## **PROJECT-X: NUCLEAR PHYSICS**

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Working group meeting, IUAC, New Delhi, 17-18th June

What we want to do?

**What experimental set-up is being planned?** 

Which part of experiments from Indian side can be involved?

If we can propose new setup?

**Our experience!!!** 

What we can do for strengthen INDIA-US the collaboration!!!

**Exploring exotic nuclei at intermediate energy to probe exotic world of physics** 

**\*\* Beyond STANDARD model** Tests of the Standard Model at low energy

- Low energy tests

   e.g. Time reversal violation
   precision measurements

   Stable ↔ unstable nuclides

   nuclear & atomic physics

   The role of trapping nuclides
   sample manipulation & detection
- Applications and examples
- WORLD-WIDE DEVELOPMENT

# Time reversal violation and the Electric Dipole Moment



Consider all nuclides

**EDM** violates parity and time reversal

## **Time reversal violation in B-decay** positron J **180**<sup>0</sup> D neutrii Q

$$\langle \vec{J} \cdot \vec{p} \times \vec{q} \rangle \neq 0$$
 ?

nuclide & appropriate structure neutrino detection  $\rightarrow$  recoil measurement



# EDM Now and in the Future



## WHAT WE HAVE DONE IN XITH PLAN



New magic no Failure of magic no



OG



**Neutron star** 

XIth plan , ✓ First time in INDIA build ✓ MMRPC (dt<100ps) using ✓ local facility U.Datta pramanik et al NIM A 2010 ✓ Perform leadership expt. at GSI, ✓ Michigan







### Expt. (GSI) Jan, 2009

<sup>33</sup>Mg,33Mg, <sup>32</sup>Mg, )
Tripathi et al. PRL101 (2008)
Yordanov et al., PRL 99 (2007),
R. Kanungo et al PLB,(2010)
No conclusion on gr state
yet.





In this laboratory MMRPC was developed

### Expt. Sept, 2010



*developed MMRPC* σt<(65ps), 100ps, 150ps Efficiency~95-40% σx~1.5 cm

U.Datta Pramanik, S.Chakraborty, P.Basu et al NIM A, article in press

doi:10.10.16/j.nimaa.2010.10.055 Anisur Rahaman , Santosh Chakraborty Ph.d Student



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z						119Ce	120Ce	121Ce	122Ce	123Ce	124Ce	125Ce	126Ce	127Ce	128Ce	129Ce	130Ce
					117La	118La	119La	120La	121La	122La	123La	124La	125La	126La	127La	128La	129La
56			114Ba	115Ba	116Ba	117Ba	118Ba	119Ba	120Ba	121 <b>B</b> a	1228-	123Ba	124Ba	125Ba	126Ba	127Ba	128Ba
		112Cs	113Cs	114Cs	115Cs	116Cs	117Cs	118Cs	11 <mark>9</mark> Cs	12 <b>0</b> Cs	121Cs	122Cs	123Cs	124Cs	125Cs	126Cs	127Cs
54	110Xe	111Xe	112Xe	113Xe	114Xe	115Xe	116Xe	117Xe	118Xe	119Xe		121Xe	122Xe	123Xe	124Xe	125Xe	126Xe
52	1091	110I	1111	112I	113I	114I		116I	117I	118I	119I	120I	121I	122I	123I	124I	1251
	108Te	109Te	1107.	111Te	112Te	113Te	114те	115Te	116Te	117Te	118Te	119Te	120Te	121Te	122Te	123Te	124Te
	107Sb	108Sb	109Sb	110Sb	111Sb	112Sb	113Sb	114Sb	115Sb	116Sb	117Sb	118Sb	119Sb	120Sb	121Sb	122Sb	123Sb
50	106Sn	107Sn	108Sn	109Sn	110Sn	111\$n	112Sn	113Sn	114Sn	115\$n	116\$n	117\$n	118Sn	119Sn	120Sn	121\$n	122\$n
	56		58		60		62		64		66		68		70		N

#### (14-16 neutron less than stable)

#### **Exotic decay mode**



•<sup>111</sup>Ba •<sup>112</sup>Cs •<sup>121</sup>La \*<sup>120</sup>Ba \*<sup>120</sup>Cs •<sup>120</sup>Xe •<sup>115</sup>Xe \*<sup>119</sup>Xe \*<sup>115</sup>Xe \*<sup>119</sup>Cs \*<sup>115</sup>Xe •<sup>115</sup>Xe •<sup>115</sup>Te •<sup>115</sup>Te •<sup>116</sup>Te •<sup>155</sup>Ru •<sup>155</sup>Ru •<sup>55</sup>Ru •<sup>155</sup>Ru •<sup>55</sup>Ru PLAND to do
Test the Standard Model of Nuclear Structure;
Study nucleon interactions in neutron-rich matter.

•A new setup for charge and matter radii measurements

•Involvement if MOT developments by

•Measurements of cosmic exposure through limunacence technique (irradiation of proton with metiorites)

•Look for suitable new exotic nuclei for EDM measurements

