



Trento Institute for
Fundamental Physics
and Applications



The enhanced X-ray Timing and Polarimetry mission will cost around three billion yuan (£340m) and is set to launch by 2025 (courtesy: Institute of High Energy Physics)

XRO X-RAY OBSERVATORIES

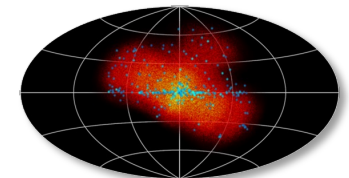
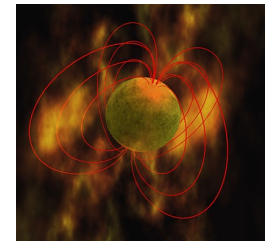
Irina Rashevskaya

29 giugno 2023 CSN2

XRO eXTP science

Study of matter under extreme conditions of gravity, density and magnetism. For the first time: simultaneous, high-throughput spectral, timing and polarimetry observations.

- Constrain the **Equation of state** of the supra-nuclear density matter in the interior of neutron stars.
- **Accretion** physics in the **strong-field** regime of **gravity** and tests of General Relativity in neutron stars and black holes over the mass scale.
- Physics of light and matter in the presence of **ultra-strong magnetic fields** in magnetars and X-ray pulsars.
- Multi-purpose **observatory** and wide-field monitoring for transients (and e.m. counterparts of GWs). Rapid follow-up.



- Sigla CSN2 da 2021

IXPE Imaging X-Ray Polarimetry Explorer

L. Baldini (PI)

eXTP enhanced X-ray Timing and Polarimetry

V. Bonvicini (TS)

- Strutture partecipanti:

TS, PI, TO, MI, PV, BO, TIFPA, PG, RM2

- ~ 30 FTE complessivi

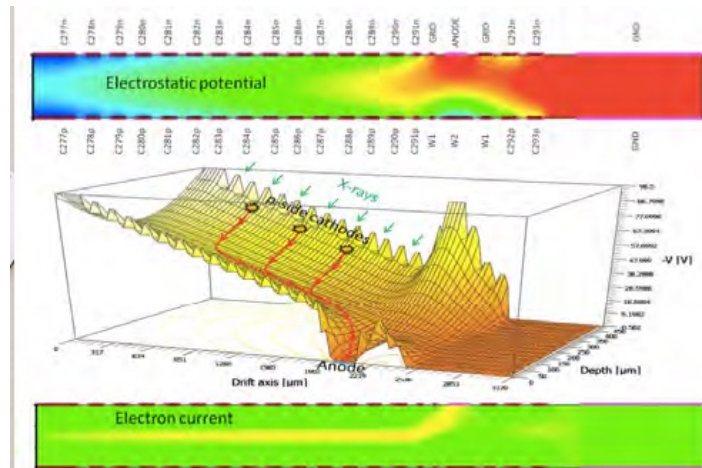
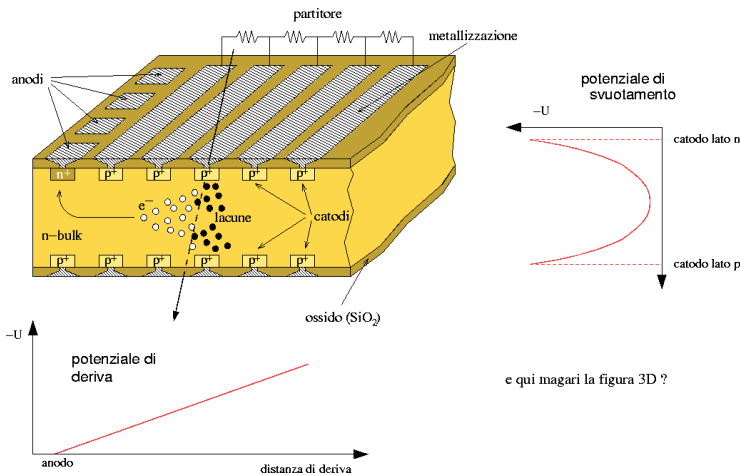
- Attività di TIFPA focalizzata su **eXTP**

Silicon Drift Detector per LAD e WFM

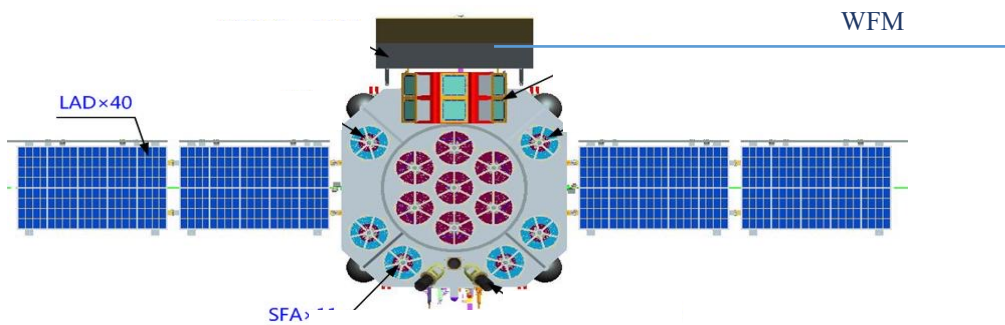
Linear Silicon Drift Detector

Large Area Silicon Drift Detectors for X-ray spectroscopy, timing and imaging

- designed by INFN,
- produced by FBK
- developed in collaboration REDSOX .
- More than 10 yrs R&D activity.



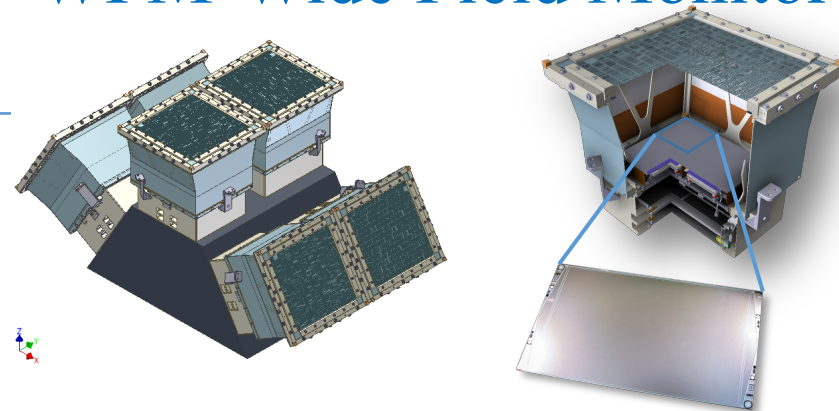
LAD – Large Area Detector



- Total effective area: 3.4 m^2 @8 keV
- Energy band: 2-30 keV
- Energy resolution: $<240 \text{ eV FWHM}$ @6 keV
- Based on the LOFT/LAD design
- 40 Modules on 2 deployable panels
- 640 large-area SDD detector

112 anods pitch 970um x2

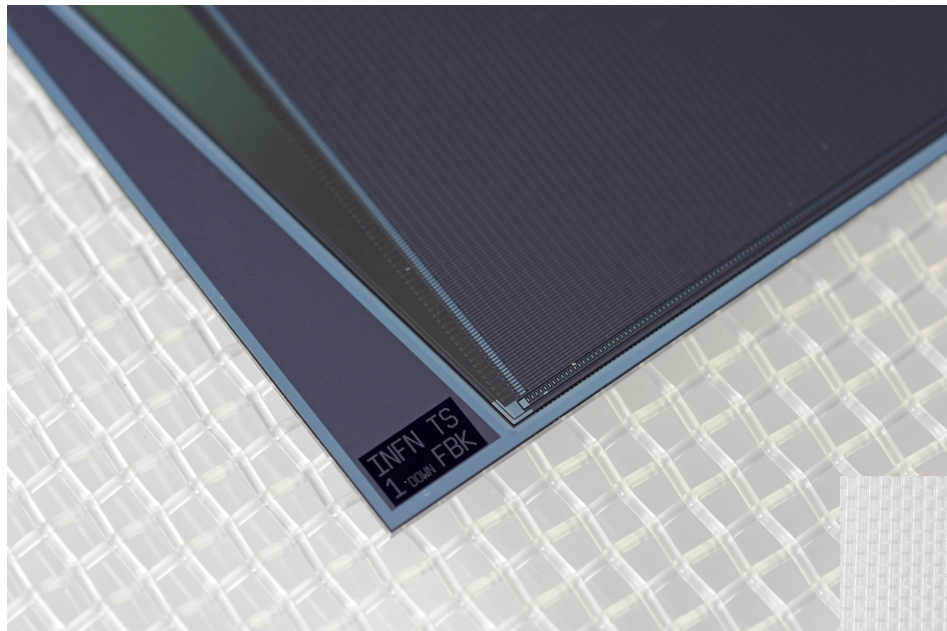
WFM-Wide Field Monitor



- Field of View: 4 steradian (at 20% response)
- Imaging, $<5 \text{ arcmin}$ angular resolution,
- Energy band: 2-50 keV
- Energy resolution: 300 eV FWHM @6 keV
- Effective area: 80 cm^2 @6 keV
- 3 units (6 cameras)
- 24 large-area SDD detectors

384 anodes pitch 169um x2

LOTTO WFM 211- dicembre 2022



FBK

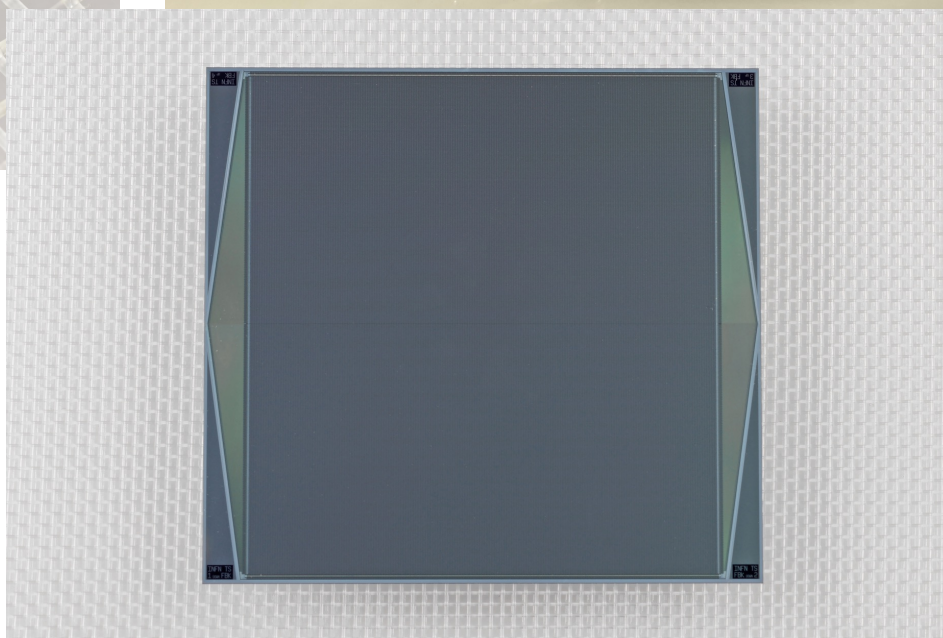
Misura I-V a tre punte 15 wafer

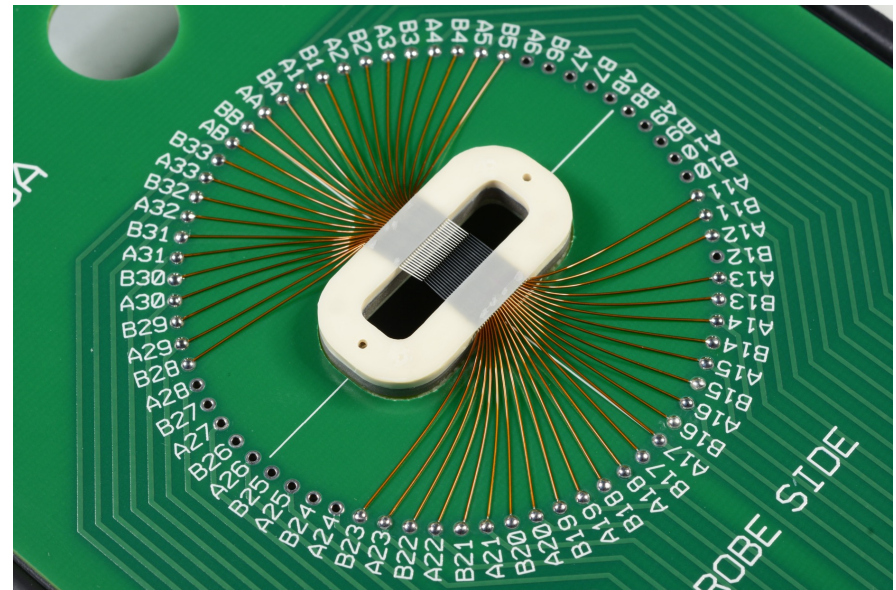
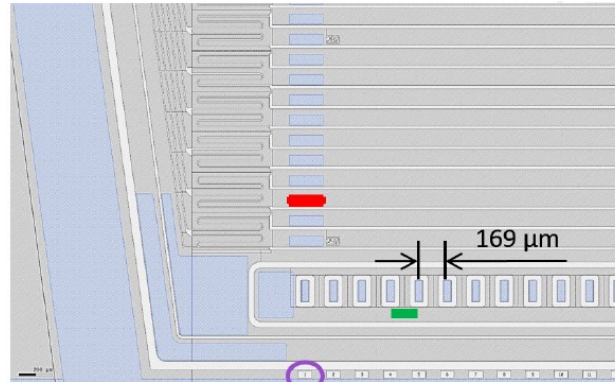
Scan Catodi 15 wafer

TIFPA

Misura I-V GelPack 6 sensors

Scan Anodi GIG 7 sensors



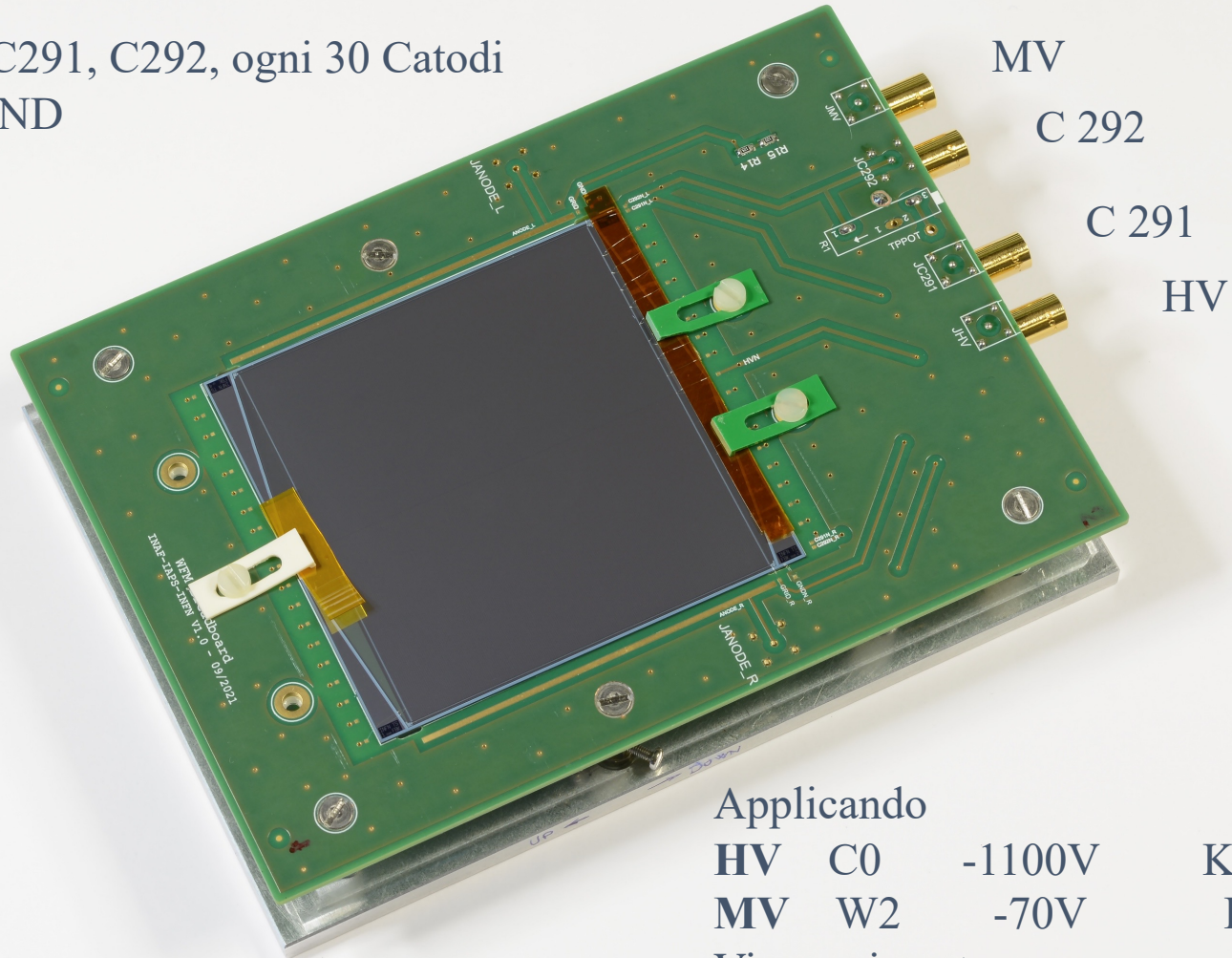


BOND

P&N side - C0, C291, C292, ogni 30 Catodi

N side – Grid, GND

P side –W2, W1



Applicando

HV C0 -1100V

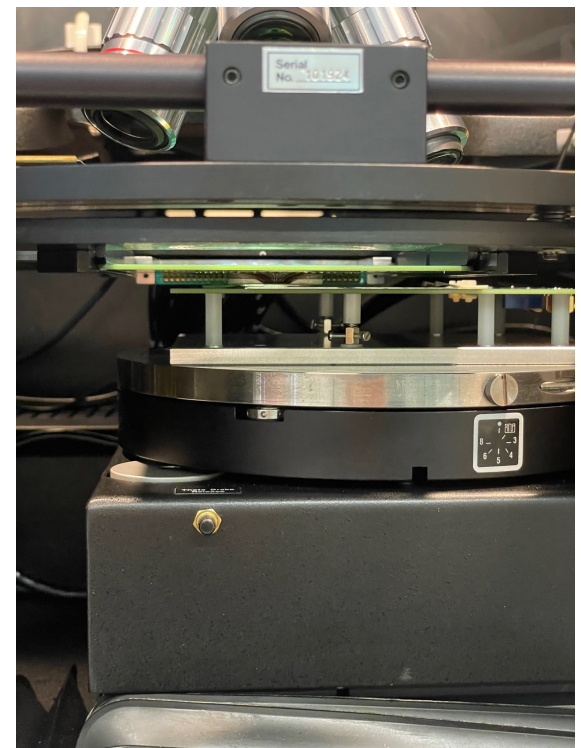
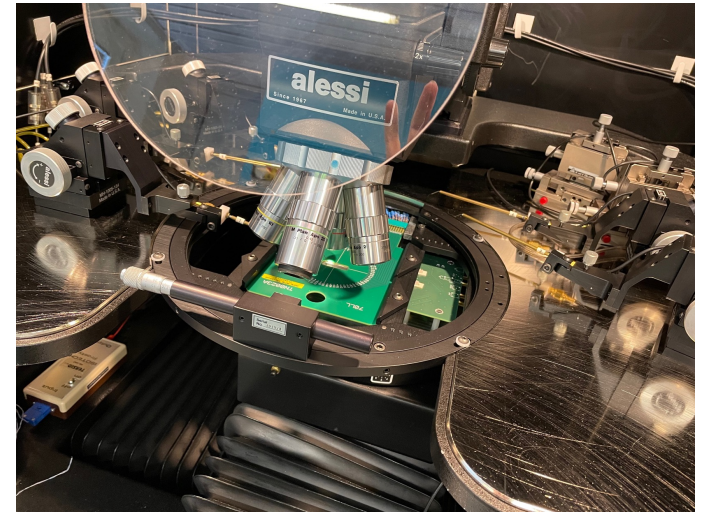
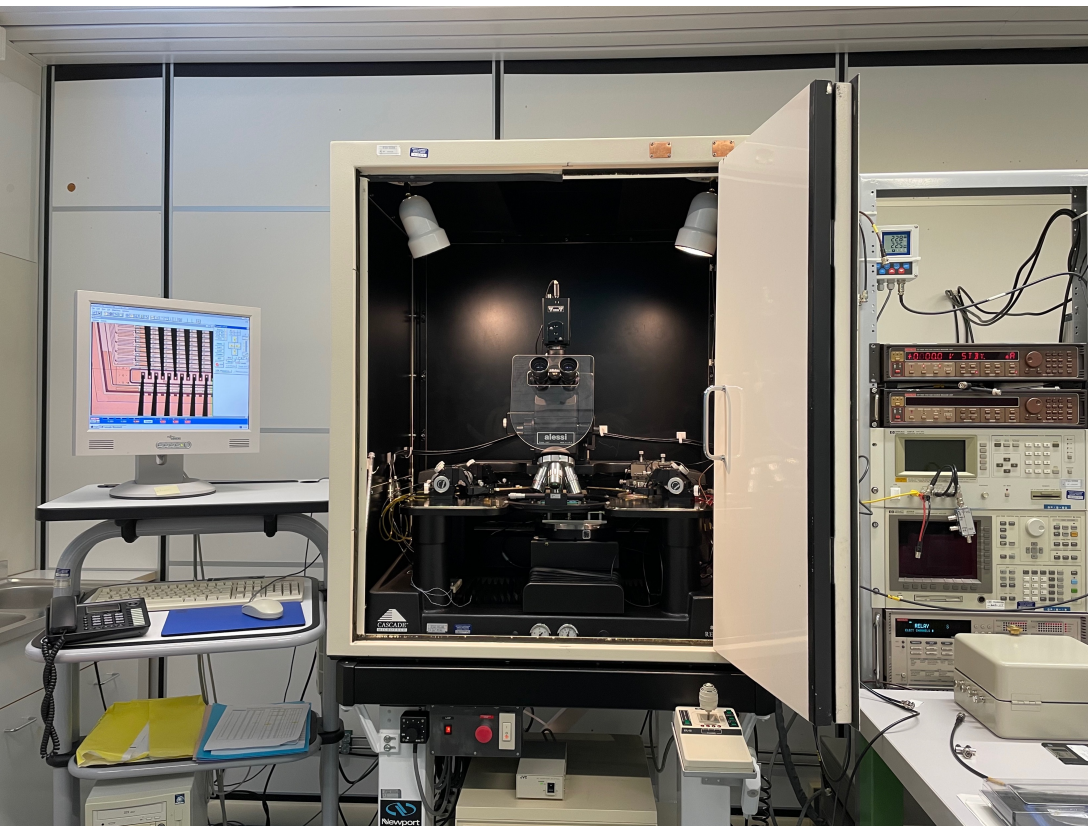
MV W2 -70V

Viene misurato

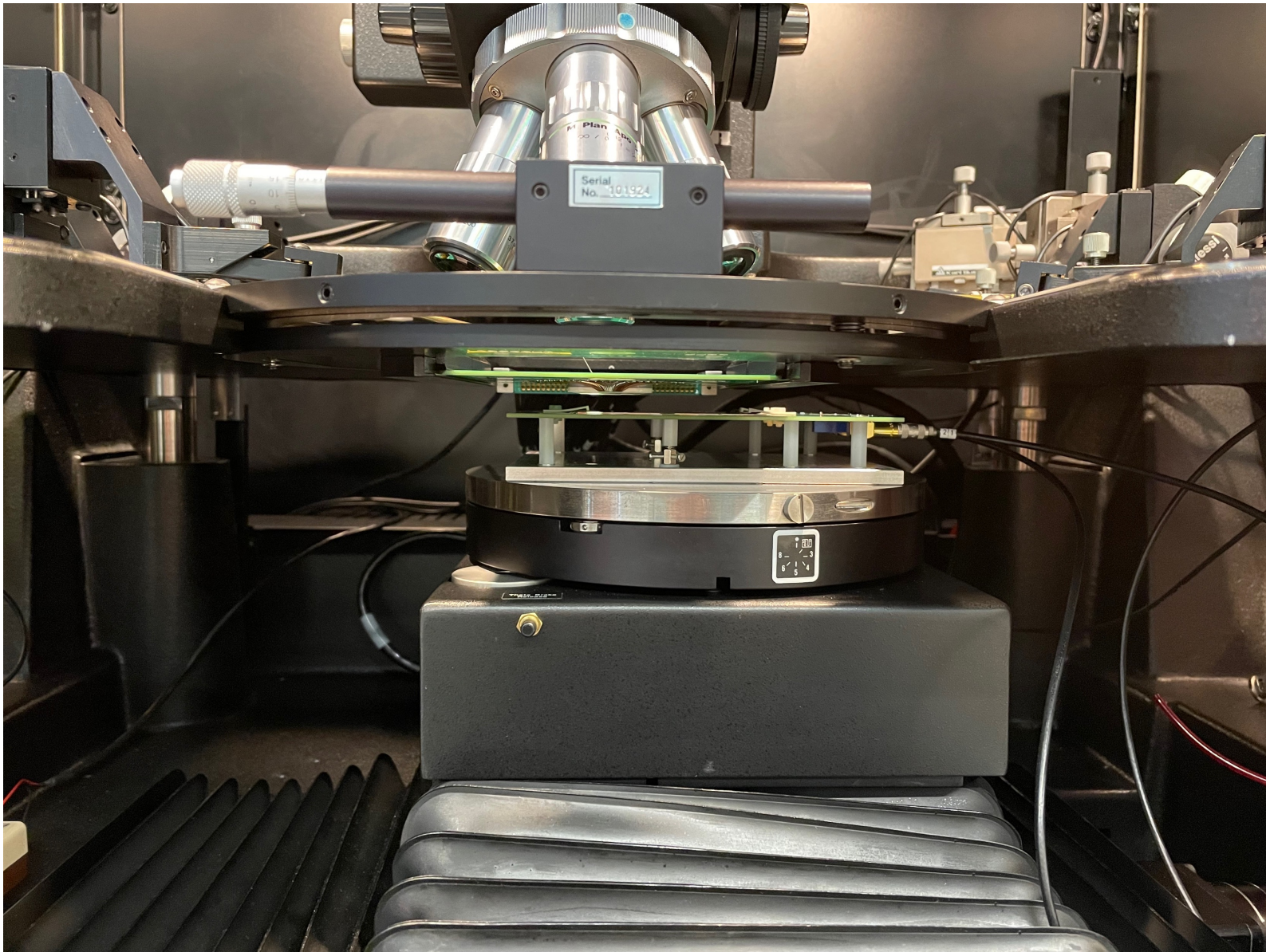
V C291, V C292

Keithley 237
HP4141B

WFM 211 Probe Station



WFM 211 SCAN

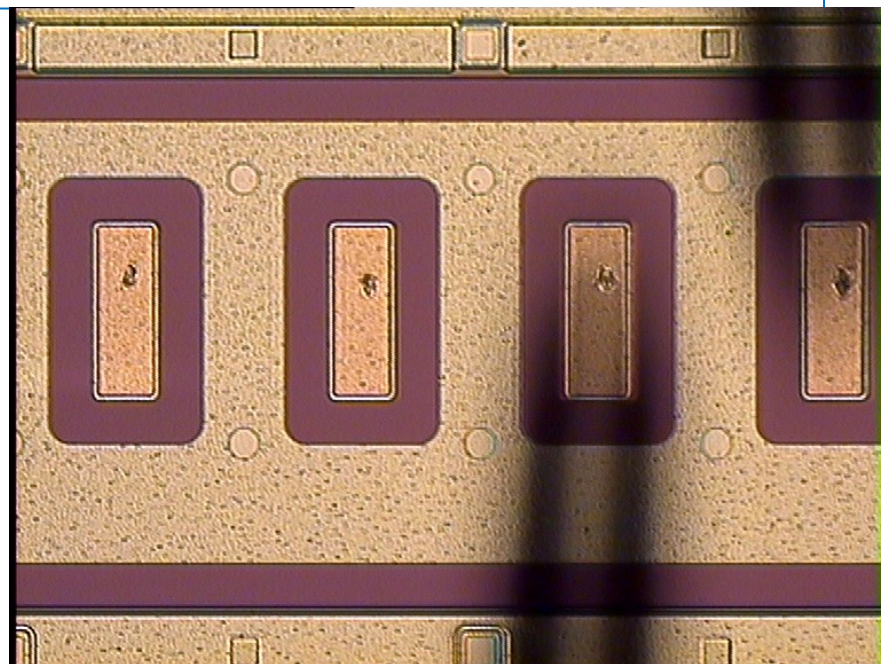
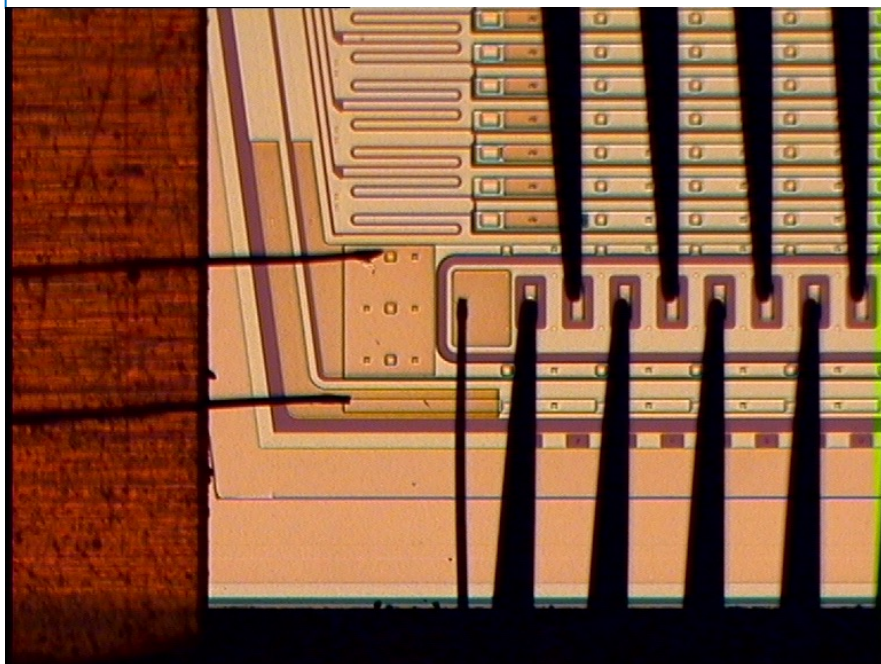


29/06/2023

XRO_Irina Rashevskaya_TIFPA CSN2

10

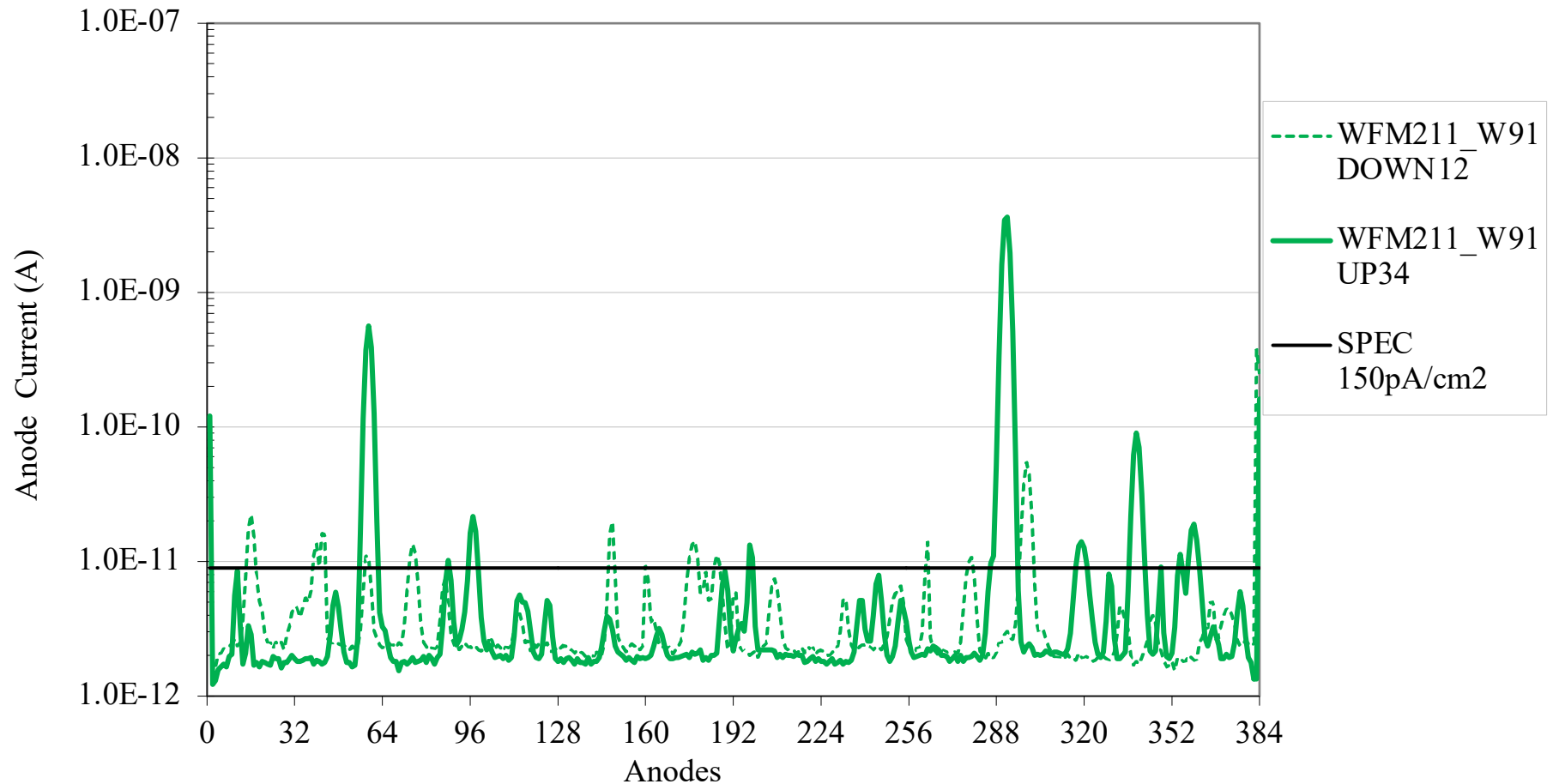
- **384 Anodi con passo 169 μm**
- Lo scan automatico viene eseguito con la ProbeCard da 50 punte e gestita dai **programmi** LabView. Ci sono esattamente 8 posizioni della probecard. Nella prima posizione vengono misurati gli anodi 1- 48. Poi per 6 posizioni della probecard vengono misurati 48 anodi centrali con due punte esterne connesse a GND. Nell'ultima posizione vengono testati gli ultimi 48 anodi con due prime punte connesse a GND.
- Gli scan vengono eseguiti per gli **Down12** e **UP34**.



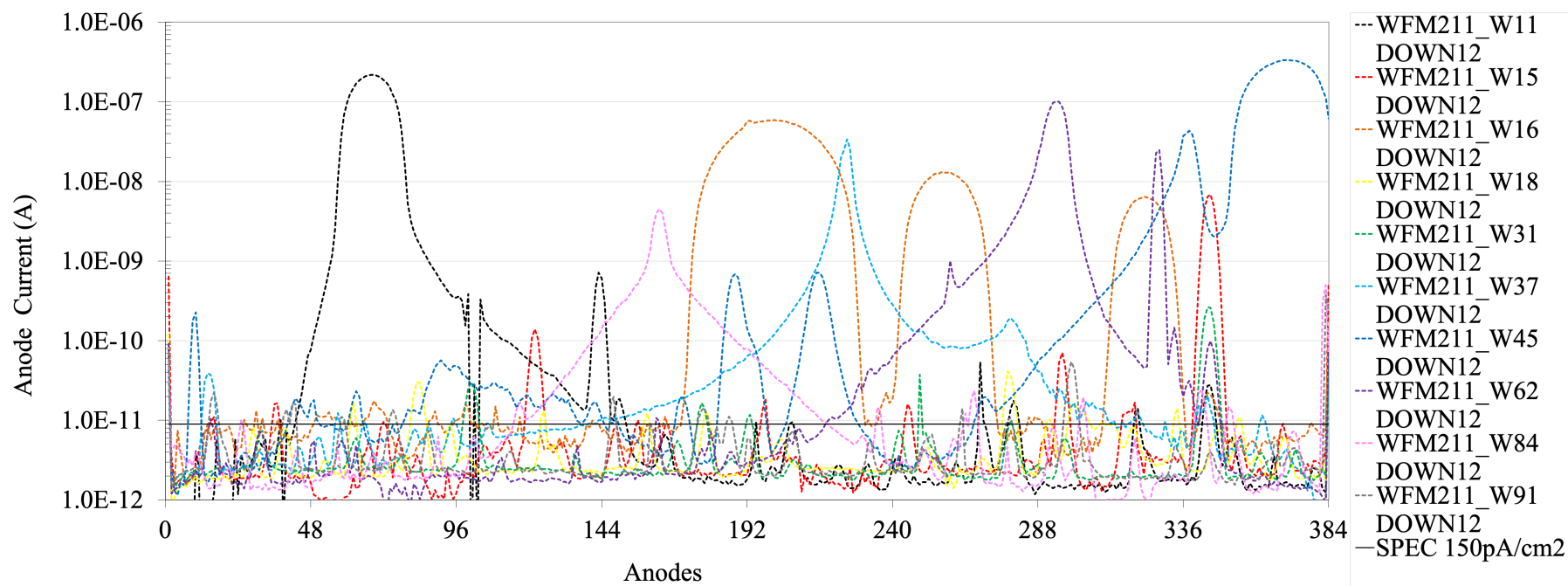


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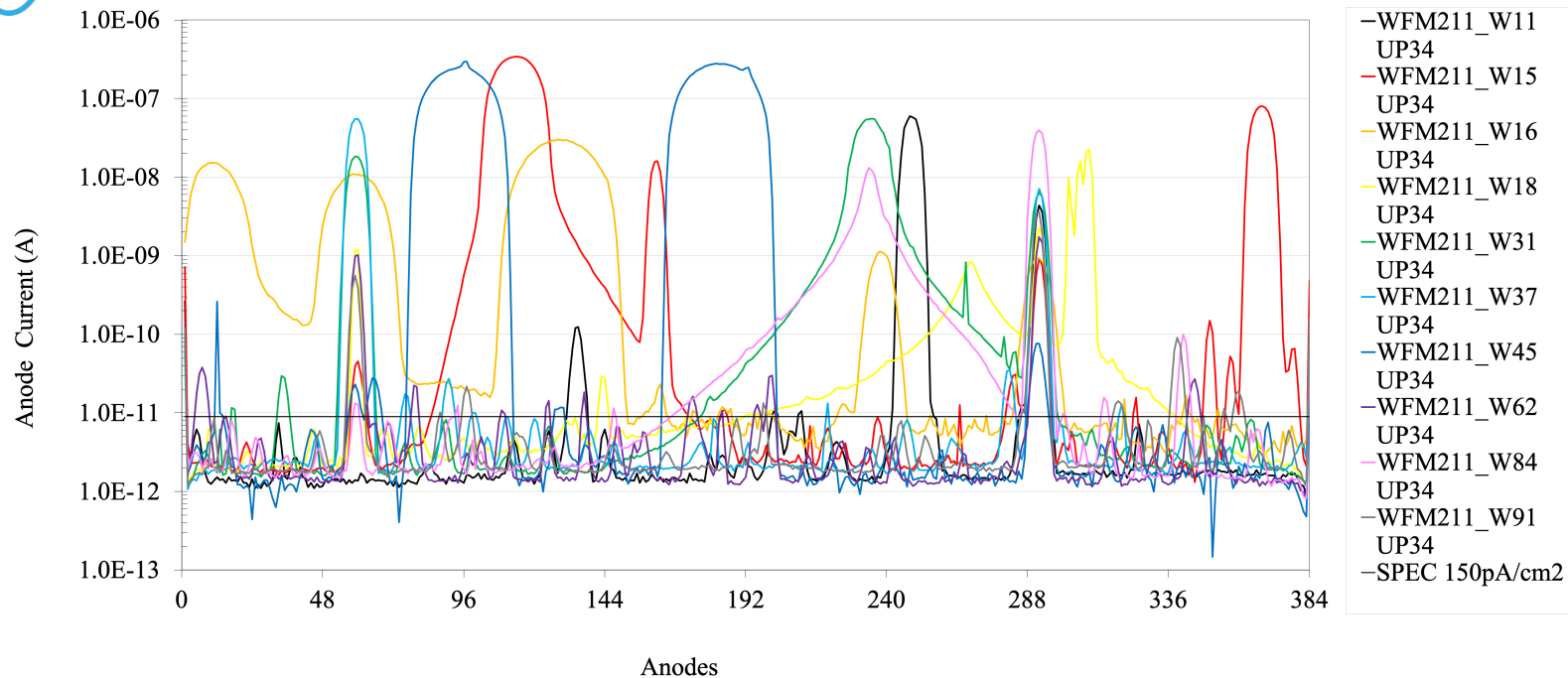
WFM 211 W91 SCAN Anodi THE BEST



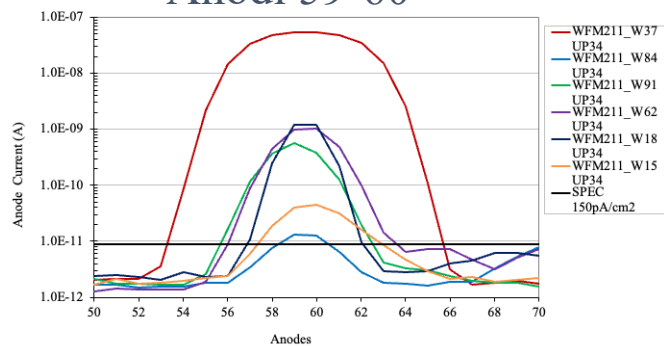
WFM 211 SCAN Anodi DOWN12



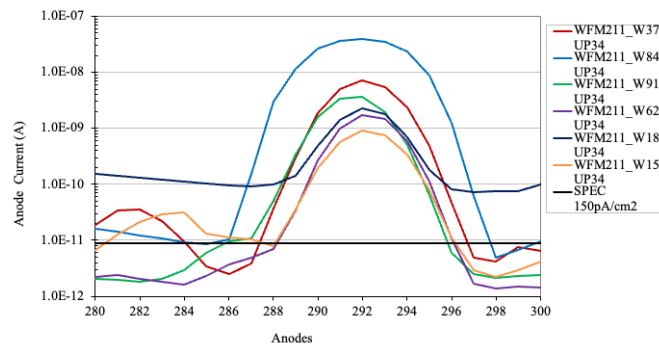
WFM 211 SCAN Anodi UP34



Anodi 59-60

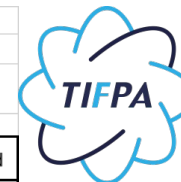


Anod 291-292



	WFM			
		pA	A	pA/cm2
	I limits	8.955	8.96E-12	150.0

WFM 211 SCAN Anodi

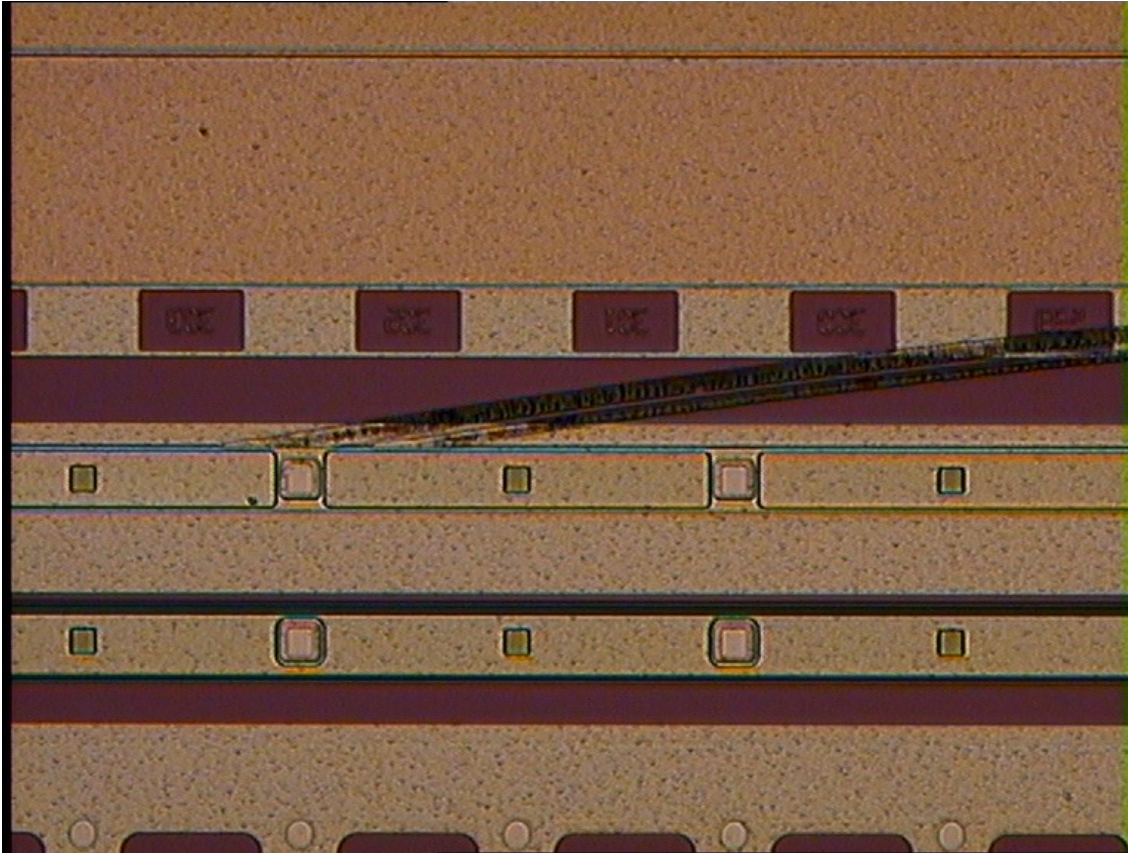


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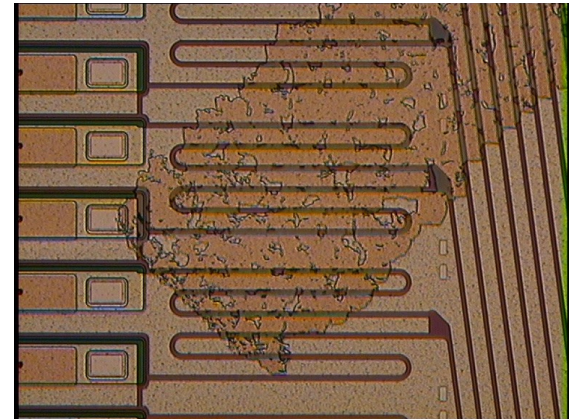
	LOT	WAFER	Probecard		I min	I limits	I max	< I Anodes >, I Anodes < I limits			GOOD	BAD	Yield
					A	A	A	A	pA	pA/ cm2	N	N	%
								20C	20C	20C			
1	WFM211	37	50 punte	DOWN12	6.56E-13	8.96E-12	3.39E-08	4.72E-12	4.7	79	181	203	47%
	19/01/2023		48 test	UP34	1.06E-12	8.96E-12	5.50E-08	2.80E-12	2.8	47	344	40	90%
				TOT	6.56E-13	8.96E-12	5.50E-08	3.46E-12	3.5	58	525	243	68%
2	WFM211	84	50 punte	DOWN12	8.89E-13	8.96E-12	4.50E-09	2.87E-12	2.9	48	258	126	67%
	21/01/2023			UP34	-1.50E-13	8.96E-12	3.96E-08	2.81E-12	2.8	47	236	148	61%
				TOT	-1.50E-13	8.96E-12	3.96E-08	2.84E-12	2.8	48	494	274	64%
3	WFM211	91	50 punte	DOWN12	1.50E-12	8.96E-12	3.78E-10	2.93E-12	2.9	49	350	34	91%
	23/01/2023			UP34	1.22E-12	8.96E-12	3.63E-09	2.65E-12	2.6	44	341	43	89%
				TOT	1.22E-12	8.96E-12	3.63E-09	2.79E-12	2.8	47	691	77	90%
4	WFM211	62	50 punte	DOWN12	4.25E-13	8.96E-12	1.01E-07	2.54E-12	2.5	43	249	135	65%
	25/01/2023			UP34	8.34E-13	8.96E-12	1.73E-09	2.34E-12	2.3	39	338	46	88%
				TOT	4.25E-13	8.96E-12	1.01E-07	2.43E-12	2.4	41	587	181	76%
5	WFM211	18	50 punte	DOWN12	9.02E-13	8.96E-12	1.63E-10	3.10E-12	3.1	52	345	39	90%
	25/01/2023			UP34	1.36E-12	8.96E-12	2.28E-08	4.03E-12	4.0	67	224	160	58%
				TOT	9.02E-13	8.96E-12	2.28E-08	3.46E-12	3.5	58	569	199	74%
6	WFM211	15	50 punte	DOWN12	9.57E-13	8.96E-12	6.83E-09	2.93E-12	2.9	49	341	43	89%
	25/01/2023			UP34	1.31E-12	8.96E-12	3.43E-07	3.07E-12	3.1	51	239	145	62%
				TOT	9.57E-13	8.96E-12	3.43E-07	2.99E-12	3.0	50	580	188	76%
7	WFM211	45	50 punte	DOWN12	1.14E-12	8.96E-12	3.33E-07	4.64E-12	4.6	78	132	252	34%
	09/02/2023			UP34	1.47E-13	8.96E-12	2.95E-07	2.09E-12	2.1	35	281	103	73%
				TOT	1.47E-13	8.96E-12	3.33E-07	2.91E-12	2.9	49	413	355	54%
8	WFM211	16	50 punte	DOWN12	1.15E-12	8.96E-12	5.94E-08	6.02E-12	6.0	101	199	185	52%
	09/02/2023			UP34	3.03E-12	8.96E-12	3.00E-08	5.86E-12	5.9	98	163	221	42%
				TOT	1.15E-12	8.96E-12	5.94E-08	5.94E-12	5.9	100	362	406	47%
9	WFM211	31	50 punte	DOWN12	1.31E-12	8.96E-12	2.62E-10	2.69E-12	2.7	45	362	22	94%
	10/02/2023			UP34	1.16E-12	8.96E-12	5.55E-08	2.98E-12	3.0	50	240	144	63%
				TOT	1.16E-12	8.96E-12	5.55E-08	2.81E-12	2.8	47	602	166	78%
10	WFM211	11	50 punte	DOWN12	-7.58E-14	8.96E-12	2.17E-07	2.46E-12	2.5	41	252	132	66%
	14/02/2023			UP34	-2.27E-13	8.96E-12	5.98E-08	2.00E-12	2.0	34	343	41	89%
				TOT	-2.27E-13	8.96E-12	2.17E-07	2.20E-12	2.2	37	595	173	77%

WFM W18 C292

$$I_{C292} = 74\mu A$$



Non è questo.

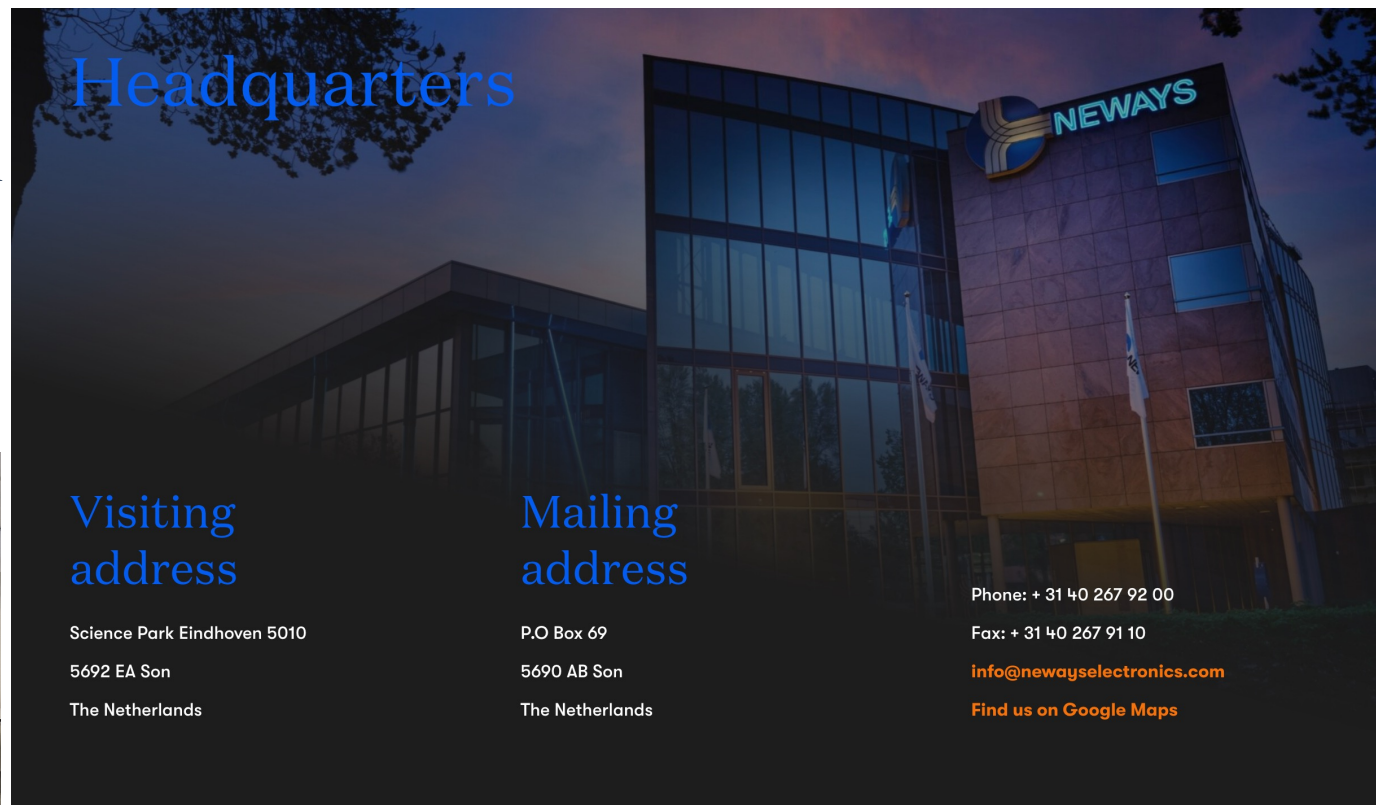




Trento Institute for
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WFM montaggio NEWAYS

- Montaggio
- Meccanica
- Bonding 17-200 μm
- Camere pulite
- Altissima professionalita e capacita.



Headquarters

Visiting address

Science Park Eindhoven 5010
5692 EA Son
The Netherlands

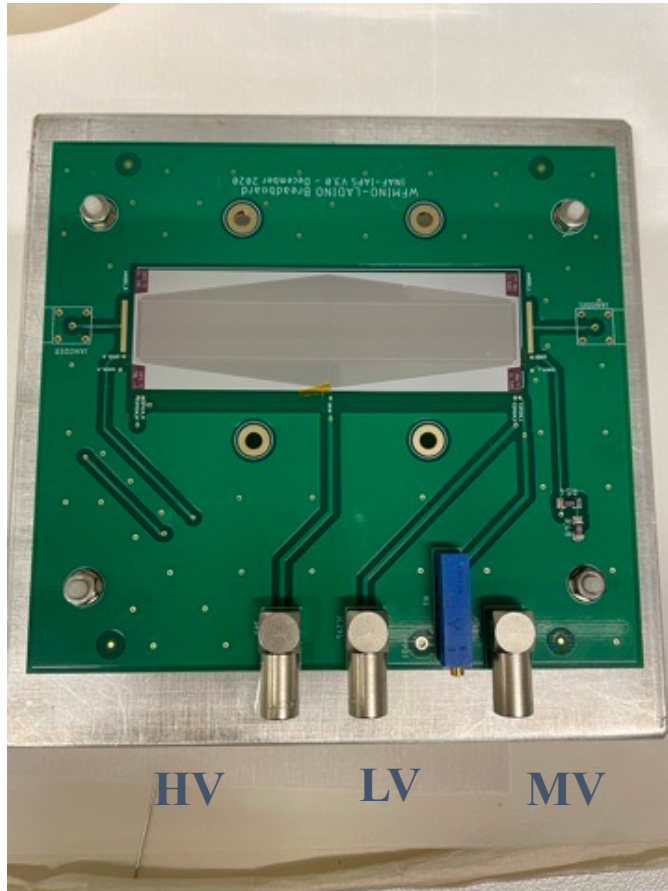
Mailing address

P.O Box 69
5690 AB Son
The Netherlands

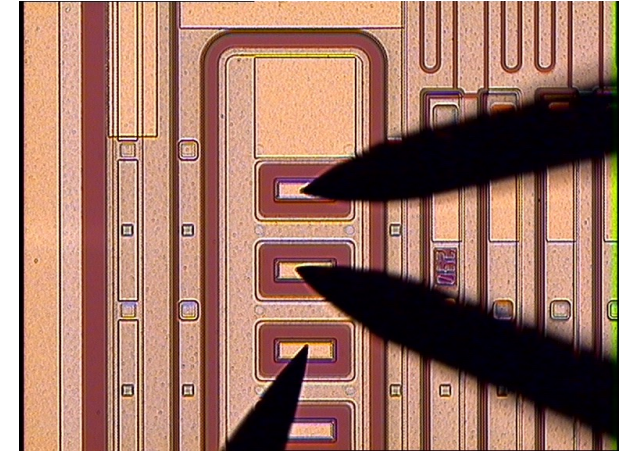
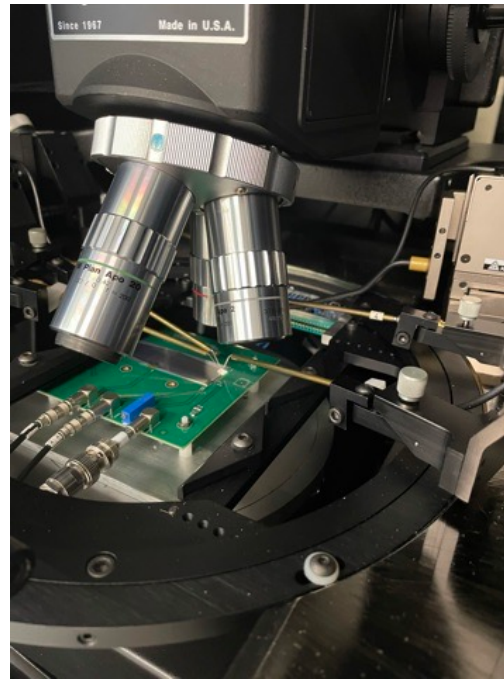
Phone: + 31 40 267 92 00
Fax: + 31 40 267 91 10
info@newayselectronics.com
[Find us on Google Maps](#)

(MIPOT ???) ☺

eXTP WFMino



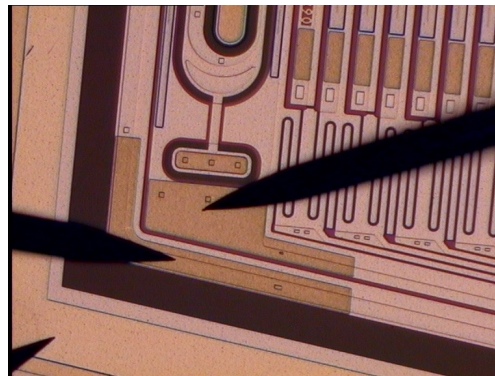
-1100V -40V -70V



WFMino 64 Anodi con passo 169um

- Lo scan automatico viene eseguito con tre punte.
- La punta centrale misura la corrente dell'anodo e le punte 1 e 3 raccolgono corrente variabile dal resto del sensore e vengono misurate insieme.

- Test e la caratterizzazione elettrica di WFM (Lotto **WFM211**- dicembre 2022)
- Ispezione ottica dei sensori LAD WFM LADino WFMino
- Classificazione dei difetti e Studio di resa
- Definizione dei parametri di processo e del materiale attraverso la caratterizzazione delle strutture di test
- Partecipazione al design del nuovo anodo del LAD.
- Test e la caratterizzazione elettrica LADino WFMino



Documents

Export Date: 26 Jun 2023

Search: AU-ID("Rashevskaya, Irina" 15844304700)

- 1) Cirrincione, D., Antonelli, M., Aquilanti, G., Bellutti, P., Bertuccio, G., Borghi, G., Cautero, G., Ficorella, F., Gandola, M., Giuressi, D., Mele, F., Menk, R.H., Olivi, L., Orzan, G., Pepponi, G., Picciotto, A., Rashevskaya, I., Rachevski, A., Stebel, L., Zampa, G., Zampa, N., Zorzi, N., Vacchi, A.
[A new collimated multichannel modular detection system based on Silicon Drift Detectors](#)
(2023) Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 1049, art. no. 168118, .
1) <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85148686788&doi=10.1016%2fj.nima.2023.168118&partnerID=40&md5=DOI: 10.1016/j.nima.2023.168118>

Document Type: Article

Publication Stage: Final

Source: Scopus

- 2) Rachevski, A., Antonelli, M., Bellutti, P., Bonvicini, V., Borghi, G., Campana, R., Ceraudo, F., Cirrincione, D., Del Monte, E., Evangelista, Y., Feroci, M., Ficorella, F., Orzan, G., Pepponi, G., Picciotto, A., Rashevskaya, I., Zampa, G., Zampa, N., Zorzi, N., Vacchi, A.
[eXTP Large Area Detector: Qualification procedure of the mass production](#)
(2023) Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 1046, art. no. 167750, .
2) <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85142420818&doi=10.1016%2fj.nima.2022.167750&partnerID=40&md5=DOI: 10.1016/j.nima.2022.167750>

Document Type: Article

Publication Stage: Final

Source: Scopus

Situazione Contabile Esperimenti

Filtra le richieste

Anno:
2023

Struttura:
Trento Institute for Fundamental Physics and Application

Esperimento:
Xro

Gruppo Collegato:
TIFP

Filtra

TIPO PRATICA	RICHIESTE NON IMPEGNATE	PREVISIONE NON VALUTATA DAL RESP. ESPERIMENTO	PREVISIONE AUTORIZZATA DAL RESP. ESPERIMENTO	TOTALE
MISSIONI *	0	0	0	0

* Eventuali variazioni di spesa inserite a revisione della prima richiesta di autorizzazione impegnata non sono qui conteggiate.

Capitolo	Descrizione	Stanziano	Variato	Subjudice e Cong.	Preimpegno	Impegni	Disponib.	Proposta in corso	Disp. Teorica
U1030102008	Strumenti tecnico-speci	1.500,00	0,00	0,00	0,00	0,00	1.500,00	0,00	1.500,00
U1030202001	Rimborso per viaggio e	4.000,00	0,00	0,00	0,00	3.417,10	582,90	0,00	582,90
Totale:		5.500,00	0,00	0,00	0,00	3.417,10	2.082,90	0,00	2.082,90

Esporta

⏪ ⏴ 1/1 ⏵ ⏩ 10

* Eventuali variazioni di spesa inserite a revisione della prima richiesta di autorizzazione impegnata non sono qui conteggiate.

Capitolo	Descrizione	Stanziano	Variato	Subjudice e Cong.	Preimpegno	Impegni	Disponib.	Proposta in corso	Disp. Teorica
U1030202001	Rimborso per viaggio e	0,00	13,00	0,00	0,00	11,10	1,90	0,00	1,90
U2020105001	Attrezzature scientific	0,00	1.494,04	0,00	0,00	0,00	1.494,04	0,00	1.494,04
Totale:		0,00	1.507,04	0,00	0,00	11,10	1.495,94	0,00	1.495,94



XRO eXTP TIFPA obiettivi 2024

- Test e la caratterizzazione elettrica di WFM
(Lotto **WFM231** marzo – settembre (?) 2023)
- Ispezione ottica dei sensori LAD WFM LADino WFMino
- Classificazione dei difetti e Studio di resa
- Definizione dei parametri di processo e del materiale attraverso la caratterizzazione delle strutture di test
- Partecipazione al design
- Test e la caratterizzazione elettrica LADino WFMino
- Test e la caratterizzazione elettrica Lotto LAD **senza gettering**
(settembre - dicembre 2023(?))



eXTP TIFPA FTE 2024

Irina Rashevskaya	Tecnologo	TIFPA	70%	RESP
Antonino Picciotto		FBK	20%	
Mateo Centis Vignali		FBK	20%	
Francesco Ficorella		FBK	20%	
Nicola Zorzi		FBK	20%	
TOTALE				1.5 FTE

Richieste finanziarie 2024

Missioni:

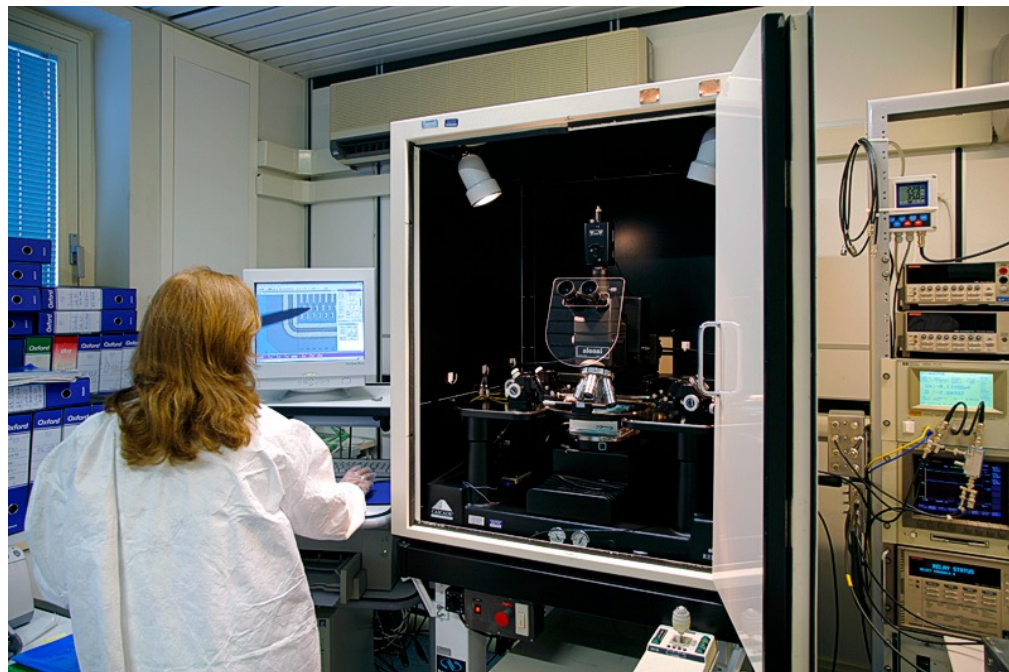
- | | |
|--|---------|
| 1. Riunione del TEAM a Roma 2gg. | 2.00 kE |
| 2. Test di sensori in lab a Trieste. Solo viaggio. | 4.00 kE |

<u>Consumo:</u>	4.00 kE
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Thank you



Messa in funzione seconda postazione di
test con la Probe Station semiautomatica
KarSuss e rack di strumenti.



Parameter	Value
Orbit	550 km, <2.5° inclination
Launcher	Long-March CZ-7 + upper stage, from Wenchang
Mass	4500 kg
Power	3.6 kW
Telemetry	3.2 Tb/day (X-band)
Ground Stations	Sanya, Malindi
Pointing	3-axis stabilized, < 0.01° (3-sigma)
Sky visibility	50% (goal 75%)
Mission Duration	5 years (goal 8 years)
Launch date	2027

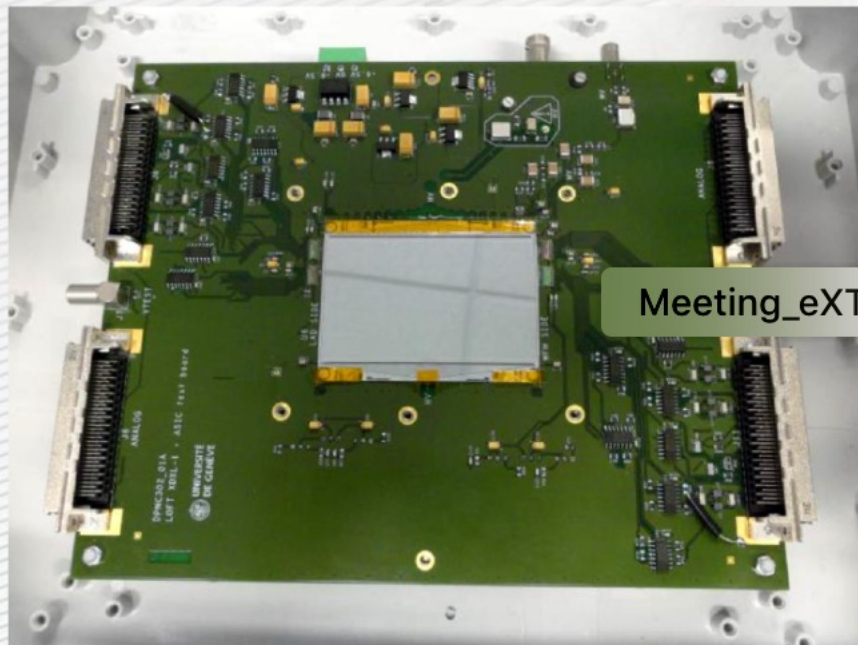
Soft Response

Large area

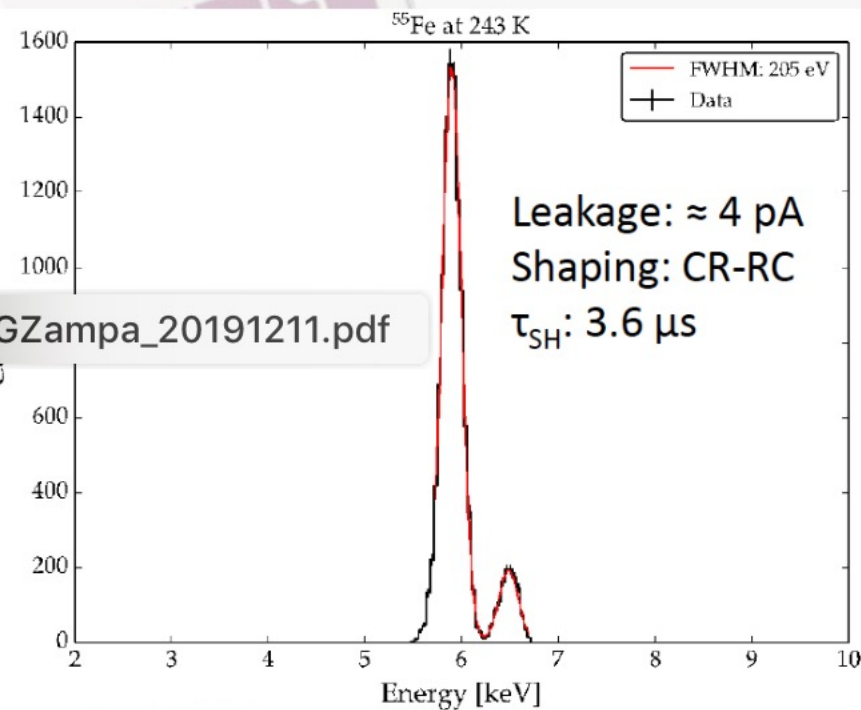
Polarization

Monitoring

Payload	Parameter	Specification
SFA	Energy range	0.5-10 keV
	Effective area	>7000 cm ² @1 keV, >5000 cm ² @6 keV
	Energy resolution	<180 eV FWHM @6 keV
	FoV/HPD	12 arcmin / 1 arcmin
	Focal plane detector	Pixelated SDD (19 pixels)
LAD	Energy range	2-30 keV (extended: 30-80 keV for out-FoV)
	Effective area	34000 cm ²
	Energy resolution	<240 eV FWHM @6 keV
	FoV	1° (FWHM)
	Detector	Large area SDD (640 units, 40 Modules)
PFA	Energy range	2-10 keV
	Effective area	>900 cm ² @2 keV (including QE)
	Energy resolution	1.2 keV FWHM @6 keV
	FoV/HPD	12 arcmin / 20 arcsec
	Focal plane detector	GPD (4 units)
WFM	Energy range	2-50 keV
	Energy resolution	300 eV FWHM @6keV
	FoV	>4 sr (at 20% of peak response)
	Angular resolution	<5 arcmin
	Localization accuracy	<1 arcmin
	Detector	Large area SDD



Meeting_eXTP_GZampa_20191211.pdf



- Misure ottenute prima della riduzione del leakage tramite l'ottimizzazione del processo di produzione (FBK)
- Risoluzione energetica misurata a -30 °C: **205 eV FWHM a 5.9 keV** (ENC = 19.8 e⁻ RMS)