TALC*: A high gain antenna for submillimeter astrophysics.

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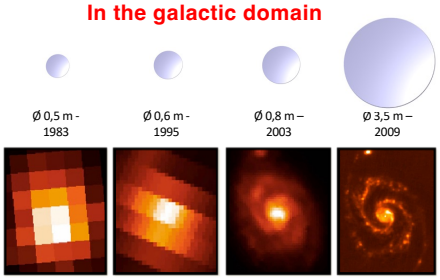
*TALC= Thinned Aperture Light Collector

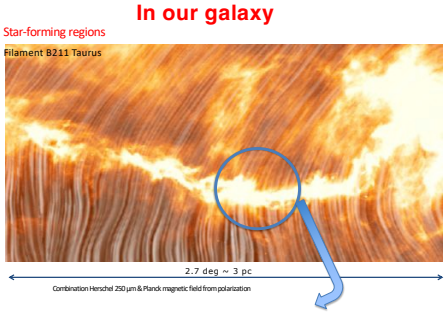
INTRODUCTION

Astronomy is driven by the quest for higher sensitivity and improved angular resolution in order to detect fainter or smaller objects. This is true in the far-infrared to submillimeter domain, a unique window on the cold and obscured Universe. In this domain, space observations are mandatory given the blocking effect of our atmosphere specially for some important key elements as water.

In the galactic domain



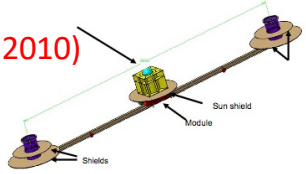
In our galaxy

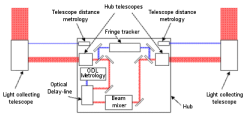


What is the inner structure in the filaments ?

Need for large telescope in space or interferometer

FIRI (2010)





The FIRI U-V plane filling strategy

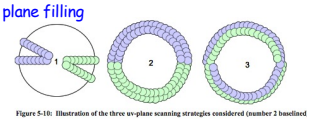


Figure 5-10: Illustration of the three uv-plane scanning strategies considered (number 2 baselined

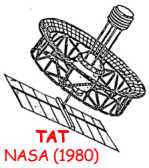
Here is the TALC intuition !

No single dish above 4.5 m or Folded mirror above 10 meters can be envisaged.

METHODS

Not a totally original concept

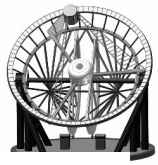
In space

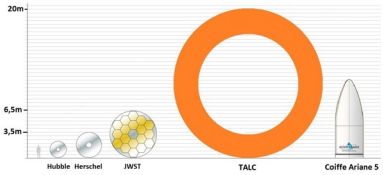


TAT
NASA (1980)
UV & vis
100 m in space

On ground

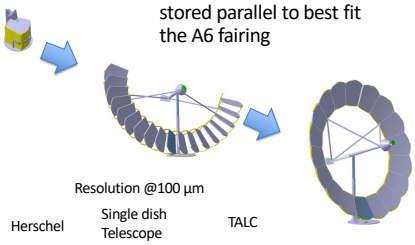
SPIE (2006)
China
vis & IR
30 m telescope





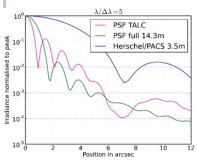
The studied solution : a Pantograph folding

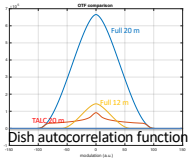
Beryllium segments are stored parallel to best fit the A6 fairing



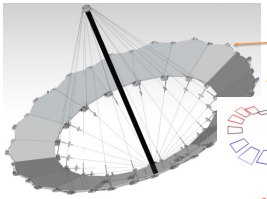
Resolution @100 µm

Herschel	Single dish Telescope	TALC
9.5 m2 Ø3.5 m	150 m2 Ø12.3 m	150 m2 Ø20 m

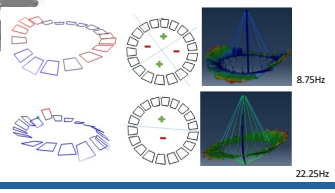




Dish autocorrelation function



Active cophasing and damping

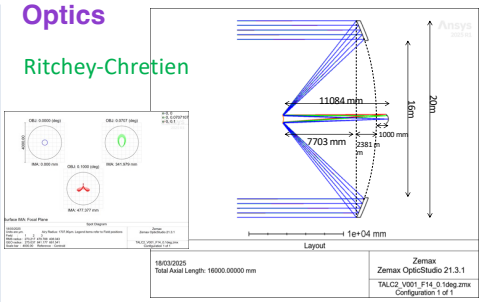


Vibrations Sensitivity

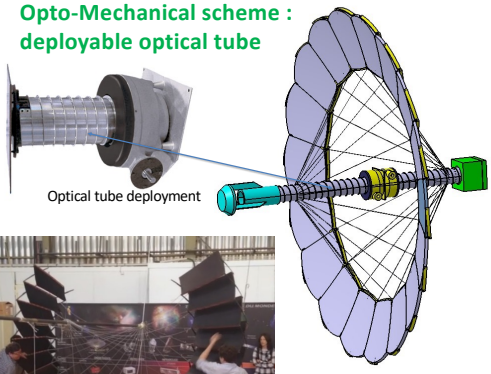
RESULTS

Optics

Ritchey-Chretien



Opto-Mechanical scheme : deployable optical tube



First deployable mirror setup (¼ scale)

CONCLUSIONS

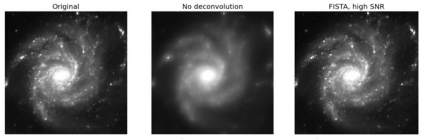
Solutions to improve angular resolution and collecting surface in space are emerging. We have been part of the SALTUS project with an inflatable 14 meter diameter main dish.

We propose now the TALC* concept with two deployable mechanisms:

- the Pantograph for segmented mirror petals.

- the Spiralift ® for optical tube deployment.

Next step: a ¼ scale model by end 2025.



Deconvolution at work