

Complex DM Dynamics

SM copy
MS's

Mirror stars { 1909.04072 }
 { 1909.04071 } } Jaozsef, DC

- ↳ LSST microlensing 2012.07136 Wind, Setford, BOVY, DC
- ↳ Mirror Neutron stars 2103.01965 Higgin, Setford, Tan, DC, Norana-Huttler, Yunes
- ↳ in GAIA: 2112.05766 Howe, Setford, Curtin, Matzner

$$\epsilon \lesssim 10^{-10} \text{ WD}$$

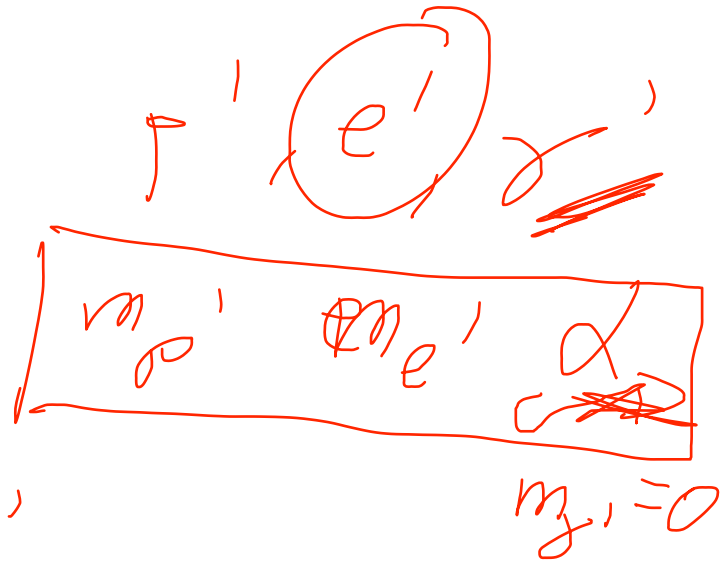
Atomic DM

- ↳ White dwarf cooling 2010.00601 Setford, DC
- ↳ Precision Cosmo: Jared Barman, Yuhsin Tsai, Sarabh Bansal, DC
- ↳ N-body Sim: Sandip Roy, Lisano, Murray, Hopkins, Jacob Shen

Asymmetric Atomic Dark Matter

DMs

\int_{DM} : dark protons
e



m_{DM}

\int_{DM} : DM fraction "Dark 30s"

≤ 0.2

$\int_{DM} \int_{DM} \int_{DM}$

$\leq 10^{-9}$ Cosmology

$\hookrightarrow 1909 - 00696$
Suzuki et al

10^{-13}

\int_{DM}

\int_{DM}

$T_{CMB} \lesssim 0.4$

ΔN_{eff}

ΔN_{eff}

Λ CDM

Theory Motivation: HIP \rightarrow Twin Higgs

$$\exists \gamma_{SM} + \gamma_{SM}' \quad \sigma \rightarrow \sigma'$$

$$\begin{matrix} \swarrow & \searrow \\ \gamma_{SM} & \gamma_{SM}' \end{matrix}$$

$$\begin{matrix} \gamma_{SM} & \gamma_{SM}' \\ \gamma_{SM} & \gamma_{SM}' \end{matrix}$$

$$\begin{matrix} \gamma_{SM} & \gamma_{SM}' \\ \gamma_{SM} & \gamma_{SM}' \end{matrix}$$

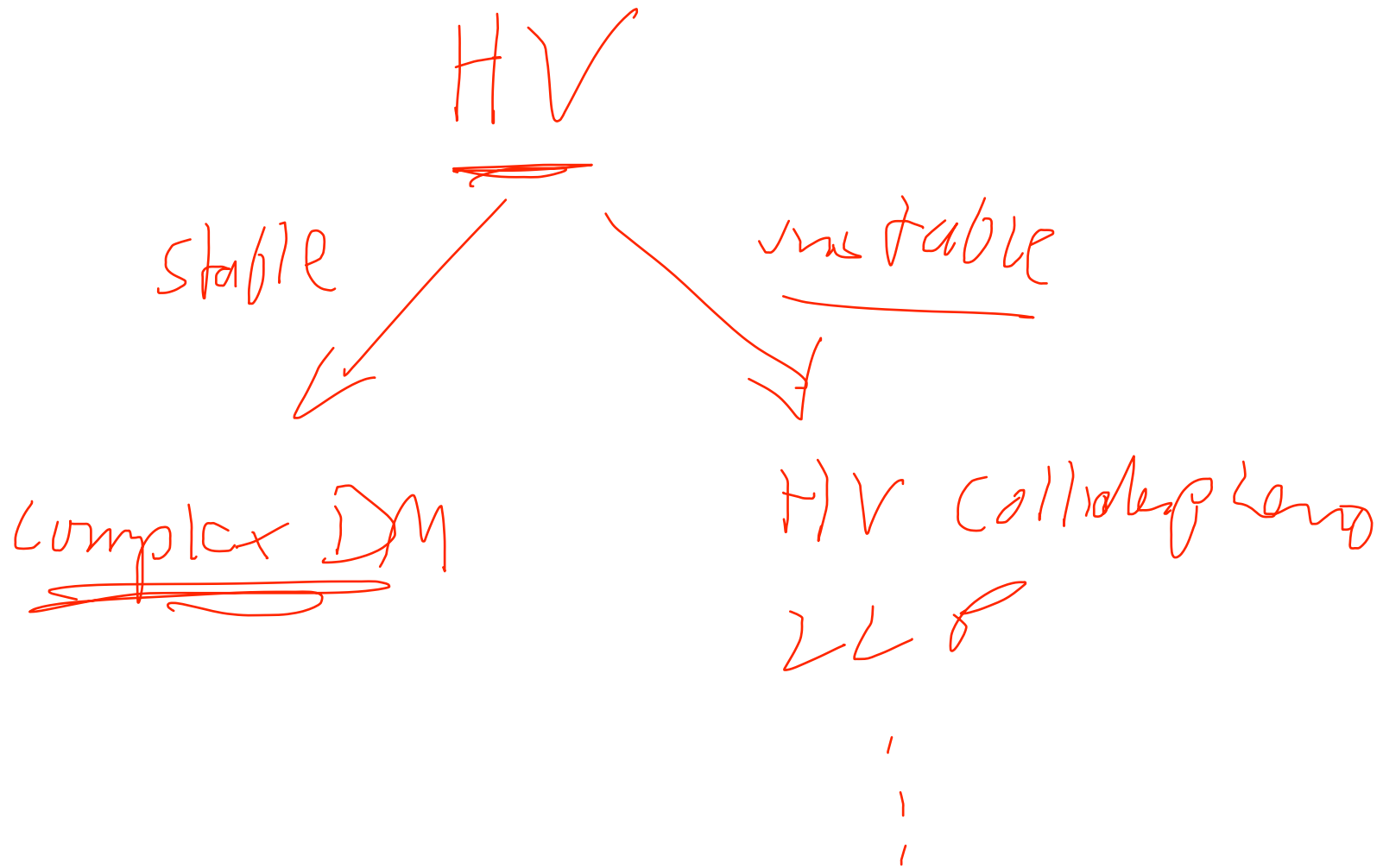
Higgs sector

$$\frac{\langle H_B \rangle}{\langle H_A \rangle} = \frac{v}{v'} \approx 3$$

$$\mathcal{L} = \underbrace{\gamma_A^2 \lambda_A^2 H_A^2}_{\text{Higgs sector}} + \gamma_B^2 \lambda_B^2 H_B^2$$

$$\approx \gamma^2 \lambda^2 (H_A^2 + H_B^2)$$

$$H^2 = \begin{pmatrix} H_A \\ H_B \end{pmatrix}$$



ADN → DISSIPATION



MIRROR
STARS

↳ Kelvin Helmholtz
vortex

DARK QCD

↳ DARK FUSION long lifetimes ???

MACHO?

MICROSTAR

N_{ADM} , ρ_{core} , T_{core} , T_{ms}

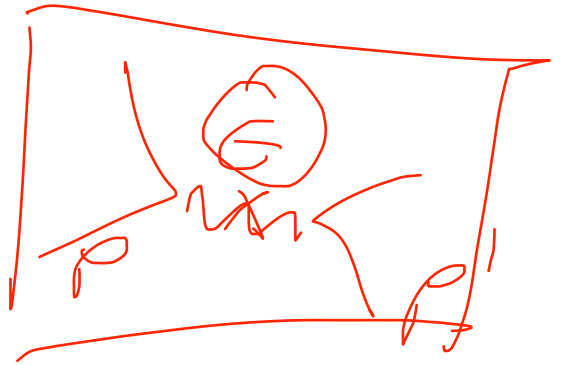
$\underline{EF\tilde{E}} \sim 10^{-4}$
 $\sim 10^{-13}$
 ISM



$\langle v \rangle$
 p, He
 SM capsule
 in MS

10^3 km

$T_{magnet} \sim 10^4$ K



$\rho_{neut} \sim E^2$

$\rho_{cool} \sim \underline{\underline{\tau_e}}$

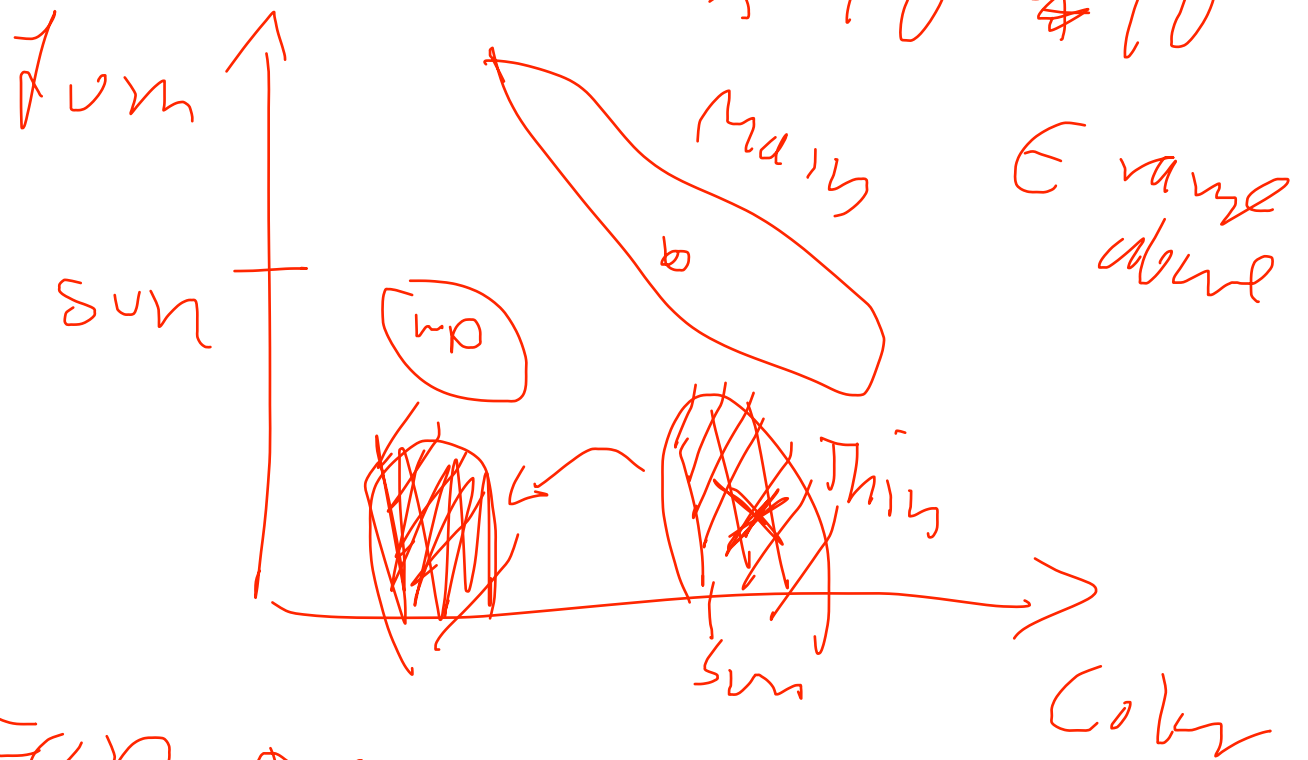


\hookrightarrow bremsstrahlung

Properties of Neutron: SM physics

↳ change parameters from Sun ~~to~~ ~~to~~ ^{13A}

$\times 10^{-4}$ ~~\neq~~ 10^{+4}



GAIA

↳ LOOK FOR DM

SM like MS with $E \approx 10^{-12}$ ≈ 10 pc \rightarrow red

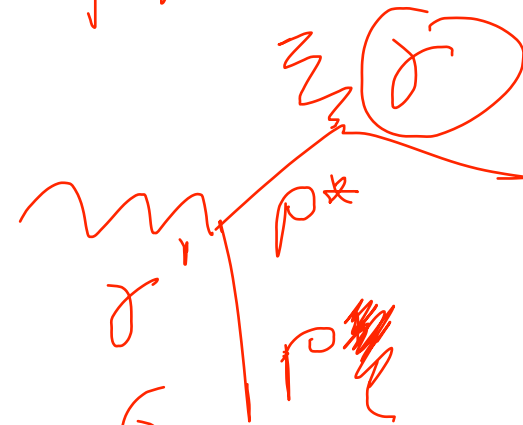
2nd signal

Probes Minus sedn

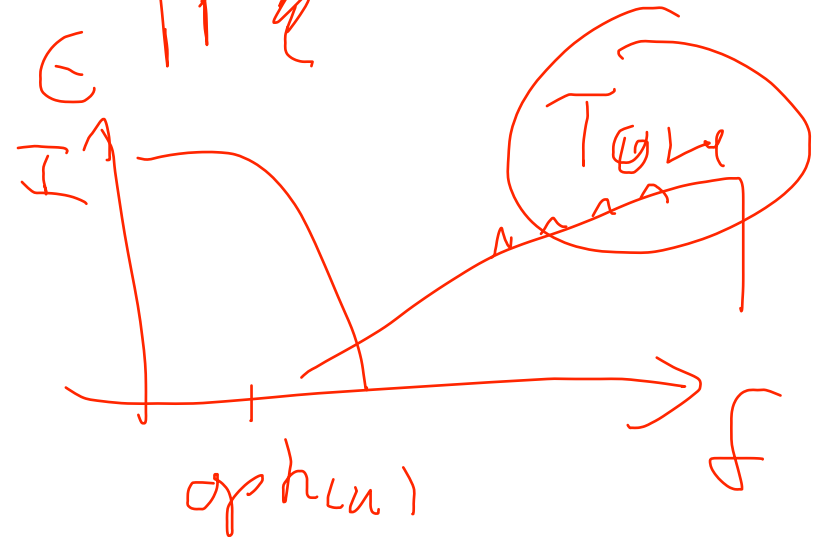
> rays



Thomson Conversion



$$v_0 = v_{sm}$$



MS → generic aDM signature

→ spectacular?

→ Depend on full aDM

Astro physics

↳ distribution of aDM in our galaxy

↳ MS formation rate
mass function
properties

We need to

understand
aDM astro!

↳ are there other
generic aDM sys

DARK
DISKS

QUALITATIVE

Other MS sigs : GRAVITATIONAL

↳ Micro lensing

MS \rightarrow Dark Disk \rightarrow LSST Vera Rubin
Telescope

$$\frac{P_{MS}}{P_{com}} f_{ms} \sim 10^{-4}$$



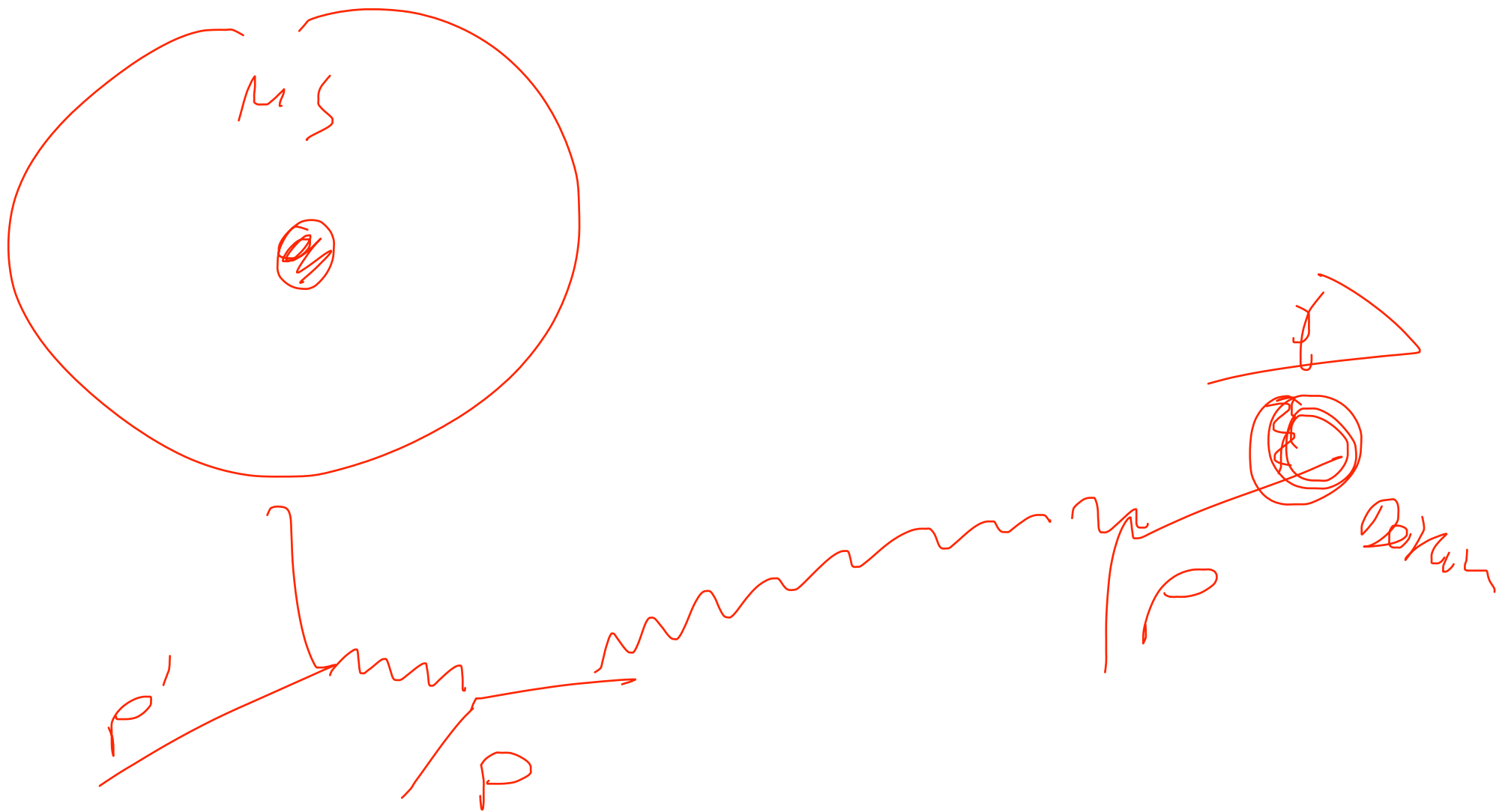
see Mirror NS

mergers

be distinguishable
from NS, B1+

$n_{MS binaries}$

$n_{NS binaries}$



ALL OF THIS depends on a DM Asho

