

Level Structure of ^{69}Ga

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presented by

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the doubly-magic ($Z, N = 28$) ^{56}Ni core & around

first (lowest) closure emerging from inclusion of l.s coupling
in the shell model Hamiltonian

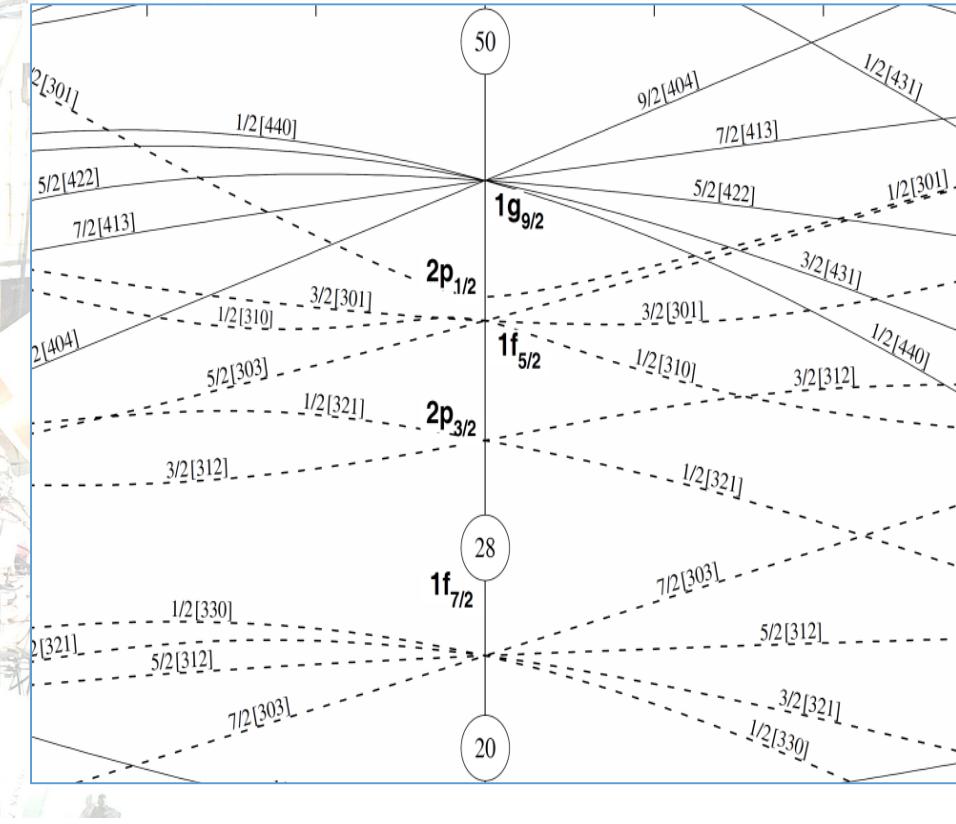
testing grounds for shell
model calculations

evolution of shell closure

observation of core-broken
states

development of collectivity

other excitation phenomena
(shears mechanism)



very recent studies on Mn ($Z = 25$), Fe ($Z = 26$), Co ($Z = 27$),
Ni ($Z = 28$), Cu ($Z = 29$), Zn ($Z = 30$)

[UNC/TUNL, FSU, Peking, VECC, VB, IUAC, UGC-DAE CSR ...]

Spectroscopy around the Doubly Magic ^{56}Ni Core @ UGC-DAE CSR, Kolkata Centre

experiment at TIFR using $^7\text{Li} + ^{59}\text{Co}$ @ $E_{\text{lab.}} = 22-24 \text{ MeV}$;
11 Compton suppressed HPGe clover detector;
5.2 mg/cm² ^{59}Co (mono-isotopic) target on 4 mg/cm² Ta

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Single-particle excitations in the level structure of ^{64}Cu

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PHYSICAL REVIEW C **99**, 014315 (2019)

Single particle configurations in ^{61}Ni

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Single-particle configurations of low- and medium-spin states in ^{63}Cu

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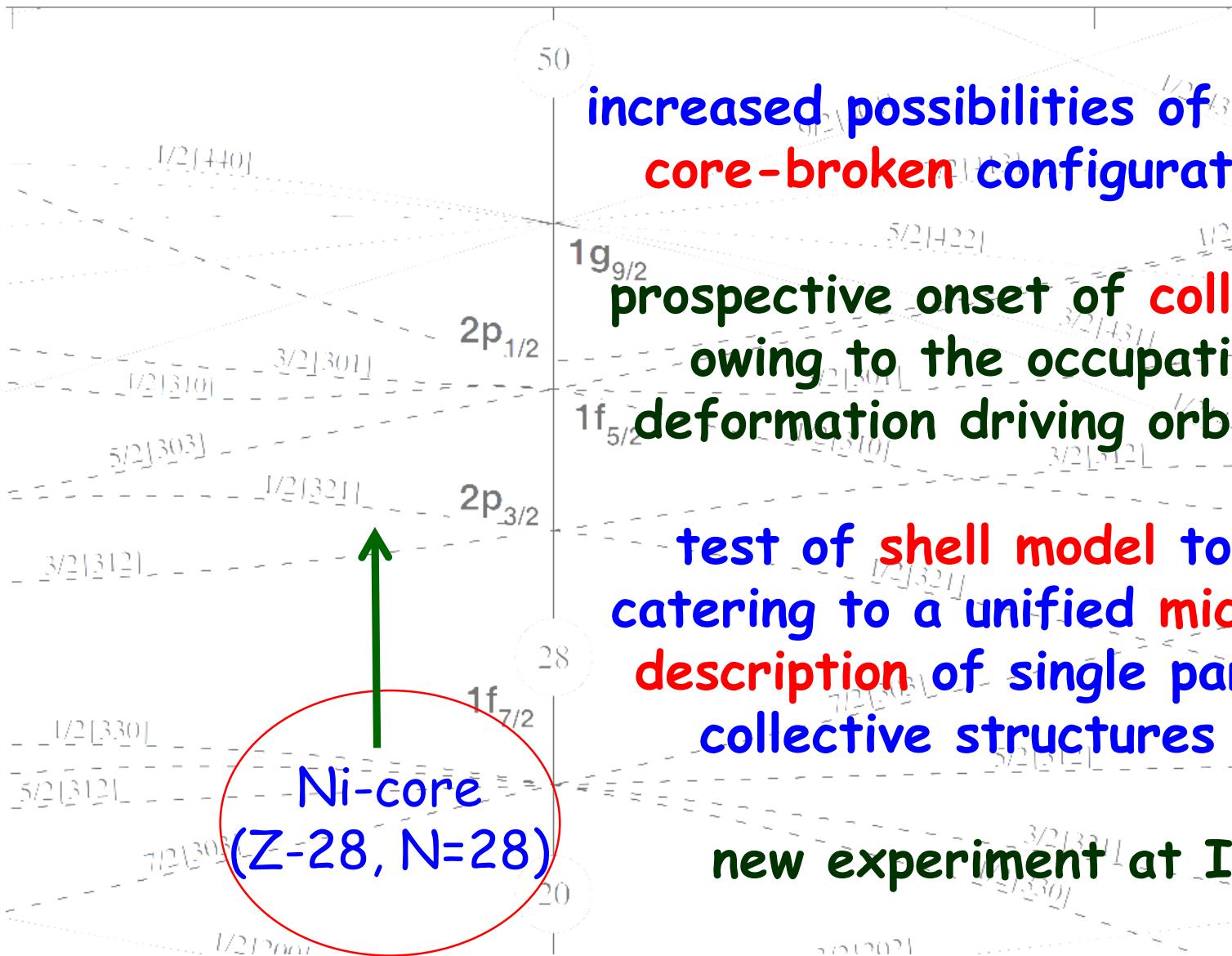
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new transitions; interpretation from large basis shell model calculations with fpg model space; $f_{7/2}$ excited configurations probed for ^{63}Cu ; identification of $g_{9/2}$ occupancy without any evidence of collectivity higher excitations, heavier systems ?

Nuclei with Few Nucleons Outside ^{56}Ni Core



increased possibilities of observing
core-broken configurations

prospective onset of collectivity,
owing to the occupation of
deformation driving orbitals

test of shell model towards
catering to a unified microscopic
description of single particle &
collective structures

new experiment at IUAC

our experiment at INGA @ IUAC

$^{59}\text{Co}(^{13}\text{C},xnypz\alpha)\text{As,Ge,Ga}$ @ $E_{\text{lab.}} = 45, 50 \text{ MeV}$
[$V_B \sim 23 \text{ MeV}$]

target $\sim 5.2 \text{ mg/cm}^2$ (99%) thick ^{59}Co on 4 mg/cm^2 Ta backing
(fabricated at TIFR target laboratory)

beam energy optimized following an excitation function measurement;

INGA consisting of 16 Compton suppressed Clover detectors
 $148^\circ, 123^\circ, 90^\circ, 57^\circ, 32^\circ$

triggered at ≥ 2 -fold multiplicity
events rate $\sim 5\text{-}6 \text{ kHz}$.

data sorted using LAMPS (BARC) & SPRINGZ (developed at UGC-DAE CSR, KC) & analyzed using CUBIX, RADWARE

Literature on ^{69}Ga

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Excited states in ^{69}Ga

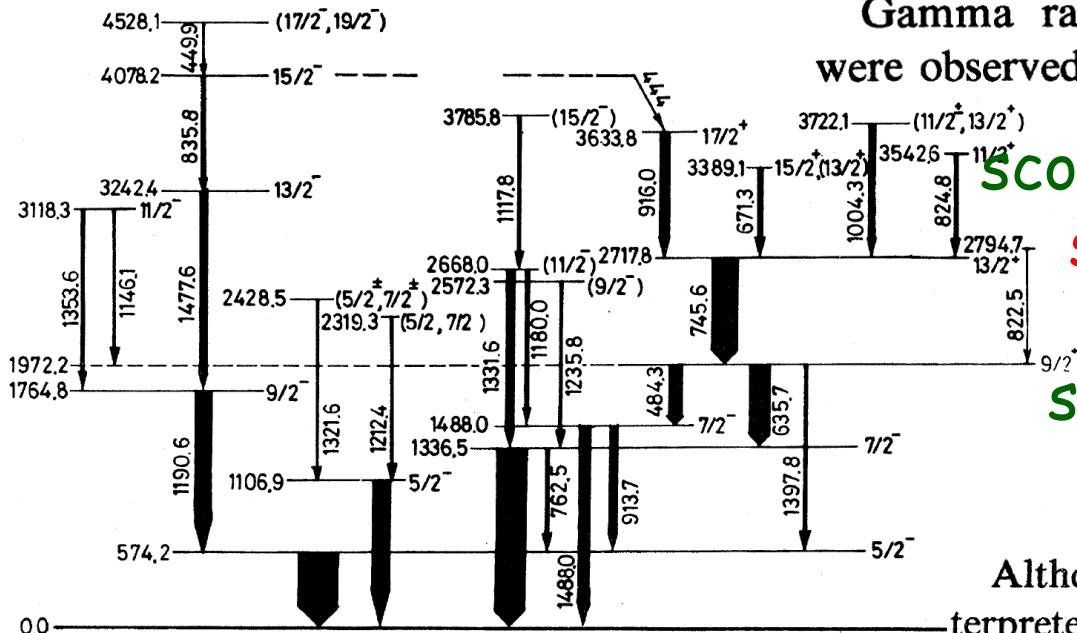
P. Bakoyeorgos and T. Paradellis

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P. A. Assimakopoulos

The University of Ioannina, Ioannina, Greece

Gamma rays resulting from the bombardment were observed with the aid of two Ge(Li) detectors



shell model interpretation

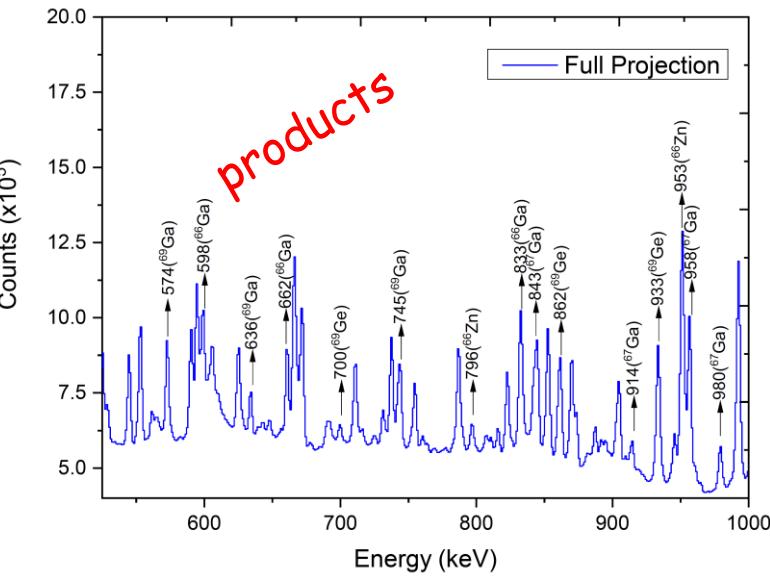
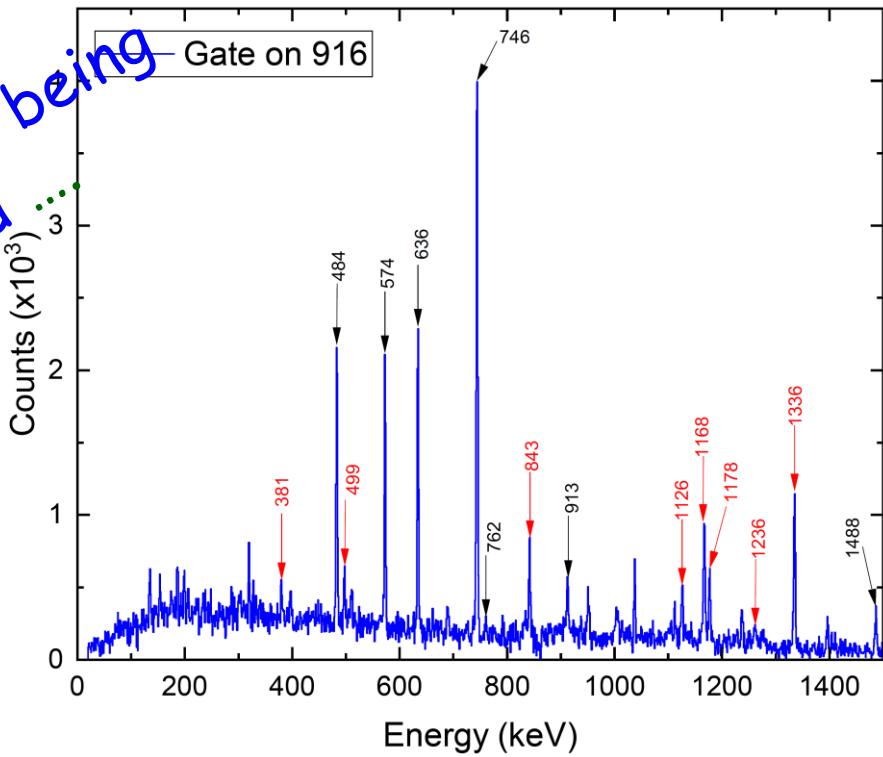
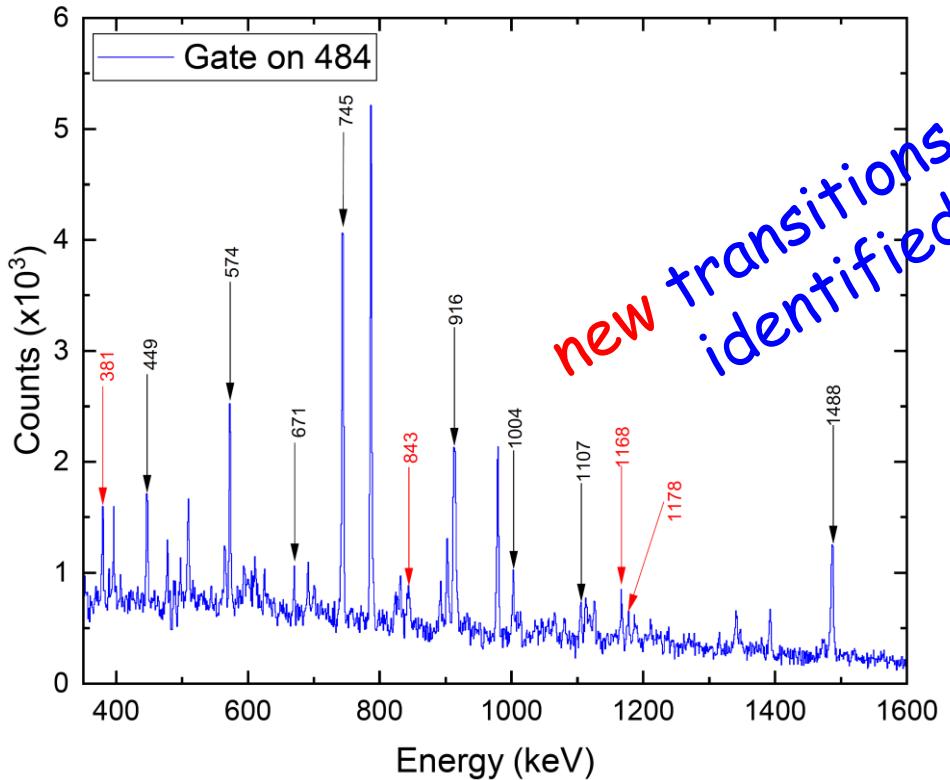
Although the gross structure of ^{69}Ga may be interpreted in terms of particle-core coupling of the form $\{g_{9/2} \times J\}_{I+}$ and $\{f_{5/2} \times J\}_{I-}$ with $J = 0^+, 2^+, 4^+, 6^+$, the energy separation between successive levels is not consistent with the expected values.

scope of expanding the level scheme, following high resolution gamma-ray spectroscopy with large detector array

Data Analysis

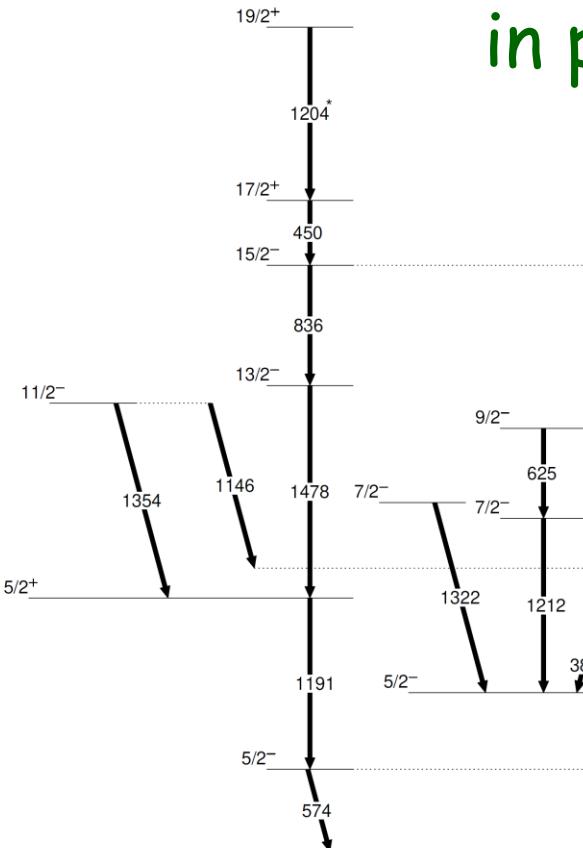
standard practices of gamma-ray spectroscopy based on coincidence measurements

gamma-gamma symmetric & asymmetric matrices for extracting the level structure information



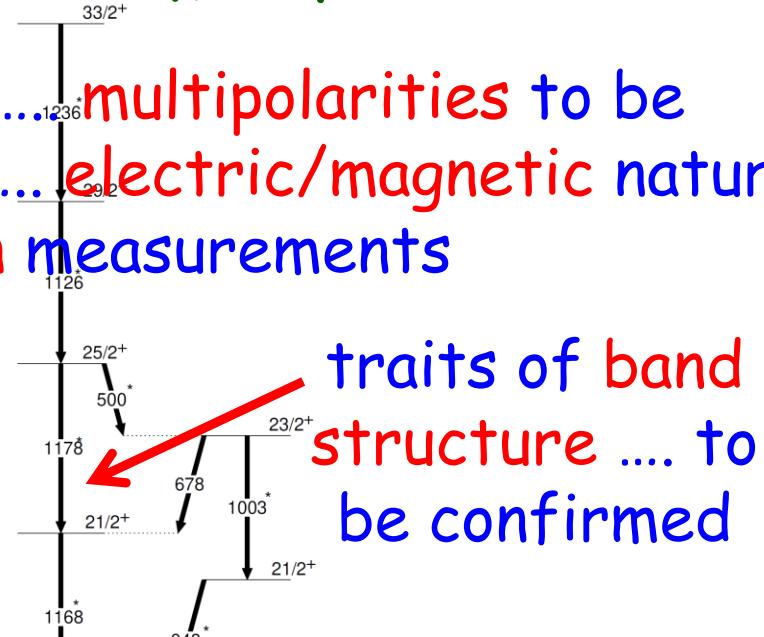
Updated Excitation Scheme of ^{69}Ga

new transitions being added multipolarities to be extracted from the R_{DCO} values electric/magnetic nature from the polarization measurements



in progress

thank you very much



traits of band structure to be confirmed

to be interpreted in the shell model framework ... model space outside Ni-core