

From: Yamamoto, Hiroaki hiroy@caltech.edu
Subject: Re: BRDF of ETM08
Date: May 24, 2022 at 11:32 PM
To: Billingsley, GariLynn GariLynn.Billingsley@caltech.edu



GariLynn

Current requirement about the polishing of the ETM S1 side is
“Measured over the central 160 mm diameter aperture: $\sigma_{\text{rms}} < 0.3$
nanometers “ in E080512-v6. I cannot find anything newer.

All newly polished ETMs satisfy this requirement, 0.22~0.25nm.

All old ETMs (7,8,9,12) are better (0.1~0.18nm).

But, simply setting this documented requirement of 0.3nm to 0.1nm will not
guarantee the necessary smoothness.

One way is to require $\sigma(\text{spatial wavelength} < 2\text{cm}) < 0.05\text{nm}$.

Old ETMs(8,9,12) satisfy this condition, ETM07 does not (0.12nm).

LIGO Laboratory
Caltech M/S 100-36
1200 E. California Blvd Pasadena, CA 91125
+1 (626) 864-6719

From: Billingsley, GariLynn <GariLynn.Billingsley@caltech.edu>
Date: Monday, May 23, 2022 at 11:33 AM
To: Yamamoto, Hiroaki <hiroy@caltech.edu>
Subject: Fwd: BRDF of ETM08

Do you have any guidance to offer to Zygo about our sensitivities? - see below

Begin forwarded message:

From: Bill Reichman <bill.reichman@ametek.com>
Subject: RE: BRDF of ETM08
Date: May 23, 2022 at 10:41:13 AM PDT
To: "Billingsley, GariLynn" <GariLynn.Billingsley@caltech.edu>

Hello Gari,

I'm sorry that the part figure is causing concerns. That likely reflects changes to the

polishing processes used previously vs the current processes. For our internal metrics we were only targeting the cumulative RMS error for features larger than 1mm or between 1mm and 0.0013mm. As I consider different options to improve the parts, could I get a bit more information about how wide the sensitivity band is? What would be the impacts of RMS error accumulations around 0.5cm or 2cm?

Thanks,
Bill

From: Billingsley, GariLynn <GariLynn.Billingsley@caltech.edu>
Sent: Monday, May 23, 2022 7:24 AM
To: Bill Reichman <bill.reichman@ametek.com>
Subject: Fwd: BRDF of ETM08

*****NOTICE*** This came from an external source. Use caution when replying, clicking links, or opening attachments.**

A little bad press coming your way. There is concern about the excess power around 1 cm.

The yellow line is of a coated substrate that was removed because the coating had the spirograph pattern, this interacted strongly with the beamtube because the surface frequency was largely in the 1 cm range.

Any strings you are willing to pull would be appreciated.

G

Begin forwarded message:

From: "Yamamoto, Hiroaki" <hiroy@caltech.edu>
Subject: Re: BRDF of ETM08
Date: May 22, 2022 at 9:37:44 PM PDT
To: "Billingsley, GariLynn" <GariLynn.Billingsley@caltech.edu>

Thank you very much.

I compare all new 4 ETM polished surface vs old ETM08.
All new maps look similar.

LIGO Laboratory
Caltech M/S 100-36
1200 E. California Blvd Pasadena, CA 91125
+1 (626) 864-6719

From: Billingsley, GariLynn <GariLynn.Billingsley@caltech.edu>
Date: Sunday, May 22, 2022 at 8:09 PM
To: Yamamoto, Hiroaki <hiroy@caltech.edu>
Subject: Re: BRDF of ETM08

Yes please use whatever maps seem useful - but note in your work that we don't yet have a final mirror map on ETM08.

Thanks!

G

On May 20, 2022, at 4:46 PM, Yamamoto, Hiroaki
<hiroy@caltech.edu> wrote:

GariLynn

I am going to give a talk about BRDF in general at the GWADW next week (early Monday morning).

As an example of PSD vs BRDF, I was going to use the old ETM08 spiral pattern to the scattering which could have caused the back scatter noise.

Can I include the result using the new ETM08 polished map to show that how the PSD around 1cm induces scattering to the beam tube?

Best regards

LIGO Laboratory
Caltech M/S 100-36
1200 E. California Blvd Pasadena, CA 91125
+1 (626) 864-6719