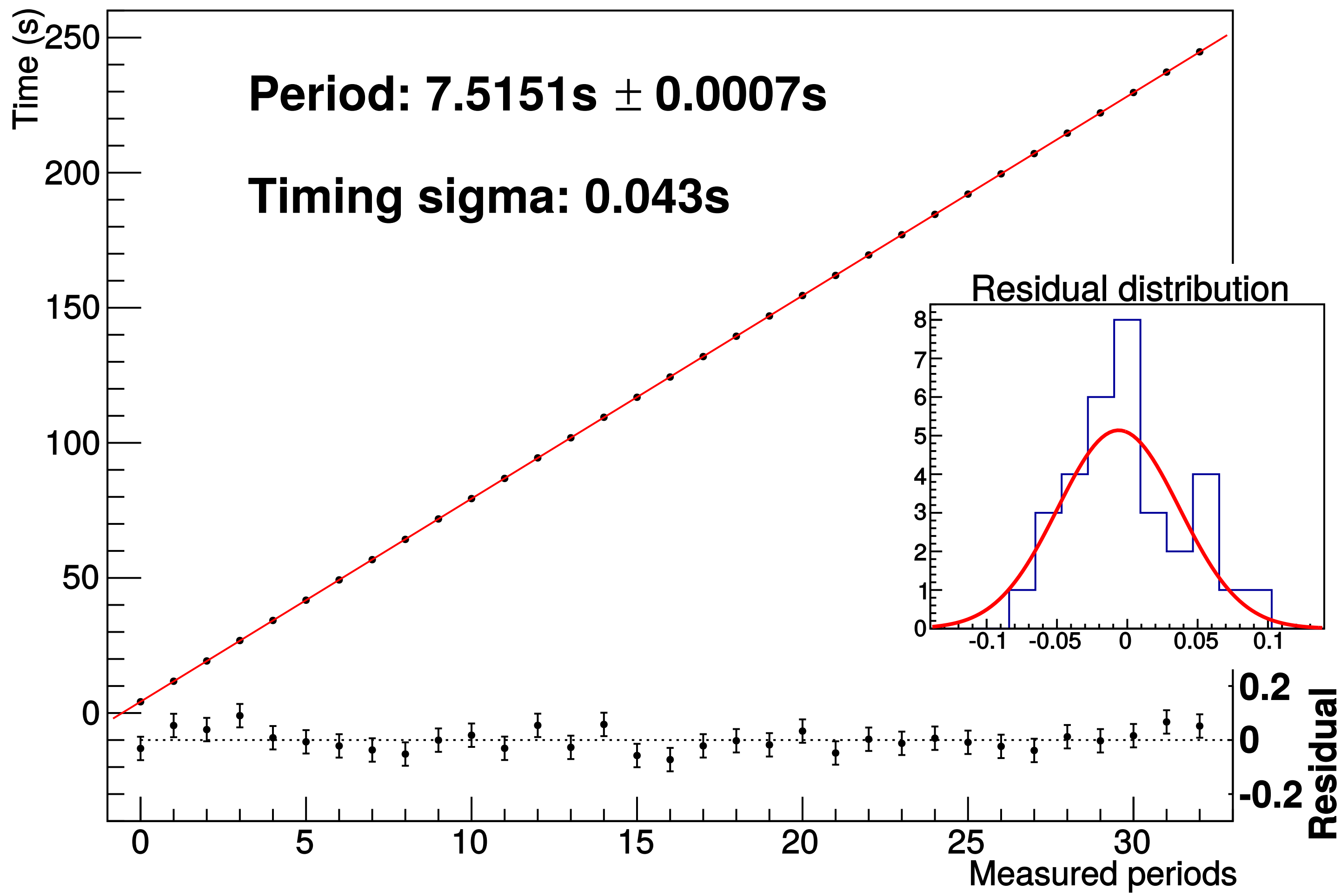
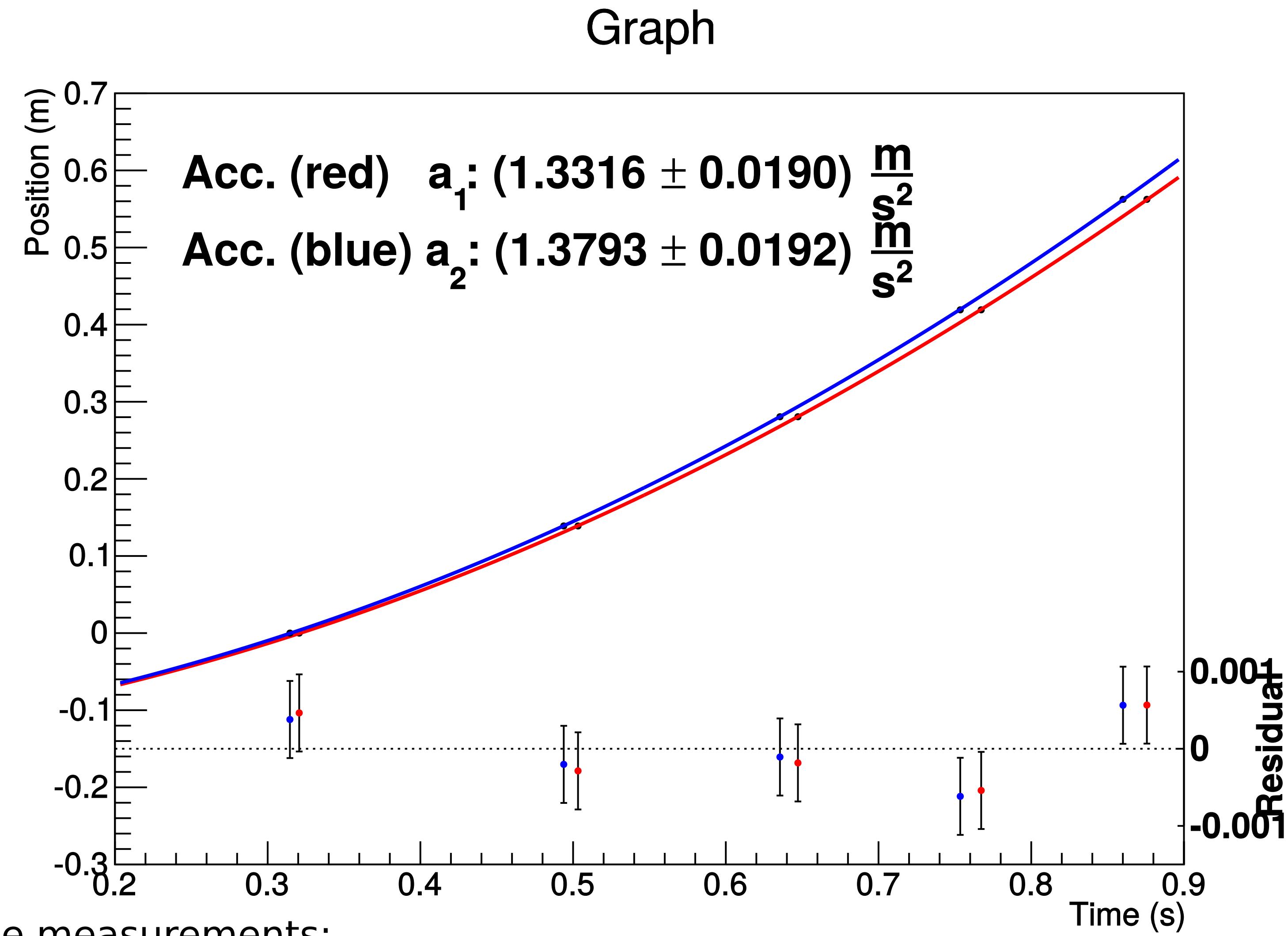


Time measurements:
-Many independent time measurements
-Insignificant systematic uncertainties
-Statistical error estimation is ok

Length measurements:
-Reading errors can be estimated statistically
-Systematic uncertainties can not be reduced by multiple measurements if the sources of the error is not independent same device
-A devices systematic error is usually not below it's smallest division



Time measurements:
-Insignificant uncertainties (many repititions not necessarily needed)

Distance measurements:
-Reading errors can be estimated statistically
-Systematic uncertainties on length measurements
-Diode placement is also a systematic errors, as well as diode sensing area

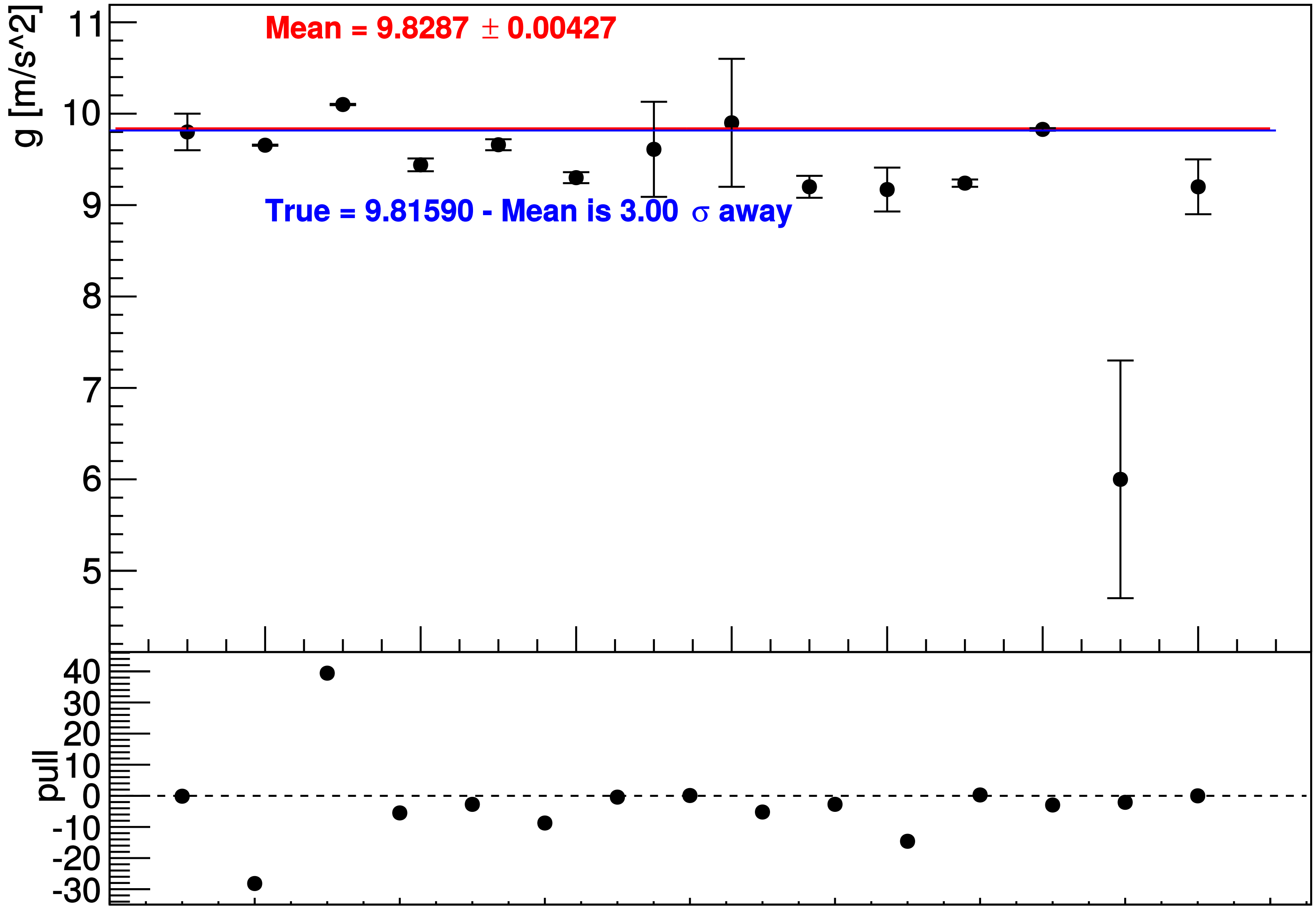
Single gate passing point in time:
-Defining a single point in time for passing simplifies the analysis

	Value	Uncertainty	Ef ect on g	Unit
Incline angle α	0.1881	0.0004	0.02	rad
Table angle β	0.007	0.005	0.14	rad
Ball diameter b	0.01035	0.00005	4e-10	m
Gap d	0.0058	0.00010	1e-09	m
Acceleration a_1	1.33	0.02	0.1	m/s^2
Acceleration a_2	1.38	0.02	0.1	m/s^2
g	9.9	0.3		m/s^2

The table angle is calculated using the dif erence in acceleration between the two experiments: $k = \frac{a_2}{a_1} = \frac{\sin(\alpha-\beta/2)}{\sin(\alpha+\beta/2)} \Rightarrow \beta = 2\arctan(\frac{k-1}{k+1}\tan(\alpha))$. The stated ef ect of the uncertainty of a_1 and a_2 on g, does not include the ef ect of the uncertainty of the incline angle β. The total contribution of a_1 and a_2 to the uncertainty of g is $\Delta g_{a_1} + \Delta g_{\beta} = \Delta g_{a_2} + \Delta g_{\beta}$.

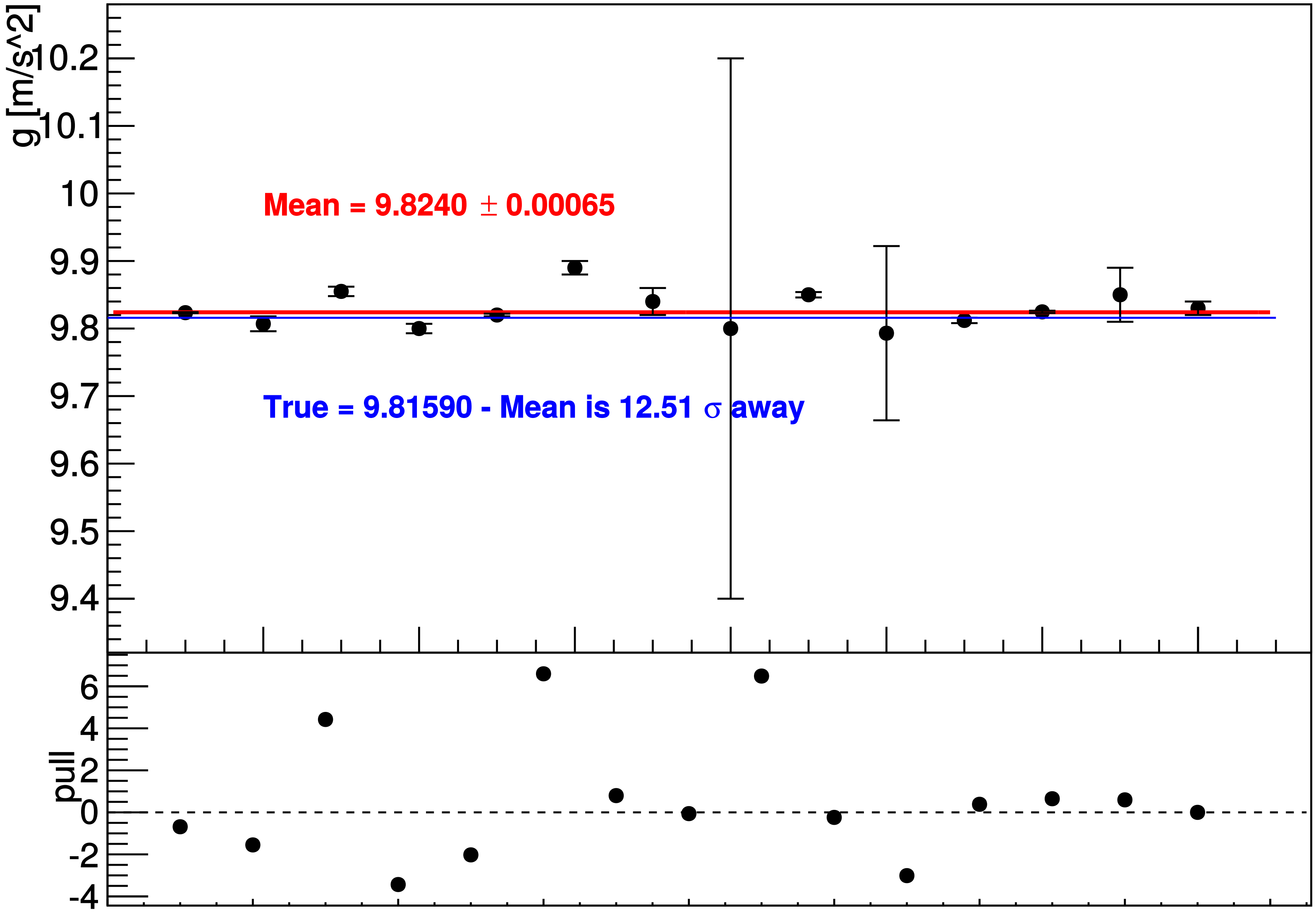
	Value	Uncertainty	Ef ect on g	Unit
Period T	7.5151	0.0007	0.0019	s
Length l	14.036	0.003	0.0024	m
g	9.812	0.004		m/s^2

-Both measurements of g are consistent with each other and the reference value for Copenhagen (9.8159 m/s^2)
-The desired precision is only possible with the pendulum
-Note that the uncertainty on g for the table is quite large



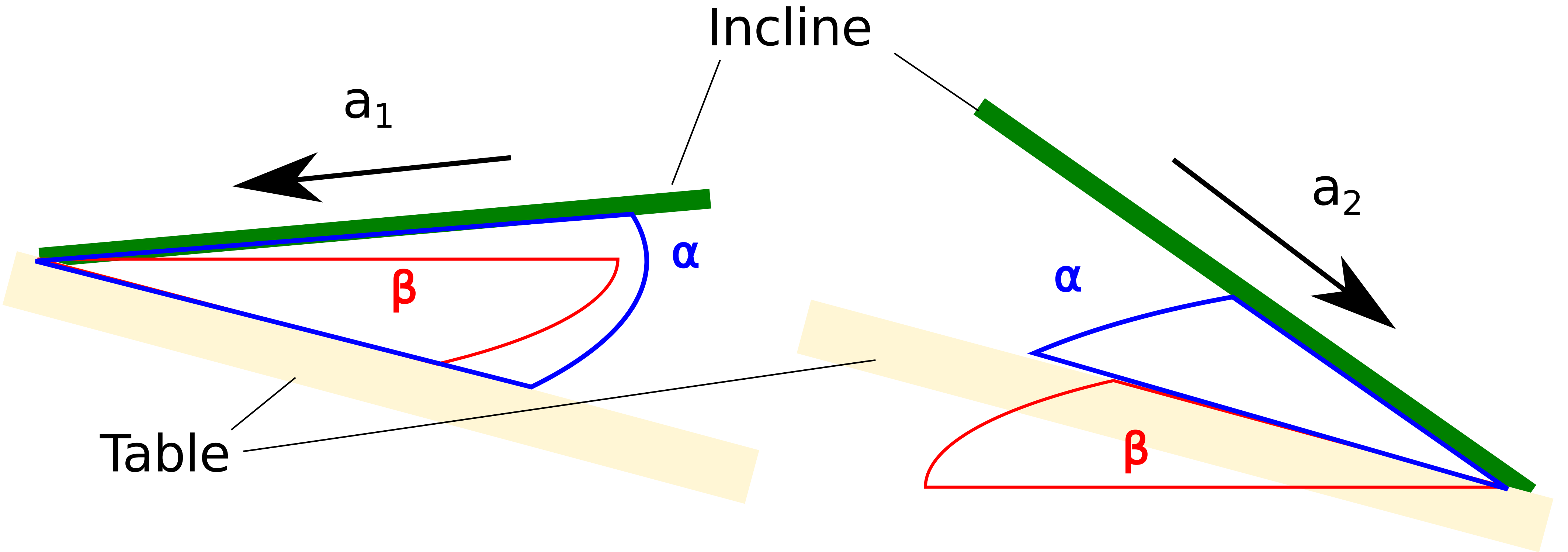
The weigthed mean is close to the true value

The pulls (distance to mean in terms of individual error) are disturbing and indicate too small error estimates.



- Results are more consistent
- Errors are underestimated
- Combined result for g is still not consistent with the reference value
- Please estimate systemtic errors less optimistically

Calculate and utilize the table angle:



$$\frac{a_2}{a_1} = \frac{\sin(\alpha-\beta)}{\sin(\alpha+\beta)}$$

Then use α±β as angle in the formula for g with either a_1 or a_2. (Both combinations yield the same result)

Be carefull with error estimation and propagation:
-Systematic errors do not decrease with repitition\
-Propagation of systematic errors is not necessarily done in quadrature
-You have to think about systematic errors (be conservative if you are uncertain)

Always show your measurements in an appropriate way:
-Plots
-Measurement tables (including uncertainties)

Always comment on the consistency of your results:
-Compare results of different methods
-Compare to reference value if possible (in general, not asked here)

Results in the abstract (if you are writing in paper format)

Explain your symbols in formulas

Label your schematics (relate to symbols in formulas where possible)

Be short and precise in describing on what you are doing and measuring

Always use intermediate results with full precision instead of rounded to the last significant decimal