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20190220

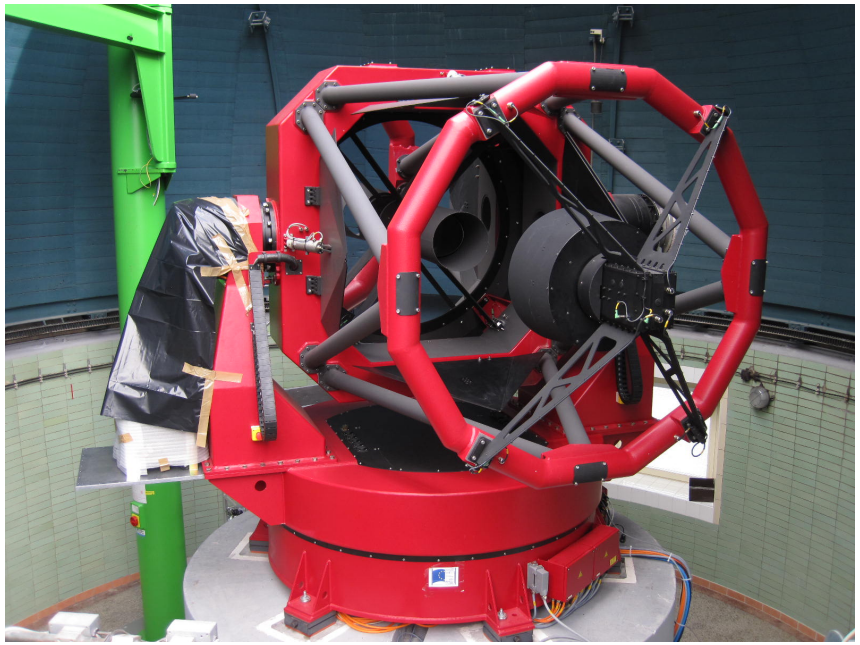
Remote observations at Skalnaté Pleso:

concept, current status

Remote observations at Skalnaté Pleso: concept, current status

Telescope

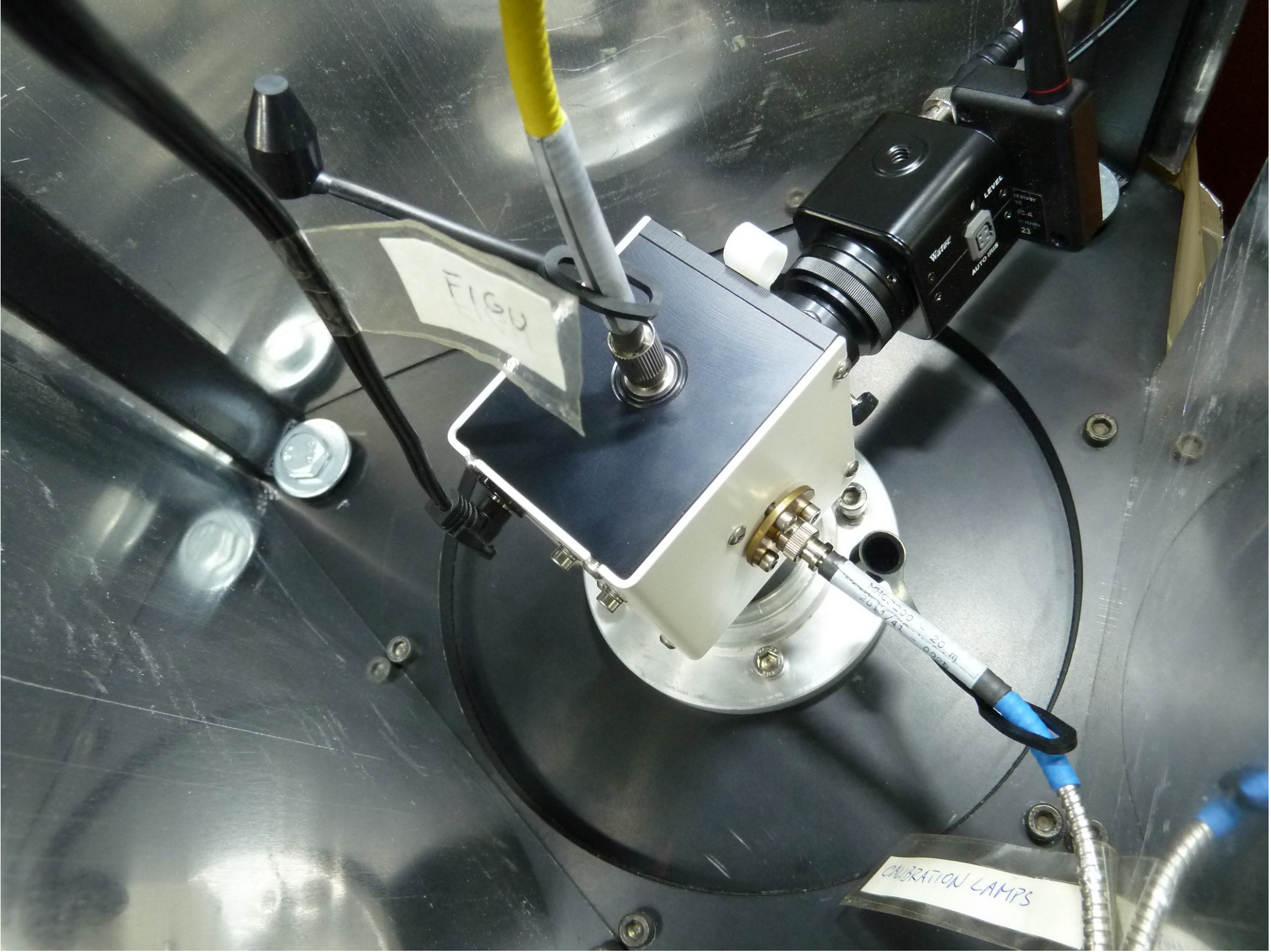
- Astelco http://www.astelco.com/
- spring 2014
- Aperture: 1300mm
- Focal length: 10400mm
- Alt-Az mount (something new!)
- two Nasmyth focuses/ports: N1, N2
  - N1 - spectroscopy
  - N2 - CCD (CMOS) photometry: FilterWhell+Shutter, CCD/CMOS cameras

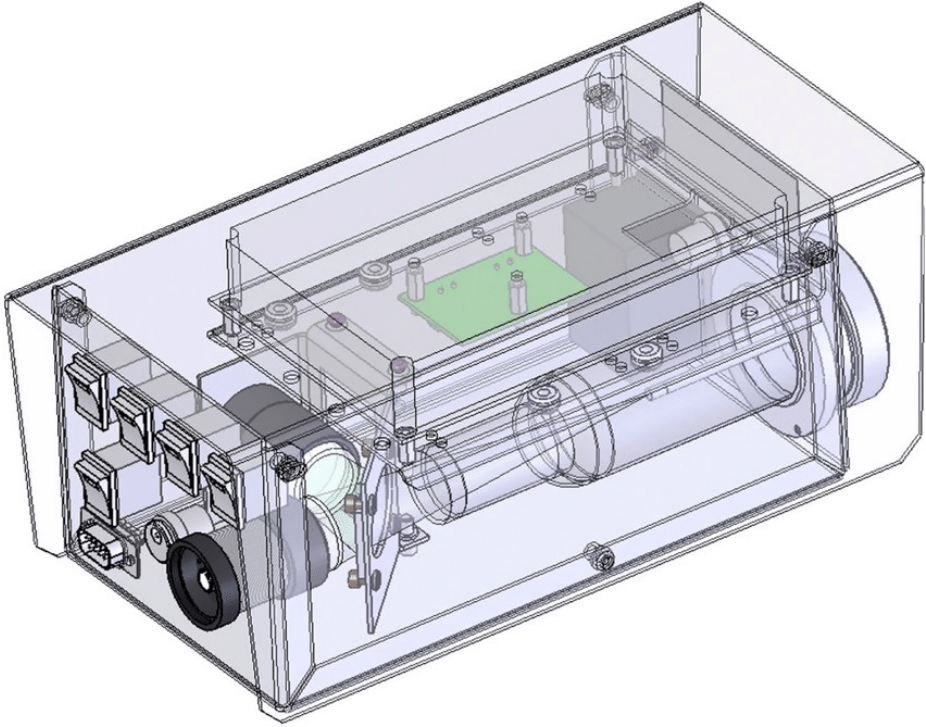


Devices:

- spectrograph: https://www.shelyak.com/description-eshel/?lang=en
  - Shelyak MuSiCoS, echelle
  - 50 µm optical fiber (calibration, telescope)
  - parabolic colimator (D=100, f=400)
  - echelle grating - 31.6 gr/mm, blaze 64deg
  - prism (crossdiperzer)
  - teleobjective Canon 400mm f/2.8
  - FIGU (Fiber Injection & Guiding Unit)
  - CU (Calibration Unit)
    - Thorium-Argon lamp with high voltage power supply for precise calibration
    - flat lamp for echelle order geometry and blaze processing
    - electronic to control remotely calibration frame acquisition
  - CCD Andor iKon L936
    - pixel size: 13.5 µm
    - image size: 2048 x 2048
    - sensor size: 27.6 x 27.6 mm
    - binning: 1x1
  - Parameters:
    - 4200-7375 A
    - 57 spectral orders
    - spectral resolution: 4200 A (R = 18500), 4900 A (34200), 7250 A (23500)
    - SNR 4230 A (SNR=43), 5000 A (90), 6000 A (70), 7040 (55)

ANDOR


FIGU
LEVEL
AUTO IRIS
CALIBRATION LAMPS



mA
OFF
HCL POWER SUPPLY
WWW.SHELYAK.COM
Mirror
Flat
Thorium
On
Guiding unit
PF0006 Guiding Unit
S/N 5H-117

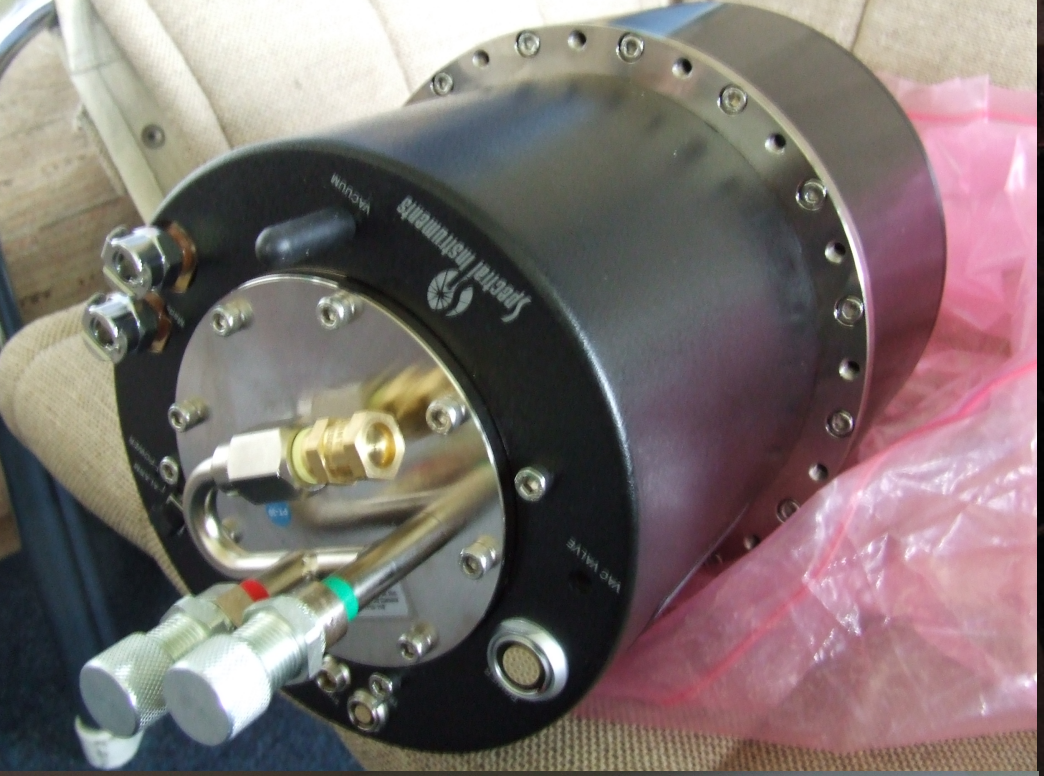
Devices:

- CCD ARC 4Kx4K
  - http://www.astro-cam.com/
  - chip STA4150A http://www.sta-inc.net/sta4150/
  - Pixel size: 15 µm
  - Image size: 4096 x 4096
  - Sensor size: 61.44 x 61.44mm
  - Binning: 2x2
  - FOV: 20.31' x 20.31'
  - Resolution: 0.59"/pixel
  - Area: 0.11 sq°

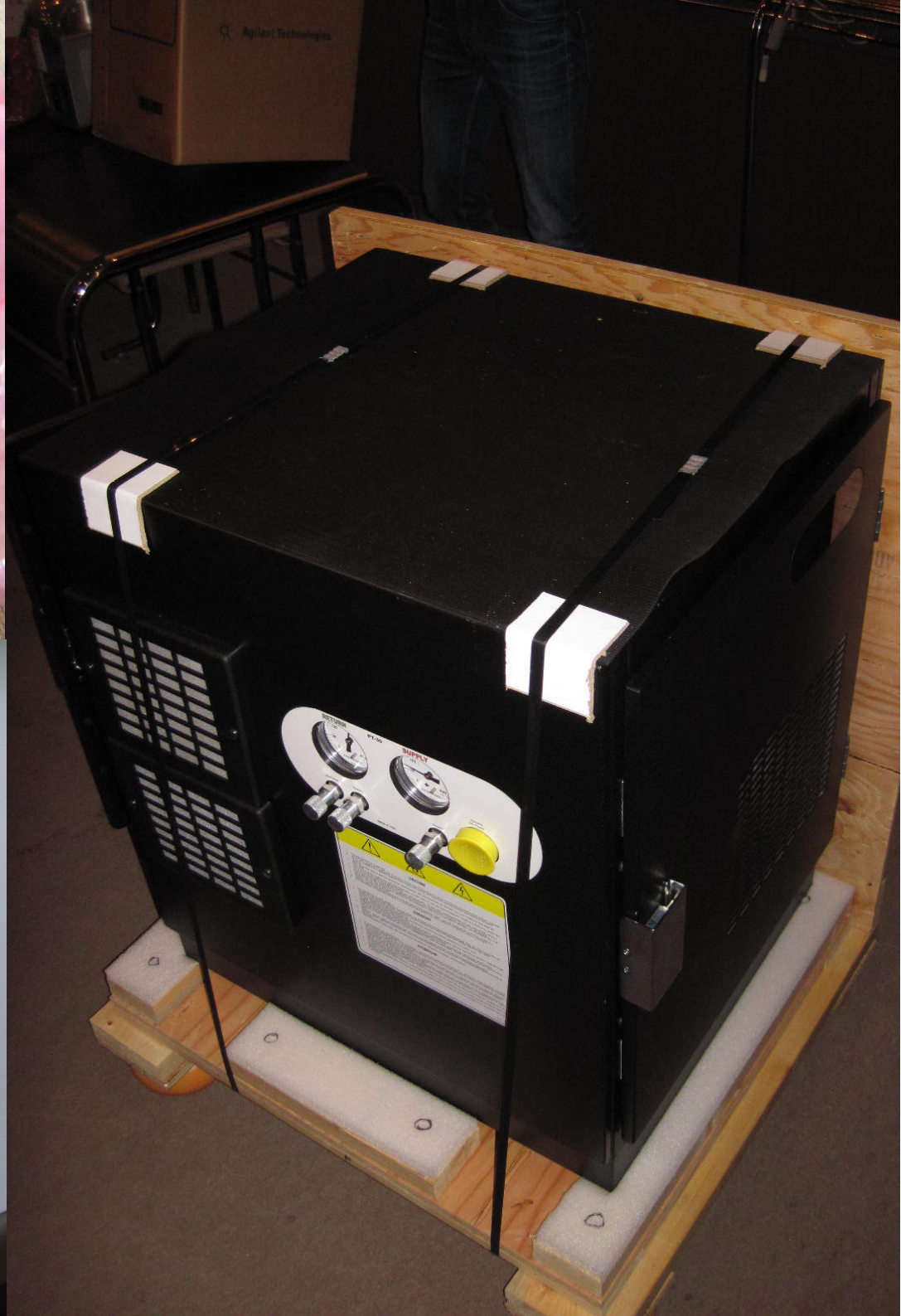
- CCD Spectral Instruments – SI: (MPH) 10Kx10K
  - http://www.specinst.com/

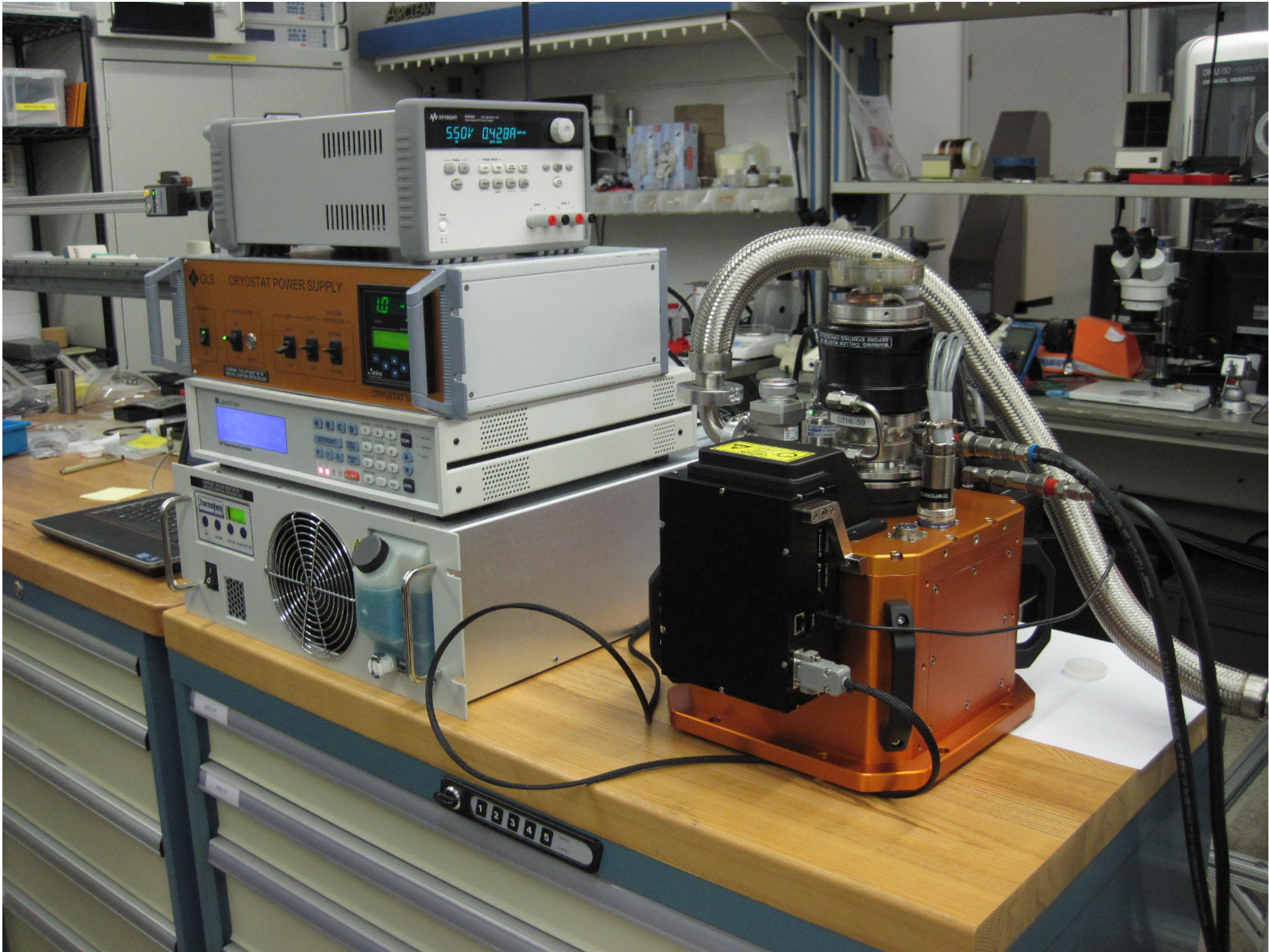
- CMOS H2RG NIR
  - GLSci/Teledyne
  - chip Hg-Cd-Te
  - 70K
  - 1 filter J 1220 nm, K 2190 nm
  - no cryogenic filterwheel

Zákaz pracovat
na živých částech
pod napětím !


Spectra Instruments
VACUUM
VAC VALVE

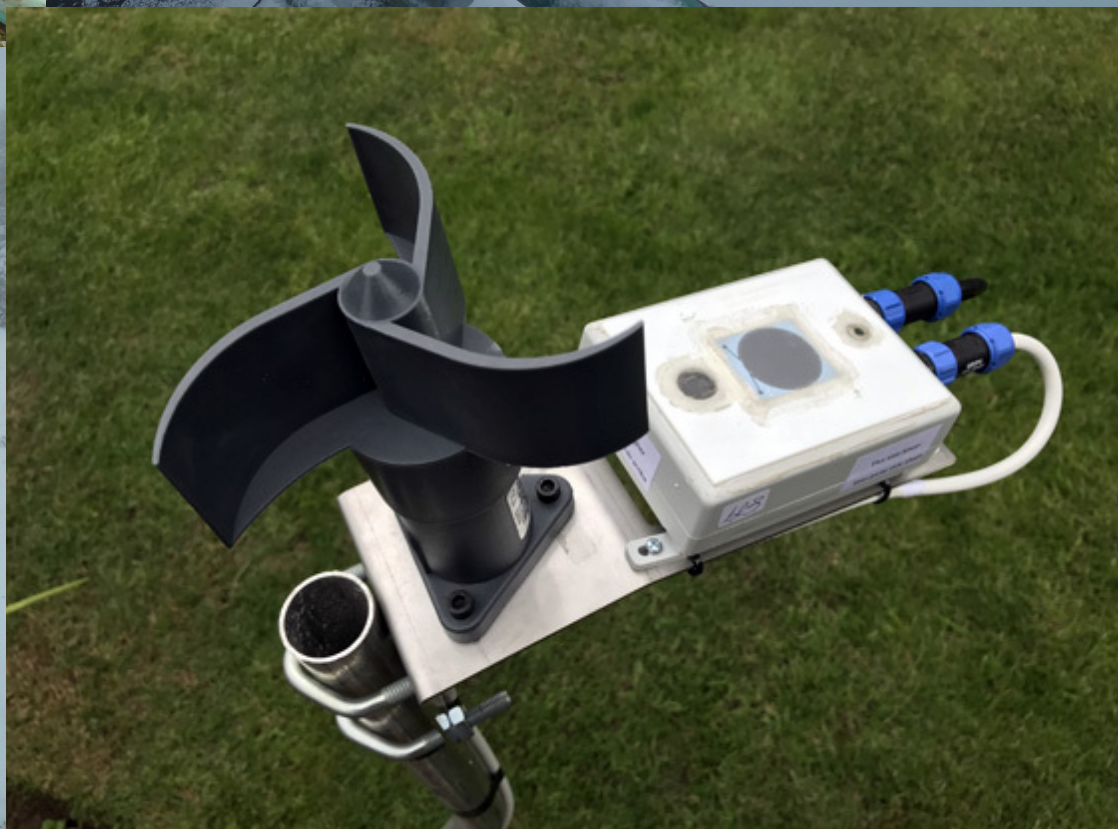
Avago
4174 C
U16
3816 A
U4


Agilent Technologies


CRYOSTAT POWER SUPPLY

Devices:

- water cooling for Andor iKon L936
  - -80degC vs. -100degC
  - price: 700€ vs. 3000US$ - tichepc.sk
- vacuum pump: AgilentTurbo 969-9180
- sensors (temperature, pressure, humidity, skytemperature/clouds, brightness, wind, rain)
- power plugs
  - EnerGenie Programmable power strip with LAN interface (EG-PM2-LAN)
  - https://energenie.com/item.aspx?id=7557
  - http://stopowerspspectrograph.ta3.sk/
- UPS: stabilized voltage, backup
- relays: USB, GPIO, …
- generator: backup power supply - emergency power system
- power source: US 120V/60Hz

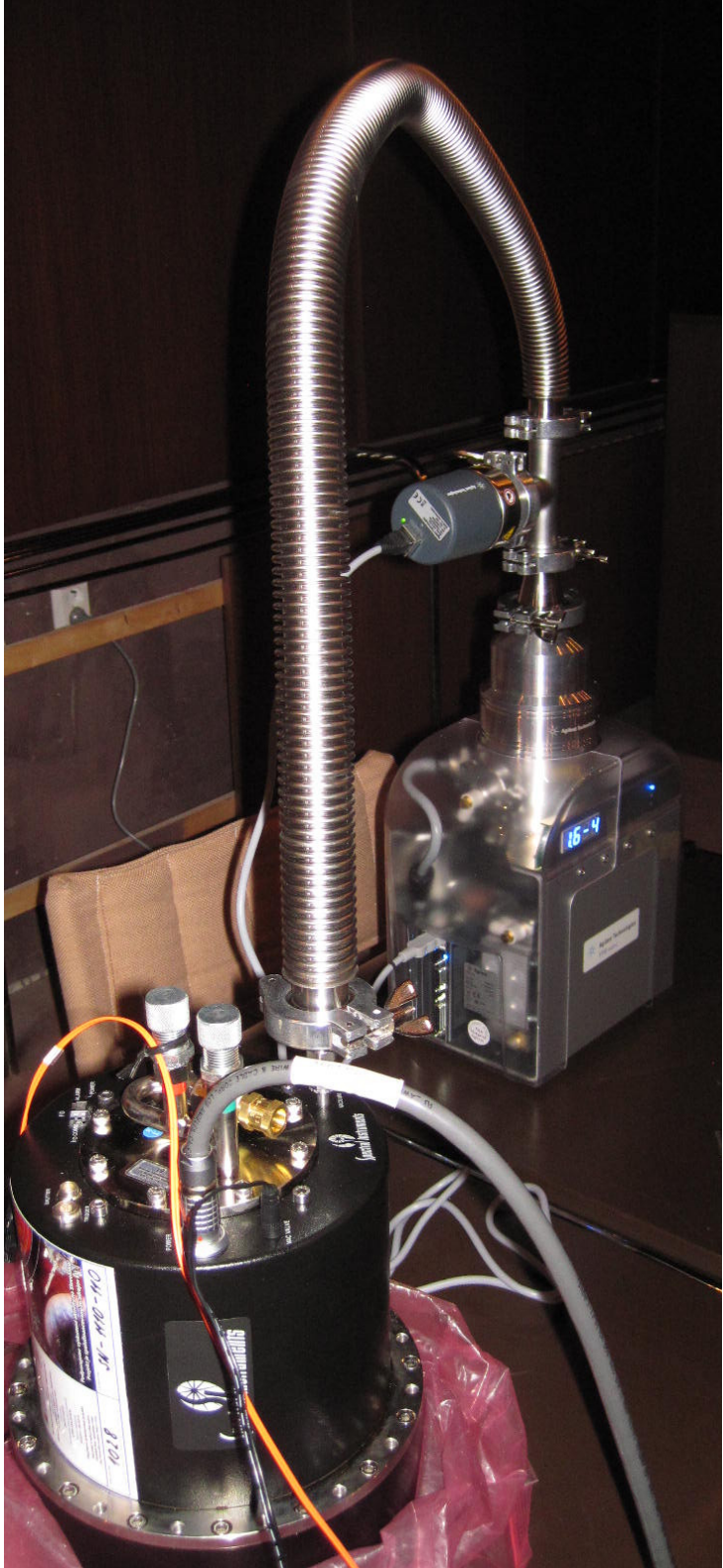


energenie
POWER MANAGER LR1

FOSCAM

www.endress-generator.com

eye SYS Mini-IMG
OPTIONAL
Mini-IMG Active Gauge Kit is Available for the Mini-Task AG81 on this site
2.3-8
VARIAN
VACUUM TECHNOLOGIES
Mini-TASK
AG81



Devices:

- Raspberry PI: cheap, 5V power supply
  - GPIO - General Purpose Input Output
    - 5V (TTL)
    - 3.3V (CMOS logic levels)
    - GND
    - PWM (Pulse-Width Modulation)
    - UART - RXD, TXD - RS232
  - typical use: remote (via TCP/IP - ethernet) Watec CCD@FIGU: mirror, exposure time, gain
  - http://wiringpi.com/

- Zotac PC:
  - minicomputer, SBC (Single Board Computer)
  - fanless
  - SSD
  - minimal heating
  - Intel vs ARM CPU
  - LAN: 1Gbps

HDMI
EDAC
1523
ETHERNET

ZOTAC
Antenna
USB3.0
USB2.0
HDMI
DP
DCIN

DISPLAY
HDMI

Devices: PROBLEMS

- cryocoolers: hoses torsion - derotator
- condensed water on CCD entrance window:
  - blow nitrogen gas over the window, at a small flow rate
  - install a wire heater around the perimeter of the window (anti-dew-heater)
- reverse logics of the ACE FW shutter: 0-5V
- interfaces/connectors: USB, no ethernet: distance
- relay board in Shelyak CU - does not report state (On/Off)
- US 120V/60Hz vs. EU 230V/50Hz, US plugs
- screws: imperial vs. metric
- place for cables, fibers inside the telescope - missing ducts and/or microducts
- lack of documentation (e.g. Astelco ADAM)

Observations: new software

MOTIVATION/OBJECTIVES:

- image acquisition: astronomy is an "image science" - the observations are mostly about "taking pictures"
- various software:
  - MaxImDL (Win),
  - ekos/kstars (linux),
  - owl (java - platform independent)
  - Spectral Instruments

  ---> not effective, too many to handle
- no usable software for some new devices:
  - ARC CCD: owl (java) - no FW, etc..
  - ACE FW: very simple ASCOM driver
- hard to integrate new devices, various manufacturers
- some hardware delivered with just API (Application Programming Interface)
  - ARC: API - C++, java
  - ACE: RS232 communication, protocol description
- integration of a localy manufactured hardware
- distributed: dedicated computers to handle one device, typically close to it, interconnected via TCP/IP. Easier to find an error (?)

- observations: automatic vs. remote - dome doors, snow, ...

Observations: new software

INDI/INDIGO vs. ASCOM - ekos vs. MaxImDL:

- ASCOM:
  - all your devices need to be connected to a single Windows host
  - not open: standards are set by two HW producers

- INDI/INDIGO
  - Instrument Neutral Distributed Interface
  - device described in abstract entities
  - https://indilib.org/
  - http://www.indigo-astronomy.org
  - free
  - open (GNU copyleft)
  - crossplatform, multi platform
  - client agnostic
  - distributed
  - better control (modular) - easier to find/localize an error/problem

Observations: new software

INDI/INDIGO CURRENT STATUS:

- CCDs:
  - Andor iKon L 936 - (Rumen Bogdanovski - INDIGO)
  - FLI + FilterWheel
  - SBIG
  - Moravian Instruments
  - Atik (FIGU at SP)
  - ARC 4Kx4K (RK - INDI)
- FilterWheels
  - ACE FW (RK - INDI)
- Telescope
- Dome
- Weather Stations
  - AAG - Lunatico
- AUX
  - Shelyak eShel CU
  - WatecRemote (RK - INDI)
    20190218: gain - remote handle for Watec camera --> spectroscopy fully operable remotely

Observations: new software

INDI/INDIGO FUTURE:

- close future
  - Astelco focuser
  - guider

- more distant
  - automatization of SP big dome dooors/enclosures (mechanical issues), possible at given dome azimuth - electric power, https://www.astronomical.com/observadome/

- ???
  - ASCOL (Rumen Bogdanovski - INDIGO) - ProjectSoft controlller (small dome)ASCOL (Rumen Bogdanovski - INDIGO) - ProjectSoft controlller (small dome)

MISC

- PhotoDocumentation
  - https://www.sto.ta3.sk/misc/FotoDokumentacia/pristroje/
- Journals
  - https://www.sto.ta3.sk/misc/instrument_journals/

- SAFETY
  - nobody present at the roof, dome
  - nothing obstructing telescope (ladder, crane)

- Packages:
  - repo: https://www.sto.ta3.sk/RPMs/sto.repo
    - sto
    - stoPowerOnOff
    - stoAstelco
    - stoSpectrograph

  - indi-watecremote-bleeding
  - indi-arcccd-bleeding
  - indi-acefilterwheel

DEMO

- SAFETY
  - dome doors closed
  - colleague Sivanič - present at Skalnaté Pleso
  - phone

- sensors (weather)
  - AAG cloudwatcher http://www.lunatico.es/ourproducts/aag-cloud-watcher.html
    - http://spcloudaag.ta3.sk/
  - SNMP TCP/IP thermometer + humidity + pressure
    - https://www.sto.astro.sk/archives/STOsensors/rrdtool/STOd_temperature_M1_BD.html
    - https://www.sto.astro.sk/archives/STOsensors/rrdtool/STOa_temperature.html
    - https://www.sto.astro.sk/archives/STOsensors/rrdtool/STOc_humidity.html

- PowerOnOff
  - rkomzik@spsto3: /usr/bin/stoPowerOnOff

DEMO

- AsTelOS + Foscam camery
  - rkomzik@spsto3: /usr/bin/stoAstelco_run
  - https://www.sto.astro.sk/private/DomeCameras/
  - vlc: rtsp://viewer:STOkamerkaSP@STOcamSP1.ta3.sk:88/videoMain
    rtsp://viewer:STOkamerkaSP@STOcamSP2.ta3.sk:88/videoMain

- Spectroscopy
  - observer@SPpcSpectrograph: MaxImDL
  - rkomzik@spsto3: /usr/bin/stoPowerOnOff - vlc for Watec@FIGU
  - rkomzik@spsto3: kstars: ekos - indi: WatecRemote, Shelyak-eShell

A&G
IAU General Assembly
Special Issue