Technical Note

Uncompromising XIU Quality: Scaling Our Commitment to Performance by Integrating Advanced Asian Manufacturing into Our Global Operations

Introduction

A Crystal Interface Unit (XIU) is a critical component of a Quartz Crystal Microbalance (QCM) that enables the quartz crystal to resonate via INFICON ModeLock™ technology (*Fig. 1*). XIU performance repeatability is paramount to advanced processes for organic light-emitting diode (OLED) and optical deposition, as it is responsible for layer deposition rate, thickness optimization, and overall end-product quality.

Fig. 1: Representation picture of the Crystal Interface Unit (XIU)

As such, INFICON took deliberate steps when selecting a new manufacturing location in China to ensure established performance levels would be maintained. Extensive validation was conducted on new XIUs using proven methods for assessing and confirming optimal XIU performance.

Experimental Method

Every XIU manufactured by INFICON undergoes the following inspection criteria:

- **Cable Compensation Test**: Verifies the quartz crystal will resonate with the accepted cable length ranges per XIU specification
- **Long-Term Noise Test**: Verifies low noise floor for quartz crystal frequency measurements

Samples of both 781-600-G1 and 781-600-G2 XIUs manufactured at INFICON China were compared to reference samples manufactured at INFICON USA. Each XIU was exposed to the cable compensation test and the long-term noise test to ensure that the XIUs meet our testing criteria standards. To avoid potential systematic bias, comparison testing took place at INFICON USA.

Cable Compensation Test

Cable compensation testing verifies that using any acceptable cable lengths for the specified XIU will not impact the quartz crystal's performance. The test applies different amounts of capacitance to the XIU and verifies its fine and coarse capacitance adjustments can cancel out the capacitance that normally would come from the cable length used. If the fine or coarse adjustments stay above 0, then the XIU is able to correctly apply cable compensation.

For the 780-600-G1 and 781-600-G1 (78X-600-G1), cable lengths up to 2 meters are acceptable. The results of the cable compensation test confirm the fine adjustment did not drop below zero for capacitance values that equate to cable lengths up to 2.5 meters (*Figs. 2 and 3*). The results verify that 78X-600-G1 XIUs will accept all cable lengths up to 2.5 meters without degradation to the frequency signal from the attached quartz crystal. Figure 3 also shows a good overlap transition of coarse compensation branches for cable lengths when transitioning from one range of length to the next.

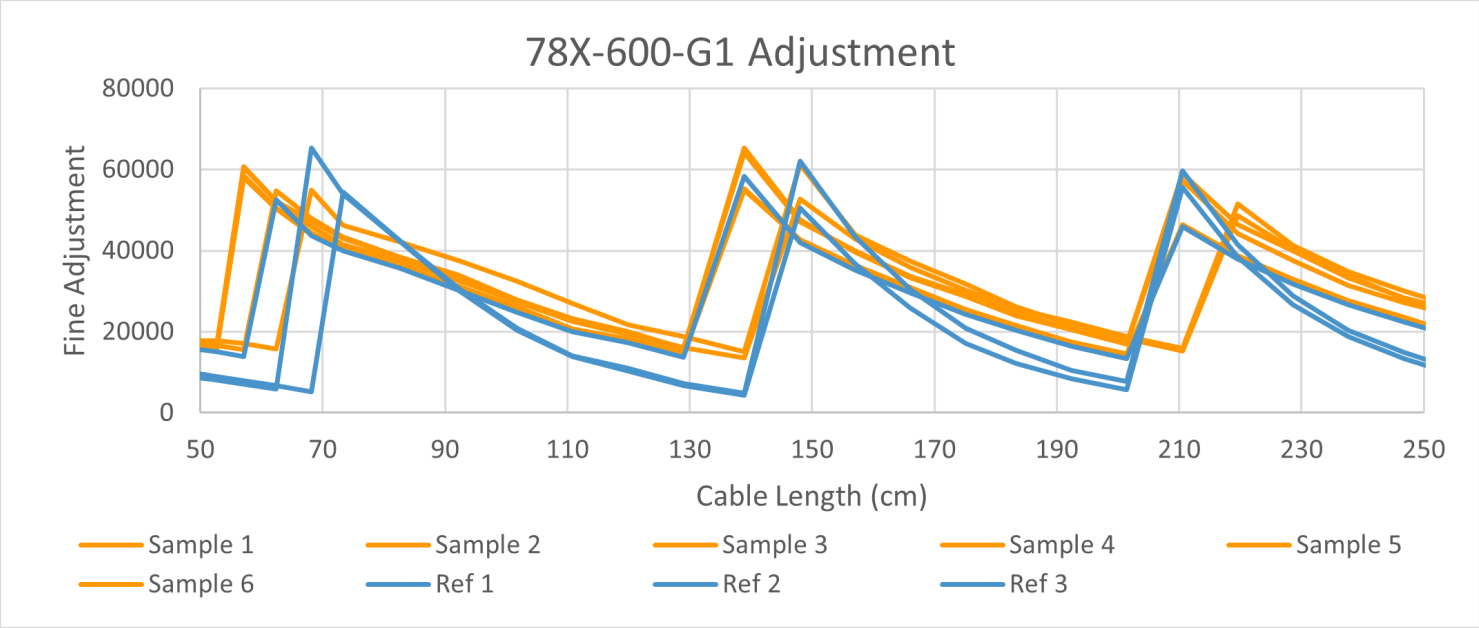

Fig. 2: Fine adjustments for cable compensation from cable lengths up to 2.5 meters.

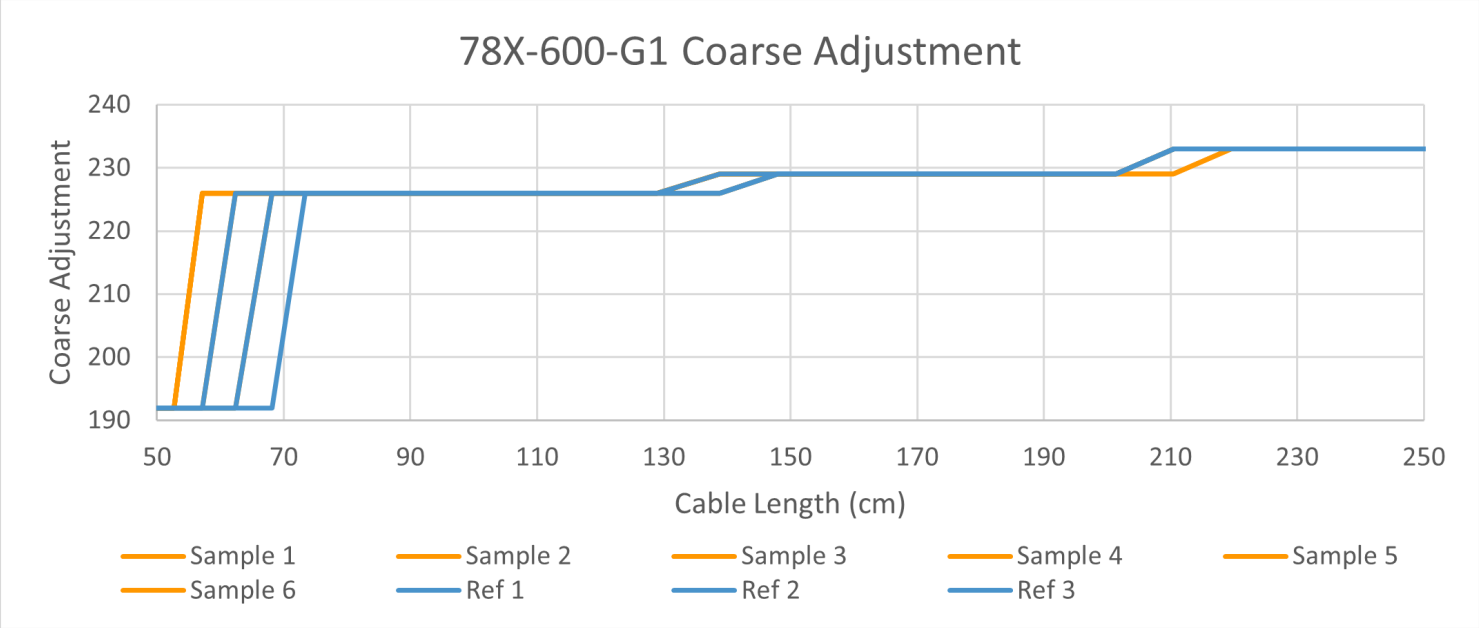

Fig. 3: Coarse adjustments for cable compensation from cable lengths up to 2.5 meters.

For the 780-600-G2 and 781-600-G2 (78X-600-G2), cable lengths between 3 meters and 4.5 meters are acceptable. The results of the cable compensation test confirm the fine adjustment did not drop below zero for capacitance values that equate to cable lengths between 3 meters and 4.5 meters (*Figs. 4 and 5*). The results verify that 78X-600-G1 XIUs will accept all cable lengths between 3 meters and 4.5 meters without degradation to the frequency signal from the attached quartz crystal.

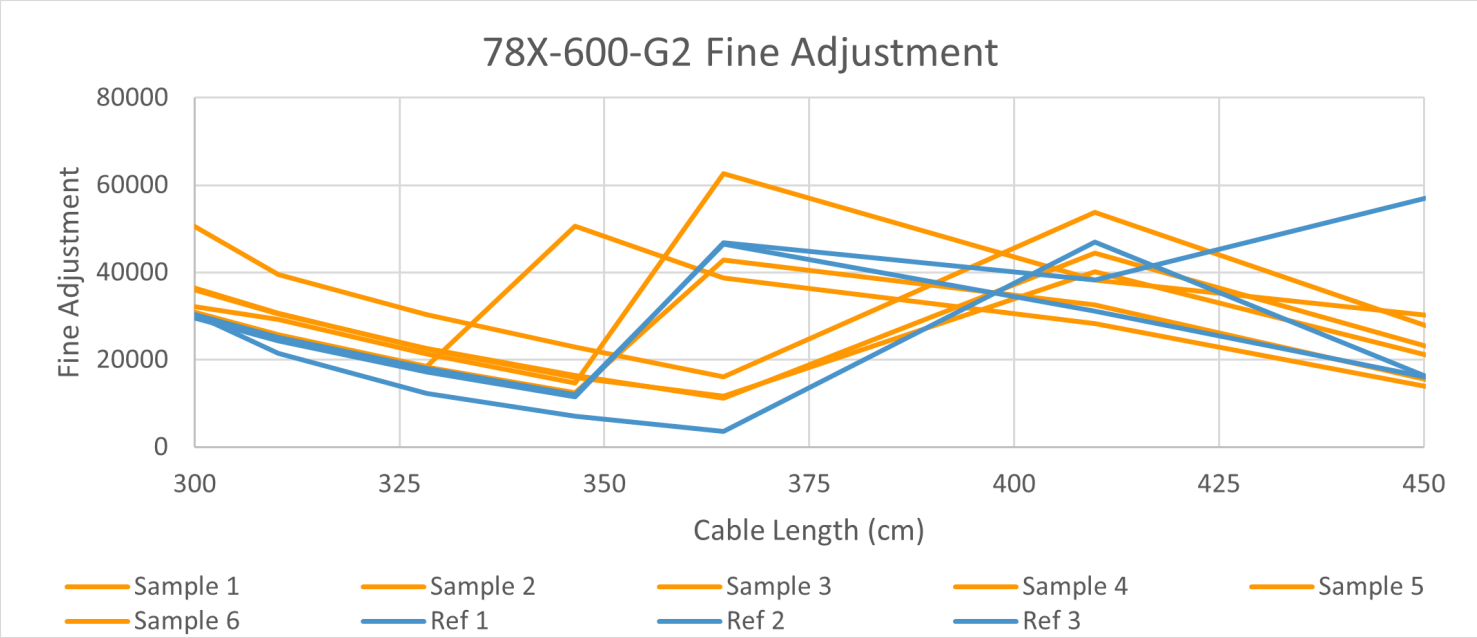

Fig. 4: Fine adjustments for cable compensation from cable lengths between 3 meters and 4.5 meters.

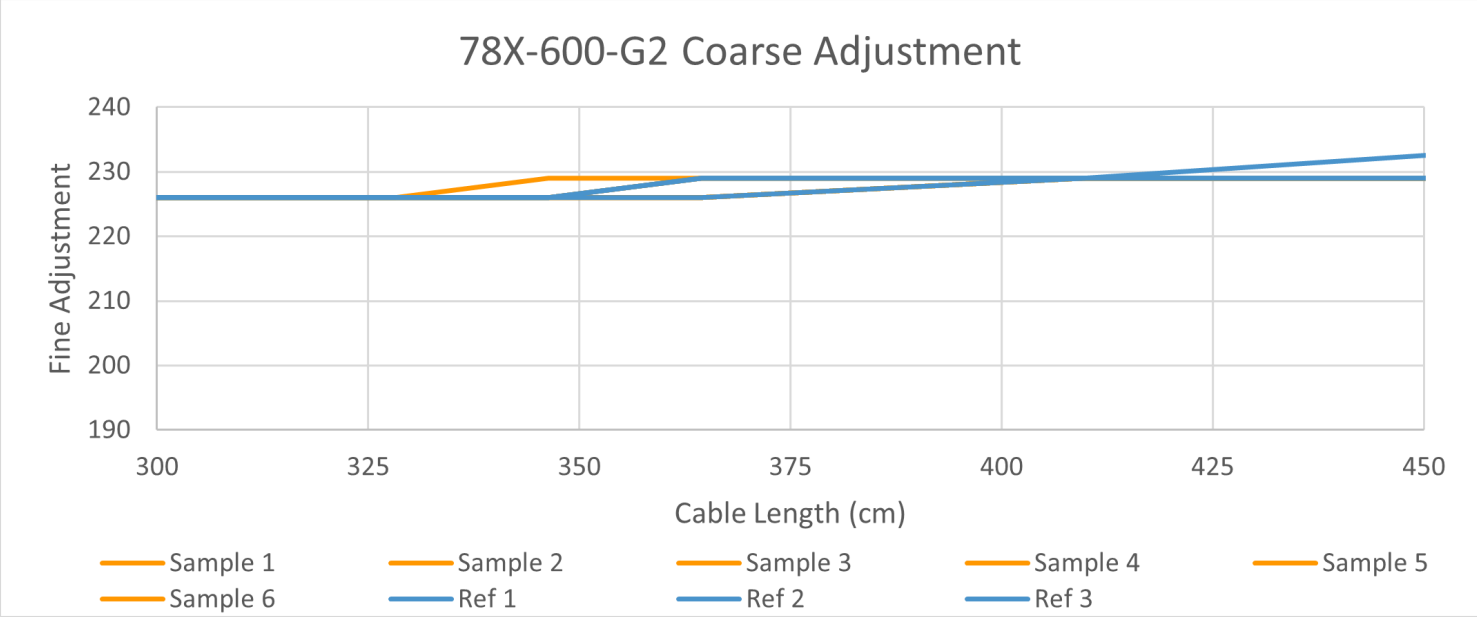

Fig. 5: Coarse adjustments for cable compensation from cable lengths between 3 meters and 4.5 meters.

Long-Term Noise Test

A long-term noise test is conducted on each XIU to guarantee low noise rate and thickness measurements. This test observes the frequency of a thermally isolated quartz crystal standard and looks for unexpected changes in frequency that would otherwise be induced by the XIU. This test uses controllers, interconnect cables, BNC cables, and connectors that are of very low noise to evaluate the noise component resulting from the XIU under test. This test is conducted for a minimum of 14 hours, which rules out the possibility of premature failure.

All XIUs built in both manufacturing locations pass our testing credentials. Long-term noise test results on units manufactured at INFICON China perform the same as those manufactured at INFICON USA (*Table 1*), ensuring that all XIUs are high quality and will not be a source of noise in QCM rate and thickness measurements.

Item	Result	Bin3	Bin4	Bin5	Bin6	Time (hours)
Old 1	**Pass**	0	0	0	0	15.8
Old 2	**Pass**	325	16	0	0	15.8
New 1	**Pass**	0	0	0	0	15.9
New 2	**Pass**	0	0	0	0	14.7
New 3	**Pass**	0	0	0	0	14.7
New 4	**Pass**	0	0	0	0	15.9
New 5	**Pass**	0	0	0	0	14.7
New 6	**Pass**	0	0	0	0	15.9
New 7	**Pass**	20	0	0	0	20.2
New 8	**Pass**	0	0	0	0	20.2
New 9	**Pass**	0	0	0	0	19.5
New 10	**Pass**	0	0	0	0	19.5

Table 1: XIUs produced at both locations have the same passing long-term noise test results.

Summary

In order to ensure the location change for manufacturing has not impacted the quality or performance of our XIUs, we have investigated both long-term noise and cable compensation. Data collected from both tests indicate that INFICON 780-600-G1, 781-600-G1, 780-600-G2, and 781-600-G2 XIUs maintain the same level of quality and performance, regardless of manufacturing location.

Ultimately, this strategic evolution to integrate advanced Asian manufacturing into our global operations is about more than just location—it's about precision at scale. Our priority remains exactly where it has always been: delivering proven quality and performance. By leveraging Asia's world-class centers for excellence, we ensure that our products continue to meet the highest performance standards while increasing our ability to serve customers more efficiently. We are excited to embark on this next chapter of growth, anchored by an uncompromising commitment to excellence.