c. 6P control

The principles presented above can be used to determine an optimal acquisition control device that can optimize all acquisition parameters. Acquisition condition parameters that can be optimized are: x-ray tube high-voltage (kVp), x-ray tube current (mA), x-ray pulse exposure time (ms), focal spot size selection, spectral filter selection, and detector dose level. In total, up to 6 parameters can be automatically selected by a **6P control** device (Figure 6).
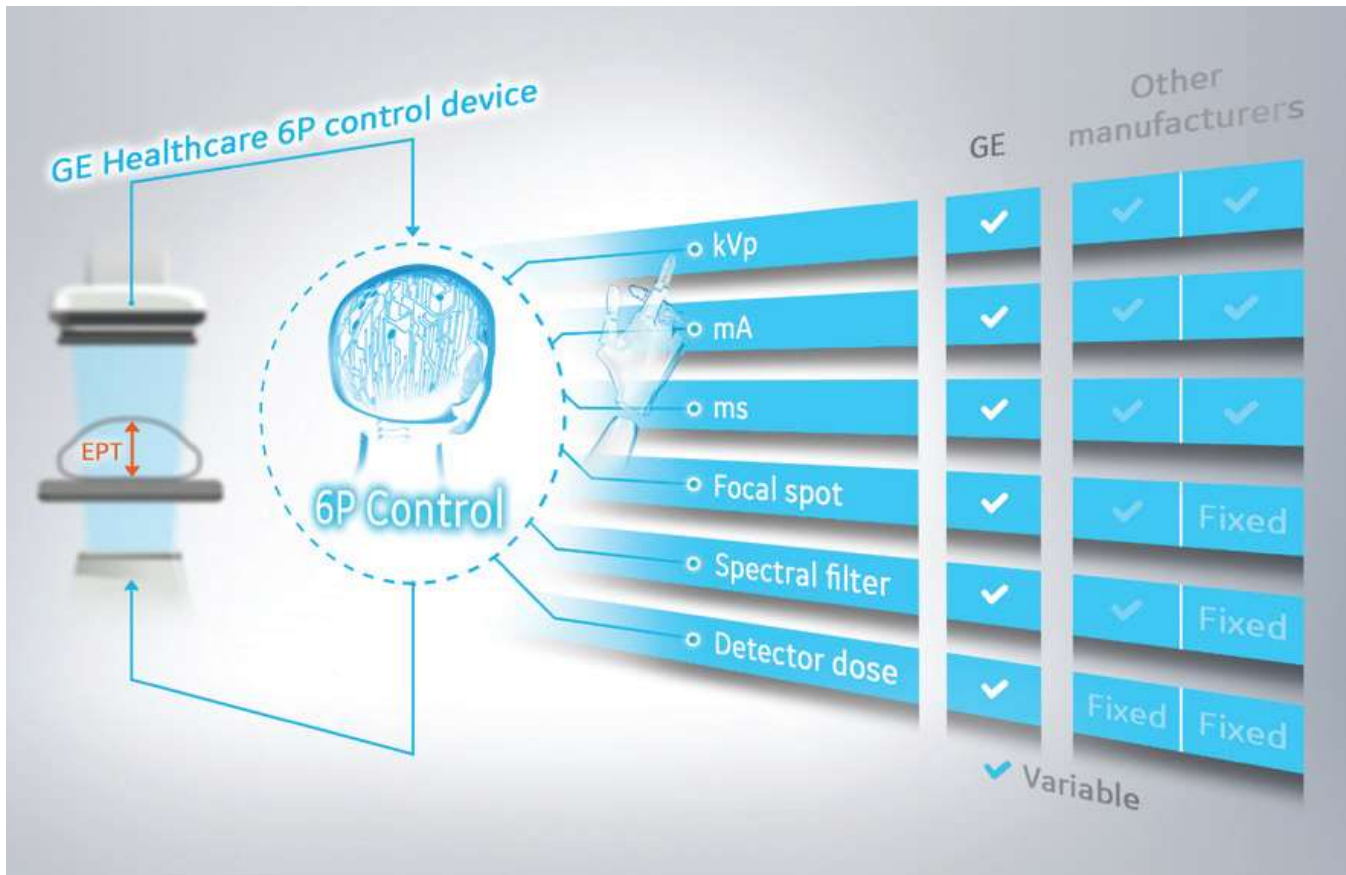

Figure 6. 6P control device descriptive chart

Using a fixed detector dose could not be avoided in the past when detector technologies were limited to analog argentic film. This older technology tightly links detector dose to the image inherent brightness, while digital flat-panel detector technology with large dynamic range enables separate control of detector dose and image brightness with automatic digital rescaling of the image content.

Allowing the detector dose to be adjusted differently depending on different patient thickness results in better dose efficiency and better control of the resulting image quality level. When the detector dose is fixed, the resulting image quality level naturally decreases over increasing patient thickness and results in higher dose and/or lower image quality compared to a variable detector dose.

Several physical effects must be combined in a complex manner, with some becoming dominant based on patient thickness and desired image quality. These effects are detailed in "Implementation of a spatio-temporal figure of merit for new automatic dose rate control regimes in dynamic x-ray imaging."[5]

Considering all natures of automated parameters, the 6P control principle can achieve the best possible trade-off using these parameters, thus contributing to the ALARA goal. This allows for more flexible IQ and dose optimization.