

GPi



ADVANCED SILICON NITRIDE COATING TECHNOLOGY

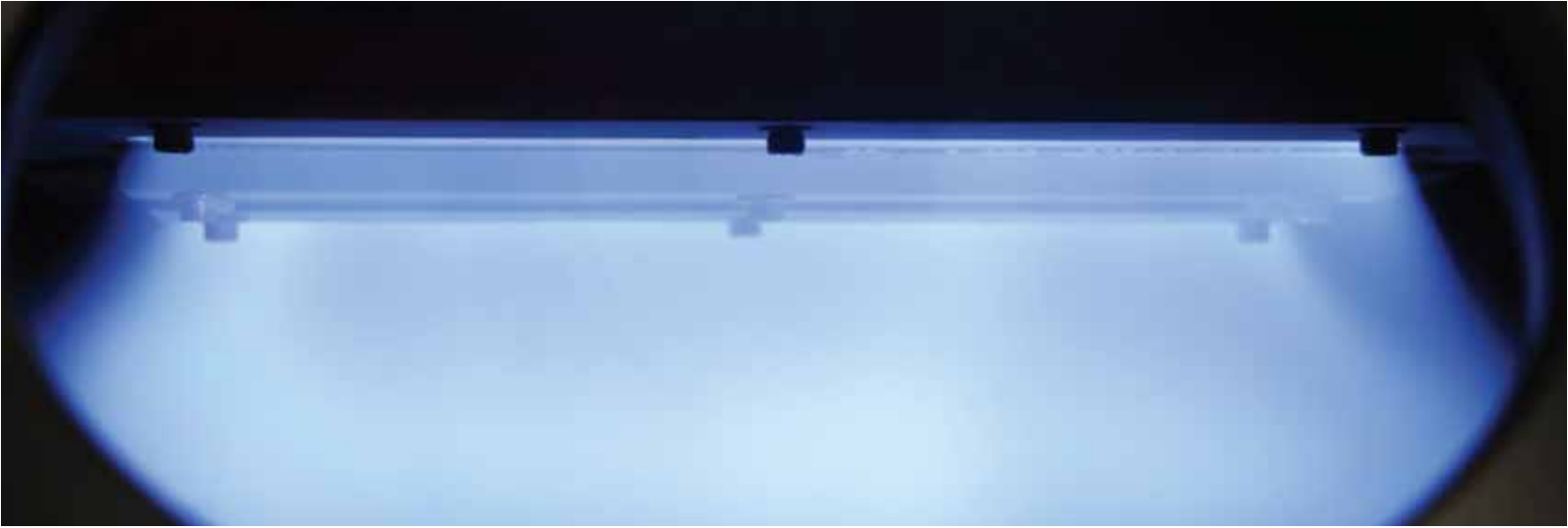
**New Plasma Source
Delivers Breakthrough
in Plasma CVD
Technology**

- 2ms Carrier Lifetime
- +/-3% Uniformity Over 1+ Meter
- Refractive Index Control 1.85-2.25
- High Deposition Rate (>60nm.m/min per Source)
- Long Production Runs – No Exposed Electrodes
- Efficient Silane Use (>15%)



www.GeneralPlasma.com

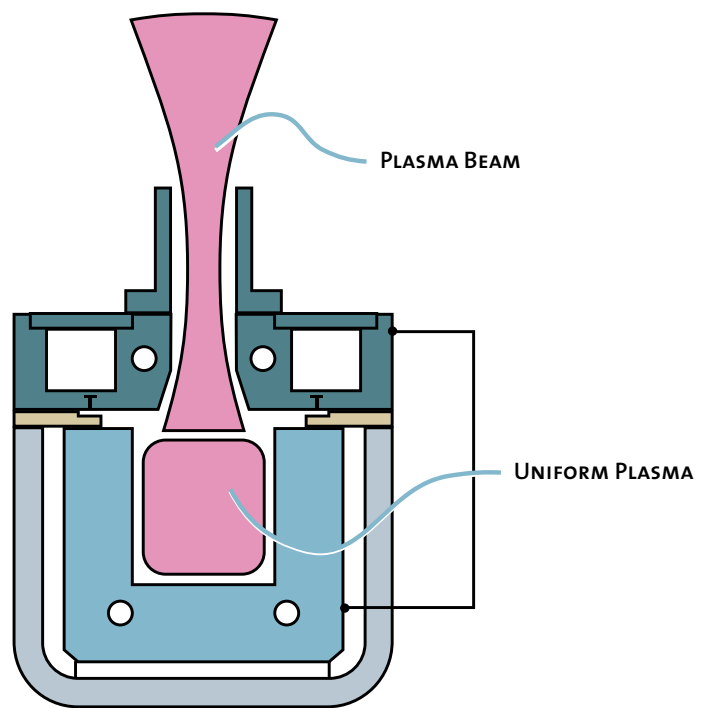
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GPI's Plasma Beam Source™

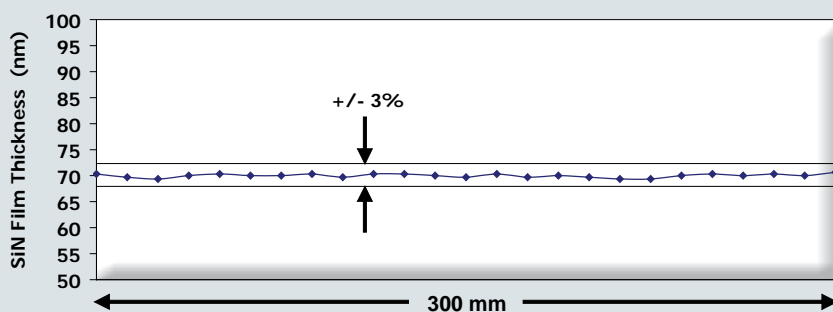
Patented, additional patents pending

- **SPUTTER MAGNETRON-LIKE UNIFORMITY**
Extendable to 3+ meters
- **INTERNAL "HIDDEN" ELECTRODE**
No electrode coating
Long production runs
Minimal maintenance
- **UNIQUE HIGH ION FLUX/LOW ION ENERGY SOURCE**
>2ms carrier lifetime at 300°C
>1.5ms carrier lifetime at 200°C
- **HIGH DENSITY PLASMA**
High rate, 60nm.m/min deposition
>15% SiH₄ efficiency

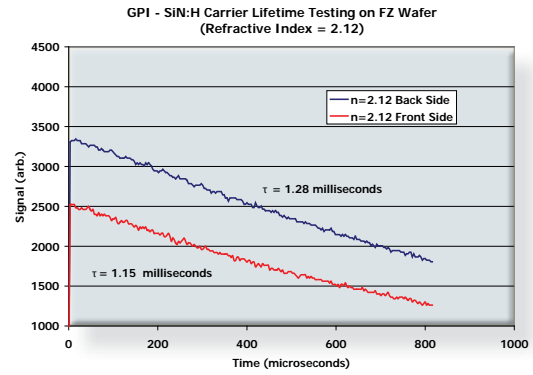
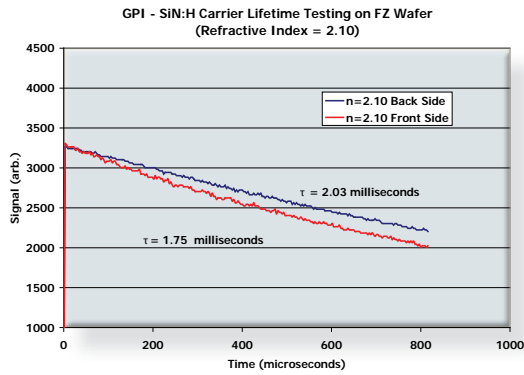


Uniformity

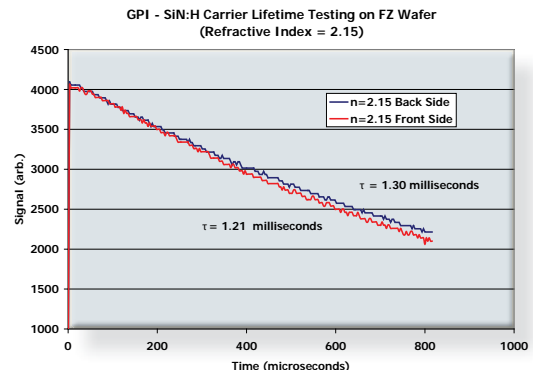
The inherent scalability of the PBS™ (Plasma Beam Source) enables uniformity to be comparable to magnetron sputtering, far exceeding other PECVD technologies. The uniformity across a 300mm substrate is shown here.



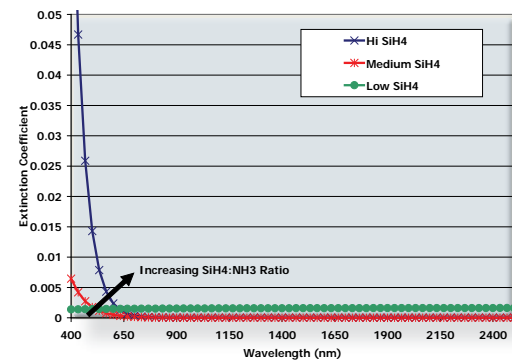
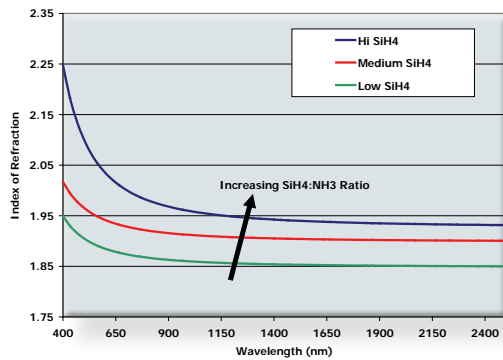
Carrier Lifetime



Carrier lifetime measurements¹ were made on SiN coated wafers with different refractive indices. GPI carrier lifetimes far exceed industry benchmarks.



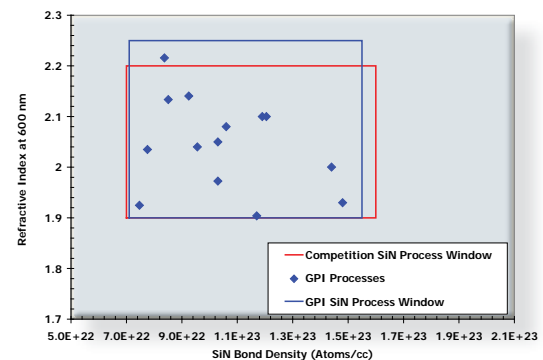
Optical Performance



WIDE PROCESS WINDOW

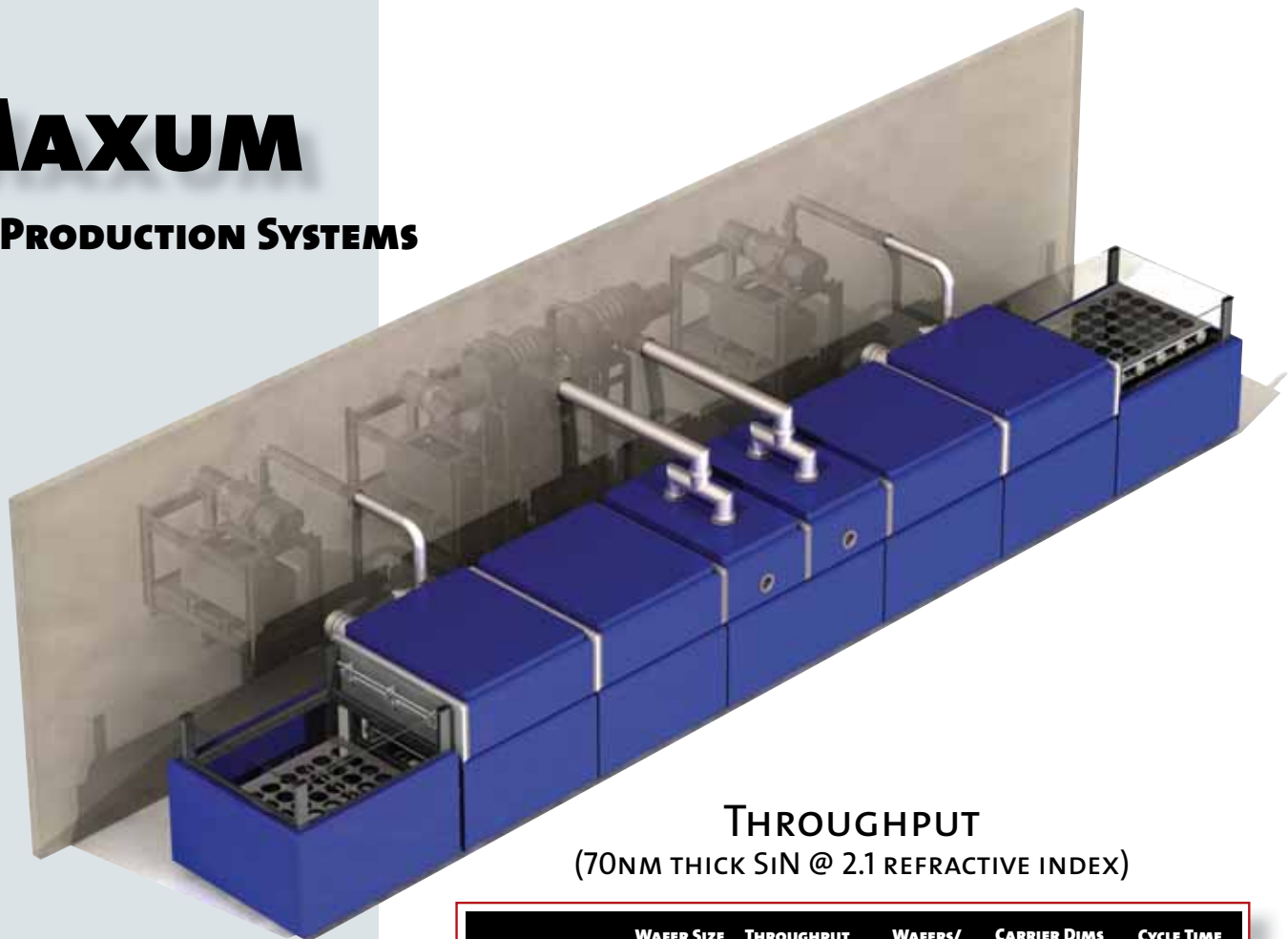
- REFRACTIVE INDEX: 1.85-2.25
- SiN BOND DENSITY: 7.0×10^{22} - 1.9×10^{23} ATOMS/CC
- CARRIER LIFETIMES EXCEEDING 2MS DEMONSTRATED

¹Measurements were certified by Dr. R. Ahrenkiel, Research Professor at Colorado School of Mines and Research Fellow at the National Renewable Energy Laboratory (NREL).



MAXUM

SiN PRODUCTION SYSTEMS



THROUGHPUT (70NM THICK SiN @ 2.1 REFRACTIVE INDEX)

| | WAFER SIZE (MM) | THROUGHPUT (WAFERS/HOUR) | WAFERS/ CARRIER | CARRIER DIMS (MM) | CYCLE TIME (s) |
|----------------|--------------------|-----------------------------|--------------------|----------------------|-------------------|
| MAXUM 600L | 125 | 720 | 18 | 600 x 1000 | 90 |
| | 156 | 600 | 15 | | |
| | 210 | 320 | 8 | | |
| MAXUM 600H | 125 | 1080 | 18 | 600 x 1000 | 60 |
| | 156 | 900 | 15 | | |
| | 210 | 480 | 8 | | |
| MAXUM 1000L | 125 | 2160 | 54 | 1000 x 1300 | 90 |
| | 156 | 1400 | 35 | | |
| | 210 | 800 | 20 | | |
| MAXUM 1000H | 125 | 3240 | 54 | 1000 x 1300 | 60 |
| | 156 | 2100 | 35 | | |
| | 210 | 1200 | 20 | | |

**PRODUCTION COATERS FOR
SiN IMPLEMENTING GPI'S
REVOLUTIONARY PBS™
TECHNOLOGY. SYSTEM SIZES
FROM PILOT TO FULLY AUTO-
MATED HIGH THROUGHPUT
PRODUCTION.**

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General Plasma is a premier supplier of advanced PECVD solutions, custom thin film systems and advanced source technologies. General Plasma's Plasma Beam Source™ is a revolutionary new thin film technology that will enable a host of applications – including PV.