

# RILIS upgrade and LARIS scientific priorities

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Follow-up of the report to the Standing Group for the  
Upgrade of ISOLDE  
13/11/2007

# Nd:YAG lasers installed at RILIS

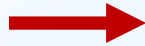
Diode Pumped Solid State Nd:YAG Lasers as replacement of Copper Vapor Lasers:

CVL

15 ns @ 11 kHz

Green Beams  
45 W @ 511 nm

Yellow Beams  
35 W @ 578 nm



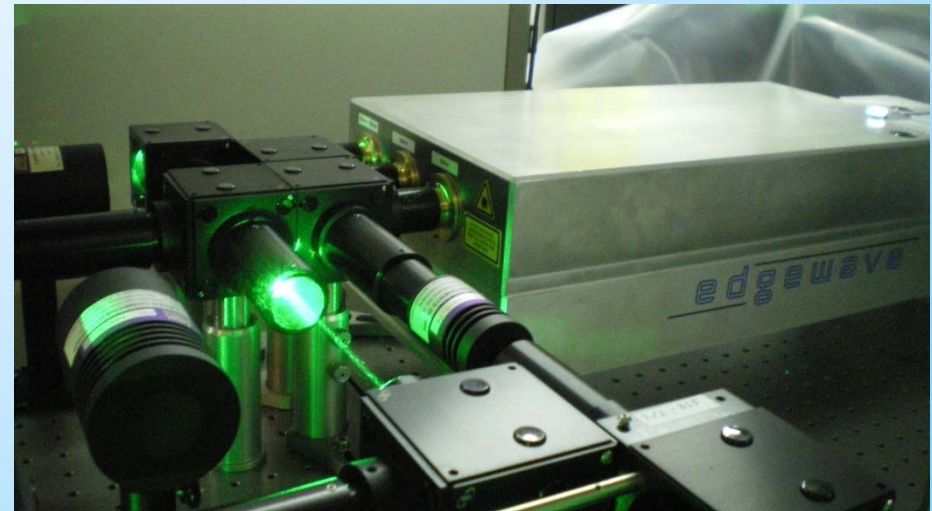
SSL

8 ns @ 10 kHz

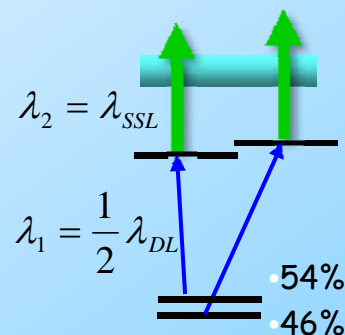
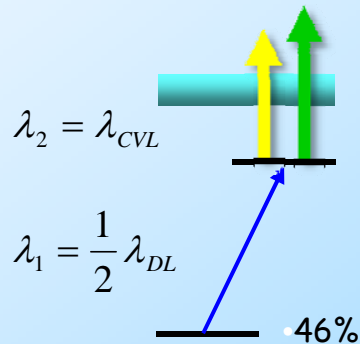
Green Beams  
92 W @ 532 nm

UV Beam  
18 W @ 355 nm

IR Beam  
45 W @ 1064 nm



Ga ion beam has been produced with the SSL



Improvement of ionization efficiency by SSL :

- Two dye lasers were applied at 1<sup>st</sup> step of excitation - x 2.2
- More power could be delivered to HRS target at the 2<sup>nd</sup> step of excitation

*And CVLs are still available for runs ...*

# RILIS Elements

Ion beams of 28 elements are produced at RILIS

elements available at ISOLDE LIS

ionization scheme tested

ionization scheme untested

1 H																	2 He						
3 Li	4 Be																	5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg																	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr						
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe						
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn						
87 Fr	88 Ra	89 Ac	104 Rf	105 Ha	106 Sg	107 Ns	108 Hs	109 Mt	110	111	112												

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

- [RILIS web page](http://isolde-project-rilis.web.cern.ch/isolde-project-rilis/intro/principle.html): <http://isolde-project-rilis.web.cern.ch/isolde-project-rilis/intro/principle.html>

# Efficiencies and Priorities

Element	Step 1			Step 2			Step 3			Efficiency off-line	
	$\lambda_1$ , nm	CVL system	YAG system	$\lambda_2$ , nm	CVL system	YAG system	$\lambda_3$ , nm	CVL system	YAG system		
<sup>4</sup> Be	234.9	Rhod 700	?	297.3	Pyrr 597	Pyrr 597	-			>7%	
<sup>12</sup> Mg	285.2	Rhod 6G	Rhod 6G	552.8	Rhod 110	Rhod 110	510.6 & 578.2	CVL	YAG	10%	AIS ?
<sup>13</sup> Al	309.3	Rhod B	Rhod B	510.6 & 578.2	CVL	YAG	-			20%	
	308.2	Rhod B	Rhod B								
<sup>20</sup> Ca	272.2	Rhod 110	Pyrr 567	510.6 & 578.2	CVL	YAG	-			0.50%	AIS ?
<sup>21</sup> Sc	327.4	Phenox 9	Phenox 9	719.8	Rhod 700	?	510.6 & 578.2	CVL	YAG	15%	AIS ?
<sup>25</sup> Mn	279.8	Pyrr 567	Pyrr 567	628.3	Rhod 101	Rhod B	510.6	CVL	?	19%	AIS ?
<sup>27</sup> Co	304.4	Rhod B	Rhod B	544.5	Rhod 110	Rhod 110	510.6 & 578.2	CVL	YAG	>3.8%	AIS ?
<sup>28</sup> Ni	305.1	Rhod B	Rhod B	611.1	Rhod B	Rhod B	748.2	Rhod 700	?	>6%	
<sup>29</sup> Cu	327.4	Phenox 9	Phenox 9	287.9	Rhod 6G	Rhod 6G	-			>7%	
<sup>30</sup> Zn	213.9	Phenox 9	Phenox 9	636.2	DCM	DCM	510.6 & 578.2	CVL	YAG	4.90%	AIS ?
<sup>31</sup> Ga	287.4	Rhod 6G	Rhod 6G	510.6 & 578.2	CVL	YAG	-			21%	
	294.4		Rhod 6G								
<sup>39</sup> Y	414.3	Styr 9		662.4	Phenox 9	Phenox 9	510.6	CVL	YAG		AIS ?
<sup>47</sup> Ag	328.1	Phenox 9	Phenox 9	546.6	Rhod 110	Pyrr 567	510.6 & 578.2	CVL	YAG	14%	AIS ?
<sup>48</sup> Cd	228.8	Ox 170	?	643.8	DCM	DCM	510.6	CVL	YAG	10.40%	AIS ?
<sup>49</sup> In	303.9	Rhod B	Rhod B	510.6 & 578.2	CVL	YAG	-				
	325.6		Phenox 9								
<sup>50</sup> Sn	286.3	Rhod 6G	Rhod 6G	811.4	Styr 9	Styr 9	823.5	Styr 9	Styr 9	9%	
<sup>51</sup> Sb	217.6	Phenox 9	Phenox 9	560.2	Rhod 110	Pyrr 567	510.6	CVL	YAG	2.70%	AIS ?
<sup>65</sup> Tb	579.6	Rhod 6G	Rhod 6G	551.7	Rhod 110	Pyrr 567	618.3	Rhod 101	Rhod B		
<sup>66</sup> Dy	625.9	DCM	DCM	607.5	Rhod 101	Rhod B	510.6	CVL	YAG	20%	
<sup>70</sup> Yb	555.6	Pyrr 567	Pyrr 567	581.0	Rhod 6G	Rhod 6G	581.0	Rhod 6G	Rhod 6G	15%	
<sup>79</sup> Au	267.6	Pyrr 546	?	306.5	Rhod B	Rhod B	673.9	Phenox 9	Phenox 9	>3%	AIS ?
<sup>80</sup> Hg	253.7	LDS 759	?	313.2	DCM	DCM	626	DCM	DCM	0.10%	AIS ?
<sup>81</sup> Tl	276.8	Rhod 110	Pyrr 567	510.6 & 578.2	CVL	YAG	-			27%	
<sup>82</sup> Pb	283.3	Rhod 6G	Rhod 6G	600.2	Rhod B	Pyrr 597	510.6 & 578.2	CVL	YAG	>3%	
<sup>83</sup> Bi	306.8	Rhod B	Rhod B	555.2	Rhod 110	Pyrr 567	510.6 & 578.2	CVL	YAG	6%	AIS ?
<sup>84</sup> Po	255.8	Rhod 700	?	843.4	Styr 9	Styr 9	510.6	CVL	YAG		
	245.0	Rhod 700	?	532.3	Pyrr 546	?	510.6	CVL	YAG		

# RILIS running plan 2008

APRIL						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	Nd	15	16	17	18	19
20	21	22	Ga	24	Be	26
27	28	29	30			

JULY						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	Au	10	11	12
13	14	15	16	17	18	19
20	Cu	22	23	24	25	26
27	28	29	30	31		

OCTOBER						
S	M	T	W	T	F	S
		1	2	3	4	
5	6	7	8	9	10	11
12	13	14	Mg	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

MAY						
S	M	T	W	T	F	S
				1	2	3
4	5	6	Cd	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	Tl	28	29	30	31

AUGUST						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

NOVEMBER						
S	M	T	W	T	F	S
						1
2	3	Pb	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

JUNE						
S	M	T	W	T	F	S
1	2	3	4	5	Be	7
8	9	10	11	12	13	14
15	16	17	18	Mn	20	21
22	23	Nd	25	26	27	28
29	Ga					

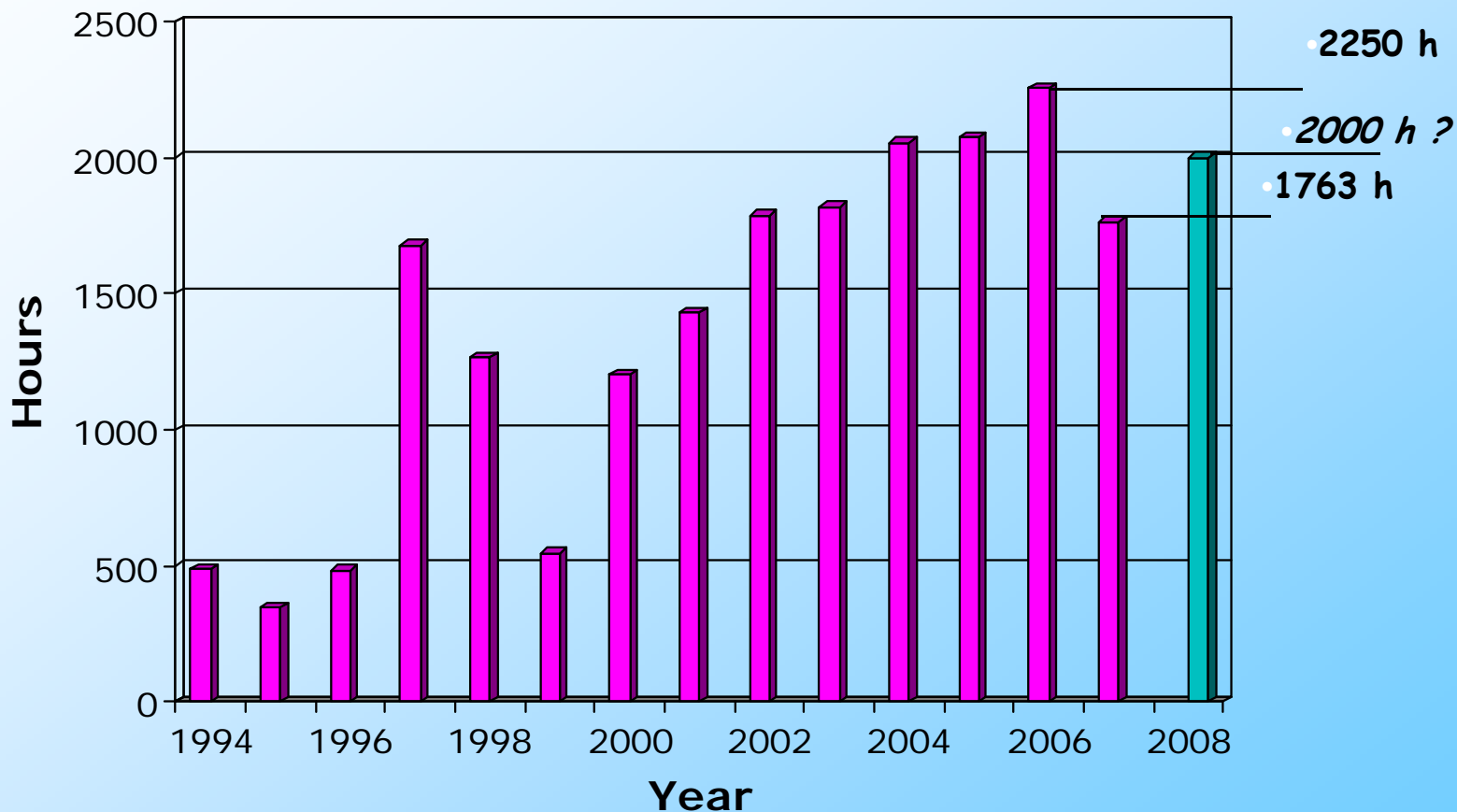
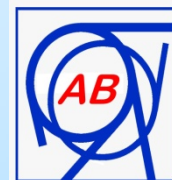
SEPTEMBER						
S	M	T	W	T	F	S
	1	Mn	3	4	5	6
7	8	Cd	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

DECEMBER						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

- Setup time - preliminary estimate
- RILIS ready, day work
- RILIS running overnights

On-line physics runs: 178 shifts = 1424 hours  
 Off-line work and laser setup: ~ 600 hours  
**TOTAL:** ~ 2000 hours

# RILIS operation in 1994-2008



Reduction of planned RILIS operation time for 2007 down to 1500 hours has been recommended in the conclusions of the 2007 ATC/ABOC days.



No laser trouble happened during scheduled operation, all required service and repair work was performed between runs