

# Proposed LBV Outburst Mechanism in SBS 0335-052 E SSCs 1&2

## Binary System: LBV + Companion

Colliding winds

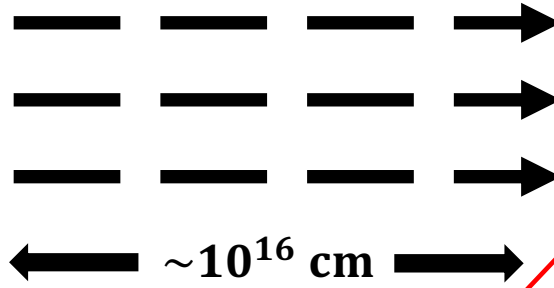
Hot star  
 $35,000 \lesssim T_{\text{eff}} \lesssim 40,000 \text{ K}$

Cool LBV star  
 $T_{\text{eff}} \sim 15,000 \text{ K}$

$\sim 5 - 50 \text{ AU}$

## LBV Outburst (Phase II)

- CNO-cycled (nitrogen-enriched) material
- $\sim 5 \text{ years}$



shock interaction  
with the CSM

forward shock

reverse shock

**CSM formed from pre-outburst  
stellar winds (Phase I)**

- $v_w \sim 200 \text{ km s}^{-1}$
- $\tau_e \sim 10$

**H $\alpha$  asymmetry due to electron  
scatterings within the CSM:**

- Blue Wing:  $-5,000 \text{ km/s}$
- Red Wing:  $+10,000 \text{ km/s}$
- Blue-to-Red Flux ratio:  $0.57 \pm 0.10$

**Radiative cooling of the  
forward shock:**

- ULX
- [Fe v] emission

## LBV Outburst Shocked Ejecta

- Partially ionized ( $T_e \sim 7 \times 10^3 \text{ K}$ )
- [Fe II] emission ( $n_e \sim 10^6 \text{ cm}^{-3}$ )
- Efficient warm dust ( $\sim 400 - 500 \text{ K}$ )  
formation  $\rightarrow$  NIR excess

## Cold Dense Shell (CDS)

- Cold dust ( $\sim 80 \text{ K}$ )
- $\text{H}_2$

$\sim 10^{17} \text{ cm}$