

Dalitz Plots

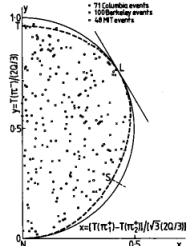
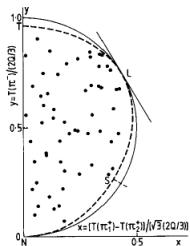
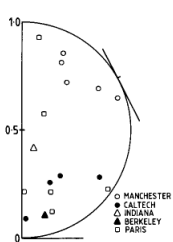
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Some References

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Dalitz Plots for θ decay

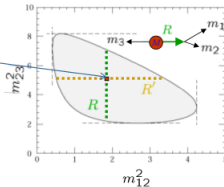




Density distribution in the Dalitz Plot given by

$$\Gamma(m_{12}^2, m_{23}^2) = \frac{1}{(2\pi)^3 32M^3} |\mathcal{M}|^2 dm_{12}^2 dm_{23}^2$$

for Spin-0 Particles M, m_1, m_2, m_3



Dynamics is contained by the matrix element \mathcal{M}

non-resonant processes $\Rightarrow \mathcal{M} = \text{const.}$, uniform distribution

resonant processes \Rightarrow bands (horizontal, vertical, diagonal)

spins \Rightarrow Density distribution along the bands

Properties of Dalitz Plots



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For the process $M \rightarrow Rm_3, R \rightarrow m_1m_2$ the matrix element can be expressed like

$$\mathcal{M}_R(L, m_{12}, m_{23}) = Z(L, \vec{\beta}, \vec{q}) \cdot B_L^M(p) \cdot B_L^R(q) \cdot T_R(m_{12})$$

Winkelverteilung
(Legendre Polyn.)

Formfaktor
(Blatt-Weisskopf-F.)

Resonanz-Fkt.
(z.B. Breit Wigner)

$Z(L, \vec{\beta}, \vec{q})$ decay angular distribution of R



$B_L^M(p)$ Form-(Blatt-Weisskopf)-Factor for $M \rightarrow Rm_3, p=p_3$ in R_{12}

$B_L^R(q)$ Form-(Blatt-Weisskopf)-Factor for $R \rightarrow m_1m_2, q=p_1$ in R_{12}

$T_R(m_{12})$ Dynamical Function (Breit-Wigner, K-Matrix, Flatté)

$J \rightarrow L+I$	Z
$0 \rightarrow 0 + 0$	1
$0 \rightarrow 1 + 1$	$\cos^2\theta$
$0 \rightarrow 2 + 2$	$[\cos^2\theta - 1/3]^2$



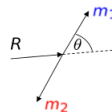
Angular Distributions



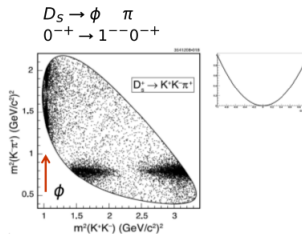
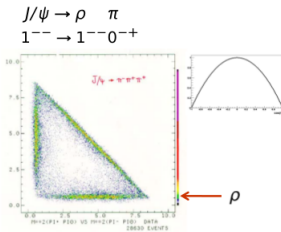
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density distribution along the band =
decay angular distribution of R

results from Spin of R , the spin configuration
and polarization of initial and final state(s)



Compare $R=\rho$ and ϕ (both 1^-) angular distributions are different !!



Phase space

visual inspection of the phase space distribution

are the structures?

structures from signal or background?

are there strong interferences, threshold effects, potential resonances?

