# Turtle peanut shell

Analysis of slits C, D, E, F


| | (x , y) | $V_c \pm dV$ | $V_t$ |
|---|---|---|---|
| C center : | (+5.2, -1.7) | -43 ± 10 | 47 |
| D center | (+2.3, -2.1) | -45 ± 17 | — |
| D south | (+2.3, -4.2) | -42.5 ± 14.5 | 57 |
| D north | (+2.3, +1) | -52.5 ± 12.5 | 22 |
| E center | (-1.2, 0) | -43.5 ± 21.5 | — |
| E south | (-1.2, -3) | -40 ± 10 | 20 |
| E north | (-1.2, 3) | -45 ± 14 | 57 |
| F center | (-3.6, 0.5) | -40.5 ± 15 | — |
| F south | (-3.6, -2) | -35.5 ± 10.5 | 29 |
| F north | (-3.6, 3.3) | -44 ± 13 | 26 |

- Green vertical lines (|) show portions of each slit where peanut shell splitting is measured : $V_c \pm dV$ where $V_c = \frac{1}{2}(V_{red} + V_{blue})$ and $dV = \frac{1}{2}(V_{red} - V_{blue})$, measured in heliocentric frame. Positions (x, y) are offsets (δRA, δDEC) in arcsec from star.
- Blue crosses (×) are positions where proper motions are measure
- Red dots (•) mark the strongest gradient in the shell centroid velocity (underlined in table). This is across the projected minor axis (PA ≃ 70°) and amounts to 17 km/s (redder towards SW).
- There is a much weaker gradient along the projected major axis (PA ≃ −20°) of 1.5 km/s (redder towards SSE).
- The largest splitting is in the center (unsurprisingly) and amounts to +21.5 km/s

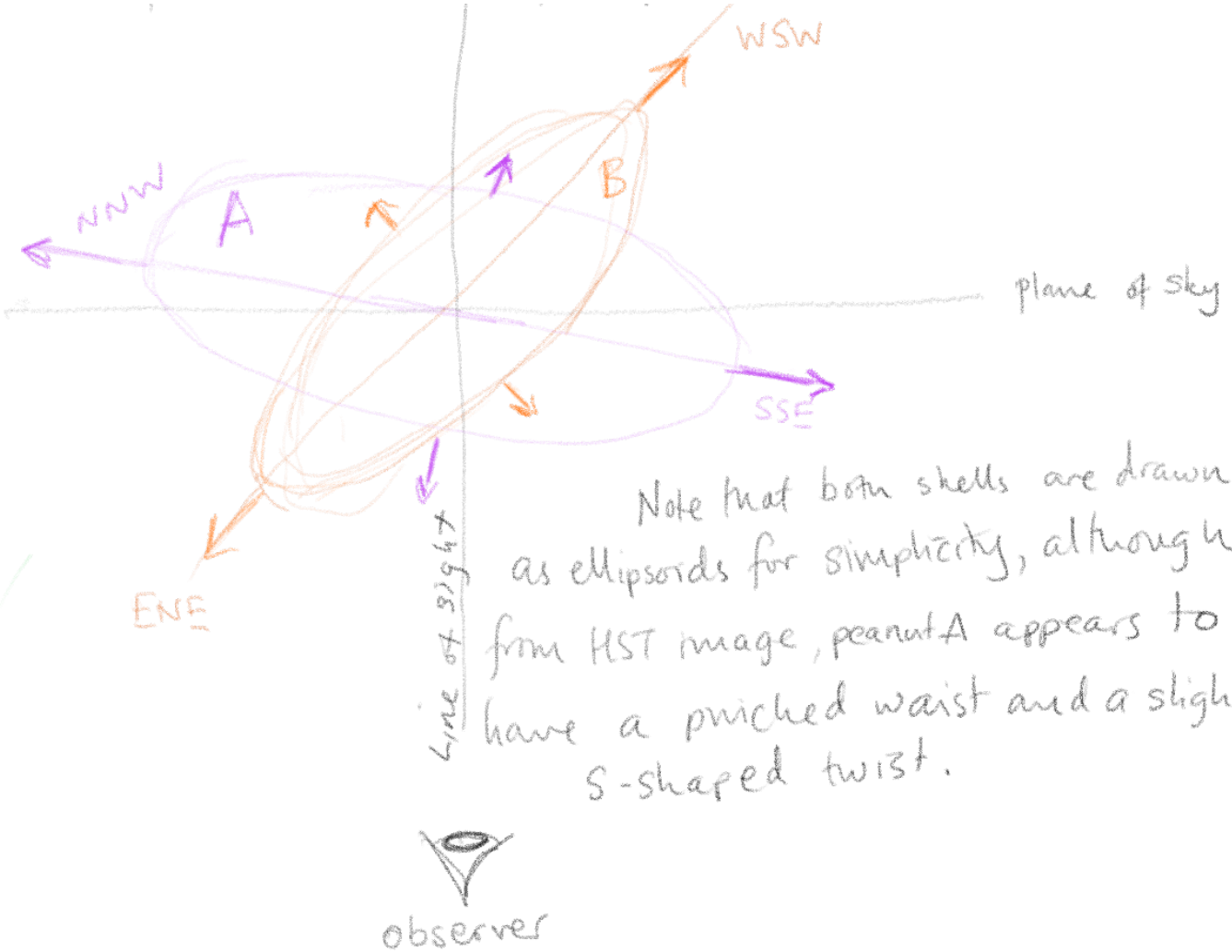
- Proper motions of the shell edge are 20–30 km/s along projected minor axis and 50–60 km/s along projected major axis

## INTERPRETATION

1. There must be at least two shells that form the peanut; both of which must be elongated (bipolar or ellipsoidal), with roughly 2:1 to 3:1 aspect ratio.

Peanut A. Axis aligned with projected major axis and close to plane of sky. This expands axially at about 60 km/s (from proper motions) and laterally at about 20 km/s (from splitting).

Peanut B. Axis aligned with projected minor axis, but highly inclined from plane of sky, which gives the velocity gradient from D North → E Center → F South.




Note that both shells are drawn as ellipsoids for simplicity, although from HST image, peanut A appears to have a pinched waist and a slight S-shaped twist.

2. Inspection of slit W (Hα + [NII] only) confirms this picture — it runs almost exactly along the peanut B axis. It shows the skewness of the velocity ellipse, as expected.

3. The axis of Peanut B is very close to the axis between [NII] knot complexes SW Red and NE Blue, which lie at slightly large radii and higher velocities. It also coincides in projection with the axis of the intermediate shell.