## AGENCY/DEPARTMENT: DEPARTMENT OF INDUSTRY, INNOVATION AND SCIENCE

TOPIC: Australian Astronomical Observatory instrumentation program

**REFERENCE:** Written Question – Senator Carr

## QUESTION No.: BI-100

- 1. What is AAO's astronomical instrumentation program?
- 2. Where is the program based?
- 3. What are its capabilities?
- 4. Does the AAO earn any external revenue? If so, how much?

## ANSWER

- 1. The AAO conducts a coherent program of in-house capability development, research and development of new technologies for optical astronomy, as well as scoping, design, prototyping, testing, contracted construction and commissioning of new or upgraded instrumentation for the Anglo-Australian Telescope and for overseas observatory clients.
- 2. The AAO instrumentation program is based at the AAO headquarters, North Ryde in Sydney.
- 3. The AAO is regarded as an international leader in the field of astronomical instrumentation. The AAO has signature capabilities in fibre optic robotic positioning systems, fibre optic light dispersion systems, and optical and infrared spectrographs.

Particular AAO technical capabilities in their instrumentation program include translating science cases from astronomers, scoping instrumentation specifications, engineering drafting, solid modelling and analysis using ANSYS / NASTRAN (Finite Element Analysis package) and ZEMAX (optical modelling and analysis package); fibre optics splicing and connecting; optical alignment, advanced manufacturing capabilities using Computer Numerical Control machines, three-dimensional printing; and precision metrology.

Innovative enabling technologies developed by AAO for robotic fibre positioning include its 2dF (X-Y table) positioner, Starbugs and Echidna systems. Each has its own set of benefits and applications, especially in efficient spectrographs that can split the light from multiple sources in the night sky simultaneously into their visible and infrared wavelengths for detailed analysis.

Photonics technologies being developed by the AAO in conjunction with Macquarie and Sydney Universities are expected to have further applications, such as in infrared imaging systems and remote sensing.

The AAO has considerable potential to contribute to the National Science and Research Priorities such as advanced manufacturing, medical applications and big data through appropriate exploitation beyond astronomy of the technologies it develops. 4. AAO receives external revenue from Astronomy Australia Ltd (AAL), Australian universities and international astronomy organisations.

Instrument development for and construction contracts with international observatories have included Subaru Observatory (Hawaii), Keck Telescopes (Hawaii), Gemini Observatory (Hawaii and Chile) the Giant Magellan Telescope project (Chile) and the European Southern Observatory (ESO) (Chile).

External revenue earned by AAO is as follows:

Year	AAO external revenue
2012-13	\$2,237,186
2013-14	\$2,949,620
2014-15	\$3,646,167
2015-16	\$6,113,673
2016-17	\$3,865,841