**Physical optics analysis for the partially constructed FYST model**

The FYST telescope, currently pre-assembled in Xanten, will be partially constructed from the centra and one-half panels of its two mirrors, as depicted in Figure 1. To check the possibility of using the half antenna to test the FYST holographic system, I simulated the beam patterns of the incomplete antenna and studied the influence of the Carbon Fiber structure on the antenna’s beam patterns.

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M2

M1

Figure 1. Partially constructed FYST model. The model consists of centre and Right-side panels on M1 and M2.

**Beam pattern of the half antenna**

The telescope is horizontal reflection symmetric. Compared to the full-mirror antenna, only half power of input signal can be delivered to the receiver. Then the gain loss is greater than or equal to 3dB. Figure 2 shows the simulated beams of the half-antenna and full-mirror model. In the model, the source is located 300m away from telescope rotation axis, and receiver is 715mm behind the nominal focus. The gain is reduced by around 4dB, and the beam changes into elliptical beam. The beam size is also extended along elevation axis.

A graph of different types of graphs

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Figure 2. The beams of the half-antenna model compared to the original beams in elevation and azimuth axes.

A blue and yellow grids of a waveform

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Figure 3. 2D beam pattern of the FYST beam pattern (left) and Half-antenna beam map (right).

The beam maps in Figure 3 shows a strong diffraction pattern in horizontal axis.

**Effects of the exposed Carbon Fiber plate**

Due to the absence of half panels, the carbon fiber would be exposed, see the model in figure 4. The flat plates do scatter the light and introduce error patterns in the antenna beam. Here we made an extreme assumption, treating the carbon fiber as a flat metal plate without loss in its surface.

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Figure 4. Carbon fiber plates and FYST panels.