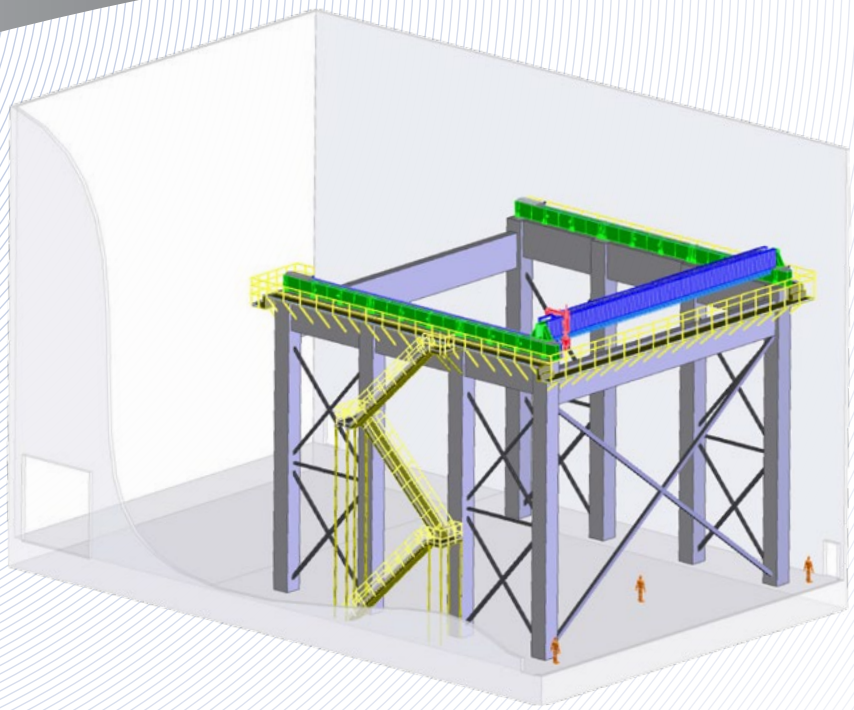

MI-815 Family of Horizontal Scanners

- Scan areas from 6 x 6 to 66 x 66 feet (1.8 x 1.8 to 20 x 20 meters)
- Precise and smooth closed loop servo drive system incorporating direct feedback encoders
- 1D and 3D precision laser-based enhanced accuracy options
- Up to 24 inches/second in Scan Axis
- Turn-key system solution for demanding antenna measurement applications
- Designed for a long service life

Description

The MI-815 Family of Horizontal Scanners is designed for general purpose antenna measurement applications requiring extremely high accuracy, fast measurement speed and a long service life. These scanners can be configured with a variety of standard options to improve accuracy, automation and simplify operation while balancing total system cost. MI-815 Family of Horizontal Scanners incorporates a next generation precision closed loop servo drive system and a highly engineered structure. A variety of laser-based enhanced accuracy options are also available to provide best in class performance.

Applications

Absolute position accuracy is critical to most measurement applications. The MI-815 Family of Horizontal Scanners is designed to make repeated measurements at critically accurate positions. A prime example is the position accuracy required for near-field antenna measurements. MI's horizontal scanners are useful when the antenna under test (AUT) is designed to be supported from below or cannot be mounted to face a vertical scanner. These antennas include planar phased arrays, space deployable satellite antennas and other antennas either too large to move during the test or otherwise sensitive to the gravity vector. Typically high-gain directional antennas with low sidelobes are tested in the planar near-field, and even the smallest position errors and uncertainties can quickly degrade measurement accuracies.

Specifications

MI-815-	6x6	10x10	20x20	26x20	30x30	66x66
Scan Area ft. (m)	6 x 6 (1.8 x 1.8)	10 x 10 (3 x 3)	20 x 20 (6.1 x 6.1)	26 x 20 (7.9 x 6.1)	30 x 30 (9.1 x 9.1)	66 x 66 (20.1 x 20.1)
Standard Scan Plane Height [1] ft. (m)	4.1 (1.25)	8.2 (2.5)	18 (5.5)	18 (5.5)	26.25 (8)	65.62 (20)
Recommended Frequency Range (GHz)*						
Low	2.2	.96	.75	.75	.49	.2
High	110	60	40	40	40	40
Planarity						
Native Accuracy [2] in. rms (mm rms)	.002 (.05)	.003 (.08)	.004 (.10)	.004 (.10)	.004 (.10)	.008 (.20)
Enhanced Accuracy in. rms (mm rms)	.001 (.025)	.001 (.025)	.002 (.05)	.002 (.05)	.002 (.05)	.002 (.05)
Accuracy						
X-Axis [2] in. rms (mm rms)	.002 (.05)	.002 (.05)	.003 (.07)	.003 (.07)	.004 (.10)	.007 (.17)
Y-Axis [2] in. rms (mm rms)	.002 (.05)	.002 (.05)	.003 (.07)	.003 (.07)	.004 (.10)	.007 (.17)
Z-Axis ± in./ft.	.001	.001	.001	.001	.001	.001
Roll Axis (deg)	.03°	.03°	.03°	.03°	.03°	.03°
Scan Speed						
X in/sec (cm/sec)	10 (25.4)	10 (25.4)	10 (25.4)	10 (25.4)	10 (25.4)	10 (25.4)
Y in/sec (cm/sec)	10 (25.4)	10 (25.4)	24 (61)	24 (61)	24 (61)	24 (61)
Max Z-Axis Travel in. (cm)	12 (30.5)	24 (61)	24 (61)	40 (101.6)	40 (101.6)	40 (101.6)
Roll Axis Travel						
Motorized [3]	Continuous with rotary joint					
Motorized Roll Capacity	Standard: 40 lbs (18.1 kg)	Standard: 40 lbs (18.1 kg)	High: 180 lbs (27.2 kg)	High: 180 lbs (27.2 kg)	High: 180 lbs (27.2 kg)	High: 180 lbs (27.2 kg)
Outline Dimensions						
Height ft. (m)	12.5 (3.81)	16.67 (5.08)	26.75 (8.15)	26.75 (8.15)	35.08 (10.69)	79.42 (24.21)
Width (x) ft. (m)	14.82 (4.52)	16.82 (5.13)	26.82 (8.17)	32.82 (10)	40.82 (12.44)	79.42 (24.21)
Depth (y) ft. (m)	14.87 (4.53)	18.81 (5.73)	28.81 (8.78)	28.81 (8.78)	33.81 (10.31)	80.17 (24.43)

* Consult factory for customizing the scanner for operation above and below the recommended frequency range

[1] Scan plane height can be customized to suit customer's specific needs

[2] Temperature variation ±2° F and standard scan plane height

[3] Limit switches available

System Description

MI Technologies' Horizontal Planar Near-Field systems are based on the MI-350 Advanced Microwave Measurement System and is comprised of the following:

Data Acquisition, Control and Analysis

- MI-3001 Data Acquisition and Analysis Workstation
- MI-3000 Arena™ software
- MI-3044 Planar Near-Field Analysis software
- MI-788 Networked Acquisition Controller (manages real-time instrument control (handshaking, etc) during data acquisition, as well as to provide a 16-bit output to the CFE beam steering controller)

RF

The RF subsystem is based on the MI-750 Microwave Receiver, MI-3120 Family of Synthesized Signal Sources and MI-3340 Family of Mixers. The MI-750 is capable of acquiring 4,000,000 samples per second and equipped with advanced DSP algorithms offering a choice of several digital filter types. The MI-3120 Signal Sources provide a fast, accurate and economical signal generation solution.

Position Control

Precise motion positioning is achieved through high efficiency brushless servo motors and the MI-710C Integrated Position Controller. Position feedback is provided to the MI-710C in real-time for each axis by high accuracy encoders.

During an acquisition, the controller triggers the MI-788 to collect receiver data. The controller will monitor the changing scan axis position data and output a TTL compatible pulse at each specified point on the scan plane. The MI-710C sends control commands to its power amplifier. The power amplifier is the source of energy that moves the scanner axes.

The MI-710C provides the servo amplifier drive capability needed to accurately control the positioning system for the planar scanner. It is capable of driving low, medium, and high power motors up to 5 HP. It reads velocity and position feedback and closes a velocity control loop.

Enhanced Accuracy Options

MI's planar scanners can be configured with MI's Motion Control and Laser Technology to achieve even higher levels of measurement accuracy. MI offers two versions of Laser-Based Calibration Systems. Each version can be used to characterize and compensate for errors that are repeatable over a short time span. The compensation in each version is determined as a combination of an off-line calibration procedure prior to measurement and several real-time updates to that calibration during the measurement. The motion of the near-field probe is compensated in real time to follow the predicted path that will minimize position errors.

Characteristics that distinguish between the two versions are listed below:

1D Laser-Based Calibration System

- Precision Spinning Laser and one or more laser targets
- Z-axis error compensation relative to the laser plane
- Automatically generates and applies Z correction profile
- Laser updates performed every (1D) scan using data from previous scan
- Provides separate compensation for thermal RF drift
- Achieves planarity accuracy of 0.02 mm RMS (typical)

3D Laser-Based Calibration System

- Tracking Laser and multiple Spherically Mounted Retroreflectors
- 3D volumetric positioning and motion error compensation (X, Y and Z) relative to reference coordinate system
- Thermal Growth Compensation
  - » Maintains a constant scan plane relative to the antenna under test (AUT) height
    - Recognizes that AUT Z will also be changing during acquisition
  - » Measures and compensates growth along X and Y axes
  - » Thermal expansion of the floor itself is also addressed
- Automatically generates and applies X, Y, & Z correction profiles
  - » AUT Z measured periodically during acquisition
- Laser updates performed at user-specified rate (every Nth scan)
  - » Also just before each thermal drift measurement
- Accuracies in X, Y, and Z of 0.05 mm RMS (typical)

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