

Main signals used for Helicity information are:

MPS - 30 HZ master pulse, used as gate for helicity signal.

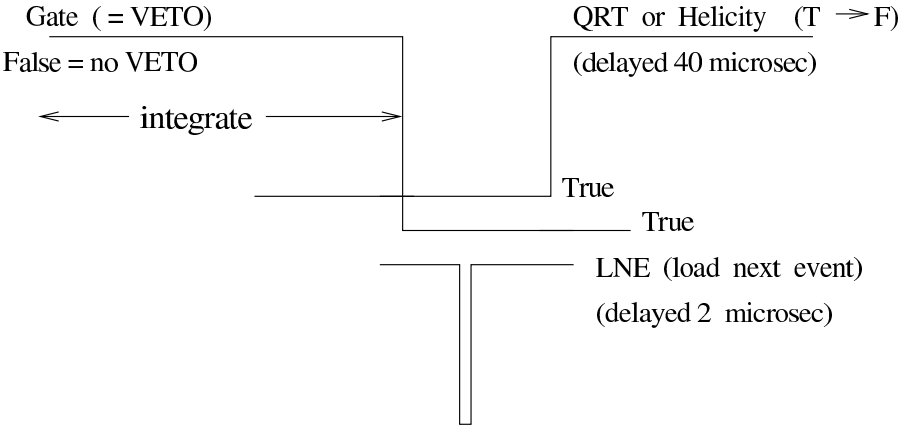
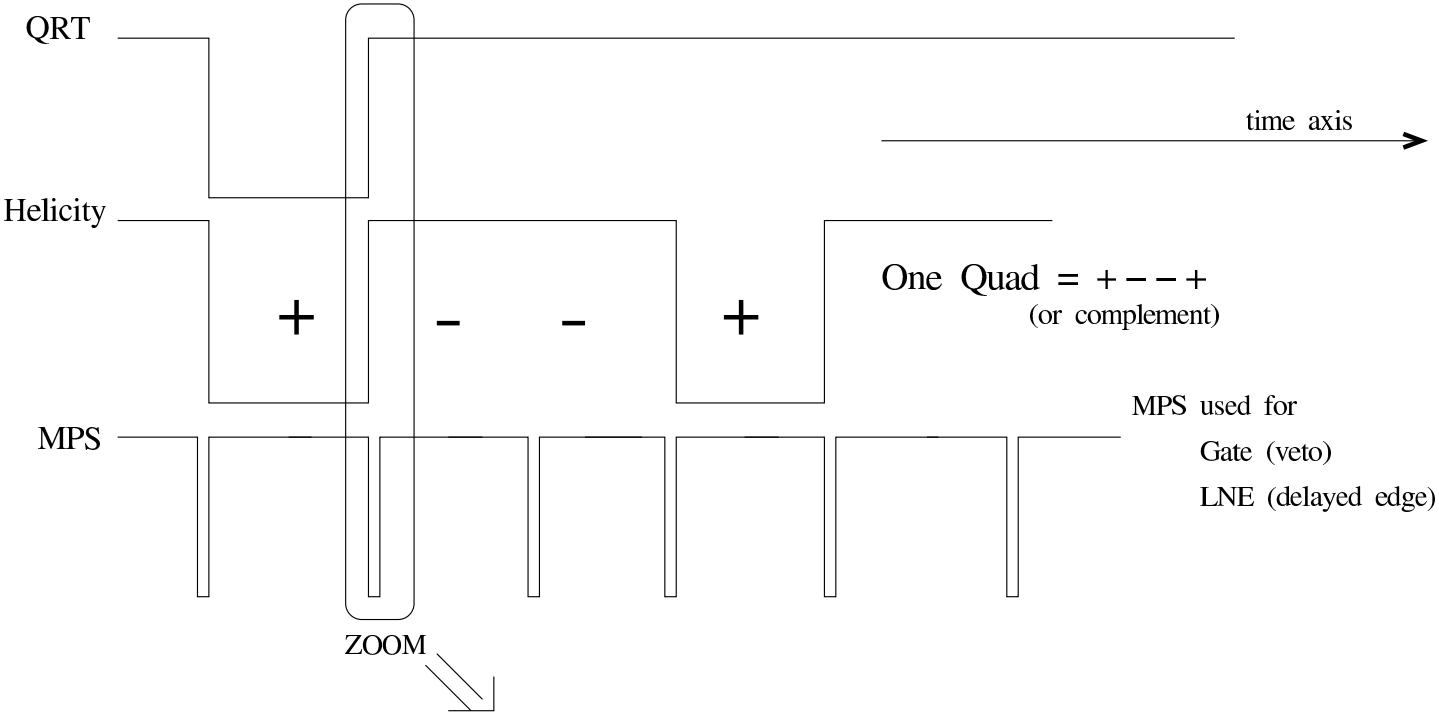
QRT - Showing the beginning of new helicity quad.

Helicity - Helicity signal showing helicity sign.

Helicity signal comes in quad structure either $+-+$ or $-+-$. Each helicity cycle (time between 2 helicity switches) is 33.3msec. There is 0.5msec blank-off period for each cycle which is necessary for Pockel cell changing and settling. Due to that dead period we have about 1.5% events with unknown helicity, which is shown in data as helicity = 0. For all that events trigger T9 (delayed MPS signal which initiates each helicity sequence) exists because of all T9 come at the time when gate==0. Except that we have unknown helicity period at the start of each run, because of prediction algorithm need to collect enough information before it starts work.

Another signal used to synchronize helicity information with physics events is 105 kHz clock.

Helicity Signals for G0 Mode (Oscilloscope View)



QRT, Helicity, Gate treated by THaHelicity to produce helicity

LNE loads data into helicity scaler.

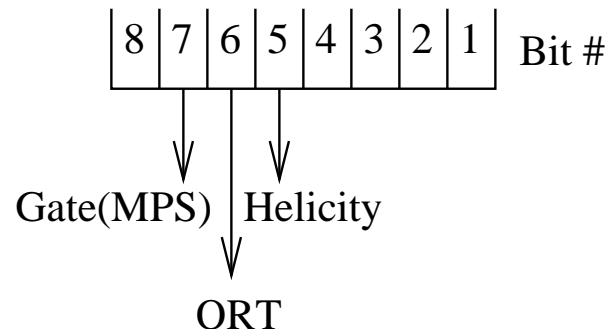
Software code responsible for decoding helicity information is in the AGEN library: GenHelicity.cxx. Decoding process could be divided into 3 main parts:

- Reading data

- Initialization of helicity prediction algorithm

- Uses of helicity prediction algorithm to get helicity sign

Helicity information in data file presented in hex format, where 5-th bit is helicity itself, 6-th bit is QRT, 7-th bit is MPS signal (gate).



Reading data

On the first step of decoding program reads 3 bits from the data-file: QRT, MPS and Helicity and also the 105kHz clock information.

Initialization of prediction algorithm.

Collecting enough helicity data to make helicity sign prediction for following events. For that part of run helicity is unknown.

Use of prediction algorithm to get the helicity sign.

As soon as prediction algorithm initialized, program starts use it to get helicity information. First it does helicity predictor calibration using 105kHz clock to match predicted helicity with physics event. Then a couple of checking is done to be sure that we don't miss Helicity signals due to DAQ dead time or beam trip. In the case of such missing program try to reconstruct missing quads using last available information. If for some reason predicted helicity does not match read out value or if reconstruction of missing quads is impossible, decoding starts from the initialization step.

Functions in GenHelicity.cxx file responsible for that are ReadData(), QuadCalib(), QuadHelicity().