



BAIBÜ Nükleer Radyasyon Dedektörleri Arastırma ve Uygulama Merkezi Altyapısı ve Yapılan Çalışmalar

NÜRDAM adına Dr. Yalçın KALKAN

Parçacık Hızlandırıcıları ve Algıçları Yerel Altyapı ve Ar-Ge Çalıştayı - 3-4 Aralık 2022
İstinye Üniversitesi Vadi Kampüs , İSTANBUL

İçerik

- NÜRDAM Hakkında
- NÜRDAM Laboratuvar Altyapısı
- Bazı yerel işbirlikleri
- NürFET ve Polimer Tabanlı OFET
- Gazlı Detektörlerde İyonik Küme Boyutlarının Ölçülmesi
- Polimer Tabanlı X-Işını Dedektörleri
- Değişik GEM yaprağı formlarının geliştirilmesi
- UV/Alev Dedektörleri
- Özet/Sonuç





2012
KURULUŞ
T.C. Cumhurbaşkanlığı, Strateji ve
Bütçe Başkanlığı Desteği



2014
Faaliyete Geçiş



2016
T.C. Cumhurbaşkanlığı,
Strateji ve Bütçe
Başkanlığı Desteği



2016
Doğu Marmara Kalkınma
Ajansı Desteği (MARKA)



2018
NÜRDAM
Ek Bina İnşaatı



NÜRDAM Laboratuvarları

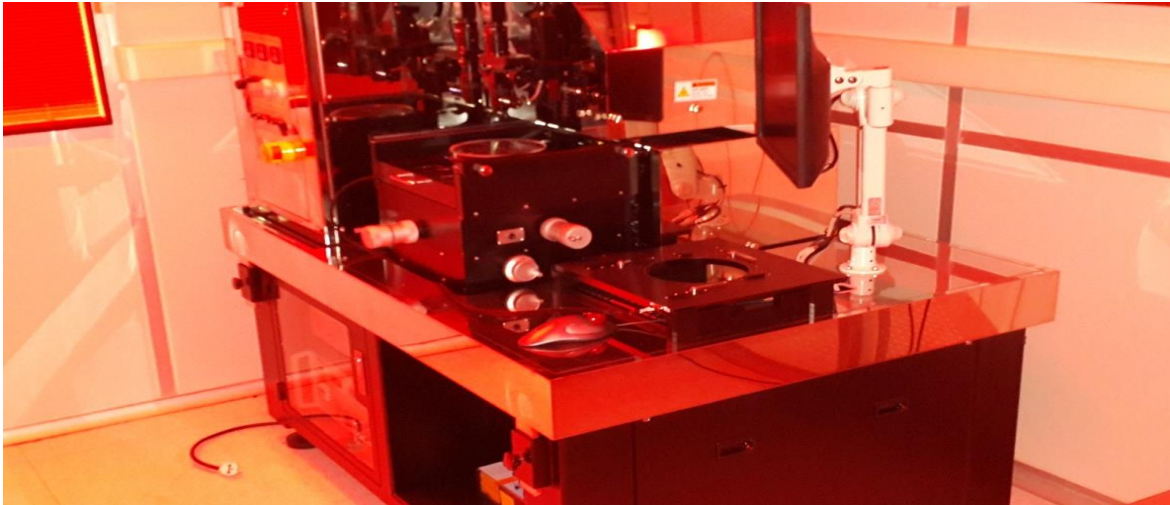
1000-Sınıf Proses Lab.



10/100-Sınıf RCA Temizleme Lab.



10-Sınıf Litografi Lab.



100- Sınıf Metalizasyon Lab.





Atomik Katman Biriktirme (ALD)

e-Beam Kaplama





- Saçtırma ile kaplama (Sputter)
- Termal buharlaştırma (Thermal Evoparaor)
- Döndürerek kaplama (Spin Coater)
- Dört noktadan elektriksel karakterizasyon
- Dilimleyici Testere (Dicing Saw)
- Kalınlık ve yansıma ölçüm sistemi
- Oksijen Plazma
- Tavlama fırını
- Difüzyon fırınları (Boron, Fosfor, SiO₂)



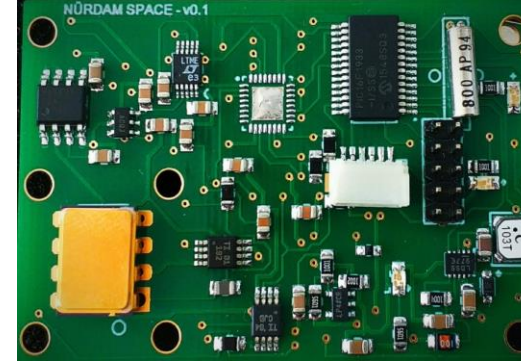
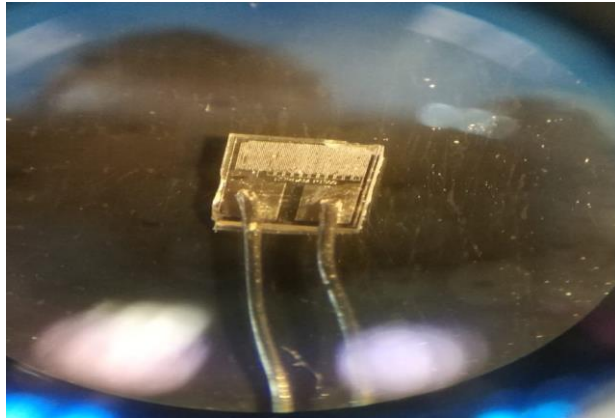
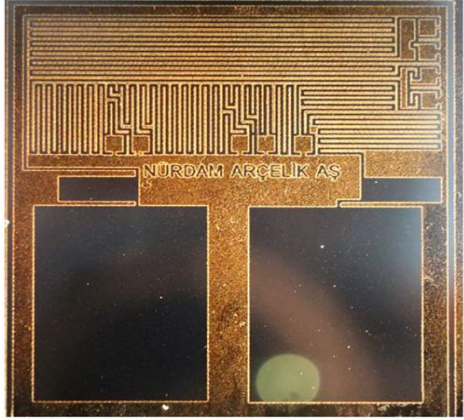
- Özdirenç ölçüm sistemi
- Probe Station
- Yarıiletken tel bağlama sistemi (Wire Bounder)
- Solar laminasyon cihazı
- Metalurjik mikroskop
- Maske hizalama ve litografi cihazı
- Solar Simulator
- Hızlı tavlama cihazı (RTA)
- Workstation

Detay için

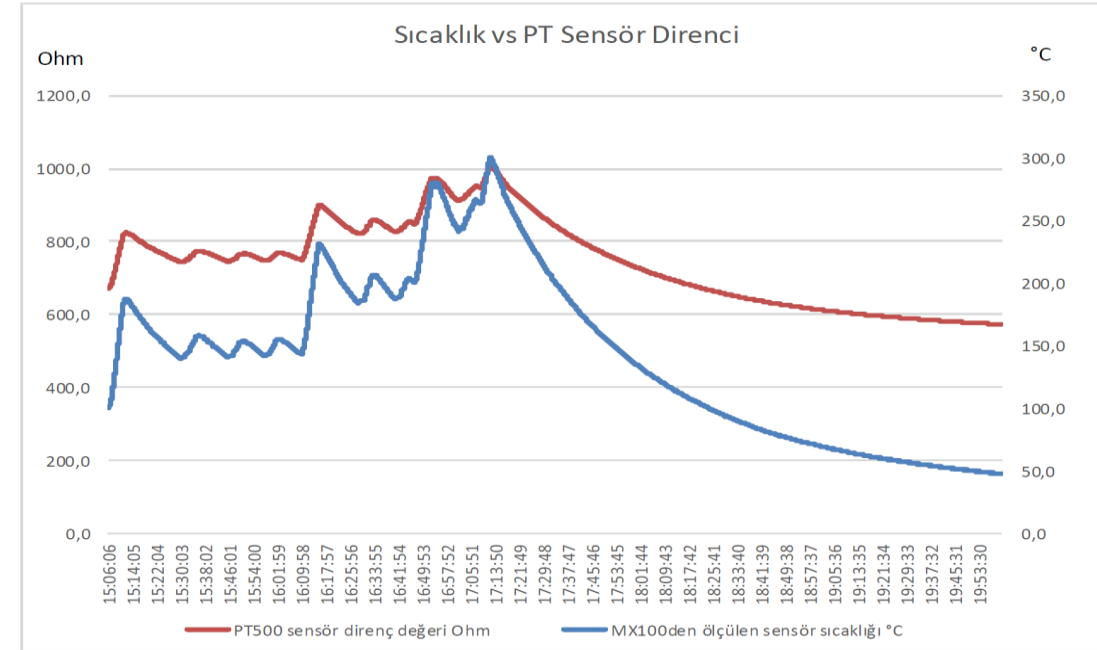
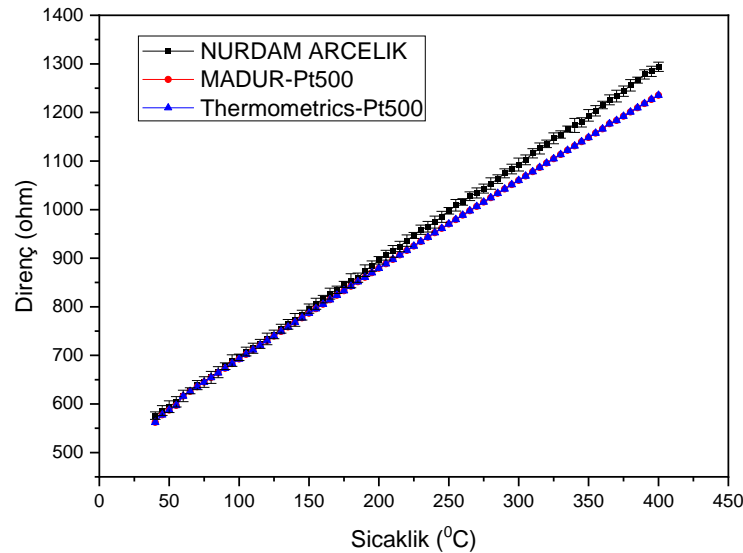
<http://nrhc.ibu.edu.tr/>
nrhc@ibu.edu.tr



TÜBİTAK UZAY-NÜRDAM İşbirliği Protokolü



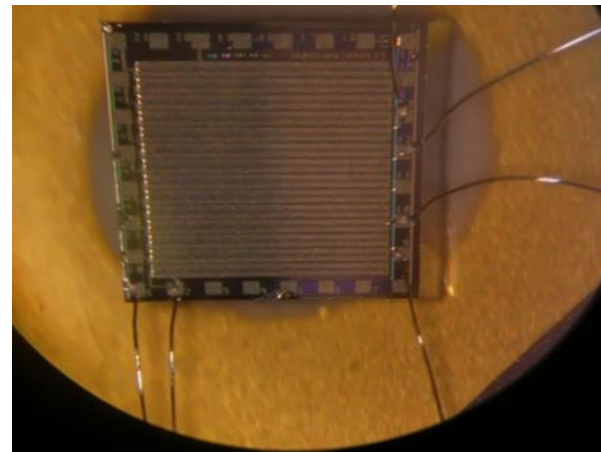
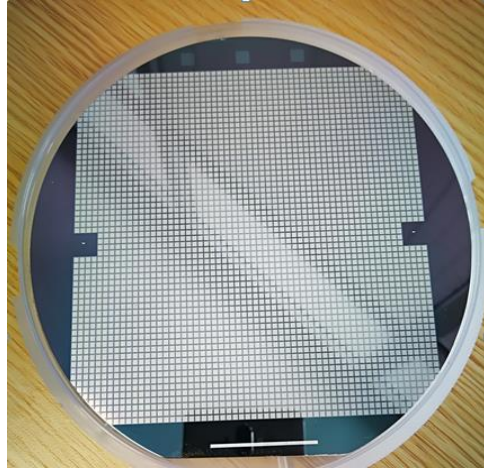
ARÇELİK-NÜRDAM Ortak Projesi





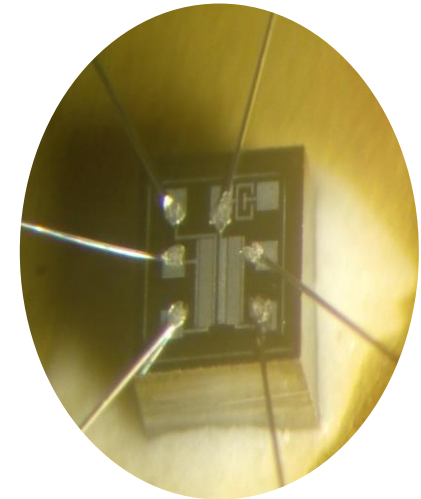
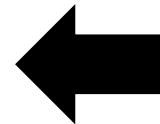
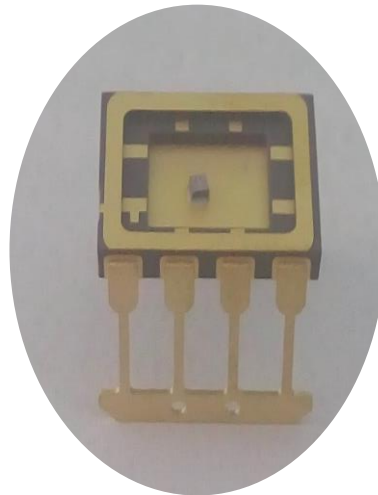
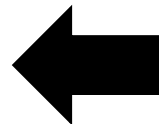
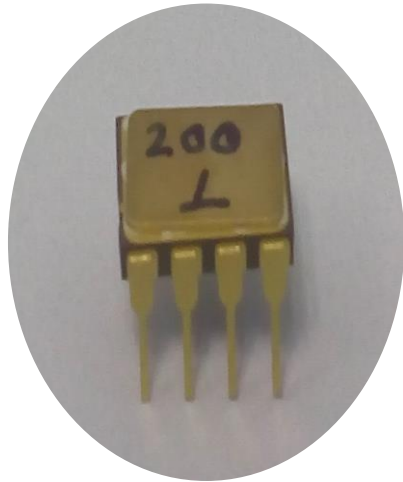
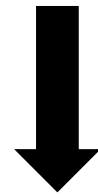
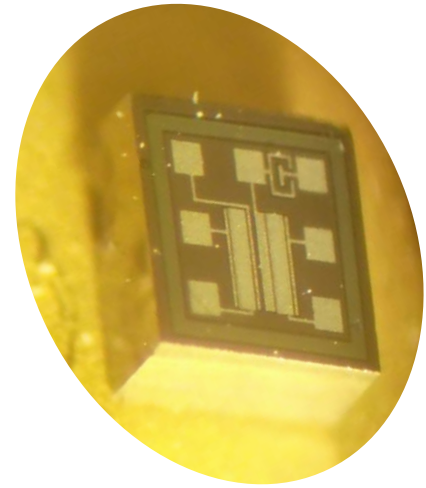
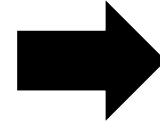
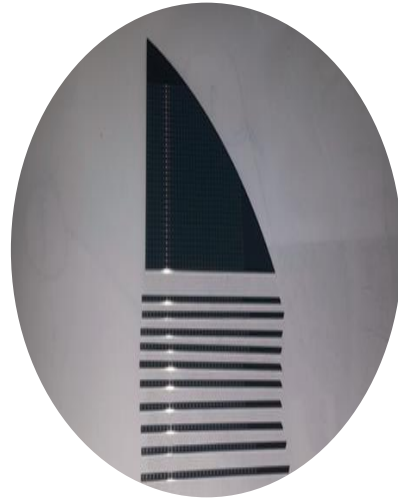
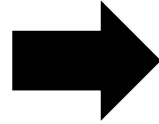
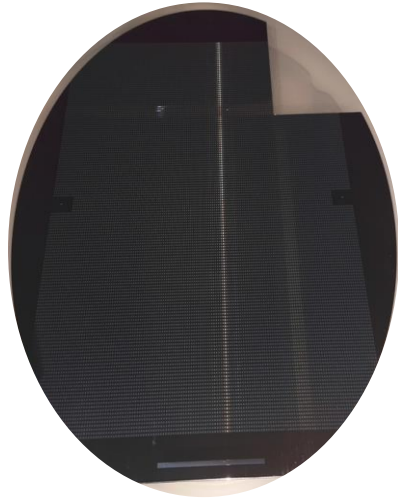
NürFET

- *p-kanallı MOSFET*
- *Düşük enerji tüketimi*
- *Küçük boyut*
- *Ucuz maliyet*
- *Anlık ölçüm*
- *CMOS teknolojisi ile uyumlu*



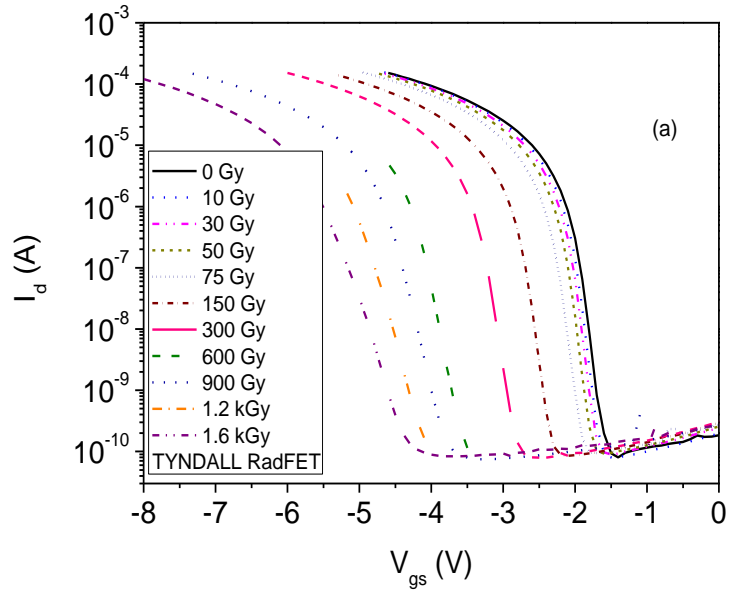


NürFET

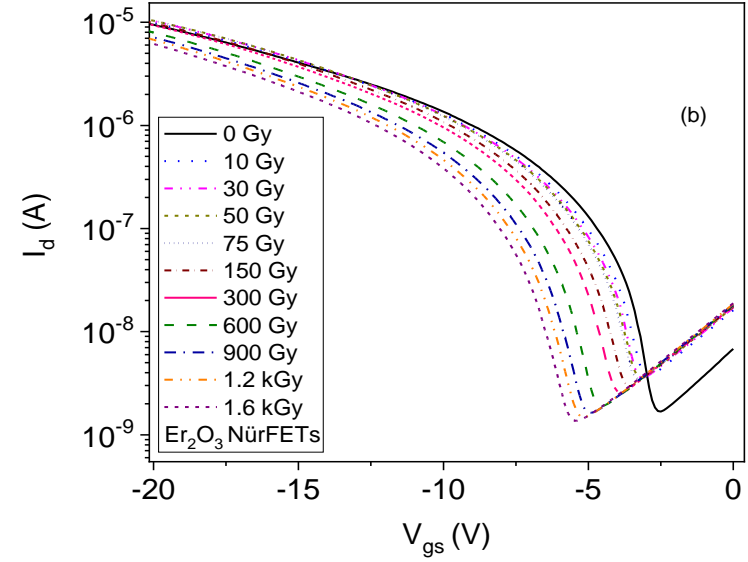




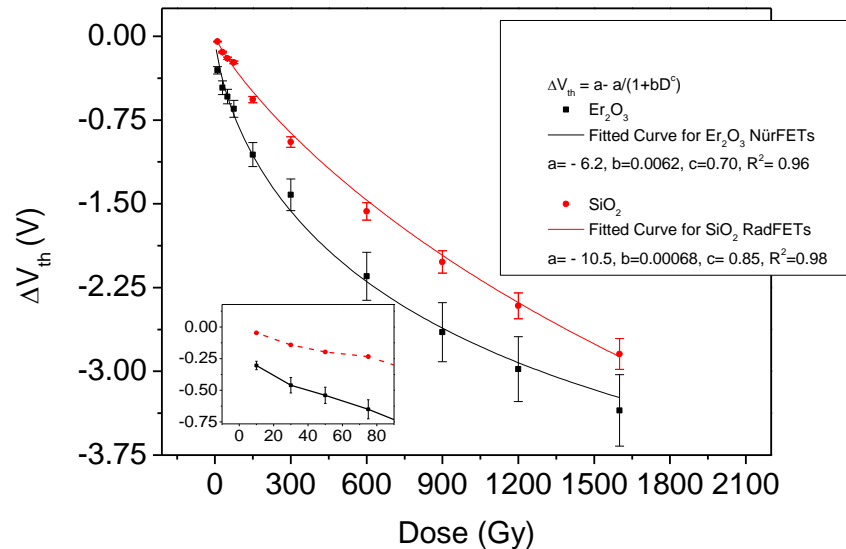
NürFET



SiO₂ RadFET transfer karakteristikleri



Er₂O₃ NürFETs transfer characteristics

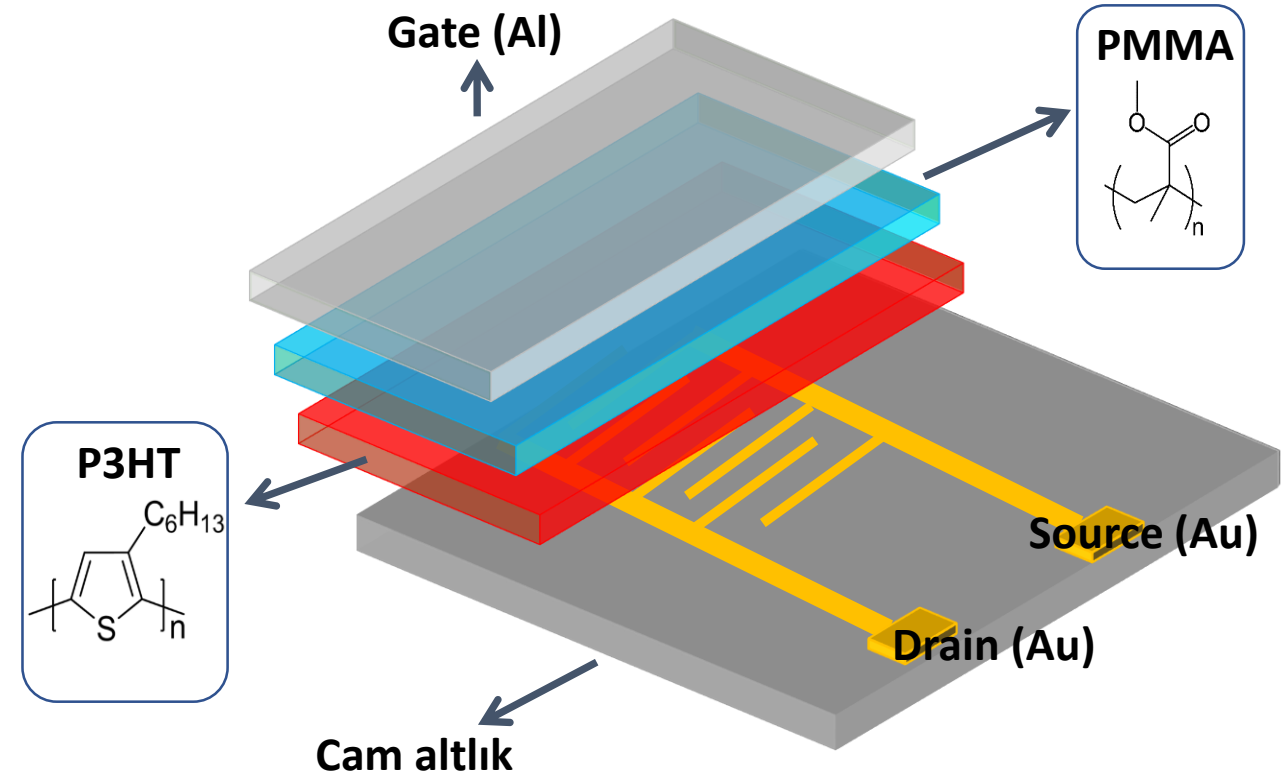
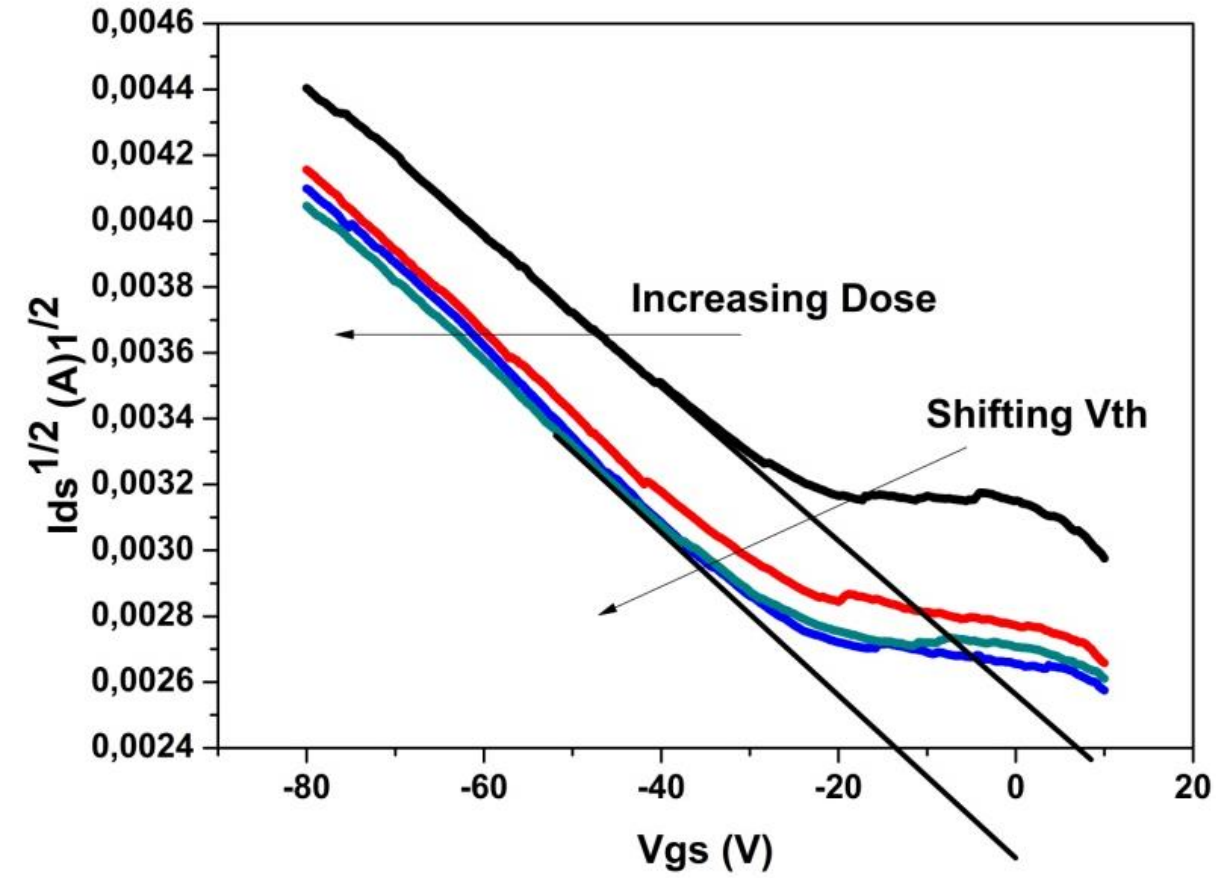


Cihazların hassasiyeti

Er₂O₃ NürFETs at 30 Gy is 15 mV/Gy vs.
 SiO₂ RADFETs at 30 Gy is 4.6 mV/Gy



Polimer Tabanlı OFET Dozimetre

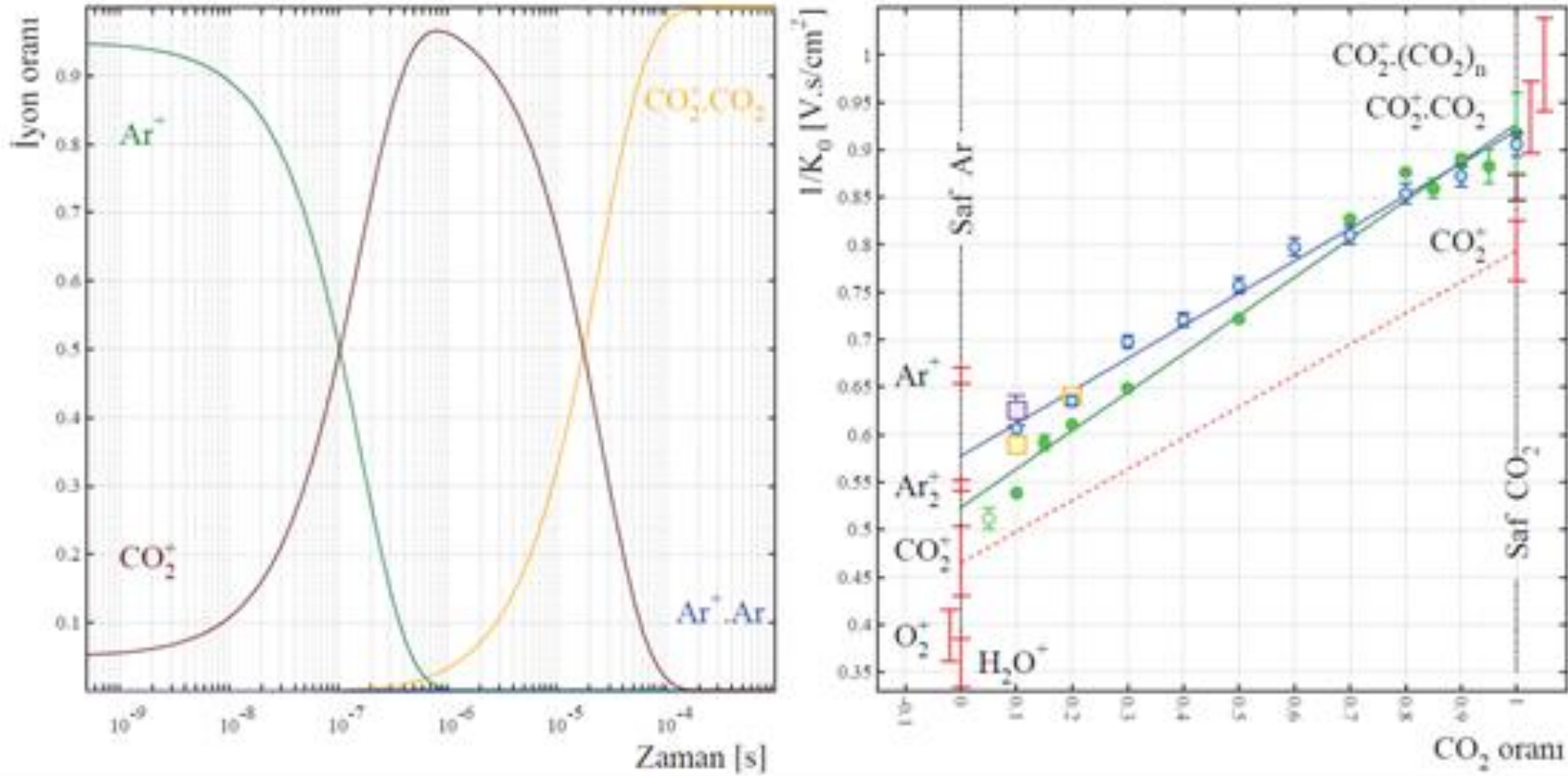




Gazlı Detektörlerde İyonik Küme Boyutlarının Ölçülmesi

- Gazlı detektör standart koşullarda çalışırken, iyonik kümelerin oluştuğu ortamda Rayleigh saçılması yöntemiyle boyut analizi yapılabilmesi için deney düzeneğinin kurulması.
- Gazlı detektörlerde sıklıkla kullanılan Ar-CO₂ gaz karışımı için oluşan iyonik küme boyutlarının belirlenmesi ve verilerin analiz edilmesi.
- Mevcut simülasyon programlarının güncellenerek iyon etkilerinin [sinyale etkilerinin](#) dikkate alınması
- Problemin çözümüne yönelik devam eden bilimsel çalışmalara yön verme

İyonik Kümeler

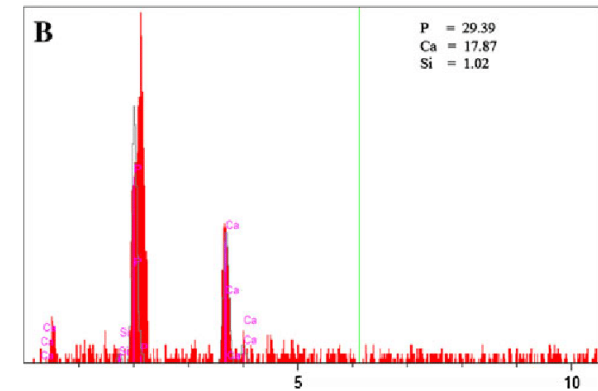
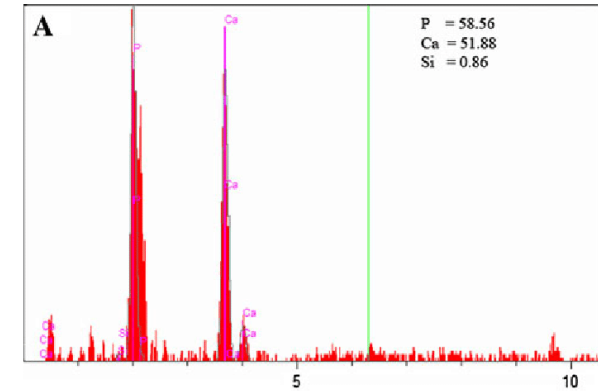
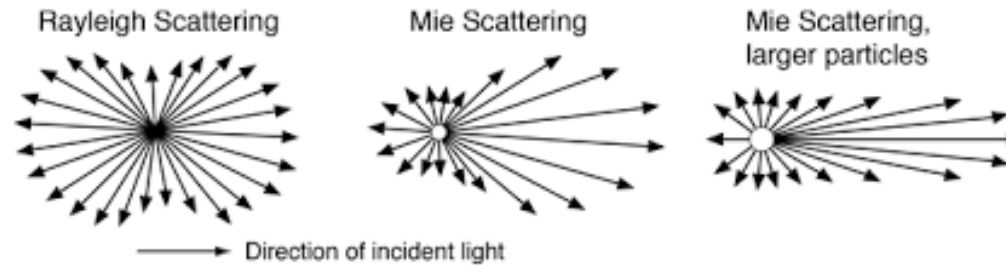
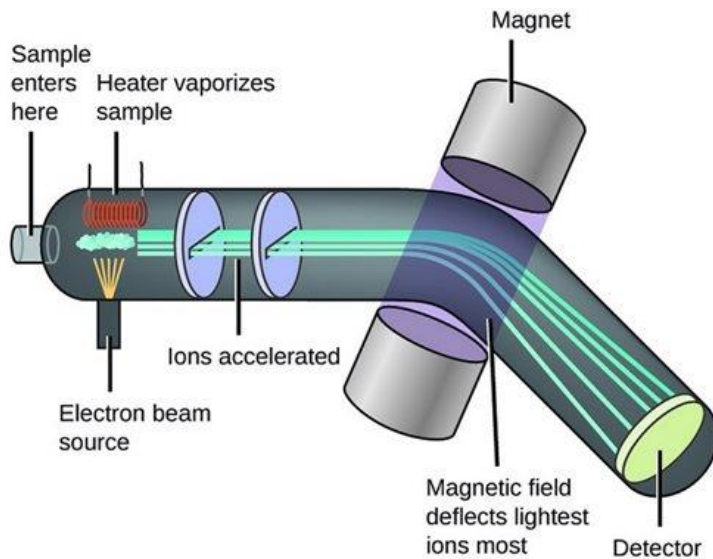


Sol: %95 Ar - %5 CO₂ gaz karışımında, 1070 Pa basınç altında iyonik kümelerin hesaplanmış oranları. Sağ: Ar-CO₂ gaz karışımı için Blauk Diyagramı
@Garfield⁺⁺

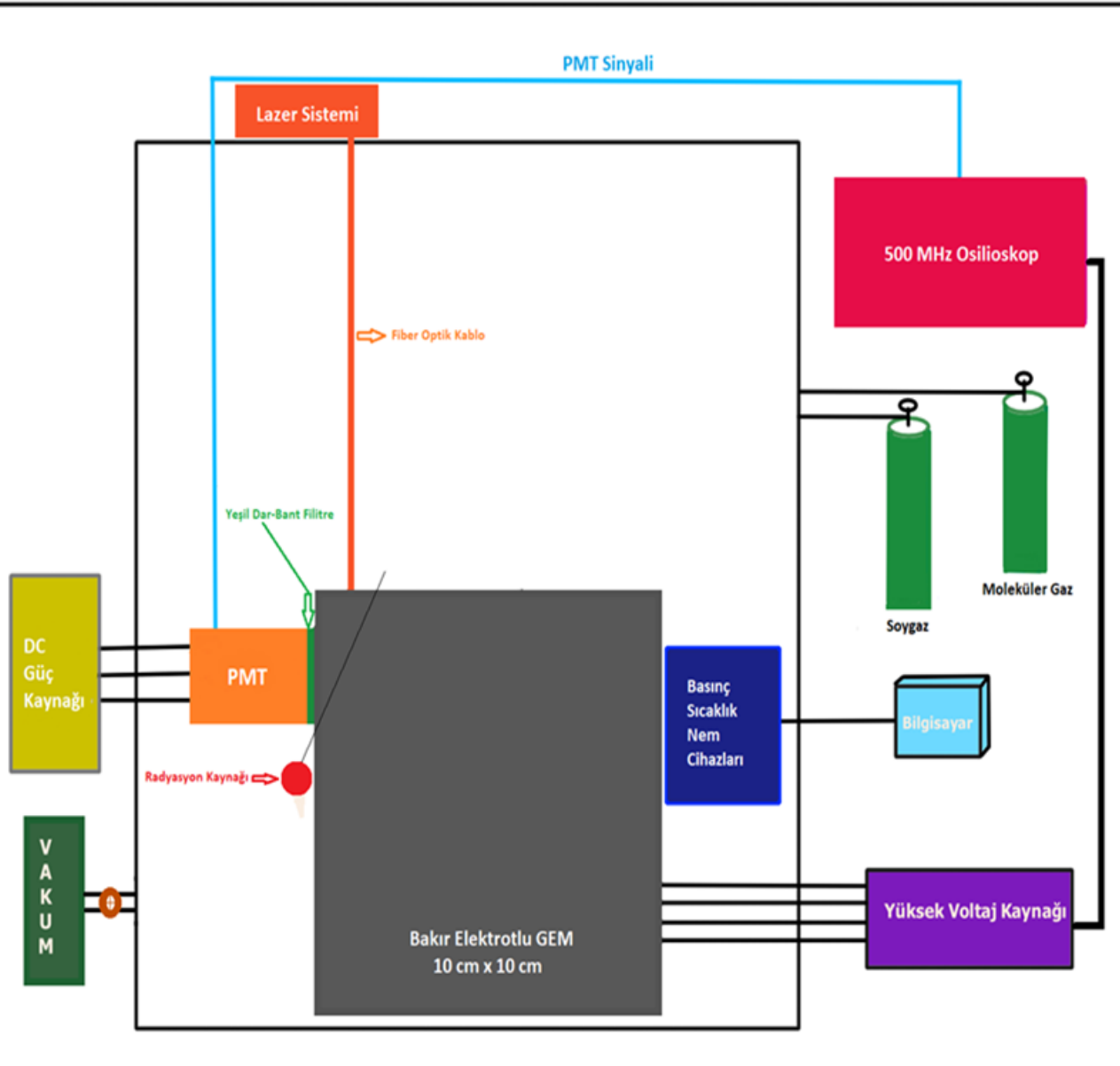
Moleküler Boyut Analizinde Kullanılan Yöntemler

İyonik kümeler ile alakalı araştırmalar incelendiğinde, ana amacın boyutlarını belirlemek ve böylece ne derece etkili olduklarını ortaya koymaktır.

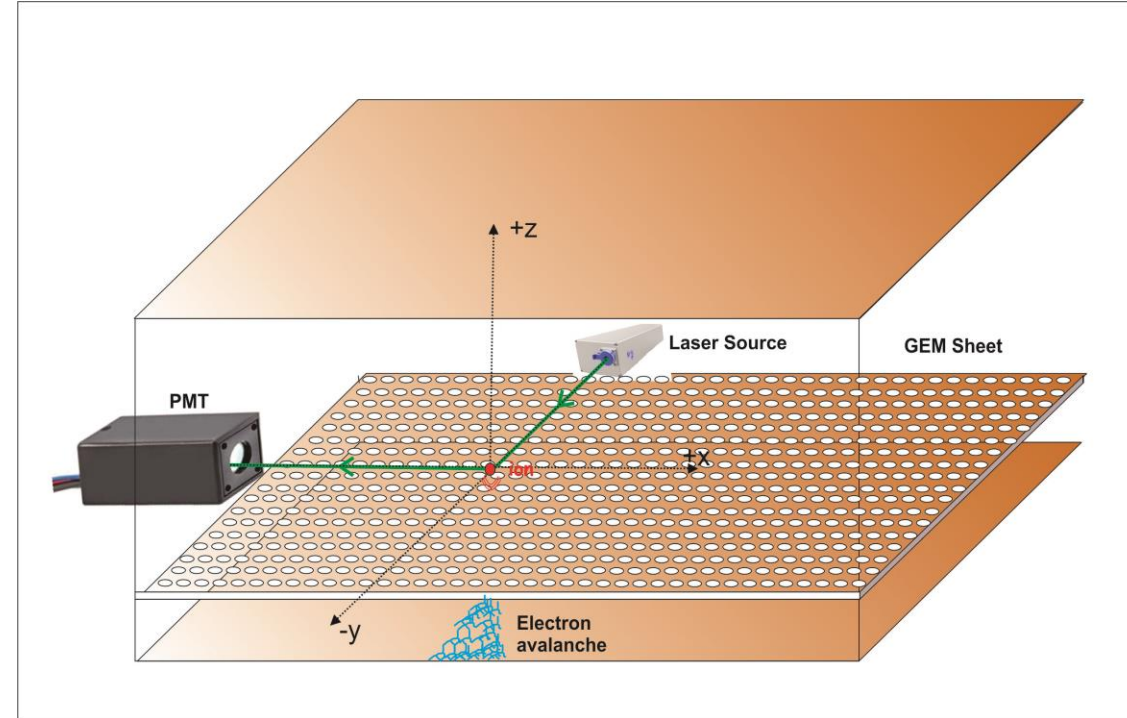
- Kütle Spektrometrisi (Mass Spectrometry (MS))
- Yüksek Enerjili Elektron Kırınımı
- Rayleigh Saçılması Yöntemi (Mie Saçılması)
- He saçılması

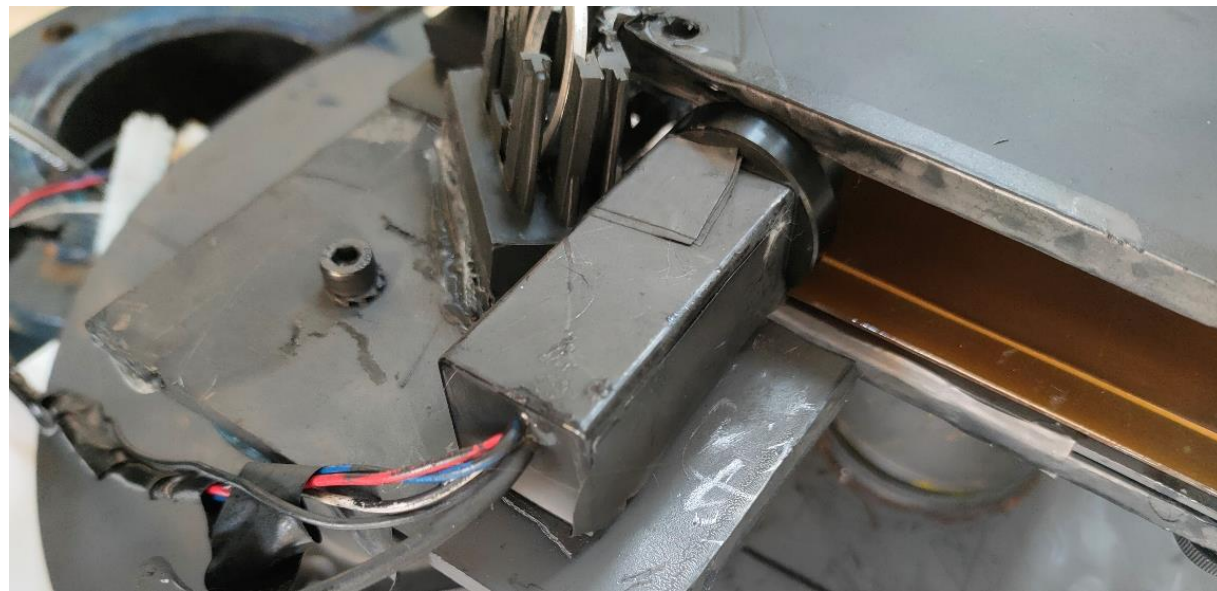
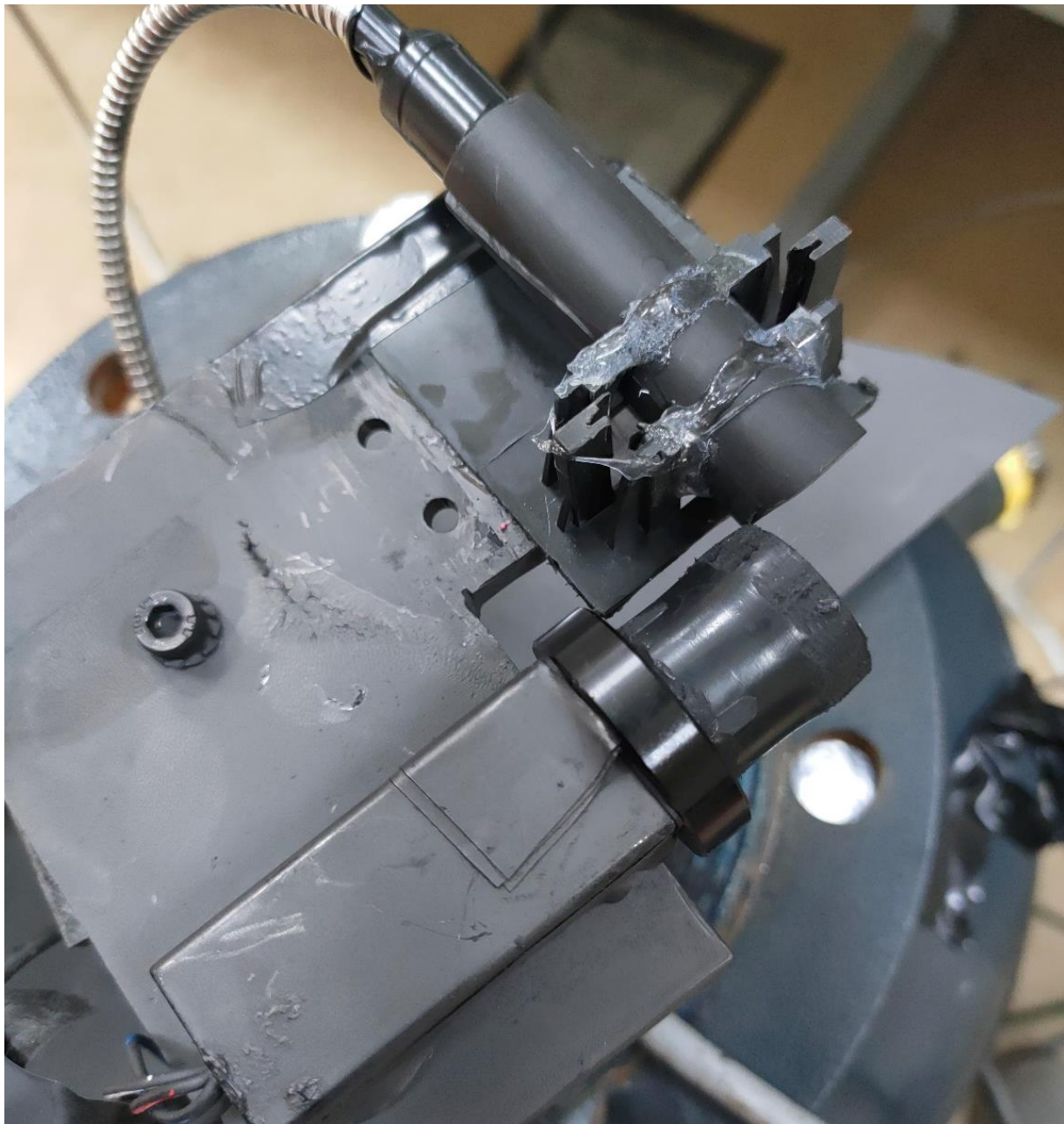


Deneysel Kurulum Şeması

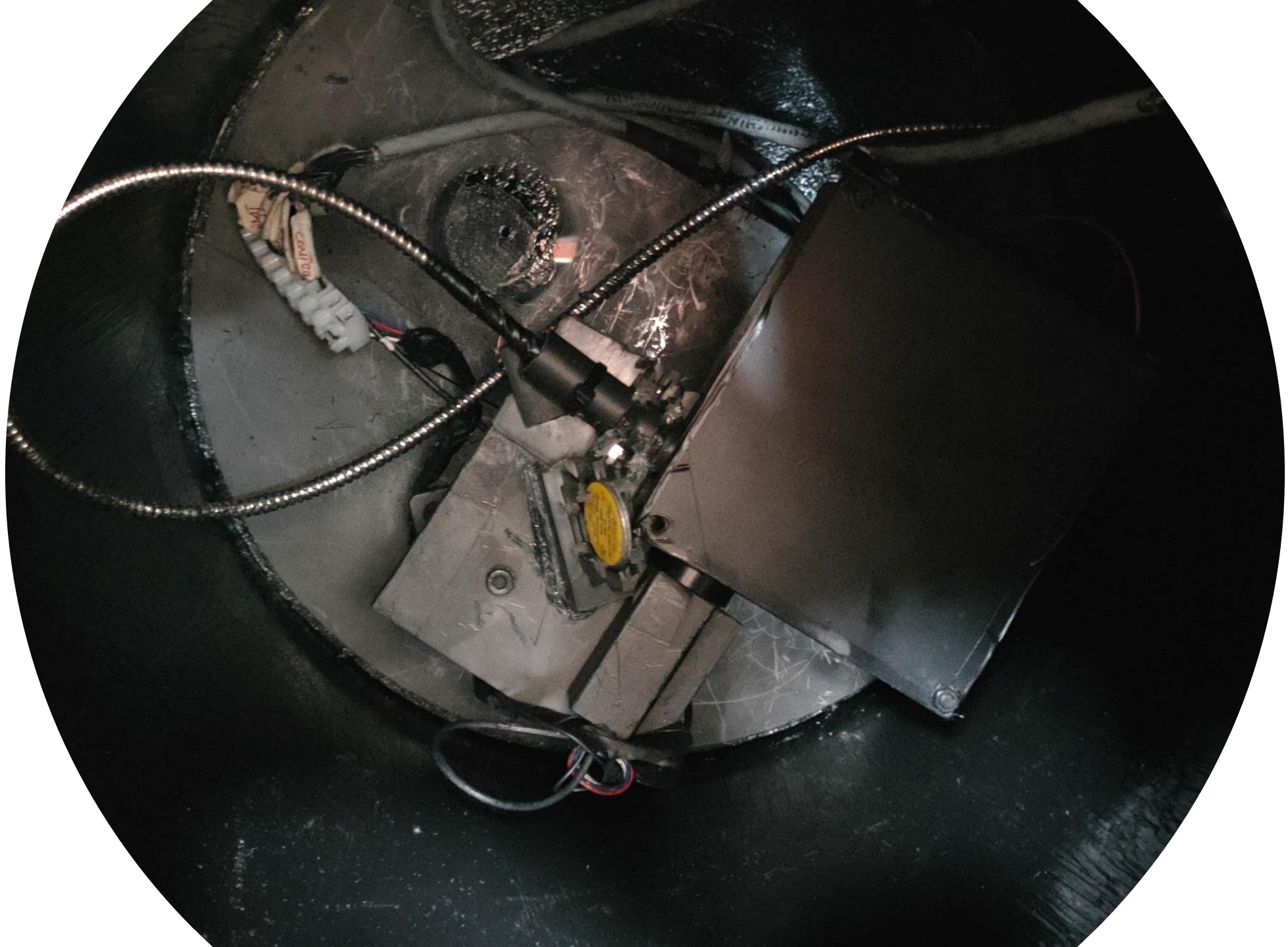


TÜBİTAK 3501 Kariyer Geliştirme Destek Programı Çerçevesinde desteklenmiştir.



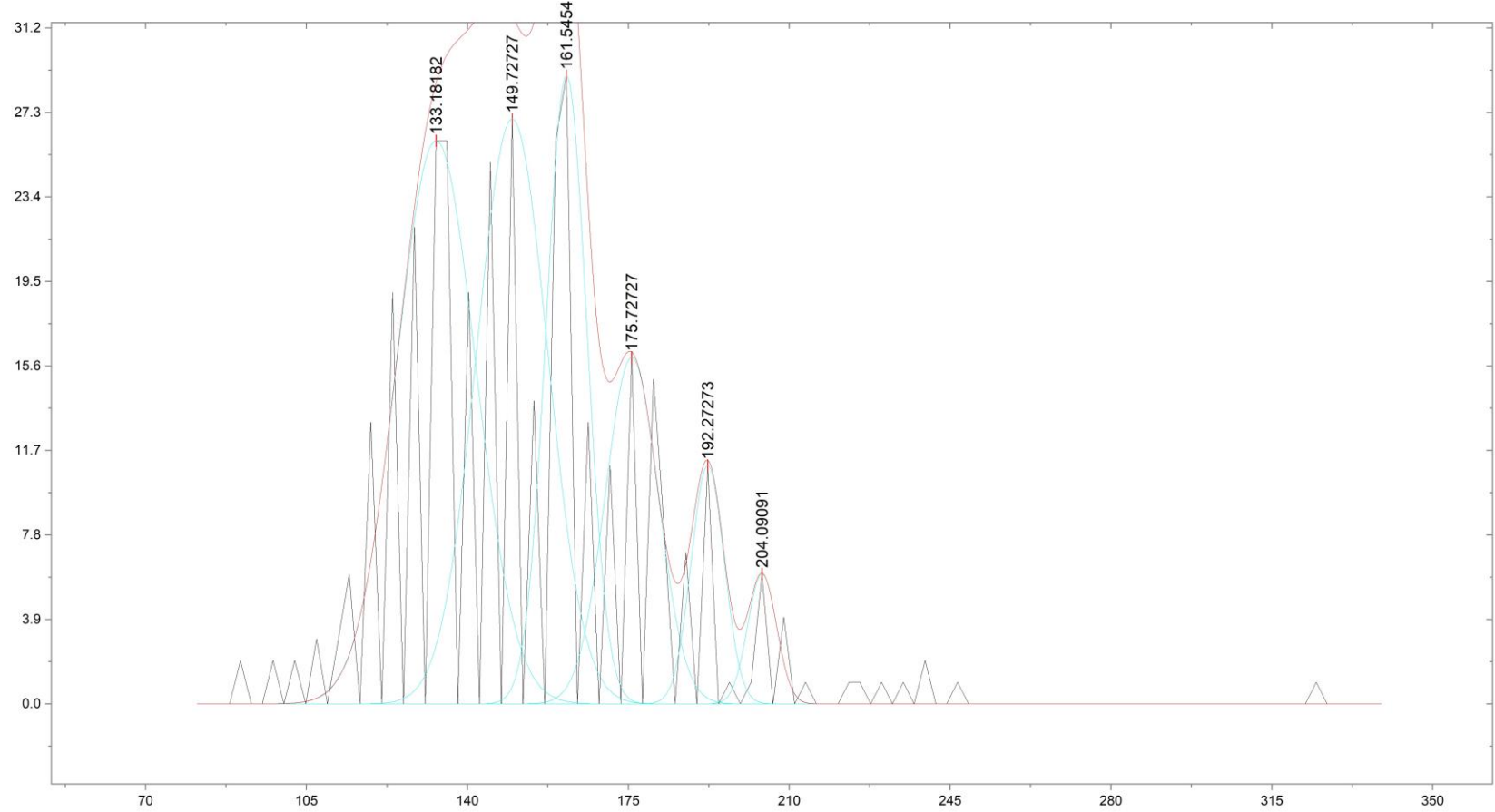
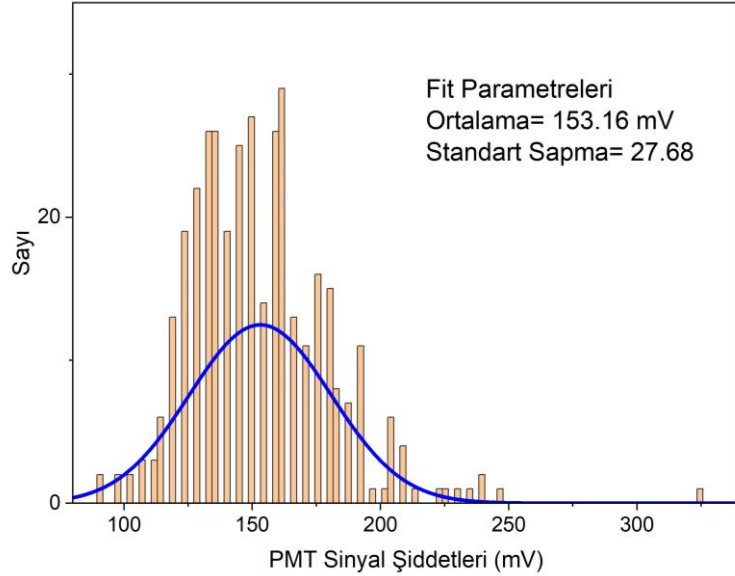








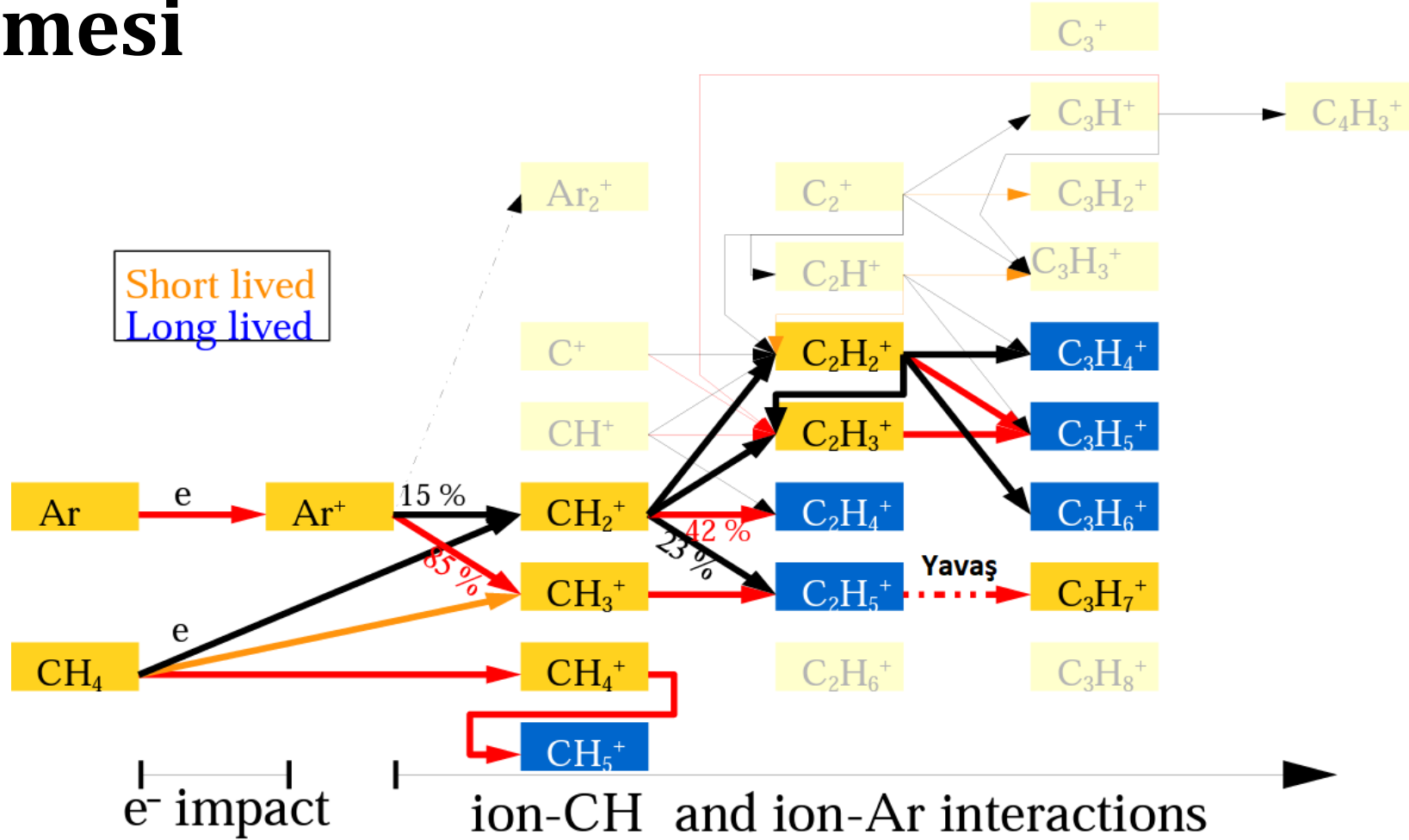
Gazlı Detektörlerde İyonik Küme Boyutlarının Ölçülmesi



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	420.68858	26.97	14.65374	134.44842	51.49968
2	Gaussian	26.75234	0.97359	25.81393	149.45134	3.27496
3	Gaussian	155.36193	1.80742	80.75195	160.3921	19.01903
4	Gaussian	172.52796	19.87288	8.1558	176.42438	21.12045
5	Gaussian	24.57624	0.88889	25.9738	192.81275	3.00856
6	Gaussian	16.96914	1.66378	9.58145	203.37026	2.07732

1 Bar basınç altında 24 °C sıcaklık ve %6 nem parametrelerinde %50 Argon - %50 Karbondioksit karışımı kullanılan bir GEM dedektörünün sürüklenme bölgesinde 6 çeşit atomik/moleküler/kümelenmiş (cluster) yapı tespit edilmiştir.

Gazlı Detektörlerde İyonik Küme Boyutlarının Ölçülmesi



Ar-CH₄ karışımı kullanılan bir GEM dedektörü içerisinde oluşabilecek atomik/moleküler/iyonik yapılar

Effects of PCBM loading on high sensitive P3HT based vertical bulk resistive X-ray detector

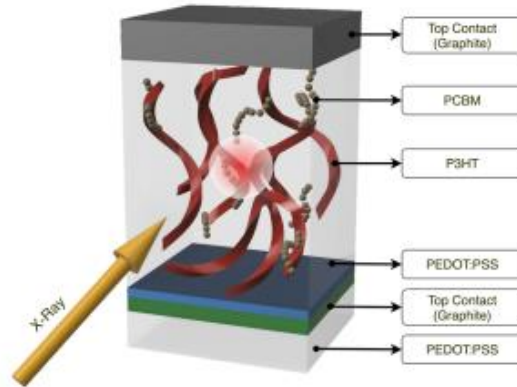
Yalçın Kalkan^a, Sadullah Öztürk^b, Arif Kösemen^{b, c}

^a Department of Physics, Bolu Abant İzzet Baysal University, Bolu, Turkey

^b Institute of Nanotechnology and Biotechnology, Istanbul University-Cerrahpaşa, Istanbul, Turkey

^c Department of Detector and Sensor Technologies, Muş Alparslan University, Muş, Turkey

Received 1 July 2022, Revised 7 October 2022, Accepted 9 October 2022, Available online 12 October 2022.



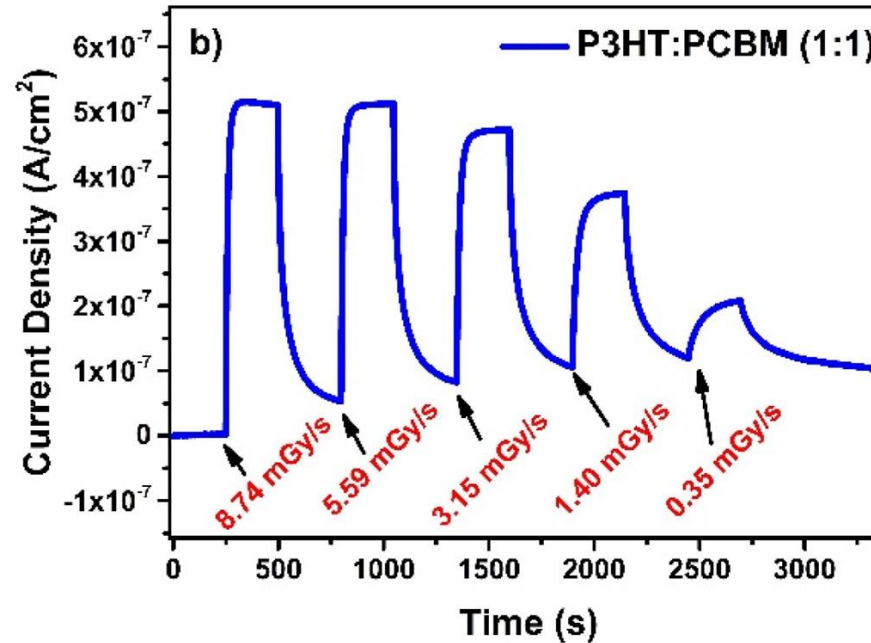
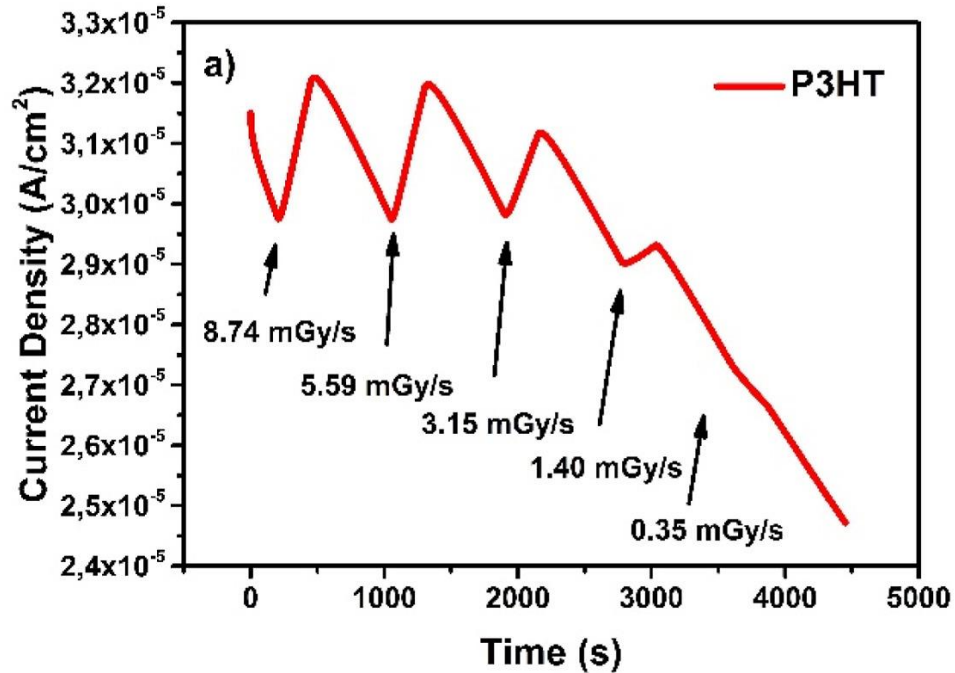
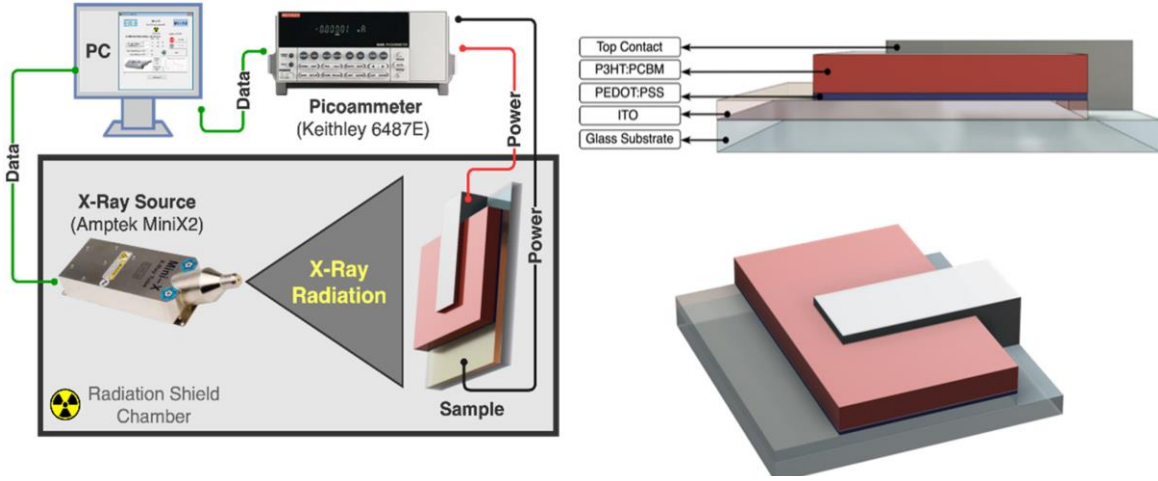
Abstract: Presents X-ray detection properties of P3HT:PCBM blend structure with different PCBM loading ratios. P3HT:PCBM mixing ratio was changed from 1:0 to 1:2. Top contact of device were produced by a solution based graphite ink. Devices were constructed with vertical bulk resistive architecture within an ohmic electrode structure as ITO/PEDOT:PSS/P3HT:PCBM/Graphite configuration. The blend structured devices exhibited stable saw-tooth type behaviour in photocurrent responses against the on and off states of X-rays. Saw-tooth type responses could be evaluated as major evidence for a potential usage of organic electronic device technology direct radiation detectors.

HIGHLIGHTS

- P3HT:PCBM active layer based X Ray detectors were fabricated and effect of PCBM ratio was investigated.
- Spray coated graphite electrode was used as the top ohmic contact for all devices.
- P3HT:PCBM ratio was changed as (1:0), (1:0.5), (1:1), (1:2) and investigate PCBM concentrations how effect X Ray detection parameters with different X Ray dose rates under 10 V bias.
- Best sensitivity value to X-ray was obtained with the blend structure with equal ratio of PCBM and P3HT (1:1).

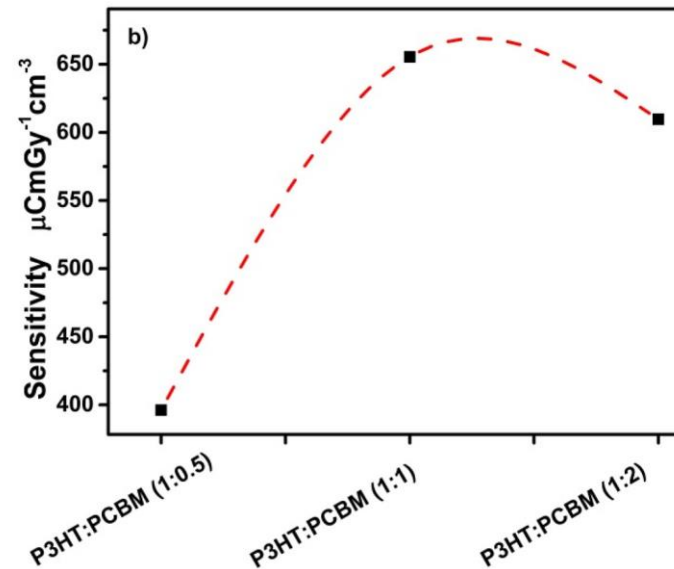
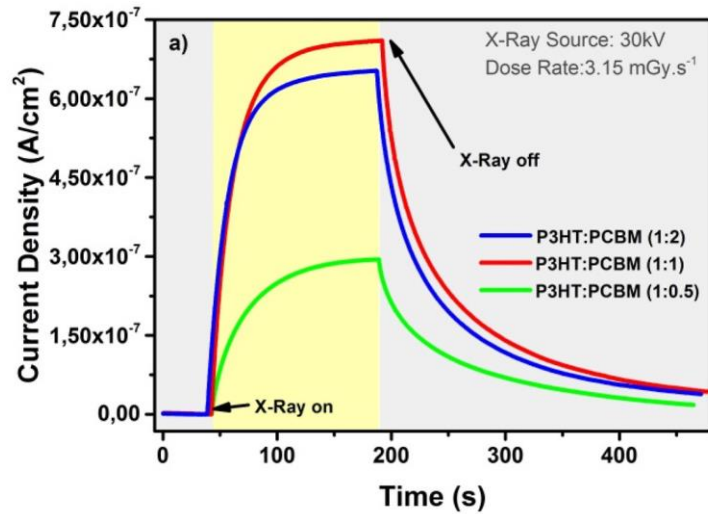
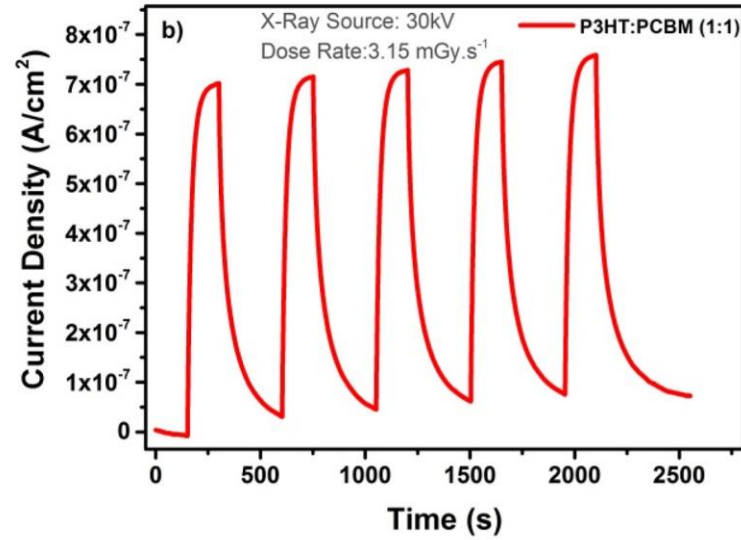
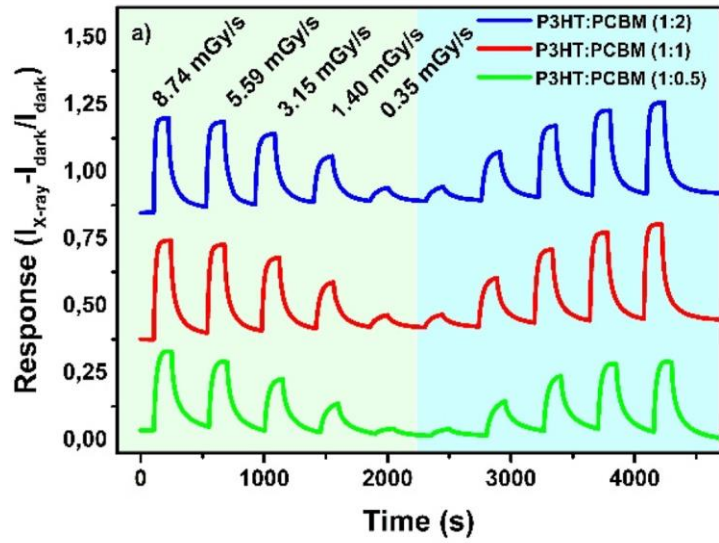


Polimer Tabanlı X-ışını dedektörleri





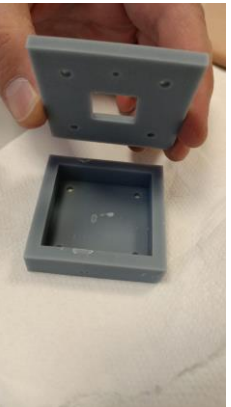
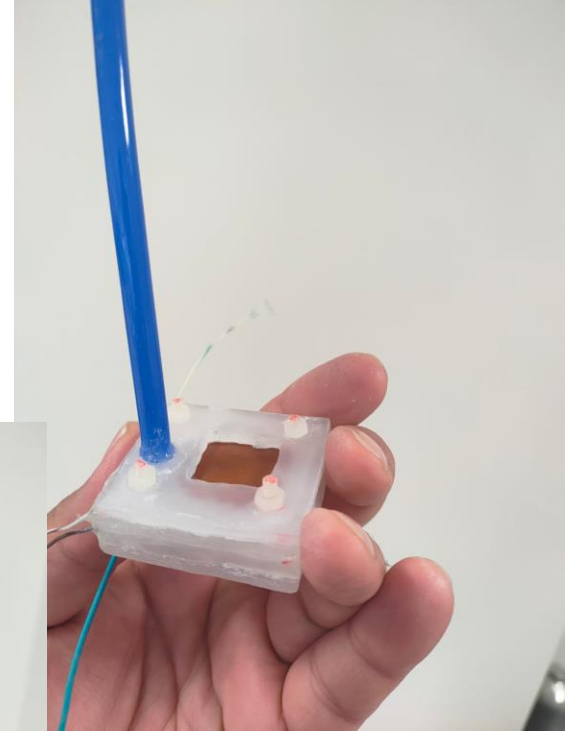
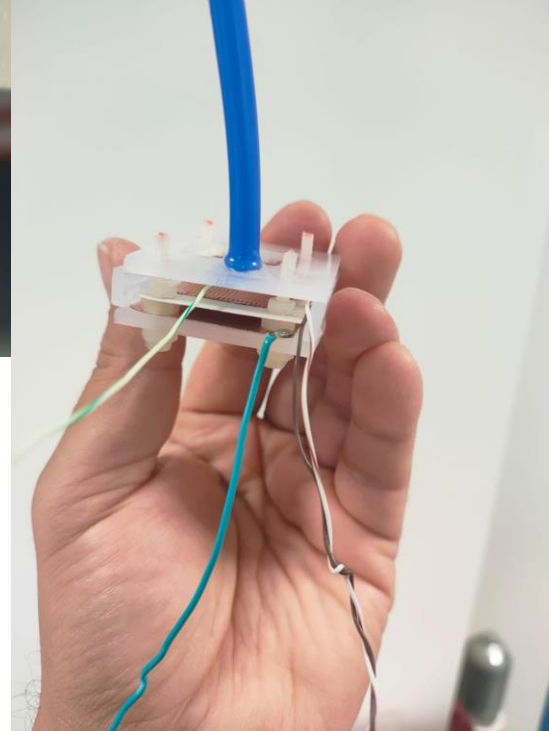
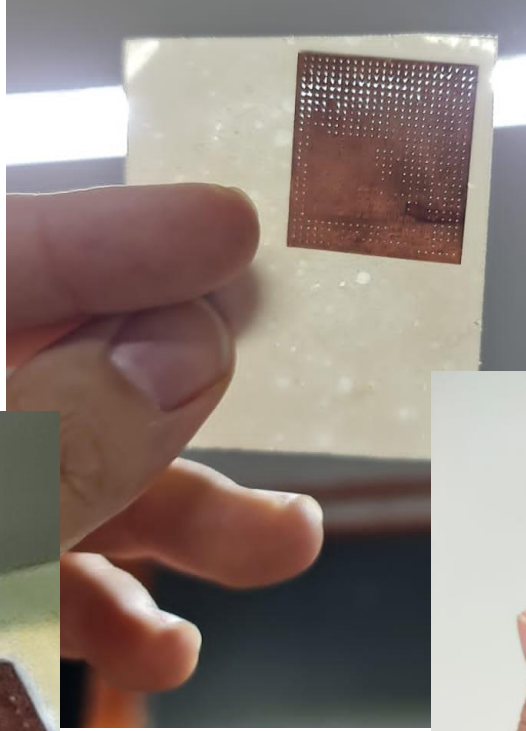
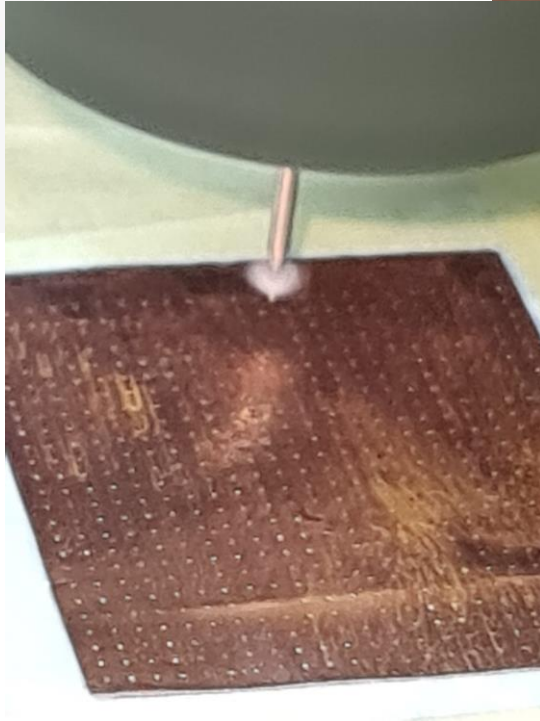
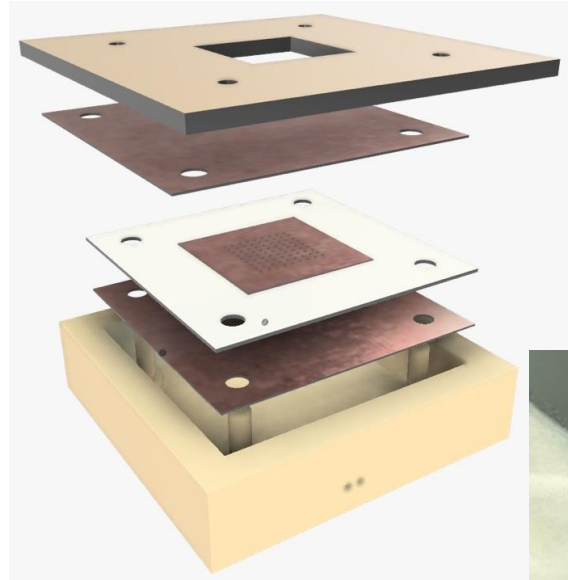
Polimer Tabanlı X-ışını dedektörleri





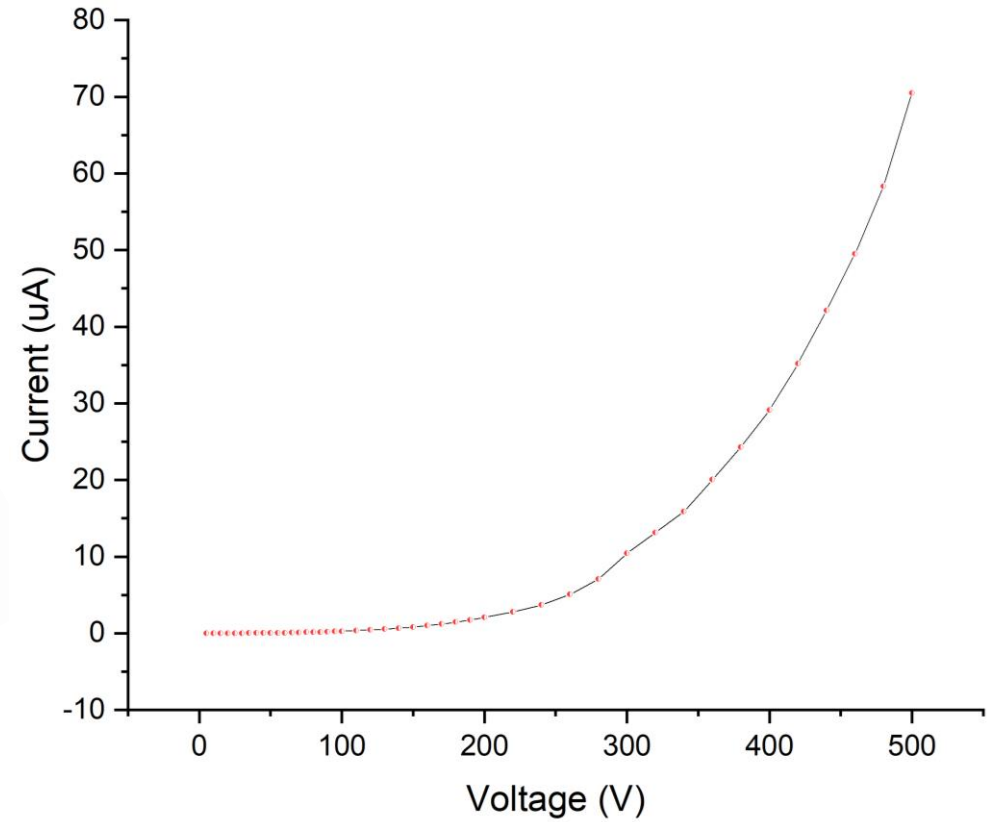
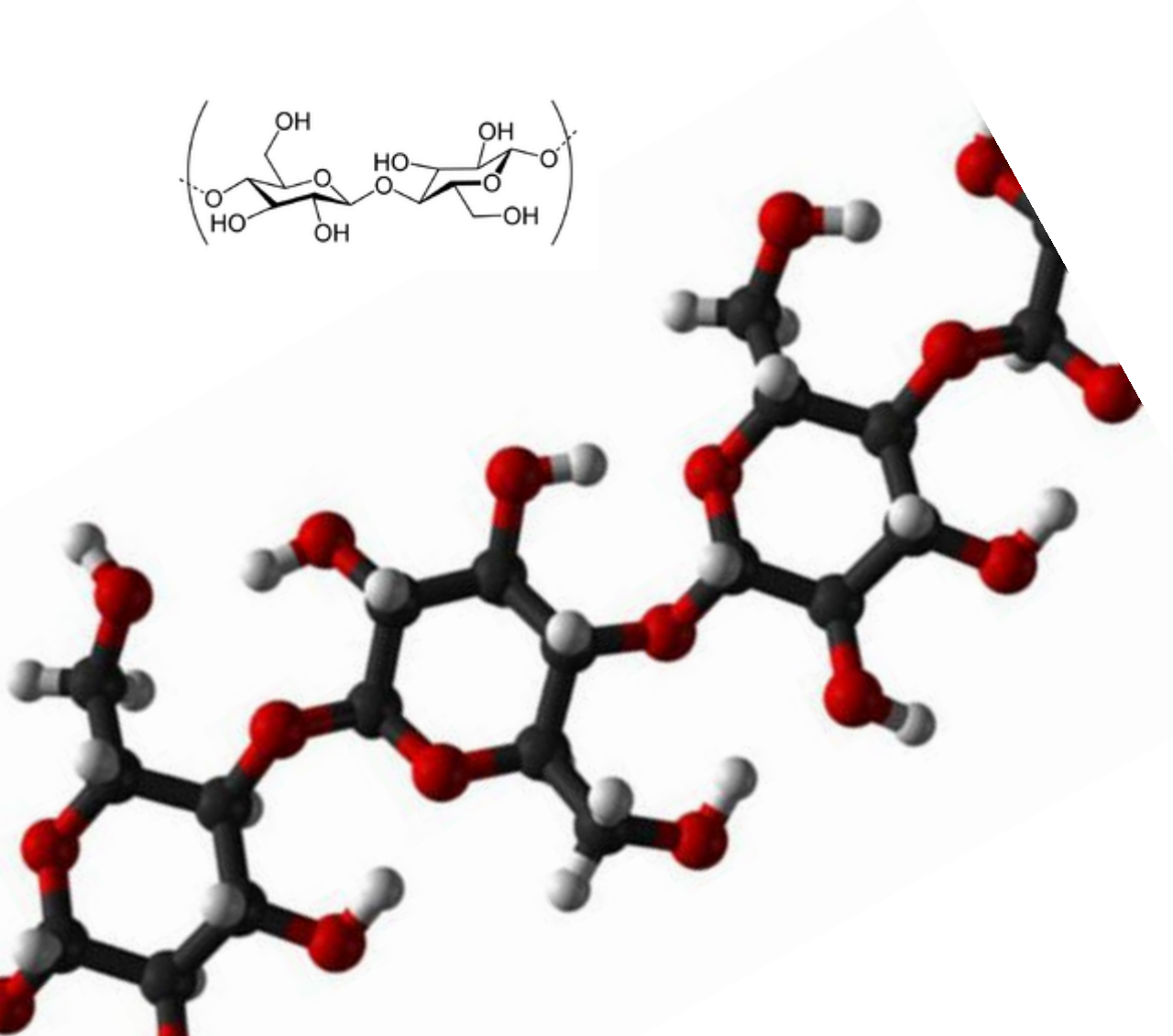
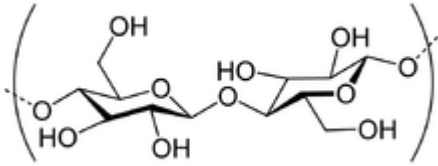
Değişik GEM yaprağı formlarının geliştirilmesi

Selülöz-GEM

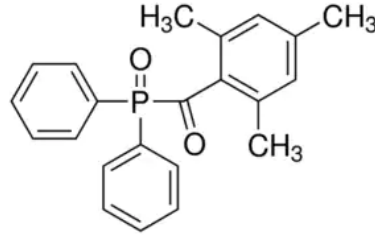


Değişik GEM yaprağı formlarının geliştirilmesi

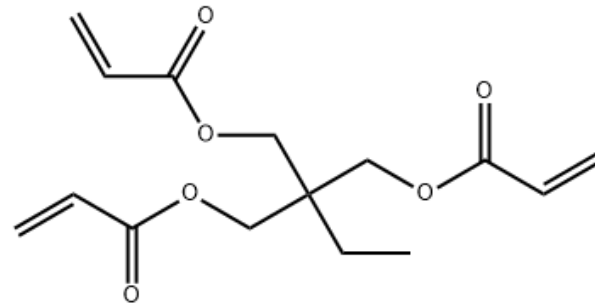
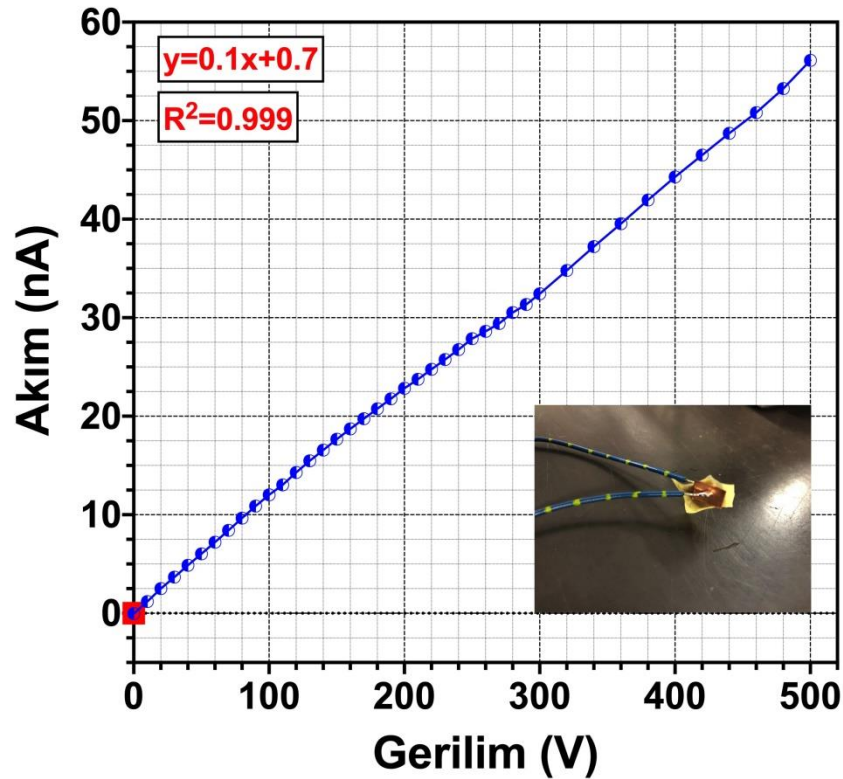
Selülöz-GEM



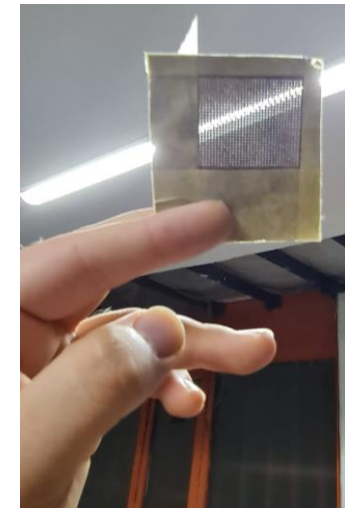
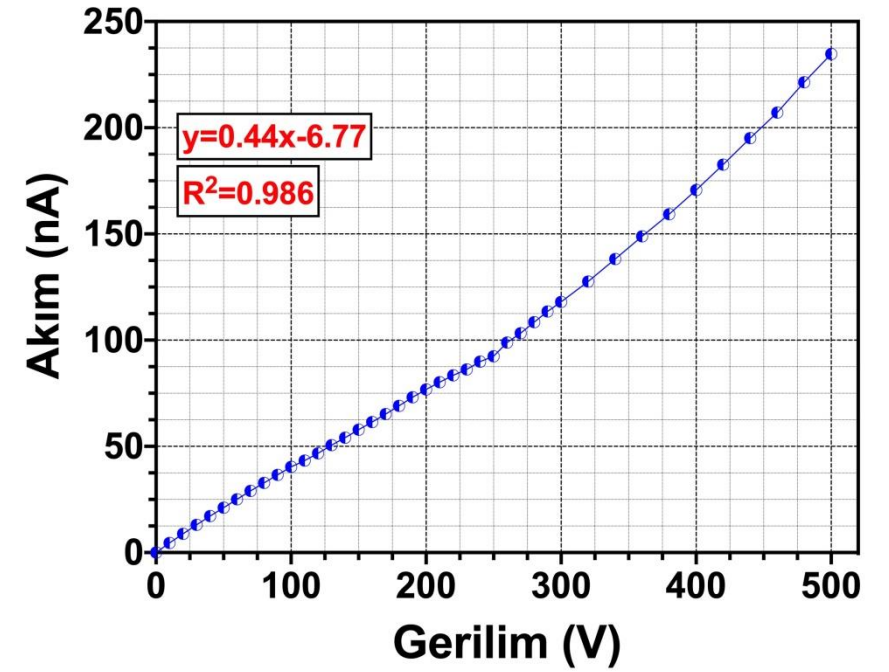
Değişik GEM yaprağı formlarının geliştirilmesi



Difenil(2,4,6-trimetilbenzoil) fosfin oksit (TPO)



Trimethylolpropane triacrylate



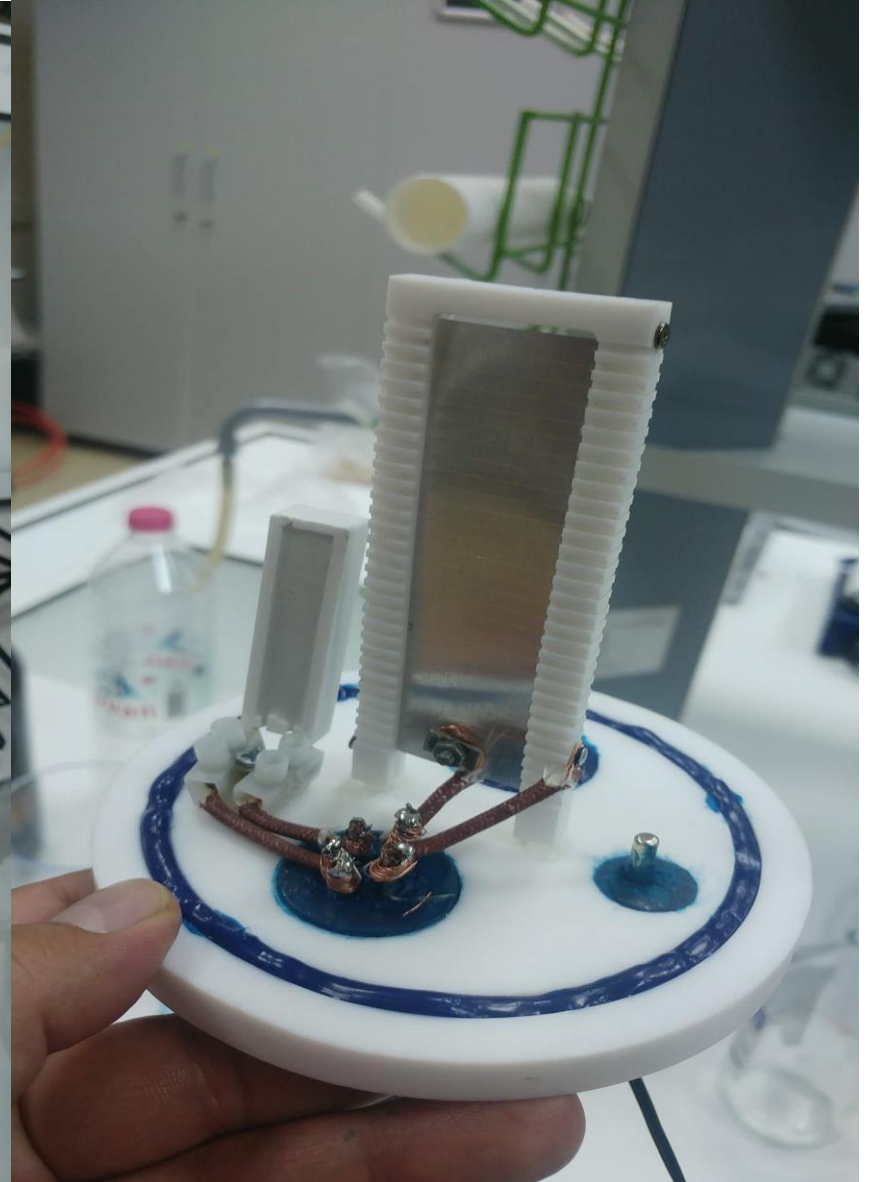
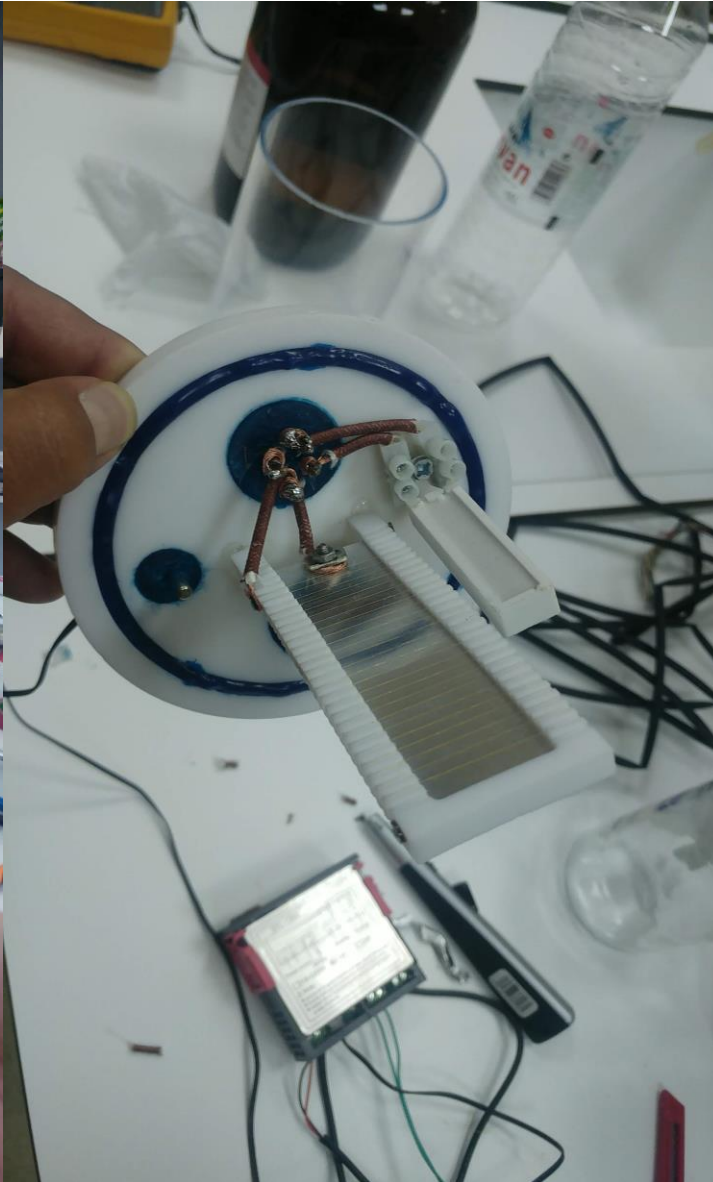
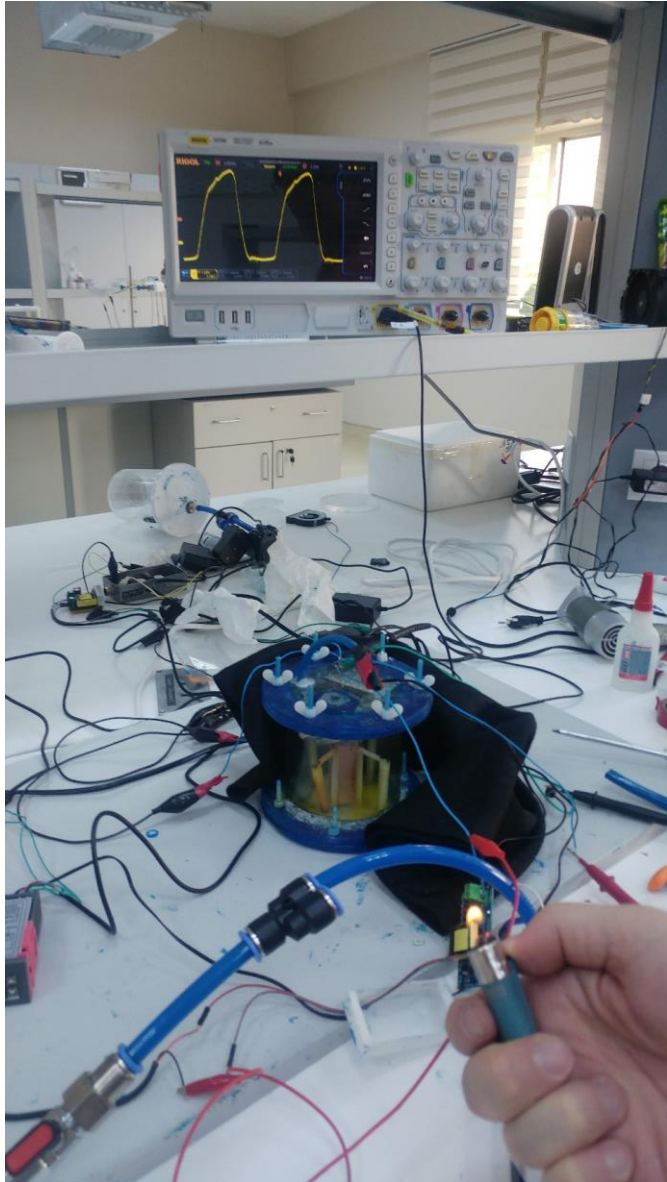
Manavgat'ta çıkan orman yangınında 5 kişi hayatını kaybetti, 58 kişinin tedavisi devam ediyor. Yangına havadan ve karadan müdahale sürdü. Bazı alanlarda ise ekipler tohumlama çalışması yaptı.

GÜNCELLENDİ



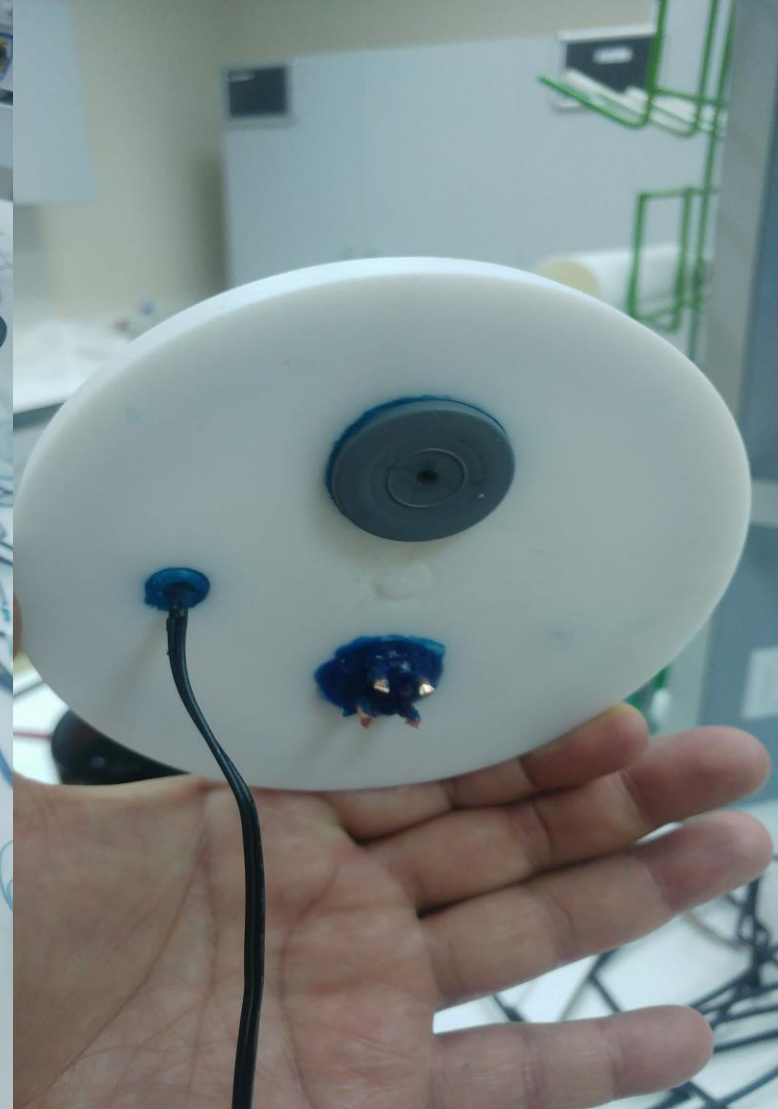
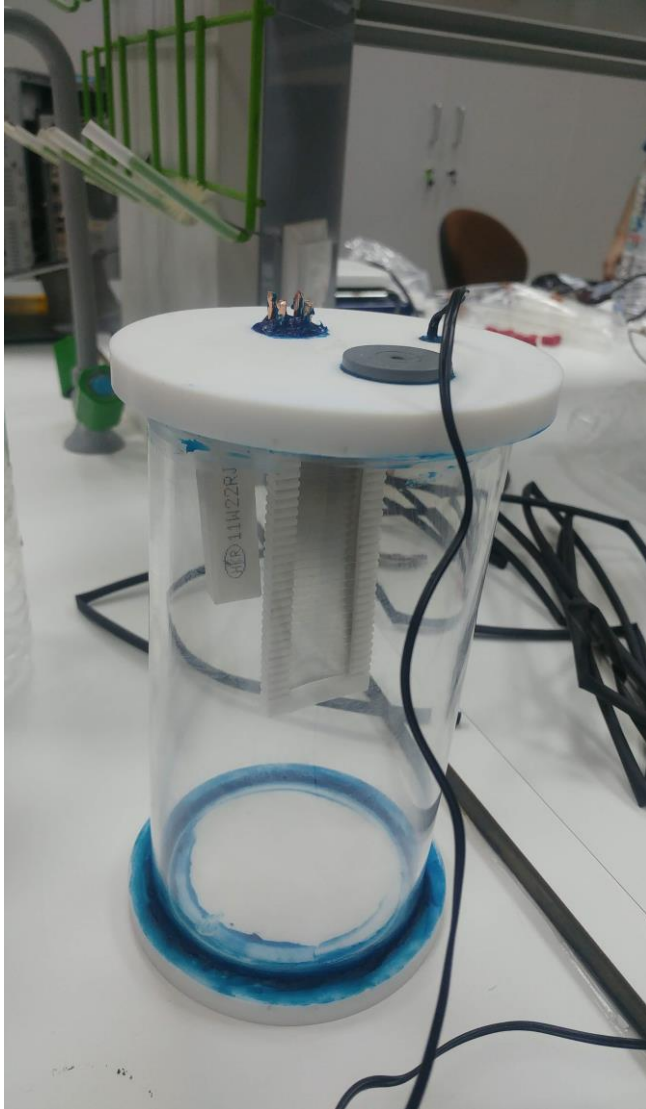


UV/Alev Dedektörleri





UV/Alev Dedektörleri

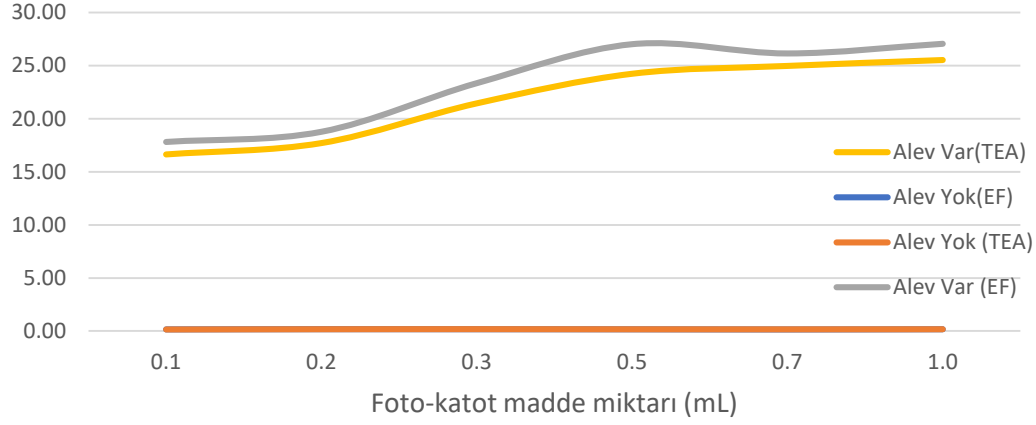




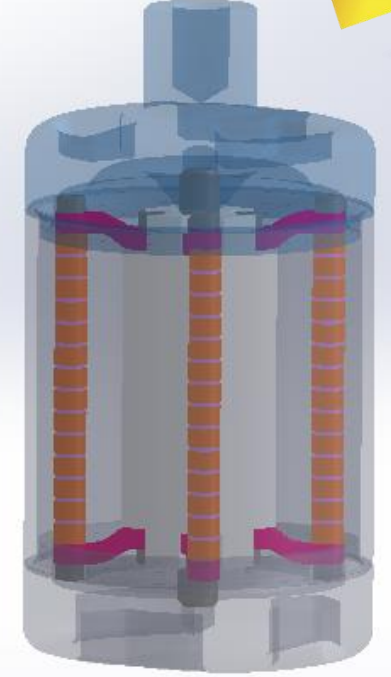
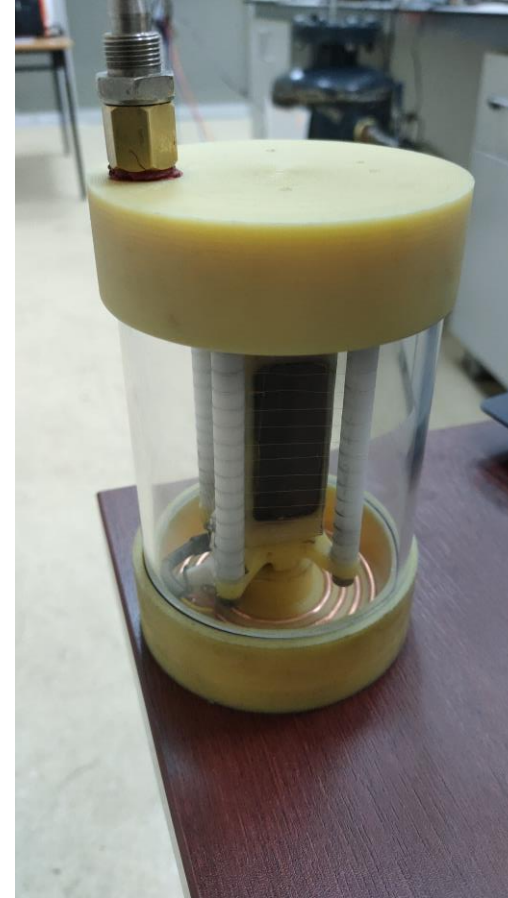
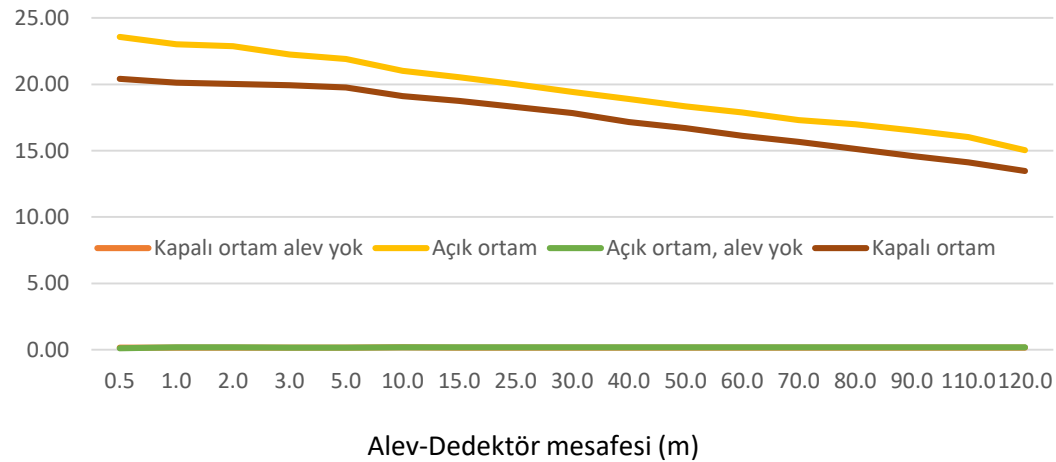
UV/Alev Dedektörleri

PATENTLİ ÜRÜN

EF ile üretilen maks. Akım Değerleri (μA)



Mesafeye (m) bağlı olarak üretilen akım (μA)





Center For Nuclear

Radiation Detector

Research And Applications

Teşekkürler

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