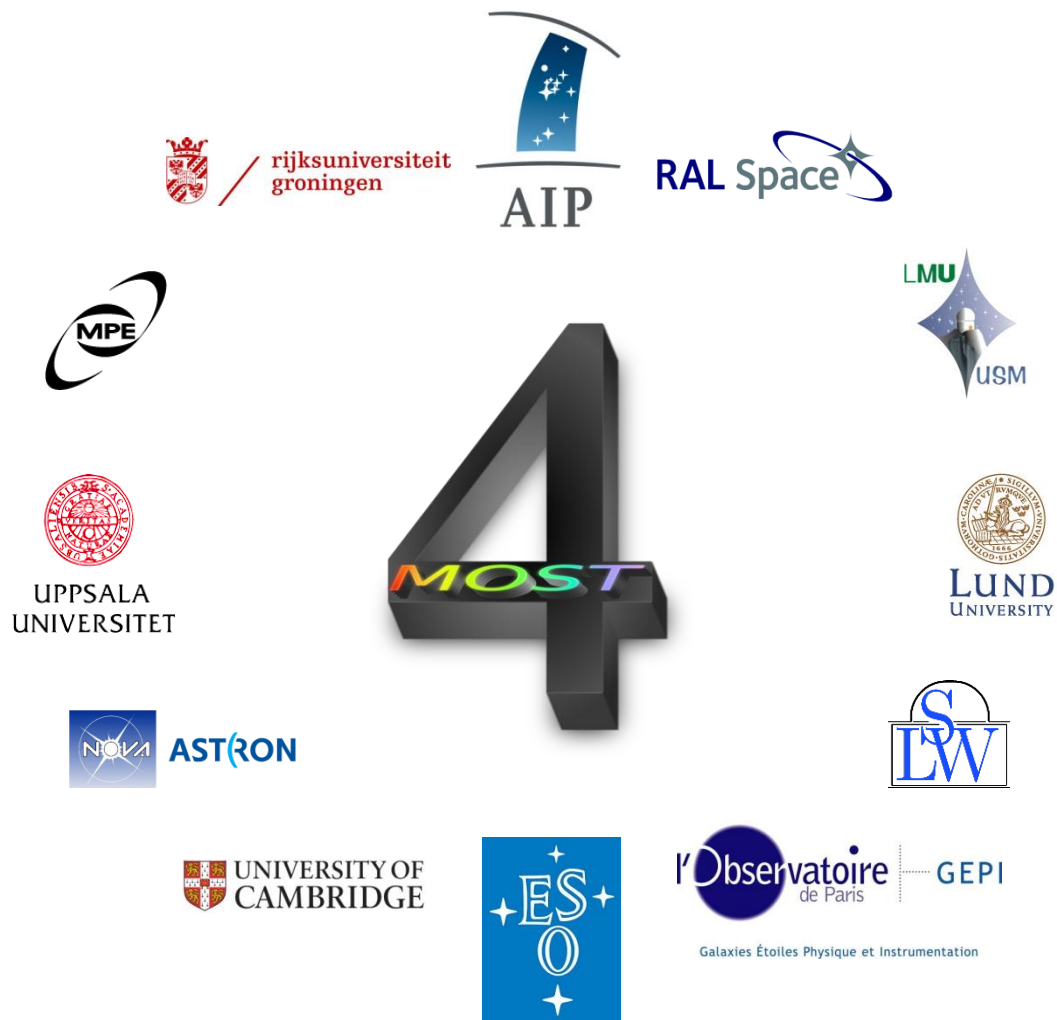


4

4MOST High-Res add-on Science



4MOST add-on surveys: The High-Res fibers

C.J. Walcher (AIP)

4MOST add-on surveys

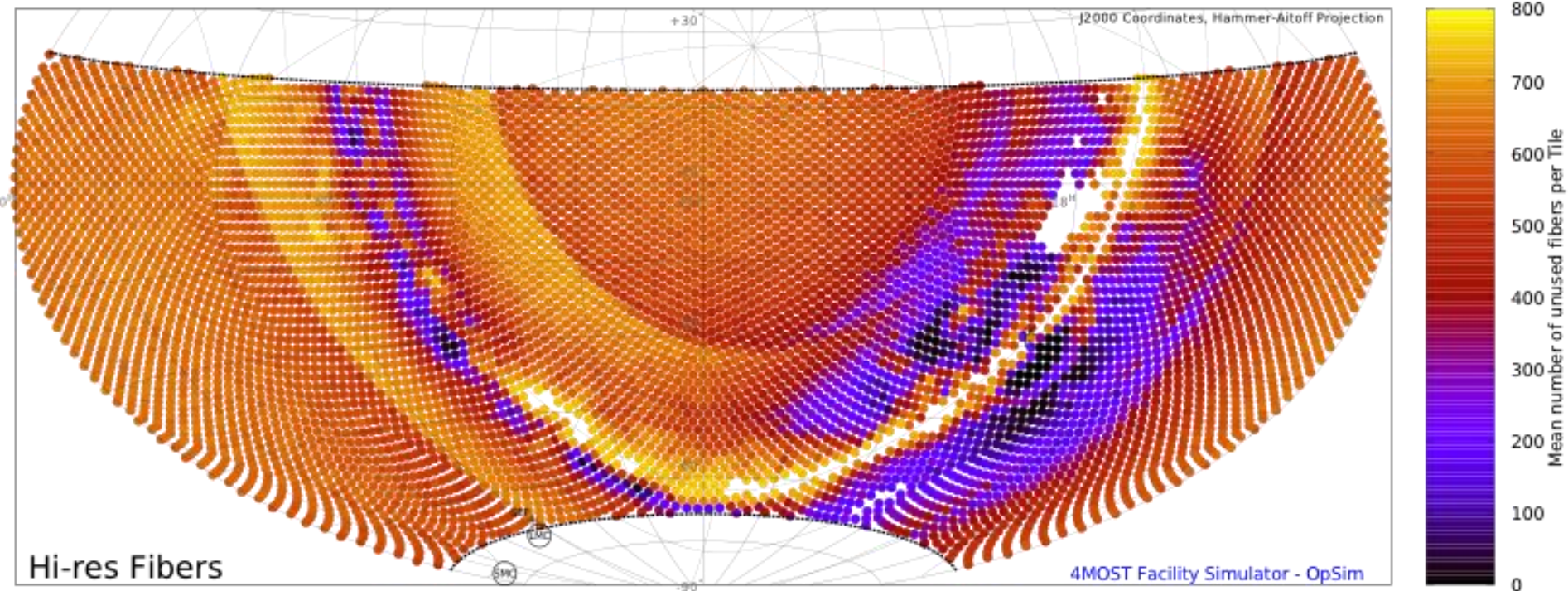
- 4MOST offers unique opportunities to do samples with $1e3$ - $1e5$ objects at little or even no cost to the main surveys!
- The current DRS drive the design of the instrument, but there will be opportunities to propose more science before the actual start of the survey(s) – for the consortium and for the community!

Available HR fibers

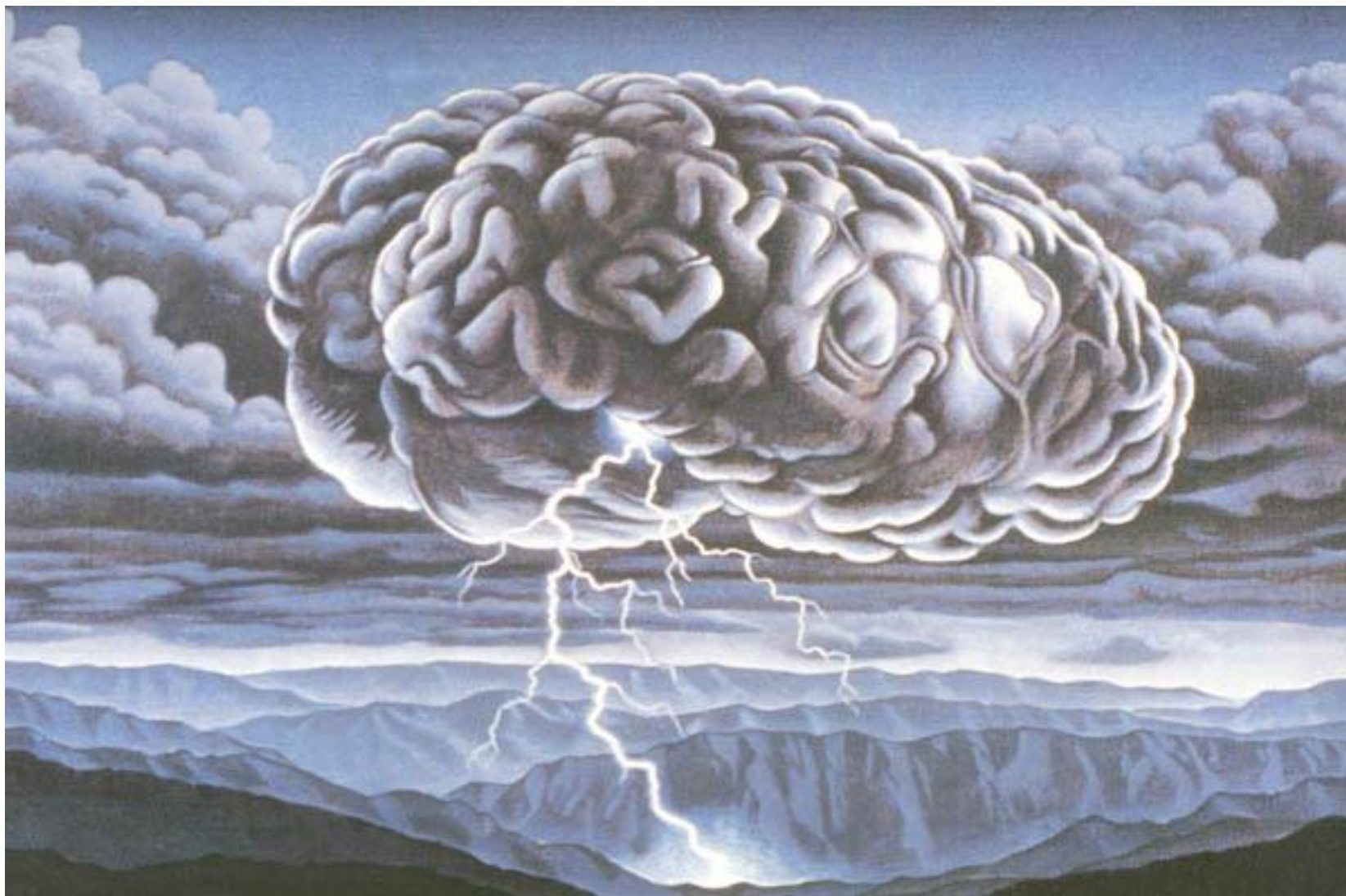
- HR fiber number needed to address main 4MOST science case and choice of positioner (driven by fiber quantity and sky area coverage filling factor)
- Nevertheless, many fibers unallocated for current design reference surveys, in particular in halo / extragalactic sky
- Ideal opportunity for community surveys (big or small) and consortium internal add-on surveys.

Available HR fibers

4MOST Unassigned Fibers Map
Tele=VISTA Positioner='Echidna-like' Geodesic- $N_{\text{pnts}}=10892$, FOV= 4.059deg^2 , 5 year survey



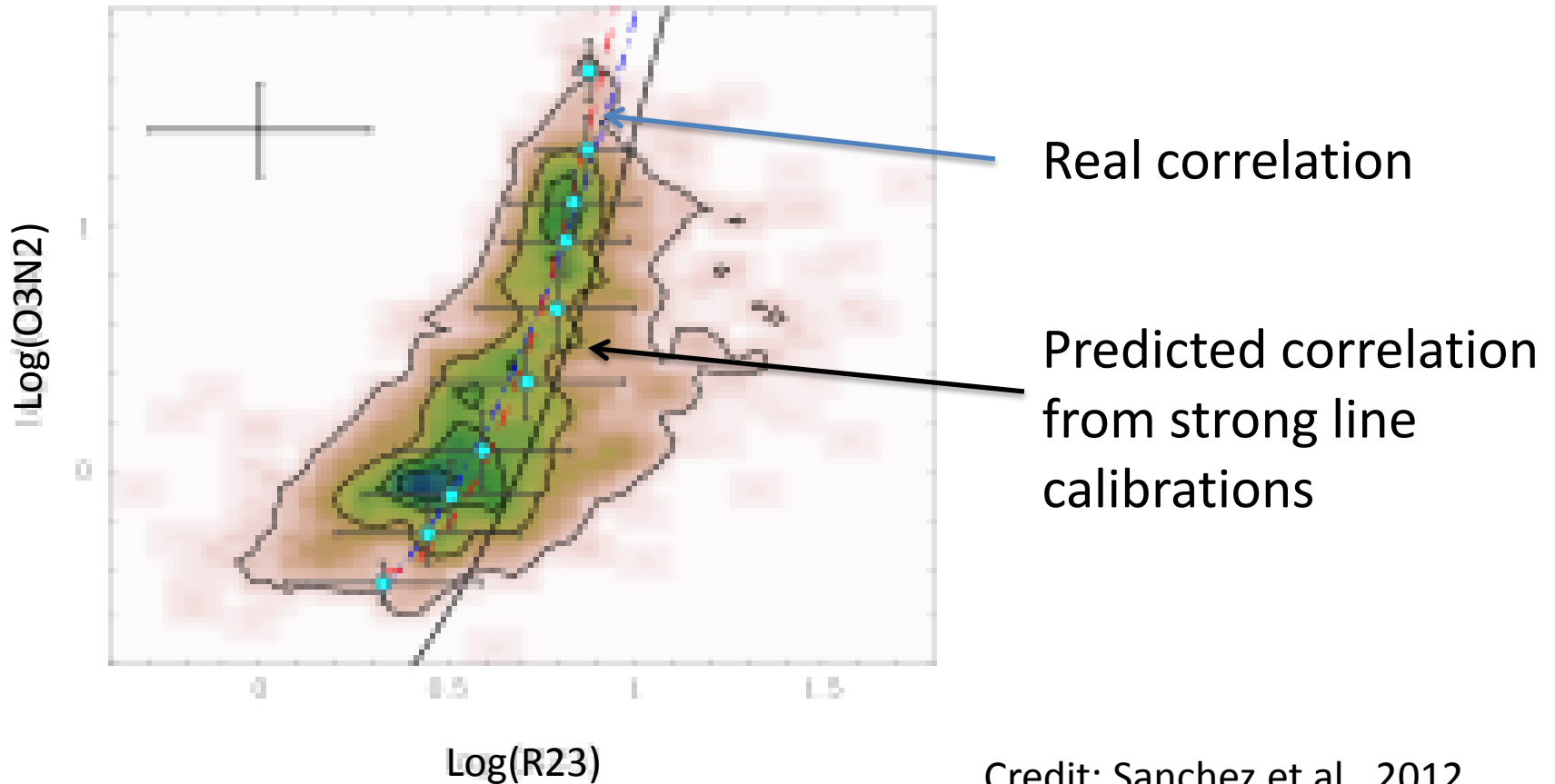
3950 – 4565 && 5870 – 6730 R=20000



Brainstorm over topics

- Solving the Hii region metallicity problem
- The kinematics of the central kpc
- I have no idea about galactic surveys with stars fainter than 16
- Disk-halo interaction
- Lyman alpha forest (although best in LR?)
- An integral field-like survey of M31 (would take 5 years, but would give the entire galaxy plus halo!)
- Add yours here... !!!!

The abundance problem



Credit: Sanchez et al., 2012

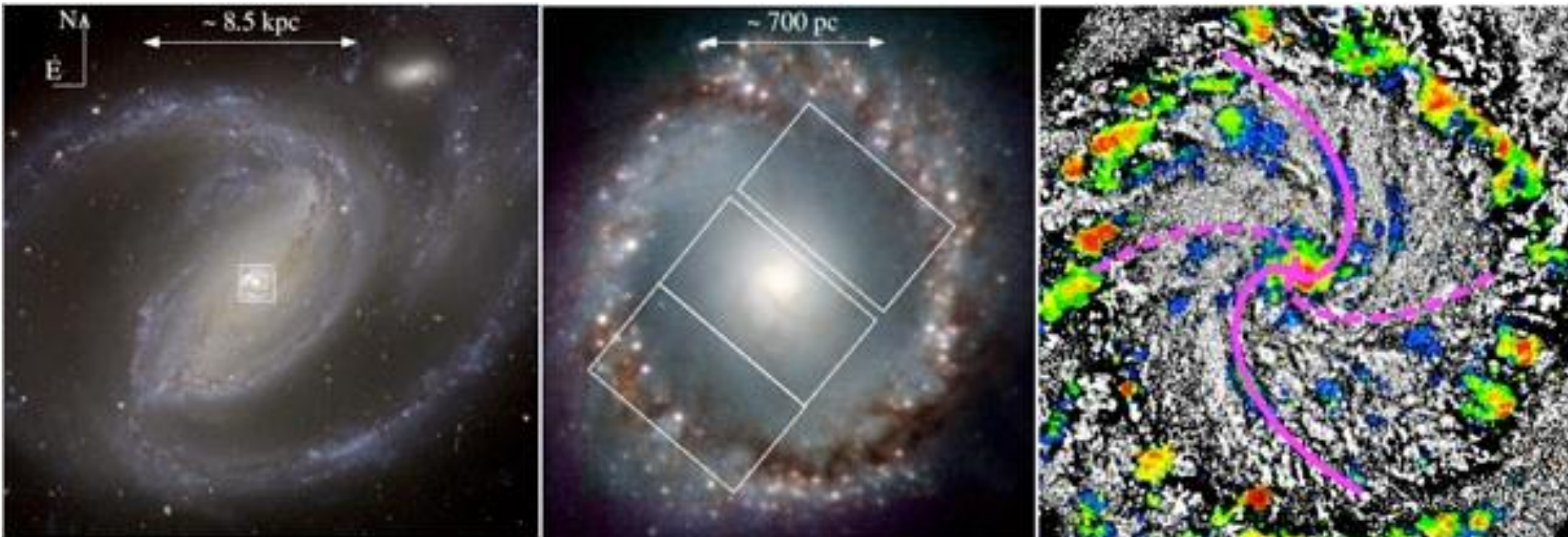
Solving the abundance problem

- ISM metallicities are measured from
 - Weak lines („accurate“, difficult observationally)
 - Strong lines („approximate“, easy observationally)
- Key are the weak lines, OIII 4363 (or NII 5755 or SIII 6312) for Te measurements
- Add-on survey idea:
 - target HII (or even all EL?) regions in background galaxies
 - 5*20 HR (4363) and 1*20 LR (all ELs)
 - 10 km/s intrinsic width is well matched to 15 km/s spectro width

ISM abundances, feasibility

- Line intrinsically narrow (10km/s), HR helps with line sensitivity!
- Compared to SDSS:
 - 4 times more collecting area
 - 10 times better resolution
 - But fiber area about a third
 - Order of magnitude better line sensitivity ($\sim 3e-18$ erg/cm²/s)
- 12 galaxies per sqdeg out to distances OK for HII regions selection (within volume where $1'' < 1\text{kpc}$) $\rightarrow \sim 10^5$ HII regions

Nuclear spiral



Credits: van de Ven, VLT, HST

Kinematics in the central kpc

- All current surveys have fibers $>1''$
- Cannot resolve the kinematics in central kpc for large samples spatially
- But could resolve spectrally
 - Gaussian : dispersion supported
 - Double horn: disk
 - Structured: clumpy and chaotic
- Add-on survey idea:
 - Target galaxy centers of all types
 - Make it complementary to on-going IFU surveys (SAMI, MaNGA)

Kinematics feasibility

- Again, 12 useful galaxies per sqdeg -> 10^5 galaxies sample
- Compare to SDSS:
 - 4 times larger collecting area
 - 2.5 times the exposure time
 - ~ 3 times better S/N per AA
 - But fiber size difference in conjunction with galaxy SBP
- Would give a statistical answer as to what dominates the kinematics in galaxy centers, with break-down by mass, type, etc...

4MOST HR fibers summary

- 4MOST offers unique opportunities to do samples with $1e3$ - $1e5$ objects at little or even no cost to the main surveys!
- The current DRS drive the design of the instrument, but there will be opportunities to propose more science before the actual start of the survey(s).
- In particular the availability of HR fibers all over the sky cannot be over-estimated!