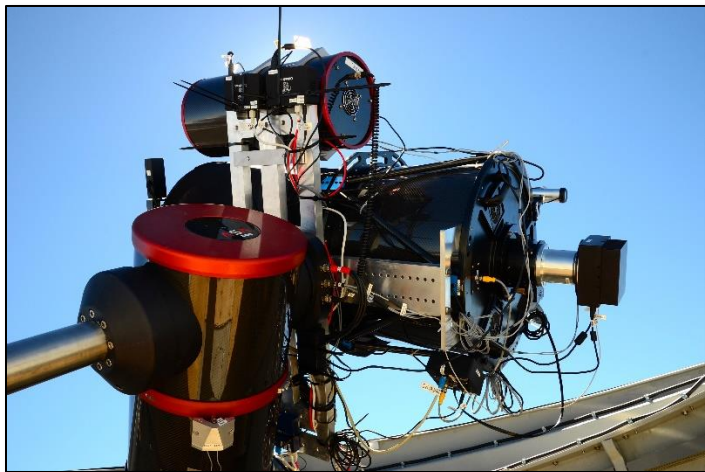


# STATUS REPORT IADC WG1 – DLR

Hauke Fiedler  
GSOC – German Space Operations Center  
Bengaluru, April 2024



# Sensors: Optical I



Location	South Africa
Aperture	50cm / 20cm
Focal Length	3420mm / 590mm
Sensor	CCD / CCD
Field of View	0.6°x0.6° / 3.5°x3.5°
Operational	89,3%



Location	Australia
Aperture	50cm / 25cm
Focal Length	3420mm / 900mm
Sensor	CCD / CCD
Field of View	0.6°x0.6° / 2.3°x2.3°
Operational	98,1%



Location	Chile
Aperture	50cm / 25cm
Focal Length	3420mm / 900mm
Sensor	CCD / CCD
Field of View	0.6°x0.6° / 2.3°x2.3°
Operational	26.02.2024



# Sensors: Optical II



Location	Stuttgart
Aperture	20 cm
Focal Length	560 mm
Sensor	sCMOS
Field of View	0.92° × 0.69°
Operational	On demand



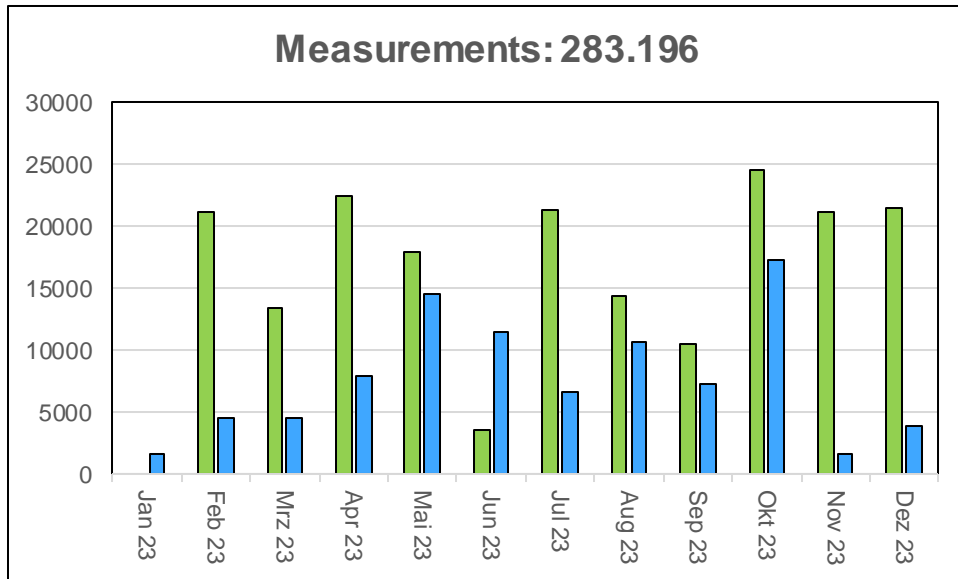
Location	Munich
Aperture	10 cm
Focal Length	200 mm
Sensor	CCD
Field of View	10.4° × 10.4°
Operational	On demand



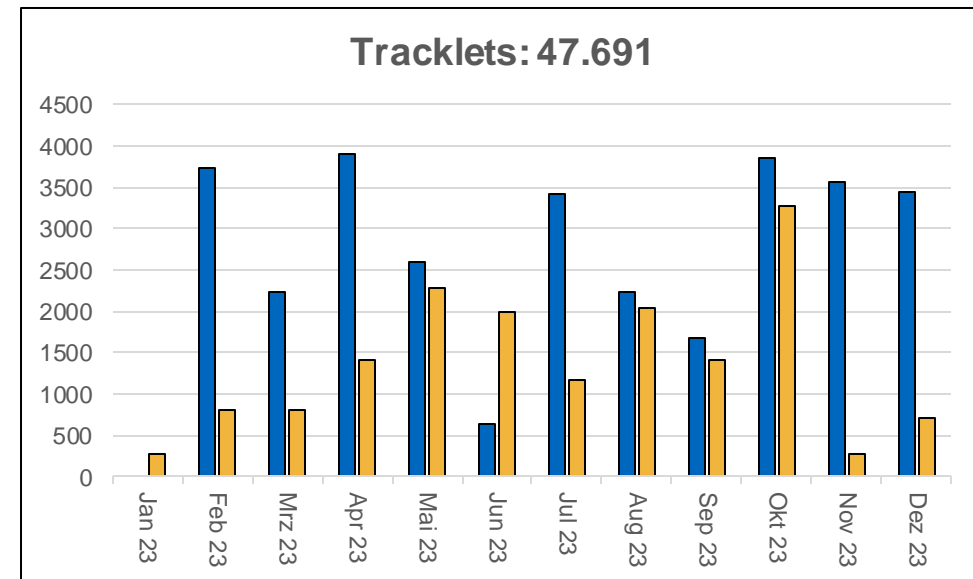
Location	Stuttgart
Aperture	7.5 cm
Focal Length	105 mm
Sensor	sCMOS
Field of View	19.8° × 19.8°
Operational	Fall 2024

# Measurements 2023

## South Africa and Australia



## South Africa and Australia



**Successful correlation of tracklets to 2.170 unique objects**

miniSLR and APPARILLO:

- research instrument
- data on request
- Network operations of APPARILLO in preparation

# Software, Calibration, and Processing



## Software

- SMARTies (telescope operations: fully operational)
- SMARTware (autonomous operation of station: fully operational)
- SMARTpro (processing of images: in development)
- softApp (APPARILLO operational software)

## Calibration

- Time offset for RA / DEC measurements on a monthly base
- Dark
- Flat
- Bias
- Rolling Shutter (in development)

## Processing with BACARDI

- Tracklet correlation
- Orbit determination
- Orbit refinement
- Manoeuvre detection

# Satellite Operations



## LEO:

TerraSAR  
TanDEM-X  
Grace FO1,2  
EnMAP  
CubeL  
BIROS  
EuCROPIS  
BIRD

## MEO:

28 Galileo

## GEO:

SATCOMBw-1  
SATCOMBw-2  
EDRS-C

## Uni-support (LEO)

AISAT  
FLYING-LAPTOP  
EIVE

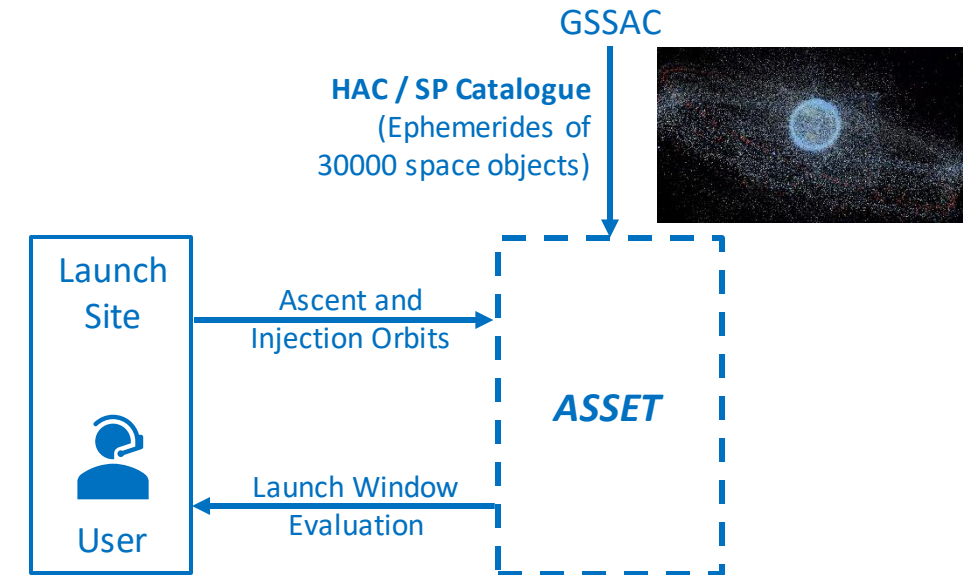
DLR	LEO 2023	MEO 2023	GEO 2023
Monitored Spacecraft	12	28	3
CDM managed	858.743	34	883
Conjunctions	9.317	3	21
Avoidance Manoeuvres	4	0	0



# ASSET (Ascending Safety)

ASSET (AScent SafeTy), developed by GSOC Flight Dynamics, provides an assessment on the safety of launch trajectories in terms of probability of collision with orbiting objects:

- Analysis of the rocket trajectory and injected satellite orbits within the launch window
  - Estimation of probability of collision with resident objects (active/inactive satellites, debris, etc.)
- Decision support for the launch provider in terms of launch windows' closures, estimated risk of collision and mitigation actions + collision avoidance operations in early orbit phase
- Integration of ASSET in the launch segment

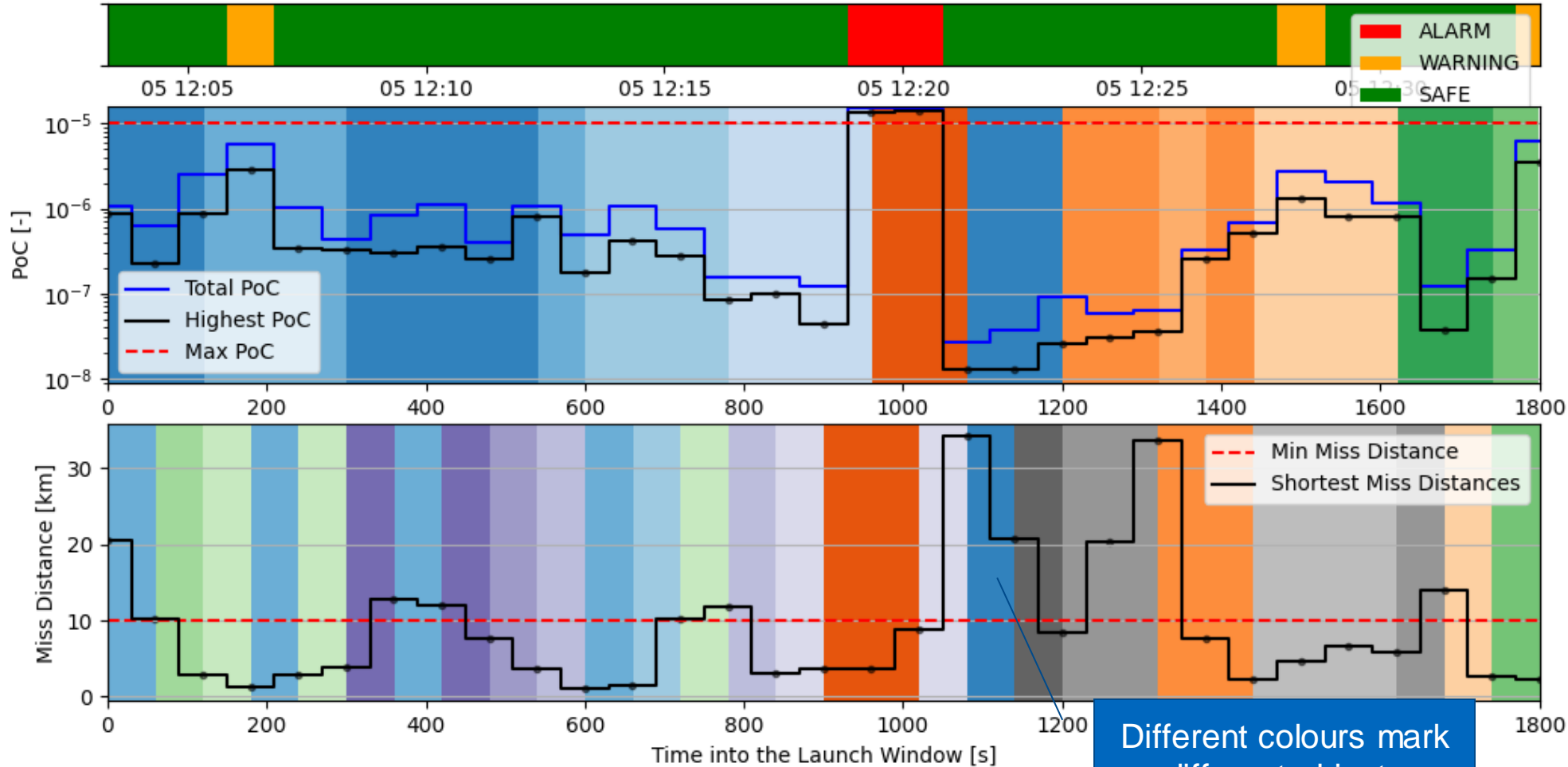


# ASSET (Ascending Safety)



Example scenario:

- Rocket launch to 500 km SSO orbit
- Starlink mega-constellation operational altitude 550 km (lower when decaying)
- Max PoC =  $1e-5$
- Result → launch window closures (red segments, top plot) due to **high risk of collision**





# Standardization Activities



- ISO TC20 SC14 Space Systems and Operations
  - WG 1 Design Engineering and Production
  - WG 2 System requirements, verification and validation, interfaces, integration, and test
  - WG 3 Operations and Support Systems
  - WG 4 Space Environment (natural and artificial)
  - WG 5 Space System Program Management and Quality
  - WG 6 Materials and processes
  - WG 7 Orbital Debris Working Group
- ISO TC172 SC9
  - WG 1 "Terminology and test methods for electro-optical systems"
- ISO 9490 STC
- ECSS STM (Mirror Working Group)
- CCSDS TDM