Case Study:

Solar-Level Irradiance Tunable Spectrum
Collimated Projector System

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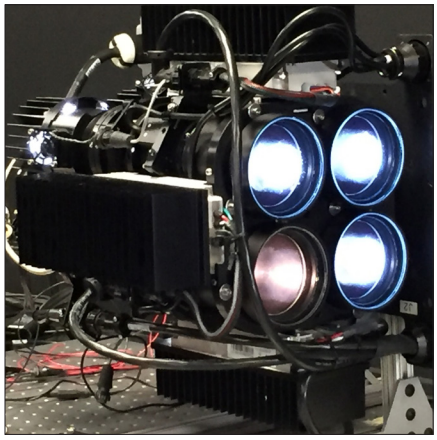

Technical Situation

Institute of Remote Sensing and Digital Earth (RADI) in Beijing China (http://english.radi.cas.cn/) is looking to create the world's largest BRDF instrument with an arc of over 3m radius. This instrument will be used for real samples (soil, grasses and materials) up to 0.3m in diameter with hyperspectral observation instruments. Labsphere was challenged to design the world's first absolute radiometric collimated, uniform, spectrally tunable ASTM-compliant solar source as the centerpiece illuminator for this unprecedented instrument.

Business Challenge

The BRDF measurement require a high quality, broad-band, collimated uniform source so that a sample may be illuminated at different angles with directional light. Since the customer was trying to emulate the sun, the source had to deliver exceptionally high illuminance levels and a spectral content that was close to native sunlight. The source had to be able to go from 100% illumination level to 50% of the highest output level without dramatically shifting spectral content. Additionally, the radius of the BRDF machine was 3m…the light source then had to travel through a mechanized arc at this radius…so weight and remote operation were essential to a functional design. There was no commercial source that could do this at the working distance of 3m with the solar spectrum, sunlight levels and a 0.2m uniform spot. Truly, a combination of tasks that created a challenging optical problem.

Labsphere's Solution

The technical challenges outlining this system required a custom design that would combine Labsphere plasma technology, QTH lamps and HELIOS system modular components. Our design had to also limit weight and size for component to be use on the custom's radius track nearly 4m off the floor. The power supply system would need to be remotely located at the floor due to weight, heat and power requirements. Initial designs did not meet all of the requirements and several iterations on the optical design were required to simultaneously serve all of the intended performance values. The design comprised (3) PEL-250 sources along with (1) QTH to provide a complete spectrum from 350-2500nm. Variable attenuators were used on each lamp to be able to provide independent level control, spectral mixing control and be able to change from 100% to 50% levels with at least 10% resolution in steps.

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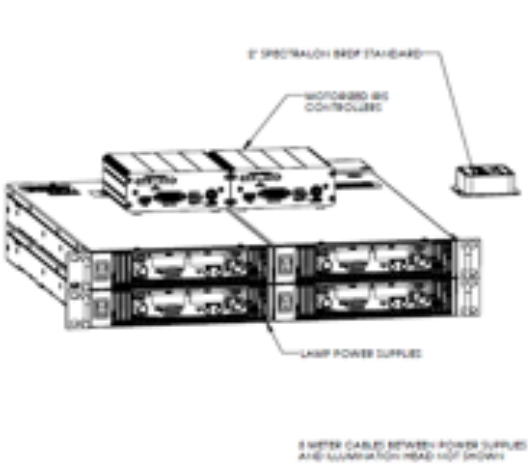
Benefits

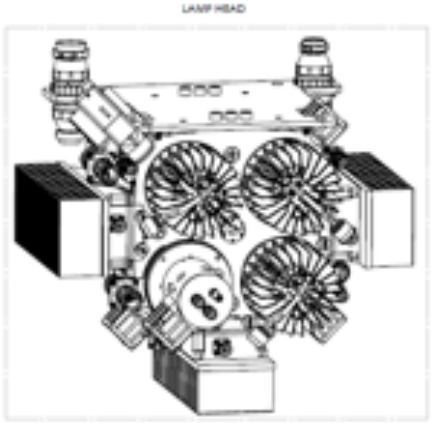
The final system was able to meet the intended goals required by the customer:

- Semi-portable system with relatively low weight and size profile
    - o Optical head <50kg
    - o Electrical controls <30kg
- ASTM Compliance collimated solar source (<2 degree).
- 20cm spot size
- >97% uniformity across spot.
- Solar spectrum 97,000 Lux at 4300K (100% output) from 350-2500nm.
- CCT available range from 2800K to 5100K
- Adjustable output with 4300K from 100% level (97klux) to 50% level with (10) discrete steps.
- Other uses:
    - o PV Solar Cell testing
    - o Portable light source for illuminating targets
    - o Large scale reflectance and transmittance source for testing architectural materials.

Objective	Benefits Received
Collimated Uniform Source	BRDF Testing of Real Samples
Solar Tunable Spectrum	350-2500nm testing
Low Weight / Semi Portable	Remote Deployment

Ask Labsphere how we can help solve your remote sensing challenges, create efficiency, and save time and money on your programs.





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