

Laboratorija za atomske sudarne procese Institut za fiziku Beograd

Sistem za optičku
spektroskopiju

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graph TD; A[Sistem za optičku spektroskopiju] --> B[Laserski indukovana fluorescencija]; A --> C[Optički spektri (LIBS tehnika)]; A --> D[Luminescencija nanopraškova];
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Laserski
indukovana
fluorescencija

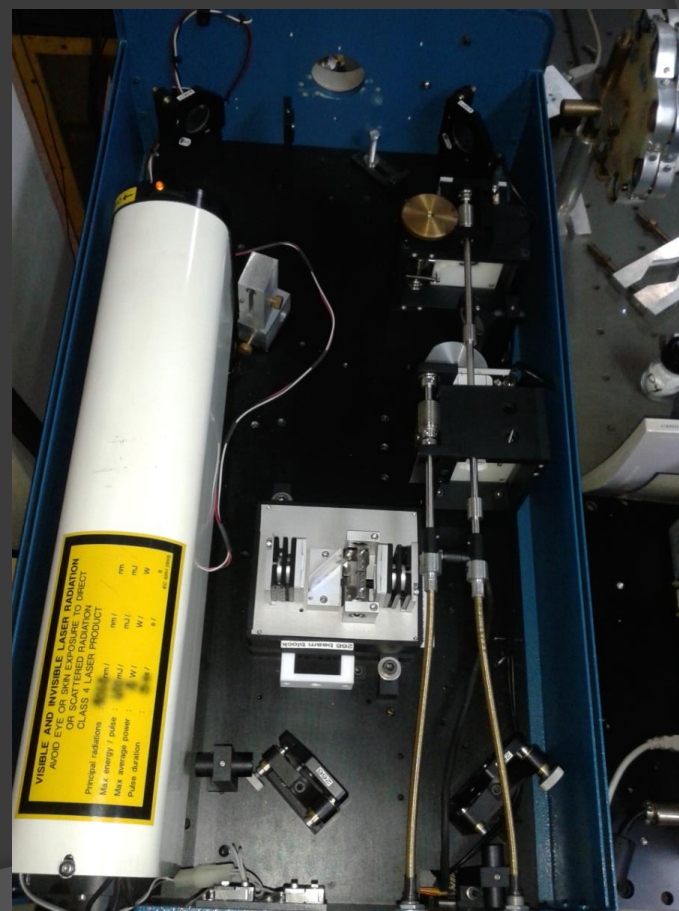
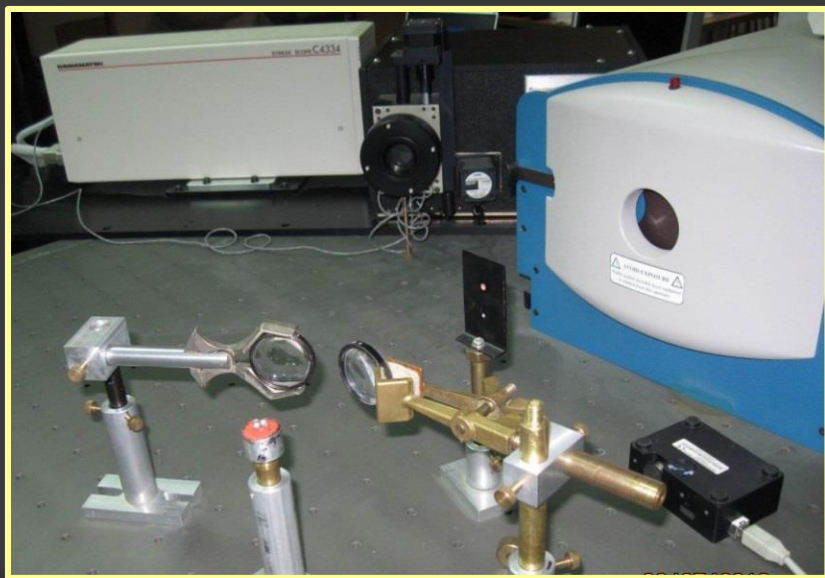
Optički
spektri
(LIBS
tehnika)

Luminescencija
nanopraškova

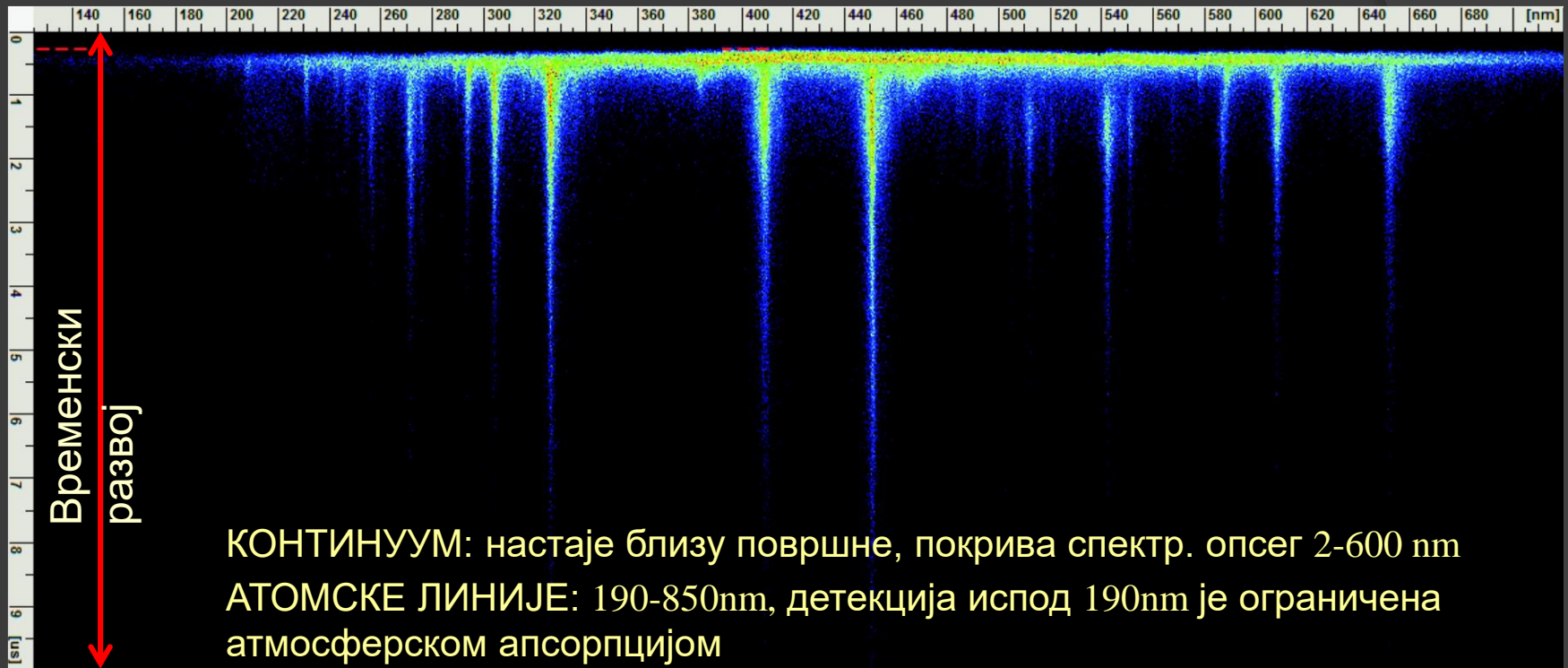
Sistem za snimanje optičkih spektara

Основни делови овог уређаја:

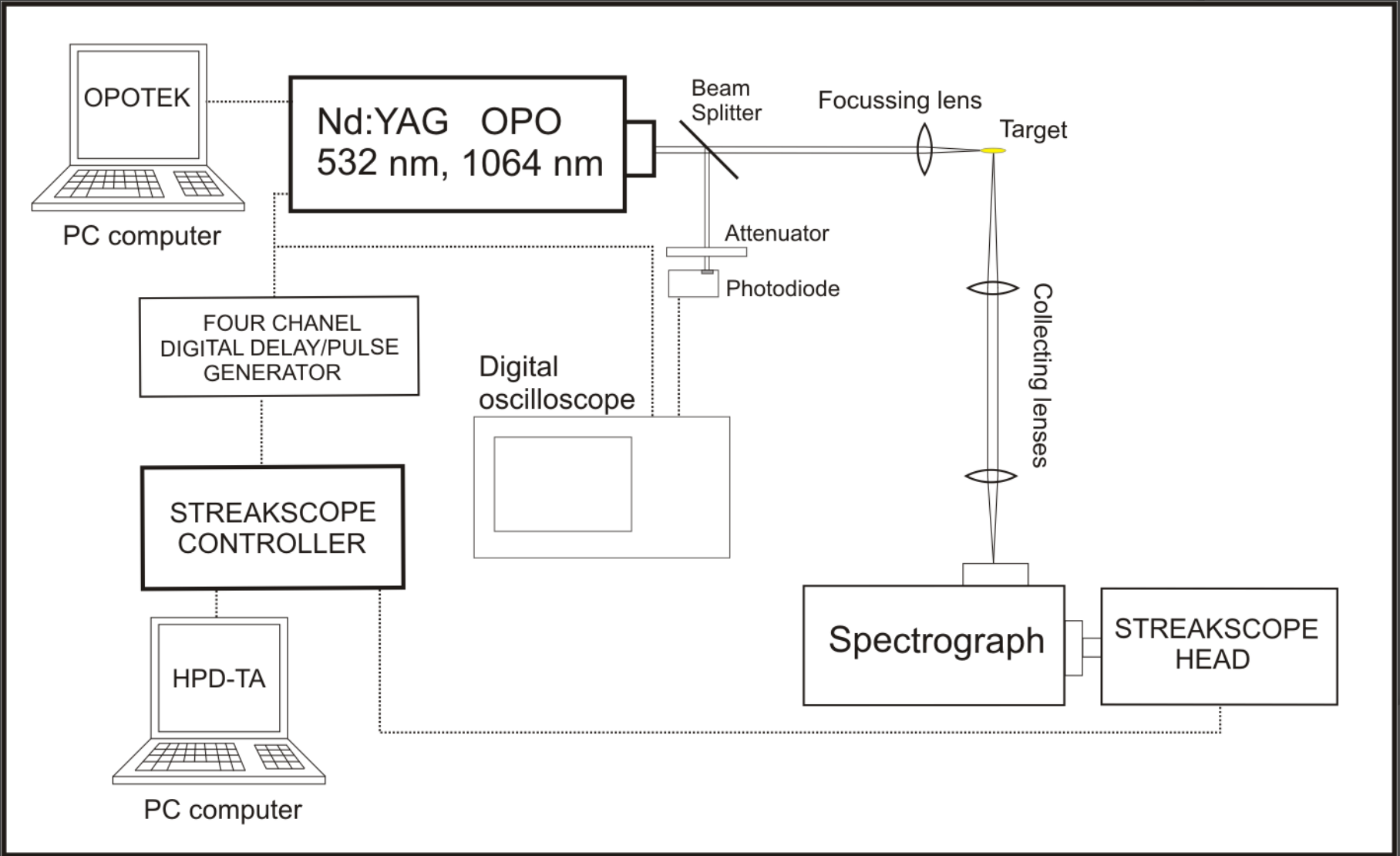
- извор зрачења (Nd : YAG laser i OPO)
- дисперзиони елемент (спектрограф)
- оптички детектор (стрик камера и CCD)



1. Laser induced breakdown spectroscopy



Ласерски импулс се фокусира на површину мете, из снимљеног сигнала емитованог из аблацијског облака добија се оптички спектар, са њега се могу детектовати линије атома и јона присутних у узорку

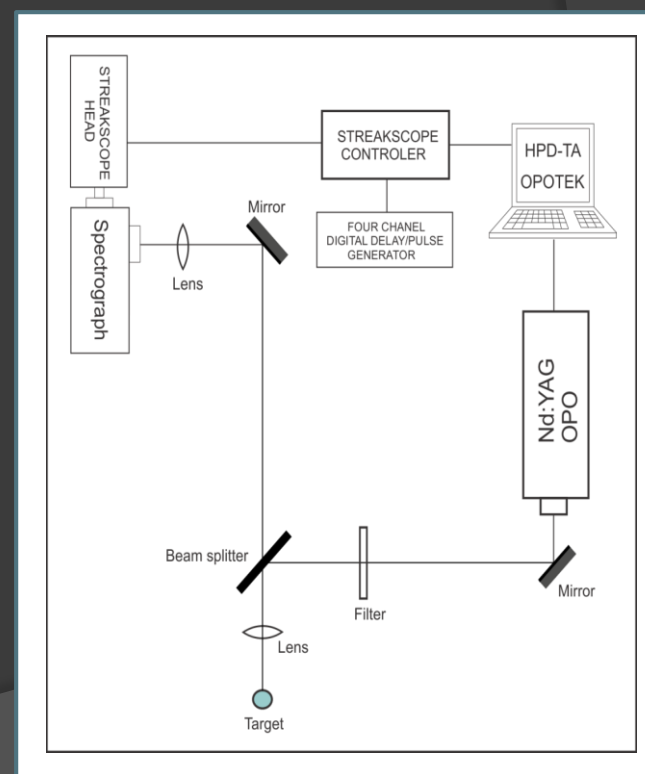


2. Luminescentna spektroskopija

Luminescentni materijali: matrica (u cijju strukturu se ugradjuju) + dopanti (koji predst. luminesc. centre)

Matrice (organskog ili neorganskog porekla):

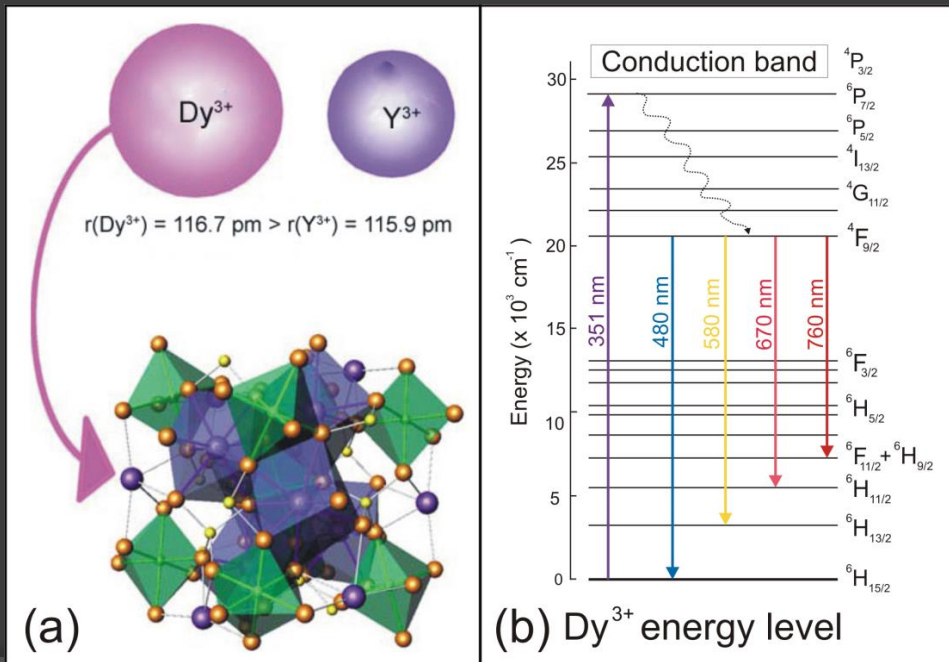
- Oksidi (Y_2O_3 , Gd_2O_3 , Lu_2O_3 , ZrO_2)
- Mešani oksidi ($(Y_{1-x}Gd_x)_2O_3$, $(Y_{1-x}La_x)_2O_3$, $ZnO-SiO_2$)
- Fluoridi ($NaYF_4$, $KMgF_3$, $LiYbF_4$)
- Silikati (Ln_2SiO_5 , $Ln_2Si_2O_7$)
- Fosfati ($KCaPO_4$, $NaCaPO_4$, $BaCaPO_4$)
- ($GdVO_4$), ($Gd_2Zr_2O_7$), YAG ($Y_3Al_5O_{12}$), YVO_4



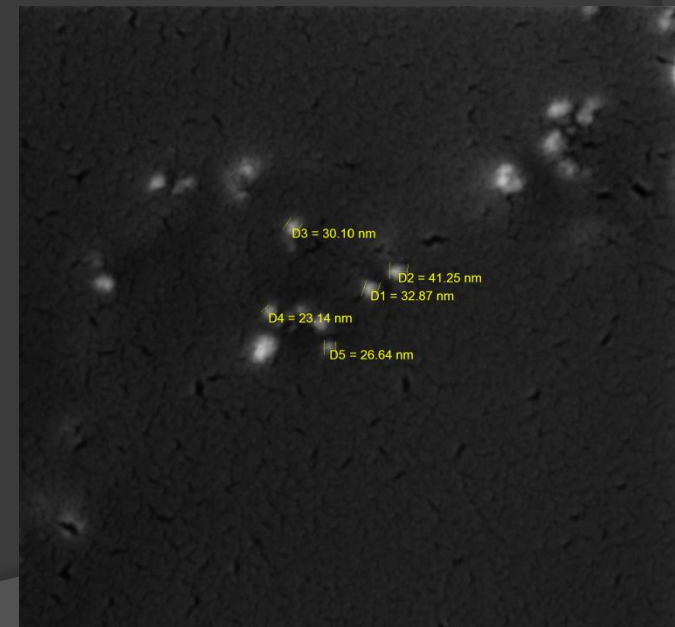
Fosfori – klasa luminescentnih materijala koji ispoljavaju fenomen fosforescencije:

1. Izvori svetlosti kao što su fluorescentne lampe
2. Displeji (katodne cevi, plazma displeji)
3. Detektori visokoenergetskog zračenja
4. Za izradu čvrstotelnih lasera
5. Detektori IC, bio-proba, zaštita od falsifikovanja novčanica i dokumenata

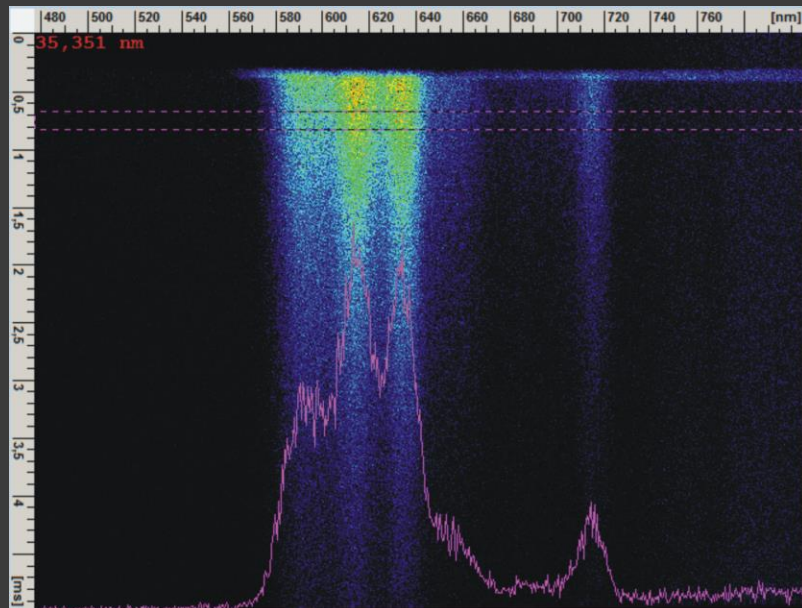
YAG (Yttrium Aluminum Garnet)



Scanning electron microscopy (SEM)

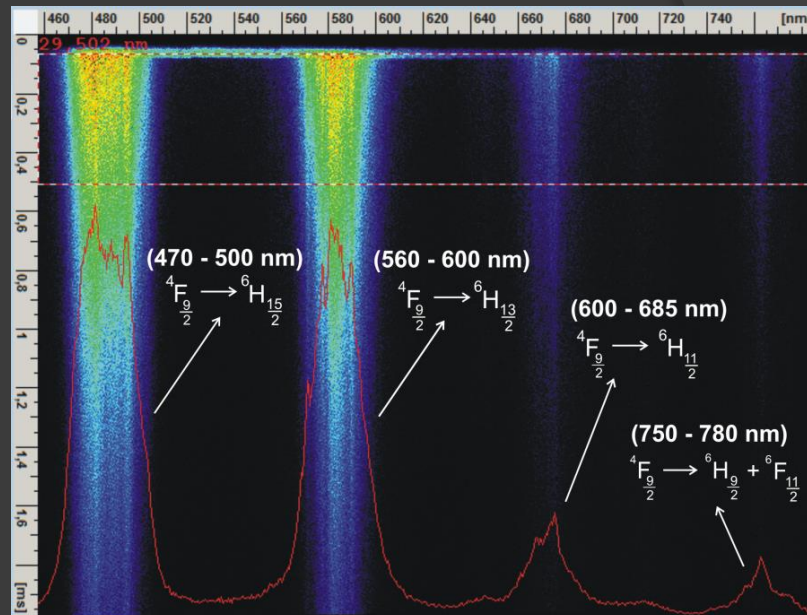


Luminescentni spektri



Luminescentni emisijski spekter Eu^{3+} dopanega $\text{Gd}_2\text{Zr}_2\text{O}_7$ OPO je pri 360 nm.

Eu^{3+}



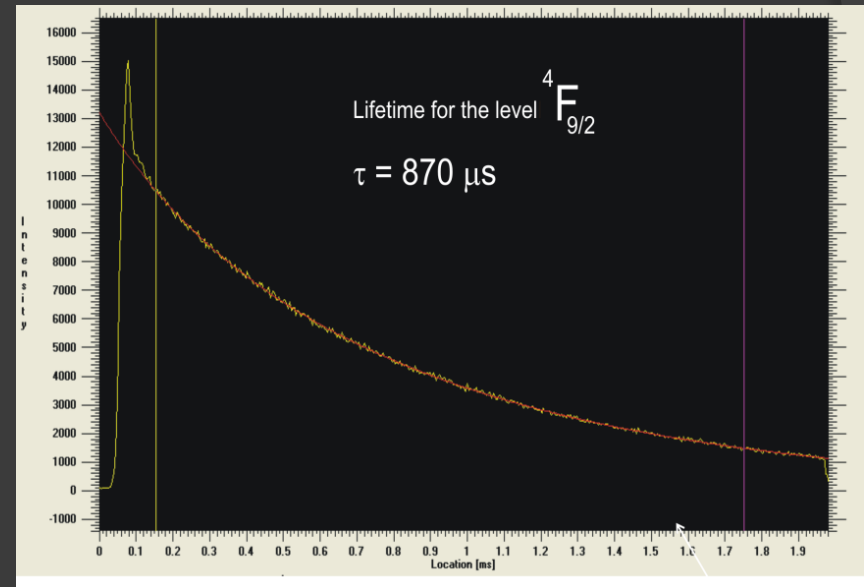
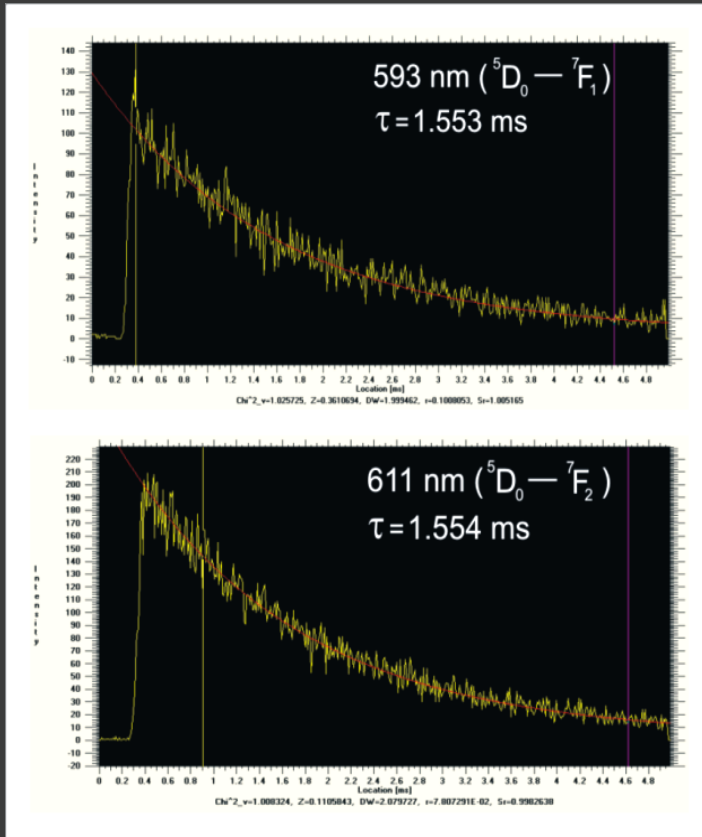
Time-resolved photoluminescence spectrum of Dy^{3+} dopanega YAG nanopowder

Dy^{3+}

Lifetime analiza

Ukupnu verovatnoću možemo predstaviti zborom verovatnoća za radijativne A_r i neradijativne procese A_{nr} :

$$\tau = \frac{1}{A_{nr}(T) + A_r}$$



Lifetime analiza za 2 prelaza
za jon Eu^{3+}

za jon Dy^{3+}

Publikacije sa “Time Resolved Spectroscopy” eksperimenta

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9. Maja S. Rabasovic, Mihailo D. Rabasovic, Bratislav P. Marinkovic and Dragutin Sevic, “Laser-Induced Plasma Measurements Using Nd:YAG Laser and Streak Camera: Timing Considerations”, *Atoms*, **7**(1), 6 (2019) [12pp]. [doi: 10.3390/atoms7010006](https://doi.org/10.3390/atoms7010006)
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