#1288 EURAMET Project

Final Report – Appendix 3

Proposed method of calculation of the reference value

Proposed calculation of the reference value

$$x_{Ref} = \frac{\sum_{i=1}^{N} \delta_i \frac{1}{u_i{}^2} x_i}{\sum_{i=1}^{N} \delta_i \frac{1}{u_i{}^2}}$$

$$\delta_i = \begin{cases} 1 \\ 0 \end{cases}$$

← for the „most reliable" results

← for other results

$$u_{wei} = \frac{1}{\sqrt{\sum_{i=1}^{N} \delta_i \frac{1}{u_i^2}}}$$

$$u_{Ref}^2 = u_{wei}^2 + u_{rep}^2$$

For Inλ standards

$$x_i \xrightarrow{\Delta T} x'_i = x_i + c_T \cdot \Delta T$$

← the correction for $T \neq T_{Ref}$

The „most reliable" results = the results for which it is unambiguously stated that the residual non-liniearities of TIC and other non-compensated systematic effects are included into uncertainties (eg. for SR620 – $U \geq 0{,}15$ ns) and which are consistent with other results (omitting outlieres).

Illustration of the problem of reliablity

Accompanied TIC measurements

XXX_SR620 – U = 23 ps (at all time intervals)

$\tau_{TIC} - \tau_{weig\_mean\_osc} \approx$ between -69 ps and +23 ps

XXX_SR620 – U = 115 ps (at all time intervals)

$\tau_{TIC} - \tau_{weig\_mean\_osc} \approx$ between -2 ps and +46 ps

XXX_53230A – U = from 408 ps to 437 ps

$\tau_{TIC} - \tau_{weig\_mean\_osc} \approx$ between 2 ps and 26 ps

XXX_53230A – U = 21 ps (at all time intervals)

$\tau_{TIC} - \tau_{weig\_mean\_osc} \approx$ between -8 ps and +21 ps

Proposed calculation of the equivalence coefficient

$$E_i = \frac{x_i - x_{Ref}}{U(x_i - x_{Ref})}$$

for InLambda standards

u_{rep} = 5 ps / or 10 ps

for TIGen of GUM/AGH

u_{rep} = 1,5 ps / or 2,5 ps

$$u^2(x_i - x_{Ref}) = u_i^2 + (1 - 2\delta_i)u_{wei}^2 + u_{rep}^2$$

δ_i = 1 or -1

$$U(x_i - x_{Ref}) = 2u(x_i - x_{Ref})$$

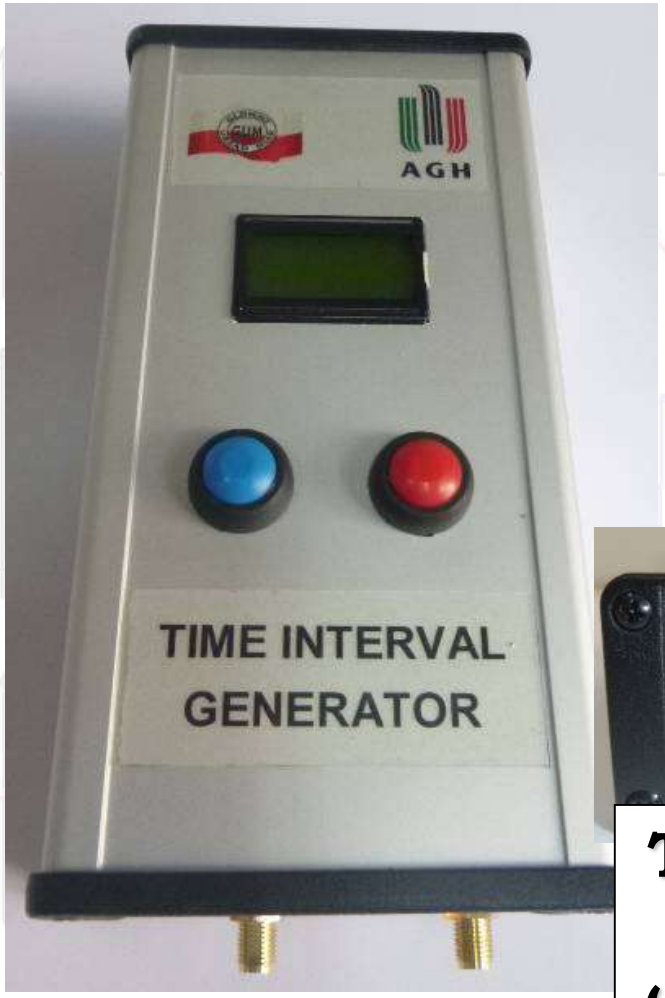
values chosen by TC-TF

$|E_i| \leq 1$ ← result positive

$|E_i| > 1$ ← result negative

The proposed time intervals for Supplementary Comparison

3 time intervals/delays:
Inλ 20, Inλ 100, Inλ 300
(c. 20 ns, c. 100 ns, c. 300 ns)



The proposed time intervals:
dn0, dn3, dn7 and dn126
(c. 20 ns, 250 ns, 1,5 µs and 12 µs)

U
t

U
t

U
t

U
t

U
t

U
t

U
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U
t