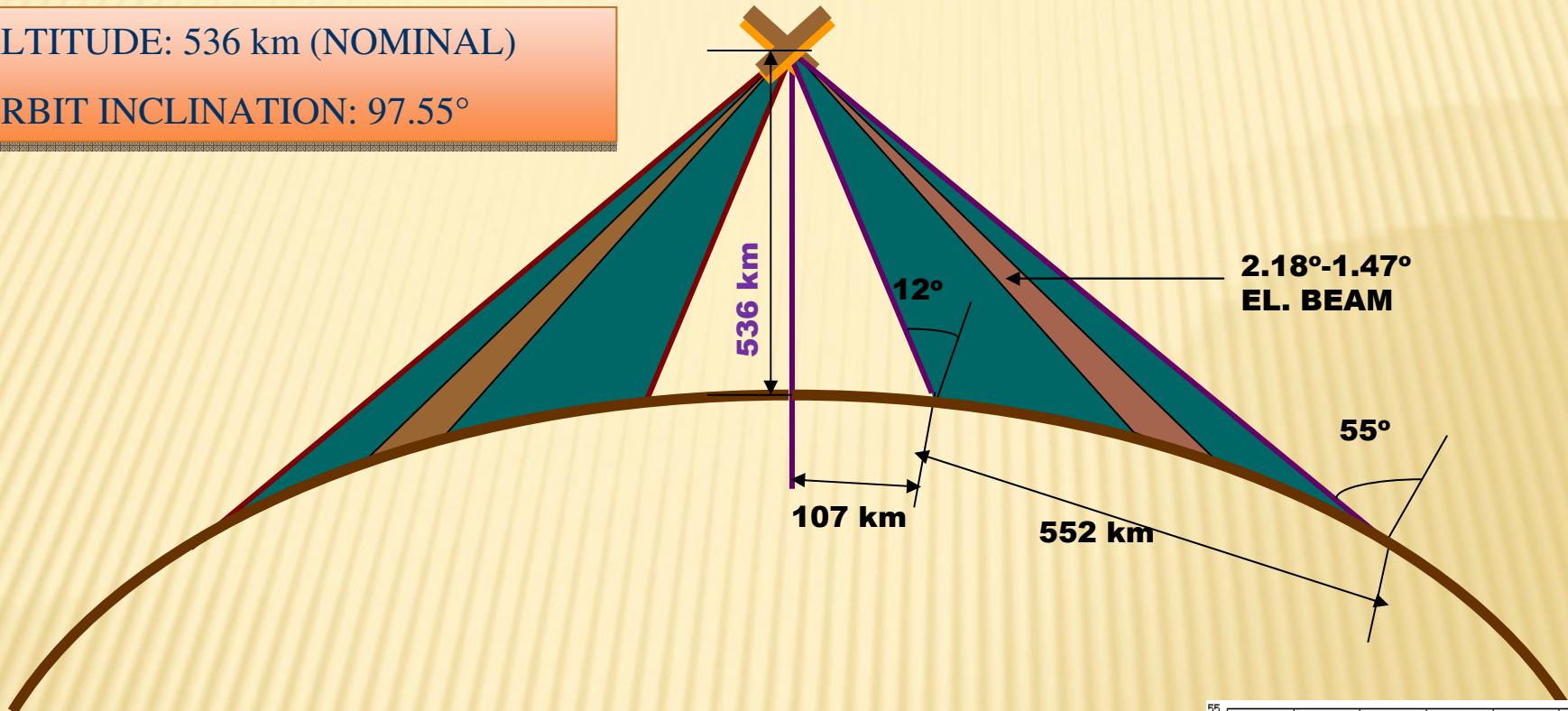
ORBIT INCLINATION: 97.55°

SUN-SYNCHRONOUS ORBIT

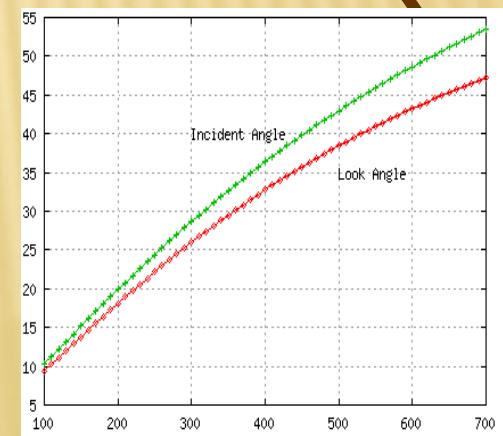
25-DAY REPEATIVITY (MRS)

SWATH SELECTIBILITY REGION: 107KM TO 659KM

FROM EITHER SIDE OF THE SUB-SATELLITE TRACK

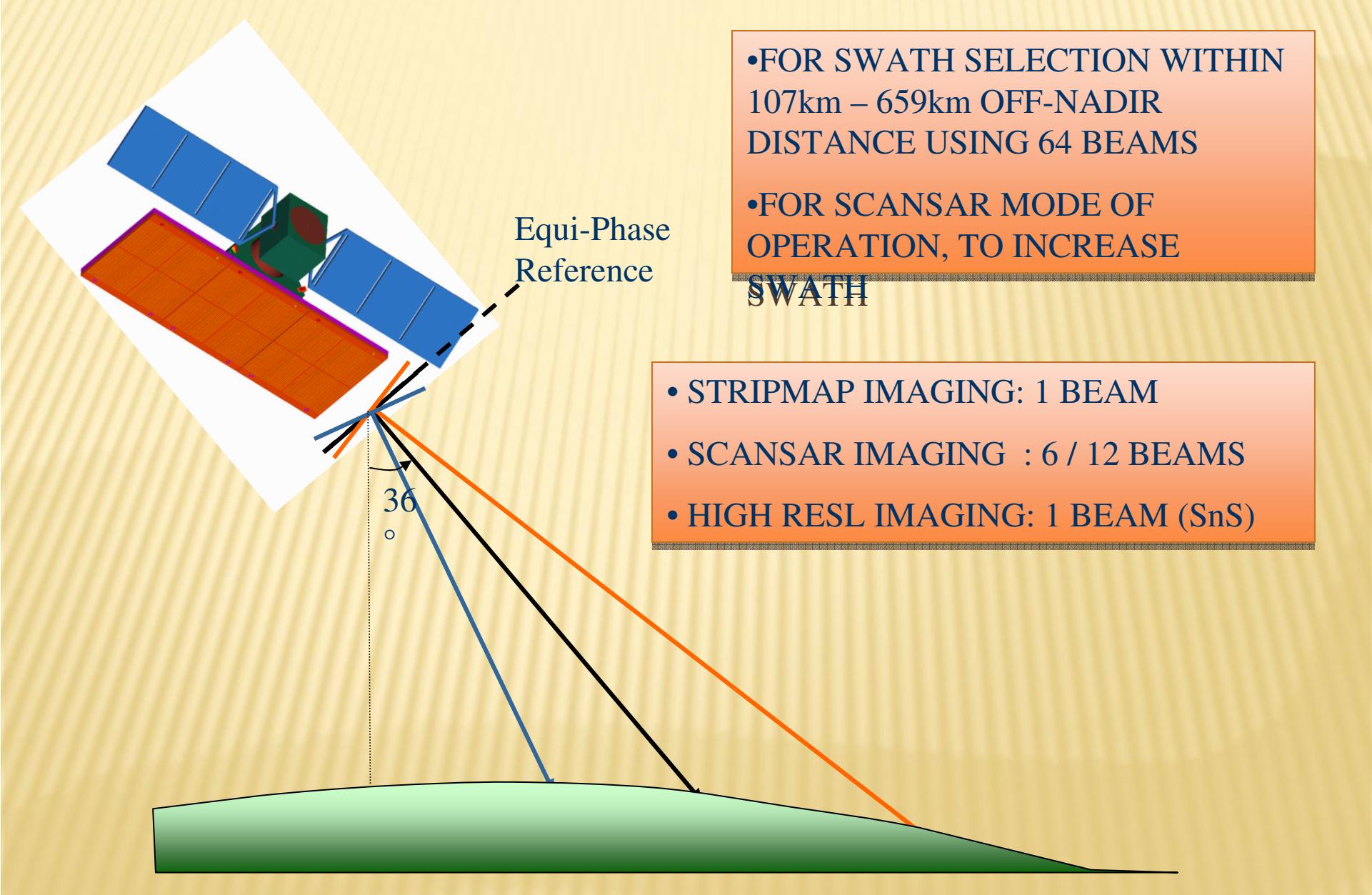


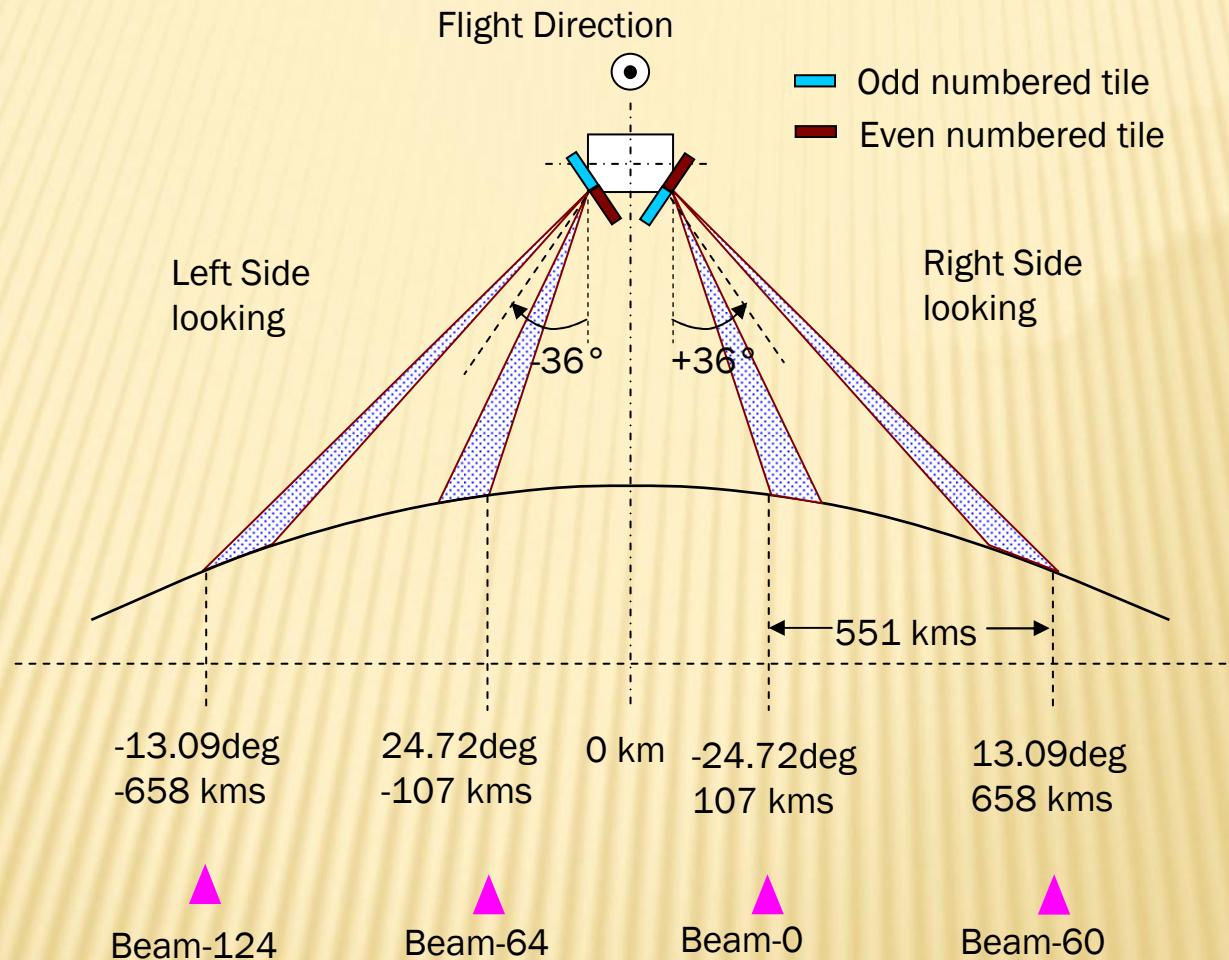
Look angle &
Incidence
angle, in deg.



Off nadir distance, in km

ELECTRONIC BEAM STEERING USING ACTIVE PHASED ARRAY ANTENNA

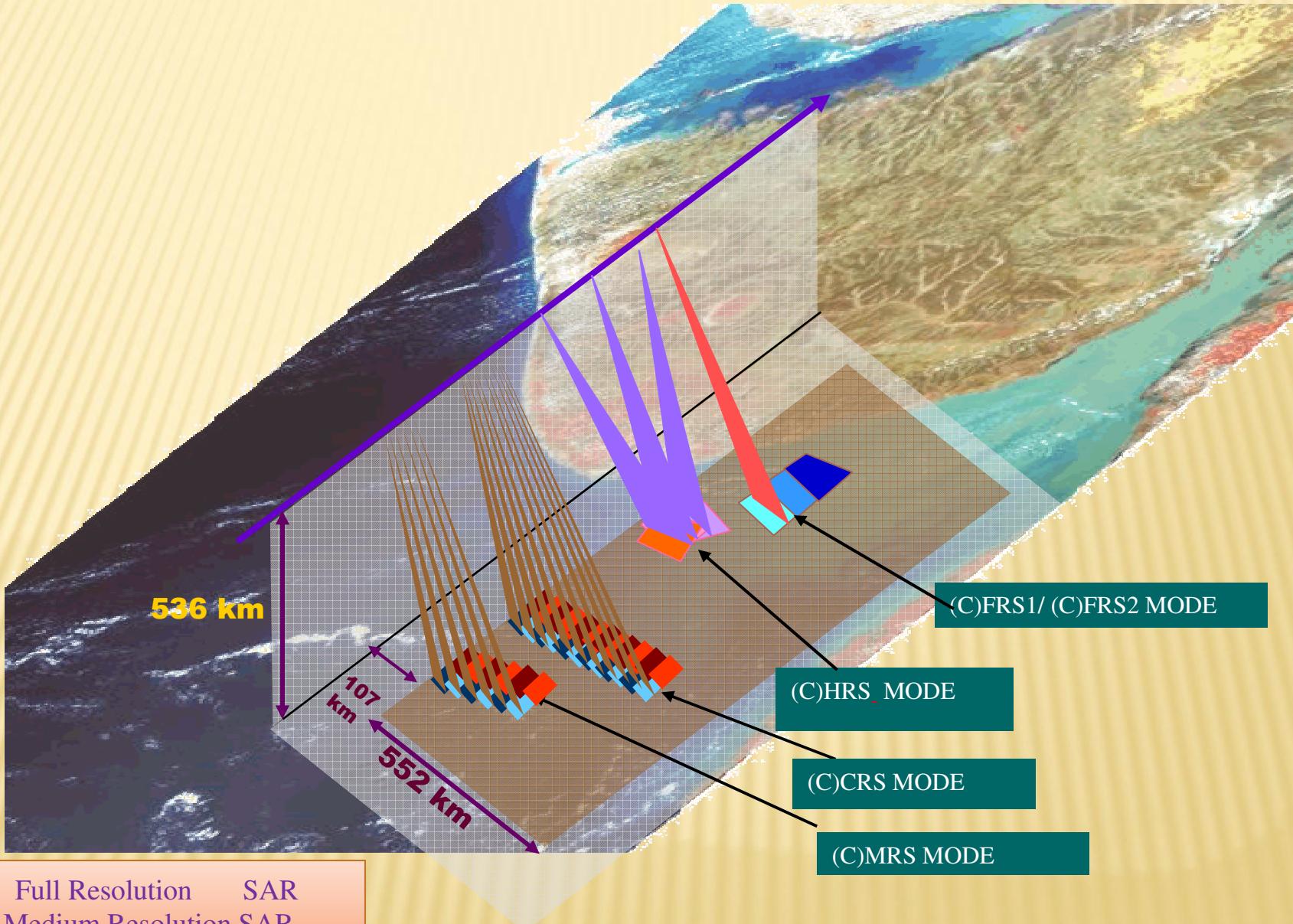




Beams:61-63 & 125-127 are Reserved beams

RISAT-1

MODES OF OPERATION

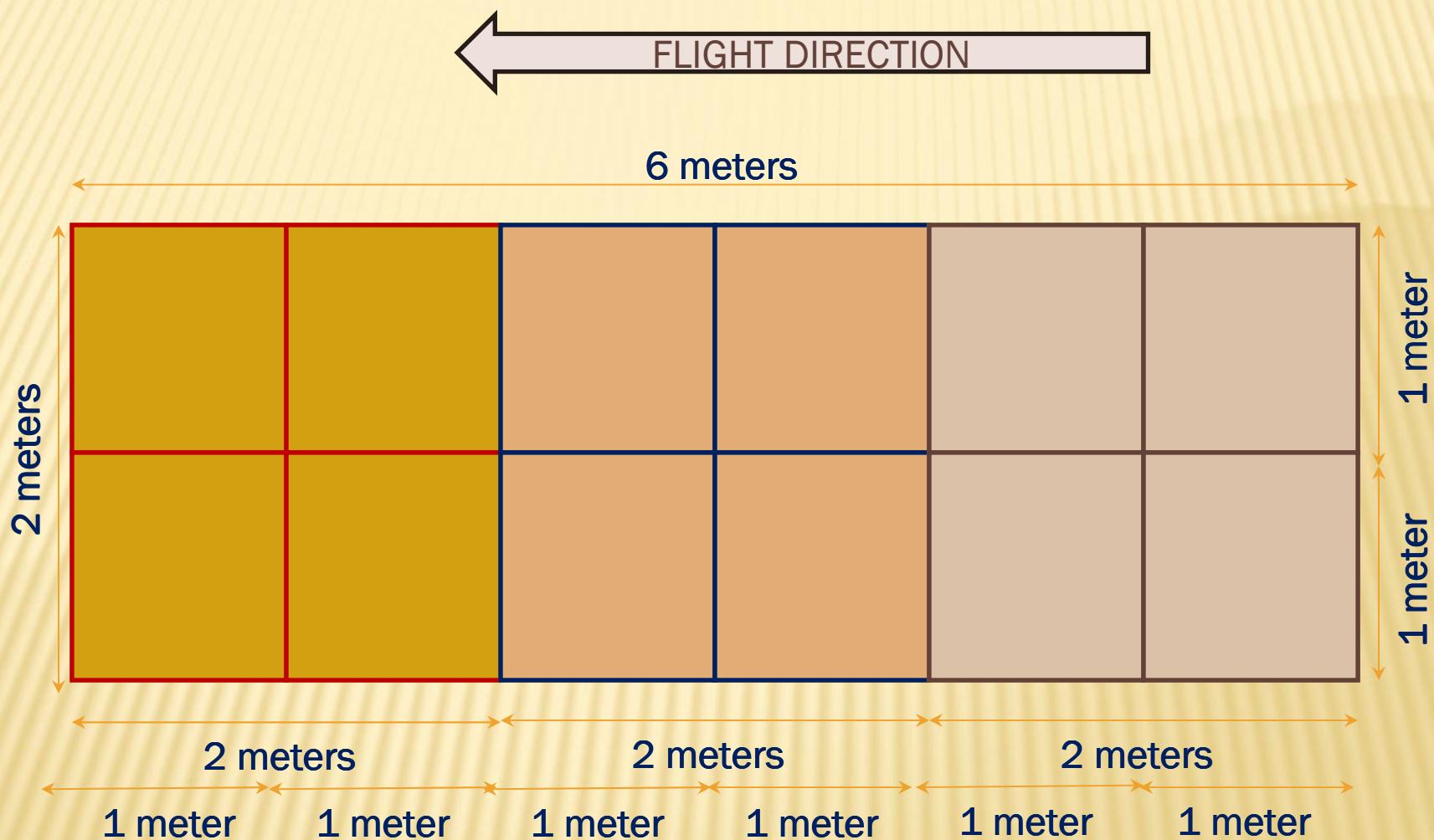


FRS : Full Resolution SAR
MRS: Medium Resolution SAR
CRS : Coarse Resolution SAR
HRS : High Resolution SAR

C: Stands for Circular polarization

	<i>Single Pol HH/HV/VV/V H</i>	<i>Dual Pol HH+HV/ VV+VH</i>	<i>Circular Polarimetry TX: CP Rx: V and H</i>	<i>Quad Pol HH+HV+VV+VH</i>
High Resolution Spotlight Mode (HRS)	0.7m x 1m resolution, 10 x 10 Km (10x100 km Experimental) Spot $\sigma_o = -16$ dB			
Fine Resolution Stripmap Mode-1 (FRS-1)	2m x 3m resolution, 25 Km swath $\sigma_o = -17$ dB			
Fine Resolution Stripmap Mode-2 (FRS-2)		4m x 3m resolution, 25 Km swath $\sigma_o = -20$ dB	4m x9m resolution, 25Km swath $\sigma_o = -19$ dB	
Medium Resolution ScanSAR Mode (MRS)	8m x 25m resolution,115 Km swath $\sigma_o = -17$ dB			
Coarse Resolution ScanSAR Mode (CRS)	8m x 50m resolution, 223 Km swath $\sigma_o = -17$ dB			
Resolution definition as (SL Range x Az); Radiometric Resolution: 3dB Gnd resolution factor: 4.8 (for 12deg incidence) – 1.2 (for 55deg incidence)				

SAR ACTIVE ANTENNA



SUBSYSTEM	FEATURES
Power	<ul style="list-style-type: none">▪ 70 V Bus (Payload , Wheels, Heaters)▪ Two 40 V AUX Buses (Heritage Systems)▪ Two Un interrupted Buses 40 – 70 V▪ Uninterrupted Bus Regulators 35 v (OBC , S-band Rx)▪ EED Bus 28 – 42 V▪ Ni-H Battery 70 AH▪ Battery protection logics▪ 12 min Payload Operation per orbit
On-Board Computer	<ul style="list-style-type: none">• ASIC based OBC• Specific to RISAT - POWER system safety features
Sensors	<ul style="list-style-type: none">• Two axis Digital Sun Sensor• Earth Sensor, Star Sensor, Magnetometer, 4PI, Solar Panel Sun Sensor
Control System	<ul style="list-style-type: none">• Normal Modes -Earth Sensor-DTG, Update Kalman Filter, Star Kalman Filter, Dynamic Observer• Thruster Modes—Inertial Attitude Control, Rate Damp mode, Sun Acquisition mode, Earth Acquisition, Orbit Maneuver modes

SUBSYSTEM	FEATURES
Satellite Positioning System	<ul style="list-style-type: none">▪ Position : 15 m, Velocity : 0.15 m/sec▪ Field Of View is about 158 deg
Solar Array Drive Assembly	<ul style="list-style-type: none">▪ Unified Solar Array Drive Assembly▪ Auto Mode & OBC driven mode▪ Micro stepping
Reaction Wheel	<ul style="list-style-type: none">▪ 50 Nms, 0.3 Nm capacity
Inertial Reference Unit	<ul style="list-style-type: none">▪ Miniature version
Reaction Control System	<ul style="list-style-type: none">▪ 8 X 11 N Attitude thrusters▪ 1 X 11 N Centrally mounted for Orbit Maneuver▪ Single tank – 100kg fuel
RF systems	<ul style="list-style-type: none">▪ S-band (TTC), X-Band , PAA▪ RHCP & LHCP with single X-Band carrier

SUBSYSTEM	FEATURES
Data Handling System	<ul style="list-style-type: none">• Varying Payload data rate• Real time, Record, Stretch , Real time + Record, Playback
Solid State Recorder	<ul style="list-style-type: none">• 300 GB total capacity• Nominally 2 partitions –150 GB each• 32 file IDs• Record Time (For 44 Mbps \approx 57 min, 739 Mbps \approx 4 min)• PB time for 150 Gb is \sim 8 min
Thermal	<ul style="list-style-type: none">• 133 Heaters• 253 Temp Sensors

RISAT-1 STATUS

Routine Operations

- Daily P/L Ops → 3 or 4 per day (FRS-1, FRS-2, MRS & CRS)
- SPS-PB collection over SAN visibility
- DSS Offset & window times uplink
- SADA Profile uplink (Amp & Phase 26.09,-0.17)
- Eclipse Entry/Exit times uplink
- NIE orbit coeffs for Background Propagator(BP) update
- Orbit Maneuver for Frozen Perigee and track maintenance

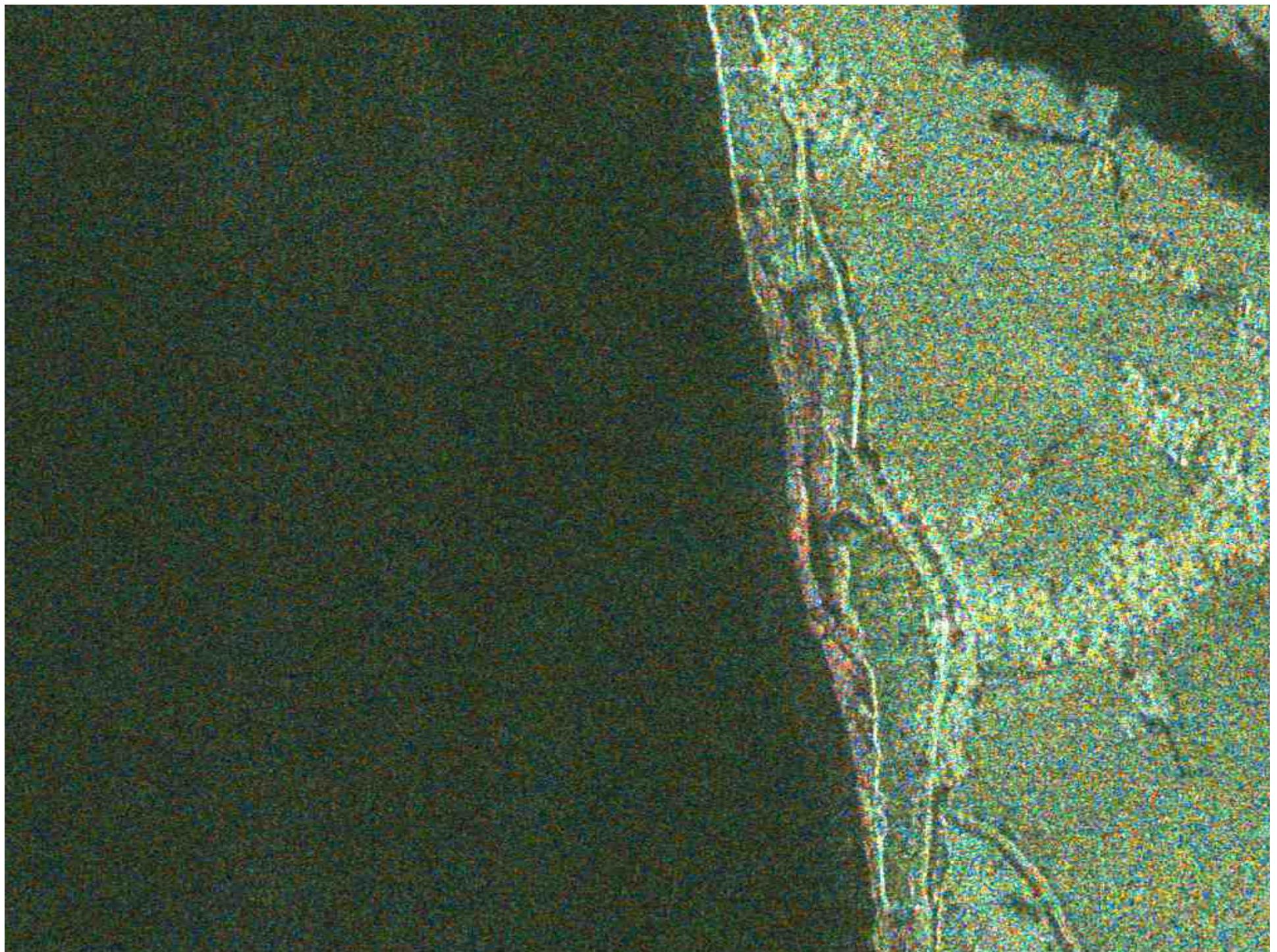
Planned Operations

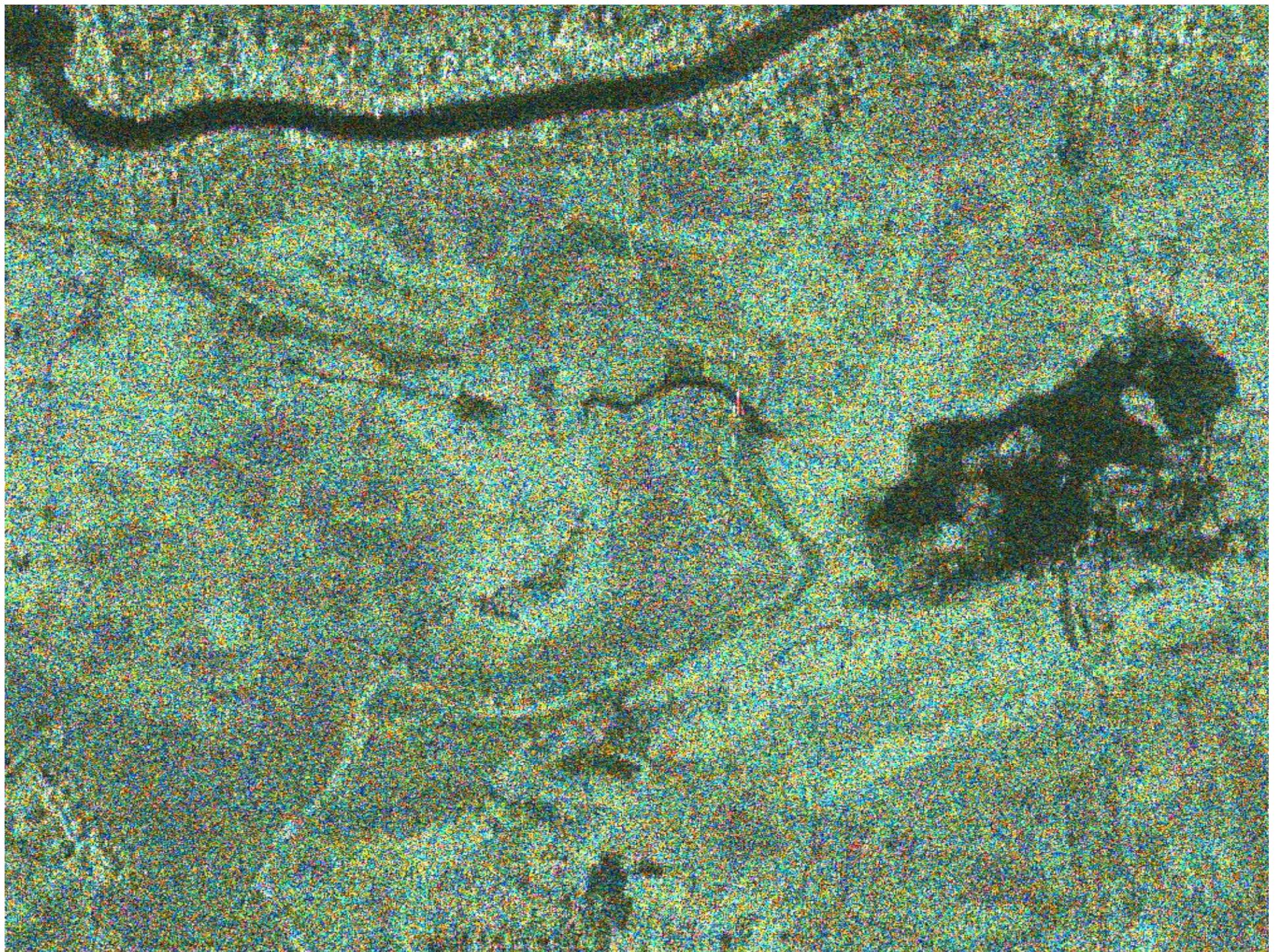
- AMAZON Forest imaging with all beams
(4°S – 9°S Latitude & 55°W – 66°W Longitude)

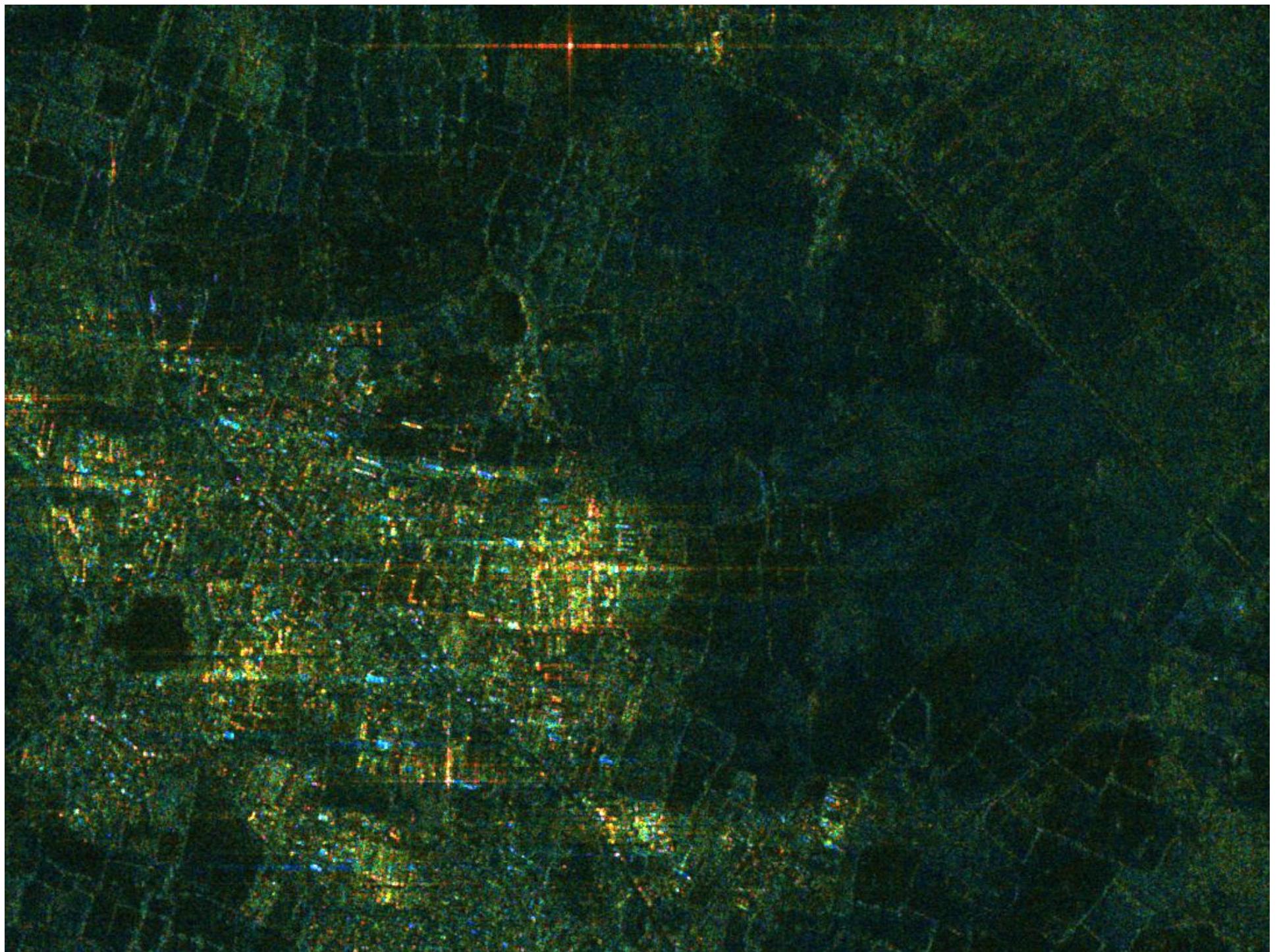
Right Look (60 beams H pol; 60 beams V pol)

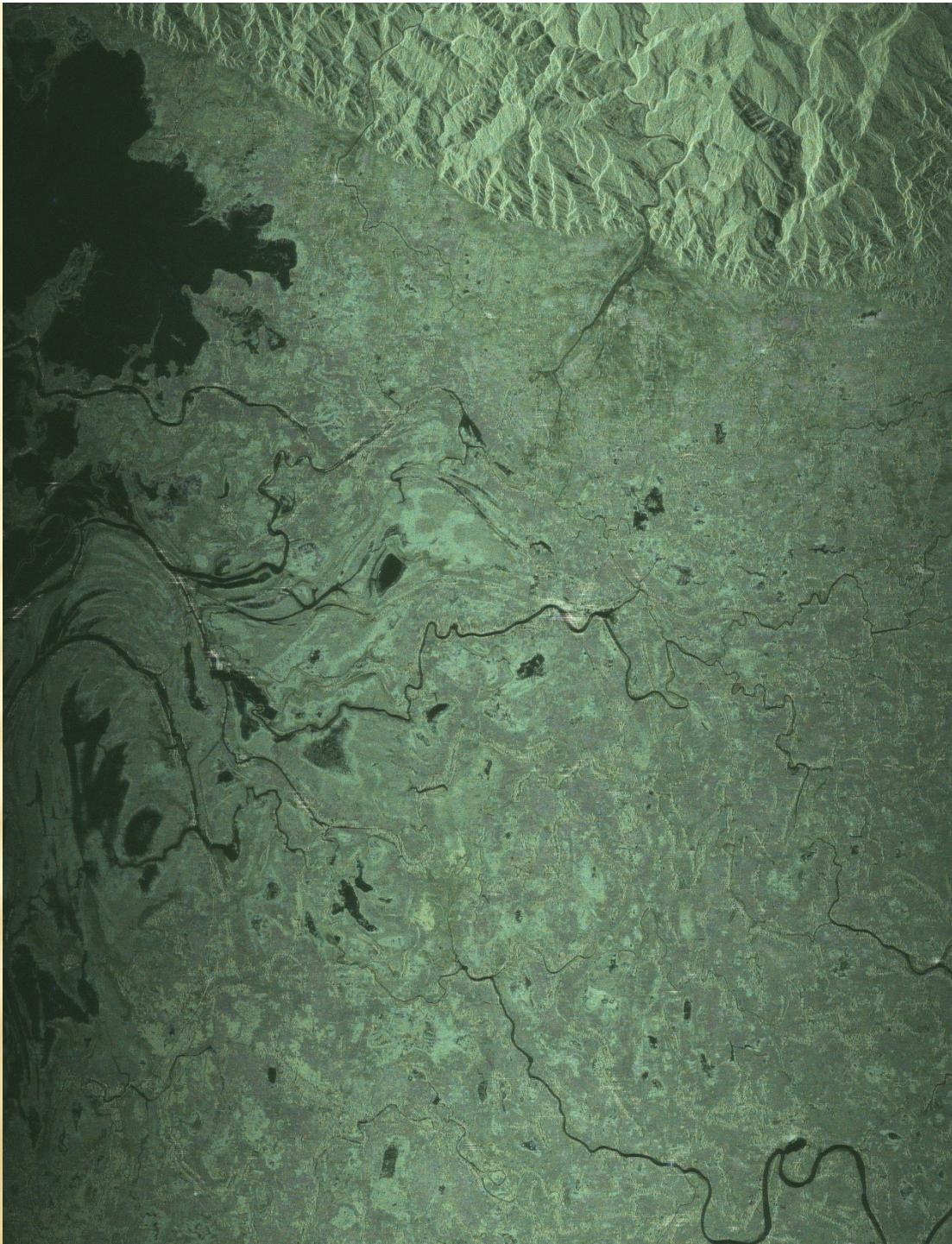
Left Look (60 beams H pol; 60 beams V pol)

- HRS Mode of imaging

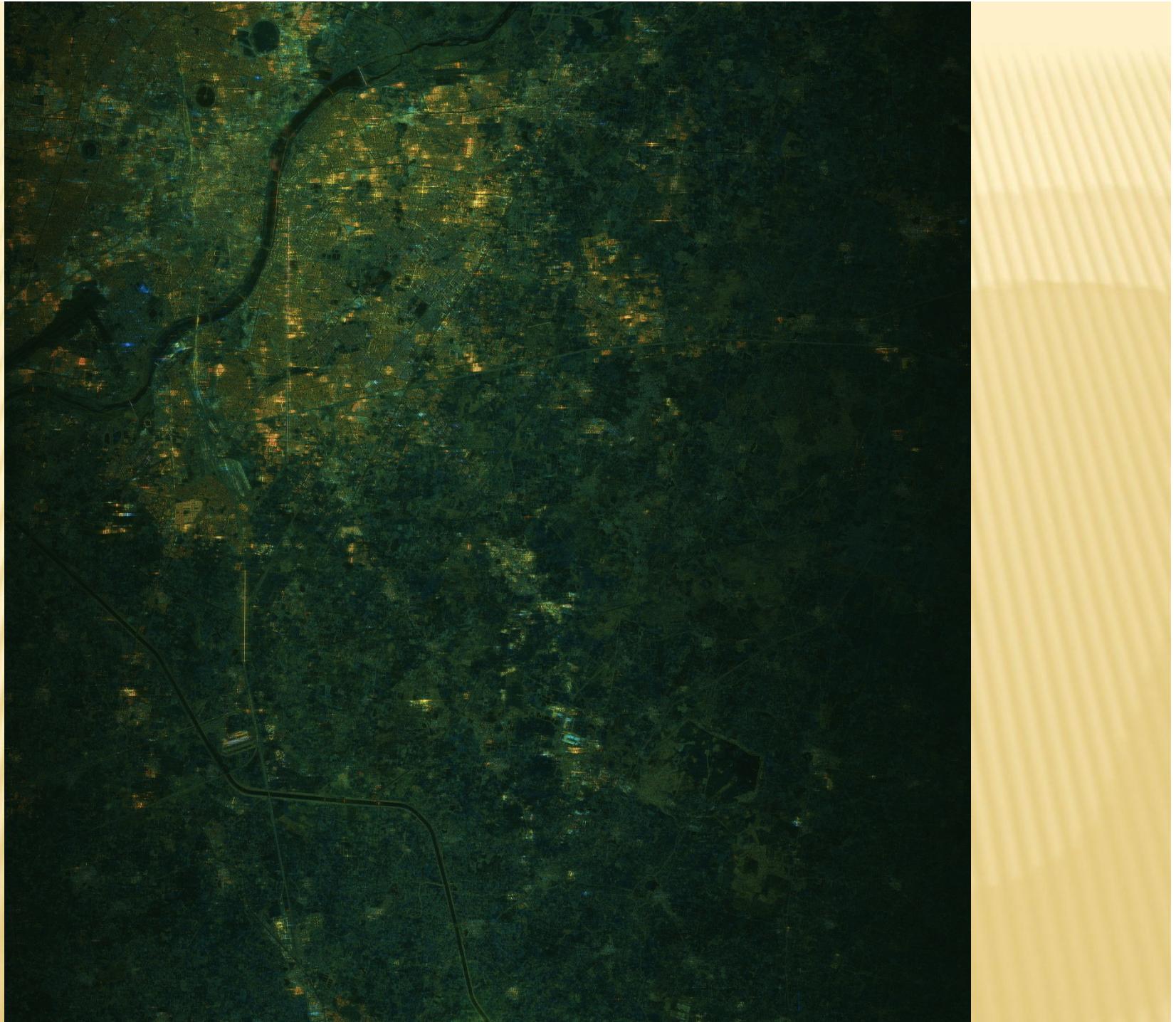


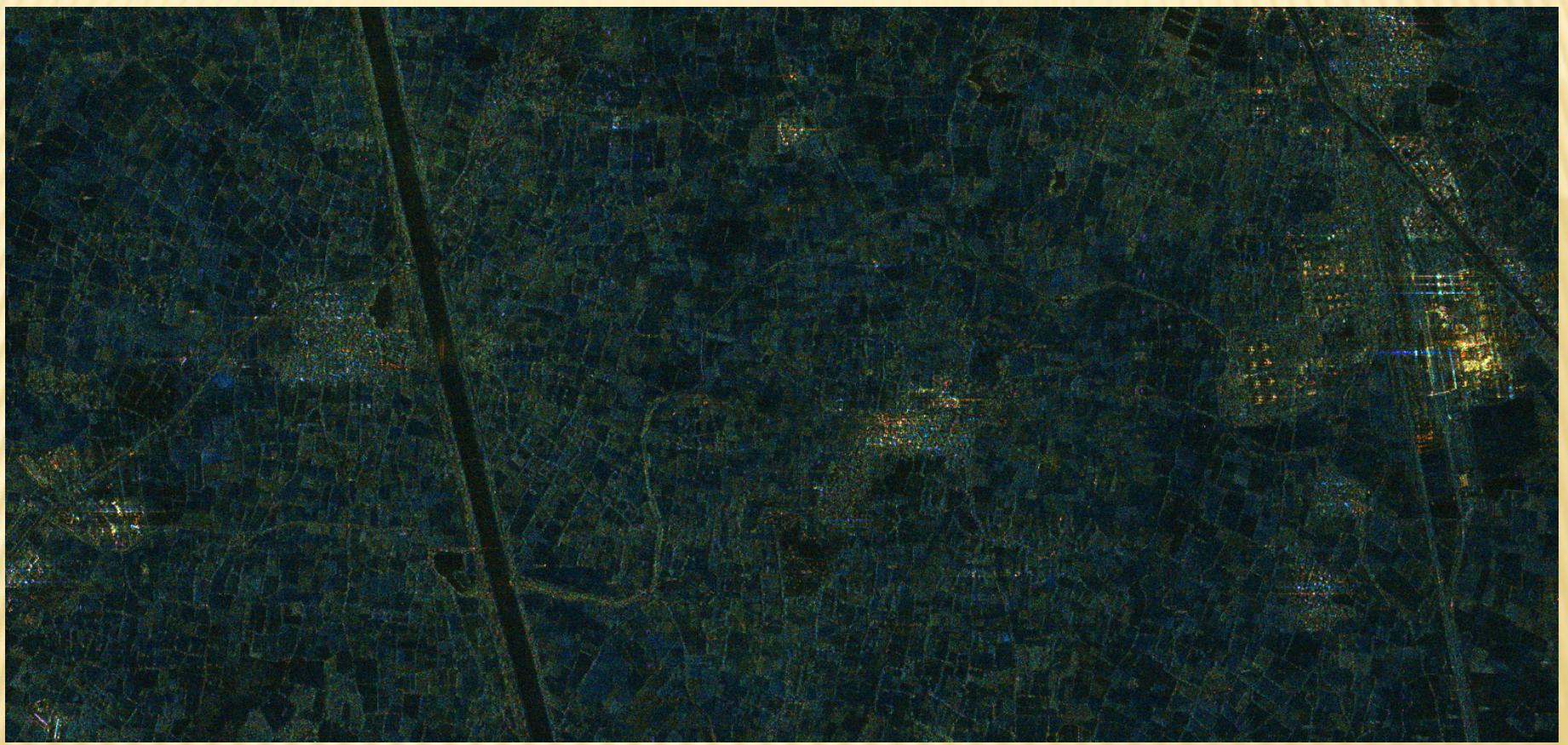












Thank you