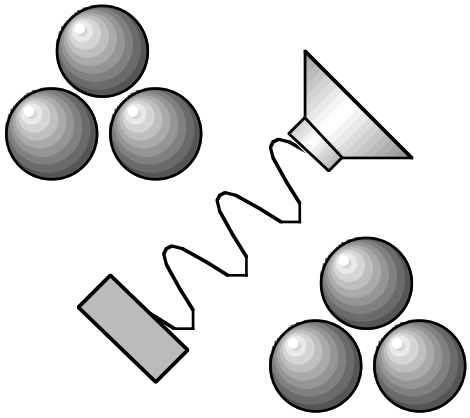

LIVERPOOL PHYSICS OLYMPICS 2003

Teleportation

Aim To transmit the quark structure of three particles from one pair of team members to the other using an audio signal.

Apparatus 1 signal generator plus loudspeaker (per team)

Method After 10 minutes to discuss tactics, each team splits into two pairs (*A* and *B*) sited at different locations. Pair *A* is given the quark structure of three particles (a list of quarks is given on a separate sheet). Pair *A* must then communicate this information to pair *B* using an audio signal generator connected to a loudspeaker that pair *B* can hear.

Conditions Once the team pairs have separated into locations *A* and *B*, they cannot regroup to discuss tactics.

Time limit 10 minutes preparation plus 15 minutes communication.

Ranking The ranking order will be determined by the time taken to correctly identify the quark structure of the three particles, with a 5 minute penalty for each incorrect identification.

Team | | ***Result*** | ***Ptcl 1*** | ***Ptcl 2*** | ***Ptcl 3***
---|---|---|---|---
| | | |

Do not write below line

Rank |

There are six quarks and six anti–quarks

u	d	s	c	t	b
up	*down*	*strange*	*charm*	*top*	*bottom*
$\bar{u}$	$\bar{d}$	$\bar{s}$	$\bar{c}$	$\bar{t}$	$\bar{b}$
u-bar	*d-bar*	*s-bar*	*c-bar*	*t-bar*	*b-bar*

Quarks can group into pairs...

For example, the pair $u\bar{s}$
is the K^+ (or "kaon") particle

or into triplets...

For example, the uud triplet is a proton

and the $\bar{u}\bar{d}\bar{d}$ triplet is an anti-neutron