

3 Generationen von je 2 Quarks:

alle sind Fermionen mit Spin $\frac{1}{2}$

u und d-Quark haben eine spin-ähnliche Quantenzahl Isospin $I = 1/2$

Generation	Flavour	q	m	I_3	S	C	B	T	A
1	d (down)	$-1/3$	$\simeq 3 \text{ MeV}$	$-1/2$	0	0	0	0	$1/3$
	u (up)	$+2/3$	$\simeq 5 \text{ MeV}$	$+1/2$	0	0	0	0	$1/3$
2	s (strange)	$-1/3$	$\simeq 100 \text{ MeV}$	0	-1	0	0	0	$1/3$
	c (charm)	$+2/3$	$\simeq 1.2 \text{ GeV}$	0	0	1	0	0	$1/3$
3	b (bottom)	$-1/3$	$\simeq 4.2 \text{ GeV}$	0	0	0	-1	0	$1/3$
	t (top)	$+2/3$	$\simeq 171 \text{ GeV}$	0	0	0	0	1	$1/3$

die starke und die elektromagnetische WW erhalten die “ladungsartigen” Quantenzahlen I_3 , S, C, B, T, A

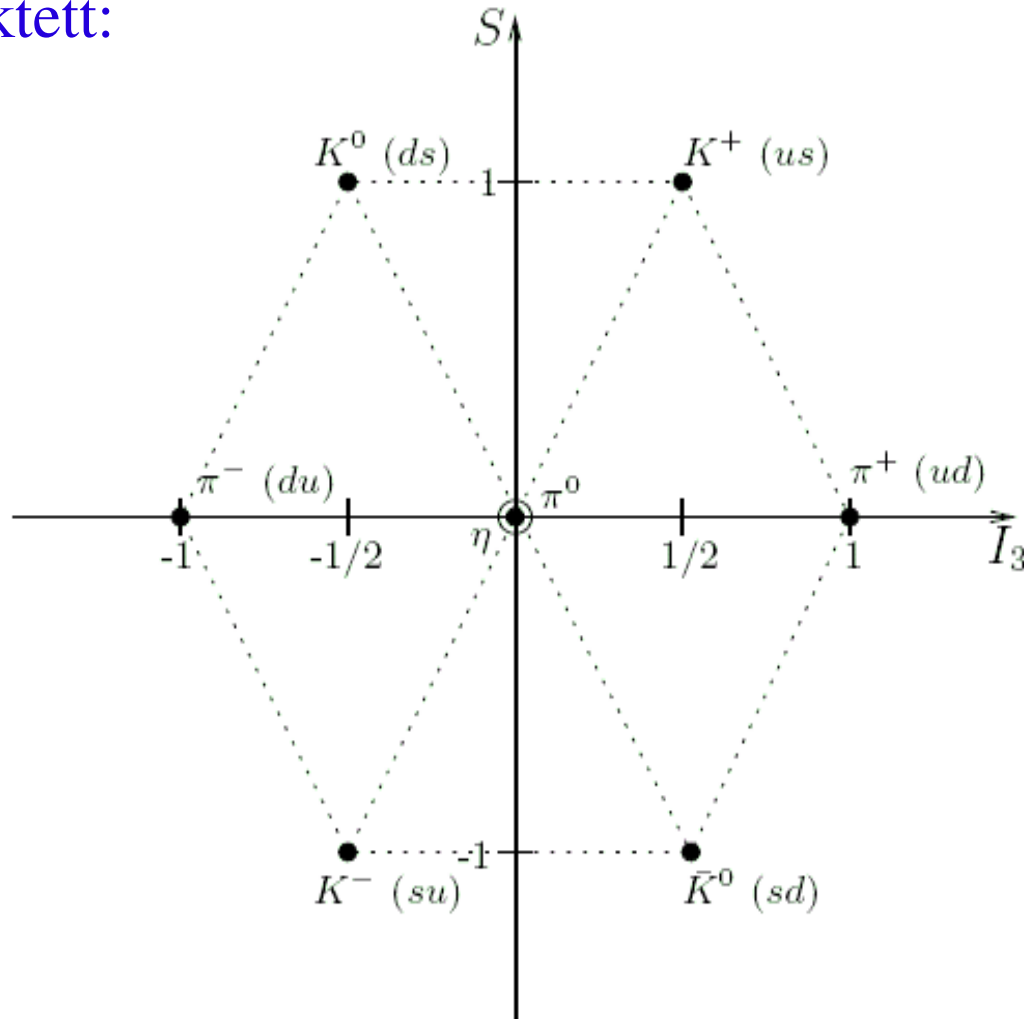
REORDERING THE $q\bar{q}$ STATES ACCORDING TO STRANGENESS AND ISOSPIN COMPONENT I_3 .

	$I_3 = -1$	$-1/2$	0	$1/2$	1
$S \left\{ \begin{array}{l} 1 \\ 0 \\ -1 \end{array} \right.$		$d\bar{s}$		$u\bar{s}$	
	$d\bar{u}$		$u\bar{u}, d\bar{d}, s\bar{s}$		$u\bar{d}$
		$s\bar{u}$		$s\bar{d}$	

9 mögliche Zustände mit
Spin = 0

-> pseudoskalare Mesonen
von Gruppenstruktur
ein Oktett und ein Singlett

Oktett:



Singlett:

$I=0, J=0, S=0$ η'

Fig. 3-1

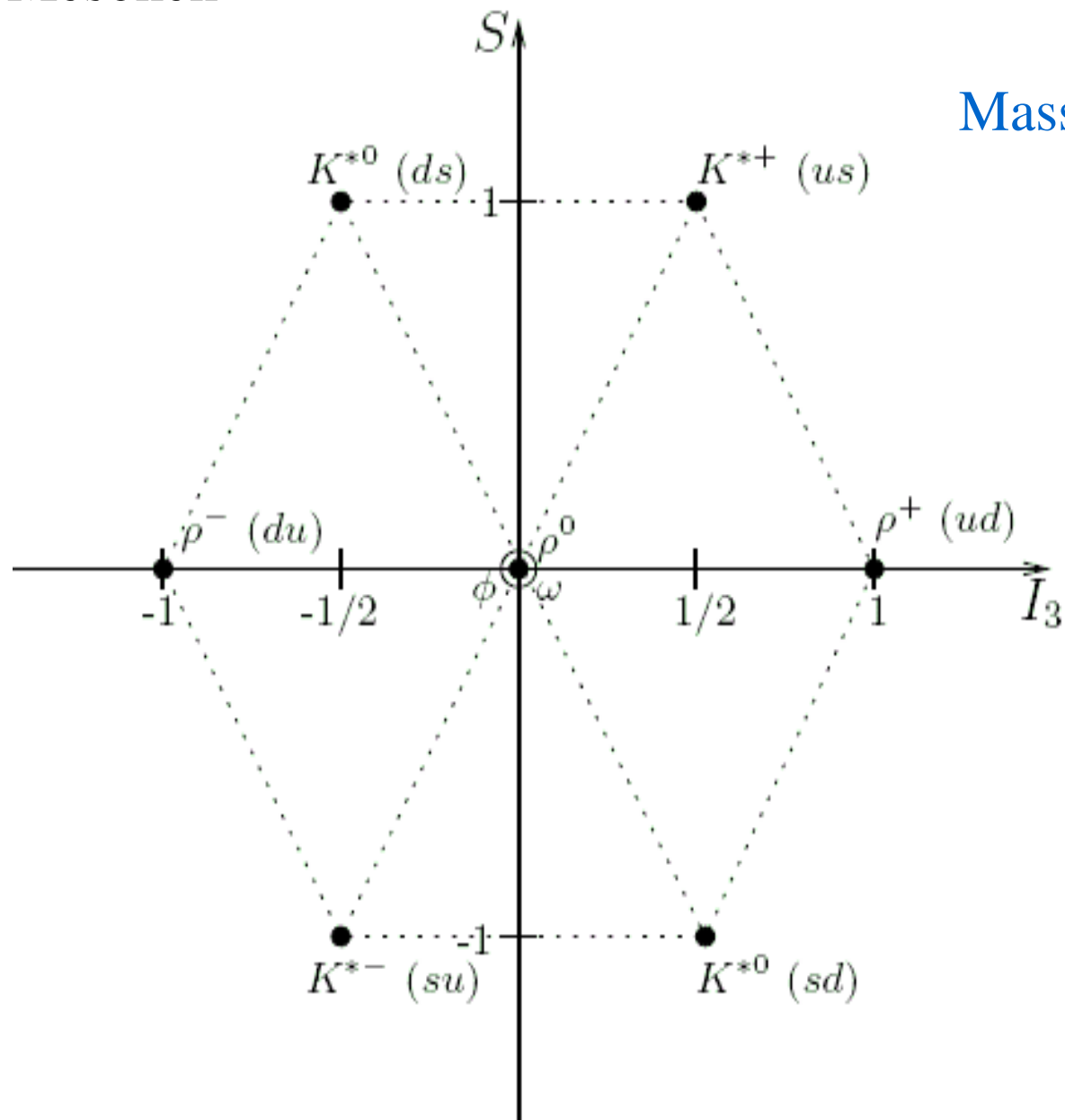
pseudoskalare Mesonen (S=Strangeness)

Meson	Quark-Kombination	I	I_3	S	Masse / MeV
π^-	$d\bar{u}$	1	-1	0	140
π^+	$u\bar{d}$	1	1	0	140
π^0	$\frac{1}{\sqrt{2}}(d\bar{d} - u\bar{u})$	1	0	0	135
K^+	$u\bar{s}$	1/2	1/2	+1	494
K^0	$d\bar{s}$	1/2	-1/2	+1	498
K^-	$\bar{u}s$	1/2	-1/2	-1	494
$\bar{K}^0$	$\bar{d}s$	1/2	1/2	-1	498
η	$\frac{1}{\sqrt{6}}(d\bar{d} + u\bar{u} - 2s\bar{s})$	0	0	0	549
η'	$\frac{1}{\sqrt{3}}(d\bar{d} + u\bar{u} + s\bar{s})$	0	0	0	958

Fig. 3-1a

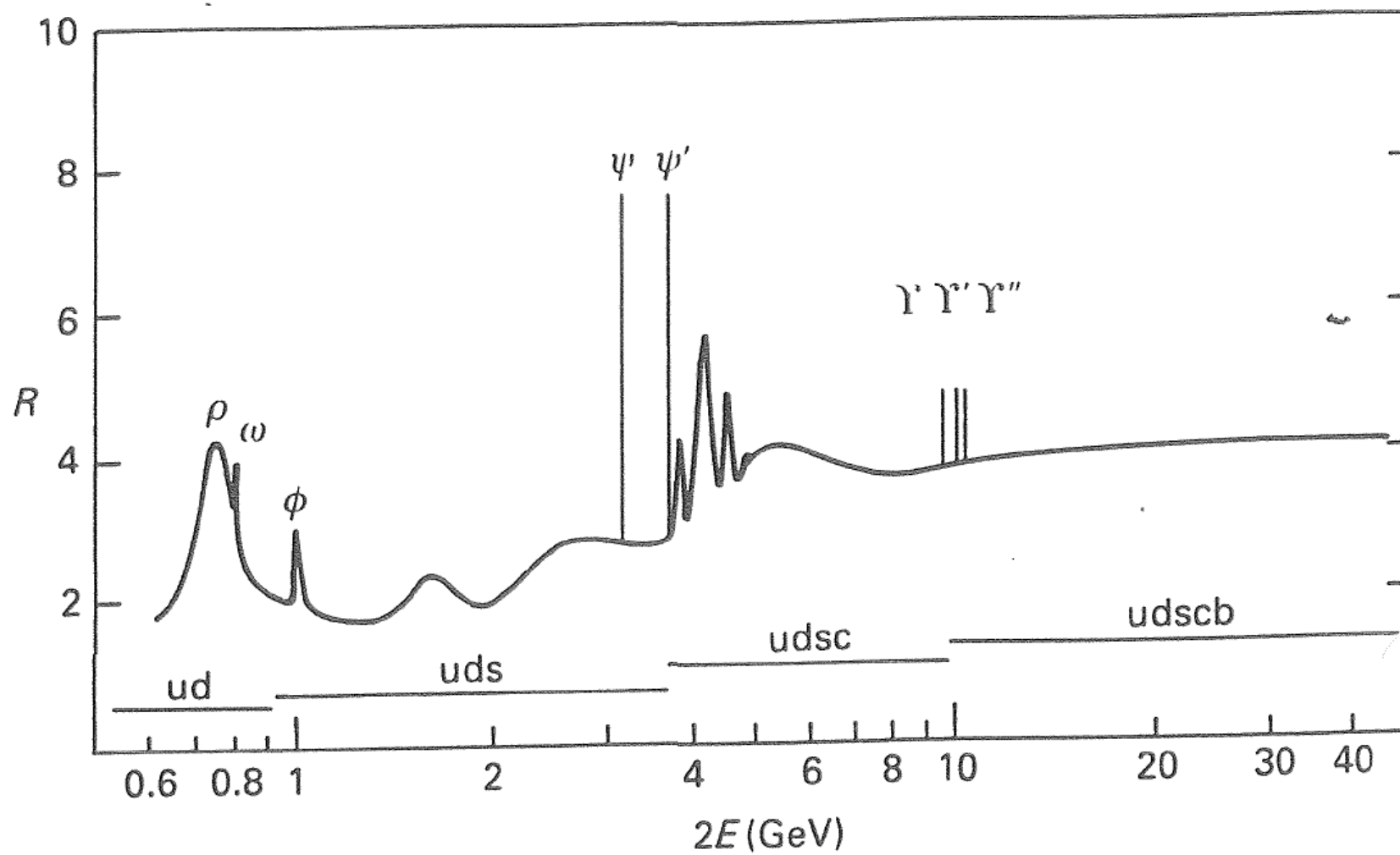
9 mögliche Zustände mit Spin = 1

-> Vektor-Mesonen



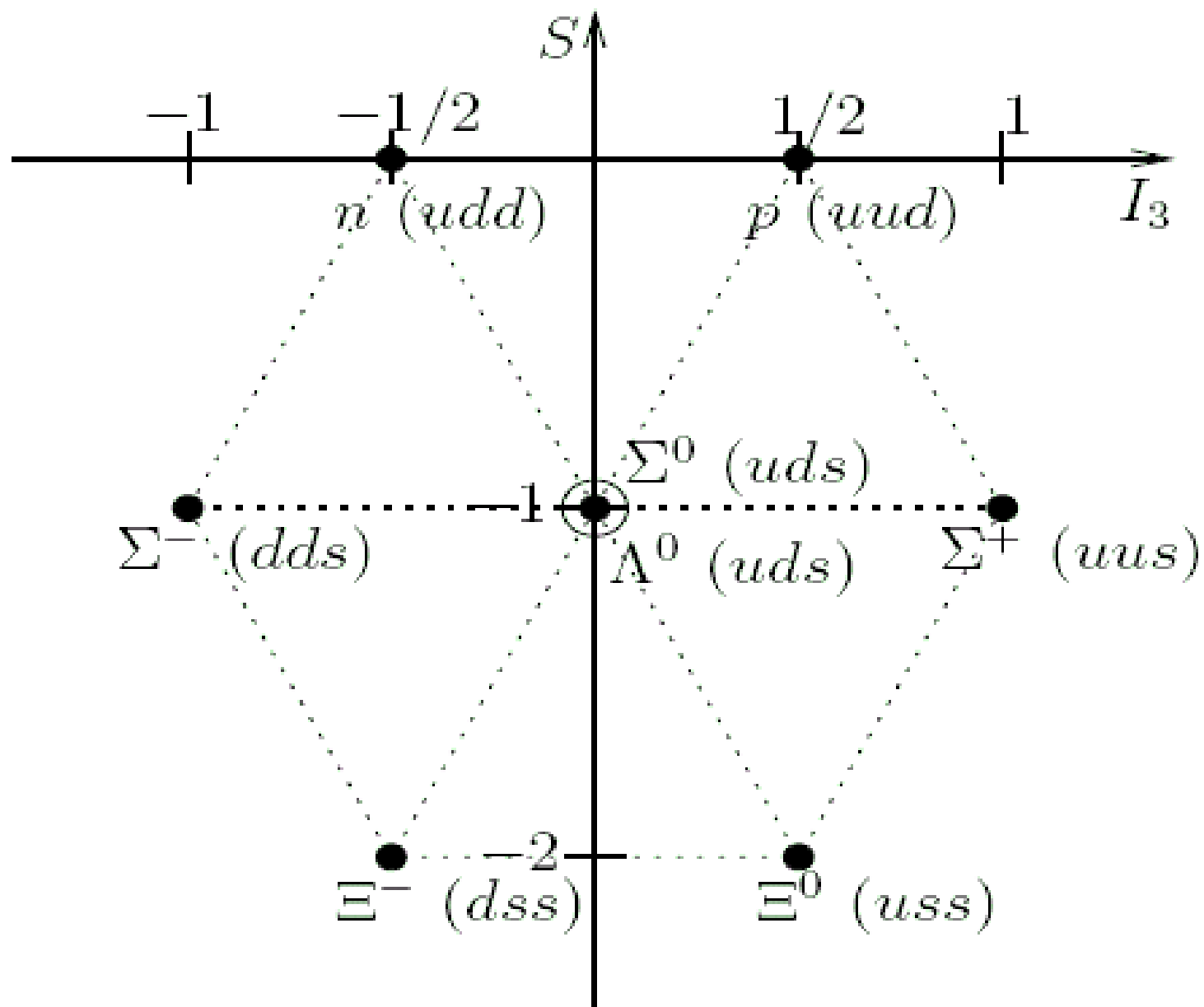
Massen 800-1000 MeV

Fig. 3-2



$$R = \frac{\text{cross-section for } e^+e^- \rightarrow \text{hadrons}}{\text{cross-section for } e^+e^- \rightarrow \mu^+\mu^-}$$

Fig. 3-3



Das $\frac{1}{2}^+$ Baryon-Oktett

Fig. 3-4

das $J^\pi = 3/2^+$ Baryon-Dekuplett:

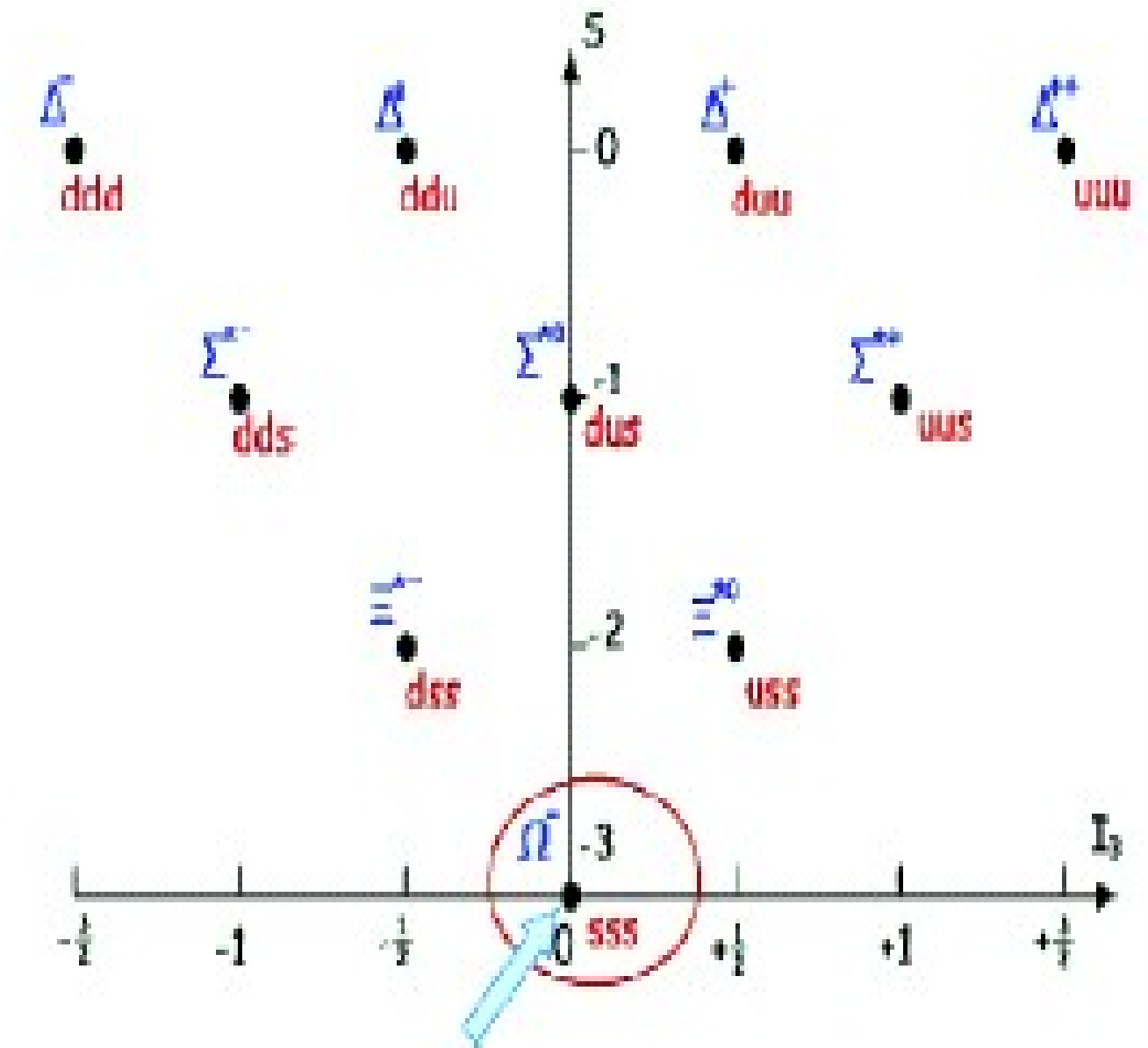


Fig. 3-5

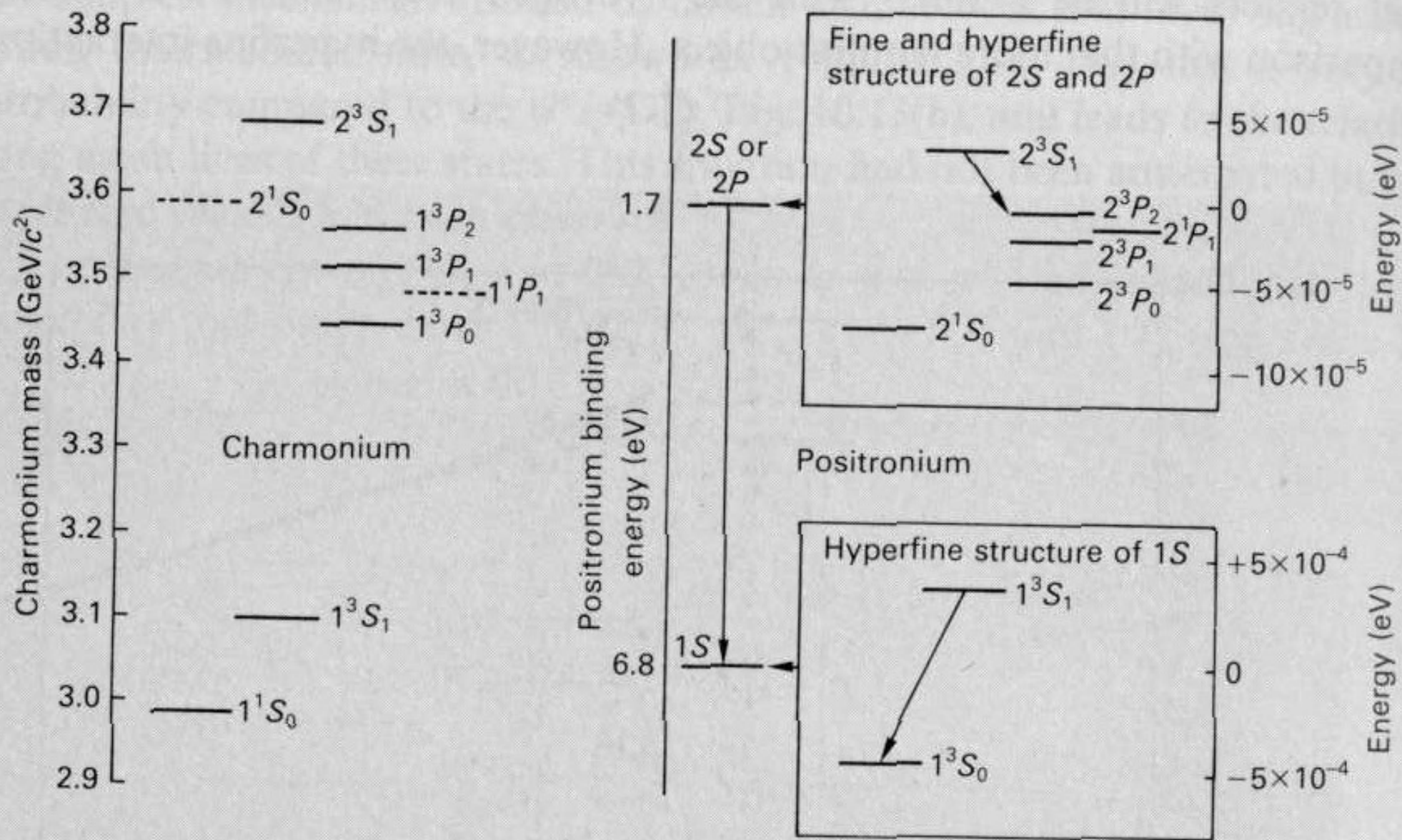
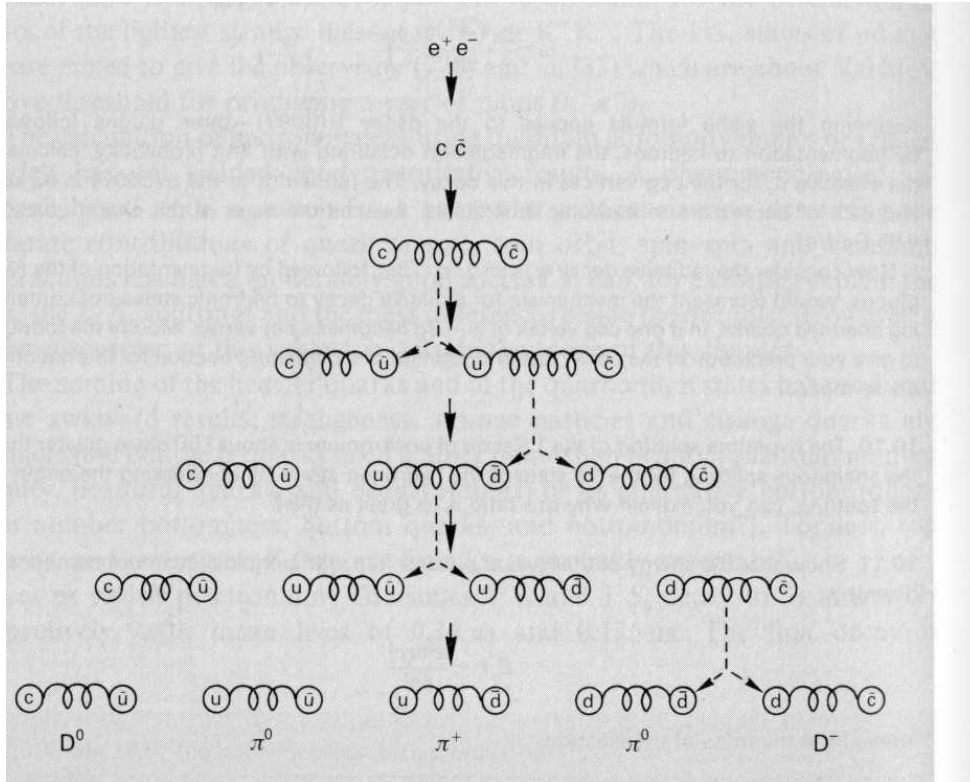


Fig. 3-6

Quarks materialisieren sich als Jets

Prinzip:



im Experiment:

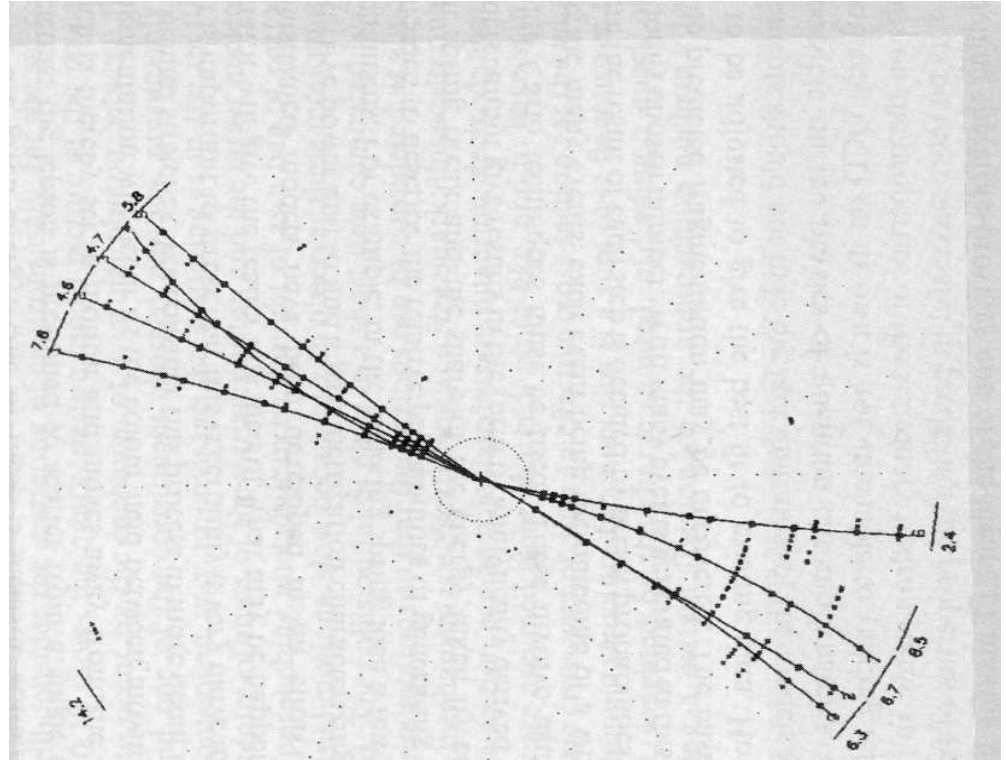


Fig. 3-7

CDF: Nachweis von 2 b-Jets aus
 $t\bar{t}$ decay

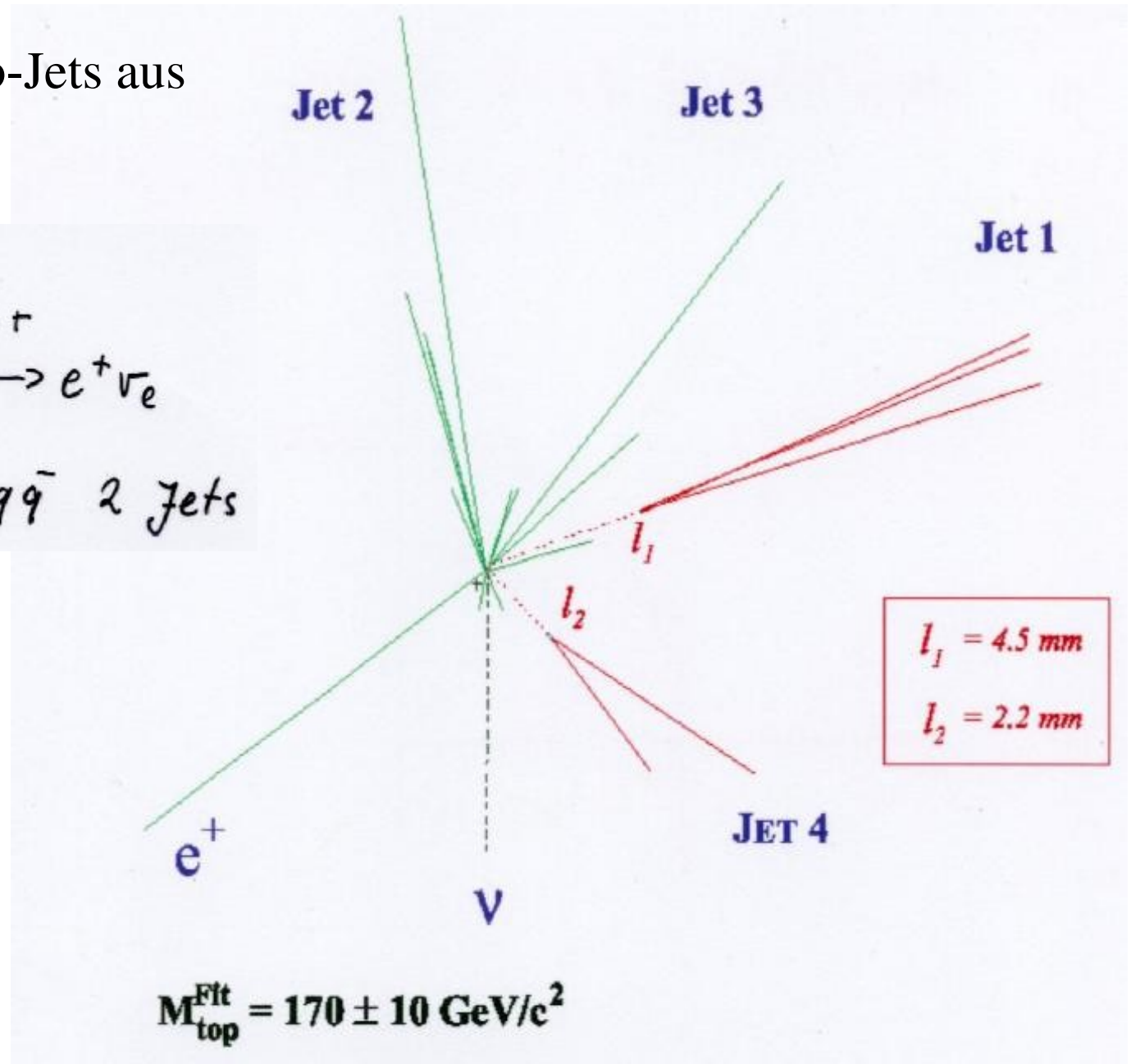
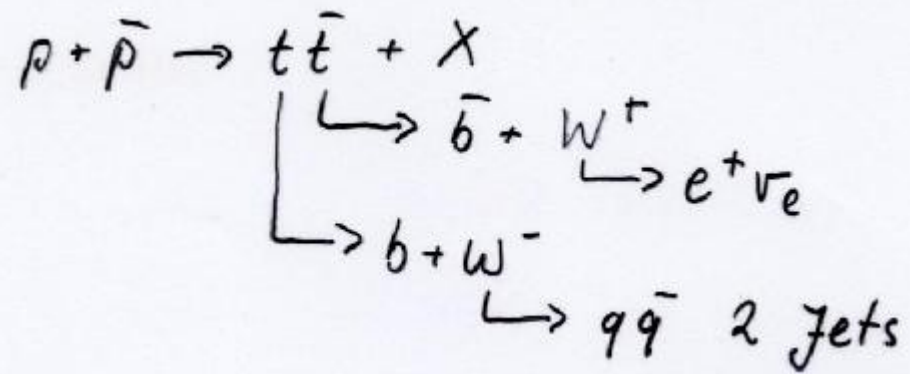


Fig. 3-8

$e + 4 \text{ jet event}$

40758_44414

24-September, 1992

TWO jets tagged by SVX

fit top mass is $170 \pm 10 \text{ GeV}$

e^+ , Missing E_t , jet #4 from top

jets 1,2,3 from top (2&3 from W)

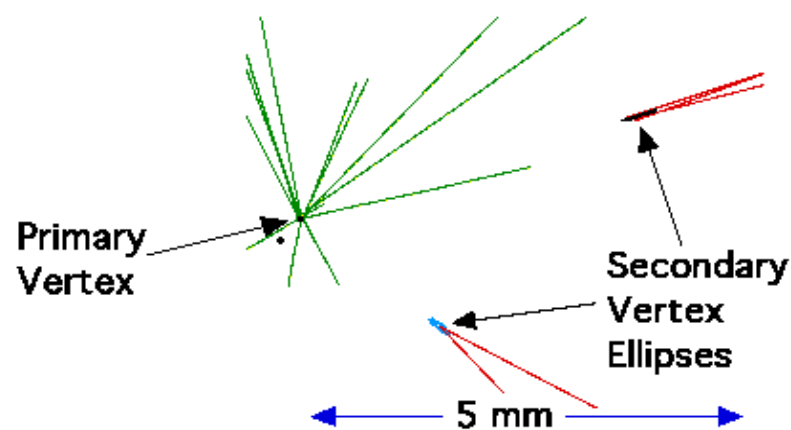
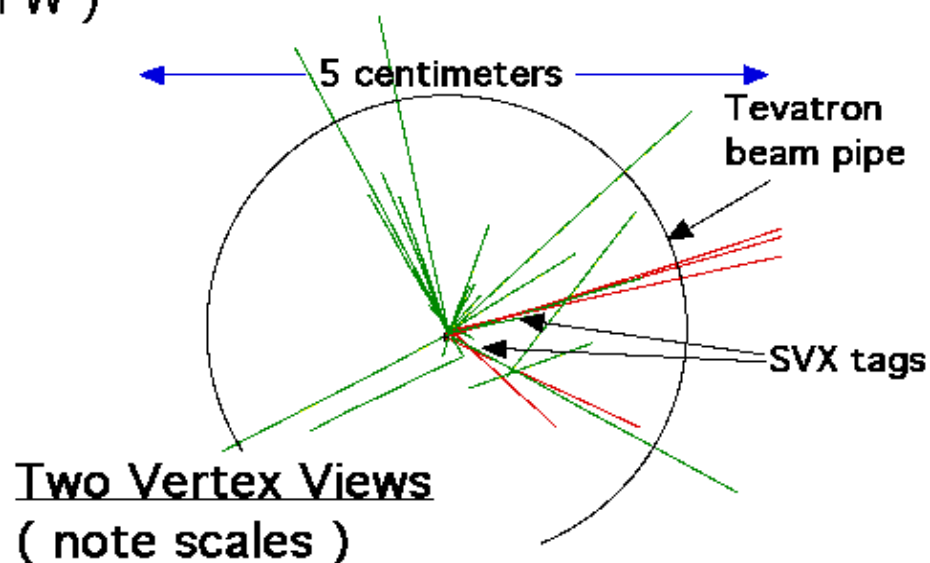
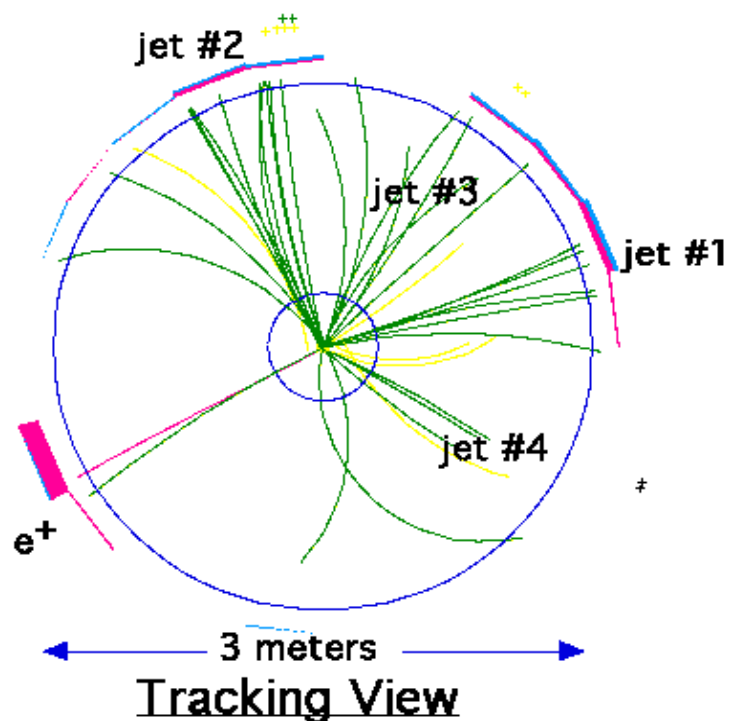
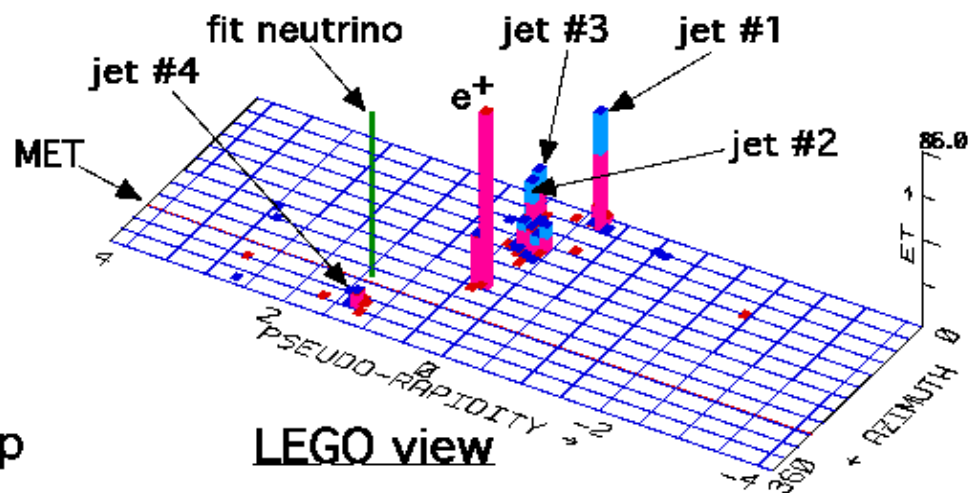


Fig. 3-9