

## Chemical Analysis Overall Flag System

CTS has modified the criteria used to assign an **Action Item** to laboratory results in the chemical tests. These new criteria have been applied starting with the Report #71, 3<sup>rd</sup> Quarter 2005 and will continue to be used in future reports. This new system does not introduce any new concepts; rather it is an approach that combines elements from the existing analysis. This new system effectively reduces the number of Action Items assigned in the chemical tests. CTS has chosen to implement these improved criteria to provide laboratories with a better tool in making decisions on their chemical data.

An **Action Item** will now be assigned to results that have an **Overall Flag**. Overall Flag is a new term; it is only assigned to laboratory results when two criteria have been met.

1. The results must have an “X” Data Flag (results fall outside the 99% T<sup>2</sup> control ellipse).
2. The Lab Mean or the Within Sample Variation of either sample must be significantly different from the group.

The Overall Flag may be represented by formula:

*OverAll Flag = “X”Data Flag + CPV Flag and/or K Flag, where*

*CPV Flag* means that the CPV of either Lab Mean is greater than the critical limit and

*K Flag* means that the variation within a Lab Mean is greater than the critical limit.

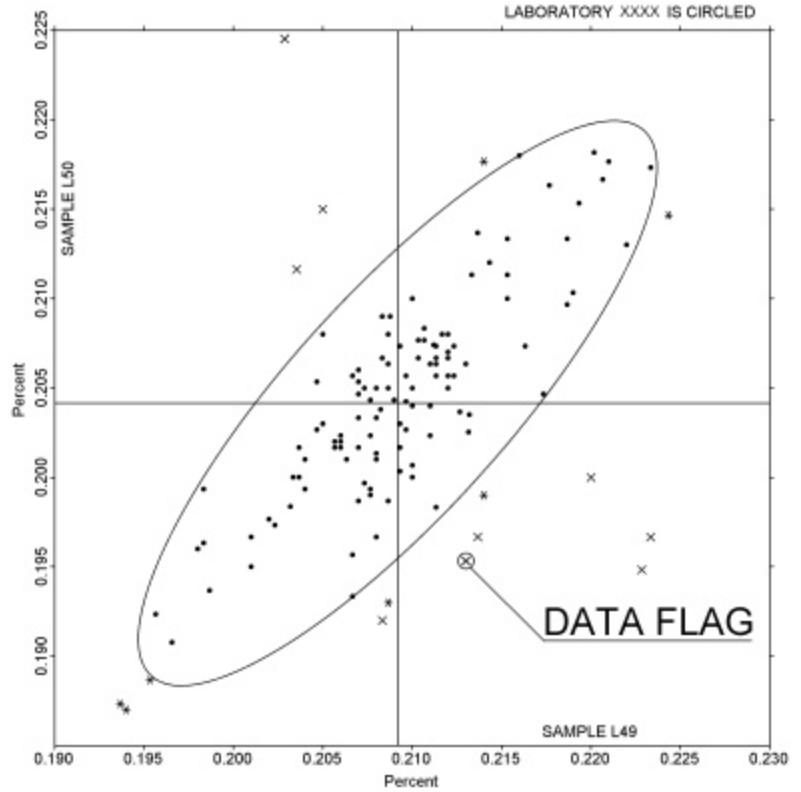
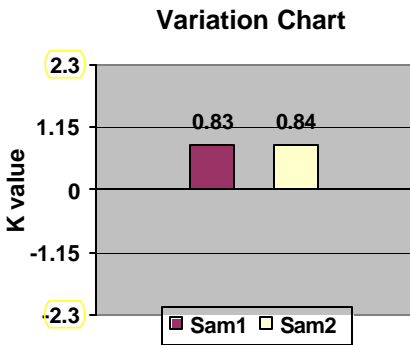
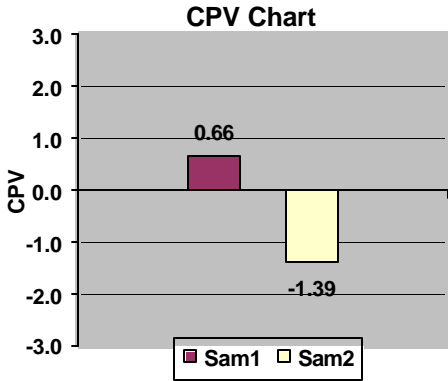
The CPV values, the K values and the critical limits are calculated according to the [ASTM E691-99 “Standard Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method”](#). CPV in the CTS program is equivalent to “h” statistic in the ASTM E691. The critical values for CPV depend on the number of laboratories participating in the test and the critical values for K depend both on the number of laboratories and on the number of replicate test results per laboratory per sample. The critical limits as well as the K values are not shown in the CTS reports.

The following pages show few examples of when the Overall Flag will or will not be assigned.

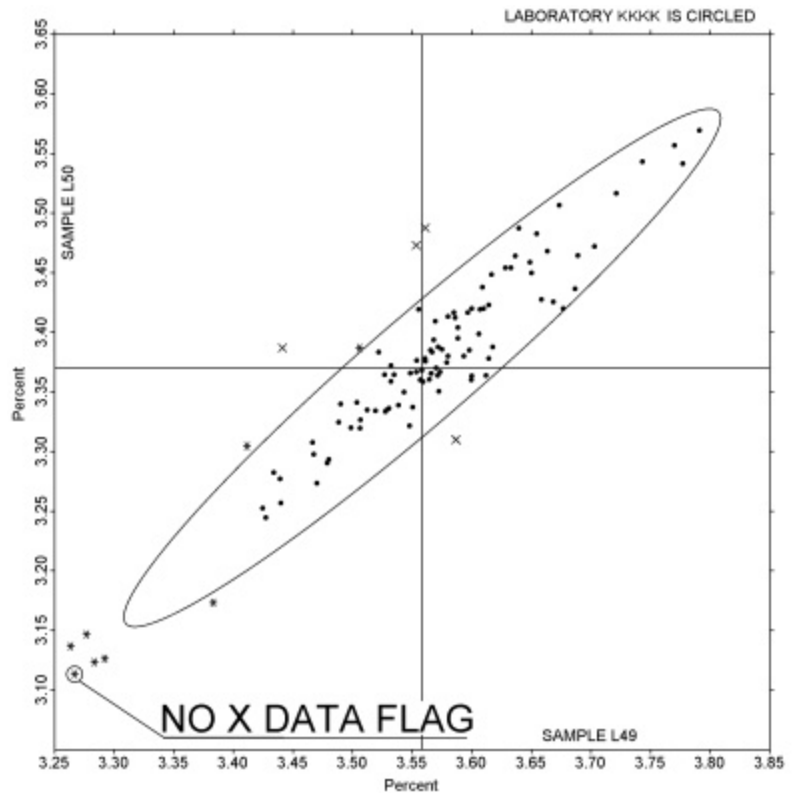
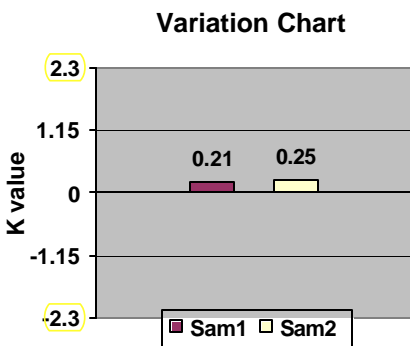
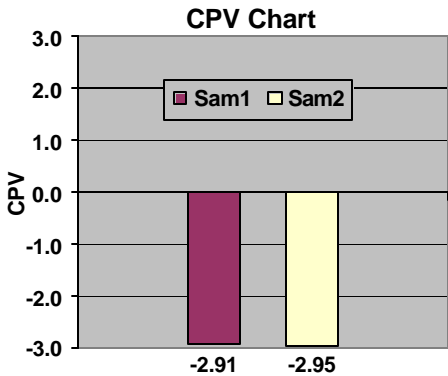
We can begin with the two most basic cases. First, if the laboratory’s results have no flags assigned (No Data Flag, No CPV Flags, No K Flags), no Overall Flag is given and the results are considered to agree well with the other participants. Second, if a laboratory has all three types of flags assigned, an Overall Flag will be shown with an Action Item. These results are considered significantly different when compared with the other participants.

The examples below explain the situations when some, but not all three types of flags have been assigned. It is important to remember that an “X” Data Flag is the most basic requirement for an Overall Flag to be assigned. In other words, if there is no “X” Data Flag assigned, there will be no Overall Flag even if there are other flags (Example 2). However, some laboratories that are assigned an “X” Data Flag may not receive an Overall Flag (Example 1). This means that the Overall Flag does not change the consensus statistics or the number of included/excluded laboratories. The Overall Flag will be assigned if the Data Flag and CPV Flag at least for one sample are assigned (Example 3). If the Data Flag and K Flag for one or two samples are assigned, the Overall Flag is assigned as well (Example 4). (The ranges of the charts show the critical limits of the K values for the particular examples.)

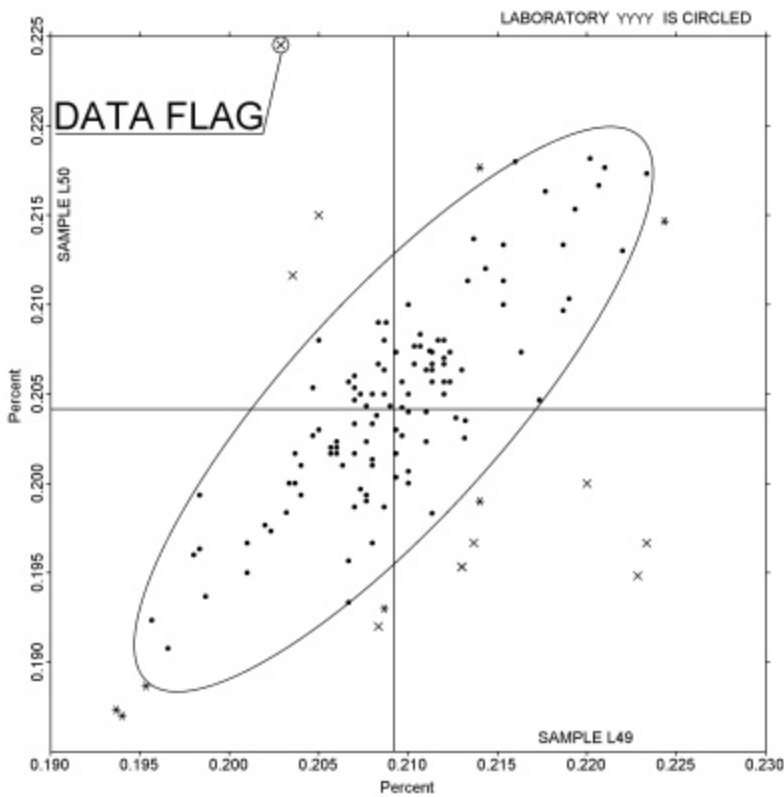
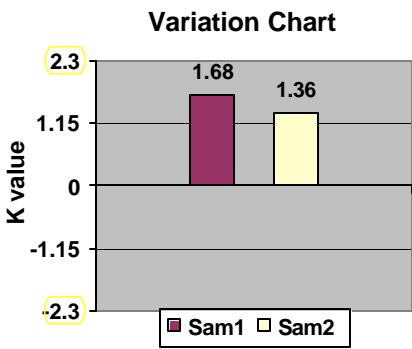
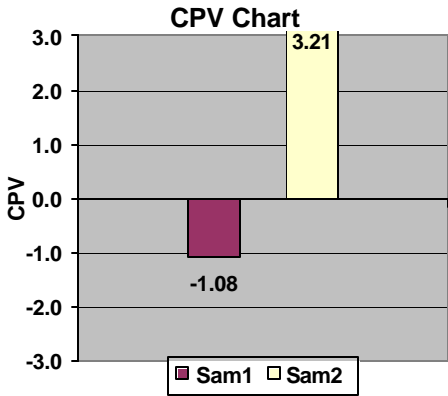
**Example 1.** “X”Data Flag is assigned (see the graph). No CPV Flags are assigned (see CPV Chart). No K Flags are assigned (see Variation Chart). In this case Overall Flag is not assigned.



**Example 2.** No “X”Data Flag is assigned (see the graph). Two CPV Flags are assigned (see CPV Chart). No K Flags are assigned (see Variation Chart). In this case Overall Flag is not assigned.



**Example 3.** “X”Data Flag is assigned (see the graph). One CPV Flag is assigned(see CPV Chart). No K Flags are assigned (see Variation Chart). In this case Overall Flag is assigned.



**Example 4.** “X”Data Flag is assigned (see the graph). No CPV Flags are assigned (see CPV Chart). Two K Flags are assigned (see Variation Chart). In this case Overall Flag is assigned.

