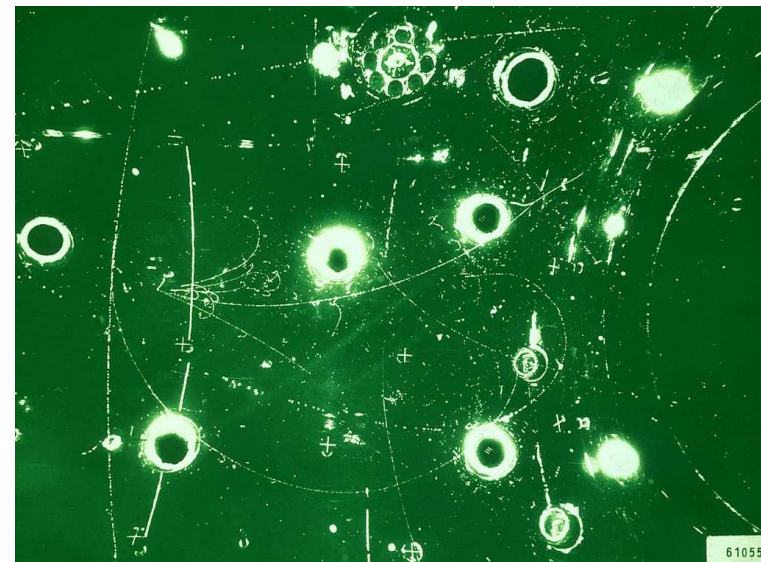
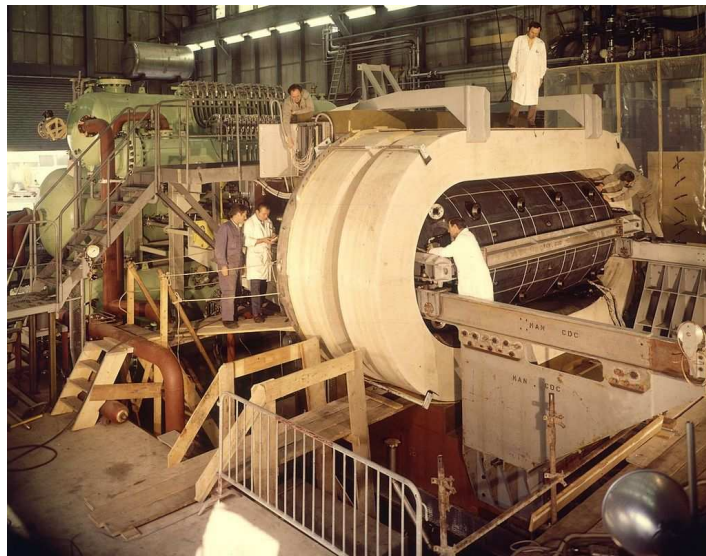
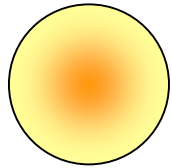


Teil 4: Teilchenzoo und Quarks



Standardmodell 1948



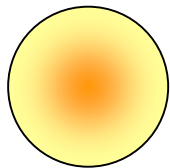
Neutron



Elektron



Neutrino

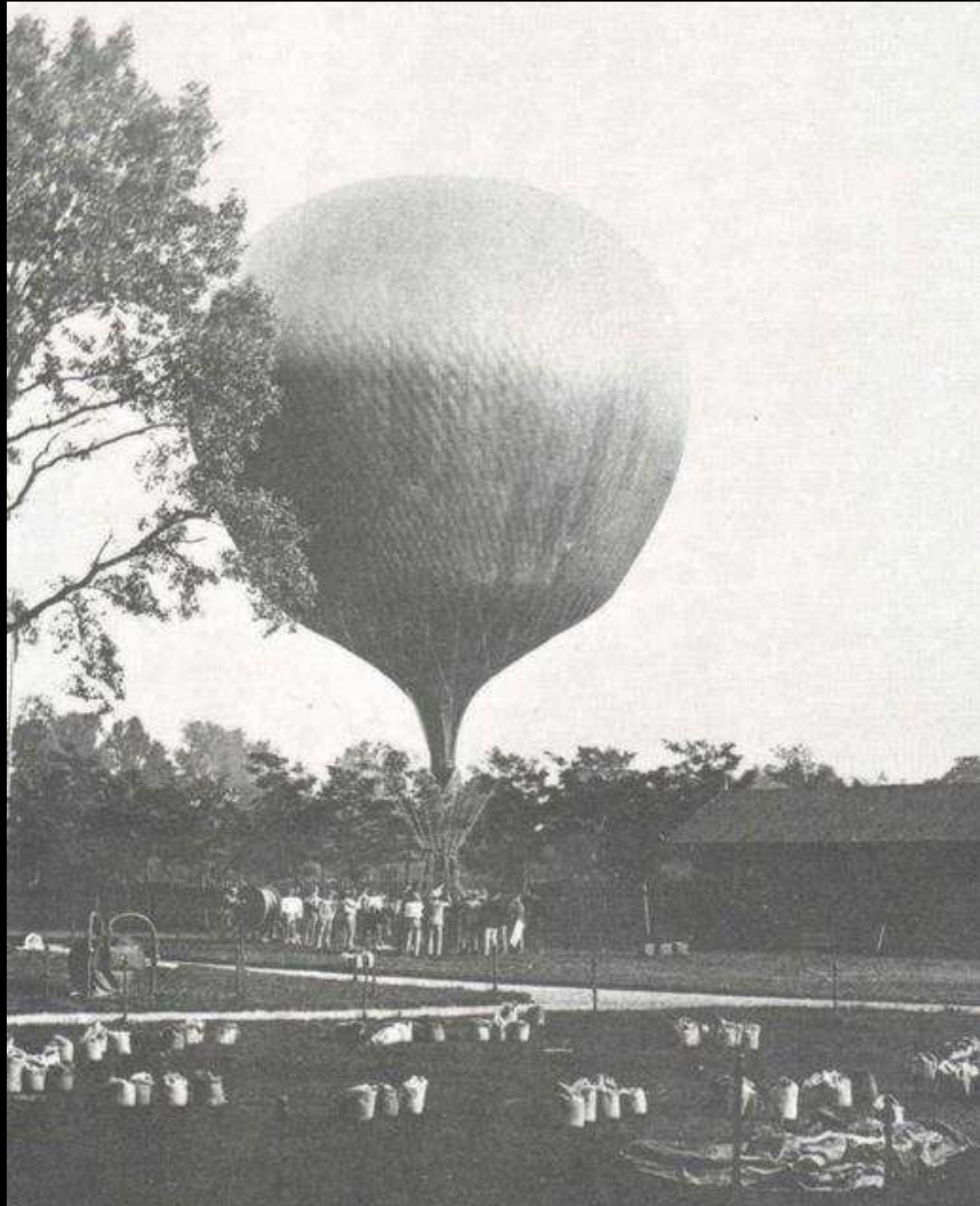


Proton



Myon

+ Antiteilchen



1911

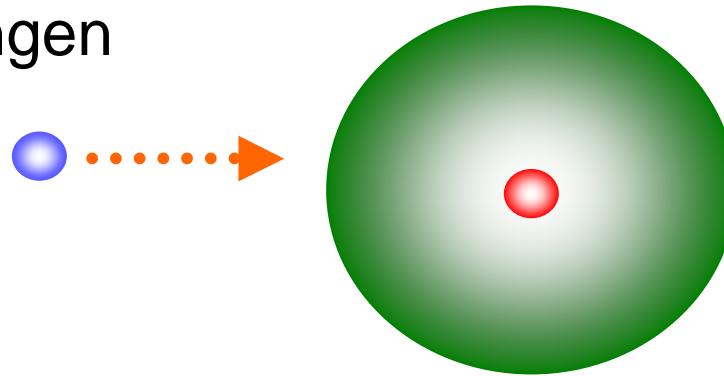




Streuexperimente



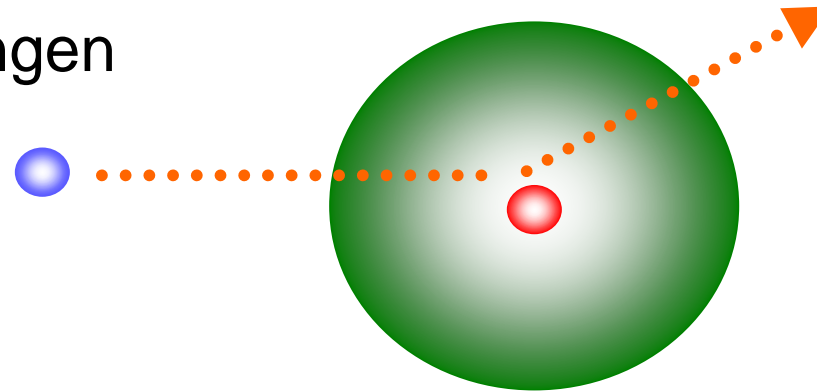
- Elastische Streuung
→ Strukturuntersuchungen



Streuexperimente



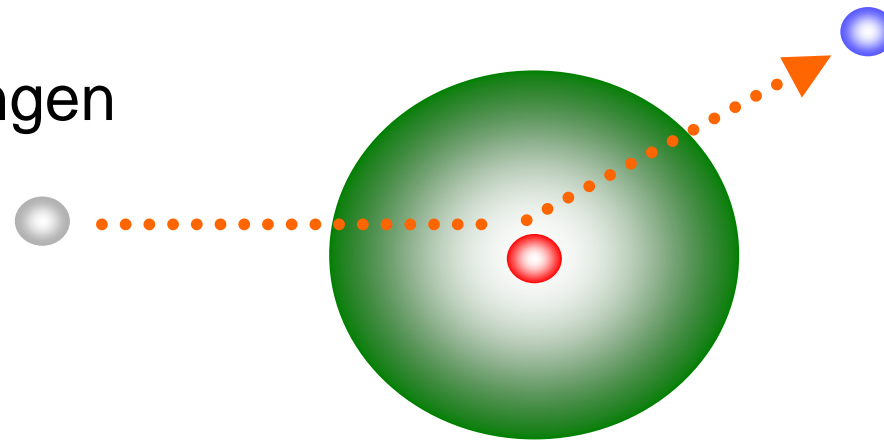
- Elastische Streuung
→ Strukturuntersuchungen



Streuexperimente



- Elastische Streuung
→ Strukturuntersuchungen

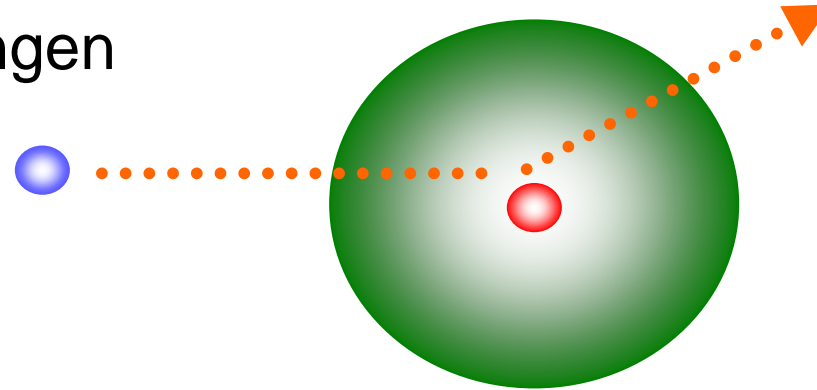


Streuexperimente



- Elastische Streuung

- ➔ Strukturuntersuchungen



- Inelastische Streuung

- ➔ Erzeugung neuer Teilchen

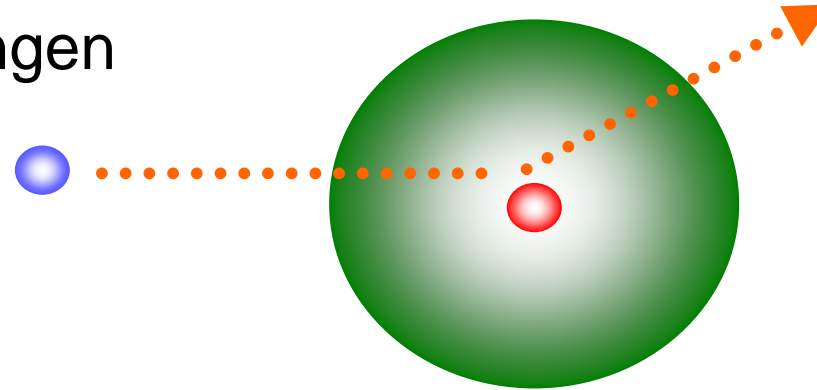


Streuexperimente



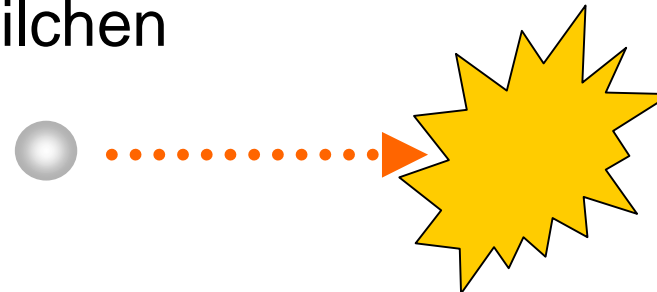
- Elastische Streuung

- ➔ Strukturuntersuchungen



- Inelastische Streuung

- ➔ Erzeugung neuer Teilchen

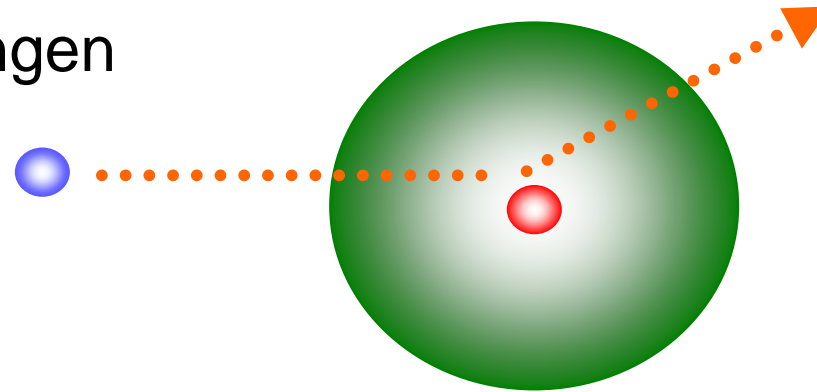


Streuexperimente



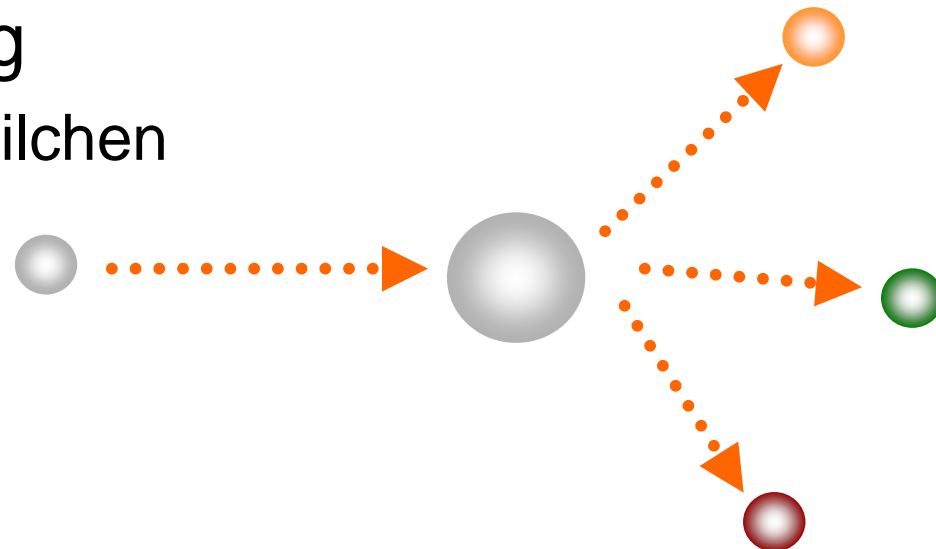
- Elastische Streuung

- ➔ Strukturuntersuchungen



- Inelastische Streuung

- ➔ Erzeugung neuer Teilchen

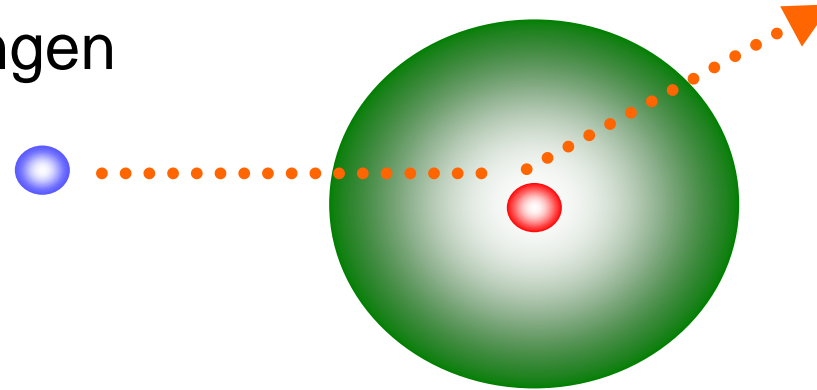


Streuexperimente



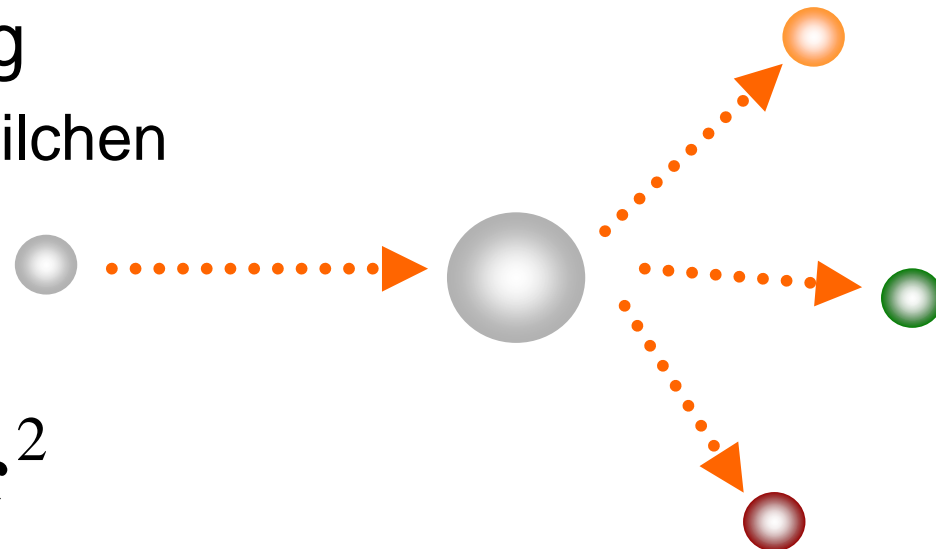
- Elastische Streuung

- ➔ Strukturuntersuchungen



- Inelastische Streuung

- ➔ Erzeugung neuer Teilchen



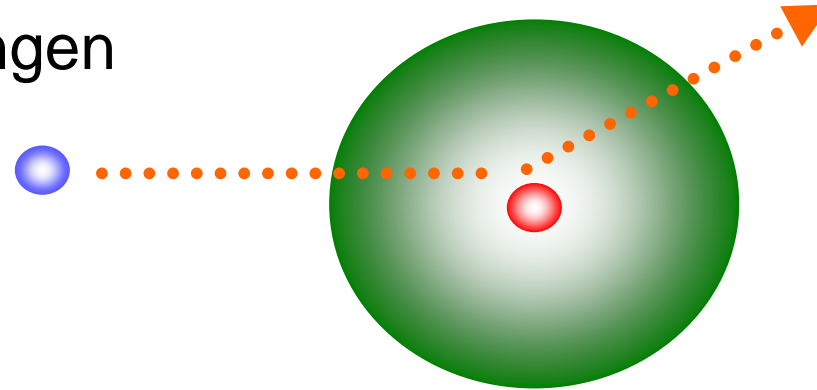
$$E = m \cdot c^2$$

Streuexperimente



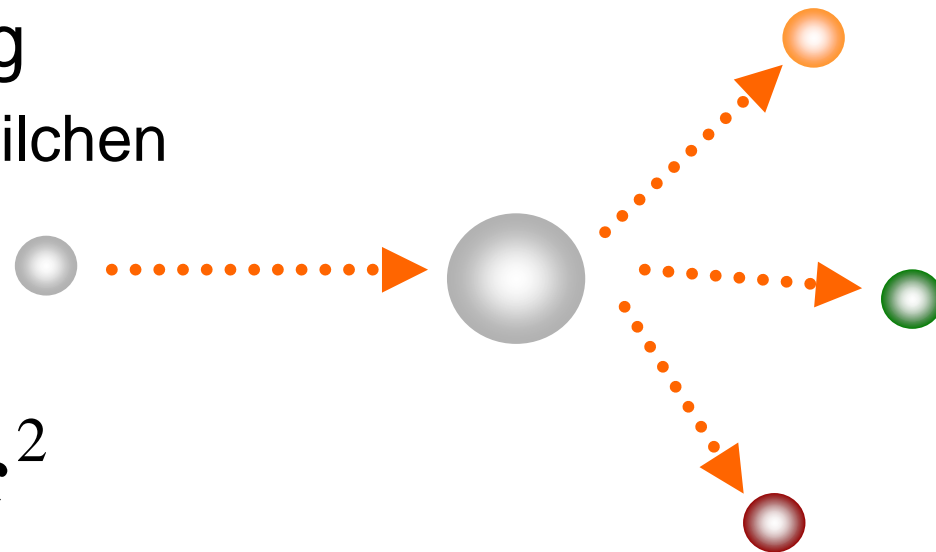
- Elastische Streuung

→ Strukturuntersuchungen



- Inelastische Streuung

→ Erzeugung neuer Teilchen



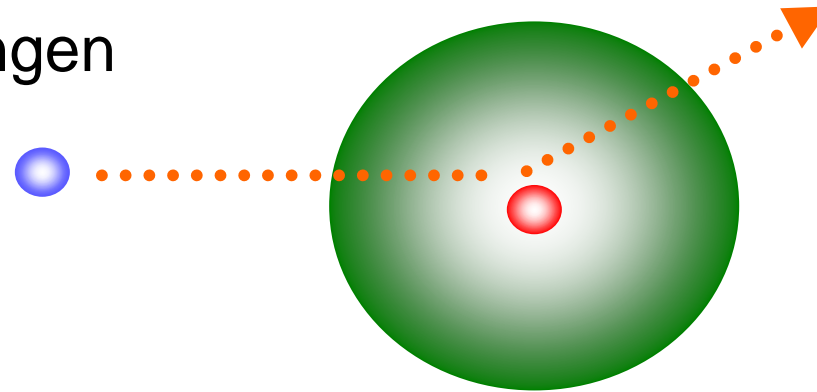
$$E = m \cdot c^2$$

Streuexperimente



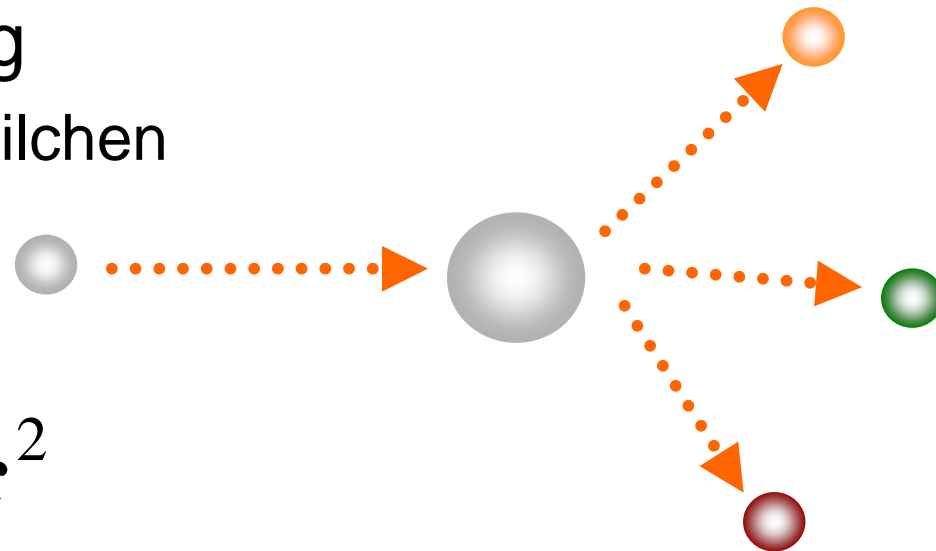
- Elastische Streuung

- ➔ Strukturuntersuchungen



- Inelastische Streuung

- ➔ Erzeugung neuer Teilchen



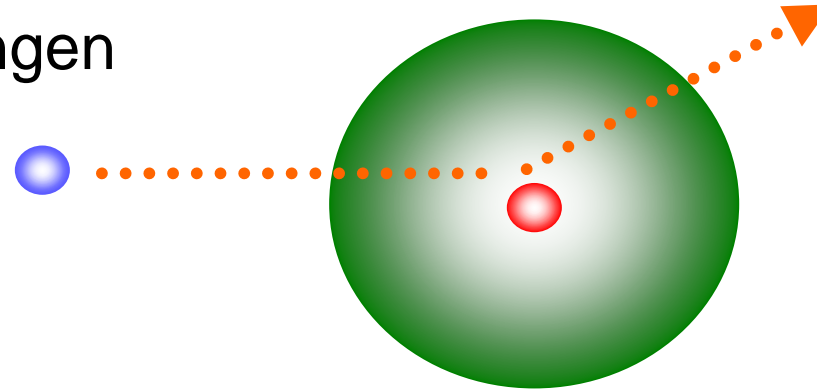
$$E = m \cdot c^2$$

Streuexperimente



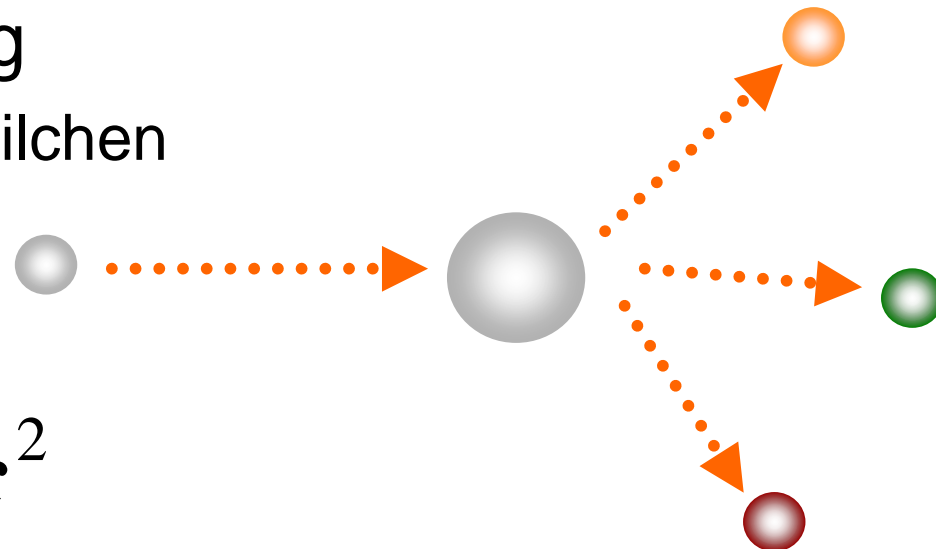
- Elastische Streuung

→ Strukturuntersuchungen

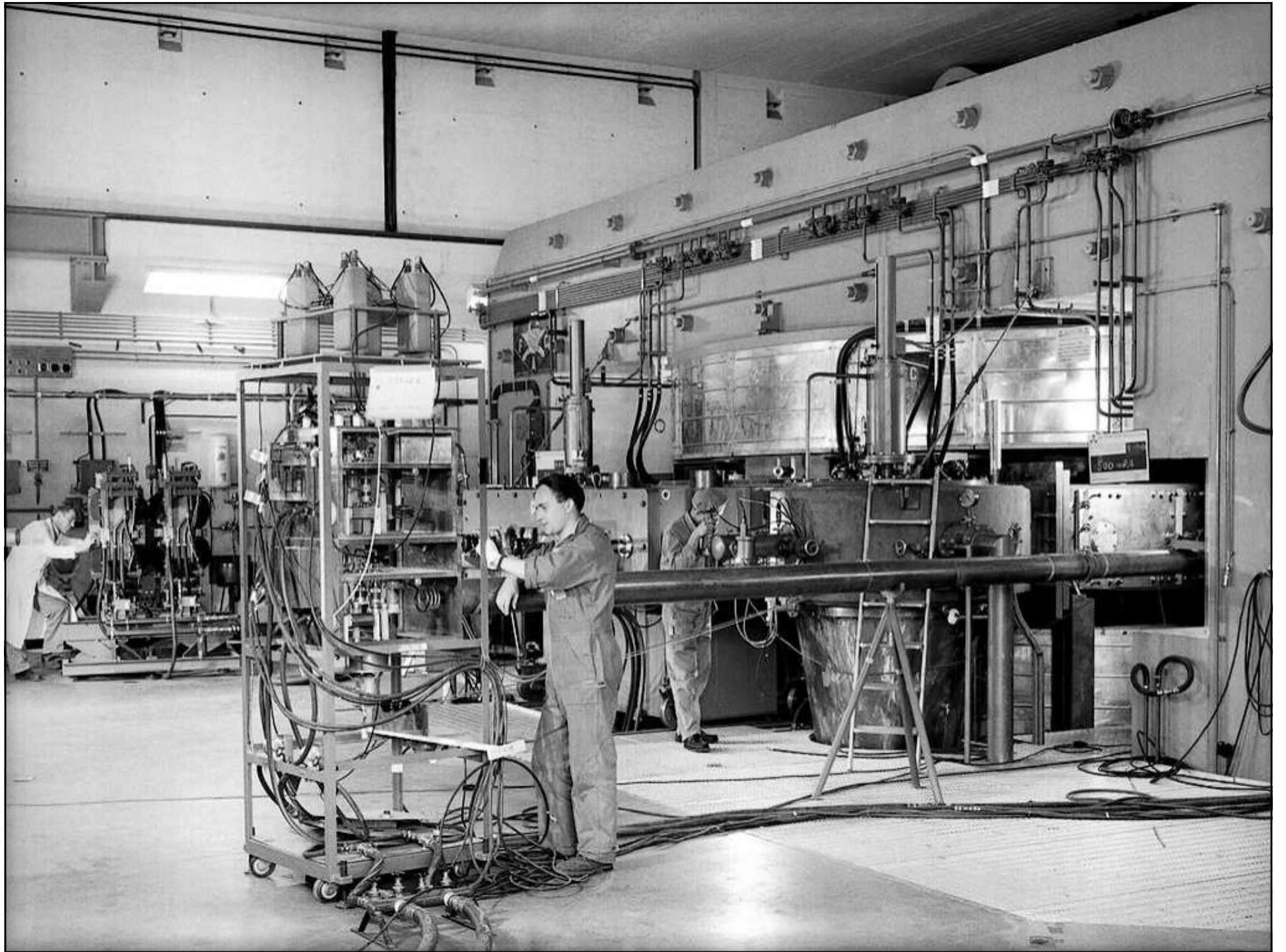


- Inelastische Streuung

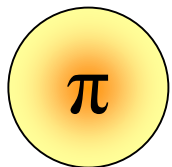
→ Erzeugung neuer Teilchen



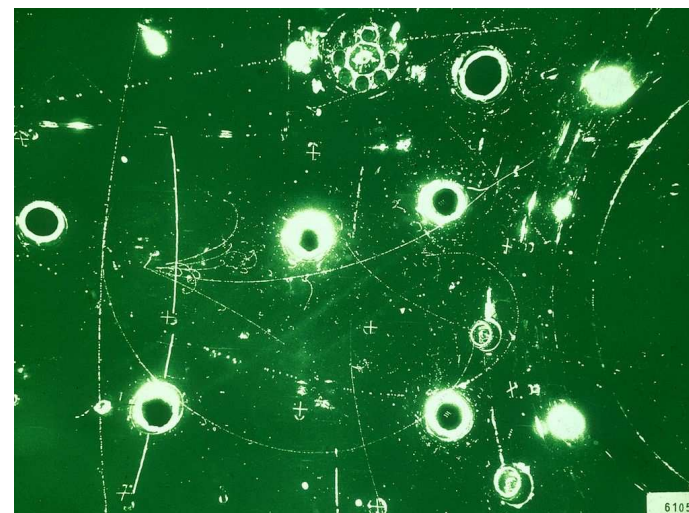
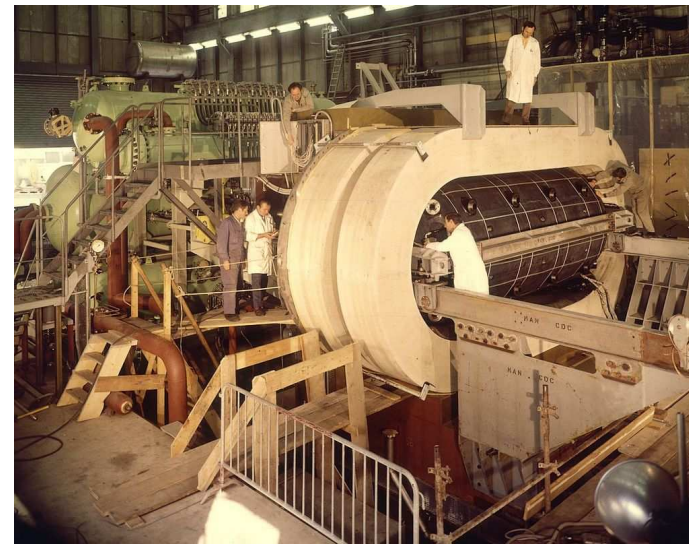
$$E = m \cdot c^2$$



Hadronen

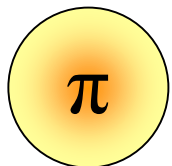


Pion

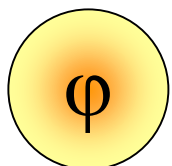


61055

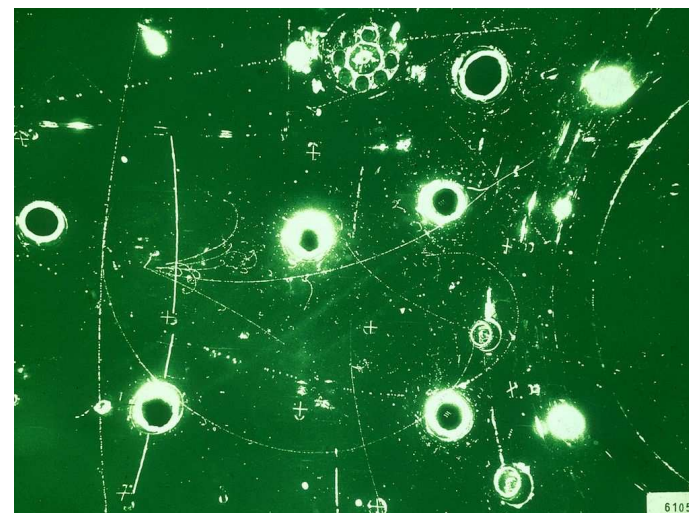
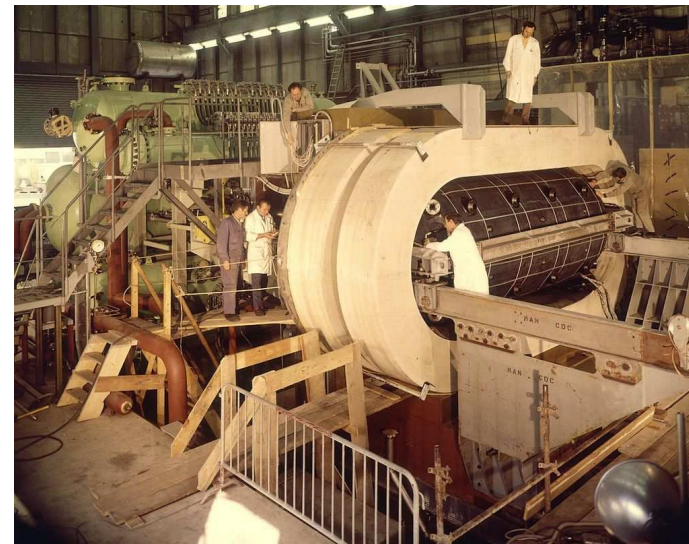
Hadronen



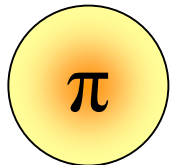
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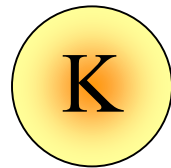
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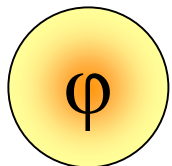
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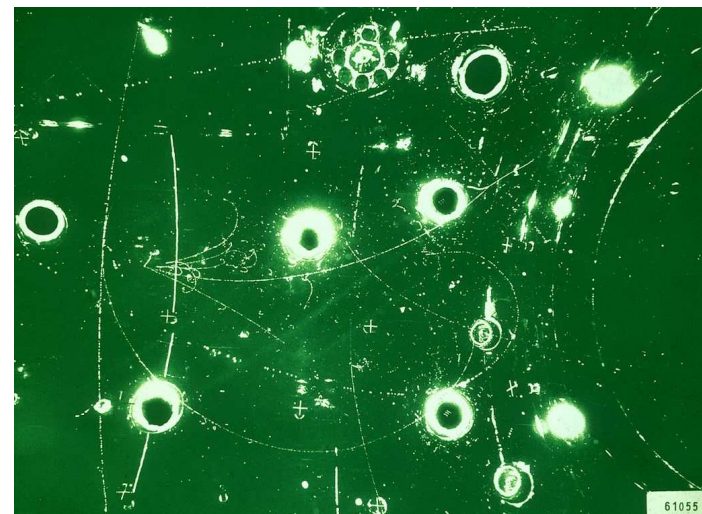
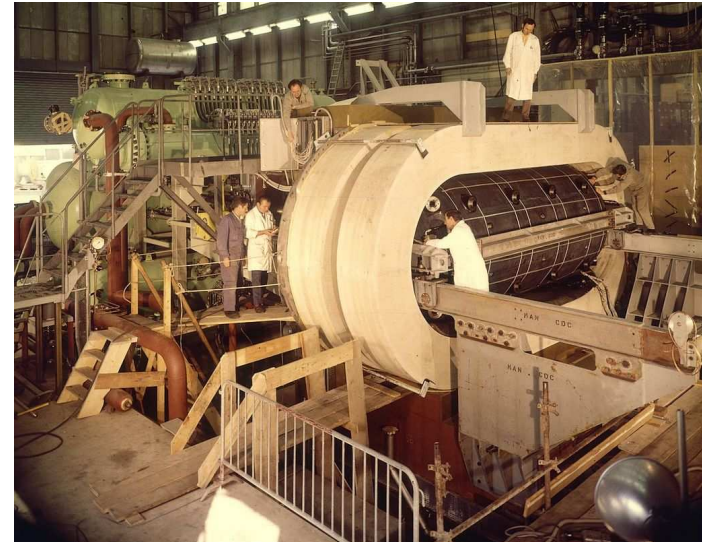
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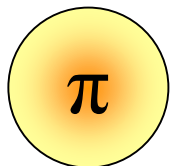
Kaon



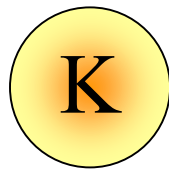
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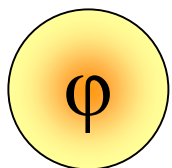
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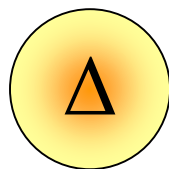
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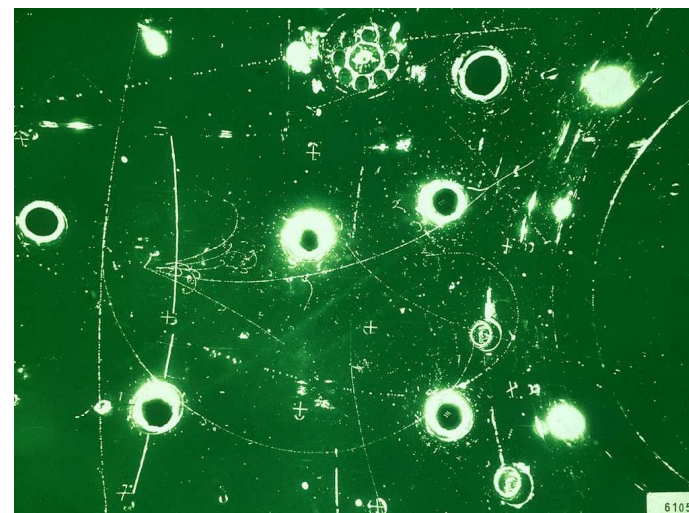
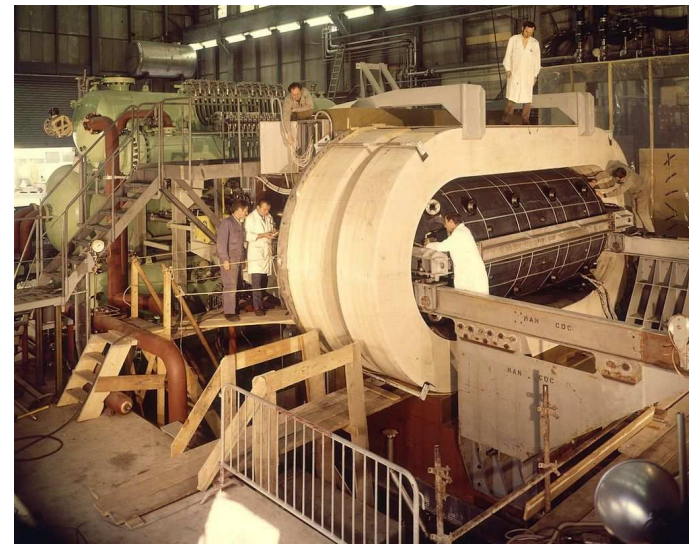
Kaon



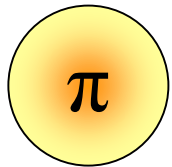
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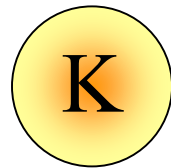
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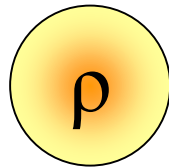
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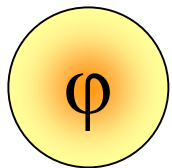
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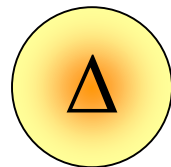
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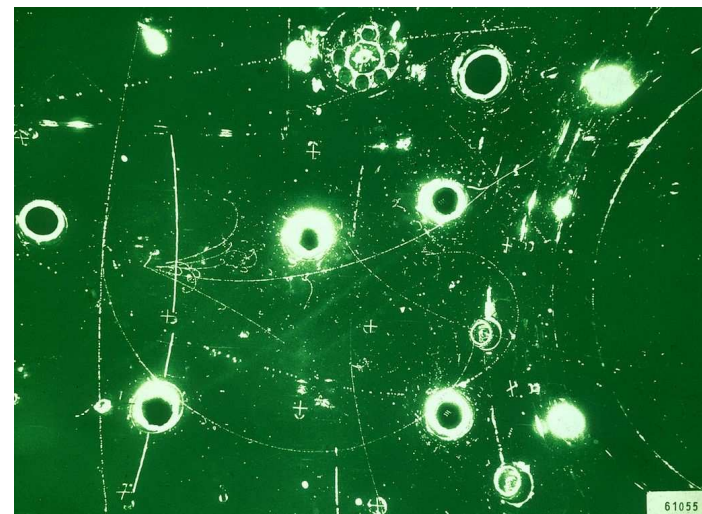
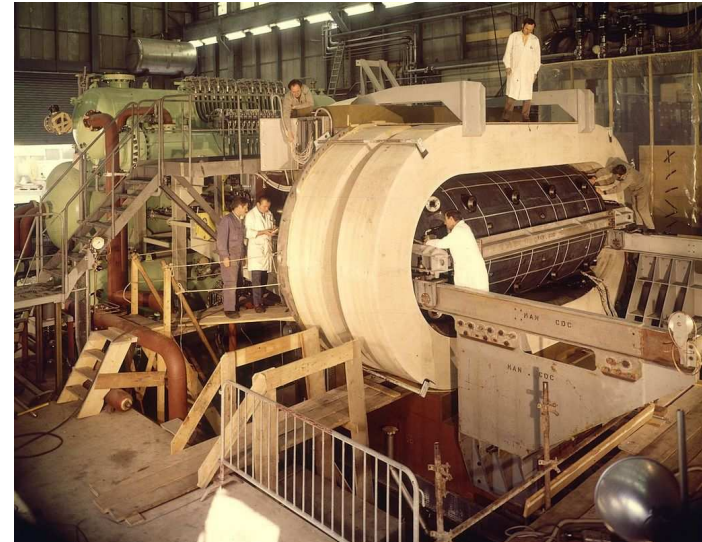
Rho



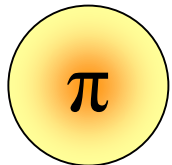
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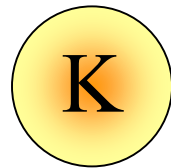
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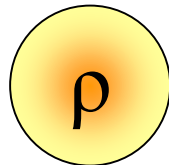
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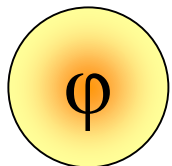
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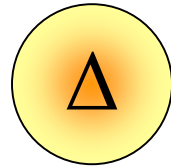
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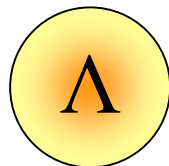
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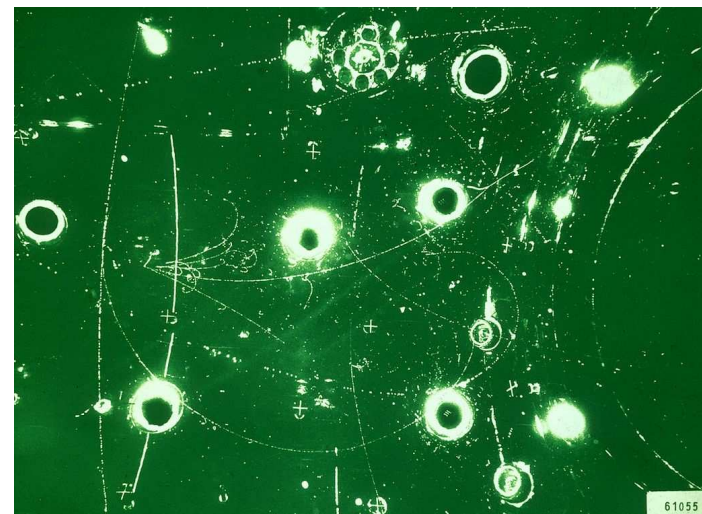
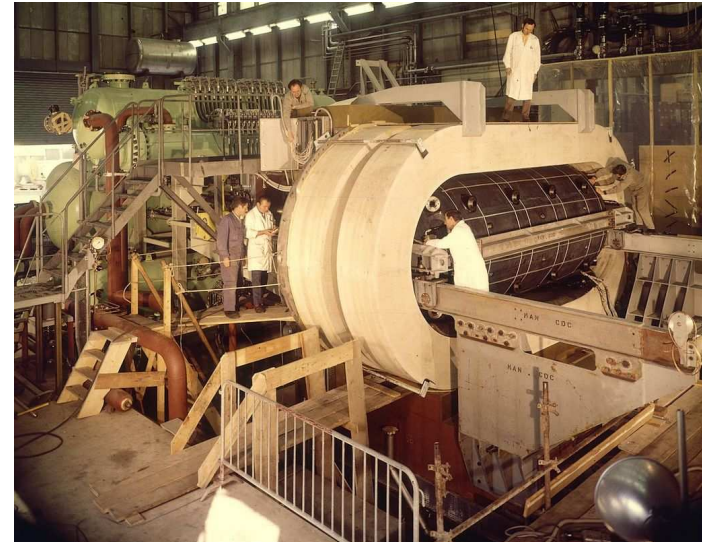
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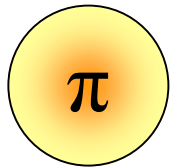
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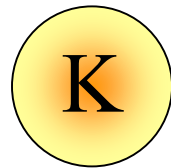
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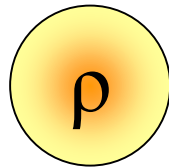
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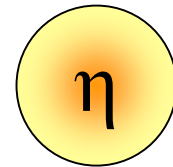
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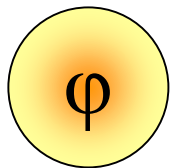
Kaon



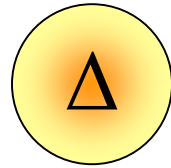
Rho



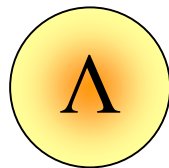
Eta



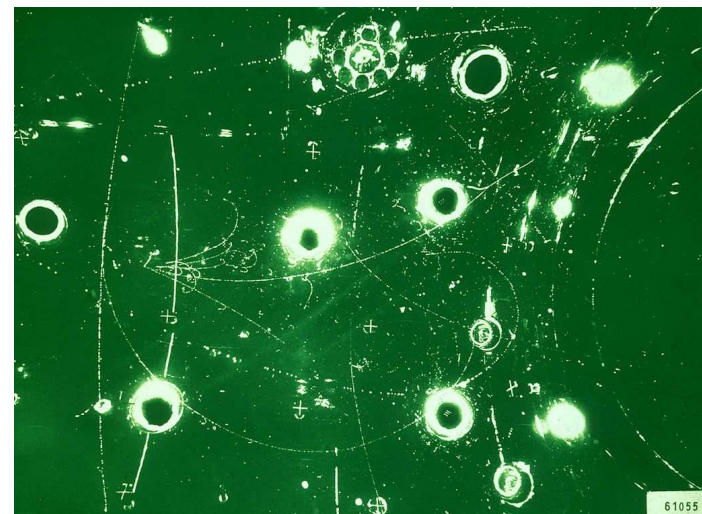
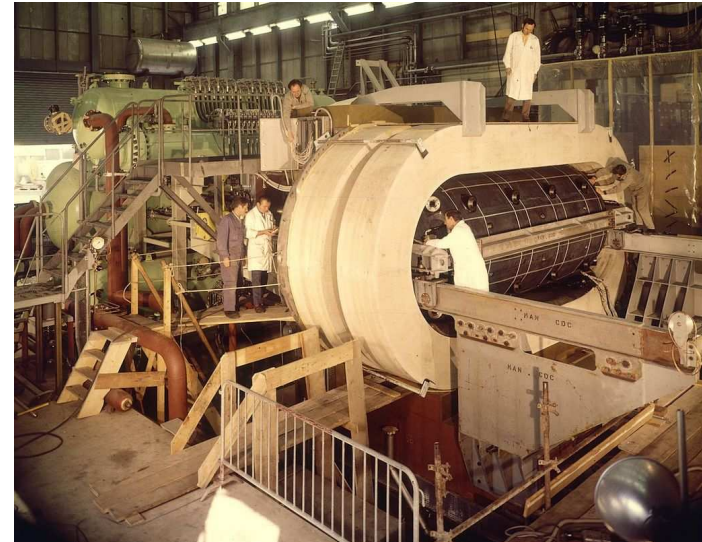
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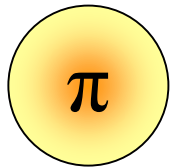
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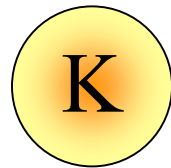
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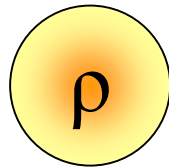
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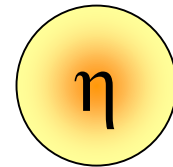
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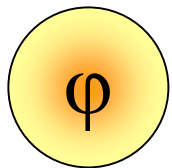
Kaon



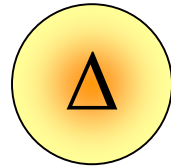
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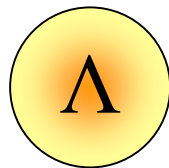
Eta



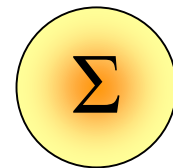
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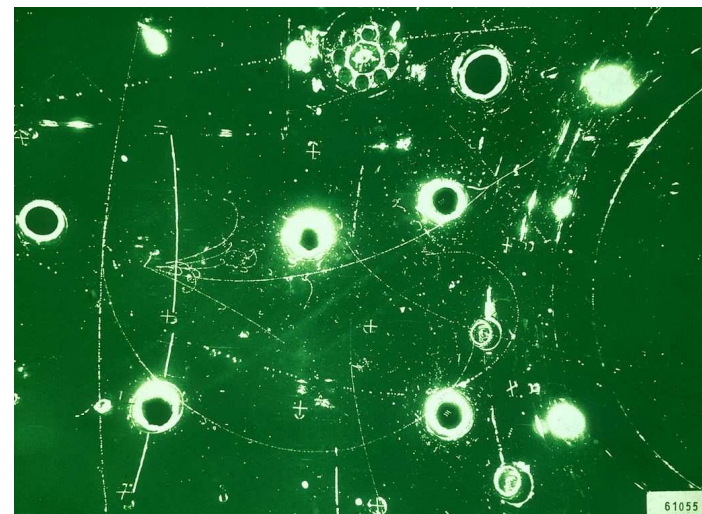
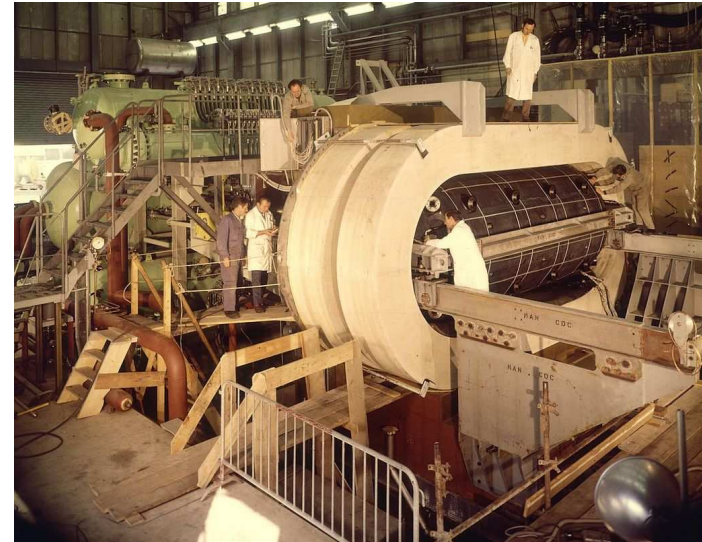
Delta



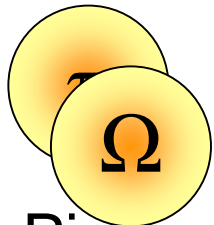
Lambda



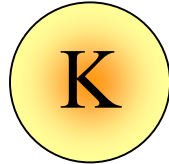
Sigma



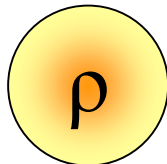
Hadronen



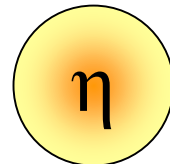
Pion
Omega



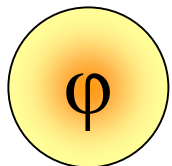
Kaon



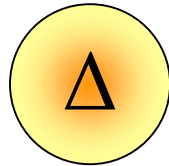
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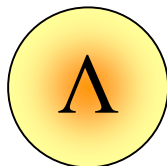
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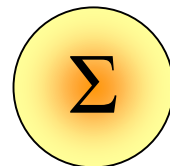
Phi



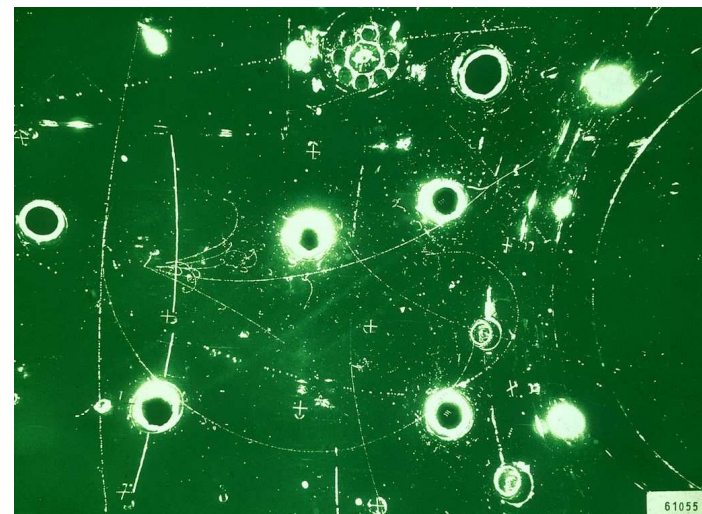
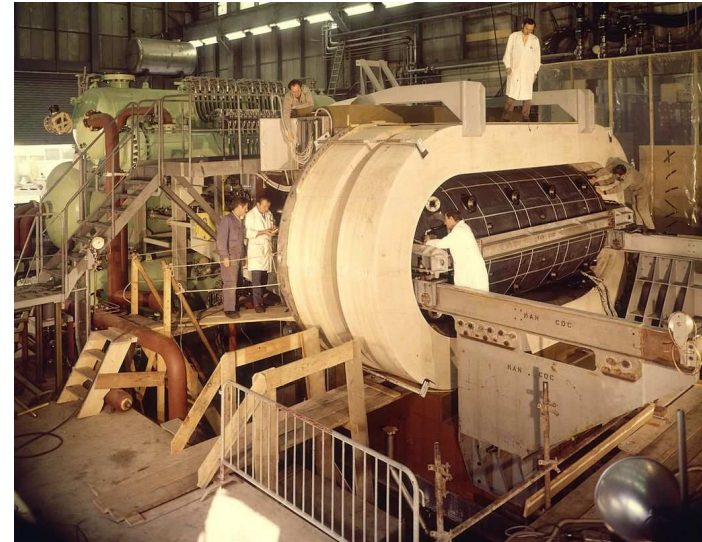
Delta



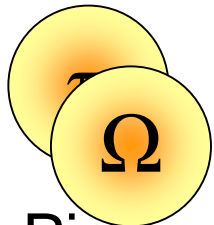
Lambda



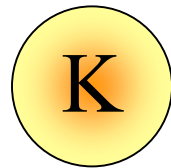
Sigma



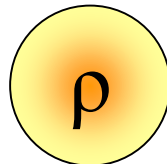
Hadronen



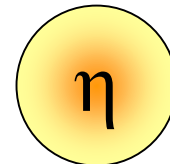
Pion
Omega



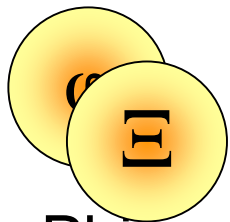
Kaon



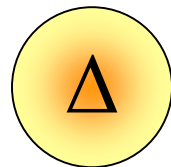
Rho



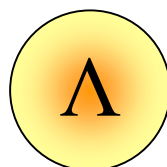
Eta



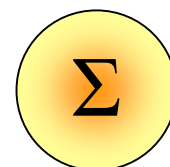
Phi
Sigma



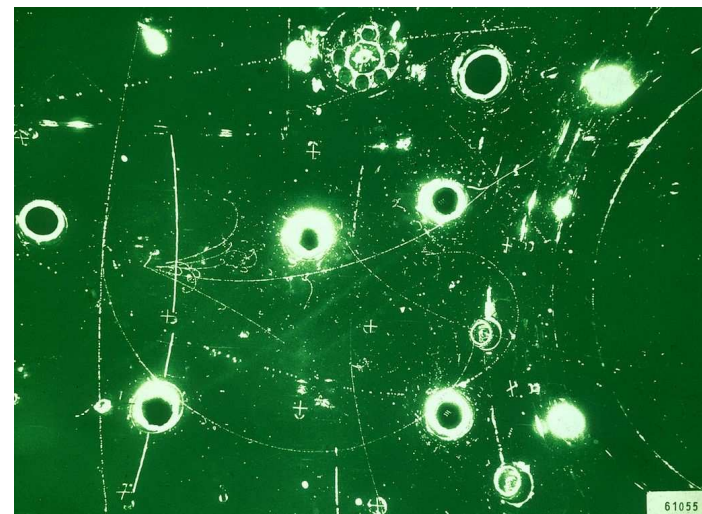
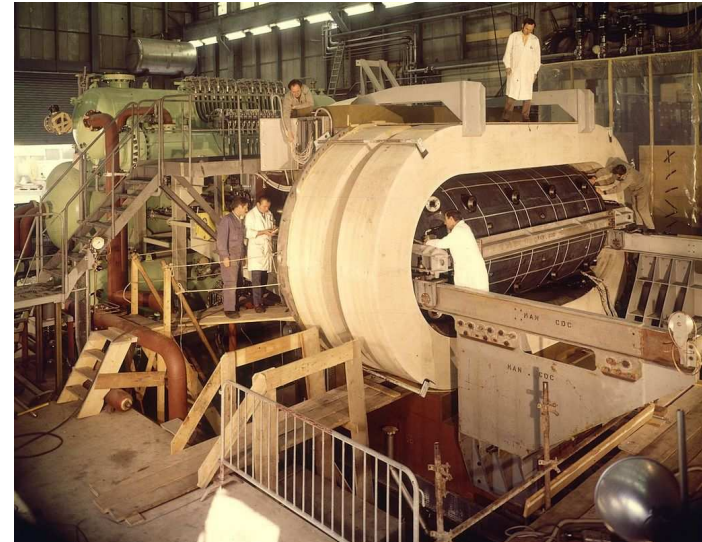
Delta



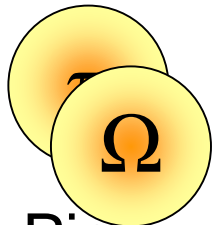
Lambda



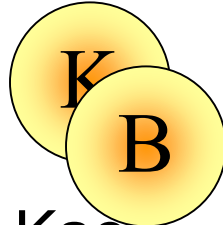
Sigma



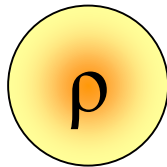
Hadronen



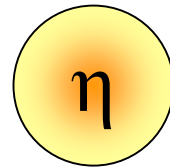
Pion
Omega



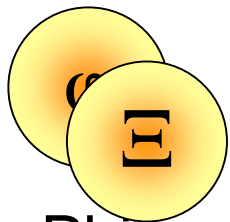
Kaon
B



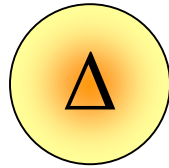
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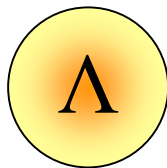
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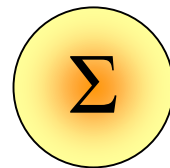
Phi
Sigma



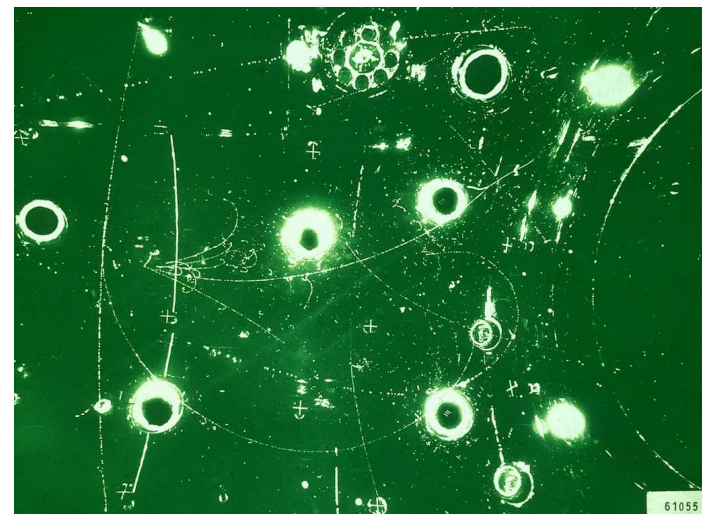
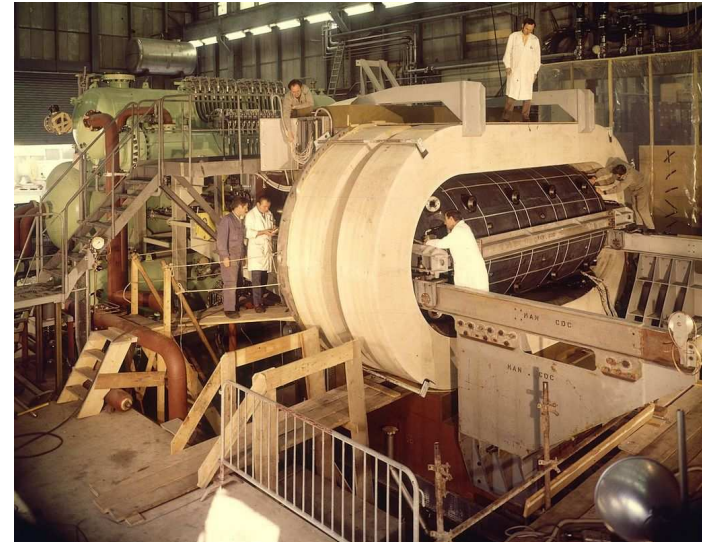
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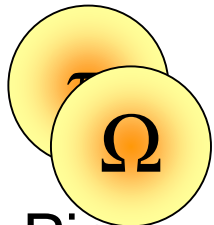
Lambda



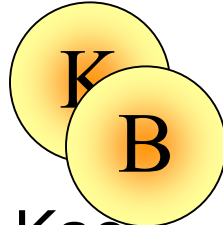
Sigma



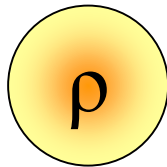
Hadronen



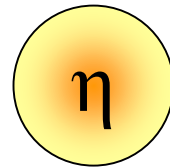
Pion
Omega



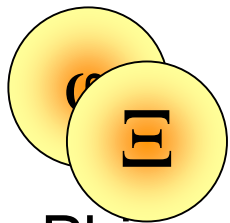
Kaon
B



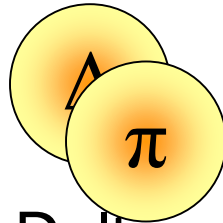
Rho



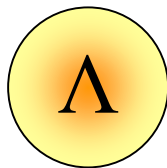
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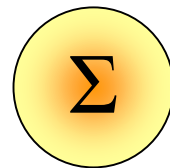
Phi
Sigma



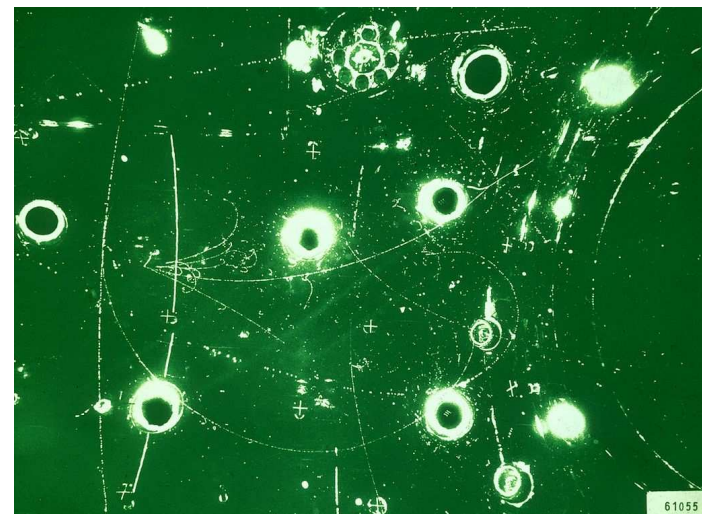
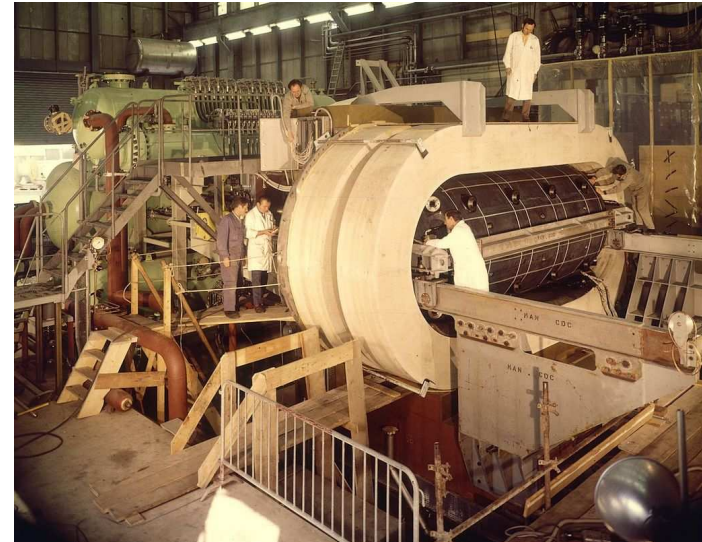
Delta
Pion



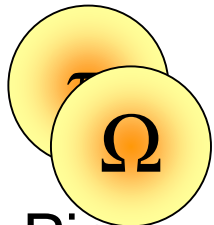
Lambda



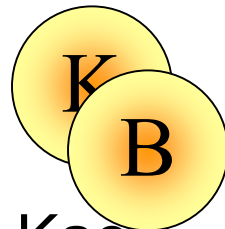
Sigma



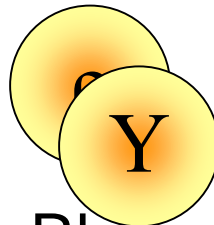
Hadronen



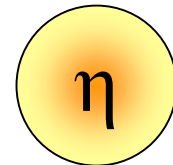
Pion
Omega



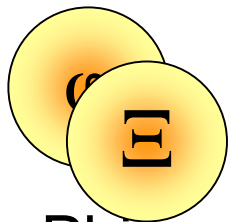
Kaon
B



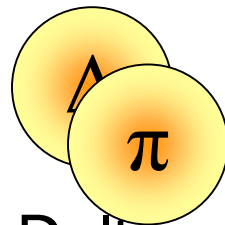
Rho
Ypsilon



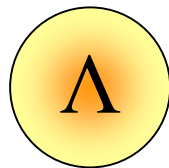
Eta



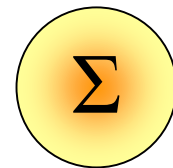
Phi
Sigma



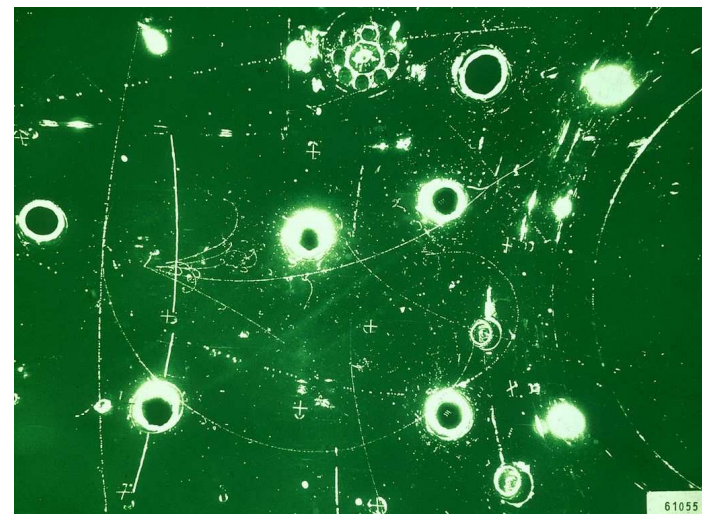
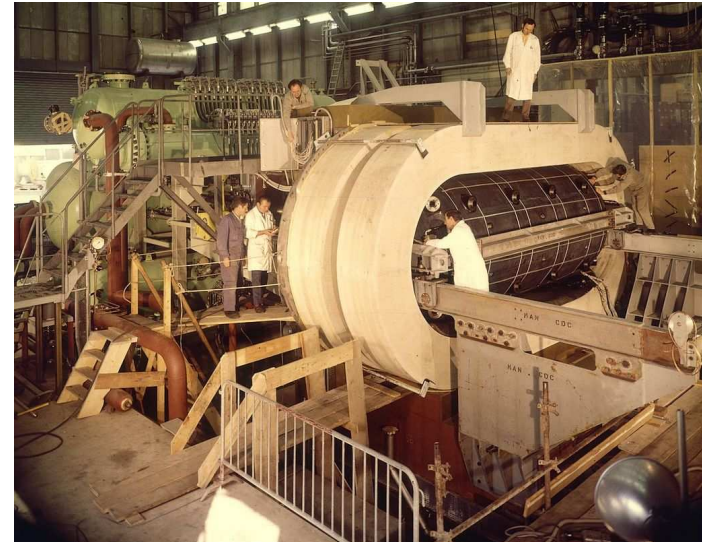
Delta
Pion



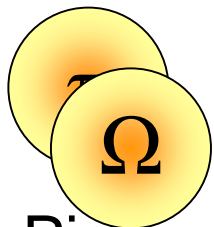
Lambda



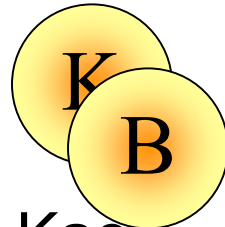
Sigma



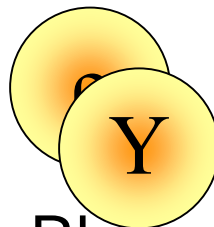
Hadronen



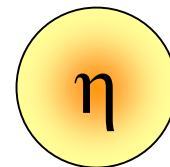
Pion
Omega



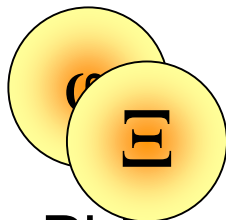
Kaon
B



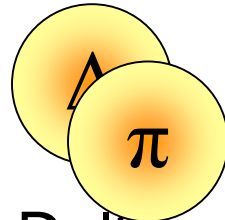
Rho
Ypsilon



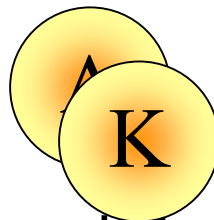
Eta



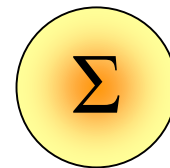
Phi
Sigma



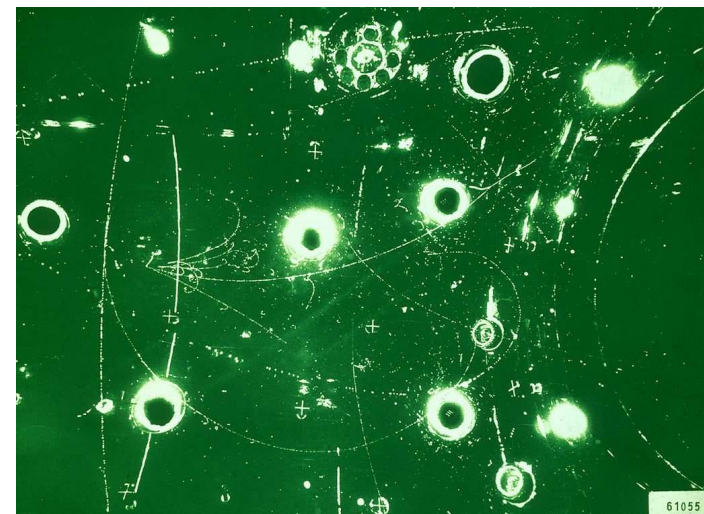
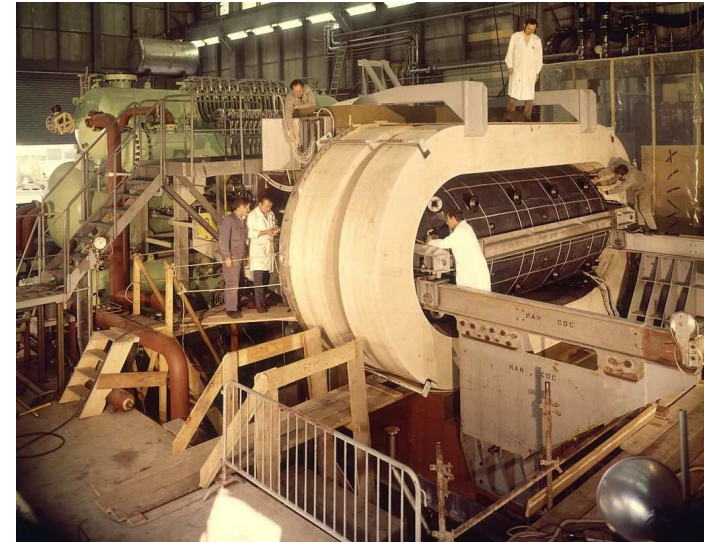
Delta
Pion



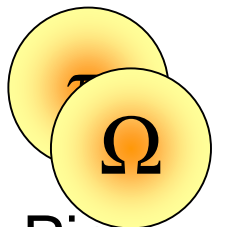
Lambda
Kaon



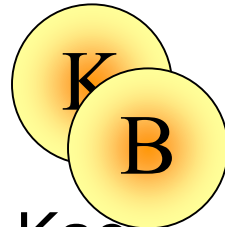
Sigma



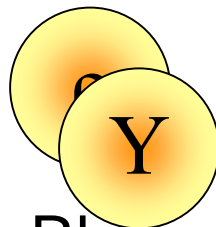
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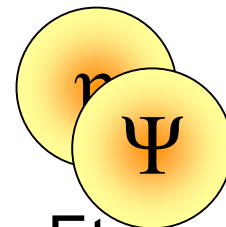
Pion
Omega



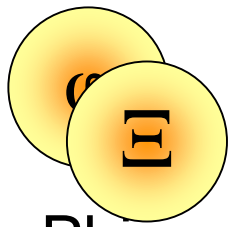
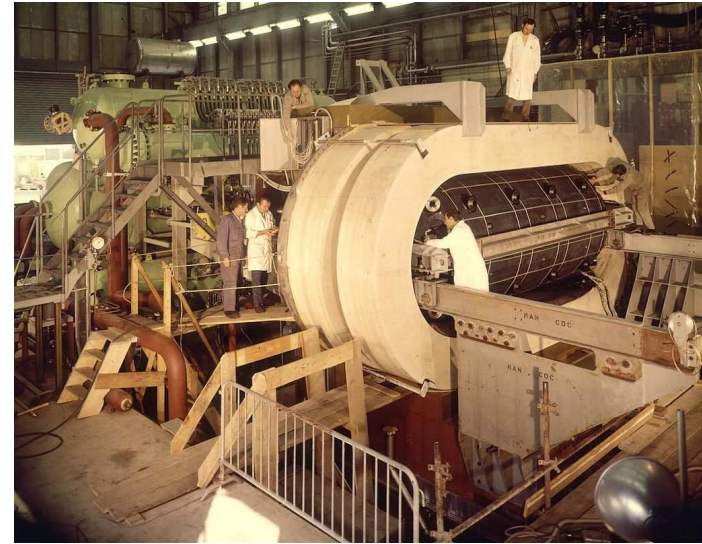
Kaon
B



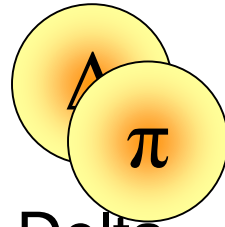
Rho
Ypsilon



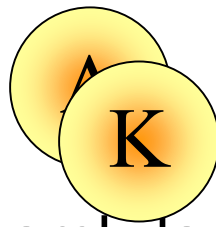
Eta
Psi



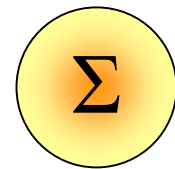
Phi
Sigma



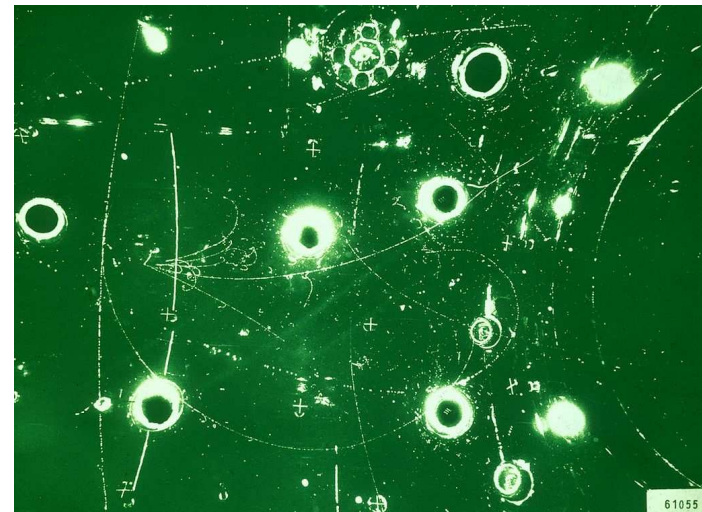
Delta
Pion



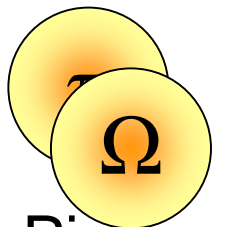
Lambda
Kaon



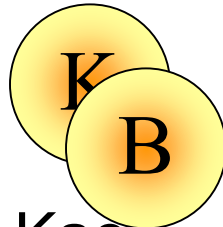
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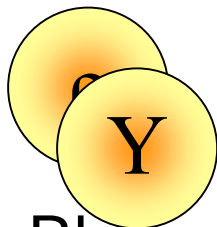
Hadronen



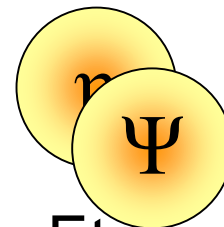
Pion
Omega



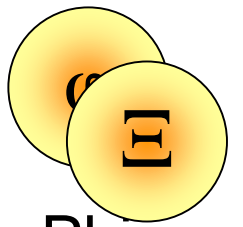
Kaon
B



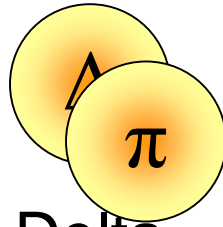
Rho
Ypsilon



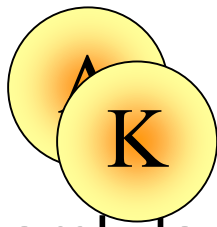
Eta
Psi



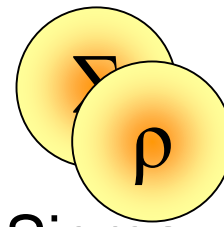
Phi
Sigma



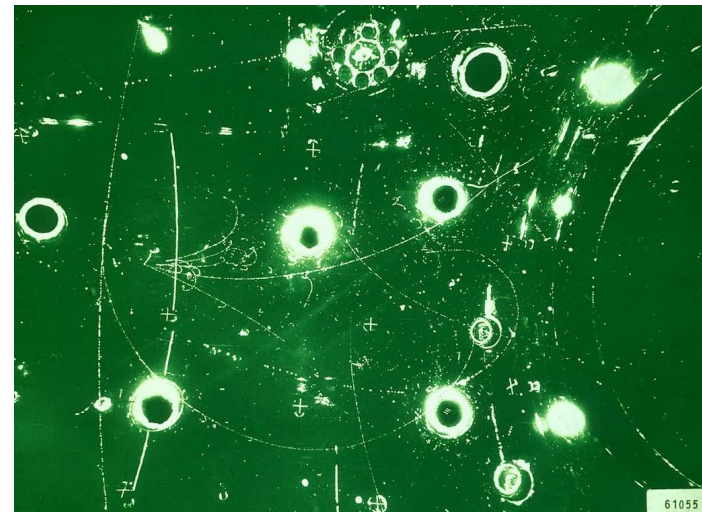
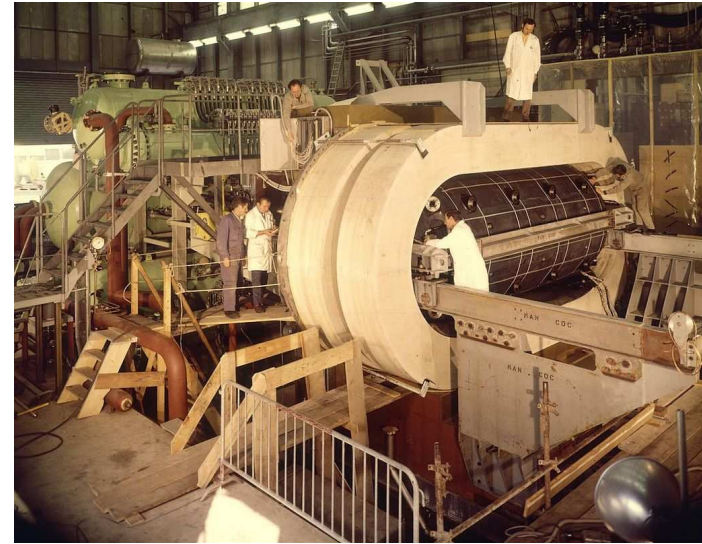
Delta
Pion



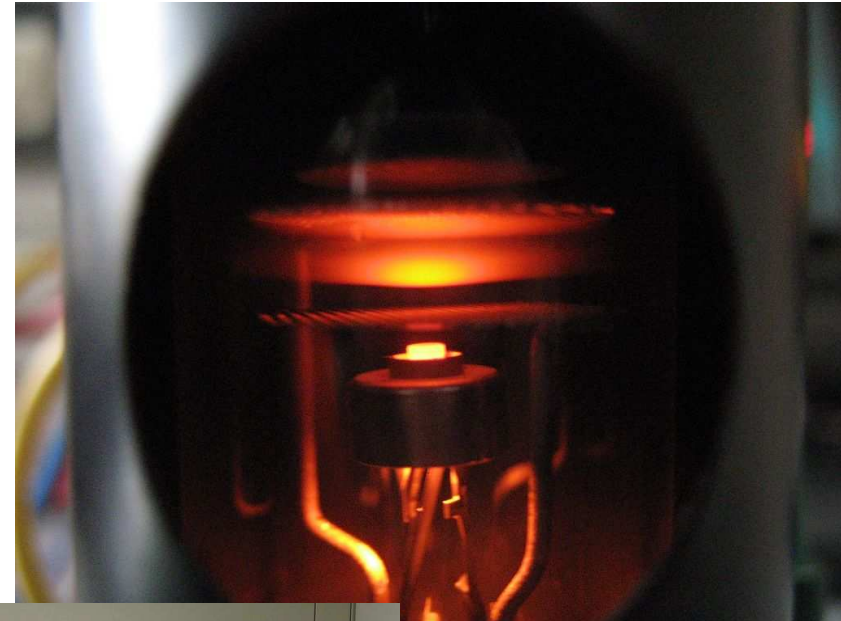
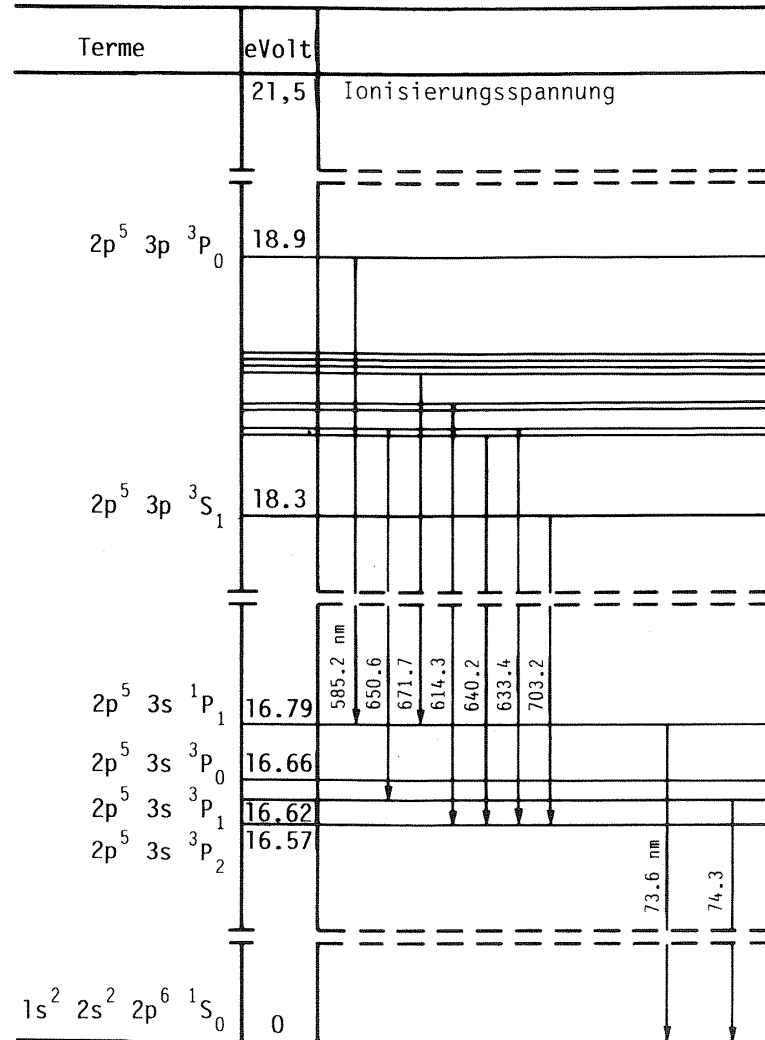
Lambda
Kaon



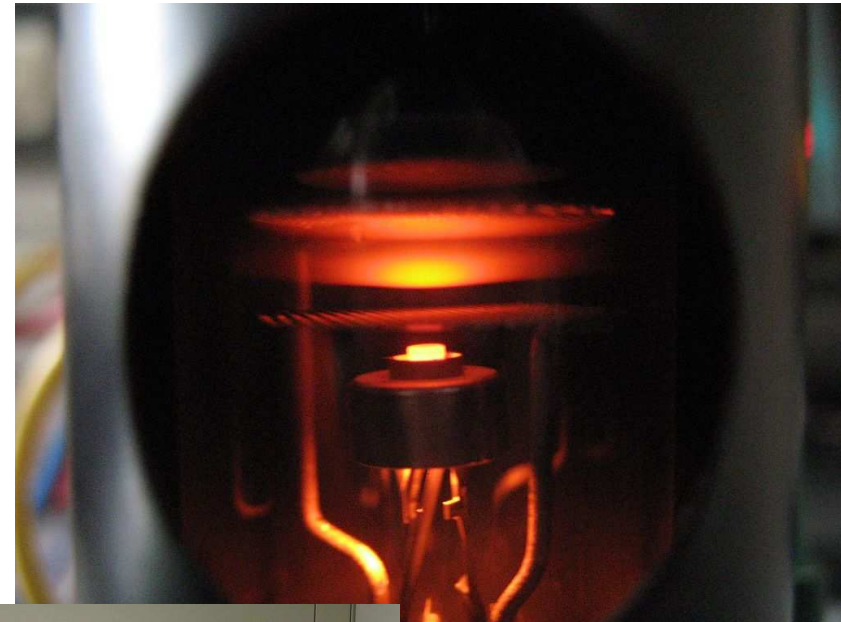
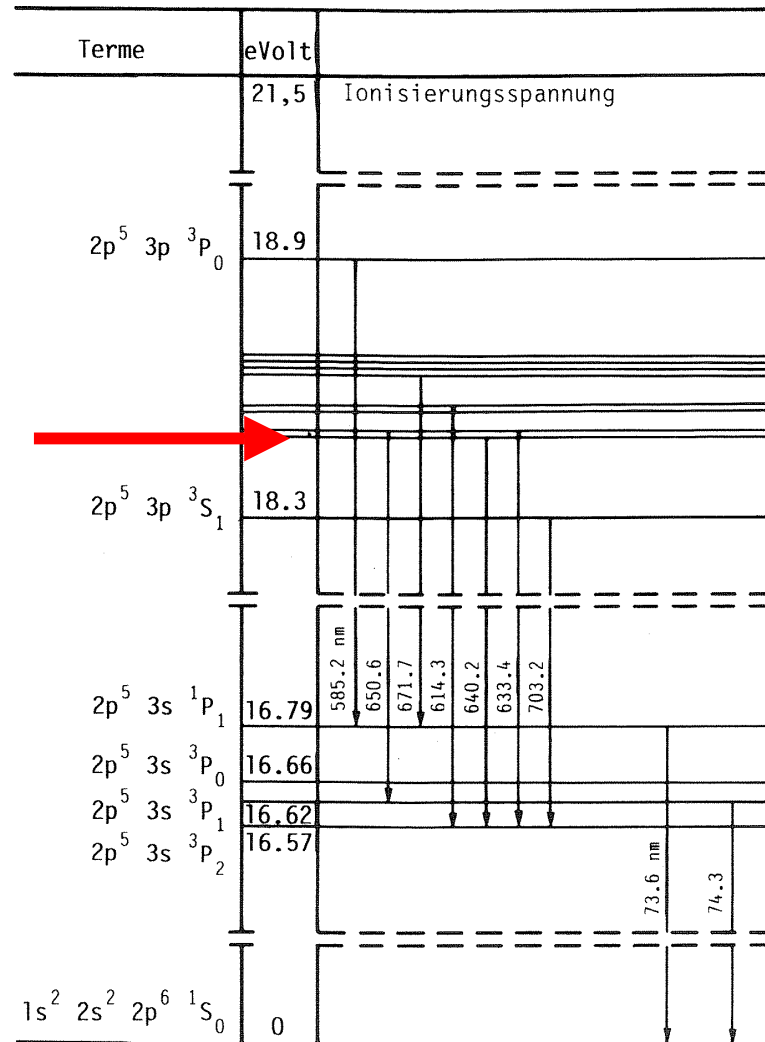
Sigma
Rho



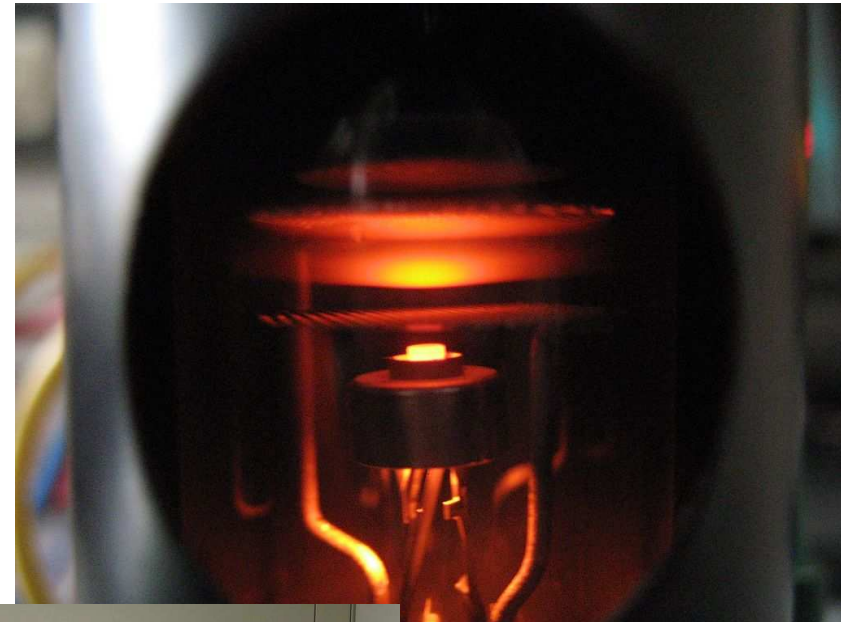
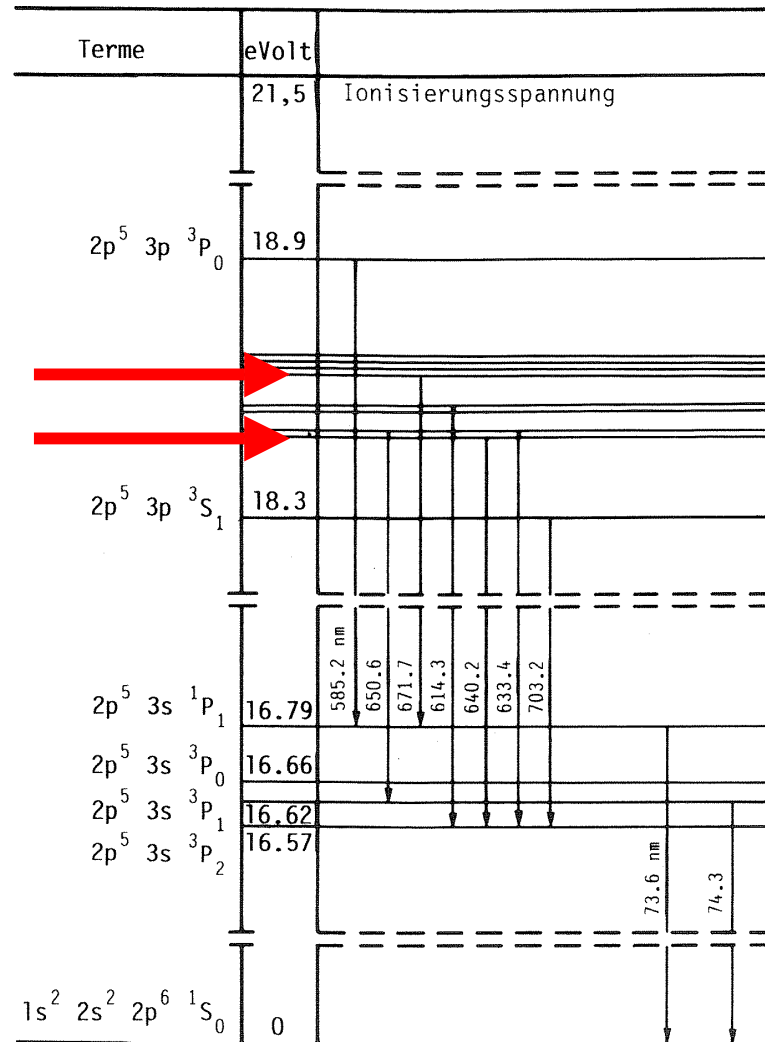
Atomphysik bei hohen Energien



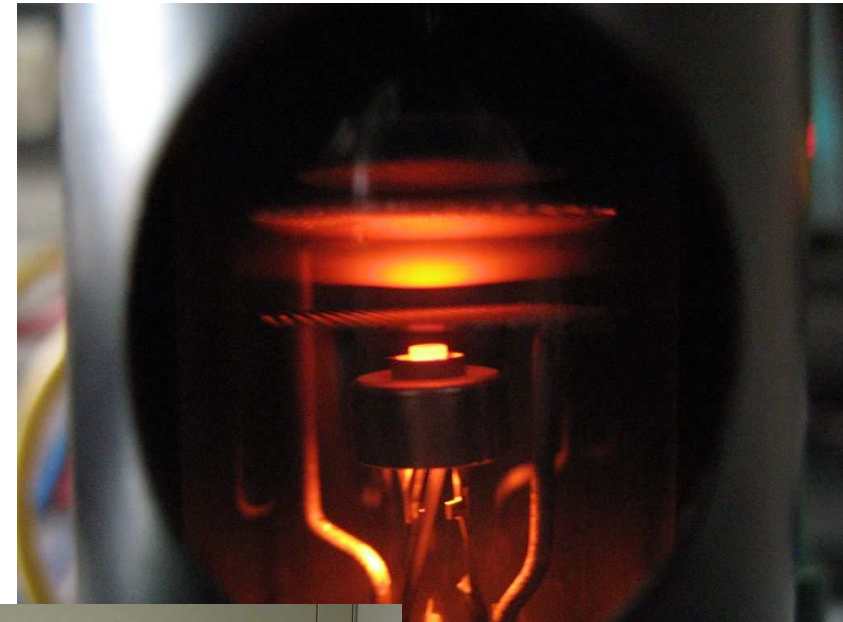
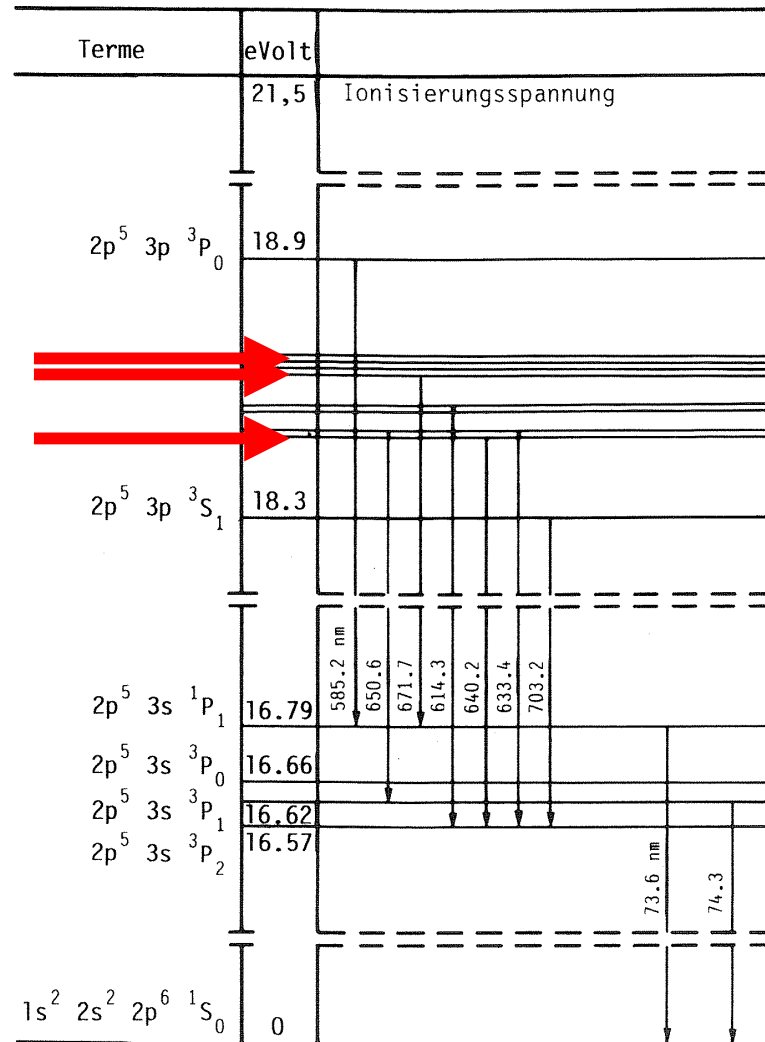
Atomphysik bei hohen Energien



Atomphysik bei hohen Energien




Atomphysik bei hohen Energien

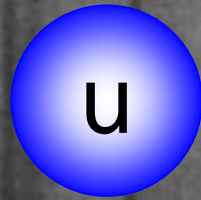




Murray Gell-Mann, 1963

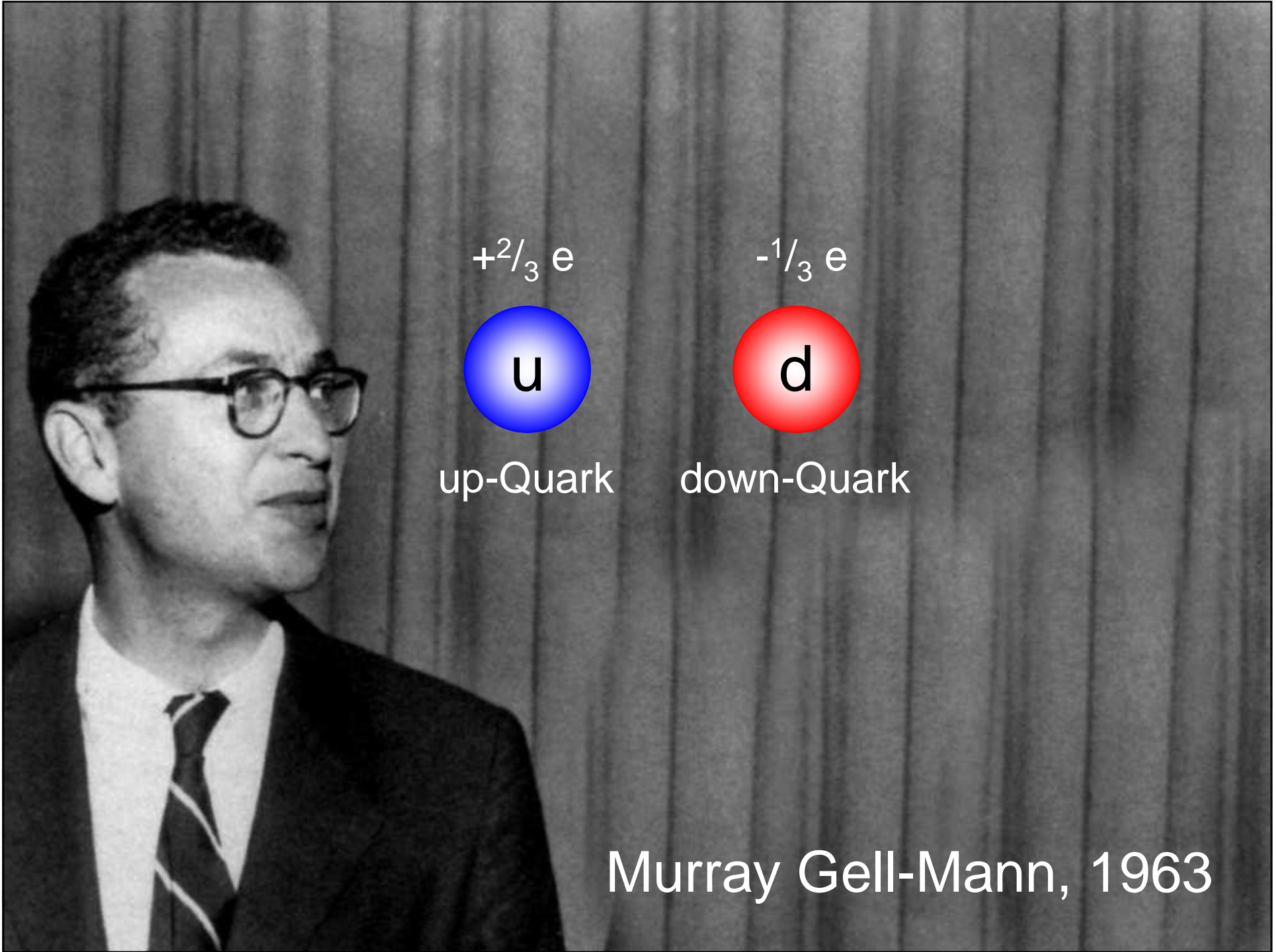
A black and white photograph of Murray Gell-Mann, a physicist, wearing glasses and a suit. He is looking slightly to the right. The background is a dark, vertically striped curtain.

$+\frac{2}{3} e$



up-Quark

Murray Gell-Mann, 1963

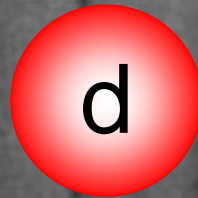


$+2/3 e$



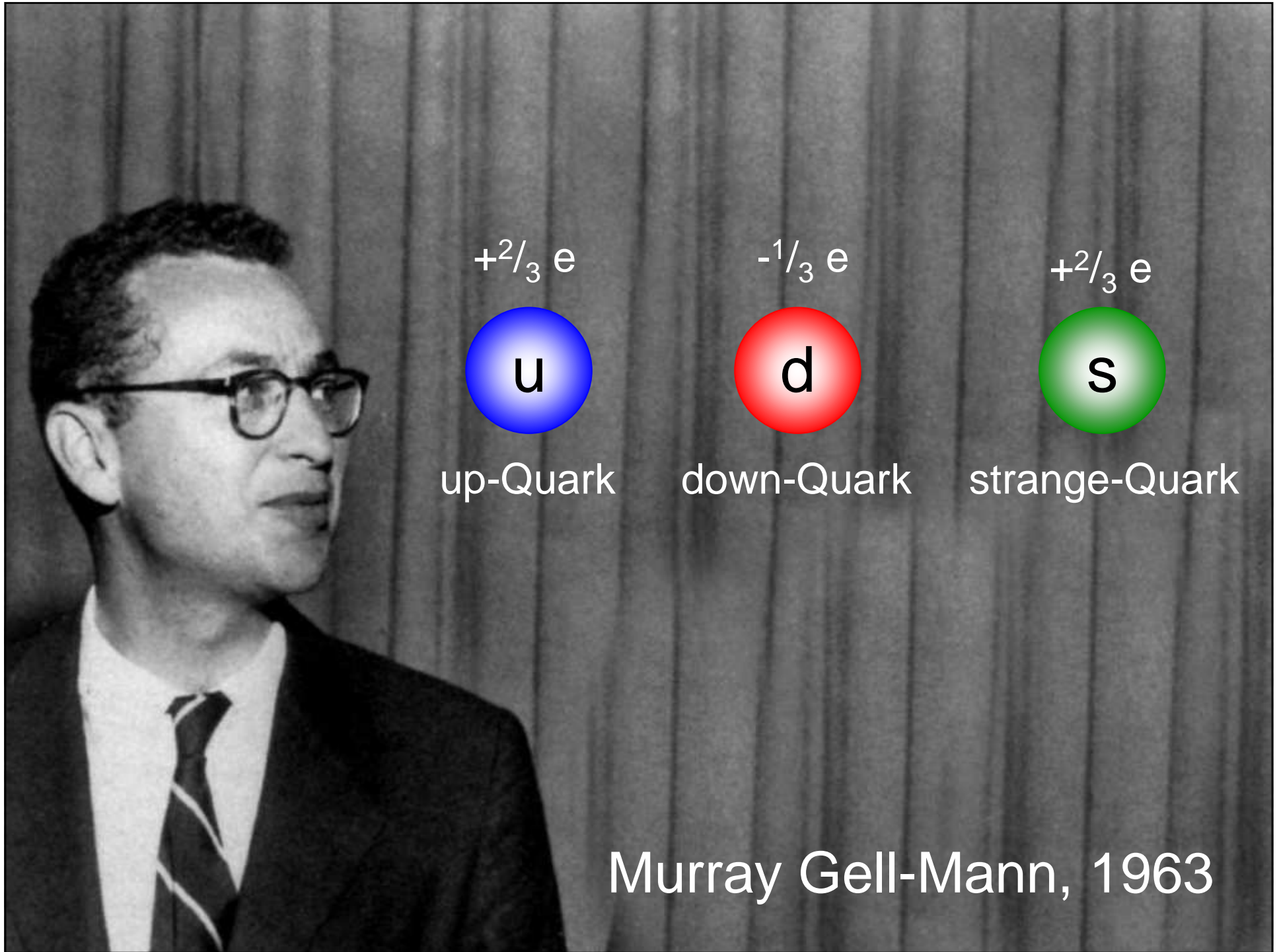
up-Quark

$-1/3 e$

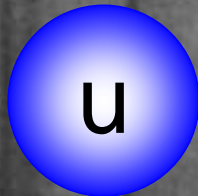


down-Quark

Murray Gell-Mann, 1963

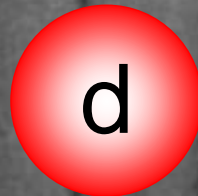


$+2/3 e$



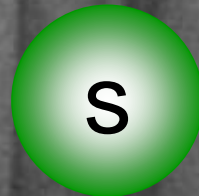
up-Quark

$-1/3 e$



down-Quark

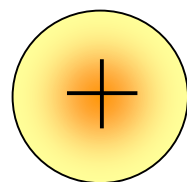
$+2/3 e$



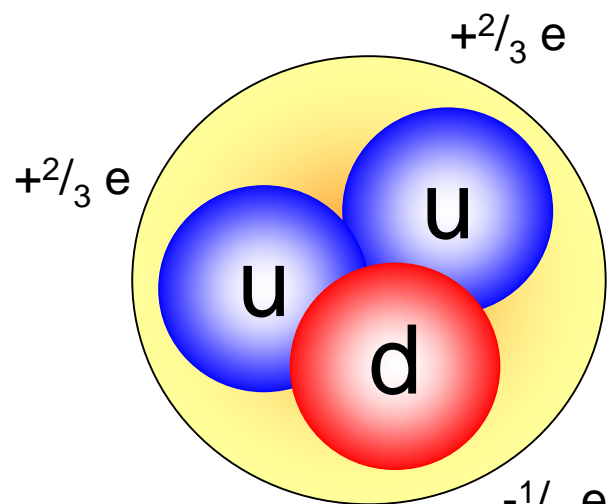
strange-Quark

Murray Gell-Mann, 1963

Quarks

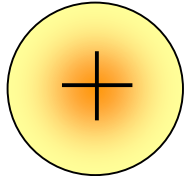


Proton

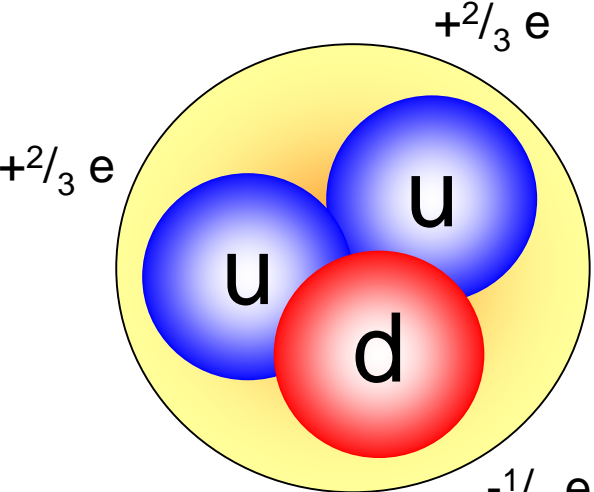


Proton

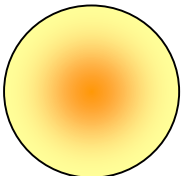
Quarks



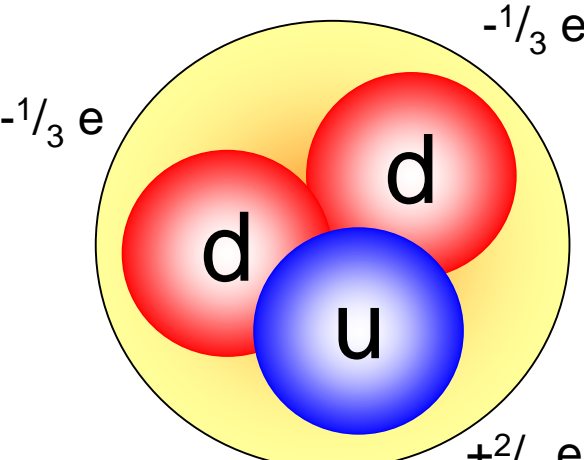
Proton



Proton

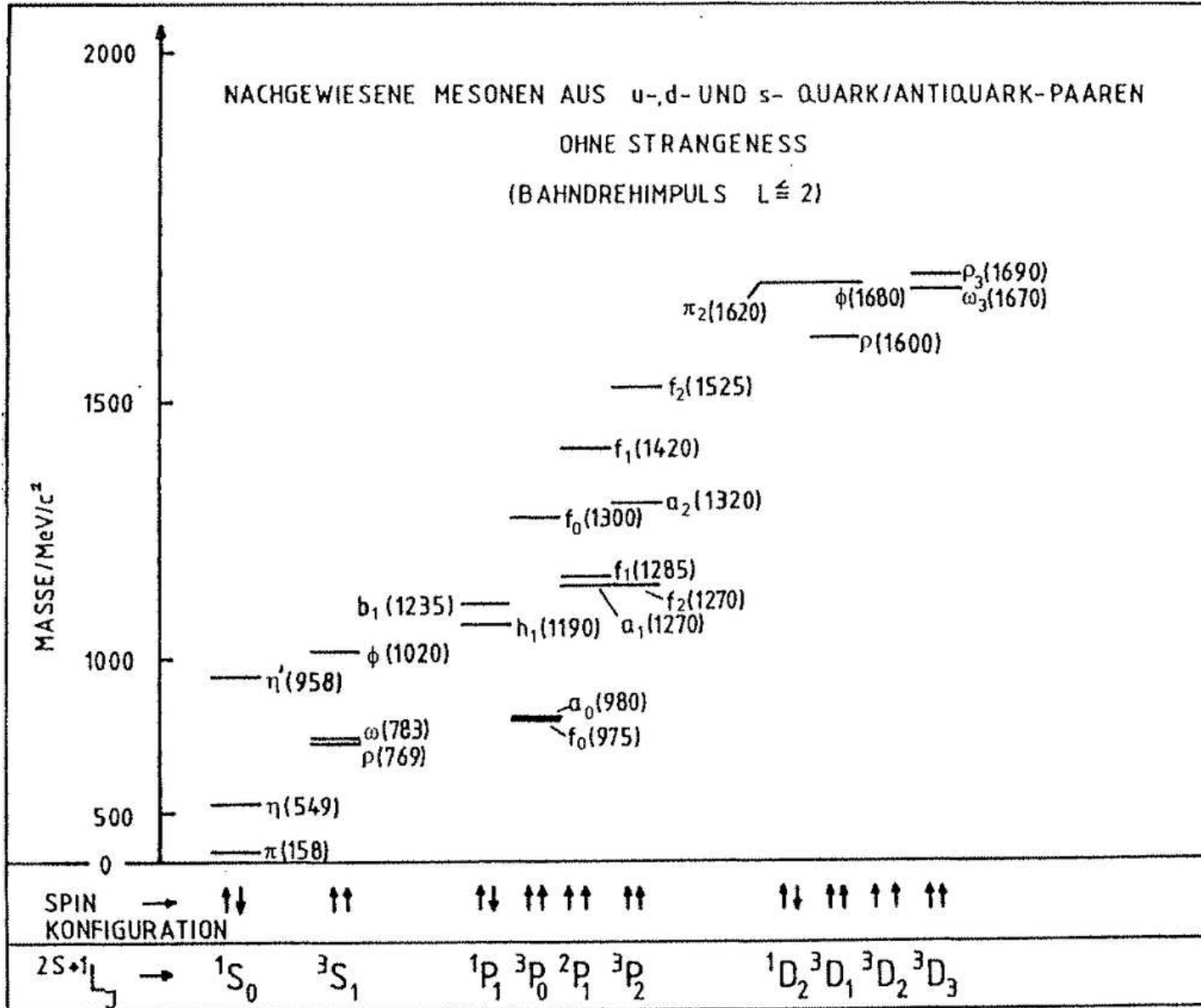


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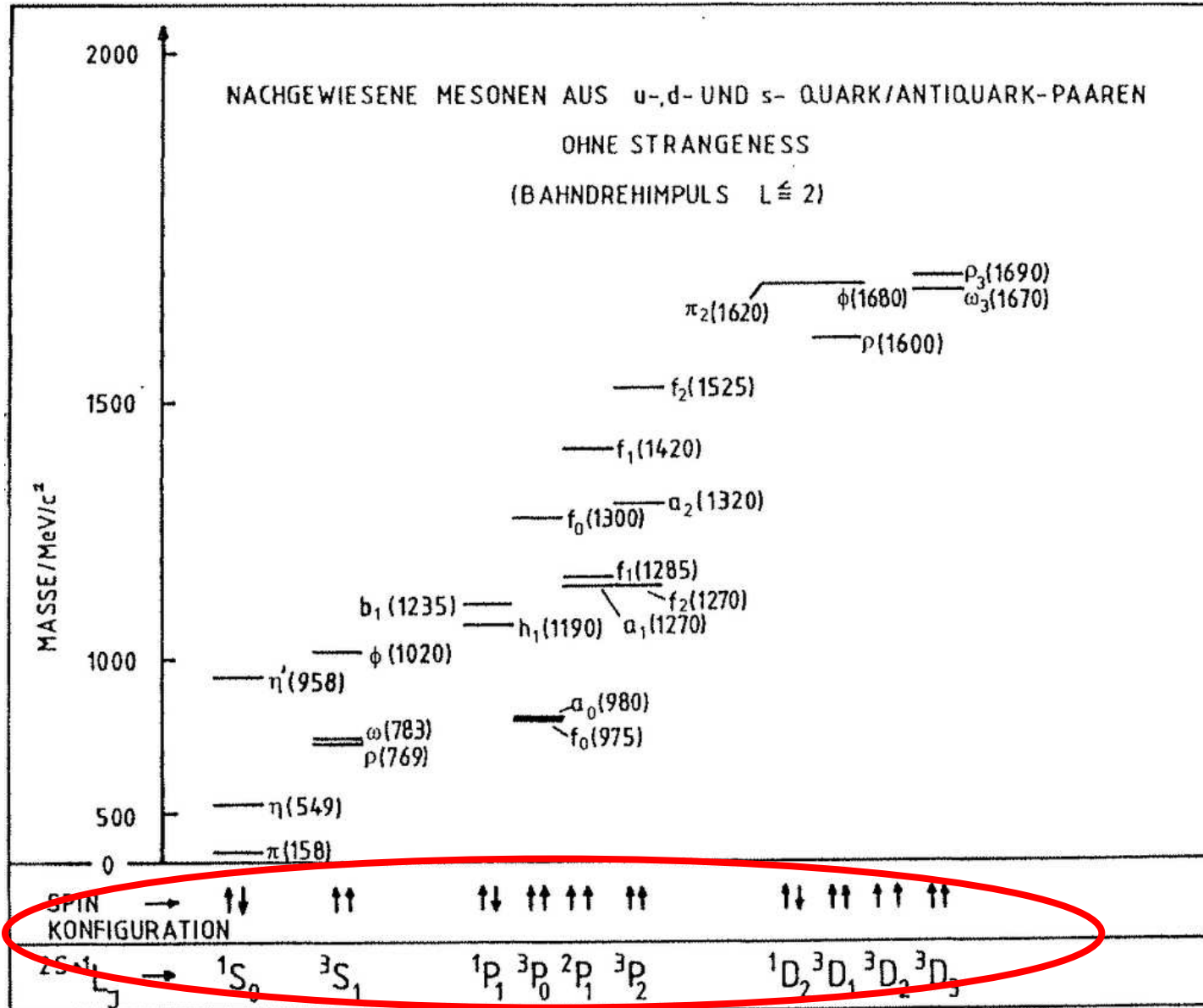


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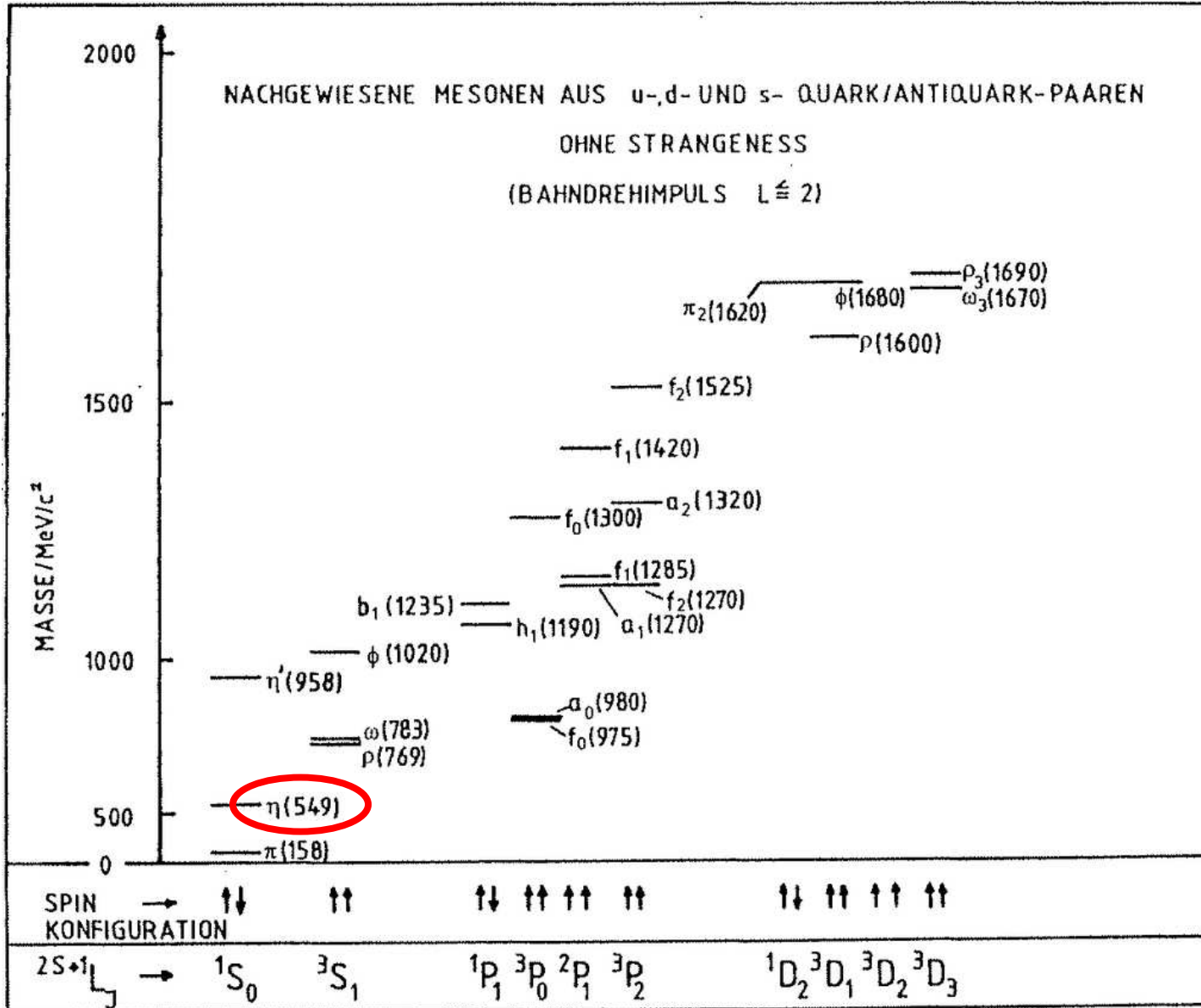
Atomphysik bei hohen Energien



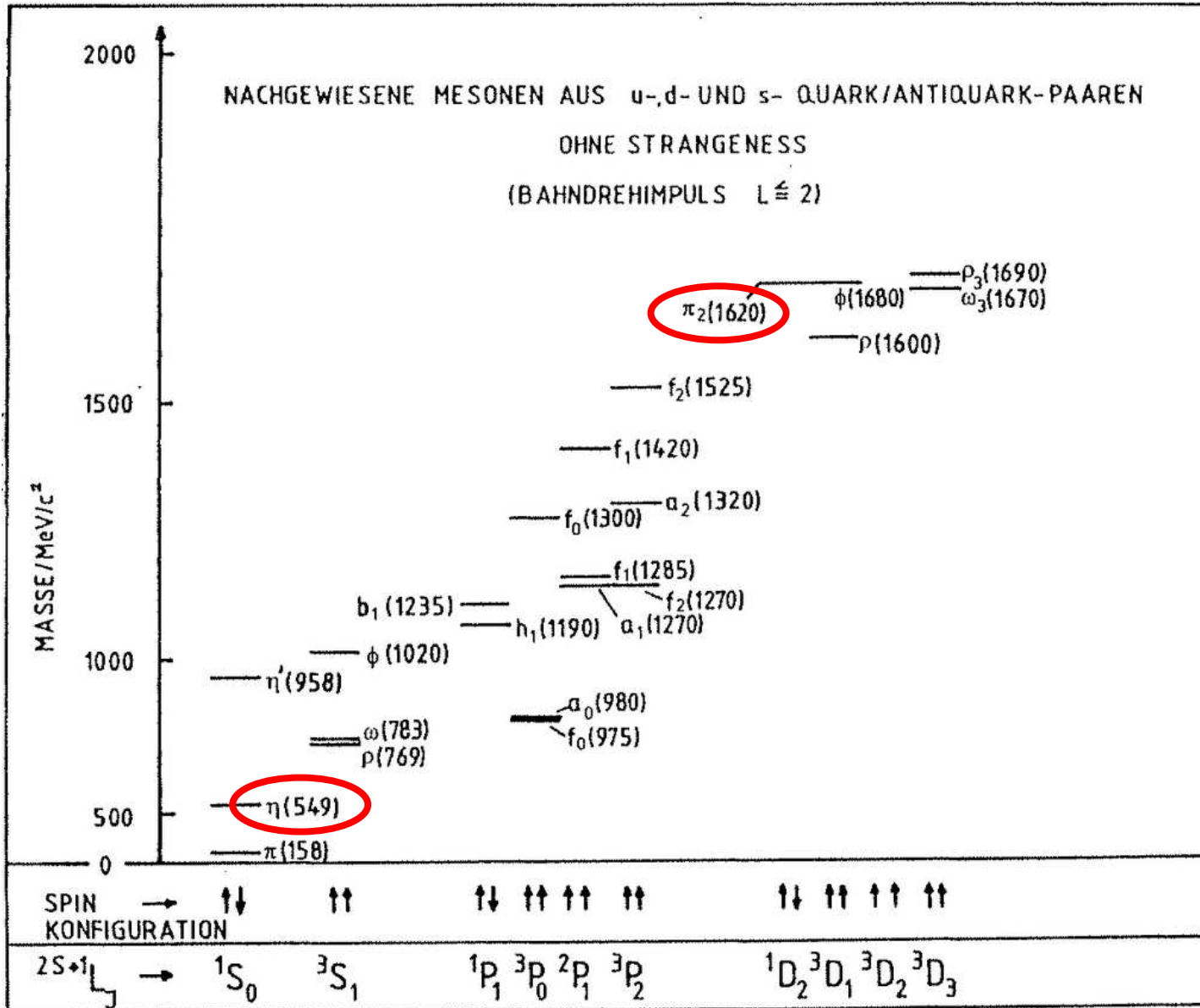
Atomphysik bei hohen Energien



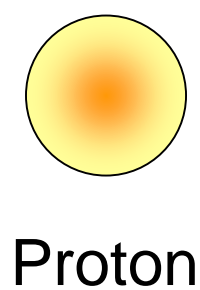
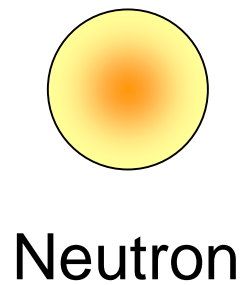
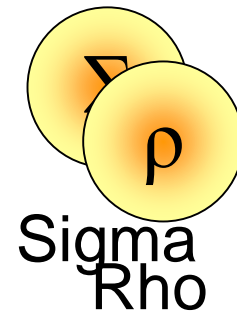
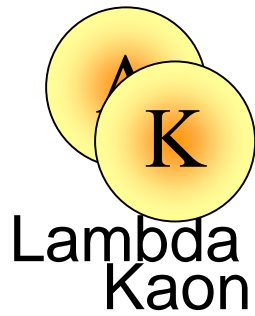
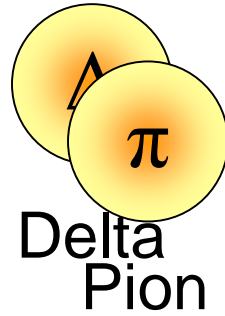
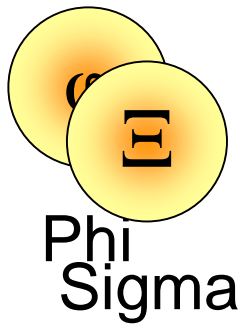
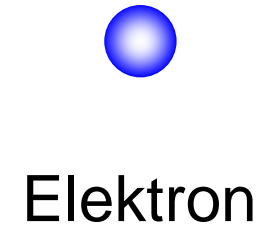
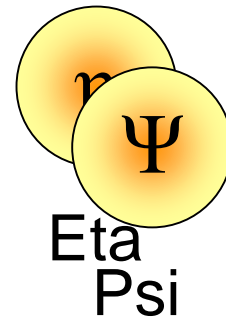
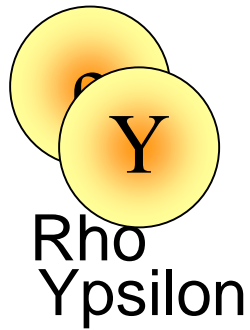
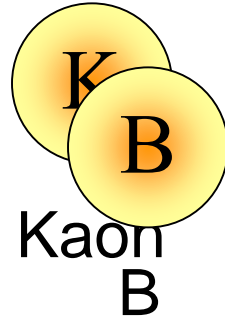
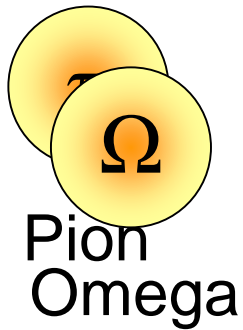
Atomphysik bei hohen Energien



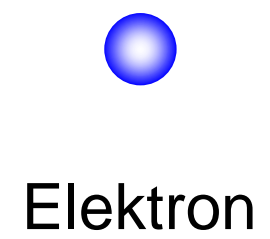
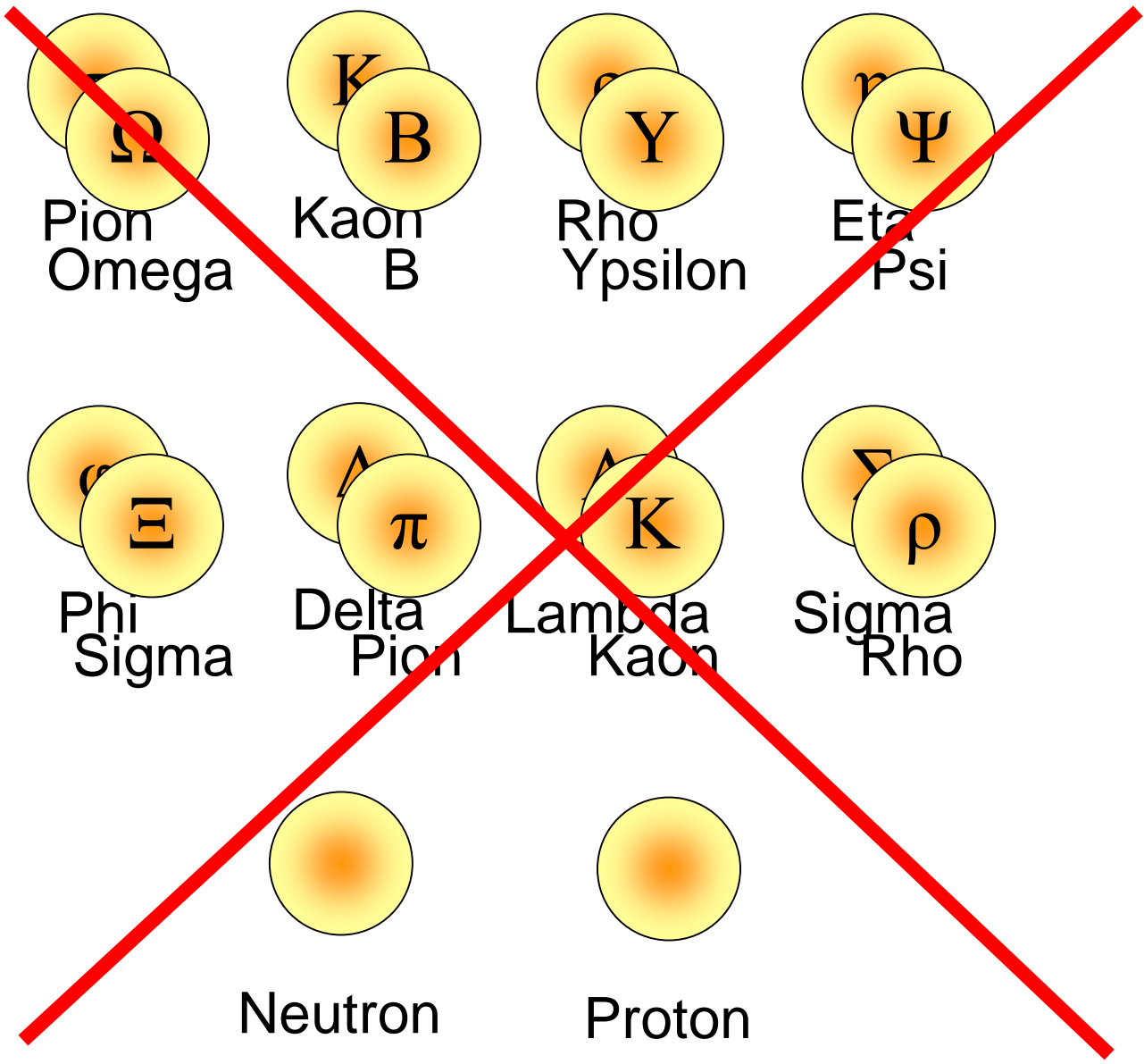
Atomphysik bei hohen Energien



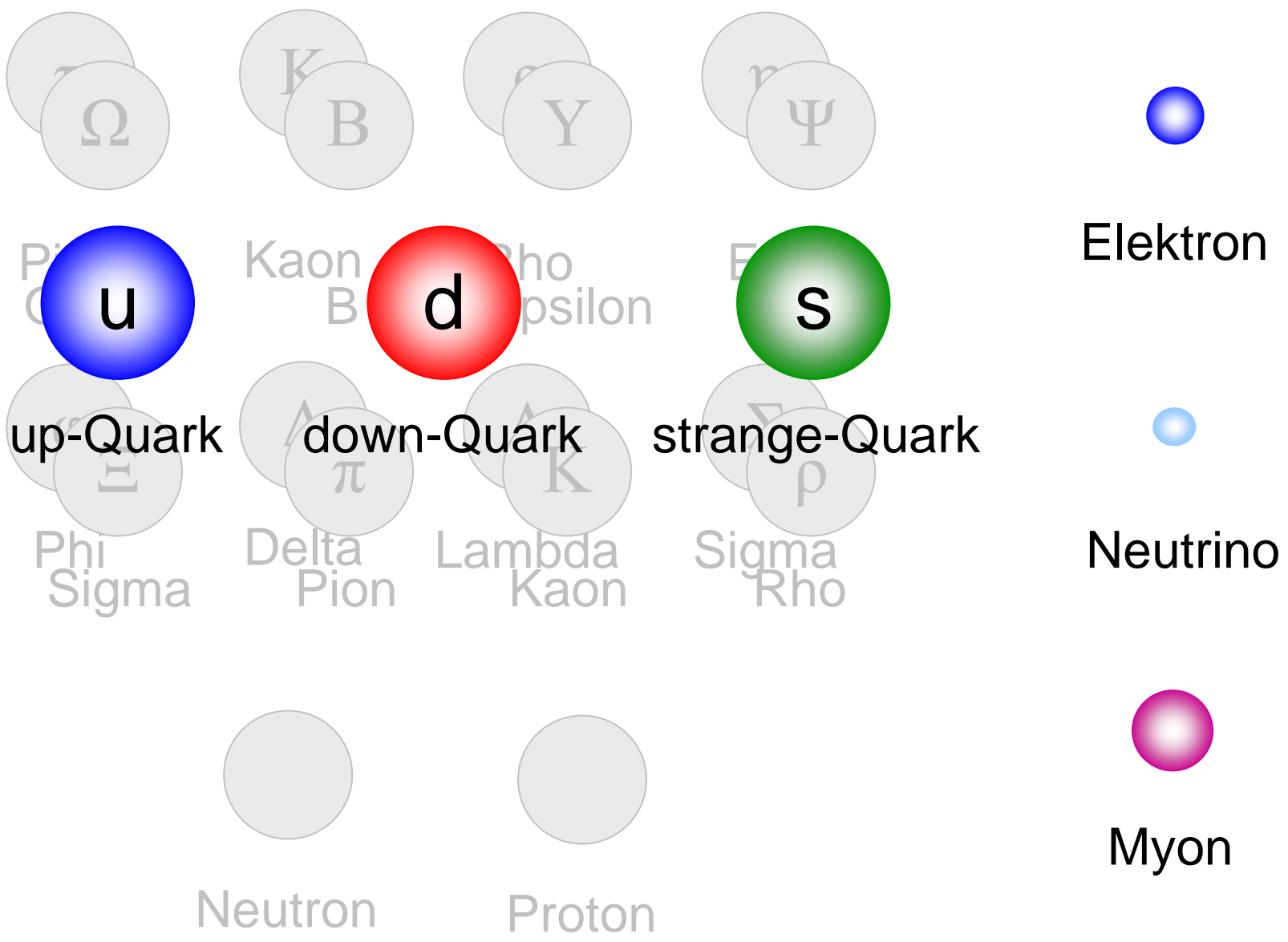
Standardmodell



Standardmodell



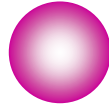
Standardmodell



Standardmodell 1970



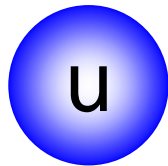
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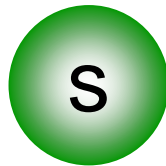
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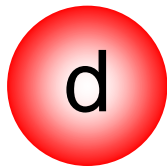
Neutrino



up-Quark



strange-Quark



down-Quark

+ Antiteilchen