RCNP EXPERIMENT E

# PROPOSAL FOR EXPERIMENT AT RCNP

14 September 2015

**TITLE:**

**Search for chiral doublet structures in transitional nucleus $^{190}$Ir**

**SPOKESPERSON:**


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**EXPERIMENTAL GROUP:**


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| Atsushi Tamii | RCNP, Osaka University | Associate Professor |
| Hooi Jin Ong | RCNP, Osaka University | Lecturer |
| Tomokazu Suzuki | RCNP, Osaka University | Assistant Professor |
| Shumpei Noji | RCNP, Osaka University | Assistant Professor |
| Chihiro Iwamoto | RCNP, Osaka University | Post-doc |
| Ryan Tang | RCNP, Osaka University | Lecturer |
| Tetsuya Yamamoto | RCNP, Osaka University | D2 |
| Yasutaka Yamamoto | RCNP, Osaka University | D1 |
| Thi Ha Hoang | RCNP, Osaka University | M1 |
| Atsuko Odahara | Department of Physics, Osaka University | Associate Professor |
| Takeshi Koike | Tohoku University | Associate Professor |
| Michael Carpenter | Argonne National Laboratory | Staff Physicist |
| Minliang Liu | Institute of Modern Physics, CAS | Researcher |
| Jianguo Wang | Institute of Modern Physics, CAS | Associate Researcher |
| Bingshui Gao | Institute of Modern Physics, CAS | Assistant Researcher |
| and CAGRA Collaboration | | |


**THEORETICAL SUPPORT:**


| Name | Institution | Title or Position |
|---|---|---|
| J. Meng | School of Physics, Peking University | Professor |
| S. Q. Zhang | School of Physics, Peking University | Associate Professor |
| Z. Shi | School of Physics, Beihang University | D2 |
| Q. B. Chen | School of Physics, Peking University | D3 |

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| **RUNNING TIME:** | Beam tuning and DAQ setup | 1 days |
| | Data runs | 7 days |
| **BEAM LINE:** | | AVF : EN course |
| **BEAM REQUIREMENTS:** | Type of particle | $^{187}$Re or $^{7}$Li |
| | Beam energy | 1100 MeV ($^{187}$Re) or 45 MeV ($^{7}$Li) |
| | Beam intensity | $\leq$ 20 pnA ($^{7}$Li) or $\geq$ 0.5pnA ($^{187}$Re) |

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| **BUDGET:** | Enriched $^{187}$Re/ $^{9}$Be target | 200,000 yen |

**TITLE:**
**Search for chiral doublet structures in transitional nucleus $^{190}$Ir**

**SPOKESPERSON:** Yongde Fang, Eiji Ideguchi

## SUMMARY OF THE PROPOSAL

We propose an experiment with the availability of the CAGRA clover array to identify high-spin states in $^{190}$Ir, aiming at a search for chiral doublet bands in mass 190 region. The structure of nucleus $^{190}$Ir is of considerable interest because it fall in the transitional region where static and dynamic effects due to the traxial degree of freedom are expected to be important. Calculations based on a combination of the constrained triaxial RMF theory and the TPRM predicted that the $\pi h_{9/2} \otimes \nu i^{-1}_{13/2}$ configuration expected in $^{190}$Ir could be a very good candidate to form chiral doublet bands. For odd-A $^{187-193}$Ir isotopes, a prolate to triaxial shape transition has been suggested in a recent paper. Thus the experimental observation of chiral bands in $^{190}$Ir could provide a strong evidence for nuclear triaxiality. The goal of this proposal is to search the possibility of chiral bands in $^{190}$Ir nucleus. The results would also be valuable in understanding the static and dynamic effects on nuclei due to the triaxial degree of freedom.

Little information exists in the literature concerning the structure of the $^{190}$Ir nucleus due to it close to the line of stability. In 2013, a test experiment was performed at CIAE in BeiJing using the $^{7}$Li+$^{186}$W reaction at beam energy of 42 MeV. However, due to its low cross section of $^{186}$W($^{7}$Li,3n)$^{190}$Ir channel, only a few transitions have been identified. In this proposal we propose to use $^{9}$Be($^{187}$Re,$\alpha$2n) or $^{186}$W($^{7}$Li,3n) reaction to populate high-spin states in $^{190}$Ir. Excited states in $^{190}$Ir will be identified by measuring the $\gamma$ rays de-exciting populated levels with the CAGRA clover array. A $4\pi$ Si-Ball detector array will be used to detect the charged particles to produce a clean trigger of reaction products.