



# Suggested MRS Upgrades

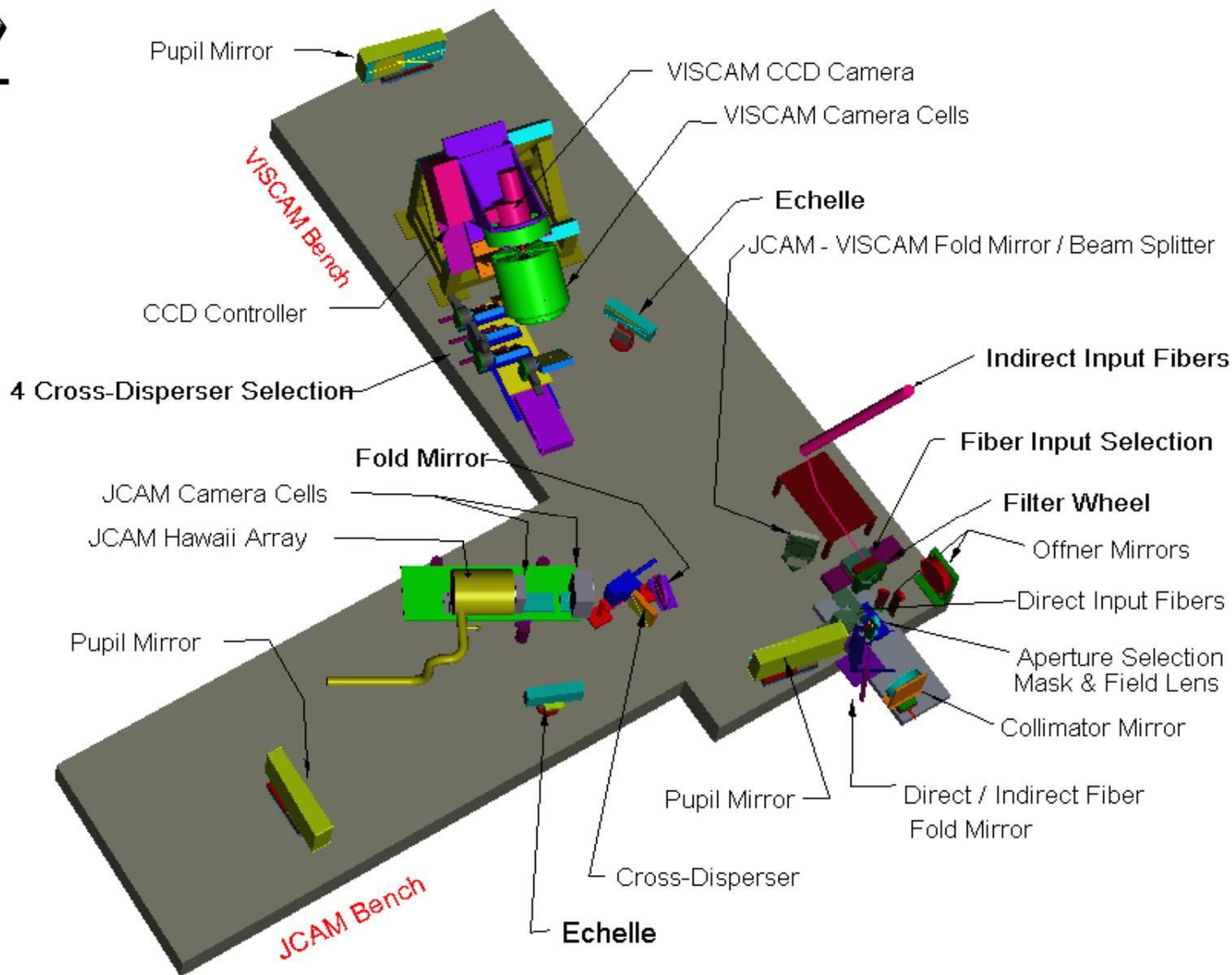
- **Upgrade fibers**
  - All STU
  - 1.5 arc second & 1 arc second from current 2.0 and 1 arc second
- **Available resolving powers**
  - Focus two ranges
- **Bandwidth**
  - Commission Blue and Red XD
- **Sky Subtraction**
  - Update long slits
- **IR Arm**
  - Will need a cold pupil to be interesting
- **Control environment**



# Instrument Summary: Design Goals

<b>Medium Resolution Spectrograph (MRS)</b>		
	<b>Visible Beam</b>	<b>NIR Beam</b>
<b>Fiber Fed MOS: Maximum number of Objects</b>	9	5
<b>Wavelength range (nm)</b>		
<i>Typical</i>	430-880	1000-1300
<i>Blue Limit</i>	380	900
<i>Red limit</i>	900	1350
<b>Resolution-slit product (<math>R\phi</math> arc-sec)</b>	10,400	10,400
<b>Max. resolution</b>	~20,000	10,400
<b>Camera</b>	dioptric F/1.2	dioptric F/1.6
<b>Detectors</b>	Two 2K x 4K, Marconi 15 $\mu$ m pixels	1k x1k HgCdTe Hawaii 18 $\mu$ m pixels
<b>Echelle</b>	79 or 110 g/mm, R2	31.6 g/mm, R2
<b>Crossdispersers (g/mm and wavelength of max. efficiency)</b>	#1: 900 g/mm, 5150 nm	#1: 400 g/mm, 1200 nm
	#2: 600 g/mm, 650nm	#2 TBD
	#3: 1200 g/mm, 560 nm	
	#4: 220 g/mm, 590 nm	
<b>Maximum wavelength range/frame</b>	450 nm	300 nm

# MRS Spectrograph Mechanical Layout

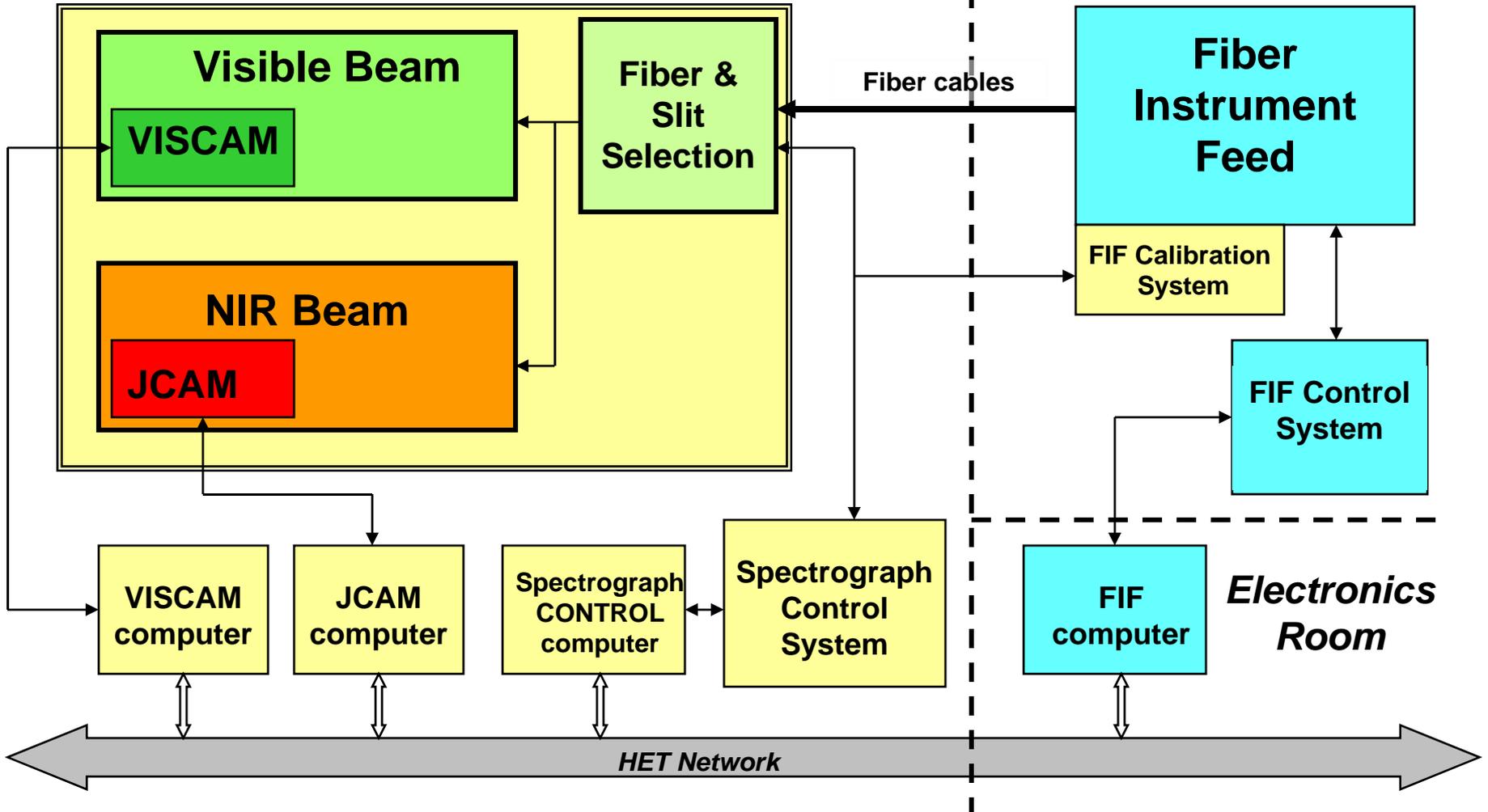




# The MRS system is modularized so change is easy

## *Spectrograph Room*

## *Telescope*

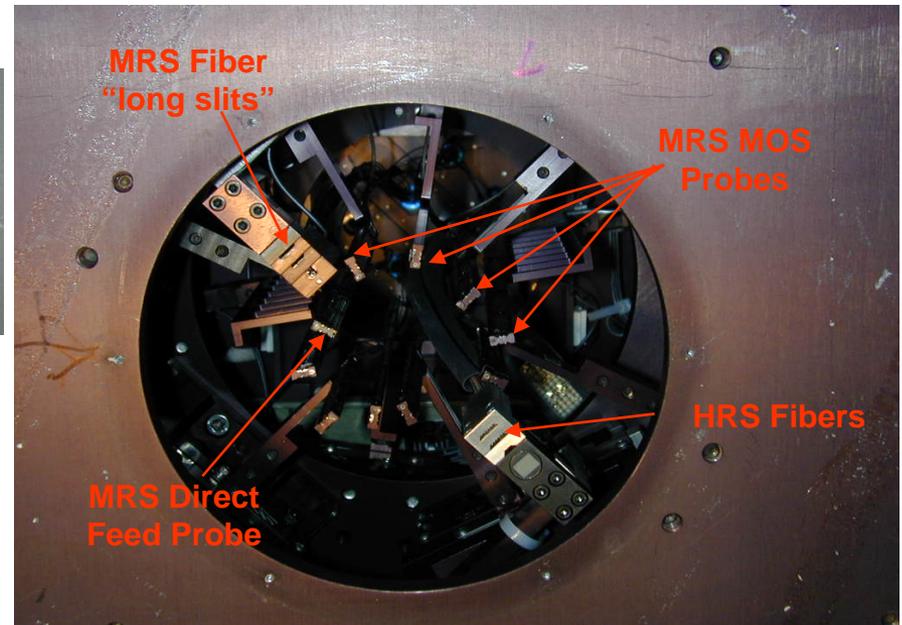
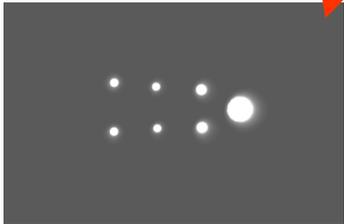




# Current Fiber Properties

MOS Probe fiber distribution										
	Lower		Mid				Upper			
	Type 0		Type 1				Type 1			
Fiber description	MOS 0	MOS 1	MOS 2	MOS 3	MOS 4	MOS 5	MOS 6	MOS 7	MOS 8	MOS 9
STU 300330370500		2	2	2	2	2	2	2	2	2
STU 400440480900		2	2	2	2	2	2	2	2	2
FVP300330370500	2									
FVP400440480900	1									
FIP 300330370500	2	2	2		2		2		2	
FIP 400440480900	1			2		2		2		2

**MOS 0 =  
Direct Feed**





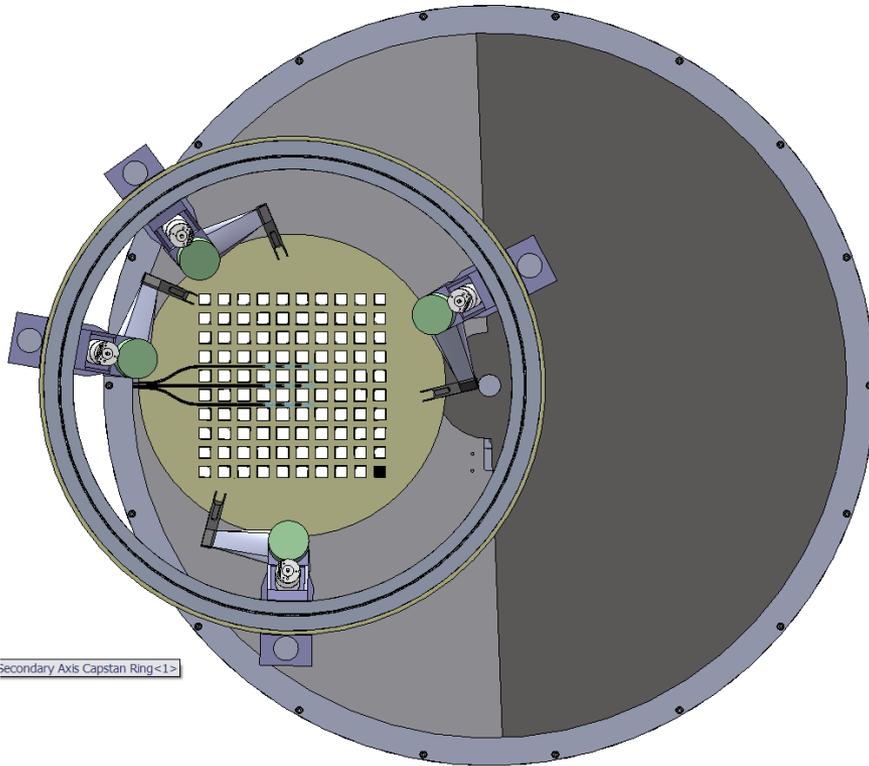
# Fiber Feed Upgrade

- **Using Virus focal plane will require accommodating the faster WFU focal ratio**
  - New collimator option?
  - Refocus in focal plane with micro-lens?
- **Opportunity**
  - Simplify current MRS Fiber feed system
  - Take advantage of latest fiber technology
    - » Wider bandwidth fiber
  - Take advantage of improved image quality
    - » Higher throughput with 1.5 arc-sec for nominal  $R \sim 7-10,000$
    - » Unsliced  $R \sim 15,000$  mode with 1 arc sec fiber
- **WFU offers WF!**
  - ~20 arc-minute field makes MRS MOS more interesting
  - MOS feed would be separate instrument

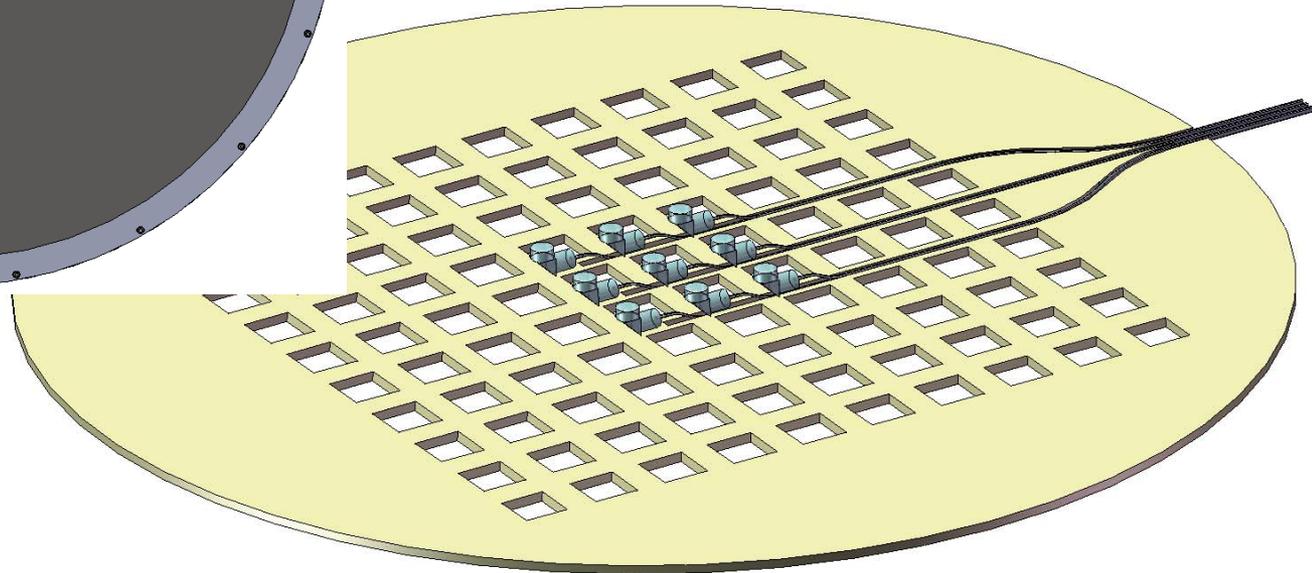


# HETDEX Prime Focus Fiber Feed

Current concept is for HRS/MRS?LRS fibers to be fed between Virus blocks presumably using fold prisms.



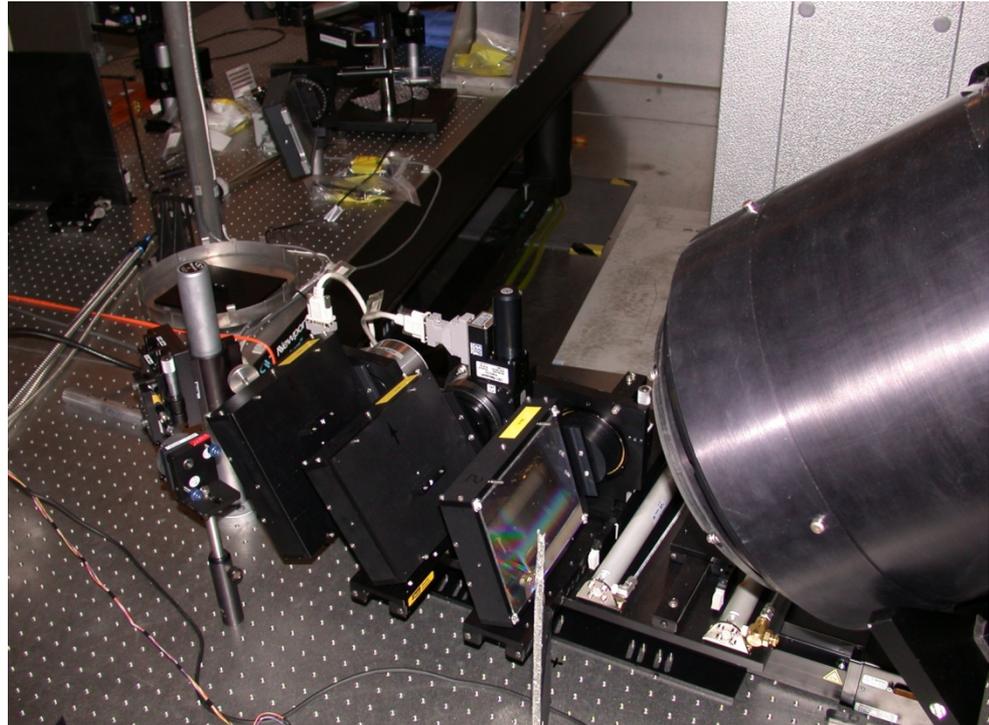
secondary Axis Capstan Ring<1>





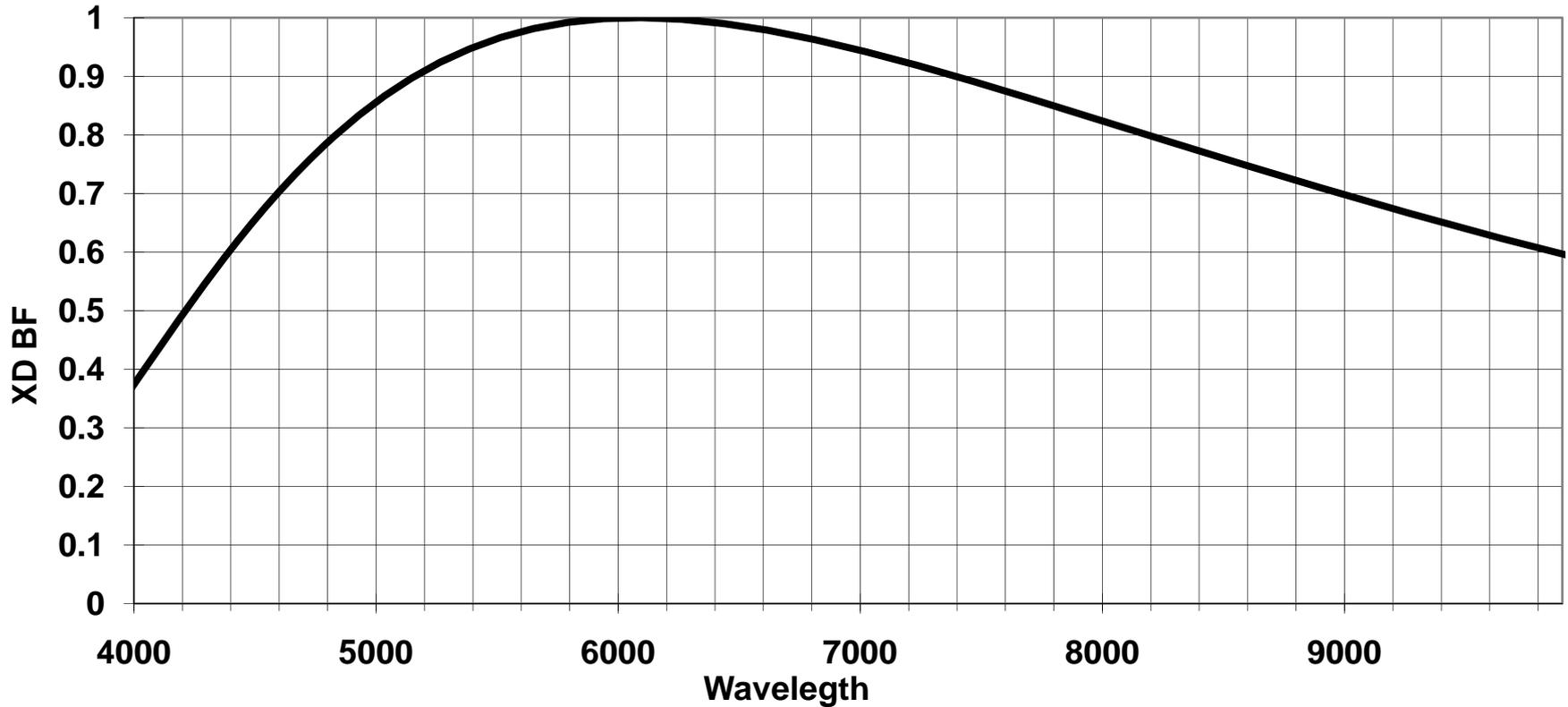
# XD grating upgrade

- Current poor blue throughput due to XD
- Need to implement Red & Blue XD's





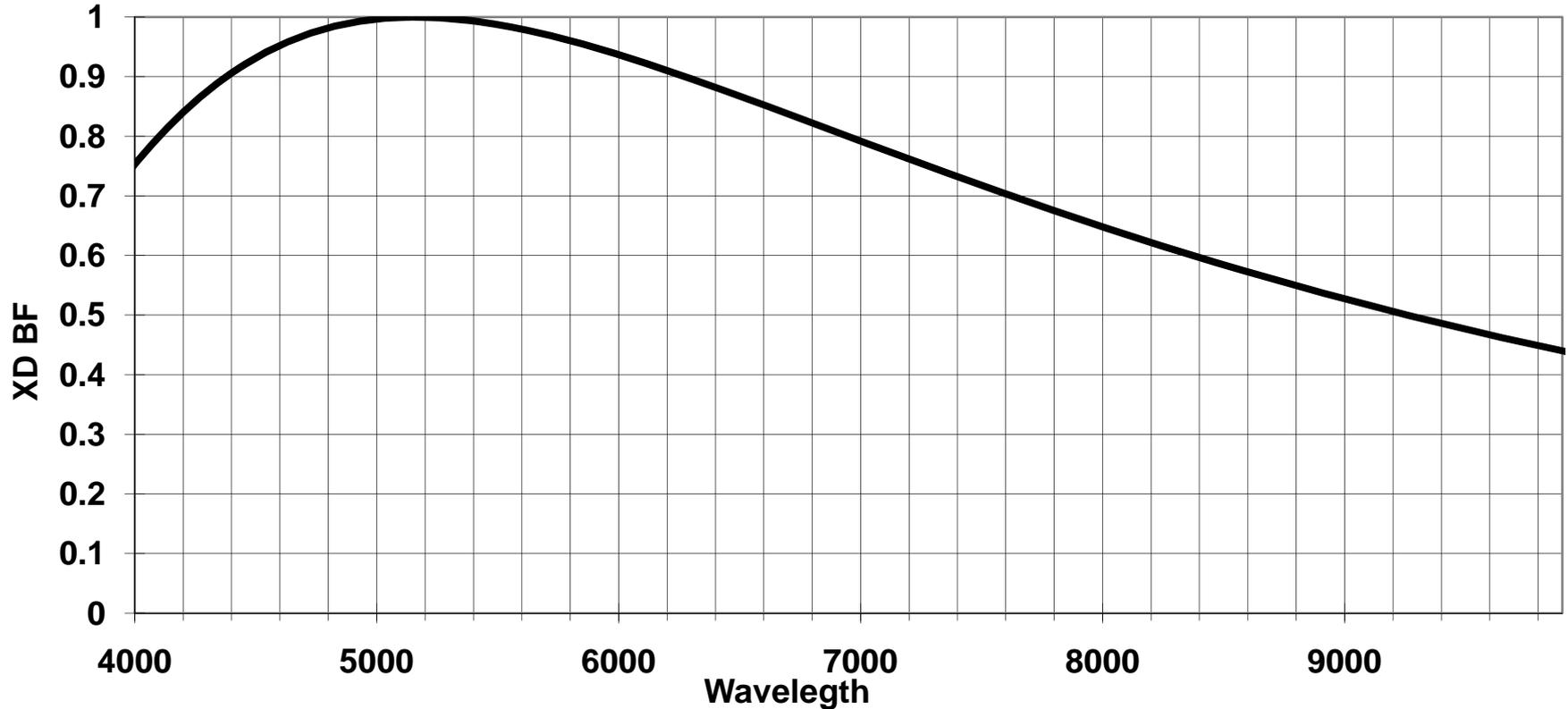
# Current XD: 226 l/mm 4.08° Blaze



**XD currently used is commissioning configuration  
Great for red & coverage of full octave**



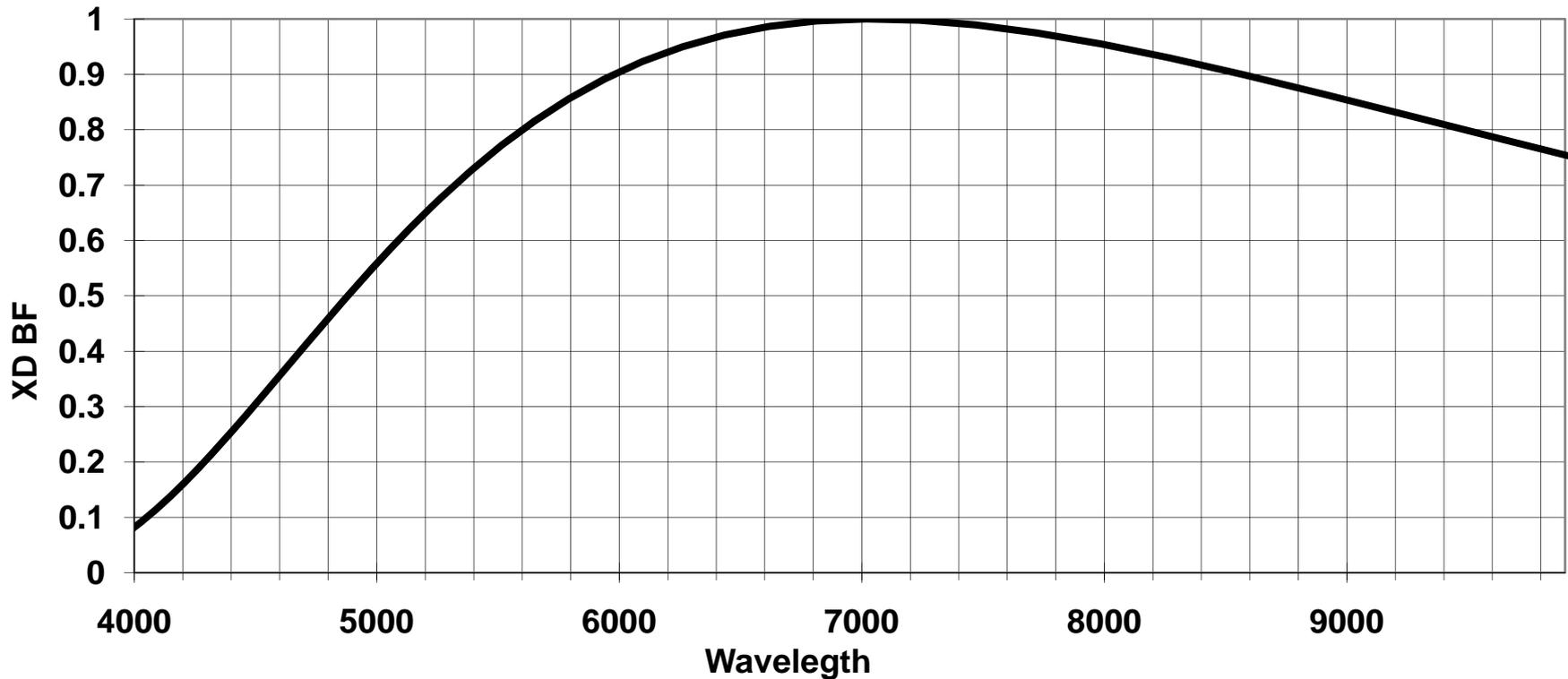
# Blue Cross disperser: 900 l/mm 14.3°



**Optimum Blue XD selected from catalog circa 2002  
Good blue efficiency by only ~ 1400 Ang. coverage**



## Blue Cross disperser: 316 l/mm 6.8°



**Optimum red XD selected from catalog circa 2002  
Good red efficiency > 6000 Ang. Octave coverage  
from 5000-10000 Ang. or 5500 to 11000 Ang.**



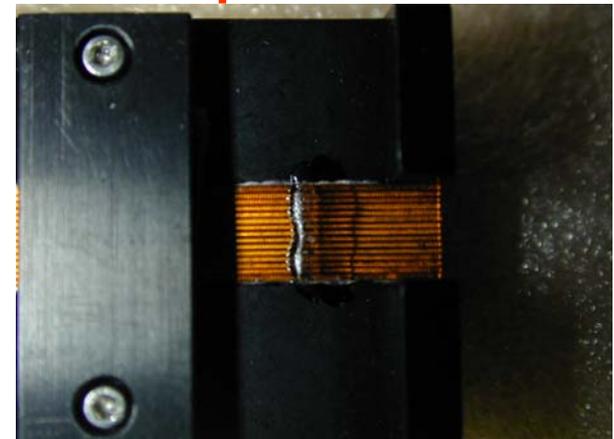
# Improved Sky subtraction

- **Desire to increase S/N in sky by ~ 4x.**
  - Requires ~16 fibers
  - Need to conduct trade study
    - » Use fiber Long Slit similar to current feed
    - » Distribute fibers in Focal Plane

**Input ends**



**Output end**

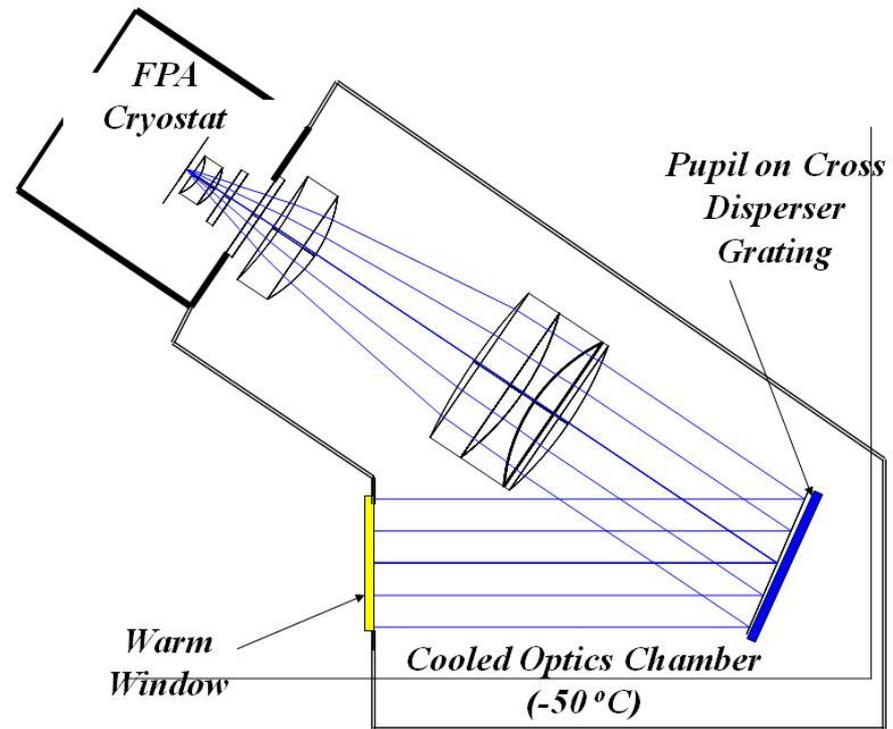




# IR Arm

Current low priority---but

Gary & I have learned the hard way that one needs a cold pupil even for NIR





**The End**