Total risk matrix regarding dangers for humans for AJA Sputter and Evaporator

Very Serious (E)	**3**				
Serious (D)					
Moderate (C)					
Small (B)	**1, 2,**	**4**			
Very small (A)					
Cons. ↑ Propab. →	**Very small (1)**	**Small (2)**	**Average (3)**	**High (4)**	**Very high (5)**

The colours show areas with evaluated risks which are acceptable (green), considerable, measures should be taken (yellow) and not acceptable, measures MUST be taken to reduce the risk (red).

Description of Consequences

	Security / immediate damage to people	**environmental consequences**
A => Very small	=> damage which requires first aid only	**=>** insignificant damage and short restitution time
B => Small	**=>** damage which requires professional medical attention	=> less damage and short restitution time
C => Moderate	=> serious damage /illness	=> less damage but long restitution time
D => Serious	=> Serious damage/illness with possible inability to work	=> long lasting damage with long restitution time
E => Very serious	=> Death	=> long lasting and not reversible damage

Description of Probability

1 => Very small	=> Ca. one incident in 50 years or less often
2 => Small	=> Ca. one incident in 10 years or less often
3 => Average	=> Ca. one incident per year or less often
3 => High	=> Ca. one incident per month or less often
4 => Very High	=> weekly

Risk evaluation of AJA Sputter and Evaporator

Participants during risk evaluation (+function): Espen Rogstad (instrument responsible).

The responsibility for all described risks lies at the NTNU NanoLab leader and this document is approved by him or her:

Consequences (A-E)								
ID	Activity/Name	Description (involved dangers and consequences)	Law, regulation	Existing safety measures	Existing documentation and other comments	Probabi-lity (1-5)	Humans (A-E)	Environ-ment (A-E)
1	UV radiation	Looking through the view port to the process chamber during evaporation. Danger of UV radiation.	Law of radiation protection (Strålevernloven)	Polarisations-filter, UV protection goggles. 10mm thick glass on view-ports.	Manual. User Course	**1**	**B**	**--**
2	X-ray radiation	Danger of X-ray radiation during evaporation.	Law of radiation protection (Strålevernloven)	Metal shielding. 10mm thick glass on view-ports.	Manual. User Course	**1**	**B**	**--**

3	Potentially dangerous voltages	Potentially dangerous electrical currents, might be present inside parts of the machine while power is connected to it. This could cause an electric shock if a cover is removed from the unit and internal parts are touched Attention: Capacitors might keep high voltage for some minutes after the power is unplugged	Law regarding service at and work with electrical constructi ons and equipment	A safety switch disconnects the voltage source when there is no vacuum in the process chamber. An earthing rod is used on every metal surface every time the chamber is opened to discharge any possibly remaining charge. During more extensive maintenance (than changing targets and crystal) the safety switch is turned off and one waits 3 minutes before starting the maintenance so that the capacitors has completely discharged. Only qualified staff have permission to open the process chamber.	Course and manual.	**1**	**E**	**--**
4	Burn hazard	Danger of burns on hands and fingers. The system is equipped with a heater that can be heated up to 850ºC. The sample holder which is made of metal could cause severe burns if handled after the heater has been used. During evaporation a lot of heat is produced especially for metals with high melting temperature. This would also make the sample holder hot enough to cause burns when later handled.	-	The users are informed of the risk of burns when attending the mandatory instrument course. Heat resistant gloves (which are found in the service finger) must be used when handling the sample holder when it is hot.	Course.	**2**	**B**	**--**