What is quark?

Lubomir Vlcek
Rokytov 132, 086 01, Slovak Republic
Email: lubomir.vlcek@gmail.com

Abstract
Two energies, which are measured in opposite directions, and we consider them as quarks are actually two different kinetic energy of a single proton, the first in the direction of its movement, and the second in the opposite direction. Quarks are actually locked (confinement) in proton, as is clear from the individual tables.

Introduction
u and d quarks in the QCD theory really mass much smaller than 1/3 the mass of a proton.

mass of a proton
1.672621777(74)×10^{-27} kg\(^2\)[1]
938.272046(21) MeV/c\(^2\)[1]

Up quark: 2.3 MeV/c\(^2\)
Down quark: 4.8 MeV/c\(^2\)
c quark: 1275 MeV/c\(^2\)
s quark: 95 MeV/c\(^2\)
b quark: 4180 MeV/c\(^2\)
t quark: 173070 MeV/c\(^2\)

Why are discovered by quarks in pairs?
u,d
c,s
t,b

We show that each particle is accompanied by his twin.

A pair of quarks of one generation = one speed of proton
Introduction

The other side of asymptotic freedom - confinement. Since the strength of the interaction between color charges does not decrease with distance, it is assumed that the quarks and gluons can never be released from a hadron. This aspect of the theory of lattice QCD calculations confirmed, but not mathematically proven. Search this proof - one of the seven "millennium problems" declared Clay Mathematics Institute. Other prospects nonperturbative QCD - study phases of quark matter, including quark-gluon plasma.

Quarks aren't found on their own. They roam in pairs, and certain pairs always team up. The pairs are as follows, up and down, charm and strange, top and bottom.

Theory

**Kinetic energy of proton** $T_{\text{kin}} = mc^2 \left[ \ln \left| 1 - \frac{v}{c} \right| + \frac{v}{c} / \left( 1 - \frac{v}{c} \right) \right]$ in direction of motion of proton, where $v$ is velocity of proton and $m$ is mass of proton.\(^2\)

**Kinetic energy of proton** $T_{\text{kin}} = mc^2 \left[ \ln \left| 1 + \frac{v}{c} \right| - \frac{v}{c} / \left( 1 + \frac{v}{c} \right) \right]$ against direction of motion of proton, where $v$ is velocity of proton and $m$ is mass of proton.

**$u,d$ quarks** are in the proton at speed of proton from $v = 0.075c$ to $v = 0.094686c$:

<table>
<thead>
<tr>
<th>PROTON</th>
<th>Front of proton</th>
<th>Behind proton</th>
</tr>
</thead>
<tbody>
<tr>
<td>$v/c$</td>
<td>$\left[ \ln \left</td>
<td>1 - \frac{v}{c} \right</td>
</tr>
<tr>
<td>0.68215556</td>
<td>1.000000000000000000000000000000254</td>
<td>0.1145513850359705191549799138</td>
</tr>
<tr>
<td>0.075</td>
<td>0.0031195396113692259672105451 down quark: 2.92697671 MeV/c^2</td>
<td>0.0025532197191610043413170483 up quark: 2.4MeV/c^2</td>
</tr>
<tr>
<td>0.094686</td>
<td>0.00511569184940226624325622138 down quark: 4.8MeV/c^2</td>
<td>0.0039715278483606256196473452 up quark: 3.72637 MeV/c^2</td>
</tr>
</tbody>
</table>

**$c,s$ quarks** are in the proton at speed of proton from $v = 0.713c$ to $v = 0.72585c$:

<table>
<thead>
<tr>
<th>PROTON</th>
<th>Front of proton</th>
<th>Behind proton</th>
</tr>
</thead>
<tbody>
<tr>
<td>$v/c$</td>
<td>$\left[ \ln \left</td>
<td>1 - \frac{v}{c} \right</td>
</tr>
<tr>
<td>0.68215556</td>
<td>1.000000000000000000000000000000254</td>
<td>0.1145513850359705191549799138</td>
</tr>
<tr>
<td>0.713</td>
<td>1.23604749426877325552441352943 c quark: 1160 MeV/c^2</td>
<td>0.122017381046594682487035019 s quark: 114.485493763640 MeV/c^2</td>
</tr>
</tbody>
</table>

\(^2\)See reference P. 2 for further details.
\( t \) quark is in the proton at speed of proton: \( v = 0.994637c \) for top quark 169 100 MeV/c^2

\( v = 0.994766c \) for top quark 173 400 MeV/c^2

\[
\begin{array}{|c|c|c|}
\hline
\text{PROTON} & \text{Front of proton} & \text{Behind proton} \\
\hline
v/c & \left[ \ln \left| 1 - \frac{v}{c} \right| + \frac{v}{c} \right] & \left[ \ln \left| 1 + \frac{v}{c} \right| - \frac{v}{c} \right] \\
& \text{kinetic energy of proton} & \text{kinetic energy of proton} \\
& \text{in direction of motion of proton} & \text{against direction of motion of proton} \\
\hline
0.994637 & 180.2249215745799592957129046 & 0.1918064337864411229061029593 \\
\text{top quark} & 169 100 \text{MeV/c}^2 & 179.9666087792708042658841 \text{MeV/c}^2 \\
0.994766 & 184.8078143171624183434454031 & 0.19188683558872289730044041 \\
\text{top quark} & 173 400 \text{MeV/c}^2 & 179.9968678381815771389178 \text{MeV/c}^2 \\
\hline
\end{array}
\]

\( b \) quark is in the proton at speed of proton: \( v = 0.8665c \) for bottom quark 4.2 GeV

\[
\begin{array}{|c|c|c|}
\hline
\text{PROTON} & \text{Front of proton} & \text{Behind proton} \\
\hline
v/c & \left[ \ln \left| 1 - \frac{v}{c} \right| + \frac{v}{c} \right] & \left[ \ln \left| 1 + \frac{v}{c} \right| - \frac{v}{c} \right] \\
& \text{kinetic energy of proton} & \text{kinetic energy of proton} \\
& \text{in direction of motion of proton} & \text{against direction of motion of proton} \\
\hline
0.8665 & 4.476313841592169302436394 & 0.159827140990503087217669575 \\
\text{bottom quark} & 4 200 \text{MeV/c}^2 & 149.96133 \text{MeV/c}^2 \\
\hline
\end{array}
\]

Calculation of the kinetic energy \( T_{\text{kin}} \) of a body moving at the velocity of \( v \)

<table>
<thead>
<tr>
<th>v/c</th>
<th>( T_{\text{kin}} )</th>
<th>( T_{\text{kin}} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.0050 m c^2</td>
<td>0.0050 m c^2</td>
</tr>
<tr>
<td>0.2</td>
<td>0.0212 m c^2</td>
<td>0.0200 m c^2</td>
</tr>
<tr>
<td>0.3</td>
<td>0.0517 m c^2</td>
<td>0.0480 m c^2</td>
</tr>
<tr>
<td>0.4</td>
<td>0.1033 m c^2</td>
<td>0.0910 m c^2</td>
</tr>
<tr>
<td>0.5</td>
<td>0.1895 mc^2</td>
<td>0.1550 m c^2</td>
</tr>
<tr>
<td>0.6</td>
<td>0.3393 m c^2</td>
<td>0.2500 m c^2</td>
</tr>
<tr>
<td>0.7</td>
<td>0.6233 m c^2</td>
<td>0.4010 m c^2</td>
</tr>
<tr>
<td>0.8</td>
<td>1.2669 m c^2</td>
<td>0.6670 m c^2</td>
</tr>
<tr>
<td>0.9</td>
<td>3.4327 m c^2</td>
<td>1.2930 m c^2</td>
</tr>
<tr>
<td>0.99</td>
<td>47.294 m c^2</td>
<td>6.9200 m c^2</td>
</tr>
<tr>
<td>1.0</td>
<td>infinite</td>
<td>infinite</td>
</tr>
</tbody>
</table>
Direct measurement of the speed in the experiments Kirchner\textsuperscript{[3],[4]}, Perry, Chaffee\textsuperscript{[5]} for $v/c = 0.08-0.27$ can not yet prove the validity of Vlcek's theory\textsuperscript{[2]} or Einstein's theory\textsuperscript{[6]}.

\textbf{Conclusion}

Quarks are actually locked (confinement) in proton, as is clear from the individual tables.

\textbf{References}


