NEAR irradiation stations

NSTAPP – Neutrons in Science, Technology and applications (22 of November 2021)

AP.Bernardes SY-STI on behalf of the n_TOF team

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HSE-RP: JF.Gruber, F.Pozzi, N.Conan

EDMS 2664682

Agenda

1. Introduction
2. NEAR irradiation station (NEAR IN)
3. NEAR experimental station (NEAR OUT)
4. Conclusion

Introduction - NEAR at n_TOF

EAR2: Experimental area 2

EAR1: Experimental area 1

TT2A- 802

n_TOF target

NEAR

NEW

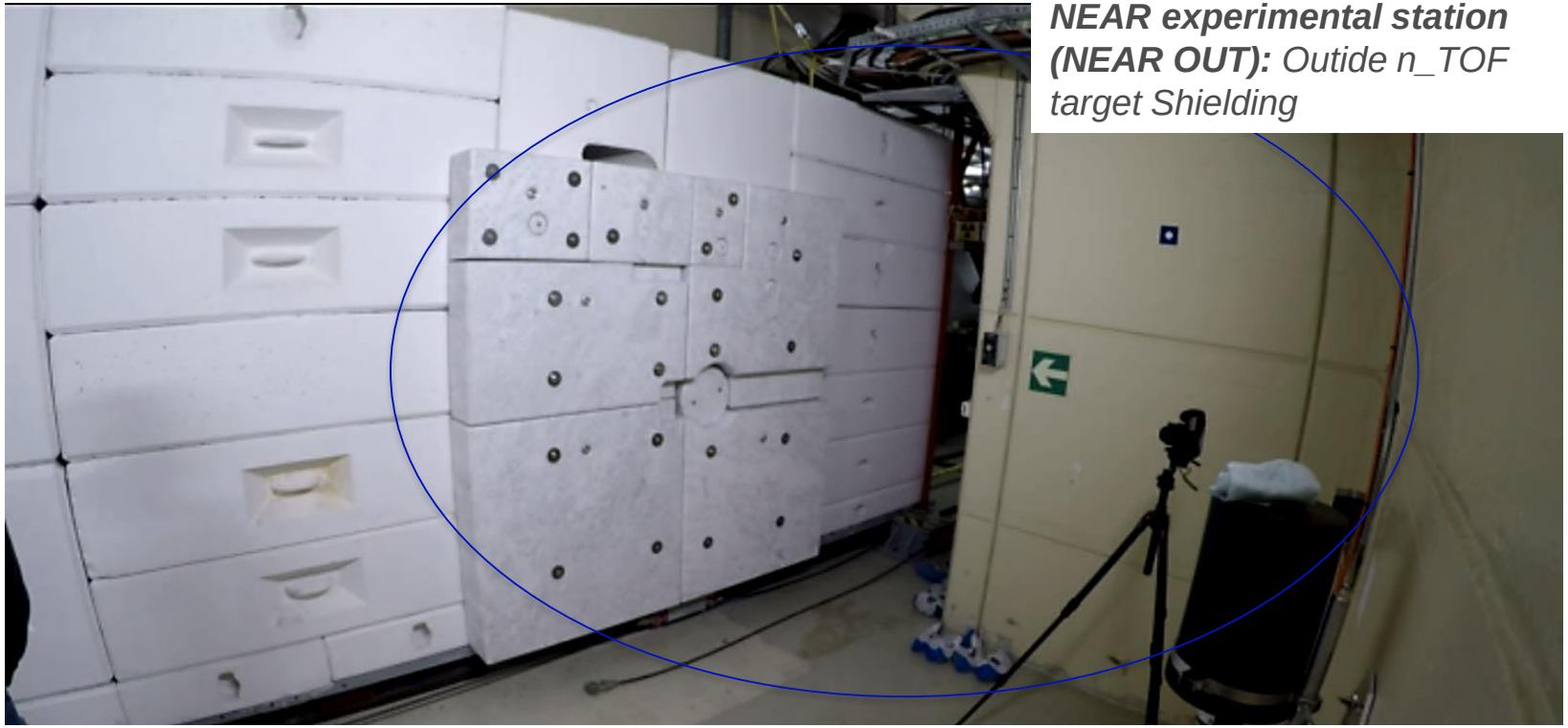
TT2 - 801

Protons from PS

NEAR irradiation and experimental station

Roadmap for the Implementation of a New Target Mobile Shielding and a NEAR Experimental Station at the n_TOF Facility: EDMS 2158356 and associated ECR EDMS 2379173

NEAR irradiation station (NEAR IN): *Inside Shielding close to n_TOF target. Dedicated to R2M*

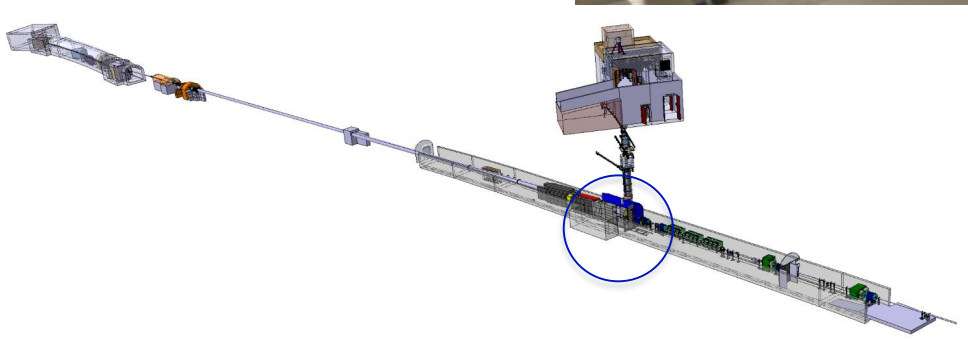


NEAR experimental station (NEAR OUT): *Outide n_TOF target Shielding*

n_TOF mixed field irradiation places for R2M, R2E and n_TOF community applications - **Initially foreseen during YETS 2021-2022 but successfully installed before run 3 in 2021**

Introduction - NEAR at n_TOF

n_TOF target area –
Shielding **OPEN**

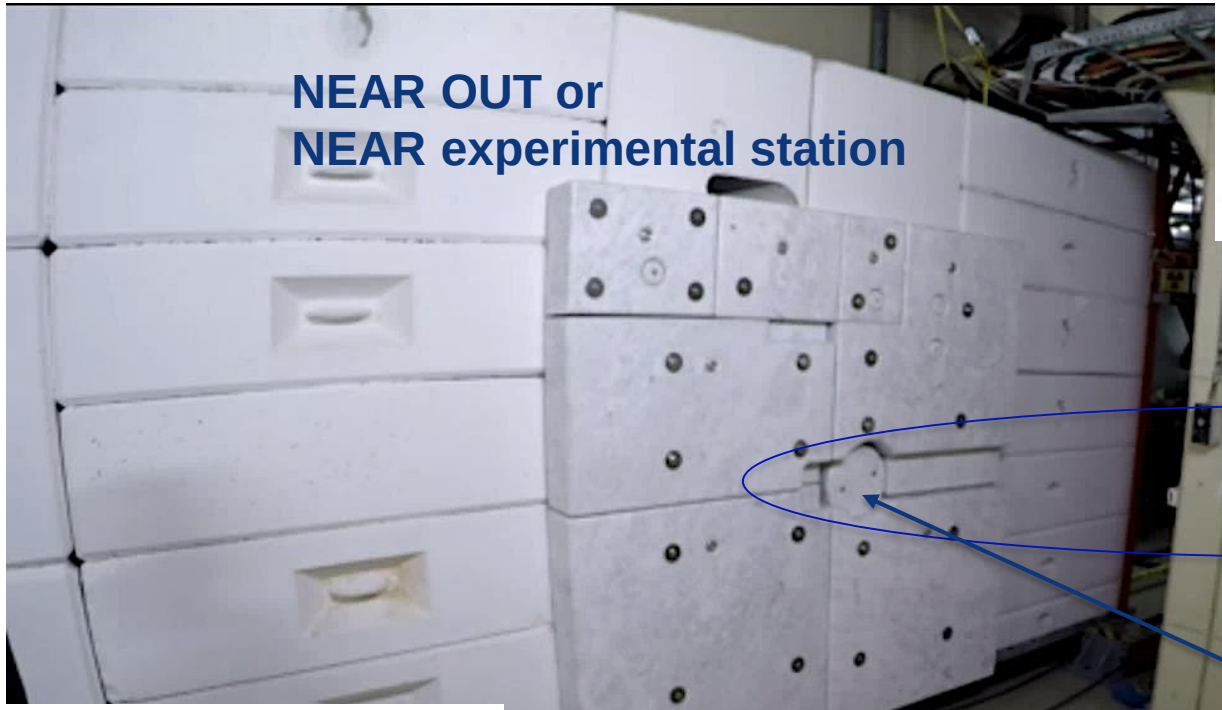


Irradiation positions inside shielding - Close to the target

Acknowledgment: M.Barbagallo

Introduction - NEAR at n_TOF

n-TOF target area – Shielding **CLOSED**



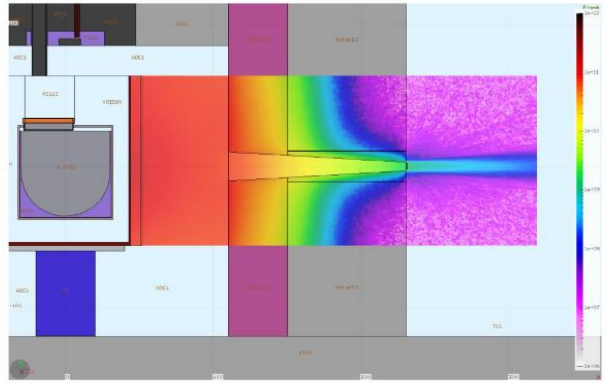
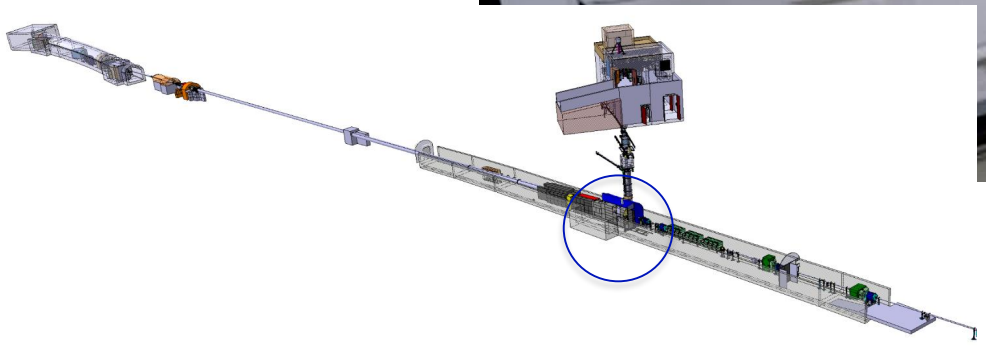


Figure 12. The figure shows a transversal cross section of the n_TOF Target pit and a potential configuration of the modified target shielding, showing the neutron fluence in units of n/cm²/pulse, averaged along the center of the external cone aperture.



Irradiation positions along the center of the external cone aperture

NEAR irradiation station (NEAR IN)

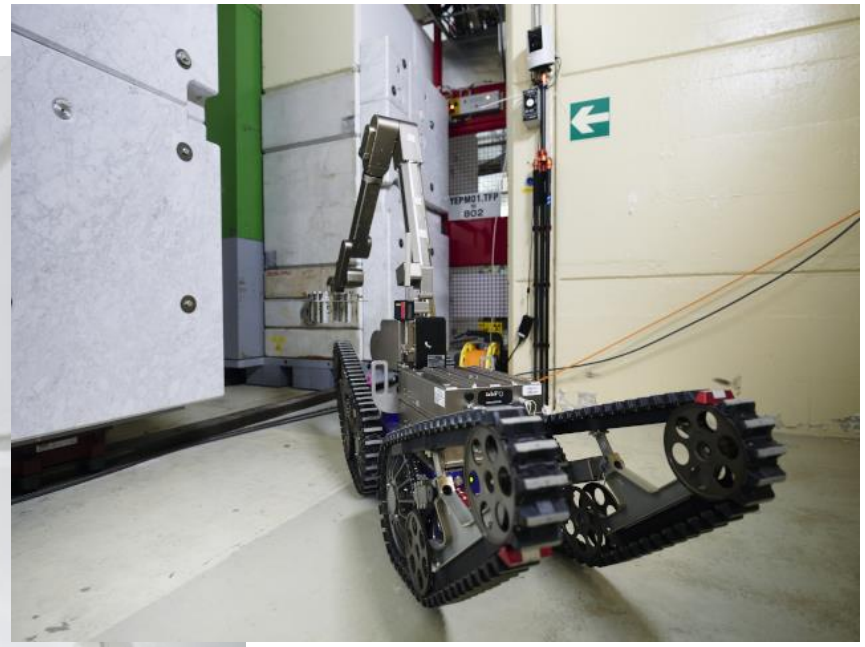
NEAR irradiation station (NEAR IN) - Shelve installation

Dose rate without target and after 2 years decay time **8 mSv/h**

Acknowledgements

L.R.Buonocore, C.Veiga Almagro, E.Romagnoli, L.Barbosa Pina Pereira BE-CEM, JF.Gruber HSE-RP, D.Senajova SY-STI

NEAR irradiation station (NEAR IN) – Samples installation



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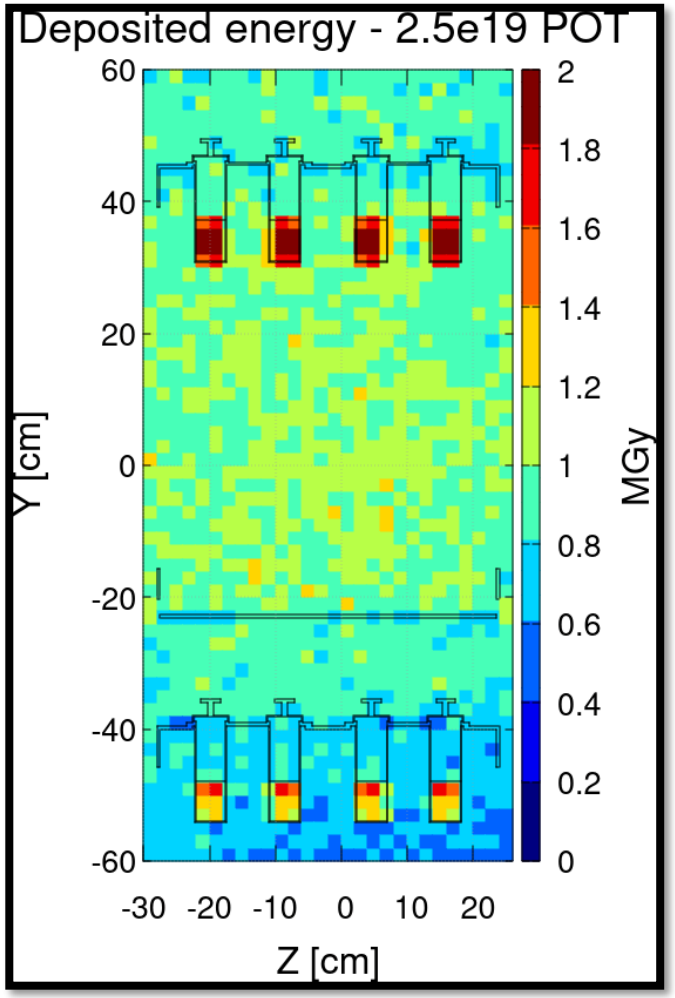
NEAR irradiation station (NEAR IN) – Irradiation parameters



IRRADIATION CONDITIONS

- ✓ Neutron dose 80 to 85 % (in organic materials)
- ✓ Neutrons in MeV range: dominant component
- ✓ ≈ 2 MGy/y – top shelf
- ✓ ≈ 1 MGy/y – bottom shelf
- ✓ Satisfactory homogeneity

Total absorbed dose in the samples (FLUKA)
Top and bottom shelf
F.Pozzi, A. Makovec (HSE-RP), March 2021

Slide courtesy: M.Ferrari (SY-STI)
March 2021

NEAR irradiation station (NEAR IN) – 2021 Samples

List of selected commercial Materials irradiated in 2021 at NEAR

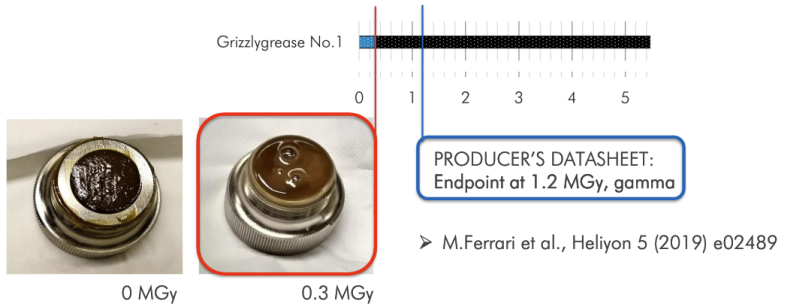
Most of materials are used ate CERN

#	PRODUCT	PRODUCER	TYPE	GENERAL COMPOSITION	TOTAL AMOUNT (2 samples per material)
1	RP-42R	MORESCO	oil	PPE (polyphenyl ether)	200 mL
2	RG-42R-1	MORESCO	grease	PPE + bentonite	200 g
3	RG-42R-2	MORESCO	grease	PPE + bentonite	200 g
4	LY PPE 360	Lubrilog	oil	PPE	200 mL
5	LX AGFA 00	Lubrilog	grease	PPE + silica	200 g
6	LX AGFA 2	Lubrilog	grease	PPE + silica	200 g
7	PETAMO GHY 133N	Kluberlub	grease	Minera oil + polyurea	200 g
8	GRIZZLYGREASE N.1	Lubcon	grease	Minera oil + Li/Ca	200 g
9	SANTOVAC 5GB	SANTOLUBES	grease	PPE + unknown additives	200 g
10	NUCLEOL G121	Castrol	grease	Mineral oil + inorganic thickener	200 g
11	EPDM 70.10-02	Angst + Pfister	elastomer		
12	Shieldseal 663	James Walker	elastomer		
13	Alf	Sigma-Aldrich	Powder		

Remote handling Irradiation samples recovery planned in december 2021

Acknowledgements
M.Ferrari SY-STI

GRIZZLYGREASE No.1 BY LUBCON

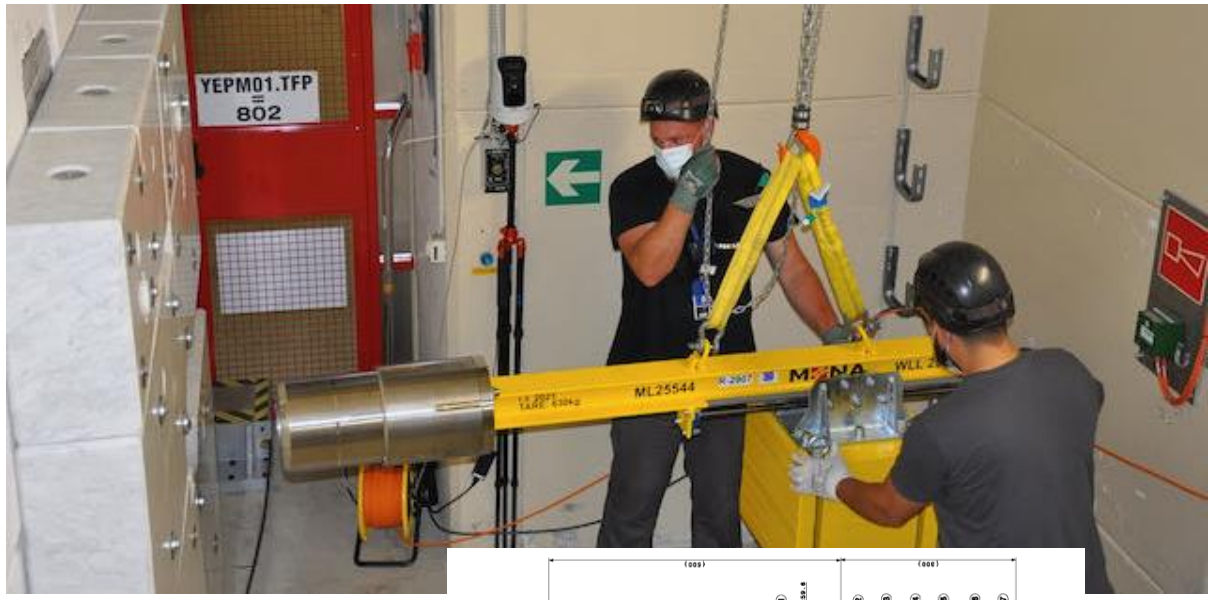


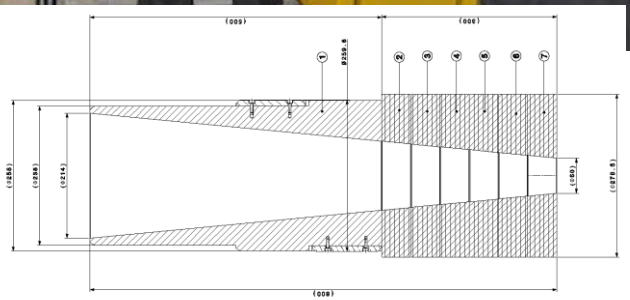
DEGRADATION IN DOSE RANGE EXPECTED AT NEAR

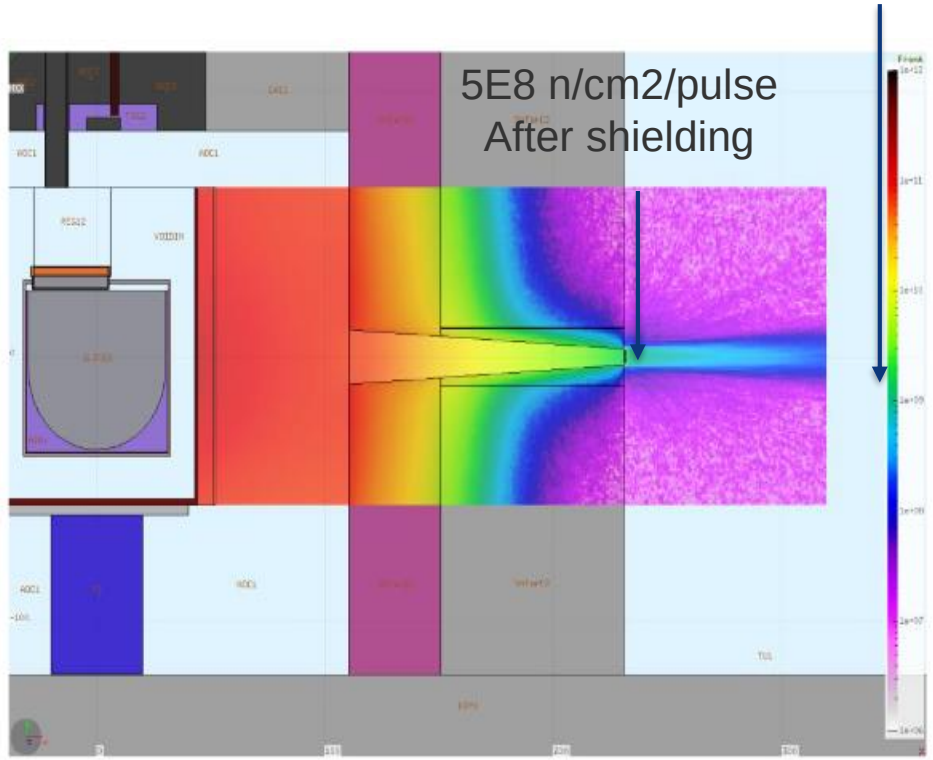
NEAR experimental station (NEAR OUT)

NEAR experimental station (NEAR OUT) – Collimator installation

3E6 n/cm2/pulse at the wall
(considering a pulse of 7E12 protons)







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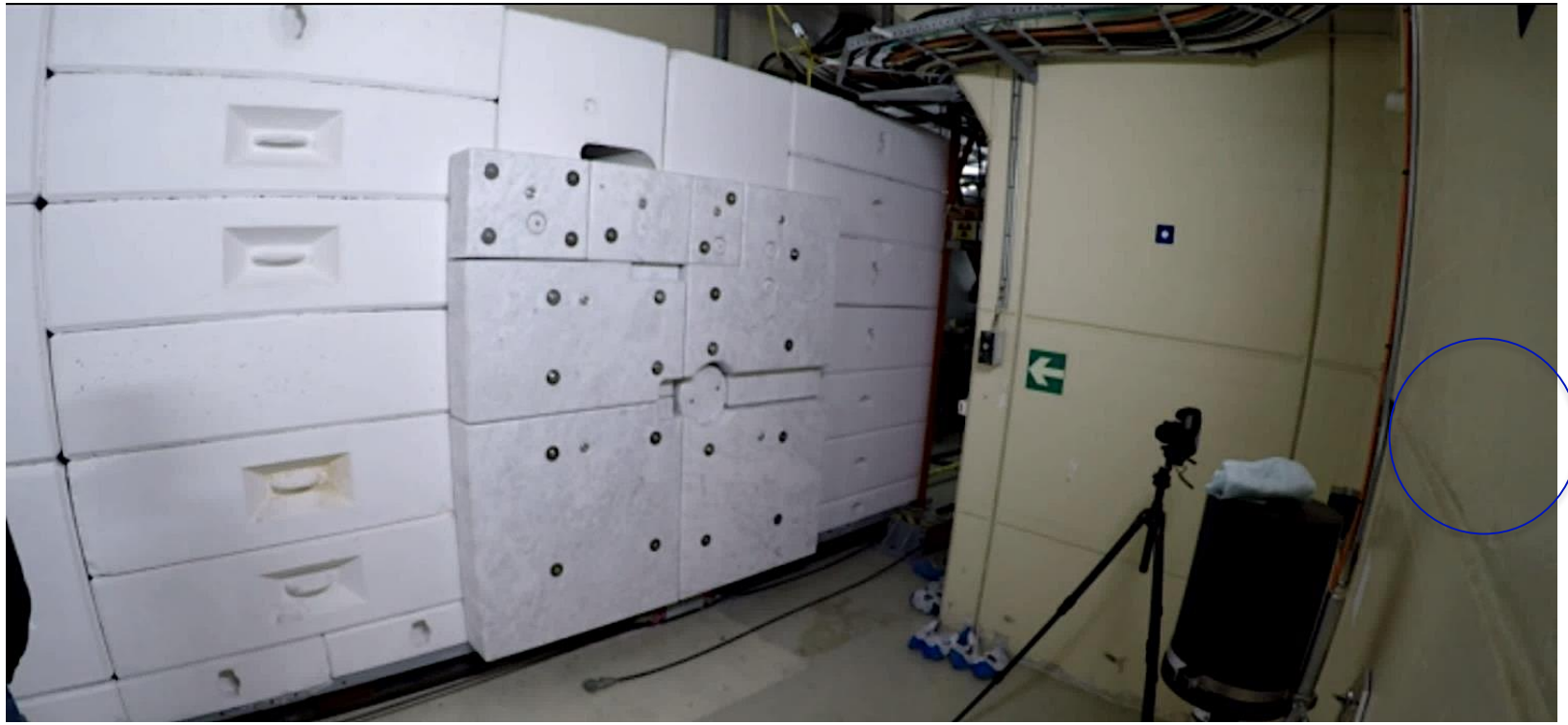
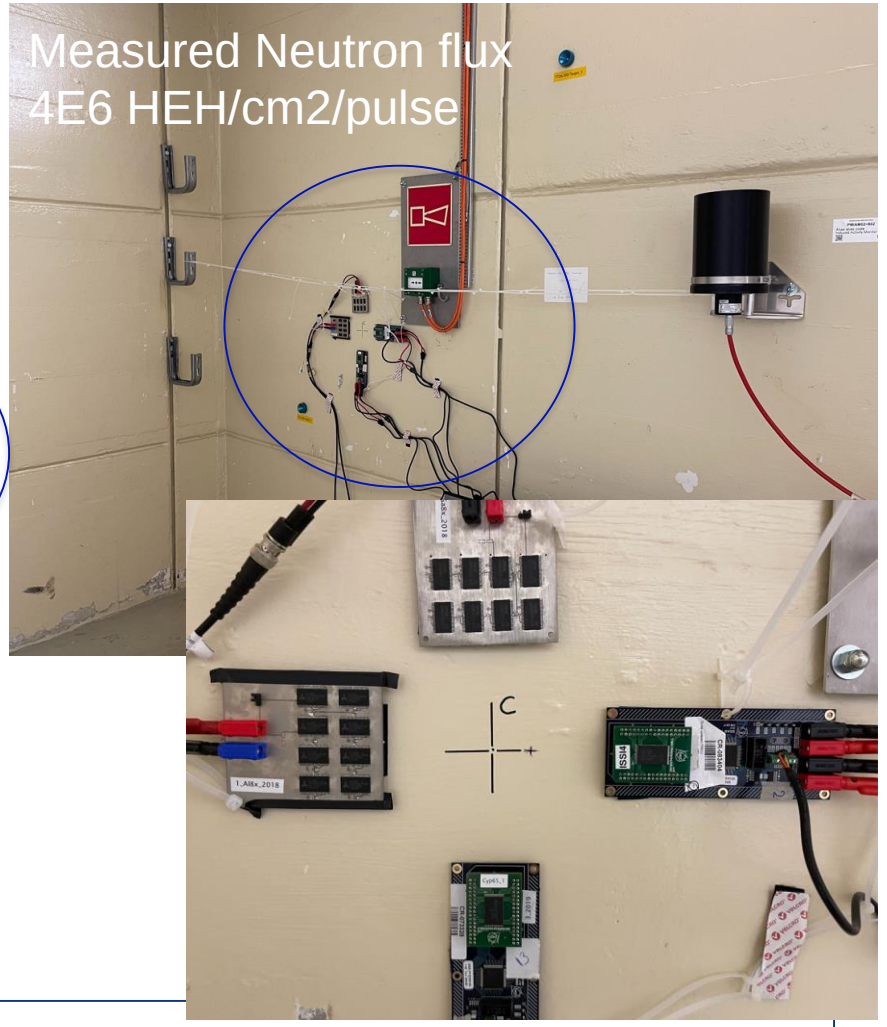
Acknowledgments: M.Barbagallo, G.Lerner, M.Cecchetto

NEAR experimental station (NEAR OUT) – Multifoils activation

Acknowledgements : O.Fjeld, JF.Gruber, O.Aberle, P.Perez Maroto, G.Lavezzari, Y.Aguiar, J.A.Praena Rodriguez, A.Mengoni, N.Patronis

NEAR experimental station (NEAR OUT) – R2E





Determine the High Energy Hadron fluence at NEAR by means of SRAM memories

Future **neutron beam for Displacement Damage testing in electronics**

Acknowledgements : M.Sacristan Barbero, M.Cecchetto SY-STI-BMI

Summary

- n_TOF is well known for the study of neutron-induced reactions

The NEAR Station at n_TOF for:

- Irradiation station for R2M (material irradiation)
- Irradiation station for R2E (irradiation of electronics)
- n-TOF Multifoils activation at the collimator position

Thank you for
your attention!