A Test Platform for Lab Quality Testing at the Point-of-Care

Katrin Steinmetzer, Torsten Schulz, Thomas Ullrich, Eugen Ermantraut
Alere technologies GmbH
Jena/Germany

Product Requirements for POC Platform / POC HIV VL Test

- sample collection should be simple and require no sample handling prior to loading onto test device
- any contamination risks to be addressed
- instruments must be portable
- limited user input
- quick system/test setup
- test turn-around time < one hour
- test to provide internal process controls (nucleic acid purification, amplification and detection), be compatible with EQA schemes and to cover all clinical relevant genotypes of target virus (HIV-1/HIV-2)
- support quality assurance and performance monitoring through connectivity
- no compromises on analytical performance
- viable manufacturing and deployment costs

The sample of choice: Capillary Whole Blood

Frequent Detection of Cell-Associated HIV-1 RNA in Patients With Plasma Viral Load <50 Copies/ml

Bernd Kupfer,[1] Bertfried Matz,[1] Martin P. Däumer,[2] Fabienne Roden,[2] Jürgen K. Rockstroh,[3] Nazifa Qurishi,[3] Ulrich Spengler,[3] and Rolf Kaiser[2]*

Journal of Medical Virology 79:1440–1445 (2007)

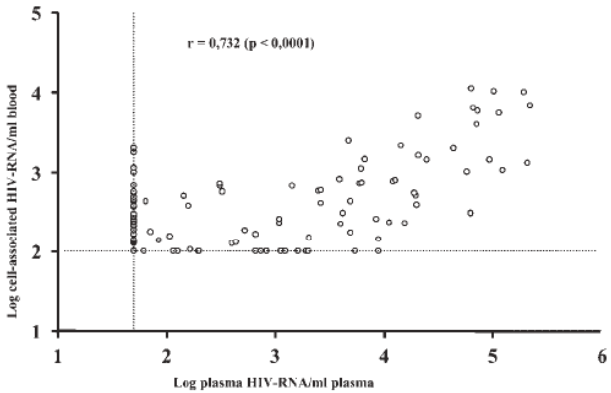
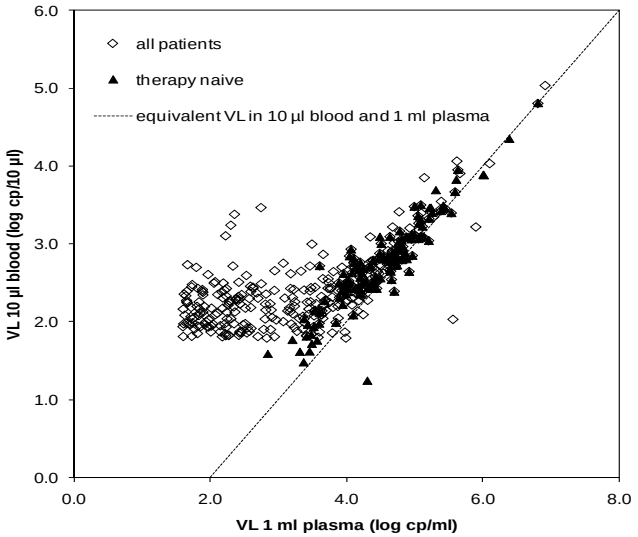


Fig. 1. Correlation between pVL and cVL. The dotted lines represent the lower detection limits of the assays used in this study. r: Spearman rank correlation coefficient; *P*: significance value. *P*-values <0.05 were regarded as significant.

Data in the public domain supports the idea of using viral RNA in whole blood as a measure for viral replication

Diagram shows results for plasma VL > 40 cp/ml



Comparison of VL data obtained from single measurement with 10 µl WB and 1 ml of plasma of 1094 samples from 126 donors confirmed to be infected with HIV.

Correlation found for samples with a plasma VL >3000cp (r=0.863, P<0.001); below Plasma VL of 3000cp/ml no correlation was found (r=0.011,P=0.895) but rather a baseline. Baseline level WB most probably reflects cell- associated nucelic acids. [1)]

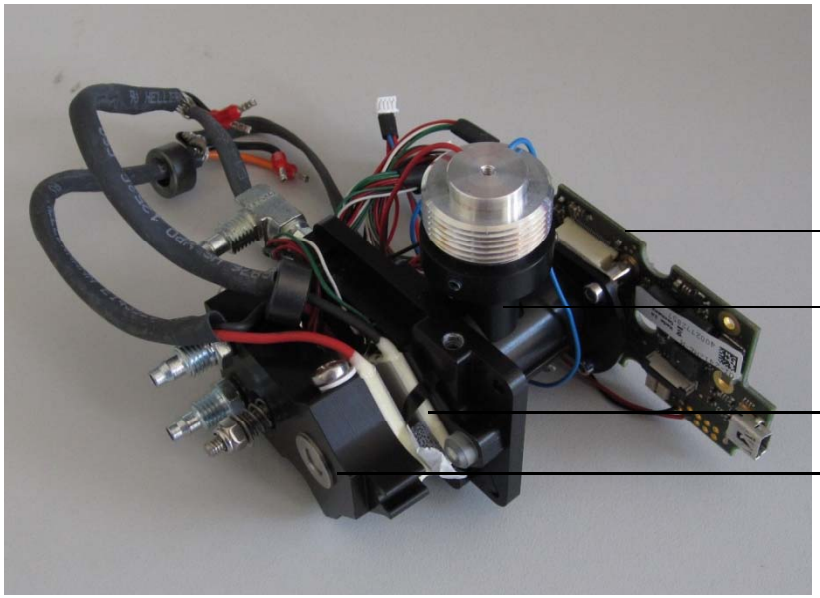
[1)] HIV Viral Load Testing with Small Samples of Whole Blood; Steinmetzer et al, JClin Microbiol 2010

The qNAT Platform

qNAT Analyzer/ HIV VL Test Prototype

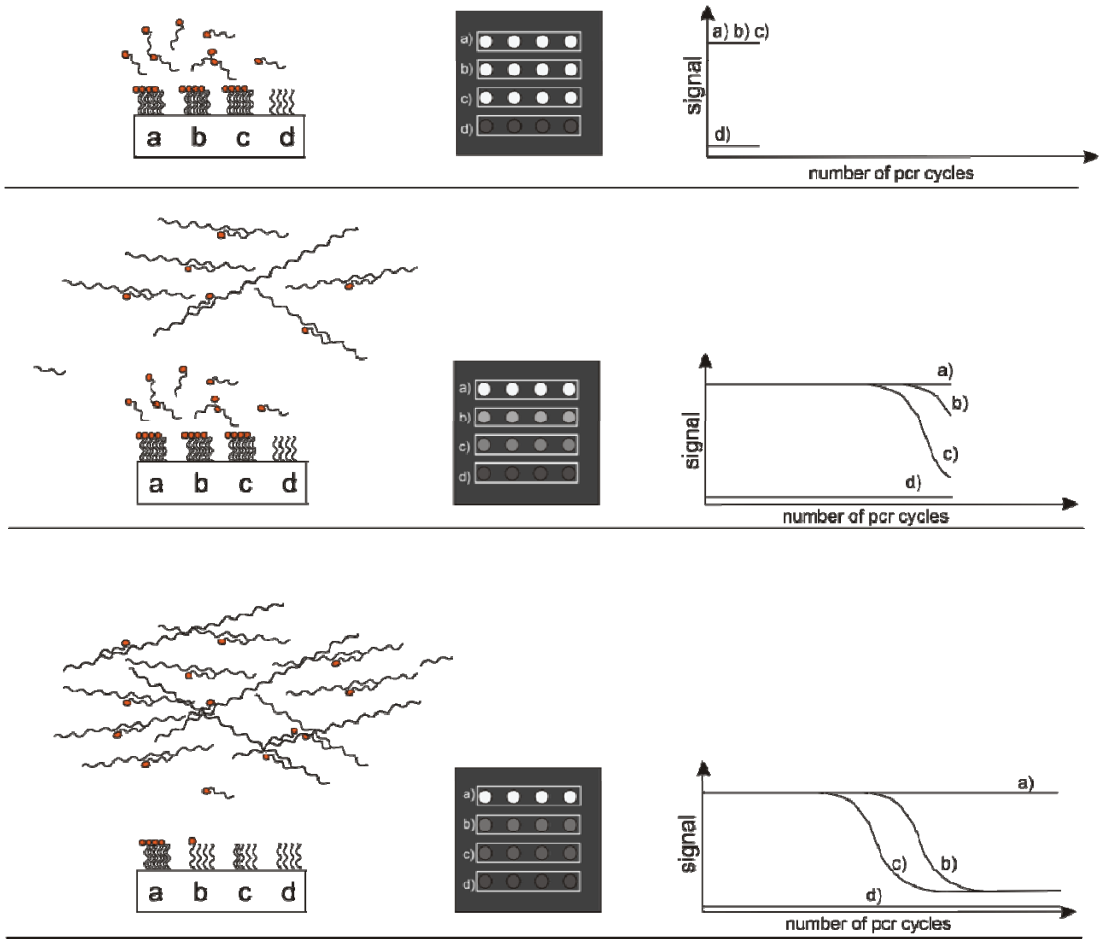
Battery powered instrument accommodates seamless test processing including:

- fully automated sample preparation and nucleic acid extraction
- high speed target amplification and real time multiplex detection based on proprietary CMA (competitive reporter amplification) assay format
- automatic signal processing and data analysis
- data export and archiving functions



Combined temperature control and real time florescence imaging module used in the qNAT instrument

The Principle of Competitor Monitored Amplification (CMA)



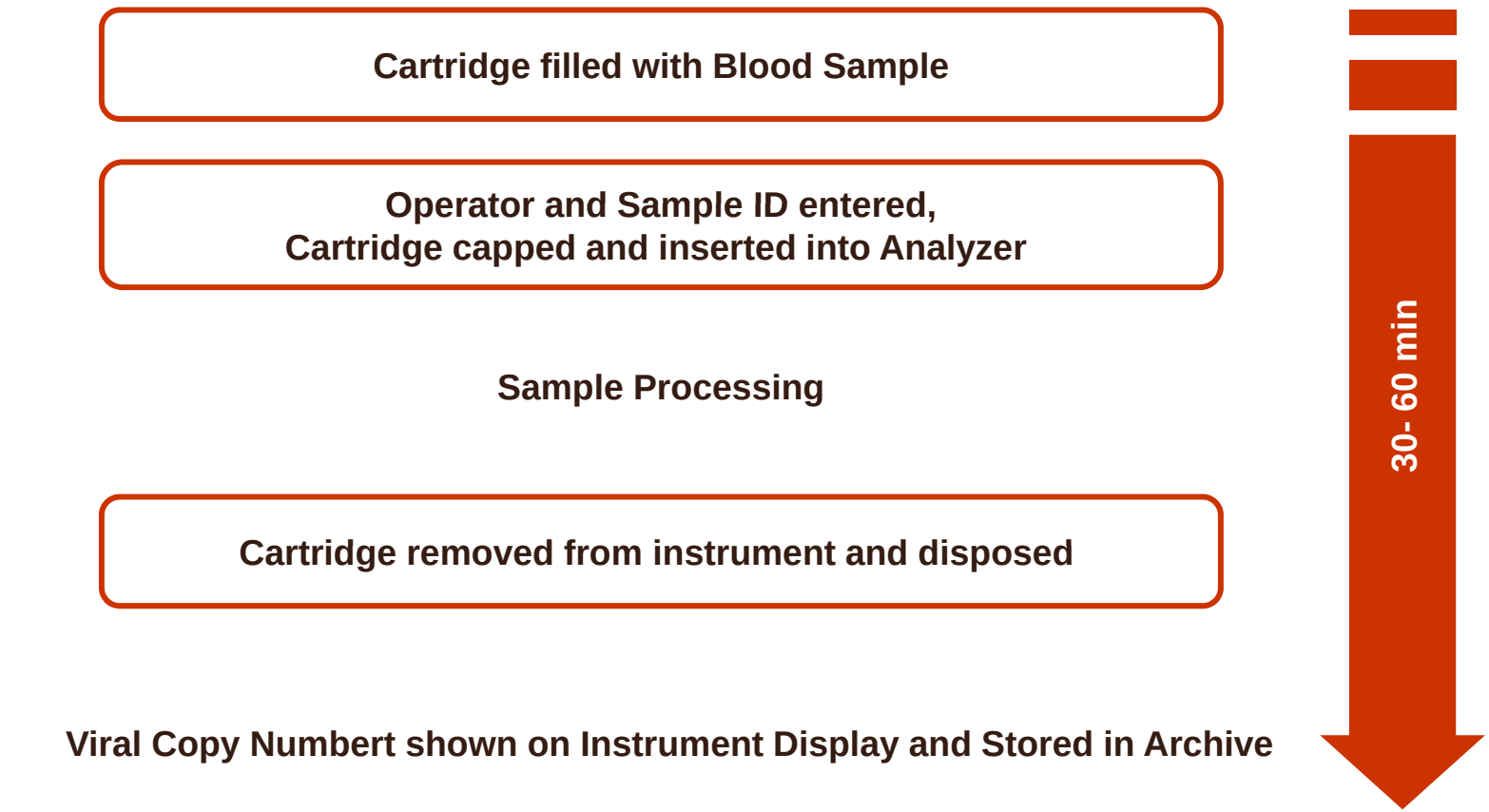
a) positive hybridization control
b) Target
c) internal control
d) negative hybridization control

Simultaneous quantitative detection of the amplified target is achieved by using fluorescence labelled reporter oligonucleotides complimentary to probes immobilized on the microarray and to the respective site of the molecular target. The signal on the respective positions on the array is collected by fluorescence imaging for each cycle.

The more target is produced in solution the less reporters bind to the probes on the microarray.

By using just one fluorescence dye for all targets and controls we overcome the limitations of current real time quantification methods

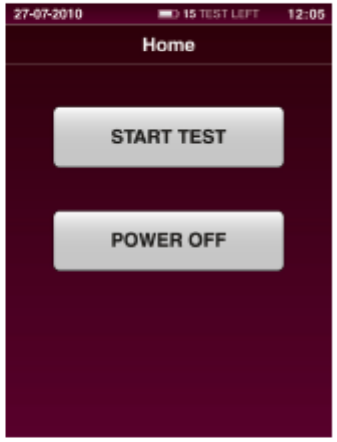
Test Workflow



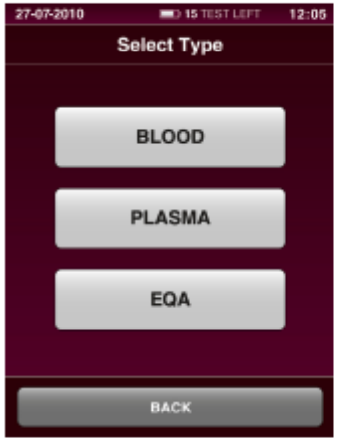
qNAT/ HIV VL Sample Collection

qNAT/HIV VL User Interface

Boot Screen | *Hochfahren*

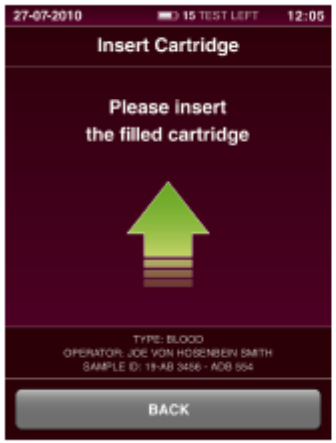


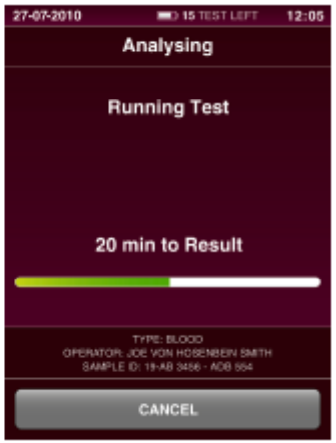
Home

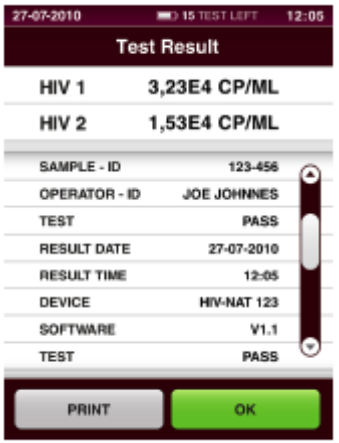


Test Selection | *Auswahl Teststart*

Select Operator | *Auswahl Operator*







Test result with connected printer
Testergebnis mit angeschlossenem Drucker

- Performance Data on HIV VL test

- More Applications

- User Experience

- Points to be considered for Implementation