A Versatile Method for Quantification of DNA and PCR Products Based on Time-resolved Eu^{III} Luminescence

Bo Song,[a] Caroline D. B. Vandevyver,[a,1] Emmanuel Deiters,[a] Anne-Sophie Chauvin,[a] Ilkka Hemmilä,[b] and Jean-Claude G. Bünzli[a]

[a] *Laboratory of Lanthanide Supramolecular Chemistry, École Polytechnique Fédérale de Lausanne,*
BCH 1404, 1015 Lausanne, Switzerland.
[b] *Perkin Elmer Life and Analytical Sciences, Wallac Oy, P.O. Box 10, FIN-20101 Turku, Finland*

Electronic Supplementary Information (ESI)

8 pages

[1] caroline.vandevyver@epfl.ch (Caroline D.B. Vandevyver)

Table S1. Integrated relative intensities of the $^5D_0 \rightarrow {}^7F_J$ emission bands[a] of $[Eu_2(L^{C2})_3]$ in presence and absence of DNA (20 ng/μL)

	J =0	J = 1	J = 2	J = 3	J = 4	J =5
Actin sense-2 DNA	0.008	1.000	0.939	0.120	1.698	0.054
λDNA/*Hind* III	0.009	1.000	0.939	0.107	1.715	0.050
Sheared salmon sperm DNA	0.008	1.000	0.948	0.114	1.713	0.064
Plasmid DNA	0.008	1.000	0.948	0.110	1.799	0.040
No DNA	0.008	1.000	0.942	0.114	1.722	0.045

[a] The $^5D_0 \rightarrow {}^7F_6$ transition is out of the detector range

Table S2. Lifetime (ms) of the Eu($^5D_0$) level for solutions of $[Eu_2(L^{C2})_3]$ 0.1 μM in Tris-HCl and in presence of 20 ng/μL ss or dsDNA; λ_{ex} = 325 nm, λ_{em} = 615 nm, slits: 12 nm (exc.), 12 nm (em.).

Actin sense-2 DNA	λDNA/*Hind* III	Sheared salmon sperm DNA	Plasmid DNA	No DNA
2.49 ± 0.02	2.49 ± 0.04	2.47 ± 0.03	2.48 ± 0.01	2.47 ± 0.02

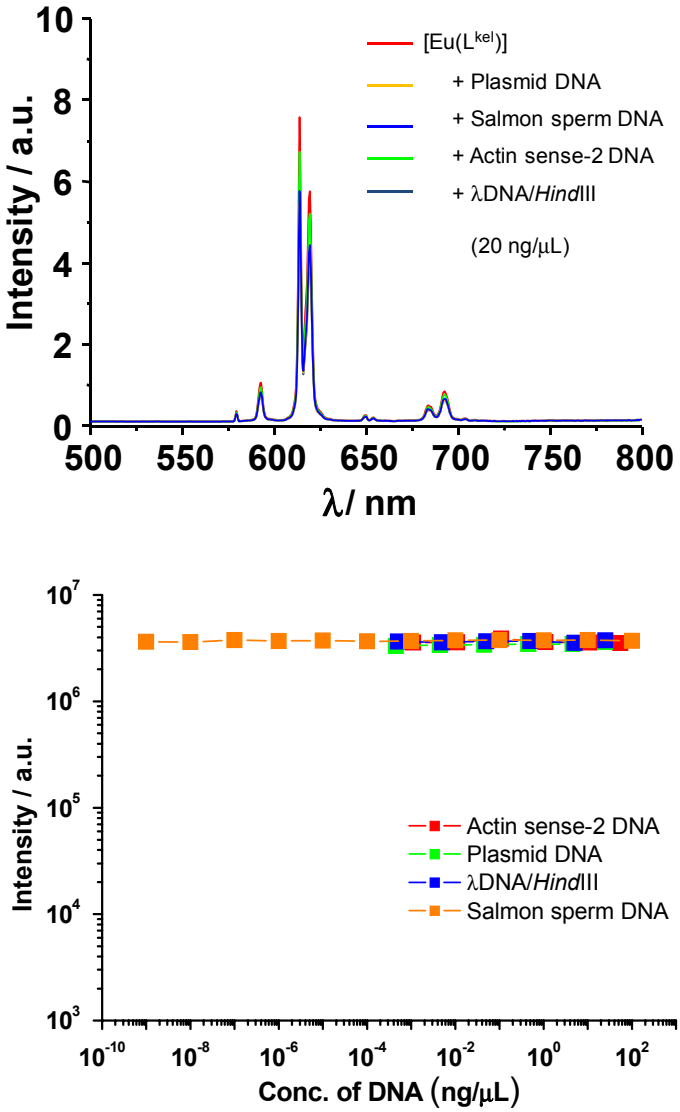

Fig. S1. Effect of different kinds of DNAs on the luminescence spectra (top) and time-resolved detected luminescence intensity (bottom) of [Eu(L^{kel})] 0.1 μM in Tris-HCl.

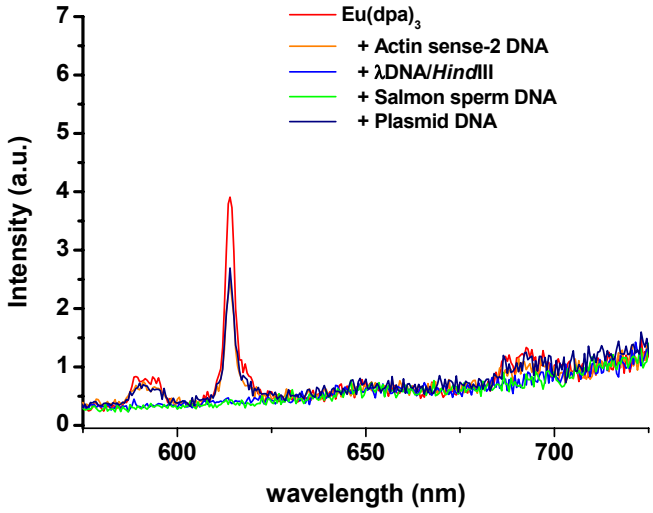

Fig. S2. Emission spectra (λ_{ex} = 279 nm) of $[Eu(dpa)_3]^{3-}$ 0.1 μM in Tris-HCl. Without DNA, red line; with 20 ng/μL DNA: Actin sense-2 DNA, orange line; λDNA/*Hind*III, blue line; sheared salmon sperm DNA, green line; Plasmid DNA, navy blue line. *Note*: influence of DNA on the luminescence intensity of $[Eu(dpa)_3]^{3-}$ could not be measured under time-resolved conditions due to its too short excitation wavelength.

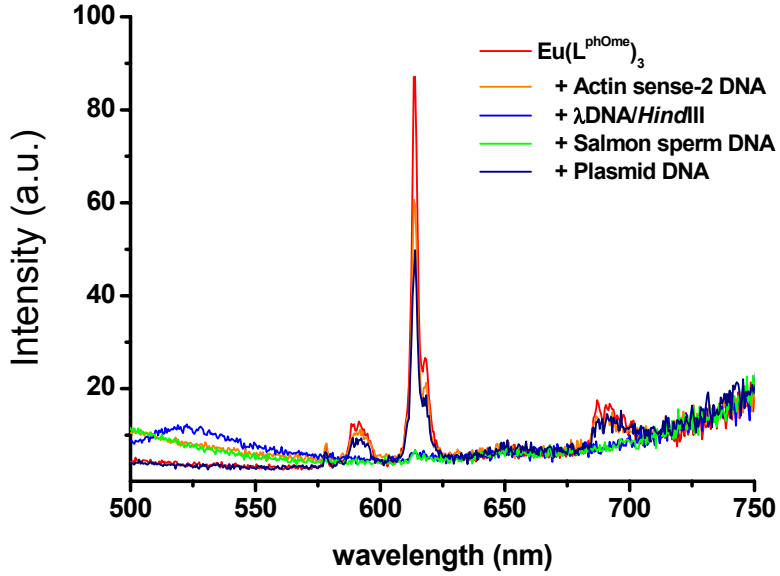

Fig. S3. Emission spectra (λ_{ex} = 306 nm) of $[Eu(L^{PhOMe})_3]^{3-}$ 0.1 μM in Tris-HCl. Without DNA, red line; with 20 ng/μL DNA: Actin sense-2 DNA, orange line; λDNA/*Hind* III, blue line; sheared salmon sperm DNA, green line; Plasmid DNA, navy blue line.

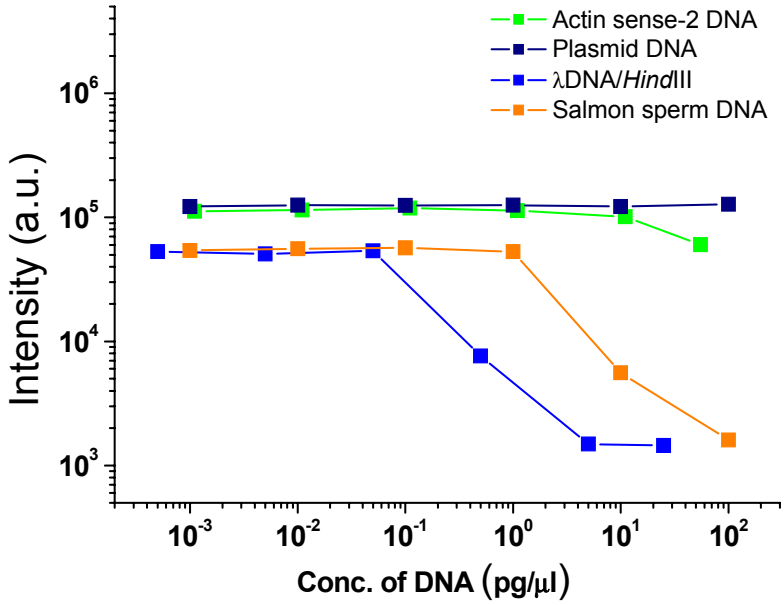

Fig. S4. Effect of DNA on the luminescence intensity of $[Eu(L^{phOMe})_3]^{3-}$ (0.1 μM in Tris-HCl)), determined under time-resolved conditions.

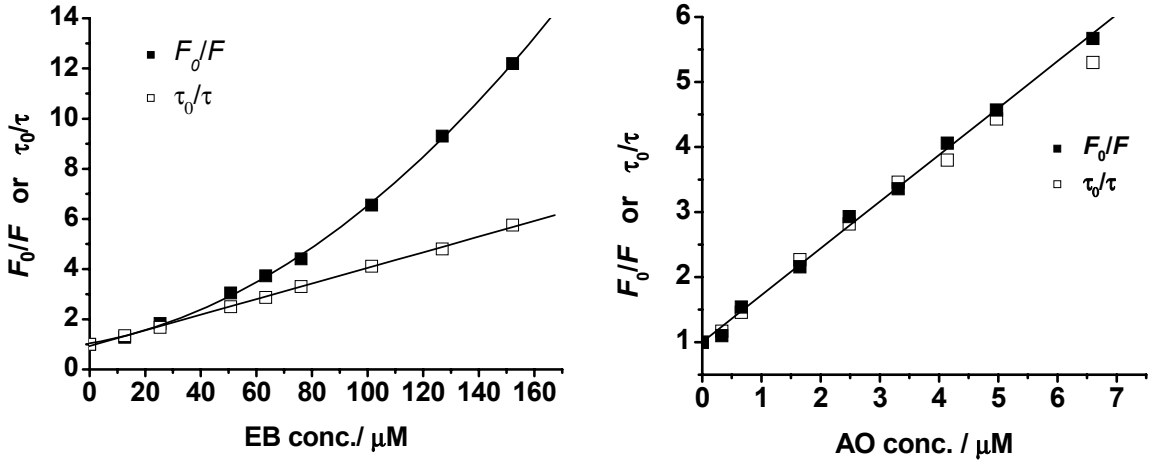

Fig. S5. Stern-Volmer plots for the quenching of $[Eu(dpa)_3]^{3-}$ 5 μM in Tris-HCl buffer (λ_{exc} = 279 nm) by EB (left) and AO (right).

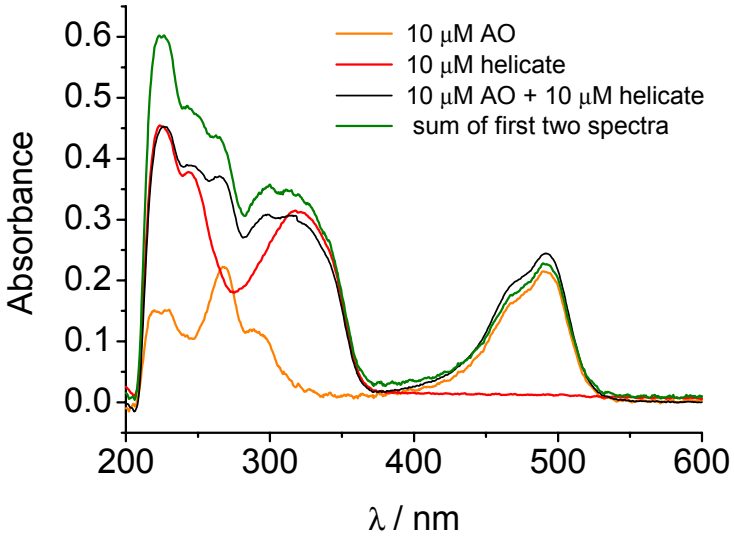

Fig. S6. Absorption spectra of AO (10 μM in Tris-HCI, solid line), $[Eu_2(L^{C2})_3]$ (10 μM in Tris-HCl, dotted line) and of the corresponding equimolar mixture, dash line.

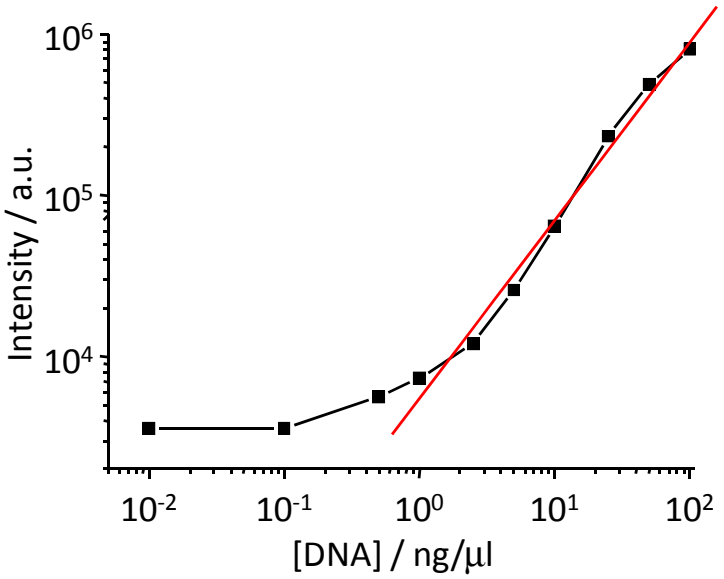

Fig. S7. Calibration curve for Plasmid DNA using the $[Eu_2(L^{C2})_3]$/AO system. The measurement conditions are the same as for **Error! Reference source not found.**.

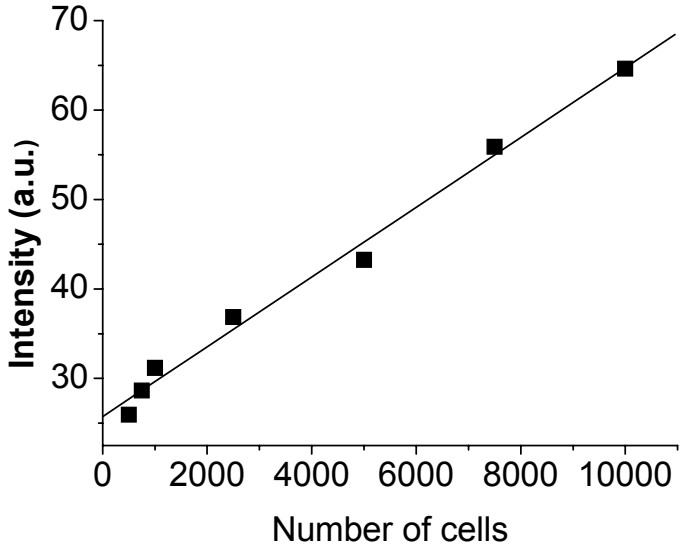

Fig. S8. Luminescence intensity of $[Eu_2(L^{C2})_3]$ as function of the number of lysed HeLa cells using $[Eu_2(L^{C2})_3]$ 0.1 μM /AO 10 μg/mL in 0.1 M Tris-HCl (pH 7.4).

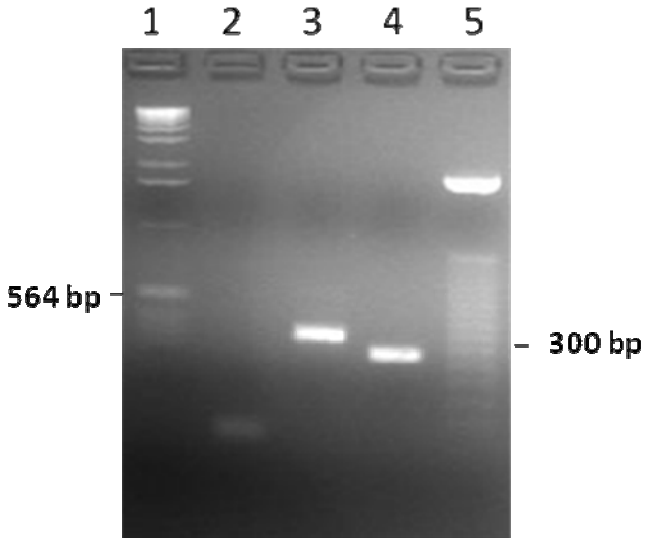

Fig. S9. Agarose gel electrophoresis of PCR products. Lane 1: Lambda DNA marker; lane 2: 73 bp fragment of the β-actin gene; Lane 3: 347 bp fragment of the β-actin gene ; Lane 4: 287 bp fragment of the β-2-microglobulin; Lane 5: DNA 50 bp step ladder.

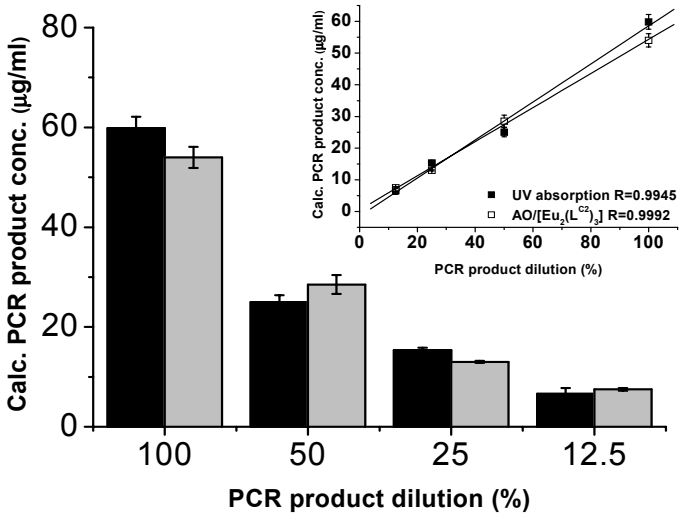

Fig. S10. Comparison of the two DNA quantification methods used in the assay of a PCR product (73 bp fragment of the β-actin gene): UV absorption (black) and $[Eu_2(L^{C2})_3]$/AO (gray). The inset shows the linearity of UV absorption (solid), and $[Eu_2(L^{C2})_3]$/AO (open) methods.

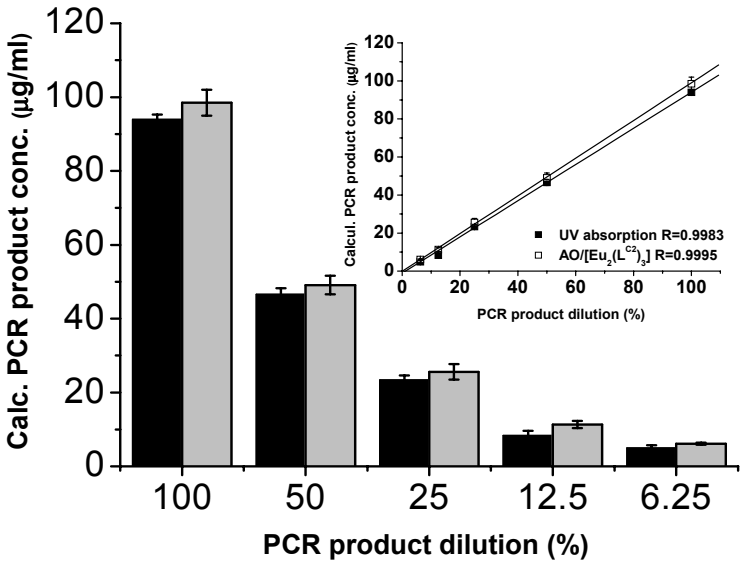

Fig. S11. Comparison of two DNA quantification methods used in the assay of a PCR product (287 bp fragment of the β-2-microglobulin gene): UV absorption (black) and $[Eu_2(L^{C2})_3]$/AO

(gray) methods. The inset shows the linearity of UV absorption (solid), and $[Eu_2(L^{C2})_3]$/AO (open) methods.