

**NATIONAL NUCLEAR DATA CENTER  
Bldg. 197D  
Brookhaven National Laboratory  
P. O. Box 5000  
Upton, NY 11973-5000 U.S.A.**

(Internet) "NNDC@BNL.GOV

Telephone: (516)344-2902  
FAX: (516)344-2806

**Memo CP-C/346**

**DATE:** August 6, 2004  
**TO:** Distribution  
**FROM:** V. McLane  
**SUBJECT:** Angular distribution data

As more complicated types of data are compiled it is necessary to define more clearly the different angles used to describe the data.

I propose the addition of the following headings to differentiate the different angles used in cross section measurements.

ANG-AZ      Azimuthal angle between reaction planes of two particles (also, ANG-AZ-ERR)  
ANG-MN      Mean angle of correlated particle pair (also, ANG-MN-ERR)  
ANG-RL      Angle between two particles (also, ANG-RL-ERR)

The following modifier would be added to Dictionary 34:

NCP              Non-coplanar

Following is a discussion of the terms used, and my proposals on how the data should be compiled, formatted as the basis of a LEXFOR entry. These proposals will require updating several data sets, but many are already using the formats proposed. I will look to see which data sets need updating.

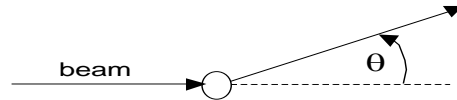
**Distribution:**

M. Chiba, Sapporo  
F. E. Chukreev, CAJaD  
S. Dunaeva, NDS  
S. Taova, Sarov  
O. Gritzay, KINR  
K. Kato, JCPDG  
M. Kellett, NEADB  
V. N. Manokhin, CJD

S. Maev, CJD  
O. Schwerer, NDS  
S. Takács, ATOMKI  
F. T. Tárkányi, ATOMKI  
V. Varlamov, CDFE  
CNDC  
NNDC Distribution

Reaction plane: The plane defined by the incident beam direction and the outgoing particle direction. For the following discussions plane  $A$  is defined by the incident beam direction and the outgoing particle  $a$  direction

Angular distribution: probability for a particle to be emitted into an area of solid angle  $d\Omega$  lying at a mean angle of  $\theta$  to the incident beam direction in the reaction plane; given as  $\sigma(\theta) = d\sigma/d\Omega$ . The data are given in units of cross section per unit solid angle (*e.g.*, mb/sr).

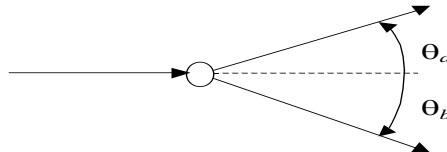


REACTION coding: DA in SF6.  
Units are of the type DA (*e.g.*, B/SR)

Data may also be given as relative angular distribution  $W(\theta)$ ; the data are dimensionless, and are most often normalized to  $W(90^\circ) = 1$ .

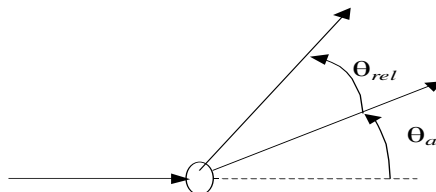
REACTION coding: DA in SF6; REL in SF8.  
Units are NO-DIM.

Angular correlation: probability that, if a particle  $a$  is emitted at a mean angle of  $\theta_a$  to the incident beam direction in the reaction plane, particle  $b$  will be emitted at a mean angle of  $\theta_b$  to the incident beam direction in the same plane (coplanar); given as  $d^2\sigma/d\Omega_a d\Omega_b$ . The data are given in units of cross section per unit solid angle squared (*e.g.*, mb/sr<sup>2</sup>).



REACTION coding: DA/DA in SF6; particles in SF7 as  $a/b$  (*e.g.*, P/D).  
The angles  $\theta_a$  and  $\theta_b$  are coded under the headings ANG1 and ANG2, in the same order as the particles appear in SF7.  
Units are of the type DA2 (*e.g.*, MB/SR2)

Alternately, the angle of particle  $b$ ,  $\theta_b$ , may be given with the angle between the two emitted particles  $\theta_{rel}$ .

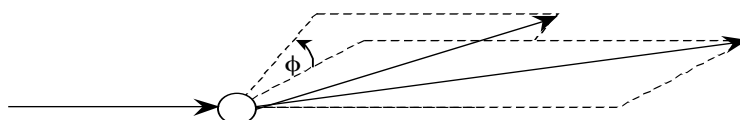


REACTION coding: DA/DA in SF6; particles in SF7 (*e.g.*, P/P+A).  
The angles would be given as ANG1 and ANG-RL.  
Data units are of the type DA2 (*e.g.*, MB/SR2)

The angular correlation is often given as an angular correlation function  $W(\theta_a, \theta_b)$ ; the data are dimensionless.

REACTION coding: DA/DA in SF6; particles in SF7, REL in SF8.  
Units are NO-DIM.

Non-coplanar angular correlations: The more general situation is for particle  $a$  and particle  $b$  not in the same reaction plane. Then  $\theta_a$  is the angle of particle  $a$  relative to the beam direction in plane  $A$ ,  $\theta_b$  is the angle of particle  $b$  relative to the beam direction in plane  $B$ , and a third angle  $\phi$  is defined as the angle between the  $A$  and  $B$  reaction planes (azimuthal angle).

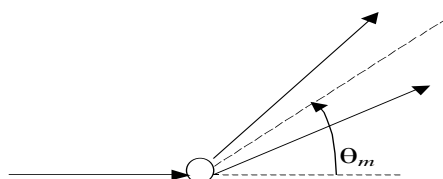


REACTION coding: DA/DA in SF6; particles in SF7 as  $a/b$  (e.g., N/P) ; NCP in SF8.  
The angles  $\theta_a$  and  $\theta_b$  are coded under the headings ANG1 and ANG2, in the same order as the particles appear in SF7.  
The azimuthal angle is coded under the heading ANG-AZ.

The angular correlation function is then given as  $W(\theta_a, \theta_b, \phi)$ .

REACTION coding: DA/DA in SF6; particles in SF7; NCP/REL in SF8.  
Units are NO-DIM.

Cross section for correlated pairs: probability that a particle  $a$  and a particle  $b$  will be emitted at a mean angle  $\theta_m$  to the incident beam direction; given as  $d\sigma/d\Omega_m$ .



REACTION coding: DA/CRL in SF6; particles in SF7 as  $a+b$  (e.g., P+A).  
The angle is given under the heading ANG-MN  
Units are of the type DA (e.g., B/SR)