



# Status of ageing studies

A. Bross

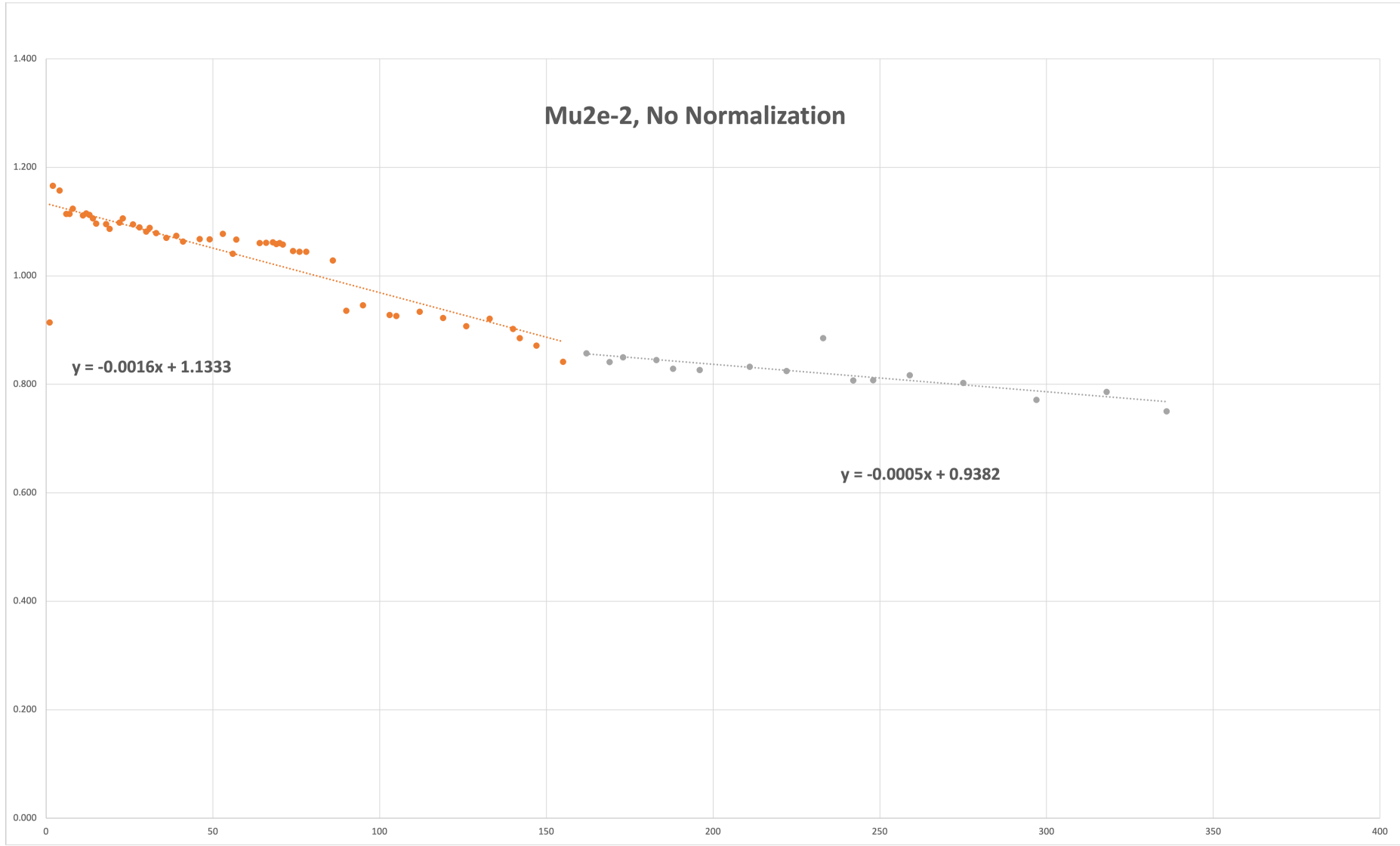
Scintillator R&D Meeting

April 18<sup>th</sup>, 2022

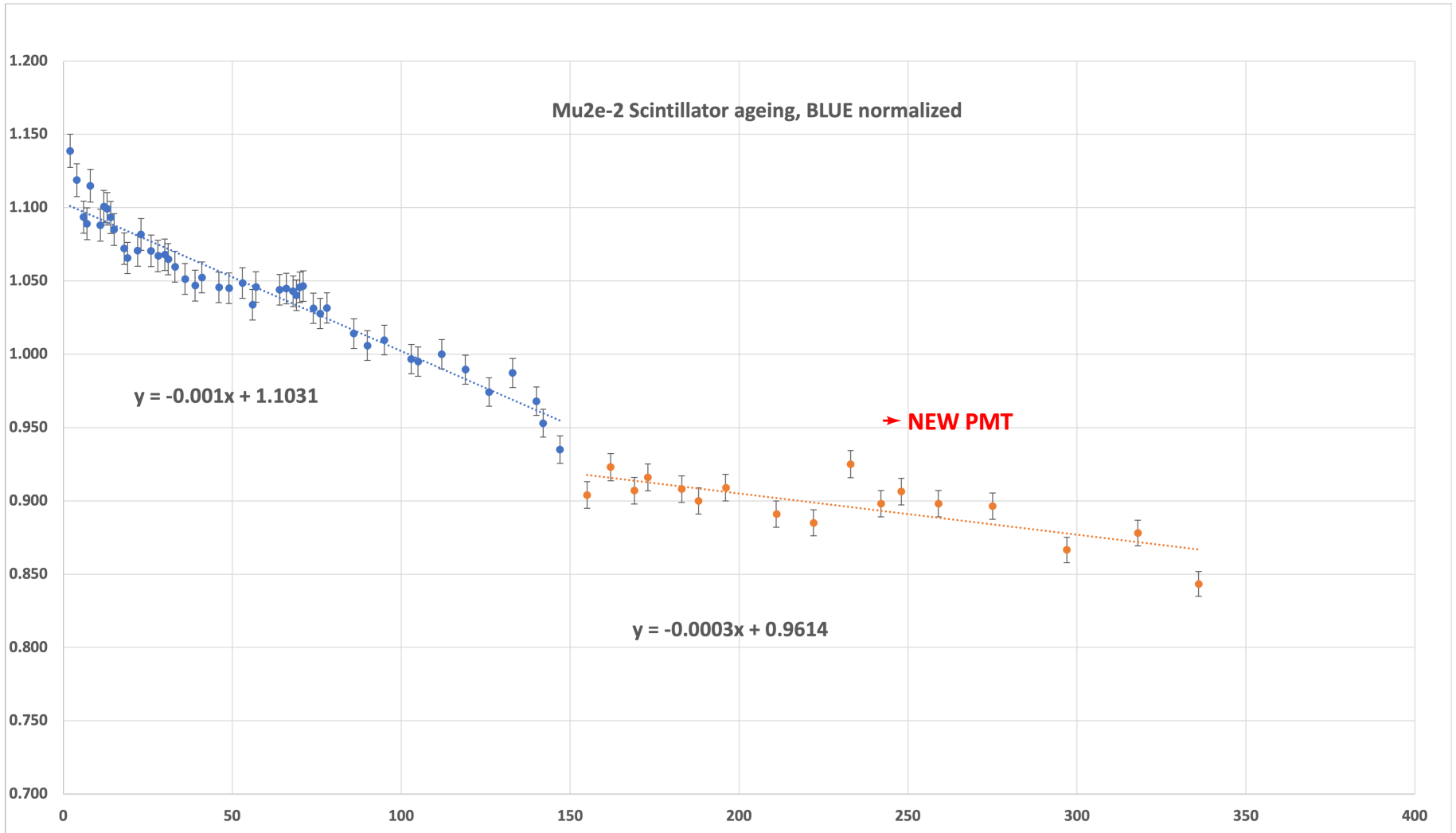
# Review: Ageing studies

- The first round of ageing studies started almost a year ago using a Mu2e sample that was produced in 2019 (had been on the shelf for  $\sim 2$  years).
- Source:  $^{207}\text{Bi}$
- Used two references:
  - Blue scintillator
  - Green scintillator with similar fluorescence to WLS fiber
- Note: during this time, we have replaced our shaper amp and PMT ( 🤪 ).
  - Unfortunately, this PMT we are now using is not as stable.

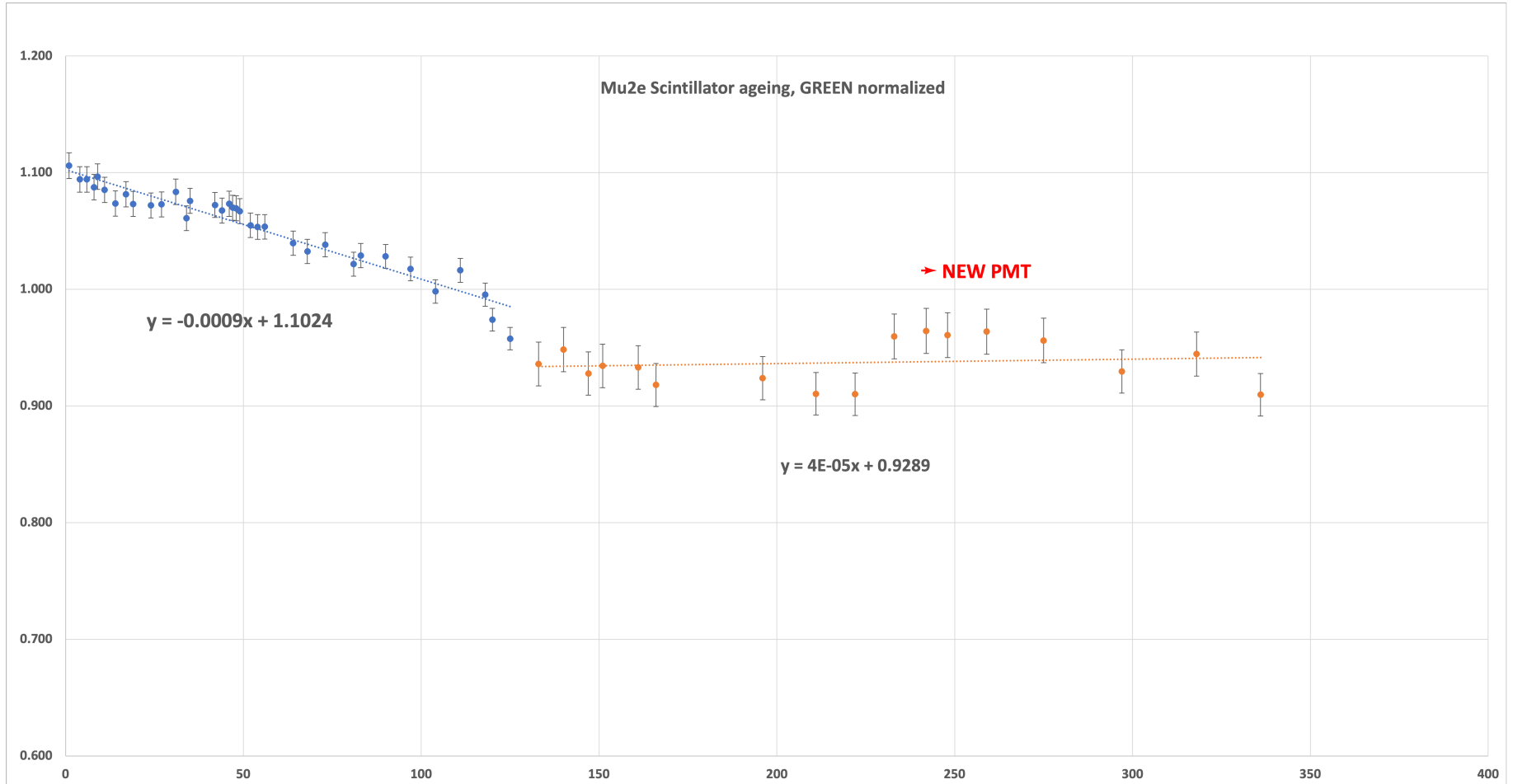
# Round 1



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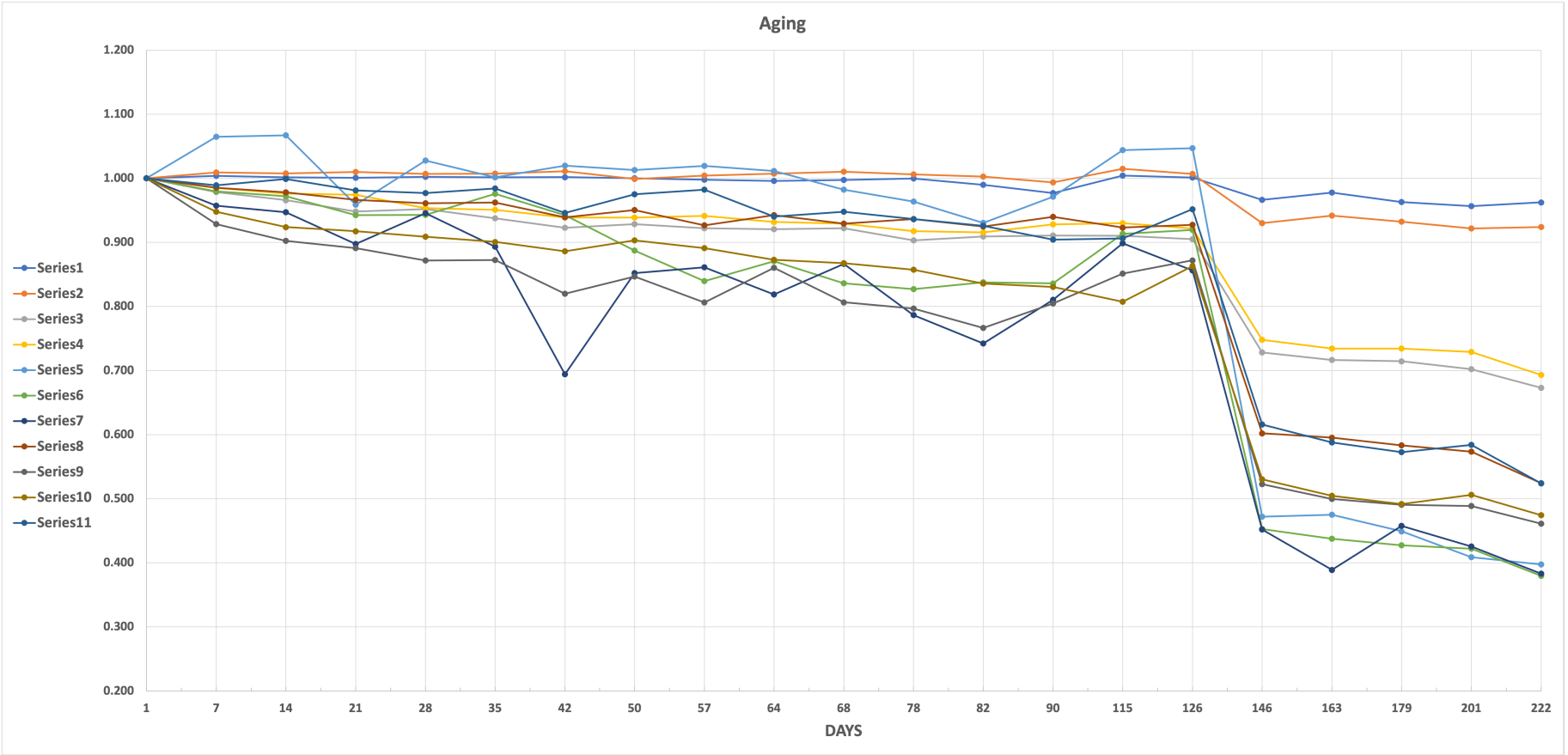
# Round 1



## Round 2

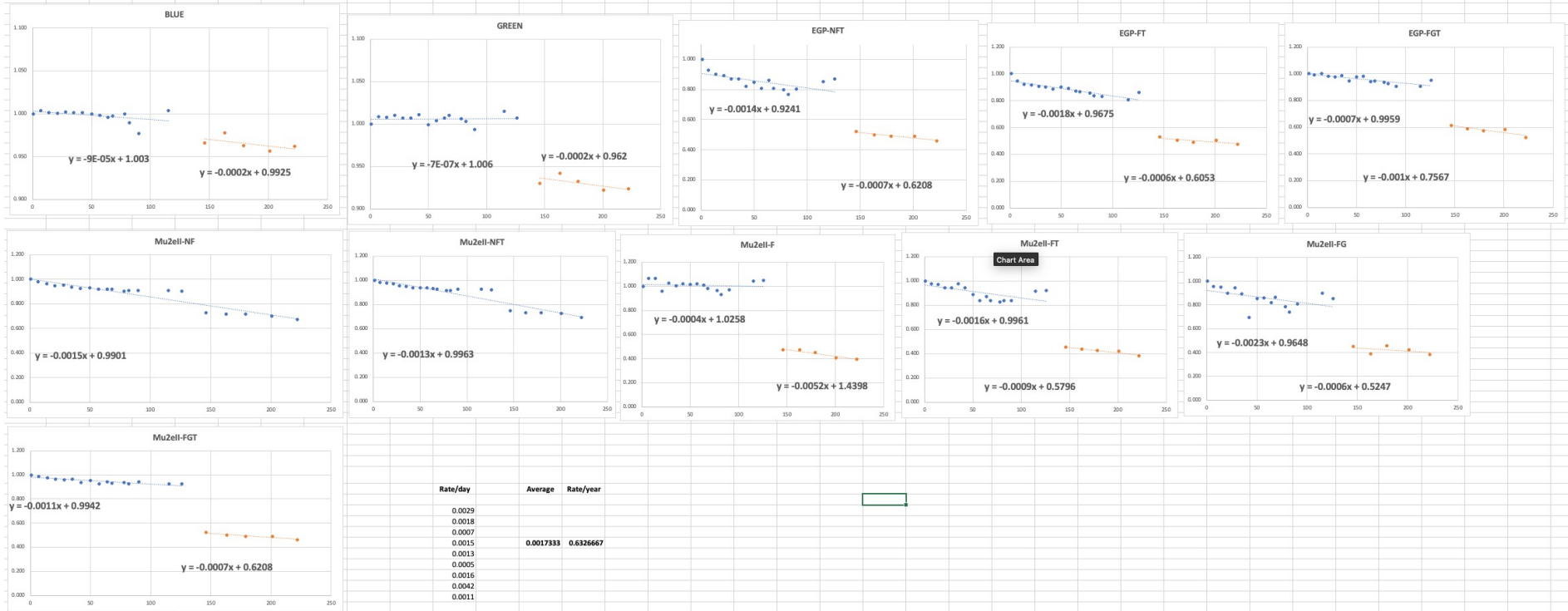
- New Samples of the Mu2e extrusion and the new EGP triangle were produced
  - Mu2e: May 2021
  - EGP: June 2021
- Samples with and without fiber, with and without glue, with and without reflective tape

# Round 2



# Round 2

Note: 1% per year =  $\sim 3 \times 10^{-5}$



- Conclusions:
  - All samples have large initial ageing rate
    - 85% down to 16%
    - No obvious correlation with glue/no-glue, fiber/no-fiber, etc.
  - Ageing seems to be flattening out.
    - Time will tell



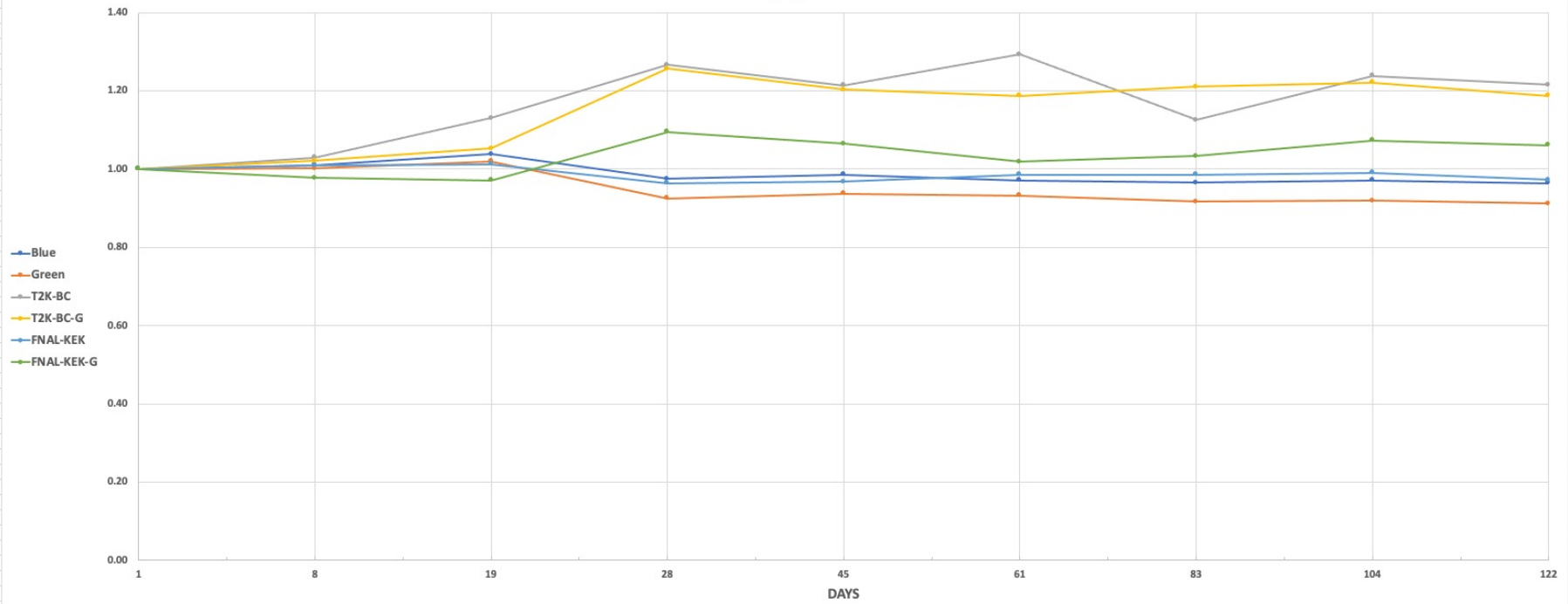
## Round 3

- Obtained 1 X 1 cm samples from T2K which were made in Canada (following exactly our formula) -- 2010
- 1 X 1 cm samples made at Fermilab -- 2014

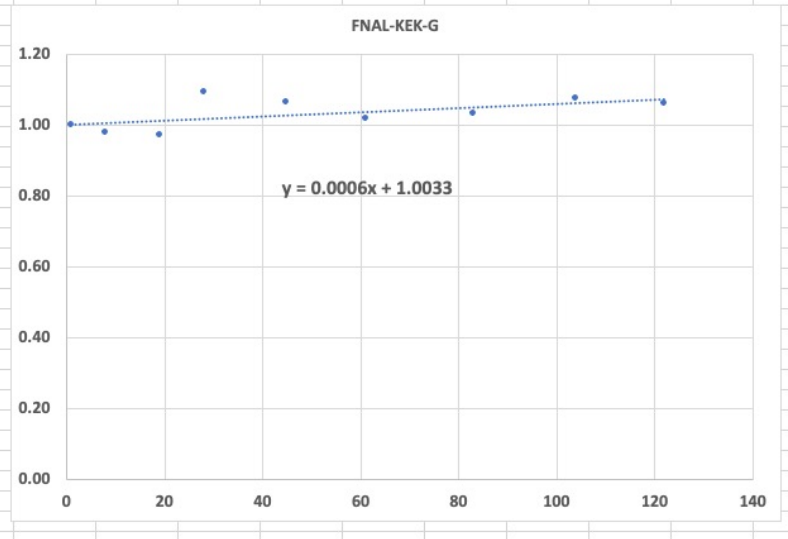
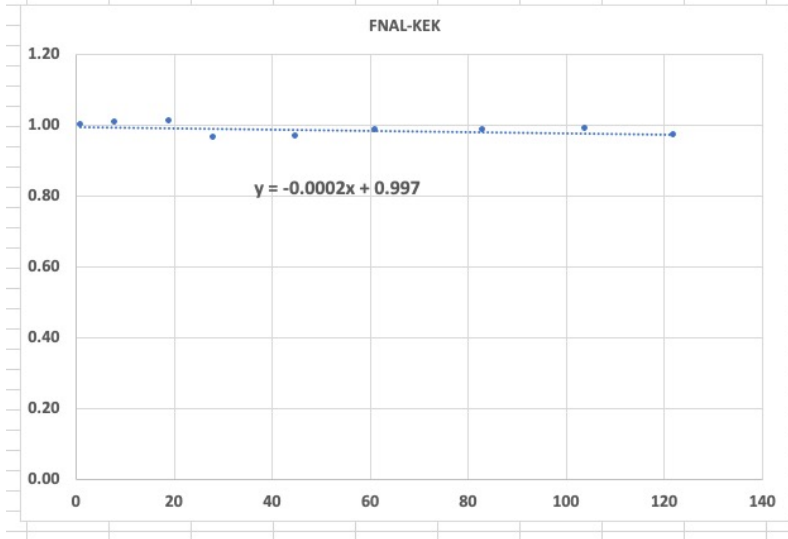
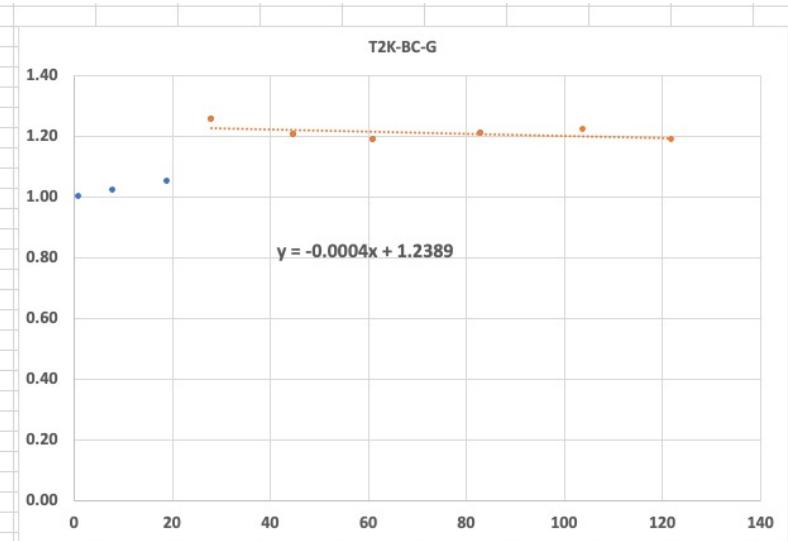
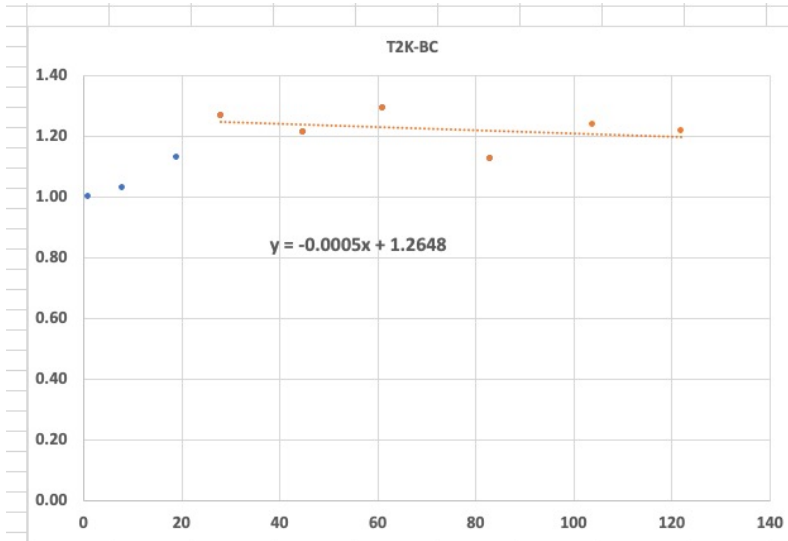
# Round 3

	DATE	DAYS	BLUE	GREEN	T2K-BC	T2K-BC-G	FNAL-KEK	FNAL-KEK-G	Measured by:	Notes			
Reference (LDL 150) 12/15	15-Dec	1	225,556,380	251,744,428	19,067,868	19,408,051	14,420,065	20,403,490	AB				
		1	1	1	1	1	1	1		Ratio T2K-BC-G/T2K-BC	1.018	Ratio FNAL-KEK-G/FNAL-KEK	1.415
	23-Dec	8	1.010	1.002	1.029	1.021	1.009	0.977	AB		0.991		1.371
T2K-BC produced in 2010	3-Jan	19	1.038	1.020	1.131	1.052	1.013	0.971	AB		0.947		1.357
FNAL-KEK produced in 2014	12-Jan	28	0.975	0.926	1.267	1.256	0.964	1.095	AB		1.010		1.607
	29-Jan	45	0.986	0.937	1.214	1.203	0.968	1.065	AB		1.009		1.557
	14-Feb	61	0.971	0.933	1.293	1.188	0.986	1.019	AB		0.935		1.463
	8-Mar	83	0.965	0.916	1.125	1.211	0.986	1.033	AB		0.953		1.483
	29-Mar	104	0.971	0.919	1.239	1.221	0.990	1.074	AB		1.003		1.534
	16-Apr	122	0.964	0.912	1.215	1.187	0.973	1.061	AB		0.994		1.543

Aging



# Round 3



# Conclusions

- We see a leveling off of the light decrease
  - Samples of new scintillator show factor of up to 4 reduction in rate
- Still No clear indicator as to what the issue is
- Old scintillator does not appear to age
  - Seems to indicate that sample prep does not cause the problem
  - Continue through the summer