



MAGIS-100 Camera Schedule

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Schedule overview

Quarterly overview of baseline schedule for Fermilab activities (anticipated after Aug 2021 BCR):

| | | | | Accelerator Shutdown | n | | | Accelerator Shutdown | 1 | | | | |
|--------------|------------|--------------|---------------|----------------------|--------------------|--------------------|--------------------|----------------------|------------|---------------|--|--|--|
| FY20 | FY21 | | | (technicians scarce) | FY22 | | | (technicians scarce) | FY23 | | | | |
| July-Sept 20 | Oct-Dec 20 | Jan-March 21 | April-June 21 | July-Sept 21 | Oct-Dec 21 | Jan-March 22 | April-June 22 | July-Sept 22 | Oct-Dec 22 | Jan-March 23 | | | |
| | | | | | | | | | | Shaft Phase 1 | | | |
| Design | | | | Design/Procure | | | Modular Assembl | Installation | | | | | |
| | | | | | | Civil Construction | - | | | Shaft Phase 2 | | | |
| | | | | Civil Construction | contracts prepared | Laser Room | Civil Construction | - Shaft | | Installation | | | |
| | | | | | | | Laser Installation | | | | | | |

Baseline schedule anticipated after August 2021 baseline change request.



Camera schedule

| Act | tivity | D | Activity Name | Start | Finish |
|-----|--------|---------------|--|-------------|-----------|
| 6 | - | MAGIS100-WS-2 | 109.08 Camera System | 02-Jan-19 A | 19-Sep-22 |
| | - | MAGIS100-WS | S-2109.08.01 Science cameras | 01-Sep-20 A | 16-Aug-22 |
| | | A1501010 | Science camera design | 01-Sep-20 A | 01-Nov-21 |
| | | A1501020 | Science camera procurement | 02-Nov-21 | 08-Feb-22 |
| | | A1501030 | Science camera qualification | 09-Feb-22 | 16-Aug-22 |
| | - | MAGIS100-WS | S-2109.08.02 Diagnostic Cameras | 02-Jan-19 A | 16-Sep-22 |
| | | A1502010 | Diagnostic camera design | 02-Jan-19 A | 15-Oct-21 |
| | | A1502020 | Diagnostic camera procurement | 18-0ct-21 | 13-Dec-21 |
| | | A1502030 | Diagnostic camera qualification | 14-Dec-21 | 16-Sep-22 |
| | - | MAGIS100-WS | S-2109.08.03 Equipment transport | 19-Sep-22 | 19-Sep-22 |
| | | A1503020 | Diagnostic cameras shipped - milestone | 19-Sep-22 | |

Schedule from September 2021.

Science cameras are sent to Stanford for integration into atom source connection nodes. Diagnostic cameras are sent directly to Fermilab for installation in modular connection nodes.

Original date for science camera procurement is next week – more time may be acceptable as shown in the following slides.

‡ Fermilab

Connection Node schedule

| ctivity | y I | D | Activity Name | Start | Finish 🗸 | |
|---------|-----|---------------|---|-------------|-------------|---------------------|
| - | 1 | MAGIS100-WS-2 | 109.05 Connection Node | 01-Oct-19 A | 04-Oct-22 | |
| E | - | MAGIS100-WS | S-2109.05.01 Prototype | 01-Oct-19 A | 06-Jun-22 | |
| | | A0501010 | Connection Node Prototype Design | 01-Oct-19 A | 30-Jul-21 A | |
| | | A0501020 | Connection Node Prototype Procurement | 02-Aug-21 | 01-Dec-21 | |
| | | A0501030 | Assembly 30% complete - milestone | | 04-Feb-22 | |
| | | A0501040 | Assembly 60% complete - milestone | | 05-Apr-22 | |
| | ľ | A0501000 | Connection Node Prototype Assembly Progress (monthly report | 02-Dec-21 | 06-Jun-22 | |
| | | A0501050 | Assembly 100% complete - milestone | | 06-Jun-22 | |
| E | - | MAGIS100-WS | S-2109.05.02 Lattice and in-vacuum optics | 06-Feb-20 A | 08-Jul-22 | |
| | ſ | A1802320 | Lattice and In-vacuum optics design complete | | 01-Nov-21 | |
| | | A0502010 | Lattice and in-vacuum optics Design | 06-Feb-20 A | 01-Nov-21 | |
| | | A0502020 | Lattice and in-vacuum optics Procurement | 09-Nov-21 | 11-Jan-22 | |
| | | A0502030 | Lattice and in-vacuum optics Assembly | 12-Jan-22 | 08-Jul-22 | |
| E | - | MAGIS100-WS | S-2109.05.03 Cameras system Integration | 17-Aug-22 | 16-Sep-22 | |
| | | A0503030 | Align cameras in connection node enclosure | 17-Aug-22 | 16-Sep-22 | |
| E | | MAGIS100-WS | S-2109.05.04 Correction coils for gaps at atom sources | 02-Oct-19 A | 09-Aug-22 | |
| | | A0504010 | Correction coils for gaps at atom sources - Design | 02-Oct-19 A | 01-Nov-21 | |
| | | A0504020 | Correction coils for gaps at atom sources - Procurement | 02-Nov-21 | 01-Dec-21 | |
| | | A0504030 | Correction coils for gaps at atom sources - Assembly | 11-Jul-22 | 09-Aug-22 | |
| E | - | MAGIS100-WS | S-2109.05.05 Enclosure | 01-Oct-19 A | 07-Dec-21 | |
| | | A1802140 | Connection Node Enclosure design complete | | 29-Oct-21 | |
| | | A0505010 | Enclosure Design | 01-Oct-19 A | 29-Oct-21 | |
| | | A0505020 | Enclosure Procurement | 03-Nov-21 | 07-Dec-21 | |
| E | - | MAGIS100-WS | S-2109.05.06 Connection node integration | 17-Aug-22 | 15-Sep-22 | |
| | | A0506030 | Connection node 3 integration | 17-Aug-22 | 15-Sep-22 | |
| | | A0506020 | Connection node 2 integration | 17-Aug-22 | 15-Sep-22 | |
| | | A0506010 | Connection node 1 integration | 17-Aug-22 | 15-Sep-22 | N |
| E | | MAGIS100-WS | S-2109.05.07 Qualification | 19-Sep-22 | 03-Oct-22 | $\langle \ \rangle$ |
| | | A0507030 | Connection node 3 qualification | 19-Sep-22 | 03-Oct-22 | |
| | | A0507020 | Connection node 2 qualification | 19-Sep-22 | 03-Oct-22 | |
| | | A0507010 | Connection node 1 qualification | 19-Sep-22 | 03-Oct-22 | |
| E | | MAGIS100-WS | S-2109.05.08 Equipment transport | 04-Oct-22 | 04-Oct-22 | |
| | | A0508010 | Connection node 1 shipped - milestone | 04-Oct-22 | | |
| | | A0508020 | Connection node 2 shipped - milestone | 04-Oct-22 | | |
| | | A0508030 | Connection node 3 shipped - milestone | 04-Oct-22 | | |

Schedule from September 2021.

Science cameras are integrated into atom source connection nodes before being shipped to Fermilab.



Schedule delays indicate more time

Mid-level view of MAGIS-100 schedule (September 2021):

| | | | | | | | | | Accelerato | r Shutdown (te | echnicians scare | ce) | | | | | | | |
|--|--------------|-------------|------------|------------|-----------------|--------|----------------------------|------------------------------|------------|----------------|------------------|--------|--------------|--------|---------|-----------------|-----------------|----------------|----------|
| Oct-21 | Nov-21 | Dec-21 | Jan-22 | Feb-22 | Mar-22 | Apr-22 | May-22 | Jun-22 | Jul-22 | Aug-22 | Sep-22 | Oct-22 | Nov-22 | Dec-22 | Jan-23 | Feb-23 | Mar-23 | Apr-23 | May-23 |
| | | | | | | | | | | | | | | | | | | | С |
| Atom Source Design/Procurement Atom Source Assembly/Qu | | | | | | | | | | | | | | | | Atom Source | es Prep/Install | Install Fibers | o |
| | | | | | | | Install Science Cameras at | | | | | | | | | | м | | |
| Connection | Node Design/ | Procurement | Connection | Node Assem | bly/Qualificati | on | | | | St | anford | | | | | | | | м |
| | | | | | | | | | | | | | Sections and | | 1 | | | | |
| Vacuum Tube Procurement/Processing | | | | | | | | Assembly of Modular Sections | | | | | | | | n Nodes Install | | s | |
| | | | | | | | | | | | | | | | Install | s | | | |
| Magnetic Systems Design/Procurement | | | | | | | | | Couplers | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 0 |

Schedule from September 2021.

The schedule is always shifting, so the gap may disappear or be needed for other purposes. Any proposed delay for science camera delivery to Stanford must be approved. NING START

Complete Schedule View Mid-level map view of MAGIS-100 schedule (September 2021):

| | | Accelerator Shutdown (technicians scarce) | | | | | | | | | | | | | | | | | | |
|---------------|---|---|----------------------|----------------|---------------|-----------------|---------------|--------------|---------------|----------------------------|----------------|---------------|-----------------|---------|---------|--------|-----------|-------------------|--------------------|--------|
| WBS levels | Oct-21 | Nov-21 | Dec-21 | Jan-22 | Feb-22 | Mar-22 | Apr-22 | May-22 | Jun-22 | Jul-22 | Aug-22 | Sep-22 | Oct-22 | Nov-22 | Dec-22 | Jan-23 | Feb-23 | Mar-23 | Apr-23 | May-23 |
| 2, 16, 17 | Atom Source | Design/Proce | ure | Atom Sourc | e Assembly/C | ualification | | | | | | | | | | | Atom Sour | rces Prep/Install | Install Fibers | C o |
| F 0 1C 17 | Comparties N | ada Dasian // | | Composition | N | | | | | | ice Cameras at | | | | | | | | м | |
| 5, 8, 16, 17 | Connection Node Design/Procure Connection Node Assembly/Qualification Science | | | | | | | | | | Sta | anford | | | | | - | | | м |
| 8, 16, 17 | Cameras Design Procure Science Camera Qualification | | | | | | | | | | To Stanford | | | | | | | | | s |
| 12 16 17 | | | | | | | | | | | | | | | | | | | | S |
| 12, 16, 17 | Assembly Fix | Procure | | | | | | | | | - 1 | | | | | | | | | |
| 9, 12, 16, 17 | Vacuum Tube | Procure/Fin | al Chamber De | esign/Processi | ng | | | | | | | | | | | 0 | | | | |
| 0 12 16 17 | Vacuum Syste | ame Design | Procure | | | | | | | | | | | | | N | | | | |
| 9, 12, 16, 17 | | ents Design | Procure | | | | | | | 1 | | Assembly of M | iouular Section | 115 | | | | | Install | N |
| 6, 16, 17 | Magnetic Sys | | | | | Procure | | | | Couplers | | | | | | | | | | |
| 10, 16, 17 | DAQ for Modular Assembly Sensors Procure DAQ Sensors Qualification | | | | | | | | | | | | | | | | | | s | |
| 10, 10, 17 | | | | | | | | | | | | | | | | | | | т | |
| 11, 16, 17 | Modular Infra | structure De | sign | | Procure | | | | | | | | 1 | | | | | | Lundon II | A |
| 8, 16, 17 | Diagnostic Ca | meras Desig | n/Procure | Diagnostic (| Camera Qualif | ication | | | | | | | | | | | Modula | r Sections and | Install Cameras | R |
| | | Diagnostic Cameras Design/Procure Diagnostic Camera Qualification | | | | | | | | | | | | | | | Connectio | on Nodes Install | Install | s |
| 7, 16, 17 | Retroreflectiv | e Mirror Pro | curement | Retroreflect | ive Mirror As | sembly/Qualifi | cation | - | | | | | | | | | - | | Mirror | - |
| 11, 16, 17 | Secondary Cra | ane Design | Procure | | | | Install Crane | | | | | | | | | | | | | |
| | | | | | | | | | Assembly/ | | | | | | | | | | | |
| 12, 16, 17 | Installation F | ixture Design | 1 | | | Procure | | | Qualification | | | | | | | | - | | | - |
| 11, 16, 17 | Connections t | o Walls of Sl | naft Designs (F | FESS) | Civil Constru | uction Bid Proc | ess | | | | | | | | | | | | | |
| | | | Designs to | | | | | | | | | | | | | | | | | |
| 11, 16, 17 | Adjustable Su Platform Stat | | BESS ↑ Designs to | Procure | | | | | | | | | | | | | - | | | - |
| 11, 16, 17 | Design | | FESS ↑ | Procure | | | | | | Install Structural Systems | | | | | | | | | | |
| 11 16 17 | Mobile Work | Platform | Designs to | | | | | | | | | | | | | | | | | |
| 11, 16, 17 | Design | | FESS ↑ | Procure | | | | | | | | | | Install | | | - | | | - |
| 12, 16, 17 | Electrical Des | igns* | _ | | Procure | | | | | | | | - | Cables | | | | | | |
| 10, 16, 17 | DAQ Computing | Brocuro | DAO and Er | ont End Desigr | Qualification | | | | | | | | | | | | | | Install DAQ | |
| 10, 10, 17 | Controls and | | DAQ and Th | one End Design | rquanneation | | Controls and | d Networking | Install | | | | | | | | | | | |
| 13, 16, 17 | Design | | Procure | | | | Qualit | fication | Controls | | | | | | | | | | | - |
| 3, 16, 17 | Interferomet | v Laser Syste | ems Assembly | /Qualification | | | | | | | | | | | | | | | | |
| -,, | Laser Room | | | | | | | | Laser | | | | | | | | | | | |
| 11, 16, 17 | Design Civil Construction Bid Process | | | | | | | System | | | | | | | | | | | - | |
| 12, 16, 17 | Compressed Air Design* Procure Laser Room Construction | | | | | | | | Installation | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 12, 16, 17 | Interlocks Final Design/Procure* | | | | | | | | LTS | | | | | | | | | | | |
| 11, 16, 17 | | | | | | | | | Assembly | LTS Install | | | | | | | | | | |
| | Frequency Co | mb System | | | | | | | | | | | | | Install | | | | | |
| 4, 16, 17 | Design/Procu Water | re | Frequency C | Lomb System A | Assembly/Inte | gration/Qualif | Ication | | | | | | | | Comb | | | | | |
| 12, 16, 17 | Design* | Procure | | | | Install Wate | r | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

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*BCR developing