



Eksperimentalna fizika osnovnih delcev

Kaj so to osnovni delci in zakaj so pomembni?

- So najmanjši gradniki snovi – ne moremo jih razbiti na še manjše delce
- Vsa snov (ljudje, živa in neživa narava, vesolje) je sestavljena iz osnovnih delcev
- Ne samo snov – celo sile so posledica osnovnih delcev

Prva teorija osnovnih delcev



... danes pa vemo, da je še nekaj bolj osnovnega kot so **zemlja**, **voda**, zrak in **ogenj**

Periodni sistem elementov

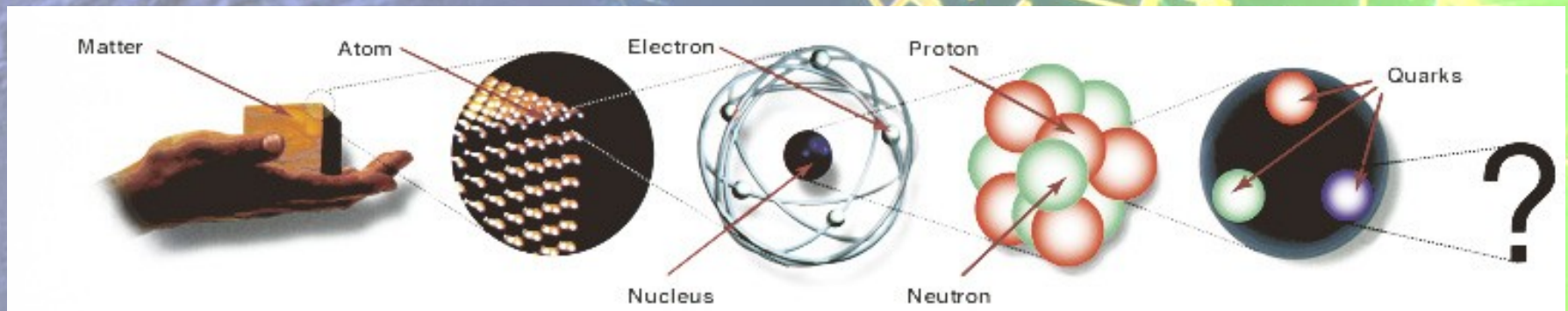
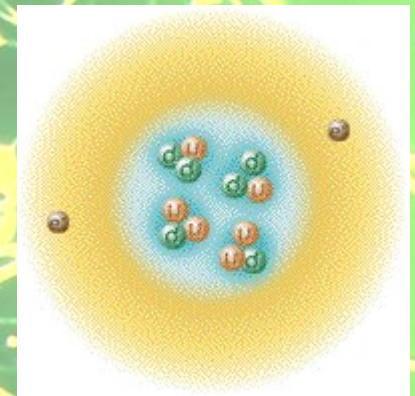
Periodni sistem elementov																																					
1	IA	1	H																	2	0																
2		3	Li	4	IIA	Be																	10	Ne													
3		11	Na	12	Mg	IIIB	13	Al	14	Si	15	P	16	S	17	Cl	18	Ar																			
4		19	K	20	Ca	Sc	21	Ti	22	V	23	Cr	24	Mn	25	Fe	26	Co	27	Ni	28	Cu	29	Zn	30	31	Ga	32	Ge	33	As	34	Se	35	Br	36	Kr
5		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
6		55	Cs	56	Ba	*La	57	Hf	72	Ta	73	W	74	Re	75	Os	76	Ir	77	Pt	78	Au	79	Hg	80	81	Tl	82	Pb	83	Bi	84	Po	85	At	86	Rn
7		87	Fr	88	Ra	+Ac	89	Rf	104	Ha	105	106	107	108	109	110																					

* Lanthanide Series

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

+ Actinide Series

Atom



Fizika delcev danes

- Naravo v mikrosvetu opisuje **Standardni Model** elektrošibke in močne interakcije
- Snov je sestavljena iz **kvarkov** in **leptonov**, ki se ponovijo v **treh generacijah**; so fermioni s polovičnim spinom
- Vsakemu **delcu** pripada **anti-delec** z nasprotnim nabojem

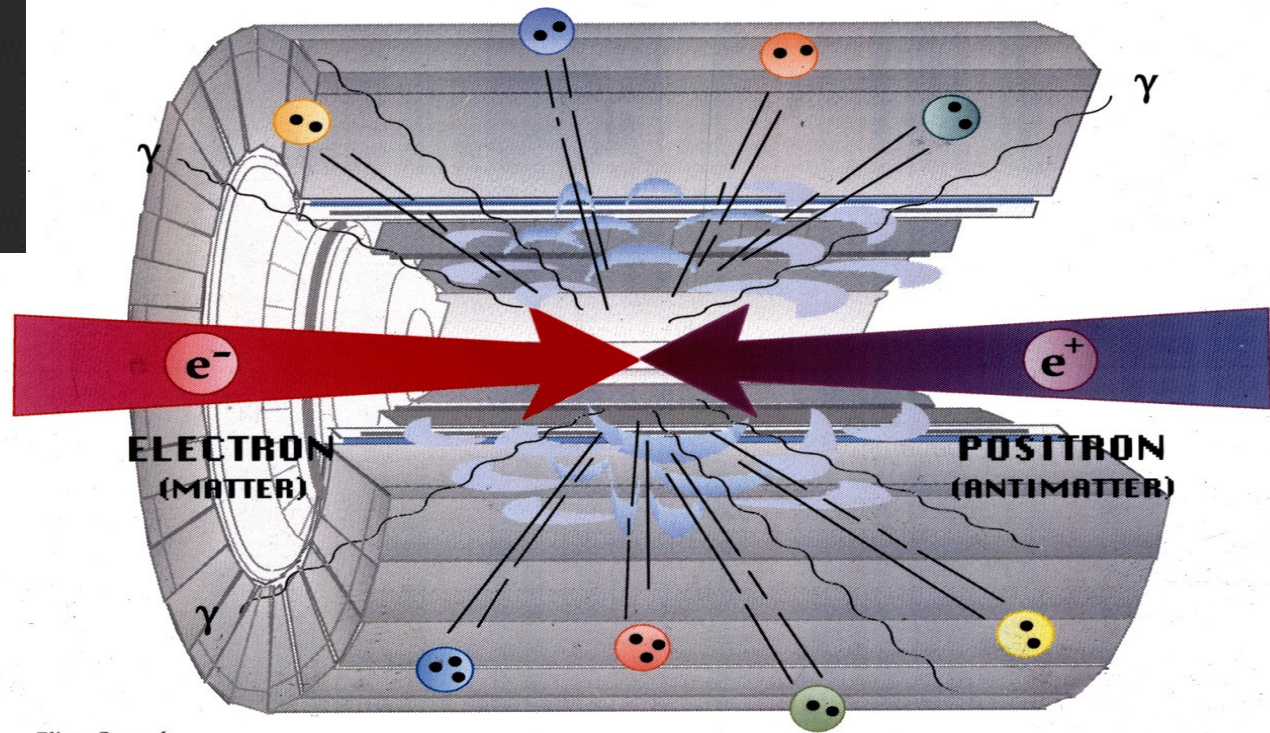
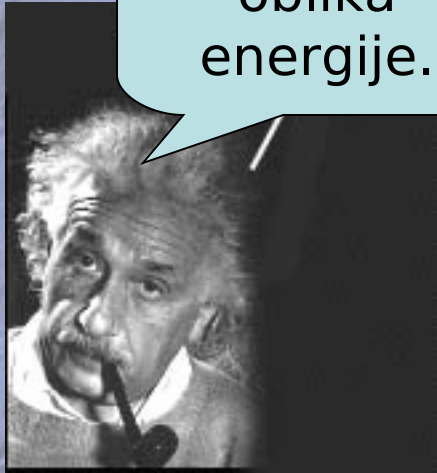
Quarks	u up	c charm	t top
	d down	s strange	b bottom
Leptons	ν_e e- Neutrino	ν_μ μ - Neutrino	ν_τ τ - Neutrino
	e electron	μ muon	τ tau
I II III The Generations of Matter			

- Med njimi delujejo **elektromagnetna**, **šibka** in **močna** sila, **gravitacija** je zanemarljiva
- Posredniki sil so **foton**, **šibki bozoni W in Z** ter **gluoni**; vsi so bozoni s spinom 1
- Zaradi **lastnosti močne sile** kvarki ne obstajajo prosti, družijo se v hadrone: mezone (par kvark-antikvark) in barione (trije kvarki)

				
	Gravity	Weak	Electromagnetic	Strong
Carried By	Graviton (not yet observed)	W ⁺ W ⁻ Z ⁰ (Electroweak)		Photon
Acts on	All	Quarks and Leptons	Quarks and Charged Leptons and W ⁺ W ⁻	Quarks and Gluons

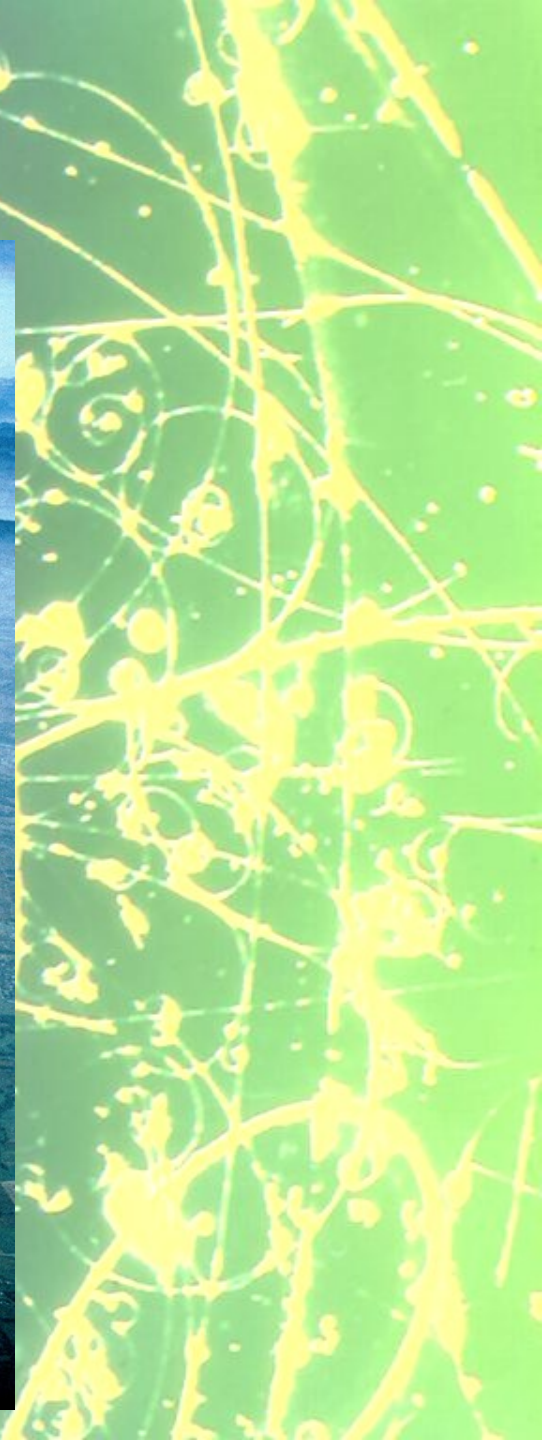
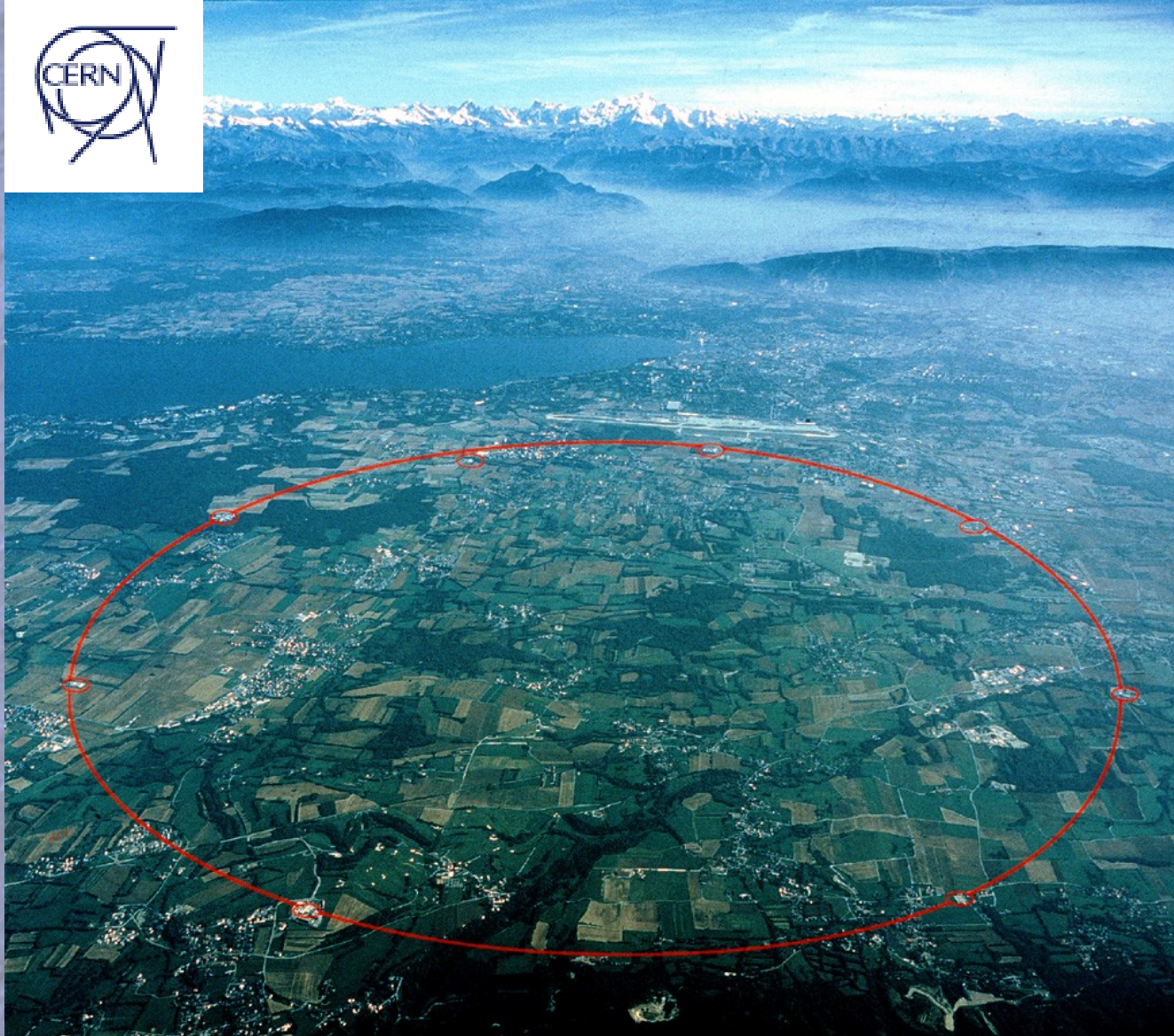
Kako delce sploh vidimo?

Masa je
oblika
energije.

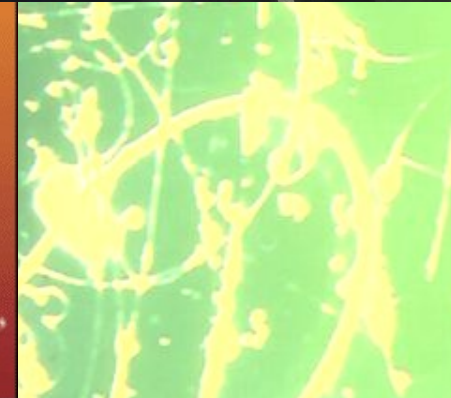
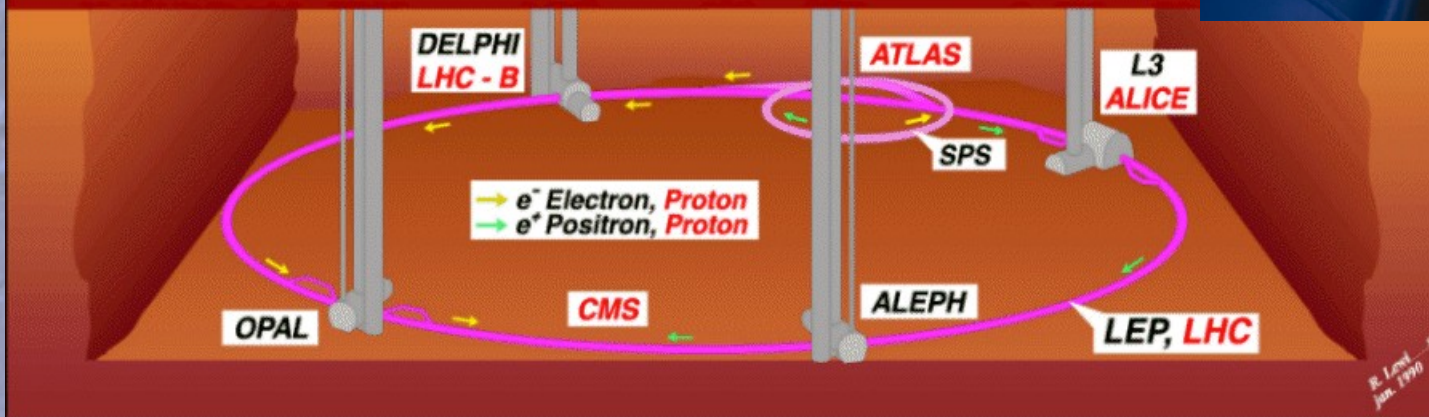
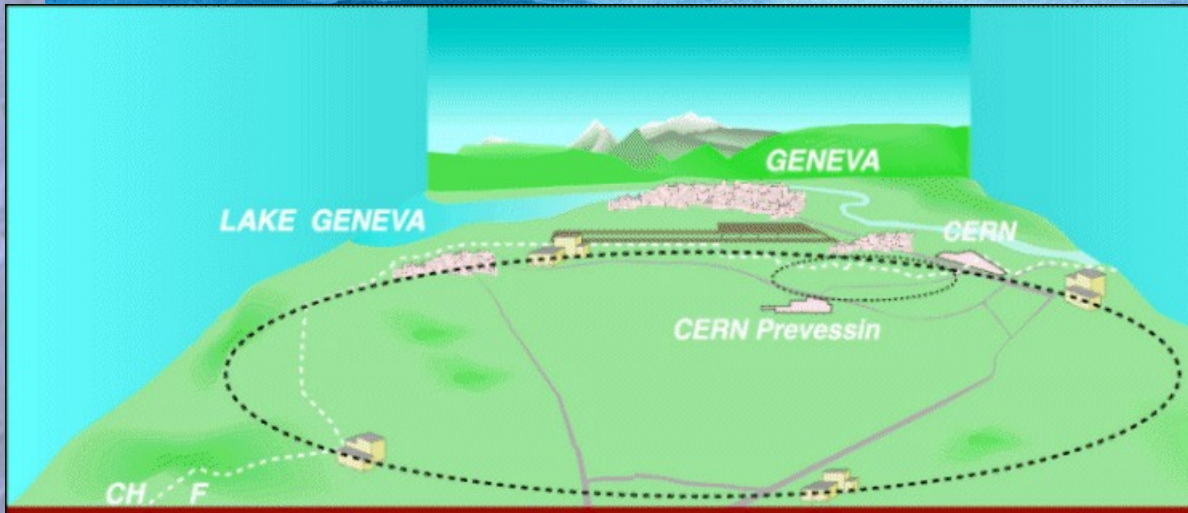


Eliane Onursal

Pospeševalniki

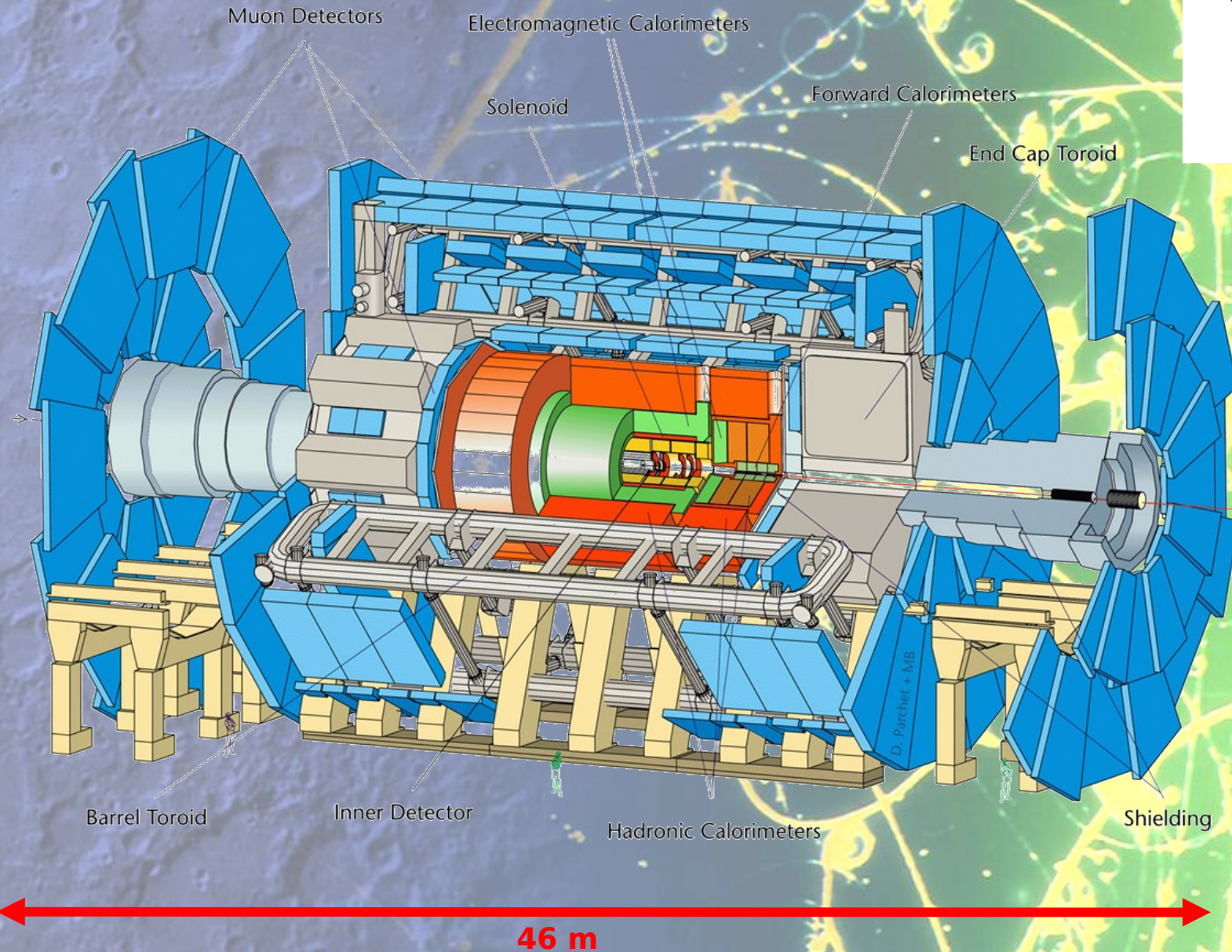


Pospeševalniki

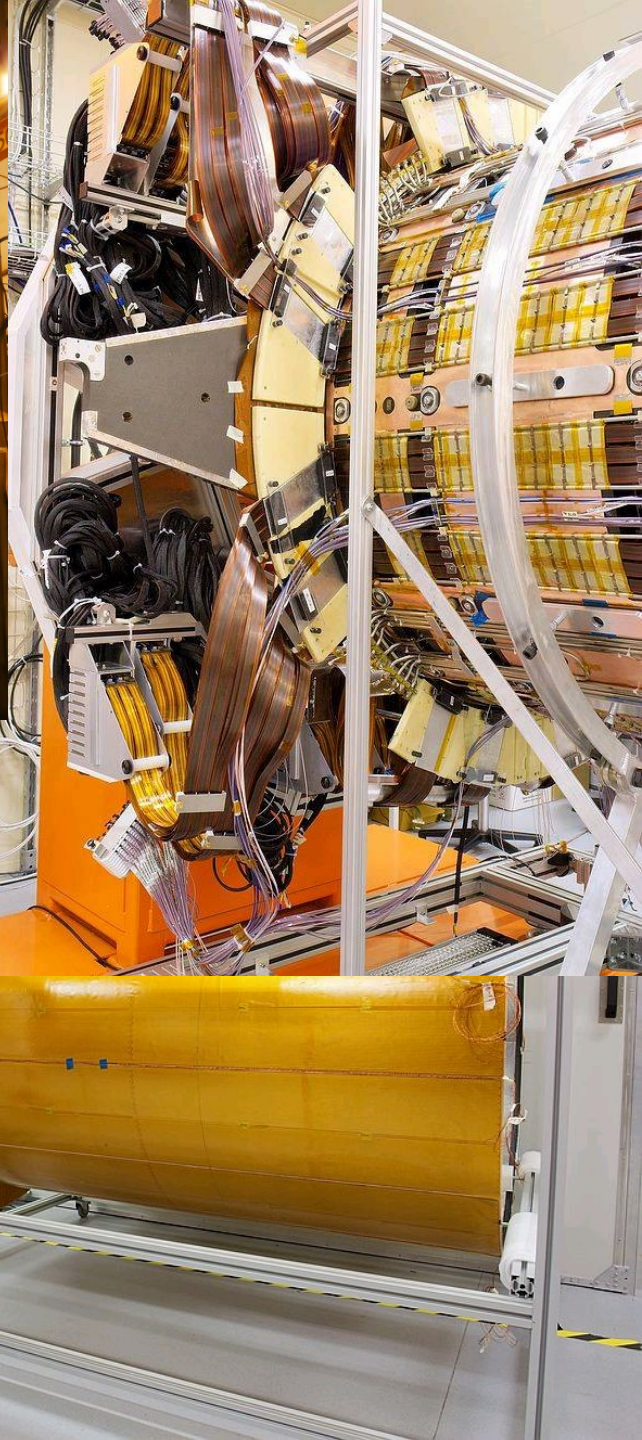


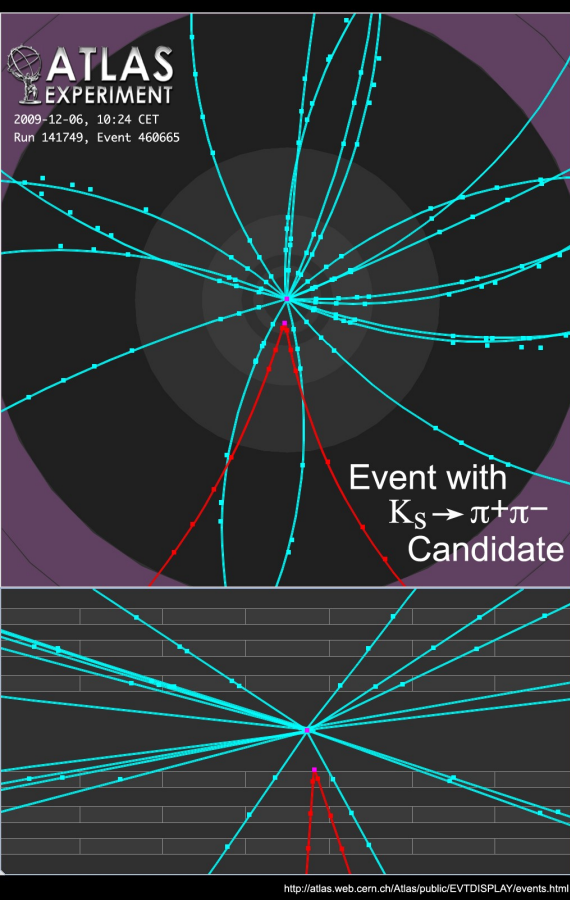
CERN, Ženeva, Švica: LHC eksperiment:
A Toroidal LHC Apparatus: ATLAS

$m = 7\,000\text{ t}$

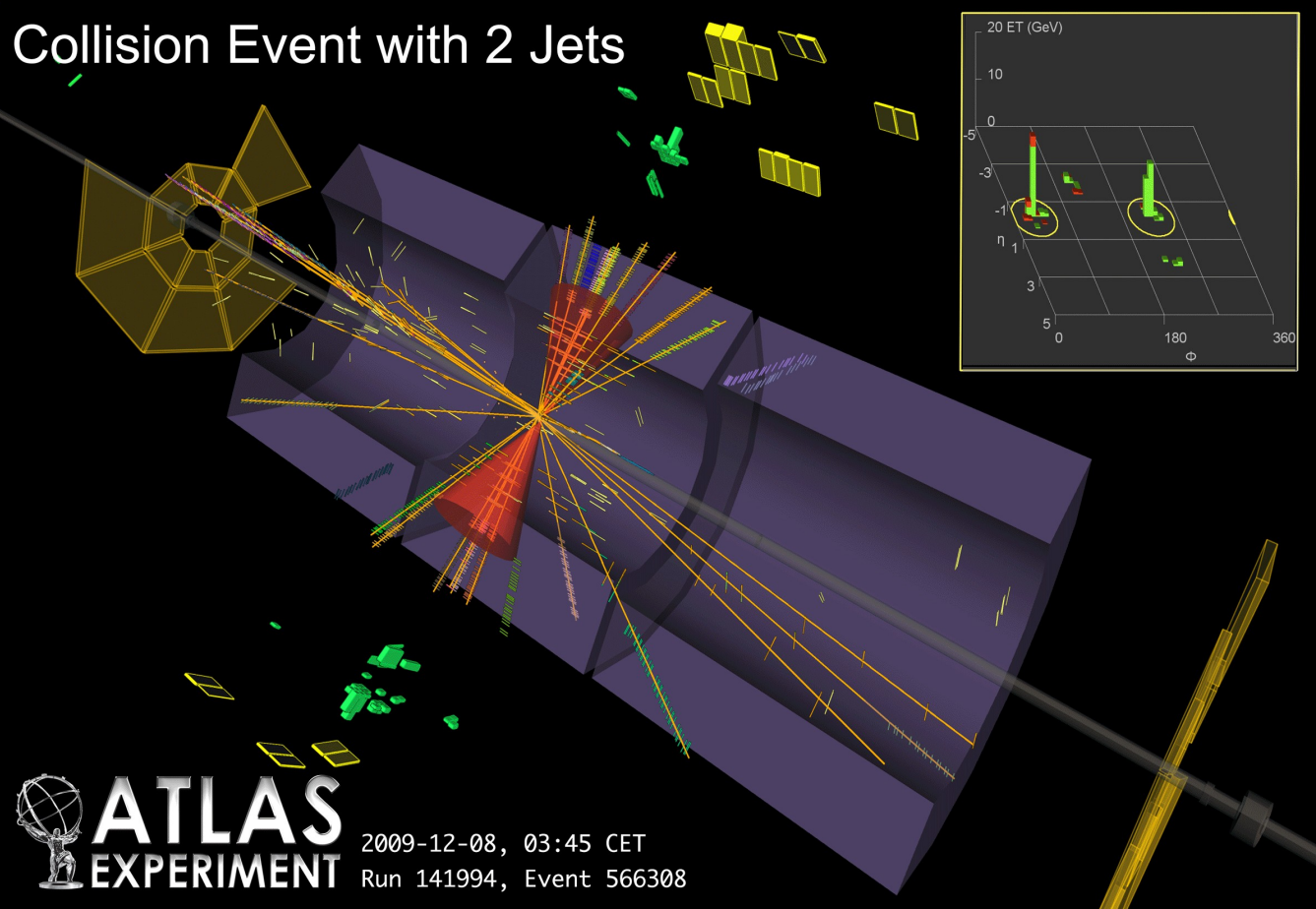






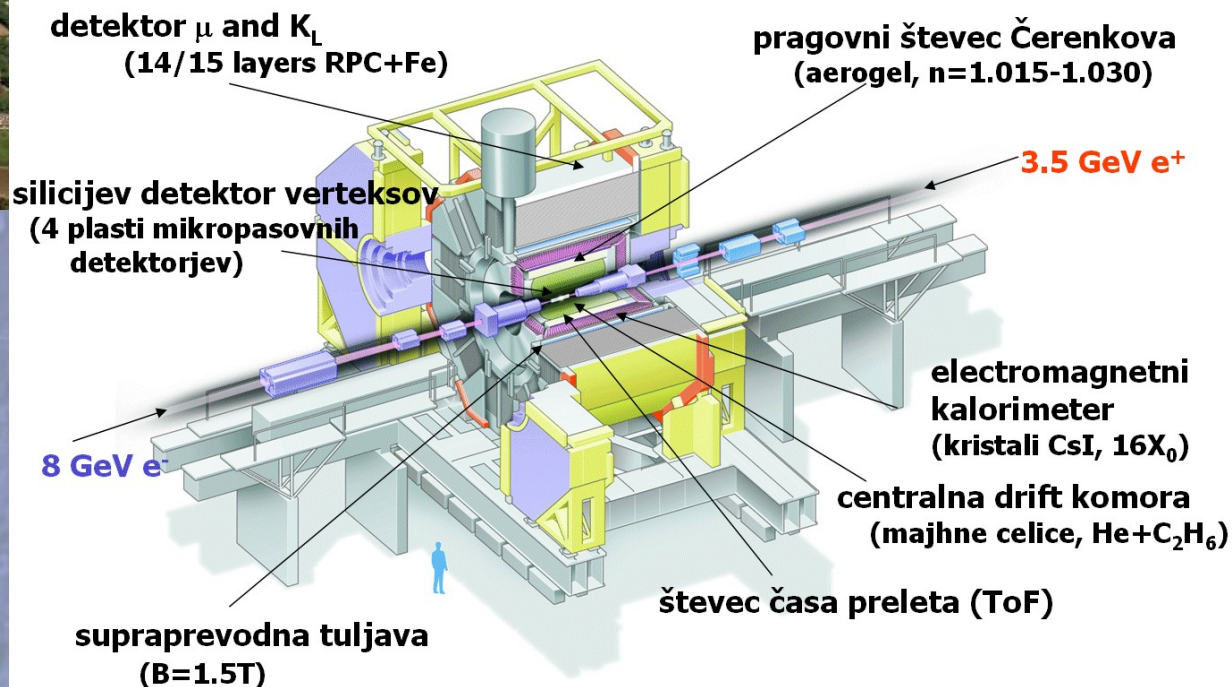


Collision Event with 2 Jets



ATLAS - prvi trki

KEK, Tsukuba, Japonska:

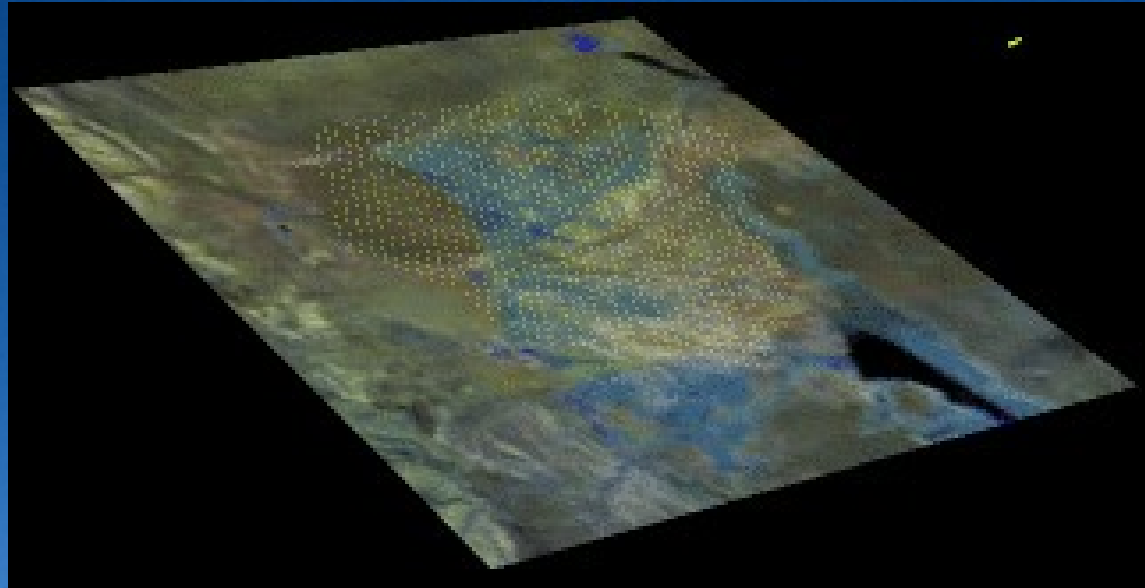
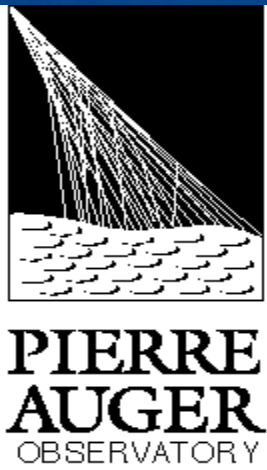




**Nobelova nagrada 2008 (M.Kobayashi,
T.Maskava)**

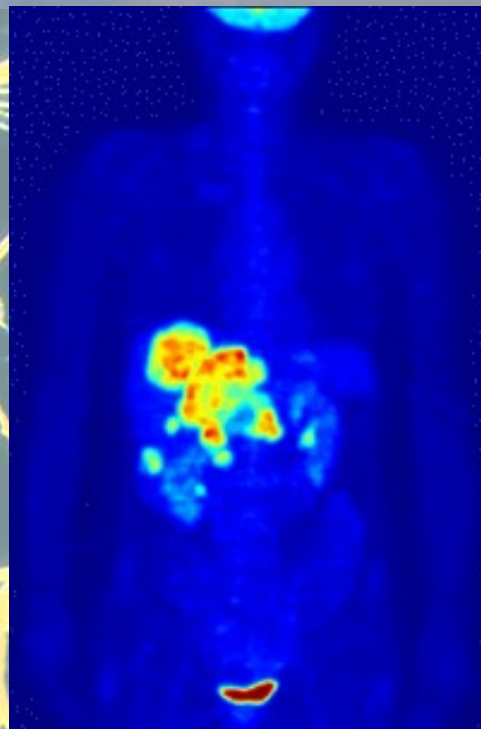
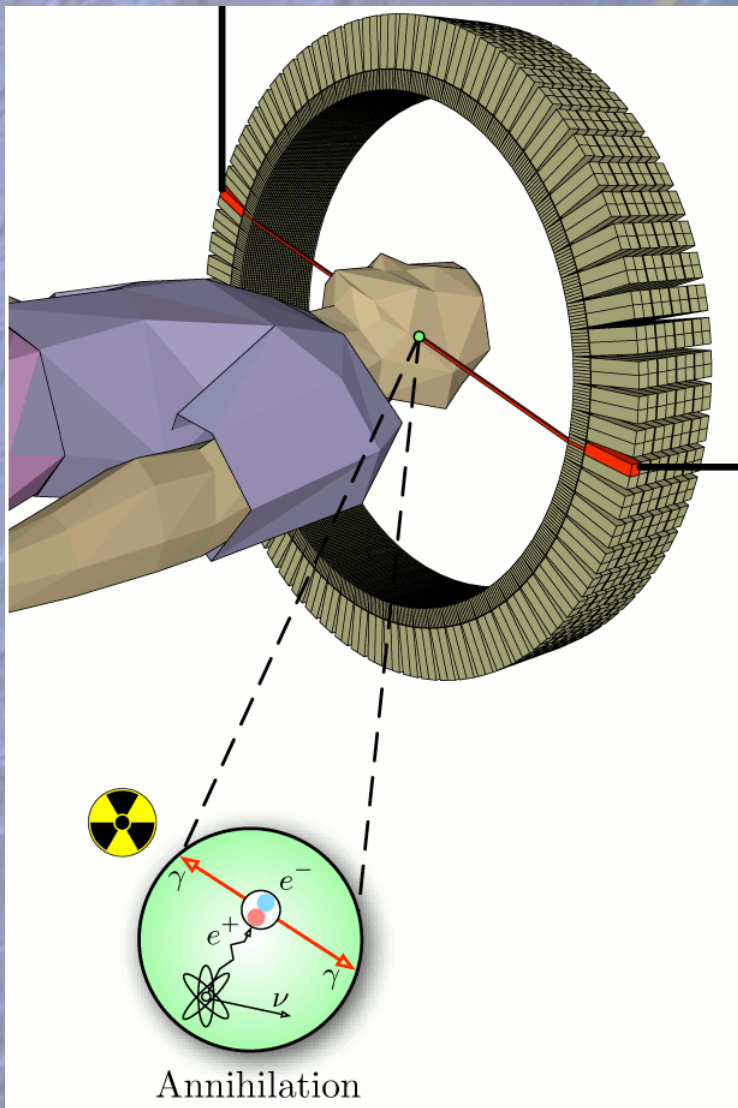


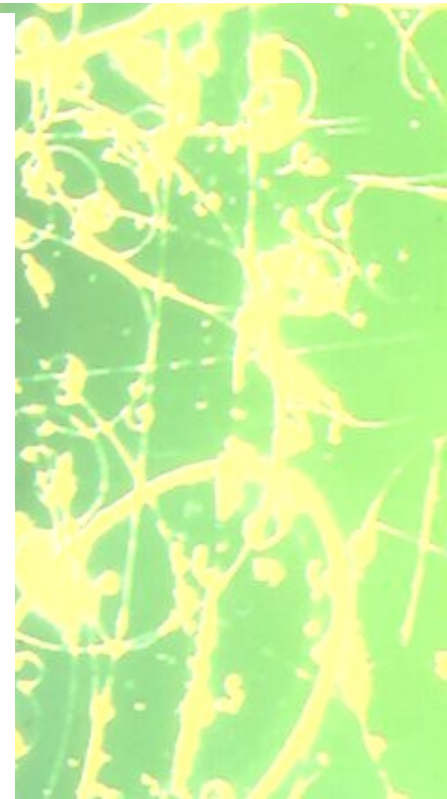
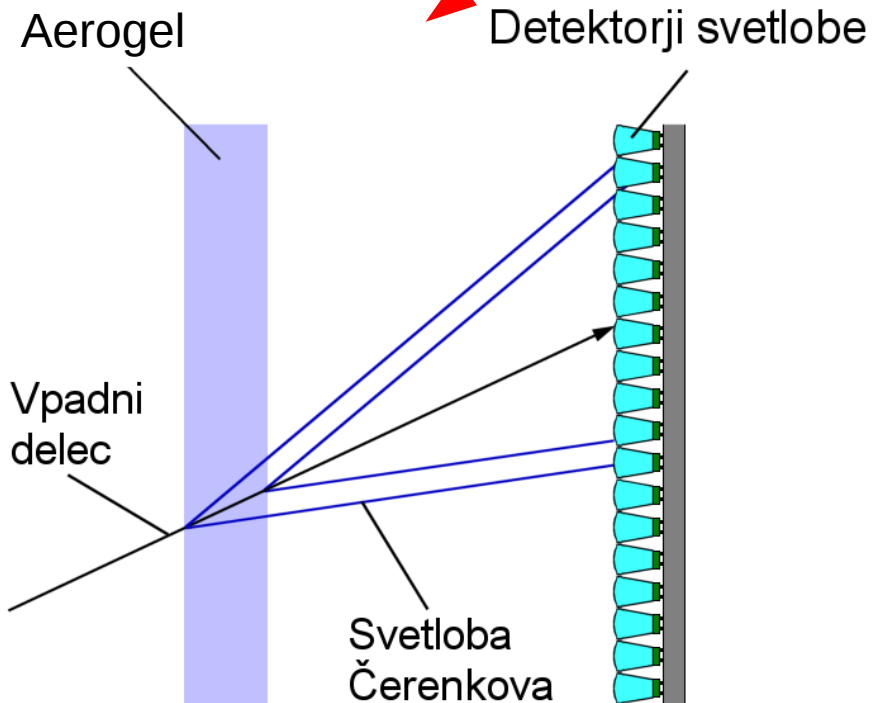
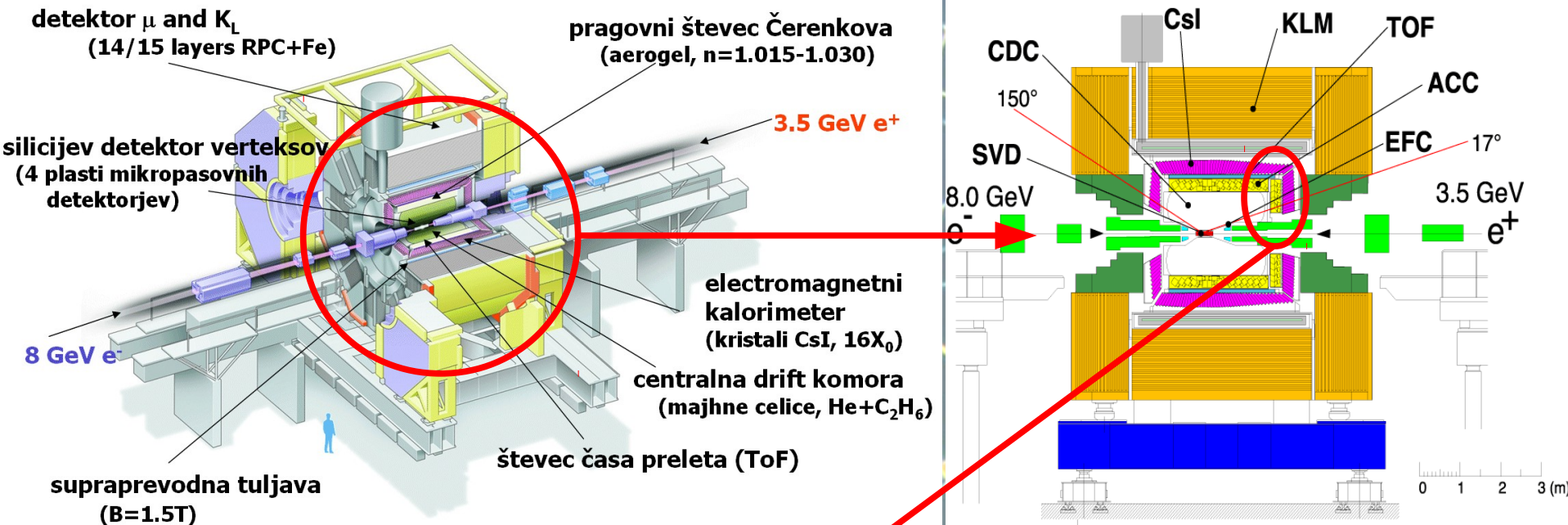
Pierre Auger Observatory, Malargue, Mendoza, Argentina



Prenos tehnologije - Medicina:

Pozitronska tomografija (PET):





Aerogel – odličen izolator toplote

