

Workshop Laboratorio Spettroscopia INAF

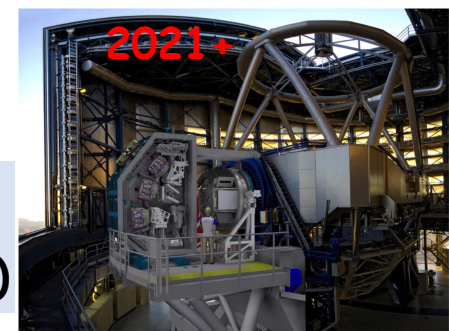
Monte Porzio, June 10-11, 2019

MOONS & Labs

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MOONS in a nutshell

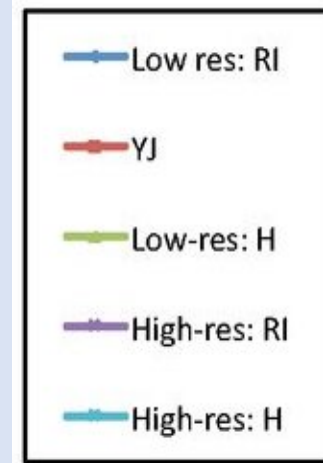
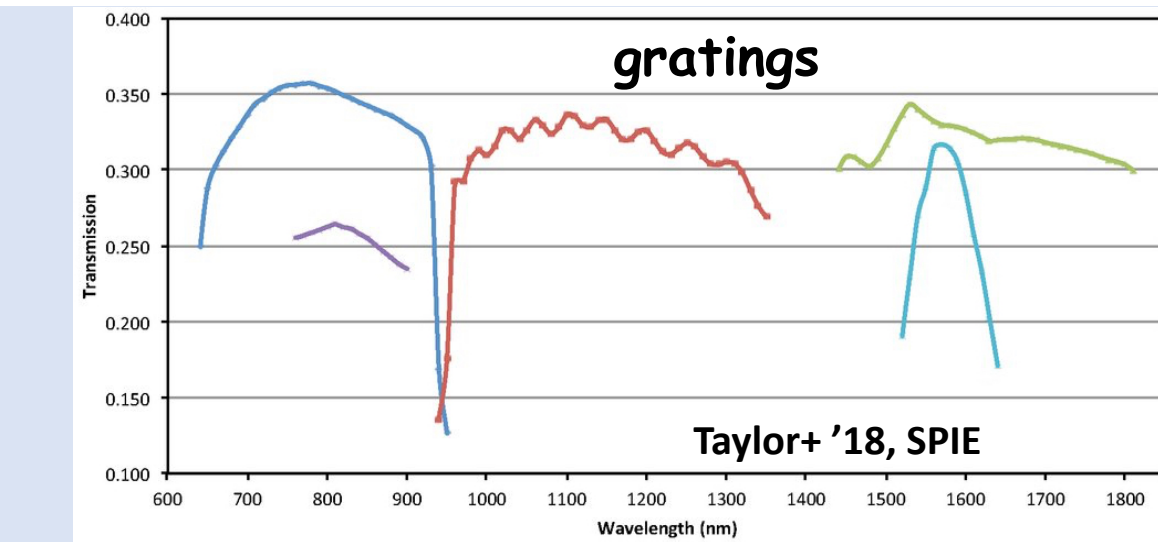


FoV: 500 arcmin² at the Nasmyth focus of the 8.2m VLT
multiplex: 1000 fibers, possible deployment in pairs (target+sky)

two observing modes:

LR: simultaneously 0.7-1.8 μ m at R~4-6,000

HR: 3 bands, 0.75-0.90 μ m at R~9,000; YJ at R~4,000; 1.52-1.63 μ m at R~19,000



R~4,100

R~4,300

R~6,600

R~9,200

R~18,300

300 GTO nights over 5 yrs split in two main surveys:

- extra-galactic survey (200 nights)
- Galactic survey (100 nights)

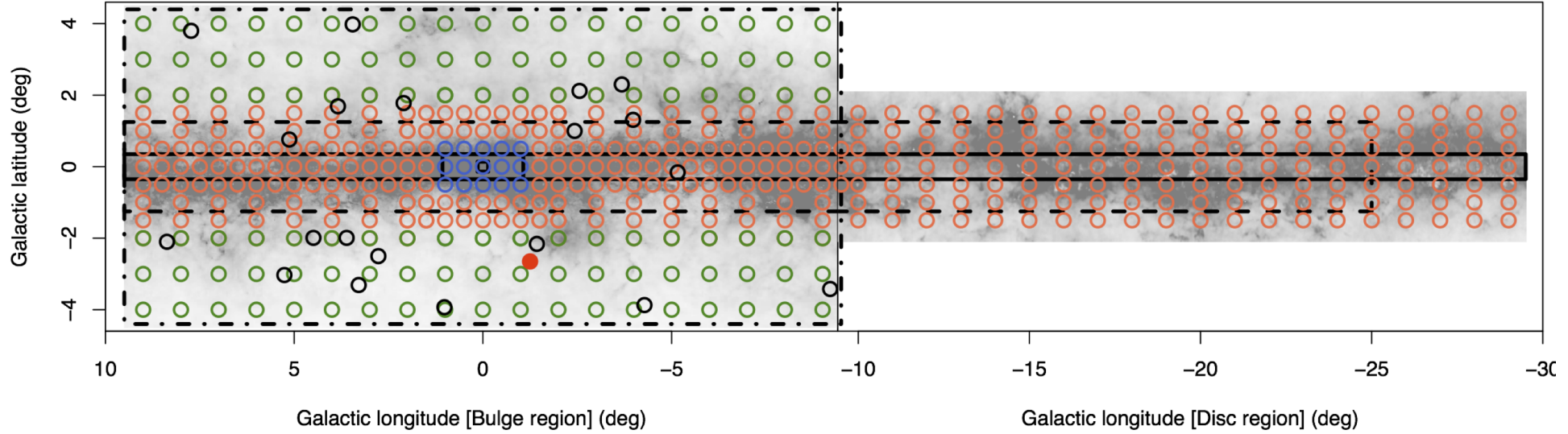
MOONS GTO Galactic Survey

survey strategy

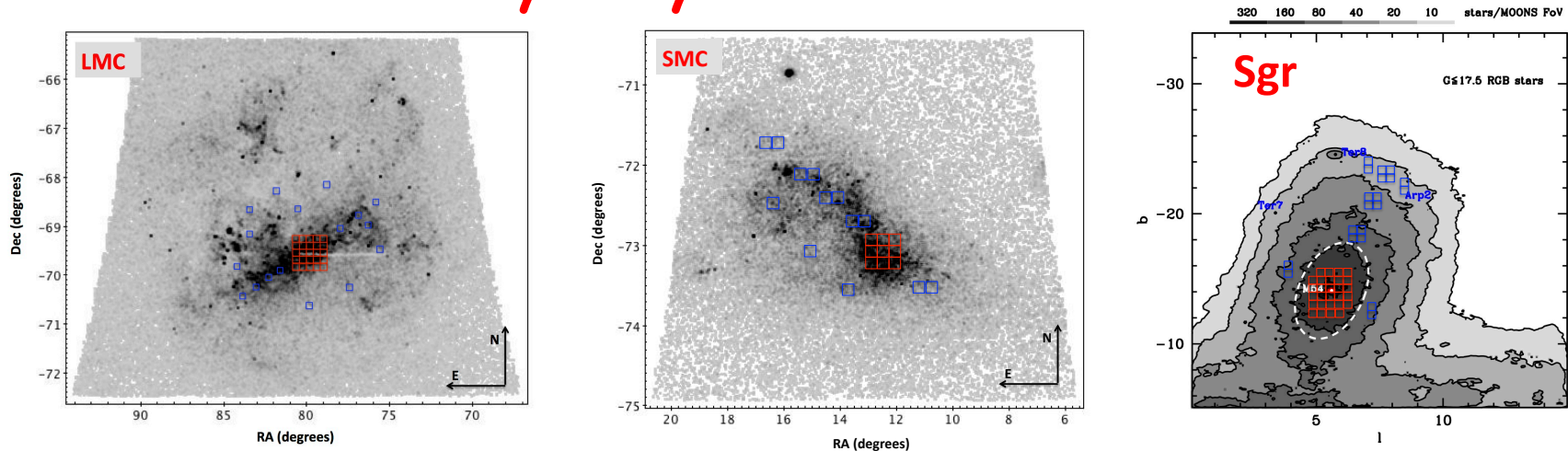
- in the ERA of Gaia and follow-up massive spectroscopic surveys (e.g. GES, GIBS, APOGEE, GALAH, WEAVE, 4MOST etc.) **MOONS** will be the **first red-IR MOS with high multiplex at an 8m telescope** → GTO focus on sampling stellar pops and environments poorly explored by other surveys
- maximizing the scientific information from kinematics + detailed chemistry
- select fields dense enough at the desired magnitudes to maximize fiber allocation
- science-driven tradeoff analysis between depth/SNR (i.e. exp time) and survey size (i.e. # of fields) to fulfill the science goals and maximize the legacy value of the survey

MOONS GTO Galactic Survey

GS1 - red/reddened Milky Way $\sim 70n \rightarrow 0.5M$ stars

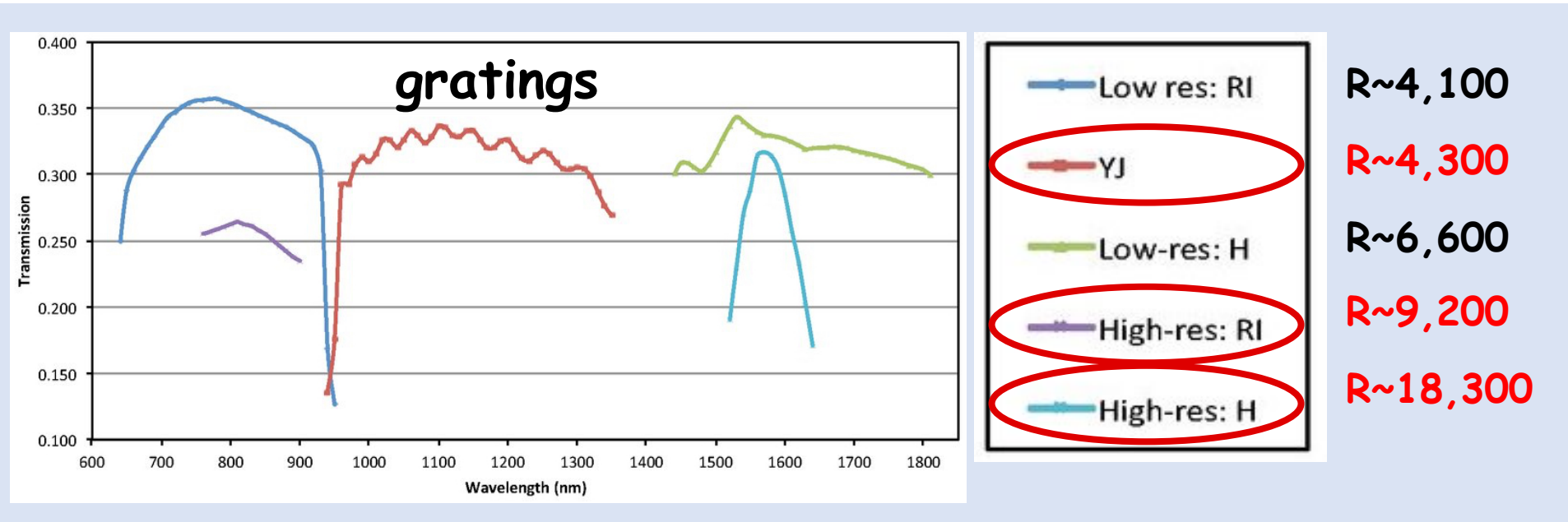


GS2 - Milky Way satellites $\sim 30n \rightarrow 0.1M$ stars



MOONS GTO Galactic Survey

main requirements and instrument setups identified



exposure time: tradeoff between **depth/SNR** and **sky coverage** (*i.e.* # of fields)

- on average $t_{\text{exp}} \sim 1\text{-}2\text{hrs}$ per pointing, *i.e.* 4-8 fields per night

sky subtraction

- mostly a la FLAMES, *i.e.* stare mode with a few tens fibers on sky and the other 900+ to target stars
- for young star clusters XSWITCH

MOONS GTO Galactic Survey

data treatment

we expect more than 2M spectra to be reduced and analyzed

MOONS *data reduction pipeline* for 1D spectrum extraction, wavelength calibration and telluric correction (TBD) → *to be delivered with the instrument*

WP3.3 - 15.3 FTE GEPI Paris (resp.F. Royer)

science analysis with dedicated pipelines for RV & chemical abundance measurements
→ *work in progress*

- TLRs currently under discussion/definition within the Galactic Survey Science Team
- SW development, data archiving → *TBD, likely under the responsibility of UK-ATC*

calibrations on a few representative (*e.g.* in common with other surveys) fields in the inner Galaxy, in the MCs and in Sgr with well studied stars at HR

NO pointing to individual stars or star clusters, unless strictly necessary

Labs

thanks to Marco & Germano to have started a process and drafting a proposal

The goal of the **proposed Laboratorio di Spettroscopia INAF** is to further enhance the already strong role of INAF in this rapidly expanding field by pursuing a more synergic approach to on-going and future surveys. In particular, we aim at a more efficient use of the existing skills and tools and to stimulate the development of new ones that can be beneficial for the whole INAF community.

The proposed Lab, and therefore this workshop, does not focus on the instrumentation needed to carry out spectroscopic surveys nor on the fantastic science that can be extracted from them.

It is instead conceived to explore the possibility of **sharing within the INAF community software tools and expertise** that are extremely valuable when planning, carrying out, or analyzing data from large optical or near-infrared spectroscopic surveys.

QUESTIONS ...

- *proposed Lab vs projects ...*
- *proposed Lab vs INAF activities ...*
- *proposed Lab vs Labs ...*

the proposed Laboratorio di Spettroscopia INAF vs PROJECTS

- projects are inspired by a science goal
- the science goal defines the Top Level Requirements
- starting from the science TLRs, an instrument concept is developed

SW tools, pipelines *etc.* are tightly linked to science and instrument

The Lab would be the focal point where to collect and distribute these tools, showcase individual or group expertise relevant for spectroscopic surveys, and stimulate the creation of new tools under the guidance of the INAF spectroscopic community.

A Lab focused on one topic can be poorly representative of the context and poorly effective in promoting skills and/or coordinating activities

also restrictions to archival & distribution of project products may apply, due to Consortium and/or Observatory policies/rules

the proposed Laboratorio di Spettroscopia INAF **vs MOONS**

INAF contribution to MOONS

in-kind 990 k-Euros

32 FTEs on

hardware

WP2.2 Spectrometer optics and mechanics, Arcetri, **21.5 FTEs** including co-PI

WP1.3 Acquisition cameras, Roma **3.0 FTEs**

SW tools

WP3.4 Observation preparation software, Milano, **6.5 FTEs**

WP3.5 End-to-end simulations, Roma, **1.4 FTEs**

other FTEs on science & survey design (15 Italian researchers in the GS Science Team)

→ by policy not counted in the GTO share

The proposed Lab would leave out too much INAF-MOONS

the proposed Laboratorio di Spettroscopia INAF vs Spectroscopy at INAF

not only *massive surveys*,
also *normal, large, monitoring, pilot, commissioning, SV etc. programs*

not only *wide field MOS*,
also *quantitative echelle spectroscopy of selected targets,*
spectroscopy of dense stellar fields/extended objects with IFU/longslit,
high contrast spectroscopy with coronagraphy etc.

not only *SW tools*, also *science, instrumentation, technology, engineering,*
data management etc.

The proposed Lab *would leave out too much* Spettroscopia INAF

what a Lab should be ?

theoretical definition ...

... a place providing opportunity for experimentation, observation, testing, practice ...

some practical applications ...

a) forum for open discussion or expression of ideas

b) inventory/repository site of expertise/resources

c) coordination facility → facility

d) institute

The proposed Lab

... would be the focal point where to collect and distribute these tools, showcase individual or group expertise relevant for spectroscopic surveys, and stimulate the creation of new tools under the guidance of the INAF spectroscopic community.

→ mostly a) + b)

for discussion ...

the proposed Lab

- should not be named **Laboratorio di Spettroscopia INAF**
- should be more appropriately named **SW tools per surveys spettroscopiche**
- *should it be a Lab ? it looks more a working group/work package*

a Lab should probably have

- *a broader, comprehensive goal (science+instrumentation+SW+...), vision & strategy*
- *some resources*

for discussion ...

Laboratorio di Spettroscopia INAF

goals ? structuring ? ... ?

before posing/answering specific questions we should probably

- first understand INAF vision and strategy for *Labs*

- then verify opportunity, feasibility *etc.*