Trigger selector system for BigRIPS DAQ

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A new trigger selector system has been introduced for the BigRIPS data acquisition (DAQ) system. One of the advantages of this system is that trigger signals could be switched by a web-interface controller without physically chaining connections between trigger-related circuits. This function will help the RI-beam tuning in BigRIPS because the trigger for the BigRIPS DAQ is frequently switched to obtain profiles of RI beams at each focal plane. In addition, it is possible to configure a complex trigger condition by applying logic gates of AND, OR, and NOT for triggers from each focal plane.

The new system consists of five Generic Trigger Operator[1] (GTO) modules and a web-interface controller coded in the PHP language. A connection diagram of the system is shown in Fig. 1. This system is divided into three sections: the focal plane section, trigger logic section, and trigger output section. The trigger signal for the measurement is hierarchically selected by these three sections. GTO modules with selector firmware[2] (SELGTO) are used for the focal plane and trigger output sections. To configure complex trigger conditions in the trigger logic section, new firmware for the logic unit has been developed and implemented in the GTO module (LUGTO). LUGTO has 20 input channels and 8 output channels. Up to 8 logic conditions, a combination circuit of input signals with AND, OR, and NOT logic gates can be configured in LUGTO.

In the focal plane section, the signals from plastic scintillators and PPACs at the F1–F12 focal planes are separately connected to three SELGTO modules. Here, signals named as F1–F12 Beam are produced and sent to the trigger logic section. For example, the F2 Beam signal is defined from the selection of signals from F2Plastic, F2PPAC1, and F2PPAC2 detectors. By using LUGTO in the trigger logic section, coincidence triggers named as BigRIPS, ZeroDegree, and dE can be configured by signals labeled as F1–F7 Beam, F8–F11 Beam and F3–F7dE (energy-loss gate at each focal plane), respectively. For example, the BigRIPS (ZeroDegree) trigger can be defined as F3Beam×F7Beam (F8Beam×F11Beam). Finally, the trigger output is determined by choosing signals of BigRIPS, down-scaled BigRIPS (BigRIPS(1/n)), ZeroDegree, dE, etc. in the trigger output section.

The trigger configuration is selected from the web-interface controller as shown in Fig. 2. The settings in GTO modules are updated on pushing the "Save" button. However, these settings will be lost when a power cycle occurs. The "EEPWrite" button is used to keep configurations permanently in GTO modules. Components of the web-interface contoller can be customized by a text setting file to facilitate the modification of trigger connections.

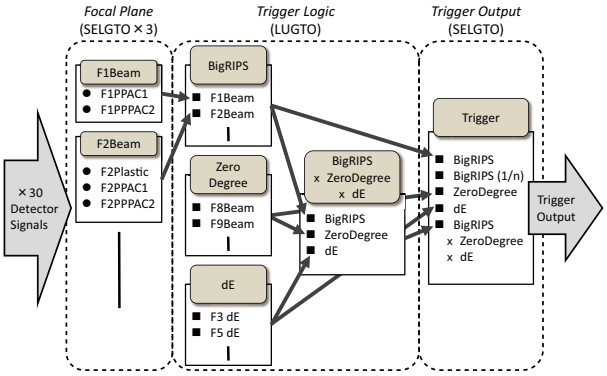

Fig. 1. Diagram of signal connections.

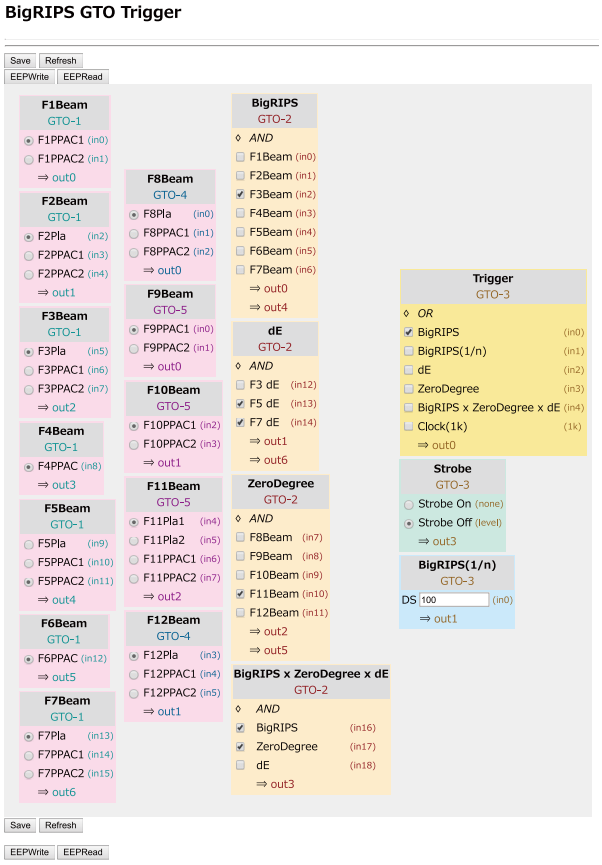

Fig. 2. Screenshot of the web-interface controller.

This trigger selector system for the BigRIPS DAQ has been in operation since from April 2018, enabling us to perform RI-beam tuning efficiently.

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References

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