发件人： **Chengdong FU** fucd@ihep.ac.cn
主题： Re: Re: Re: Re: Re: Re: Urgent: Material budget of MOST2 Vertex Prototype
日期： 2023年6月14日 10:21
收件人： joao guimaraes da costa guimaraes@ihep.ac.cn
抄送： zeng hao zenghao@ihep.ac.cn, xinhui huang huangxinhui@ihep.ac.cn, zhijun liang zhijun.liang@cern.ch, hujun@ihep.ac.cn, tianya wu: wuty@ihep.ac.cn, shuqi shuqi.li@cern.ch, gang li ligang@ihep.ac.cn, fu jinyu fujy@ihep.ac.cn

Hi all,

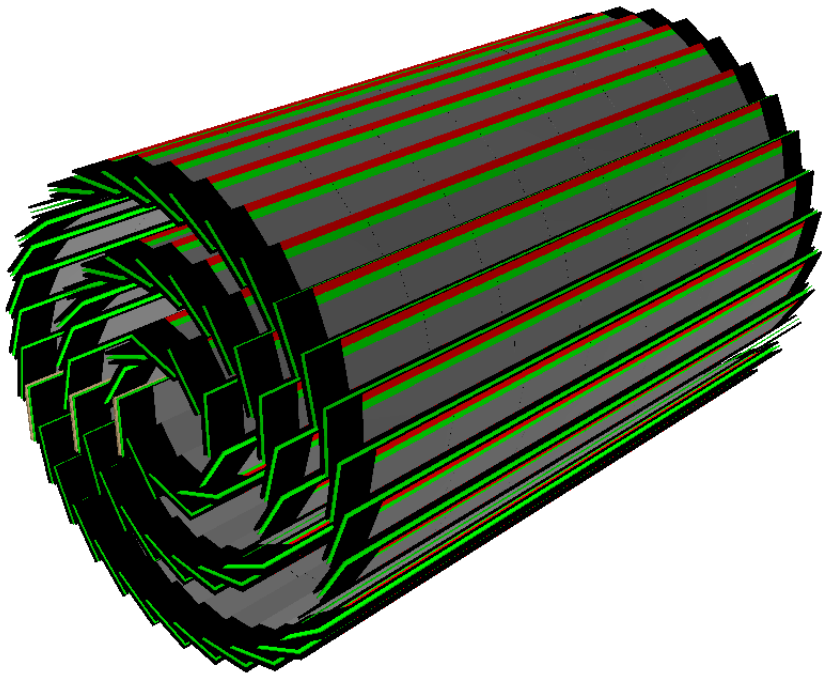
According to your information, I wrote the geomtery option for full simulation. In my mind, Polyimide = Kapton, Acrylic Adhesive = mylar, glue is silica gel, is right? If I miss something or mis-understand some materials/values, please let me know.

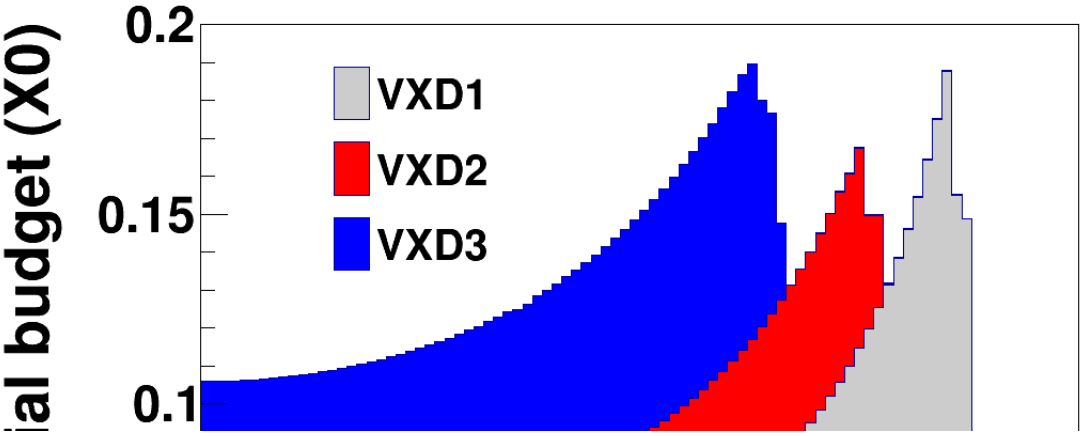
And based on this preliminary parameters, the 3rd and 4th figures show the material budget at phi=0 and phi=90 degrees, respectively.

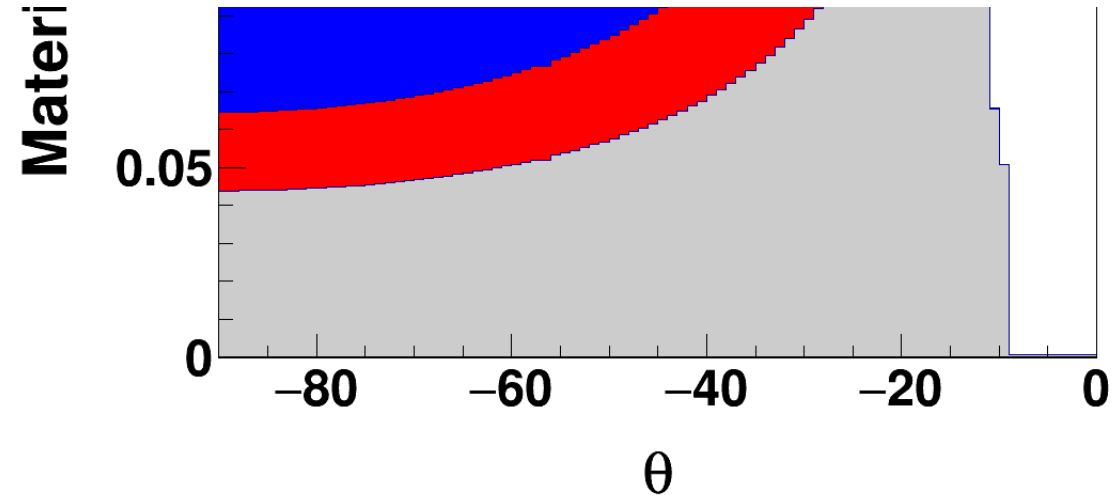
They are preliminary, and once the parameters are verified, I will generator again. If needed, I also can generate the average budget at phi direction.

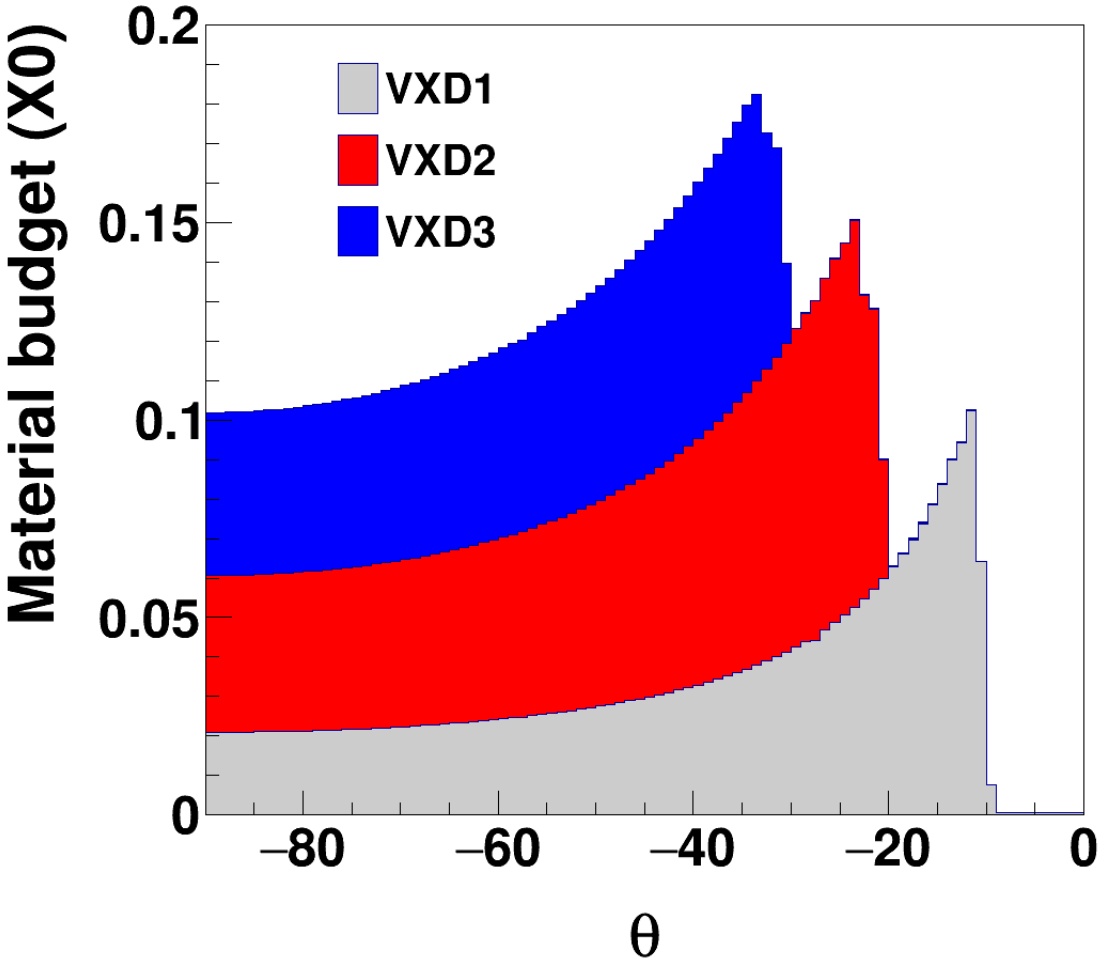
If any requirement/comment, please let me know.

```
<ladder isDoubleSided="true">
  <ladderSupport height="2*mm" length="200*mm" thickness="250*um" width="16.8*mm" mat="CFRP_CMS"/>
  <flex n_slices="15">
    <slice length="200*mm" thickness="200 *um" width="16.8*mm" mat="g10"/> <!--glue between flex and sensor/support-->
    <slice length="200*mm" thickness="12.5*um" width="16.8*mm" mat="Kapton"/>
    <slice length="200*mm" thickness="20.0*um" width="16.8*mm" mat="mylar"/>
    <slice length="200*mm" thickness="24.0*um" width="16.8*mm" mat="G4_Cu"/>
    <slice length="200*mm" thickness="13.0*um" width="16.8*mm" mat="Kapton"/>
    <slice length="200*mm" thickness="12.5*um" width="16.8*mm" mat="mylar"/>
    <slice length="200*mm" thickness="12.0*um" width="16.8*mm" mat="G4_Cu"/>
    <slice length="200*mm" thickness="25.0*um" width="16.8*mm" mat="Kapton"/>
    <slice length="200*mm" thickness="12.0*um" width="16.8*mm" mat="G4_Cu"/>
    <slice length="200*mm" thickness="12.5*um" width="16.8*mm" mat="mylar"/>
    <slice length="200*mm" thickness="13.0*um" width="16.8*mm" mat="Kapton"/>
    <slice length="200*mm" thickness="24.0*um" width="16.8*mm" mat="G4_Cu"/>
    <slice length="200*mm" thickness="20.0*um" width="16.8*mm" mat="mylar"/>
    <slice length="200*mm" thickness="12.5*um" width="16.8*mm" mat="Kapton"/>
    <slice length="200*mm" thickness="250 *um" width="16.8*mm" mat="g10"/> <!--glue between flex and sensor/support-->
  </flex>
  <sensor n_sensors="7" gap="0.1*mm" thickness="50*um" active_length="25.6*mm" active_width="12.8*mm" dead_width="2*mm
          deadwire_length="(7*(25.6+0.1)-0.1)*mm" deadwire_width="2*mm" deadwire_thickness="(50/10)*um" deadwire_mat="
</ladder>
```









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Best,

Chengdong

> -----原始邮件-----
> **发件人:**"Chengdong FU" <fucd@ihep.ac.cn>
> **发送时间:**2023-06-13 15:55:27 (星期二)
> **收件人:** "fu jinyu" <fujy@ihep.ac.cn>
> **抄送:** "joao guimaraes da costa" <guimaraes@ihep.ac.cn>, "zeng hao" <zenghao@ihep.ac.cn>, "xinhui huang" <huangxinhui@ihep.ac.cn>, "zhijun liang" <zhijun.liang@cern.ch>, hujun@ihep.ac.cn, "tianya wu:" <wuty@ihep.ac.cn>, shuqi <shuqi.li@cern.ch>, "gang
> **主题:** Re: Re: Re: Re: Re: Urgent: Material budget of MOST2 Vertex Prototype
>
> Got it and thank you. I will use CFRP_EPX as approximation. Of course, it can be updated at any time once we have accurate mesurements by ourselves.
>
> --
>
> Best,
>
> Chengdong
>
> > -----原始邮件-----
> > **发件人:**"FU Jinyu" <fujy@ihep.ac.cn>
> > **发送时间:**2023-06-13 15:44:17 (星期二)
> > **收件人:** "chengdong fu" <fucd@ihep.ac.cn>
> > **抄送:** "joao guimaraes da costa" <guimaraes@ihep.ac.cn>, "zeng hao" <zenghao@ihep.ac.cn>, "xinhui huang" <huangxinhui@ihep.ac.cn>, "zhijun liang" <zhijun.liang@cern.ch>, hujun@ihep.ac.cn, "tianya wu:" <wuty@ihep.ac.cn>, shuqi <shuqi.li@cern.ch>, "ga
> > **主题:** Re: Re: Re: Re: Urgent: Material budget of MOST2 Vertex Prototype
> >
> > Hi Chengdong
> >
> > The CFRP we used for prototype has a density ranges 1.4-1.5 (comfirmed with the vendor), so it is close to the third (1.43) one of you list. Thanks.
> >
> > Regards
> >
> > Jinyu

-----原始邮件-----
发件人:"Chengdong FU" <fucd@ihep.ac.cn>
发送时间:2023-06-13 15:27:57 (星期二)
收件人: "fu jinyu" <fujy@ihep.ac.cn>
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主题: Re: Re: Re: Urgent: Material budget of MOST2 Vertex Prototype

Hi Jinyu,

Have you the detail about CFRP? I list some types of CFRP used in CMS. Is the CFRP that we used close to one of them? Or could you provide the values of density and ratio of C and epoxy?

CFRP_OTST	1.55	C:0.71	Epoxy:0.29
CFRP_ITST	1.622	C:0.71	Epoxy:0.29
CFRP_EPX	1.43	C:0.71	Epoxy:0.29
CFRP_FPX	2.198	C:0.71	Epoxy:0.29

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Best,
Chengdong

-----原始邮件-----
发件人:"FU Jinyu" <fujy@ihep.ac.cn>
发送时间:2023-06-12 11:57:03 (星期一)
收件人: "joao guimaraes da costa" <guimaraes@ihep.ac.cn>
抄送: "chengdong fu" <fucd@ihep.ac.cn>, "zeng hao" <zenghao@ihep.ac.cn>, "xinhui huang" <huangxinhui@ihep.ac.cn>, "zhijun liang" <zhijun.liang@cern.ch>, hujun@ihep.ac.cn, "tianya wu:" <wuty@ihep.ac.cn>, shuqi <shuqi.li@cern.ch>, "gang li" <ligan
主题: Re: Re: Urgent: Material budget of MOST2 Vertex Prototype

Hi Joao,

The thickess of CFRP laminate we used in simulation is 0.12mm and density is 1.55 g/cm3. For the prototype, the CFRP laminate thickness is less than 0.25 mm, density is ranges 1.4-1.5 g/cm3 (double confirmed with the manufacture), so take twice weight

Regards
Jinyu

-----原始邮件-----
发件人:"Joao Guimaraes da Costa" <guimaraes@ihep.ac.cn>
发送时间:2023-06-12 11:13:17 (星期一)
收件人: "FU Jinyu" <fujy@ihep.ac.cn>
抄送: "chengdong fu" <fucd@ihep.ac.cn>, "zeng hao" <zenghao@ihep.ac.cn>, "xinhui huang" <huangxinhui@ihep.ac.cn>, "zhijun liang" <zhijun.liang@cern.ch>, hujun@ihep.ac.cn, "tianya wu:" <wuty@ihep.ac.cn>, shuqi <shuqi.li@cern.ch>, "gang li" <lig
主题: Re: Urgent: Material budget of MOST2 Vertex Prototype

Hi Jinyu,

Can you provide the actual number?

Thanks,
-Joao

On 12 Jun 2023, at 10:54, FU Jinyu wrote:

> Hi All,
>
> For your reference, the response to item 4 : Correct. The thickness of the (CFRP laiminate of the) ladder support for the prototye is about twice of what we used in simulation, accordingly the weight is twice. Thanks.
>
> Regards
> Jinyu
>
> -----原始邮件-----
> **发件人:**"Joao Guimaraes da Costa" <guimaraes@ihep.ac.cn>
> **发送时间:**2023-06-10 19:34:05 (星期六)
> **收件人:** "Chengdong FU" <fucd@ihep.ac.cn>, "FU Jinyu" <fujy@ihep.ac.cn>, "ZENG Hao" <zenghao@ihep.ac.cn>, "Xinhui Huang" <huangxinhui@ihep.ac.cn>, "Zhijun Liang" <zhijun.liang@cern.ch>, hujun@ihep.ac.cn, "Tianya Wu:" <wuty@ihep.ac.
> **抄送:** Shuqi <shuqi.li@cern.ch>, "Gang LI" <ligang@ihep.ac.cn>
> **主题:** Urgent: Material budget of MOST2 Vertex Prototype
>
> Hello all,
>
> As you know the final assessment of the MOST2 will be one week from now, on June 19.
> We are still lacking a good understanding from simulation of the expected behavior of the prototype.
> We did simulation studies in the past but these had a much optimized material budget, as planned for the CEPC, not the actual values we are using in the prototype.
>
> I am hoping you can help us urgently to get:
>
> 1. An assessment of the material budget actually used in the prototype
> 2. Some simulation expectation, if at all possible
>
> For the material assessment, we need to know:
>
> 1. Estimate of the amount of metal. Hujun, I understand that we used 4 layers of copper, instead of two layers of aluminum we had in the simulation. Do you know the thickness/weight of the copper layers?
> 2. Mylar(?) material in the flex board. Hujun, do you know what material was used in-between the copper? What was the thickness used?
> 3. Jinyu, Xinhui, Tianya, what is the total thickness of the flex board? We can use a caliper to measure that. Together with the information above, we should be able to have a first estimation of the material budget for the flex pcb.
> 4. Jinyu, what is the final weight of the carbon fiber of the ladder? My understanding is that the thickness is the same as what we currently have in the simulation, but the weight might be twice as much. Please clarify.
> 5. Xinhui, Tianya, do you have an estimate of how much glue is used to glue one chip to the flex tail? I hope this will be about the same as what we already have in the simulation, but it is good to check.
>
> Anything else i am missing?
>
> I understand that we have a fast simulation and a full simulation integrated in the offline code. I think either of these are useful, even if the digitation is not included.
>
> Chengdong, would be possible to possible to make an update of the material contributions, once we have the information above, so that we can get a proper estimate of the material budget from Geant? This is the minimum information needed.
>
> Ideally, we would also run the simulation and get an estimate of the impact parameter resolution, but that might require too much time. Please do let me know.
>
> Hao, please verify if you code still runs, and an estimation can also be done. It would be nicer to get an estimate from offline, but this could be a backup solution.
>
> Thanks,
> -Joao
>
> --
> Institute of High Energy Physics, Chinese Academy of Sciences 19B Yuquanlu, Shijingshan District, 100049, Beijing

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