



INDux Training Course Basic Level Modules 1 and 2

GENERAL INFORMATION ON TRAINING COURSE

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| GOALS | <ul style="list-style-type: none"> - Familiarization with the Rhodotron® and its main subsystems and improvement of the level of autonomy in its use. - Familiarization with the RF and cooling systems. |
| LOCATION | INDux center |
| PROGRAM | See table below |
| DURATION | 5 full days for each module |
| ATTENDANCE | 5 -8 persons |
| TRAINEE'S PRE-REQUIREMENT | The trainees should be fluent in English, having an adequate degree of experience and technical expertise corresponding to the responsibilities involved. |

Certificate of attendance will be issued to the trainees at the end of the training week.

BASIC 1

| MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY |
|--|---|--|---|--|
| RHODOTRON DISCOVERY | VACUUM SYSTEM | E-SOURCE CATHODE REPLACEMENT | POWER SUPPLIES BASIC | CATHODE REGENERATION |
| <ul style="list-style-type: none"> - The journey of electrons. - Identification of subsystems & components. - Use of mechanical tools, identification of materials, vacuum seals. - Rhodotron factory visit. | <ul style="list-style-type: none"> - Theory of vacuum, working principles, units and ranges. - Practical exercises: pumps replacement, leak detection, vacuum controller (TPG). | <ul style="list-style-type: none"> - Description of E-source subsystems components. - First introduction to the Rhodotron HMI (human machine interface) and to the use of an oscilloscope. - E-beam and X-ray theory. | <ul style="list-style-type: none"> - Identification of the main devices composing a power supply. - Discussion about the typical failures of these devices. - Identification of cables and assembly of connectors. | <ul style="list-style-type: none"> - E-source high voltage conditioning, reactivation. - E-source socket disassembly. - E-source beam tuning (simulator). |

BASIC 2

| MONDAY & TUESDAY | WEDNESDAY & THURSDAY | FRIDAY |
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| INTRODUCTION TO THE WORLD OF RADIO FREQUENCY AND TO DEIONIZED WATER | BEAM CURRENT MONITORING, RF CHAIN REGULATION (LOW-LEVEL RF RACK) AND FINAL POWER AMPLIFIER DISCOVERY (FPA) | DRIVER AMPLIFIER, DOCUMENTATION & TRAINING MODULE SUMMARY |
| <ul style="list-style-type: none"> - Transmission line, impedance matching, standing wave and use of the network analyzer. - Introduction to the Rhodotron RF chain, practical exercises on each amplifier in the chain (Pre-Driver, Driver and tetrode RF tube). - Testing the impact of the deionized water, replacement of the deionization bottle. - Preventive maintenance – general tasks. | <ul style="list-style-type: none"> - DCCT working principle & calibrations. - Introduction to the LLRF parameters and its regulation loops (voltage and frequency). - Disassembly of Final Power Amplifier, Kapton sheets replacement and High voltage tests. | <ul style="list-style-type: none"> - Driver tetrode replacement and Driver input tuning. - Wiring list and Bill of Material (BOM) usage. Introduction to troubleshooting. - Recap of Basic Modules 1 & 2. |