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In[1]:=
```
Quit[]
```

In[63]:=
```
ga[μ_, σ_, x_] := e^(-(x-μ)^2/(2 σ^2)) / (Sqrt[2 π] σ)
Needs["HypothesisTesting`"]
Needs["ErrorBarPlots`"]

th = Thickness[3 × 10^-3];
fs = {th, GrayLevel[0.]};
cm = 72 / 2.54;
```

In[1780]:=
```
SetDirectory["E:\\projects\\omar\\2018.09.19"];
(*SystemOpen[%];*)

name = "A.txt"
m = 4;
n = 5;(*# of replicates*)
color = Cyan;
```

Out[1781]= A.txt

In[1642]:=
```
SetDirectory["E:\\projects\\omar\\2018.09.19"];
(*SystemOpen[%];*)

name = "B.txt"
m = 5;
n = 3;(*# of replicates*)
color = Purple;
```

Out[1643]= B.txt

In[1707]:=
```
SetDirectory["E:\\projects\\omar\\2018.09.19"];
(*SystemOpen[%];*)

name = "calibration_2016.11.23.txt"
m = 5;
n = 6;(*# of replicates*)
color = Magenta;
```

Out[1708]= calibration_2016.11.23.txt

In[1784]:=
```
d0 = Sort[Import[name, "Table"]];
d0 = d0[[1 ;; m, ;;]];

MatrixForm[d0]

Clear[d];
d = {};
j = 1;
```

```
While[j ≤ n,
  AppendTo[d, 1 Partition[Riffle[d0[[ ;; , 1]], d0[[ ;; , 1 + j]]], 2]];
  j++];
d = Sort[Partition[Flatten[d], 2]];
MatrixForm[d]

X = d;
Partition[Flatten[Split[X]], 2][[ ;; , 1]];
u = Union[%, %];
TM = {};
i = 1;
While[i <= Length[u],
  z = Flatten[Position[X[[ ;; , 1]], u[[i]]]];
  U = Take[X, {z[[1]], z[[-1]]}][[ ;; , 2]];
  AppendTo[TM, {u[[i]], Mean[U], StandardDeviation[U]}];
  (*Flatten[{U,U}]*)
  i++];

de = Table[{{TM[[i, 1]], TM[[i, 2]]}, ErrorBar[TM[[i, 3]]]}, {i, Length[TM]}];



fig1 = Show[
  ListPlot[d,
   PlotRange → {{-0.1 d[[-1, 1]], All}, {0, All}},
   PlotStyle → color,
   PlotMarkers → {Automatic, 10},
   PlotLabel → StringDrop[name, -4],
   Joined → False,

   Frame → True,
   FrameStyle → {fs, fs, fs, fs},
   FrameLabel → {"iRBCs full blood (μL^-1)", "Slope (s^-1)"},

   FrameTicks → {{Automatic, None}, {Automatic, None}},
   FrameTicksStyle → th,

   GridLines → None,
   GridLinesStyle → {{th, Dashed}, {th, Dashed}},

   LabelStyle → Directive[Bold, FontFamily → "Arial Baltic", FontSize → 14],

   AspectRatio → 1,
   ImageSize → {12 cm, 12 cm},
   ImageMargins → 0. cm,
   ImagePadding → Full
  ]
  ,
  ErrorListPlot[de,
   PlotRange → All,
   PlotStyle → Black
  ]
 ]
```

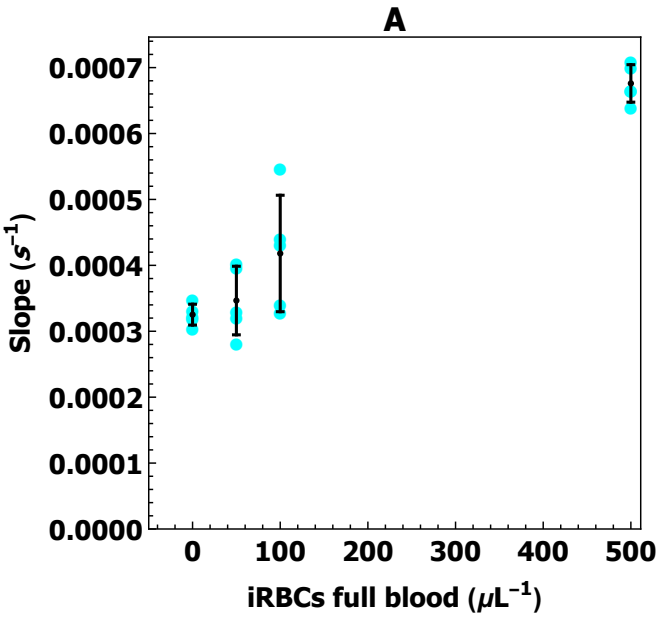
Out[1786]//MatrixForm=

0	0.000331	0.000348	0.000319	0.000305	0.000323
50	0.000397	0.000282	0.000321	0.00033	0.000403
100	0.000441	0.000432	0.000329	0.000547	0.000341
500	0.0007	0.000709	0.000639	0.000666	0.000666

Out[1792]//MatrixForm=

0	0.000305
0	0.000319
0	0.000323
0	0.000331
0	0.000348
50	0.000282
50	0.000321
50	0.00033
50	0.000397
50	0.000403
100	0.000329
100	0.000341
100	0.000432
100	0.000441
100	0.000547
500	0.000639
500	0.000666
500	0.000666
500	0.0007
500	0.000709

Out[1800]=

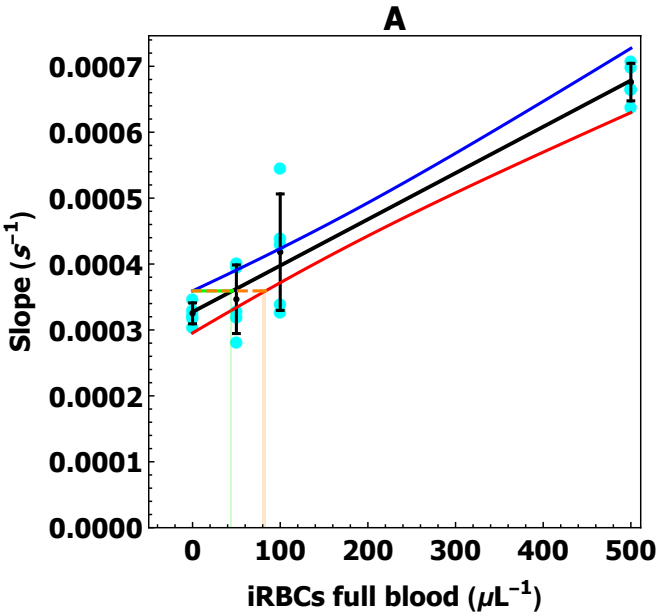


In[1801]:=
```
cf = 0.95;

Clear[fa, fb, lmf, bands, x];
lmf = LinearModelFit[d, {1, x}, x, ConfidenceLevel → cf];
lmf["ParameterTable"]
a = lmf["BestFitParameters"][[1]];
b = lmf["BestFitParameters"][[2]];
bands[x_] = lmf["MeanPredictionBands", ConfidenceLevel → cf];

dc = NSolve[lmf[x] == Max[bands[0]], x, Reals] ;(*Decision limit*)
sb = NSolve[bands[x][[1]] == Max[bands[0]], x, Reals] ;(*Detection limit*)

fig2 = Show[
  fig1
  ,
  Plot[{lmf[x], bands[x][[1]], bands[x][[2]]},
   {x, d[[1, 1]], d[[-1, 1]]}, PlotStyle → {{Black, Thick}, {Red}, {Blue}}]
  ,
  Plot[{Max[bands[0]]}, {x, d[[1, 1]], dc[[1]][[1]][[2]]}, PlotStyle → {Green}]
  ,
  Plot[{Max[bands[0]]},
   {x, d[[1, 1]], sb[[1]][[1]][[2]]}, PlotStyle → {Orange, Dashed}]
  ,
  Plot[lmf[dc[[1]][[1]][[2]]], {x, 0.95 dc[[1]][[1]][[2]], dc[[1]][[1]][[2]]},
   PlotStyle → Green, Filling → Axis]
  ,
  Plot[bands[sb[[1]][[1]][[2]]][[1]], {x, 0.95 sb[[1]][[1]][[2]],
    sb[[1]][[1]][[2]]}, PlotStyle → Orange, Filling → Axis]
 ]

res = lmf["FitResiduals"];
ShapiroWilkTest[res, {"TestDataTable", "ShortTestConclusion"}]

Print["Decision limit:", dc];
Print["Detection limit: ", sb];
```

Out[1804]=

	Estimate	Standard Error	t-Statistic	P-Value
1	0.000327312	0.0000151956	21.5399	2.6668×10^{-14}
x	7.0239×10^{-7}	5.93175×10^{-8}	11.8412	6.2517×10^{-10}

Out[1809]=



Out[1811]=

	Statistic	P-Value
Shapiro-Wilk	0.921387	0.105372

, Do not reject

Decision limit: {{x → 45.4516}}

Detection limit: {{x → 83.2943}}

Export data

```
sid = StringDrop[name, -4];

linfit = Table[{u[[i]], lmf[u[[i]]]}, {i, Length[u]}];
linfitbands = Table[{u[[i]], bands[u[[i]]]}, {i, Length[u]}];

X = TableForm[
   {
    "Confidence level: ", cf,
    "Decision limit: ", dc[[1]][[1]][[2]],
    "Detection limit: ", sb[[1]][[1]][[2]]
   }
  ]

Export[sid <> "_fig.jpg", fig2, ImageResolution → 300]
Export[sid <> "_data_linfit.txt", linfit, "Table"]
Export[sid <> "_data_linfit_confbands.txt",
 Partition[Flatten[linfitbands], 3], "Table"]
Export[sid <> "_limits.pdf", X]
```

Out[1680]//TableForm=

ConfidenceLevel:	
0.95	
Decision limit:	
5.29611	
Detection limit:	
9.70036	

Out[1681]= B_fig.jpg

Out[1682]= B_data_linfit.txt

Out[1683]= B_data_linfit_confbands.txt

Out[1684]= B_limits.pdf