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A New Kaon

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Abstract

A data processing technique has been used to discover a new Kaon composed of an anti-down (d') and a strange (s) quark. Anti-down is indicated by d' instead of the usual d with an overline. The reason is d' can be stored in a database and overlined d cannot. The K^+ kaon is symmetric with the K^- kaon, but the K^0 composed of a down and anti-strange does not have a symmetric anti-down and strange opposite.

Discovery Process

While working on a more involved research effort, a data application was developed using Microsoft Access to combine quarks into particles. The table relationships are as follows:

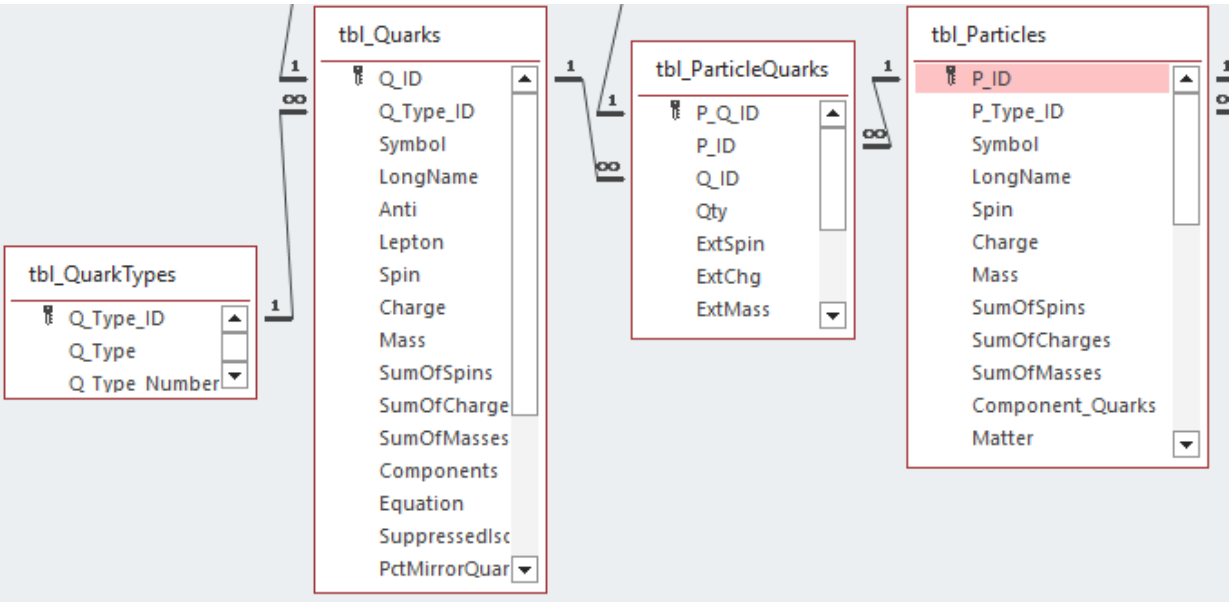

Figure 1 - Table Relationships

Forms to perform data entry and reporting were created to populate the tables. A main form shown below opens the forms and reports as labeled.

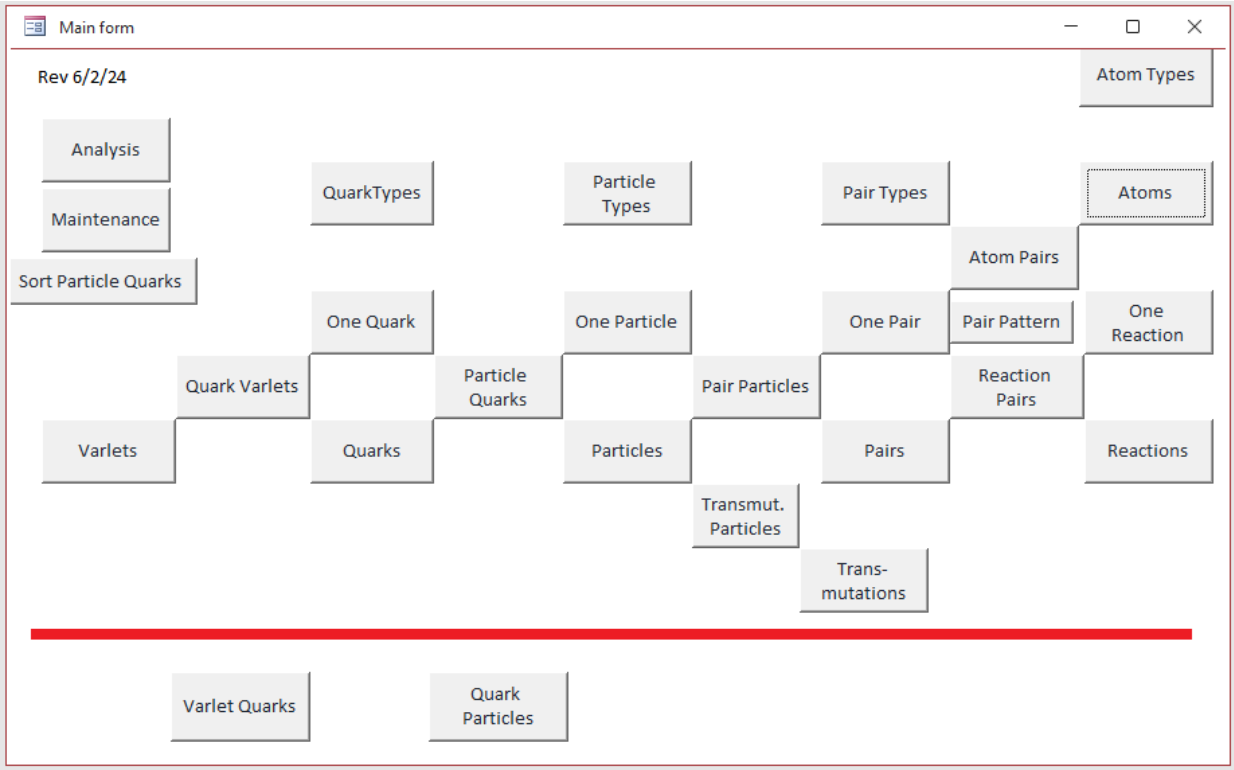

Figure 2 – Main Form in Application

The button labeled “Sort Particle Quarks” opens the following form:

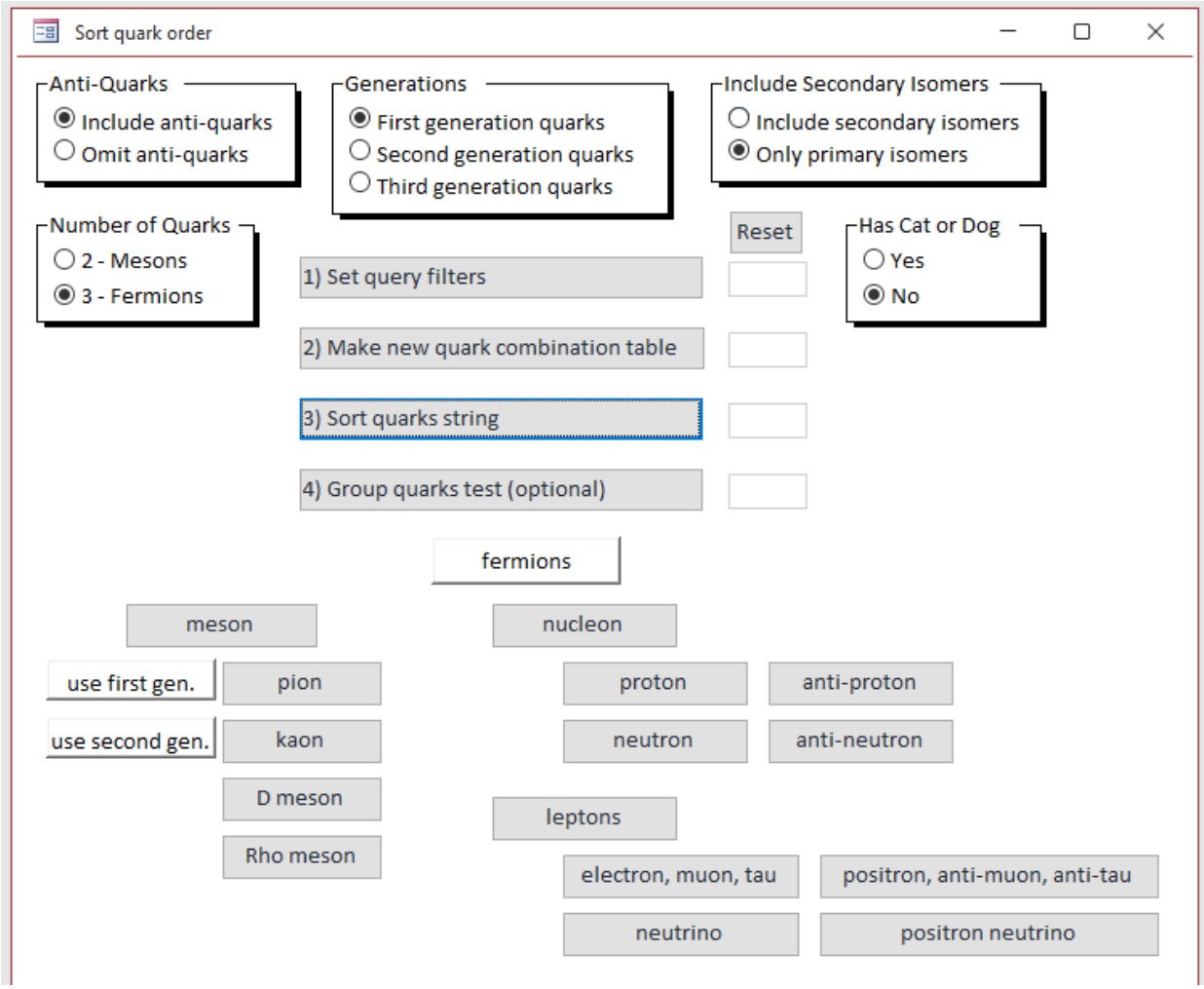

Figure 3 - Sort Quark Order Form

Find the new kaon using the following choices and steps:

Anti-Quarks selector: “Include anti-quarks”

Number of Quarks selector: “2 – Mesons”

Generations selector: “Second generation quarks”

Include secondary isomers selector: “Only primary isomers”

Has Cat or Dog selector: “No”

Click on buttons 1) thru 4). The boxes to the right of the buttons fill with “Done” when finished. Click the “Reset” button to clear the “Done” from the boxes to the right of the buttons. Step 4 opens the data table from which the mesons can be filtered from, and can be closed as one does with any Microsoft application.

Click on the kaon button. This launches a query with its design view as follows:

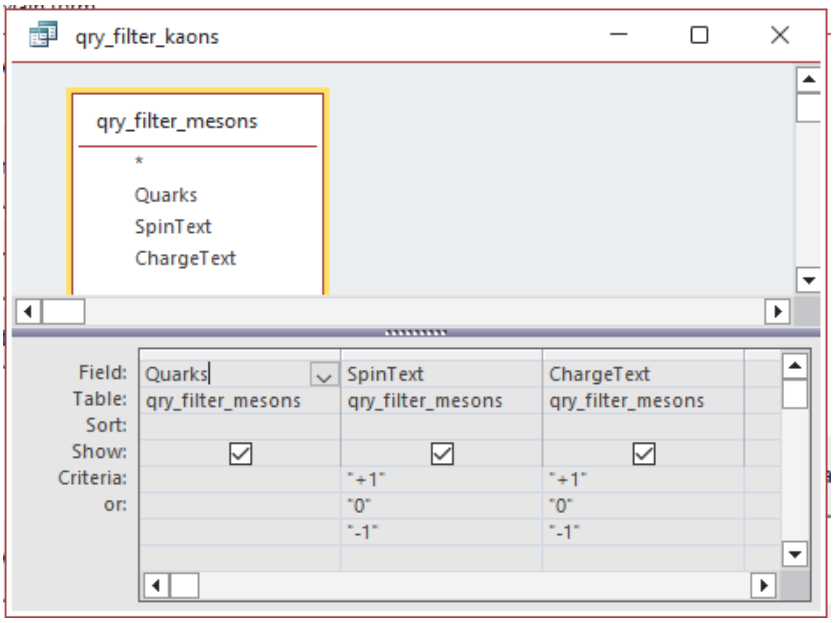

Figure 4 - Kaon Filter Query

This kaon filter query opens and may be exported to a spreadsheet using the "External Data" and "Excel" clicks. Once exported, the spreadsheet appears as follows. Three new columns have been added that were not in the Access query, "existing", "new" and "similar"

Quarks	Spin	Charge	existing	new	similar
c,c'	0	0			K^0
c',d	-1	-1			K^-
c,d'	+1	+1			K^+
c',s	-1	-1		K^-	
c,s'	+1	+1		K^+	
c',u	0	0			K^0
c,u'	0	0			K^0
d,d'	0	0			K^0
d',s	0	0		K^0	
d,s'	0	0	K^0		
d',u	+1	+1			K^+
d,u'	-1	-1			K^-
s,s'	0	0		K^0	
s',u	+1	+1	K^+		
s,u'	-1	-1	K^-		
u,u'	0	0			K^0

Figure 5 - Kaon Data Results

Comparing the above table spin and charge values with a kaon reference, the new columns can be populated.

Sample calculation of spin and charge for a neutron:

u, d, d spin: (+1/2) + (-1/2) + (-1/2) = -1/2 charge: (+2/3) + (-1/3) + (-1/3) = 0

Reviewing the strong and weak isospin for the quarks

I : (strong) isospin
I_3 : weak isospin
u: I = 1/2, I_3 = +1/2 u': I = 1/2, I_3 = -1/2
d: I = 1/2, I_3 = -1/2 u': I = 1/2, I_3 = +1/2
s, c, t, b: I = 0
s: I_3 = -1/2
c: I_3 = +1/2

Kaon

Composition	K^+: $u\bar{s}$
	K^0: $d\bar{s}$
	K^-: $s\bar{u}$
Symbol	K^+, K^0, K^-
Antiparticle	K^+: K^-
	K^0: $\bar{K}^0$
	K^-: K^+
Electric charge	$K^\pm$: ±1 *e*
	K^0: 0 *e*
Spin	0 *ħ*
Isospin	K^+, $\bar{K}^0$: $+\frac{1}{2}$
	K^0, K^-: $-\frac{1}{2}$

Figure 6 - Kaon Reference[1]

To restate the difference between (strong) spin and (weak) isospin in the above reference, "Weak isospin is the gauge symmetry of the weak interaction which connects quark and lepton doublets of left-handed particles in all generations; for example, up and down quarks, top and bottom quarks,

[1] Kaon - Wikipedia

electrons and electron neutrinos. By contrast (strong) isospin connects only up and down quarks, acts on both chiralities (left and right)…"[2]

Spin arithmetic where "(-(" is the antimatter sign change:

$K^+ = u + s' \Rightarrow I_3 = (+1/2) + (-(-1/2)) = +1$

$K^- = s + u' \Rightarrow I_3 = (-1/2) + (-(+1/2)) = -1$

$K^0 = d + s' \Rightarrow I_3 = (+1/2) + (-1/2) = 0$

"Kaon Data Results" table lists the 3 kaons (K^-, K^0, K^+) described in the reference. It also shows 4 mesons labeled "new" that could be considered, by spin, charge and the presence of a strange quark, to be kaons. The only deficiency is these potential 4 kaons have a down or charm quark. Nine "similar" mesons in this table do not have the required strange quark to be considered a kaon. In this "similar" column, the kaon is listed that is identical by spin and charge. A most compelling question is why the case is not made for the following:

$K^0 = d' + s \Rightarrow I_3 = (-1/2) + (+1/2) = 0$

This process and database application may be used for validating existing quark combinations and discovering new particles such as this new kaon composed of an anti-down and a strange quark.

[2] Isospin - Wikipedia