QUBIT® 2.0 FLUOROMETER

invitrogen™
by life technologies™

accuracy gets you
what you're looking for

Qubit® 2.0 Fluorometer

For your precious samples and high-value applications

life technologies™

Who should use the Qubit® 2.0 Fluorometer?

If you work with **precious samples** or perform **delicate applications** or applications for which you have a significant investment in the outcome of the research, Qubit® fluorometric quantitation is the ideal choice for you. Ask yourself:

— Are my samples rare and difficult to process?
— Do I have only small quantities of DNA, RNA, or protein after extraction?
— Is the sample going to be used in expensive downstream experiments?
— Do I use applications like quantitative real-time PCR (qPCR) or next-generation sequencing that require precise measurements?
— Will I perform transfection or other applications where it may be days or weeks before I get results?
— Am I doing complex sample preparation that takes special skills, like laser capture microdissection?

If you answered yes to any of these questions, then Qubit® fluorometric quantitation is for you.

Why use the Qubit® 2.0 Fluorometer?

The Qubit® 2.0 Fluorometer utilizes specifically designed fluorometric technology using Molecular Probes® dyes. These fluorescent dyes emit signals ONLY when bound to specific target molecules, even in the presence of free nucleotides or degraded nucleic acids. Qubit® fluorometric quantitation provides the most specific and sensitive DNA and RNA quantitation available, even at low concentrations.

- Selective—Qubit® fluorometric quantitation (Figure 1) uses Qubit® assays (Table 1) that contain advanced dyes that only fluoresce when bound to DNA, RNA, or protein. This specificity allows you to get very accurate results because Qubit® technology only reports the concentration of the molecule of interest, not contaminants.
- Sensitive—each Qubit® assay kit is highly sensitive for a single analyte. Samples with concentrations as low as 10 pg/µL of DNA, and 12.5 µg/mL of protein, may be accurately and reliably quantitated.
- Simple and intuitive—the new Qubit® 2.0 Fluorometer provides the same high accuracy you've come to expect but now is even faster and requires less effort to use.

The new features include:

- *Large LCD color touch screen*
- *Automatic data logging and USB port for data management*
- *Easy workflow navigation*
- *Standard curve display after calibration completion*

Figure 1. The Qubit® Fluorometric Quantitation System.

Table 1. Assay ranges for the Qubit® assay kits.

Kit	Assay range	Sample starting concentration
Qubit® dsDNA HS Assay	0.2–100 ng	10 pg/µL–100 ng/µL
Qubit® dsDNA BR Assay	2–1000 ng	100 pg/µL–1 µg/µL
Qubit® ssDNA Assay	1–200 ng	50 pg/µL–200 ng/µL
Qubit® RNA Assay	5–100 ng	250 pg/µL–100 ng/µL
Qubit® RNA BR Assay	20–1000 ng	1 ng/µL–1 µg/µL
Qubit® Protein Assay*	0.25–5 µg	12.5 µg/mL–5 mg/mL

*** The Qubit® Protein Assay is compatible with all reducing reagents. It is compatible with 0.01% SDS (1% SDS in the sample, if 2 µL of sample is used for the assay) but not other detergents.**

How does Qubit® fluorometric quantitation work?

Qubit® fluorometric quantitation uses fluorescent dyes to quantitate biomolecules of interest.

The Qubit® assays for use with the Qubit® 2.0 Fluorometer are all peformed using the same general protocol. A simple mix-and-read format is used, with incubation times of only 2 minutes required for DNA and RNA assays (Figure 2). Abbreviated protocols for Qubit® assays are available at www.invitrogen.com/qubit.

For best results, store the dye and the buffer at room temperature. Store the DNA, RNA, and protein standards at 4 °C. Ensure that all assay reagents are at room temperature before you begin.

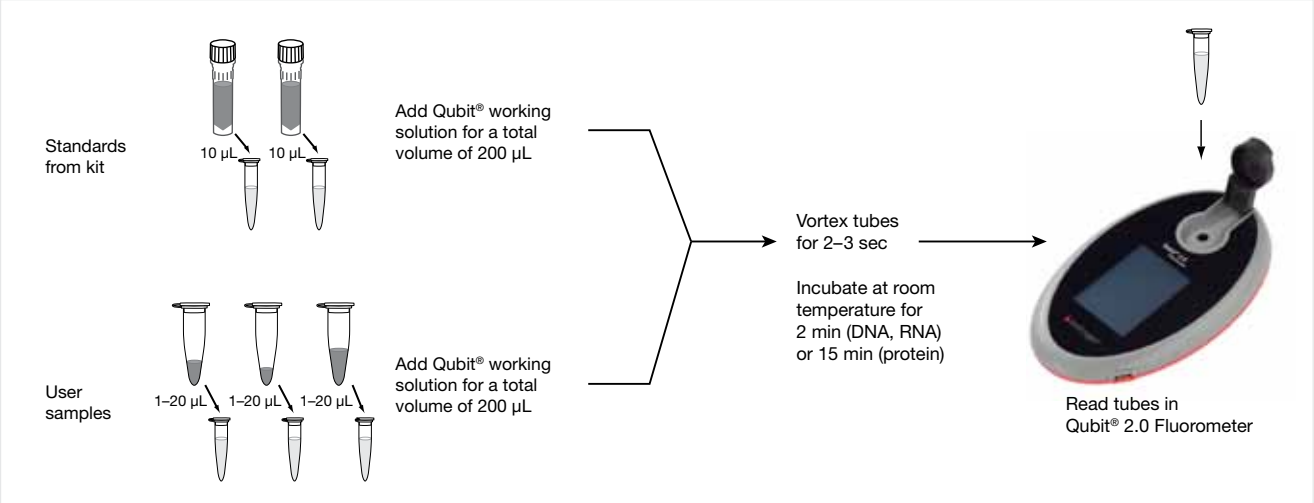

Figure 2. Workflow for the Qubit® assays using the Qubit® 2.0 Fluorometer.

"It gives me the **possibility** to measure very diluted samples. Good, quick, and easy."

How does Qubit® fluorometric quantitation differ from NanoDrop® and other UV spectrophotometer quantitation?

The NanoDrop® and other UV spectrophotometers use UV absorbance, which cannot distinguish between DNA, RNA, degraded nucleic acids, free nucleotides, and other contaminants. The Qubit® Quantitation Platform, in contrast, uses fluorescent dyes to measure the concentration of the specific molecules of interest.

Although the UV absorbance is one of the most common methods used to quantitate DNA or RNA, it can be unreliable and inaccurate [1–4]. UV absorbance readings indiscriminately measure anything that absorbs at 260 nm, including DNA, RNA, protein, degraded nucleic acids, and free nucleotides. While typically lower than A_{260} measurements, quantitation by the Qubit® 2.0 fluorometer is more accurate since it detects only the molecule of interest.

In addition, the sensitivity of spectrophotometry is often inadequate, prohibiting quantitation of DNA and RNA at low concentrations. In contrast, the Qubit® 2.0 Fluorometer generates more accurate and precise results across a lower concentration range than those obtained by UV absorbance measurements on the NanoDrop® spectrophotometer (Figure 3). Due to this accuracy and precision, fluorescent quantitation of nucleic acids is recommended in the MIQE (Minimal Information for Publication of Quantitative Real-Time PCR Experiments) Guidelines [5].

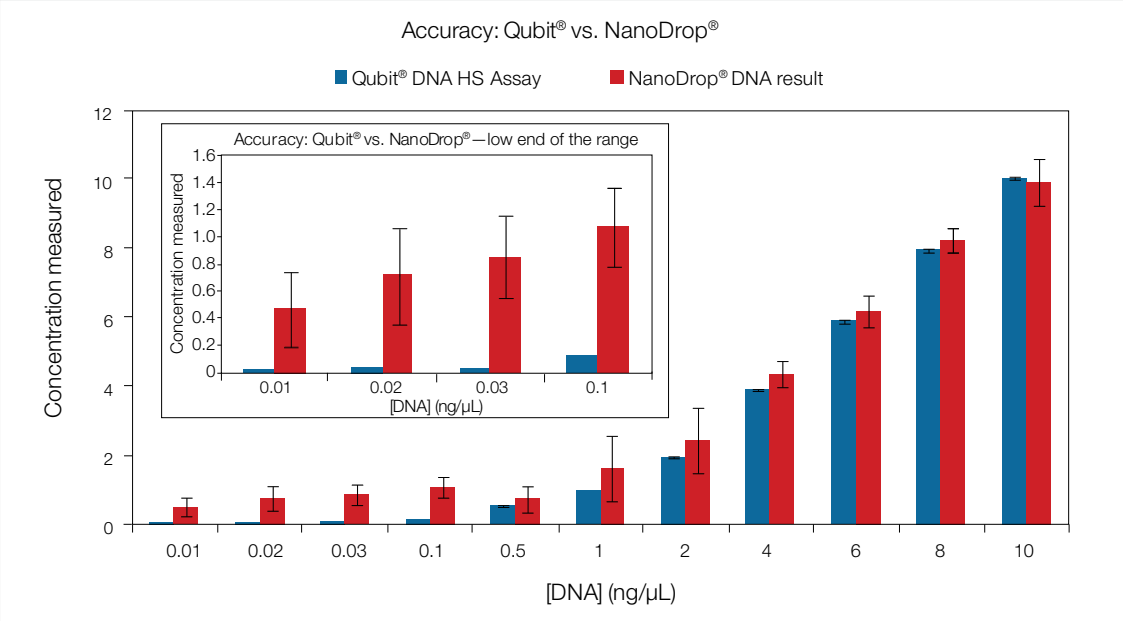

Figure 3. Accuracy and precision of the Qubit® 2.0 Fluorometer. Ten replicates of lambda DNA at concentrations from 0.01 to 10 ng/µL were assayed using the Qubit® DNA HS Assay on the Qubit® Fluorometer according to the standard kit protocol. The same concentrations of DNA were measured in 10 replicates using a NanoDrop® ND-1000 Spectrophotometer, and results were compared for both accuracy and precision. Each bar represents the average of 10 replicates. Error bars represent the standard deviations of the 10 replicates. The concentrations indicated are the concentrations of DNA in the starting samples, before dilution in the Qubit® assay tubes.

References

1. Glasel JA (1995) *Biotechniques* 18:62–63.
2. Huberman JA (1995) *Biotechniques* 18:636.
3. Manchester KL (1995) *Biotechniques* 19:208–210.
4. Manchester KL (1996) *Biotechniques* 20:968–970.
5. Bustin SA (2010) *Clinical Chemistry* 55:611–622.

How does the Qubit® Protein Assay compare to other protein assays?

Quantitating protein at low concentrations with the Qubit® 2.0 Fluorometer is simple, thanks to the easy protocol. Compared to other protein assays, the Qubit® Protein Assay exhibits very low protein-to-protein variability (Figure 4).

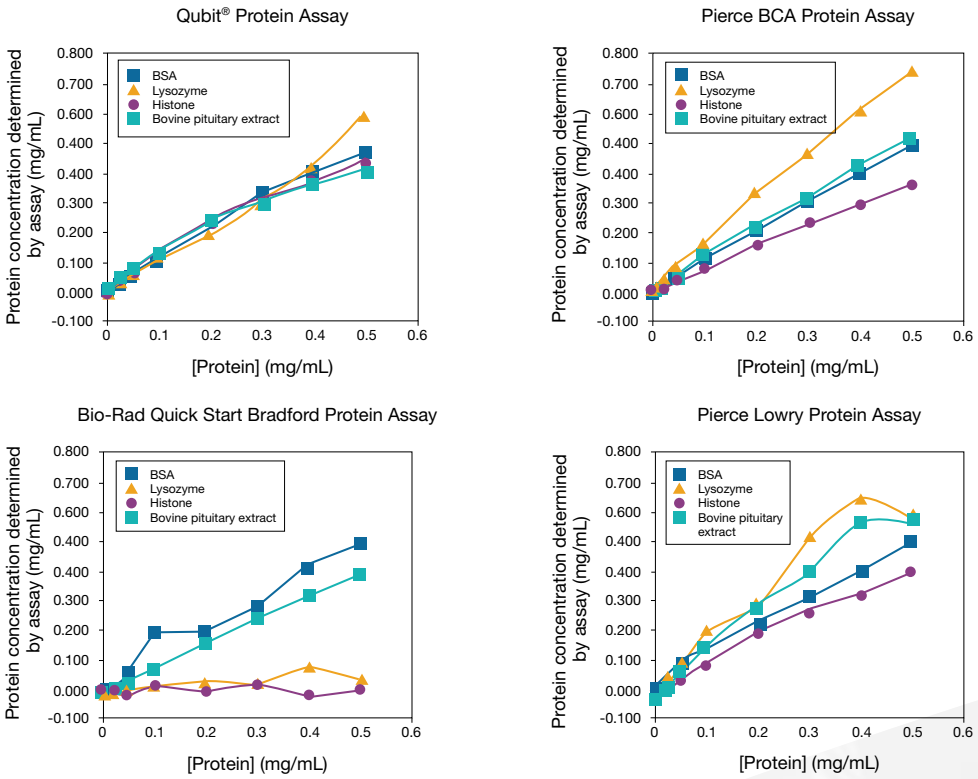

Figure 4. Protein-to-protein variability. Triplicate samples of BSA, lysozyme, histone, and bovine pituitary extract were assayed at concentrations of 0–0.5 mg/mL using the Qubit® Protein Assay on the Qubit® 2.0 Fluorometer, and various other protein quantitation methods. The variability at 0.3 mg/mL for the Qubit® assay was found to be <7%.

Protein sample preparation requires 3 standards and 15 minutes of incubation time. The Qubit® Protein Assay Kits provide concentrated assay reagent, 1X buffer, and prediluted BSA standards. Simply dilute the reagent using the buffer provided, add your sample (any volume between 1 µL and 20 µL is acceptable), incubate, and read the concentration using the Qubit® 2.0 Fluorometer.

For the most accurate results when quantitating protein with the Qubit® Protein Assay, use detergent-free protein samples. For contaminants tolerated by the Qubit® protein assay, see Table 2 of the Qubit® Protein Assay Kits manual. You can download the manual at www.invitrogen.com/qubitproteinassay.

What are the advantages of Qubit® fluorometric quantitation?

- Good accuracy and precision, even at low concentrations
- Unparalleled selectivity—provides accurate measurement of both DNA and RNA from the same sample
- Satisfies all your quantitation needs:
  - Qubit® dsDNA kits—for sequencing samples, genomic DNA samples, and routine cloning experiments
  - Qubit® ssDNA kit—for quantitating single-stranded DNA or oligonucleotides*
  - Qubit® RNA kits—for microarray experiments, real-time PCR samples, and northern blots
  - Qubit® protein kit—for western blotting, activity assays, and routine gel analysis

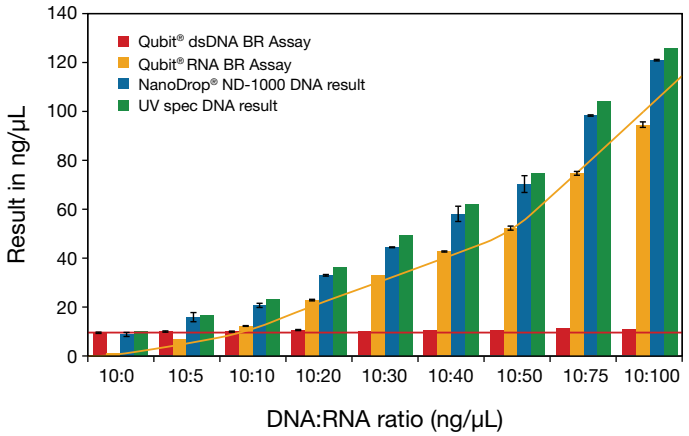

Figure 5. Selectivity of the Qubit® assays compared to UV spectroscopy. Triplicate samples containing lambda DNA (10 ng/µL) and varying amounts of *E. coli* ribosomal RNA (0 to 100 ng/µL) were assayed using Qubit® DNA BR and Qubit® RNA BR assays and the Qubit® 2.0 Fluorometer according to kit protocols. The same samples were subsequently measured in triplicate using a NanoDrop® ND-1000 Spectrophotometer, and single measurements were made using a PerkinElmer Lambda 35 Spectrophotometer. The red and orange trendlines indicate the actual concentrations of DNA and RNA, respectively, in the starting samples. With UV analysis, results for samples containing both DNA and RNA are nondiscriminatory—you cannot distinguish one from the other.

Are there publications citing the Qubit® Fluorometer?

Yes. There are over 300 publications on Qubit® fluorometric quantitation. Here are some selected recent publications. More citations are available at www.invitrogen.com/qubit.

1. Ewan-Campen B et al. (2011) The maternal and early embryonic transcriptome of the milkweed bug Oncopeltus fasciatus. *BMC Genomics* 12:61.
2. Sleep E et al (2010) Transcriptomics approach to investigate zebrafish heart regeneration. *J Card Med* 11:369–380.
3. Roberts SA et al. (2010) Ku is a 5'-dRP/AP lyase that excises nucleotide damage near broken ends. *Nature* 464:1214–1217.
4. Amend AS (2010) Indoor fungal composition is geographically patterned and more diverse in temperate zones than in the tropics. *Proc Natl Acad Sci U S A* 107:13748–13753.
5. Acar E et al. (2009) Optimization and validation studies of the Mentype® Argus X-8 kit for paternity cases. *Forensic Sci Int Genet Suppl* 2:47–48.
6. Bajrami B et al. (2009) Shifting unoccupied spectral space in mass spectrum of peptide fragment ions. *J Am Soc Mass Spectrom* 20:2124–2134.
7. Bakos J et al. (2009) Enriched environment influences hormonal status and hippocampal brain derived neurotrophic factor in a sex dependent manner. *Neurosci* 164:788–797.
8. Beveridge NJ et al. (2009) Down-regulation of miR-17 family expression in response to retinoic acid induced neuronal differentiation. *Cell Signal* 21:1837–1845.

* Note that this kit is not specific for ssDNA; it will also detect dsDNA and RNA, but it will not detect contaminating protein or nucleotides. Its unique advantage is that it will quantitate ssDNA. To check for dsDNA or RNA contamination, use a dsDNA or RNA assay.

What are the warranty terms and return policy?

We will replace any faulty or failing Qubit® 2.0 Fluorometer under the 1-year warranty (from the date of purchase). However, the warranty will be voided if the instrument is disassembled or a customer has attempted to repair the instrument.

Contact Invitrogen Technical Support (in the USA and Canada, call 800.955.6288 or email techsupport@invitrogen.com) to obtain a Return Authorization number. DO NOT ship an instrument to us without prior telephone or email contact.

If you are outside the United States and have purchased the instrument from an authorized Invitrogen distributor, contact that distributor directly. If you purchased directly from Invitrogen, follow the same procedure described above. We cannot, however, pay for shipping, duties, and documentation costs outside the continental United States.

Is technical support available?
Yes. You can reach Technical Support at 800.955.6288 or via email at techsupport@invitrogen.com (in the USA or Canada).

How do I get more information?
Go to www.invitrogen.com/qubit for product, ordering, and pricing information, as well as technical data, technical notes, and frequently asked questions.

"**Faster** quantification of DNA, **faster** sequencing. Please buy one quickly."

Ordering information

Product	Quantity	Cat. No.
Qubit® 2.0 Fluorometer	Each	Q32866
Qubit® 2.0 Quantitation Starter Kit	Each	Q32871
Qubit® 2.0 Quantitation Lab Starter Kit	Each	Q32872
Qubit® dsDNA BR Assay Kit	100 assays, 2–1000 ng	Q32850
	500 assays, 2–1000 ng	Q32853
Qubit® dsDNA HS Assay Kit	100 assays, 0.2–100 ng	Q32851
	500 assays, 0.2–100 ng	Q32854
Qubit® ssDNA Assay Kit	100 assays, 1–200 ng	Q10212
Qubit® RNA Assay Kit	100 assays, 5–100 ng	Q32852
	500 assays, 5–100 ng	Q32855
Qubit® RNA BR Assay Kit	100 assays, 20–1000 ng	Q10210
	500 assays, 20–1000 ng	Q10211
Qubit® Protein Assay Kit	100 assays, 0.25–5 µg	Q33211
	500 assays, 0.25–5 µg	Q33212
Qubit® Assay Tubes	Set of 500	Q32856

What do our customers have to say about Qubit® fluorometric quantitation?

"Quick and easy with excellent repeatability; more reliable than spec and more confidence in results."
Kevin Barr, University of Western Ontario

"It gives me the possibility to measure very diluted samples. Good, quick, and easy."
Silvia Rodriguez, Institut de Recerca Biomedica de Barcelona (IRB)

"Based on the Qubit measurements, NanoDrop overestimated the amount of RNA in the blood spot samples about 10 times and this number would agree with the amount of cDNA and qPCR numbers that we are getting from the samples."
Julia Busik, Asst. Professor, Michigan State University

"The Qubit is working wonderful! And to think it did not cost an arm and a leg. I never knew that doing DNA analysis could be so much fun! I hope Invitrogen can continue coming up with such products because that little instrument has sure made life a whole lot easier for me."
George Aspery, President, Microbiological Laboratories, Inc.

"It's easy enough for undergraduates to learn to use quickly. I feel like I'm using the latest technology."
Estelle Hrabak, University of New Hampshire

"Faster quantification of DNA, faster sequencing. Please buy one quickly."
Maja Okuka, University of South Florida

"For production we need to make a large mass of DNA, and we need to measure the concentration accurately before aliquotting. Our production methodology yields large amounts of RNA along with the DNA. So we treat the sample with RNase A, but even after treatment the individual RNA monomers still absorb at 260 nm, so we can't use a spectrophotometer to quantify the DNA. This is where the Qubit comes in. We can use it to accurately quantify the DNA in the presence of the digested RNA since the dye only binds to DNA. We looked at the measurement relative to the intensity of known standards on a gel and the Qubit appears to be quite accurate."
Mark G. Wise, PhD, Staff Scientist, Bacterial Barcodes, Inc.
(a wholly-owned subsidiary of BioMerieux, Inc.)

"If we compare the concentration from the Qubit, the NanoDrop, and the Bioanalyzer, we would always use the Qubit quantitation."
Sue Sipkovsky, Lab Manager, Center for Animal Functional Genomics, Michigan State University

"The Qubit Protein Assay completely saved my experiment. The UV spec inaccurately quantified my protein."
Bryan Warf, PhD candidate, University of Oregon

"It saves an hour a day in quantitating samples."
Steve Enkemann, Director of Microarray Core Facility, Moffitt Cancer Center

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