

Characterisation of TLDs used within the MATROSHKA project - results of ICCHIBAN-6 and NSRL-ICCHIBAN experiments

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MATROSHKA project

four types of TLDs are used:

standard

$^7\text{LiF:Mg,Ti}$

MTS-7

high-sensitive

$^7\text{LiF:Mg,Cu,P}$

MCP-7

newly developed

$^7\text{LiF:Mg,Ti}$

MTT-7

with increased
high-LET response

standard

$^6\text{LiF:Mg,Ti}$

MTS-6

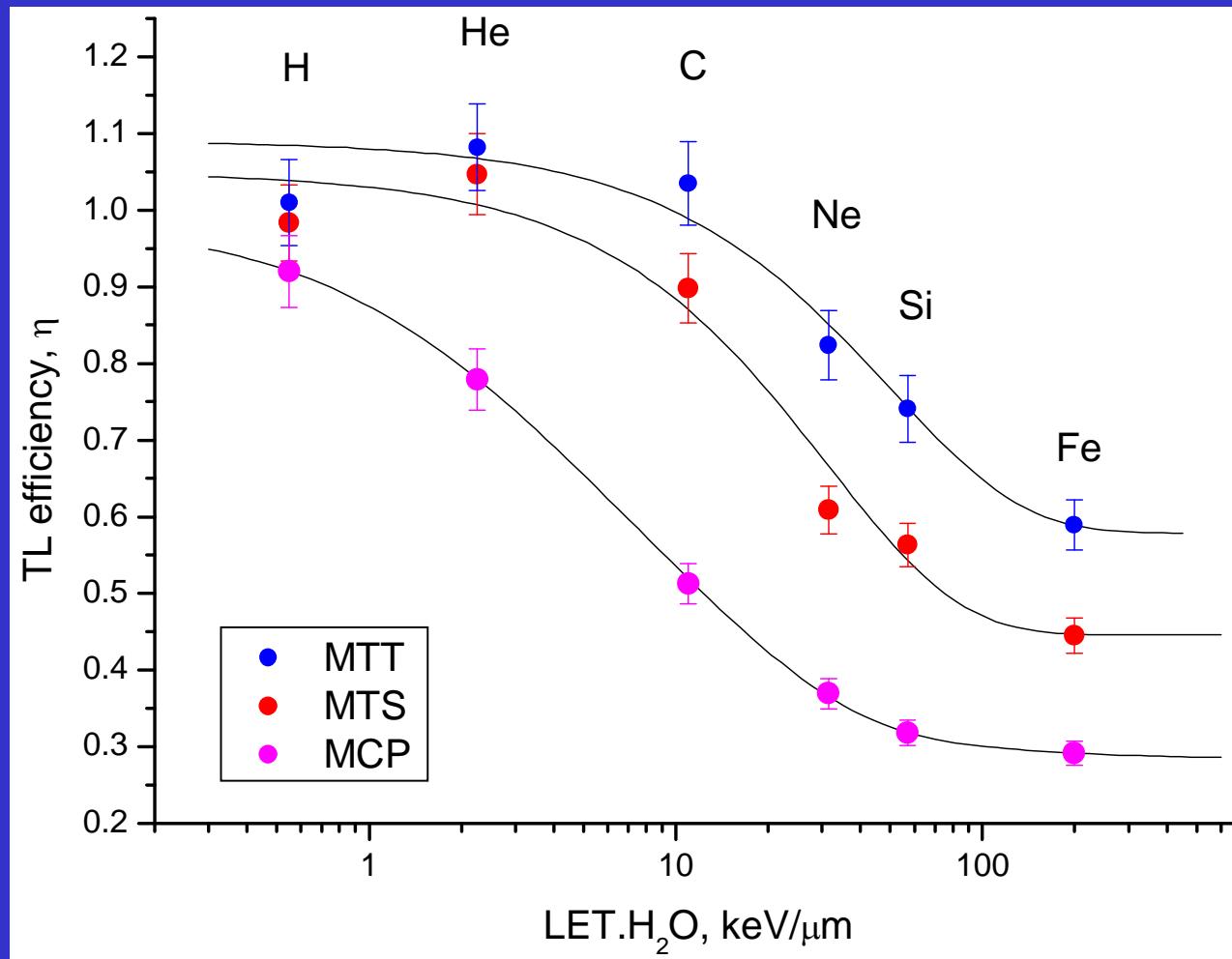
neutron sensitive



PREVIOUS RESULTS

ICCHIBAN 2 & 4, Dubna

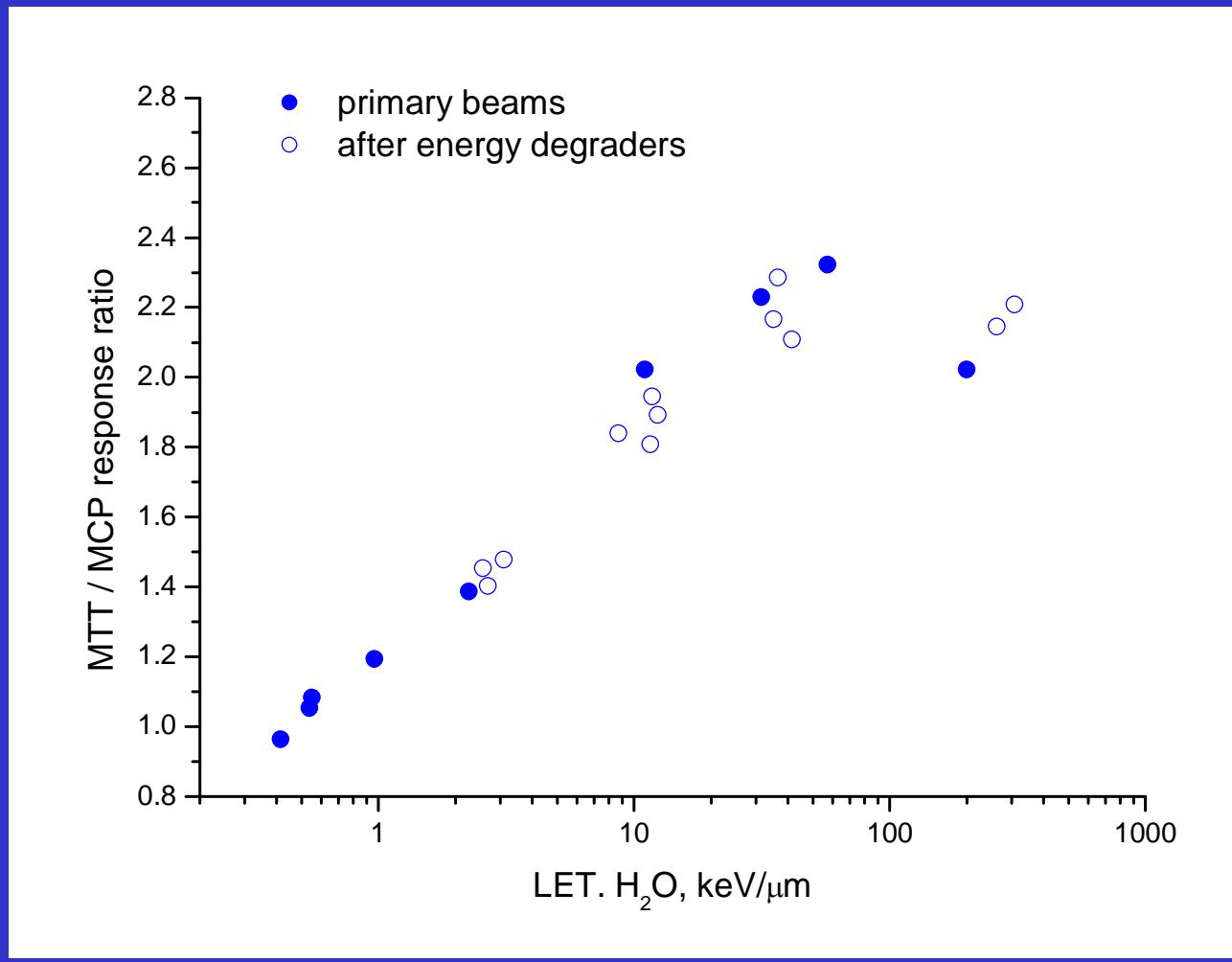
TLD RELATIVE EFFICIENCY



PREVIOUS RESULTS

ICCHIBAN 2 & 4, Dubna, Loma Linda

TLD RESPONSE RATIO



ICCHIBAN - 6

Ion	Energy, MeV/n	LET, keV/ μ m	Dose, mGy
^{12}C	110	24.1	50
$^{12}\text{C} + \text{PMMA}$	61.5	37.9	73
^{40}Ar	459.3	95.8	50
$^{40}\text{Ar+PMMA}$	201	151	57
^{84}Kr	313.1	448.4	50
$^{84}\text{Kr+PMMA}$	193	595.7	62.5

ICCHIBAN - 6

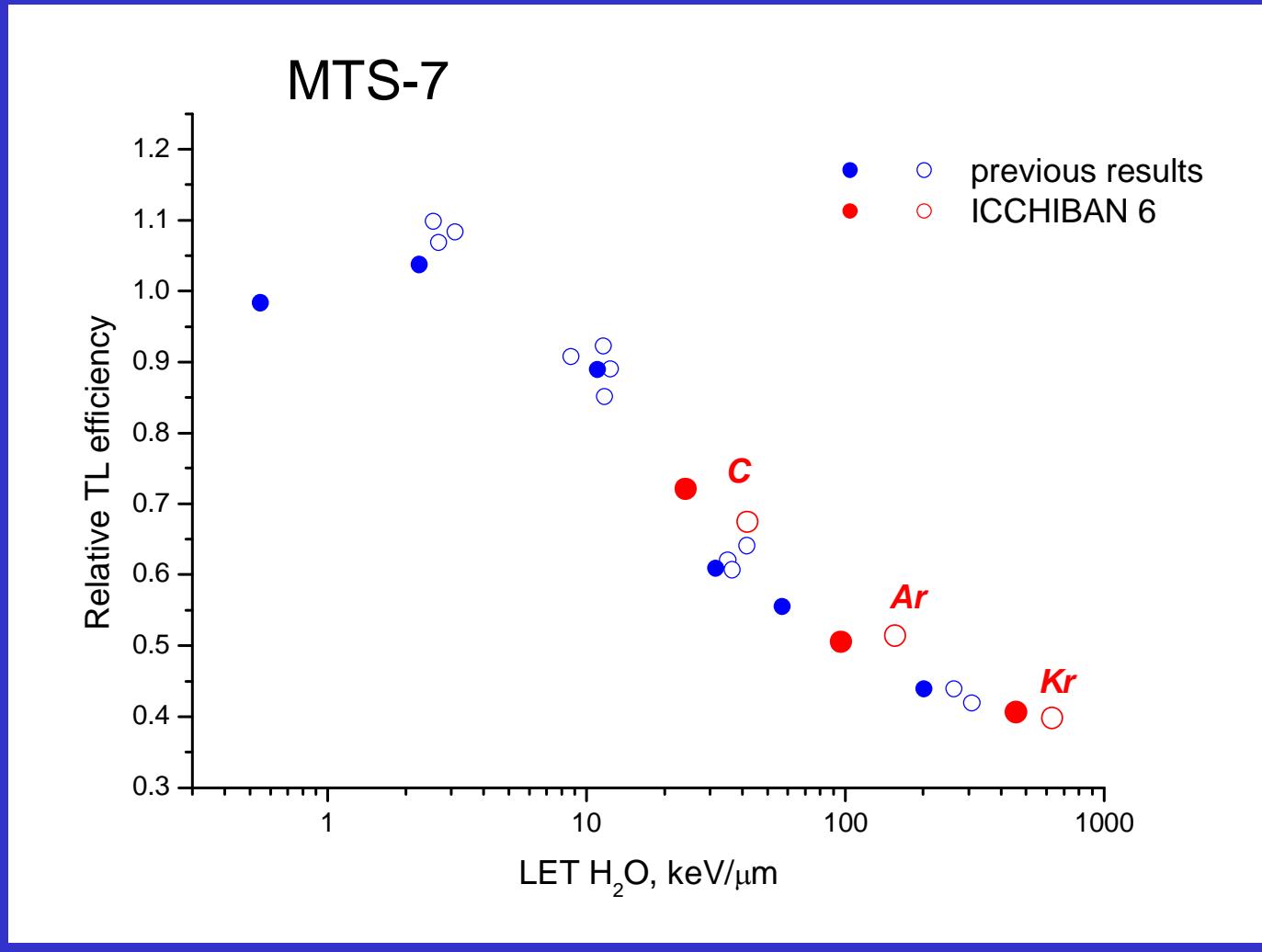
Ion	Dose, mGy	Measured dose, mGy		
		MTS-7	MTT-7	MCP-7
^{12}C	50	36.0	43.5	18.0
$^{12}\text{C} + \text{PMMA}$	73	46.5	59.4	22.2
^{40}Ar	50	25.2	30.9	15.5
$^{40}\text{Ar+PMMA}$	57	29.3	36.6	17.0
^{84}Kr	50	20.3	25.4	14.3
$^{84}\text{Kr+PMMA}$	62.5	24.9	31.7	16.6

ICCHIBAN - 6

Ion	Dose, mGy	Relative efficiency		
		MTS-7	MTT-7	MCP-7
^{12}C	50	0.72	0.87	0.36
$^{12}\text{C} + \text{PMMA}$	73	0.60	0.86	0.32
^{40}Ar	50	0.50	0.62	0.31
$^{40}\text{Ar+PMMA}$	57	0.51	0.64	0.30
^{84}Kr	50	0.41	0.51	0.29
$^{84}\text{Kr+PMMA}$	62.5	0.40	0.51	0.27

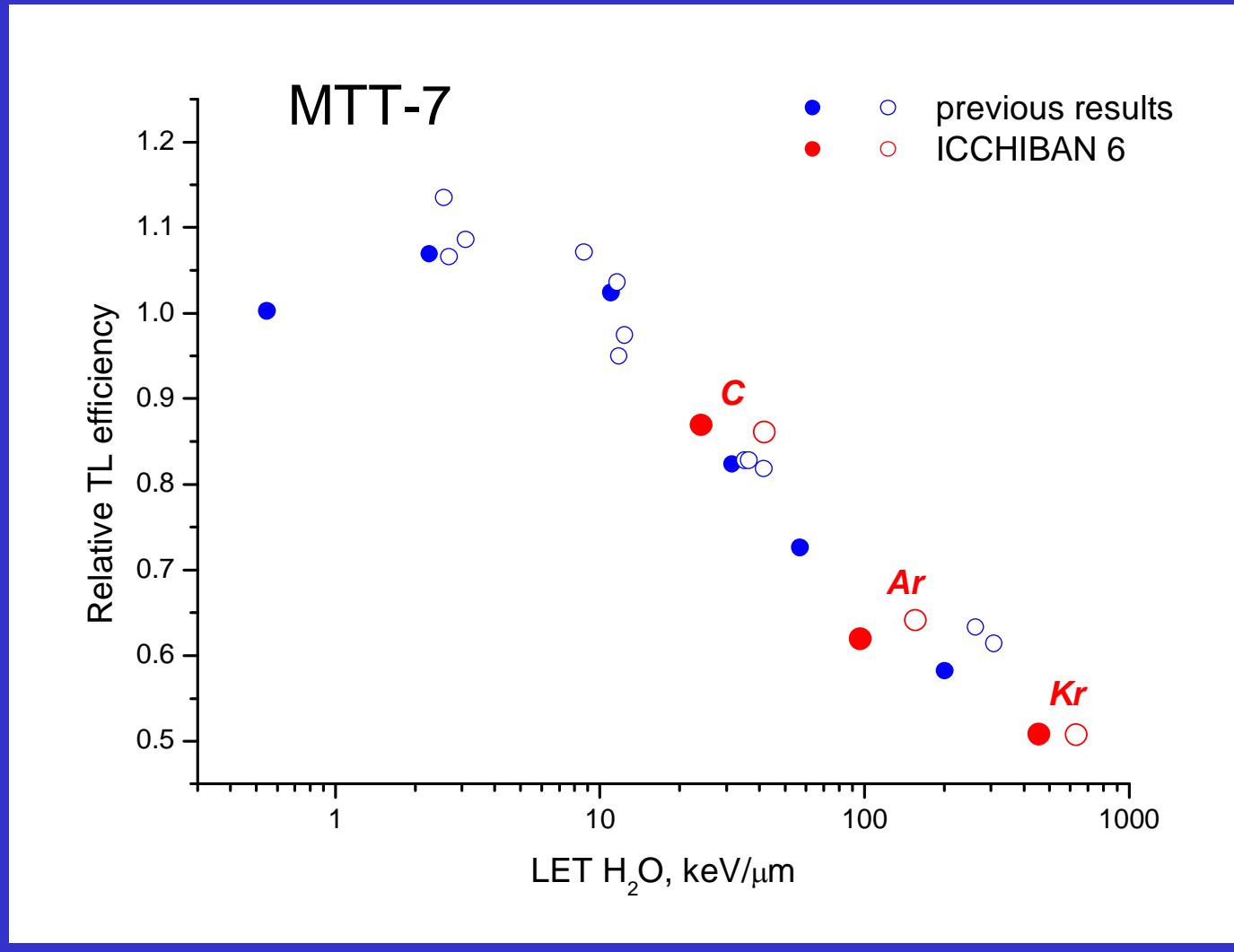
ICCHIBAN - 6

TLD RELATIVE EFFICIENCY



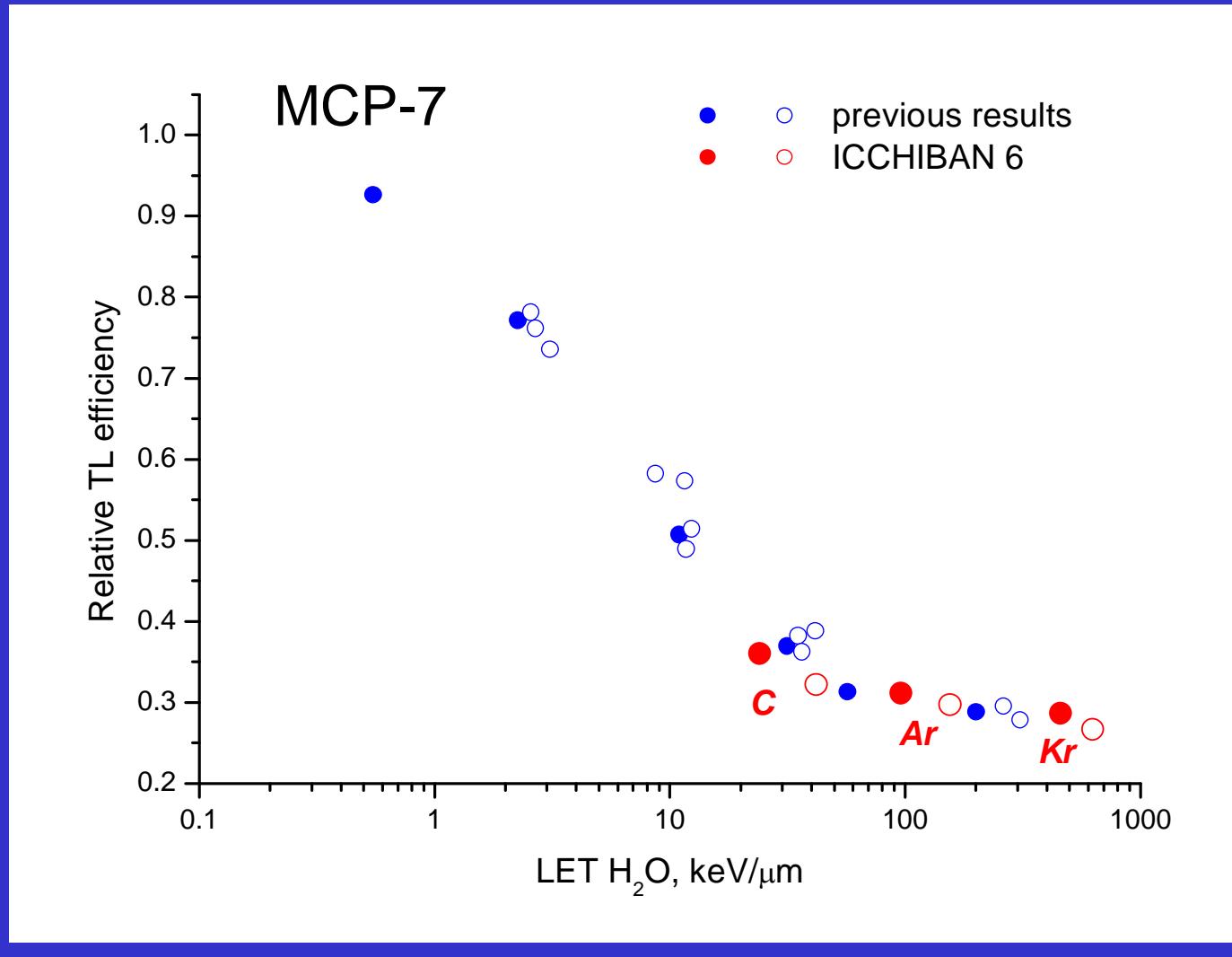
ICCHIBAN - 6

TLD RELATIVE EFFICIENCY



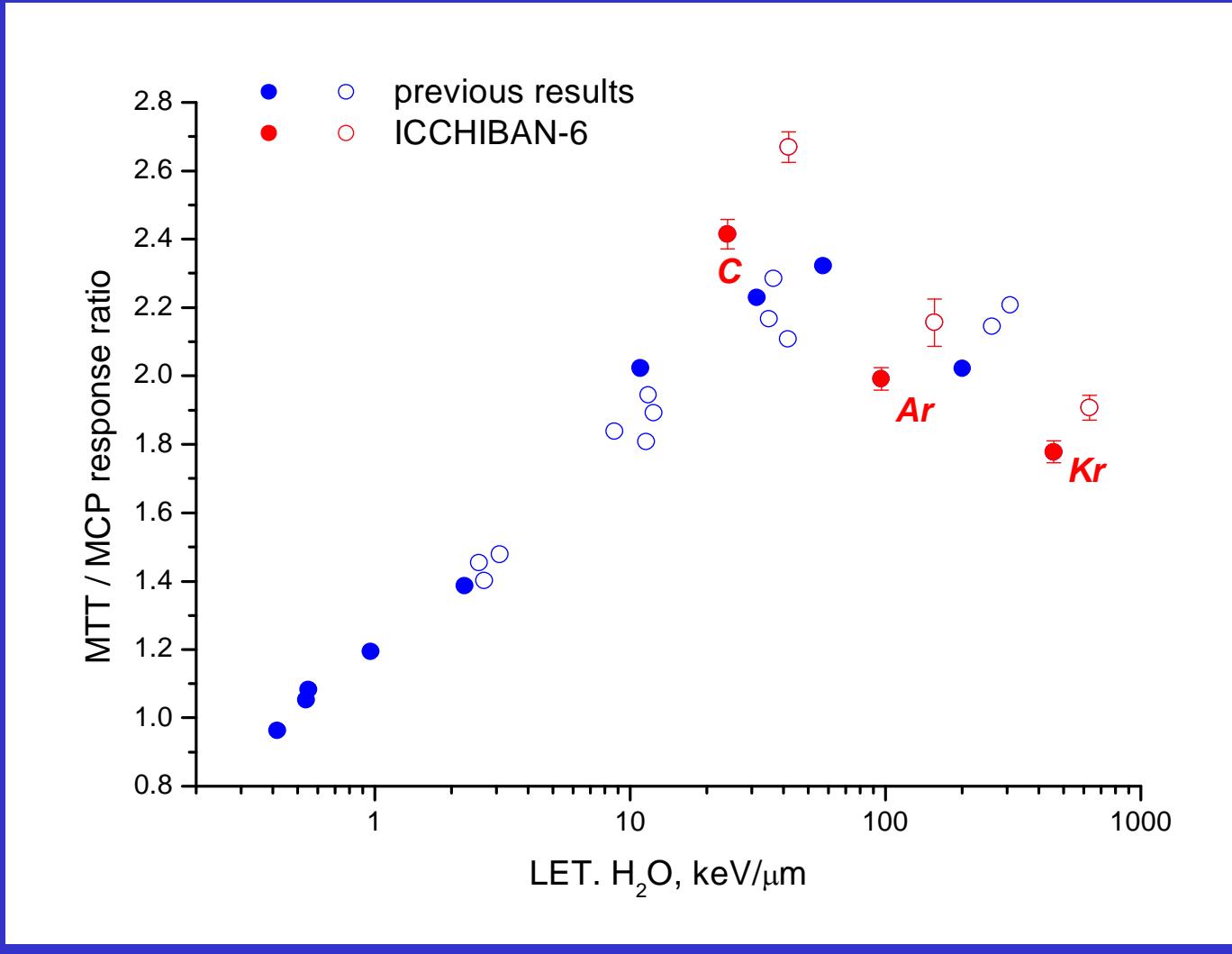
ICCHIBAN - 6

TLD RELATIVE EFFICIENCY



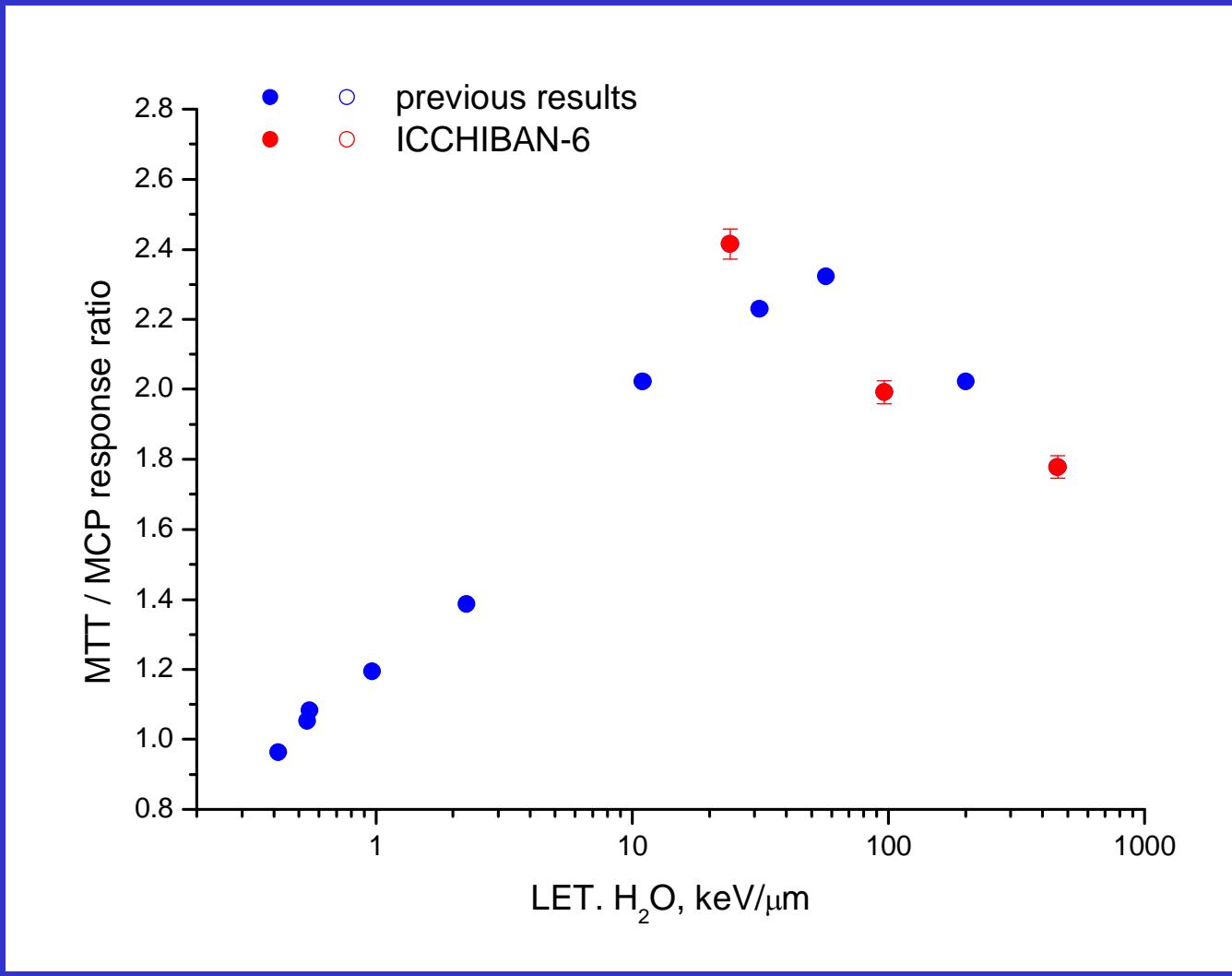
ICCHIBAN - 6

TLD RESPONSE RATIO



ICCHIBAN - 6

TLD RESPONSE RATIO



ICCHIBAN - 6

Blind exposures

Measured doses [mGy] - without any corrections

	MTS-7	MTT-7	MCP-7
blind 1	96.1	98.4	104.3
blind 2	94.3	96.6	100.4
blind 3	98.0	99.4	105.0
blind 4	86.5	91.8	80.0
blind 5	99.4	99.8	105.6
blind 6	159.4	158.2	136.7

ICCHIBAN - 6

Blind exposures

Response ratio

	MTS / MCP	MTT / MCP	MTT / MTS
blind 1	0.92	0.94	1.02
blind 2	0.94	0.96	1.03
blind 3	0.93	0.95	1.01
blind 4	1.08	1.15	1.06
blind 5	0.94	0.95	1.00
blind 6	1.17	1.16	0.99

ICCHIBAN - 6

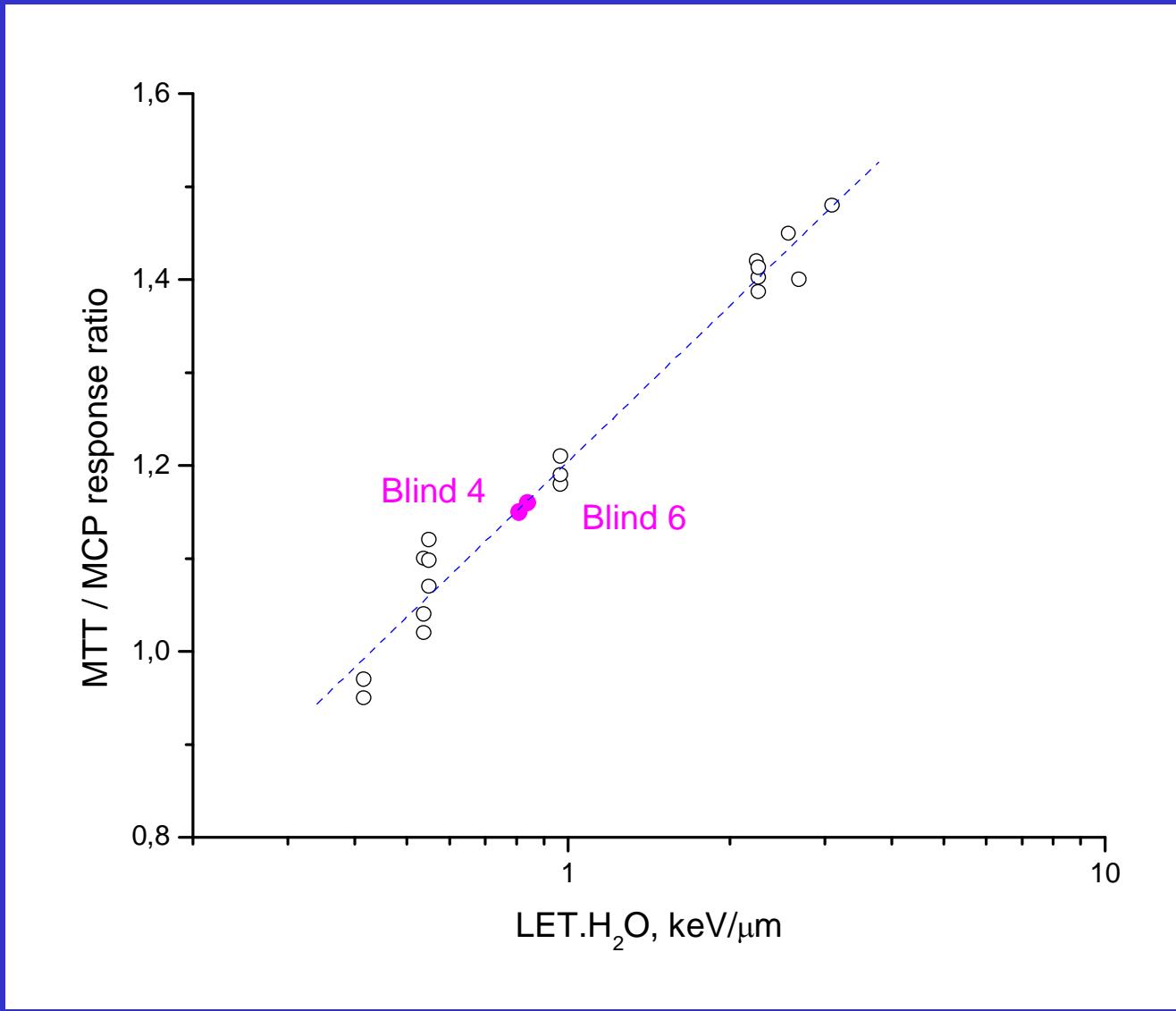
Blind exposures

Response ratio

	MTS / MCP	MTT / MCP	MTT / MTS
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blind 5	0.94	0.95	1.00
blind 6	1.17	1.16	0.99

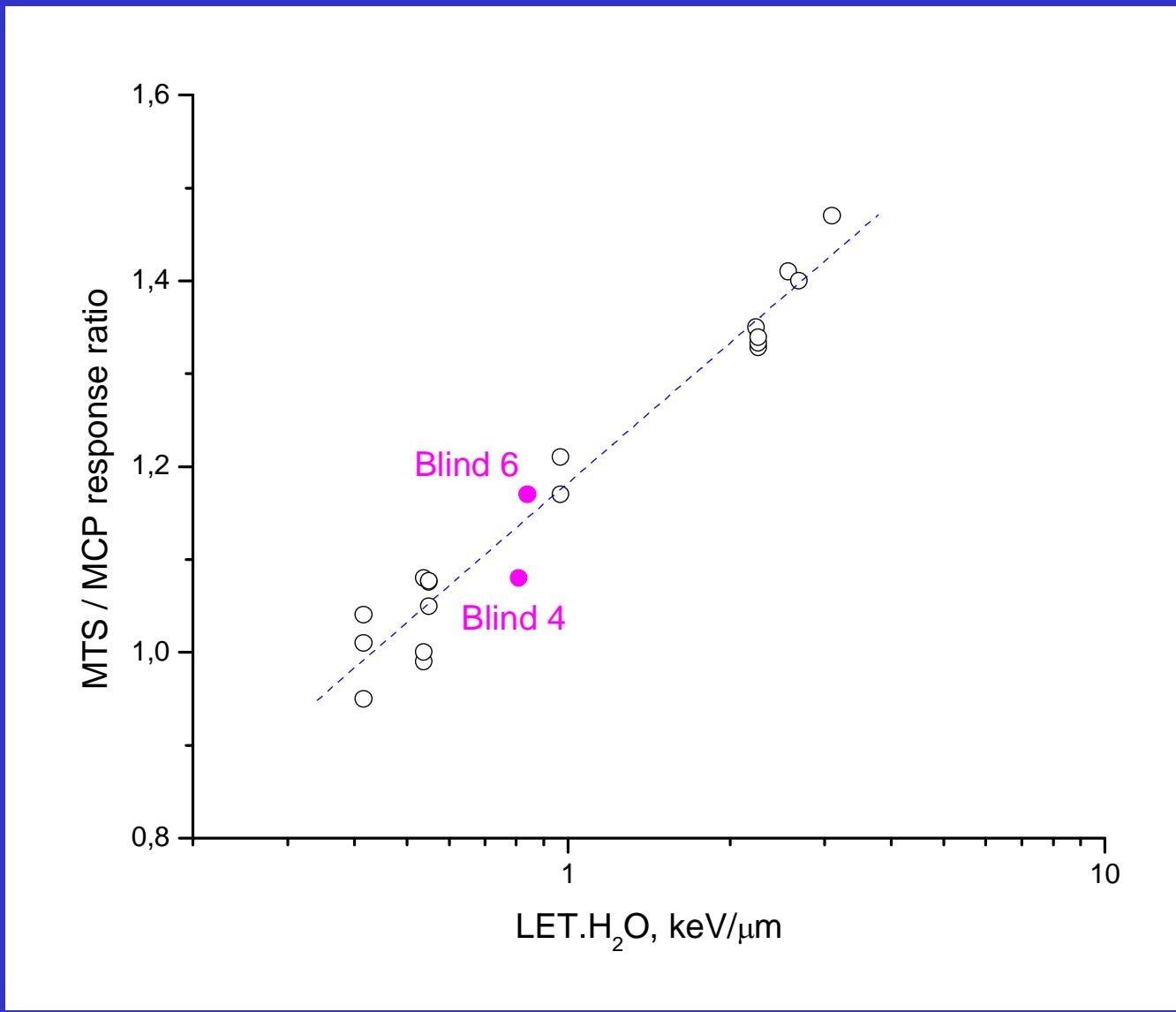
ICCHIBAN - 6

Blind exposures



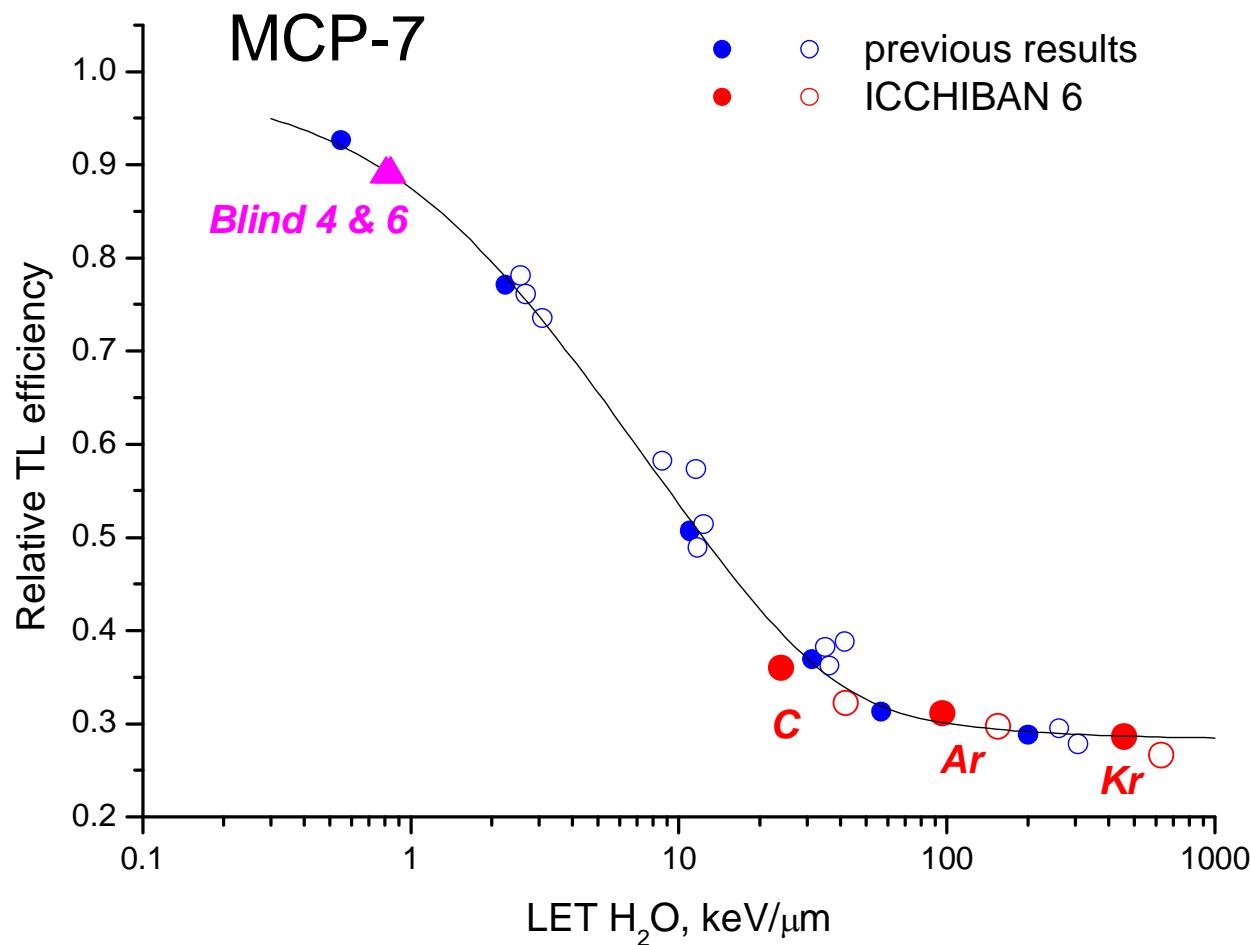
ICCHIBAN - 6

Blind exposures



ICCHIBAN - 6

Blind exposures



ICCHIBAN - 6

Blind exposures

Measured doses [mGy] - with corrections

	MTS-7	MTT-7	MCP-7
blind 1	96.1	98.4	104.3
blind 2	94.3	96.6	100.4
blind 3	98.0	99.4	105.0
blind 4	86.5	91.8	80.0 88.0
blind 5	99.4	99.8	105.6
blind 6	159.4	158.2	136.7 150,5

NSRL ICCHIBAN

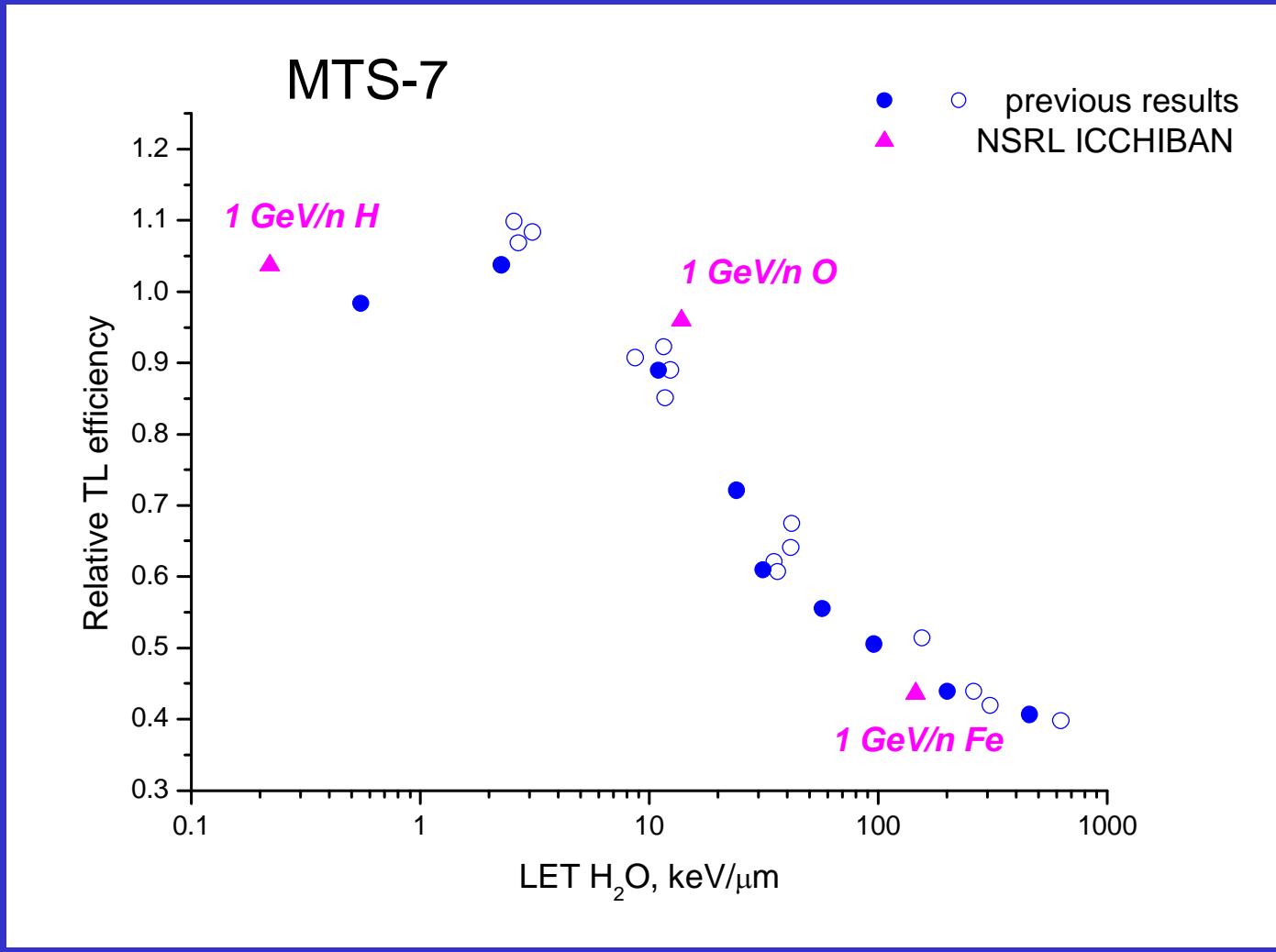
Energy 1 GeV/n

Ion	Measured dose, mGy		
	MTS-7	MTT-7	MCP-7
H	51.9	56.0	48.2
H 54 g/cm ² Al	33.4	36.9	31.0
O	48.0	59.0	24.4
O 54 g/cm ² Al	33.5	43.0	18.8
Fe	21.8	31.1	13.8
Fe 10 g/cm ² Al	21.7	30.6	13.7

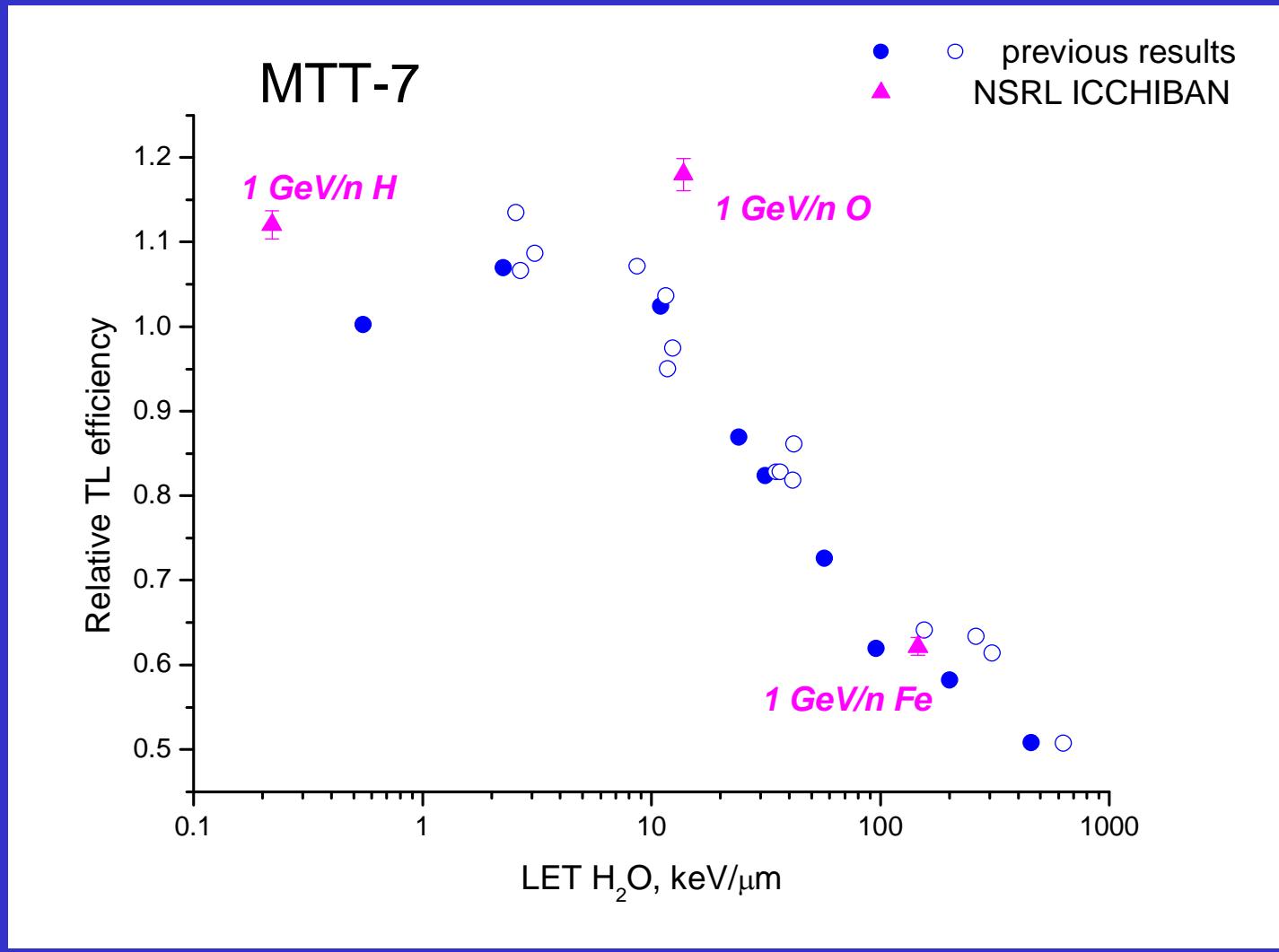
NSRL ICCHIBAN

Ion	Relative efficiency		
	MTS-7	MTT-7	MCP-7
H	1.04	1.12	0.96
H 54 g/cm ² Al	-	-	-
O	0.96	1.18	0.49
O 54 g/cm ² Al	-	-	-
Fe	0.44	0.62	0.28
Fe 10 g/cm ² Al	-	-	-

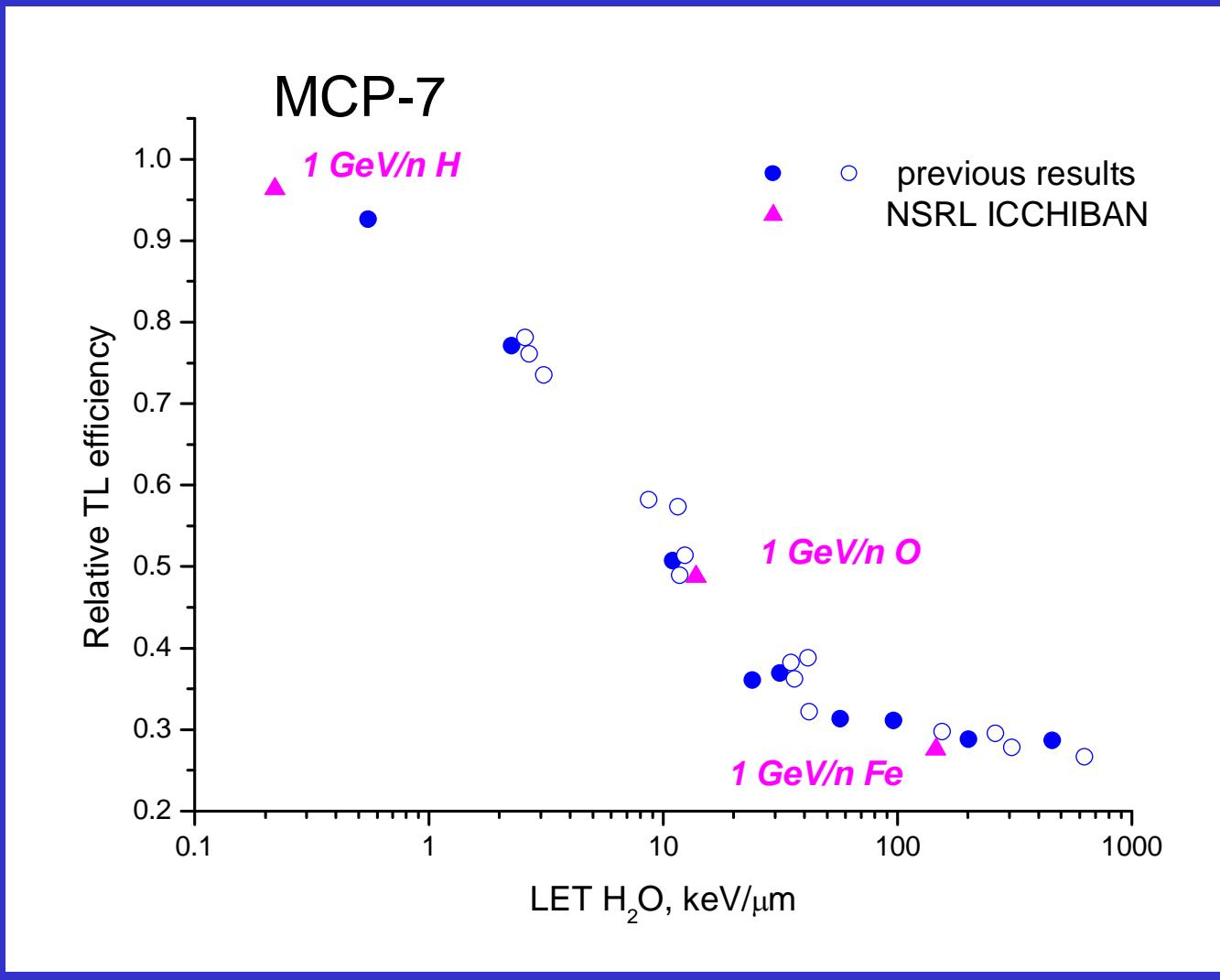
NSRL ICCHIBAN



NSRL ICCHIBAN



NSRL ICCHIBAN



NSRL ICCHIBAN

Measured doses [mGy] - without any corrections

	MTS-7	MTT-7	MCP-7
blind 1	33.7	37.4	35.0
blind 2	34.9	38.1	33.1
blind 3	0.97	1.17	0.46
blind 4	0.23	0.26	0.16

NSRL ICCHIBAN

*Measured doses [mGy]
with corrections*

	MTS-7	MTT-7	MCP-7
blind 1	33.7	37.4	37.6
blind 2	35.0	38.1	36.7
blind 3	1.57	1.48	1.35
blind 4	0.25	0.25	0.26

CONCLUSIONS

- ICCHIBAN-6 and NSRL-ICCHIBAN produced a lot of useful experimental data
- ICCHIBAN-6 results agree well with the general trend of relative TL efficiency for all TLDs
- NSRL-ICCHIBAN results measured for MTT detectors with H and O ions differ somewhat from the general trend. Other results fit to the trend