VESPA report to Spectroscopy STAP

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Adrien Perrichon, on behalf of the VESPA team

VESPA team

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Transfers of Scope and Procurement & Updated Timeline

The transfers of procurement of all civil engineering (cave, hutch, sample preparation area, etc), of the beryllium filter, and of the analyser backplates, has now been formalised and is pending signature of all parties. The scope transfer of the analyser coating (to be undertaken by the ESS chopper group) is also ready to be signed.

Due to the custom dimensions of the helium tubes for VESPA (∅ 6 mm), the total lead and manufacturing time is expected to be 9 months. Together with the extended duration of the tender process at INFN (9 expected, 15 months and counting for the guide), the TG5 is pushed from March 2029 to May 2029. To recover these two months and prevent further delays, discussions are ongoing between CNR, INFN and ESS to transfer the procurement of the detector tubes, as well as of the remaining tenders (second batch of HOPG crystals, cryostat if not available via direct procurement).

Overview of recent activities

- Supermirror guide. The tender has been awarded to Swiss Neutronics in January. Several administrative difficulties have been delaying the contract signature and thus the start of the work. This delay is not yet affecting the project timeline.

- Heavy shutter. The design has been completed and the CTV is passed. The procurement via tenders of the heavy shutter detailed design and manufacture have started.

- Cave & other civil constructions. As the preliminary design of the secondary spectrometer was finalised, and with it the space reservation for its translation and maintenance, a concept layout of the cave was produced in December 2025 based on coarse analytical estimations for the wall thicknesses to ensure radiological safety. With the help of Amalia Chambon (DTU), neutronics calculations were performed to validate the wall thicknesses and iterate the cave design. The preliminary results were sufficient to produce a preliminary design of the cave. The CTV of the cave is ongoing, and the procurement is expected to start at ESS in April. Enough room was left in the design so that additional radiological shielding could be added if found necessary in the finalised neutronics simulations.

- Secondary spectrometer. The preliminary design of the secondary spectrometer was completed in December, and the PDR was passed in January. Since then, work has focused on the design of the background shielding of the secondary spectrometer, prototyping of the analyser coating, and additional preliminary designs not included in the review of the core components (detector electronics, cabling, vacuum system for the beryllium filter, etc). Additionally, technical specifications for the beryllium filter, the cryostat and the detector tubes are in preparation, with the procurements expected to start shortly.

Prototyping

- HOPG crystals. Upcoming measurements of the 1500 Optigraph crystals in May at ISIS on IMAT, with the purpose of excluding outliers and secure enough crystal to build the full-scale prototype (module 0) of the analyser bank. Additionally, 100 crystals from Momentive will be purchased shortly to test the reliability of their manufacturing process.

- Analyser coating. Several small prototypes have been measured on MARI in February. The issue with the uneven thickness control has now been sorted, and the coating shows improved performance, yet not at a satisfactory level (see Fig. 1). While the amount of material and resource can now be estimated (i.e. moving forward with transfer of scope), additional processing steps to remove the uppermost layers of the surface are required. Furthermore, the trap pattern of the analyser backplate could be further optimised. Additional samples will be produced after the summer, to be tested in Q4 2026.

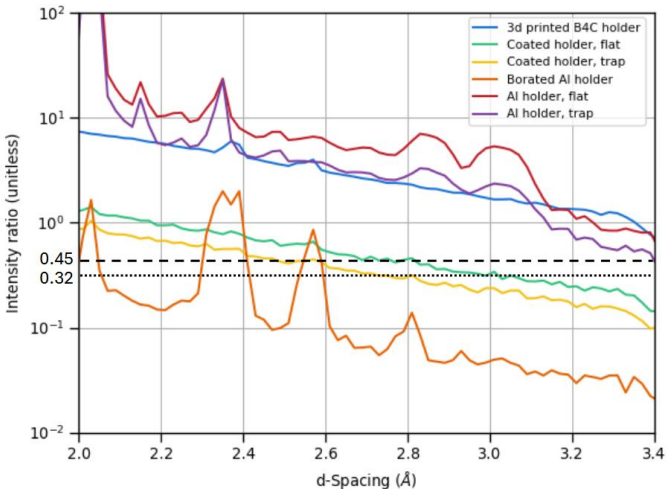

Figure 1. White beam measurements of several prototype analysers on MARI. The intensities are normalised by the HOPG background baseline. The contribution of the holder should be less than 10% of that of the crystal, i.e. be less than 0.45 for d-spacing >2 Å (illustrated by the dashed line). The best performing analyser is currently the coated one with trap patterns (yellow), yet which has insufficient performance in the range 2.0-2.8 Å.

Rescoping

Over the next few months, as the procurement of the 3He tubes, beryllium filter, and second batch of crystals are awarded, the exact cost to complete the spectroscopy modules will be known. The strategy proposed by the VESPA team is to purchase in bulk via tender the crystals, 3He tubes, and filters to minimise the overall price of the rescoping. Additional expenses can be broken in direct procurements to known/local suppliers or be handled in house. The actual assembly of the modules at ESS can be sorted out later once resources are available (from 2027, as the other instruments are completed). This way the cost can be minimised, and the rescoping will have no impact on the completion of the day 1 scope of VESPA and the other instruments.