

# Early Performance Evaluation of cobas® HBV, cobas® HCV and cobas® HIV-1 Quantitative Nucleic Acid Tests for use on the new cobas® 6800/8800 Systems

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## ABSTRACT

**Background:** Accurate and timely molecular test results play an important role in patient management, the laboratory must develop greater efficiencies and flexibility in testing in order to accommodate a growing number of molecular diagnostics tests. The cobas® 6800/8800 Systems completely automate the processing of patient samples all the way through to final results for a combination of up to 3 different tests in parallel. Here we describe the first experience on the new system at Biomnis, FR including analytical performance data for 3 new virology assays cobas® HBV, cobas® HCV and cobas® HIV-1.

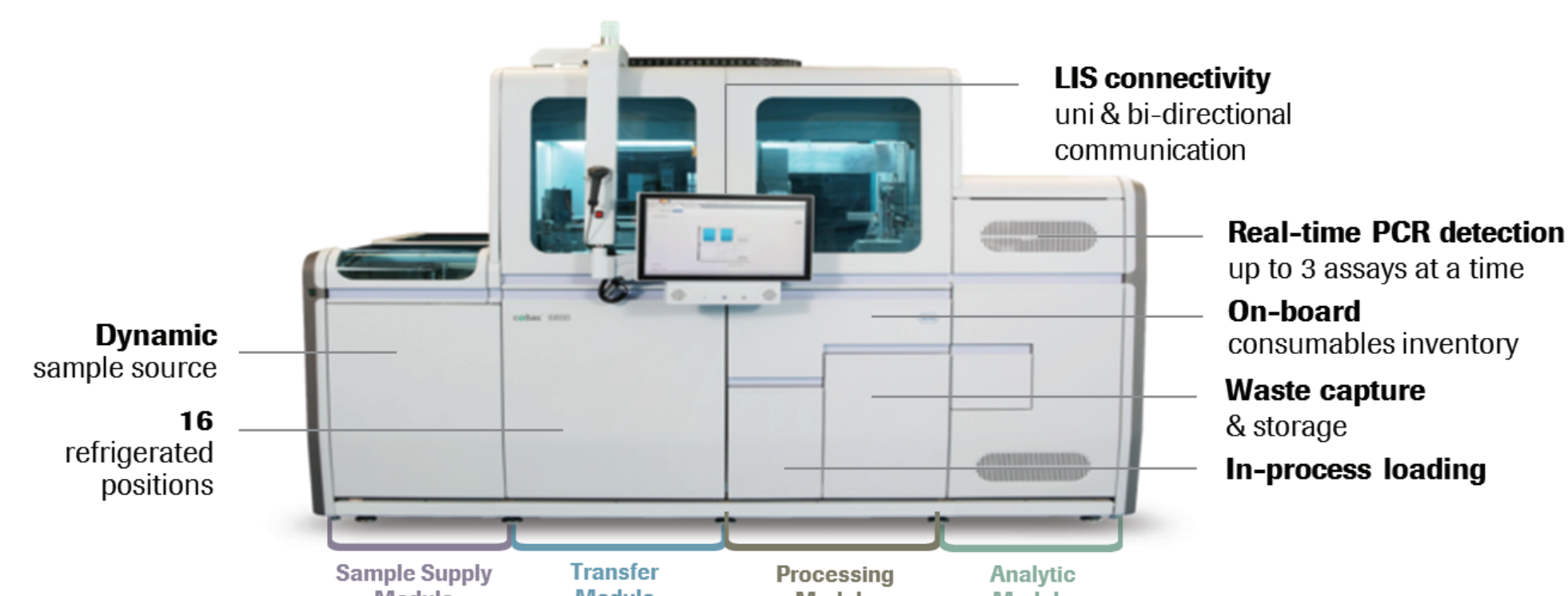
**Method:** The assays were evaluated on cobas® 6800 System for linearity, genotype (GT) inclusivity (HBV GTs A, B, C, D, H, HCV GTs 1a, 1b, 2-6 and HIV-1 Subtypes B and C) and repeatability using commercial panels (Qnostics, UK). In addition, time to first results was assessed using de-identified clinical samples.

**Results:** cobas® HCV, cobas® HBV and cobas® HIV-1 demonstrated a high level of linearity after ordinary least squares (OLS) analysis with r-square values respectively 0.99, 0.99 and 0.97. Linearity panels consist of up to 6 members covering the lower to middle range (1.7 to 4.3 log<sub>10</sub> IU/mL) for HCV and HBV assays and 4 members ranging from 2.8 to 4.0 log<sub>10</sub> cp/mL for cobas® HIV-1 test. For cobas® HCV (n=36), cobas® HBV (n=30) and cobas® HIV-1 (n=30) samples were analyzed resulting in y=0.99x+0.11, y=0.95x-0.03 and y=0.92x+0.46 respectively for OLS analysis. Repeatability of results was high with log<sub>10</sub> SD values < 0.13 log<sub>10</sub> for all assays. Full GT coverage was demonstrated for cobas® HCV and all isolates were quantified with good accuracy (< 0.33 log<sub>10</sub> difference). For cobas® HBV and cobas® HIV-1 subsets of GTs were measured demonstrating good accuracy (< 0.16 log<sub>10</sub> and < 0.25 log<sub>10</sub> difference respectively). All samples were loaded at once and the system continued processing without the need of pre-sorting. The system delivered the first 87 results after < 3.5 hours and a second batch after an additional 85 minutes.

**Conclusion:** We demonstrated that the new cobas® assays perform well based on a limited set of data. The new cobas® 6800 system combines multiple target parallel testing and fast turnaround time and is well suited to support current and future needs of laboratories.

## SYSTEM CHARACTERISTICS

The cobas® 6800 System is an analytic system that is distinguished by throughput and is run along with an Instrument Gateway for data management, scheduling and workflow control. The cobas® 6800 System is designed to run up to 384 tests per 8-hour shift. In addition, each analytic system contains (as an accessory) a Sample Supply Module for loading and unloading samples.



Each system is comprised of the cobas® 6800 instrument, system software, Assay Specific Analysis Packages (ASAP), assay reagents (test-specific reagents and universal reagents such as sample preparation reagents, wash buffer, etc.) and consumables / accessories (such as P-plates, racks, AD-plates, waste bags, pipette tips, and secondary tubes).

## RESULTS — Linearity

Linearity for HCV, HBV and HIV-1 were analyzed with linearity panels for the respective targets. Panel members were tested in duplicates over 3 different runs on the cobas® 6800 system. The results are presented in figures 1, 2 and 3.

Figure 1. Linearity plot for an HCV linearity panel with 6 levels tested with cobas® HCV

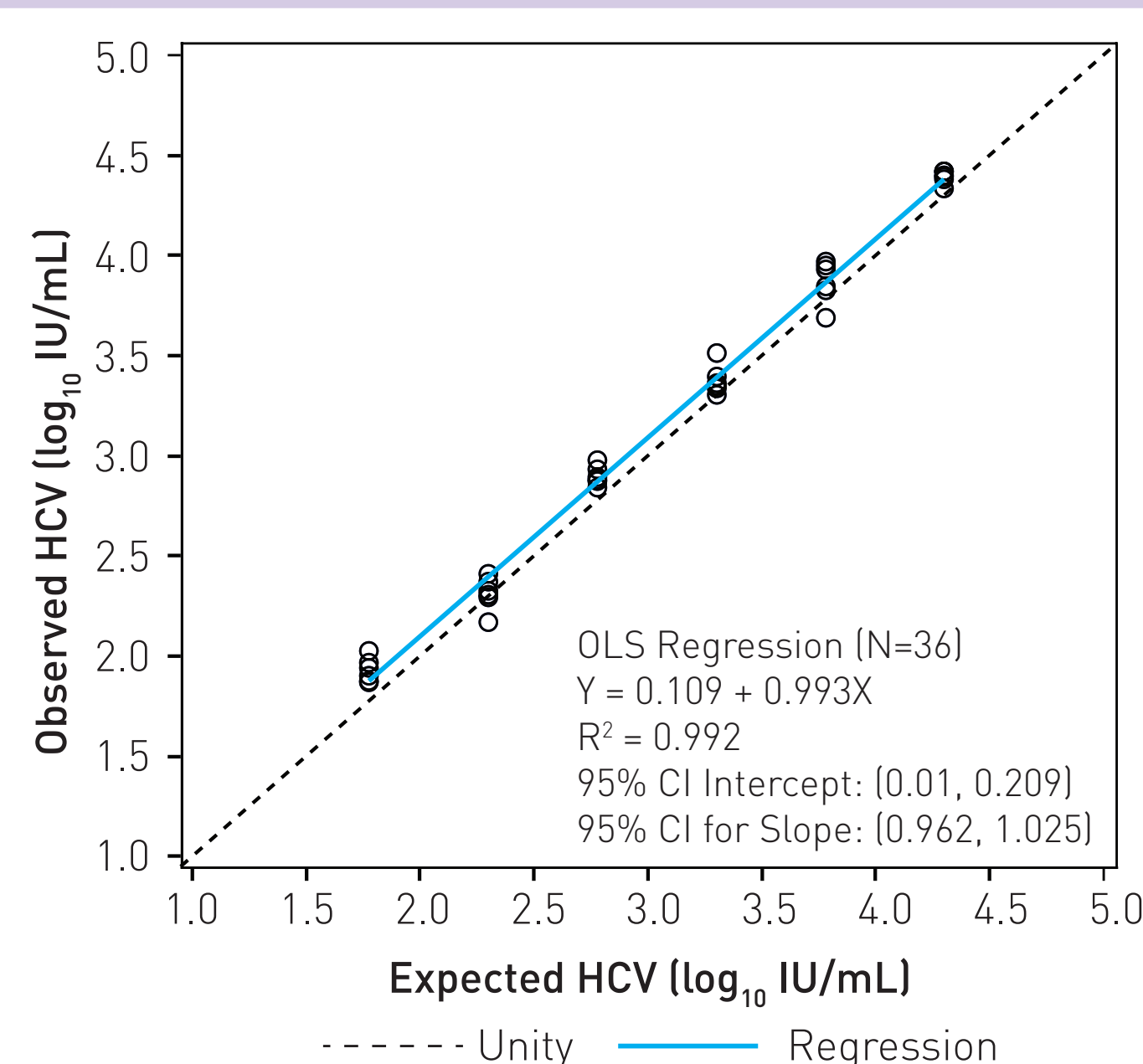


Figure 2. Linearity plot for an HBV linearity panel with 4 levels tested with cobas® HBV

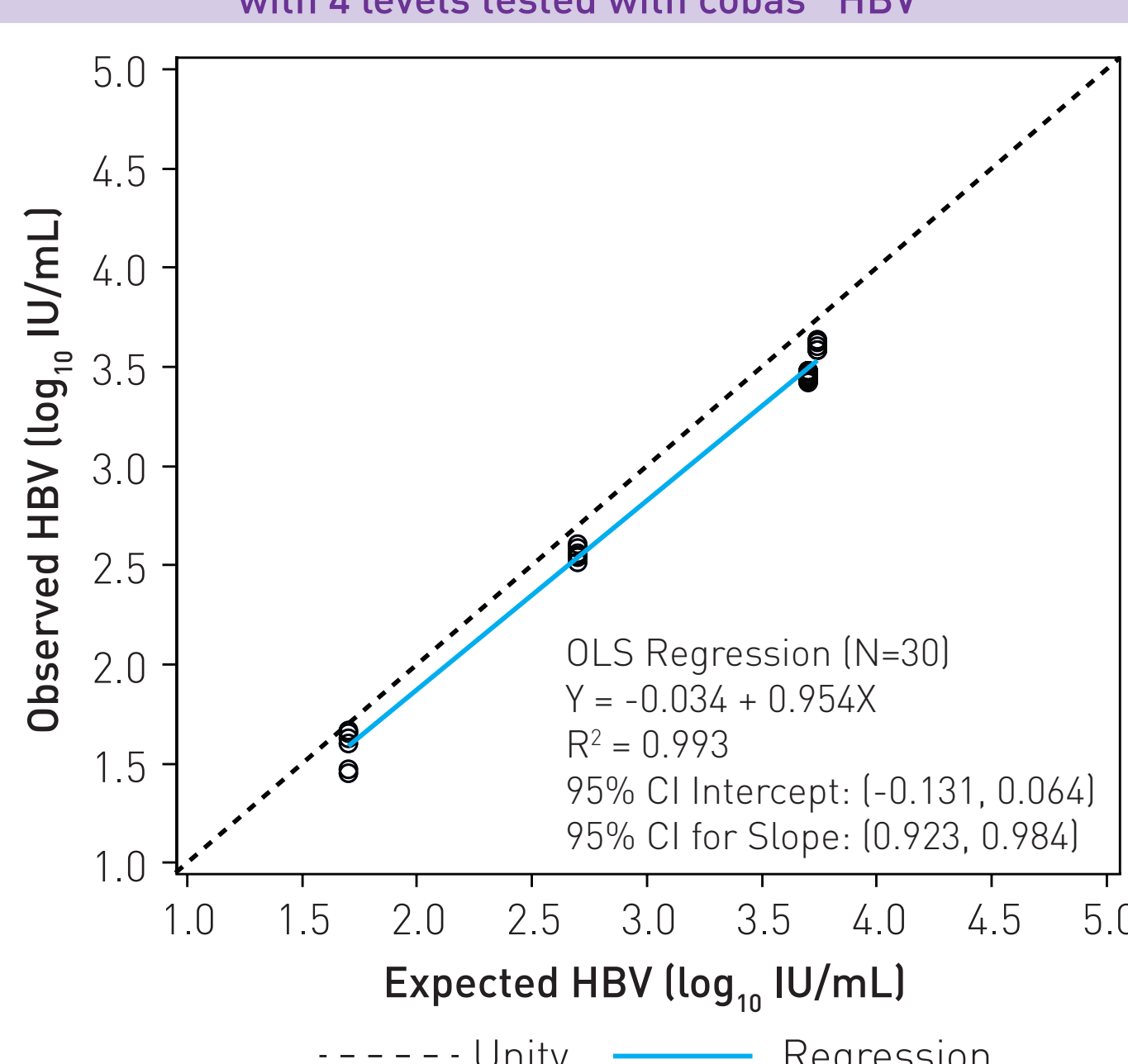
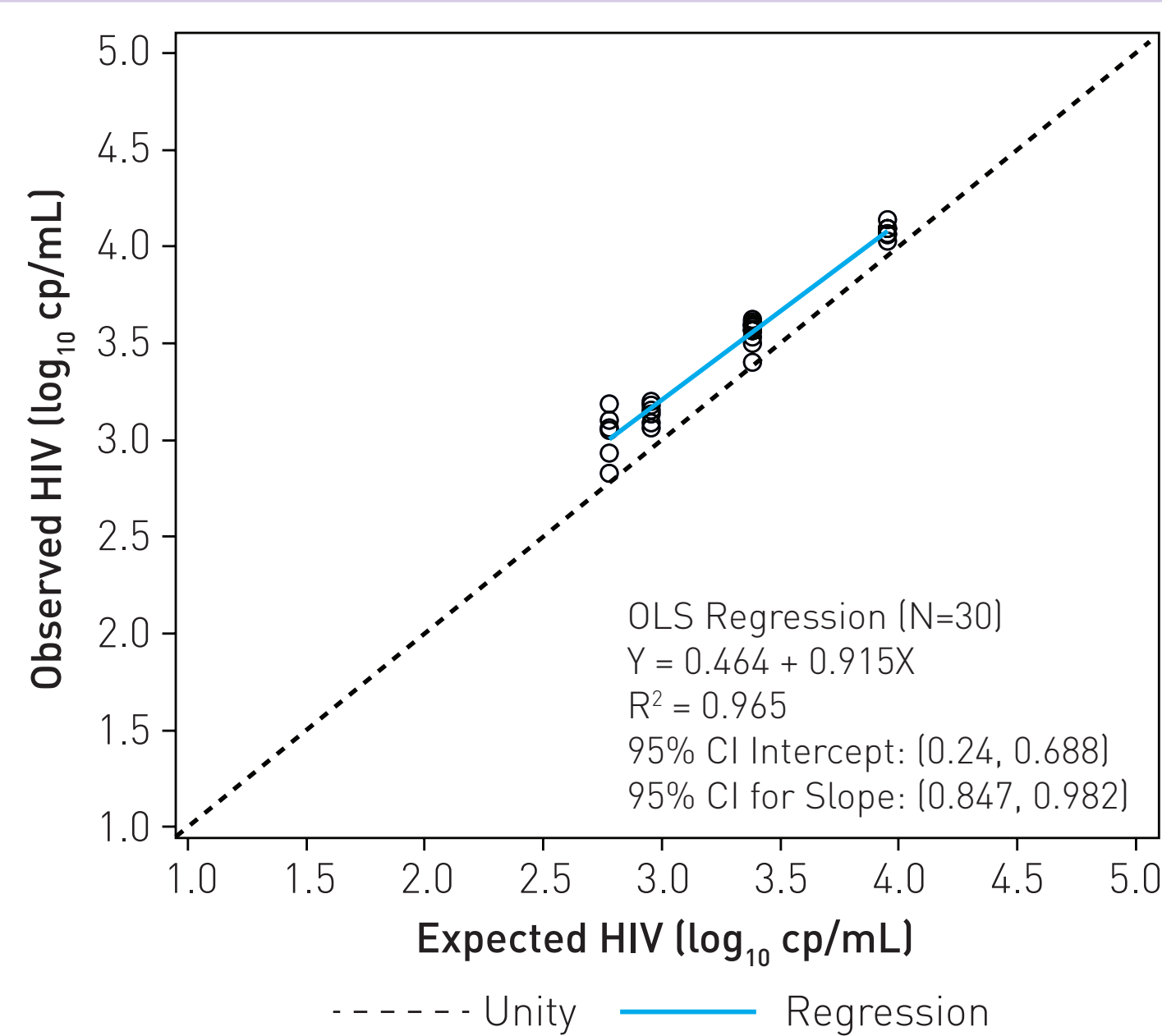


Figure 3. Linearity plot for an HIV-1 linearity panel with 4 levels tested with cobas® HIV-1



- Overall the equations show good linearity even with the small number of samples tested with R<sup>2</sup> result of 0.992 for HCV, 0.993 for HBV and 0.965 for HIV

## RESULTS — Repeatability of results and precision

Panel members were tested in duplicates in 3 different runs. The results were combined in tables 1 to 3.

### HCV

Table 1. Mean observed results and standard deviation for an HCV panel with 6 levels

Nominal Titer (IU/mL)	Nominal Concentration (log <sub>10</sub> IU/mL)	N	Observed Mean (IU/mL)	Observed Mean (log <sub>10</sub> IU/mL)	Observed SD (log <sub>10</sub> IU/mL)	log <sub>10</sub> Difference (observed - nominal)
20000	4.30	6	24644	4.39	0.03	0.09
6000	3.78	6	7545	3.87	0.10	0.09
2000	3.30	6	2414	3.38	0.07	0.08
600	2.78	6	796	2.90	0.05	0.12
200	2.30	6	208	2.31	0.08	0.01
60	1.78	6	85	1.93	0.06	0.15

### HBV

Table 2. Mean observed results and standard deviation for an HBV panel with 4 levels.

Nominal Titer (IU/mL)	Nominal Concentration (log <sub>10</sub> IU/mL)	N	Observed Mean (IU/mL)	Observed Mean (log <sub>10</sub> IU/mL)	Observed SD (log <sub>10</sub> IU/mL)	log <sub>10</sub> Difference (observed - nominal)
5500	3.74	6	4083	3.61	0.02	-0.13
5000	3.70	12	2819	3.45	0.02	-0.25
500	2.70	6	364	2.56	0.03	-0.14
50	1.70	6	39	1.58	0.09	-0.12

### HIV

Table 3. Mean observed results and standard deviation for an HIV panel with 4 levels

Nominal Titer (cp/mL)	Nominal Titer (log <sub>10</sub> cp/mL)	HIV subtype	N	Observed Mean (cp/mL)	Observed Mean (log <sub>10</sub> cp/mL)	Observed SD (log <sub>10</sub> cp/mL)	log <sub>10</sub> Difference (observed - nominal)
9000	3.95	C	6	12051	4.08	0.04	0.13
2400	3.38	B	12	3673	3.56	0.06	0.18
900	2.95	B	6	1374	3.14	0.05	0.18
600	2.78	C	6	1099	3.03	0.13	0.25

- Repeatability of results was high with log<sub>10</sub> SD values < 0.13 log<sub>10</sub> for all assays

## RESULTS — Genotype inclusivity and precision

Genotype inclusivity was assessed by testing 2 replicates of a genotype panel in 3 consecutive runs for HCV and HBV. The mean titer is indicated in the bars on figures 4 and 5.

The number above the bars represents the standard deviation (SD) of the mean observed results.

Figure 4. Mean results and SD values per HCV genotype

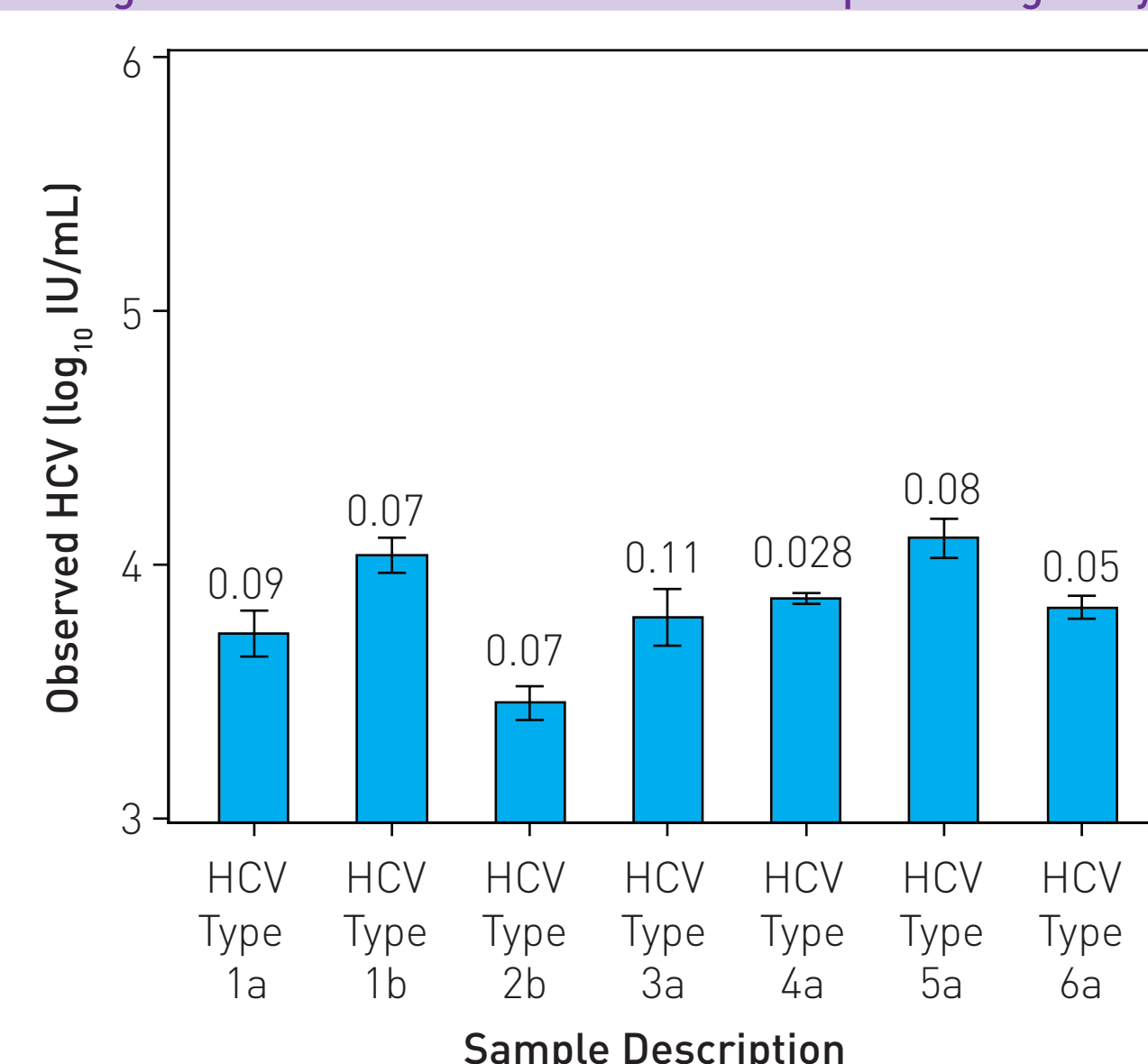
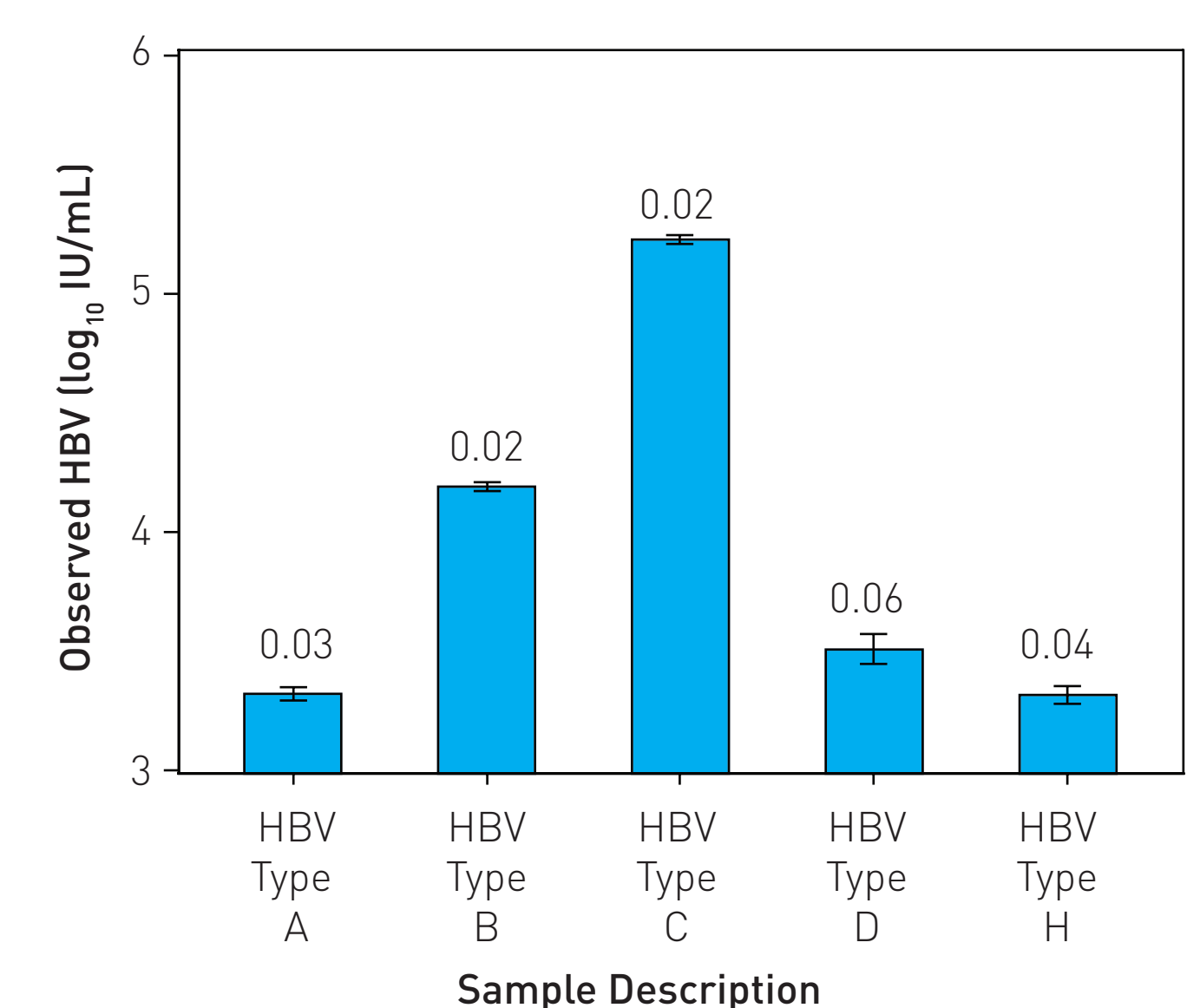


Figure 5. Mean results and SD per HBV genotype



- SD values for duplicate measures are tight not exceeding 0.11 log<sub>10</sub>

## RESULTS — Repeatability of results and precision

Genotype panel members were tested in duplicates in 3 different runs. The results were combined in tables 4 and 5.

### HCV

Table 4. Mean observed results and standard deviation for an HCV genotype panel

HCV Genotype	Nominal Titer	Log <sub>10</sub> Target Concentration	N	Observed Mean	Log <sub>10</sub> Observed Mean	SD Log <sub>10</sub> Observed	Log <sub>10</sub> Diff (obs - nominal)
1a	4786	3.68	6	5485.20	3.73	0.09	0.05
1b	5623	3.75	6	11030.44	4.04	0.07	0.29
2b	2512	3.4	6	2888.12	3.46	0.07	0.06
3a	5012	3.7	5	6381.69	3.79	0.11	0.09
4	6026	3.78	6	7408.66	3.87	0.02	0.09
5a	6026	3.78	6	12915.58	4.11	0.08	0.33
6a	5012	3.7	6	6822.23	3.83	0.05	0.13

- Full GT coverage was demonstrated for cobas® HCV and all isolates were quantified with good accuracy (SD ≤ 0.33 log<sub>10</sub> difference).

### HBV

Table 5. Mean observed results and standard deviation for an HBV genotype panel

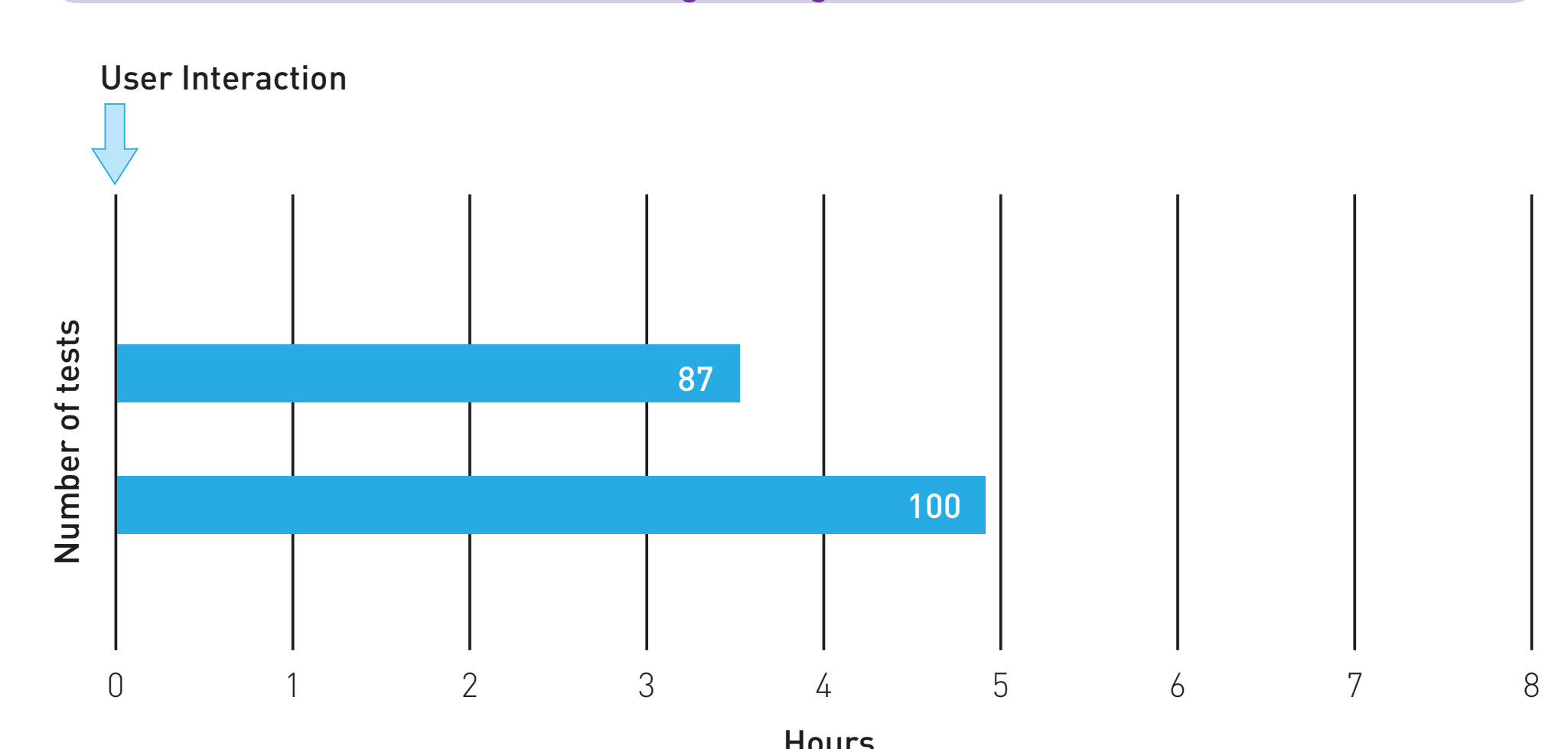
HBV Genotype	Nominal Titer	Log <sub>10</sub> Target Concentration	N	Observed Mean	Log <sub>10</sub> Observed Mean	SD Log <sub>10</sub> Observed	Log <sub>10</sub> Diff (obs - nominal)
A	1778	3.25	6	2098.74	3.32	0.03	0.07
B	16982	4.23	6	15587.14	4.19	0.02	-0.04
C	117490	5.07	6	168594.79	5.23	0.02	0.16
D	3236	3.51	6	3248.28	3.51	0.06	0.00
H	2570	3.41	6	2078.54	3.32	0.04	-0.09

- For cobas® HBV a subset of the most relevant genotypes was measured demonstrating good accuracy (SD ≤ 0.25 log<sub>10</sub> difference)

## RESULTS — Time to results

Time to results was assessed using 100 de-identified clinical samples left-overs from routine testing (50 for HIV-1 and 50 for HCV) and is represented in Figure 6. Figure 7 illustrates the system capabilities.

Figure 6. Time to results for the clinical samples observed during testing (excludes controls)



- The only intervention after initial set up and load of kits and reagents on the system was sample loading that took 10 min.

## Conclusion

We demonstrated that the new cobas® assays perform well based on a limited set of data. The new cobas® 6800 system combines multiple target parallel testing and fast turnaround time and is well suited to support current and future needs of laboratories.