

# GUVI Operational Concept

B. S. Ogorzalek

JHU/APL

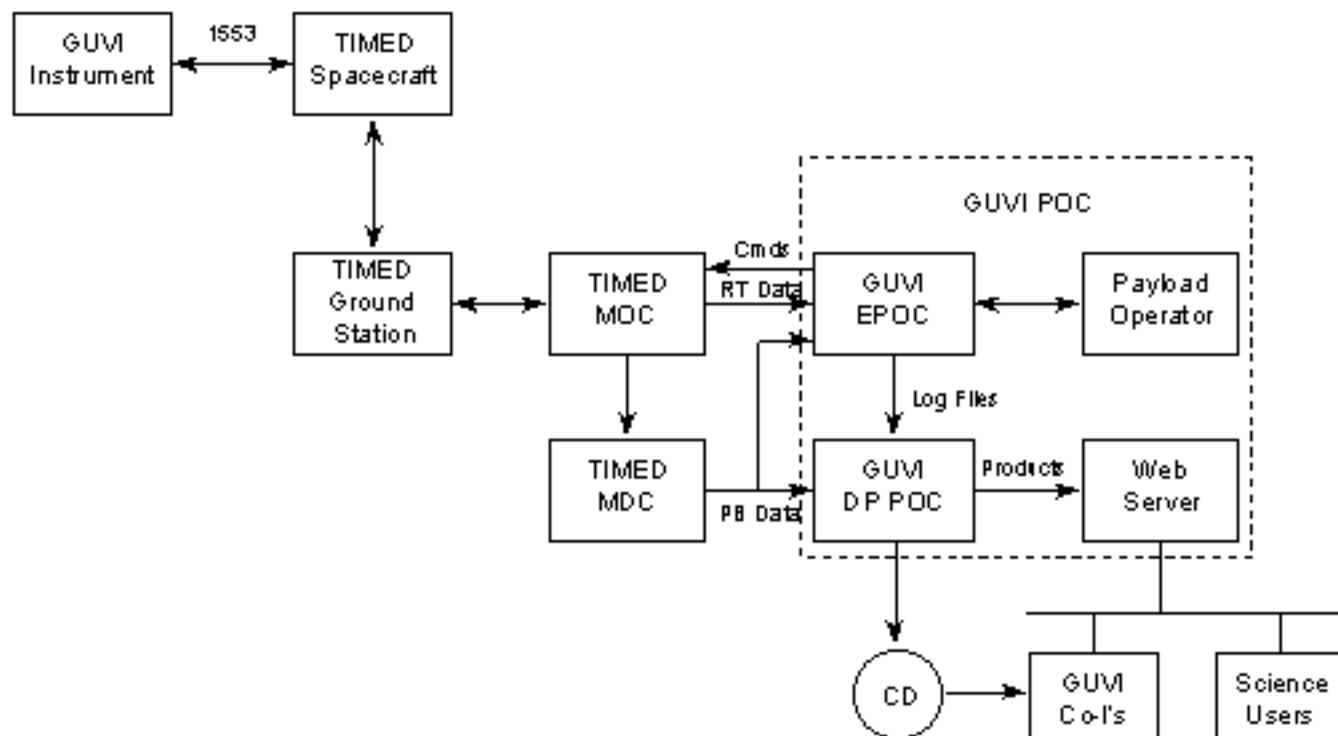
# Operational Concept Overview

- Operational Requirements
- System Overview
  - Flight Instrument
  - POC
- Operational Environment
- Operational Scenarios

# Operational Requirements

- Instrument is commanded from POC
- Instrument stores time tagged commands
- One command upload per day
- POC evaluates instrument performance
- POC produces data products
- One data download per day

# GUVI SYSTEM BLOCK DIAGRAM



# Flight Instrument Modes

- Maintenance
  - memory uploads and maintenance
  - entered at instrument power on
- Test
  - detector performance test
  - quick pulse height distribution

# Flight Instrument Modes

- Imaging
  - horizon to horizon scan at 5 colors
  - main operating mode
- Spectrograph
  - fixed viewing angle / all wavelengths
  - calibration mode

# Special Events

- Sun Event
  - high voltage off
  - scan motor stowed
  - wait in safe mode until command received
- Yaw Maneuver
  - high voltage off
  - scan motor stowed
  - wait in safe mode until end of yaw maneuver message received

# Special Events

- Solar Panel Maneuver
  - no change in operating mode
  - mark data with solar panel maneuver flag
- Terminator Crossing
  - no change in operating mode
  - mark data with terminator crossing flag



# Special Events

- Safe Message from Spacecraft
  - high voltage off
  - scan motor stowed
- Loss of 1553 Heartbeat
  - cycle main power once
  - if no response, then keep power off
- Out of Limit Current/Temperature Monitors
  - action TBD

# GUVI Engineering POC

- Functions
  - Commanding
  - Health, Status, and Trending
- Autonomous Operation
  - Poll MDC for new telemetry data
  - Critical alarms will generate phone page

# GUVI Data Processing POC

- Functions
  - Data Product Generation
  - Data Access and Distribution
- Autonomous Operation
  - Poll MDC for new telemetry data
  - Web Server

# POC Interfaces

- Instrument commands from EPOC to MOC
- Command verification from MOC to EPOC
- Real time telemetry from MOC to EPOC
- Playback data from MDC to EPOC and DP POC
- Support data from MDC to DP POC
- Log files from EPOC to DP POC
- DP POC web server to users

# Operational Environment

- POC Hardware
  - EPOC: Macintosh with UPS
  - DP POC: Sun Ultra (2)
- Backup
  - EPOC: Spare Macintosh available
  - DP POC: Will repair hardware as needed

# Operational Environment

- Security
  - Command authentication
  - Commanding protected from network access
- Personnel
  - Continuous staffing not required
  - EPOC: Two payload operators desired
  - DP POC: Two DP operators desired

# Operational Scenarios

- Routine Commanding
- Routine Engineering Data Processing
- Routine Science Data Processing
- On-Orbit Calibration
- Early Orbit
- Anomalies

# Routine Commanding

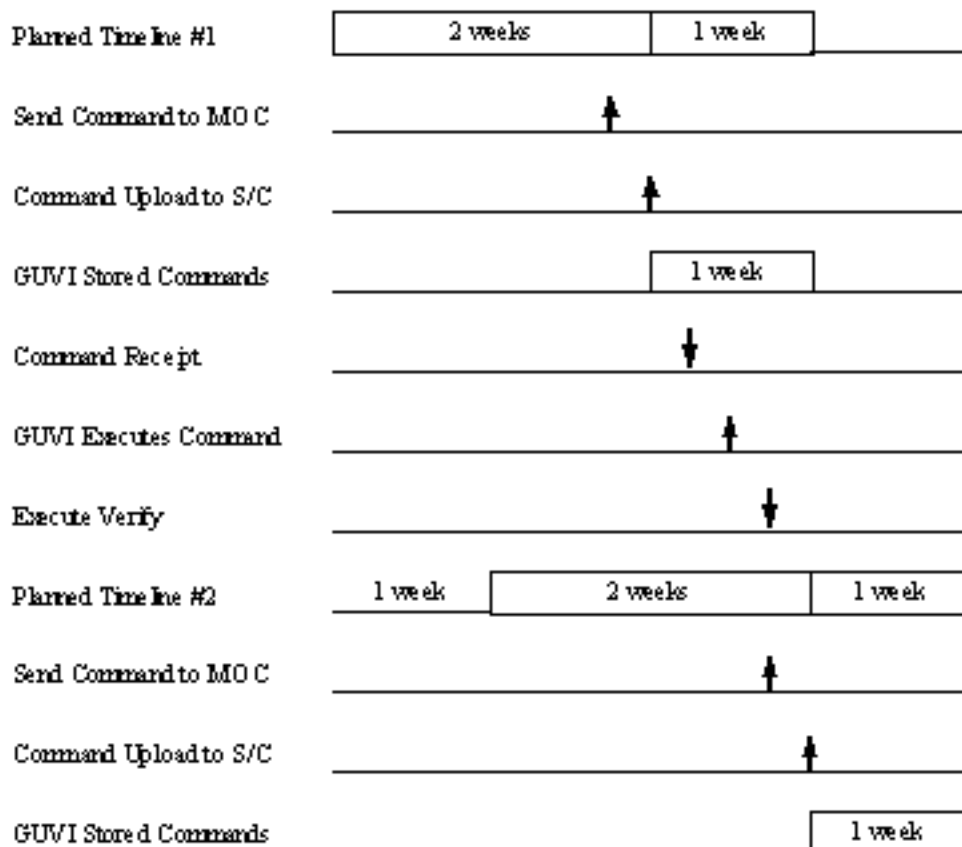
- GUVI PI will originate or approve all GUVI mode changes
- GUVI Payload operations manager will implement mode changes into command file
- Commands will be uploaded once per week for all mode changes planned for that week
- Command upload will typically consist of less than 20 GUVI commands
- Only regularly scheduled mode change will be to transition from imaging mode to calibration mode once per month



# Commanding Timeline

- Planned timeline available
  - Two weeks before desired upload time
- Send command packet to MOC
  - At least one day prior to desired upload time
- Command receipt verified
  - One day after command upload
- GUVI executes command
- Command execution verified
  - One day after execution
- Process repeated every 7 days

## Commanding Timeline



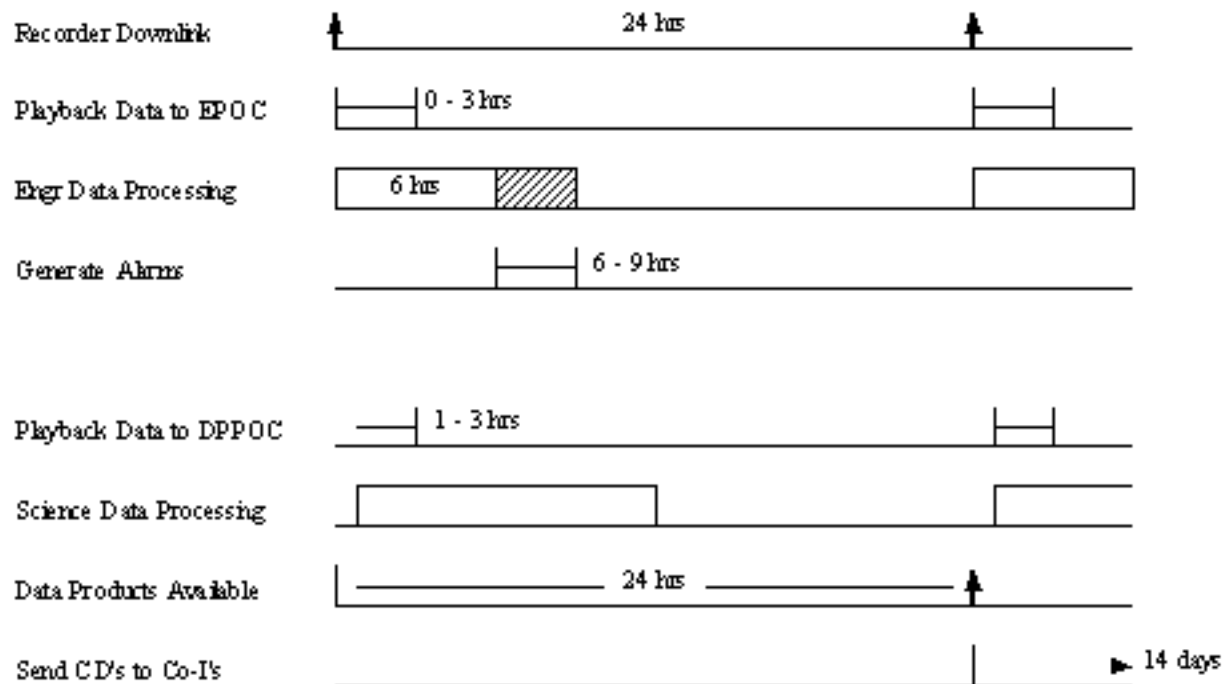
# Routine Engineering Processing

- EPOC polls MDC for new data
  - continuous
- Recorder data downlinked to MOC
  - once per day
- Playback data available for POC
  - 0 to 3 hours after downlink
- Engineering data processing complete
  - 6 to 9 hours after downlink
- Alarms generated
  - 6 to 9 hours after downlink
- Process repeated every 24 hours

# Routine Science Data Processing

- DPPOC polls MDC for new data
  - continuous
- Recorder data downlinked to MOC
  - once per day
- Playback data available for POC
  - 1 to 3 hours after downlink
- Data products available on web server
  - 24 hours after downlink
- Data products CD mailed to Co-I's
  - 14 days after products available
- Process repeated every 24 hours

## Data Processing Timeline



# On-Orbit Calibration

- Calibration to be performed once per month
- Calibration mode duration is 5 minutes per orbit for 3 to 5 orbits
- Calibration Sequence
  - At predetermined time, switch to spectrograph mode with scan mirror pointing at star, do for active detector only
  - After 5 minutes, return to imaging mode
  - Repeat for 3 to 5 consecutive orbits
- Time tagged commands to control sequence of events

# Early Orbit Operations

- Phase 1: Before SIS Cover Opened
  - Perform test of processor communications, SIS mechanisms, and detector dark count
- May take about 4 passes to complete tests
- Assume 8 minutes per pass
- Will power on instrument only during pass

# Early Orbit Operations

- Open SIS cover at launch + 14 days
  - Instrument power must be on when pyros fired
- Phase 2: After SIS Cover Opened
  - Test scan motor, detector response to airglow, imaging mode operation, star calibration
  - May take about 10 passes to complete tests
- Instrument ready for normal operations after phase 2 testing completed



# On-Orbit Anomalies

- EPOC will detect out of limit parameters
- Sun event should only occur if spacecraft attitude were anomalous
- GUVI payload operations manager responsible for evaluating anomalous condition and generating plan of action
- Instrument contains redundant detectors and motor drive circuits if needed