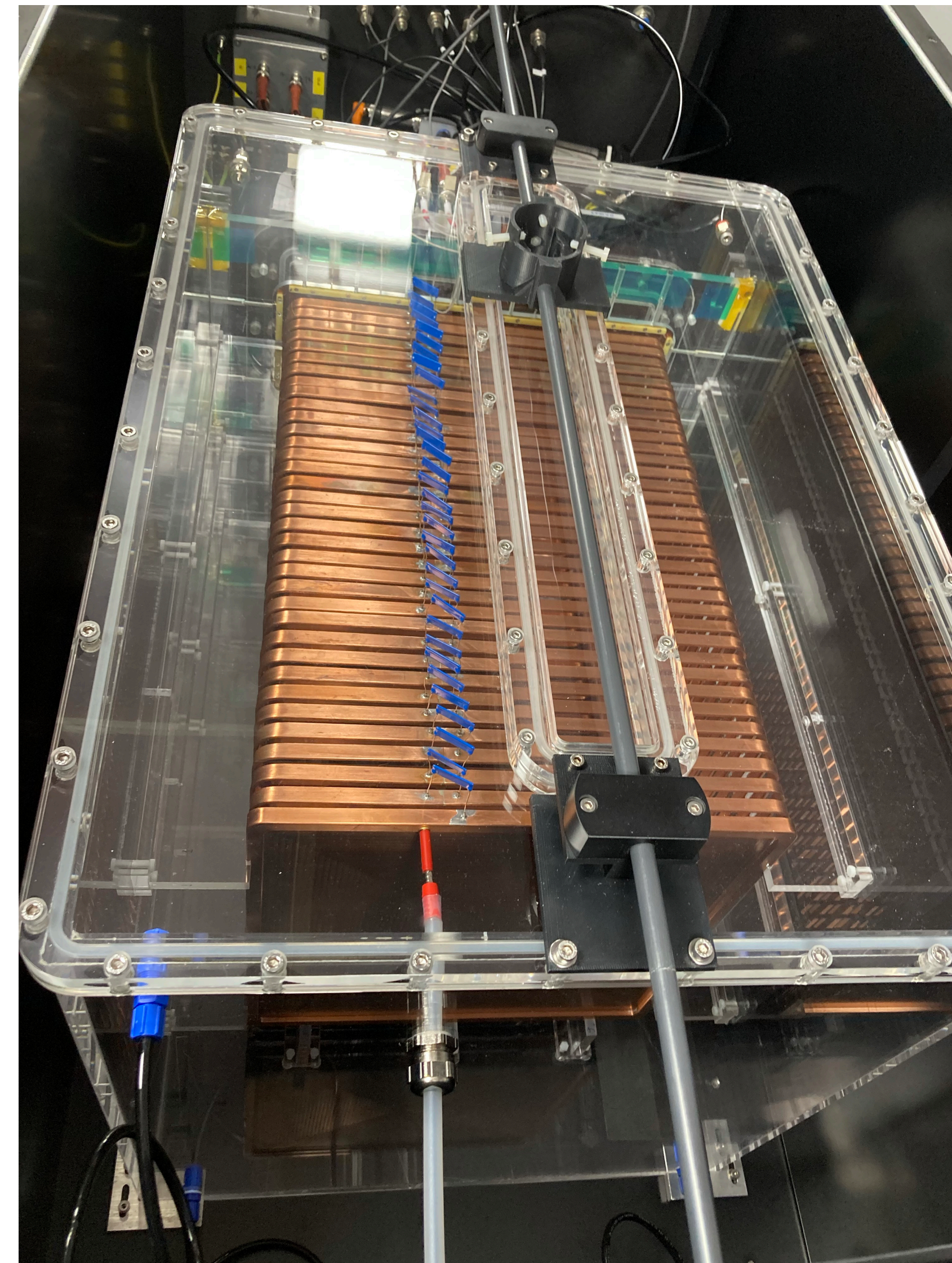


LIME: dead time measurement

Stefano Piacentini

General Meeting

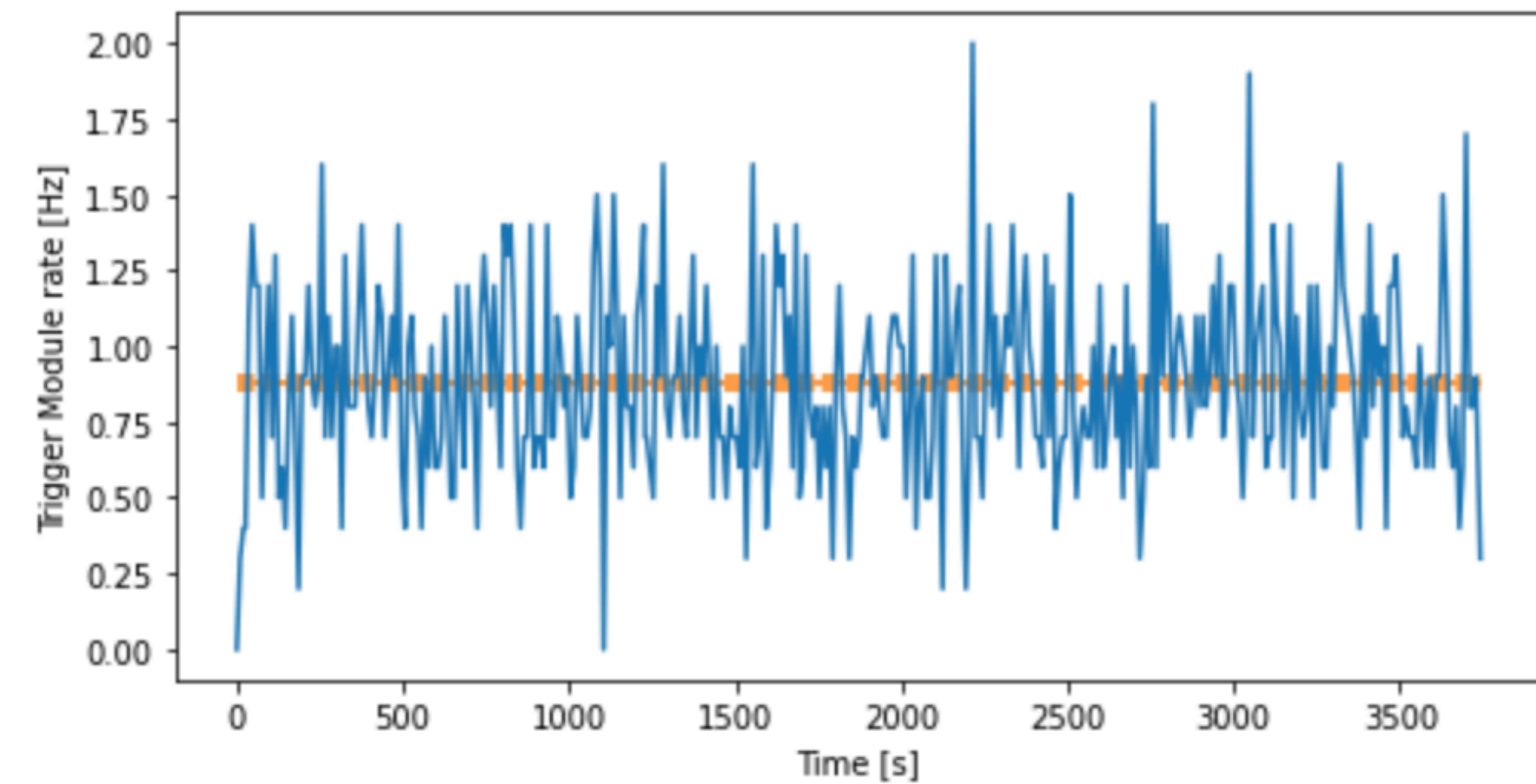
15/04/2024



Data used for the study

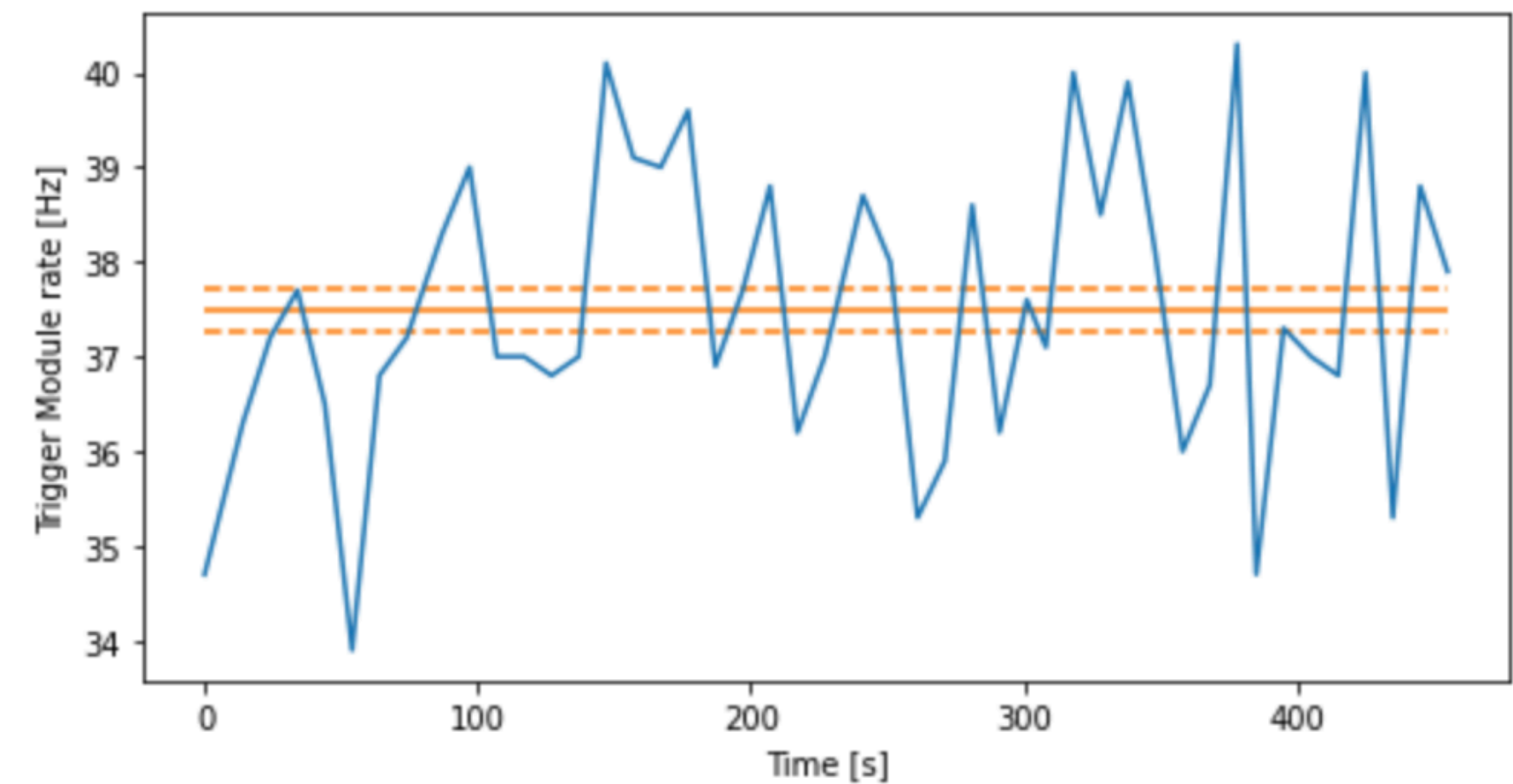
1. LIME RUN4 standard configuration (trigger rate ~ 0.9 Hz):

➔ Runs [47973, 47978]



2. LIME with ^{55}Fe & PMTs @ 590 V (trigger rate ~ 36 Hz):

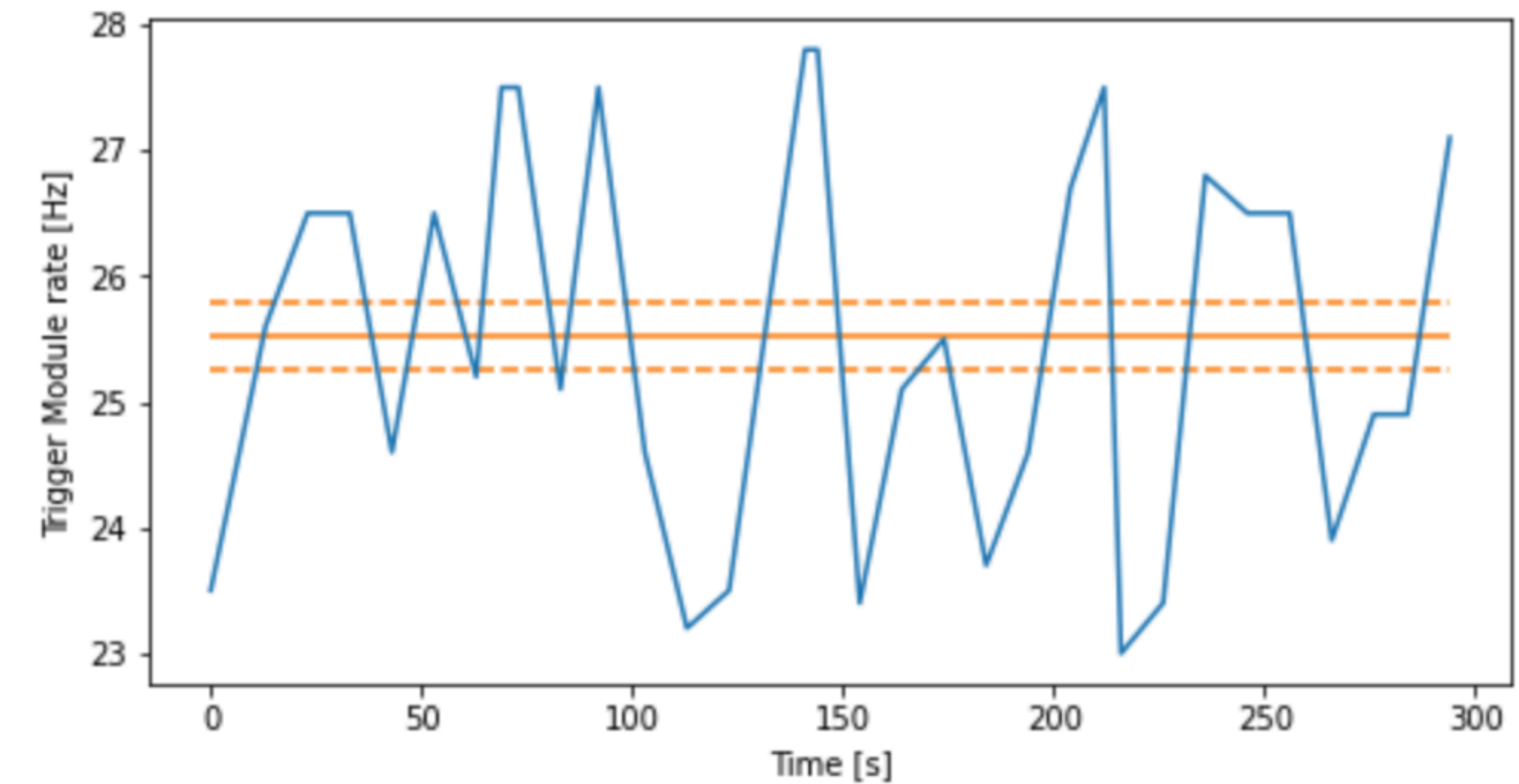
➔ Runs [47982, 47985]



Data used for the study

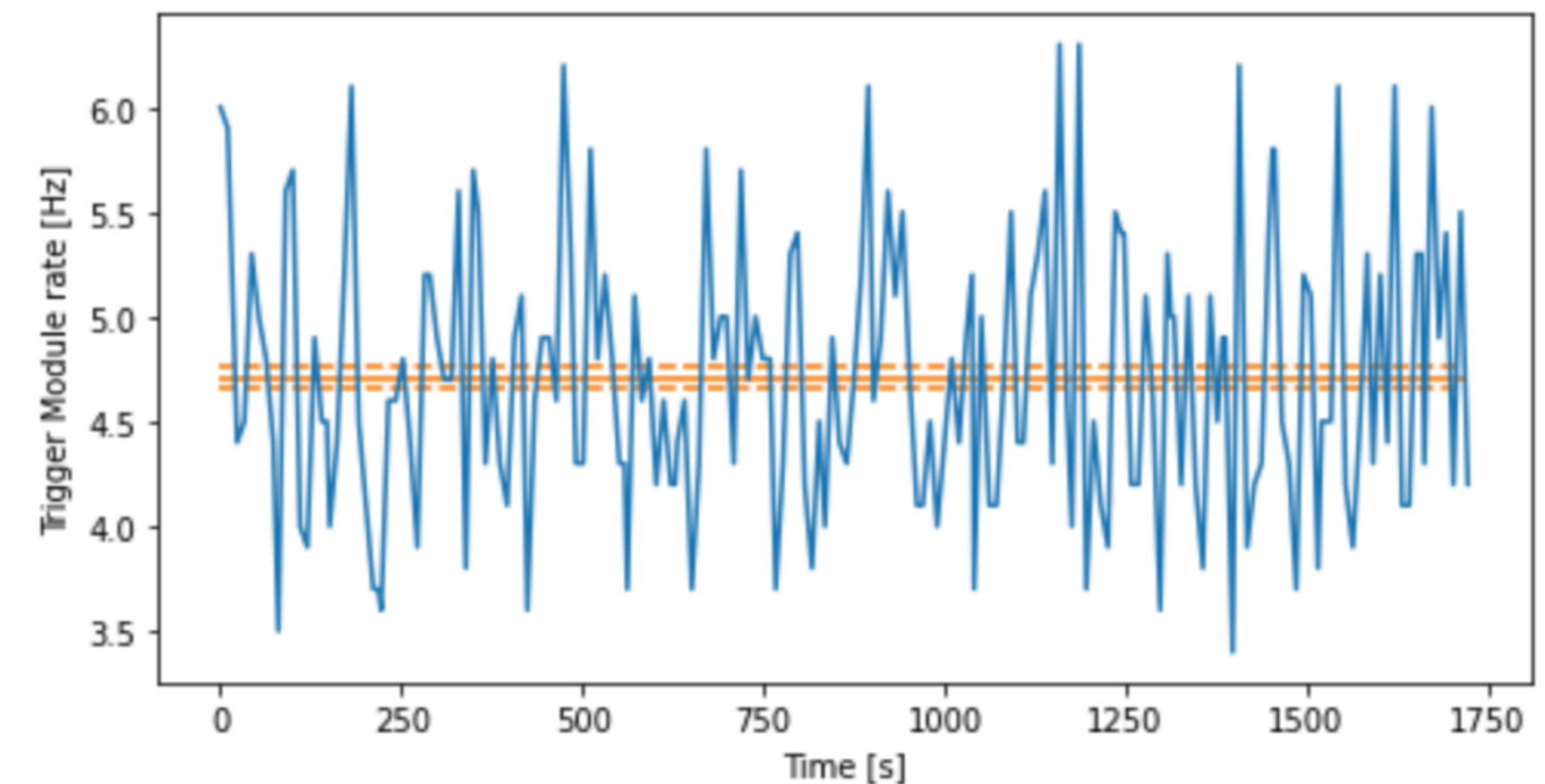
3. LIME with ^{55}Fe & PMTs @ 580 V (trigger rate ~ 26 Hz):

➔ Runs [47986, 47989]



4. LIME with ^{55}Fe & PMTs @ 560 V (trigger rate ~ 5 Hz):

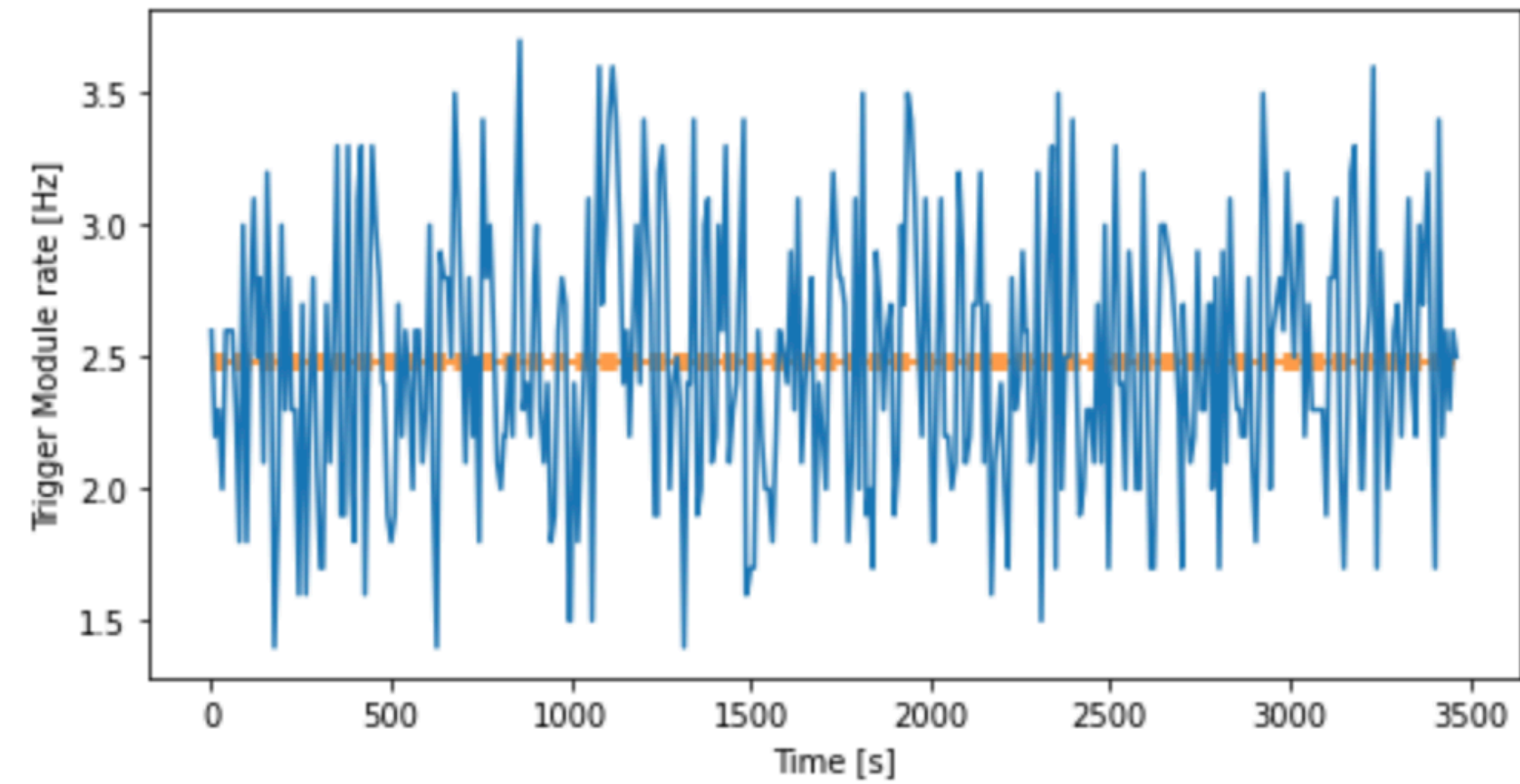
➔ Runs [47990, 48014]



Data used for the study

5. LIME with ^{55}Fe & PMTs @ 555 V (trigger rate ~ 2.5 Hz):

➔ Runs [48015, 48054]



Ingredients for the analysis

- **Idea:** measure dead time inefficiency by **comparing** the trigger signals as counted by the **Trigger Module** (before they are sent to the DAQ for the acquisition) with the number of **PMT waveforms** acquired by the **whole DAQ** system
- **Caveat:** given the way the Trigger module works, **there's a ~ 20-30 s delay between the two systems**. Therefore, the events counted with the two methods could not be the same over the whole time windows considered, and we are **forced to compare the two by means of the average measured trigger rate**.

Average rate of events
measured by the Trigger Module

Average rate of events
acquired by the DAQ

• **Dead time** inefficiency computed as:

$$\epsilon_{DT} = \frac{\langle R_{TM} \rangle - \langle R_{DAQ} \rangle}{\langle R_{TM} \rangle}$$

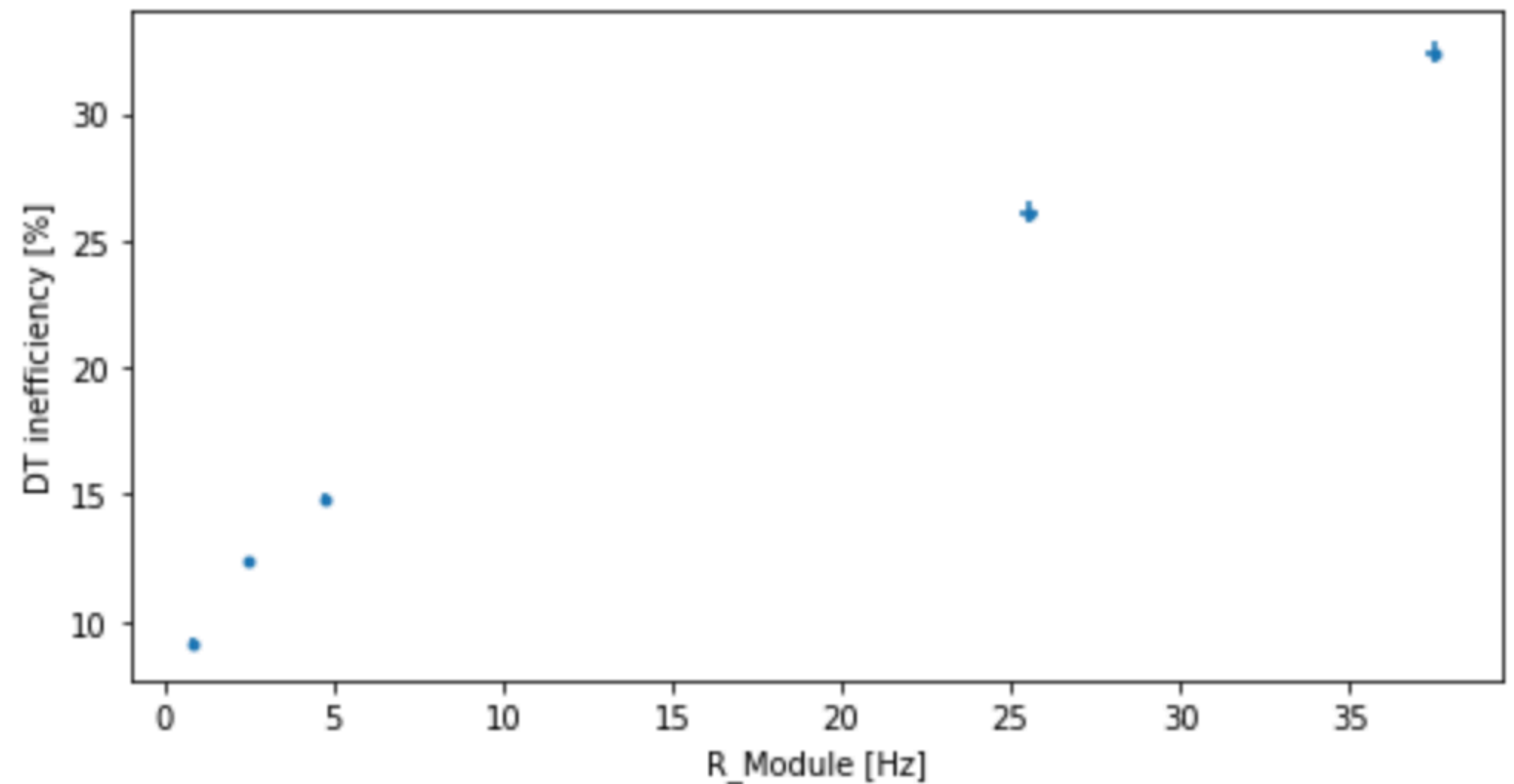
Results

	T.M. [Hz]			DAQ [Hz]			e_DT [%]		
Conf # 1	0,880	±	0,016	0,800	±	0,015	9,12	±	0,24
Conf # 2	37,49	±	0,22	25,34	±	0,30	32,39	±	0,42
Conf # 3	25,52	±	0,26	18,86	±	0,26	26,12	±	0,45
Conf # 4	4,71	±	0,05	4,01	±	0,05	14,87	±	0,24
Conf # 5	2,48	±	0,03	2,17	±	0,03	12,35	±	0,20

Flaminia's correction factors:

Phase	R_{PMT} [Hz]	D
Run 1	30	1.42 ± 0.06
Run 2	3.5	1.104 ± 0.009
Run 3	1.6	1.081 ± 0.007

They are relatively close to the measurements!



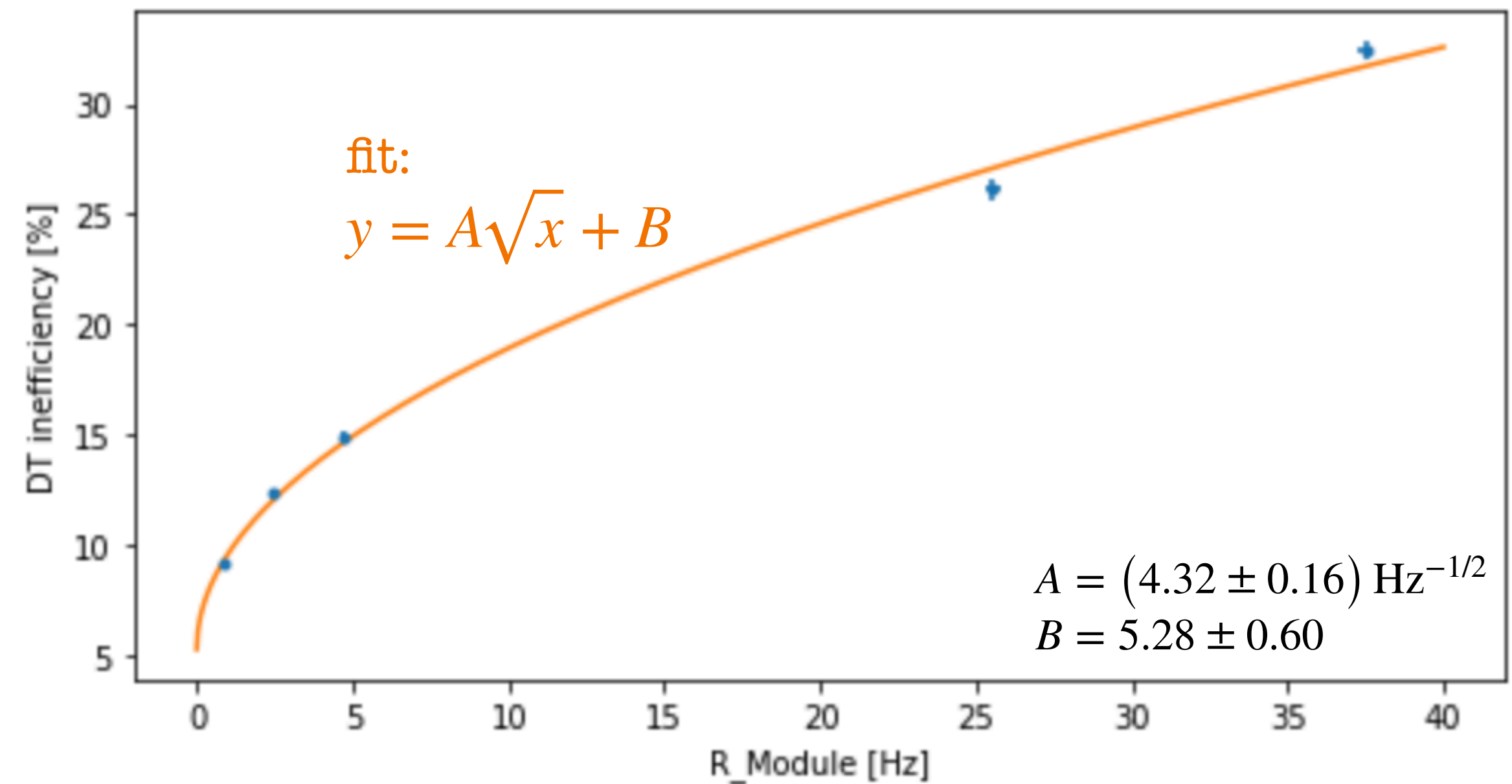
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Flaminia's correction factors:

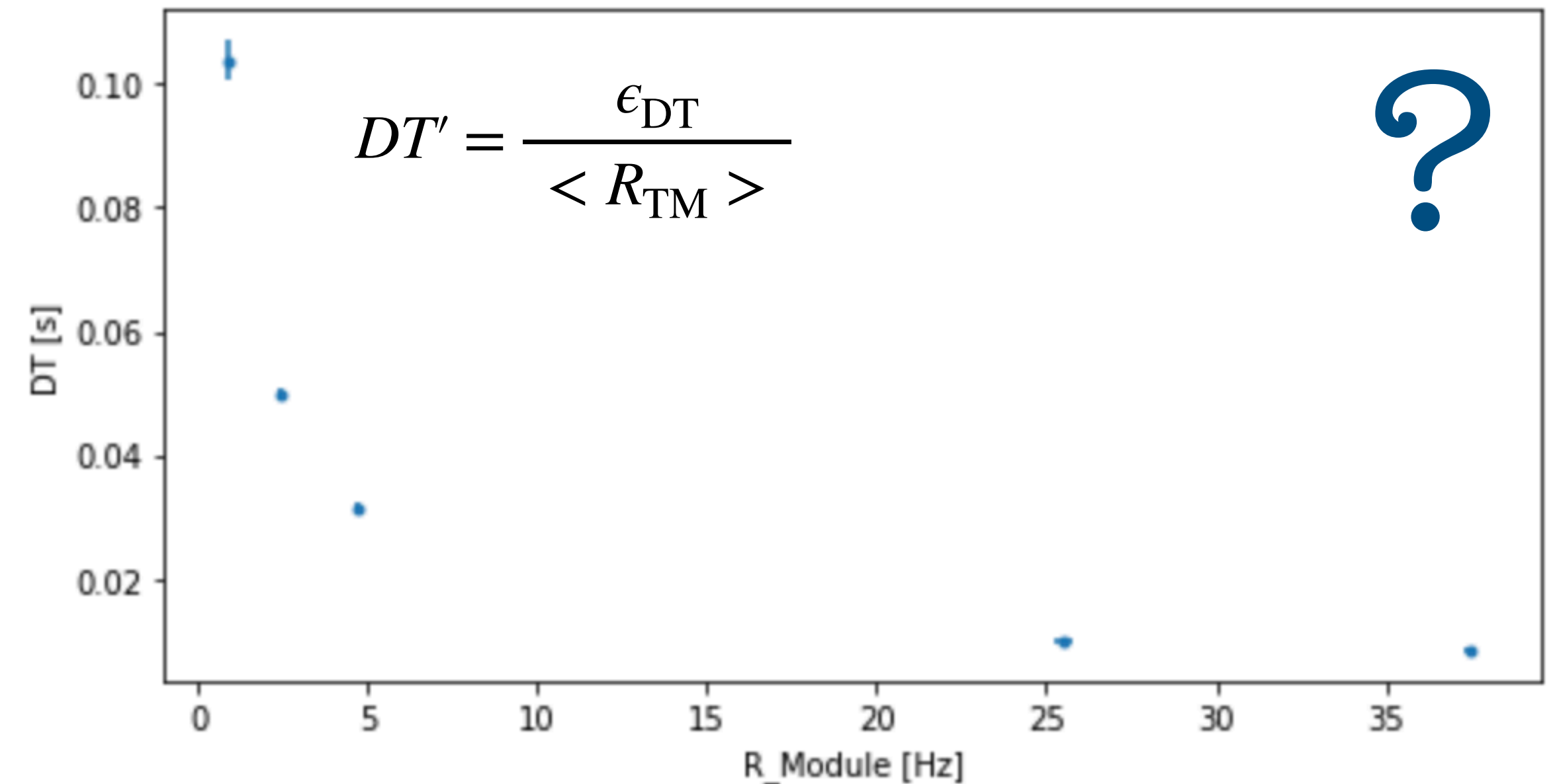
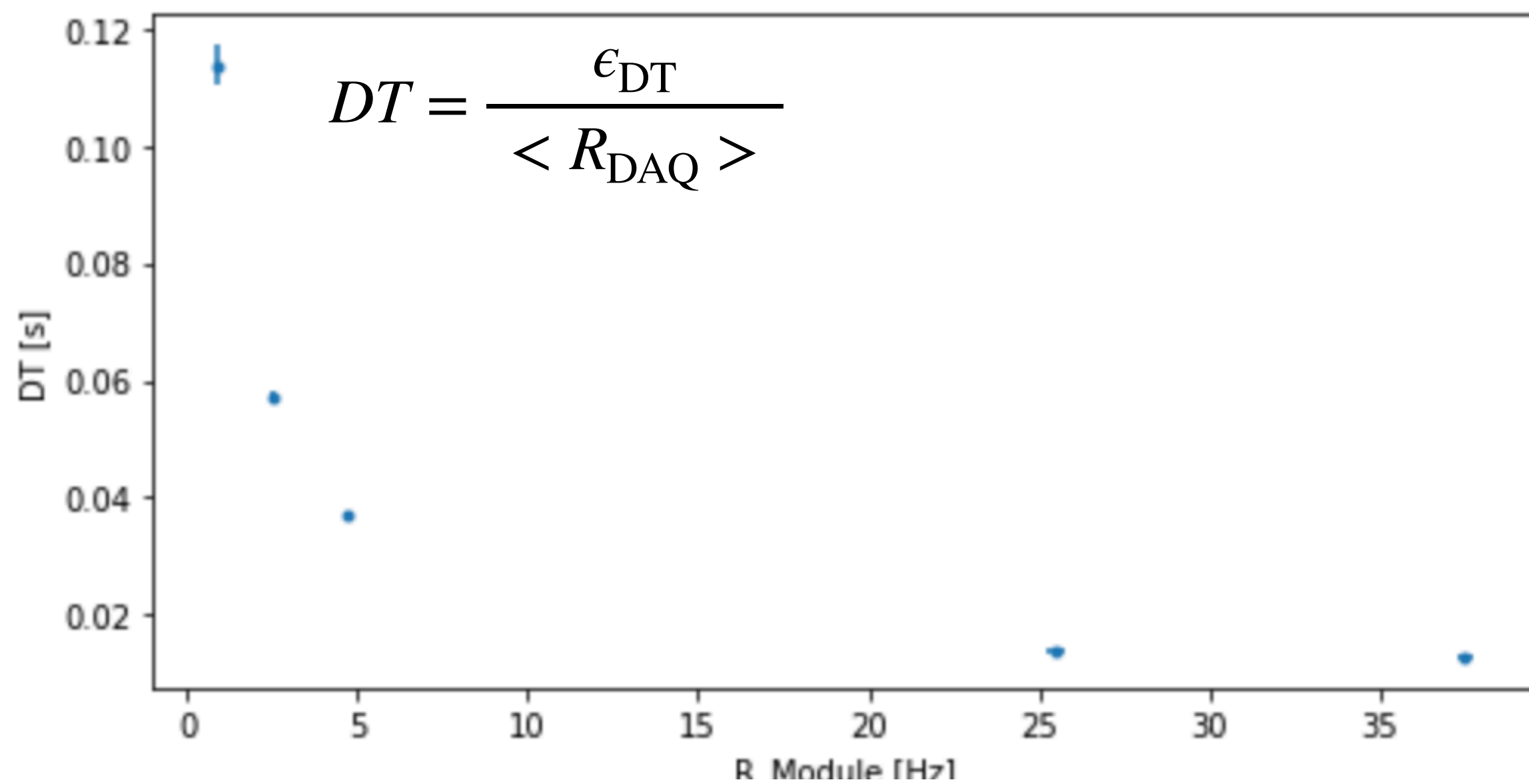
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DT per foto = 30 ms + Nwf* 10 ms