

## How is this 8us calculated?

- $\tau$  is a measure unit for FrobeniusMap(a,n) map function in NTT domain.

### Using the formular:

$$z \in \mathbb{C} \xrightarrow{\tau-1} (mQ(X)) \in \mathbb{Q}(X)/(X^N + 1) \xrightarrow{b\Delta \cdot e} m(X) \in \mathbb{R}\mathbb{Q}$$

where  $\tau : z_i \mapsto mQ(\zeta^i)$  and  $\tilde{z} = (z_i)_{i \in [0, N-1]}$ ,  $\zeta^i = \zeta^{\tau^i}$ ,  $\zeta = \exp(-2\pi i/4M)$ , and  $[\Delta \cdot] : a \rightarrow [\Delta \cdot a]$ .

The result obtained is defined by substituting  $\zeta^i$  for  $X$  in  $mQ(X)$  as the value of the **i-th slot**.

Considering slot rotation: assuming that the rotation by  $n$  slots is performed in  $mQ(X)$ ,

the resultant polynomial  $m^Q(X) \in \mathbb{Q}[X]/(X^N + 1)$

should preserve  $m^Q(\zeta^i) = mQ(\zeta^{i+n})$ .

That is, the value in the  $(i + n)$ -th slot of  $m^Q(X)$  should be the same as the one in the  $i$ -th slot of  $mQ(X)$ .

Because  $\zeta^{i+n} = \zeta^{\tau^{i+n}} = \zeta^{\tau^i \tau^n}$ , we need to compute  $m^Q(X) = mQ(X^{\tau^{-n}})$  from  $mQ(X)$ .