



STEELIES

SOAR Telescope Echelle Spectrograph

Estado do Projeto

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LNA LABORATÓRIO
NACIONAL DE ASTROFÍSICA



Para quem conhece o instrumento...

O que há de novo?

- Revisão do desenho conceitual - Novembro 2003
 - CCDs
 - Criostatos
 - Controladores
- } CTIO / I.Milênio
- CoDR SOAR Report - recebido (10 meses...)
 - Calculadora de tempo de exposição - pronta
 - Software de redução - avançando
 - Protótipos das redes holográficas - prontas

Para quem não conhece o instrumento...



~~Requisitos~~

Resultados do Conceito

- ✓ Resolução para cálculos de abundâncias 50.000
- ✓ Grande cobertura espectral 300-890nm
- ✓ Capacidade para o UV próximo ~10% at 300nm
- ✓ Eficiente > 20% at 600nm
- ✓ Compacto 1.6 x 1.8m
- ✓ Estável bench mounted
- ✓ Custo compatível com as capacidades das agências financiadoras brasileiras U\$ 1M

Qual a ciência pretendida ?

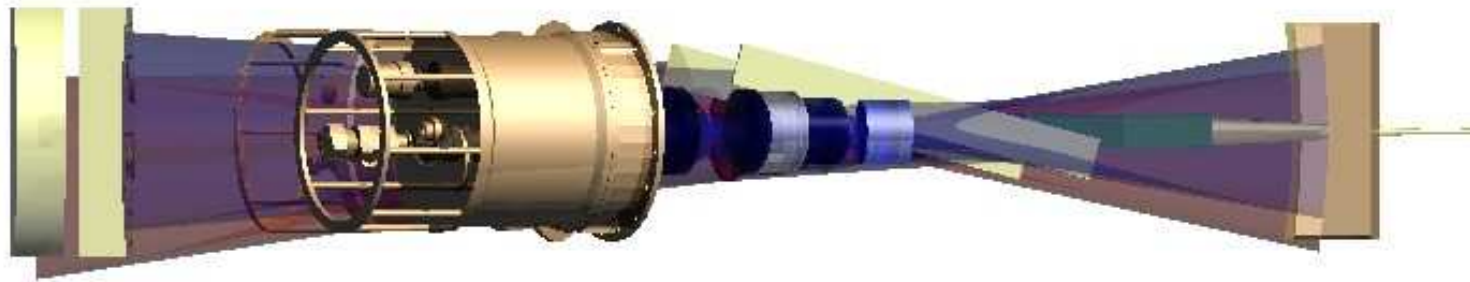
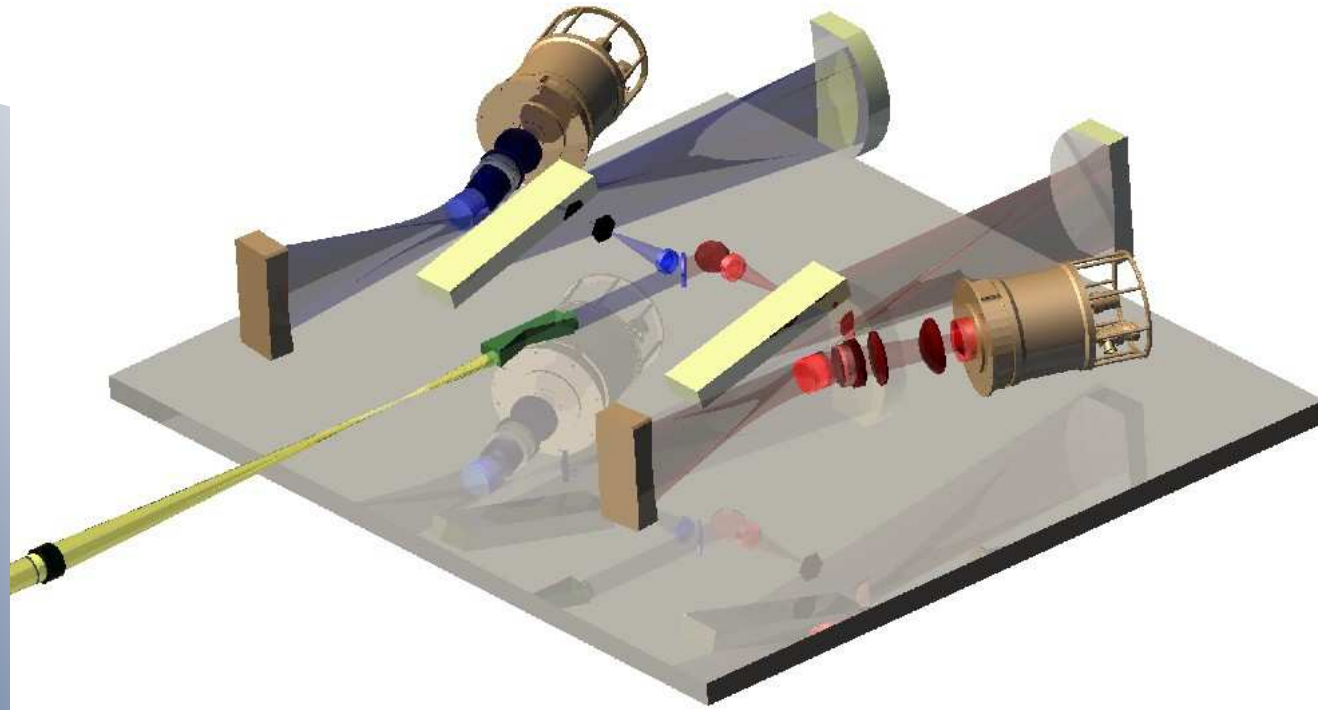
- Muitos projetos possíveis
- ver poster sobre o assunto

O Instrumento

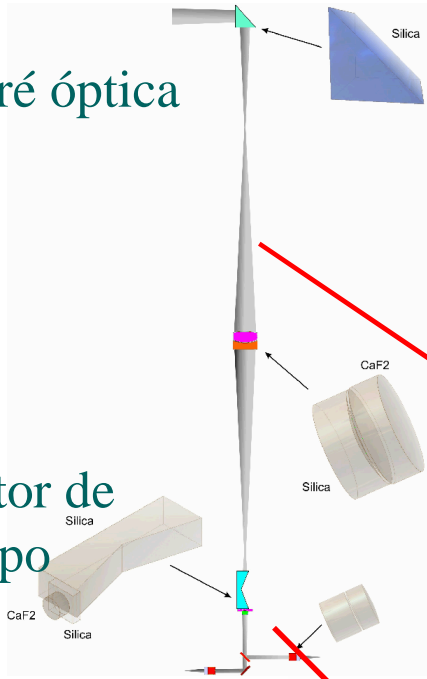
- 2 canais
- dispersão cruzada - redes holográficas
- pupila branca
- montagem no pier do telescópio
- alimentação pelo foco Nasmyth
- configuração fixa
- mínimo de partes móveis
- 3000 Å - 8900Å em uma exposição
- R= 50000 (3 pixels)
 - ◆ até 80-70k com fenda estreita
- software de redução automática

	STELES	Blue	Red
Wavelength range in one exposure	3000-8900Å	3000-5700Å	5300-8900Å
Resolving Power	50k	max. (80 k)	max. (67 k)
Slit Entrance Aperture (arcsec)	0.8"	min. (~0.5") - 2pix	min. (~0.6") - 2pix
Fore Optics Input/Output	F / 16 - F / 7.5		
Spectrograph Beam Size	100 mm		
Off-axis Collimators		F / 7.5	F / 7.5
Echelles	R4	41.67 gr/mm	31.6 gr/mm
Crossdisperser Grism		600 gr/mm	300gr/mm
Dioptric Cameras		F / 3.0	F / 2.5





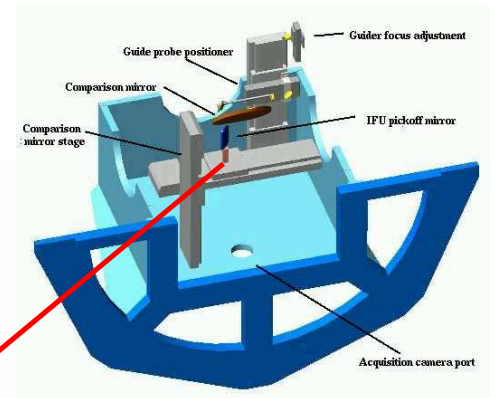
pré óptica



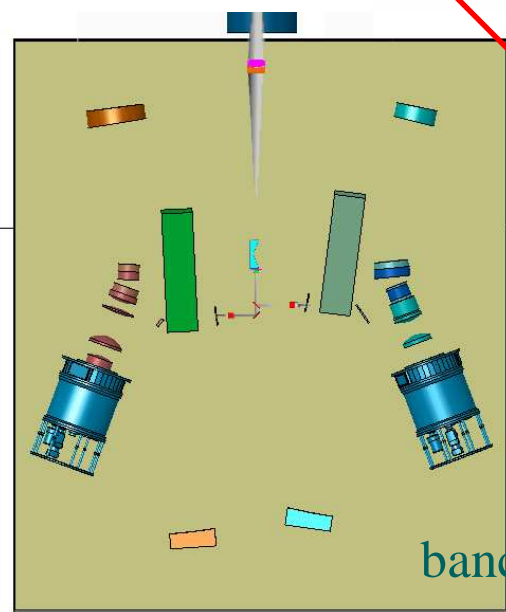
rotator de campo

tubo retrátil

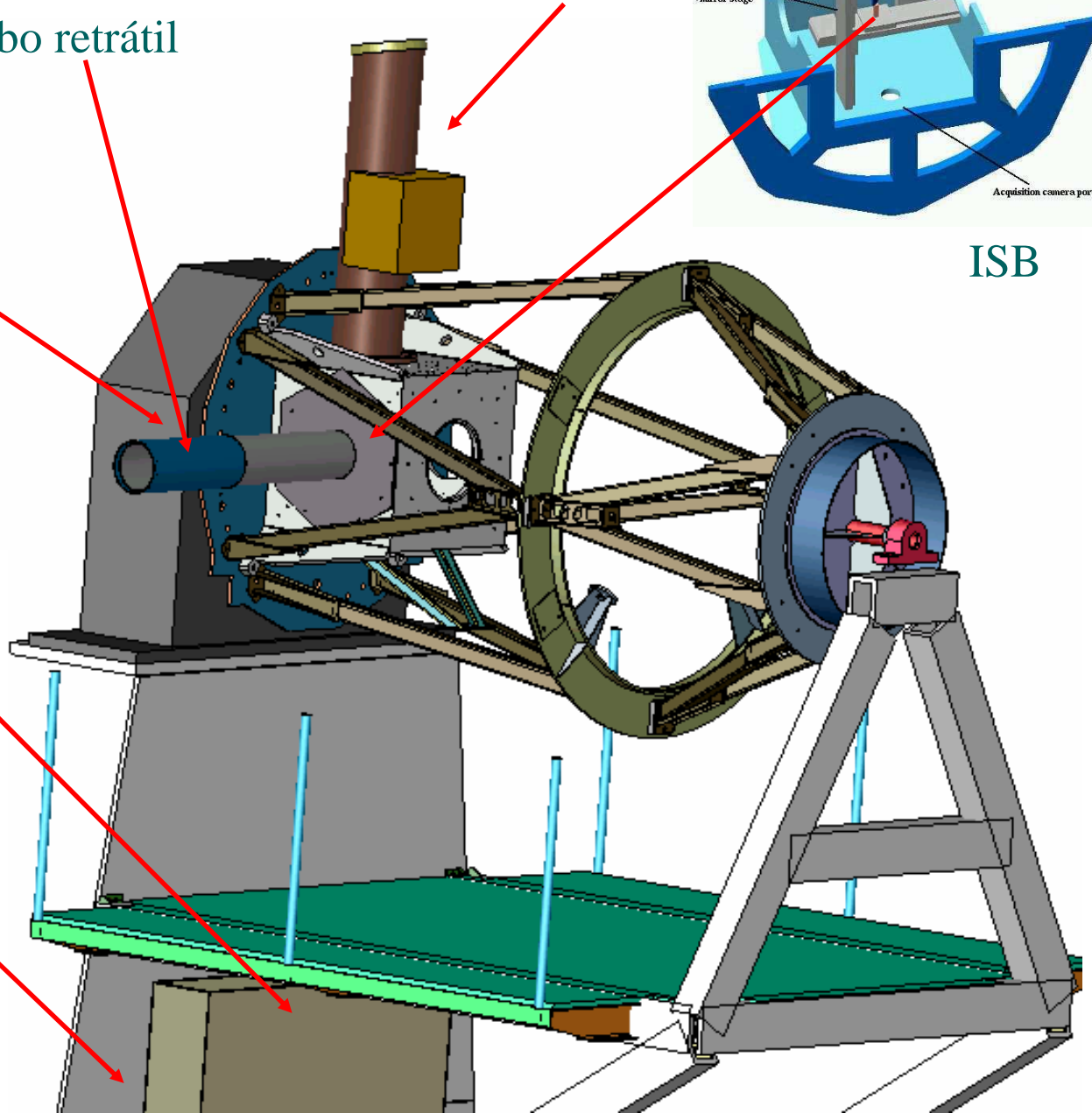
unidade de calibração

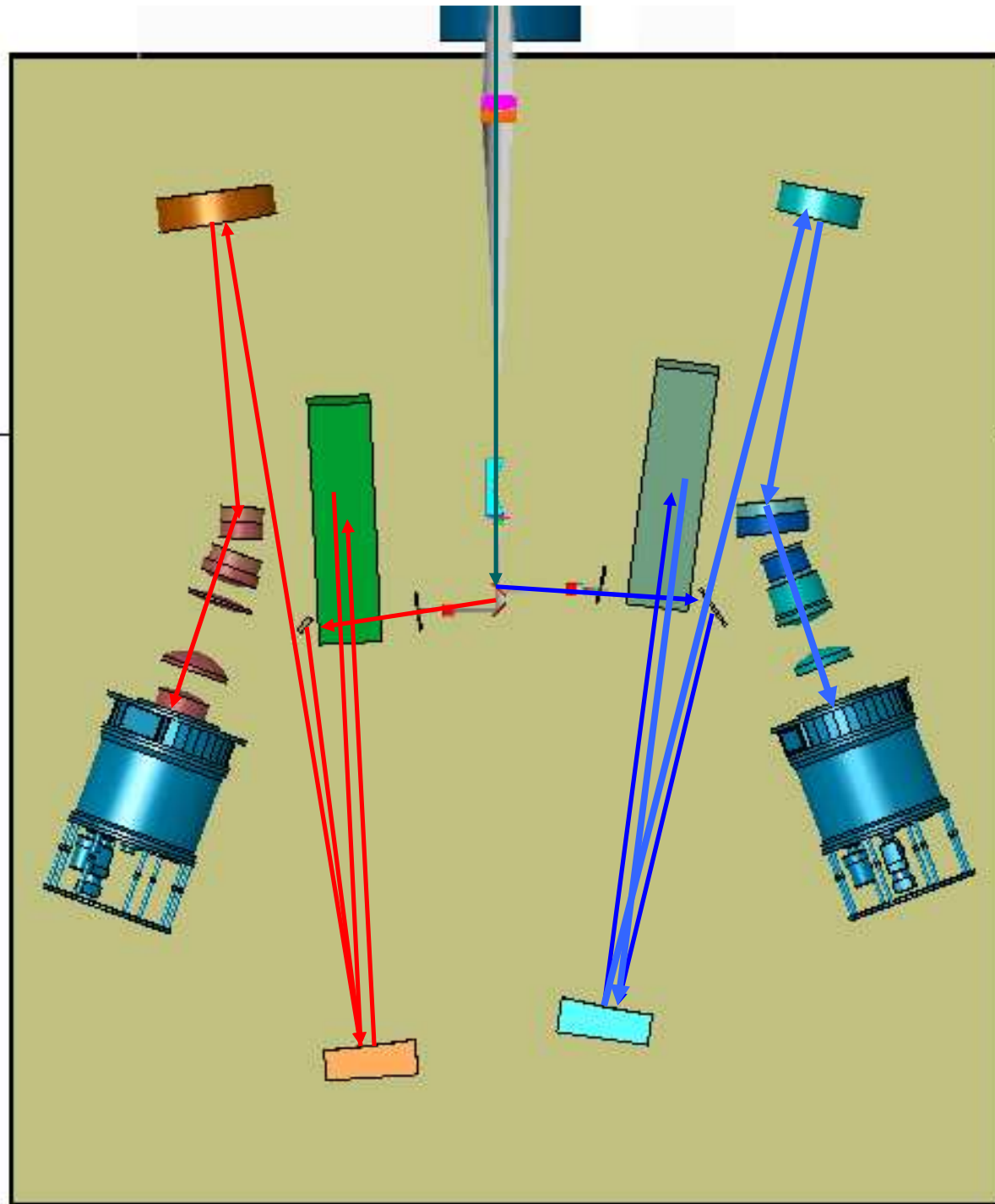


ISB



bancada





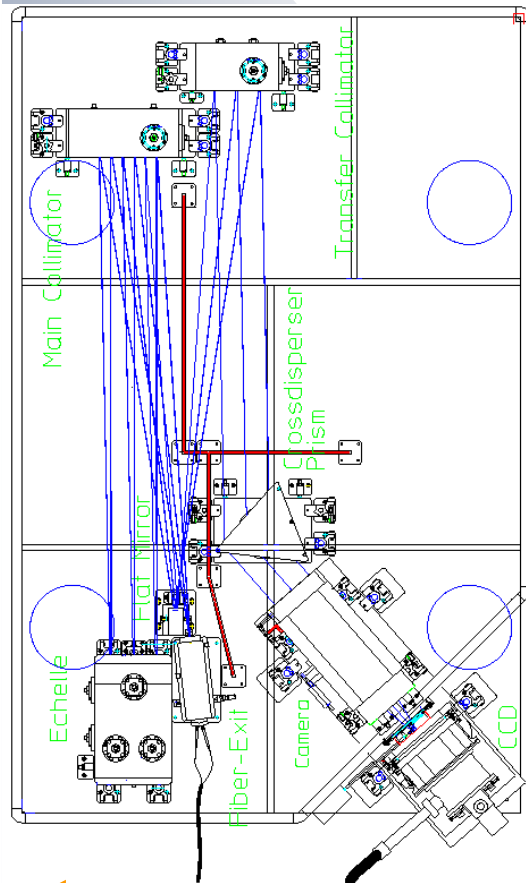
Comparação de tamanhos

3.5m

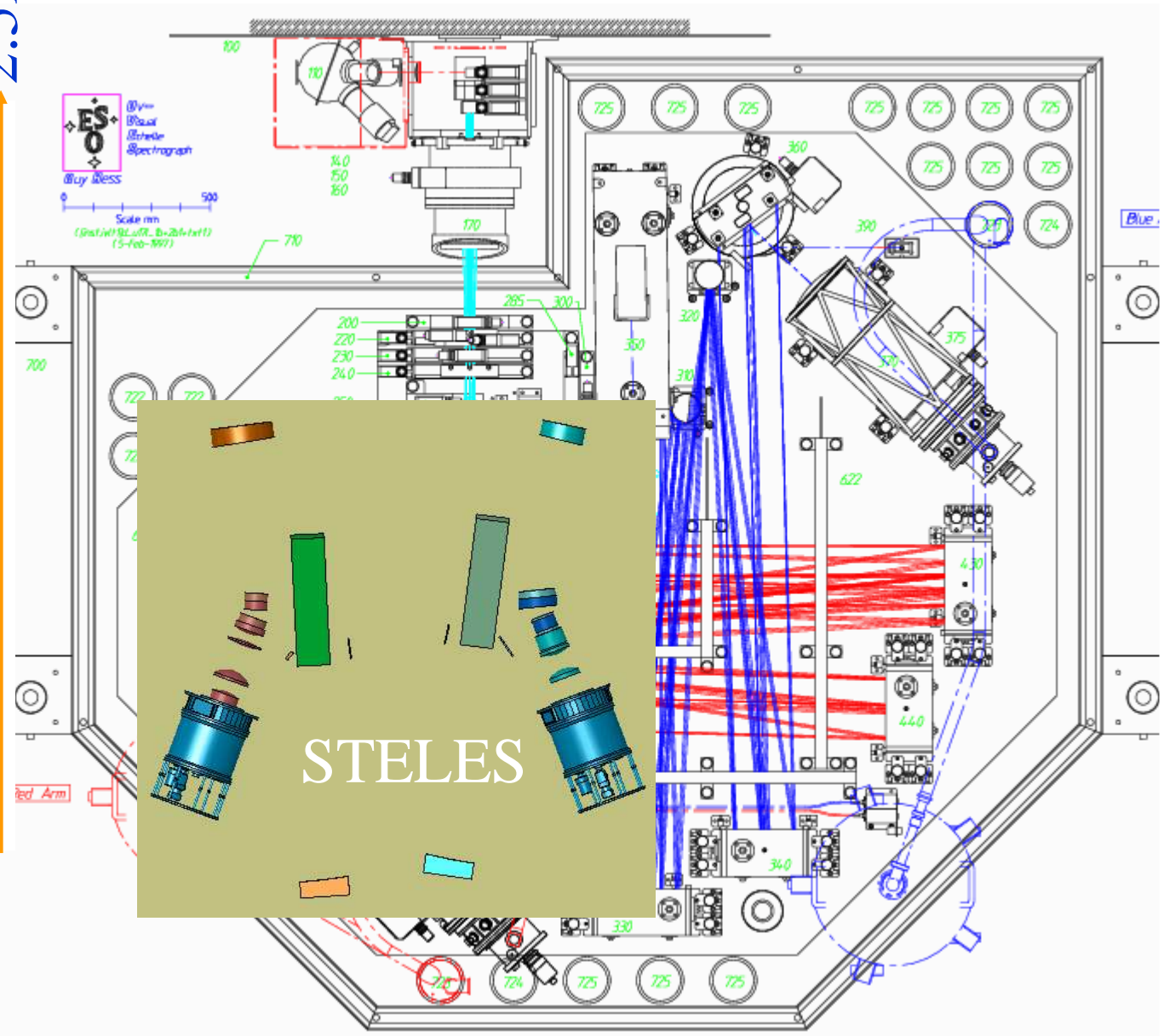
UVES

FEROS

2.5m

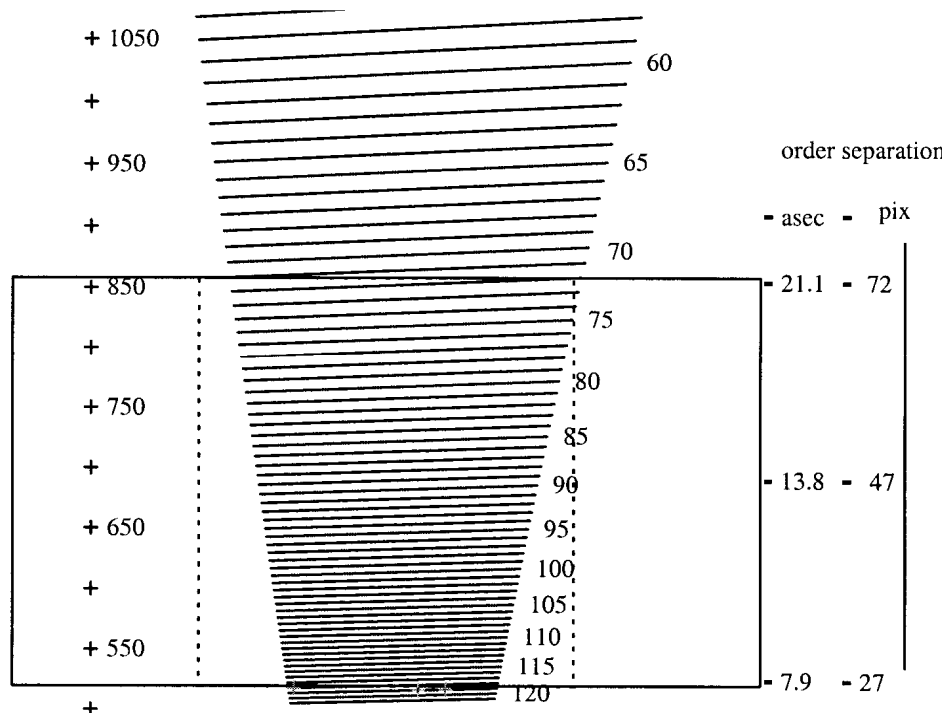


1.5m



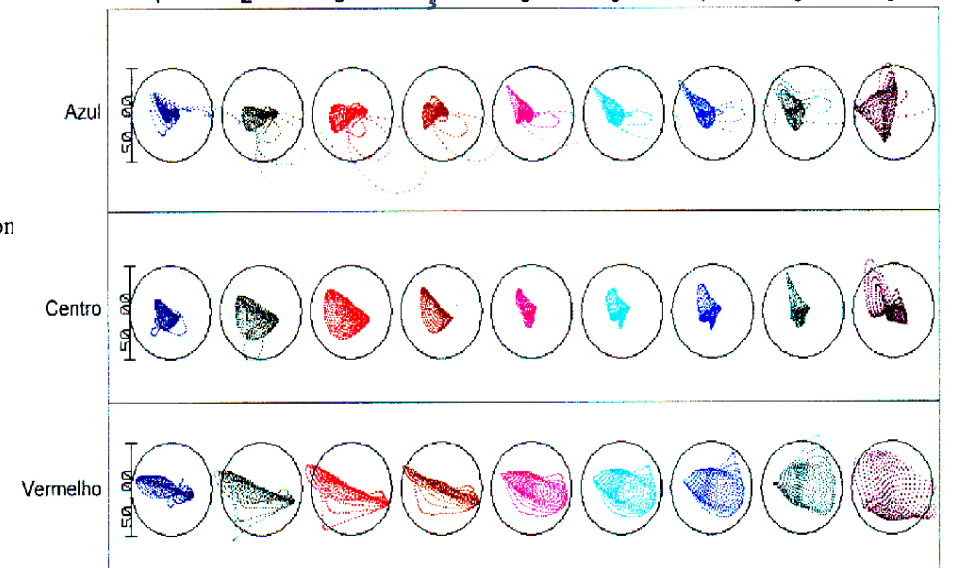
STELES

Qualidade da Imagem e Formato Espectral



Canal Vermelho

Canal Azul
Valores pré
otimização



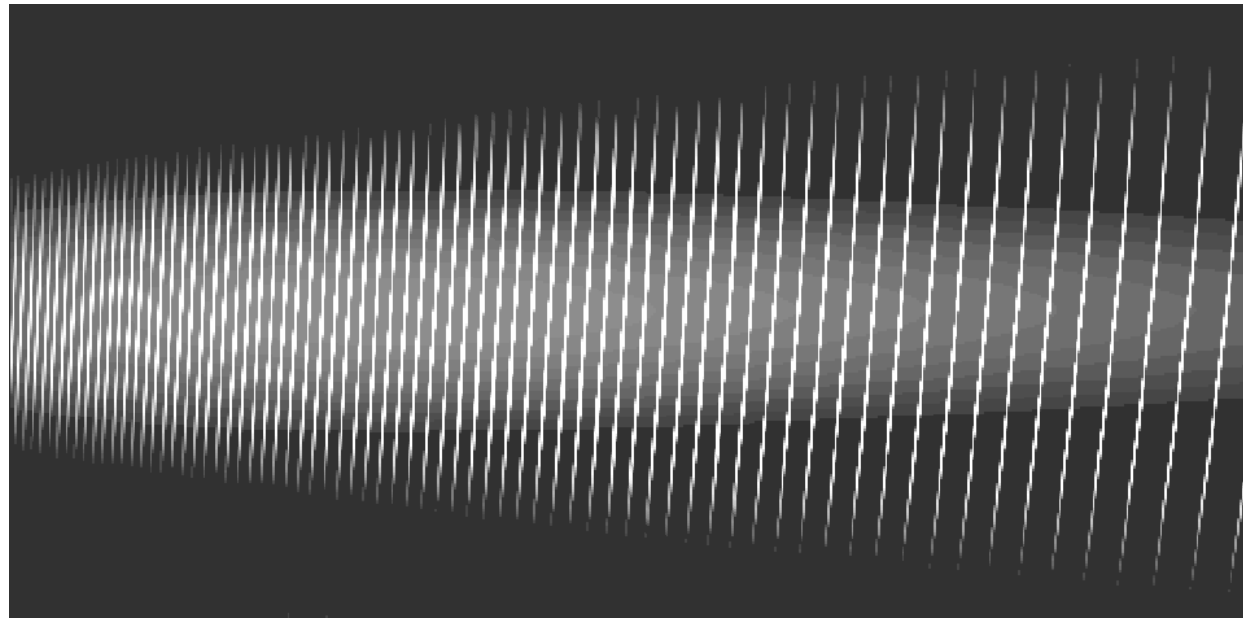
Config.	Ordem	λ_{azul}	λ_{c}	$\lambda_{\text{verm.}}$
1	84	5486	5519	5552
2	90	5123	5151	5180
3	96	4804	4829	4855
4	102	4523	4545	4568
5	108	4273	4293	4313
6	119	3880	3896	3912
7	130	3552	3566	3580
8	141	3276	3288	3300
9	152	3040	3050	3060

Azul

72 ordens

6' - 23' sep.

300-550

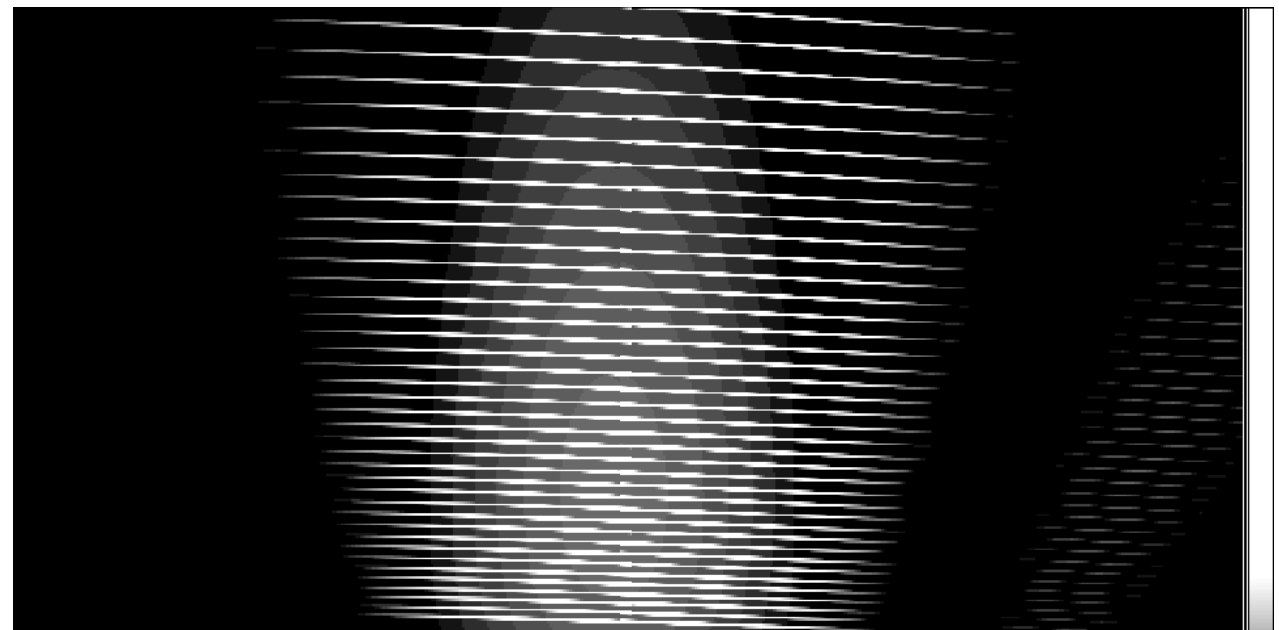


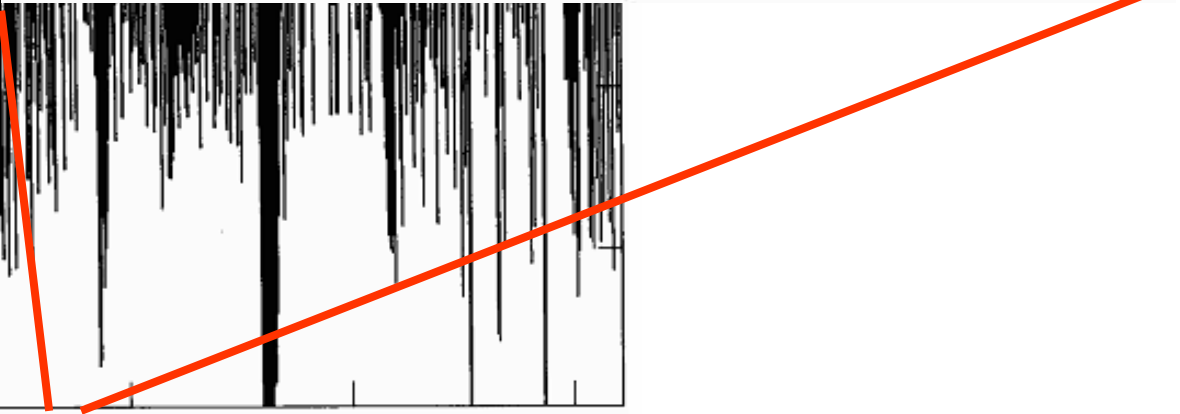
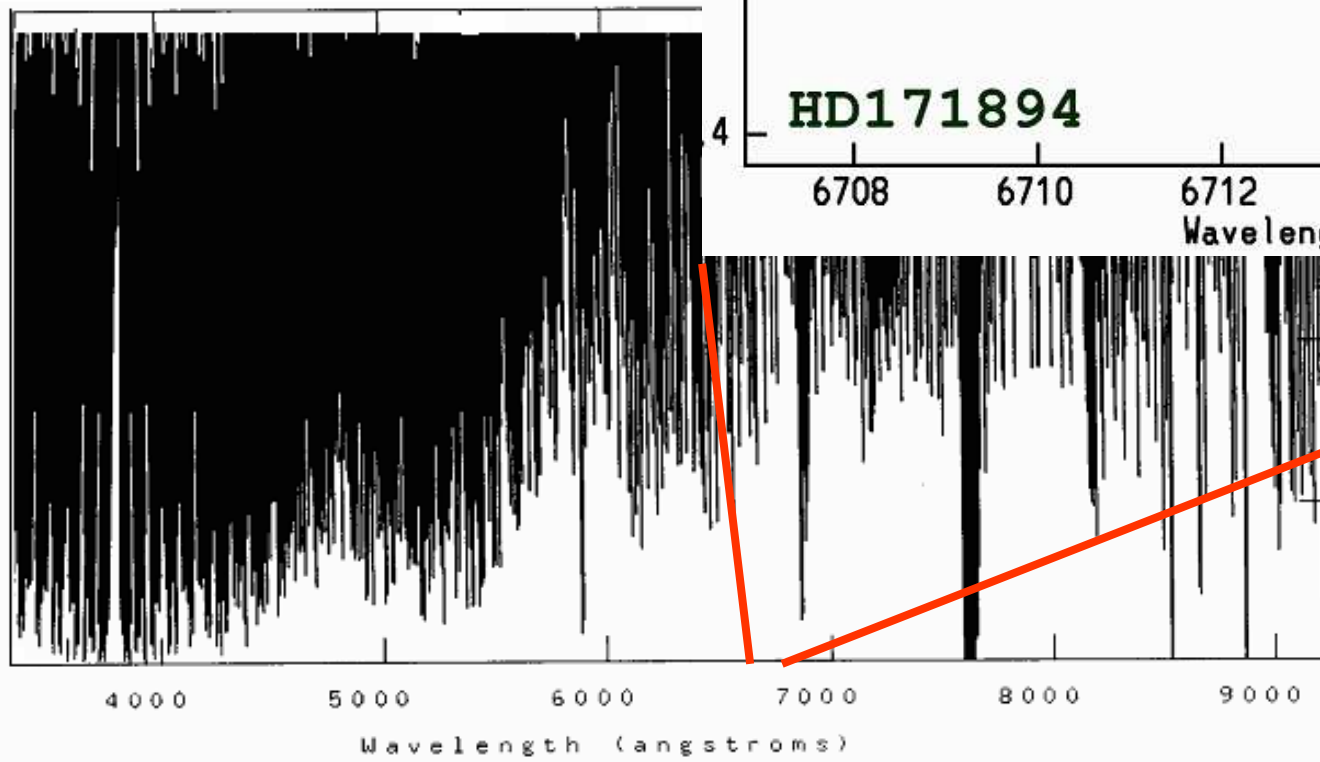
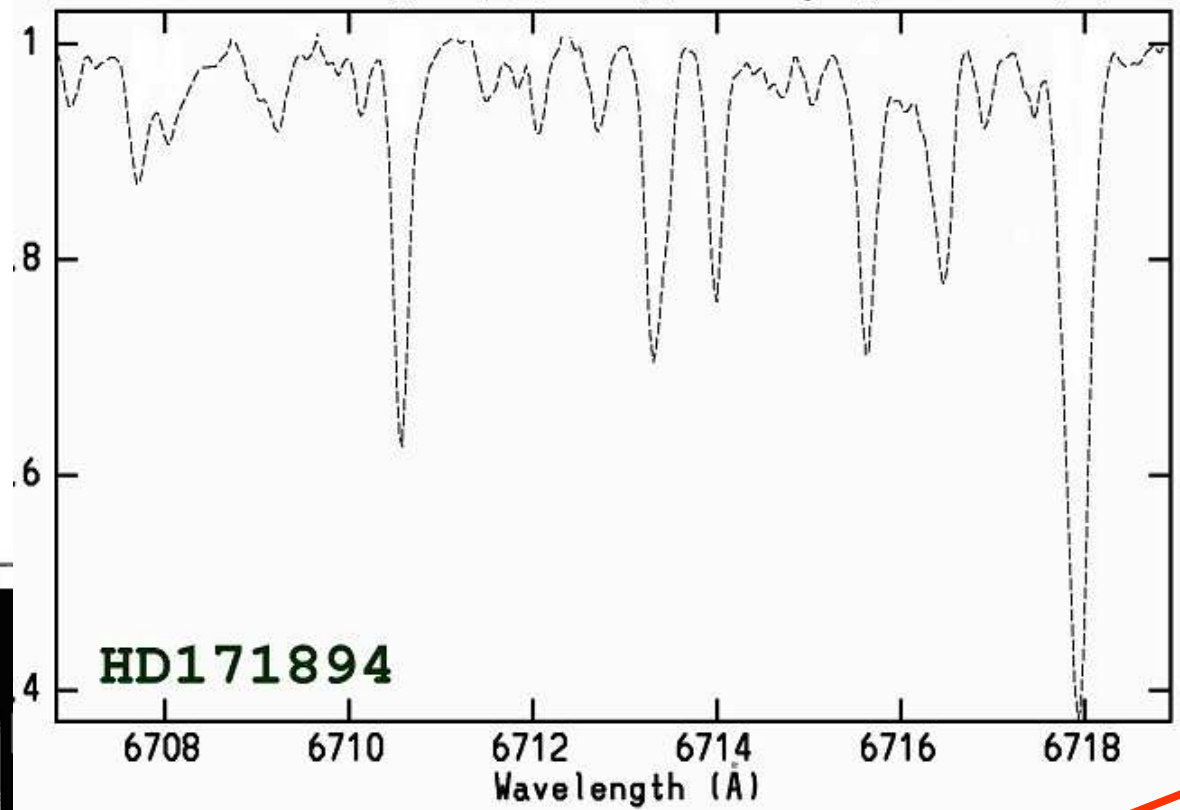
Vermelho

38 ordens

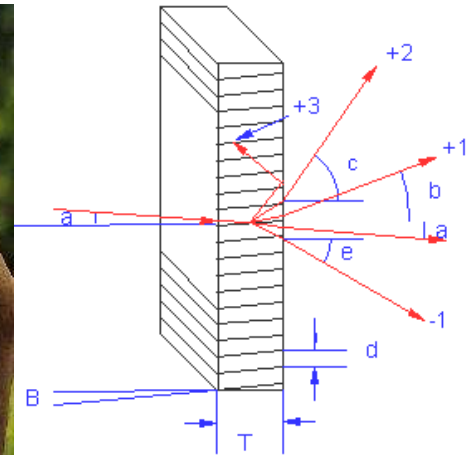
6' - 20' sep.

530-890





Porque redes holográficas?



- Mais eficientes
- transmissão (dão o ângulo exato que precisamos)
- baratas
- qq tamanho

porque não

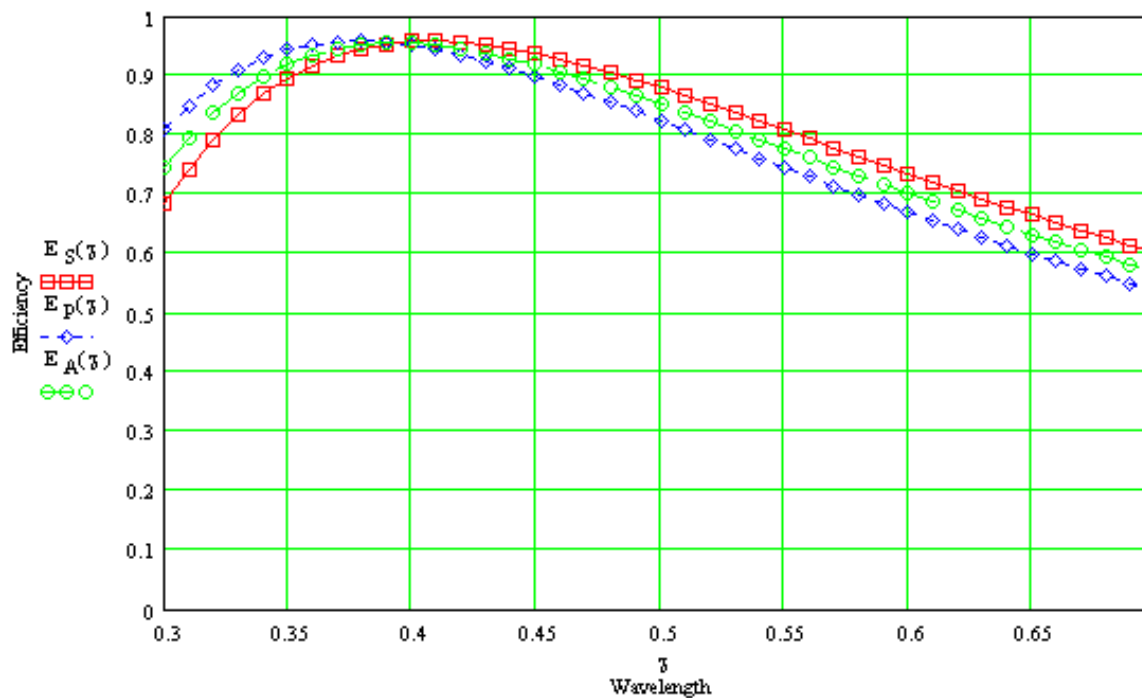
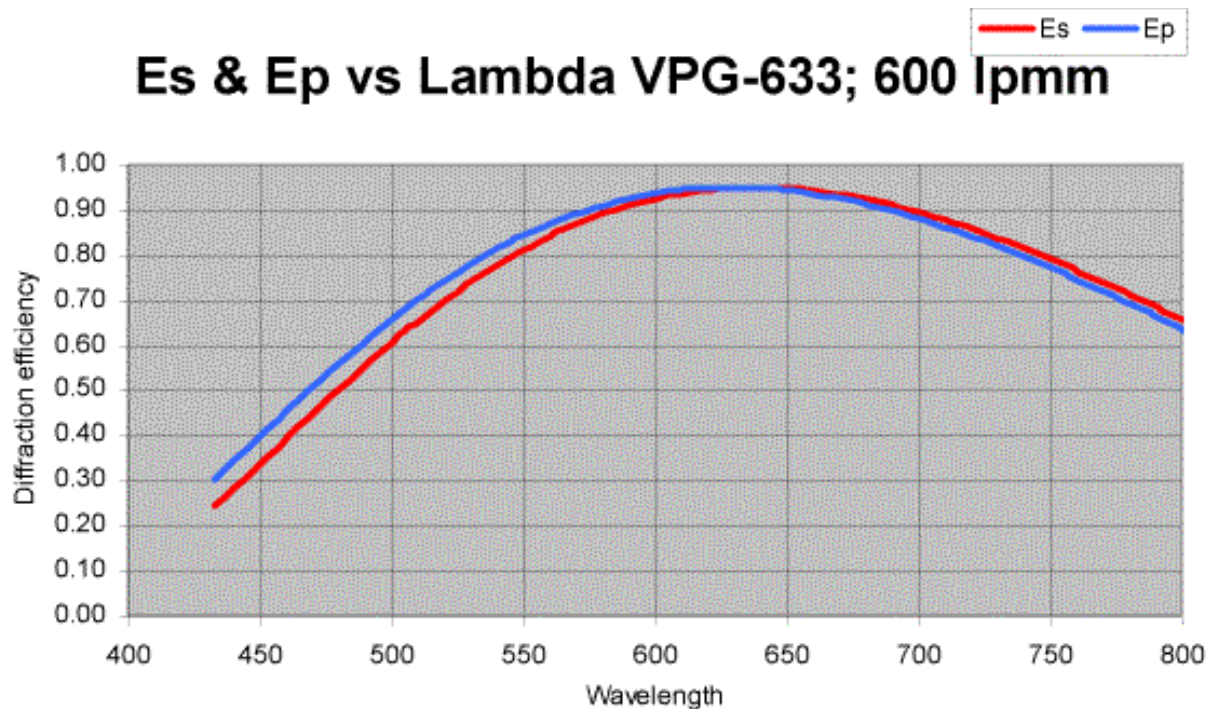
- queda rápida na eficiência
- dispersão muito alta para echelles
- são relativamente novas

Wasatch faz melhor

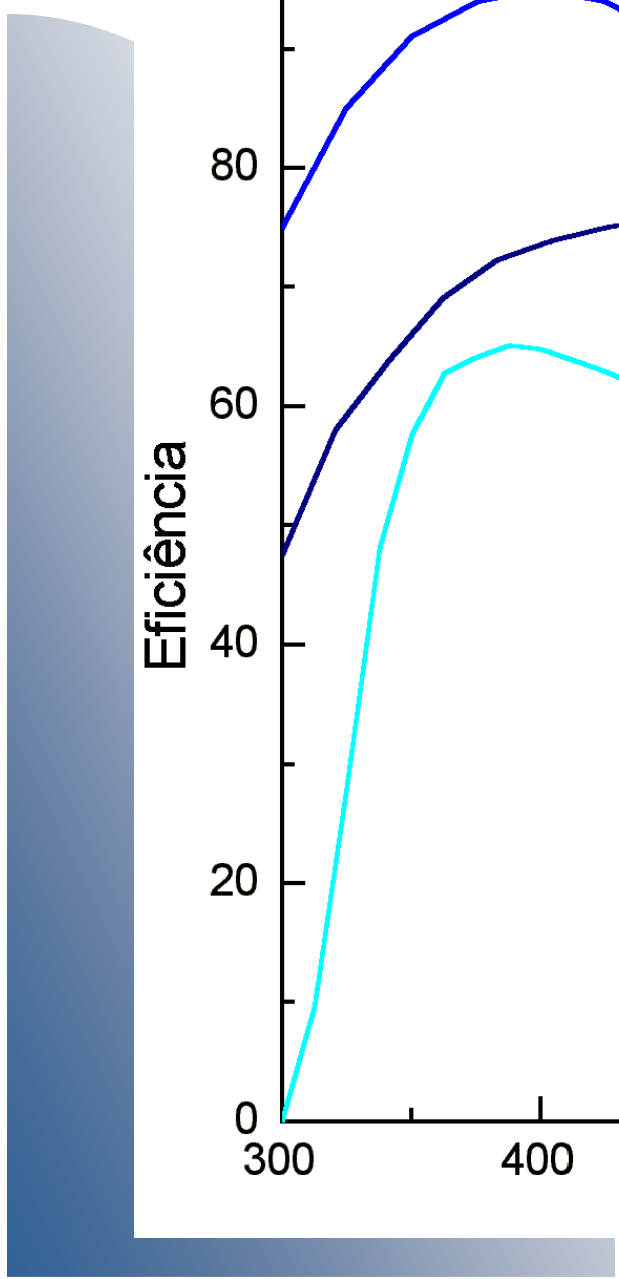
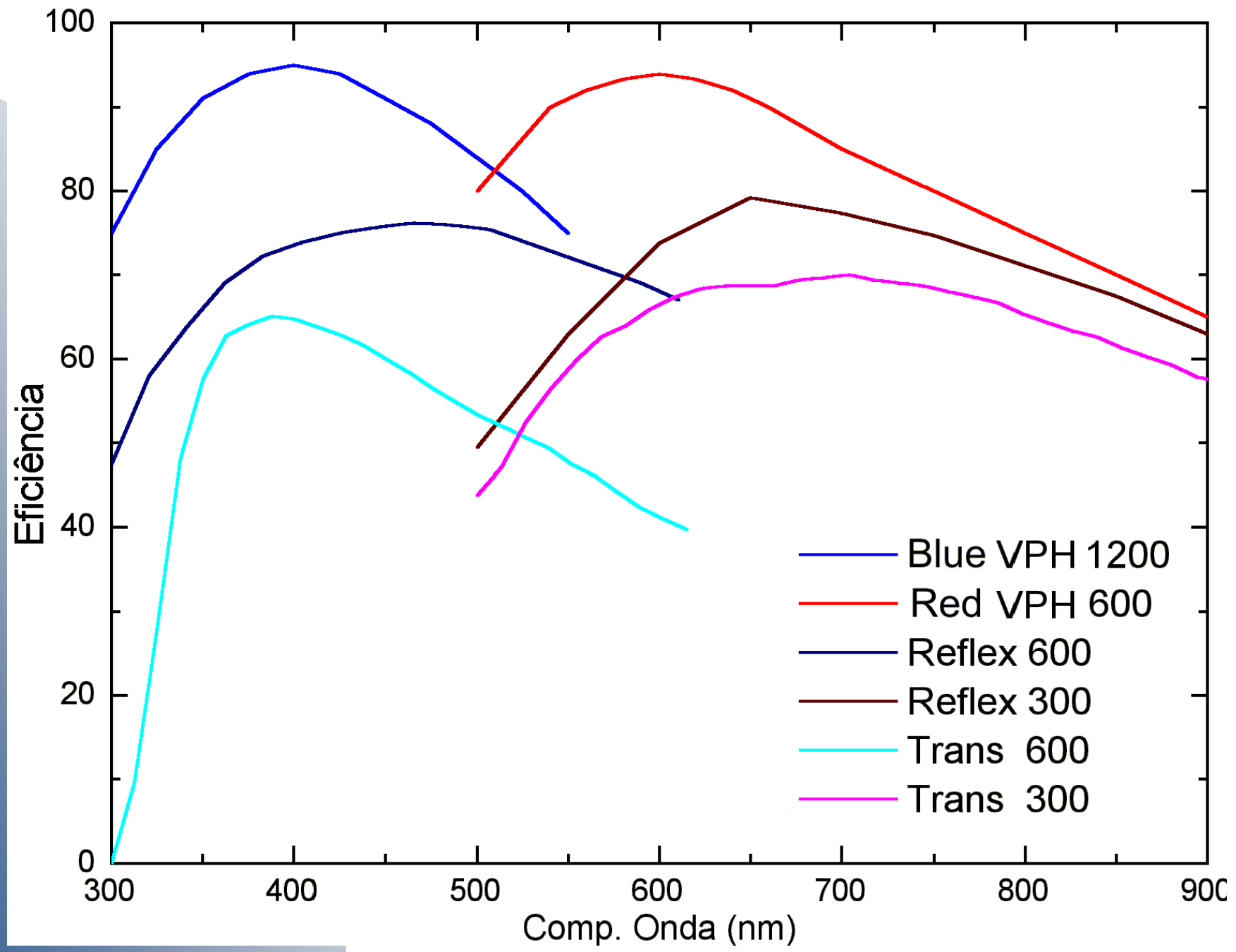
Desenho do Bernard resolveu isto

alguem tem que tentar

Es & Ep vs Lambda VPG-633; 600 Ipmm



trace 1



Redes Holográficas (*status*)

Produzidas segundo nossas especificações por



Primeiro contato - abril 2003

Especificação e cotação - maio 2003 (US\$8500)

processo para pagar (IAG, FUSP, CNPq, FINEP, Banco Mundial)

junho 2003 a junho de 2004!!!!!!!!!!!!

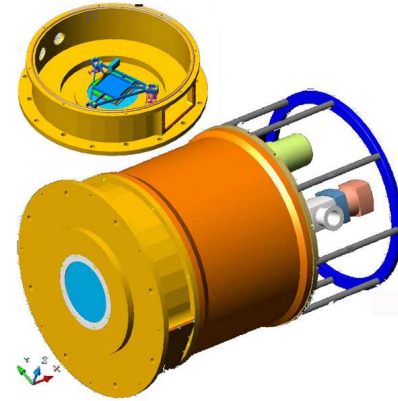
Produção julho/agosto 2004

processo para receber (CNPq) setembro de 2004 - ????

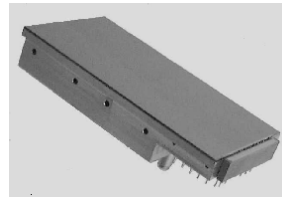
Detetores, Criogenia e controle CCDs

- Contrato I.Milênio - CTIO

- ◆ 2 Criostatos tipo SOAR customizados p/ STELES



- ◆ 2 CCDs e2v 4x2K (um azul outro vermelho)



- ◆ controlador eletrônico
Bob Leach



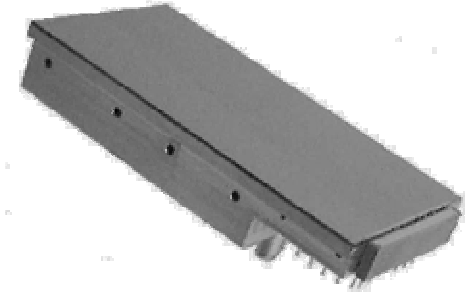
Detetores



- ◆ 2 CCDs 4x2K E2V44-82 Back Illuminated

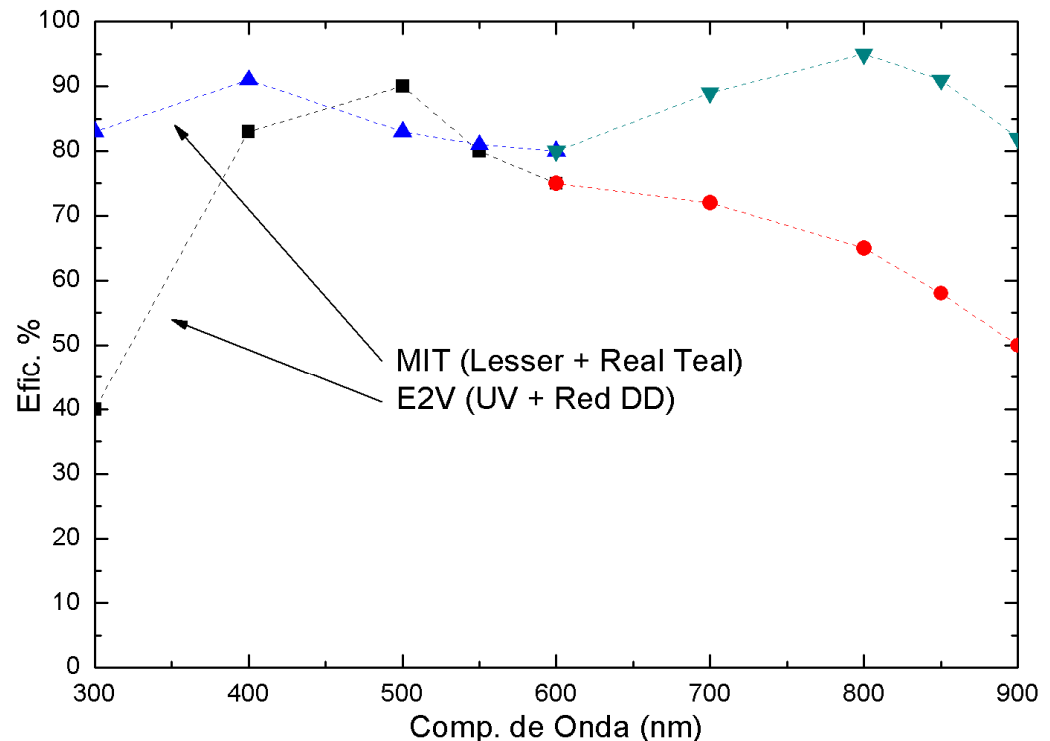
- ◆ um azul outro vermelho

- ✎ CCD-44-82-1-B43 Red coat., deep depletion 98,000
- ✎ CD-44-82-1-A43 UV Optimized coating 83,000



- ◆ porque E2V?

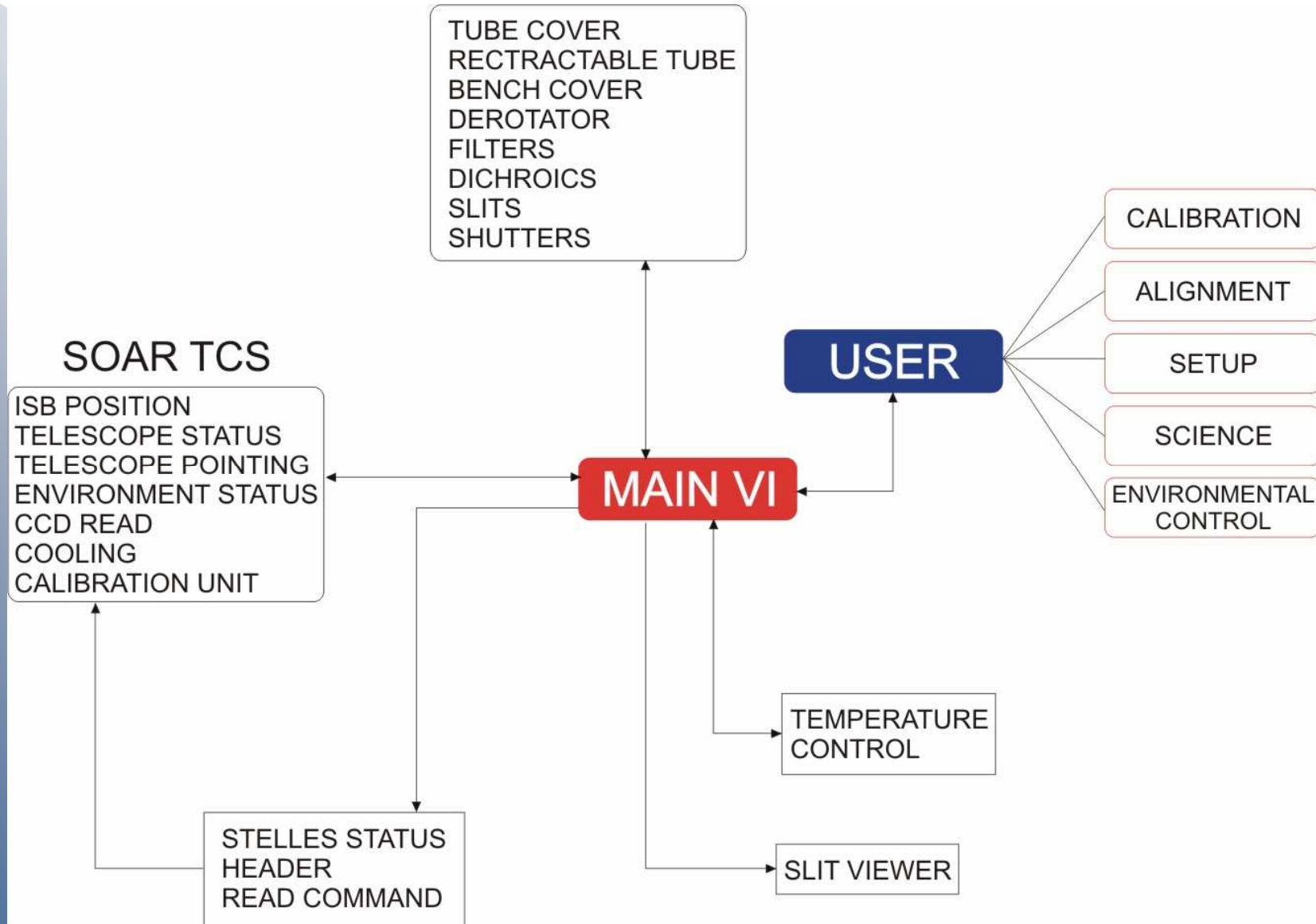
Porque eles tem pra vender



Software

- SOAR integrated control system
- web based exposure time calculator
- on-line data reduction software

Sistema de Controle



SETUP

CALIBRATION

SCIENCE

ENVIRONMENTAL CONTROL

ALIGNMENT /GUIDING



FORE OPTICS

FILTER WHEEL

1

FIELD DEROTATOR

SHIFT

0,00

STOP

SIDEREAL SPEED

CUSTOM SPEED

0,00

DICHROICS

A

B

SLIT WIDTH

BLUE 0,00

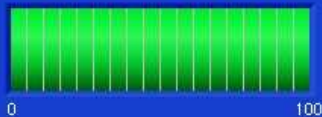
RED 0,00

STELLES

ON OFF

- ISB POSITION
- LIGHT BAFFLE TUBE
- SPECTROGRAPH SHUTTER
- MOTORS ON
- STELLES TEMPERATURE CONTROL
- TEMPERATURE CONTROL STABLE

SYSTEM CHECK PROGRESS

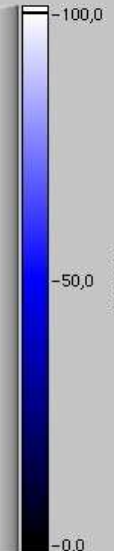
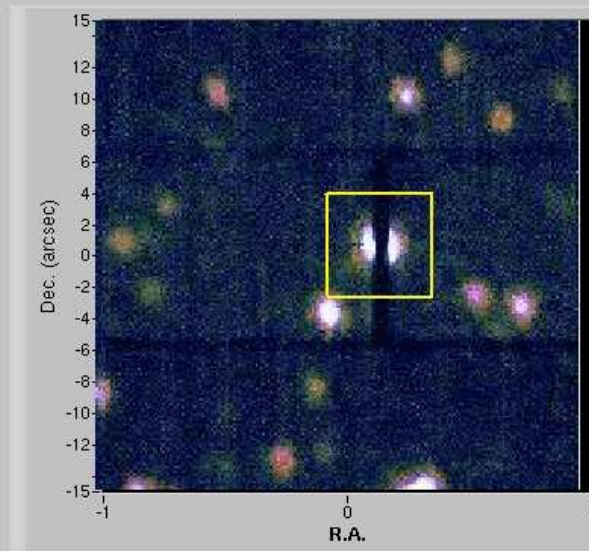


CURRENT TIME

11:55:52

DATE

11/13/03



- RED CAM ON/OFF
- BLUE CAM ON/OFF

VISUALIZATION

- Channel: BLUE
- Scale: 1X
- Show Slit: OFF/ON
- Show Sky: OFF/ON

INTENSITY Right Ascension Declination
 0 20:53:32 0,0000

MANUAL



Step 0,00 Pixel

- ACQUIRE
- SHOW BOX

LOOP

- SLIT CENTER
- OFFSET STAR
- Avg. Time (sec) 0,00 SET

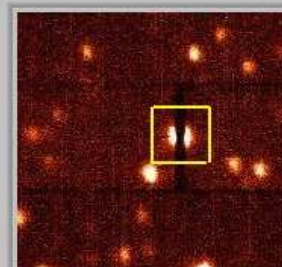
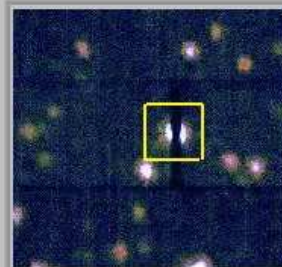
OFFSETS

	Last	Avg	Est. Err
ERRX (Pixels)	0,00	0,00	0,00
ERRY (Pixels)	0,00	0,00	0,00

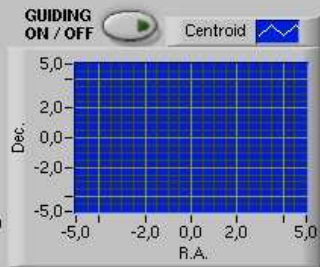
REMAINING TIME

0 seconds

BLUE



RED



Calculadora de Tempo de Exposição

IRAF *sptime* + PHP + Python

- Tempo \rightarrow S/N
- S/N \rightarrow Tempo
- Ordens simples
- Todas as ordens

STELES
Exposure Time Calculator
SOAR Telescope Echelle Spectrograph

[Online help for SPECTIME](#)

☉ Signal-to-noise ratio: ☾ Integration time in seconds:

Maximum time per single exposure (seconds):

Central wavelength: From 3000 to 5399 [Å] data is computed for Channel A
From 5400 to 9000 [Å] data is computed for Channel B

Slit width in arcsecs (+) or pixels (-): Dichroic:

Filter:

Detector binning (dispersion):

Seeing (arcsecs): Airmass:

Lunar Phase (0-14 days from new moon, 0 = new, 14 = full):

Describe the source with the following parameters. The power law index is only used if the source spectrum is set to F_{λ_power} or F_{ν_power} . Setting the power law index to 0 is equivalent to a flat spectrum for that particular power law function. If the value of the wavelength of the source flux is set to INDEF then the central wavelength value above is used. The wavelength of the source flux is ignored for source units = U, B, V, R, I.

Source spectrum: Temperature (K) for blackbody source: Power law index:

Wavelength (λ) of source flux or magnitude: Source flux or magnitude: Units of source flux or magnitude:

E(B-V) (reddening of source in magnitudes):

Detector: [Help for Detector Type](#)

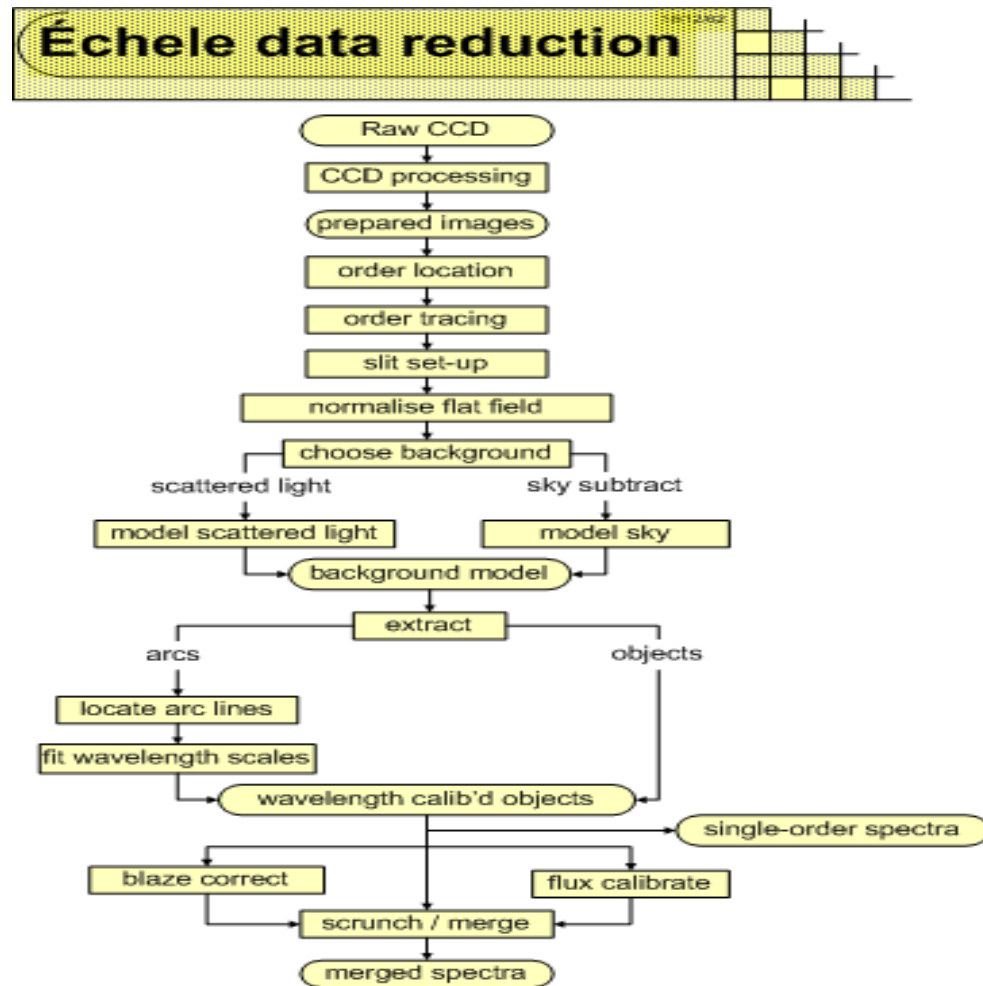
sediyama@efei.br

LNA LABORATÓRIO NACIONAL DE ASTROFÍSICA **SOAR** TELESCOPE INSTITUTO 30 MILENIO **CT BRASIL** Ministério da Ciência e Tecnologia

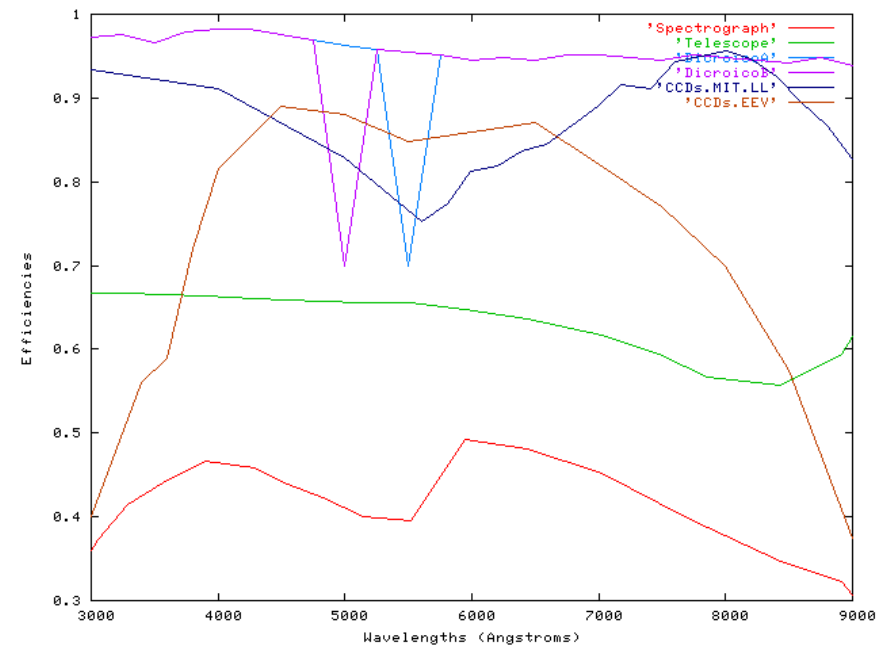
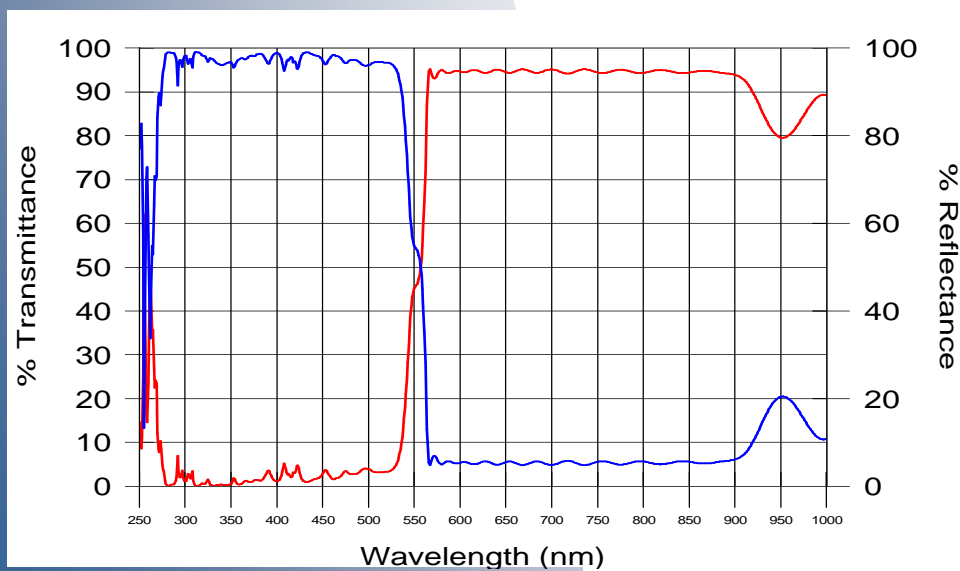
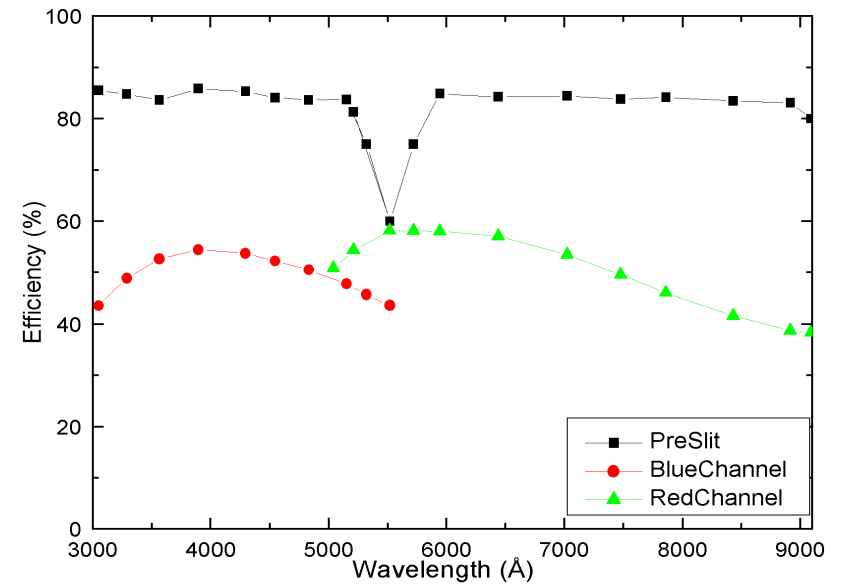
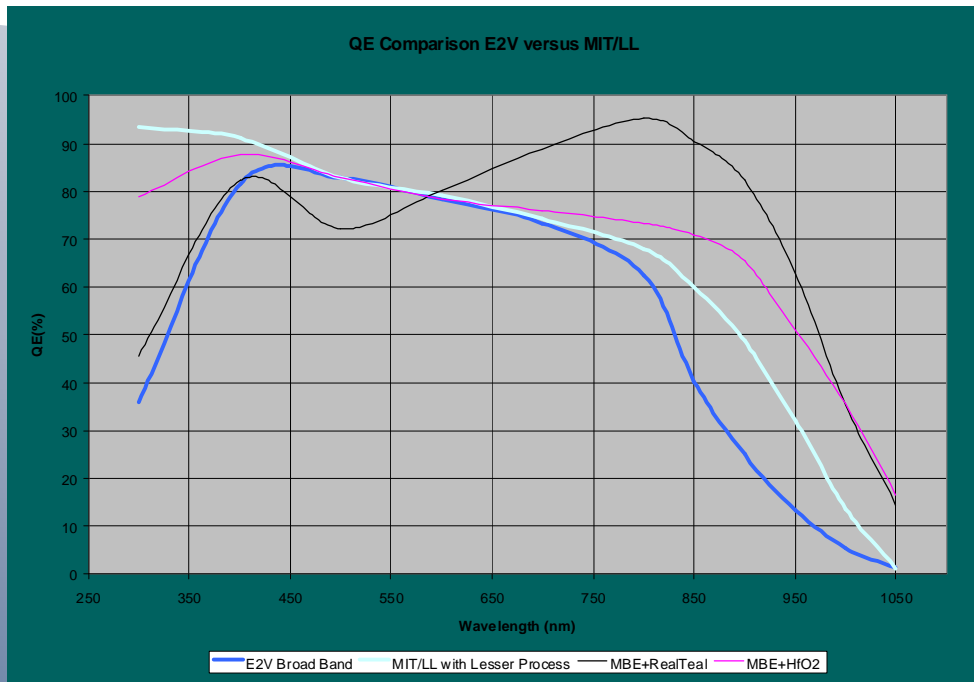
Redução de Dados

- Redução padrão echelle customizada para o STELES

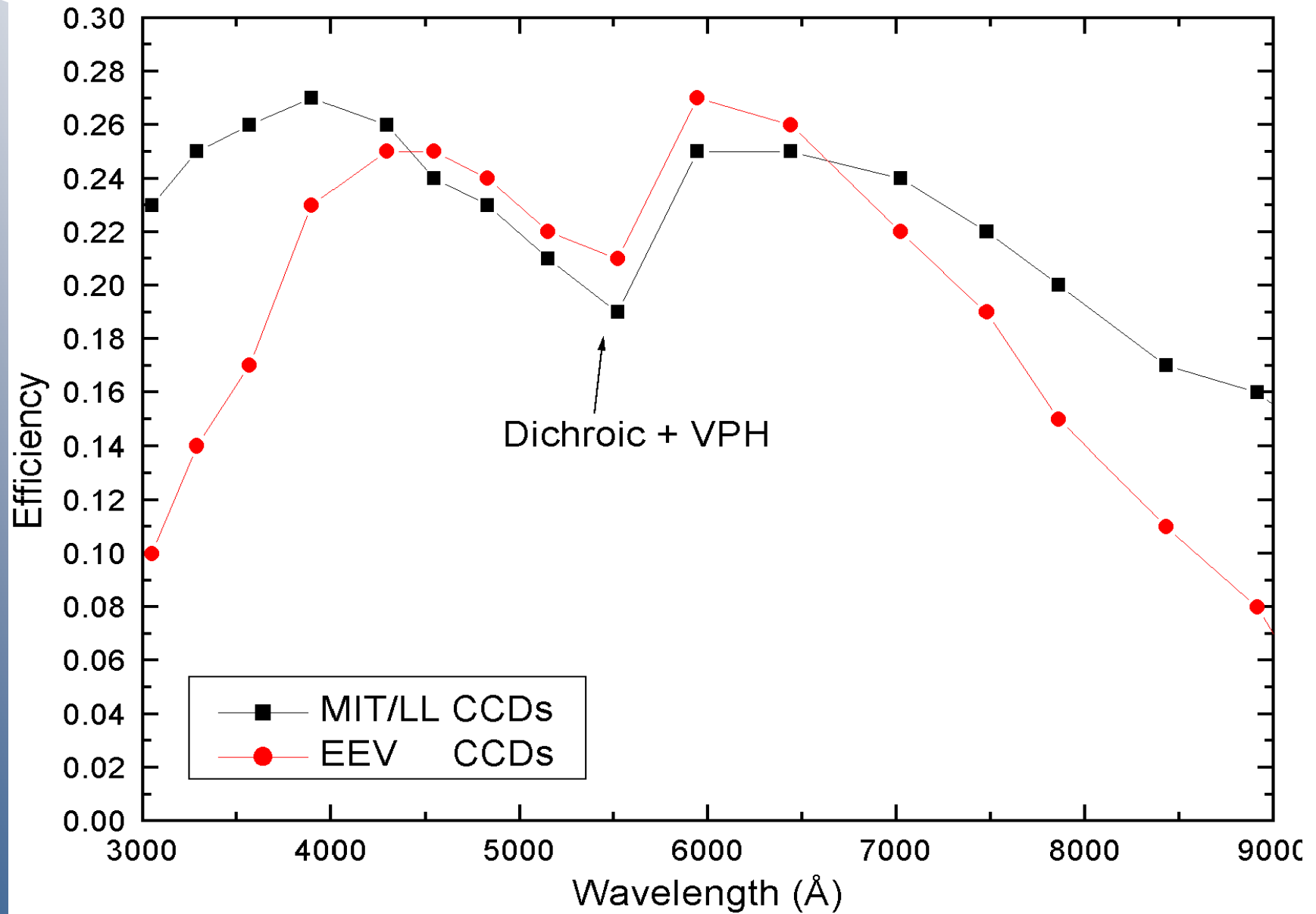
- Pipe line
- IRAF + Phytton



Eficiência - curvas teóricas



Eficiência - valores teóricos, STELES + SOAR

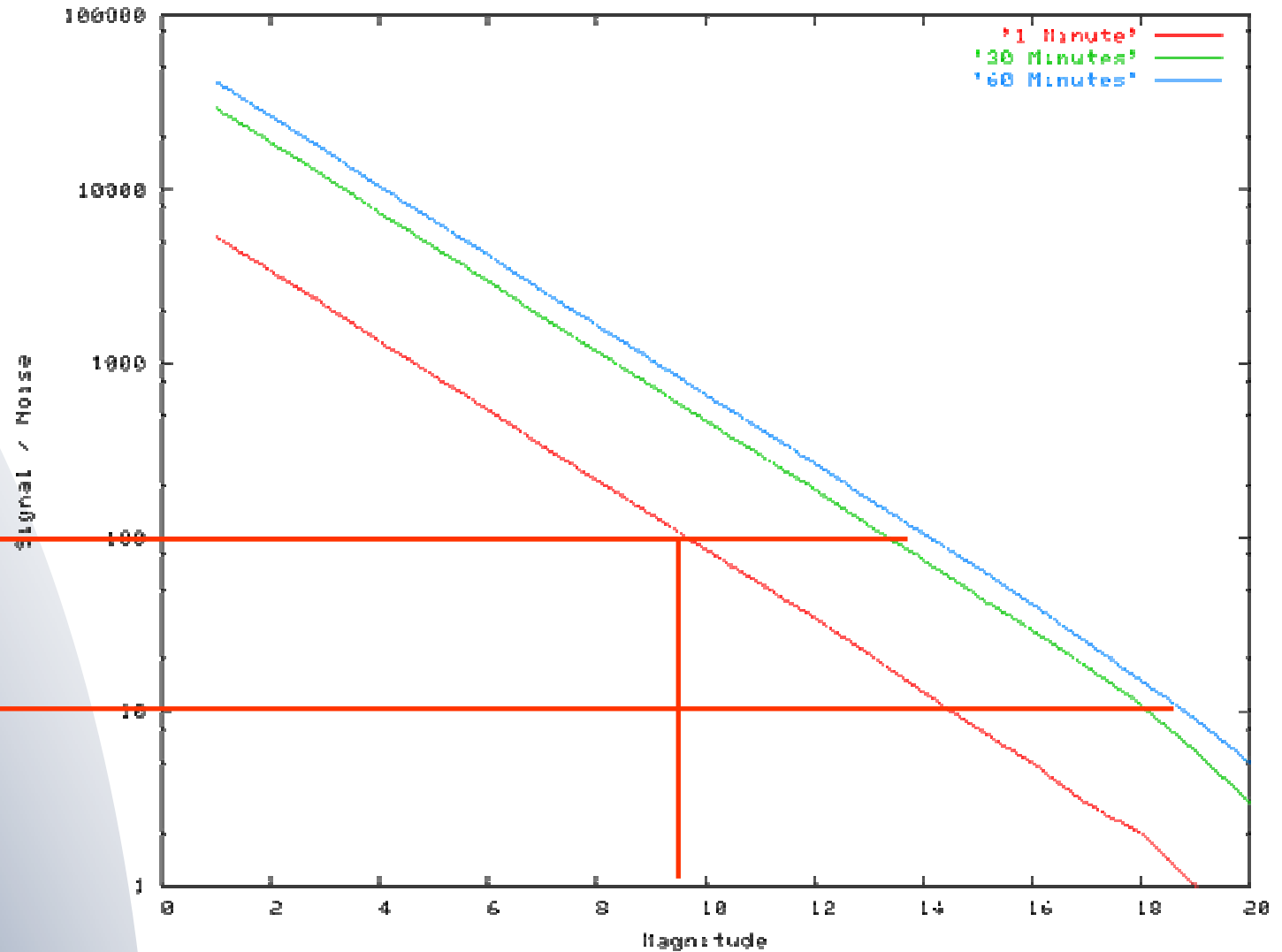


V=14
S/N 100
1 hora

V=9.3
S/N 100
1 min

V= \sim 18
S/N 10
1 hora

slit 0.8", seen 0.8", Air mass 1.0, New moon, 5700K, 600nm



Custos

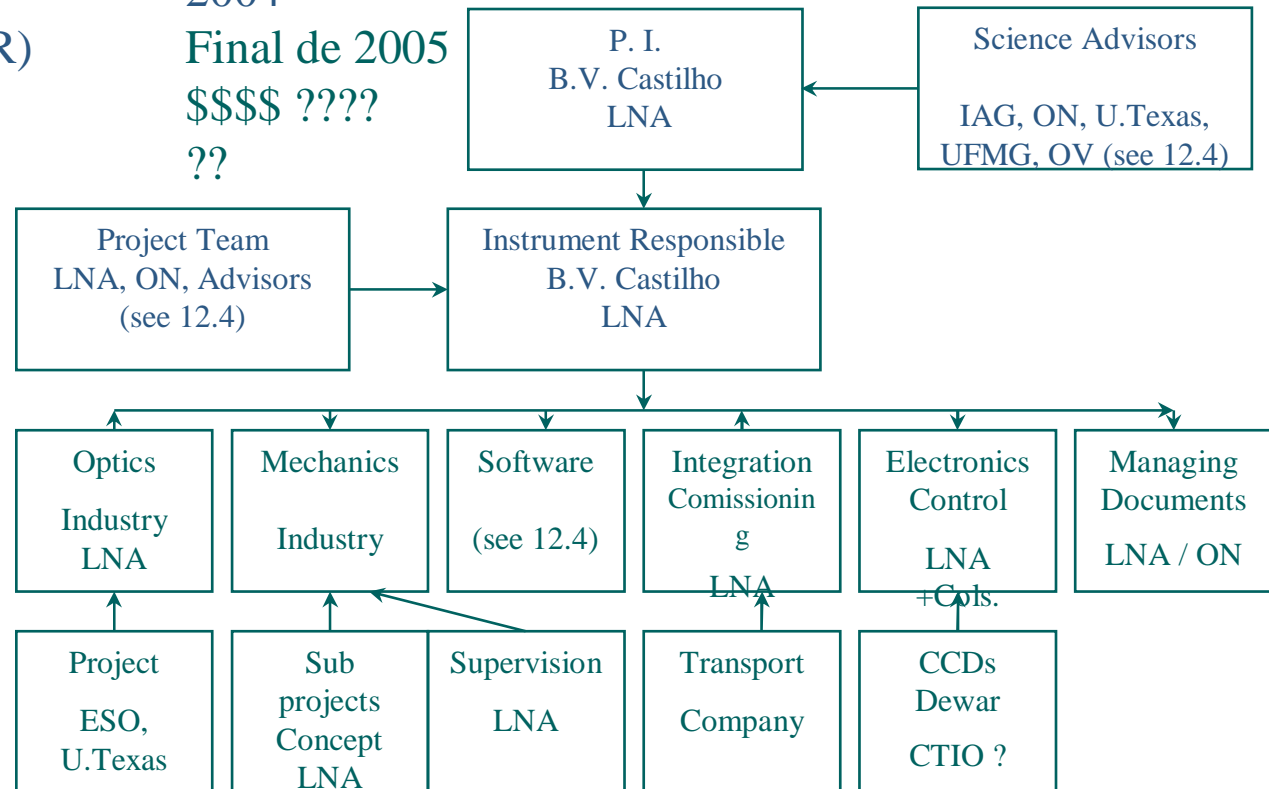


<i>Project</i>		<i>Construction</i>	
<i>PDR level Project</i>	30 k	Echelle and VPH Gratings	80 k
<i>FDR level Project</i>	20K	Cameras	150 k
<i>Meetings / Travels</i>	30 k	Other Optics	70 k
<i>Personnel / Salaries</i>	to be calculated	CCDs / Dewar	320 K
		Mechanics / Electronics	165 k
		Semi Total	785 k
		Meetings / Travels	70 k
		Integration, Tests, Tran-sport, Comissioning	50 k
Total	80 k +salaries	Total	905K + salaries

1/3 do projeto financiado

Planejamento e Construção

- Definição Científica 2000
- Montagem da Equipe 2000-2001
- Desenho Conceitual 2001-2002
- Conceptual Design Review Nov 2002
- Detalhamento do Desenho 2003
- Project Design Review (PDR) Nov 2003
- Detalhamento do Desenho 2004
- Final Design Review (FDR) Final de 2005
- Construção \$\$\$\$????
- Acceptance Test (AT) ??
- Comissionamento



STEELES

<http://www.lna.br/~steles/index.html>

<http://www.lna.br/soar/soar.html>



Fim