Optical Investigations of YAG Screens

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Optical Investigations of YAG Screens
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HELMHOLTZ ASSOCIATION

DESY

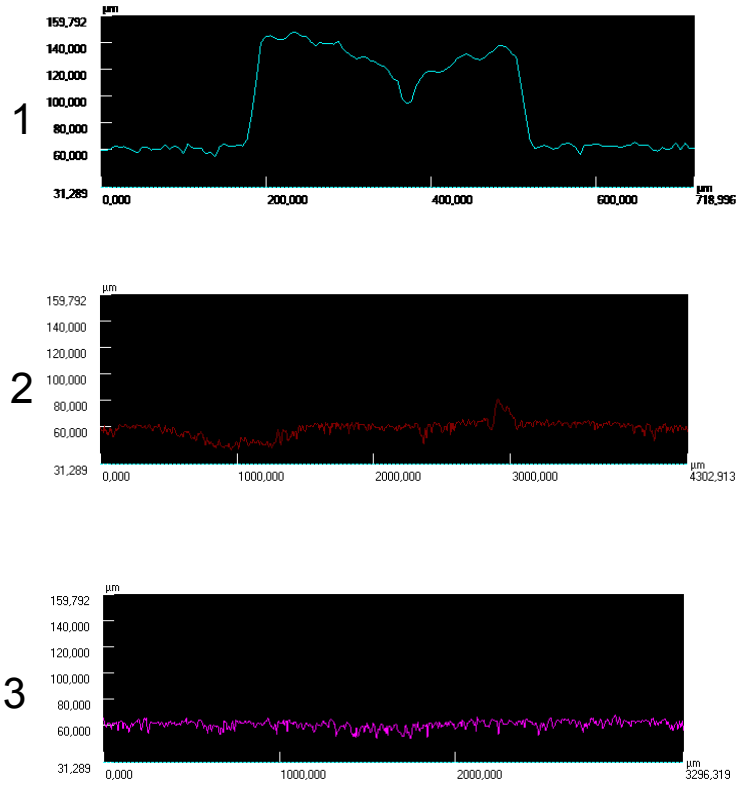
Table of Contents

Motivation

- Study surface profiles
- Emission behavior by exciting with UV
- Any connection between surface properties and optical ones
- Looking for general criteria

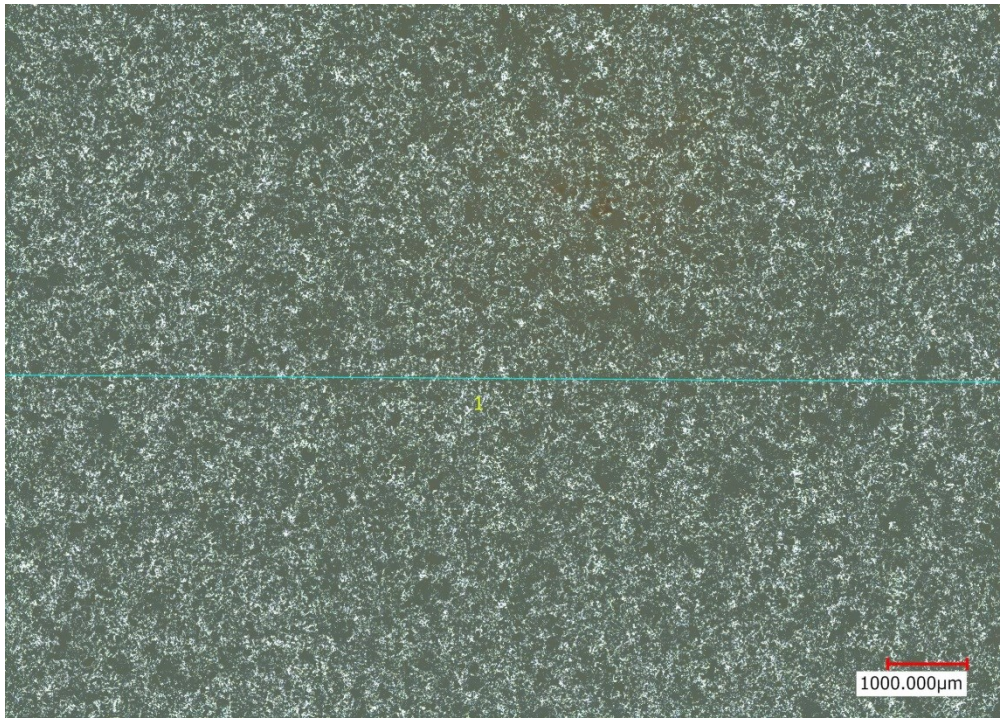
Screen 1

Surface scan

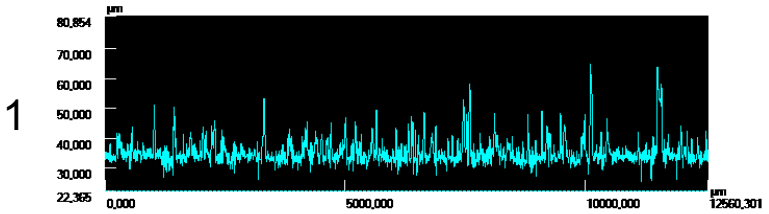


Surface profile measurements

Screen 2

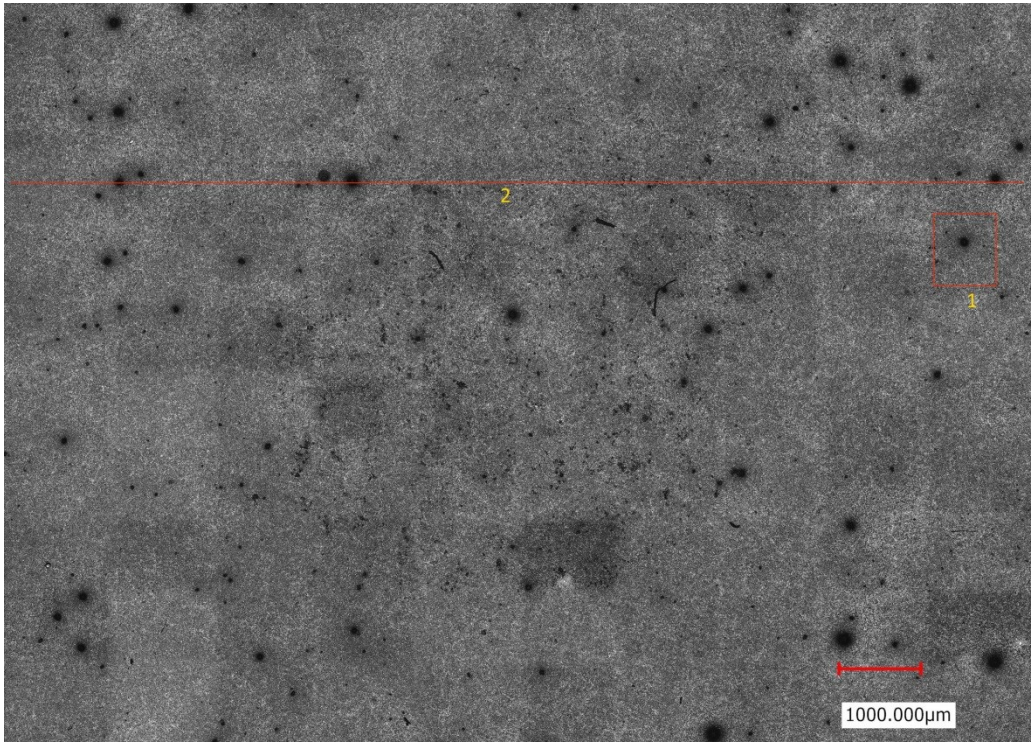


Surface scan

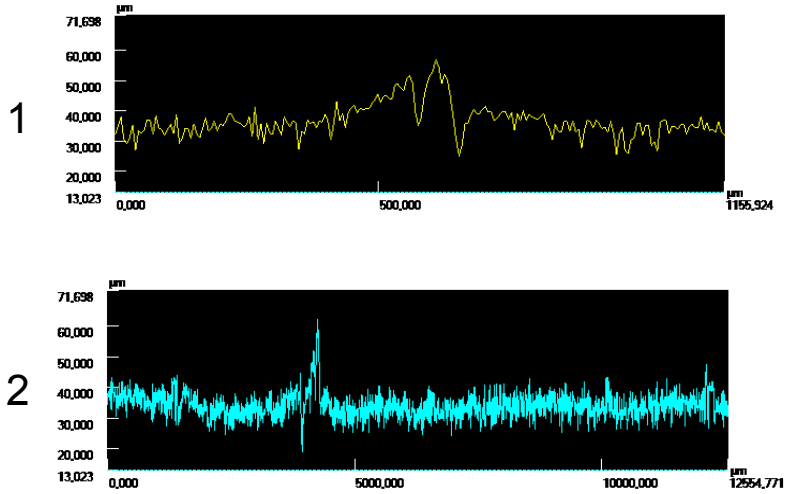


Surface profile measurements

Screen 3

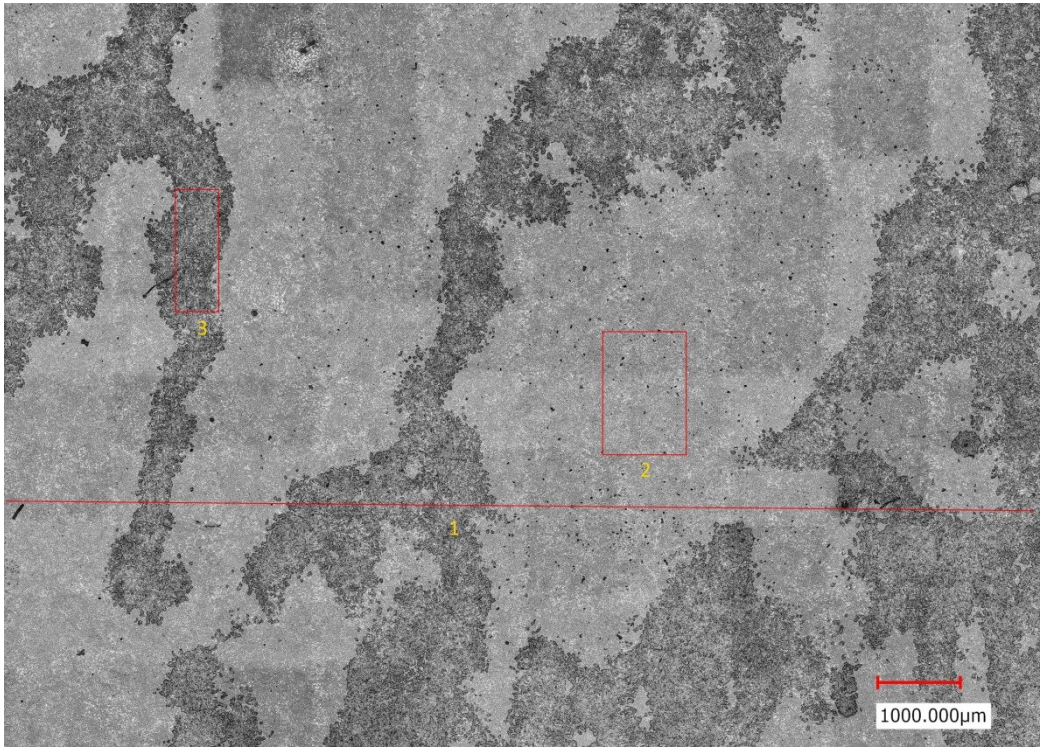


Surface scan

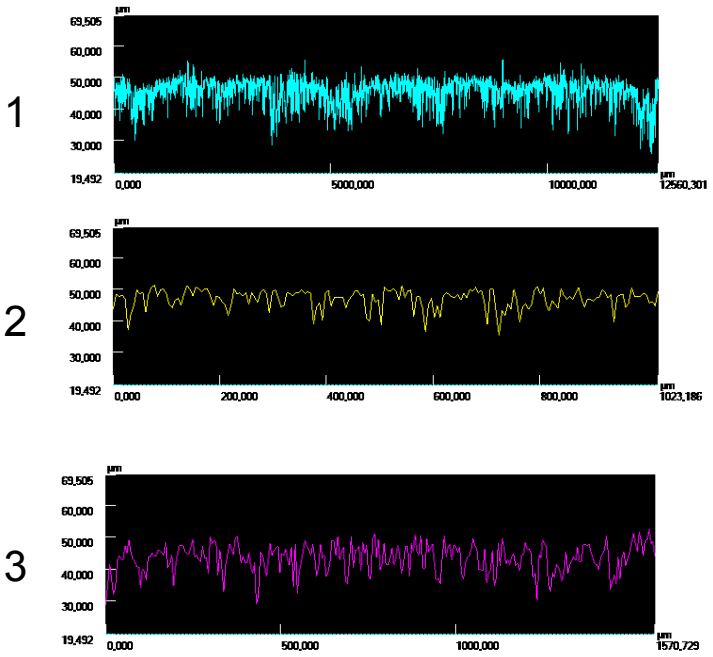


Surface profile measurements

Screen 4

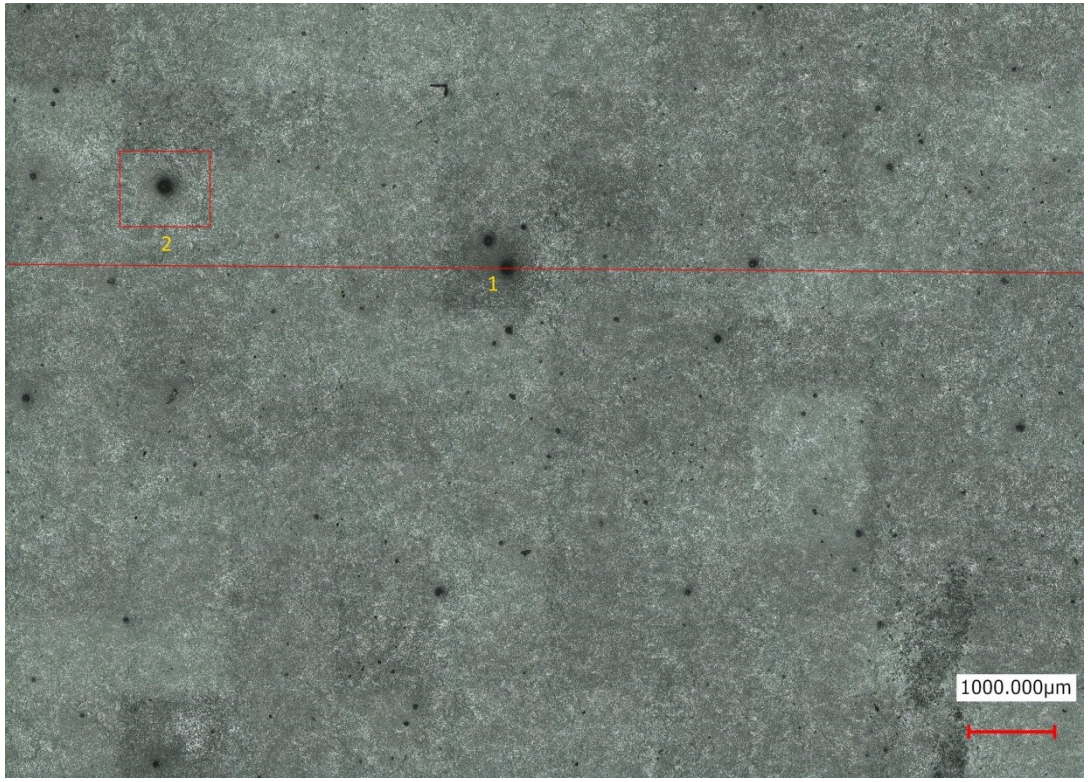


Surface scan



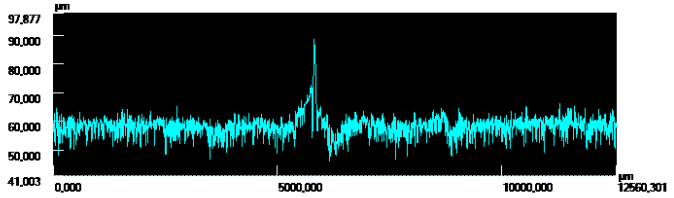
Surface profile measurements

Screen 6



Surface scan

1



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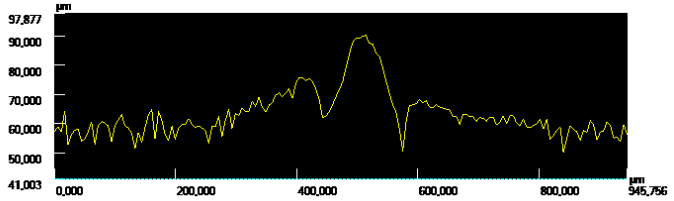
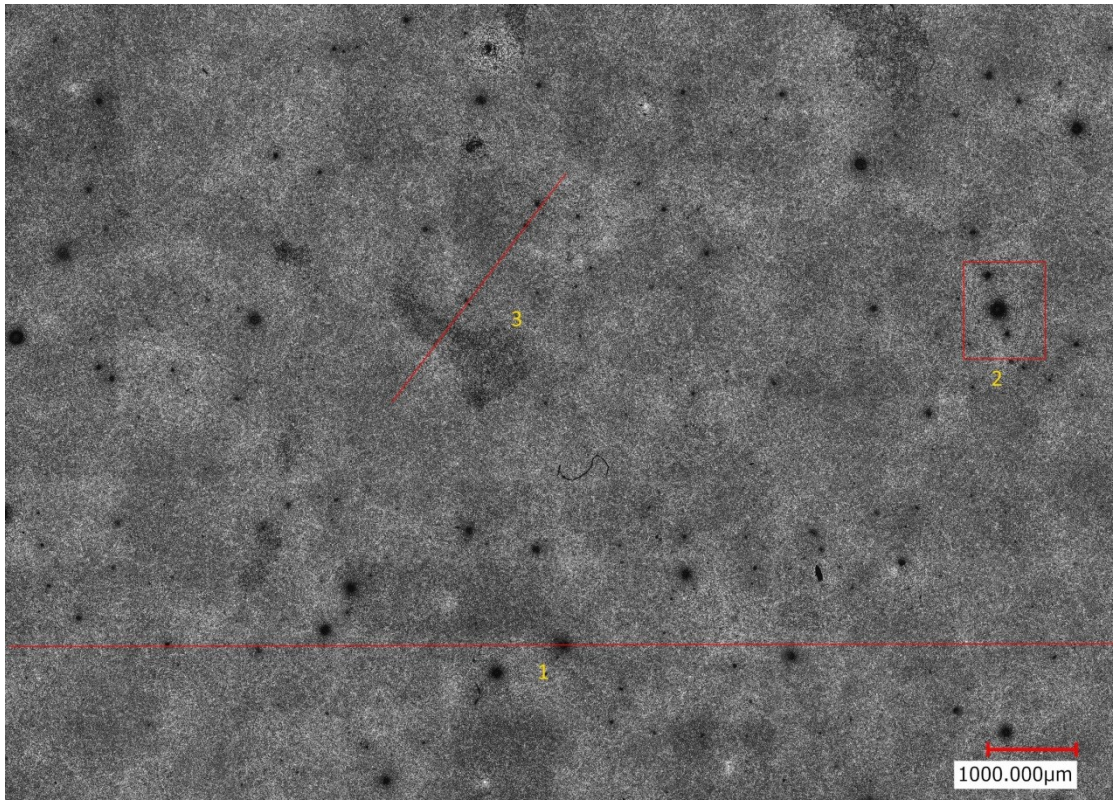


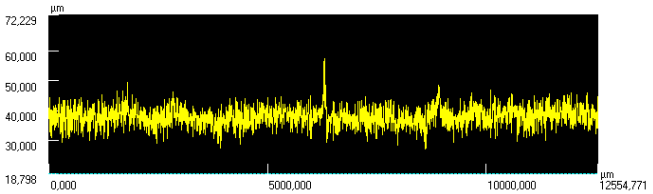
Surface profile measurements

Screen 7



Surface scan

1



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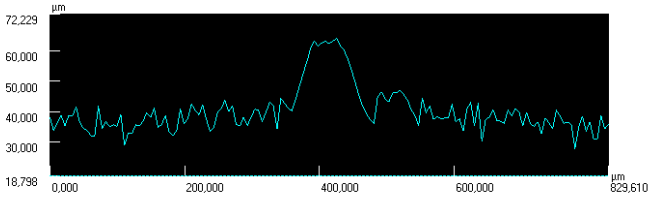

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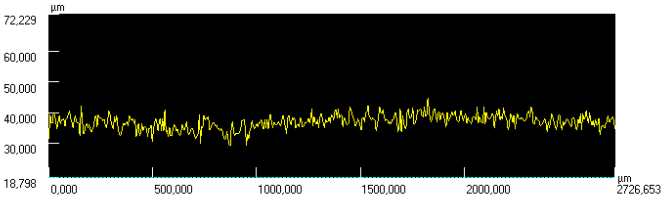


Surface profile measurements

Surface stats

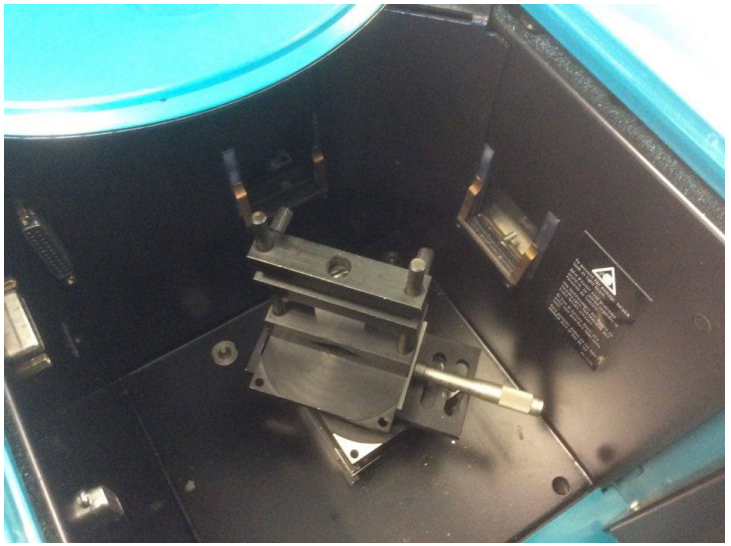
YAG-Screen	film thickness [µm]	Ra [µm] (entire surface)	Ra [µm] (sector)
1	60	2,899	2,663
2	35	3,158	/
3	35	2,655	2,536
4	45	3,500	3,981
5	42	1,978	1,720
6	60	2,425	2,293
7	37	2,460	2,302
8	75	6,691	3,651

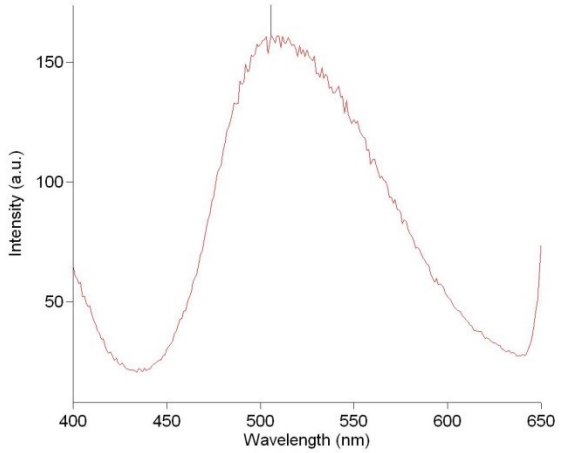
Surface profiles results

- Many different surface errors
- Wide spread of film thickness
- no unused flawless screen
- At least some small flawless areas

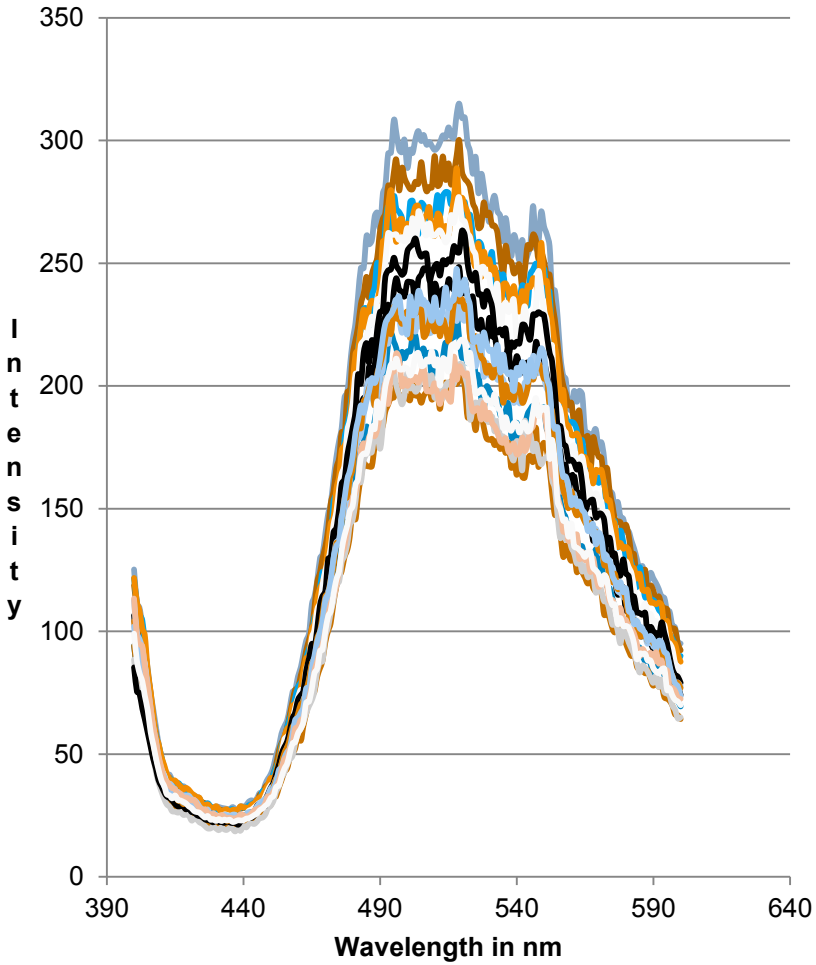
Measurements using fluorescence spectroscopy

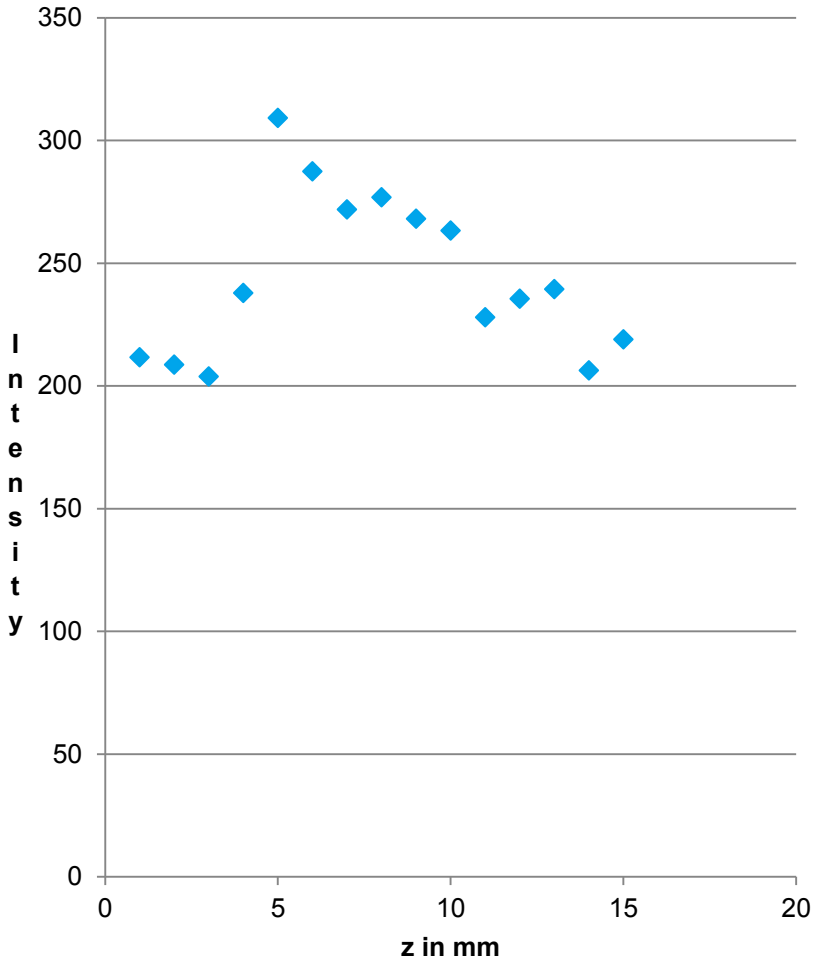
- UV-radiation to excite YAG:Ce (350nm)
- Measuring the intensity
- Using the table to examine line scan





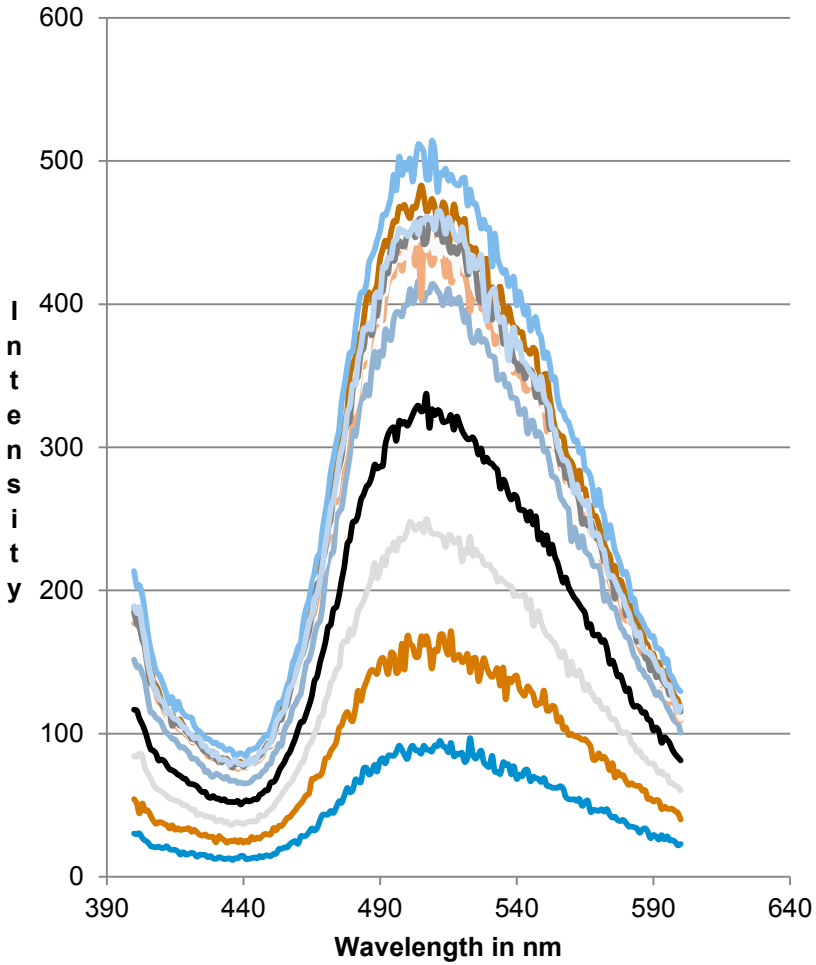
Screen 1

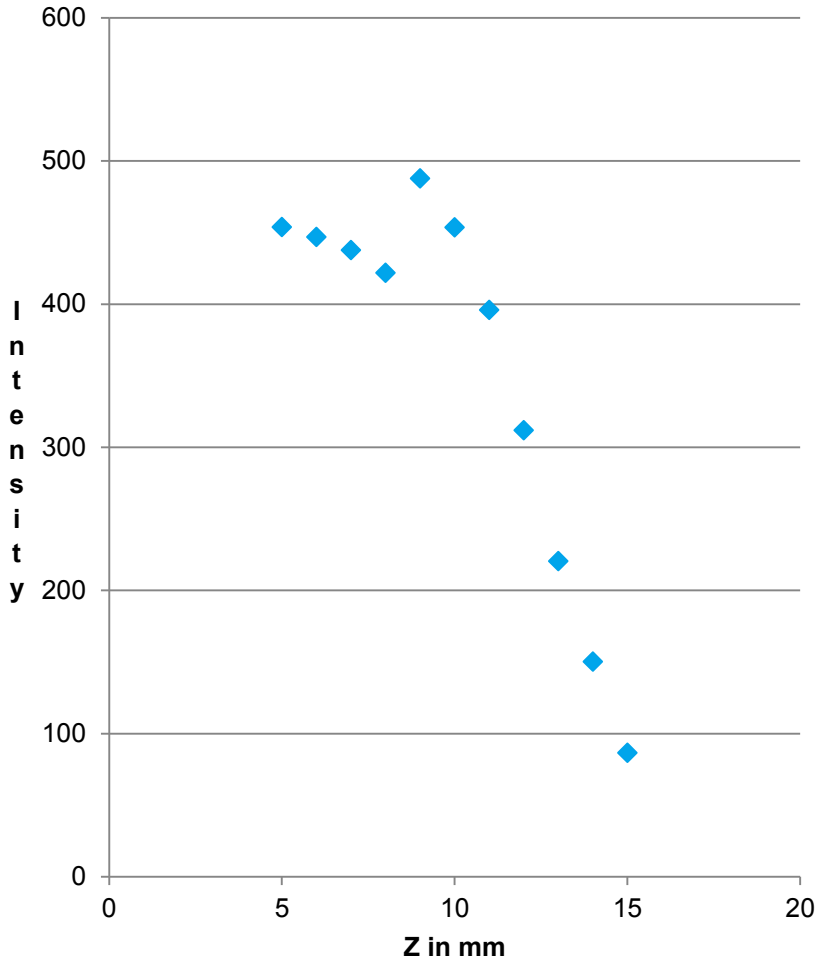




emission spectrum of YAG screen 1 at different screen positions

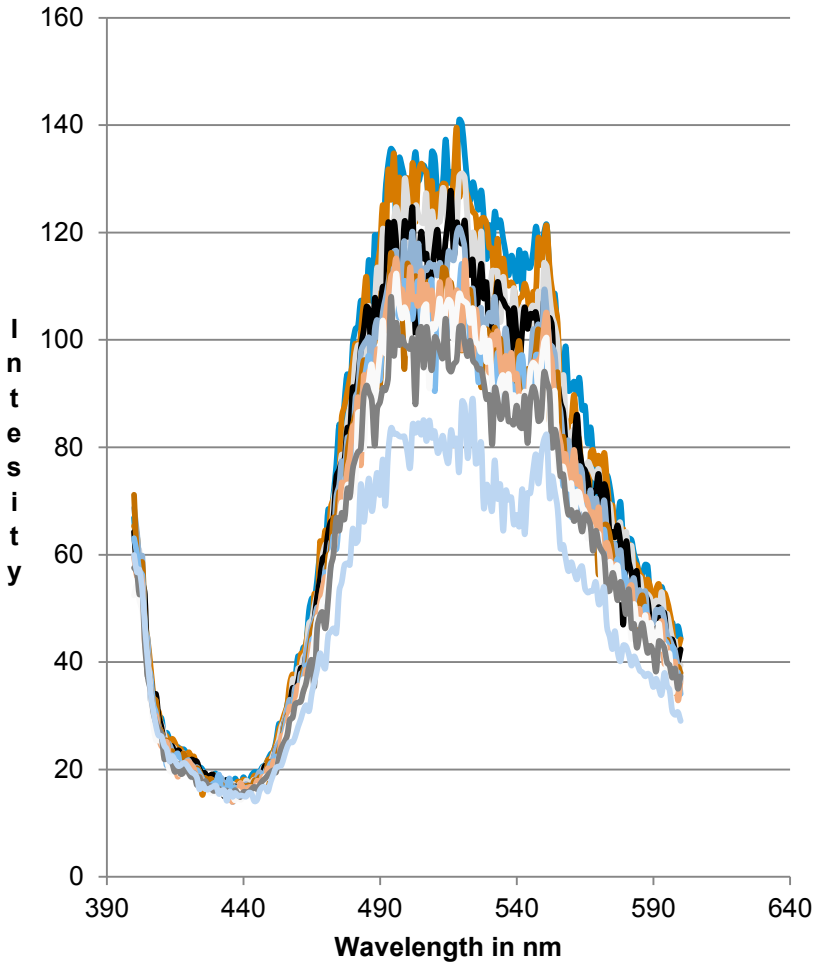
Screen 2

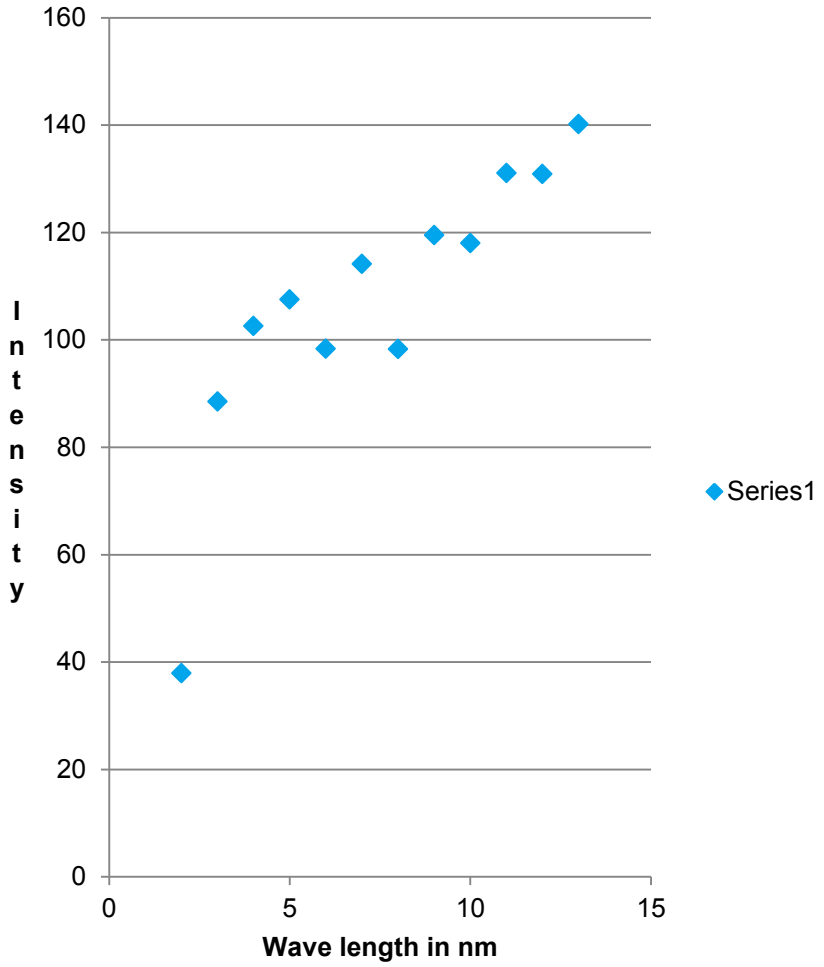




emission spectrum of YAG screen 2 at different screen positions

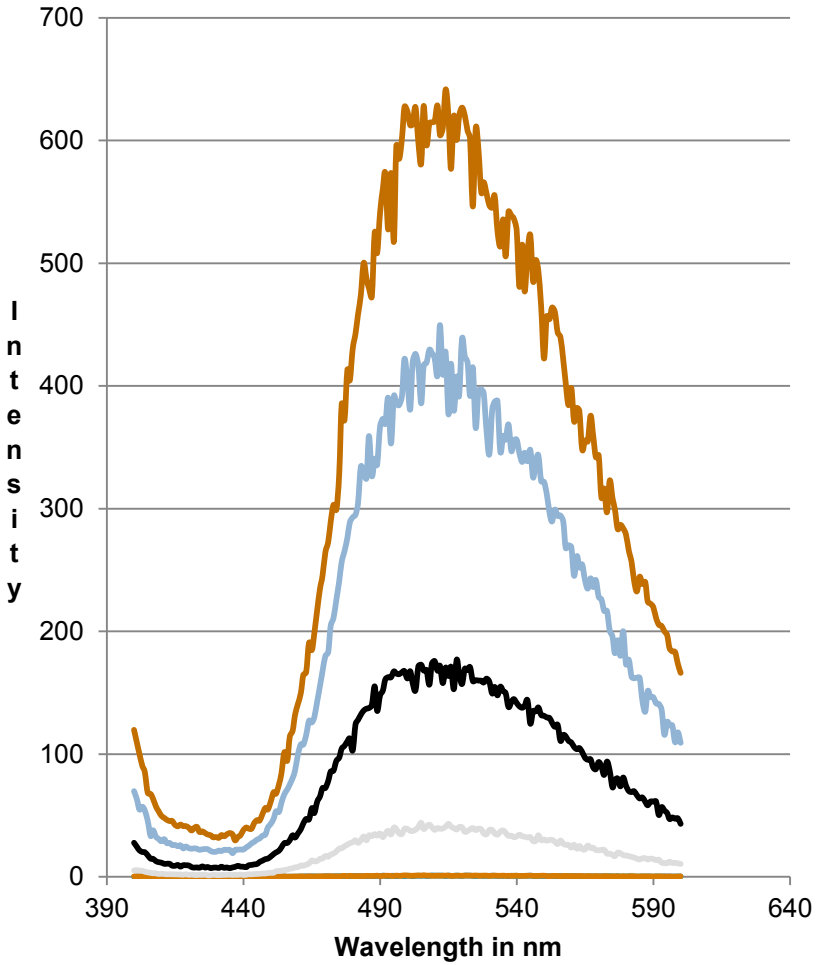
Screen 3

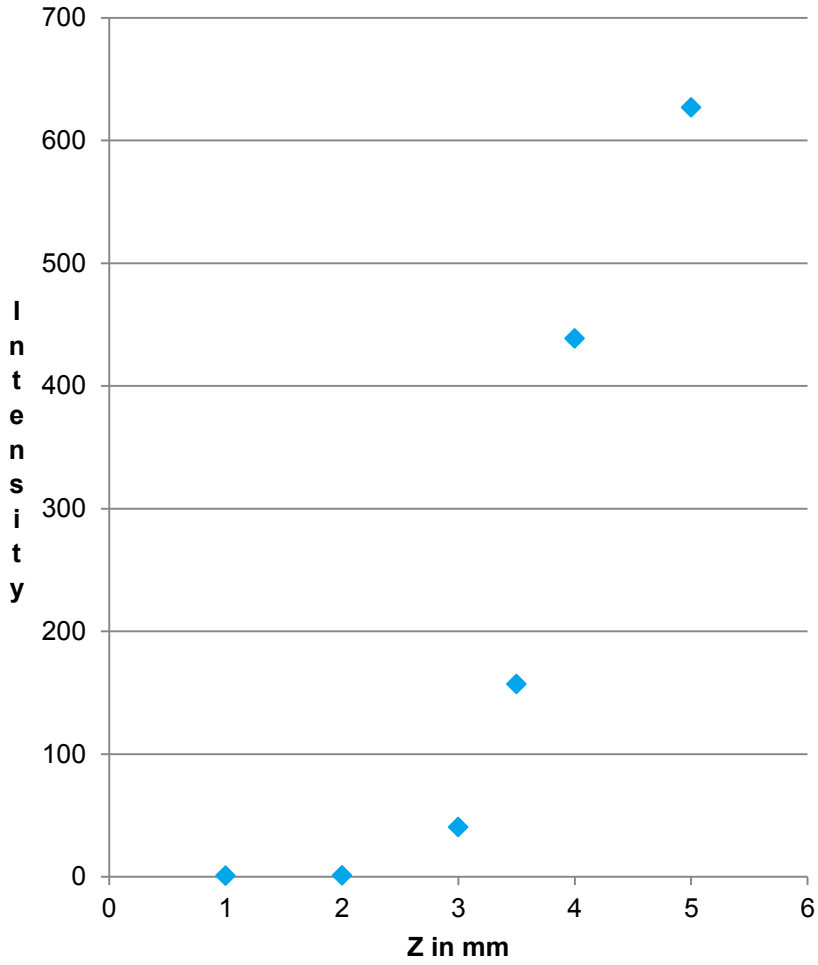




emission spectrum of YAG screen 3 at different screen positions

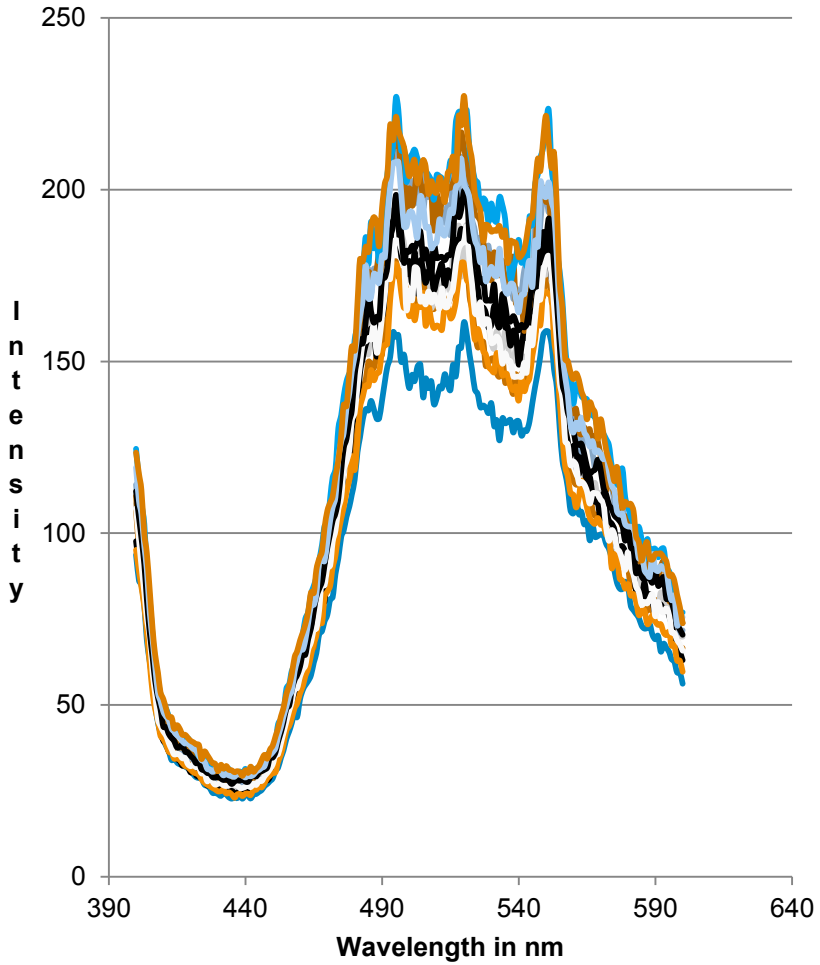
Screen 4

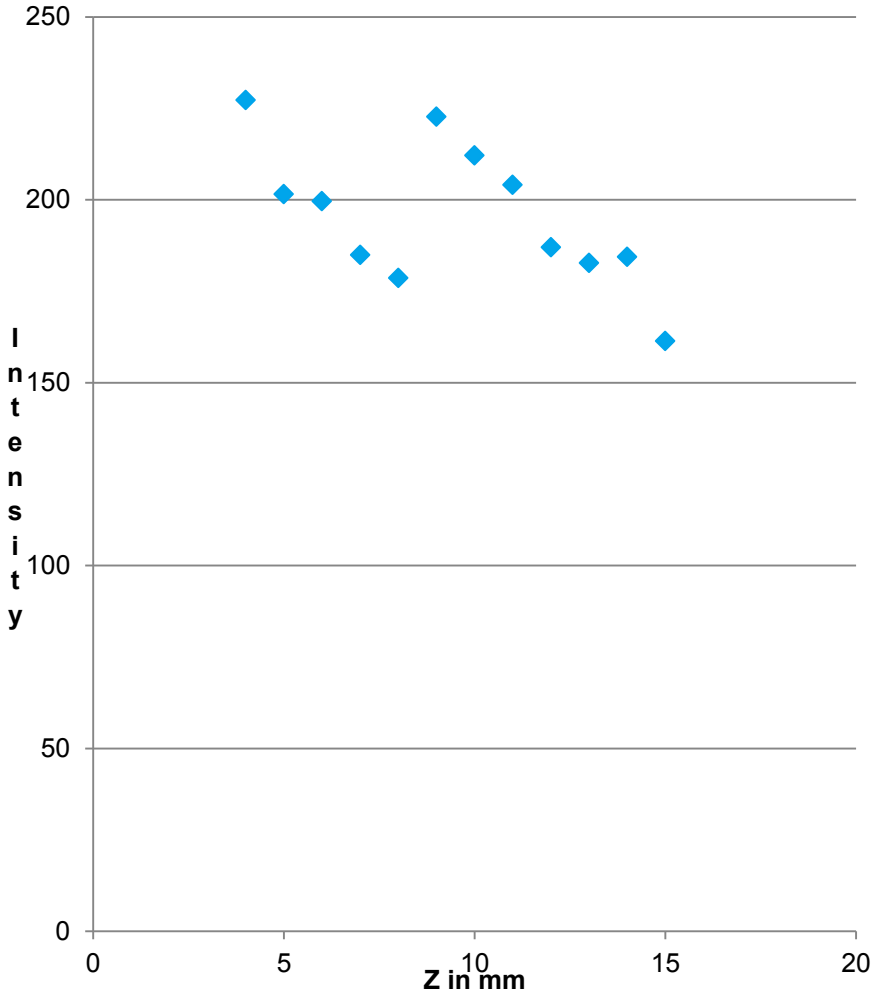




emission spectrum of YAG screen 4 at different screen positions

Screen 6





emission spectrum of YAG screen 6 at different screen positions

Problems

- No fixed position towards the slits → Intensity strongly depends on position
- Therefore intensity can’t be compared
- UV 350nm equals to energy of 3.54 eV
- Electron beam energy is 6.5 MeV
- Does surface properties even matter ?

Conclusion

- Successful excitation of YAG screens
- There could be a correlation between optical and surface properties
- Further investigations needed for accurate results