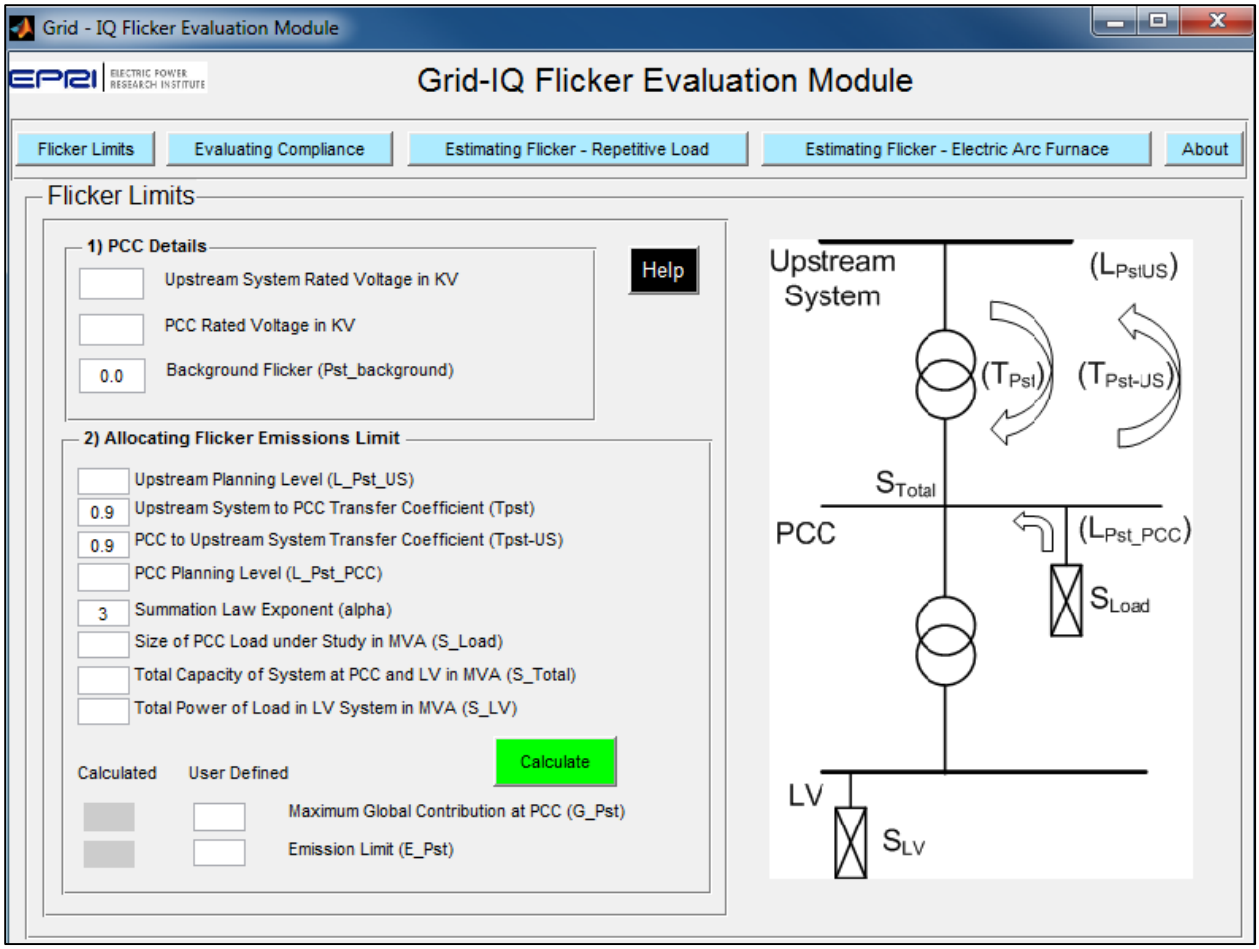

Figure 1
Grid-IQ FEM analysis interface – Flicker Limits tab

Tab 1 – Flicker Limits

This is the default tab in the interface (see Figure 1). It deals with computing the recommended planning flicker levels for the utility system. It also determines appropriate flicker emission limits for a flicker-inducing facility. Various user inputs regarding the system and the load that are needed for the necessary computations are explained in this section.

Point of Common Coupling Details

This section describes the point of common coupling (PCC) parameters that need to be provided:

- Upstream System Rated Voltage in kV: This field represents the system voltage on the HV side of the nearest step-transformer upstream of the PCC. This value is used to determine the recommend flicker planning levels in the upstream system.
- PCC Rated Voltage in kV: This field represents the system voltage on the HV side of the nearest step-transformer downstream of the PCC. This value is used to determine the recommend flicker planning levels at the PCC.
- Background flicker (Pst_background): These are the flicker levels at the PCC that can be attributed to the operation of all the loads in the system, excluding the facility being

investigated. This flicker can be combined with the flicker contribution of the facility itself to arrive at the resultant flicker at the PCC. The default value is 0.0.

Allocating Flicker Emissions Limits

This section describes the various fields that are related to computing the emission limits for the facility.

- Upstream Voltage Planning level (L_Pst_US): This field represents the planning levels corresponding to the system voltage on the HV system upstream of the PCC as described in the previous section. This field gets auto-populated with the levels recommended in IEEE Std 1453 (see the limits tables in Evaluating Compliance Section) based on the specified PCC attributes. This field is editable if another value needs to be used.
- Upstream Step-up System to PCC Transfer Coefficient (Tpst): The transfer coefficient of flicker that represents the proportion of the "Background Flicker" that gets transferred from the upstream HV system to the PCC. The default value is 0.9, which assumes that there is some damping. A value of 1.0 would assume all that flicker is transferred to the PCC system.
- PCC to Upstream System Transfer Coefficient (Tpst-US): The transfer coefficient of flicker represents the proportion of the PCC load flicker that gets transferred from the PCC to the upstream HV system. The default value is 0.9, which assumes that there is some damping. A value of 1.0 would assume that all flicker is transferred to the upstream system.
- PCC Planning level (L_Pst_PCC): This field represents the planning levels corresponding to the system voltage at the PCC. This field also gets auto-populated with the levels recommended in IEEE Std 1453 based on the specified PCC attributes. This field is editable if another value needs to be used.
- Summation Law exponent (alpha): This variable describes how the flicker form the various contributions combine at the PCC. A value of 1.0 assumes that the flicker from the various sources adds uniformly. A value of 2 assumes more diversity in contributing sources. A default value of 3 is provided and is suitable for the majority of cases.
- Size of PCC Load under study in MVA (S_Load): Rated power of the considered fluctuating installation.
- Total capacity of system at PCC and LV in MVA (S_Total): Total supply capacity of the system at the PCC and LV including provision for future load growth.
- Total power of load in downstream LV system in MVA (S_LV): Total power of the load supplied directly at LV in the considered system, including provision for future load growth.
- Maximum global contribution at PCC (G_Pst): Maximum global contribution to the flicker level of all the fluctuating installations that can be connected to the PCC without exceeding the flicker planning levels. The module computes this value and is provided for information purpose. It is assumed here that the LV fluctuating installations have a negligible impact at the medium voltage PCC.
- Emission limit (E_Pst): This is the flicker emission limit for the PCC (medium voltage) load facility. The module computes this value based on the maximum global contribution at the PCC and size of MV/LV load. Limiting MV facility flicker contribution under this limit would ensure that the planning levels are not exceeded at PCC.

Completing the “PCC Details” fields and the “Allocating Flicker Emissions Limit” fields as discussed above and then pressing “Calculate” allows the module to compute the PCC (G_Pst) and “Emission Limit (E_Pst) values. Fields are also provided for the user to provide his/her own G_Pst and/or E_Pst values if preferred. An example completed Flicker Limits screen is provide in Figure 2. Depending on user selection, the “Calculated” or “User Defined” limits will be used in subsequent screens for comparison of estimated flicker results.

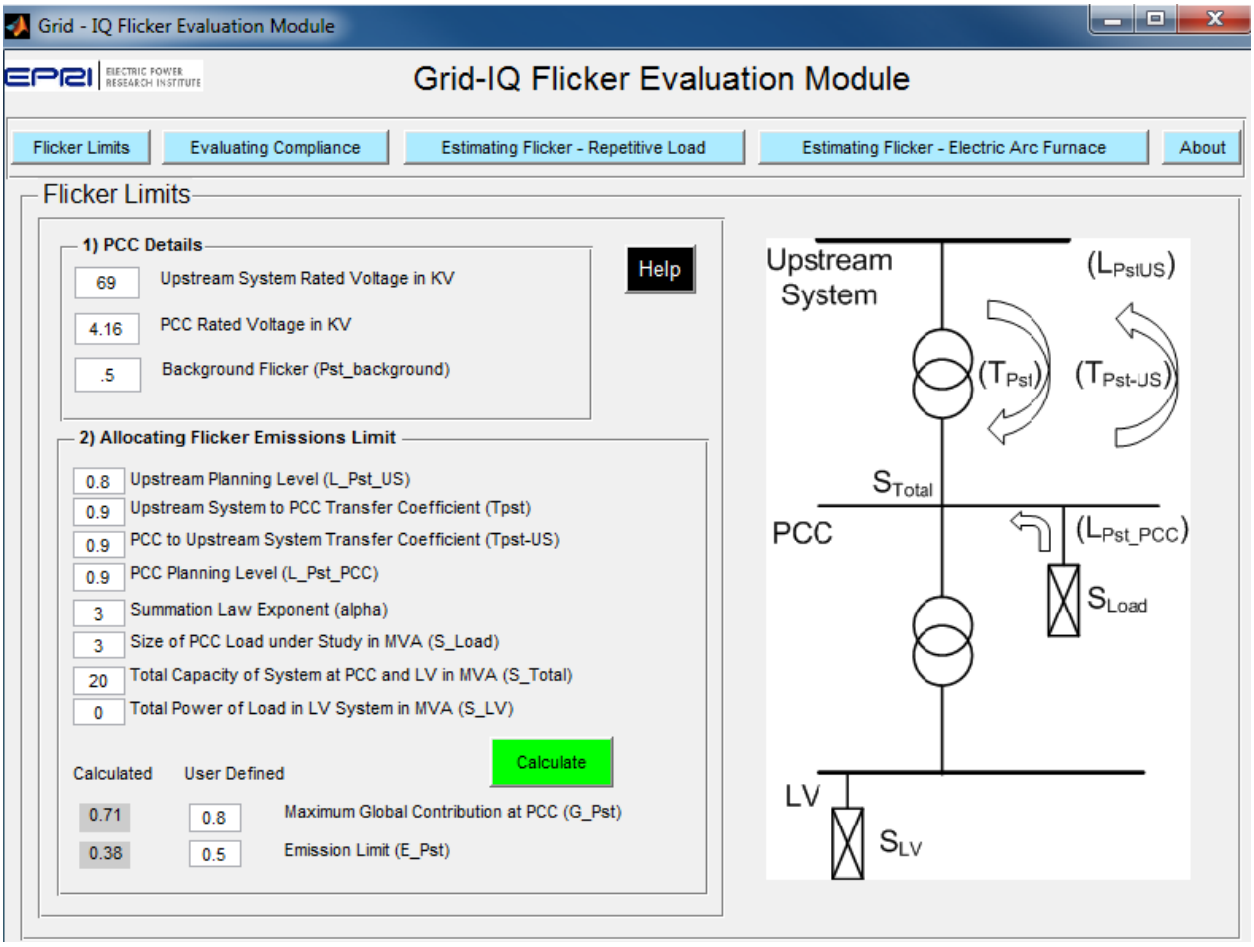

Figure 2
Completed Flicker Limits tab