Polarimetry down to 90nm

A. López Ariste

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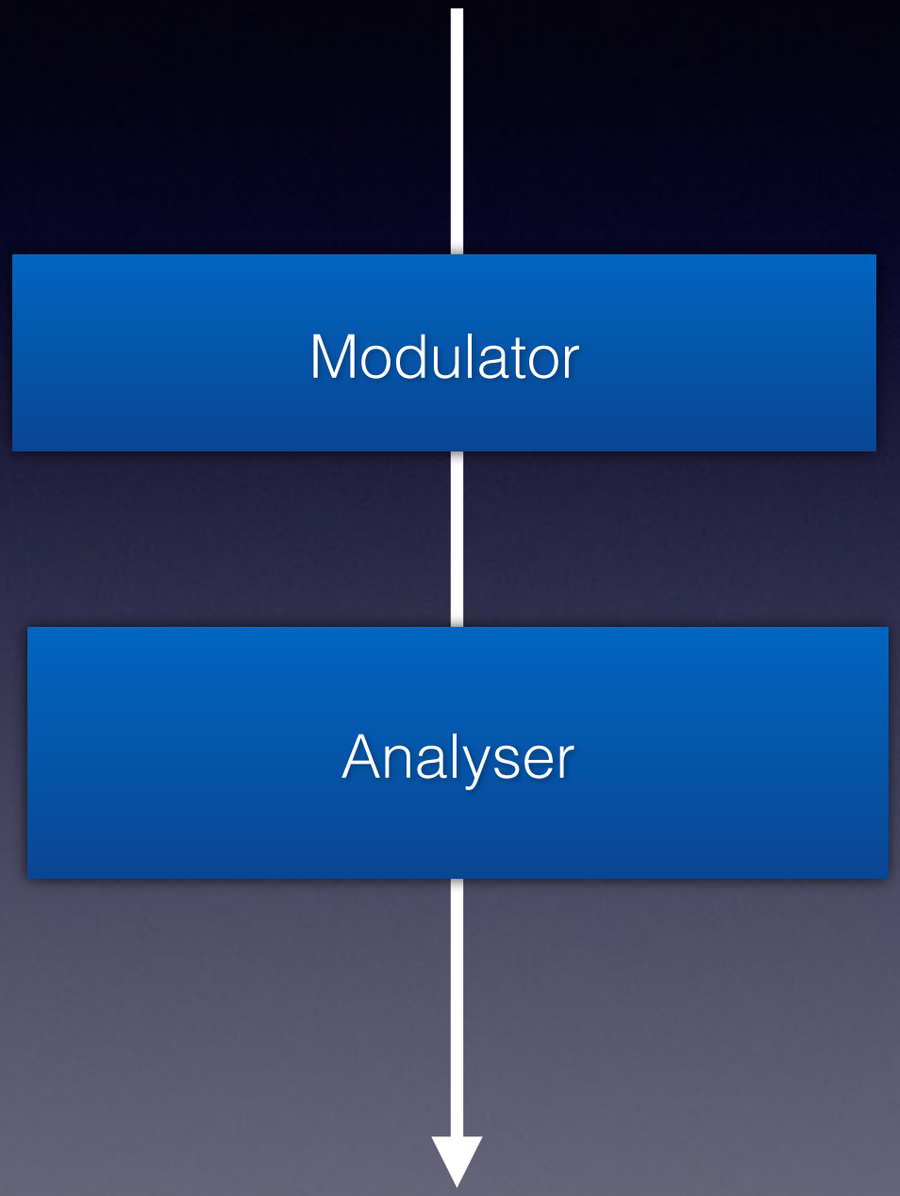
Concepts



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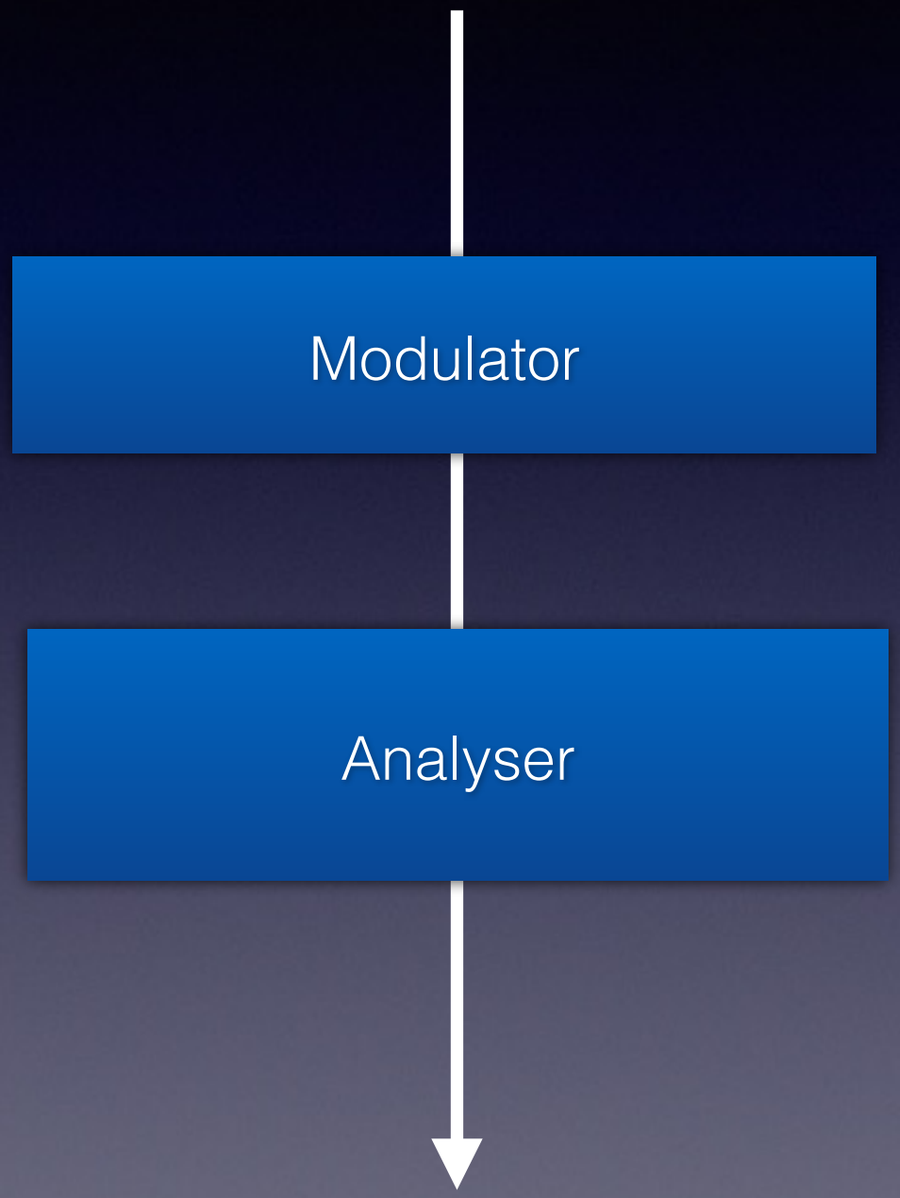
Concepts

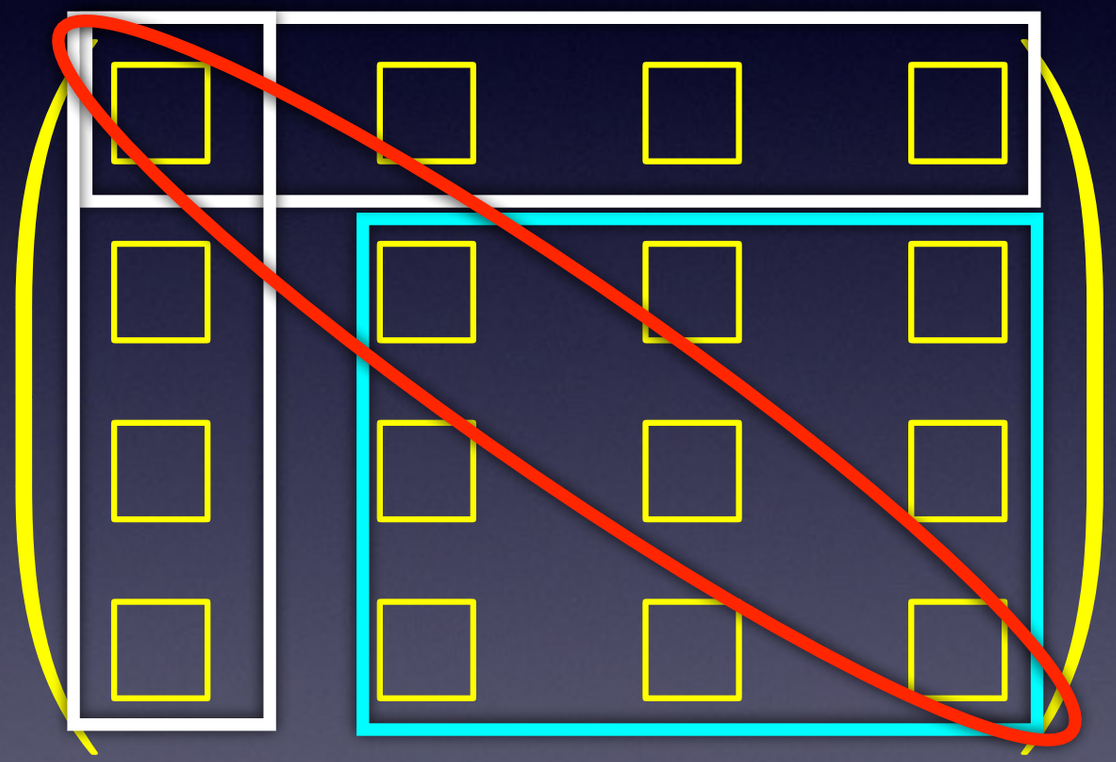


Retardance

Polarisation

Mueller matrix

Polarisation



Retardance

Absorption

Classic Solutions

Modulator

Waveplates

Liquid Crystals

Fresnel Rhombs

Analyser

Calcite beamsplitters

Wollaston

Linear polarizers

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Arago

Modulator

Spark's MgF2 wedge

Analyser

Wollaston

MgF2 piling

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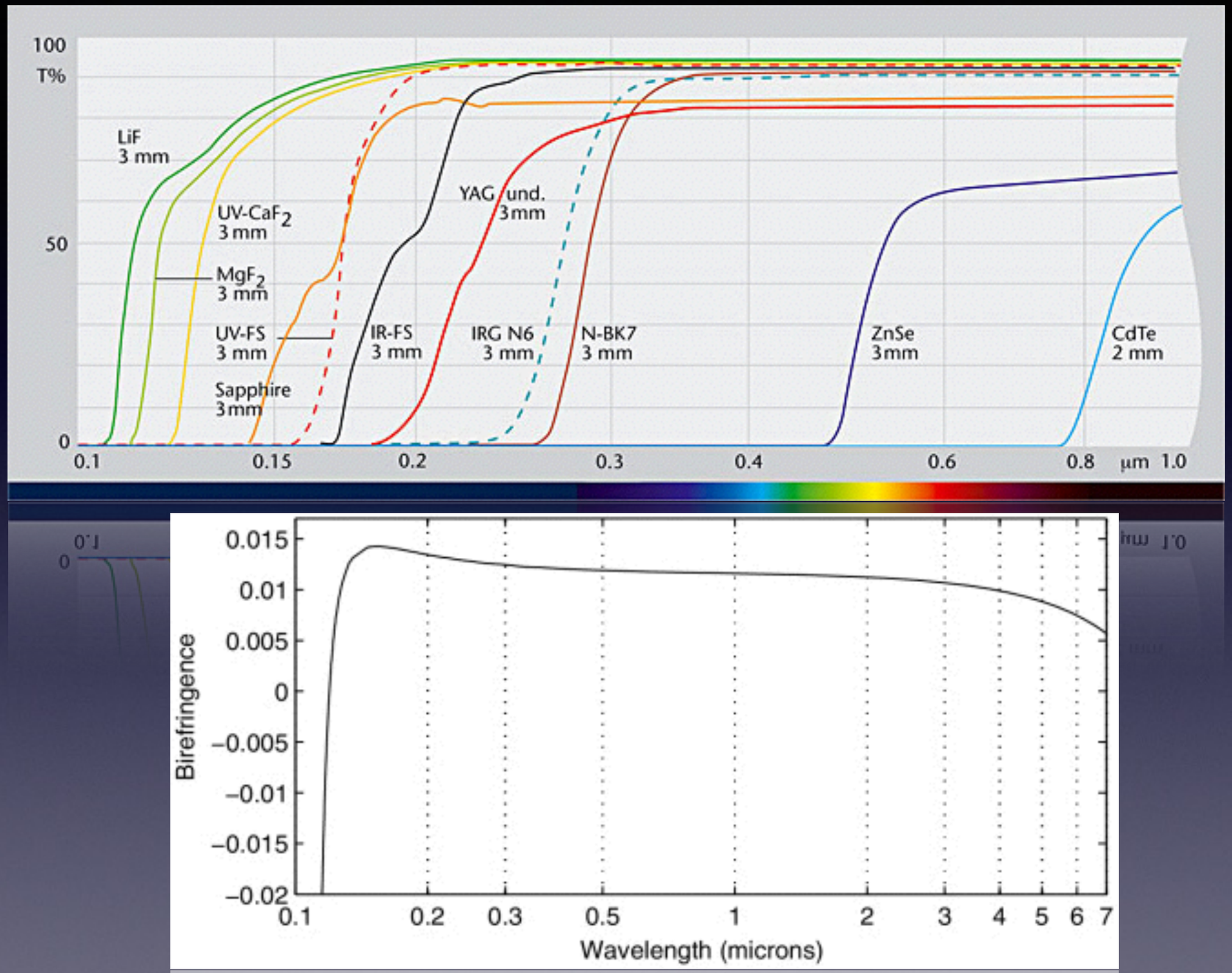

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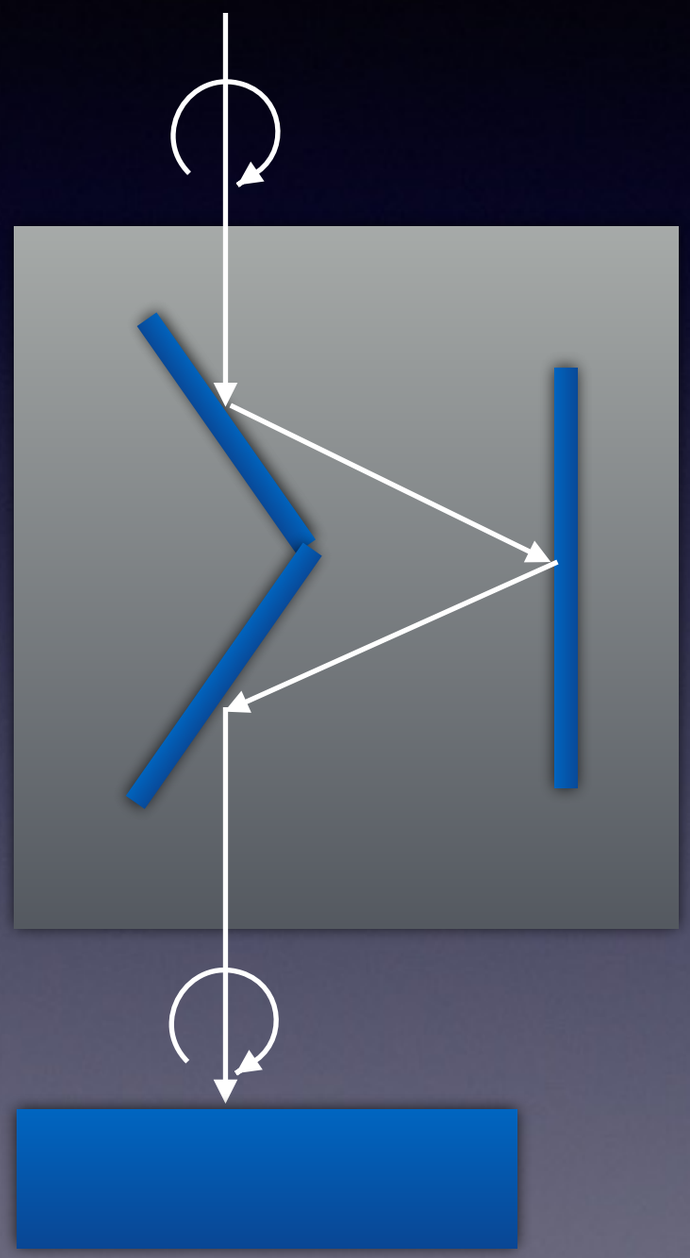
Pollux Problems

- Transmission
- Retardance
- Polarization

Basic concept for Pollux



Modulator

Analyser

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Muller matrix for reflections

$$\begin{pmatrix} \chi^2+1 & \chi^2-1 & 0 & 0 \\ \chi^2-1 & \chi^2+1 & 0 & 0 \\ 0 & 0 & \chi\cos\delta & \chi\sin\delta \\ 0 & 0 & -\chi\sin\delta & \chi\cos\delta \end{pmatrix}$$

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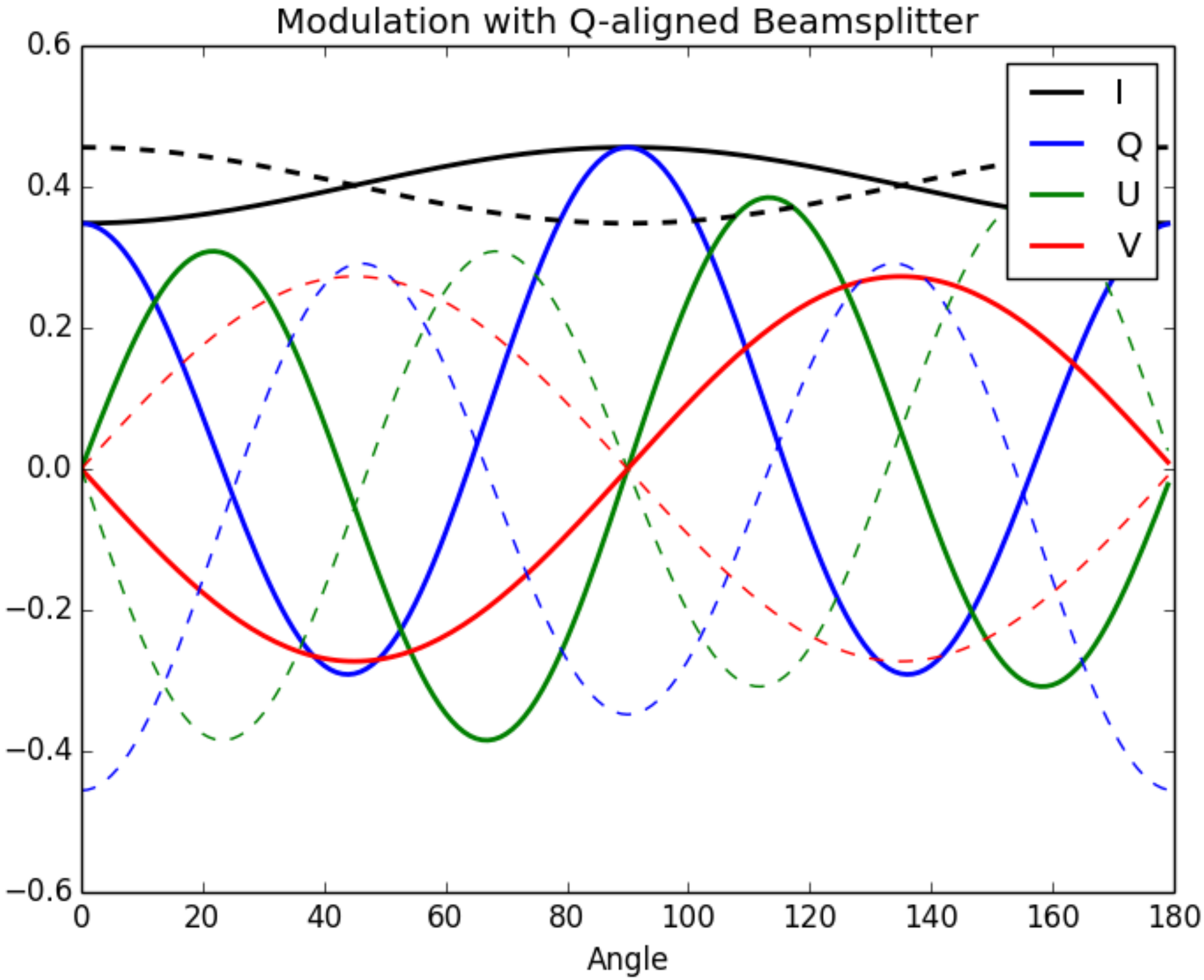
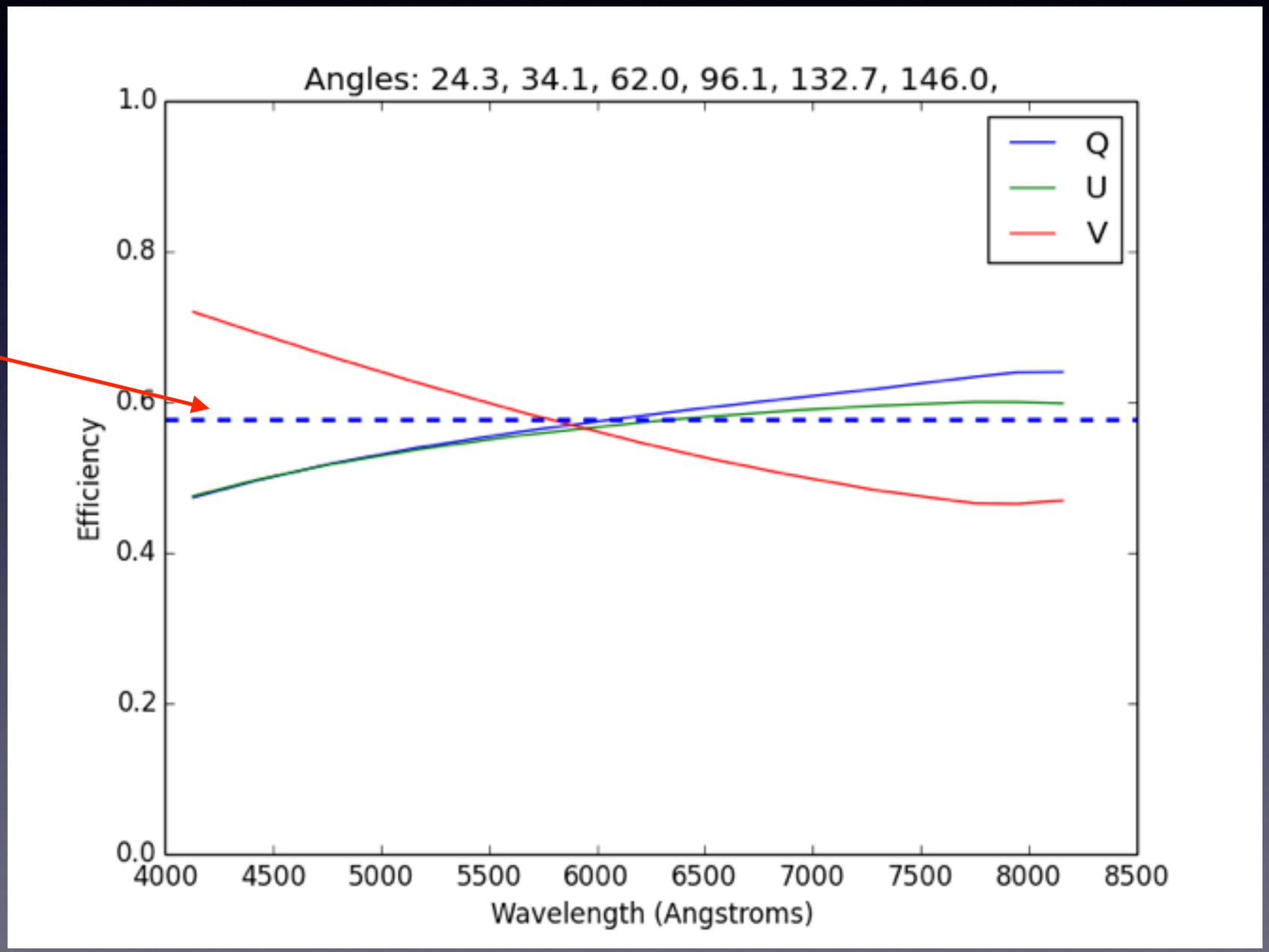

Modulation with Q-aligned Beamsplitter
I
Q
U
V
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
0
20
40
60
80
100
120
140
160
180
Angle

Mirror modulation in the visible

$$\sum_{i=1,3} \frac{1}{\epsilon_i^2} = 1.$$



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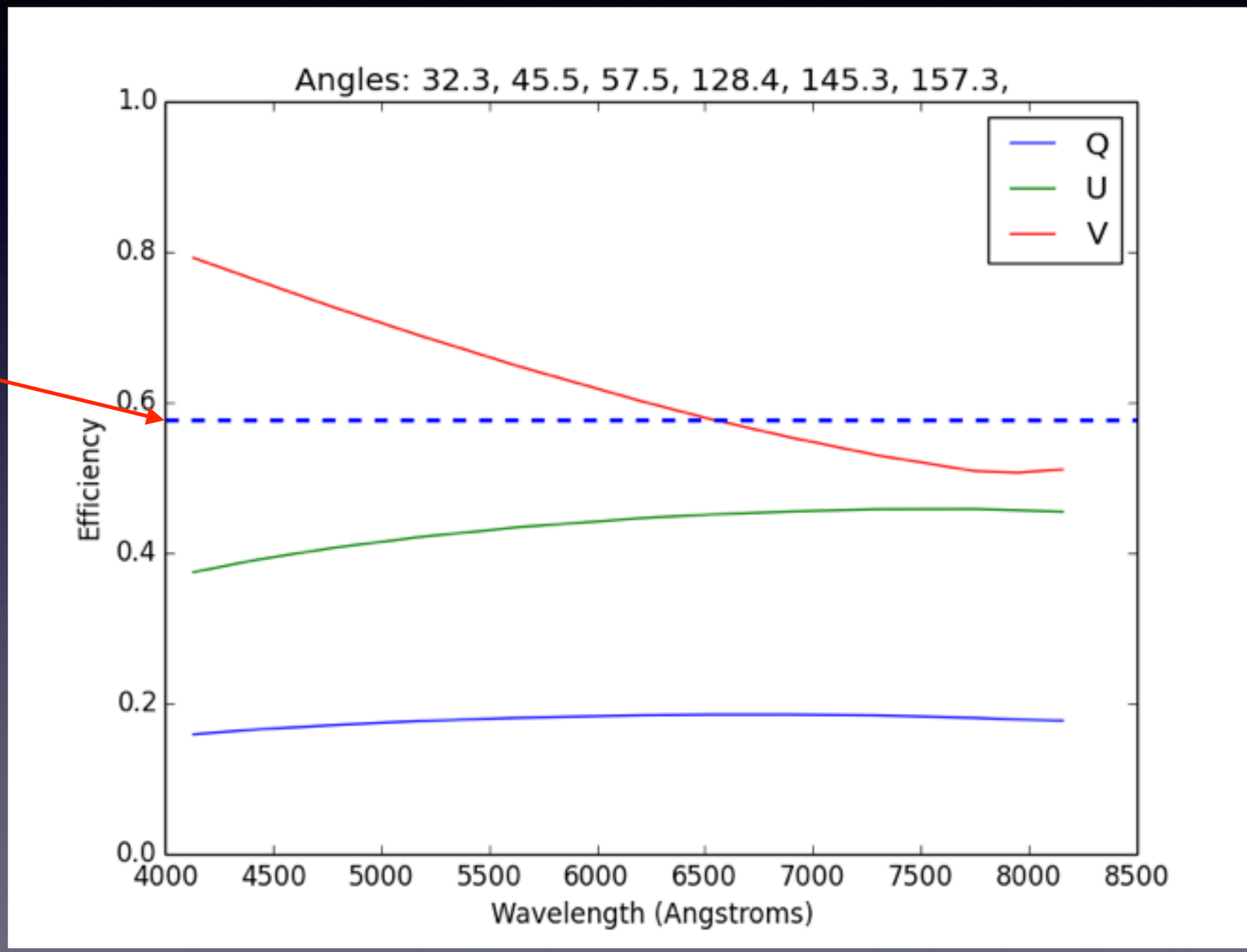
Mirror modulation in the visible

$$\sum_{i=1,3} \frac{1}{\epsilon_i^2} = 1.$$



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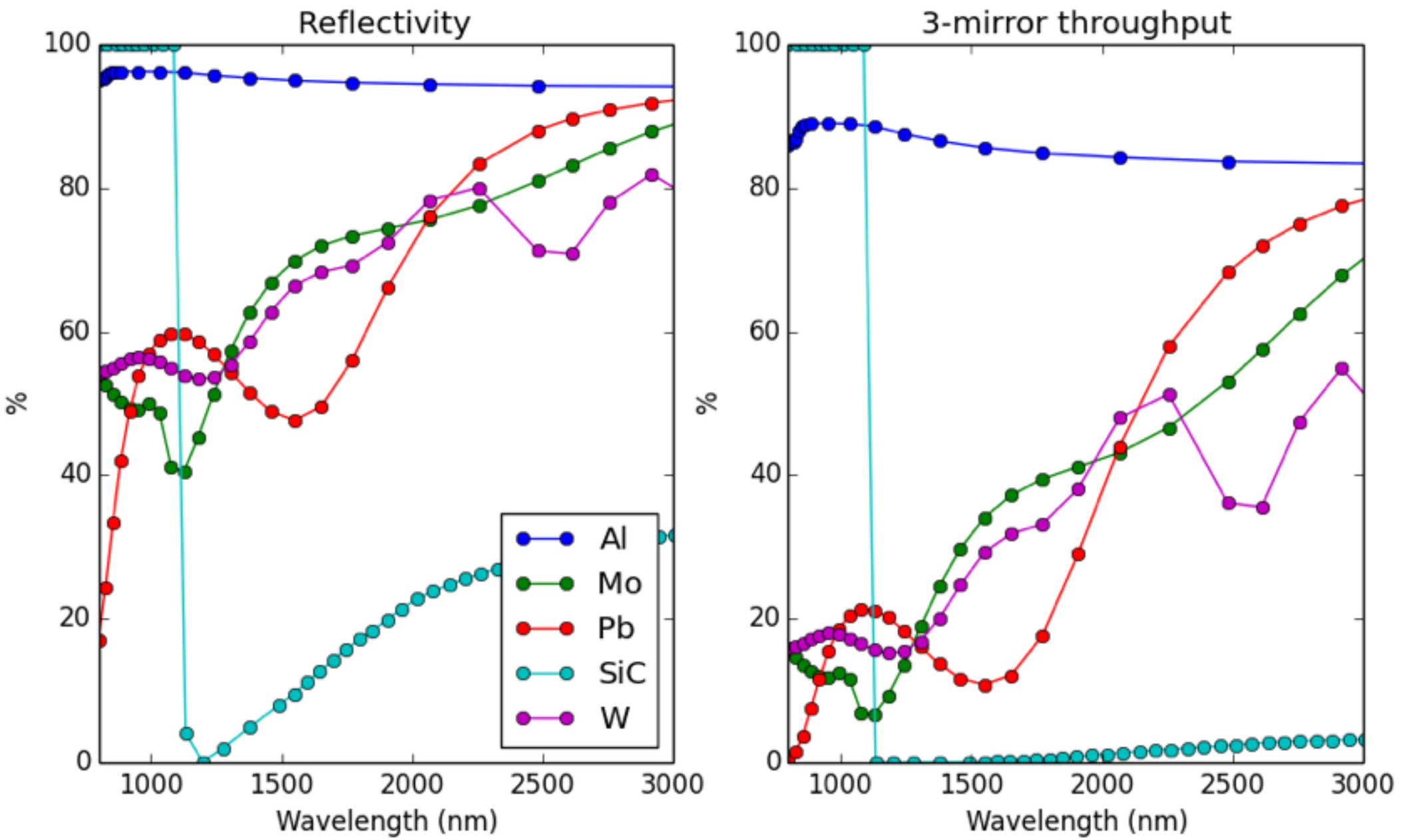
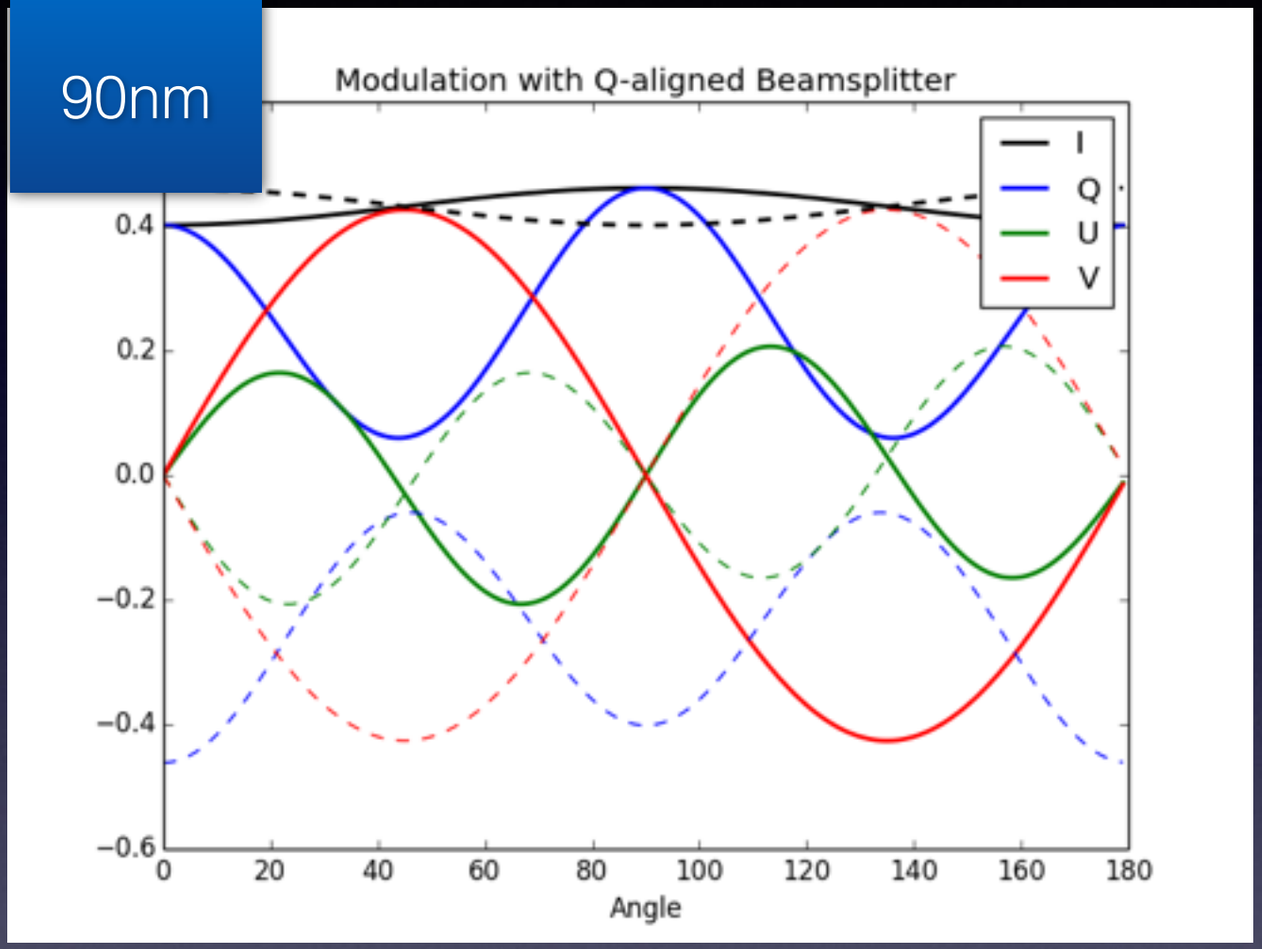
Mirrors for UV

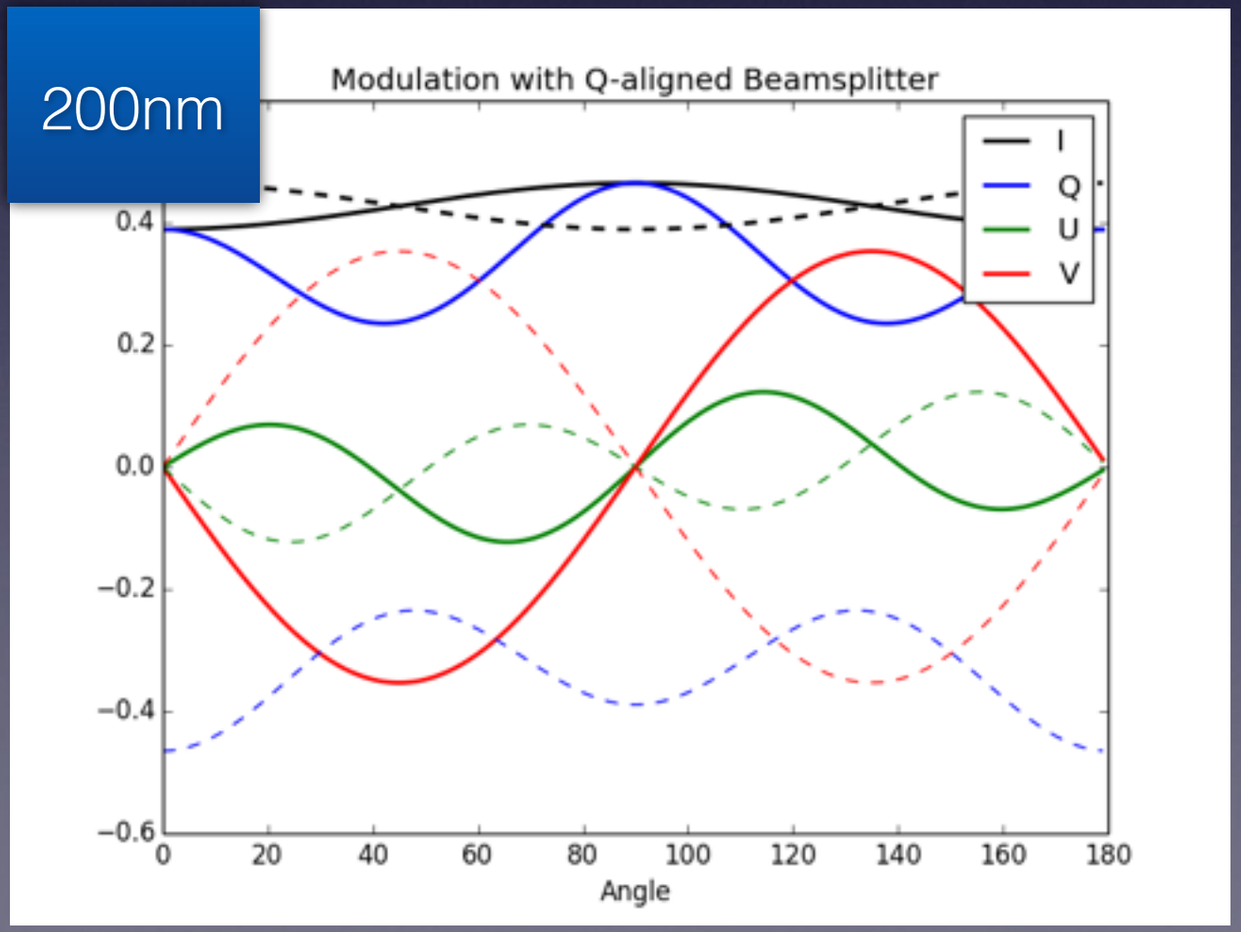


Al mirrors

90nm



200nm



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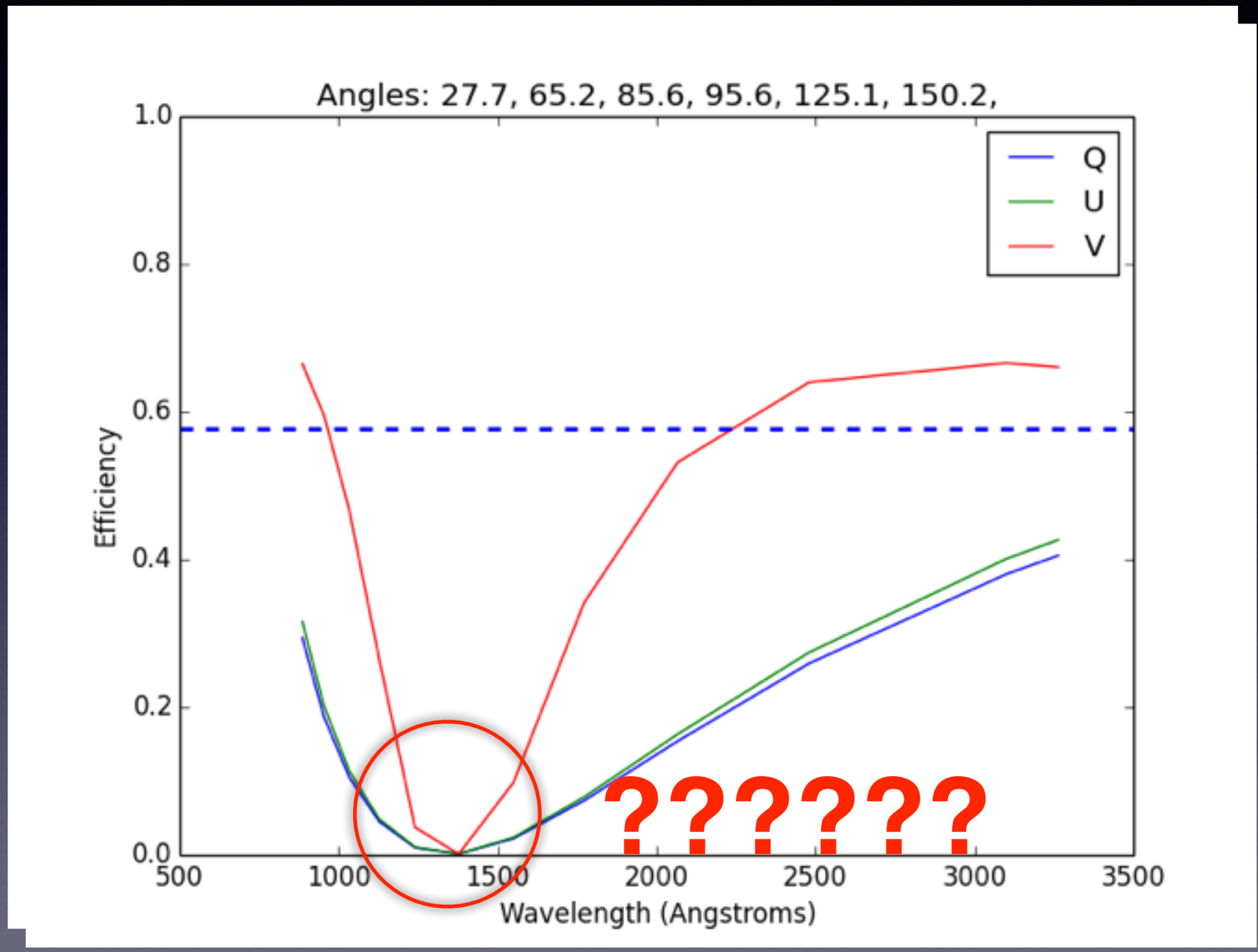
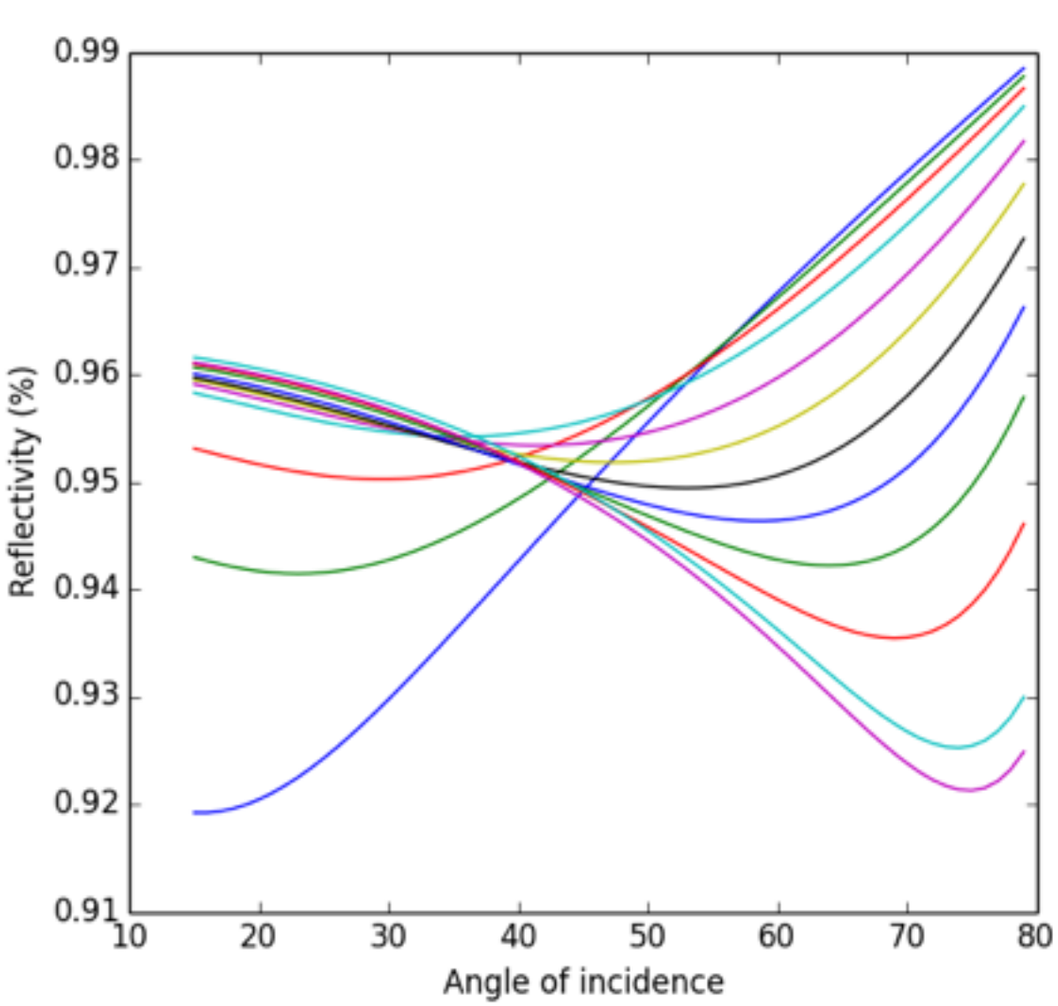
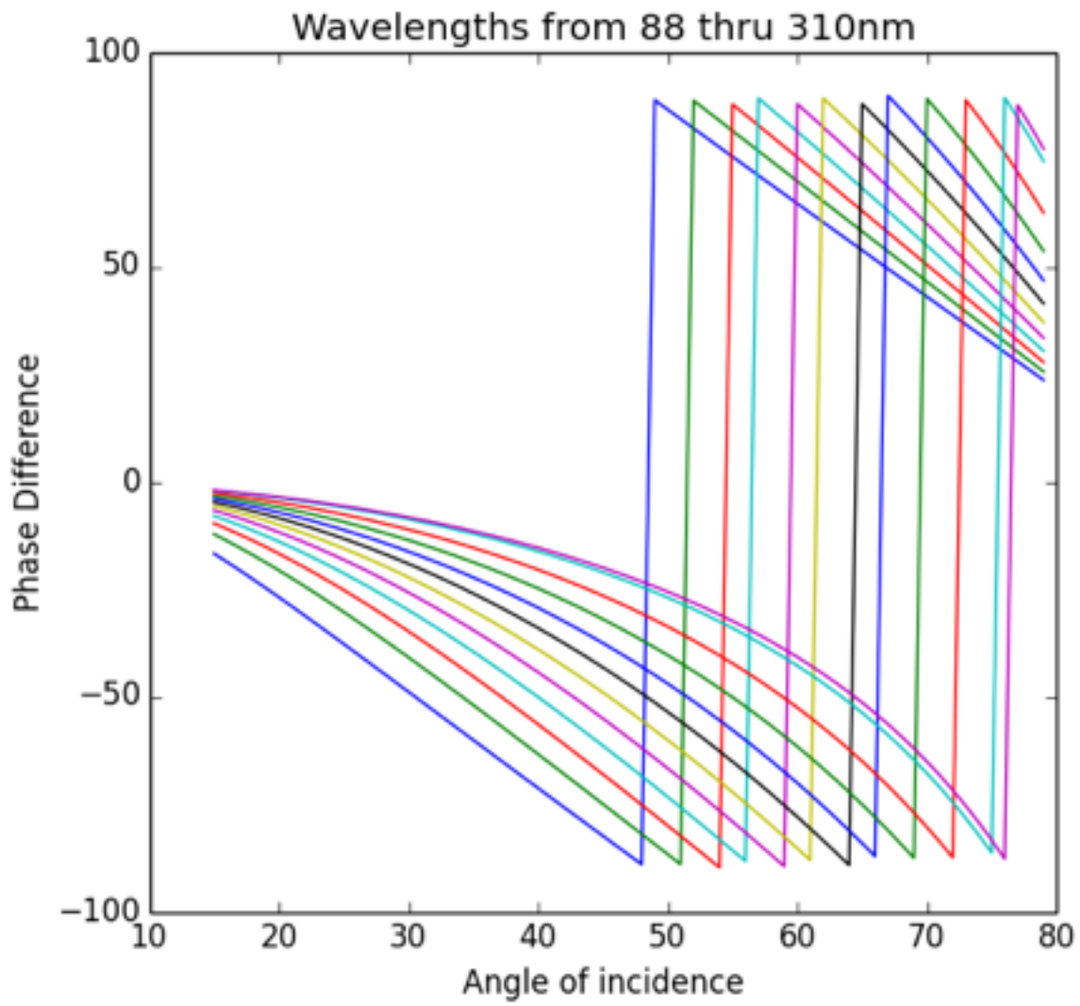
Optimal modulation in the UV







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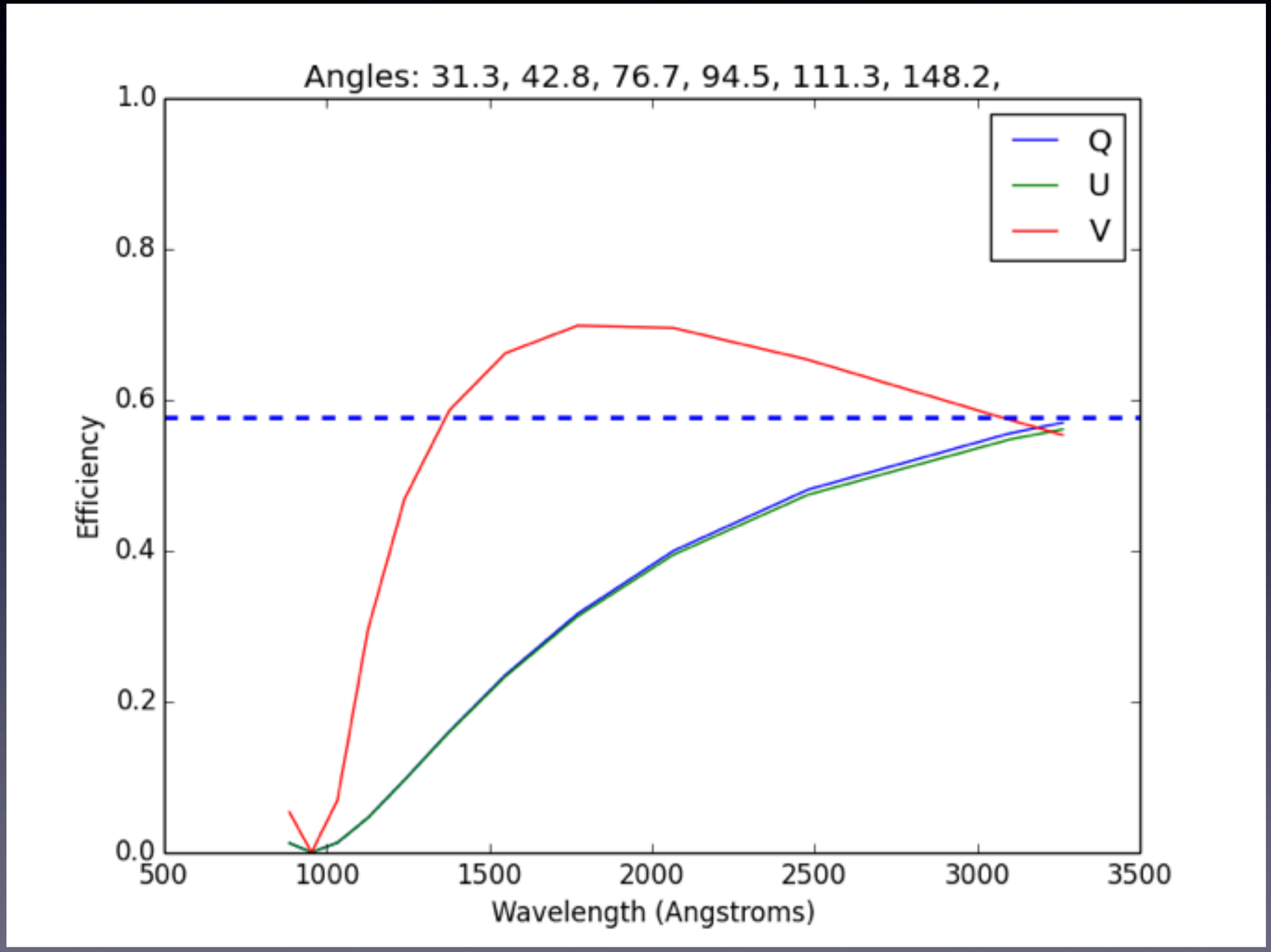
Optimal modulation 2



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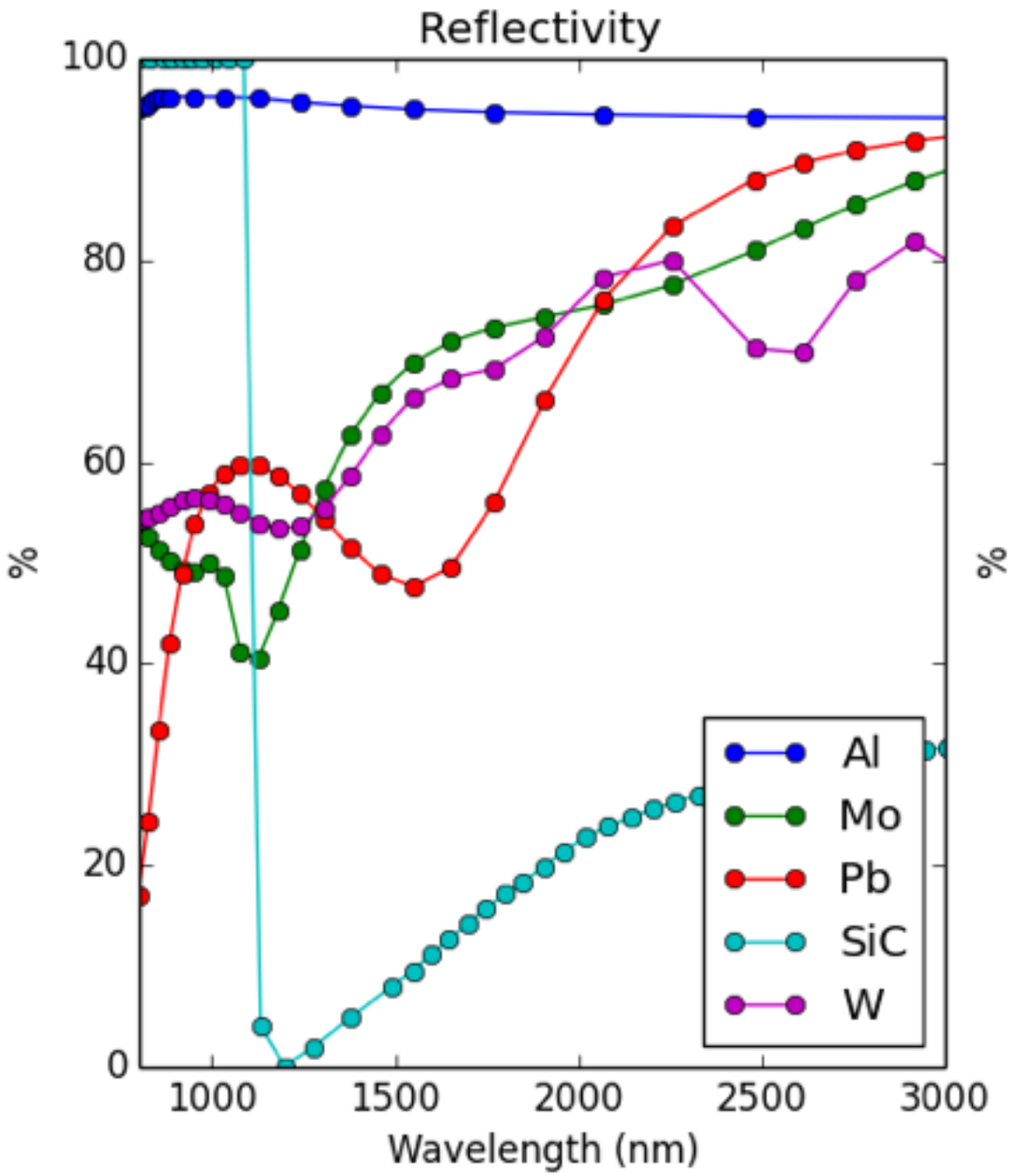
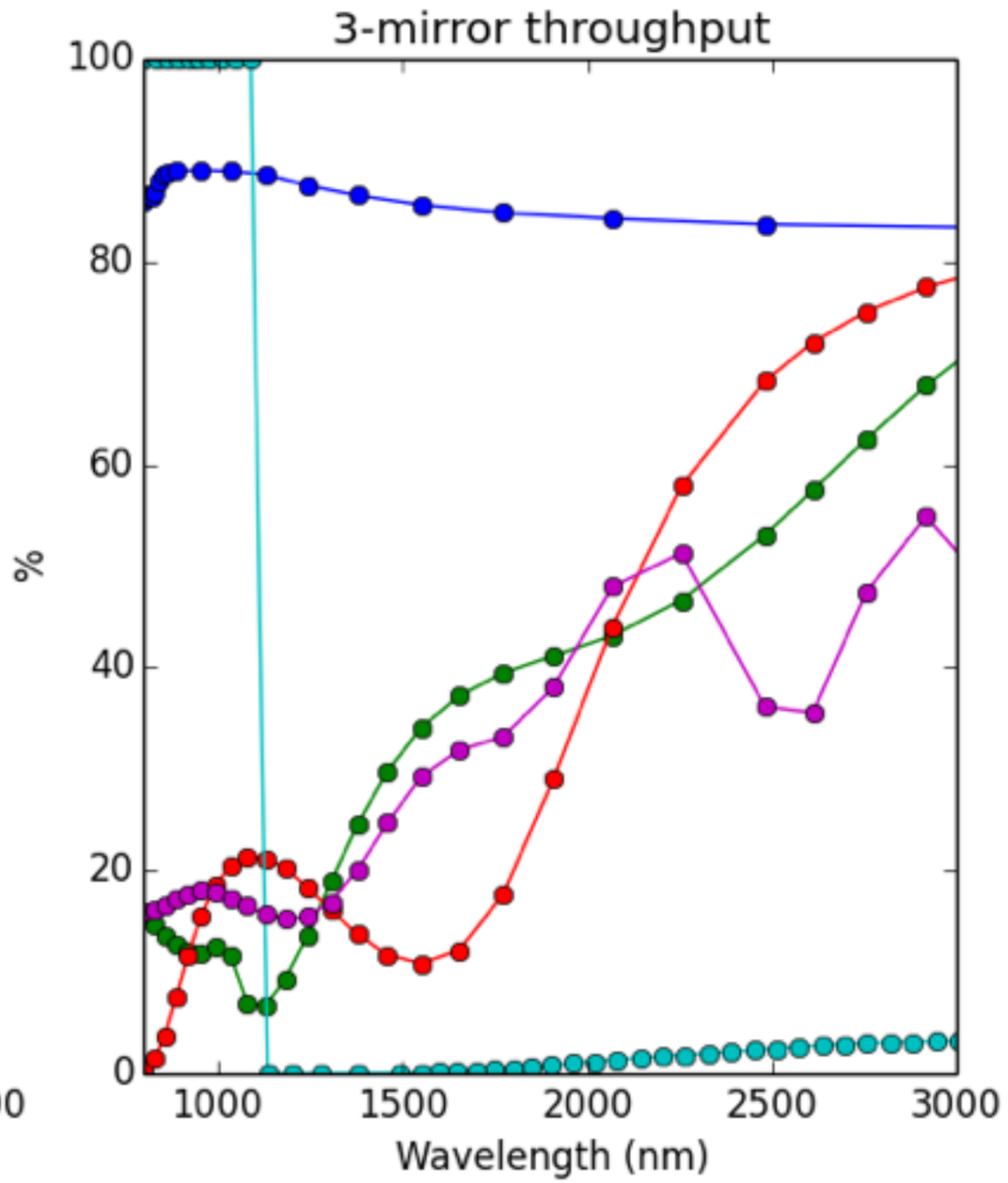
Al-SiC mirrors





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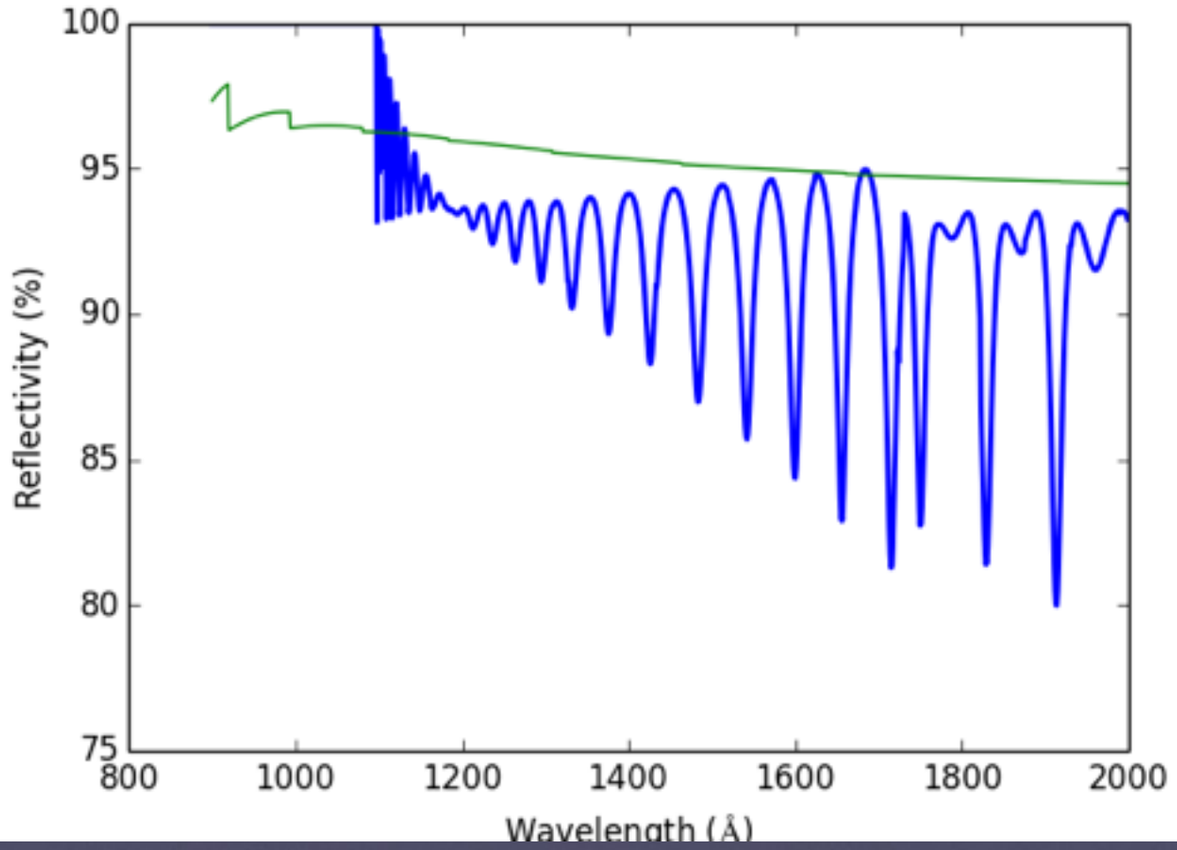
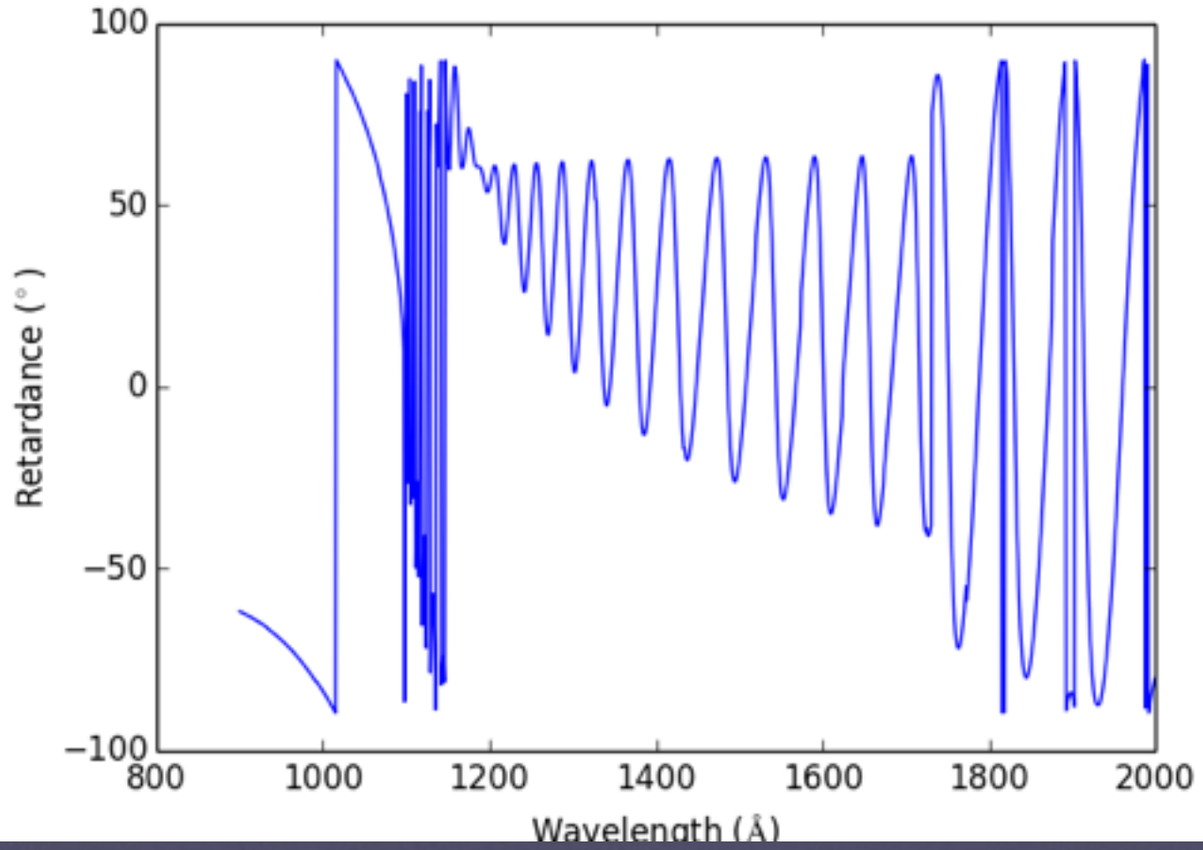
Al-Sic Mirrors





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Modulator Summary

- Three mirror concept
- >90% transmission with Al mirrors
- No modulation at certain wavelengths
- >70% transmission with Al-Sic mirrors
- Modulation mess

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The analyser

Two options:

- High transmission and low polarisability

Mirrors at quasi-Brewster angle

- Low transmission and hight polarisability

Piles of mirrors

MgF2-made Wollaston

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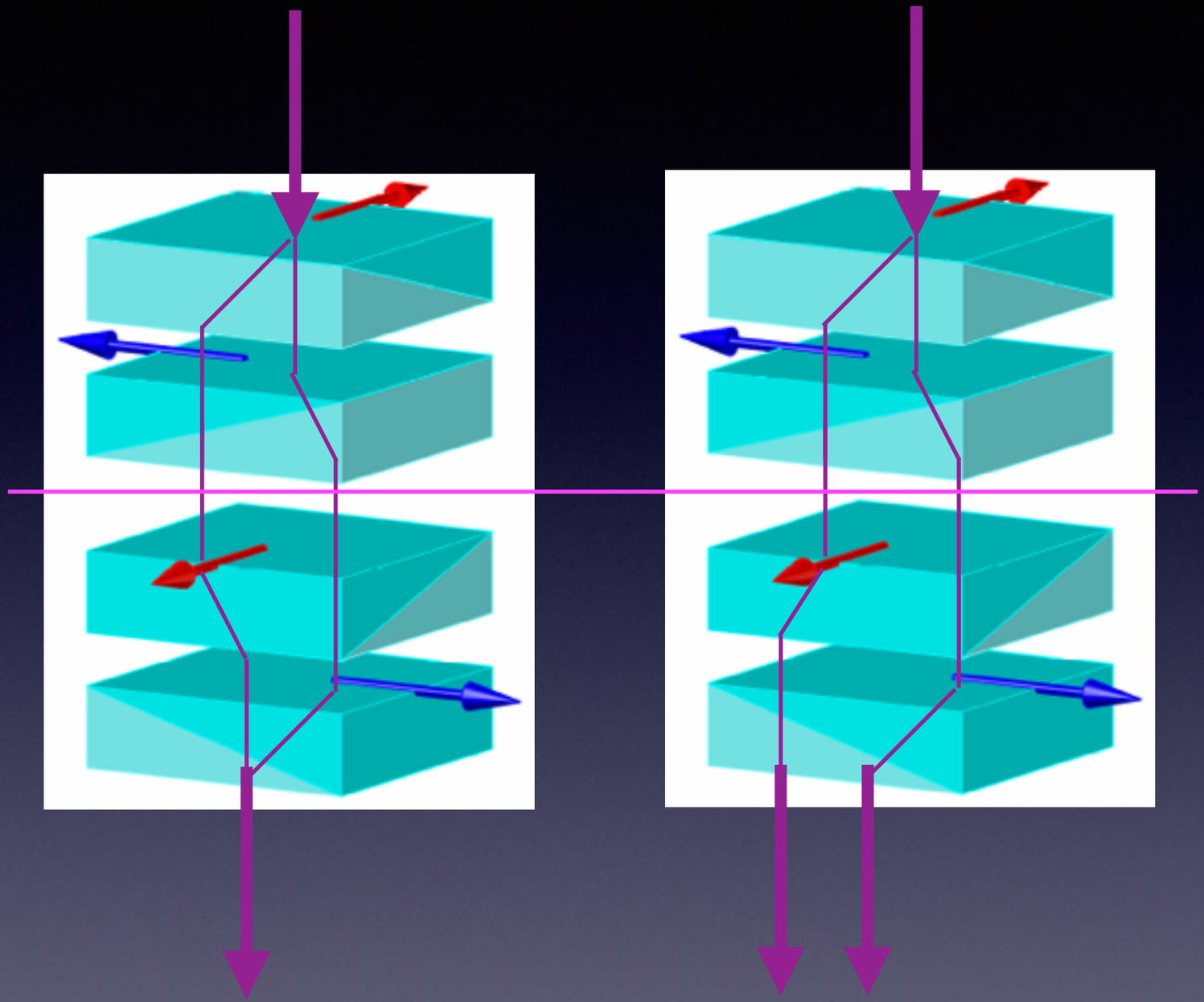
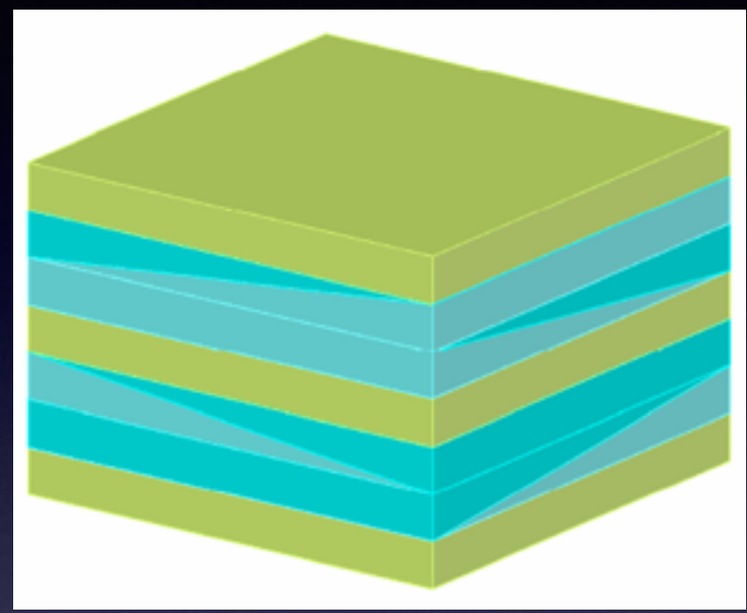
“Retractable” polarimeter by rotation



THEMIS device



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