

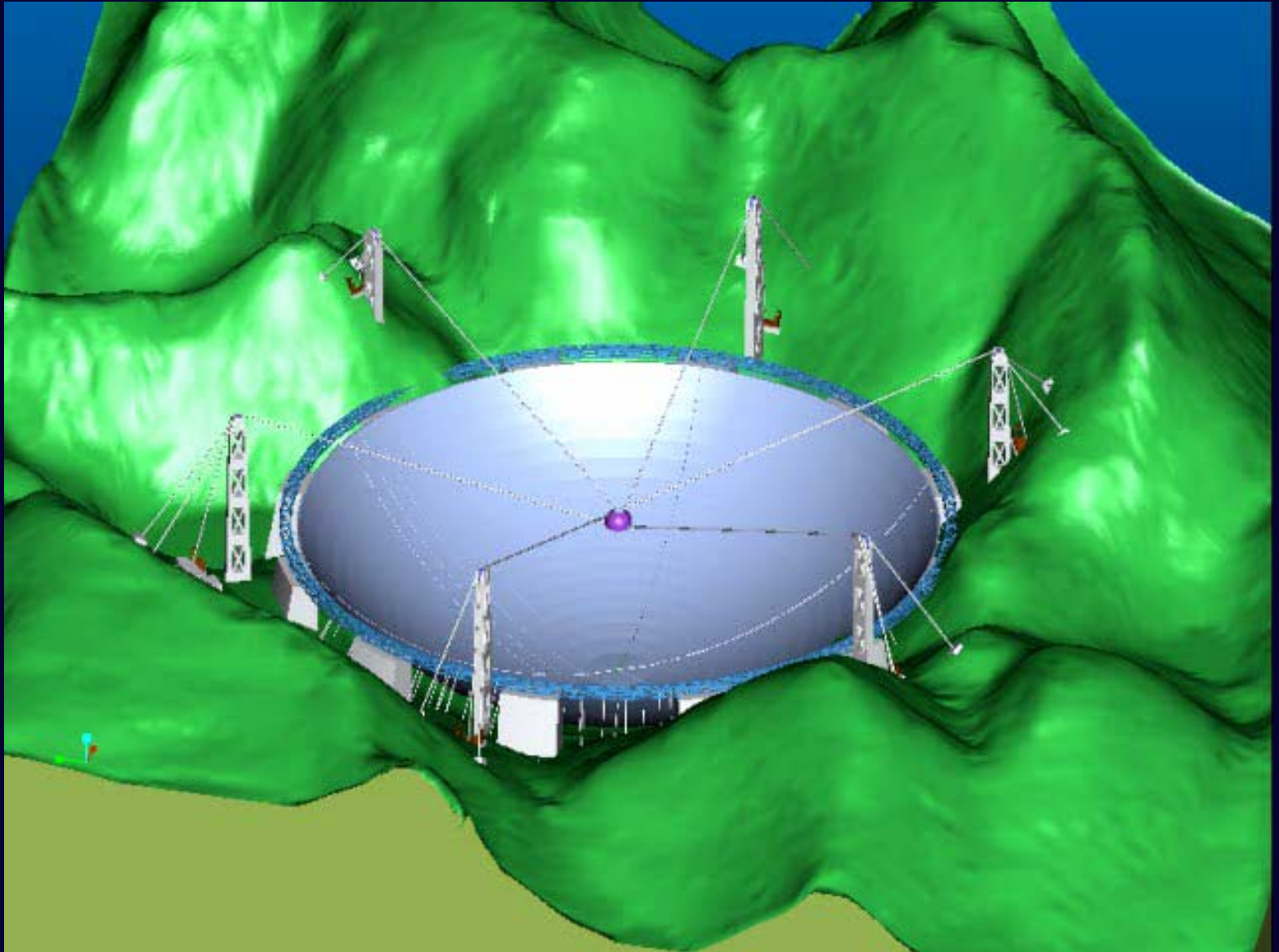
Possible application of FPA technology on FAST



FAST Lab, NAOC

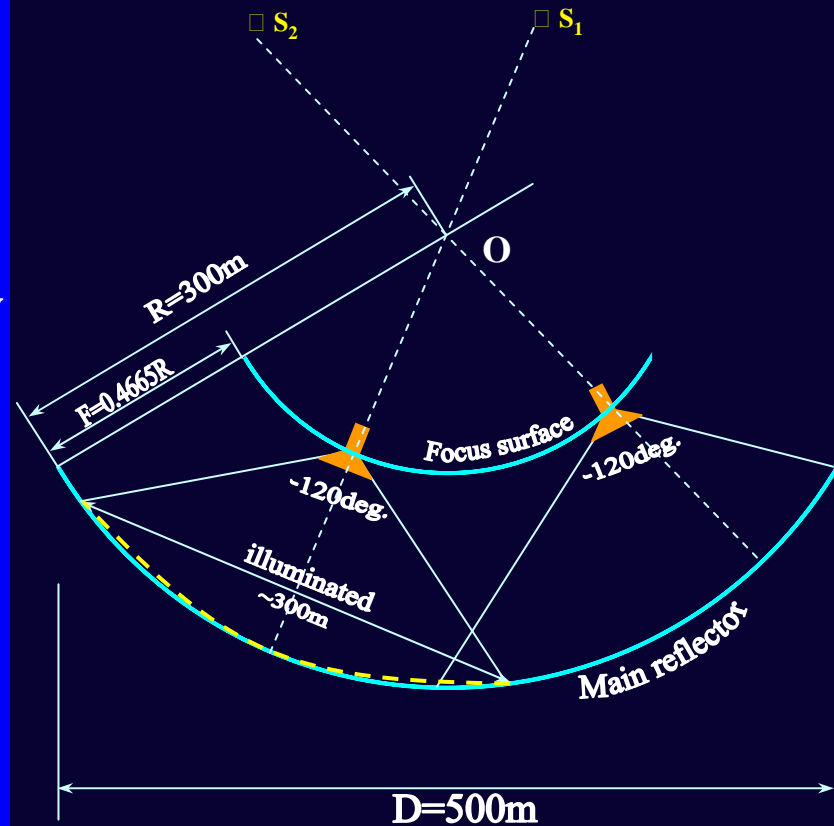
2005-06-09

The FAST

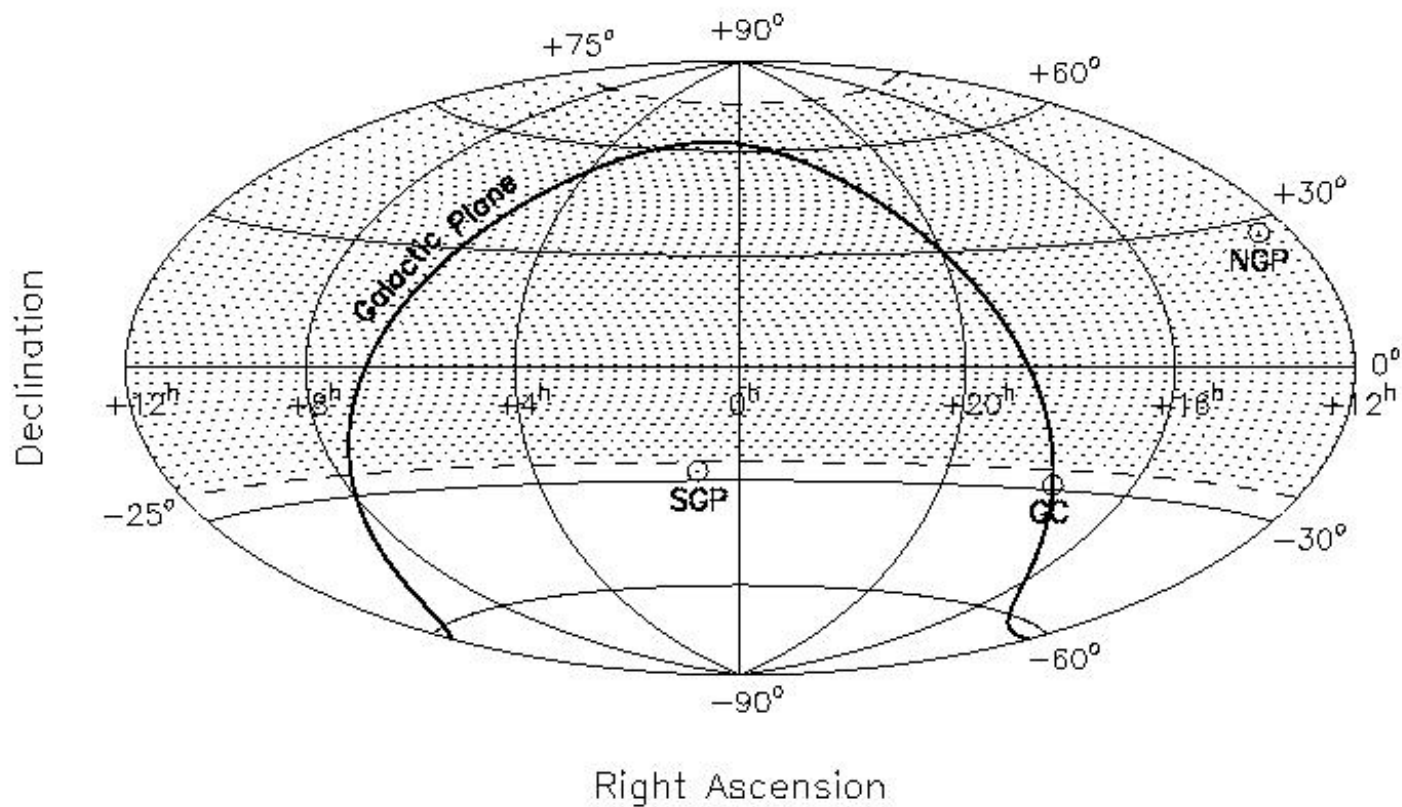


Optical geometry

- Reflector: $R \approx 300\text{m}$, $D \approx 500\text{m}$, opening angle: $\theta \approx 120^\circ$
- Illuminated: $D_{\text{eff}} = 300\text{m}$
- Sky coverage, max zenith 50° , up to 70° with large efficiency loss, $S_t = 68\% \approx S_i = 18\%$
- Working frequencies (GHz) \approx 0.13-0.46, 0.46-0.92, 0.92-1.72, 2.15-2.35, 2.8-3.3, 4.5-5.1, 5.7-6.7, 8.0-8.8
- multibeam
- Pointing accuracy $\approx 4''$
- Slewing: $10^\circ/\text{min}$



Sky coverage - FAST



The Focus Cabin

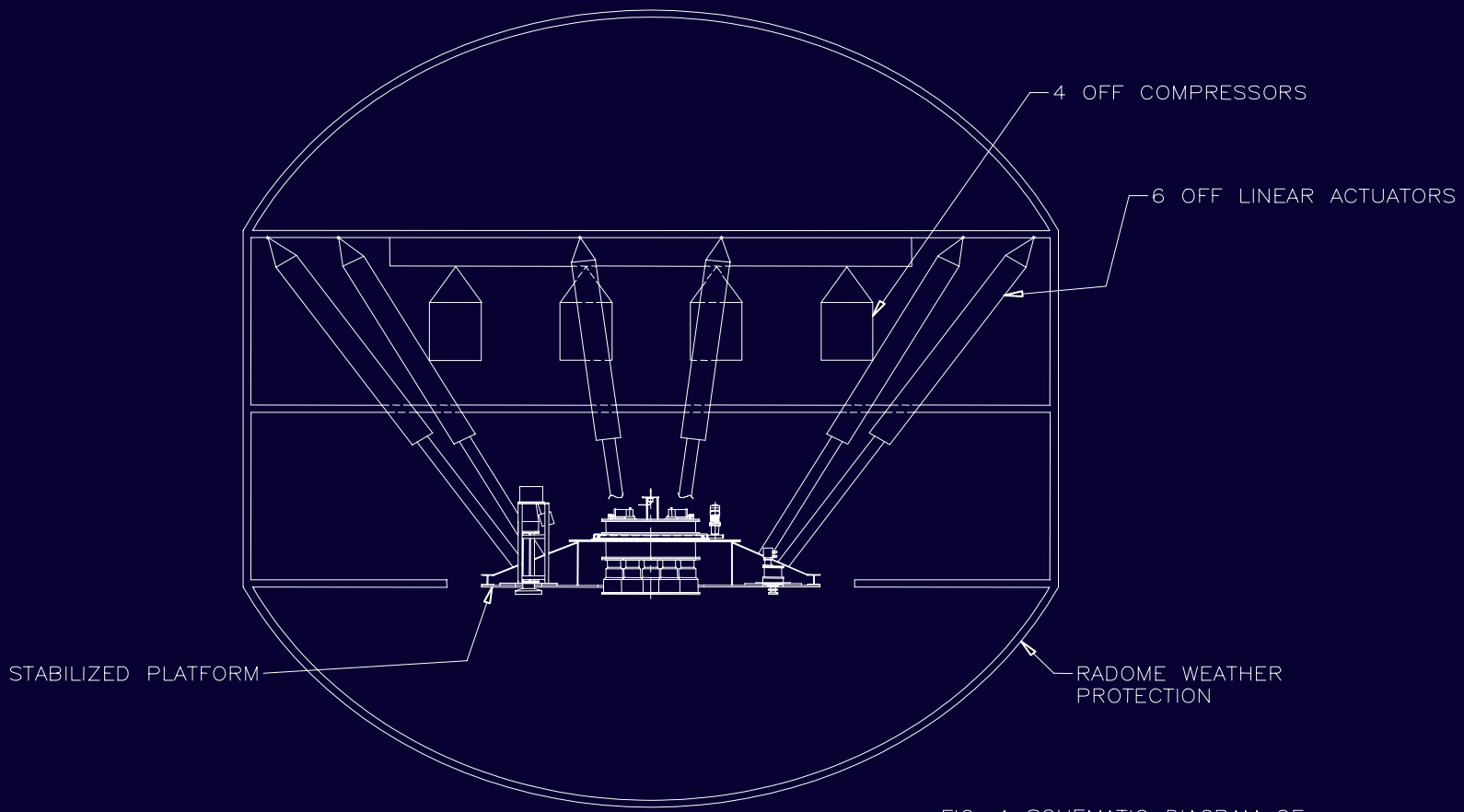
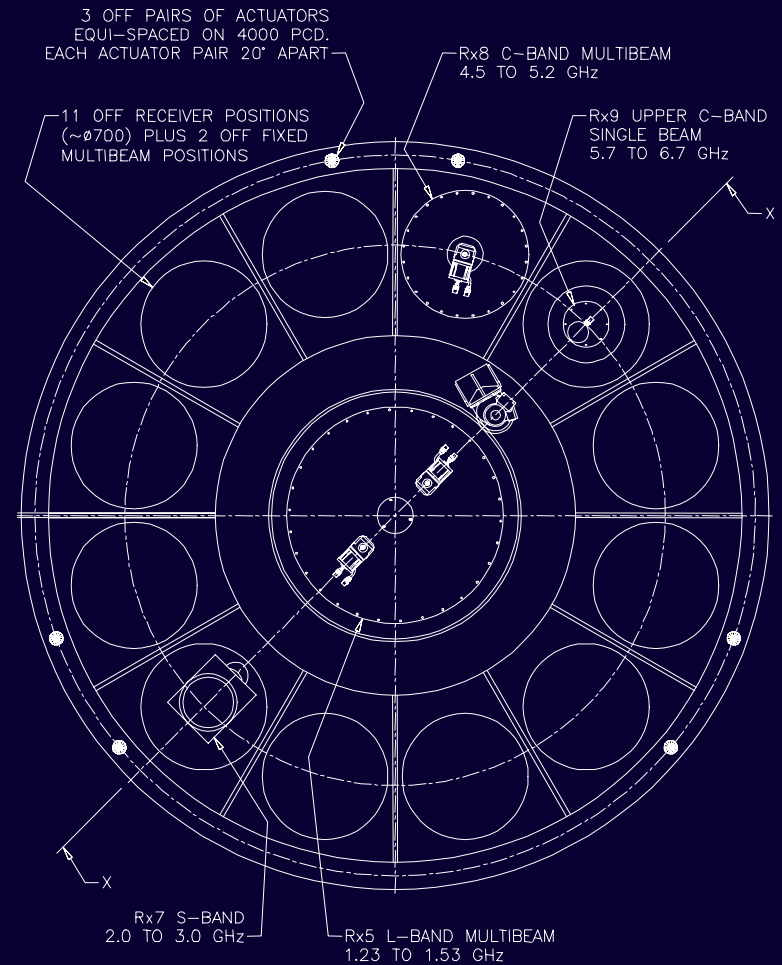
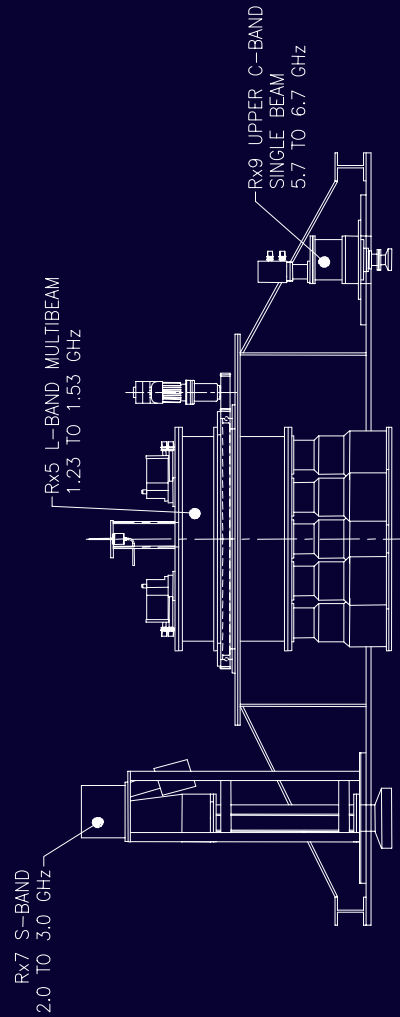


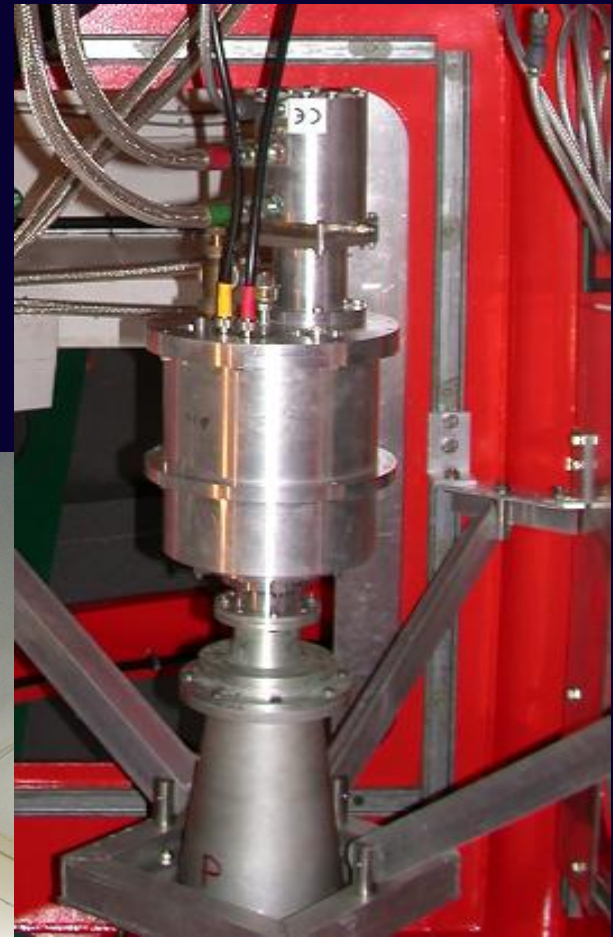
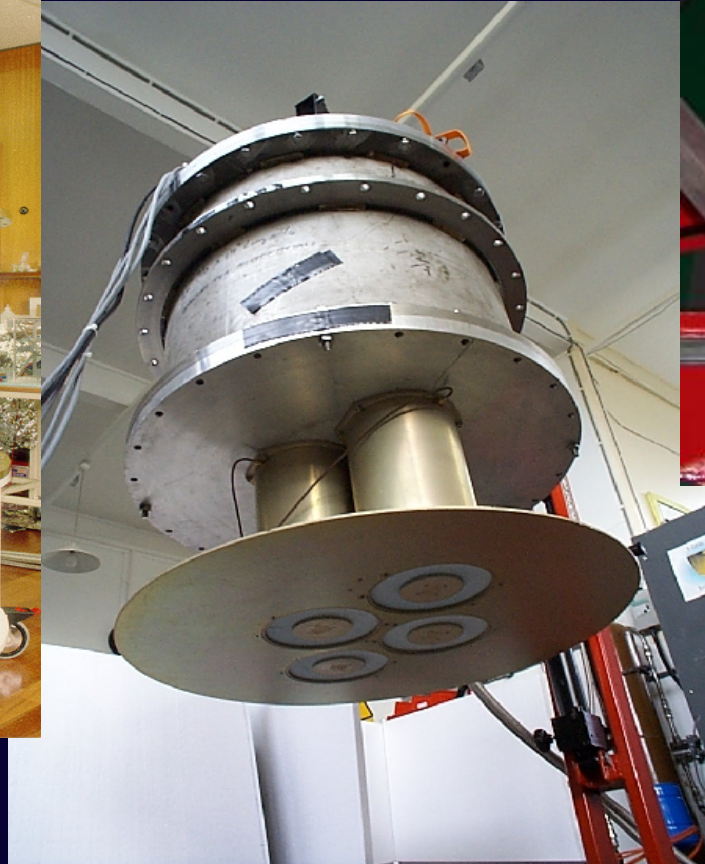
FIG. 1 SCHEMATIC DIAGRAM OF POSSIBLE FOCUS CABIN LAYOUT

The layout design

- 1 0.13 – 0.55
- 2 0.55 – 0.64
- 3 0.63 – 1.15
- 4 1.15 – 1.72
- 5 1.23 – 1.53
- 6 2.15 – 2.35
- 7 2.00 – 3.00
- 8 4.50 – 5.20
- 9 5.70 – 6.70



Multi-Beam and Cooled receiver



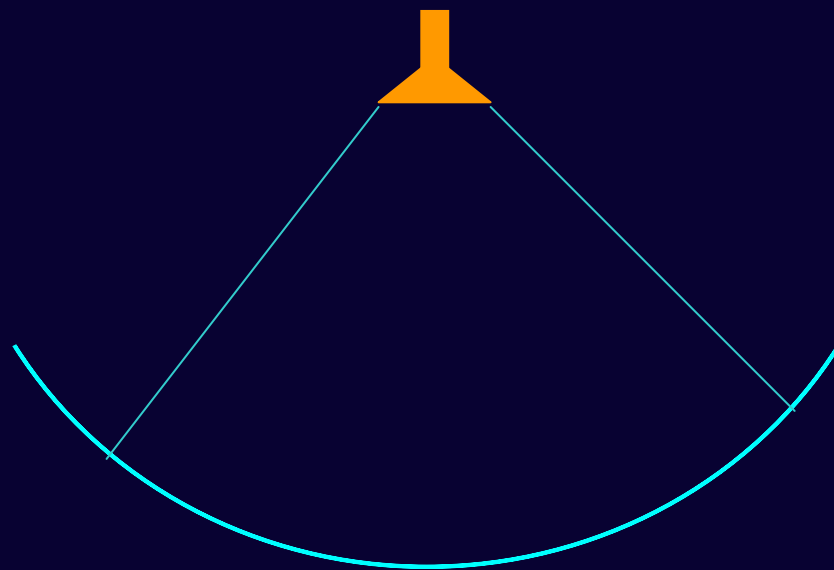
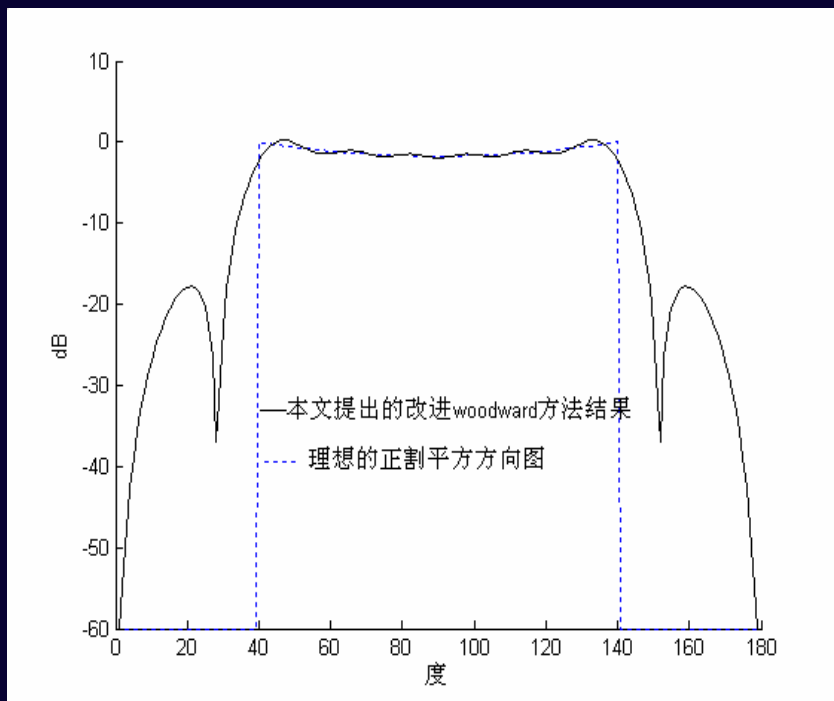
FPA on the FAST ?

- Make more use of the collecting area
- Higher efficiency in surveying mode

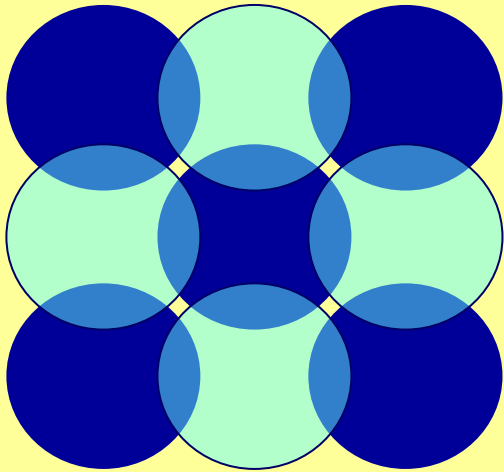
FPA on the FAST

- Better illumination;
- Continuous sky coverage;
- Allow large scale errors on the main reflector;
- Enlarge sky coverage;
- Larger aperture at the zenith;
- Electronical pointing;

Optimizing the illumination: Larger G/T

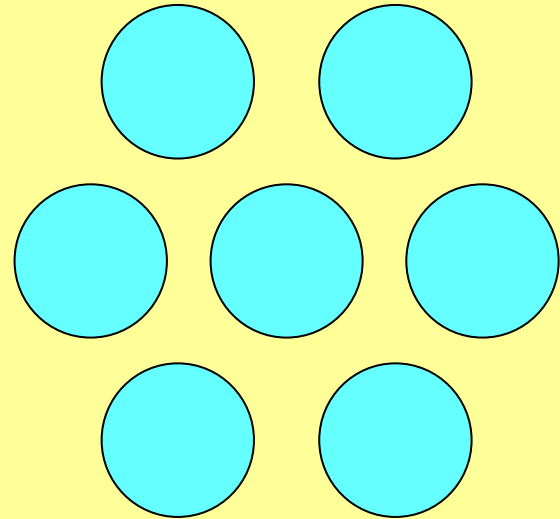


Continuous sky coverage



FPA

vs.

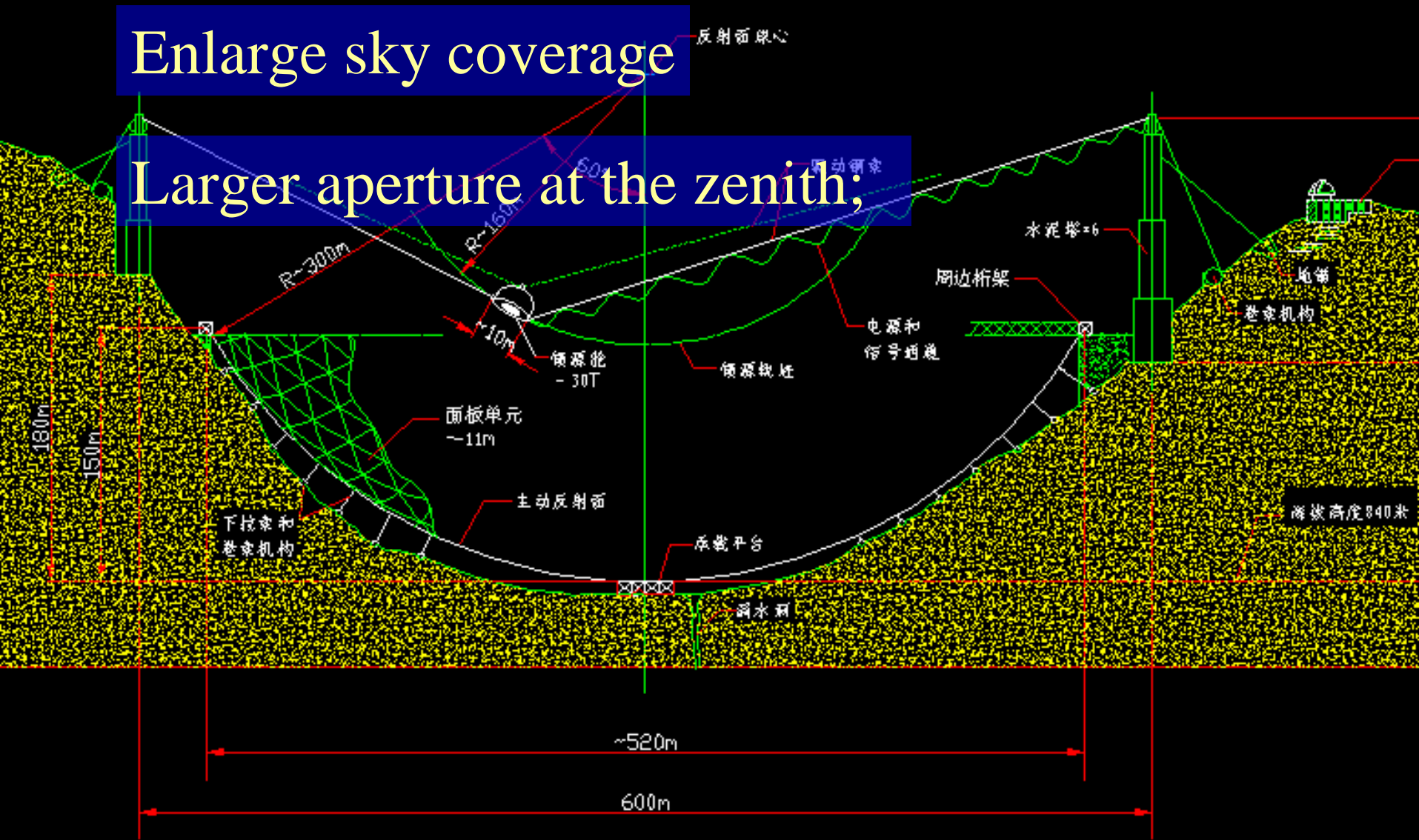


Multi-beam

Allow large scale errors on the main reflector

Enlarge sky coverage

Larger aperture at the zenith;



Electronical pointing:

Fast variation, e.g. IDV

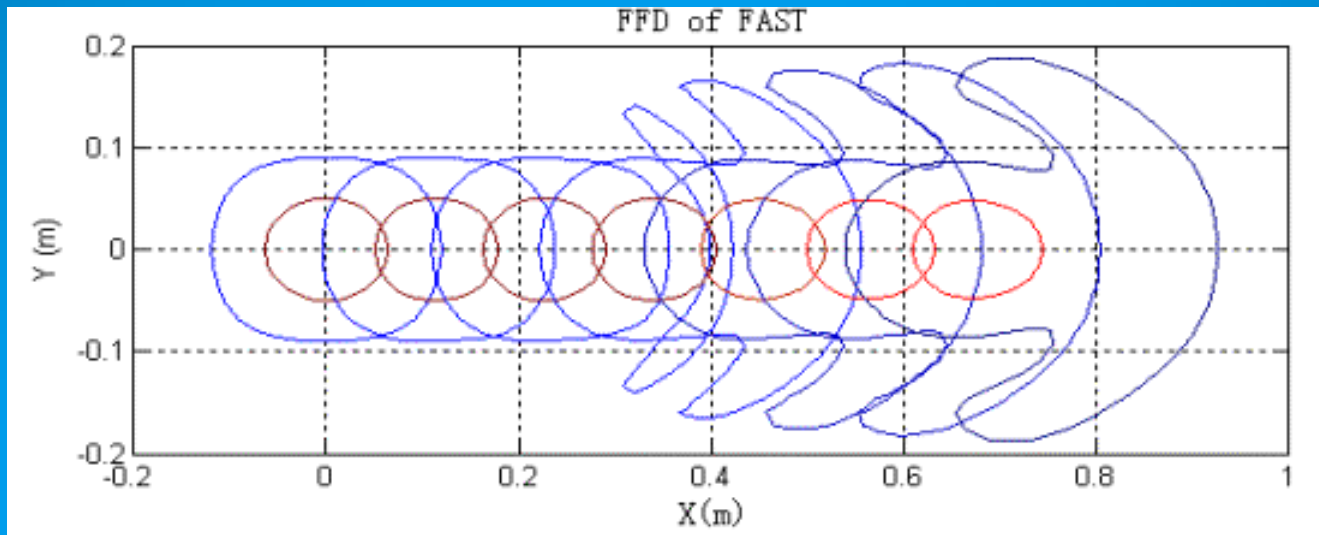
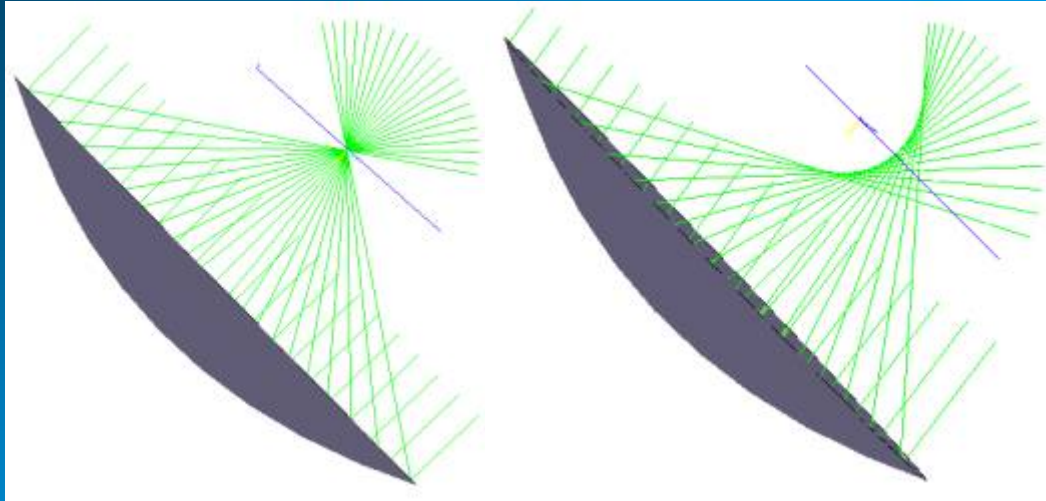
Large number of simultaneous beams

Electronical pointing

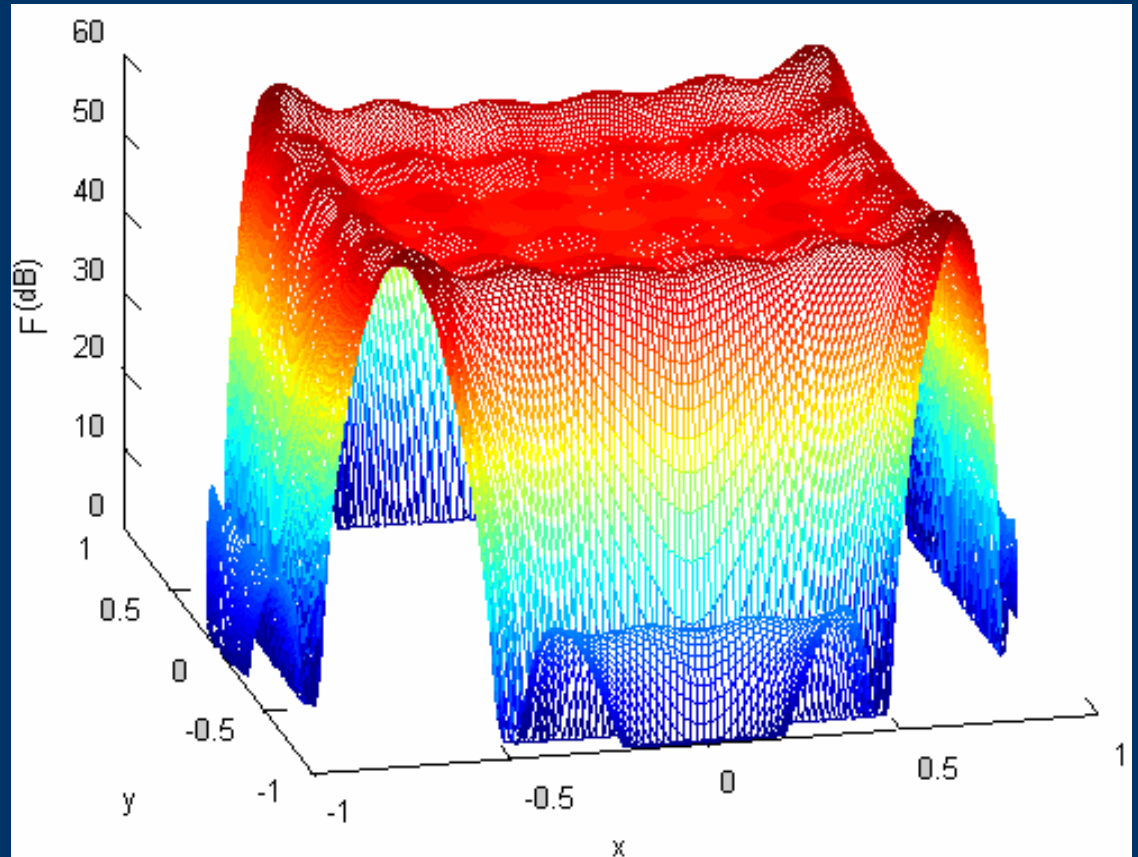
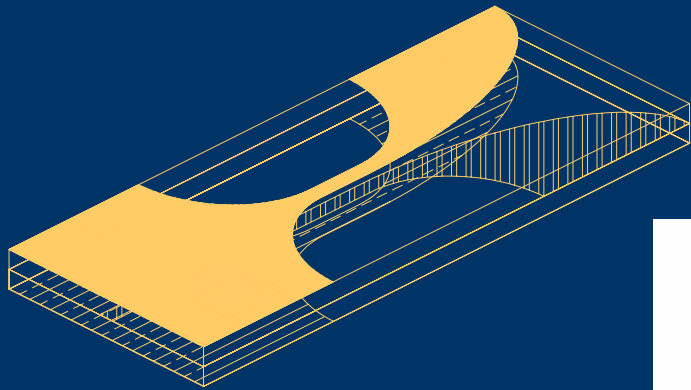
Some feasibility study

- FAST Focal Field Distribution analysis;
- Vivaldi element, focal array, beam forming;

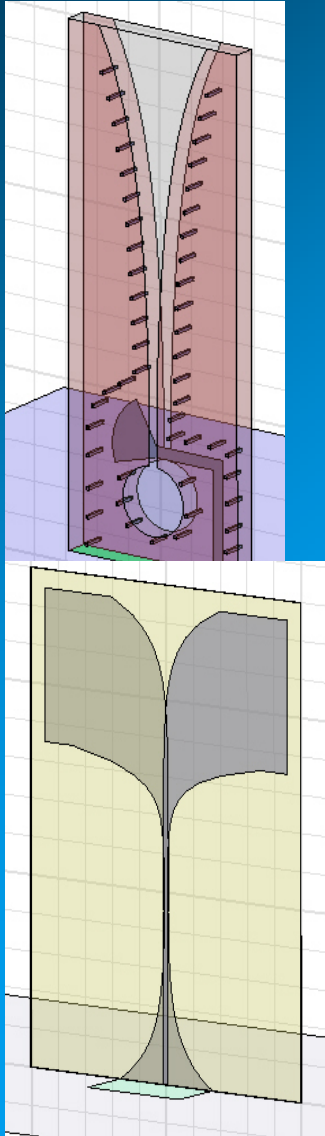
FAST Focal Field Distribution



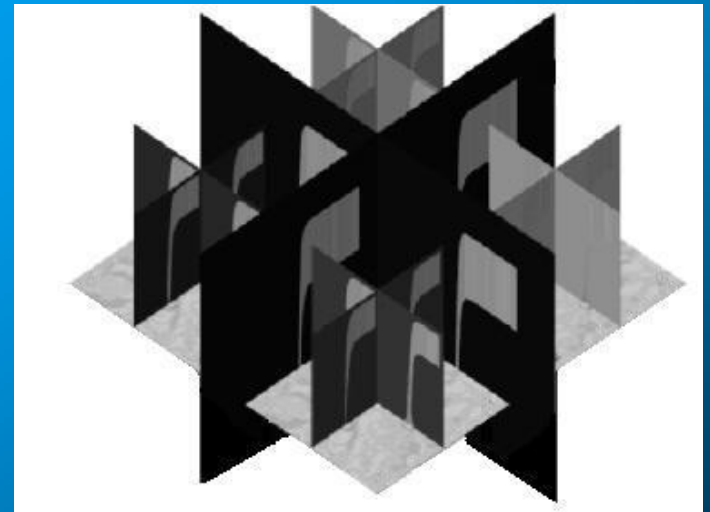
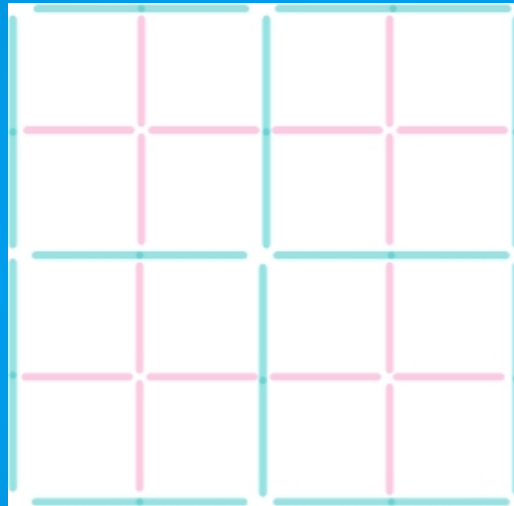
FPA on the FAST: - by Beihang University



FPA on the FAST: - by Tsinghua University



LSA (Lower Sub Array) : 0.5GHz~1GHz
USA (Upper Sub Array) : 0.9GHz ~1.7GHz



FPA on the FAST

Some speculated specs:

- Frequency coverage 500-1700MHz
- R.M.S of the main reflector (3cm rms)
- Field Of View 0.5 degree
- Size of the FPA 2.5m
- Number of the Vivaldy elements ~1600
- Cooling room temperature

Some enquires:

- The current status and future trend
- FPA on the FAST:
Weight, space requirements
Cooling, etc.

Suggestions and advices are welcome!

THANK
S!