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**Initial Design of Porthos Switchyard and Possible Synergy
with P³ experiment**

Requirements for Switchyard

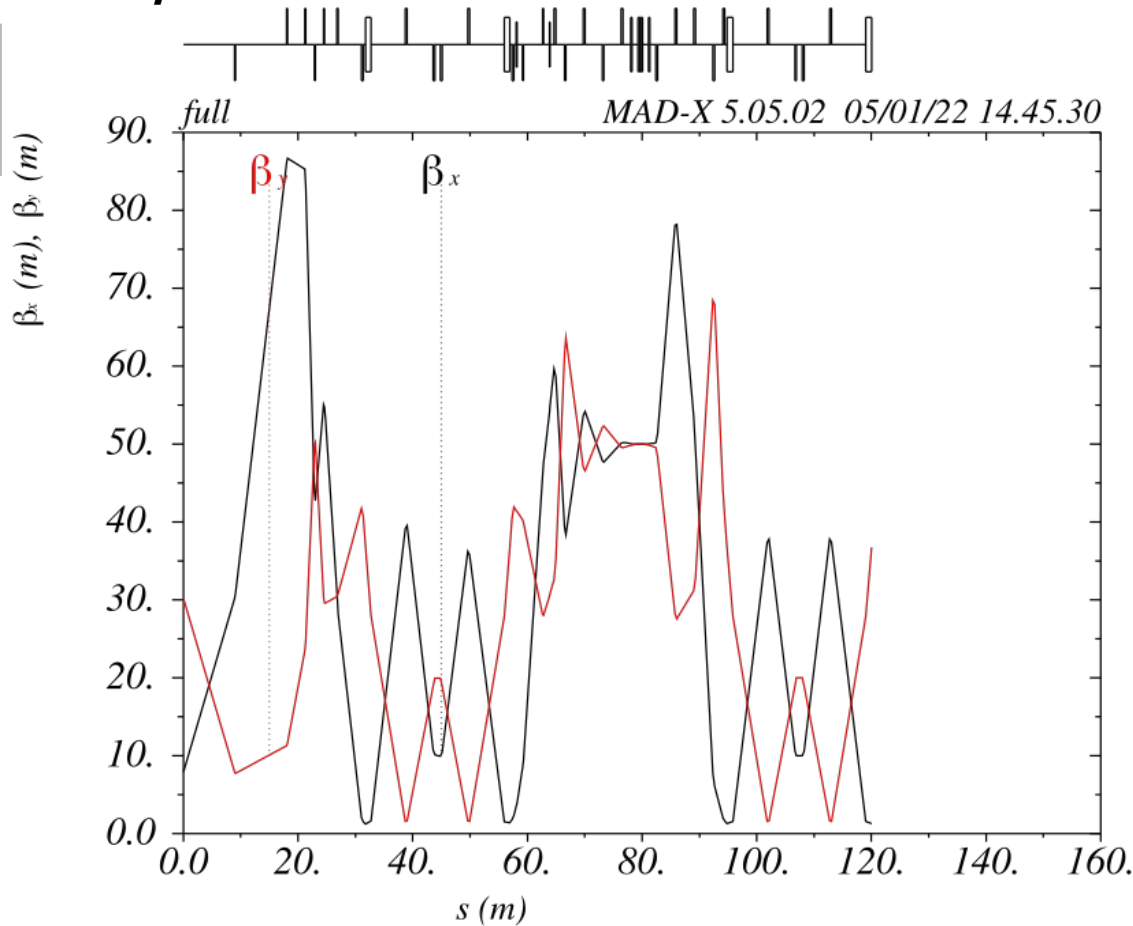
- **Maximum beam energy of up to 8 GeV**
- **Resonant extraction, similar to Athos switchyard (kicker+Septum approach)**
- **Injection with a 10 mm vertical offset.**
- **Transverse offset of 5.5 m with respect to Aramis line**
- **Reserve space for possible acceleration of Porthos bunch**

Lesson learned from Athos

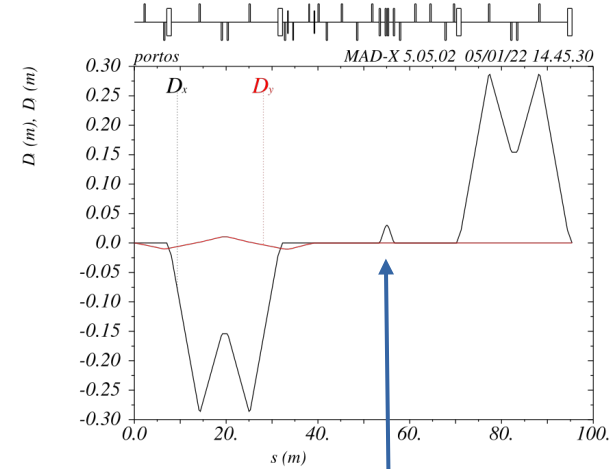
- **Avoid central dipole to decouple optics and compression**
➔ *Requires stronger septum but helps with separation*
- **Add chicane in the middle to compensate for the R56 of the two double-bend section and to minimize effect of microbunch instability.**

Proposed Solution

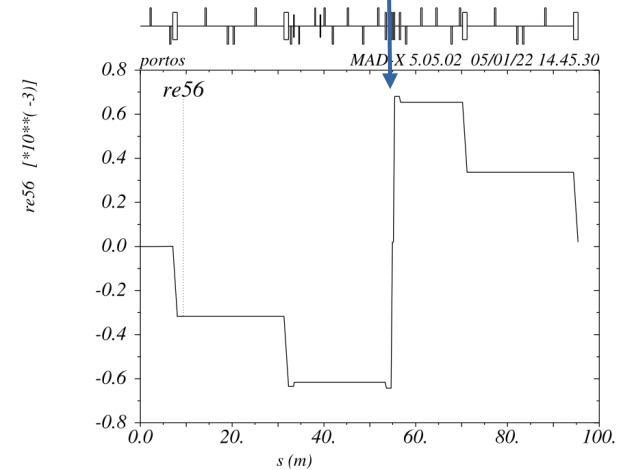
Optics



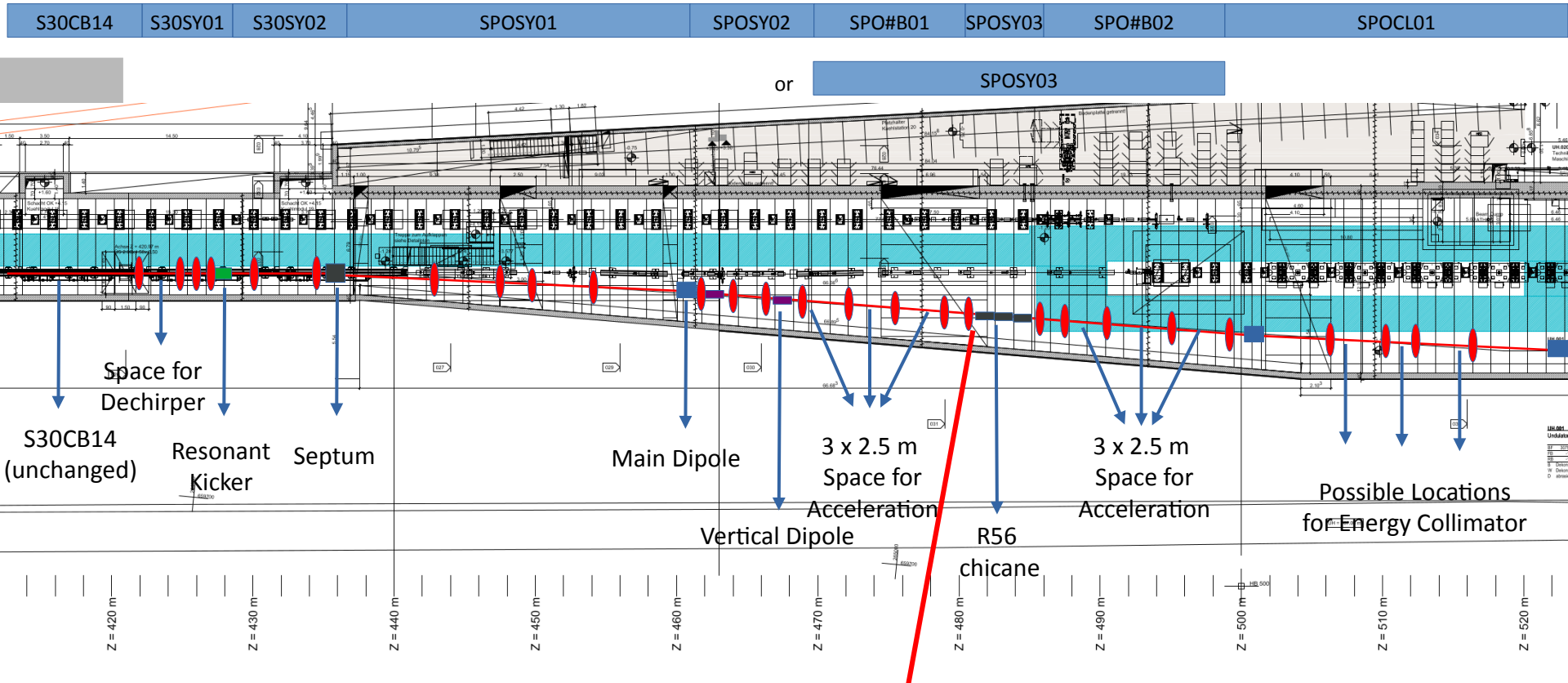
Dispersion



R56



Porthos Extraction Layout



Possible starting point for accelerator experiments (e.g. P^3)

Dipole Strength Requirement

Location	Count	Angle	Length*	
Septum	1	2.5	1.2**	New
SPOSY01	1	2.5	0.71	New***
SPOSY02	2	0.1	0.03	AFBC1
SPOSY03	4	1.3	0.37	New
SPOCL01	2	2.5	0.71	New

*scaled from AFD1 (2 m with 8 degree at 7 GeV)

**Info from M. Paraliiev for an aggressive design. A scaled version from Athos septum would require about 2 m.

***Info from P. Craievich: B190 Dipole from CERN with 1.9 m length can deflect up to to 6.5 degree at 8 GeV.

CSR effect favors shortes possible magnet length.

Quadrupole Strength Requirement

Section	Number	k1L (1/m)	Type	Comment
S30CB13	QUAD1	-0.00774755171	QFD	existing
S30CB14	QUAD1	0.04872931718	QFD	existing
S30SY01	QUAD1	0.1780929071	QFM	
S30SY01	QUAD2	-0.3419413497	QFM	
S30SY01	QUAD3	0.1953288441	QFM	
S30SY02	QUAD1	0.03171381827	QFA	
S30SY02	QUAD2	-0.1585690913	QFA	
SPOSY01	QUAD1	0.2511493706	QFM	
SPOSY01	QUAD2	-0.1821261326	QFM	
SPOSY01	QUAD3	-0.1821261326	QFM	
SPOSY01	QUAD4	0.2511493706	QFM	
SPOSY02	QUAD1	-0.1347837276	QFM	
SPOSY02	QUAD2	-0.03685534341	QFD	
SPOSY02	QUAD3	0.09715206573	QFD	
SPOCB01	QUAD1	0.1786876362	QFM	
SPOCB01	QUAD2	-0.2076017569	QFM	
SPOCB01	QUAD3	0.07257501482	QFD or QFM	
SPOCB01	QUAD4	-0.02825329558	QFD or QFM	
SPOCB01	QUAD5	0.01008867385	QFD or QFM	
SPOCB02	QUAD1	-0.07665805293	QFD or QFM	
SPOCB02	QUAD2	0.1207990704	QFM	
SPOCB02	QUAD3	0.1280159078	QFM	
SPOCB02	QUAD4	-0.2306204632	QFM	
SPOCB02	QUAD5	0.0420334686	QFD or QFM	
SPOCL01	QUAD1	0.2511493706	QFM	
SPOCL01	QUAD2	-0.1821261326	QFM	
SPOCL01	QUAD3	-0.1821261326	QFM	
SPOCL01	QUAD4	0.2511493706	QFM	

Type	max k1L @ 8 GeV
QFD	0.112
QFM	0.563
QFA	0.174

«Shopping List»:

- QFA: 2x
- QFD: 2x
- QFM: 22x (for P³: 13x)
- 1 Quad to compensate septum/dipol asymmetry
- Corrector Quads: x2
- Corrector Skew Quads: x2
- Sextupoles: To be studied (~6-8)

Synergy with P³ Experiment

- **In principle there is a good synergy with the extraction arm if the experiment is placed after SPOCB01 (this is valid for any other beam dynamics experiment)**
- **The current extraction for the P³ experiment is simpler because:**
 - **Has less beamline elements (quads, dipoles)**
 - **Keeps the main linac layout unchanged except for a dipole in S30CB16**
 - **Has a shorter extraction length since the dispersion needs to be closed in only one plane. This shifts the P³ location closer to the wall, away from the main beamline.**
 - **Uses existing elements or elements with existing design to build up the extraction.**
- **A compromised design (e.g. without resonant extraction) is nearly impossible without moving the girders afterwards.**