Chapter IV.5

JUAS during the period 2006–2010

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This chapter covers the period François Méot was JUAS Director (i.e. between 2006 and 2010).

If I had to define the greatest experience of managing JUAS, it would be having the opportunity to be continuously blended with the upcoming generation over a period of ten weeks, as shown in Fig. IV.5.1. Meeting the young students anywhere on the JUAS premises; observing them in the auditorium listening to and discussing with the lecturers; following their interactions during coffee breaks and lab visits, while they easily exchanged information with the scientists they met; hearing about their plans for the future; taking pleasure in their interest for accelerator science and science in general; having fun during breaks, as illustrated in Fig. IV.5.2; sometimes trying to be smart and providing (hopefully) sound advice; or just working out, with one or more students, the route for the following morning's 6-a.m. run

Fig. IV.5.1: A morning at JUAS. The President of the ESI at the time, Manfred Buhler-Broglin, is standing on the left.

This chapter should be cited as: JUAS during the period 2006–2010, F. Méot, DOI: 10.23730/CYRSP-2024-003.2273, in: Proceedings of the Joint Universities Accelerator School (JUAS): Courses and exercises, E. Métral (ed.), CERN Yellow Reports: School Proceedings, CERN-2024-003, DOI: 10.23730/CYRSP-2024-003, p. 2273.

to the Col de la Croisette (which can be seen in the background in Fig. IV.5.1—that particular year, we had to wait until the snow was gone).

Fig. IV.5.2: Recess time... would you believe that!

Next in the list of experiences would be the ongoing contact with expert lecturers—an exciting and thoroughly enriching experience. I learned a lot from this, probably as much about accelerator physics and technology as about teaching and school management skills.

In general, the tenure of a JUAS Director has typically spanned approximately five to six years. My own mandate, third in that list, commenced mid-2005 with the preparation of the JUAS 2006 session (see Fig. IV.5.3), and it was no exception. While there is no formal requirement to step down, various factors often motivate the Director to eventually pass on the responsibility. An obvious reason to stop would be the toll it takes on your laboratory time (if you're not retired!): ten weeks non-stop. As far as I was concerned, a 50% duty cycle was required to achieve the daily tasks properly. A day at JUAS was spent working to get things organised to ensure a smooth ten-week JUAS session, to push paperwork, projects, administrative business, to answer questions from all sides, to talk to the diverse parties involved: Archamps Technopole, JUAS, and ESI staff, lecturers, JUAS Advisory Board members, etc.

In a general way, from these ten weeks of continuing interactions, I tried as much as I could—and as time allowed—to figure out possible improvements to the school, with the specific goal of actually implementing them. I believe I did succeed with a few novelties, with the enthusiastic and active collaboration of the JUAS faculty, as well as the JUAS and ESI staff. More on that below.

One of those novelties involved making a more appealing, super-high-tech-looking poster. We therefore spent some time talking to a designer in Annecy, and we ended up with what appears in Fig. IV.5.4, of which we were quite proud. All in all, this was not a straightforward management task,

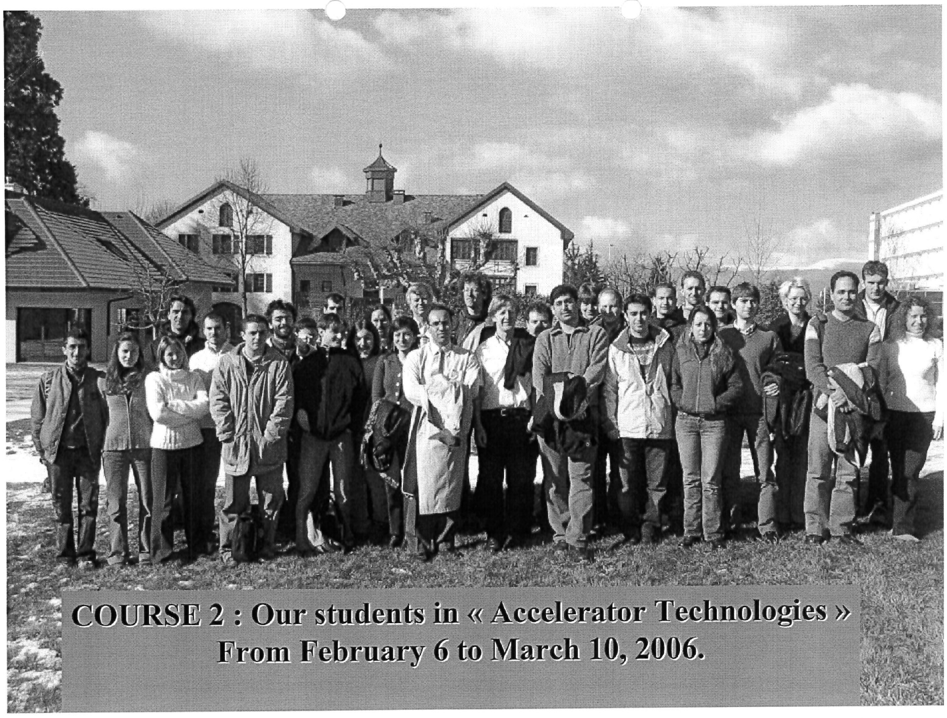


Fig. IV.5.3: First JUAS session of the third JUAS Director—pictured here, attendees of the "Accelerator Technology" course. There were 45 participants over the ten weeks for this first experience, including students and professionals. The Director is at the front in the middle, as he is the boss—although a couple of students shed some shadow on him, but this is okay. Fritz Caspers stands paternally at the back. This photo includes Heidi, JUAS assistant at the time, fourth from the right.

and it involved quite a substantial personal investment, but most of the time it was also a lot of fun. For example, 2006 was the first year with Wi-Fi, which students with laptops were able to use! Nonetheless, it was also a little boring at times; this included the routine tasks of trying to find/obtain money from various national and EU institutions. In the end, it all boiled down to concentration, dedication, and devotion! These requisites are quite apparent in Fig. IV.5.5, and even more so in Fig. IV.5.6.

IV.5.1 JUAS team and life, 2005–2010

During my whole period at JUAS, from autumn 2005 when I began getting up to speed until summer 2010, Manfred Buhler-Broglin (top-left photo in Fig. IV.5.7) was President of the ESI. Sharing the same premises as JUAS, the other school under ESI was the European School of Medical Physics, whose Director was Yves Lemoigne. Yves would take an important part in setting up the 30-station computer room for ESMP and JUAS, as illustrated in Fig. IV.5.8.

During 2005–2006 Séverine Guilland was the ESI administrator, and Heidi her JUAS assistant. Heidi left later in 2006, and Violaine Presset took over. Both V. Presset and S. Guilland then left after the 2007 session, and the three remaining years of my period, 2008 to 2010, had Tamara Barbaran as ESI administrator and Filiz Demolis as JUAS assistant, who both feature in Fig. IV.5.7.

My time at JUAS also included some sad events, including the passing of Dieter Engelhardt, member of the JUAS Advisory Committee, on 14 December 2007. Life at JUAS also changed as the

Fig. IV.5.4: Left: an early poster. Right: a fantastic new poster! (Used from 2008 onwards.)

Fig. IV.5.5: Hard times as JUAS Director.

Archamps park and infrastructure evolved. This resulted in JUAS moving from the “Salève” to the “Mont-Blanc” building in September 2007, and back to the Salève in 2009 after the January–March 2008 session in the Mont-Blanc building. A notable development in 2007 was the introduction of the first year of computer classes at Archamps, which was indeed a big step for JUAS. The project was undertaken and brought to completion by Yves Lemoigne (ESMP), among others. A total of 30 screens had been bought in 2005, and 30 workstations were bought at the end of 2006. A dedicated room on the

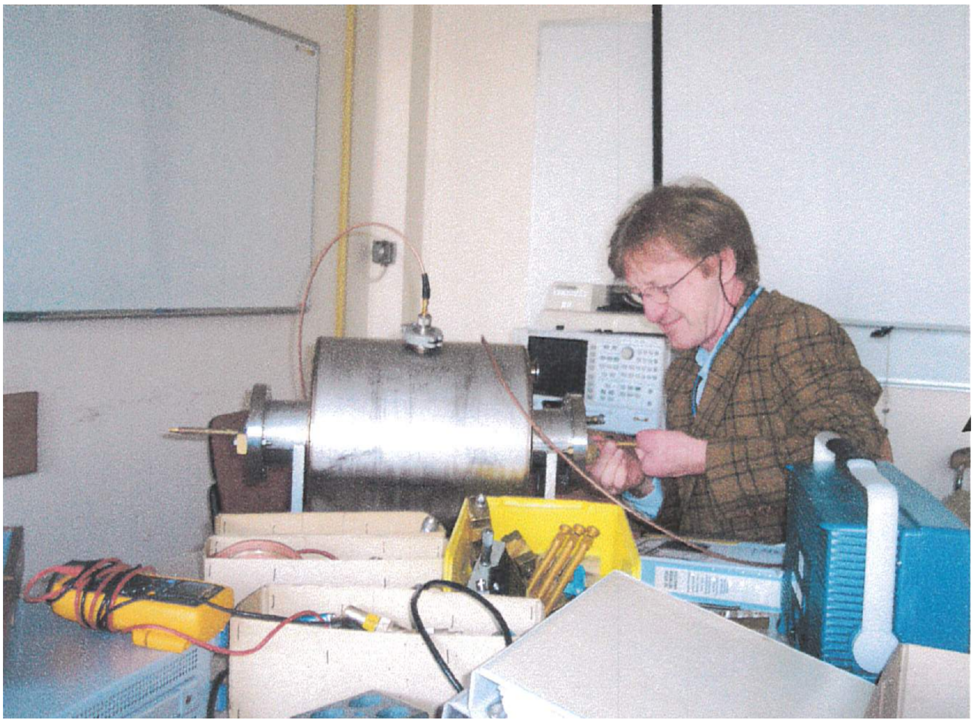


Fig. IV.5.6: More seriously… JUAS Director (F1PID, N1PID) testing his skills on radio systems (under Fritz's watch).

JUAS floor was set aside to install these computers. The room remained operational for JUAS sessions thereafter (see Fig. IV.5.8).

On a personal level, I was extremely oriented towards international collaborations. Not only was that my lab experience—years working with people from around the planet—but this was actually a strong motivation for me to take part in the JUAS experience. I sought to identify collaboration opportunities through JUAS. In that spirit, when possibilities presented themselves, I recruited lecturers from non-EU countries (I was in collaborations with various labs in the USA, Japan, Canada, and other countries at the time); but that was not pursued in later editions. One idea I had in mind was that this would create bridges, and thereby offer more opportunities and wider horizons for JUAS students. There were several ambitious accelerator R&D areas under investigation—specifically, in terms of fields and countries: ADS reactors in China and India, carbon-therapy synchrotrons in Japan as well as a now 24-year-old fixed-field alternating gradient accelerator (FFAG) programme, high-power linacs and radioactive ion beams in the USA, the electron–ion collider there today, and so forth. These contacts helped to send JUAS students abroad. To name but two: Thomas Planche and Jean-Baptiste Lagrange who, after attending JUAS, undertook PhDs at Kyoto University. In a general manner, former JUAS students can be found in many labs and industries, around the world. For example, I have had several around me at Brookhaven National Laboratory, both PhDs and staff members. Saudi Arabia, in that very period, contacted us to discuss the possibility of JUAS collaborating with Prince Abdulaziz University in Riyadh to help create an accelerator school similar to JUAS. Clearly, to me, JUAS has a broad worldwide outreach, with many former JUAS students working today in accelerator science outside the EU. I had it in mind to take further advantage of this radiance: in the same way that we read, "For the future, it was

Fig. IV.5.7: JUAS team: 2008, 2009, 2010, and beyond.

agreed to increase the number of lecturers coming from the university partners" [S. Guilland, minutes, APC 2007, Darmstadt], I envisioned enlarging the scope to include those coming from overseas.

In addition to these significant "big picture" events in the life at JUAS, many smaller things would also happen at JUAS/Archamps over a ten-week session. In terms of collaborations, an example worth mentioning—which I only learned about a couple of years ago—saw the CEO of SIGMAPHI, who I had invited to visit JUAS, meeting and discussing with Martin Wilson. This ended up with superconducting magnet technologies being added to SIGMAPHI's catalogue of accelerator components. On the fun side, I will always remember running up the Salève to the Col de la Croisette over five years, always accompanied by one or two willing students. When it came to lunchtime, we had no choice but to use restaurants, which was fine, as at the time, there were a few pleasant ones in and around Archamps. I loved the Best Western at lunch, and it was right down the stairs from JUAS floor. Going out for an evening in Genève with the students from time to time was also a pleasant experience. Less fun at times (unfortunately somewhat frequently) was the transition from Grenoble (where I lived at the time) to the Geneva area. The transition was clear when passing through the Mont Sion tunnel: glorious sunshine at the southern end of the tunnel, persistent fog at the northern end... which indeed sometimes lasted the whole week over Archamps.

IV.5.2 Practical work in CERN Labs

There were two mini-workshops at JUAS: Phil Bryant's machine design and Klaus Wille's synchrotron radiation (see Fig. IV.5.9). Students appreciated both, and they met with great success; however, that was "on the accelerator theory side". It occurred to me that, perhaps, an "accelerator technology" style

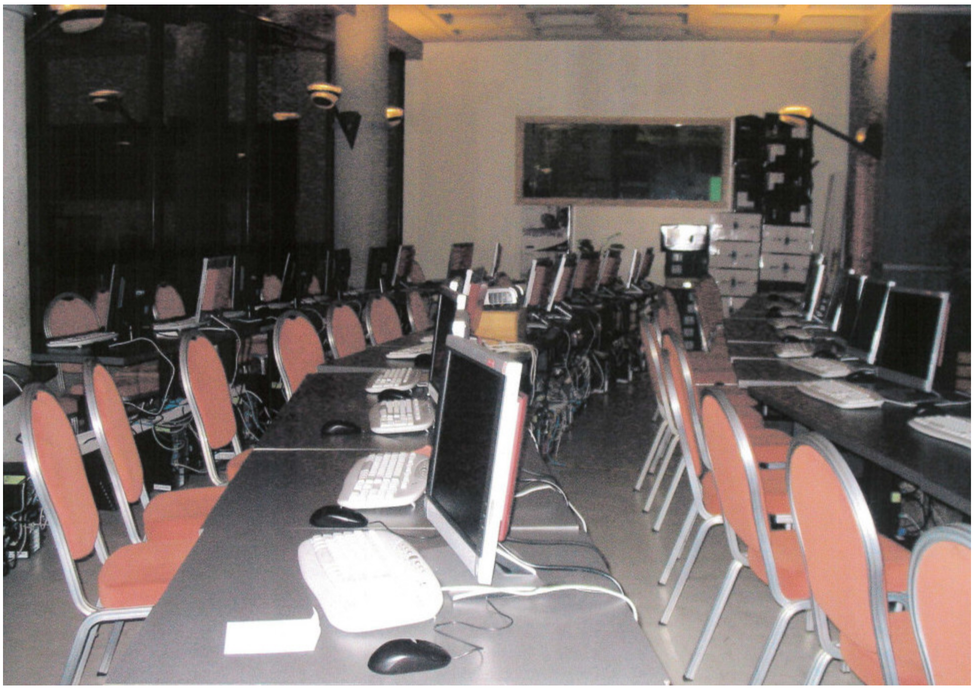


Fig. IV.5.8: The new computer room (JUAS 2007).

of workshop, with a wide scope, was missing; hence me seeking to add to the Bergoz Instrumentation lab day.

I started investigating the possibility of launching “laboratory works”, in CERN labs, as early as during my first JUAS session, January–March 2006. I discussed this with potential tutors there: Fritz Caspers (RF technologies), Amalia Ballarino (high-temperature superconducting materials, cryogenics), Alain Poncet (vacuum), and Walter Venturini (magnets). A visit was paid to Philippe Lebrun, in the company of the President of the ESI, Manfred Buhler-Broglin, and the architecture of the project and its feasibility on CERN side were confirmed. I submitted this proposal to the yearly APC meeting, in March 2006 in Naples. This was approved. At some point later, Stephan Russenschuck, whom I met every week as he was teaching magnets at JUAS, proposed the addition of magnet design tutorials using ROXIE; this did happen, and it took place in Archamps, in the JUAS computer room. Students would be split about evenly between the five different lab activities.

It was recognised that JUAS schedules were dense, and there was too little free time left for the students: “too much to learn, too little time left for understanding” [Ref. JUAS 2006 APC]. The practical work at CERN was no small part—indeed, it was a full day… However, as was discussed at the 2007 APC, it was possible to make this work by suppressing some repeated content; by moving some lectures to seminars; by slimming down or removing a couple of lectures whose content would be covered by the practical work instead; by removing a couple of lectures that students did not like; by removing a couple of visits—out of many—at CERN; the list of “victims” included Future Accelerators, Cryogenics, some Medical Application lectures, etc.

It was agreed by APC 2006 that a version of the new schedule including this new practical work day would be sent by the JUAS Director to the APC for approval prior to communication to the 2007

Fig. IV.5.9: Klaus Wille's synchrotron radiation workshop slides (excerpt).

JUAS session lecturers. An excerpt from the minutes of the JUAS 2007 APC meeting in TU Darmstadt: "[As part of his report, the] JUAS Director gave a quick tour through the content of the work day and presented some photos. Should be continued, because of large interest of students. Nice group dynamics, pleasant atmosphere and a lot of experience! A lot of students have been interested in doing cryogenics. Rearranging of the groups was necessary, but without any problem. CERN members did a good job! Good enthusiasm could be seen at all involved people!"

IV.5.3 JUAS nomenclature

I began work on a JUAS nomenclature leaflet during the 2007 session, essentially to take the temperature with lecturers: Fritz Caspers, Phil Bryant, and others. Phil was quite enthusiastic about such a document (I had strong recommendations from APC 2007: "Take Phil Bryant's notations!" [Luigi Palumbo, APC 2007 minutes], and he invested time with me on that. We used to meet at JUAS and discuss such aspects of a specific (or not) nomenclature as: notations in one matter vs. another matter, CAS vs. JUAS, US notation versus EU notation, USPAS[1] vs. JUAS, whether we would have enough letters in the Greek alphabet, etc.

When we were about happy with a preliminary document, we eventually decided that it would be a good idea to submit it to CAS. Daniel Brandt was in charge at the time; he happened to be quite favorable, to the point of deciding that he would adopt this nomenclature for CAS as well. The joint CAS-JUAS five-page document, which was finalized in 2008 after a few months of work and discussions with the many parties involved, is reproduced at the end of this chapter (see pages 2282–2286).

[1]USPAS: U.S. Particle Accelerator School.

IV.5.4 Reinstating the visit to PSI

PSI has (almost) every possible type of accelerator and application. For this reason, I thought it would be a good idea to allow 1.5 days for a visit there (travelling there in the afternoon and going back to Archamps the following evening). I then learned that the school had previously included a visit to PSI, but it had been cancelled under the previous Director due to a lack of funding. I submitted the idea to the 2006 APC meeting in Napoli; I got a "YES" [Ref. 2006 APC minutes], and we reinstated the activity.

IV.5.5 Summer 2010: leaving

I had been invited in the summer of 2005 to take over the management of JUAS, by Johann Collot, then Director of the CNRS/LPSC laboratory in Grenoble—who, in passing, was the founder of the detector school, ESIPAP, at ESI. Given the aforementioned average lifetime of a JUAS Director, I had five years ahead of me to try and achieve something original and significant for the future of the school. I believe I succeeded, more than once, as noted in the previous sections. I left in 2010 (I actually came back briefly in January 2011 to give my last beam optics lecture), and the only reason for my departure was that I was relocating to a different continent. I would have stayed a couple more years otherwise, although probably not more. As with other teaching or research projects, after a few months or a few years you (well, I) need a change: to move forward, learn more, and see more of the world!

Acknowledgements

I wish to thank Bob Holland and Stéphanie Vandergooten for their help in recovering archived documents, which were of great help in re-establishing the true series of events that marked these five years in the history of JUAS.

Facsimile of the JUAS 2008 nomenclature leaflet

CAS

THE CERN ACCELERATOR SCHOOL

JUAS

THE JOINT UNIVERSITIES ACCELERATOR SCHOOL

Nomenclature & Formulæ

This document has been produced by the Advisory and Programme Committee of the Joint Universities Accelerator School (JUAS), under the coordination of the School Director.

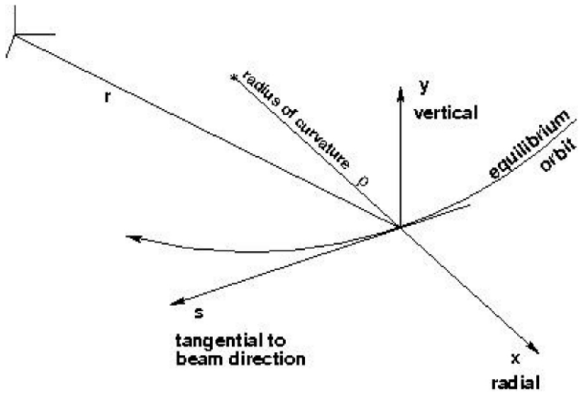
It has been agreed between the two Schools, CAS and JUAS, that it should serve as a guideline for the lectures presented both at the JUAS and CAS courses.

- September 2008 -

Nomenclature & Formulæ

JUAS 2008

Local curvilinear, right-handed coordinate system (*x, y, s*) that follows the beam



Special symbols and conventions

Bold type	denotes a matrix or vector
|**u**|	norm of vector **u**
Suffix $_0$	denotes a reference value, central orbit, rest mass etc.
Suffix ⊥	denotes a transverse value
Suffix //	denotes a parallel value
$\dot{y}$	differentiation with respect to time, d/d*t*
y'	differentiation with respect to a specified variable, usually distance d/d*s*
$\bar{y}$	average value of a variable
<..>	average over a distribution
$_s$	Small changes made to the synchronous ion by an RF device
	Small differences between an ion and the synchronous ion
δ	Small changes caused by energy exchanges between an ion and an electrostatic field

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d, ∂	absolute and partial differentials

Latin symbols

a	radius of inscribed circle defined by magnet poles or electrodes [m]
A_1, B_1, *etc.*	constants
$\boldsymbol{B}$, B_x etc.	magnetic induction [T]
c	speed of light [m s^{-1}]
C	Circumference of a ring lattice [m] ($C = 2\pi R$)
D_x, D_y	dispersion function [m]
e	unit electronic charge [As] or [C]
$\boldsymbol{E}$, E_x etc.	electric field intensity [Vm^{-1}]
E	total energy [eV].

(Note E_0 may be used for the rest mass energy and as electric field amplitude.)

$\boldsymbol{F}$	force [N]
f	frequency [s^{-1}]
g	full gap height in a dipole [m]
h	half gap height in a dipole or radius of inscribed circle in a lens [m]
h	harmonic number for an RF system = revolution period / RF period
k	normalised magnetic gradient ($k = -(|1/B\rho|)(dB_y/dx)_0$) [$m^{-2}$]
k_s	normalised magnetic skew gradient ($k_s = -(|1/B\rho|)(dB_x/dx)_0$) [$m^{-2}$]
K	general focusing constant [m^{-2}]
ℓ	length of an element <u>measured on the equilibrium orbit</u> [m]
L	characteristic length e.g, rectilinear length of a dipole [m]
m, m_0	mass and rest mass [kg]
m	modulation factor for the vanes of an RFQ. ($m = r_{max}/r_{min}$)
M	normalised solenoid field ($M = B_s/(B\rho)$) [m^{-1}]
m, n	integer indices
$\boldsymbol{p}$	momentum [eV/c]
Q_x, Q_y, Q_s	wave numbers
Q'	∂Q / ∂p/p, chromaticity
q	charge ($q = ne$) [As] or [C]

3

r, θ , s	general cylindrical coordinates [m, rad, m]
R	average radius of curvature of a ring lattice [m]
s	axial distance coordinate[m]
t	time [s]
T	transit time factor
T	relativistic kinetic energy [eV]
U	potential function [V]
$\boldsymbol{v}$, v_x etc.	velocity [m s^{-1}]
V	electrode voltage [V]
x, y, s	local curvilinear coordinate system used for the beam [m]
X, Y, Z	survey coordinates [m]

Greek symbols

α_x, α_y, α_s	derivation of the Twiss beta function ($\alpha = -(1/2)d\beta/ds$)

(Note that the suffixes are often omitted for brevity. Note also that there are Twiss functions in the longitudinal plane.)

α_p	momentum compaction function
α, θ	angular deflection [rad]
β_x, β_y, β_s	Twiss betatron amplitude function [m]
β	ratio of particle speed to speed of light ($\beta = v/c$)
η	df/f / dp/p, phase slippage factor
γ_x, γ_y, γ_s	a Twiss function $\gamma = (1 + \alpha^2)/\beta$
γ	Lorentz parameter ($\gamma = m/m_0$)
ε_x, ε_y, ε_s	emittance [m rad], phase space area / π (calculated at 1-$\sigma_{x,y,s}$)
$\varepsilon_{x,n}$, $\varepsilon_{y,n}$, $\varepsilon_{s,n}$	normalised emittances [m rad]
ε	edge angle in 'hard-edge' model [rad]
φ	phase angle [rad]
φ_s	synchronous phase angle [rad]
Φ	potential function [V]
λ	wavelength [m]
Λ	propagation coefficient ($\Lambda = 2\pi/L$)

μ_x, μ_y, μ_s	Twiss phase advances [rad]
ρ	bending radius of trajectory [m]
$1/\rho$	curvature [m^{-1}]
σ_x, σ_y, σ_s or σ_z	1-σ beam size
τ_x, τ_y, τ_s or τ_z	damping times
ξ	$\partial Q/Q$ / $\partial p/p$ = Q'/Q, chromaticity
ω	angular frequency ($\omega = 2\pi f$) [s^{-1}]
Ω, Ω_c	angular frequency and cyclotron frequency [s^{-1}]